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# Cardiovascular Disease Knowledge, Awareness, Perceived Risk, And Hormonal Contraceptive Use Among Female College Students

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# CARDIOVASCULAR DISEASE KNOWLEDGE, AWARENESS, PERCEIVED RISK, AND HORMONAL CONTRACEPTIVE USE AMONG FEMALE COLLEGE STUDENTS

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ABSTRACT

Cardiovascular disease (CVD) is the leading cause of death for men and women of most racial and ethnic groups in the United States (Centers for Disease Control and Prevention, 2012). Over the past 20 years, women have experienced greater levels of CVD mortality compared to men, and specific risk factors for CVD have been identified that are unique to women, including the use of hormonal contraceptives (Corrao et al., 1990; Roger et al., 2011). However, previous research has not addressed knowledge of CVD among college-aged hormonal contraceptive users. Therefore, this cross-sectional study assessed knowledge, awareness, and perceived risk of CVD among college-aged hormonal contraceptive users and non-users through the administration of an online questionnaire. Questionnaires were emailed to all 8,525 undergraduate female students and 658 completed the questionnaire (13% response rate). Of the 658 submissions, 500 met all of the qualification criteria and were used in the final data analysis. Descriptive statistics, Pearson correlation, and one-way ANOVA were performed to analyze the data. An alpha level of .05 was used for all analyses. The sample (n = 500) had a mean age of 20.56 (± 1.44), 79.4% were White, and 58.6% were hormonal contraceptive users. Half (49.2%) of participants correctly identified CVD as the leading cause of death for women. The average CVD knowledge score was 53.4%, and perceived susceptibility and perceived severity of CVD were low (M = 11.4 and 13.2 respectively). The women in this study worried twice as much about breast cancer in comparison to CVD. Moreover, hormonal contraceptive users who smoked had significantly higher knowledge scores than the non-users who were non-smokers, $p$ = .001. Results from this study add to the body of research showing low CVD knowledge and

awareness among young women. Additionally, the results from this study emphasize the importance of ensuring women are properly educated about CVD and the increased risk associated with hormonal contraceptive use. Increasing knowledge and awareness among young women may lead to the engagement in CVD preventative behaviors earlier in life, the safer use of hormonal contraceptives among all women, and further discourage women from initiating smoking.

# DEDICATION

This thesis is dedicated to my family, friends, mentors, and colleagues who have encouraged and supported me throughout my work as a Master's student. I would not be where I am today without their continued guidance and support.

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TABLE OF CONTENTS

TABLE OF CONTENTS CONT.

TABLE OF CONTENTS CONT.

LIST OF TABLES

# CHAPTER I:
# INTRODUCTION

## Background of the Problem

Cardiovascular disease (CVD) is the leading cause of death worldwide, and more people die from CVD annually than any other cause (World Health Organization [WHO], 2014). According to the American Heart Association (AHA), CVD is a comprehensive term used to describe numerous health conditions related to the heart and blood vessels. CVD encompasses numerous disorders including hypertension, coronary artery disease, myocardial infarction, and stroke (AHA, 2014a; WHO, 2014). In 2008, an estimated 17.3 million people died from CVD related events, comprising 30% of all global deaths during that year (WHO, 2014). The WHO (2014) estimates that if disease trends continue, by the year 2030 CVD will remain the single leading cause of death worldwide and will be responsible for approximately 23.6 million deaths each year.

According to the National Vital Statistics Reports (2012) data concerning deaths in the United States, CVD was the leading cause of death for men and women of most racial and ethnic groups, including African Americans, Hispanics, and Whites. In regards to American Indians, Alaska Natives, and Asian or Pacific Islanders, CVD is second only to cancer (Centers for Disease Control [CDC], 2012a). Approximately 600,000 deaths in the United States each year are attributable to CVD, which represents one in every four deaths. Coronary heart disease is the most common of the CVD disorders, and kills more than 385,000 Americans annually. The

economic burden of coronary heart disease alone totals to approximately $109 billion each year. Even though CVD is the leading cause of death for both men and women, women have been disproportionately affected by CVD. Information from the AHA indicates that the number of CVD related deaths for men declined from 1980 to 2007. Conversely, in regards to women, CVD deaths remained stagnant or increased slightly during the same 20 year time period (Roger et al., 2011; Rosamond et al., 2008). Therefore, according to this information, the number of deaths attributable to CVD for women has exceeded those for men over the past 20 years (Roger et al., 2011; Rosamond et al., 2008).

## CVD Risk Factors

The AHA has identified numerous risk factors associated with the development of CVD throughout an individual's lifetime (AHA, 2014a). Risk factors for CVD include modifiable and non-modifiable components. The non-modifiable risk factors include age, race, gender, and heredity, whereas the modifiable components involve behaviors and conditions, such as cigarette smoking, high serum cholesterol, hypertension, obesity, and diabetes mellitus (AHA, 2014a). Men and women share the aforementioned risk factors, but risk factors exist that are unique to women. These specific risk factors include the use of hormonal contraceptives, menopause, and post-menopausal hormone treatment (Corrao, Becker, Ockene, & Hamilton, 1990). Research has indicated that regular use of hormonal contraceptives may increase the risk of CVD in some women (Plu-Bureau, Hugon-Rodin, Maitrot-Mantelet, & Canonico, 2013). This risk is also exacerbated in women who engage in certain lifestyle behaviors, such as smoking cigarettes, where overall risk may be increased by as much as 20% (AHA, 2014a).

The most common major adverse effect of hormonal contraceptive use is an increase in the incidence of diseases related to CVD (Farley, Meirik, & Collins, 1999). Research has shown that hormonal contraceptive use contributes to a substantial number of cardiac events among young women aged 15 to 44 years (Farley, Meirik, & Collins, 1999). Considering that hormonal contraceptives are used by more than 80% of women in their lifetime, the regular use of these medications is a unique and important CVD risk factor to identify among women (Plu-Bureau et al., 2013).

The National Health Statistics Reports (2012) stated that among women aged 15 to 24 years, 62.8% used hormonal contraceptive medication as their primary method of contraception. As women increased in age, however, the use of hormonal contraceptives decreased. Among women aged 25 to 44 years, only 25.7% used hormonal contraception for birth control. The report also revealed that hormonal contraceptive use has increased significantly in recent years among all age groups. Considering a substantial number of young women in the United States are using hormonal contraceptives as a birth control method, it is crucial that women recognize the benefits and risks associated with the use of these medications, including the increase in CVD risk (CDC, 2012b).

## CVD Knowledge and Awareness

Despite the impact of CVD on mortality among women, many women are not aware that CVD is the leading cause of death for women (CDC, 2013b). Research conducted to assess awareness of CVD has shown low levels of knowledge and awareness concerning CVD among women, particularly in reference to correctly identifying CVD as the leading cause of death (Jensen & Moser, 2008; Marcuccio, Loving, Bennett, & Hayes, 2003; Mosca et al., 2000; Mosca,

Ferris, Fabunmi, & Robertson, 2004). Mosca, Mochari-Greenberger, Dolor, Newby, & Robb (2010) found that among 1,158 women surveyed in the year 2009, only 54% correctly identified CVD as the leading cause of death for women. The results of this survey were compared to data collected in previous years (1997, 2000, 2003, and 2006). Awareness has significantly increased since 1997 (30%), but has stabilized in recent years. Moreover, results from the 2009 sample indicated a decrease in awareness (54%) when compared to the 2006 study sample (57%).

Lack of knowledge regarding CVD is also apparent among young adults. The Coronary Artery Risk in Young Adults (CARDIA) study found that overall CVD knowledge among young men and women aged 18 to 30 years is very low (Lynch, Liu, Kiefe, & Greenland, 2006). Other studies among college-aged students have also shown lack of knowledge and perceived risk of CVD among this age group (Collins, Dantico, Shearer, & Mossman, 2004; Frost, 1992; Vale, 2000). Collins and colleagues (2004) reported low levels of knowledge regarding CVD among college students compared to other diseases, including STD's and psychological disorders. Furthermore, students indicated a lower perception of CVD for women when compared to men and inaccurately perceived breast cancer as a more important health concern for women than CVD. The results of this study illustrate the pervasive knowledge gap that exists concerning CVD in this age group. Ensuring that college students and young adults are educated concerning CVD is especially important, considering the most effective methods of CVD prevention begin early in life (Collins et al., 2004).

## CVD Risk Perception

Lack of perceived risk for CVD is not only apparent in college students but also among women of all ages (Covello & Peters, 2002; DiLorenzo et al., 2006; Mosca et al., 2000; Wilcox

et al., 2002; Wang et al., 2009). In studies analyzing risk perception for various chronic diseases, women tend to have an optimistic bias in regards to CVD risk and consistently display heightened levels of worry and risk in regards to breast cancer (Mosca et al., 2000; Mosca et al., 2004; Smith et al., 2012; Wilcox et al., 2002). Smith and colleagues (1996) found that women under the age of 30 years overestimated their risk of developing breast cancer in the next 10 years by over 72-fold. Along with lack of awareness of CVD risk, misperceptions of breast cancer risk may inadvertently influence women to underestimate their risk for CVD. If women do not identify or perceive CVD as a significant health problem, they may fail to engage in preventative behavior or seek out early care and advice to combat CVD morbidity and mortality (Smith et al., 2012).

## Significance of the Study

Despite the common misconception of CVD as a disease of the elderly, the National Vital Statistics Reports (2012) rank diseases of the heart as the fifth leading cause of death among teenagers and young adults aged 15 to 24 years (CDC, 2012a). It is well documented that CVD risk factors are developed early in life and transcend into adulthood (Berenson et al., 1998; Collins et al., 2004; Muñoz et al., 2010; Strong et al., 1999). Furthermore, health promotion research suggests that the college years are an important time to increase CVD awareness and to promote preventative behaviors for CVD (Dinger & Waigandt, 1997; Von Ah et al., 2004).

As demonstrated in the preceding discussion, it is well established that young women lack knowledge and awareness concerning CVD and its related risk factors (Frost, 1992; Lynch et al., 2006; Vale, 2000). Research has also shown that women in the same age group lack an appreciation for the risk of developing CVD during their lifetime (Collins et al., 2004; Smith et

al., 1996; Smith et al., 2012). However, previous research has not addressed CVD knowledge and perceived risk among certain groups that may be at an increased risk for CVD, most importantly, hormonal contraceptive users.

Hormonal contraceptives have been shown to contribute to the majority of cardiac events occurring among young women aged 15 to 44 years (Farley, Meirik, & Collins, 1999). Additionally, women aged 15 to 24 years constitute the largest proportion of hormonal contraceptive users in the United States, demonstrating significantly higher usage when compared to all other age groups (CDC, 2012b). In order for this group of women to make informed healthcare decisions in regards to CVD prevention, they must not only be knowledgeable concerning CVD but also concurrently perceive themselves at risk for CVD.

## Statement of Purpose

The present study focused on CVD knowledge and health beliefs among young women in a university setting. The primary purpose of this research was to determine CVD knowledge, awareness, perceived risk, and hormonal contraceptive use among college-aged women. Additionally, the study examined if any differences exist in CVD knowledge concerning hormonal contraceptive use between hormonal contraceptive users and non-users in the college population. Current smoking behavior was also ascertained in order to determine if differences exist in knowledge and risk perception. To the researcher's knowledge, this is the first study focusing on CVD knowledge and risk perception among college-aged hormonal contraceptive users. Therefore, this study contributes to the literature concerning CVD knowledge and risk perception among young women.

## Significance to Health Promotion and Education

The information obtained in this research study contributes to the profession of health promotion and education in various ways. Through the assessment of CVD knowledge, awareness, and risk perception among young hormonal contraceptive users, health promotion and education professionals can receive invaluable information to guide the development, implementation, and evaluation of CVD prevention programs for this population. The information acquired in this study also highlights a unique population for future CVD prevention efforts to focus on. Moreover, considering health educators work in various settings, including healthcare, community, and university locations, health education practitioners can utilize the findings of this study for promotion and prevention of CVD in their respective entities.

## Research Questions

The following research questions were posed in this research study:

1. What is the level of CVD awareness among college-aged women?
2. What is the level of CVD knowledge among college-aged women?
3. What is the level of CVD knowledge concerning hormonal contraceptive use among college-aged women?
4. What is the perceived risk of CVD among college-aged women?
5. What is the association between CVD knowledge and perceived risk of CVD?
6. Is there a significant difference in CVD knowledge concerning hormonal contraceptive use between college-aged hormonal contraceptive users and non-users?

## Hypotheses

For data analysis, participants were separated into four groups: Group 1 included hormonal contraceptive users who do not smoke, Group 2 included hormonal contraceptive users who smoke, Group 3 included non-users who do not smoke, and Group 4 included non-users who smoke.

Ho1: There is no significant relationship between CVD knowledge, CVD knowledge concerning hormonal contraceptives, and perceived risk.

Ho2: There is no significant difference in CVD knowledge concerning hormonal contraceptive use between groups.

## Operational Definitions

In this research study, study concepts were operationalized as follows:

1. *CVD Knowledge* is an individual's understanding of risk factors, symptomology, and medical knowledge in regards to CVD prevention, onset, and treatment. CVD knowledge will be measured using a modified version of the Heart Disease Knowledge Questionnaire (Bergman, Reeve, Moser, Scholl, & Klein, 2011);
2. *Awareness of CVD* refers to an individual's ability to identify CVD as a significant and important public health problem for women. Awareness will be measured through the correct identification of CVD as the leading cause of death for women in the United States and questions addressing women's health issues from the AHA's Women's Health Study Survey (Mosca, Hammond, Mochari-Greenberger, Towfighi, & Albert, 2013);

3. *Perceived Risk of CVD* is defined as the individual's perception that she is at risk for CVD. Perceived risk will be measured using the Risk Perceptions Related to Cardiovascular Disease Scale (Tovar, Rayens, Clark, & Nguyen, 2010);
4. *Demographic Variables* refer to any modifying factors that may affect an individual's knowledge and perceptions concerning CVD. Several demographic variables will be measured by the researcher, including: age, gender, and race/ethnicity. Additionally, hormonal contraceptive use, smoking status, family history of CVD, and CVD knowledge will be ascertained.

# CHAPTER II:
# REVIEW OF THE LITERATURE

## Introduction

Cardiovascular disease (CVD) is the leading cause of death in the United States for both men and women of most racial and ethnic groups (Rosamond et al., 2008; Plu-Bureau, Hugon-Rodin, Maitrot-Mantelet, & Canonico, 2013). The term CVD encompasses a wide range of cardiac events resulting from the over accumulation of plaque in the arteries. Cardiac events related to CVD include myocardial infarction, stroke, and coronary artery disease. According to the American Heart Association (AHA), death rates attributable to CVD declined 31% in the ten-year span from 2000 to 2010. Nevertheless, even with the decrease observed for CVD in recent years, approximately 600,000 deaths in the United States each year are attributable to CVD, representing one in every four deaths. The economic burden of coronary heart disease alone totals to approximately $109 billion each year. This total cost incorporates the cost of health care services, medications, and lost productivity (CDC, 2013a). If these disease trends continue, by the year 2030, annual healthcare costs of CVD are projected to increase to approximately $900 billion (American Heart Association [AHA], 2014b).

## CVD Gender Disparities

A common misconception lies in the assumption that CVD disproportionately affects men in comparison to women. However, over the past 20 years, women have experienced greater

mortality levels from CVD compared to men, and the rate of CVD mortality for women less than 50 years of age is twice that of men in the same age classification (Roger et al., 2011; Vaccarino et al., 1999). CVD claimed approximately 400,000 deaths in the year 2010 among women living in the United States. This number is equivalent to the combined female deaths from cancer, Alzheimer's disease, and chronic lower respiratory disease for that year. For various reasons, many Americans are under the inaccurate impression that breast cancer is the most common cause of death and greatest health concern among women. However, in the year 2010, breast cancer was associated with one in 30 deaths, whereas CVD was responsible for one in every seven deaths among women (AHA, 2014).

As seen in patterns with men, the annual incidence of cardiac events associated with CVD among women increases in concurrence with age (Rosamond et al., 2008). Approximately two out of every million women aged 30 to 34 years suffer a myocardial infarction yearly, and this number increases to 20 per million among women aged 40 to 44 years (Farley, Meirik, & Collins, 1999). The same pattern is demonstrated in respect to annual stroke incidence in women (6 per million from age 20 to 24 years, 10 per million from age 30 to 34 years, and 16 per million from age 40 to 44 years). Even though the risk associated with these events increases as women age, young women are still susceptible to experiencing potentially fatal cardiac events. Furthermore, the lifelong impact of CVD is rooted in lifestyle and behavioral factors established during adolescence and young adulthood (Farley et al., 1999).

## CVD Risk Factors

The AHA has identified numerous risk factors associated with CVD. Risk factors for CVD include non-modifiable components, such as age, race, and heredity, and modifiable lifestyle risk factors (AHA, 2014). Modifiable risk factors include behaviors such as cigarette smoking and physical inactivity, as well as conditions, such as high blood cholesterol, hypertension, diabetes mellitus, and obesity (AHA, 2014). Men and women share many of the risk factors for CVD, including age, hypertension, cigarette smoking, diabetes, obesity, and family history (AHA, 2014). Risk factors that are unique to women include the use of hormonal contraceptives, menopause, and post-menopausal hormone treatment (Corrao, Becker, Ockene, & Hamilton, 1990). Even though the use of hormonal contraceptives is considered a safe and reliable method of birth control, research has shown that regular use may cause an increased risk of CVD in some women (Plu-Bureau, Hugon-Rodin, Maitrot-Mantelet, & Canonico, 2013). This risk is especially important in women who already have one or more risk factors for CVD or have been previously diagnosed with CVD. Certain lifestyle choices combined with hormonal contraceptive use may also amplify CVD risk (AHA, 2014). For example, the combination of smoking and the simultaneous use of hormonal birth control increase the overall risk of CVD by 20% in women (AHA, 2014).

Even though there is an increased risk of CVD related events in women who use hormonal contraceptives, the risk is still fairly low for seemingly healthy women under the age of 35 years who do not smoke (Farley et al., 1998). Considering the fairly low risk for healthy women, professionals do not discourage use of hormonal contraceptives, as they are considered extremely effective methods of birth control, but rather advise women to recognize the risk involved with the regular use of these medications. If women are unaware that they are at risk for

CVD or are unable to correctly identify risk factors associated with CVD, they may not be capable of making appropriately informed decisions regarding their health, especially in regards to healthcare decisions and engagement in preventive behavior.

