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Risk Perception in Cardiovascular Disease

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ACE	Angiotensin Converting Enzyme
AHA	American Heart Association
ANCOVA	Analysis of Covariance
ARBs	Angiotensin II Receptor Blockers
BCSK	Breast Cancer Symptom Knowledge
BDI	Beck Depression Inventory
BMI	Body Mass Index
BP	Blood Pressure
CABG	Coronary Artery Bypass Graft
CAC	Coronary Artery Calcium
CAD	Coronary Artery Disease
CARDIA	Coronary Artery Risk Development in Young Adults
CDC	Center for Disease Control
CES-D	Center for Epidemiologic Studies Depression Scale
CHD	Coronary Heart Disease
COPE	Coping Operations Preference Enquiry
CRP	C-reactive Protein
CRIP	Cardiovascular Risk Individual Perception
CVD	Cardiovascular Disease

DASH	Dietary Approaches to Stop Hypertension
EBCT	Electron Beam Tomography Scan
EFA	Exploratory Factor Analysis
FRS	Framingham Risk Score
GSES	General Self-Efficacy Scare
HAART	Highly Active Antiretroviral Therapy
HDL	High Density Lipoprotein
HDL-C	High Density Lipoprotein Cholesterol
HF	Heart Failure
HHS	Heart Health Score
HIV	Human Immunodeficiency Virus
HLM	Hierarchical Linear Modeling
HWS	Healthy Women Study
IBMSPSS	International Business Machines Statistical Software Package for Social Sciences
IMT	Intima Medical Thickness
IVUS	Intravascular Ultrasound
JNC	Joint National Committee
LAP-R	Life Attitude Profile - Revised
LDL	Low Density Lipoprotein
LDL-C	Low Density Lipoprotein Cholesterol
LET	Life Engagement Test
LOT	Life Orientation Test

LOT-R	Life Orientation Test – Revised
MDD	Major Depressive Disorder
MI	Myocardial Infarction
MRFIT	Multiple Risk Factor Intervention Trial
MRI	Magnetic Resonance Imaging
NCEP	National Cholesterol Education Program
NHLBI	National Heart, Lung and Blood Institute
NKCA	Natural Killer Cell Activity
NKCC	Natural Killer Cell Cytotoxicity
NMRI	Nuclear Magnetic Resonance Imaging
PAQ	Paffenbarger Activity Questionnaire
PDAY	Pathobioliological Determinants of Atherosclerosis in Youth
PHQ	Patient Health Questionnaire
POMS	Profile of Moods State
PSS	Perceived Stress Scale
PTCA	Percutaneous Coronary Transluminal Angioplasty
PVD	Peripheral Vascular Disease
QOL	Quality of Life
rbGH	Recombinant Bovine Growth Hormone
SCD	Sudden Cardiac Death
SES	Socioeconomic Status
SIP	Sickness Impact Profile
SSRIs	Selective Serotonin Reuptake Inhibitors

TCL	Therapeutic Lifestyle Change
TNF-a	Tumor Necrosing Factor-Alpha
VLDLs	Very Low Density Lipoproteins
WHO	World Health Organization

ABSTRACT

Background: Cardiovascular disease (CVD) remains among the leading causes of death in the United States despite widespread knowledge about risk factors as well as effective primary prevention strategies. Risk perception is a complex phenomenon that plays an important role in how persons view disease and ultimately how they make health behavior choices. This study is supported by the knowledge that few studies have examined how persons perceive cardiovascular risk or the variables thought to contribute to the formation of risk perception.

Purpose: The purpose of this study was to examine how accurately persons perceive personal risk for cardiovascular disease and identify variables that contribute to the formation of risk perception.

Methods: This study used a cross-sectional descriptive correlational design with adults at least forty years old and without known cardiovascular disease. The nonprobability convenience sample was recruited at health screenings held at multiple locations within a single hospital system in Northwest Indiana. One hundred thirteen participants who could read, write, and speak English completed the study booklet containing a compendium of questions regarding knowledge and awareness of CVD from the American Heart Association, as well as established tools to measure the key variables: the Cardiovascular Risk Individual Perception instrument (CRIP) measuring risk perception, the Revised Life Orientation Test (LOT-r) measuring optimism, the Life Engagement Test (LET) measuring life satisfaction, and the Patient Health Questionnaire (PHQ-8) measuring

depression. Participants also consented to share physiological measurements and laboratory results from the community screening program. Actual cardiovascular risk was calculated using two tools: the Heart Health Scale (HHS; Wellsource screening tool) that provides information on "current risk", and the Framingham Risk Score (FRS) that "projects one's 10-year risk" for a cardiac event. The study was approved by the institutional review boards from Loyola University Chicago, the hospital where the screenings were held and the university where the investigator is on faculty.

Results: Study participants had a mean age of 58 years, 69% were female, 70% were White Caucasian (non-Hispanic), and the majority were married, well-educated, employed, and had private insurance. Overall the sample recognized heart disease as the leading cause of death for men and women and could identify the key prevention steps to reduce personal risk. While physiological measurements obtained during the screenings revealed a relatively healthy group, with the majority of participants at goal for glucose, LDL-C, HDL-C and triglyceride levels, the majority were also found to be either overweight or obese, and physically inactive. Overall, 80% had two or more self-reported risk factors, and 43% had three or more.

Participants did accurately perceive their personal risk, with the prevalence/number of self-reported risk factors being significantly correlated with higher levels of risk perception as measured by the CRIP ($r=.44$, $p < .01$). HHS scores showed that more than 55% of the participants were categorized as either "Needs Improving" or "High Risk", indicating the presence of multiple risk factors. HHS scores were also statistically correlated with risk perception ($r=-.40$, $p < .01$). In addition, chi square analysis showed a significant relationship between increased risk (using HHS) and

increased risk perception scores (using CRIP). Framingham Risk Scores, a measure of projected future cardiac risk, were not correlated with current risk perception.

The majority of the sample had increased levels of optimism and life satisfaction and low levels of depression. While three variables (having a friend with CVD, optimism, and depression) were correlated with risk perception, depression was found to be the single predictor when entered into multiple regression analysis ($\beta = .278$, $p = .003$).

Implications for Providers: Community based health screenings play an important role in primary prevention strategies. Although persons may accurately recognize that they have risk factors for CVD, this alone may not be enough to prompt positive health behavior changes. Persons often need further counseling to understand the role risk factors play in subsequent subclinical atherosclerosis. While mass media campaigns related to healthy eating, exercise, and heart disease have increased health literacy in this area, health care providers need to be part of this dialogue since they are uniquely positioned to counsel patients on effective methods for promoting positive health behaviors.

CHAPTER ONE

INTRODUCTION

Although much is known about cardiovascular risk factors and the subsequent development of related co-morbid conditions, the United States and much of the world continue to face cardiovascular disease (CVD) as the number one killer among the adult population (American Heart Association [AHA], 2013). Risk factor modification is crucial in reducing the development of CVD. The way an individual views risk has an impact on decision-making and ultimately health behavior choices. Thus risk perception plays an important role in primary prevention strategies. This study describes the phenomena of risk perception and its related concepts and proposed relationships between them. This introductory chapter provides support for the need for this study through an overview of the problem of CVD, how primary prevention efforts can reduce CVD, and the importance of risk perception in the design of intervention strategies. The chapter ends with a description of the research questions for this study and their significance.

Overview of the Problem of CVD

CVD encompasses coronary heart disease (CHD), peripheral vascular disease (PVD), stroke, and heart failure (HF). It is estimated that one in every three adults has some form of cardiovascular disease. Furthermore, 600,000 people die annually from heart disease alone accounting for one in every four deaths in the United States (Centers for Disease Control [CDC], 2013). These statistics are expected to increase as the

population ages in the United States (AHA, 2013). Consequently, CVD will continue to threaten lives and, in addition, have a great economic impact.

The economic burden of CVD is astounding. As cited in the 2013 update from the AHA, the annual projected estimated direct and indirect costs of CVD in the United States is $312.6 billion. Direct costs are defined in terms of financial cost of hospitalization and treatment, while indirect costs are defined in terms of healthcare visits and lost productivity. However, using a methodology to project future cost of care, it is estimated that by 2030, 40.8% of the US population will have some form of CVD with predicted costs topping $818 billion annually (AHA, 2013). Therefore, the importance of CVD prevention is paramount because it not only reduces morbidity and mortality, but also the associated economic burden.

Primary Prevention

There is overwhelming evidence to confirm that both modifiable and non-modifiable risk factors contribute to the development of CVD. Therefore, risk factor modification is crucial in reducing the development of CVD. The CDC and the National Heart, Lung, and Blood Institute (NHLBI) have recognized that more emphasis needs to be placed on primary prevention strategies in an effort to impact this growing problem and reverse the “epidemic” of heart disease. “Primary prevention pertains to the prevention of the onset of symptomatic disease in persons without prior symptoms of cardiovascular disease” (Wilson & Pearson, 2005, p. 494). One example of primary prevention in cardiovascular disease is to treat hypertension through lifestyle changes or medications. Primary prevention interventions that target individuals at increased risk have been proven successful in reducing the incidence of CVD and in decreasing

morbidity and mortality (AHA, 2013; Bacon, Sherwood, Hindliter, & Blumenthal, 2004; CDC, 2008; Crichley & Capewell, 2003; Warburton, Nicol, & Bredin, 2006; Wilson & Pearson, 2005). Not only does risk factor reduction reduce atherogenesis through endothelial stabilization, but it also prevents/addresses CVD and other co-morbid conditions such as hypertension and obesity.

The AHA has emphasized that those adults who maintain healthy lifestyles and do not present with traditional risk factors for CVD by approximately 50 years of age have a greater likelihood of sustaining longevity (AHA, 2013). While many states fund primary prevention programs, this author's home state of Indiana remains an unfunded state, despite ranking among the highest for total CVD and coronary heart disease (CHD). In fact, Indiana is one of 12 states which has a multiple risk factor prevalence of greater than 40% (AHA, 2013). However, primary prevention cannot occur unless there is awareness regarding the presence of risk factors and counseling on ways to address these risks.

Risk Perception

Even though knowledge and awareness about risk factors and CVD is crucial in addressing its development, it is not enough. Examining areas that impact how individuals view risk for the development of CVD and ultimately make decisions regarding health behavior choices is crucial. In order to be effective, interventions will need to be tailored to individual health beliefs and perception of risk for CVD development. Thus, an underlying challenge for healthcare providers is to examine individual risk perception for cardiovascular disease.

Risk perception implies that risk is perceived, not assigned or calculated. It surrounds an individual on a daily basis; however, these risks all vary in degree. For

example, risks related to which product to purchase is, overall, less threatening than risk related to a health threat. The way in which an individual views risk has an impact on decision-making and ultimately health behavior choices. Risk perception plays an important role in primary prevention strategies. It is through cognitive realization that an individual recognizes the threat of risk to their well-being. Once an individual realizes the threat to well-being, prevention strategies can be utilized to foster health behavior choices and ultimately prevent the onset of the threat.

Risk perception is not a new concept in the field of behavioral science. In fact, its roots stretch back as far as the late 1970s. It has been studied in topics such as environmental risk and consumer purchasing to examine why and how individuals form perceptions related to risk. More recently, healthcare researchers have investigated risk perception.

A large challenge to addressing individual risk perception is identifying how perception is formed. In fact, risk perception is a multifaceted concept comprised of overlapping concepts. Initially, risk perception was identified in the cancer literature, but was actually being measured and reported as optimism and optimistic bias (Katapodi, Lee, Facione, & Dodd, 2004). These areas have overlap both conceptually and contextually. Therefore, the concepts of optimism and optimistic bias need to be explored as they relate to risk perception. Although optimism and optimistic bias have been studied in disease processes such as arthritis progression and breast, colon and skin cancers, they have not been studied in depth in cardiovascular disease. In addition, the concept of “negative emotions”, specifically depression, has emerged as yet another link to risk perception and health behaviors. It has been purported that the opposite of

optimism may not be pessimism, but actually depression. Lastly, the concept of life purpose has been associated with risk perception. Thus, risk perception needs to be viewed as a complex phenomenon with attention to how all these concepts contribute to an individual's risk perception. In doing so, new intervention strategies can be tailored to increase health behavior choices that will ultimately affect morbidity and mortality related to CVD development.

Significance/Research Questions

This study examines the concept of risk perception in cardiovascular disease. The primary aims are to: examine the accuracy of one's perceived risk for CVD; and to examine the relationship between perceived risk and key demographic and psychological variables that may influence risk perception. Therefore, this study is framed by the following research questions:

1. Do persons perceive their risk for cardiovascular disease accurately?
2. Do the psychological variables of optimism, life purpose, and depressive symptoms predict risk perception?
3. Do the sociodemographic variables (age, gender, family history, personal knowledge, level of education, and socioeconomic status) predict risk perception? By examining risk perception and the associated terms of optimism, life purpose, optimistic bias, and negative emotions, it is this researcher's hope that there will be a greater understanding of the variables affecting health behavior choices. Through this understanding, nurses can address more meaningful and effective ways to assist persons to incorporate primary prevention strategies that will impact and maintain optimal health.

CHAPTER TWO

LITERATURE REVIEW

There is little dispute that CVD causes both personal and social burden. Chapter one explained how morbidity, mortality and economics are all affected by the epidemic of CVD. Furthermore, a brief discussion of prevention highlighted the need to understand the concept of risk perception and the related psychological variables of optimism, life purpose, and depressive symptoms (or so called "negative emotions"). Before exploring the literature on risk perception and its related variables, this chapter will begin with a brief overview of the pathogenesis of atherosclerosis leading to CVD. Known risk factors that contribute to atherosclerosis and CVD will be reviewed, including: smoking, obesity, sedentary lifestyle, dyslipidemia, and hypertension. Benefits of reducing these risk factors will be highlighted. Measurements for predicting an individual's personal risk for a future cardiac event will be discussed. Finally, the concept of risk perception will be explored in depth, since successful risk factors reduction cannot occur unless individuals are aware of their personal CVD risk.

Atherogenesis

The Endothelium

The relationship between endothelial dysfunction and cardiovascular events has been clearly established, with endothelial dysfunction found to be an independent predictor of future cardiac events (Gokce et al., 2002; Halcox, et al., 2002; Perticone et

al., 2001). The function of the endothelium is complex as it acts to maintain both homeostasis and hemostasis within the vascular bed (Corti, Fuster, & Badimon, 2003; Davignon & Ganz, 2004; Halcox et al., 2002). The healthy endothelium exhibits atheroprotective properties that include promotion of vasodilation; anti-inflammatory, anticoagulant, and profibrinolytic effects, while inhibiting leukocyte adhesion and migration, smooth muscle cell proliferation and migration, and platelet aggregation and adhesion (Bonetti, Lerman, & Lerman 2003). Conversely, when these properties are disrupted and the endothelium becomes less stable, atherogenic manifestations take place.

Plaque Formation

Atherogenesis is an immune/inflammatory response that develops as a complex, cascading process (Glass & Witzum, 2001). The evolution of atherosclerotic lesions progess through a multi-step process including: endothelial injury, monocyte migration, lipid accumulation, smooth muscle cell proliferation and cap formation, lipid core formation, plaque vascularization, plaque remodeling, and plaque progression (Gotto & Pownall, 2003). This can be further broken down into the following three distinct stages: the fatty streak, the fibrous plaque, and plaque progression.

The fatty streak is characterized by the accumulation of intercellular lipids and foam cells within the intimal lining of the artery and is the hallmark of both early and late developing atherosclerotic lesions (Glass & Witzum, 2001). The formation of the fatty streak is initiated by impairment of the endothelium leading to inflammation within the vessel wall. Cardiovascular risk factors such as dyslipidemia, hypertension, and smoking contribute to the inflammatory process and oxidative stress (Ross, 1999; Schlächinger & Zeiher, 2002). The resultant oxidative process allows monocyte-derived macrophages to

invade the intimal lining of the artery. Monocytes are present in all phases of atherogenesis (Ross, 1999; Schlächinger & Zeiher, 2002). Cellular mediators of the inflammatory process play a key role in the low density lipoprotein cholesterol (LDL-C) particles binding to the endothelium. Once there, circulating LDL-C particles become engulfed by the macrophages and transform into foam cells, which contain liquid cholesterol esters (Ross, 1999). This process contributes to more inflammation and a vicious cycle ensues, as long as the LDL particles are present.

The fibrous plaque is characterized by smooth muscle cell migration from the medial to the intimal layer of the endothelium (Ross, 1999). Platelets and macrophages stimulate the proliferation of smooth muscle cells and allow a fibrous matrix to form. The core beneath the cap contains degenerating foam cells, which are full of lipids and cholesterol esters.

Plaque progression leads to the increase in size and density of the lesion as the inflammatory process progresses. The progressive stage of the process allows the lesions to encroach into the lumen of the vessel, compromising blood flow (Ross, 1999). It is at this point that the plaque will calcify or rupture, depending on the morphology of the particular lesion.

The formation and morphology of plaque plays a significant role in the diagnosis and treatment of cardiovascular disease. Plaque can be categorized as stable or unstable. Stable plaque is morphologically different from unstable plaque. The formation of the fibrous plaque and the size of the lipid core are directly related to endothelium function and dysfunction.

Stable plaque develops a thick, uniform fibrous cap, which is less likely to rupture (Ross, 1999). Over time, calcification of the lesions develops and encroachment of the vessel lumen occurs. Conversely, unstable plaque is described as more prone to rupture due to a thinner, uneven fibrous cap and larger lipid core (Fayad & Fuster, 2001; Ross, 1999). As the lesion grows, the vessel lumen may also narrow. The continuation of oxidative stress and inflammation, the same processes that contribute to the cascade of endothelial dysfunction, also contribute to plaque destabilization and fibrous cap thinning (Ross, 1999; Schlächinger & Zeiher, 2002). Unstable plaque has been linked to acute coronary syndrome (ACS), unstable angina, acute myocardial infarctions, and sudden cardiac death (SCD).

Risk Factors

The development of coronary artery disease (CAD) has long been linked to known risk factors, thus identification of one's risk factors is key to stemming this tide. Large national and international studies have consistently reported that nine potentially modifiable risk factors account for greater than 90% of the risk of an acute myocardial infarction (MI) (Yusuf et al., 2004). Moreoever, it is estimated that more than 90% of CVD events occur in persons with a single risk factor (Vasan et al., 2005). Each risk factor contributes to the complex dynamic of endothelial function and dysfunction and the subsequent development of CAD (Bonetti et al.; 2003; Corti et al., 2003; Lerman & Zeiher, 2005; Ross, 1999). Risk factor reduction has been shown to reduce the incidence of cardiovascular disease and is clearly supported by literature. Risk factor reduction strategies have confirmed increased stabilization of the endothelium as well as decreased morbidity and mortality from cardiovascular disease. Risk factor reduction is significant

because many strategies impact more than one risk factor. For example, implementing a walking program not only addresses the risk of physical inactivity, but also affects weight and obesity. Likewise, smoking cessation would impact the negative effects of smoking in addition to high density lipoprotein cholesterol (HDL-C) levels. For the purposes of this paper, smoking, obesity, sedentary lifestyle, dyslipidemia, hypertension, and depression are discussed related to both endothelial dysfunction and the subsequent impact of risk factor modification.

Smoking

While smoking is commonly discussed as the leading cause of lung cancer, it also greatly affects the number of deaths related to cardiovascular disease. Globally, smoking causes 5 million deaths annually and is expected to climb to at least 8 million by 2030 (CDC, 2013). Furthermore, smoking triples the risk of dying from heart disease among middle-aged men and women and, on average, men die 13 years sooner and women die 14.5 years sooner than their non-smoking counterparts (AHA, 2013). Both active and passive (second-hand) smoking contributes to atherogenesis. In addition, smoking contributes to physiologic conditions such as hypertension and decreases high density lipoprotein (HDL) cholesterol (AHA, 2013). Furthermore, when smoking is combined with other risk factors the synergistic effect substantially raises the risk for CVD.

Roth and Shick (1958) described the effects of smoking on the cardiovascular system, stating that early investigation of smoking and cardiovascular damage dates back to 1848. Since that time, scientists have continued to study and document the deleterious effects of smoking on the human body. Early descriptions of “heart dysfunction” have more recently been replaced with scientific knowledge that smoking adversely affects

vascular endothelial function, which leading to cardiovascular disease (Newby et al., 2001; Ross, 1999; U.S. Department of Health and Human Services, 2004). Smoking disrupts endothelial homeostasis and hemostasis leading to atherothrombosis (Newby et al., 2001). In addition, smoking is not only associated with CAD, but also with sudden cardiac death (SCD). The incidence for SCD is related to impaired hemostasis, endothelial dysfunction, and atherothrombosis (Newby et al., 2001).

Crichley and Capewell (2003) conducted a systematic review to determine the effects of smoking cessation on cardiovascular risk. A total of 20 prospective cohort studies were used from a screening of 665 publications. The authors included studies that reported all-cause mortality data, patients diagnosed with CHD, and those with a follow-up of at least two years. Conclusions from this review state that smoking cessation is correlated with a substantial decrease in all-cause mortality among persons with CHD. The World Health Organization (WHO) reported a dramatic 50% reduction in CHD risk one year after quitting smoking. In addition, smoking cessation decreases the risk of dying prematurely (CDC, 2013).

Obesity

Obesity is a complex risk factor for CAD. Although it is an independent CVD risk factor, it is also closely related to other risk factors such as physical inactivity, hypertension, lipid abnormalities, elevated C-reactive protein (CRP) and insulin resistance. Since 1993, the prevalence of obesity has steadily increased and forecasts that by 2030 more than 51% of the population will be obese (AHA, 2013). Public health officials have recognized the detriments on health related to obesity and have stated that the continuation of current trends may negate gains made in treatment of heart disease

and other chronic diseases (Fontaine, Redden, Wang, Westfall, & Allison, 2003). Furthermore, obesity is associated with a shortened lifespan, especially among younger adults (Fontaine et al., 2003).