## Hormonal Contraceptives and CVD Risk

Over 10,000 women of reproductive age (15 to 44 years) are diagnosed with myocardial infarction or suffer a fatal cardiac event annually in the United States (Rosamond et al., 2008). Moreover, the use of hormonal contraceptives contributes to a substantial number of the arterial events reported among young women (Farley et al., 1999). Hormonal contraceptives delivered through oral, transdermal, and vaginal routes of administration are the most commonly prescribed and utilized birth control methods by women in the United States. Approximately four out of every five sexually active women have used hormonal contraceptives at some point during their lifetime (CDC, 2013). National data show that hormonal contraceptives are used by approximately 80% of women at some point during their reproductive years (Plu-Bureau et al., 2013).

The National Health Statistics Reports (2012) collected data concerning the method of contraception used by women nationwide and classified use by various factors, including age, race, marital status, and education level. Data utilized in the analysis were collected from the years 2006 to 2010 and were compared to similar data obtained in 1995. According to this report, the use of hormonal contraceptives is prominent among women and is the predominantly preferred method of contraception among women less than 24 years of age. In 2010, 62.8% of women aged 15 to 24 years designated the hormonal contraceptive pill or another form of hormonal contraceptive (implant, injectable shot, contraceptive patch, or contraceptive ring) as

their primary birth control method. The remainder of women using contraception in this age group chose condoms (23.6%), intrauterine devices (4.6%), periodic abstinence (0.3%), or other methods (6.4%) as their contraception of choice. Conversely, women aged 25 to 44 years reported much lower use of hormonal contraceptives (25.7%). The primary method of contraception for this age group was female sterilization (34.4%), and the remainder of women indicated condoms (14.1%), intrauterine devices (5.9%), periodic abstinence (1.4%), or other methods (5.5%) as their primary method. Additionally, data indicated that white women, women in their teens and 20's, never-married women, cohabitating women, childless women, and college graduates were most likely to use hormonal contraceptives over other methods.

The National Health and Statistics Report (2012) also denoted changes in contraception use among women between data collected in the 1995 and 2006-2010 surveys. Comparisons revealed significant changes, including an increase in the number of women currently using intrauterine devices (IUDs) and other non-oral hormonal methods. A decrease in the number of women indicating condoms as their current method of choice was also observed. Considering increases in hormonal contraceptive use among all age groups were observed, it is imperative that women recognize all aspects of the benefit/risk profile associated with hormonal contraceptive use, including the increase in CVD risk (CDC, 2012b).

## Generations of Hormonal Contraceptives

When hormonal contraceptives were introduced over 50 years ago, most hormonal contraceptives delivered a daily dose of 50 micrograms of ethinylestradiol or mestranol, a synthetic form of the female sex hormone estrogen. These formulations of hormonal contraceptives are now referred to as first generation contraceptives. Early epidemiological

studies analyzing the side effects of first generation hormonal contraceptives indicated a significantly increased risk of cardiovascular disease among women prescribed the medication (Bailargeon, McClish, Essah, & Nestler, 2005; Khader, Rice, John, & Abueita 2003; Chan et al., 2004; Gillum, Mamidipudi, & Johnston, 2000). These investigations led to changes in the composition of hormonal contraceptives, leading to the creation of modern, low-dose second and third generation hormonal contraceptives containing 35 to 15 micrograms of ethinylestradiol or estradiol. The new hormonal contraceptives also contain progestins, which work in concordance with estrogen to regulate the female menstrual cycle (Bitzer & Simon, 2011). First generation hormonal contraceptives are no longer available due to the detrimental effects observed by their regular use. Currently, prescribed hormonal contraceptives are classified as either second or third generation pills, and in recent years, non-oral methods of contraception, including the transdermal patch and vaginal ring, have been introduced as additional options for consumers (Plu-Bureau et al., 2013).

Plu-Bureau et al. (2013) assessed the relative risk of MI according to the composition of the hormonal contraceptive (first, second, or third generation). A meta-analysis of seven studies resulted in a pooled odds ratio of 2.9 (95% CI: 2.1-4.1) for first generation users, 2.1 (95% CI: 1.7-2.4) for second generation users, and 1.8 (95% CI: 1.6-2.1) for third generation users respectively. Results from this investigation indicate that when compared with non-users, users of first, second, and third generation hormonal contraceptives have an increased risk of MI. Additionally, differences were also noted between generations of hormonal contraceptives. The pooled odds ratio among first generation users and third generation users was found to be significantly different ($p < 0.01$); however, no significance was found between first and second generation users ($p = 0.09$) and second and third generation users ($p = 0.23$). Even though it is

known that second and third generation pills contain lower doses of progestin and/or estrogen, researchers are currently unable to attribute the significant difference in risk between first generation pills and other generation contraceptives to the change in hormone dosage (Plu-Bureau et al., 2013).

## Hormonal Contraceptive Use and Risk of CVD Related Events

The AHA has identified myocardial infarction (MI) as one of the detrimental outcomes of CVD. The risk of MI associated with the use of hormonal contraceptives has been assessed in numerous studies. Plu-Bureau and colleagues (2013) conducted a meta-analysis of relative risk for MI among hormonal contraceptive users from study results published after the year 1990. Eleven studies and their reported odds ratios were evaluated in the meta-analysis and produced a pooled odds ratio of 1.7 (95% Confidence Interval [CI]: 1.2-2.3), indicating a statistically significant increase in the risk of MI among hormonal contraceptive users compared to non-hormonal contraceptive users. The pooled odds ratio of 1.7 aligns with results reported in previous meta-analyses, which include users of first generation hormonal contraceptives (Bailargeon et al., 2005; Khader et al., 2003). Dunn et al. (1999) also assessed the risk of dying from MI among hormonal contraceptive users. While the overall absolute risk is still quite low, results indicated a slightly increased risk of death from MI for users of hormonal contraceptives (Dunn et al., 1999).

A review of epidemiological studies, including women after the introduction of third generation hormonal contraceptives, showed a significantly increased risk of ischemic stroke among current users (Plu-Bureau et al., 2013). A meta-analysis of fourteen publications after the year 1990 revealed a pooled odds ratio for ischemic stroke of 1.8 (95% CI: 1.2-2.8) for current

hormonal contraceptive users when compared to non-users. As stated previously, researchers are currently unable to determine if the difference in risk from first generation pills to second and third generation pills is due to the changing of progestin and/or estrogen doses (Plu-Bureau et al., 2013).

Another outcome involving the use of hormonal contraceptives and CVD risk is venous thromboembolism (VTE). VTE occurs when a blood clot formed within a vein breaks off into the bloodstream, potentially causing a life-threatening embolism (Saha et al., 2011). Previous literature has supported the hypothesis that the use of hormonal contraceptives increases the risk of VTE in women, and recent publications including second and third generation contraception users have found similar results to support this finding (Lidegaard et al., 2002).

Reported odds ratios for VTE risk in hormonal contraceptive users range from as low as 2.1 (95% CI : 1.3-3.50) to as high as 5.1 (95% CI: 1.2-21.4) (Bloemenkamp, Helmerhorst, Rosendaal, Vandenbroucke, & Buller, 1995; Bloemenkamp et al., 1999; Farmer, Lawrenson, Thompson, Kennedy, & Hambleton, 1997; Lewis et al., 1999; Lidegaard, Edstrom, & Kreiner,1998; Parkin, Skagg, Wilson, Herbison, & Paul, 2000; Poulter et al., 1997; Spitzer, Lewis, Heinemann, Thorogood, & MacRae, 1996). Lidegaard, Edstrom, and Kreiner (2002) evaluated the effects of hormonal contraceptives on VTE risk in a 5-year case control study among Danish women. Results from the study indicated second generation contraceptives increased the risk of VTE 2.9 times among their study population, and third generation contraceptive users experienced a 4 times increased risk of VTE.

New routes of administration for hormonal contraceptives have been introduced in recent years, including the transdermal patch and vaginal ring (Plu-Bureau et al., 2013). Considering the recent introduction of these products to consumers, limited information is available regarding

cardiovascular risk by route of administration, and the literature varies in conclusions regarding the difference in risk. In regards to MI risk, Lidegaard (2012) found a relative risk for MI of 2.08 (95% CI: 0.67-6.48) among women currently using the vaginal ring. This relative risk was slightly higher than those cited for second and third generation hormonal contraceptive users (2.0 [95% CI: 1.6-2.5] and 1.9 [95% CI: 1.7-2.3] respectively). The same study also stated that the risk of stroke was 3.15 (95% CI: 0.79-12.6) among women using the contraceptive patch and 2.49 (95% CI: 1.41-4.41) for women using the vaginal ring. Lidegaard (2012) concluded that in respect to CVD risk, the non-oral route was not considered a safer alternative to the traditionally prescribed oral methods.

Another large, national cohort study conducted by the Food and Drug Administration (FDA) analyzed the difference in CVD risk in reference to the route of administration (Sidney et al., 2012). The retrospective cohort study involved 835,826 women aged 10 to 55 years and amassed 898,251 person-years of hormonal contraceptive use from January 1, 2001 to December 31, 2007. Data for the investigation was ascertained from medical records. The study endpoints included hospitalized acute MI, hospitalized ischemic stroke, hospitalized VTE, and CVD mortality. Study results showed no difference in MI or ischemic stroke risk among women currently using non-oral hormonal contraceptives when compared to women using oral methods. However, differences in risk were noted for VTE among users of the contraceptive patch and vaginal ring. A significant interaction with age was also observed. Women less than 35 years of age using the aforementioned non-oral methods were at a significantly higher risk of VTE in comparison to non-oral users over the age of 35 (Sidney et al., 2012).

Even though results of the aforementioned studies indicate an increase in CVD risk for users of non-oral methods, it is important to note that when analyzing risk for users of these new

routes of administration, one must consider that the number of women using these methods is considerably smaller than women using traditional oral methods (Lidegaard, 2012). Drug compliance concerns may also influence a woman's choice of a non-oral hormonal contraceptive over the traditional oral methods. Preference of non-oral methods may stem from the belief among women that these options are not as easy to forget as the oral pill rather than from concerns about potential side effects (Merki-Feld & Gruber, 2013). It is possible that women who have concerns such as these may have a different CVD risk profile. Therefore, precautions must be made when making conclusions after reading the small body of literature available that includes non-oral hormonal contraceptives.

## Hormonal Contraceptives, Smoking, and CVD Risk

The combination of cigarette smoking and the use of hormonal contraceptives has been shown to synergistically increase the CVD risk discussed in the aforementioned sections. Previous studies have demonstrated the effects of the simultaneous use of both substances (Pomp, Rosendaal, & Doggen, 2007; Tanis et al., 2001; Webber et al., 1982). The Bogalusa Heart Study, an ongoing biracial (African American and Caucasian) study of children in Louisiana analyzing the early history of CVD, assessed the effects of smoking cigarettes and hormonal contraceptive use among adolescents. Results suggested that adolescent females who smoked cigarettes and used hormonal contraceptives had higher total cholesterol levels when compared to non-users. The authors suggested that the potential biological mechanism for the increased CVD risk is related to a lipid response to smoking cigarettes and hormonal contraceptive use (Weber et al., 1982).

Other studies have shown increased risk for both MI and VTE in hormonal contraceptive users who also smoke cigarettes (Pomp et al., 2007; Tanis et al., 2001). Tanis et al. (2001) assessed the effects of the combination of hormonal contraceptive use with traditionally identified CVD risk factors (current smoking, diabetes, and hypertension) in a population-based, case-control study. Among women currently using hormonal contraceptives, a 13.6 odds ratio was reported among those who had smoked, whereas among women who had not smoked the relative risk of an MI was 3.1. Lidegaard and colleagues (2002) also noted significantly increased risk of VTE in hormonal contraceptive users who smoked cigarettes. Women who smoked more than 10 cigarettes per day experienced a 71% increase in VTE risk. Moreover, a 94% increased risk was observed for women who smoked more than 20 cigarettes per day.

Similarly, Romp, Rosendaal, and Doggen (2008) utilized MEGA, a population-based, case-control study, to evaluate the combined effect of smoking and hormonal contraceptive use as a risk factor for VTE. Results indicated an increased risk not only between non-hormonal contraceptive using smokers and non-smokers but also between hormonal contraceptive using smokers and non-smokers. An 8.8-fold higher risk was reported for smokers currently using hormonal contraceptives when compared to non-smoking hormonal contraceptive users. Conclusions from this study indicate that smoking appears to be a significant risk factor for venous thrombosis. Furthermore, the authors reported that smoking demonstrates the greatest effect on young women who participate in the simultaneous use of hormonal contraceptives and smoking cigarettes.

As discussed previously, cigarette smoking exacerbates the CVD risk associated with the use of hormonal contraceptives. Cigarette smoking alone increases the risk for certain cardiac events (MI and venous thrombosis), and the synergistic effect of smoking cigarettes and

hormonal contraceptive use is considerably more harmful. Even though the risk of CVD related events in hormonal contraceptive users is small in absolute terms, it has an important effect on women's health, since approximately 35 to 45% of women of reproductive age use hormonal contraceptives as their primary method of birth control. Moreover, it is suggested that when prescribing hormonal contraceptives to women, the single most important advice practitioners can provide to women is to refrain from smoking cigarettes (Tanis et al., 2001).

## Methodology of the Literature Review

The following review of literature focuses on recent studies concerning the prospective study's key variables: knowledge, awareness, and perceived risk of CVD. A literature search was performed using three databases: EBSCO, GoogleScholar, and PubMed. The primary search terms used in various combinations were cardiovascular disease, heart disease, hormonal contraceptives, perceived risk, knowledge, awareness, college students, young adults, and women. The search was restricted to articles published in the last 20 years, in order to include seminal research in CVD knowledge and risk perception among college students. Articles included in the search ranged from the year 1990 to present. The search was restricted to journal articles published in English. Articles discussing CVD knowledge, awareness, and perception of risk among young adults and women were included in the search. Conversely, articles were excluded if: (1) the results of the article were not relevant to the purpose of the review; (2) the article assessed prevalence of CVD in college students; (3) the article focused on CVD knowledge, awareness, or risk perception in a different population than young adults; and (4) the study was not conducted in the United States.

The electronic database search resulted in 240 potential citations for review. All of the citations were reviewed, and after review, 150 were excluded based on the aforementioned exclusion criteria. The abstracts of the remaining 90 articles were screened and 35 were deemed suitable for inclusion in the literature review. In conjunction with the database search, the reference lists of articles selected for review were manually searched for potentially relevant articles. Thirty articles and their respective citations were read in their entirety, and 17 were selected for inclusion in the final literature review below. A summary of the reviewed studies is included in Table 1.

## Cardiovascular Disease Knowledge and Awareness

As stated previously, CVD is a significant public health problem for men and women of most racial/ethnic groups in the United States (CDC, 2013). Despite the significant problem of CVD among women, gaps in knowledge regarding CVD among women have continuously been identified in research assessing knowledge, attitudes, and beliefs about CVD and/or related risk factors (Jensen and Moser, 2008). Studies have indicated that minimal numbers of women are able to correctly identify CVD as the leading cause of death in women and have shown gender to significantly influence CVD knowledge and awareness. Results vary from as little as 8% to 46% of participants correctly identifying CVD as the leading cause of death for women (Marcuccio, Loving, Bennett, & Hayes, 2003; Mosca et al., 2000; Mosca, Ferris, Fabunmi, & Robertson, 2004). Other factors have also been shown to influence differences in CVD awareness among women, including racial/ethnic minority status and age (Mochari-Greenberger, Miller, & Mosca, 2012). In a study conducted by Mochari-Greenberger and colleagues (2012), African American and Hispanic women were 66% less likely than white women to accurately denote CVD as the

leading cause of death in women. Additionally, the same study showed that young women (< 55 years) displayed less awareness and access to information regarding CVD than their older counterparts.

Mosca et al. (2000) utilized a national telephone survey in 1997 to assess (1) knowledge of CVD risk factors and (2) perceptions of CVD and its prevention among women in the United States. Results showed minimal knowledge among respondents of all racial/ethnic groups regarding CVD risk. Only 8% of women identified CVD/stroke as their greatest health concern, and less than 33% of the respondents correctly identified CVD as the leading cause of death for women. Women aged 25 to 44 years indicated that they were not well informed about heart disease and stroke. Moreover, even though 90% of participants displayed an interest in discussing CVD with their primary care physician, more than 70% reported never having this conversation with their physician.

Mosca and colleagues (2004) extended the research from 1997 and 2000 through administering a follow-up assessment of knowledge, awareness, and perceptions of CVD among women in the United States. This assessment was important considering the AHA implemented a national CVD awareness campaign for women in 1997. A telephone survey was administered in June and July 2003 to households across the United States utilizing an intentional oversampling of African American and Hispanic women. Results indicated that CVD awareness had significantly increased since 1997, but awareness was still fairly low. In 2003, 46% of women identified CVD as the leading cause of death in women, which improved from 30% in 1997 ($p < 0.05$) and 34% in 2000 ($p < 0.05$). African American, Hispanic, and younger women (< 45 years old) had lower awareness of CVD than white and older women. Additionally, in 2009 a 12-year follow-up to the initial investigation revealed similar findings. Reports showed that even though

a significant increase in knowledge regarding CVD had occurred since 1997, awareness levels are beginning to stabilize and are still lacking in racial/ethnic minorities and younger women (Mosca, Mochari-Greenberger, Dolor, Newby, & Robb, 2010). Therefore, the authors suggested that future educational interventions focus not only on women but also on minorities and younger women.

Furthermore, Marcuccio and colleagues (2003) denoted a CVD knowledge gap among women with previous diagnosis of CVD. The researchers administered a telephone survey to 204 women with self-reported previous diagnosis of CVD. The survey utilized open-ended questions to assess various aspects of CVD knowledge, including the participants' diagnoses, symptoms, interactions with the health care system, knowledge of risks and symptoms, satisfaction with care, and the effect of the disease on their lifestyle, psychosocial well-being, finances, interpersonal relationships, and spirituality. Almost half of the women were unaware of their individual risk for CVD prior to diagnosis, and after diagnosis, one-fourth of the women did not seek out additional information concerning their diagnosis or treatment options. Astoundingly, despite their lack of awareness concerning their own personal risk, many of these same women were able to identify that the men in their family were at risk for developing CVD.

## CVD Knowledge among College Students

Low levels of heart health knowledge are not only seen in older adults but have also been identified among young adults, including college students. Seminal research in the area of CVD knowledge and risk perception among college students revealed mixed results in regards to knowledge, but highlighted the lack of appreciation for CVD risk among this age group (Frost, 1992; Vale, 2000). Frost (1992) revealed that even though college students displayed adequate

knowledge regarding CVD related risk factors, such as hypertension, smoking, and cholesterol level, the students did not engage in proper preventative behavior to combat CVD. Results also indicated that college students generally seek health information from traditional sources, predominantly primary care physicians. Vale (2000) further reported that some risk factors are better known among young adults than others. Smoking, high cholesterol, and family history displayed the highest level of awareness, whereas this population did not as readily identify hypertension and a sedentary lifestyle as significant risk factors for CVD.

The Coronary Artery Risk in Young Adults (CARDIA) study was a multicenter, longitudinal study conducted to assess the knowledge of CVD risk factors and the relationship between knowledge and changes in CVD risk among urban young adults aged 18 to 30 years (Lynch et al., 2006). Participants included Caucasian and African American young adults with varying educational backgrounds. Study results indicated that knowledge of CVD among these young adults was very low. Results also indicated that knowledge increased concordantly with the presence of risk factors, as higher levels of knowledge were apparent in individuals reporting current risk factors for CVD.

Collins, Dantico, Shearer, and Mossman (2004) assessed heart disease awareness and perceptions among college students and reported similar information regarding knowledge levels as the aforementioned studies among older women. The study sample included both male and female respondents representing various racial/ethnic groups. Overall, the survey population showed very little knowledge regarding CVD and denoted limited access to information concerning CVD as a barrier to CVD prevention. When prompted to identify the health issue they knew the most about, the largest number of respondents selected sexually transmitted diseases (37%), followed by psychological disorders (32%) and cancer (15%). Respondents

reported the least amount of knowledge regarding heart disease (8%) and diabetes (7%), demonstrating a large knowledge gap among this population in respect to CVD. The majority of students believed that women had a relatively low risk of developing CVD at some point in their lifetime and inaccurately designated breast cancer to be the leading cause of death among women. However, students overwhelmingly correctly identified CVD as the leading cause of death for men. The authors encourage future health promotion efforts to target CVD risk management among young adults, women, and minorities.

Muñoz et al. (2010) assessed the level of CVD knowledge and awareness among female college students. The study sample was predominantly composed of women aged 18 to 24 years and included a diverse representation of racial/ethnic groups. Results from this study suggest that age may significantly impact knowledge and awareness of CVD among women. The younger group of students (18 to 24 years) was less likely than their older counterparts (25 to 34 years) to correctly identify CVD as the leading cause of death for women. Knowledge differences were also noted in regards to race/ethnicity, but it is important to note that an overwhelmingly large number of participants in this sample were of Hispanic origin.

## CVD Risk Perception

For decades, perceptions of risk, worry, and severity have served as the foundation for various theories in health behavior literature (Wang et al., 2009). In many health belief theories, perceived risk (or perceived susceptibility or perceived vulnerability) is not only an early link in a causal chain of factors contributing to an individual's health behavior but also an important component in the development of health protective behavior (Aiken, Gerend, & Jackson, 2001). The importance of perceived risk for predicting health behavior has been studied extensively in

many disease contexts; however, less information has been published concerning the variation of these perceptions across common diseases (Wang et al., 2009). Previous research has provided insight regarding the influence of disease perception on an individual's preventative health behavior. Disease perception, whether described as risk, worry, or severity, has been shown to significantly influence the health protective actions an individual may or may not take in order to reduce his or her risk for a particular disease (DiLorenzo et al., 2006; Erblich, Boybierg, Norman, Valdimarsdottir, & Montgomery, 2000). Furthermore, existing perceptions for one disease may influence how an individual processes and responds to new health information regarding that disease or another disease/health condition that may also impose significant health risk for an individual (Wang et al., 2009).

Previous research has analyzed the concept of perceived risk for chronic diseases, including cancer, heart disease, and diabetes, among both men and women. Research suggests that adults generally incorrectly perceive their risk for various diseases and lean towards an optimistic bias (Green et al., 2003). Much of the literature has focused on perceived risk among women, and discussions throughout previous research shows that females tend to inaccurately estimate their CVD risk in comparison to men (Covello & Peters, 2002; DiLorenzo et al., 2006; Mosca et al., 2000; Wilcox, Ainsworth, LaMonte, & DuBose, 2002; Wang et al., 2009). DiLorenzo et al. (2006) showed that men perceived their risks for heart disease as their greatest health risk, followed by prostate cancer, diabetes, and colorectal cancer. Considering heart disease is the leading cause of death for men, the men in this study accurately portrayed their risk for CVD in comparison to other chronic diseases. Women, however, tend to significantly underestimate their CVD risk, and numerous research studies have shown similar trends.

CVD Risk Perception among Women

In research solely analyzing perceptions among women, numerous studies have shown that women tend to inaccurately perceive disease risk when compared to actual disease diagnosis (Covello & Peters, 2002; Mosca et al., 2000; Wilcox et al., 2002; Wang et al., 2009). Many studies indicate that women have heightened inaccurate perceptions of breast cancer risk in comparison to all other major chronic diseases. However, national statistics show that other diseases, such as lung cancer and heart disease, have higher combined mortality rates among women than breast cancer alone (Covello & Peters, 2002). Mosca et al. (2000) reports that young women aged 25 to 44 years considerably underestimate their CVD risk. In this study, only 8% of women identified heart disease and stroke as their greatest health concern, and less than 33% of respondents accurately identified heart disease as the leading cause of death for women. Women among this age group were more likely to inaccurately identify breast cancer as the leading cause of death when compared to female respondents over the age of 65. These study results indicate that age displayed the greatest influence on CVD knowledge, and the authors encouraged practitioners to develop programs targeted at young women in order to address the influence of lifestyle behaviors on long-term health outcomes.

Other studies have also shown higher risk perception for breast cancers and other cancers in comparison to heart disease among female participants (Mosca et al., 2000; Mosca et al., 2004; Wilcox et al., 2002). Misperceptions of breast cancer risk among women may influence women to underestimate their CVD risk. Women's perceptions of their risk for CVD can greatly influence their healthcare decisions in regards to preventive behavior, especially early in life. Therefore, these underestimations may prove to be harmful considering women may fail to seek out early care and intervention in order to combat CVD morbidity and mortality. Practitioners

are not only encouraged to target and educate women with known CVD early in life but also to focus prevention efforts towards women displaying various CVD risk factors. Thanavaro, Moore, Anthony, Narsavage, and Delicath (2006) recommend that education be initiated earlier in life for women with significant CVD risk factors. Their recommendations extend to women in their 20's, with specific focus on women using hormonal contraception.

## College Students' CVD Risk Appraisal

The risk appraisal literature extends into the college population, and recent studies have focused on this population's CVD risk perception. College students are a unique and influential population. College students tend to enter the university setting around age 18 or 19 years, and during this transition, students experience a considerable amount of change and newfound control over their lifestyles (Von Ah et al., 2004). This transitional period proposes an opportune time to develop healthy lifestyle behaviors that will transition into adulthood. However, studies report that very few college students engage in adequate preventative behaviors (Collins, Dantico, Shearer, & Mossman, 2004). Research has shown that many college students engage in risky behaviors, including tobacco use, alcohol use, physical inactivity, and unhealthy dietary habits, which may have long-term effects on their health (Von Ah et al., 2004). Additionally, research has indicated that similar to the adult population, young men and women lack an appreciation for the risk of developing certain chronic diseases (Green et al., 2003; Smith, Dickerson, Sosa, McKyer, and Ory, 2012; Wendt, 2005).

Green, Grant, Hill, Brizzolara, and Belmont (2003) studied risk perception for coronary heart disease (CHD) in college men and women. Their research revealed two important findings: (1) college-age men and women are optimistically biased concerning overall CVD risk and

significantly underestimate their risk for a heart attack and (2) college-age men and women do not accurately comprehend a significant number of commonly known risk factors for CVD. Without knowledge of common precursors to CVD, young men and women cannot create changes in their lifestyle that may positively impact future CVD morbidity and mortality nor make informed decisions about their healthcare.

Smith and colleagues (2012) compared college students' perceived disease risk with recorded disease prevalence rates for four chronic conditions: heart disease, cancer, diabetes, and overweight/obesity. Their findings indicated similar results in regards to female disease risk perception. Female participants displayed a substantial incongruence between perceived cancer risk and actual cancer prevalence rates in the United States. This difference was also identified among male participants for perceived cancer risk, but unlike their female counterparts, males demonstrated an equivalent level of risk perception for CVD as cancer. For participants in both groups, the risk of developing diseases considered to be precursors for CVD (diabetes and overweight/obesity) were the lowest among the disease risk perceptions ascertained in the study. Therefore, the authors established that college students not only underestimate their risk for CVD but also fail to acknowledge their risk of developing diseases/conditions that are known precursors for CVD.

As stated in the discussion concerning older adults, young women tend to perceive the risk of breast cancer as far more serious than the risk of CVD (Smith et al., 2012; Wendt, 2005). Wendt (2005) analyzed perceived future risk of breast cancer and CVD among a sample of college-aged women. Results indicated that women portrayed an unrealistic pessimism in regards to breast cancer risk among their peers and an unrealistic level of optimism in regards to personal CVD risk. When comparing the two chronic diseases, participants were significantly more

worried about breast cancer. Moreover, approximately 25% of the participants believed that breast cancer would affect greater than one out of every two of their peers.

Varying explanations have been proposed to rationalize the extreme risk perception for breast cancer among young women. One proposed explanation implies that these findings might demonstrate the overwhelming success of efforts to increase cancer awareness among females. Even though this is an important public health concern to advocate to young women, these successful efforts to raise cancer awareness may overshadow other efforts and campaigns pertaining to more prevalent chronic conditions, such as CVD, diabetes, and obesity. Another explanation proposes that females are much more likely than males to regularly visit a physician. This may impose a substantial influence on cancer awareness considering regular cancer screening by a physician generally begins in adolescence or young adulthood, especially for females (Smith et al., 2012).

## Conclusions of the Literature Review

However dismal the statistics may be, CVD is not only largely preventable but also generally not considered an uncontrollable aspect of aging considering the preventable risk factors associated with the development of CVD later in life (Collins et al., 2004). Even though it is known that CVD symptoms manifest later in life, disease pathogenesis begins early in life and the most effective prevention begins at a young age. Health protective behaviors that are established during adolescence and young adulthood may transcend into health behaviors later in life to protect against the occurrence of diseases (Von Ah et al., 2004).

It is well stated throughout CVD literature that risk factors for CVD begin developing at a young age (Collins et al., 2004; Muñoz et al., 2010). Health promotion research supports the

implication that the college years are a critical time to increase awareness of CVD risk and to establish healthy lifestyles that may assist in offsetting the development of CVD in the future (Von Ah et al., 2004). Knowledge and preventative actions are necessary at a young age in order to adequately engage in CVD risk prevention throughout the lifetime (Collins et al., 2004; Jensen & Moser, 2008). In regards to women, prevention efforts and identification of the importance of CVD risk must be initiated early in life in order to have a significant impact on health protective behaviors (Thanavaro, Moore, Anthony, Narsavage, and Delicath, 2006).

Professionals suggest that educational intervention efforts must be made to target young adults in order to increase knowledge regarding CVD and its related risk factors. However, before intervention efforts can be successful in reducing behaviors contributing to the development of CVD, young adults must first recognize CVD as an important and potential health concern in their near future (Green, Grant, Hill, Brizzolara, & Belmont, 2003; Smith et al., 2012; Von Ah et al., 2004). Preventative healthcare for CVD not only depends on knowledge and awareness of CVD and its related risk factors but also relies heavily on awareness and perception of personal risk (Muñoz et al., 2010).

The lack of knowledge among most young women regarding CVD is a major public health concern and actions should be taken in order to resolve the CVD knowledge gap, especially in relation to gender. Even though knowledge alone is not a sufficient mediator to change behavior, it is necessary in the causal chain to initiate a behavior change when cardiac symptoms are identified. If women are unaware that they are at risk for CVD or are unable to correctly identify risk factors associated with CVD, heart protective behaviors and lifestyle modifications will not be initiated (Jensen & Moser, 2008). An individual must first understand the actual risks associated with a particular disease in order to make the appropriate choices

concerning his or her health in relation to disease prevention (Green et al., 2003). This is especially important for young women, considering this particular group demonstrates a lack of knowledge in regards to CVD and primary prevention of CVD begins early in life.

Efforts to promote CVD knowledge, awareness, and risk perception among women should utilize gender specific risk factors and symptoms, including hormonal contraceptive use, menopause, and post-menopausal hormone replacement therapy (Corrao et al., 1990; Farley et al., 1999). A few select risk factors solely affect women, most notably the use of hormonal contraceptives (Collins et al., 2004; Corrao et al., 1990). As discussed previously, the use of hormonal contraceptives may increase the risk for CVD in some women, especially women with preexisting CVD risk factors. Furthermore, a synergistic use of hormonal contraceptives and smoking has been shown to further increase the risk of CVD related events.

Previous research has evaluated knowledge and risk perception among women and young adults concerning CVD, and it is well established that a CVD knowledge gap and lack of appreciation for CVD risk exist among women. However, there is not abundant research addressing CVD risk perception in young women. Moreover, prior research has not addressed CVD knowledge, awareness, and/or risk perception among hormonal contraceptive users, even though this group has been identified at risk for CVD. This research study was designed to assess knowledge and perceived risk of CVD among young hormonal contraceptives users in order to expand upon the literature addressing CVD among young women.

Table 1

*Summary of Studies Included in the Literature Review*

| Author, Date | Study Objective | Study Setting/ Data Collection | Participant Demographics | Results | Conclusions |
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| Frost, 1992 | (1) Study knowledge, attitudes, and behaviors in realtion to CVD risk in college students; (2) determine preferred modes of gaining information about CVD | 4-year public liberal arts college | *n* = 1,503; 63.9% female & 35.9% male | 91% knew hypertension was a major CVD risk factor, 90% identified smoking, 86.7% identified cholesterol level, 72% identified exercise | General knowledge of CVD risk factors is high among college students |
| Erblich et al., 2000 | Examine the possibility that families with history of breast cancer may overestimate breast cancer risk and underestimate their CVD risk | Medical center in New York City | *n* = 177 women; mean age = 41.7; 64% African American, 26% Caucasian; 47% completed college, 45% high school and some college | Women with family history of breast cancer has significantly higher perceived lifetime risk of breast cancer ($p < 0.0002$) and lower perceived risk of CVD ($p < 0.002$) | Women with family history of breast cancer may be underestimating their risk of a variety of chronic diseases<br><br>The emphasis on breast cancer risk in women may need to be balanced with educational efforts concerning risk of other diseases, such as CVD |
| Mosca et al., 2000 | Assess knowledge of risks, perceptions of heart disease and stroke, and the prevention of CVD among women in the United States | Telephone Survey in 1997; random US households | *n* = 1,000 women; age >25 years; 66% white, 13% African American, 13% Hispanic | 8% of respondents identified heart disease/stroke as their greatest health concern; < 33% identified CVD as the leading cause of death for women<br><br>More women aged 25-44 years identified breast cancer as the leading cause of death than women > 65 years | Most women do not perceive heart disease as a substantial health concern and are not well informed about their individual risk; age influenced knowledge to a greater extent than ethnicity; and programs are needed to address the effects of lifestyle behaviors on long-term health |

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| Vale, 2000 | Investigate whether prevention of heart disease was important to young adults | Young adults were recruited from music organizations and represented 19 states | *n* = 63; 50 male & 13 female; 18-21 years old | Participants identified CVD risk factors as follows: increasing age (2%), gender (2%), family history (37%), high blood pressure (17%), high cholesterol (49%), cigarette smoking (63%), and sedentary lifestyle (27%) | Results indicate that moderate levels of knowledge exist among young adults regarding CVD risk. |
| Covello & Peters, 2002 | (1) Determine the perceptions among women of their health risks of various age-related diseases; (2) determine how women process information about health risks, how they make decisions about these risks, and what types of interventions can improve their decision making | Information was collected using (1) 6 focus groups in 3 regional locations; (2) two national random telephone surveys; and (3) a media content analysis over a 4-month period | 6 focus groups containing 8-10 women each<br><br>Survey A: *n* = 1,000, 45-54 years old<br><br>Survey B: *n* = 1,000, 45-64 years old<br><br>Media analysis of 11,000 national newspaper, magazine, TV, & radio stories | 1/3 of women believed they had a greater chance of dying from breast cancer than CVD<br><br>3/5 cited cancer as the health problem they feared the most<br><br>1/5 incorrectly believed heart disease is the leading cause of death for men but not for women<br><br>4/5 of women relied on general media for information on health issues<br><br>Media reports on women's health issues tend to focus on breast cancer | Information and education related to women's health issues that is focused on improved public understanding and decision making regarding health risks is needed to achieve improved health outcomes for women |
| Wilcox et al., 2002 | Examine worry regarding seven major diseases and their correlates in a diverse group of women | Part of a 5-year community study (Cross-Cultural Activity Participation Study) as a part of the Women's Health Initiative; data collected through interview-based surveys | *n* = 160 women from New Mexico (Native-American, *n* = 50; Caucasian n = 25) and South Carolina (African American, *n* = 57; Caucasian, *n* = 28)<br><br>Mean age = 54.7 years (36-91 years) | African American and Native American women were most worried about developing cancer (44% and 50%) and Caucasian women were most worried about osteoporosis and cancer (37% and 33%)<br><br>Women from all groups were more worried about cancer then CVD and related risk factors | Results were consistent with other studies showing that women are more worried about developing cancer than CVD<br><br>Further effort is needed to increase women's knowledge concerning the seriousness of CVD and preventative actions to reduce risk |

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| Green et al., 2003 | Assess the perception of risks for CVD in college men and women | 2 4-year major universities<br><br>40-item causation instrument to measure perception of risk ($\alpha$ = 0.943) | *n* = 341 undergraduate students; 45.7% male; 77.3% White; Mean age = 22.2 years | 68% rated their risk of heart disease as lower or much lower than their peers, indicating an optimistic bias towards their personal CVD perceived risk<br><br>No differences were observed in perceived risk in relation to race/ethnicity or gender | College-aged men and women are optimistically biased about their overall heart disease risk<br><br>College-aged men and women are unaware of a significant number of commonly known risk factors for heart disease |
| Marcuccio et al., 2003 | Assess the knowledge, attitudes, and experiences of women with heart disease and the effect of heart disease on their lives | Random selection of participants from WomenHeart, data collected through a 22-item telephone survey | *n* = 204 women with self-reported diagnosis of heart disease from 41 different states<br><br>52% of women were between 40-59 years old | Over half of the women were unaware they were at risk for CVD before their diagnosis<br><br>One-fourth did not see out additional information about CVD after diagnosis | Heart disease affects numerous aspects of women's lives.<br><br>Beneficial lifestyle changes may not be implemented for various reasons, such as dissatisfaction with care, lack of resources, symptoms of depressions, and lack of social support |
| Collins et al., 2004 | Explore college students' attitudes concerning heart disease risks and preventative strategies | Students enrolled in lecture courses at a 4-year university in the western United States<br><br>Survey instrument with 35 close-ended questions | *n* = 1,481 undergraduate students; 56.7% female; 75.1% white | 44% believed cancer was their greatest health risk, then heart disease (24%), and accidents/homicides (24%)<br><br>49% of women cited cancer as their greatest health concern<br><br>69% indicated heart disease was the leading cause of death for men, but 67% cited cancer for women<br><br>Students reported knowing the most about STD's (37%) | Overall, students showed a lack of knowledge regarding heart disease and lack of access to information about heart disease compared to other health problems<br><br>Educational interventions are needed to increase knowledge about heart disease, especially awareness among women and minorities |