Obesity is associated with increased coagulopathy, endothelial dysfunction and inflammation. Moreoever, there are many metabolic effects that are derived from adipose tissue that can mediate the development of atherosclerosis: secretion of tumor necrosing factor-alpha (TNF-α), interluken 6, and plasminogin activator inhibitor. Abdominal adiposity carries a higher risk than general adiposity (Warziski, Choo, Novak, & Burke, 2008).

The contribution of general obesity to atherosclerosis has been debated. While the Seven Countries Study showed little correlation between body weight and atherosclerosis, both the Framingham Heart Study and the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Study demonstrated a clear association between obesity and atherosclerosis (Grundy, 2002). Grundy proposed that variability among groups may help to explain the differences. For example, the PDAY study found that obesity was associated with atherosclerosis in adolescent and young men, but not in their female counterparts (McGill et al., 2002). Similarly, McKeigue and colleagues (1993) found that moderate weight gain increased the risk for CHD in South Asians. Further explanation may lie within the endothelial dysfunction mechanisms specific to obesity. Grundy (2002) suggested that obesity acts as a mediator through emerging risk factors including insulin resistance, C-reactive protein, and plasminogen activator inhibitor-1. Therefore it may be a stronger and more complex risk factor than originally thought.

Hotamisligil, Shargill, and Spiegelman (1993) were among the first to establish the link between obesity and factors affecting endothelial dysfunction, namely tissue necrosis factor-alpha (TNF-α). They used rodent models to identify how obese animals differed from the lean control models. At this time, TNF-α was already known to affect serum triglycerides and very low density lipoproteins (VLDLs). The results of their study indicated that the obese animals produced a minimum of five to ten times the amount of TNF-α mRNA than the lean control animals. Since this landmark study, the relationship between obesity and endothelial dysfunction continues to be supported and informed (Dandona, Aljada, Chaudhuri, Mohanty, & Garg, 2005; Rutter, Meigs, Sullivan, D'Agostino, & Wilson, 2004; Ziccardi, et al., 2002).

Since obesity contributes to other traditional risk factors, such as hypertension, hyperlipidemia, and increased glucose values, weight loss also has a dramatic effect on these variables. Anderson, Konz, Frederich, and Wood (2001) conducted a meta-analysis of eleven studies and concluded that the effect of weight loss systematically modifies risk factors for CHD, thereby reducing overall risk from CHD. While modification of this factor has the potential to greatly impact overall cardiovascular risk, the high rate of recidivism with weight loss programs poses a significant challenge.

Sedentary Lifestyle

Sedentary lifestyle has been identified as a cardiovascular risk factor since the 1970s. It is closely related to the risk factors of obesity and hypertension. In addition, sedentary lifestyle has an impact on the lipid profile, especially high density lipoprotein cholesterol (HDL-C). Given these factors, physical inactivity, like obesity, has the potential to not only impact these related risk factors, but overall cardiovascular risk.

Trends have shown that with the advances in modern technology and changes in transportation modes American have adopted a more sedentary lifestyle. Most American adults are not physically active on a regular basis. In fact, more than 50% of adults in the United States do not engage in enough physical activity to gain any health benefits (CDC). This resultant lack of physical activity is associated with an increased risk for CVD and all-cause mortality (Blair & Church, 2004).

While there is an established relationship between sedentary lifestyle and cardiovascular health, exact pathways and mediating mechanisms continue to be explored (Mora, Cook, Buring, Ridker, & Lee, 2007). Novel risk factors such as homocysteine, creatinine, C-reactive protein (CRP), and other inflammatory biomarkers are examples of potential mediating mechanisms that may explain the role sedentary lifestyle plays in reducing CVD.

Physical activity is related to increased health benefits. Not only can enough physical activity help to achieve or maintain a healthy weight, but it can also help lower blood pressure, triglycerides, insulin resistance and glucose intolerance, and enhance HDL cholesterol levels (CDC, 2008). At the cellular level, increased physical activity has an antioxidant effect, thereby stabilizing the endothelium (Harrison et al., 2006). Harrison and colleagues (2006) reported that increased blood flow, produced by increased activity, within the vasculature provides laminar shear stress. In turn, nitric oxide production increases which results in decreased inflammation in the endothelium. Chronic or habitual physical activity, therefore, provides a lasting and protective effect on the endothelium.

The level of physical activity needed to provide health benefits is referred to as dose response. This is important because many people have limitations that allow for only low to moderate levels of physical activity. The level of physical activity does not need to be strenuous or intense to provide health benefits (Church, Earnest, Skinner, & Blair, 2007). Current recommendations suggest adults need to accumulate 150 minutes per week of moderate level aerobic exercise such as walking, bicycle riding, water aerobics, or playing doubles tennis. This prescription can be completed in 10 minute intervals if preferred (CDC, 2013).

Dyslipidemia

The traditional components of the lipid profile have been studied at length. Low density lipoprotein cholesterol (LDL-C) has been shown to contribute to plaque development, while high density lipoprotein cholesterol (HDL-C) has been shown to be atheroprotective. Research data has consistently shown through major trials such as The Helsinki Heart Study, Multiple Risk Factor Intervention Trial (MRFIT), and the Seven Countries Study that when these components are maintained at recommended levels, the endothelium remains healthier and poses less risk for the development of CVD and CVD related mortality. More recently, focus has shifted to more specific subcomponents of the lipid profile, such as apolipoprotein subgroups. However, since the focus of this paper is to provide an overview of risk factors, only the traditional components will be discussed.

LDL-C plays a significant role in the development of atherogenesis via the oxidative process. Oxidation of LDL particles stimulates the release of a host of negative factors such as interleukin-6 and tumor necrosis factor-alpha from the endothelial cells and macrophages. This contributes to stimulating the inflammatory process, causing

further endothelial dysfunction. In addition, LDL-C contributes to direct injury of the endothelial lining and underlying vascular smooth muscle (Ross, 1999; Vogel, 1999). Very low density lipoprotein cholesterol (VLDL) also contributes to oxidation and inflammation within the endothelium (Libby, Ridker, & Masseri, 2002).

A large body of studies from epidemiological, angiographic outcomes trials, and randomized controlled trials consistently support the evidence that lowering LDL cholesterol has a positive effect on CVD prevention. This evidence served as the basis for The National Cholesterol Education Program (NCEP) first issued in 1985. This program and the two subsequent panels provide clear directives and strategies for reaching primary prevention goals. Strategies for improving the lipid profile include lifestyle or behavioral changes and medication therapy (ATP III, 2004). NCEP refers to the non-pharmacologic measures as Therapeutic Lifestyle Changes (TLC). The TLC diet consists of limiting total fat intake to 25-35% of diet (with up to 20% of this from monounsaturated fat), saturated fat to less than 7% of total calories, 20-30 grams of high fiber foods, increased levels of fruits and vegetables and addition, of plant sterols. This diet is supported by the American Heart Association to decrease the risk of CVD (AHA, 2013). For primary prevention, this diet should be monitored for six weeks, and if not at goal, another six week trial should be prescribed. After those efforts, pharmacological therapy is recommended to treat any persistent dyslipidemia. Medications that lower both LDL-C and total cholesterol while increasing HDL-C have consistently shown reduction in mortality related to CVD. In particular HMG CoA reductase inhibitors, or statins reduce endothelial inflammation through decreased oxidative stress (Libby et al., 2002; Vogel, 1999).

Hypertension

Approximately 77.9 million Americans over the age of 20 have high blood pressure (AHA, 2013). This startling statistic translates to slightly more than one in every three adults. While the etiology for the majority of hypertension is unknown, the disease can be easily identified through screening and treated in a variety of ways. Hypertension is not only one of the major risk factors for CVD, but is also a co-morbid condition with serious health consequences. Hypertension has been studied in many epidemiological studies such as the Framingham Heart Study, followed by an extensive number of randomized control trials that showed that antihypertensive drug therapy works to reduce the risk of CVD events.

Hypertension causes vascular damage including impaired endothelium-dependent vasodilation, decreased production of nitric oxide, increased resistance in the coronary vasculature and atherosclerotic narrowing of the coronary arteries. With hypertension, the endothelium is subjected to increased shear stress that also results in inflammation (Libby et al., 2002). Libby and colleagues suggest that the inflammatory process may be the link between hypertension and CVD. Angiotensin II, which is part of the physiologic process of hypertension not only causes vasoconstriction, but also instigates endothelial inflammation.

Lifestyle modifications are an essential component of prevention and treatment of hypertension. These treatments include dietary management, weight loss, and exercise. Dietary Approaches to Stop Hypertension (DASH) eating plan is one of the most successful adjuncts to decreasing blood pressure. The original DASH study and the second DASH study both demonstrated that adherence to this program resulted in a

decrease in blood pressure (Bacon et al., 2004). The Premier study, which utilized the DASH eating plan and other lifestyle modifications, showed similar findings (Lien et al., 2007). The DASH eating plan utilizes a modest amount of sodium and increased amounts of fruits and vegetables, and is recommended by the American Heart Association and the National Heart, Lung, and Blood Institute.

Pharmacologic treatment of hypertension is guided by the Joint National Committee guidelines (JNC). The most recent guidelines recommend a variety of medications including thiazide diuretics, angiotensin converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), beta blockers, and calcium channel blockers based on compelling indications. ACE-I and ARBs interrupts the pathways that lead to the inflammatory process (Libby et al., 2002). Furthermore, ACE inhibitors affect fibrinolysis and coagulation, further stabilizing the endothelium. Consequently, research has demonstrated that these two classifications of medications used to treat hypertension have demonstrated a decrease in both cardiovascular related events such as myocardial infarction and mortality related to CHD.

Depression

Psychosocial components are becoming more widely recognized as risk factors for CVD. Initially, the “type A” behavior was considered as a risk factor. More recently, other psychosocial components such as depression, anxiety, and personality traits have been recognized as more significant contributing factors to CVD (Elovainio et al., 2005; Frasure-Smith & Lespérance, 2006; Rosansky & Kubzansky, 2005). In fact, the prevalence of depression is nearly three times higher in those with CVD (Thombs, 2005).

While there are various psychosocial factors discussed in the literature, this paper will focus on depression.

It is important to distinguish between depression and the presence of depressive symptoms. Rozanski, Blumenthal, and Kaplan (1999) describe depression as the presence of depressed mood and a marked decrease in all activities that persists for at least two weeks. In addition, this mood alteration is also accompanied by at least two of the following symptoms: “changes in appetite, sleep disturbance, fatigue, psychomotor retardation or agitation, feelings of guilt or worthlessness, problems concentrating, and suicidal thoughts” (p. 2193). Depressive symptoms may have components of clinical depression, but lack sufficient magnitude to be classified as such. Rozanski and colleagues outlined the presence of a threefold higher depression rate among those with CAD. In addition, these authors also highlight that the risk for CAD is associated with the degree of depressive symptoms, suggesting that depression manifests itself on a continuum.

Depression and the presence of depressive symptoms affect endothelial function in three different ways. First, increases in cortisol results in the promotion of central adiposity, insulin resistance and development of diabetes (Rozansky, Blumenthal, Davidson, Saab & Kubzansky, 2005). Second, increased platelet reactivity and hypercoagulability develops which contributes to prothrombotic properties in the endoethelium (Matthews, Schott, Bromberger, Cyranowski, Everson-Rose, & Sowers, 2007; Miller, Rohleder, Stetler, & Kirschbaum, 2005; Rozansky et al., 2005). Lastly, inflammation increases within the endothelium and is demonstrated, in part, by increases in C-reactive protein, interleukin-6, and tumor necrosing factor (Barr-Taylor et al., 2006;

Rozansky et al., 2005). Thus, strong evidence demonstrates the relationship between depression and depressive symptoms and endothelial dysfunction that leads to the development of CVD. Biobehavioral mechanisms are also responsible for the link between depressive symptoms and depression to cardiovascular disease. Both have been shown to contribute to behaviors leading to other risk factors for CVD. This complexity poses a challenge for adherence to both treatment modalities for depression and other underlying risk factors for CVD (DiMatteo, Lepper & Croghan, 2000).

Similar to other risk factors, depression and manifestation of depressive symptoms can be successfully treated with both behavioral and pharmacological interventions (Blumenthal et al., 2007). Pharmacological treatments for depression have been studied both for safety and efficacy, with several classes of antidepressants, most notably selective serotonin reuptake inhibitors (SSRIs), and found to be quite effective. Psychosocial and behavioral interventions have not been explored in as much depth. Types of psychosocial intervention have included: one on one counseling, group counseling, educational programs, and physiologic stress management to name a few.

Further research should be conducted in the area of psychosocial and behavioral intervention to elucidate the effectiveness of these techniques (Frasure-Smith & Lespérance, 2006; Rosansky & Kubzansky, 2005). While there is evidence to support psychosocial and behavioral therapy to treat depression and depressive symptoms, combination with pharmacological treatment is recommended for the maximum benefit.

Summary

Risk factor reduction has been shown to reduce the incidence of CVD and is clearly supported by research. Healthcare providers are being challenged to find ways to assist

the public to identify and modify their personal CVD risk factors. Many evidence-based strategies and therapies are currently available. But the greatest challenge is assisting individuals to “perceive” that they are at risk in the first place. To help persons address the development of CVD, measuring cardiovascular risk is thus necessary.

Measuring Cardiovascular Risk

Measuring risk for developing cardiovascular disease (CVD) or having a cardiac event, such as a myocardial infarction, is an evolving science. While the risk factors for cardiovascular disease and their subsequent contribution to disease progression have been extensively studied and well-documented, it remains difficult to precisely predict the likelihood of a cardiovascular event. Epidemiologic research has shown that reliance on one single risk factor can be misleading. Rather, quantitative multivariable risk assessments confer a more accurate prediction, especially since most of the standard risk factors tend to synergistically affect each other as discussed earlier in this paper (Kannel, 2005). Therefore, multivariable cardiovascular risk assessment has become a necessity.

Several methods are available to mathematically estimate risk, including the Framingham Risk Score (FRS), coronary artery calcium (CAC) score and intravascular ultrasound (IVUS). While each method contributes a greater understanding of actual risk for a cardiac event and possesses individual strengths and weaknesses, no one method completely or accurately calculates risk for a cardiac event. The FRS will be discussed in this paper, since it is the method employed in this study. In addition, the Heart Health Score will also be discussed as a tool commonly used for health screenings among the lay population.

Framingham Risk Score

The Framingham Risk Score (FRS) is one of the most widely used methods for predicting and calculating risk for a future cardiovascular event. This method evolved from the Framingham Heart Study, which began in 1948, and ultimately identified risk factors for CVD. A mathematical calculation integrates age, gender, smoking history, blood pressure, and cholesterol as well as blood glucose or a history of diabetes in persons without a history of CAD to demonstrate the multiplicative and cumulative aspects of atherogenesis (Greenland, LaBree, Azen, Doherty, & Detrano, 2004). Based on the presence of these risk factors, a 10-year risk of having a cardiovascular event is calculated. However, this method has both strengths and weaknesses.

A positive attribute of this method is the inclusion of multiple or "global" risk factors. The presence of CVD is most frequently attributed to risk factor combinations closely associated with one another. For example, persons who smoke and also have dyslipidemia will be at higher risk for CVD. By addressing the multiplicity of risk factors through the FRS mathematical equation, a more comprehensive view of true risk is examined.

The FRS provides a 10-year, gender specific projected risk of having a cardiovascular event. In addition, risk results are stratified with a percentage. A low risk is correlated with a calculated risk of less than 10%. A moderate risk is correlated with a risk between 11% and 20%. High risk is correlated with a calculated risk of greater than 20%. This level of risk is used to determine which patients require more intensive management of LDL cholesterol, as outlined by the ATP III recommendations (Grundy et al., 2004).

Risk stratification may act as a motivational factor to inspire behavior changes in at risk individuals. However, there are limitations to projecting risk. For example, how much projected risk for a cardiovascular event in the next ten years would it take to motivate a person to stop smoking, exercise more, lose weight, or become more physically active? Logically, it would seem that the higher the projected risk, the more motivated a person would be to make positive behavior choices. But theoretically, motivation could also depend on how that person "perceives" their risk. Do people consider "time" when formulating risk perception? Does projecting risk out to a 10-year period negatively affect how risk is perceived? Is 10 years too long of a projection? Would a shorter time frame be more of a motivating factor? These and other questions bring to light the challenges of using the FRS.

This tool is indicated for primary prevention screening. Those individuals who already have known CVD, or who have a CVD "risk equivalent" such as diabetes, peripheral artery disease, abdominal aortic aneurysm or symptomatic carotid artery disease are already at 20% risk of a cardiac event in 10 years, so calculation of personal risk factors is not necessary for prediction.

Heart Health Score

Wellsource© is a company that provides health appraisal programs to organizations and has been in business for more than 30 years. Wellsource© offers a wide range of wellness programs and is commonly used in the cardiac rehabilitation setting as well as corporate wellness programs. Wellsource© compiles individual risk profiles based on self-report and physiological data and also offers a variety of online educational resources for customer use (Wellsource, 2013).

The Heart Health Score (HHS) is derived from a combination of physiologic and self-report data and is based on the NCEP III revised guidelines taking into account both the severity and amount of major versus moderate risk factors. In addition to using the same variables as the Framingham risk calculation, it considers fitness level as well as personal and family history of cardiovascular disease and reflects current risk as opposed to future projected risk (Wellsource©, 2012). A computer program generates a "Heart Health Score" (HHS) in one of four categories:

- "Excellent" or "Ideal risk" (score of 75-100), defined as no risk factors other than age;
- "Doing Well" or "Low Risk" (score of 50-74),defined as having 1 to 3 moderate CHD risks factors not including age, or having a personal history of CHD when blood lipids are "not known"
- "Needs Improving" or "Moderate Risk" (score of 25-49), defined as having only one major CHD risk factor not including age or family history or having 4 or more moderate CHD risk factors (counting age and family history as moderate risk factors), and
- "Caution" or "High Risk" (score of 0-24 defined as having moderate CHD risk blood lipids AND 2 or more major CHD risks OR having two or more major CHD risks not including age OR having one major CHD risk, plus the age major risk AND Low fitness OR having blood lipids or triglycerides within "Ultra-high" category.

Risk Perception

Risk perception is a complex concept comprised of several interrelated concepts. A cross-disciplinary literature review was conducted using the term “risk perception” in the areas of business, law, medicine, psychology, sociology, and nursing using: ABI inform, Criminal Justice Periodicals Index, Medline, PsychINFO, Social Science Abstracts and CINAHL data bases. The search was limited to English only. Both a computerized and hand-search of current literature was performed to elicit relevant current information on risk perception. Main themes were identified in each discipline after reviewing the literature on risk perception (see Table 1). These themes were used to identify additional literature on optimism, optimistic bias, and negative emotions such as anger, hostility, uncertainty, anxiety, and depression. While risk perception, optimism, and optimistic bias are recognized in many disciplines, including medicine, there is little literature regarding risk perception directly relating to cardiovascular disease. However, there is a connection between these concepts that will be demonstrated throughout the paper. A relationship between negative emotions and CVD has been demonstrated in the literature and will also be explored in this paper.

Table 1. Risk Perception Literature Search

Search terms used	**Discipline searched: Data base used**	**Main themes**
Risk perception	Business: ABI Inform	Consumer marketing strategies, Risk versus benefit
	Law: Criminal justice periodicals	Gun policy, crime deterrents, violence in prison, sexual violence, burglary, criminal decision making, fear of crime, HIV, date rape
	Medicine: Medline	HIV/AIDS, blood transfusions, cancer, spinal cord injury, immunization, surgery and treatment options, informed consent
	Nursing: CINAHL	Breast cancer, colon cancer, tanning, genetics, HIV/AIDS, pain, peripheral vascular disease, infectious disease, asthma, tanning, genetics, vaccination, and pregnancy
	Psychology: PsychINFO	Reasons for perception, differences in perception, comparative vs real risk
	Sociology: Social science abstracts	Population risk, risks important to people, social theory and social support

Literature from the areas of business, law, medicine, nursing, psychology and sociology addresses different, but important aspects of risk perception. The business literature focuses on consumer marketing strategies and ways that consumers make decisions about purchases and investments. These decisions are made using a risk versus benefit analysis. While this decision-making process may appear to be specific to purchases, it is really a part of human psychology that examines how persons make decisions regarding behaviors and actions. In contrast, the law literature draws on the concept of fear, such as being a target of crime or the risk of contracting the human immunodeficiency virus (HIV) in prison. While both the medical and nursing literature address risk perception by examining specific disease processes, such as HIV and different types of cancer, the medical literature also includes decision-making about treatment options and specific processes such as informed consent. In contrast, the nursing literature examines beliefs about a disease process and/or behaviors that either lead to or prevent a disease process. Breast and colon cancer literature are the most

prevalent disease processes in the nursing literature. Psychology literature examines reasons and differences in perception of risk, while the sociology literature focuses on theories that attempt to explain behavior and behavior choices. Both the psychology and sociology literature use theory and empirical findings to explain how persons make decisions involving risk. For example, one area of study is public perception of fear involving violence. This fear has been linked to the media's sensationalizing crime and violence through newspapers and increased television programming of both drama and reality police shows demonstrating violence. However, this paper will focus primarily on business and healthcare concepts.

Literature on Risk Perception

Current business literature relevant to this paper on risk perception addresses: consumer-marketing strategies, risk benefit ratio, and risk factors. In business literature, risk perception is used as a consumer-marketing tool and is viewed from a consumer psychology standpoint. Consumer psychology evaluates the reasons a consumer will or will not buy a product or service. While consumers use a risk versus benefit process to make a decision with regards to purchases, the decision making process is driven by the potential to encounter potentially negative outcomes. Risk perception arises from the potential for unanticipated and uncertain consequences related to purchasing of products (Dholakia, 2001). The marketing of products is based on the strategies to reduce consumer risk perception related to the product or service. Risk perception has been an integral part of economic growth, however, in order for it to be successfully utilized, it must first be understood.

Ropeik (2002) reviewed articles spanning over 20 years to compile a list of 14 risk perception factors (see Table 2). Each factor explains a different aspect of consumer decision-making and acts as motivational factors to influence behavioral responses. Each of the fourteen factors will be discussed with an example related to healthcare.

Table 2. Risk Perception Factors

Risk Perception Factors in Consumer Purchasing		
Number	**Perception factor Label**	**Definition**
1	Trust versus Lack of Trust Factor	The more trust there is in those informing us about a risk, the less fear there will be of that risk.
2	Imposed versus Voluntary Factor	There is increased fear of a risk that is imposed than a risk that is chosen.
3	Natural versus Human-made Factor	Exposure to natural risk, sun exposure is less feared than nuclear exposure.
4	Catastrophic versus Chronic Factor	Most often, people are more afraid of things/events that kill a large number of people at once, suddenly and violently, than things such as heart disease. Although heart disease kills more people annually, it is individual and more dispersed.
5	Dread Factor	The worse the outcome from a risk, the more a person is afraid of it. It is postulated that cancer has a high dread factor.
6	Hard to Understand Factor	The harder a potential risk is to understand the higher the fear of that risk.
7	Uncertainty Factor	When science provides the answers to problems with technology, fear about the technology will decrease.
8	Familiar versus New Factor	The first time encounter to a new risk increases the fear of that risk. However, after a person lives with the risk, the fear will eventually begin to decrease.
9	Awareness Factor	Increased media coverage of a risk has a positive influence on risk perception.
10	A Known Victim Factor	Personal knowledge of someone who has been affected by a risk will lead to increased fear of that risk
11	Future Generations Factor	When children are involved, the fear of a risk is increased.
12	Does it Affect Me?	A person perceives risk more personally than they do for society.
13	Risk versus Benefit Factor	The more a person perceives a benefit from a potential hazard, the less likely a person will be afraid of the risk. This can be specifically applied to medication and treatment therapies.
14	Control versus No Control Factor	If a person feels that he or she can control the outcome of a hazard or risk, the less likely that person will be to be afraid of that risk

Note: From "Understanding Factors of Risk Perception," by D. Ropeik, 2002, *Nieman Reports, 4*, p.52.

The trust versus lack of trust factor (#1) addresses the trust that the consumer places on the person(s) informing the consumer. Specifically, the more trust there is in the person(s) informing the consumer about a risk, the less fear the consumer will have about the presented risk. Conversely, if there is a lack of trust in the person informing the consumer, the consumer is more likely to be fearful of the risk. An example related to healthcare is receiving advice on decreasing cholesterol in one's diet from a dietician or nurse versus a lay person in the supermarket. While a friendly face in the vegetable aisle may be accurate in providing information, a person would trust information given to them by a healthcare professional.

The imposed versus voluntary factor (#2) posits that an imposed risk is more feared than a risk taken voluntarily. For example, while smokers realize that there is a health risk associated with tobacco consumption they are often not fearful enough to stop smoking. However, if consumers were told they would be exposed to an unhealthy smoking environment every day in the workplace, they would be more fearful of the health consequences (exposure on the job does not involve addiction and also removes all control).

The natural versus human-made factor (#3) examines risk based on whether or not the risk is human-made or naturally occurring. A simple example is fear of cancer. While the sun exposes people to a form of radiation and an increased potential for skin cancer, consumers are more afraid of getting cancer from a nuclear exposure or manufacturing exposure, which are human-made processes.

The catastrophic versus chronic factor (#4) bases the fear of risk on the numbers of people that are harmed at one given time. Consumers tend to be more afraid of those

events that kill large numbers of people catastrophically than things that kill people annually. While it is known that cardiovascular disease kills more Americans annually in the United States, there is a greater fear of dying in a plane crash because this catastrophic incident can kill hundreds of people at one time.

The dread factor (#5) posits that the worse the perceived outcome from an event, the more fear that is associated with the event. Cancer has a high dread factor. This may explain the misconception that American women have regarding breast cancer. Studies have shown that more women are afraid of dying from breast cancer than from cardiovascular disease, when scientific evidence clearly demonstrates that more women die annually from cardiovascular disease than from breast and colon cancer combined (NHLBI, 2006). Perhaps death from breast cancer is perceived as being more painful than with cardiovascular disease. In addition, the dread may be related to whether death is quick or drawn out. Finally, breast cancer is often viewed as disfiguring.

The hard to understand factor (#6) states that fear about a risk increases as difficulty in understanding the risk increases. Disease processes are complex and difficult to understand, which provokes fear in patients. From laboratory results to a spectrum of procedures such as percutaneous transluminal angioplasty, persons possess a fear of things that they do not understand. However, fear associated with these processes can be lessened when the healthcare provider is able to educate the patient about signs and symptoms, diagnostic procedures, treatment regimens, and recovery processes.

The uncertainty factor (#7) is related to science and technology. This factor states that fear regarding specific technology will decrease if science explains problems with that particular technology. There has been an increase in health-related technology over

the last decade. Magnetic resonance imaging (MRI) was originally termed nuclear magnetic resonance imaging (NMRI). Although there were no instances that this test was harmful in studying brain function, the change in name gained the confidence of the public (Goldberg, 2007). It can be explained to the patient that, unlike x-rays, the MRI does not expose patients to any form of radioactivity or radiation.

The familiar versus new factor (#8) established that repeated exposure to a risk results in decreased fear regarding the risk over time. For example, air travel is feared by many people. However, those who frequently travel by air (repeated exposure) do not view this mode of transportation as an unnecessary risk. Traveling by automobile actually carries more risk for injury and death than does air travel, however, due to familiarity with auto travel, most people do not fear driving in a car at all. In healthcare, new treatment regimens such as chemotherapy may be fearful to people. However, after a patient has gone through one or two rounds of chemotherapy, the anxiety about the treatment regimen decreases.

The awareness factor (#9) is related to the amount of media coverage that is focused on the risk. Increased media coverage of a given risk will increase the fear of that risk (Ropeik, 2002; Sjöberg, 2000). This is similar to the media coverage prevalent today to market drugs and to advertise drug recalls. When Vioxx was publicly linked to an increase in cardiac deaths, there was a frenzy of people calling their physicians about continued use of Vioxx and similar non-steroidal anti-inflammatory medications (Mukherjee, Nissen, & Topol, 2001).

The known victim factor (#10) supports that personal knowledge of someone who has been affected by a risk will influence fear about the risk. Knowing either a friend or

relative with cancer raises awareness about the symptoms, treatments, and certainly the effects of the disease (Katapodi, Lee, Facione, & Dodd, 2004). Those who know someone with cancer often take primary prevention measures such as screenings very seriously. In addition, these same persons often take part in raising awareness in the community in events such as walk-a-thons.

The future generations factor (#11) states that fear will increase if children are involved in the risk. For example, while parents may not be overly concerned about second-hand smoke exposure for themselves, they are more concerned if their children are exposed to this hazard or risk. Another example is the fear of vaccines causing or being related to autism (Woo, Ball, Bostrom, Shadomy, Ball, Evans, et al., 2004). Parents go to great lengths to keep children safe from perceived hazards.

The "does it affect me" factor (#12) states that a person often perceives a risk differently for others than they do for themselves and it can be explained by people thinking "it cannot happen to me" or "this is something that happens to others". This factor, also referred to as comparative risk, is especially pertinent because when people perceive less risk for themselves than for others, risk prevention may not be seriously considered (Weinstein, 1982).

The risk versus benefit factor (#13) is associated with a person weighing risks and benefits of a risk or behavior. If the benefits of a behavior outweigh the risks, the person is less likely to be afraid of the risk or behavior. For example, a person may have a belief that taking medication is unnecessary, unnatural, costly, and can cause side effects. The person is prescribed a medication to treat high blood pressure. If a healthcare provider was able to demonstrate that this medication could decrease the chance for stroke and

heart attack while also decreasing recent symptoms of impotence, the person may be more likely to see the benefits of treatment and decide that the risk of taking medication is worth it.

Lastly, the control versus no control factor (#14) states that if a person perceives that they can control the outcome of a risk, the person will be less afraid of that risk. Conversely, if a person perceives that they will have little or no control over a risk, the person will be more afraid of the risk. Risky sexual practice and the potential contraction of human immunodeficiency virus (HIV) is one example. Stolte, Dukers, Geskus, Countinho, & de Wit (2004) conducted a study and observed a correlation between homosexual men who believed that highly active antiretroviral therapy (HAART) would prevent the contraction of HIV and unprotected anal sex.

These fourteen factors all contribute to different aspects of risk perception and have relevant implications for the healthcare environment. Each of these factors serves as a basis to understand perception by the consumer and may act as a motivator that will influence consumer behavior. The risk perception factors may be one way for healthcare providers to understand how health behavior decisions are made. Furthermore, by studying these factors, healthcare providers may be able to tailor interventions based on how each person may view risk in a given situation.

Additional literature on risk perception will be examined using subcategories including demographic variables and risk awareness and knowledge. Both optimism and optimistic bias will be explored as terms closely related to risk perception.

Demographic Variables Affecting Perception

Consumer-marketing strategies in the business literature concluded that consumers are not only influenced by the motivating factors outlined by Ropeik (2002), but vary by personal characteristics such as age, gender, income, education, marital status, parental status (Grobe, Douthitt & Zepeda, 1999; Sjöberg, 2000), and also by the context of the perceived risk (Grobe et al.; Sjöberg, 2000). Age has been established as a variable or mediator that affects perception of risk (Cohn, Macfarlane, Yanez, & Imai, 1995). Therefore, conducting research in different populations may elucidate effective strategies that will increase awareness of risk in different age samples.

Grobe and colleagues investigated the influence of personal characteristics (age, gender, household size, socioeconomic status, and education level) on risk perception of recombinant bovine growth hormone (rbGH) using Weinstein's Self-Protective Theory. This theory posits that personal susceptibility and severity affect the way an individual perceived risk. A nationwide telephone survey was conducted on 1,910 (56.1% of the sample) primary food shoppers regarding recombinant bovine growth hormone (rbGH) in milk. Data was analyzed using Chi Square analysis. The study concluded that perceived health risks from rbGH were dependent on individual perceived exposure (χ^2= 0.98, p = 0.05), fear of risks in general (χ^2 = 0.48, p = 0.05), household size (χ^2 = 0.12, p = 0.05), and socioeconomic status (χ^2= 0.125, p = 0.05). Furthermore, level of education (χ^2= -0.024, p = 0.05, χ^2= -0.093, p = 0.05, χ^2= 0.050, p = 0.05) male gender (χ^2= -0.052, p = 0.05), and increased age (χ^2 = 0.001, p = 0.05) were associated with higher level of awareness about rbGH. This finding is particularly poignant since awareness is not only essential for understanding information, but also for processing it as a risk or threat.

Additional information regarding awareness and knowledge will be discussed in a later section of this paper. Lastly, feeling a lack of control in life was associated with increased concern regarding rbGH, but not enough to exhibit self-protective behaviors. However, self-protective behaviors increased when the exposure could affect the family members. Thus, responsibility for others may act as a motivating factor to lessen exposure to a risk or threat.

Limitations of this study are due to the nonexperimental study design. While survey research can provide descriptions and breadth, it can lack depth. Thus, it may serve as a foundation for future studies on the topic. Strength of the results from survey research can vary based upon the expertise of the researcher(s) in sampling, survey construction, interviewing, and data analysis. In this study, the researchers stated that questions were compiled from risk perception theories and results from focus group research. However, it is not stated whether the questionnaire was piloted prior to use or if it was tested for construct, face, or content validity. Furthermore, the authors did not report reliability or validity data from this study. Such information would be useful for further research in this area.

Risk Benefit Ratio

Risk benefit ratio has been identified in the business (Dholakia, 2001; Ropeik, 2002), psychology (Simonet & Wild, 1997; Weinstein, 1988; Weinstein, Marcus, & Moser, 2005), and sociology (Wilkinson, 2001) literature. The risk benefit ratio posits that persons make decisions based on the risk versus the benefit in a given situation, whether it involves a purchase or behavior choice, supporting that health behavior decisions are made consciously and not haphazardly. Before making a decision to

incorporate a lifestyle change, a person carefully weighs the benefits and risks of the behavior. While consumer psychology tends to evaluate risk as a condition that arises from a potentially negative outcome, behavioral based disciplines such as psychology, sociology, medicine, and nursing take into account both potential positive and negative outcomes that guide individual decision making processes (Dholakia, 2001). In effect, the perception factors defined by Ropeik (2002) can be viewed as motivational factors that could influence behavior regarding the risk. The conclusions drawn from the business literature may be helpful in planning education strategies for the public in matters of disease risk and prevention. Consumers of healthcare are influenced by the same motivational factors (table 2) as consumers of products and services in the business industry. However, little is known about how healthcare consumers use a risk benefit ratio that may influence decision making lifestyle behaviors. Instead, the healthcare discipline utilizes health behavior models and theories that attempt to explain behavior choices.

Risk Awareness and Knowledge

The concept of risk perception has not been used consistently in the healthcare literature. While some studies state that risk perception is being measured or use the term "perception of risk" in their title, it is commonly awareness or knowledge about risk factors that is being measured and reported (King et al., 2002; Oliver-McNeil & Artinian, 2002). For example, in an article titled *Perception of risk for coronary heart disease in women undergoing coronary angiography*, King and colleagues surveyed a convenience sample of 450 women undergoing coronary angiography to examine the relationship between a woman's recollection of being told that she was at risk for CHD and the

presence of personal risk factors. The mean age of the participants was 64.5 years and ranged from 32-93 years. The sample was 94% white/Caucasian, 5.8% African American, and 0.2% Hispanic, thus not ethnically/racially diverse. However, the authors reported the sample as representative of the community, having a similar percentage of those with hypertension, diabetes, and physical inactivity. Results found that 83.6% had three or more risk factors, 12.2% had one or two risk factors, and 0.9% had no risk factors. Furthermore, only 35% of the women recalled being told that they were at risk for CHD, even though 84% reported having three or more risk factors. Using a multivariate regression analysis, age (95% CI = 0.96-0.99; p= 0.03), education (95% CI = 1.03-1.79, p= 0.03), and being told by provider about high cholesterol level (95% CI = 1.01-2.45, p= 0.05) were the only significant variables that predicted recollection of being told about personal risk for CHD. Results from this study highlight the importance of providing accurate information about risk factor for CHD. However, while awareness about risk factors plays a significant role in the formation of risk perception, risk awareness and risk perception are two separate and distinct concepts.

In critiquing this study, it is noted that threats to internal validity are addressed by using two trained nurses to conduct the structured interviews and following a set procedure for data collection. In addition, all but two of the participants were interviewed in person in the same hospital setting. This study included a large cohort of women with a wide range of ages. While the mean age was 64.5 years, there were participants as old as 95. At first glance, it appears that a participant at the age of 95 would be an outlier in the sample. It would have been helpful to provide the reader with the number of participants within a given age range. In addition, data analyzed by age category may provide

information about how knowledge and awareness about CVD changes with life stage and life experience. Due to the survey design of this study, causality and relationships cannot be assigned. However, this study can act as a basis for future research on this topic.

Perception of risk for CHD cannot be formed without awareness and knowledge of risk factors for CHD. For example, if a person does not know what factors contribute to the development of CVD (knowledge), then it would be difficult to become aware of the potential risk to health. Risk knowledge can arise from several sources including: media such as television, radio, internet, and printed sources; and dialogue with those who can provide accurate and candid information, whether they are healthcare professionals or well-informed lay persons. In addition to general knowledge, individualized information about personal risk factors such as blood pressure readings or lipid profile results further contribute to risk awareness and the subsequent formation of risk perception. Accurate perception of a risk is not necessarily guaranteed, even if complete and thorough knowledge is given and awareness of the risk is raised because the individual must be able to process the information to perceive a threat to well-being. The key to risk perception is how a person cognitively processes the information and subsequently is able to internalize and personalize the threat. Both internal and external influences affect how an individual processes a risk.

Lefler (2004) completed an integrative review of 11 studies including both men and women to examine why women do not perceive they are at risk for a myocardial infarction (MI) or heart attack. Lefler listed the following as some of the major findings from the studies: women were unaware that heart disease was the number one killer of women and believed that it is a male disease; women often underestimate the significance

of chest pain; women's symptoms for MI are often different that for their male counterparts; women reported paternalistic attitudes from physicians about symptoms; women often felt uninformed about heart disease; women often use print media as a primary source of health information; fewer physicians discussed heart disease with women; primary care providers often did not discussed disease prevention; and lower perceived risk was commonly reported by women, African American, those with lower levels of education, and younger patients. She concluded that there are gender differences that affect perceived risk of a heart attack. Moreover, she concluded that there is a need to involve the patient, family, and community to provide knowledge and reinforce behavior changed that will positively impact the lives of women. While Lefler did include both qualitative and quantitative studies that increased the richness of the findings, no audit trail was provided other than which search terms and databases were investigated. In addition, findings from quantitative studies were not supported by either significance levels or indication of sufficient power within the studies. Furthermore, there was no evidence presented about the strengths and limitations of the studies. Therefore, without this information, the conclusions drawn by Lefler may be weak and have limited application in practice.

Terms Related to Risk Perception

Both optimism and optimistic bias are terms closely associated with risk perception. When examining studies that involve risk perception, one or both of these related terms are often measured. In some cases, while optimism or optimistic bias is measured, results are reported as risk perception. Both optimism and optimistic bias will be examined in more detail later in this paper. But first the following meta-analysis is presented as a

poignant example of how risk perception was studied in the breast cancer literature and how the term overestimation (optimistic bias) was reported in many of the studies.

Katapodi and colleagues (2004) conducted a meta analysis on 42 studies related to risk perception and breast cancer screening using clearly described research methods. In addition, search terms, limitations, inclusion and exclusion criteria, and coding/analysis of data were provided in detail. Effect sizes were calculated using Hedge's G statistic in which g = 0.20 were considered small, g = 0.50 were considered moderate, and g = 0.80 were considered large. Odds ratios were also calculated along with a 95% confidence interval. The use of Hedge's G statistic is appropriate for the calculation of effect sizes in meta analysis. Thus, those studies with a small effect size have a stronger instrument to measure perceived risk. There is a large amount of variation is the type of instrument used to measure perceived risk. In this analysis, the authors noted that perceived risk was measured in a variety of ways, ranging from a single question to an eight-item panel of questions. In addition, both subjective and objective risk can be measured verbally on a Likert-type scale, or numerically as a percentage. Furthermore, Katapodi reported that in these studies, questions were formulated as subjective risk (the risk an individual assigned to him/herself based on variables such as knowledge and personal risk factors), or comparative risk (the risk an individual assigns to him/herself while comparing their risk against others), or both (see Appendix A). Most often, the comparison included demographics such as age group, gender, socioeconomic status, education level, and race/ethnicity. The table in this analysis clearly shows that the concept of risk perception has not been consistently defined and measured which poses a threat to reliability and validity of individual study results. For example these authors explain that while single-

item scales can be administered easily due to brevity and have adequate face validity the major limitation is limited discriminatory capacity. In addition, since the data is most often classified as interval level data, there is an increased risk for limited reliability due to measurement error. Lastly, single item scales have commonly been used to measure more than one construct leading to measurement errors.

Unlike the study conducted by Grobe and colleagues (1999), these researchers found conflicting results on the influence of demographic characteristics on breast cancer and perceived risk. Although seven of the studies concluded that younger women were more likely than older women to perceive higher risk for developing breast cancer, the effect size was small and the confidence interval was low (total N= 38,000, g = 0.13, 95%, CI 0.13-0.14). Katapodi and colleagues (2004) ultimately concluded that no relationship exists between age and increased perceived risk due to the small effect size for these seven studies and insufficient data to calculate an effect size for the remaining five studies. This conclusion limits the application of the findings.

This meta analysis is important to include for several reasons. To begin with, after searching the literature, this was one of the studies that ultimately revealed that risk perception is being measured in a variety of ways. In addition, risk perception is often reported as optimistic bias. Lastly, the analysis found gaps in the breast cancer literature that not only lays the groundwork for future research in breast cancer, but also in the areas of cardiovascular disease.

Literature on Optimism

The relationship between the concepts of optimism and risk perception was identified by this author after reviewing several studies that discussed risk perception, but

measured optimism (Facione, 2002; Katapodi, et al., 2004). Optimism, dispositional optimism, or "overestimation" can be defined as either a state or trait of personality or character in which a person views the word positively. It is thought that optimistic individuals make the best of things and are able to cope with adversity; hence they may make better choices related to healthy behaviors (Scheier & Carver, 1992).

Optimism has been most often measured with the Life Orientation Test (LOT) (Scheier & Carver, 1985) or the Life Orientation Test-Revised (LOT-R) (Scheier, Carver & Bridges, 1994). The original LOT is a twelve-item self report of both positive and negative outcome expectancies measured on a five point Likert response scale (Appendix B). There are four filler items, four positively phrased items, and four negatively phrased items on the instrument. Acceptable reliability and validity has been established and published in a variety of health related areas.

The concept of pessimism is commonly integrated within the same literature and is often explained as the opposite of optimism. Research has been conducted to further elucidate the relationship between optimism and pessimism (Kubzansky, Kubzansky, & Maselko, 2004). In some instances, pessimism has been more significantly correlated to health than optimism (Carver, Lehman, & Antoni, 2003; Brenes, Rapp, Rejeski, & Miller, 2002). However, there is some discussion among researchers whether optimism and pessimism are two separate constructs rather than opposite measures of a single construct (Brenes et al., 2002; Kubzansky et al. 2004; Scheier et al., 1994). Thus, it is difficult to discuss one concept without the other. In fact, more recent literature has discussed the concepts as optimism-pessimism rather than separate terms (Carver et al.,

2003). Even though there is not complete agreement regarding the relationship between these terms, there is evidence to suggest that both constructs affect health.