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| Mosca et al., 2004 | Assess awareness, knowledge, and perceptions of heart disease among American women<br><br>Evaluate trends since 1997, when the AHA began a national campaign to increase CVD awareness in women | Telephone survey in 2003 of a random, national sample, intentional oversampling of African American & Hispanic women<br><br>32-item questionnaire with Likert scale, open-ended, and recognition questions | *n* = 1,024 women; 68% white, 12% African American, 12% Hispanic, 8% other ethnicities<br><br>48% aged 25-44, 44% aged 45-64, and 11% >65 years | 46% identified heart disease as the leading cause of death in women, up from 30% in 1997 ($p < 0.05$) and 34% in 2000 ($p < 0.05$)<br><br>African American, Hispanic, & younger women had lower awareness of heart disease as their leading cause of death than white & older women<br><br>38% of women reported that their doctors had discussed CVD with them | Even though CVD awareness has increased since 1997, there is still a significant gap between perceived and actual CVD risk<br><br>Educational interventions are needed to increase awareness, especially among minorities and younger women |
| Wendt, 2005 | Assess the relationship between perceived future risk of breast cancer and CVD and cognitive, emotional, and behavioral variables | Small, liberal arts women's college in the northeastern US<br><br>Survey administered to students in fall 1999 as part of a "Women and Health Study" | *n* = 137 female undergraduate students; mean age 20.8 years; 49.2% Caucasian; 19.2% Hispanic; 13.9% African American | Unrealistic pessimism existed regarding risk of breast cancer among peers<br><br>Unrealistic optimism existed in regards to personal risk of CVD<br><br>Participants were significantly more worried about getting breast cancer, but less aware of breast cancer risk factors | Health promotion efforts among young women need to vary based on the disease targeted |
| Lynch et al., 2006 | Assess knowledge of CVD risk factors in young adults and its association with changes in risk factor levels over a 10-year period | Coronary Artery Risk Development in Young Adults (CARDIA) Study was a multicenter, longitudinal study with participants from 4 urban US cities (1991-2001) | *n* = 4,193; 55% female; biracial sample, 48% African American, 52% Caucasian; mean age = 30 years | Participants correctly identified a mean of 2 risk factors for CVD of the 6 considered (hypertension, hyperlipidemia, smoking, overweight, sedentary lifestyle, and unhealthy diet)<br><br>65% were not aware of any risk factors for CVD & <35% recognized overweight as a risk fact | Knowledge of CVD risk factors was very low among this study sample, but increased with the presence of risk factors<br><br>Knowledge alone did not predict 10-year changes in risk factors |

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| Thanavaro et al., 2006 | Determine health promotion behavior and the best predictors of this behavior in women without prior CHD diagnosis | 3 medical practices in the Midwestern US (internal medicine and gastroenterology)<br><br>Self administered survey (HPLP II, Coronary Heart Disease Knowledge Test, Benefits Scale, Barriers Scale) | *n* = 119 women; mean age = 49.4 years; 78% white; 57% family history of CHD | Women had a low CHD knowledge level (*M* = 60%), a high perception of benefits to CHD risk modification, & moderate level of perceived barriers<br><br>The mean summed score of the HPLP II showed that women did not practice health promotion behaviors on a regular basis | Best predictors of health promotion behavior were: smoking history, family history, knowledge levels, & perceived barriers to CHD risk modification<br><br>Women more likely to practice health protective behavior had: fewer perceived barriers, higher CHD knowledge levels, and no smoking or family history of CHD |
| Wang et al., 2009 | Examine how perceptions of risk, worry, severity, and control vary for CVD, stroke, diabetes, and cancer (colon, breast, and ovarian) | Family Healthcare Impact Trial in healthcare facilities in the US from 2005-2007<br><br>Evaluate impact of web-based tool to measure risk for certain diseases<br><br>Information collected at baseline & 6-months | *n* = 2,362; 70.9% female; 91% white<br><br>59% of participants were at increased familial risk for heart disease | Perceived risk was significantly higher for cancers than for other diseases<br><br>Men worried the most about getting heart disease and women worried the most about getting cancer<br><br>Women overall had higher perceived risk/worry ratings compared to men for several of the diseases studied | Addressing disease perception when discussing multiple disease risks may create a more accurate understanding of risk for disease<br><br>This may also help individuals recognize and engage in preventative behaviors to reduce their disease risk |
| Munoz et al., 2010 | Evaluate the level of knowledge and awareness of heart disease among female college students | Cross-sectional study at a private university in south Texas<br><br>13-item survey based on the AHA national telephone survey | *n* = 320 women; mean age = 23 years; 47% Hispanic, 30% white; over 75% Juniors and Seniors | ~33% believed breast cancer was their biggest threat; ~50% reported CVD as the leading cause of death<br><br>Students aged 18-24 were significantly less likely to identify CVD as leading cause of death compared to older students (25-34 years) | Show need for educational interventions to increase awareness and knowledge for CVD among women<br><br>College may be the last chance to reach youth to affect lifestyle changes |

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| Mochari-Greenberger et al., 2012 | Examine differences in CVD awareness among women based on race/ethnicity by age group | AHA National Women's Survey data from 2006 and 2009<br><br>Telephone survey with interviewer-assisted open-ended questions | *n* = 2,147 women; 57% <55 years old; 63.2% white, | African American and Hispanic women were significantly less likely than white women to be aware that CVD is the leading cause of death for women (65% of white women were aware)<br><br>Younger women (<55 years) showed lower levels of awareness compared to older women & less likely to report being informed about CVD | Racial/ethnic minority status and age (<55) were significant risk factors for low CVD awareness among women<br><br>The above groups should be targeted for educational programs |
| Smith et al., 2012 | Compare college students' perceived disease risk with disease prevalence rates in the US | Part of Finding Roots: Exploring Your Family History Study at a 4-year university in Texas<br><br>60-item Internet-based survey | *n* = 625; 62.6% female; 87% between the ages 19-25 years; 73.1% non-Hispanic white | Females perceived their 10-year and lifetime risk of developing cancer to be significantly higher than any other chronic disease<br><br>Students also rated their risk of developing heart disease as higher than diabetes and being overweight/obese | Incongruence exists between college students perceived disease risk and current disease prevalence rates<br><br>Perceived cancer risk surpasses other chronic diseases<br><br>Improved public health education efforts need to be enforced in order to counter the lack of awareness among young adults regarding chronic diseases to reduce morbidity and mortality later in life |

# CHAPTER III:
# METHODOLOGY

## Study Design

This research study was quantitative and utilized a cross-sectional study design to determine knowledge, awareness, perceived risk, and hormonal contraceptive use among female college students. The study sample was ascertained from the population of students currently attending the University of Mississippi. Study data was collected from participants electronically through the administration of an online questionnaire. A description of the participants, instrumentation, data collection procedures, and data analysis are provided in the following sections.

## Participants

A sample of female undergraduate students enrolled at The University of Mississippi was selected for this study. Participants were eligible for participation in this study if they meet the following inclusion criteria: (1) female, (2) age 18 to 24 years, and (3) provide consent to participate in the research study. Potential participants were excluded from the research study if they were less than 18 years old, more than 24 years old, or had self-reported previous diagnosis of CVD. This sample was chosen because (1) previous research has indicated that this age group lacks knowledge and awareness of CVD, (2) the researcher's access to the sample and close

proximity to the sample, and (3) lack of research concerning CVD among university students and hormonal contraceptive users.

Enrollment statistics from the previous academic school year (2012-2013) indicate that 21,528 students were enrolled at the University of Mississippi during the 2012 fall semester (2012 Enrollment Factbook, Mississippi Public Universities). The study sample was ascertained from the current undergraduate student population at the university, which should be demographically comparable to the student population from the previous academic year. In 2012, the majority of students were full-time (85.5%), and a large proportion of students were classified as undergraduate students (77.5%). The 16,060 undergraduate students included 8,856 females (55.1%) and 7,024 males (43.7%). Racial/ethnic classification of the students identified the majority being Whites (75.4%), followed by African American (16.9%), and the remaining classified as other (7.7%). A large proportion of students enrolled were also classified as non-residents of the state of Mississippi (38.1%) (2012 Enrollment Factbook, Mississippi Public Universities).

## Sampling Method

All recruitment procedures and data collection were conducted via electronic sources. The sampling method for this study utilized the Office of the Registrar to access a computer generated sample of female undergraduate students. The researcher contacted the Office of the Registrar at the University of Mississippi prior to conducting the study, and the registrar permitted access to a computer-generated sample of female students currently enrolled at the university. The registrar agreed to contact students directly on behalf of the researcher according to the researcher's specifications. All prospective participants were contacted via email on behalf

of the researcher and recruited to participate in the study after approval was received from the University of Mississippi's Institutional Review Board (IRB).

## Instrumentation

A 36-item *Heart Disease Knowledge Questionnaire*, three items analyzing CVD awareness , and a 10-item *Risk Perceptions Related to CVD Scale* was used to measure CVD knowledge, awareness, and perceived risk (Bergman, Reeve, Moser, Scholl, & Klein (2011); Mosca, Hammond, Mochari-Greenberger, Towfighi, & Albert, 2013; Tovar, Rayens, Clark, & Nguyen, 2010). Email communication with the authors of the aforementioned questionnaires regarding use of the instrument is included in Appendix A. A 16-item demographic variable questionnaire developed by the researcher from various sources was also be used. All questionnaire materials were written in English. A copy of the entire 65-item questionnaire is provided in Appendix B.

### CVD Knowledge

The *Heart Disease Knowledge Questionnaire* developed by Bergman and colleagues (2011) was used to measure CVD knowledge. The questionnaire consists of 30 questions related to five central domains of CVD knowledge: dietary (6), epidemiology (4), medical (7), risk factors (9), and heart attack symptoms (4). The researchers developed the questionnaire in two phases. The first phase consisted of 606 undergraduate students completing an 82-item questionnaire. After phase one was completed, the instrument was modified and reduced to 29 items. In phase two, 248 undergraduate students completed the revised questionnaire. In both phases, the criteria for item reduction were based on factor loading, item content area, and

difficulty mean scores. The resulting heart disease knowledge scale is dichotomous (true/false), and the Kuder-Richardson formula 20 for internal reliability was used to determine reliability of the instrument. The overall scale had an acceptable internal reliability of 0.73. The final instrument has a reported difficulty mean of 0.54, which permits "maximum discrimination" in an individual's heart disease knowledge (Bergman et al., 2011). The entire 30-item instrument was used in the present study and is included in Appendix B.

A 6-item instrument was created by the researcher to assess knowledge of CVD risk in relation to the use of hormonal contraceptives. The instrument was developed based on the following CVD risk factors associated with hormonal contraceptive use: (1) increase in blood clotting, (2) increase in risk of stroke, (3) increase in serum cholesterol level, (4) increase in arterial blood pressure, (5) increase in risk of myocardial infarction, and (6) increase in overall CVD risk associated with synergistic use of hormonal contraceptives and smoking cigarettes (Department of Health and Human Services [DHHS], 2009). Content validity for the instrument has been established by an expert in CVD research and a medical doctor. The 6-item questionnaire is included in Appendix B.

CVD Awareness

As stated in the literature review, previous research studies have identified a substantial lack of awareness regarding CVD as the leading cause of death for women (Marcuccio, Loving, Bennett, & Hayes, 2003; Mochari-Greenberger et al., 2012; Mosca et al., 2000; Mosca, Ferris, Fabunmi, & Robertson, 2004). Therefore, the researcher incorporated questionnaire items to assess awareness among participants in the prospective study. Three questions addressing CVD awareness among women were modified from the *American Heart Association's Women and*

*Heart Disease Questionnaire* from the Women's Health Study (Mosca et al., 2013). The questions included in this study address identification of (1) the greatest health problem facing women today, (2) the leading cause of death for women in the United States, and (3) extent of worry regarding common health conditions affecting women (cancer, heart disease, AIDS, breast cancer, lung cancer, smoking, drug addiction/alcoholism, violent crime, stroke, Alzheimer's disease, diabetes, and osteoporosis). These questions are included in the questionnaire in Appendix B.

## Perceived Risk

Perceived risk was measured using the *Risk Perceptions Related to Cardiovascular Disease Scale*. This scale was created using the *Health Beliefs Related to Cardiovascular Disease Scale* developed by Tovar, Rayens, Clark, and Nguyen (2010). The original scale contains 25 items measuring four subscales (susceptibility, severity, benefits, and barriers). The five susceptibility and five severity items from the original scale were used to create a modified version of the instrument to assess perceived risk in the proposed study. Reliability of the instrument has been established previously using Cronbach's alpha for all four subscales in the instrument (Tovar et al., 2010). The five-item susceptibility subscale and five-item severity subscale had acceptable internal reliability values (0.91 and 0.71 respectively). The items from these two subscales were used by the researcher to create a modified 10-item version of the instrument. All items were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The 10-item *Risk Perceptions Related to Cardiovascular Disease Scale* that was used in this study is included in Appendix B.

Demographic Variables

The 16 questions addressing demographic variables were created using various resources. Questions one through seven assessing age, gender, height, weight, year in school, and race/ethnicity were created by the researcher after reviewing questions used in the American College Health Association's National College Health Assessment (ACHA-NCHA). Questions eight and nine addressing existing health conditions were adapted from the AHA's Women and Heart Disease questionnaire from the Women's Health Study (Mosca et al., 2013). Current smoking status was ascertained using questions 10 and 11, which were adapted from the CDC's Behavioral Risk Factor Surveillance Survey (BRFSS). The researcher and advisory committee created the remaining questions (12 through 16) in order to determine current birth control use, the type of birth control medication prescribed, medication adherence, and sources of previous exposure to information, or cues to action, regarding CVD. All demographic questionnaire items are included in Appendix B.

## Data Collection

Data was collected via an online questionnaire distributed to student email accounts in mid-April. Data collection occurred throughout a period of two weeks. Qulatrics online survey software was utilized to collect student responses. Online dissemination of the questionnaire was chosen for various reasons including: (1) the researcher's access to the Qualtrics software through the University of Mississippi's contract with the company, (2) reduction of costs associated with printing questionnaires on paper, (3) easier access to multiple participants, and (4) the ability to easily manipulate and export data after collection.

The initial email contact with potential participants contained a message from the researcher briefly explaining the purpose of the study and requesting the student's participation (Appendix C). A link was provided following the researcher's message that directed students to the online questionnaire. Once the student accessed the questionnaire, the first page contained a script discussing consent to participate in the study. Participants were prompted to select the next button to confirm consent for participation and begin completion of the questionnaire. A random lottery for four gift cards ($25 monetary value) was used as incentive for participation. Upon completion of the questionnaire, students were asked if they would like to participate in the gift card lottery. If students opted to participate, they were directed to a separate survey. This survey collected email addresses that were used to contact the recipients of the gift cards. A random number generator was used to randomly select the winners upon completion of data collection. The email lottery and questionnaire responses were not linked in order to protect the privacy of participants.

## Data Analysis

After all survey responses were received through Qualtrics, the data was exported to the statistical software for analysis. The Statistical Package for Social Sciences (SPSS) Version 21 was used to analyze all data. Descriptive statistics, including frequencies, ages, and measures of central tendency were calculated for each item in the questionnaire (knowledge, awareness, perceived risk, and demographic variables). Total knowledge score and total scale score for the *Risk Perceptions Related to Cardiovascular Disease Scale* was calculated using descriptive statistics. Pearson correlation analysis was conducted to determine if a relationship exists between CVD knowledge and perceived risk. In order to determine if differences existed for

CVD knowledge concerning hormonal contraceptive use between the aforementioned groups (hormonal contraceptive users, hormonal contraceptive users who smoke, non-users, and non-users who smoke), a one-way analysis of variance (ANOVA) was used. After significant differences were observed, Tukey's post-hoc test was conducted to determine which specific groups were significantly different from each other. An Alpha level of 0.05 was used to test all hypotheses. A summary of the research questions, survey items, and data analysis procedures are included in Table 2.

Table 2

*Summary of Data Analysis Procedures*

| Research Question(s) | Survey Item | Data Analysis Procedure |
|---|---|---|
| What is the level of CVD knowledge, awareness, and perceived risk of CVD among college-aged women? | Heart Disease Knowledge Questionnaire, CVD Awareness Questionnaire, Risk Perceptions Related to CVD Scale | Descriptive Statistics |
| How many college-aged women are contraceptive users? How many college-aged women are cigarette smokers? | Demographic Questionnaire | Descriptive Statistics |
| What is the association between CVD knowledge and perceived risk of CVD? | Heart Disease Knowledge Questionnaire and Risk Perceptions Related to CVD Scale | Pearson Correlation |
| Is there a significant difference in CVD knowledge concerning hormonal contraceptives between hormonal contraceptive users and non-users? | Hormonal Contraceptives and Heart Disease Questionnaire | One-way ANOVA |

# CHAPTER IV:
# RESULTS

The sample for this study was ascertained from the population of 8,525 female undergraduate students enrolled in a university located in the Southeastern United States. All female undergraduate students were contacted by email from the Registrar's office on behalf of the researcher. Of the 8,525 females who were contacted, 658 responded (13% response rate) during the data collection period via Qualtrics online survey software. The data was screened according to the exclusion criteria described previously. Ninety-six questionnaires were excluded because the participant fell outside of the age range (18 to 24 years), three were excluded because the participants had previous heart disease diagnosis, one survey was excluded because the participant was identified as a male, and six surveys were excluded because participants identified themselves as international students. Another 52 questionnaires were not fully completed and were also excluded from the data used for analysis. After all exclusion factors were applied, the resulting sample contained 500 participants ($n$ = 500). The completed questionnaires were exported from Qualtrics online survey software into the Statistical Package for the Social Sciences (SPSS) Version 20.0, and an alpha level of 0.05 was used for analyses.