Kubzansky and colleagues (2004) explored whether optimism and pessimism, as measured on the LOT and LOT-R, are measures of the same construct. The study was designed to examine three versions of the LOT instrument: the original LOT, a half-reversed version of the LOT, and finally, a fully-reversed version of the LOT. In the half-reversed version the framing was reversed on half of the questions, while maintaining the intent of the item. The fully-reversed version reversed the framing of all questions. In reversed items, positively phrased items are changed to negatively phrased items. For example, if the original items states “In uncertain times, I usually expect the best,” the reversed item would state, “In uncertain times, I rarely expect the worst.” Thus, the connotation opposes the meaning of the statement but the intent of the item is the same. To ensure item meanings were intact, pilot testing was performed on the two reversed versions of the instrument. In addition, both versions kept the same order as the original LOT and the filler items were left unchanged. One version of the LOT was administered along with health-related measure for trait anxiety, trait anger, symptom measures, general health status and health behaviors. In addition, external health behavior information was obtained from the university health services for each of the 429 participants, including information on gastrointestinal problems, back and neck injuries, asthma, skin rashes, and regular preventive vaccine acquisition, to name a few.

Optimism and pessimism independently predicted anxiety, anger, and depressive symptoms ($p<0.01$), suggesting that optimism and pessimism are separate constructs. These researchers posit that negative emotions may act as a mediator between optimism

and pessimism. In addition, they suggest that positive expectations may play a role in how persons cope with adverse conditions such as illness. Finally, further investigation into the conceptual nature of optimism and pessimism has been suggested to explore the concepts of risk persistence, risk behaviors, risk tolerance, denial, and coping styles.

Optimism has been the focus of studies that examine human immunodeficiency virus and disease progression (Ironson, Balbin, Stuetzle, Fletcher, O'Cleriegh, Laurenenceau et al., 2005), immune function (Sergerstrom, Taylor, Kemenym & Fahey, 1998; Von Ah, Kang & Carpenter, 2007), breast cancer and social interaction (Carver et al., 2003; Von Ah et al., 2007), and carotid artery disease progression (Matthews et al., 2004; Matthews et al., 2006). While it makes logical sense to think that a positive outlook on life can affect overall physical health and functioning, there is objective evidence to support this position.

Immune Function. Optimism has also been shown to affect the immune system of healthy individuals. Sergerstrom et al. 1998) studied 50 first year law students with confirmed healthy immune systems to determine if optimism is associated with mood, coping, and immune function in response to stress. Immune measures included $CD4^+$ cells (helper T), $CD3^+$, $CD8^+$ cells (cytotoxic C), $CD19^+$ cells (B), $CD3^+$, $CD3^-CD16+56^+$ cells (NK), and natural killer cell cytotoxicity (NKCC). Strict methods of collection, handling, and processing of the samples were described adding to internal validity of the study. Dispositional optimism (trait optimism) was measured using the LOT, which has already been described. To capture situational optimism, a 10-item scale was specifically developed for this study based on a previous study examining optimism with HIV. Reported reliability was $\alpha = 0.86$ at Time 1 and $\alpha = 0.91$ at Time 2. The correlation

between dispositional and situational optimism was 0.30 suggesting sufficient ability to discriminate between the two concepts. The Coping Operations Preference Enquiry (COPE) measured several factors including problem solving, mental accommodation, and avoidance. The Profile of Moods State (POMS), a well-established instrument to assess mood, was used to measure mood state over the past week. It assesses 65 different moods using a 5-point Likert type scale. Measures assessed for the previous week included: amount of exercise, average amount of sleep, and intake of caffeine, alcohol, nicotine, and/or drugs. Demographic characteristics were collected. Lastly, each participant was asked to describe extremely stressful recent school related experiences using a 7-point Likert type scale. The instruments were not included in the publication therefore, it is not possible to examine how these concepts were explored.

Self-reported optimism and situational optimism, related to college life as first year law students, were measured at baseline and mid-semester. Situational optimism, in this study, was defined as the outlook a student had related to school related stress. Results indicated situational optimism was associated with less perceived stress ($r = -0.28$, $p < 0.05$) and less avoidance coping ($r = -.27$, $p < 0.05$). In addition, both dispositional and situational optimism were associated with less mood disturbance at both Time 1 ($r = -.25$, $p < 0.05$; $r = -.28$, $p < 0.01$) and Time 2 ($r = -.33$, $p < 0.01$; $r = -.39$, $p < 0.01$) respectively. Lastly, situational optimism was significantly associated with levels of $CD4^+$ cells (helper T cells) ($r = 0.35$, $p < 0.05$).

Results from this study suggest that individuals who are more optimistic are less likely to perceive stress and have less mood disturbances. While only situational optimism was significantly associated with increased helper T-cells it may be that

individuals are able to remain optimistic while enduring the stress of a situation that has limits. For example, students often feel stressed before a paper is due or before an exam. However, the student is able to endure this stress without deleterious effects because it occurs during a relatively short period of time (days to weeks depending on the student's schedule and classes). However, if an individual is enduring stress over a long period of time, it may not be possible for the body to react in a protective manner. Since there is evidence to support that CVD is related to an inflammatory response, which is part of immune functioning, further research regarding optimism should be included in the area of CVD. This study provides a strong foundation for more research in this area. Not only can other age groups be studied, but also different ethnicities, and those with different disease processes.

A more recent study conducted on 54 women newly diagnosed with breast cancer found optimism to moderate the immune response while it did not have a direct effect on natural killer cell activity (NKCA) in this sample (Von Ah, Kang, & Carpenter, 2007). These researchers posit that in some instances optimism may be more of a state previously thought. In addition, Von Ah and colleagues suggest that not only does more research need to be done in this area, but specifically longitudinal studies to determine how psychosocial factors influence immune response in breast cancer.

Social Interaction. Carver and colleagues (2003) examined social interaction among women with breast cancer using a cross-sectional design. The authors hypothesized that pessimism would be correlated with less social interaction in these participants. The sample consisted of 235 women with a first experience with cancer who were otherwise physically and psychologically healthy. The participants were recruited at

three, six, or twelve months post-surgery; had either Stage 0, 1, or 2 cancer; and ranged in age from 27 to 87 years. Women with more advanced cancers were excluded from the study. The sample ethnicity was: 63.4% Caucasian/White, 11% African American, 25.5% Hispanic. Instruments included both the LOT-R to measure "optimism-pessimism" with a reported $\alpha = 0.75$ for this study. Social disruption was measured using two subscales of the Sickness Impact Profile (SIP). The first scale assessed impact on social activities ($\alpha = 0.86$), while the second examined recreation and pastime activities ($\alpha = 0.70$). In addition, emotional distress was measured with small sets of adjectives that respondents rated according to severity. For example, distress was measured as anxiety using "tense, nervous, and anxious". Furthermore, the sets were also combined to yield a composite index by averaging responses with a correlation of 0.43. Lastly, fatigue was measured by using three descriptors from the fatigue scale ("tired, worn out, and exhausted") of the Profile of Moods State (POMS) with a reported $\alpha = 0.90$ when the responses were averaged across items. These sets of adjectives were described as having adequate measures of reliability and had been used in earlier breast cancer research. In addition, the researchers did not explain why the entire fatigue scale from the POMS was not used. Perhaps it was for brevity and to lessen the burden on the participant. However, the use of only a few adjectives to measure a significant part of the study poses a threat to internal validity and may negatively impact the findings.

Regression analysis found that optimism was inversely related to social disruption ($\beta = -.25$, $t(231) = 4.16$, $p < 0.001$), distress ($\beta = -.41$, $t(231) = 6.97$, $p < 0.001$), and fatigue ($\beta = -.29$, $t(231) = 4.59$, $p < 0.001$); thus higher levels of optimism were correlated to less social disruption, distress, and fatigue. While treatment for breast cancer does imply a

certain amount of social disruption, it appears that optimism may play a role in the recovery and resultant positive social interaction for those with breast cancer. While it is not known whether the same would be found for those at risk for cardiovascular disease, further research may help to further define the relationship between optimism and pessimism, negative emotions and health outcomes. One possible explanation is that optimism acts as a mediator for more positive health outcomes.

Disease Progression. Evidence supports the premise that optimism may slow disease progression. For example, Ironson and colleagues (2005) examined the effect of optimism on human immunodeficiency virus (HIV) disease progression. The sample of 177 participants had CD4 counts between 150 and 500, were HIV positive with at the beginning of the study, denoting they were all in the "midrange" of the illness. The sample was 70% male and diverse, with 31% Caucasian, 36% African American, 28% Hispanic, and 5% reported as other ethnicity/race. Disease progression markers, psychosocial measures and adherence to the medication regimen were measured longitudinally every six months over a two and a half year period. Psychosocial measures included: optimism, depression, coping, and perceived stress. The LOT-R, which was previously discussed, was used to measure optimism. The Beck Depression Inventory (BDI), a well-established instrument, was used to measure depression. The Coping Operations Preference Enquiry (COPE) was used to measure coping ability. Lastly, the Perceived Stress Scale (PSS) was used to measure degrees of perceived stress. While these measures were very briefly discussed, no reliability or validity data was provided. However, these instruments are used widely with established reliability and validity data supporting the integrity of internal validity. The researchers explained that the statistical

method of hierarchical linear modeling (HLM) was specifically chosen to predict CD4 and viral load at each point in time, rather than predicting data at a single point in time. HLM is an appropriate method, given the nature of the data and design of the study. After controlling for significant covariates of: viral load intercept (intercept, age, gender, cocaine use), viral load slope (average slope, education, sexual orientation, optimism), antiretroviral 1 (average increment), and antiretroviral 2 (average increment), optimism measured at baseline predicted the change in CD4 and viral load over the 2 year time period. So, while the group as a whole lost CD4 cells due to the disease process (as expected), results showed that optimistic individuals showed less disease progression through an increase in CD4 cells (0.19, $t = 2.08$, $p= 0.04$) and a slower increase in viral load (-0.001, $t = –2.007$, $p= 0.04$).

This was an in depth, highly structured study that serves as a foundation to support the impact that optimism has on the immune function in those with HIV. While it is not known whether optimism has any effect on the development and/or progression of CVD, further study in this area could elucidate this relationship. If the results could be replicated in CVD, even more could be understood about immune response and the development and progression of CVD leading to new prevention and treatment measures to prevent or halt the progression of disease.

There are few studies that examine optimism and the development and progression of CVD. However, two studies most relevant to this paper correlate increased optimism and life engagement with decreased levels of CVD. Matthews, et al., (2004) measured carotid intimal thickness, a surrogate marker for atherosclerosis, in a prospective, longitudinal study of 209 middle-aged healthy women. The women were part of the

Healthy Women Study (HWS) and were premenopausal at enrollment. Data was collected on demographics, blood glucose and cholesterol levels, body mass index, blood pressure, optimism, and depressive symptoms. Carotid intimal thickness, a surrogate for atherosclerosis, was measured via ultrasound scans using certified readers with pre-study interrater reliability for establishing intima medial thickness (IMT) with an intraclass correlation of 0.86. Carotid scans were performed at 10 and 13 years into the study when women were 5 and 8 years postmenopausal.

The Life Orientation Test (LOT) was used to assess optimism-pessimism and was administered upon entry into this part of the study and at the time of the first carotid scan. Blood draw parameters were given for all laboratory assessments. Body mass index (BMI) and blood pressure (BP) procedures were described. Self-reported measured included: current medication therapy for hypertension, hyperlipidemia, and hormone replacement; smoking history and alcohol intake. In addition, the Paffenbarger Activity Questionnaire (PAQ) was used to collect data on leisure time activity spenditure. Lastly, The Beck Depression Inventory (BDI) was used to measure depression. However, information on the timing of the PAQ or BDI measures was not specified. Sound measures to collect data supporting internal validity of the study.

Multiple linear regression analysis and univariate analyses of covariance (ANCOVA) were used to analyze the data. Results showed that women who remained optimistic for the longest periods of time had less disease progression ($p < .001$) and those who reported higher pessimism scores were more likely to have greater increases in carotid intimal medial thickness ($p < .007$). Pessimism scores collected at study entry were related to an increase in mean IMT ($\beta = 0.17$, $t = 2.71$, $p < 0.007$). After being

placed in quartiles based on the distribution of pessimism scores, significant linear effects of pessimism were seen on the percentage of increase in both mean (linear contrast, $F = 3.29$, $p < 0.002$) and maximum IMT (linear contrast, $F = 2.85$, $p < 0.25$). The lowest quartile (most optimistic) showed that this group had less progression than the other three groups for both mean ($F = 15.4$, $p < 0.001$) and maximum IMT ($F = 5.6$, $p < 0.02$). Optimism and pessimism scores remained stable over the 10.4 years of follow-up (Pearson $R = 0.71$, $p < .0001$).

These results bring new information about optimism and cardiovascular disease progression. Findings from this study should leave researchers thinking that more needs to be done to examine the relationship between optimism, pessimism and the development and progression of CVD. Several limitations must be examined in light of the findings. To begin with, the subjects were all female. In addition, the study population was homogenous, with 90% of the participants being white. Additional study, including a broader range of ethnicities and with men is necessary to examine whether similar results could be replicated. Lastly, the sample was comprised of healthy individuals, thus it is not known whether similar results would be found in those with established CVD or in those with co-morbid states such as hypertension, or diabetes.

The second study, conducted by Matthews et al. (2006), found similar findings among 155 healthy women who completed instruments to measure cognitive affect and optimism before and after an electron beam tomography scan (EBCT) to measure aortic and coronary calcification. Similar to the previous study, the participants were part of the larger Healthy Women Study. This study is a continuation of the first study by Matthews et al. (2004), thus the women were now post-menopausal with a mean age of 65.1 years.

EBCT was used to measure calcification in the aorta and coronary arteries. The Agatston scoring method was used contributing to reliable and valid score reporting. Coronary and aortic calcium scores showed moderate association (Spearman's $p = 0.40$, $p < 0.001$). In addition to assessment of cardiovascular risk factors, several psychological attribute tests were administered to identify optimism, depression tendencies, self-esteem, and hostility. Elements of each measure including number of items, rating/scoring system, sample items, and alpha coefficients were described and presented as a table. All instruments reported alpha coefficients of 0.70 or higher. Similar to the previous study, the use of well-established instruments supports strong internal validity. However, there was no discussion as to which instrument measured which construct. Therefore, unless the reader is familiar with the name of the scale, it might prove difficult to fully understand the reported findings. For example, after scanning the references, it was determined that the LET is the Life Engagement Test. However, it was necessary to read that article to learn that the LET measures life engagement and life satisfaction and was explicitly designed for researchers in the fields of behavioral medicine and health psychology (Scheier, Wrosch, Baum, Cohen, Martire, & Matthews et al., 2006). So, while the LET does not measure optimism specifically, it was tested and was moderately correlated ($r = 0.39$ to $r = 0.61$, $p = 0.01$) with measures of optimism in eight separate studies. In fact, one of the eight studies is this very study (Matthews et al., 2006). The introduction of the LET without using the LOT does pose some questions since Dr. Scheier was key in the development of both instruments. Is it possible that since the LOT is correlated with optimism, researchers are now beginning to focus on engagement in life as a measure of positive emotion, namely optimism?

Findings from both studies may have a tremendous impact on the way we view emotional attributes and their impact on the development and progression of CVD. However, this impact must be tempered due to study limitations. Similar to the 2004 study, the non-diverse sample was comprised of middle-aged, highly educated white women. Only one participant had less than some college education. Thus, findings from neither study can be generalized to all women. Additional research is needed to establish whether similar relationships exist in different ethnicities and in men. While the clarity of the measures used in the study and some of the findings were difficult to interpret, brief reporting in both areas may be due to journal publication limitations and, therefore, may not a true reflection of study strength or design.

Clearly, these two studies were conducted with attention to detail in many areas and measures were taken to support strong internal validity such as the use of well-established instruments, the appropriate use of statistical regression to identify relationships, and strict data collection protocols. Both studies support a relationship between psychological factors and the development of CVD. Therefore, further research on the impact of psychological variables needs to be conducted on both men and women and in different ethnicities. As was seen in these two studies emotions played a significant role and should be investigated further.

Positive and Negative Emotions. While optimism has been studied with regards to other positive emotions such as resilience (Bowen, Morasca, & Meischke, 2003), pessimism has been examined in relationship to negative emotions such as depression, depressive symptoms, Type A personality, and anger; as well as other emotional factors such as social support, coping, and helplessness (Blumenthal, Burg, Barefoot, Williams,

Haney, & Zimet, 1987; Ironson et al., 2005; Sergerstrom et al.,1998; Shnek, Irvine, Stewart, & Abbey, 2001). The literature explaining negative emotions will be examined later in this paper.

Bowen and colleagues (2003) analyzed the relationship among resiliency variables and optimism in 357 women with a family history of breast cancer using a cross sectional design. While optimism was measured using the LOT-R, resiliency was measured using the Life Ladder Scale and the Life Attitude Profile-revised (LAP-R). The Life Ladder Scale was described as measuring comparative levels of past, present and future thriving and the LAP-R was reported to measure meaning and purpose in life as well as the motivation to find meaning and purpose in life. In addition, data was gathered using the MOS Social Support Survey; the SF-36 sub-scales of mental health, physical functioning, and perceived health; the Cancer Worry Scale; and the subscales of depression and anxiety from the Brief Symptom Inventory. Subjective risk perception was obtained by asking the participant to rate their chance of getting breast cancer on a scale from zero to 100. Lastly, quality of life (QOL) was asked as a single item "Overall, how would you rate the quality of your life?" using an 11-point Likert scale. Even though some information about these instruments and measures was reported, there were areas that were difficult to understand. For example, the authors mention using the MOS Social Support Survey, but fail to define MOS, which may assist the reader to understand more about the measure. In addition, reliability and validity were not presented for all measures, which may affect the strength of study results and contribute to Type I error.

Optimism was not correlated with any of the resilience variables and LOT-R values were lower than in previously reported studies, which may explain why the LOT-R did

not load high enough on exploratory factor analysis (EFA) to be considered a measure of resiliency. However, the researchers did suggest that the LOT-R be used in further studies since it was very close to meeting the criteria. The specific statistics for the EFA cannot be discussed because they were not included in the publication. Using multiple regression analysis, independent predictors of resilience included: age ($\beta = 0.92$, $p<0.01$), perceived risk of breast cancer ($\beta = 1.73$, $p< 0.01$), mental health ($\beta = 0.38$, $p< 0.01$), and general health ($\beta = 1.3$, $p<0.01$). It is interesting that perceived risk of breast cancer was an independent predictor of resilience and supports the intricate relationship between these closely linked concepts. However, limitations of this study should be considered. Similar to many studies in breast cancer research, this sample consisted of mostly Caucasian (93%) and well-educated women with 65.8% completing at least four years of college. Without representation from other ethnicities, it is difficult to say whether or not similar findings would be replicated. In fact, studies of African American and Chinese American women have reported an association with fatalism and breast cancer, which definitely would impact resilience. The concept of fatalism will be discussed later in this paper. In addition, there may be significant gender differences regarding resilience and optimism. Thus, further study is warranted to explore the relationship between optimism and resiliency in more diverse populations.

Summary. Overall, there has been extensive work completed on many aspects of optimism, including influence on health and health related behaviors. However, limited exploration has been completed in the areas of CVD. Specifically, only two studies examine the development and progression of cardiovascular disease. Results from both studies demonstrate the importance of investigating this area more fully with CVD.

Additional research should include more diverse samples to see if findings can be replicated.

The long-term challenge may be figuring out if individuals can be "taught" to be more optimistic. Certainly individuals that already possess trait optimism have a head start. However, it may not be completely unrealistic to teach state optimism. Behavior modification techniques, such as meditation and reframing, have proven to be successful in managing stress and adverse visceral reactions.

Literature on Optimistic Bias

Optimistic bias or unrealistic optimism is demonstrated when individuals believe that their own risk is less than that of their peers (Weinstein, 1987). Work conducted on risk perception relative to health and illness has shown that Americans tend to be optimistically biased about their susceptibility to disease and illness (Facione, 2002; Kreuter & Strecher, 1996; Weinstein, 1982, 1987).

Optimistic bias has been used to measure individual behaviors such as smoking (Ayanian & Cleary, 1999; Hahn, Rayens, Hopenhayn, & Christian, 2006; Strecher, Kreuter, & Kobrin, 1995; Weinstein et al., 2005), but has also been used to examine the Health Belief Model (Clarke, Lovegrove, Wiliams, & Machperson, 2000), susceptibility to health problems (Kruger & Burrus, 2004; Strecher et al., 1995; Weinstein, 1982), intent to change behavior (O'Brien, Fries, & Bowen, 2000) and breast cancer (Facione, 2002; Katapodi et al., 2004).

Personal Characteristics. Researchers have found that, similar to risk perception, personal characteristics also influence optimistic bias (Avis, Smith, & McKinlay, 1989; Ayanian & Cleary; 1999; Hahn et al., 2006). For example, Ayanian and Cleary examined

smokers' perception of risk for heart attack and cancer using both a telephone interview and a self-administered survey. The sample included 737 current smokers and 2,294 former smokers.