## Description of Study Participants

As shown in Table 3, the study sample ($n$ = 500) range in age from 18 to 24 years ($M$ = 20.56; $SD$ = 1.44). The racial/ethnic distribution of the sample was 79% White, 15% African

American, 2% Asian or Pacific Islander, 2% biracial or multiracial, 0.8% Hispanic or Latina, 0.4% American Indian/Alaskan Native or Native Hawaiian, and 0.4% other. The class rank included 22% first year undergraduate, 19% second year undergraduate, 25% third year undergraduate, 25% fourth year undergraduate, and 8% fifth year undergraduate. Of the 500 participants, 37% reported a family history of CVD or stroke. Another 42% reported currently being physically inactive, which was defined as engaging in less than 20 to 30 minutes of physical activity per day for at least five days per week. Moreover, 25% reported being at least 20 pounds overweight, 17% reported being depressed, 5% identified having high blood pressure, and 4% identified having high cholesterol.

In regards to current hormonal contraceptive use, 59% reported being current users and 41% reported being non-users. The majority (89%) of hormonal contraceptive users reported the birth control pill as their current method of hormonal contraceptive. Of the 293 hormonal contraceptive users, 18% had been taking the medication for less than one year, 27% for one to two years, 29% for three to four years, and 26% for five years or longer. With regards to hormonal contraceptive adherence, 91% reported taking the medication everyday as prescribed and 6% reported taking the medication almost every day. Smoking status was ascertained according to having ever used and using while taking a prescription birth control medication. A total of 57 (11%) participants reported smoking at least 100 cigarettes in their lifetime, and 28% of these identified smokers reported smoking cigarettes every day. Additionally, 101 (20%) participants identified ever smoking while using prescription birth control medication.

Prior exposure to CVD information was also assessed. Over half of the participants identified a previous health course (64%), the Internet (63%), friends or family (55%), and television (54%) as sources where they have received information regarding CVD. Other

commonly identified sources of information included: the American Heart Association (47%) and a doctor or healthcare worker (43%).

Table 3

*Description of the study participants*

| Demographic Variable | Frequency (*n*) | Percentage (%) |
|---|---|---|
| Age | | |
| 18 years | 32 | 6.4 |
| 19 years | 108 | 21.6 |
| 20 years | 94 | 18.8 |
| 21 years | 133 | 26.6 |
| 22 years | 89 | 17.8 |
| 23 years | 35 | 7.0 |
| 24 years | 9 | 1.8 |
| Race/Ethnicity | | |
| White | 397 | 79.4 |
| Black/African American | 74 | 14.8 |
| Hispanic/Latina | 4 | 0.8 |
| Asian/Pacific Islander | 12 | 2.4 |
| American Indian/Alaskan Native/Native Hawaiian | 2 | 0.4 |
| Biracial/Multiracial | 9 | 1.8 |
| Other | 2 | 0.4 |
| Year in School | | |
| 1st year undergraduate | 112 | 22.4 |
| 2nd year undergraduate | 95 | 19.0 |
| 3rd year undergraduate | 127 | 25.4 |
| 4th year undergraduate | 125 | 25.0 |
| 5th year undergraduate | 38 | 7.6 |
| Other | 3 | 0.6 |
| Current Health Conditions | | |
| High Blood Pressure | 26 | 5.2 |
| High Cholesterol | 20 | 4.0 |
| Family History of Heart Disease/Stroke | 186 | 37.2 |
| Overweight | 125 | 25.0 |
| Physical Inactivity | 212 | 42.4 |
| Depression | 83 | 16.6 |
| None of the above | 141 | 28.2 |

Table 3 Cont.

*Description of the study participants*

| Demographic Variable | Frequency (*n*) | Percentage (%) |
|---|---|---|
| Hormonal Contraceptive Use | | |
| User | 293 | 58.6 |
| Non-User | 207 | 41.4 |
| | | |
| Hormonal Contraceptive Method (Users only; *n* = 293) | | |
| Birth Control Pill | 261 | 89.1 |
| Vaginal Ring (Nuvaring) | 8 | 2.7 |
| Birth Control Patch (Ortho Evra) | 2 | 0.7 |
| Birth Control Shot (Depo Provera) | 8 | 2.7 |
| Intrauterine Device (IUD) | 3 | 0.6 |
| Birth Control Implant | 11 | 3.8 |
| | | |
| Smoking Status | | |
| Smoker | 57 | 11.4 |
| Non-Smoker | 443 | 88.6 |
| Ever Smoked while taking birth control | 101 | 20.2 |
| | | |
| Sources of CVD Information | | |
| Social Media | 169 | 33.8 |
| Radio | 76 | 15.2 |
| Television | 272 | 54.4 |
| Newspaper | 88 | 17.6 |
| Health Course | 318 | 63.6 |
| Magazine Article/Advertisement | 181 | 36.2 |
| Internet | 316 | 63.2 |
| Health Information Pamphlet | 168 | 33.6 |
| American Heart Association | 234 | 46.8 |
| Doctor/Healthcare Worker | 216 | 43.2 |
| Friends/Family | 273 | 54.6 |
| Other | 11 | 2.2 |

## Instrument Reliability

Internal consistency measures for the instruments used in the present study are depicted in Table 4. Cronbach alpha scores were calculated for the CVD perceived risk instrument and its

subscales. A modified 10-item version of the *Risk Perceptions Related to Cardiovascular Disease Scale* was used in this study. Overall Cronbach alpha for the entire instrument was 0.80. In regards to the five-item susceptibility and five-item severity subscales, Cronbach alpha was 0.87 for susceptibility and 0.66 for severity. The resulting internal consistency values were similar when compared to the original instrument (Tovar et al., 2010). For the knowledge questionnaires, internal consistency was calculated using Kuder-Richardson-20. The resulting Kuder-Richardson-20 score was 0.90 for the *Heart Disease Knowledge Questionnaire* and 0.87 for the *Hormonal Contraceptives and Heart Disease Questionnaire*. For the *Heart Disease Knowledge Questionnaire*, the internal consistency value was similar to the reliability reported for the original instrument (Bergman et al., 2011).

Table 4

*Reliability of the instrument*

| Instrument | Cronbach Alpha | Kuder-Richardson-20 |
|---|---|---|
| Risk Perceptions Related to CVD Scale | 0.80 | - |
| Susceptibility (5 items) | 0.87 | - |
| Severity (5 items) | 0.66 | - |
| Heart Disease Knowledge Questionnaire | - | 0.90 |
| Hormonal Contraceptives and Heart Disease Knowledge Questionnaire | - | 0.87 |

## Responses to Research Questions #1-6

*Research Question #1: What is the level of CVD awareness among college-aged women?*

Three questions from the *American Heart Association's Women and Heart Disease Questionnaire* were used to assess CVD awareness. The first question addressed the

identification of the greatest health problem facing women today. As shown in Table 5, 32% of participants identified breast cancer as the greatest health problem facing women today, followed by heart disease/heart attack (21%), obesity (18%), and cancer (general) (17%). Table 5 includes the frequencies and percentages for all responses. The second question assessed the participants' knowledge of the leading cause of death for women in the United States. As indicated in Table 6, approximately half (49%) of participants correctly identified heart disease as the leading cause of death. A majority of the remaining participants either indicated breast cancer (18%) or cancer (general) (19%) as the leading cause of death. Table 5 depicts the frequencies and percentages for all diseases.

Table 5

*Frequencies and percentages for the greatest health problem facing women today and leading cause of death*

| Condition/Disease | Greatest Health Problem | | Leading Cause of Death | |
|---|---|---|---|---|
| | Frequency (*n*) | Percentage (%) | Frequency (*n*) | Percentage (%) |
| Accidental Death[a] | - | - | 13 | 2.6 |
| AIDS | 3 | 0.6 | 7 | 1.4 |
| Alzheimer's Disease | 2 | 0.4 | 1 | 0.2 |
| Breast Cancer | 162 | 32.4 | 90 | 18 |
| Cancer (general) | 85 | 17.0 | 96 | 19.2 |
| Diabetes | 9 | 1.8 | 10 | 2 |
| Drug Addiction/Alcoholism | 8 | 1.6 | 3 | 0.6 |
| Heart Disease/Heart Attack | 106 | 21.2 | 246 | 49.2 |
| Lung Cancer | 3 | 0.6 | 7 | 1.4 |
| Obesity[b] | 90 | 18.0 | - | - |
| Osteoporosis | 15 | 3.0 | 1 | 0.2 |
| Smoking | 13 | 2.6 | 11 | 2.2 |
| Stroke | 4 | 0.8 | 7 | 1.4 |
| Violent Crime[c] | - | - | 8 | 4.6 |

[a] Item was only asked in reference to the leading cause of death.
[b] Item was only asked in reference to the greatest health problem.
[c] Item was only asked in reference to the leading cause of death.

As shown in Table 6 and Table 7, significant differences were identified for the leading cause of death for women and greatest health concern facing women today based on year in school and racial/ethnic group. For the greatest health problem facing women today, chi-square analysis revealed that juniors/seniors were significantly more likely to identify heart disease as the greatest health problem when compared to freshman/sophomores, $\chi^2(1, n = 500) = 8.06$, $p = .005$. No significant difference was identified concerning race/ethnicity, $\chi^2(1, n = 500) = 1.102$, $p = .576$. In regards to the leading cause of death for women, significant differences were identified for both year in school and race/ethnicity. Chi-square analysis showed that juniors/seniors were significantly more likely to identify heart disease as the leading cause of death among women than freshman and sophomores, $\chi^2(1, n = 500) = 7.09$, $p = .008$, and Caucasian women were significantly more likely to identify heart disease as the leading cause of death, $\chi^2(2, n = 500) = 9.18$, $p = .01$, when compared to African Americans and other racial/ethnic groups (52% versus 36% and 34% respectively).

Table 6

*Variations in awareness of leading cause of death and greatest health problem facing women today by race/ethnicity*

| Question | Caucasian | African American | Other[a] | Total |
|---|---|---|---|---|
| *What is the greatest health problem facing women today?* | (n = 395) | (n = 74) | (n = 29) | (n = 500) |
| Heart Disease | 85 (21%) | 17 (23%) | 4 (14%) | 106 (21%) |
| Other | 312 (79%) | 57 (77%) | 25 (86%) | 394 (79%) |
| *What is the leading cause of death for women?*[b] | (n = 395) | (n = 74) | (n = 29) | (n = 500) |
| Heart Disease | 209 (53%) | 27 (36%) | 10 (34%) | 246 (49%) |
| Other | 188 (47%) | 47 (64%) | 19 (66%) | 254 (51%) |

[a] Includes Hispanic/Latina, Asian/Pacific Islander, American Indian/Alaskan Native, Biracial/Multiracial, and other

[b] Chi-square = 9.18, $df = 2$, $p = 0.01$

Table 7

*Variations in awareness of leading cause of death and greatest health problem facing women today by year in school*

| Question | Freshman/ Sophomore | Junior/ Senior | Total |
|---|---|---|---|
| *What is the greatest health problem facing women today?*[b] | (n = 207) | (n = 290) | (n = 497)[a] |
| Heart Disease | 31 (15%) | 74 (26%) | 105 (21%) |
| Other | 176 (85%) | 216 (74%) | 392 (79%) |
| *What is the leading cause of death for women?* [c] | (n = 207) | (n = 290) | (n = 497)[a] |
| Heart Disease | 87 (42%) | 157 (54%) | 244 (49%) |
| Other | 120 (58%) | 133 (46%) | 253 (51%) |

[a] Three participants did not answer this question.
[b] Chi-square = 8.06, $df = 1$, $p = .005$
[c] Chi-square = 7.09, $df = 1$, $p = .008$

The final CVD awareness question assessed participants' worry regarding various diseases. Participants indicated their level of worry regarding future diagnosis of 12 diseases and health conditions. The level of worry was either identified as "not at all," "a little," or "worry a lot." A majority of participants worried the least ("not at all") about smoking (87%), AIDS (80%), drug addiction/alcoholism (78%), and lung cancer (60%). Moderate levels of worry ("worry a little") were indicated by the majority of participants for Alzheimer's disease (57%), breast cancer (54%), heart disease (50%), cancer (general) (50%), and osteoporosis (43%). The diseases denoted with the greatest level of worry ("worry a lot") were cancer (41%) and breast cancer (35%). In regards to heart disease, 35% of participants worried not at all about heart disease, 50% worried a little, and 14% worried a lot. Table 8 illustrates frequencies and percentages for the extent of worry regarding all 12 diseases and health conditions.

Table 8

*Extent of worry regarding certain health conditions*

| Health Condition | Not at all *n* (%) | A little *n* (%) | Worry a lot *n* (%) |
|---|---|---|---|
| AIDS | 398 (79.6%) | 85 (17%) | 17 (3.4%) |
| Alzheimer's Disease | 141 (28.2%) | 286 (57.2%) | 73 (14.6%) |
| Breast Cancer | 55 (11%) | 272 (54.4%) | 173 (34.6%) |
| Cancer (general) | 48 (9.6%) | 248 (49.6%) | 204 (40.8%) |
| Diabetes | 227 (45.4%) | 185 (37%) | 88 (17.6%) |
| Drug Addiction/Alcoholism | 390 (78%) | 91 (18.2%) | 19 (3.8%) |
| Heart Disease | 177 (35.4%) | 252 (50.4%) | 71 (14.2%) |
| Lung Cancer | 301 (60.2%) | 152 (30.4%) | 47 (9.4%) |
| Osteoporosis | 236 (47.2%) | 213 (42.6%) | 51 (10.2%) |
| Smoking | 434 (86.8%) | 44 (8.8%) | 22 (4.4%) |
| Stroke | 265 (53%) | 190 (38%) | 45 (9%) |
| Violent Crime | 197 (39.4%) | 197 (39.4%) | 106 (21.2%) |

*Research Question #2: What is the level of CVD knowledge among college-aged women?*

General CVD knowledge was measured using the 30-item *Heart Disease Knowledge Questionnaire*. The mean knowledge score for the participants ($n$ = 500) was 16.01 out of 30 possible points (53%) with a standard deviation of 5.65. The knowledge questions were divided into five sub-scales (dietary, epidemiology, medical, risk factors, and symptoms), as shown in Table 9. Significant differences in heart disease knowledge scores were identified for both year in school and race/ethnicity. There was a significant difference for year in school, $t(495) = -2.74$, $p = .006$, with juniors/seniors ($M = .55$, $SD = .18$) scoring higher than freshman/sophomores ($M = .51$, $SD = .20$). Additionally, a one-way analysis of variance (ANOVA) revealed that

knowledge scores differed significantly across the three racial/ethnic groups (Caucasian, African American, and other), $F$ (2, 497) = 6.92, $p$ = .001. Tukey post-hoc analysis indicated that Caucasian women ($M$ = 0.55, 95% CI [0.53, 0.57]) had significantly higher knowledge scores than the African American women ($M$ = 0.46, 95% CI [0.42, 0.51]), $p$ = .001. There were no significant differences in knowledge found between the other groups at the .05 Alpha level.

More than half of participants answered the dietary knowledge questions correctly, including those regarding trans fats (66%), dietary fiber (65%), and cholesterol (63%). Similarly, the majority of participants correctly answered epidemiology knowledge questions, such as heart disease is the leading cause of death (73%), heart disease is a chronic, long-term illness (72%), women are more likely to get heart disease after menopause (55%), and women are more likely to die from heart disease than breast cancer (52%). In regards to the medical knowledge questions, the majority of women knew information regarding high blood pressure (69%) and normal heart rate (79%). However, knowledge was low concerning HDL and LDL cholesterol (45%), the definition of high blood pressure (43%), exercise (39%), and atrial defibrillation (25%). Risk factor knowledge was highest concerning walking and gardening as preventative exercise (88%) and diabetes (82%). The lowest risk factor knowledge was identified for the questions concerning stress (36%) and smoking (42%). A majority of participants correctly answered questions regarding heart attack symptoms. However, the lowest number of correct responses (14%) was recorded for knowing that sudden trouble seeing in one eye is not a symptom of a heart attack.

Table 9

*Frequencies and percentages of responses to heart disease knowledge items*

| Item | Correct Answer *n* (%) | Incorrect Answer *n* (%) | Don't Know *n* (%) |
|---|---|---|---|
| Dietary Knowledge | | | |
| Polyunsaturated fats are healthier for the heart than saturated fats. | 245 (49%) | 90 (18%) | 165 (33%) |
| Trans-fats are healthier for the heart than most other kinds of fats. | 330 (66%) | 62 (12.4%) | 108 (21.6%) |
| Most of the cholesterol in an egg is in the white part of the egg. | 315 (63%) | 82 (16.4%) | 103 (20.6%) |
| Dietary fiber lowers blood cholesterol. | 321 (64.2%) | 40 (8.0%) | 139 (27.8%) |
| Margarine with liquid safflower oil is healthier than margarine with hydrogenated soy oil. | 248 (49.6%) | 54 (10.8%) | 198 (38.6%) |
| Many vegetables are high in cholesterol. | 292 (58.4%) | 73 (14.6%) | 135 (27%) |
| Epidemiology Knowledge | | | |
| Women are less likely to get heart disease after menopause than before. | 274 (54.8%) | 63 (12.6%) | 163 (32.6%) |
| Heart disease is the leading cause of death in the United States. | 365 (73%) | 44 (8.8%) | 91 (18.2%) |
| Most women are more likely to die from breast cancer than heart disease. | 262 (52.4%) | 108 (21.6%) | 130 (26%) |
| Heart disease is better defined as a short-term illness than a chronic, long-term illness. | 362 (72.4%) | 40 (8.0%) | 98 (19.6%) |
| Medical Knowledge | | | |
| Most people can tell whether or not they have high blood pressure. | 346 (69.2%) | 83 (16.6%) | 71 (14.2%) |
| The healthiest exercise for the heart involves rapid breathing for a sustained period of time. | 196 (39.2%) | 177 (35.4%) | 127 (25.4%) |
| A healthy person's pulse should return to normal within 15 minutes after exercise. | 376 (75.2%) | 25 (5.0%) | 99 (19.8%) |
| Cardiopulmonary resuscitation (CPR) helps to clear clogged blood vessels. | 253 (50.6%) | 89 (17.8%) | 158 (31.6%) |

Note: Total heart disease knowledge mean score = 16.01, Standard Deviation = 5.65

Table 9 Cont.

*Frequencies and percentages of responses to general heart disease knowledge items*

| Item | Correct Answer *n* (%) | Incorrect Answer *n* (%) | Don't Know *n* (%) |
|---|---|---|---|
| HDL refers to "good" cholesterol, and LDL refers to "bad" cholesterol. | 225 (45.0%) | 69 (13.8%) | 206 (41.2%) |
| Atrial defibrillation is a procedure where hardened arteries are open to increase blood flow. | 123 (24.6%) | 181 (36.2%) | 196 (39.2%) |
| "High" blood pressure is defined as 110/80 (systolic/diastolic) or higher. | 214(42.8%) | 137 (27.4%) | 149 (29.8%) |
| | | | |
| Risk Factor Knowledge | | | |
| Having had chicken pox increases the risk of heart disease. | 178 (35.6%) | 70 (14.0%) | 252 (50.4%) |
| Eating a lot of red meat increases heart disease risk. | 346 (69.2%) | 95 (19.0%) | 59 (11.8%) |
| The most important cause of heart attacks is stress. | 181 (36.2%) | 228 (45.6%) | 91 (18.2%) |
| Walking and gardening are considered types of exercise that can lower heart disease risk. | 441 (88.2%) | 16 (3.2%) | 43 (8.6%) |
| Smokers are more likely to die of lung cancer than heart disease. | 209 (41.8%) | 169 (33.8%) | 122 (24.4%) |
| Taking an aspirin each day decreases the risk of getting heart disease. | 229 (45.8%) | 167 (33.4%) | 104 (20.8%) |
| Taller people are more at risk for getting heart disease. | 231 (46.2%) | 63 (12.6%) | 206 (41.2%) |
| People who have diabetes are at higher risk of getting heart disease. | 409 (81.8%) | 14 (2.8%) | 77 (15.4%) |
| Eating a high fiber diet increases the risk of getting heart disease. | 327 (65.4%) | 50 (10.0%) | 123 (24.6%) |
| | | | |
| Symptoms | | | |
| Turning pale or gray is a symptom of having a heart attack. | 291 (58.2%) | 53 (10.6%) | 156 (31.2%) |
| Sudden trouble seeing in one eye is a common symptom of a heart attack. | 71 (14.2%) | 248 (49.6%) | 181 (36.2%) |
| Feeling weak, lightheaded, or faint is a common symptom of having a heart attack. | 348 (69.6%) | 49 (9.8%) | 103 (20.6%) |
| Men and women experience many of the same symptoms of a heart attack. | 273 (54.6%) | 137 (27.4%) | 90 (18.0%) |

Note: Total heart disease knowledge mean score = 16.01, Standard Deviation = 5.65

*Research Question #3: What is the level of CVD knowledge concerning hormonal contraceptive use among college-aged women?*

Knowledge of hormonal contraceptive use and CVD was measured using six items. The items and the associated responses are listed in Table 10. The mean knowledge score for the participants ($n$ = 500) was 3.16 out of 6 possible points (53%) with a standard deviation of 2.04. A majority of participants knew that smoking while using hormonal contraceptives increases CVD risk (77%), hormonal contraceptives increase the risk of blood clotting (66%), and hormonal contraceptives increase the risk of stroke (53%). Participants showed the lowest knowledge concerning the increase in cholesterol levels when taking hormonal contraceptives (27.8%).

Table 10

*Frequencies and percentages of responses to hormonal contraceptive use and heart disease knowledge items*

| Item | Correct Answer *n* (%) | Incorrect Answer *n* (%) | Don't Know *n* (%) |
|---|---|---|---|
| Hormonal contraceptives increase the risk of blood clotting. | 328 (65.6%) | 34 (6.8%) | 138 (27.6%) |
| Smoking cigarettes during the use of hormonal contraceptives decreases the risk of heart disease. | 383 (76.6%) | 16 (3.2%) | 101 (20.2%) |
| Hormonal contraceptives increase cholesterol levels. | 139 (27.8%) | 121 (24.2%) | 240 (48.0%) |
| Hormonal contraceptives decrease the risk of stroke | 267 (53.4%) | 53 (10.6%) | 180 (36.0%) |
| Hormonal contraceptives decrease blood pressure. | 236 (47.2%) | 52 (10.4%) | 212 (42.4%) |
| Hormonal contraceptives increase the risk of having a heart attack. | 223 (44.6%) | 80 (16.0%) | 197 (39.4%) |

Note: Total hormonal contraceptives and heart disease mean score = 3.16, Standard Deviation = 2.04

*Research Question #4: What is the perceived risk of CVD among college-aged women?*

Perceived risk of CVD was measured using 10 health belief items from the *Risk Perceptions Related to Heart Disease* susceptibility (5 items) and severity (5 items) sub-scales.

Summaries of the mean scores for each sub-scale are depicted in Table 11. Table 12 and Table 13 illustrate the frequencies, percentages, mean score, and standard deviation for all of the items in each sub-scale. Perceived susceptibility measured the participants' personal perception of their susceptibility for CVD. The higher the score recorded, the more susceptible an individual feels concerning CVD. The overall mean susceptibility score was 11.4 with a standard deviation of 4.13. The highest possible score for the subscale was 25. A majority of participants "strongly disagreed" or "disagreed" with the following susceptibility statements: "my chances of suffering from heart disease in the next few years are great" (83%); "I feel I will have heart disease at some time during my lifetime" (52%); "having heart disease is currently a possibility for me."(64%); and "I am concerned about the likelihood of having heart disease in the near future" (60%).

Perceived severity measured the participants' personal perception of the seriousness of developing CVD. The higher the score recorded, the greater the tendency to perceive CVD as serious. The overall mean severity score was 13.2 with a standard deviation of 3.5. The highest possible score for the subscale was 25. A majority of the participants "strongly disagreed" or "disagreed" with the following severity statements: "having a heart attack or stroke is always fatal" (76%); "having a heart attack or stroke will threaten my relationship with my significant other" (61%); and "if I have a heart attack or stroke I will die within the next 10 years" (64%). Conversely, 65% of the respondents "agreed" or "strongly agreed" with the statement "my whole life would change if I had a heart attack or stroke." Moreover, 42% of respondents were "neutral" when considering the statement "having a heart attack or stroke would have a very bad effect on my sex life.

Table 11

*Summary table for risk perceptions related to heart disease sub-scales*

| Sub-Scale | Mean | Standard Deviation |
|---|---|---|
| Perceived Susceptibility [a] | 11.4 | 4.13 |
| Perceived Severity [b] | 13.2 | 3.50 |

Note: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1; Highest possible score = 25

[a] The higher the score, the greater the tendency to feel susceptible to CVD.
[b] The higher the score, the greater the tendency to perceive CVD as serious.

Table 12

*Participants perceived susceptibility to CVD*

| Item | SD *n* (%) | D *n* (%) | N *n* (%) | A *n* (%) | SA *n* (%) | Mean | SD |
|---|---|---|---|---|---|---|---|
| It is likely that I will suffer from heart disease in the future. | 74 (14.8%) | 164 (32.8%) | 183 (36.6%) | 65 (13.0%) | 14 (2.8%) | 2.56 | 0.99 |
| My chances of suffering from heart disease in the next few years are great. | 219 (43.8%) | 195 (39.0%) | 65 (13.0%) | 17 (3.4%) | 4 (0.8%) | 1.78 | 0.86 |
| I feel I will have heart disease at some time during my lifetime. | 91 (18.2%) | 169 (33.8%) | 147 (29.4%) | 81 (16.2%) | 12 (2.4%) | 2.51 | 1.04 |

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; N (Neutral) = 3; A (Agree) = 4; SA (Strongly Agree) = 5; Highest possible score = 25. Perceived Susceptibility Total Mean Score = 2.28, Standard Deviation = 0.31; The higher the total score, the greater the tendency to feel susceptible to CVD.

Table 12 Cont.

*Participants perceived susceptibility to CVD*

| Item | SD *n* (%) | D *n* (%) | N *n* (%) | A *n* (%) | SA *n* (%) | Mean | SD |
|---|---|---|---|---|---|---|---|
| Having heart disease is currently a possibility for me. | 154 (30.8%) | 168 (33.6%) | 115 (23.0%) | 54 (10.8%) | 9 (1.8%) | 2.19 | 1.04 |
| I am concerned about the likelihood of having heart disease in the near future. | 144 (28.8%) | 154 (30.8%) | 104 (20.8%) | 77 (15.4%) | 21 (4.2%) | 2.35 | 1.17 |

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; N (Neutral) = 3; A (Agree) = 4; SA (Strongly Agree) = 5; Highest possible score = 25.
Perceived Susceptibility Total Mean Score = 2.28, Standard Deviation = 0.31; The higher the total score, the greater the tendency to feel susceptible to CVD.

Table 13

*Participants perceived severity of CVD*



| Item | SD *n* (%) | D *n* (%) | N *n* (%) | A *n* (%) | SA *n* (%) | Mean | SD |
|---|---|---|---|---|---|---|---|
| Having a heart attack or stroke is always fatal. | 173 (34.6%) | 208 (41.6%) | 66 (13.2%) | 32 (6.4%) | 21 (4.2%) | 2.04 | 1.06 |
| Having a heart attack or stroke will threaten my relationship with my significant other. | 167 (33.4%) | 140 (28.0%) | 108 (21.6%) | 67 (13.4%) | 18 (3.6%) | 2.26 | 1.16 |
| My whole life would change if I had a heart attack or stroke. | 32 (6.4%) | 54 (10.8%) | 91 (18.2%) | 197 (39.4%) | 126 (25.2%) | 3.66 | 1.16 |
| Having a heart attack or stroke would have a very bad effect on my sex life. | 56 (11.2%) | 73 (14.6%) | 212 (42.4%) | 111 (22.2%) | 48 (9.6%) | 3.04 | 1.10 |
| If I have a heart attack or stroke I will die within the next 10 years. | 122 (24.4%) | 199 (39.8%) | 146 (29.2%) | 27 (5.4%) | 6 (1.2%) | 2.19 | 0.91 |

Note: SD (Strongly Disagree) = 1; D (Disagree) = 2; N (Neutral) = 3; A (Agree) = 4; SA (Strongly Agree) = 5.
Perceived Severity Total Mean Score = 2.64, Standard Deviation = 0.69; A higher total score reflects greater tendency to perceive CVD as serious.

*Research Question #5: What is the association between CVD knowledge, CVD hormonal contraceptive knowledge, and perceived risk of CVD (perceived susceptibility and severity)?*

Pearson correlation coefficients were calculated between total CVD knowledge score, total hormonal contraceptive use and CVD knowledge score, perceived susceptibility subscale score, and perceived severity subscale score. Table 14 includes all significant and non-significant correlation coefficients. There was a significant relationship between total heart disease knowledge score and total hormonal contraceptive knowledge score, $r(498) = .48$, $p < 0.01$. The perceived risk susceptibility subscale score was also significantly correlated with the perceived risk severity subscale score, $r(498) = .35$, $p < 0.01$.

Table 14

*Correlation between total heart disease knowledge and perceived risk*

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Total CVD Knowledge | 1 | - | - | - |
| 2. Total HC/CVD Knowledge | .48** | 1 | - | - |
| 3. Total Perceived Risk Susceptibility | -.09 | .04 | 1 | - |
| 4. Total Perceived Risk Severity | -.09 | -.02 | 0.35** | 1 |

Note: ** Correlation is significant at the 0.01 level (two-tailed)

*Research Question #6: Is there a significant difference in CVD knowledge concerning hormonal contraceptive use between college-aged hormonal contraceptive users and non-users?*

A one-way analysis of variance (ANOVA) was used to test for differences in CVD knowledge concerning hormonal contraceptive use among the four groups (hormonal contraceptive users that are non-smokers, hormonal contraceptive users that are smokers, non-users who are non-smokers, and non-users who are smokers). Results indicated that knowledge

scores differed significantly across the four groups, $F$ (3, 496) = 5.378, $p$ = .001. Post-hoc analysis using the Tukey HSD test indicated that the hormonal contraceptive users who smoked ($M$ = 0.63, 95% CI [0.58, 0.70]) had significantly higher knowledge scores than the non-users who were non-smokers ($M$ = 0.47, 95% CI [0.41, 0.52]), $p$ = .001. Post-hoc comparisons between the users who were non-smokers ($M$ = 0.53, 95% CI [.49, .57]) and non-users who smoked ($M$ = 0.56, 95% CI [.38, .74]) with the other three groups were not statistically significant at the .05 Alpha level. Table 15 includes a summary of the One-Way ANOVA data.

Table 15

*Summary of one-way analysis of variance (ANOVA) for hormonal contraceptive use and heart disease knowledge scores*

| | | Mean Difference | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| (I) GroupFinal | (J) GroupFinal | (I-J) | Std. Error | Sig. | Bound | Bound |
| Users | UsersSmoke | -.10894 | .04301 | .056 | -.2198 | .0019 |
| Non-Smokers | NonuserNon | .06445 | .03359 | .222 | -.0221 | .1510 |
| | NonuserSmoke | -.02496 | .08965 | .992 | -.2561 | .2061 |
| Users | UsersNon | .10894 | .04301 | .056 | -.0019 | .2198 |
| Smoke | NonuserNon | .17339* | .04350 | .000 | .0612 | .2855 |
| | NonuserSmoke | .08398 | .09381 | .807 | -.1578 | .3258 |
| Nonusers | UsersNon | -.06445 | .03359 | .222 | -.1510 | .0221 |
| Non-Smokers | UsersSmoke | -.17339* | .04350 | .000 | -.2855 | -.0612 |
| | NonuserSmoke | -.08941 | .08989 | .753 | -.3211 | .1423 |
| Nonusers | UsersNon | .02496 | .08965 | .992 | -.2061 | .2561 |
| Smoke | UsersSmoke | -.08398 | .09381 | .807 | -.3258 | .1578 |
| | NonuserNon | .08941 | .08989 | .753 | -.1423 | .3211 |

* The mean difference is significant at the 0.05 level.

# CHAPTER V:
# DISCUSSION

The primary purpose of this study was to determine CVD knowledge, awareness, and perceived risk among a sample of college women. Additionally, the relationship between CVD knowledge and perceived risk was assessed. A secondary purpose was to assess the participants' CVD knowledge concerning hormonal contraceptive use and determine if any differences in knowledge exist between hormonal contraceptive users and non-users. Despite hormonal contraceptive users being at an increased risk for CVD, at the time of the study, no data was available concerning CVD knowledge among this population.

This study utilized a cross-sectional study design. Data was collected using a self-reported questionnaire containing 65 items that assessed demographic characteristics, CVD awareness, CVD knowledge, and perceived risk of CVD. A total of 500 students comprised the study sample. The study sample was comprised of 79.4% Caucasian women, 14.8% African American women, and 5.8% of women of other race/ethnicity. This sample was representative of the student population at The University of Mississippi (75.4% Caucasian, 16.9% African American, and 7.7% other), which allows for generalizability to the university population. The assessment of current health conditions yielded a high number of participants with known CVD risk factors. More than one-third ofwomen reported known family history of heart disease and stroke. Additionally, 43% and 25% of women reported the presences of two major modifiable risk factors for CVD, physical inactivity and overweight/obesity, respectively.

## CVD Awareness

In this study, 32.4% of college women identified breast cancer as the greatest health problem facing women today, whereas only 21.2% believed CVD/heart disease, currently the leading cause of death, was the greatest health problem for women. Additionally, women in this study not only overestimated the risk of breast cancer in comparison to CVD but also underestimated the risk of numerous other diseases, including lung cancer, osteoporosis, and obesity. Considering lung cancer is the leading cause of cancer mortality among women, it is alarming that only 0.6% of participants felt lung cancer to be a significant health problem for women (CDC, 2013). According to the CDC, in 2010 lung cancer was responsible for 37.9% of all cancer deaths among women of all racial/ethnic groups whereas breast cancer was attributed to only 21.2% of all deaths (CDC, 2013). Similarly, the severity of osteoporosis as a significant health problem for women was underestimated by this group of young women. According to the International Osteoporosis Foundation, osteoporosis is responsible for more days spent in the hospital for women over age 45 than many other diseases, including diabetes, heart disease, and cancer (IOF, 2013). Unfortunately, in this study, only 3.0% of participants identified osteoporosis as a significant public health problem. Additionally, in regards to obesity, twice as many participants believed breast cancer to be a greater health problem than obesity. However, previous research has identified obesity to have significant long-term health effects, including increased risk for chronic diseases, notably CVD and breast cancer (National Heart, Lung, and Blood Institute, 2002).

The overestimation of breast cancer risk and underestimation of other significant health problems reported in this study are similar to results recorded in previous studies with young women (Mosca et al., 2000; Mosca et al., 2004; Munoz et al., 2010; Smith et al., 2012; Wilcox et

al., 2002). Additionally, this study is in line with previous findings that suggest women tend to have misconceptions about the diseases for which they are at greatest risk of developing (Wang et al., 2009). Similar to the present study, Munoz et al. (2010) determined that approximately one-third of female college students believed breast cancer to be the greatest health concern among women. However, unlike the present study, Munoz and colleagues determined that approximately the same number of college women (37%) felt that CVD was the greatest problem facing women. Therefore, further research is necessary in order to determine chronic disease perceptions among college women.

Even though CVD is the leading cause of death for women, this study and previous findings suggest that young women still do not perceive CVD as a serious health concern (Mosca et al., 2000; Mosca et al., 2004; Munoz et al., 2010; Smith et al., 2012). Additionally, results from this study show that young women continue to overestimate the threat of breast cancer, which in turn may overshadow the attention placed upon CVD and other significant public health concerns among women, such as lung cancer, osteoporosis, and obesity. Therefore, health education efforts should focus on improving educational messages highlighting the impact and severity of these public health issues.

### Leading Cause of Death

In regards to identifying the leading cause of death for women in the United States, 49.2% (n = 246) of women in the present study correctly identified CVD. The second and third most frequently selected choices for the leading cause of death were cancer (19.2%) and breast cancer (18.0%) respectively. Interestingly, lung cancer, the leading cause of all cancer deaths, and stroke, the fourth leading cause of death, were selected by a meager 1.4% of participants.

The awareness level in this study is comparable to awareness levels reported in previous studies (Mosca et al., 2010; Munoz et al., 2010). Munoz and colleagues (2010) also found approximately half of female college students age 18 to 24 were aware that heart disease was the leading cause of death for women. Previous research suggests that even though CVD awareness has increased among all women in recent years, some groups, including young women, continue to exhibit lower awareness levels (Mosca et al., 2010). Considering CVD is a significant and detrimental health problem for women in the United States, it is striking that only half of participants were able to correctly identify CVD/heart disease as the leading cause of death and only one-fifth recognized it as the greatest health problem facing women today.