Increased perceived risk for heart attack was correlated with age greater than 65 years (O.R. = 0.2, 95% CI = 0.1-0.8, $p \leq .05$), less education (O.R. = 0.5, 95% CI = 0.2-1.1, $p \leq .05$), lighter smokers (less than 20 cigarettes per day) (O.R. = 3.0, 95% CI = 1.5-5.8, $p \leq .05$), and self-reported fair or poor physical health (O.R. = 1.6, 95% CI = 1.0-2.7, $p \leq .05$). Perception of an increased risk of cancer was correlated age greater than 65 years (OR 0.2, 95% CI 0.1-0.5, $p \leq .05$), less education (OR 0.5, 95% CI 0.2-0.9, $p \leq .05$), lighter smokers (less than 20 cigarettes per day) (OR 1.8, 95% CI 1.0-3.3, $p \leq .05$), Increased perceived risk for heart attack was correlated with age greater than 65 years (O.R. = 0.2, 95% CI = 0.1-0.8, $p \leq .05$), less education (O.R. = 0.5, 95% CI = 0.2-1.1, $p \leq .05$), lighter smokers (less than 20 cigarettes per day) (O.R. = 3.0, 95% CI = 1.5-5.8, $p \leq .05$), and self-reported fair or poor physical health (O.R. = 1.6, 95% CI = 1.0-2.7, $p \leq .05$). Perception of an increased risk of cancer was correlated age greater than 65 years (OR 0.2, 95% CI 0.1-0.5, $p \leq .05$), less education (OR 0.5, 95% CI 0.2-0.9, $p \leq .05$), lighter smokers (less than 20 cigarettes per day) (OR 1.8, 95% CI 1.0-3.3, $p \leq .05$),

In examining the results, it may appear unusual that increased perceived risk for heart attack and cancer occurred in only the light smokers (less than 20 cigarettes per day). However, this difference may be due to the fact that these individuals may have been heavy smokers at one time and cut down knowing there was a risk associated with heavy smoking. In addition, the number of light smokers may be skewed due to the self-reported nature of the data. While the results of this study highlight personal

characteristics that contribute to perceived risk for heart attack and cancer, the use of self -reported data can introduce bias and can threaten internal validity.

Avis, Smith, and McKinlay (1989) investigated influences on perceptions of heart attack risk in a random sample of 732 men and women, ages 25-65 years. Using logistic regression, the study found elevated perceived risk for heart attack was seen with increased age (O. R. = .90, 95% CI = .87, .92), self-reported poor health (O.R. = 1.80, 95% CI = 1.25, 2.58), and death of a parent caused by heart disease (O.R. = 2.72, 95% CI = 1.52, 4.87). Both increased age and self reported poor health were findings similar to those found by Ayanian and Cleary (1999). However, these values were reported without a reference to a p value, thus increasing the risk for a Type I error when interpreting the results. It is possible that the journal did not require this information to be reported nearly 19 years ago. However, this foundational study is important since it examined personal characteristics that affect risk perception. In addition, these researchers found that 42 % of the respondents underestimated their risk, 18% overestimated their risk, and 40% estimated their risk accurately when compared to an estimate provided by the RISKO tool, which is based on objective data regarding risk factors for CVD such as blood pressure and cholesterol. An overwhelming 60% of respondents inaccurately perceived their estimated risk for a heart attack. This is an important message because if individuals do not form an accurate perception of risk, there is little chance improvement in health behaviors will occur.

Individual Behaviors. Optimistic bias research centered around individual behaviors and/or risk factors includes areas such as: seat belt use, binge drinking, condom use, vaccine effectiveness, food safety, bicycle helmet use, dietary choices, and traffic

accidents, to name a few. Since the purpose of this paper is not to explore optimistic bias specifically as related to individual behaviors, this area will not be explored in depth. However, one example will be discussed to demonstrate the difference with this application. Using grounded theory method, Wolburg (2001) studied risk perception of binge drinking among 81 college students at a small Midwest university. Focus group data gathering took place prior to in depth interviews by paid volunteer participants. Results of the study revealed the following items as potential risks encountered while drinking: drunken driving, illegal activities such as fake identification and underage drinking, sexual experience including rape, passing out/losing control, fights, vandalism, physical illness, physical injuries, emotional consequences such as guilt or humiliation, drug use with alcohol, academic failure, financial consequences, and parent knowledge. The study concluded that students who feel personally vulnerable to threats/risks are more likely to understand the real risks in binge drinking. The prevailing attitude of most college students was that getting sick from drinking was the worst outcome to expect and most do not care if they get sick from drinking because they feel it is a part of college life (Wolburg). Most students conveyed that they feel "invincible" and free from consequences; therefore they do not feel vulnerable to the risks of binge drinking.

The results of this study are important for two reasons. First, because it demonstrated that these college age students participated in risky behavior such as binge drinking, despite identifying potential risks such as physical and social consequences. Second and perhaps more importantly, although this study has found this behavior to be true with college binge drinking, it may also carry over into health behaviors that affect the development of CVD such as smoking, unhealthy eating, and physical inactivity. This

study may have biased results based on the self-reported nature of the topic and use of volunteer subjects. It is possible that many participants may have purposely given misinformation about this controversial topic. Both biases may threaten the internal validity of the study.

Screening Behaviors. Facione (2002) examined screening behavior for breast cancer in 770 women ages 19-99 years (mean age 46.18 years). The sample was diverse with 26.7% African American, 33.3% Latino, and 33% White. Only 8.3% had less than a high school education. This was a secondary analysis of data collected from a previous survey study. Instruments used in the study included: the Life Orientation Test (LOT) used to measure the trait of optimism; Breast Cancer Fatalism used to examine attitudes about developing and surviving breast cancer; Breast Cancer Symptom Knowledge (BCSK) used to evaluate knowledge about breast cancer; and the Reynolds Form of the Crowne-Marlow Scale used to analyze social desirability response bias. Satisfactory validity and reliability measures were provided for each instrument used in the study supporting internal validity. Facione hypothesized that women with more knowledge about symptoms of breast cancer and the disease process would show less optimistic bias about their personal risk and make more realistic judgments about their own risk. Results confirmed this hypothesis and showed women with a college education scored higher on the BCSK (mean 9.44, SD 3.44) than women without a college education (mean 7.04, SD 4.31) and that higher education levels were significantly related to less optimistic bias on the BCSK scale (Chi square = 7.28, p= 0.007). In this study, LOT scores (trait optimism) did not significantly differ between those perceiving themselves to be at lower risk for breast cancer (mean 5.31, SD 1.84) and those perceiving themselves to be at higher risk

(mean 5.46, SD 1.70, t = .996, p = 0.314). Thus optimism did not influence their personal perception of breast cancer risk. Similar findings were described for the measure of fatalism in this study. However, 75.8% of the women gave comparative risk estimates lower than that of other women. Both the survey design and the use of a convenience sample may have produced biased results. However, the findings from this study may be cursory in helping to explain the delay in screening for breast cancer and related symptoms. Thus, communicating relative risk to women could ultimately influence preventive health practices for breast cancer.

This study is a good example of how both survey research and a secondary analysis of data is useful to researchers in examining strategies to influence health behaviors. While bias may be present, there is still enough evidence to further investigate how individuals perceive risk. The strength of this study was using established instruments with strong reliability and validity data. In addition, demographic data supported that level of education may be a powerful predictor of optimistic bias.

Susceptibility. Weinstein, Marcus, and Moser (2005) conducted a telephone interview with 6,369 participants and found that smokers underestimate their risk for lung cancer both relative to other smokers and to non-smokers. These findings support work completed by other researchers such as Ayanian & Cleary (1999) that was previously discussed. Strecher, Kreuter, and Kobrin (1995) examined perceived risk and optimistic bias for heart attack, cancer, and stroke in smokers and nonsmokers. In contrast to previous studies, Strecher and colleagues found that smokers estimated their risk for each disease higher than non-smokers. However, the smokers in this study underestimated the degree of health-related problems caused by smoking. Thus, smokers knew that smoking

had negative effects, but underestimated the severity of the consequences. This may explain why smokers continue to smoke, even though they know they are putting themselves at risk for cardiovascular disease and cancer. However, the difference in methods between these studies is that Strecher and colleagues conducted personal interviews with subjects. The technique may be partially responsible for personal bias in reporting risk. Weinstein believes that the specific questions asked have more influence on response than the type of interview. However, any type of telephone interviewing and voluntary participation may contribute to bias in the data collection affecting internal validity of the study.

Summary. Optimistic bias has been studied in many disease processes. Research has shown that personal characteristics such as age, gender, and education play a role in how individuals perceive risk. In addition, research conducted with breast cancer patients, in particular, demonstrated that optimistic bias is not only influenced by personal characteristics, but may also play a role in preventative screening behaviors. Because this concept has not been studied in CVD, it is not known how optimistic bias affects preventive health behaviors related to this disease process or risk perception for CVD. Understanding this relationship could potentially influence interventions that will effectively decrease the development and progression of CVD. The impact of primary prevention not only affects disease development and progression, but ultimately impacts healthcare resources.

Literature on Negative Emotions

While the purpose of this paper is not to specifically discuss negative emotions, psychosocial components are becoming more widely recognized as risk factors for CVD,

hence it is necessary to address this area of literature. In addition, research related to optimism has suggested that the opposite of optimism may be depression and not pessimism. Research in this area is ongoing to determine this relationship. Initially, “type A” behavior was examined and attributed as a risk factor. More recently, however, other psychosocial components such as depression, anxiety, hopelessness, and worry have been recognized as contributing factors to CVD (Elovainio et al., 2005; Ferketich, Schwartzbaum, Frid, Melvin, & Moeschberger, 2000; Matthews, Nelesen, & Dimsdale, 2005; Matthews, Owen, Edmunsowicz, Lee, & Kuller, 2006; Shnek et al. 2001; Weber-Hamann et al., 2002). These components are often referred to collectively as negative emotions. It is important to examine how pessimism is related to other negative emotions.

Rozanski, Blumenthal, and Kaplan (1999) describe depression as the presence of depressed mood and a marked decrease in all activities that persists for at least two weeks. In addition, this mood alteration is also accompanied by at least two of the following symptoms: “changes in appetite, sleep disturbance, fatigue, psychomotor retardation or agitation, feelings of guilt or worthlessness, problems concentrating, and suicidal thoughts” (p. 2193). Depressive symptoms may have components of clinical depression, but lack sufficient magnitude to be classified as such. Rozanski and colleagues outlined the presence of a threefold higher depression rate among those with CAD. It is important to distinguish between depression and the presence of depressive symptoms because research demonstrates that CAD is associated with the degree of depressive symptoms present (Matthews, Nelesen, & Dimsdale, 2005). These findings suggest that depression manifests along a continuum. Shnek and colleagues (2001) examined the relationship between psychological factors and depressive symptoms in

post-myocardial infarction patients using repeated measures at one-month post discharge and one-year follow-up. Regression analysis was run controlling for confounding variables of depressive symptoms, helplessness, self-efficacy, and cognitive distortions; optimism was the only variable negatively correlated with depressive symptoms (ΔR^2 0.34, $p < 0.001$) at time 2. This supports work initially completed in this area by Scheier and Carver (1985) conceptualizing optimism as a stable trait that is not affected by health status, mood or circumstances.

Gender. There is evidence to suggest that there are gender differences in how negative emotions manifest as part of the atherogenic process. For example, Elavainio et al. (2005) reported findings from the Young Finns study showing that higher levels of depressive symptoms, measured using a modified version of the Beck Depression Inventory, were correlated with increases in carotid intimal medial thickness in men, even after adjusting for age and cardiovascular risk factors in adolescence and childhood ($\beta = 0.08$, $F[1, 405], 9.24$, $p < 0.003$). The Young Finns Study examined both men and women ($n = 1126$) over a 21-year period, capturing adolescence through young adulthood. The researchers suggest that one possible explanation for the expressed difference between genders is that women develop atherosclerosis later in life. However, further studies between men and women may help to explain the intricacies of these differences. More recent studies have indicated that negative emotions may also contribute to the development of atherosclerosis in middle-aged women (Matthews, Raikkonen, Sutton-Tyrrell, & Kuller, 2004; Matthews, Owens, Edmunsowicz, Lee & Kuller, 2006). These studies were previously discussed in the section on optimism.

Race/Ethnicity. In addition, there is evidence to support a link between race/ethnicity and depressive symptoms. Results from the Coronary Artery Risk Development in Young Adults (CARDIA) Study followed a cohort of 5,115 participants ages 18-30 for 15 years (Knox, Barnes, Kiefe, Lewis, Iribarren, Matthews, et al. (2006). This prospective study included African American men and Caucasian men and women. Measures of depressive symptoms were obtained with the Center for Epidemiology Studies Depression Scale (CES-D) instrument, a 20-item self-reported measure using a 4-point Likert scale. Reliability and validity measures have been reported widely for this well-established instrument.

Results found African American women had more episodes of depression (n = 625) compared to African American men (n = 367), Caucasian men (n = 276), and Caucasian women (n = 413). In addition, there was a significant association between diabetes and reported episodes of depression in African American men and women in both unadjusted ($\beta = 0.09$, SE = 0.02, $p < 0.0001$) and adjusted ($\beta = 0.06$, SE = 0.02, $p < 0.0008$) regression models. A significant inverse correlation between physical activity and depressive episodes was seen across all groups: African American men and women: $\beta = -32.16$, SE = 8.21, $p = 0.0001$; Caucasian men and women: $\beta = -27.26$, SE = 8.27, $p = 0.001$). A positive correlation between smoking and depressive episodes was seen across all groups: African American men and women: $\beta = 0.09$, SE = 0.02, $p = 0.0001$; and Caucasian men and women: $\beta = 0.07$, SE = 0.02, $p = 0.003$). Similarly, a positive correlation was also seen between BMI and depressive episodes across groups: African American men and women: $\beta = 0.18$, SE = 0.18, $p = 0.0001$; and Caucasian men and women adjusted: $\beta = 0.54$, SE = 0.19, $p = 0.006$). This study showed both differences and similarities between

African Americans and Caucasians regarding depressive symptoms and risk factors for CVD. This is an important first step in tailoring treatment options that not only affect depression, but also CVD. If, in fact, African Americans experience more depression, could this also be considered a comorbid state for this population? Further study may help to explain more about the relationship between negative emotion and the development and progression of CVD in various ethnicities.

Socioeconomic Status. Socioeconomic status is also a factor related to the presence of depression, anxiety and CHD. Thurston, Kubzansky, Kawachi, and Berkman (2006) examined data from the First National Health and Nutrition Survey (NHANES I) to see if depression and anxiety mediate the relationship between low socioeconomic status (SES) and CHD using regression analysis and proportion hazard ratios. In this analysis, the researchers considered negative affect to be the presence of depressive and anxious symptoms. However, specific indicators of these symptoms were not outlined in the paper. Increased risk of CHD was associated with high levels of depressive symptoms (RR = 1.57; 95% CI, 1.29-1.92) and symptoms of anxiety (RR = 1.60; 95% CI, 1.34-1.90); as well as moderate levels of depressive symptoms (RR = 1.20; 95% CI, 1.05-1.37) and symptoms of anxiety (RR = 1.18; 95% CI, 1.03-1.36). Although these researchers reported that women had higher reports of depressive symptoms than men, after adjusting for age, the difference was marginal ($p<0.05$). While both depressive symptoms and anxiety are correlated to increased risk for CHD and lower SES, data did not support the hypothesized mediating effect.

Fatalism. While fatalism has not been examined closely in cardiovascular research, the concept is worth exploring for two reasons. First, literature on fatalism in breast

cancer research has examined fatalism along with optimism, optimistic bias, and risk perception to examine risk perception with respect to that disease process. Second, and perhaps most important in this review, is that fatalism is present in several groups that have already been identified as high risk to develop CHD, namely African Americans, and Hispanics (Facione, Giancarlo, & Chan, 2000; Franklin, Schlundt, McClellan, Kinebrew, Sheats, Belue, et al., 2007; Kwok & Sullivan, 2006; Simon, 2006). Thus, a brief review of fatalism will be discussed. Fatalism can be defined as a predetermined health outcome controlled by a higher power and not the individual (Franklin et al., 2007). Fatalism is often associated with religious or cultural beliefs among Chinese Americans (Franklin et al., 2007; Faccione et al., 2000), African Americans (Franklin et al., 2007), and Hispanics (Simon, 2006). Fatalism has been shown to hinder both screening and treatment in breast cancer, thus there is increasing interest to study its effect on daily health behaviors. Whether or not fatalism can be considered a negative emotion related to cardiovascular disease still needs to be determined, however, exploring pre-existing concepts from related disease processes such as breast cancer may help to increase knowledge about primary prevention for cardiovascular disease.

There is an ever-increasing body of research that supports the relationship between negative emotions and the development of CHD. Furthermore, continued study of negative emotions may help to elucidate their role in personal health behavior choices and strategies to treat those with depression and depressive symptoms. It is important to continue to explore the relationship between negative emotions and health status.

Summary. In summary, the literature on risk perception, optimism, optimistic bias, and negative emotions clearly shows that these areas overlap conceptually. However,

since these concepts have not been used or measured consistently, gaps in the both the literature and research are present. Health behavior choices, whether positive or negative, are conscious decisions made by individuals. Investigators want to know how factors such as risk perception, optimism, optimistic bias, and negative emotions influence a person to choose health behaviors that will influence health status or disease progression. Findings from such research may be helpful in planning primary prevention strategies, such as tailored interventions, that could ultimately impact the onset of cardiovascular disease.

Chapter Summary

The evidence reviewed in this chapter presents some concerns that need to be addressed. While the author addresses many critiques during the review of specific studies, there are a few global areas of concern. To begin with, none of the studies discussed power analysis or effect size in relation to the sample size. In addition, most samples were nonrandom convenience samples that increased the risk for bias. Second, with few exceptions (Clarke et al., 2000; Facione, Giancarlo, & Chan, 2000; Hahn et al., 2006, Meischke, et al., 2000; Scheier et al., 2006; Weinstein, 1982) studies did not use or discuss theoretical frameworks or models to guide the study. The two theoretical frameworks most frequently cited in these studies were the Health Belief Model or the Stages of Change Model.

While each study has made a contribution in understanding how risk perception, optimism, optimistic bias, and negative emotions affect health and health related outcomes, more research is needed for a number of reasons. First, there has been inconsistency in the terms used. For example, risk perception has often been used when

knowledge and awareness is being studied. In addition, comparative and subjective risk can and have been measured in many different ways. These inconsistencies present a problem when comparing study results and making conclusions regarding the findings. Adding to this concern is the use of many different instrument measures. While some instruments such as the LOT are well-established, some of the studies have used only parts of scales or descriptive words to gather data (Carver et al., 2003). Moreover, much of the work has been limited to cancer research. The knowledge gained from these studies needs to be replicated in the area of CVD. Furthermore, both genders need to be studied. Both breast cancer research and foundational research in CVD conducted by Matthews et al., (2004) and Matthews et al., (2006), has focused only on women. It is necessary to see if research including both genders would produce similar results.

In conclusion, knowledge about risk factors, alone, is not enough for individuals to make decisions about health behaviors. More understanding is needed on how psychological variables such as risk perception, optimism, optimistic bias, and negative emotions govern an individual's consciousness to make decisions regarding health behavior. Future work examining the relationship of risk perception and related concepts with CVD disease development and progression is necessary in order to make an impact on morbidity and mortality rates.

CHAPTER THREE

METHODS

The previous sections have described several factors that are conceptually related to risk perception. Psychological variables such as optimism, life satisfaction and depressive symptoms may play an important role in how persons perceive risk. In addition, other influences, such as demographic and personal variables, may also be helpful when examining risk perception. The relationships between and among these variables will help to establish how risk perception is formed and may be an important component in understanding the decision-making process that leads to behavior changes. Therefore, the purpose of this study is to examine the concept of risk perception in cardiovascular disease. The primary aims are to: 1) examine the accuracy of one's perceived risk for CVD; and 2) examine the relationship between perceived risk and key sociodemographic and psychological variables thought to influence risk perception. Hence, the study will be framed by the following research questions: 1) Do persons perceive their risk for cardiovascular disease accurately? 2) How do the sociodemographic variables of age, gender, socioeconomic status, level of education, family history of CVD, and knowledge of someone with CVD contribute to risk perception? 3) How do the psychological variables of optimism, life satisfaction, and depressive symptoms contribute to risk perception?

Study Design and Rationale

This study used a cross-sectional descriptive correlational design to explore the relationship between perceived versus calculated risk, the demographic variables that may affect perceived risk and the relationship between optimism, optimistic bias, and depressive symptoms and how each contributes to perceived risk. For the remainder of this study, the term psychological variables will refer to optimism, optimistic bias, life purpose, and depressive symptoms. The conceptual framework developed by the author supports this design and the proposed study questions (Appendix C). In addition, the review of literature also confirms the importance of examining the relationship between risk perception, demographic variables, and psychological variables.

Setting: Health Screenings

The study was conducted at monthly Health Screenings (called CV Health Risk Appraisals) in a multi-hospital system that serves racially and ethnically diverse populations in Northwest Indiana and neighboring Illinois. The three hospitals in this system have a capacity of over 750 beds. The Community Hospital is located in Munster, Indiana; St. Mary Medical Center is located in Hobart, Indiana; and St. Catherine Hospital is located in East Chicago, Indiana..

The three hospitals host the Health Screenings each month on different days of the week and at a variety of times to allow people of all ages to attend. These screenings include the following measures: systolic and diastolic blood pressure, body mass index, fasting blood sugar, measures for determining metabolic syndrome, lipid levels (total, HDL, LDL cholesterol, and triglycerides), and a heart health profile. The heart health profile ascertains family history of heart disease and dyslipidemia, as well as personal

history of diabetes, disylipidemia, hypertension, and stroke. Other measures include: intake of saturated fat, dietary sodium, and alcohol; exposure to secondhand smoke; weekly exercise patterns; and coping status. Lastly, women are asked to report use of birth control pills and hormone replacement therapy.

Recruitment

Pre-registration is required to attend a health screening even. Health screening events are advertised throughout the institutions in the hospital system. Those interested in attending a screening must call to reserve a spot and are given a designated time to arrive on the day of the screening along with instructions for fasting prior to the screening. The number of participants who attend the monthly health screenings varies, but average attendance is 10 and 20 individuals. Attendance is affected by the time and day of the screening as well as weather conditions.

The researcher planned to recruit participants from those already attending the screening event. Since the average attendance is 10-20 people per event, additional methods were used in an effort to recruit a sufficient number of participants for this study. The first supplemental method was to advertise the research study at each of the hospitals and their associated outpatient clinical facilities. Approved study fliers were left and replenished in waiting rooms at these facilities which included: wellness centers, outpatient physical therapy and rehabilitation departments, and outpatient diagnostic centers. The second method was to advertise in the community at area churches and community centers that offer instructional classes. Similarly, approved study flyers that explained the purpose of the study were sent to these facilities to be posted in a visible

area. In addition, contact information for the researcher was made available. See Appendix D for Flyers.

All departments who had staff working at the coronary risk appraisals were sent information about the participation and recruitment for the study. The researcher met with the screening coordinator prior to the start of the initial data collection to discuss the purpose of the study, approved recruitment procedure, and the informed consent process. Before each screening, the researcher talked to staff working at the screening to reinforce that any questions about the study be referred to the researcher for clarification.

The researcher was present at all screenings during the study period to advertise and recruit. The researcher sat in a designated recruitment area to discuss the purpose of the study, obtain informed consent, and complete the data collection booklet. The screening event areas were all located in well-marked areas in each hospital and easily accessible to participants.

Sample

A nonprobability convenience sample meeting both inclusion and exclusion criteria were enrolled in the study. The types of people who typically attend the screenings are: both insured and uninsured people seeking an economical way to get laboratory testing related to cardiac wellness; the ”worried well”- people who are well, but worry about their health status and frequently seek out health screenings; and those referred by their physicians for annual laboratory work.

The inclusion criteria for participation were: men and women over the age of 40 years, who are able to participate in the informed consent process and could read, speak, and understand English. The preselected age range was based on the 2012 AHA Heart

Disease and Stroke statistics that states that average age of onset for the initial major cardiovascular event is 70.4 years for women and 64.5 years for men (American Heart Association 2012 update). The age range has been selected to capture both men and women who have not experienced a cardiovascular event nor who have been diagnosed with cardiovascular disease.

The exclusion criteria for participation included: self-report of diagnosed cardiovascular disease; inability to participate in the informed consent process and inability to read, speak or understand English; those who have been diagnosed with clinical depression or are taking medications to treat depression; and those who have undergone percutaneous coronary transluminal angioplasty (PTCA) or coronary artery bypass graft surgery (CABG).

The number of pre-registered persons for each screening was communicated to the researcher so that an appropriate amount of material was brought to each screening. Each person who arrived for the screening was given a study flyer which included the description and purpose of the study (Appendix D). Those interested in participating in the study were referred to talk with the researcher and were screened for inclusion and exclusion criteria. Those meeting the stated eligibility criteria were encouraged to ask questions about the study. After all questions were answered, the participant was asked to sign duplicate informed consent and HIPAA documents (Appendices E and F, respectively).

Data Security

Each participant was assigned a study number to de-identify the data and protect the anonymity of the participant. A directory of study numbers and corresponding

participant names is kept in a locked file cabinet in the researcher's home office. Completed questionnaire booklets were transported directly from each data collection site to the researcher's home. De-identified data was entered into a password protected database on a laptop computer.

Measurements

The outcome variable in this study is risk perception, while the independent variables included: demographic variables, health history, actual/predicted cardiac risk, and psychological variables (life satisfaction, and optimism, and depression). Each variable and related measurement tools are discussed next. Instruments with acceptable reliability and validity were selected to measure these variables. See Table 3 for an overview.

Table 3. Measurement Instruments

Variables	Measurement
Outcome: Risk Perception Dependent: Demographics & Health History	• CRIP Instrument • Demographic Study Questionnaire • Wellsource© Health History Form
Life Satisfaction	• Life Engagement Test (LET)
Optimism	• Life Orientation Test Revised (LOT-R)
Depression	• Patient Health Questionniare-8 (PHQ-8)
Actual/Predicted Cardiovascular Risk	• Framingham Risk Score (estimate of 10 year risk for CVD) • Heart Health Score(Wellsource©) (estimate of level of coronary risk)

Risk Perception

Risk perception is relatively new to the area of cardiovascular research. The Cardiac Risk Perception (CRIP) instrument (Barnhart, 2009) was used in this study (Appendix G). The CRIP is a six point Likert-based instrument composed of 19 questions

encompassing the domains of perceived vulnerability, worry, self-efficacy, & perceived health status through both comparative and subjective risk statements. Scoring entails adding the total responses once the worry and self-efficacy questions are reversed (# 5, 7, 11, 14, 16), with higher scores indicating increased risk perception. The Likert response range is: Strongly Disagree/ /Disagree/ /Somewhat Disagree/ /Somewhat Agree/ /Agree/ / Strongly Agree. The CRIP has undergone vigorous pilot testing in several populations involving postmenopausal women, persons with diabetes, and mixed genders. Reported Cronbach's alpha = 0.78 in a recent study (Barnhart, 2008). The time needed to complete the instrument is approximately 10 minutes.

Demographic Variables and Health History

The demographic study questionnaire consisted of demographics such as: age, gender, marital status, socioeconomic status, and number of children as well as questions that examined health maintenance behaviors. Examples included: How often do you see your primary care provider? How often do you visit your dentist? These questions were structured to elicit ordinal or continuous level of measurement (See Appendix H). In addition, health history information was gathered using the Wellsource© Heart Health Profile. Wellsource© is a company that provides health appraisal programs widely used for more than 30 years. The Wellsource© program reports a combination of ordinal and continuous measurement data and will be discussed in the section on projected cardiac risk.

Psychological Variables

The psychological variables assessed in this study included: optimism, life satisfaction, and depressive symptoms. These types of variables may lead to misleading results during

this current economic climate. Therefore, a number of single question items were also added to the Health History Questionnaire to help determine if the presence of any depressive symptoms are situational and related to the current economic environment or whether they are more dispositional in nature. Each of these instruments are discussed in this section.

Optimism. The Revised Life Orientation Test (LOT-R) was used to measure optimism. Although there are several versions of this instrument, this study used the modified version of the tool (Appendix B) (Scheier, Carver, & Bridges, 1994). The life orientation test-revised (LOT-R) is a LIKERT scale based instrument consisting of ten questions. In the revised version, there are four filler questions (#2, 5, 6, 8), three positively worded questions (#1, 4, 10), and 3 negatively worded questions (#3, 7, 9). The coding of the LOT-R (with a total possible score of 24) is positively worded so that high values imply optimism, while low values imply pessimism (Scheier et al., 1994). Reported Cronbach's alpha for the LOT-R = .90, making the instrument highly reliable and valid for measuring optimistic bias (Scheier et al., 1994). This instrument has been used widely to measure optimism in areas previously discussed such as: immune response (Sergerstrom, Taylor, Kemeny, & Fahey, 1998), cancer, cardiovascular disease progression (Matthews 2004), and arthritis (Brenes, Rapp, Rejeski, & Miller, 2002).Time to complete this instrument is approximately five minutes.

Life Satisfaction. Life satisfaction was measured using the Life Engagement Test (LET). The LET is a five point Likert scale based instrument consisting of six questions (Appendix I). Three items (# 2, 4, and 6) are positively framed, while the other three items (# 1, 3, and 5) are negatively framed. The LET is scored in a two-step process.

First, three questions (# 1, 3, and 5) are reverse coded and then the scores are summed. The higher the summary score, the higher the reported purpose in life. Reported Cronbach's alpha for the LET in initial testing ranged from .72 to .80, making the LET reliable, especially for a newer instrument. Purpose in life has been shown to affect how persons make decisions about health behaviors and also has been correlated with development of CVD in a longitudinal study (Matthews, Owens, Edmundowicz, Lee & Kuller, 2006). Although this variable is relatively new in cardiovascular research, it may be directly related to both optimism and depressive symptoms. Time needed to complete this instrument is approximately 3-5 minutes.

Depression. The PHQ-8 (Appendix J) is a self-reported depression screening instrument using the first eight questions of the Patient Health Questionniare-9 (PHQ-9). Comparative analysis of the PHQ-9 with the PHQ-8 indicated similar operating characteristics with respect to predictability of depression severity (Kroenke, Spitzer, & Williams, 2001). The PHQ-8 omits the ninth item asking about "thoughts that you would be better off dead or of hurting yourself in some way". The use of this alternate form is supported for use in populations or samples in which one or more of the criteria are met: there is a low or negligible risk of suicide; depression is being assessed as a secondary outcome and not the focus of the research; and data is collected using self-report measures (Kroenke & Sptizer, 2002).

The questions are scored on a 0-3 Likert scale with 0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day. The scoring for the PHQ-8 is summative with a score ranging from 0 –24. Current literature supports a score of $\geq$ 10 on the PHQ-8 as being positive for symptoms of depression (Kroenke, Strine, Spitzer,

Williams, & Mokdad, 2009). In addition, reported reliability for the PHQ-9 is 0.89 in a study of 3,000 primary care patients and 0.86 in the OB-GYN study of 3,000 women.

Calculated Cardiovascular Risk

Framingham Risk Score. The Framingham Risk Score is a calculation that projects one's 10-year risk for a cardiac event, and has been widely used and reported in the literature. Calculated cardiovascular risk is based on physiological measures and self-reported health behaviors obtained at the coronary risk appraisal. This calculation used the following variables: age, gender, total and HDL cholesterol, systolic blood pressure, smoking history and diabetic history.

Calculations were performed using a gender appropriate tool and risk scores were categorized as low, medium, and high (Appendix K). Those participants with coronary risk equivalents (diabetes, stroke, and peripheral artery disease) were scored as >20% risk of developing CHD over the next 10 years. The researcher completed the calculations of the scores using the online risk calculator. This score serves as a surrogate for "actual/predicted risk for heart disease". During the calculation of the Framingham Risk Scores, the researcher noted little variability in the scores. Therefore, it was decided to also include the Heart Health Scores (HHS) in data analysis. Though the HHS is a similar concept, it does not project future risk, rather it reflects current risk based on the number and severity of risk factors.

Heart Health Score. The Heart Health Score is based on a scoring strategy using the NCEP III revised guidelines based on the severity and amount of the risk factors and includes the same variables: age, gender, lipid profile, systolic blood pressure, BMI, smoking history and diabetic history listed for the Framingham Risk Score, but the HHS

also adds fitness level and personal and family history of cardiovascular disease (Wellsource©, 2012). The Wellsource© program assigns a score based on the number and severity of risk factors (major versus moderate) present. A computer program generates a "Heart Health Score" (HHS) in one of four categories:

- "Excellent" or "Ideal risk" (score of 75-100), defined as no risk factors other than age;
- "Doing Well" or "Low Risk" (score of 50-74),defined as having 1 to 3 moderate CHD risks factors not including age, or having a personal history of CHD when blood lipids are "not known"
- "Needs Improving" or "Moderate Risk" (score of 25-49), defined as having only one major CHD risk factor not including age or family history or having 4 or more moderate CHD risk factors (counting age and family history as moderate risk factors), and
- "Caution" or "High Risk" (score of 0-24 defined as having moderate CHD risk blood lipids AND 2 or more major CHD risks OR having two or more major CHD risks not including age OR having one major CHD risk, plus the age major risk AND Low fitness OR having blood lipids or triglycerides within "Ultra-high" category.

The score is part of a report generated from the Wellsource© computer program and was provided to the researcher by the coordinator of the screening. See Appendix L.

Knowledge and Attitude Questions

Chapter two highlighted that the concept of risk perception has not been used consistently in the healthcare literature. Examples were provided that illustrated that

while some studies stated that risk perception was being measured or used the term "perception of risk" in their title, it was found that awareness or knowledge about risk factors was really being measured (King et al, 2002; Oliver-McNeil & Artinian, 2002). Knowledge and awareness are thought to be related to CVD and is therefore foundational to the formation of personal risk perception. Thus, in addition to answering the aims of the study, questions that gathered information on worry about disease, knowledge related to CVD, being informed about heart disease, risk factors to CVD, and risk factor modification strategies were also included. In addition, permission was obtained to include specific questions from the American Heart Association 2009 telephone survey tool (Mosca, Mochari-Greenberger, Dolor, Newby and Robb, 2010).

Data Collection Procedure

The usual health risk appraisal screening procedure required individuals to pre-register for the event. When participants arrived at the screening, the study was briefly explained and if they were interested in participating in the study, they were told to report to a specific area in the room after their testing was completed. Participants were given a 15 question Wellsource© Heart Health form to complete prior to having blood pressure, height, and weight taken and recorded by an exercise physiologist. Next, blood was drawn by a qualified hospital phlebotomist in order to generate laboratory results for a fasting blood sugar and lipid profile. Each sample was coded with the patient's name and patient identification number. The collected blood was later sent to the hospital laboratory where it was analyzed according to hospital policy and standardized procedures. The researcher did not interfere with nor was involved in the blood sampling procedures or blood analysis process.

Persons interested in participating in the study returned to the researcher's table to complete the informed consent process and obtain the study booklet containing a unique participant number. The researcher was available to clarify study information and to answer any questions. Granola bars were available to participants while they completed the booklet. The researcher verified that all items had been answered prior to giving a $10.00 gift card to the participant.

Approximately one week after the screening, the Health Screening Appraisal coordinator received a report containing all laboratory results. She entered the laboratory results into a Wellsource© computer program to generate a personalized report for each participant. The reports were then mailed to each participant via the United States postal service. Each report provided a composite "overall" heart health score determined by the number of risk factors present and offered a detailed explanation of the test results. For example, the lipid profile was broken down into desirable, borderline, and high risk results, while also displaying the participant's results. After results were reported, suggestions were provided on how to effectively modify any results that needed improvement. For each category, the report outlined whether the participant is "doing well" or "needs improvement". The researcher contacted the coordinator to acquire a copy of the Wellsource© report and laboratory data for each participant in the study. A Framingham Risk Score was calculated by the researcher from this report and the physiological measures taken at the screening.

Power Analysis Calculation of Sample Size

The sample size proposed for this study was estimated using power analysis in an effort to decrease the chance of making a Type II error and increase the likelihood of

finding statistically significant results erroneously rejecting the null hypothesis. The power analysis was calculated framed by the research questions. Regardless of these questions, the alpha (α) and beta (β) levels were set at 0.05 and 0.80 respectively.

The first research aim examined if persons perceive their risk for the development of CVD accurately. This aim correlated actual/predicted risk scores measured by a Framingham Risk Score (FRS) and Heart Health Score (HHS) with risk perception scores, as measured by the CRIP. Using a moderate effect size ($r = 0.30$) with $\alpha = 0.05$, $\beta = 0.80$, the sample estimate was 67 participants (Hulley, 2001). A second calculation was performed using a method proposed by Cohen (1992). Using a moderate effect size of 0.30 and $\alpha = 0.05$, the sample estimate was 85 participants.

The second and third research aims examined the contributions of psychological variables and possible confounders to risk perception: How do optimism (LOT-R), life purpose (LET), and depressive symptoms (PHQ-8) contribute to the formation of risk perception (CRIP)? The literature suggests 10-15 participants per independent variable in a regression analysis. Therefore, based on three independent variables (optimism, life purpose, and depressive symptoms) and six possible confounding variables (age, gender, level of education, socioeconomic status, family history, and personal knowledge of knowing someone with CVD), the estimated number of participants needed for this study was between 90 (nine variables x 10 = 90) and 135 (nine variables x 15 = 135). A third method outlined by Cohen (1992) was also examined. Using a moderate effect size statistic (0.15), $\alpha = 0.05$, $\beta = 0.80$, and nine variables, the sample estimate would be 111.

Data Analysis

Data analysis was conducted using International Business Machines Statistical Software Package for Social Sciences (IBM SPSS) version 20 (2012). Alpha and Beta levels were set at 0.05 and 0.90 respectively for all statistical analyses to limit the possibility of a Type II error. Data were manually screened for data entry errors including missing or potentially erroneous data. Identified errors were corrected and frequencies were run again prior to continuing further data analysis. Data were cleaned using the process of running frequencies.

Data were analyzed for normality, outliers, and extreme scores that could influence data interpretation and study outcomes. Descriptive statistics are provided for the sample and displayed in tabular form. Data obtained from the CRIP, LOT-r, LET, and PHQ 8 as well as data on the Framingham Risk Scores (FRS) and Heart Health Scores (HHS) were analyzed for normal distribution by examining histograms, measures of central tendency, skewness and kurtosis. The reliability of each instrument was examined for internal consistency using Cronbach's alpha.

Aim 1: Examine the Accuracy of Perceived Risk

The prevalence of both self-reported and physiological risk factors was examined to offer a baseline view of risk factors present in the sample. Then, the relationship between the prevalence of known risk factors and risk perception was explored using nonparametric correlation analysis. Next, Pearson correlation analysis was used to examine the relationship between the scores from both the FRS and HHS. Again, using Pearson correlation analysis the relationship between calculated cardiovascular risk (FRS, HHS) and risk perception (CRIP) was explored. Finally, a Chi-squared test was used to

determine whether there was a significant difference between FRS and HHS on risk perception scores.

Aim 2: Examine the Relationships between Perceived Risk and Sociodemographic/Psychological Variables

Relationships between sociodemographic variables (age, gender, level of education, socioeconomic status, and income), psychological variables (LOT-r, LET, & PHQ-8) and risk perception were examined using multiple regression analysis including only those variables that were significantly correlated with risk perception. A backwards stepwise method was employed since the model used to support this study is new and untested and therefore will help to account for suppressor effects and reduce the risk of making a Type II error (Field, 2009).

Institutional Review Board Approval

This study was approved by three independent review boards located at: Loyola University, Purdue University (the researcher's faculty appointment), and The Community Healthcare System (the research setting). Institutional review boards were not only designed to ensure participant safety, but also to evaluate the risks and benefits as well as the overall strength of study design thus supporting ethical integrity, sound study design, and feasibility. The study did not begin until approval was gained from all three review boards.

CHAPTER FOUR

RESULTS

The overall purpose of this study was to examine the concept of risk perception in cardiovascular disease using two specific aims: 1) To examine the accuracy of one's perceived risk for CVD; and 2) To examine the relationship between perceived risk and key sociodemographic and psychological variables thought to influence risk perception. This chapter provides the study results beginning with a discussion of the sample characteristics and key variables. The results are reported according to the specific aims of the study.

Sample

Participants were recruited at health screenings hosted by a multi-hospital system in the Midwest. Over a 14 month period, a total of 296 individuals were pre-registered for the screenings that the researcher attended, however, 71 (24%) did not show up. Of the 225 individuals present at the screenings, 63 (27%) did not meet one or more of the inclusion criteria and 48 (21%) declined participation in the study. Therefore, 114 participants were enrolled in the study. However, while matching laboratory data with the data collection booklets during the data entry process, one participant was excluded because she came to two separate screenings but used different names in the consent process. Thus a total of 113 participants who met enrollment criteria completed the study.

Sample Characteristics

The mean age of the sample was 58 years, 69% were female, 70% were White Caucasian (non-Hispanic), and 58% were married. The sample was well-educated, with 42.5% having a 4 year college degree or higher; 28% having vocational training, an Associate degree or some college; and 21% having a high school diploma. Most participants were employed full or part-time (63%) with reported annual household incomes almost evenly split between less than or greater than $50,000. The majority of the participants (91.2%) reported having private insurance, with only 8.8% having no health care coverage. Table 4 provides information on the overall sample characteristics.

Because the study took place at four sites in a multihospital system, it was expected that the study sample would resemble the racial and ethnic composition of the surrounding communities. Based on the most recent United States Census Bureau estimates, the population in Lake County, Indiana was 490,093 and included: 62.8% Caucasian, 25.5% African American, 14% Hispanic or Latino, 1.1% Asian, and 0.3% American Indiana or Alaskan Eskimo (United States Census Bureau, 2009). The study sample did closely resemble these statistics with the exception of the African American representation. See Table 4.

Table 4. Sample Characteristics

Characteristic	N	Percent
Age Mean (Standard Deviation)	113	58.02 (± 9.8)
Median (Range)		57.80 (40-83)
Gender		
Male	35	31.0%
Female	78	69.0%
Race/Ethnicity		
Hispanic/Latino Culture	14	12.4%
Black/African American (Non-Hispanic)	15	13.3%
Caucasian/White (Non-Hispanic)	80	70.8%
Asian (Pacific Islander)	3	2.7%
Other: American Indiana	1	0.9%
Marital Status		
Married	65	57.5%
Living in a marriage-like relationship	4	3.5%
Divorced or Separated	21	18.6%
Widow/Widower	11	9.7%
Never Married	12	10.6%
Education		
No formal Schooling	2	1.8%
Less than 9th Grade	2	1.8%
9th -12th Grade (no diploma)	5	4.5%
High School Diploma or GED	24	21.1%
Vocational School, Some College or Associate Degree	32	28.3%
College Graduate degree or higher	48	42.5%
Total Annual Household Income		
Under $20,000	12	10.6%
$20,000 to less than $35,000	21	18.6%
$35,000 to less than $50,000	28	24.8%
$50,000 to less than $75,000	20	17.7%
$75,000 to less than $100,000	16	14.2%
$100,000 to less than $150,000	10	8.8%
$150,000 to less than $200,000	6	5.3%
Employment Status		
Full or Part-time	71	62.8%
Retired	29	25.7%
Homemaker	7	6.2%
Other: Currently Unemployed	6	5.3%
Health Insurance		
Primary Coverage	103	91.2%
No Primary Coverage	10	8.7%
Secondary Coverage	11	9.6%

Knowledge and Awareness Survey

As discussed earlier in chapter 3, questions taken from an American Heart Association questionnaire were used to determine participants' overall awareness, knowledge and perceptions about heart disease that were expected to influence their risk

perception. Prior studies used these questions to describe their sample of interest using descriptive statistics. No "total" or "subscale" scores can be derived from these questions. Therefore, the data is reported here as background information to provide evidence of how educated and aware the sample was about heart disease and CVD risk.

Awareness and Perception about CVD

When asked to "select the greatest single health problem today from a pre-determined list, participants responded as follows: heart disease/heart attack (34.5%), obesity (25.7%), and cancer-in general (23%). Participants were also asked to identify the leading cause of death for both men and women. Heart disease/heart attack was overwhelmingly identified as the leading cause of death for men (77.9%) and women (63.7%). See Table 5.