Previous research has identified that Caucasian women were more likely to identify CVD/heart disease as the leading cause of death in comparison to other racial/ethnic groups (Christian, Rosamond, White, & Mosca, 2007; Mosca et al., 2010). Christian and colleagues (2007) and Mosca and colleagues (2010) analyzed longitudinal trends in CVD awareness among women. Both studies yielded results indicating that Caucasian women had significantly higher awareness levels than other racial/ethnic minorities (African American, Hispanic, and Asian) and suggested a racial/ethnic gap in awareness among women. In the present study, 52% of Caucasian women were capable of correctly identify CVD as the leading cause of death for women, whereas African Americans and all other racial ethnic groups had much lower awareness levels (36% and 34% respectively). Results from the present study are consistent with trends reported in both of the aforementioned studies and support the racial/ethnic gap in awareness.

## Sources of CVD Information

Responses in this sample of young women indicate that health courses, the Internet, friends/family, and television prevail as the most frequently cited sources of information regarding CVD/heart disease. Minimal numbers of women identified the radio and newspaper as sources of CVD information. Munoz and colleagues (2010) found similar findings in a study of diverse college women, where the majority cited television, magazines, and the internet as recent sources of CVD information. In contradiction to the findings of this study, Collins and colleagues (2004) found that college students cited magazines and newspapers as their preferred sources of health information. Moreover, the shift in information sources from paper sources to electronic sources may be due to the increased usage of social media and technology. Results from this study and previous studies indicate that college students may be more inclined to receive CVD information from sources such as television, friends/family, and the internet. These results are essential in order for a health education practitioner to understand and utilize the most effective communication channels for the target population when designing a health education intervention program.

Another interesting finding was that doctors and other healthcare workers were identified as sources of information for less than half of this sample. However, previous research with college women suggests that "human" sources of information, specifically physicians, may be the most effective communication methods to use when disseminating CVD information to women (Collins et al., 2004). A potential explanation for this discrepancy may lie in the assumption that young adults, especially young women, lack access to CVD information from their primary care physicians (Mosca et al., 2005). Young women generally receive care for their presenting symptoms upon accessing the healthcare system and may not receive counseling

regarding lifestyle changes or other conditions (Mosca et al., 2005). However, research has indicated that the development of lifestyle risk factors for CVD and other chronic diseases is established during young adulthood (Collins et al., 2004). Therefore, primary care physicians may be missing critical opportunities with young women to discuss heart health issues and prevention during routine physical exams and appointments. Furthermore, recent discussions among experts on women's health issues identified the need for primary care providers to take every opportunity to counsel women on lifestyle changes early in life to prevent chronic heart disease (Godfrey, 2005).

## Overall CVD Knowledge

Knowledge regarding CVD was found to be low among this sample of female college students. The average knowledge score was 16 out of 30 questions answered correctly (53.4%). This finding is similar to previous research regarding CVD knowledge among young adults and college students (Collins et al., 2004; Green et al., 2003; Lynch et al., 2006). The highest knowledge scores were observed for questions in the epidemiology subsection, and the lowest knowledge scores were recorded for questions in the risk factor and symptoms subscales. Additionally, an interesting finding from this study is the level of uncertainty among participants in regards to many of the knowledge questions. Participants indicating "I don't know" as an answer ranged from as low as 8.6% to as high as 50.4%. The patterns of uncertainty among women regarding not only CVD awareness but also CVD knowledge indicate the need for continued education in this area for women.

Among the questions in the epidemiology subscale, 73% of participants correctly responded to the question assessing CVD as the leading cause of death in the United States. This

finding is particularly interesting, considering in the awareness questions discussed previously, only 49.2% of participants knew that CVD was the leading cause of death for women. Moreover, another knowledge question in this subscale assessed mortality for breast cancer in comparison to CVD. Only slightly more than half (52.4%) of participants knew that women were more likely to die from CVD than breast cancer. These findings reflect the gender gap previously identified in regards to CVD awareness among women and the overestimation of the impact of breast cancer (Collins et al., 2004; Marcuccio et al., 2003; Mosca et al., 2010).

Discrepancies in knowledge were also seen for questions included in the risk factor subscale. Previous research among young adults is mixed in regards to CVD risk factor knowledge. Lynch and colleagues (2006) showed that knowledge of risk factors for CVD was low among young adults ages 18 to 30. However, Munoz et al. (2010) found high awareness of CVD risk factors among female college students. The present study demonstrated high levels of knowledge for many risk factors, including red meat consumption, diabetes, and exercise. However, knowledge concerning smoking and stress as risk factors for CVD was found to be notably low among this sample of young women. Smoking has been classified by the American Heart Association as one of the six major modifiable risk factors for CVD, and stress was classified as a contributing risk factor for CVD because individual responses to stress may increase established risk factors, such as overeating and smoking (AHA, 2014). In this study, only 41.8% of participants correctly answered the question concerning smoking as a risk factor, and 36.2% answered the question related to stress as a risk factor correctly. Previous research in the college population has also shown low levels of knowledge regarding smoking as a significant CVD risk factor (Collins et al., 2004).

Cigarette smoking has been identified as the most important risk factor in young men and women because it produces greater risk in those under age 50 than in those over age 50. The chance of smokers developing coronary heart disease in their lifetime is two to four times greater than the risk of non-smokers, and the risk in women has been shown to be 25% higher than in men (AHA, 2014; Huxley & Woodward, 2011). Moreover, the AHA highlights that women who smoke cigarettes and use hormonal contraceptives greatly increase their risk of coronary heart disease and stroke in comparison to non-smoking women (AHA, 2014). Research has indicated that the risk of coronary heart disease in women begins to decline within months of smoking cessation and may even reach the level of persons who have never smoked within three to five years of cessation (Rich-Edwards, Manson, Hennekens, & Buring, 1995). Therefore, encouraging smoking cessation, especially early in life, is essential to minimize the effects on smoking on heart health.

In a recent report released by the Office of the Surgeon General discussing patterns of tobacco use, young adults 18 to 25 years of age had the highest prevalence of cigarette smoking at 31.8%, with 27.1% of females in the age group classified as smokers (Office of the Surgeon General, 2014). In the present study, approximately 11% of young women were current smokers and 20% reported ever smoking while using hormonal contraceptives. Considering the substantially increased CVD risk affiliated with smoking and the high reported prevalence of smoking among young adults, it is imperative that young women are educated concerning the effects of smoking on heart health and encouraged to quit smoking to lower their risk of CVD.

CVD Knowledge Disparities among College Women

In the present study, knowledge scores were found to be significantly different by year in school as well as race/ethnicity. In regards to level of education, juniors and seniors scored significantly higher on the heart disease knowledge questions than freshman and sophomores. This discrepancy in knowledge may be attributed to exposure to information about CVD in undergraduate health/science courses. Juniors and seniors are probably more likely to have taken a course in health or science that covered material about CVD and heart health, whereas freshman and sophomores may not have had an opportunity to take these particular courses. Additionally, some universities may not require all students to enroll in a health education course but rather offer the course as an elective. Students may not choose to take these courses if they do not have a vested interest in health or wellness. However, as shown in this study, the most commonly reported source for CVD information was from a health education course. Even though heart disease manifests later in life, risk reduction strategies learned at a young age may have a significant impact on disease development in the future (Collins et al., 2004). Thus, students who do not take a health education course may be missing out on important information that could impact their health and well-being in the future.

Similar to the present study, previous research studies have shown racial and ethnic disparities in CVD knowledge, especially among African Americans (Collins et al., 2004; Lynch et al., 2006; Mosca et al., 2010). In this study, Caucasian women scored significantly higher on CVD knowledge questions than African American women. This should be of utmost concern because even though CVD is the leading cause of death for all women, African American women are impacted by CVD at an even greater rate than Caucasian women. Reported

incidence, prevalence, and mortality figures for coronary artery disease, hypertension, and stroke are all higher in African American women than Caucasian women (Williams, 2009).

## Hormonal Contraceptive Use and CVD Knowledge

In the present study, approximately 59% of participants were hormonal contraceptive users. This finding is slightly lower than the most recent data from the 2013 American College Health Association's National College Health Assessment (ACHA-NCHA), where 79% of college women were identified as using some type of hormonal contraceptive (American College Health Association, 2013). The discrepancy observed between this study and all college women may be attributed to various social and demographic factors, such as medication access, knowledge, religiosity, and perceptions of infertility (Raine, Minnis, & Padian, 2003). In this sample of college women, religious beliefs may play an important role in contraceptive choice. According to the United States Census data from 2012, approximately 55% of all Mississippi residents identified themselves as church adherents (United States Census Bureau, 2012). Additionally, previous research has shown religion to play an important role in the contraceptive choices of young women. Raine and colleagues (2003) indicated that young women raised with a religion were significantly less likely to use a hormonal contraceptive method. Therefore, the discrepancy in hormonal contraceptive use among this sample of young women when compared to national averages may be attributed to the location of the university in the southern United States and the strong religious presence in the region.

Hormonal contraceptive use is an important gender specific CVD risk factor for women. Previous research has indicated that the incidence of diseases related to the heart is the most common adverse effect women experience related to hormonal contraceptive use (Farley et al.,

1999). Additionally, hormonal contraceptive use is attributed a large proportion of CVD related deaths among women 15 to 44 years old (Plu-Bureau et al., 2013). In this study, knowledge was measured in regards to hormonal contraceptive use and CVD risk among hormonal contraceptive users and non-users. Similar to overall CVD knowledge, knowledge scores specific to hormonal contraceptive use and CVD were low, with the average score being 3.16 out of 6 (53%). Additionally, much like overall CVD knowledge, there was a high level of uncertainty among participants concerning the six knowledge questions. The percentage of respondents marking "I don't know" ranged from as low as 20.2% to as high as 48.0%. Participants scored the lowest on the questions addressing the increase in stroke risk, heart attack, and cholesterol levels associated with hormonal contraceptive use. However, the highest scores were seen for questions addressing the increased risk of blood clotting and the increased risk for CVD associated with smoking while using hormonal contraceptive methods.

A potential explanation for the increased knowledge concerning the risks associated with blood clotting and smoking may lie in the information physicians tend to highlight concerning hormonal contraceptive medication. Practitioners may be highlighting these particular risks more often to patients. Researchers suggest that the single most important advice physicians can provide to women when prescribing hormonal contraception is to refrain from smoking cigarettes (Tanis et al., 2001). Considering physicians are aware of the exacerbated risk affiliated with the synergistic use of hormonal contraceptives and smoking, they may be counseling women more often concerning smoking than other increased CVD risks.

Moreover, another potential explanation for the increased awareness of blood clotting and smoking with hormonal contraceptive use may be attributed to media campaigns and advertising for these medications. Increased risk for blood clots and the impact of smoker are side effects of

hormonal contraceptive use most often cited in television commercials and magazine advertisements for the medication. Therefore, exposure to this information may have improved knowledge regarding these risks but potentially overshadowed the increased risk of heart attack, stroke, and high blood pressure. Even though it is known that these risks are low for seemingly healthy women, it is important to note that all of these risks are increased significantly with the synergistic use of hormonal contraceptives and smoking. Thus, the high level of knowledge regarding smoking in this study is a promising finding.

In this study, hormonal contraceptive users who smoke had significantly higher knowledge scores than hormonal contraceptive users who did not smoke on the questions specific to hormonal contraceptive use and CVD risk. It is an encouraging finding that the hormonal contraceptive users who smoke scored higher on the knowledge questions than all other groups (non-smoking users, smoking non-users, and non-smoking non-users). This group of women, as discussed previously, is at a significantly greater risk of experiencing a cardiac event associated with hormonal contraceptive use (Pomp et al., 2007; Tanis et al., 2001). Even though the high level of knowledge among this group was a positive finding, extensive research on knowledge of hormonal contraceptive use and CVD risk is warranted among this population.

On the other hand, the lower knowledge levels among the other aforementioned groups are worrisome. The age of the women in this sample, 18 to 24 years old, indicates that these women are still at risk for initiating smoking. Young adults have the highest smoking rate of any age group in the United States (Freedman, Nelson, & Feldman, 2012). In the 2009 National Health Interview Survey (NHIS), 38% of current young adult smokers reported initiating smoking after age 18 (National Center for Health Statistics, 2009). Considering the women in this sample were still in this at risk age group, it is imperative that even the non-smoking women

are aware of the increased CVD risk affiliated with smoking and hormonal contraceptive use. Physicians may only be counseling women who report current smoking regarding the increased risk, and women who start smoking after being prescribed hormonal contraceptives may be unknowingly at risk. Moreover, if all women were aware of the increased risk, they may be further deterred from initiating smoking.

## Perceived Risk of CVD

The perception of CVD risk among this group of young women was very low. When asked to identify the level of worry for various diseases and conditions, participants indicated the greatest levels of worry for cancer (general) and breast cancer. Twice as many participants indicated they "worried a lot" about breast cancer in comparison to heart disease. Additionally, more participants designated they "worried a lot" about violent crime, diabetes, and Alzheimer's disease than heart disease. Even though the other diseases are significant health conditions, it is alarming that the women in this study cited greater levels of worry for many diseases in comparison to the leading cause of death in the United States. Health education programs are needed to increase awareness of CVD incidence and prevalence rates among women.

This study is not the first study among young women to identify greater worry for breast cancer in comparison to CVD and other chronic health conditions (Collins et al., 2004; Smith et al., 2012). Prevalence and mortality rates indicate that CVD is responsible for one in seven deaths among women each year, whereas breast cancer is attributable to one in 30 deaths (AHA, 2014). Thus, CVD poses a much greater threat to a woman's health than breast cancer or other cancers. The reasons behind the incongruence in breast cancer risk among young women are uncertain. A potential explanation for the exceptional level of worry may be the overwhelming

success of campaigns to increase breast cancer awareness. Although these educational efforts have proven to be successful in increasing awareness of breast cancer, they may overshadow attention placed on messages concerning other health conditions, such as CVD. Another explanation for the discrepancy in worry may lie in the fact that CVD is sometimes considered a disease of the elderly. College women may not perceive CVD as a health threat they will experience anytime in the future. However, lifestyle choices and behaviors developed in young adulthood have been linked to future diagnosis of CVD.

## Perceived Susceptibility

Perceived susceptibility to CVD among the women in this study was low. The mean perceived susceptibility score was 2.28 out of 5, indicating that the young women in this study did not perceive themselves as susceptible to CVD. A majority of the women disagreed with the statements "It is likely that I will suffer from heart disease in the future" and "I feel I will have heart disease at some point during my lifetime." However, as indicated in the discussion of the demographic data, the women in this study cited current health conditions consistent with risk factors related to CVD. These risk factors included being overweight, physical inactivity, and a family history of CVD or stroke. Even though heart disease is commonly diagnosed later in life, risk factors for heart disease are established during adolescence and young adulthood. Additionally, the college years are a critical time to establish lifestyle and behavioral choices that may offset CVD development in the future (Von ah et al., 2004). Two of the risk factors prevalent among this group of women, physical inactivity and overweight, are major risk factors for CVD that can be modified (AHA, 2014). Considering this group of women did not feel

susceptible to CVD in the future, educational efforts should focus on increasing awareness of CVD related risk factors and lifelong prevention of CVD.

The low observed susceptibility to CVD is consistent with other findings reported in the literature (Green et al., 2003; Smith et al., 2012). Smith and colleagues (2012) found similar findings to the present study, where the mean 10-year risk of CVD was very low among female participants. Additionally, the students in this study displayed a lack of appreciation for diseases and conditions considered to be precursors to CVD, including being overweight/obese. These findings are consistent with the present study where women failed to consider themselves susceptible to CVD despite the presence of known major CVD risk factors.

### Perceived Severity

Perceived severity of CVD was slightly higher than perceived susceptibility in this study, but the average score was still low (2.64 out of 5). A higher severity subscale score indicates higher perceived severity of CVD. According to the mean severity score, the women in this study did not perceive CVD as severe. The combined low perceived susceptibility and severity scores indicate a low perceived threat of CVD among the young women in this study. Many health behavior theories consider perceived risk (susceptibility plus severity) to be not only an early link in a causal chain of factors contributing to an individual's health behavior but also an important component in the development of health protective behavior (Aiken et al., 2001). In order for young women to engage in health protective behavior for future CVD prevention, they must first perceive CVD as a severe disease and feel susceptible to CVD.

Despite the overall lack of perceived severity and susceptibility, the majority of women agreed that their life would change if they had a heart attack or stroke. This is an interesting

finding considering the lack of perceived susceptibility, perceived seriousness, and knowledge concerning CVD reported in this study. Furthermore, as stated previously, approximately half of the women in this study identified CVD as the leading cause of death, but overall, they did not perceive CVD as severe or feel personally susceptible to the disease. Even though moderate awareness levels exist among the young women in this study, simply being aware of the leading cause of death may not correspond to feelings of personal susceptibility and severity to CVD.

## Limitations of the Study

There are several limitations that must be considered when interpreting the findings from this study. Even though the sample was representative of the population at the university, the sample in this study had a majority of White participants (79%). Consequently, this may limit the generalizability of the findings to all racial/ethnic groups at the university. The sample came from one university campus located in the South and may not represent the knowledge and beliefs of all college students in the United States. Additionally, the sample consisted of college students, which are generally more educated than their counterparts not attending college. Consequently, this limits the generalizability of the findings to all college-age women in the Southeast and other regions of the United States. The Internet and email based survey methodology may have created potential self-selection bias. Potential participants were recruited for the study through email communication, and consequently, the participants who completed the questionnaire may have chosen to participate due to preexisting interests in their personal health and/or CVD. Thus, the participants in this study may have been more knowledgeable about CVD and/or practice more healthy behaviors than other less health conscious individuals.

Moreover, another limitation may lie in the cross-sectional design of this study, which restricts the interpretation of causal relationships.

## Conclusions

Findings from this study indicate moderate awareness levels for CVD as the leading cause of death for women in the United States. Moreover, an overestimation of breast cancer risk in comparison to other diseases, including CVD, stroke, and lung cancer, was observed. The results indicated that the most influential sources of CVD information for college-aged women are health courses, the Internet, friends/family, and television. Therefore, these communication channels should be utilized to deliver the most effective CVD health education messages for this population.

Overall CVD knowledge scores were low among this sample of college-aged women, and disparities in knowledge were observed by year in school and race/ethnicity. Additionally, in regards to knowledge concerning hormonal contraceptive use and CVD, knowledge scores were significantly higher for hormonal contraceptive users who smoked when compared to hormonal contraceptive users who did not smoke. This finding supports the need to increase knowledge about hormonal contraceptive use and CVD among all young women, especially the young women who are still at risk for initiating smoking or using hormonal contraceptives.