Table 5. Awareness and Perception about CVD

	N (%)
Greatest health problem?	
▪ Heart disease/ heart attack	N=39 (34.5%)
▪ Obesity	N=29 (25.7%)
▪ Cancer-in general	N=26 (23.0%)
Leading cause of death for men?	
▪ Heart disease/ heart attack	N=88 (77.9%)
▪ Cancer- in general	N=11 (9.7%)
▪ Lung cancer	N= 5 (4.4%)
Leading cause of death for women?	
▪ Heart disease/ heart attack	N=72 (63.7%)
▪ Cancer- in general	N=21 (18.6%)
▪ Breast cancer	N=15 (13.3%)

Knowledge of Heart Disease

When asked about how well informed participants were about heart disease, more than half or 67 (59.3%) reported being moderately informed, followed by 32 (28.3%) being well informed, and nine (8%) being very well informed. Despite only five (4.4%) participants stating that they were not at all informed about heart disease, it is surprising

that 14.1% of the participants either strongly or somewhat agreed with the statement "There is nothing you can do to prevent yourself from getting heart disease". In addition, 19 participants (16.8%) strongly agreed and 45 (39.8%) somewhat agreed with the statement "When you think about heart disease, you most often think of someone having a heart attack and dying quickly". See Table 6.

Table 6. Knowledge of Heart Disease

How informed are you about heart disease?	
▪ Very well	N= 9 (8.0%)
▪ Well	N= 32 (28.3%)
▪ Moderately	N= 67 (59.3%)
▪ Not at all	N= 5 (4.4%)
There is nothing you can do to prevent yourself from getting heart disease	
▪ Strongly agree	N= 5 (4.4%)
▪ Somewhat agree	N=11 (9.7%)
▪ Somewhat disagree	N=24 (21.2%)
▪ Strongly disagree	N=73 (64.5%)
When thinking of heart disease, you think of someone having a heart attack and dying quickly?	
▪ Strongly agree	N=19 (16.8%)
▪ Somewhat agree	N=45 (39.8%)
▪ Somewhat disagree	N=24 (21.2%)
▪ Strongly disagree	N=22 (19.5%)
▪ Do Not Know	N= 2 (2.7%)

Perceptions of Heart Disease Risk Factors and Prevention

Knowledge related to risk factors and risk factor modification were asked using two multiple response questions from the American Heart Association. The first question was: "Based on what you know, what are the major causes of heart disease?" The participants were asked to "select all that apply" from the following list: family history of heart disease, being overweight, drinking alcohol, high cholesterol, low levels of estrogen, exercise, stress, aging, diabetes, high blood pressure, high triglycerides, menopause (in women), smoking, and racial heritage. The majority of participants correctly identified high cholesterol (100%), family history (97.3%), being overweight

(95.6%), stress (92.0%), high blood pressure (89.4%), and lack of exercise (83.2%) as contributing to heart disease. However, many participants did not identify significant factors such as: low levels of estrogen (86%), menopause (84.3%), drinking alcohol (70.2%), racial heritage (64%), aging (60.5%), diabetes (53.5%), high triglycerides (36.8%), and smoking (28.9%).

The second question asked participants to identify activities from a list that they believed could prevent or reduce the risk of getting heart disease. The majority of the participants identified losing weight (99.1%); getting physical exercise (96.5%); reducing stress (95.6%); maintaining healthy cholesterol (93.8%); quitting smoking (92.9%); maintaining blood pressure levels (91.2%); reducing dietary sodium (86.7%), dietary cholesterol intake (80.5%), and dietary animal products (74.3%), as well as taking aspirin regularly (60.2%) as strategies that prevent or reduce the risk of getting heart disease. Conversely, only a minority of the sample identified taking special vitamins like C, D, & E (28.1%) or multivitamins with folic acid (26.3%); aromatherapy (17.5%); and hormone replacement therapy (11.5%) as being activities that could prevent or reduce the risk of getting heart disease. See Table 7.

Table 7.Perceptions of Heart Disease Risk Factors and Prevention

What are major causes of disease? (**Check all that apply).**	
▪ high cholesterol	N=113 (100%)
▪ family history	N=110 (97.3%)
▪ being overweight	N=108 (95.6%)
▪ stress	N=104 (92.0%)
▪ high blood pressure	N=101 (89.4%
▪ lack of exercise	N= 94 (83.2%)
What specific activity could reduce risk of getting heart disease? (**Check all that apply).**	
▪ losing weight	N=112 (99.1%)
▪ getting more physical exercise	N=109 (96.5%)
▪ reducing stress	N=108 (95.6%)
▪ maintaining healthy cholesterol level	N=106 (93.8%)
▪ quitting smoking	
▪ maintaining a healthy blood pressure	N=105 (92.9%)
▪ reducing dietary sodium intake	N=103 (91.2%)
▪ reducing dietary cholesterol intake	N=98 (86.7%)
▪ reducing dietary animal products	N=91 (80.5%)
▪ taking aspirin regularly	N=84 (74.3%)
	N=68 (60.2%)

Sources of Information about Heart Disease

Information regarding sources for heart disease awareness was asked through two questions. An overwhelming majority (101 participants/88.6%) reported seeing, hearing, or reading information about heart disease within the last 12 months. While the majority of participants (101/88.6%) either strongly or somewhat agreed with the statement "You are comfortable talking with your doctor about preventive and treatment options regarding your health", only 41 (36%) responded that any of their physicians ever discussed heart disease with them when discussing their overall health.

Worry about Heart Disease

One question focused on whether people worry about getting twelve commonly occurring conditions and diseases. The question was worded as: "How much do you worry about getting each of the following health conditions?" The rating scale choices included "worry a lot", "worry a little", "do not worry at all" and "don't know". The

health conditions were listed in the following order and included: cancer-in general, heart disease or heart attack, AIDS, breast cancer, lung cancer, drug addiction/alcoholism, violent crime, stroke, Alzheimer's disease, diabetes, osteoporosis, and obesity.

Looking only at the "worry a lot" category, participants reported worrying the most about heart disease or a heart attack (31%) followed by obesity (27.4%) and cancer-in general (19.5%). When combining the categories of "worry a lot" and "worry a little", participants had more worry related to heart disease or a heart attack (83.2%) and cancer-in general (83.2%), than for stroke (77.8%), obesity and diabetes (62.8%), breast cancer (60.2%), and other non-cardiac conditions. See Table 8.

Table 8. Worry about Heart Disease

Worry "a lot" about Getting Specific Diseases	
▪ Heart disease or heart attack	N=35 (31.0%)
▪ Obesity	N=31 (27.4%)
▪ Cancer in general	N= 22 (19.5%)
Combined: Worry "a lot" and Worry "a little" about Specific Diseases	
▪ Heart disease or heart attack	N=94 (83.2%)
▪ Cancer in general	N=94 (83.2%)
▪ Stroke	N=88 (77.8%)
▪ Obesity	N=71 (62.8%)
▪ Diabetes	N=71 (62.8%)
▪ Breast cancer	N= 68 (60.2%)

Note: Only responses with the highest frequencies are reported here.

Data Analysis for Study Instruments

Data obtained from the CRIP, LOT-r, LET, and PHQ 8 as well as data on the Framingham Risk Scores (FRS) and Heart Health Scores (HHS) were analyzed for normal distribution by examining histograms, measures of central tendency, skewness and kurtosis. The reliability of each instrument was examined for internal consistency using Cronbach's alpha.

Data for each of the instruments fell within the prescribed possible scoring range. Overall, the data (*n* =113) were found to have a normal distribution based on frequency distributions and analysis of histograms. However, it should be noted that the Heart Health Score had a large standard deviation and standard error indicating a larger variability than the scores calculated using the Framingham Risk Calculator. See Table 9.

Table 9. Distribution Statistics of the Sample for Study Instruments

Variable	*n*	Participant Range (Tool Range)	Mean	SD	Standard Error
Risk Perception (CRIP)	113	16-91 (16-96)	50.2	13.7	1.29
Optimism (LOT-r)	113	3-24 (0-24)	16.45	4.55	0.43
Life Satisfaction (LET)	113	15-30 (6-30)	25.23	3.53	0.33
Depression (PHQ-8)	113	0-12 (0-24)	3.27	3.1	0.29
Framingham Risk Score (FRS)	113	<1-25% (0-25%)	7.12	6.88	0.44
Heart Health Score (HHS)	113	4-86 (0-100)	41.09	27.99	2.63

Variables were also assessed for the presence of both skewness and kurtosis. Both skewness and kurtosis can be positive or negative. In a normal distribution, both skewness and kurtosis should be zero. Skewness indicates asymmetry related to distribution of the variable around the mean. Positive skewness occurs when the majority of the distribution of the variable falls to the left of the mean and negative skewness occurs when the majority of the distribution of the variable falls to the right of the mean (Field, 2009). The CRIP, LOT-r, and LET were all negatively skewed, while the PHQ-8 was positively skewed. In addition, the skewness scores were close to zero indicating a normal distribution. Kurtosis indicates the shape of the distribution where positive values indicate a “pointy” distribution and negative values indicate a “flat” distribution (Field,

2009). CRIP, LOT-r, and PHQ 8 had a positive kurtosis, while LET, HHS, and FRS values had negative kurtosis. Similar to the skewness scores, the values were close to zero indicating a normal distribution. See Table 10.

Table 10. Skewness and Kurtosis of the Sample on Study Instruments (N=113)

Variable	Skewness	Kurtosis
Risk Perception (CRIP)	0.65	0.81
Optimism (LOT-r)	-0.33	0.03
Life Satisfaction (LET)	-0.55	-0.16
Depression (PHQ-8)	1.14	0.84
Framingham Risk Score (FRS)	0.89	-0.55
Heart Health Score (HHS)	0.09	-1.69

Aim 1- To Examine the Accuracy of Perceived Risk

As background to reporting the results on risk perception, it is important to point out that perception of risk for CHD cannot be formed without awareness and knowledge of risk factors for CVD (as described earlier). If a person does not know what factors contribute to the development of CVD (knowledge), then it would be difficult to become aware of the potential risk to health. However, accurate perception of a risk is not necessarily guaranteed, even if complete and thorough knowledge is given and awareness is raised, because the individual must be able to process the information to perceive a threat to well-being. This section begins with a report on the perceived risk as measured by the Coronary Risk Individual Perception (CRIP) instrument, presentation of data relating to the number and type of cardiac risk factors reported in this study, predicted cardiac risk using both the Framingham Risk Score (FRS) and the Heart Health Score (HHS) and the relationship of these variables to overall risk perception. These instruments were discussed in chapter 3.

Analysis of Risk Perception

Coronary Risk Individual Perception (CRIP) Scale. The construct of risk perception was operationalized with the 16-item, Likert scale response, Coronary Risk Individual Perception (CRIP) Scale. Five items, numbers 5, 7, 11, 12, and 14, were reverse coded before tabulating the score. CRIP scoring is the simple sum of the item scores and can range from 16-96. There are no subscales. Higher total scores on the CRIP indicate higher levels of perceived risk for coronary heart disease. The mean score for the sample was 50.2 ($\pm$ 13.7) with a range from 16-91. Table 11 displays mean and percent scores for the individual items with the reverse coding adapted for clarity in reading tables. Internal consistency was examined using Cronbach's alpha and was 0.90. Barnhart (2009) reported a mean score of 53.9 $\pm$ 10.3 with an internal consistency of 0.76. (See Table 11).

Table 11. CRIP Item Response (N=113)

	Mean (SD)	SD n/%	D n/%	SomD n/%	SomA n/%	A n/%	SA n/%
		1	2	3	4	5	6
1. I'm as healthy as anybody I know.	3.87 (1.28)	9 8%	33 29.2%	31 27.4%	16 14.2%	23 20.4%	1 0.9%
2. Compared to others my age and sex, I am at lower risk of a stroke.	3.79 (1.33)	12 10.6%	25 22.1%	30 26.5%	24 21.2%	18 15.8%	4 3.5%
3. I am at low-risk of a heart attack.	3.51 (1.35)	10 8.8%	17 15%	29 25.7%	29 25.7%	21 18.6%	7 6.2%
4. In general, my health is very good.	4.37 (1.22)	18 15.9%	42 37.2%	30 26.5%	14 12.4%	5 4.4%	4 3.5%
5. Following a low-fat diet takes too much effort.	2.92 (1.36)	19 16.8%	29 25.7%	24 21.2%	27 23.9%	10 8.8%	4 3.5%
6. Compared to a year ago, my health is better now.	3.62 (1.32)	10 8.8%	16 14.2%	39 34.5%	27 23.9%	12 10.6%	9 8%
7. I worry that I might die from a heart attack.	2.94 (1.46)	26 23%	20 17.7%	19 16.8%	37 32.7%	4 3.5%	7 6.2%
8. I'm at low risk of having a stroke.	3.42 (1.32)	9 8%	15 13.3%	25 22.1%	38 33.6%	18 15.9%	8 7.1%
9. Compared to others my age and sex, I am at lower risk of a heart attack.	3.59 (1.38)	11 9.7%	17 15%	35 31%	24 21.2%	17 15%	9 8%
10. Compared to others my age and sex, I am in good health.	4.16 (1.25)	14 12.4%	34 30.1%	41 36.3%	9 8%	11 9.7%	4 3.5%
11. I worry about having a heart attack.	3.16 (1.48)	22 19.5%	16 14.2%	22 19.5%	35 31%	10 8.8%	8 7.1%
12. I worry that I might die from a stroke.	3.14 (1.38)	16 14.2%	19 16.8%	36 31.9%	25 22.1%	9 8%	8 7.1%
13. I think my personal efforts will help control my risk of having a heart attack.	4.62 (1.08)	23 20.4%	44 38.9%	35 31%	6 5.3%	2 1.8%	3 2.7%
14. I worry more about having a heart attack than a stroke.	3.44 (1.50)	18 15.9%	10 8.8%	28 24.8%	28 24.8%	19 16.8%	10 8.8%
15. I don't mind the effort it takes to exercise.	4.15 (1.50)	22 19.5%	36 31.9%	21 18.6%	13 11.5%	14 12.4%	7 6.2%
16. I have a low lifetime risk of a heart attack.	3.24 (1.43)	9 8%	14 12.4%	26 23%	22 19.5%	31 27.4%	11 9.7%

Note: SD = Strongly Disagree, D = Disagree, SomD = Somewhat Disagree, SomA = Somewhat Agree, A = Agree, and A = Strongly Agree

Prevalence of CVD Risk Factors. The risk factors identified in the study were a combination of self-report and physiological measurements. Self-reported measures included: gender/age (females ≥55 years, males ≥45 years); family history (mother, father

or sibling) of cardiovascular disease (myocardial infarction, stent placement, coronary bypass surgery or stroke); and personal history of hypertension, smoking, diabetes, and physical activity. As shown in Table 12, the sample was relatively young (mean age 58 years) and healthy. The most common risk factor was positive family history reported by 42% of the sample, while 12% reported they had diabetes, 12% had hypertension, and 9% reported being a current smoker. For levels of physical activity, 62% reported low levels of activity performed per week.

Table 12. Self-Report Measures

Self-Report Measures:		**n (%)**
Age *		Mean (SD) 58.02(±9.81)
Family History*	Yes	48(42.5%)
	No	65(57.5%)
Hypertension*	Yes	14 (12.4%)
	No	99 (87.5%)
Current Smoker*	Yes	11(9.7%)
	No	102(90.3%)
Diabetes*	Yes	14(12.4%)
	No	99(87.6%)
Physical Activity (min/week)*	< 100	70(61.9%)
	100-150	28(24.8%)
	> 150	15(13.3%)

Physiological measurements obtained during the screening included: fasting lipids (HDL-C, LDL-C and triglycerides), fasting blood glucose, body mass index (BMI), and blood pressure. Based on lab results, 80% of the sample had glucose levels at goal, 40% has systolic blood pressures below 120 mm/Hg; 69% had LDL-C levels below 130 mg/dL; 76% had normal triglyceride levels, and 86% had good levels of HDL-C (>40mg/dL). However, 74% of the sample was either overweight or obese (BMI> 25). (See Table 13).

Table 13. Self-Report Physiological Measurements

Physiological Data:		
HDL-C (mg/dl)+ High density lipoprotein cholesterol	 < 40 41-59 ≥ 60	Mean (SD) 56.68(±16.86) 16(14.2%) 57(50.4%) 40(35.4%)
LDL-C (mg/dl)+ Low density lipoprotein cholesterol	 < 100 100-129 130-159 160-189 ≥ 190	Mean (SD) 118.37(±33.40) 35(31.0%) 43(38.1%) 16(14.2%) 13(11.5%) 6 (5.3%)
Triglycerides (mg/dl)+	 < 150 150-199 200-499 ≥ 500	Mean (SD) 121.71(±75.61) 86(76.1%) 16(14.2%) 10 (8.8%) 1(0.9%)
Fasting Blood Glucose (mg/dl)+	 <100 100-125 ≥126	Mean (SD) 92.38(±15.16) 91(80.5%) 19(16.8%) 3(2.7%)
BMI (kg/m^2)+ Body mass index	 < 25 ≥ 25 ≥ 30	Mean (SD) 29.01(±5.8) 29(25.7%) 37(32.7%) 47(41.6%)
Systolic BP (mmHg)+	 < 120 120-139 140-159 ≥ 160	Mean(SD) 123.23(±17.16) 45(39.8%) 49(43.4%) 14(12.4%) 5(4.4%)
Diastolic BP (mmHg)+	 < 80 80-89 90-99 ≥ 100	Mean (SD) 79.38(±11.72) 43(38.1%) 48(42.5%) 13(11.5%) 9(8.0%)
BP Classification+, n (%)	Normal Prehypertension Hypertension, Stage 1 Hypertension, Stage 2	27(23.9%) 53(46.9%) 22(19.5%) 11(9.7%)

Note: "*" indicates a self-reported measure, "+" indicates a physiological measure

Because the results of the physiologic measurements were not known to participants until *after* the screening results were later mailed to them, the risk factors used in the initial interpretation of perception of risk for CVD were the self-reported risk factors. Each of these approaches (using self-report vs. lab results) is prone to error. Using hypertension as an example, participants may have hypertension but deny it when

completing the study survey; or participants may self-report having hypertension, but then have a normal blood pressure reading due to the therapeutic effect of their medications; or participants may have an elevated blood pressure reading during the screening, but interpret it as a false finding, believing they don't have this problem. Since this study is focused on "awareness" of one's risk, only the self-reported risk factors were used for overall prevalence. The number of risk factors ranged from zero to five with a mean of 3.7 (SD $\pm$1.4) and a mode of two (n=42) accounting for 37.2 % of the sample. See Table 14 Note: Age/gender were combined as one risk factor (females $\geq$ 55 years, males $\geq$ 45 years).

Table 14. Prevalence of Self-Reported Risk Factors (N=113)

Number of Risk Factors	**N (%)**
0	3 (2.7)
1	19 (16.8)
2	42 (37.2)
3	29 (25.7)
4	13 (11.5)
5	7 (6.2)

Note: Age/gender was considered one (1) risk factor for this calculation

Risk Factor Prevalence and Risk Perception

The prevalence of risk factors was significantly correlated with higher levels of risk perception as measured by the CRIP ($r = .444$, $p < .01$) indicating that those with more risk factors had higher levels of risk perception and accounting for nearly 20% of the variance in CRIP scores. In addition, multiple regression analysis was conducted to see if these risk factors predict CRIP scores and is reported later.

Heart Health Score (HHS). This score was derived from a combination of physiologic and self-report data from the Wellsource© screening tool. The Heart Health Score is based on a scoring strategy using the NCEP III revised guidelines based on the

severity and amount of the risk factors and reflects "current" heart health status. All scores were examined for normal distribution as previously discussed. Scores ranged from 4-86; the mean score was 41.09 with a standard deviation of 27.99 indicating greater variability of scores. Lower HHS scores indicate an increased level of risk with the presence of more risk factors.

Six participants (5.3%) were categorized as in "Excellent" health (score of 75-100), 44 (38.9%) were categorized as "Doing Well" (score 50-74), 20 (17.7%) were categorized as "Needs Improving" (score 25-49), and 43 (38.1%) were categorized as "High Risk" (score 0-24).

Framingham Risk Score (FRS). The construct of calculated risk was operationalized using the FRS. This tool is somewhat different from both the "prevalence" of risk factors and the HHS scores, in that the FRS is projecting a 10-year risk for CVD. It is based on current risk factor status using mostly physiological measures which may have been unknown to participants until after the screening scores were reported. Scores are based on variables including age, gender, total and HDL cholesterol, smoking history, systolic blood pressure, and pharmacological treatment of hypertension. Scores were computed using an online risk calculator found on the National Heart Lung and Blood Institute website (http://hp2010.nhlbihin.net/atpiii/calculator.asp). All scores were examined for normal distribution as previously discussed. Calculation of the FRS is a two-step process. First, total points for risk factors are determined using a gender specific tool. Point totals using the ranges for men and women are reported in Table 14.

The second step in the calculation is to convert the total points to the 10-year risk score. Scores ranged from <1% -25%. Framingham scores were relatively low (X=7.12, SD 6.88) classifying the majority of the participants in the "low risk" category. Combining both genders, 76 (67.25%) were categorized as low risk (score less than 10%), 22 (19.46%) were categorized as intermediate risk (score 10-20%), and 15 (13.27%) were categorized as highest risk (score greater than 20% or having a coronary risk equivalent). Fourteen of the 15 participants in this category had diabetes, a coronary risk equivalent considered to be a risk score of >20%. These scores were included in the subsequent statistical analyses. (See Table 15).