Perceived risk of CVD among young women in this study was also found to be low. Both perceived susceptibility and severity health belief scores were low among participants. Furthermore, levels of worry assessed in this study revealed that young women worry twice as much about breast cancer in comparison to heart disease, further emphasizing the overestimation of breast cancer risk mentioned previously. The results from this study indicate a need for

increased CVD knowledge and awareness among young women, which may consequently increase perceived CVD susceptibility and severity health beliefs. These conclusions are warranted because of the detrimental effects of CVD on the health of women, including increased mortality and prevalence rates as well as the leading cause of death for women.

## Future Implications for Research

In order to better represent college-age women in the Southeastern United States and other regions of the country, future studies using larger, diverse samples of young women is recommended. While the study showed low awareness levels among young women, future research should assess factors influencing the discrepancies in awareness. Additionally, research should investigate the reasons behind the overestimation of breast cancer risk shown in findings from this study and previous studies. At the time of this study, no other studies were published assessing knowledge of hormonal contraceptive use and CVD risk. Further research is warranted in this area among this population, especially among women with more diverse racial/ethnic profiles and outside of the college environment. The differences in knowledge observed between hormonal contraceptive users who smoked and users who did not smoke should be researched in larger, more diverse studies. Additionally, future research should assess the factors influencing women to continue smoking while using hormonal contraceptives despite their awareness of the increased CVD risk. Due to the lack of perceived susceptibility and perceived severity in this study, future research should assess the formation of these perceptions. Moreover, future studies should investigate why college-age women do not engage in behaviors that may prevent future CVD diagnosis, such as physical activity, weight loss, and smoking cessation.

## Implications for Health Education and Promotion Practice

The findings from the present study and previous research suggest that CVD continues to be disregarded as a significant public health problem for women and a gender gap remains present in regards to the perceived severity and impact of CVD on women. The lagging awareness levels and lack of appreciation of CVD as a significant health problem among young women demonstrate the need for clear messages to increase CVD awareness among this population. Health education efforts should focus on improving educational messages highlighting the impact and severity of CVD on women. The communication channels identified in this study should be utilized when delivering messages concerning CVD awareness and prevention to young women, as these may serve as the most effective routes to reach this population of women.

Another important finding in this study was the low CVD knowledge levels among young women. Health education efforts should disseminate health information discussing CVD risk to these women in order to increase knowledge and awareness of CVD. Smoking and stress were two knowledge subscales with low scores among all participants. Therefore, increasing knowledge and awareness about smoking, the benefits affiliated with cessation, and the harmful synergistic effect of smoking and hormonal contraceptive use may be beneficial among this population in order to prevent CVD related events in the future. Additionally, stress management courses and information about the effect of stress on overall health and CVD risk may prove beneficial for this population.

Not only are education efforts needed for all women but there is also a need for educational efforts to target racial/ethnic minorities specifically. The lower CVD awareness and knowledge rates observed for African American women in this study and previous studies

highlights the need for increased public health education efforts specifically targeted to impact this group of women. Research has shown awareness and knowledge of CVD to be linked to preventative action for future CVD diagnosis (Mosca et al., 2004). Thus, lack of CVD knowledge may interfere with risk reduction efforts among this group of women. Health education efforts to increase CVD knowledge among this group may positively impact the disparities in mortality, incidence, and prevalence observed among African American women.

Findings from this study indicate mediocre knowledge levels among college women regarding hormonal contraceptive use and CVD risk and differences in knowledge between smokers and non-smokers using hormonal contraceptives. Educational efforts to increase the knowledge of all young women about hormonal contraceptives and CVD risk, especially emphasizing smoking as a moderating factor, should be a focus in health education and promotion. Ensuring that women are properly educated about the increased CVD risk may lead to safer use of hormonal contraceptives among all women and may also further discourage women from initiating smoking.

The low levels of perceived susceptibility and severity should also be of concern to health promotion practitioners. In this study, young women did not feel susceptible to CVD or perceive CVD as severe, but many of the women displayed one or more known risk factors for CVD, such as overweight/obesity, physical inactivity, and smoking. Considering the discrepancy between current risk factor presence and personal susceptibility to CVD, educational efforts targeted towards young adults should emphasize the impact of behavioral and lifestyle choices made during young adulthood on future CVD diagnosis. Educational efforts emphasizing the severity and susceptibility of CVD among women may influence young women to begin considering the effects of their current lifestyle decisions on future disease risk and diagnosis.

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LIST OF APPENDICES

# APPENDIX A

## PERMISSION FOR USE OF INSTRUMENTATION

Amanda Hutcheson akhutche@go.olemiss.edu Mar 2
to hannah.bergman

Ms. Bergman,

I read your article published in the American Journal of Health Education about the development of your Heart Disease Knowledge Questionnaire. I am doing similar research and trying to assess CVD knowledge and risk perception among female undergraduate students.

I am interested in using your instrument in my study, and I wanted to receive your permission before using the instrument. I believe it will be a great tool to measure CVD knowledge in this population. I will be happy to share the results of my study with you, and I will keep you updated with our study's progress.

Thank you very much for your time, and I hope to hear from you soon.

Thanks,

Amanda Hutcheson

Hannah Bergman heb38@case.edu Mar 2

to me

Hi,

Yes, you have permission to use the measure. Good luck with your research!

Hannah

Sent from my iPhone

# APPENDIX B

# INSTRUMENTATION

# Demographic Variable Questionnaire

1. What is your age?

   _____yrs.

2. What is your gender?

   - ☐ Male
   - ☐ Female

3. What is your height in feet and inches?

   _____ft_____inches

4. What is your weight in pounds?

   _____lbs

5. What is your year in school?

   - ☐ 1st year undergraduate
   - ☐ 2nd year undergraduate
   - ☐ 3rd year undergraduate
   - ☐ 4th year undergraduate
   - ☐ 5th year or more undergraduate
   - ☐ Not seeking a degree
   - ☐ Other

6. Are you an international student?

   - ☐ Yes
   - ☐ No

7. How do you classify your race/ ethnicity?

   - ☐ White
   - ☐ Black or African American
   - ☐ Hispanic or Latino/a
   - ☐ Asian or Pacific Islander
   - ☐ American Indian, Alaskan Native, or Native Hawaiian
   - ☐ Biracial or Multiracial
   - ☐ Other

8. Have ever been diagnosed with heart disease?

   - ☐ Yes
   - ☐ No
   - ☐ I don't know

9. Which of the following do you currently experience? Please select all that apply, even if they are controlled by medication.

   - ☐ High blood pressure
   - ☐ High cholesterol
   - ☐ Family history of heart disease or stroke
   - ☐ Weigh 20 pounds or more over ideal for your height/build
   - ☐ Physical inactivity (i.e., exercising less than 20-30 minutes per day, 5 or more days of the week)
   - ☐ Depression
   - ☐ None of the above

10. Are you currently prescribed a birth control medication?

    - ☐ Yes
    - ☐ No
    - ☐ I don't know

11. How long have you been taking a prescription birth control medication?

    - ☐ Less than 1 year
    - ☐ 1-2 years
    - ☐ 3-4 years
    - ☐ 5 years or more

12. If yes, what type of birth control medication are you currently prescribed?

    - ☐ Birth control pill (oral contraceptive)
    - ☐ Vaginal ring (Nuvaring)
    - ☐ Birth control patch (Ortho Evra)
    - ☐ Birth control shot (Depo Provera)
    - ☐ Intrauterine device (IUD)
    - ☐ Birth control implant
    - ☐ Other [open]

13. How often do you take your birth control medication as prescribed?

    - ☐ Everyday
    - ☐ Almost everyday
    - ☐ Sometimes
    - ☐ Rarely
    - ☐ Never

14. Have you smoked at least 100 cigarettes in your entire life?
    NOTE: 5 packs = 100 cigarettes

    - ☐ Yes
    - ☐ No
    - ☐ I don't know

15. If yes, do you now smoke cigarettes every day, some days, or not at all?

    - ☐ Every day
    - ☐ Some days
    - ☐ Not at all
    - ☐ I don't know

16. Have you ever smoked cigarettes while using birth control medication?

    - ☐ Yes
    - ☐ No
    - ☐ I don't know

17. From which of the following sources have you received information about heart disease? (Check all that apply)

- ☐ Social Media
- ☐ Radio
- ☐ Television
- ☐ Newspaper
- ☐ Health course
- ☐ Magazine article/advertisement
- ☐ Internet
- ☐ Health Information Pamphlet
- ☐ American Heart Association
- ☐ Doctor/other health care worker
- ☐ Friends/family
- ☐ Other [open]

CVD Awareness Questionnaire

1. What do you think is the greatest health problem facing women today?

- ☐ AIDS
- ☐ Alzheimer's Disease
- ☐ Breast Cancer
- ☐ Cancer (general)
- ☐ Diabetes
- ☐ Drug Addiction/Alcoholism
- ☐ Heart Disease/Heart Attack
- ☐ Lung Cancer
- ☐ Obesity
- ☐ Osteoporosis
- ☐ Smoking
- ☐ Stroke

2. As far as you know, what is the leading cause of death for all women?

- ☐ Accidental Death
- ☐ AIDS
- ☐ Alzheimer's Disease
- ☐ Breast Cancer
- ☐ Cancer (general)
- ☐ Diabetes
- ☐ Drug Addiction/Alcoholism
- ☐ Heart Disease/Heart Attack
- ☐ Lung Cancer
- ☐ Osteoporosis
- ☐ Smoking
- ☐ Stroke
- ☐ Violent Crime

3. To what extent do you worry about getting each of the following health conditions? Do you worry a lot about this, worry a little, or do you not worry at all about it?

| | Not at all | A little | Worry a lot |
|---|---|---|---|
| Cancer | | | |
| Heart Disease | | | |
| AIDS | | | |
| Breast Cancer | | | |
| Lung Cancer | | | |
| Smoking | | | |
| Drug Addiction/Alcoholism | | | |
| Violent Crime | | | |
| Stroke | | | |
| Alzheimer's | | | |
| Diabetes | | | |
| Osteoporosis | | | |

Heart Disease Knowledge Questionnaire

*Instructions:* Please answer all of the questions to the best of your knowledge. Circle only one answer for each question.

| Question | True | False | Don't Know |
|---|---|---|---|
| 1. Polyunsaturated fats are healthier for the heart than saturated fats. | | | |
| 2. Women are less likely to get heart disease after menopause than before. | | | |
| 3. Having had chicken pox increases the risk of heart disease. | | | |
| 4. Eating a lot of red meat increases heart disease risk. | | | |
| 5. Most people can tell whether or not they have high blood pressure. | | | |
| 6. Trans-fats are healthier for the heart than most other kinds of fats. | | | |
| 7. The most important cause of heart attacks is stress. | | | |
| 8. Walking and gardening are considered types of exercise that can lower heart disease risk. | | | |
| 9. Most of the cholesterol in an egg is in the white part of the egg. | | | |
| 10. Smokers are more likely to die of lung cancer than heart disease. | | | |
| 11. Taking an aspirin each day decreases the risk of getting heart disease. | | | |
| 12. Dietary fiber lowers blood cholesterol. | | | |
| 13. Heart disease is the leading cause of death in the United States. | | | |
| 14. The healthiest exercise for the heart involves rapid breathing for a sustained period of time. | | | |

| Question | True | False | Don't Know |
|---|---|---|---|
| 15. Turning pale or gray is a symptom of having a heart attack. | | | |
| 16. A healthy person's pulse should return to normal within 15 minutes after exercise. | | | |
| 17. Sudden trouble seeing in one eye is a common symptom of a heart attack. | | | |
| 18. Cardiopulmonary resuscitation (CPR) helps to clear clogged blood vessels. | | | |
| 19. HDL refers to "good" cholesterol, and LDL refers to "bad" cholesterol. | | | |
| 20. Atrial defibrillation is a procedure where hardened arteries are open to increase blood flow. | | | |
| 21. Feeling weak, lightheaded, or faint is a common symptom of having a heart attack. | | | |
| 22. Taller people are more at risk for getting heart disease. | | | |
| 23. "High" blood pressure is defined as 110/80 (systolic/diastolic) or higher. | | | |
| 24. Most women are more likely to die from breast cancer than heart disease. | | | |
| 25. Margarine with liquid safflower oil is healthier than margarine with hydrogenated soy oil. | | | |
| 26. People who have diabetes are at higher risk of getting heart disease. | | | |
| 27. Men and women experience many of the same symptoms of a heart attack. | | | |
| 28. Eating a high fiber diet increases the risk of getting heart disease. | | | |
| 29. Heart disease is better defined as a short-term illness than a chronic, long-term illness. | | | |
| 30. Many vegetables are high in cholesterol. | | | |

Hormonal Contraceptives and Heart Disease
Knowledge Questionnaire

*Instructions: Please answer all of the questions to the best of your knowledge. Circle only one answer for each question.*

| Question | True | False | Don't Know |
|---|---|---|---|
| 1. Hormonal contraceptives increase the risk of blood clotting. | | | |
| 2. Smoking cigarettes during the use of hormonal contraceptives increases the risk of heart disease. | | | |
| 3. Hormonal contraceptives increase cholesterol levels. | | | |
| 4. Hormonal contraceptives decrease the risk of stroke. | | | |
| 5. Hormonal contraceptives decrease blood pressure. | | | |
| 6. Hormonal contraceptives increase the risk of having a heart attack. | | | |

Risk Perceptions Related to Cardiovascular Disease Scale

*Instructions:* Please be as open and honest as possible and answer based on how you feel most of the time.

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. It is likely that I will suffer from heart disease in the future. | 1 | 2 | 3 | 4 | 5 |
| 2. My chances of suffering from heart disease in the next few years are great. | 1 | 2 | 3 | 4 | 5 |
| 3. I feel I will have heart disease at some time during my lifetime. | 1 | 2 | 3 | 4 | 5 |
| 4. Having heart disease is currently a possibility for me. | 1 | 2 | 3 | 4 | 5 |
| 5. I am concerned about the likelihood of having heart disease in the near future. | 1 | 2 | 3 | 4 | 5 |
| 6. Having a heart attack or stroke is always fatal. | 1 | 2 | 3 | 4 | 5 |
| 7. Having a heart attack or stroke will threaten my relationship with my significant other. | 1 | 2 | 3 | 4 | 5 |
| 8. My whole life would change if I had a heart attack or stroke. | 1 | 2 | 3 | 4 | 5 |
| 9. Having a heart attack or stroke would have a very bad effect on my sex life. | 1 | 2 | 3 | 4 | 5 |
| 10. If I have a heart attack or stroke I will die within the next 10 years. | 1 | 2 | 3 | 4 | 5 |

# APPENDIX C

# PARTICIPANT RECRUITMENT EMAIL

Dear Participants:

I am a graduate student seeking my Master's degree in Health Promotion. You are receiving this email as a request to participate in my thesis research.

The purpose of the study is to learn about female college students' knowledge and health beliefs concerning heart disease. The survey will take approximately 10 minutes to complete. All of your responses will be kept confidential. Completion of this survey is completely voluntary, and you may quit the survey at any time.

We value your participation in this study. To thank participants for their time and effort, you will have the option at the conclusion of the study to be entered into a drawing for one of four $25 gift certificates to Amazon.com. In order to assure anonymity of your responses, you will be directed to a separate survey form to request to enter the drawing. This ensures that there is no connection between your survey responses and your email address.

By clicking on the link below you are agreeing to participate in this research study.

YES, I consent to participating in this survey.

This study has been reviewed by The University of Mississippi's Institutional Review Board (IRB). If you have any questions, concerns, or reports regarding your rights as a participant of research, please contact the IRB at (662) 915-7482 or irb@olemiss.edu.

Thanks,

Amanda Hutcheson

The University of Mississippi
Master's Student in Health Promotion
Turner Center 234
akhutche@go.olemiss.edu
(662) 915-5570

VITA

Amanda K. Hutcheson

## ACADEMIC RECORD

| | | |
|---|---|---|
| May 2012 | Bachelor of Science | The University of Mississippi<br>Department of Health, Exercise Science & Recreation Management<br>School of Applied Sciences<br>Major: Exercise Science<br>GPA: 3.94 |

## EMPLOYMENT RECORD

| | | |
|---|---|---|
| 2012 – July 2014 | Graduate Teaching Instructor | Department of Health, Exercise Science & Recreation Management<br>School of Applied Sciences<br>The University of Mississippi |
| 2012 – July 2014 | Research Assistant | Bone Density Laboratory<br>The University of Mississippi |
| May - Aug 2013 | Graduate Assistant | HealthWorks (Human Resources)<br>The University of Mississippi |
| May - Aug 2012 | Student Worker | New Beginnings<br>The University of Mississippi |

## PUBLICATIONS

Nahar, V. K., Ford, M. A., Hallam, J. S., Bass, M. A., **Hutcheson, A.**, Vice, M. A. (2013). Skin Cancer Knowledge, Beliefs, Self-Efficacy, and Preventative Behaviors among North Mississippi Landscapers. *Dermatology Research and Practice*, doi:10.1155/2013/496913.

## AWARDS/HONORS

2014 - The University of Mississippi
H. Leon Garrett Graduate Student Award in Health Promotion

**AWARDS/HONORS CONT.**

2013 - The University of Mississippi
Kevser Ermin Professional Development Award
Graduate Student Travel Grant Award

**PROFESSIONAL SERVICE**

| | |
|---|---|
| 2014 | RebelQuest Youth Summer Camp, The University of Mississippi<br>*Role: Invited Lecturer (Topic: Physical Activity)* |
| 2013 | Building Bones for Mothers and Daughters, Bone Health Fair<br>*Role: Coordinator/Volunteer* |
| 2013 | Employee Health Fair, The University of Mississippi<br>*Role*: *Coordinator* |
| 2012 | Pre-test Data and Lessons Learned from a Group Research Project Examining Changes in Physical Activity Behavior Following Construction of a Rails-to-Trails Facility<br>*Role: Data Collection* |

**UNIVERSITY SERVICE**

| | |
|---|---|
| 2012 - 2014 | Graduate Student Council Senator |
| 2012 - 2013 | Graduate Student Council Philanthropic Committee Co-Chair |

**COMMUNITY SERVICE**

2013 – The University of Mississippi
Mississippi State Department of Health's Healthiest Loser Competition
Employee Walking Group Leader/Coordinator
Employee Group Fitness Coordinator
"Walking Wednesday," Della Davidson Elementary School, Oxford, MS
Good Foods for Oxford Schools, Food Day Volunteer
Special Olympic Basketball Tournament Volunteer
"Rock the Bus" School Supply Donation Volunteer, Graduate Student Council
Relay for Life, Graduate Student Council
2012 – The University of Mississippi
Move Mississippi! Initiative Oxford, MS
Employee Health Fair Vendor Coordinator, The University of Mississippi
Graduate Student Council Thanksgiving Food Drive, Volunteer/Coordinator