Table 15. Frequency of Participants Total Points and 10 year Risk Scores for Men and Women using the Gender-Specific Framingham Risk Score Calculation (N=113)

Range of Point Totals for Men	**Men Participant total scores (n= 35)**	Men Participant 10 yr risk score	Range of Point Totals for Women	**Women Participant total scores (n= 78)**	Women participant 10 yr risk score
<0	0	<1%	<9	13	<1%
0	0	1%	9	1	1%
1	0	1%	10	9	1%
2	0	1%	11	5	1%
3	1	1%	12	7	1%
4	0	1%	13	5	2%
5	0	2%	14	5	2%
6	3	2%	15	1	3%
7	1	3%	16	6	4%
8	0	4%	17	6	5%
9	0	5%	18	2	6%
10	1	6	19	5	8%
11	5	8%	20	3	11%
12	7	10%	21	1	14%
13	4	12%	22	3	17%
14	4	16%	23	0	22%
15	0	20%	24	0	27%
16	1	25%	25 or >	0	≥30%
17 or >	0	≥30%			
Known Diabetes (risk equivalent)	8	> 20%	Known Diabetes (risk equivalent)	6	> 20%

Note: Light Gray= low risk, White= intermediate risk, and Dark Gray= high risk

Comparison of HHS and FRS

A comparison of the HHS and FRS scores revealed a difference in categorization of the participants (See Table 16). The HHS categorized more participants in the "high risk" range and "intermediate risk"/"needs improving" range. Conversely, the FRS categorized more participants in the "low risk range". This disparity in classification of risk may lie in the way the scores are calculated or in the fact that the HHS scores reflect current risk while the FRS reflects a projected longer term risk.

Table 16. Comparison of HHS and Framingham Scores (N=113)

Category	FRS N (%)	HHS N (%)
"Excellent"	----	6 (5.3%)
Low risk/ "Doing well"	76 (67.2%)	44 (38.9%)
Intermediate risk/ "Needs Improving"	18 (15.9%)	20 (17.7%)
High risk	19 (16.8%)	43 (38%)

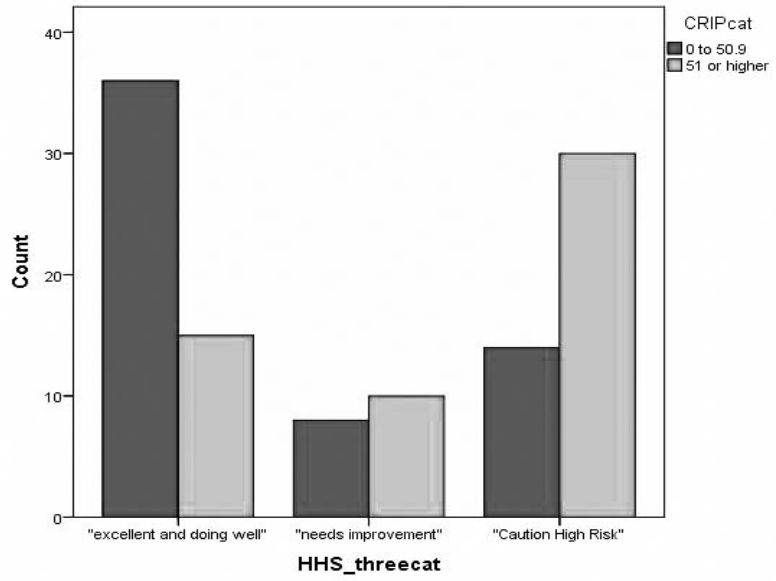
Analysis of the Relationship between CRIP scores and HHS and FRS

Correlational analyses were used to examine the relationship between CRIP scores and both the Heart Health and the Framingham Risk Scores. Results showed a significant inverse relationship between HHS scores and CRIP scores ($r = -.400$, $p < .01$) indicating that those with increased risk (using HHS) exhibited increased levels of perceived risk and accounts for 16 % of the variance in the CRIP scores. There was a non-significant relationship between perceived risk and "projected" cardiac risk using the FRS ($r = .034$, $p = .719$) indicating that perceived risk is not related to a long-term projected risk score.

A Chi-Square test was used to determine whether there was a significant difference between FRS and HHS on risk perception scores. Using the mean score of 50 obtained from this sample on the CRIP as the cut off point for the two levels and the

categorized FRS and HHS (Table 16), there was no significant difference between risk perception (CRIP) and Framingham risk scores (FRS), χ^2 (2) = 3.33, p = .189. However, there was a significant difference between risk perception (CRIP) and heart health scores (HHS), χ^2 (2) = 14.61, p = .001. Persons with lower risk scores (using HHS) were more likely to have lower risk perception scores (using CRIP) whereas persons with increased risk (using HHS) were more likely to have higher risk perception scores (using CRIP). The effect size was .36. See Figure 1. In order to meet the assumption of having a minimum of an expected count of 5 in each category, the "excellent" and "doing well" categories were combined for this analysis.

Figure 1. Chi Square Analysis of HHS with Risk Perception Scores



Summary of Aim One

Aim 1 was to examine the accuracy of one's perceived risk for CVD. As stated throughout this paper, perception of risk for CVD is based on awareness and knowledge of risk factors for CVD. Overall the sample demonstrated at least a moderate knowledge-

base of heart disease and the major risk factors associated with it. They recognized heart disease as the leading cause of death for men and women, and could identify the key prevention steps to reduce such risk. The majority had seen information on heart disease in the prior 12 months. More than half the sample admitted to "worrying a little" about getting heart disease or having a heart attack, with 30% admitting to "worrying a lot". In reviewing the self-reported risk factors, 42% had a positive family history, 12% had diabetes, 12% had hypertension, but most were physically inactive. Physiological measurements obtained during the screenings also revealed a relatively healthy group, with the majority of participants at goal for glucose, LDL-C, HDL-C and triglyceride levels. However, the majority of participants were found to be overweight or obese. Overall, 80% had 2 or more self-reported risk factors, and 43% had three or more.

Perceived individual risk scores for CVD as measured by the CRIP fell into the middle range. The participants did seem to accurately perceive their risk for CVD. The prevalence of risk factors (self-reported) was significantly correlated with higher levels of risk perception as measured by the CRIP ($r=.44$, $p < .01$).

HHS scores showed that more than 55% of the participants were categorized as either "Needs Improving" or "High Risk", indicating the presence of multiple risk factors. HHS scores were also statistically correlated with risk perception ($r=.40$, $p< .01$). In addition, Chi Square analysis showed a significant difference between increased risk (using HHS) and increased risk perception scores (using CRIP). Framingham Risk Scores, a measure of projected future cardiac risk, were not correlated with risk perception.

Aim 2-Examination of the Relationship between Perceived Risk and Key Sociodemographic and Psychological Variables

Psychological variables such as optimism, optimistic bias, life satisfaction and depressive symptoms may play an important role in how persons perceive risk. In addition, other influences, such as demographic and personal variables may also be helpful when examining risk perception. Therefore the second aim of this study was to examine the relationship between perceived risk and key sociodemographic and psychological variables thought to influence risk perception. This section begins with the report on the sociodemographic variables.

Sociodemographic Variables

The sociodemographic variables of age, gender, socioeconomic status, level of education, family history of CVD and knowledge of someone with CVD were discussed earlier in this chapter as part of the sample characteristics. As previously shown in Table 4, the sample can be described as: middle-aged (M=58.02 $\pm$ 9.8) with a range from 40 to 80 years; mostly female (69%); and well educated with approximately 70% having vocational training, an associate degree or higher. Income was almost evenly split between less than or greater than $50,000. Less than half of the sample reported knowing a relative with CVD (42.5%) or friend with CVD (36.3%).

Psychological Variables

Psychological variables include: optimism (measured by the LOT-r), life satisfaction (measured by the LET), and depressive symptoms (measured by the PHQ-8). These instruments were discussed in detail in Chapter 3 and briefly here. See Table 17.

Optimism: Life Orientation Test-revised (LOT-r). The construct of optimism was operationalized using the life orientation test-revised (LOT-R). This is a Likert scale-based instrument consisting of ten questions. In the revised version, there are four filler questions (#2, 5, 6, 8), three positively worded questions (#1, 4, 10), and 3 negatively worded questions (#3, 7, 9). The coding of the LOT-R (with a total possible score of 24) is positively correlated so that high values imply optimism, while low values imply pessimism (Scheier, Carver, & Bridges). Reported Cronbach's alpha for the LOT-R = .90. All scores were examined for normal distribution as previously discussed. In this study, internal consistency was 0.719; participant scores ranged from 3-24 with a mean of 16.45 (SD $\pm$ 4.55) and a median of 16. See Table 18. Overall, participants in this study were optimistic about their life.

Table 17. Descriptive Statistics for Psychological Variables

	N	LOT-r	LET	PHQ-8
Mean (SD)	113	16.45 (4.55)	25.23 (3.53)	3.2 (3.1)
Range	113	3-24	15-30	0-12
Possible range	113	0-24	6-30	0-27
Range for Sample	113	3-24	15-30	0-12
Internal Consistency	113	.719	.712	.738

Table 18. Item Response for Revised Life Orientation Test (LOTr) (N=113)

	Mean (SD)	Strongly Disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)
Item Response Score		0	1	2	3	4
1. In uncertain time, I usually expect the best.	2.90 (1.06)	3 2.7%	11 9.7%	19 16.8%	41 36.3%	39 34.5%
2. It is easy for me to relax.*	2.71 (1.21)	4 3.5%	19 16.8%	10 8.8%	52 46%	28 24.8%
3. If something can go wrong for me, it will.	1.58 (1.19)	28 24.8%	24 21.2	33 39.2%	23 20.4%	5 4.4%
4. I'm always optimistic about my future.	2.89 (1.02)	2 1.8%	12 10.6%	17 15%	47 41.6%	35 31%
5. I enjoy my friends a lot.*	3.58 (0.63)	0 0%	0 0%	9 8%	29 25.7%	75 66.4
6. It's important for me to keep busy.*	3.36 (0.83)	1 0.9%	2 1.8%	14 12.4%	34 30.1%	62 54.9%
7. I hardly ever expect things to go my way.	1.53 (1.22)	32 28.3%	21 18.6%	34 30.1%	20 17.7%	6 5.3%
8. I don't get upset too easily.*	2.38 (1.08)	5 4.4%	21 18.6%	28 24.8%	43 38.1%	16 14.2%
9. I rarely count on good things to happen to me.	1.43 (1.32)	39 34.5%	23 20.4%	22 19.5%	21 18.6%	8 7.1%
10. Overall, I expect more good things happen to me than bad.	3.26 (0.99)	3 2.7%	5 4.4%	11 9.7%	34 30.1%	60 53.1

Note: "*" denotes filler items that are not included for instrument scoring

.

Life Satisfaction: Life Engagement Test (LET). The construct of life satisfaction was measured using the LET. The LET is a five point Likert Scale instrument consisting of six questions (Appendix G). Three items (# 2, 4, and 6) are positively framed, while the other three items (# 1, 3, and 5) are negatively framed. The higher the summary score, the higher the reported purpose in life. Reported Cronbach's alpha for the LET in initial testing ranged from 0.72 to 0.80. All scores were examined for normal distribution as previously discussed. For this sample internal consistency was 0.712; scores ranged from 15-30, with a mean of 25.23 (SD $\pm$ 3.53) and a median of 25. Participants in this study reported increased levels of life satisfaction. See Table 19 for individual item scores.

Table 19. Item Response for Life Engagement Test (LET) (N=113)

	Mean (SD)	Strongly Disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)
Item Response Score		1	2	3	4	5
1. There is not enough purpose in my life.	1.8 (1.00)	56 49.6%	36 31.9%	9 8%	11 9.7%	1 0.9%
2. To me, the things I do are all worthwhile.	3.91 (1.02)	6 5.3%	6 5.3%	10 8.8%	61 54%	30 26.5%
3. Most of what I do seems trivial and unimportant to me.	1.92 (0.95)	41 36.3%	52 46%	11 9.7%	6 5.3%	3 2.7%
4. I value my activities a lot.	4.12 (0.80)	3 2.7%	2 1.8%	6 5.3%	69 61.1%	33 29.2%
5. I don't care very much about the things I do.	1.59 (0.73)	59 52.2%	44 38.9%	8 7.1%	1 0.9%	1 0.9%
6. I have lots of reasons to live.	4.47 (0.89)	4 3.5%	1 0.9%	4 3.5%	32 28.3%	72 63.7%

Depression Screening: Patient Health Questionnaire-8 questions (PHQ-8).

The construct of depression was operationalized using the PHQ-8. The questions are scored on a 0-3 Likert scale with 0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day. The scoring for the PHQ-8 is summative with a score ranging from 0 –24. The PHQ-8 divides scores into 4 categories: no depression (scores < 5), mild depression (scores from 5-9), moderate depression (scores from 10-14), and severe depression (scores > 20). However, a score of $\geq$ 10 on the PHQ-8 is considered as being positive for symptoms of depression. All scores were examined for normal distribution as previously discussed. For this study internal consistency was 0.738; scores ranged from 0-12 with a mean of 3.27 (SD $\pm$ 3.1) and median of 2. Categories for this tool are based on the following cut-points: <5 = no depression, 5-9 = mild depression, 10-14 = moderate depression, 15-19 = moderately severe depression, and >20 = severe depression. While the majority of the sample reported no symptoms of depression, approximately one fifth reported having mild symptoms. None of the participants scored

as being moderately severe or severe on the scale indicating that overall, the participants in this study were not depressed. See Tables 20 and 21.

Table 20. Item Response for the Eight item Patient Health Questionnaire (PHQ-8) (N=113)

Over the last 2 weeks, how often have you been bothered by any of the following:					
	Mean (SD)	Not At All N (%)	Several Days N (%)	More than half the days N (%)	Nearly Every day N (%)
Item Response Score		1	2	3	4
1. Little interest or pleasure in doing things.	1.32 (0.66)	87 77%	46 14.2%	9 8%	1 0.9%
2. Feeling down, depressed, or hopeless.	1.29 (0.52)	84 74.3%	25 22.1%	4 3.5%	0 0%
3. Trouble falling or staying asleep, or sleeping too much.	1.74 (0.91)	58 51.3%	33 29.2%	15 13.3%	7 6.2%
4. Feeling tired or having little energy.	1.84 (0.83)	42 37.2%	53 46.9%	11 9.7%	7 6.2%
5. Poor appetite or over-eating.	1.55 (0.83)	72 63.7%	22 19.5%	16 14.2%	3 2.7%
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down.	1.22 (0.47)	91 80.5%	19 16.8%	3 2.7%	0 0%
7. Trouble concentrating on things, such as reading the newspaper or watching TV.	1.23 (0.55)	93 82.3%	15 13.3%	4 3.5%	1 0.9%
8. Moving or speaking so slowly that other people could have noticed? Or the opposite- being so fidgety or restless that you have been moving around a lot more than usual.	1.07 (0.33)	103 91.2%	8 7.1%	1 0.9%	0 0%

Table 21. Summary Scores on PHQ-8 for Study Sample (N=113)

Total Scores for Sample	<5 = No depression	5-9 = Mild depression	10-14 = Moderate depression	15-19 = Moderately Severe Depression	20 or more = Severe depression
	81 (71.7%)	24 (21.2%)	8 (7.1%)	0 (0%)	0 (0%)

Analysis of the Relationship between Predictor Variables and Risk Perception

Multiple regression analysis was performed to determine predictors of risk perception (Field, 2009). Thus, this method was used to explore the relationship between these potential predictor variables and the outcome variable of risk perception as

measured by the CRIP. The nine assumptions associated with multiple regression include: 1) variable types, 2) non-zero variance, 3) multicollinearity, 4) predictors which are not correlated with external variables, 5) homoscedacticity, 6) independent errors, normal distribution, 8) independence, and 9) linearity. These assumptions were met in order to complete the regression analysis.

Spearman's rho correlation analysis for ordinal level variables was used to examine the relationship between the sociodemographic and psychological predictor variables and outcome variable of risk perception. The results are shown in Table 22. The reported significant correlations for each of these relationships were small (< .334) and indicates that none of these variables are highly correlated with each other demonstrating non-multicollinearity between the variables (Field, 2009). The variables that were significantly related to risk perception (CRIP) were used to perform multiple regression analysis in the next section.

Table 22. Correlation Matrix of Potential Covariate Predictor Variables and Outcomes Variable

	2	3	4	5	6	7	8	9	10
1. Age	-.055	-.315**	-.226*	-.033	-.200*	-.105	-.196*	-.324**	-.140
2. Gender	---	-.013	-.155	.005	-.107	.184	.184	-.076	-.021
3. Income		---	-.181	-.118	.005	.156	.214*	-.048	-.020
4. Education			---	-.106	.097	.187*	.069	-.008	-.009
5. Relative with CVD				---	.022	-.062	.027	-.022	-.170
6. Friend with CVD					---	-.172	-.145	.148	.194*
7. LOTr						---	.256**	-.173	-.125
8. LET							---	-.188*	-.201*
9. PHQ8								---	.334**
10. CRIP									---

Note: * = p< .05; ** = p< .01; CVD = cardiovascular disease; LOTr = Life Orientation Test-revised; LET = Life Engagement Test; PHQ8 = Patient Health Questionnaire (eight question); CRIP = Coronary Risk, Individual Perception

Multiple regression analysis was conducted to examine whether specific variables contribute to the outcome variable of risk perception. A backwards stepwise method was

employed to account for suppressor effects and reduce the risk of making a Type II error (Field, 2009). The variables found to be significantly related to risk perception: knowing a friend with CVD, life satisfaction, and depression were entered into the regression model and produced two models. The final model removed life satisfaction as a contributing predictor. Overall, the model explained 11.3% of variance which was found to be significant, $R^2 = .113$, $F(2, 110) = 7.03$, $p < .01$. An examination of individual predictors revealed that only depression ($\beta = .278$, $p = .003$) was a significant predictor. Having a friend with CVD ($\beta = .163$, $p = .07$) was not found to be significant. (Appendix M).

Summary of Aim Two

Aim Two was to examine the relationship between perceived risk and key sociodemographic and psychological variables thought to influence risk perception. The majority of the sample had high levels of optimism and life satisfaction and low levels of depression. Correlation analysis between the risk perception and the potential variables showed that there were three variable associated with risk perception: having a friend with CVD, optimism, and depression. These variables were then used to perform multiple regression analysis and revealed that depression was the single predictor in the model, but accounted for only 11.3% of the variance. Further exploration is needed to identify salient variables that may contribute to risk perception.

CHAPTER FIVE: DISCUSSION

Sample and Setting

Data collection took place at four separate sites within a single hospital system located throughout the county. Compared to the most recent census bureau statistical data noted in Chapter Four, the overall sample of 113 participants was representative of the county except for an underrepresentation of African Americans. This was expected, as most African Americans are established patients at other hospital systems that were not part of the study and therefore were not recruited to attend the screenings. The sample was younger and more educated than had been expected, and were employed either full or part time. The majority had primary health insurance. One would expect that participants at a community health screening would be more representative of individuals without other sources for preventive health care. It is likely that those with more education understand and value preventive healthcare and thus sought opportunities for cardiovascular health screening. Even though the screening cost was reasonable ($30.00), it is possible that those unemployed were not able to attend due to financial constraints. The screening coordinator did share that insurances with wellness benefits cover the cost of the screening, while those without insurance or those without wellness benefits paid “out of pocket” for the screening. An interesting comment made by many participants was that their primary care providers encouraged them to obtain annual laboratory work at such screenings since it was more economical than going through traditional hospital or office based laboratory methods.

Knowledge and Awareness Survey

It is reassuring that public health efforts to raise awareness of heart disease were effective in this sample of low risk patients. Most of the sample rated themselves as well-informed or moderately informed about heart disease. They correctly identified traditional risk factors known to contribute to cardiovascular disease, such as high cholesterol, family history, obesity, stress, hypertension, and lack of exercise. Similarly, most of the sample reported that heart disease and heart attack were the leading cause of death in both men and women. Overall they were actively engaged in efforts to prevent heart disease. These findings indicate a high level of health literacy and may be related to the large number of participants educated beyond the 12th grade level. Health literacy is an important determinant of health, and has been defined as the way in which individuals are able to obtain, process, understand and communicate about health-related information needed to make informed health decisions (Berkman, Davis & McCormick, 2010). Most participants reported the source of their cardiovascular health information came from reading magazines, brochures, and newspapers, from viewing television, and from the internet. Regrettably, only slightly more than one third of the sample reported that their physician ever initiated a discussion on this topic.

In response to "What is the greatest health concern today?" the sample reported "heart disease or heart attacks" followed by "obesity, and "cancer-in general". Curiously, they reported these same categories in response to a question about personal worry related to health conditions in their own lives. One would expect that most people have some experience and exposure to both heart disease and cancer (e.g., knowing family or friends with these conditions) which could increase personal worry/concern. However, it

was surprising that obesity caused such a high amount of concern and worry. Perhaps this is due to the more recent attention focused on obesity in America, with more individuals finally taking notice of this health problem. Or it may be related to the high number of participants in this sample who were overweight or obese. They may be sensitive to the health issues that obesity poses.

While this sample exhibited health literacy in many areas, it is troubling that smoking was not identified by the sample as a contributor to CVD. In fact, there were curious inconsistencies noted in the smoking and triglycerides categories. Only 29% of the participants thought that smoking contributed to CVD, yet almost every participant (93%) answered that quitting smoking would prevent or reduce CVD. These findings are contradictory. This inconsistency was also noted for triglycerides; however, this response may be explained by a lack of knowledge that triglycerides are part of the cholesterol profile.

Mosca et al. (2013) have partnered with the American Heart Association to examine changes in awareness of heart disease, especially among women, with the most recent telephone survey conducted in 2003. Since the present study had a majority of women (69%), some comparisons to the Mosca study will be made here. Both samples rated themselves as well or moderately informed about heart disease. Interestingly, both studies reported comparable results related to sources of information about heart disease, with 75-88% using the media for information, and only 36-38% having had a discussion about heart disease with their health care provider. While both samples did identify the major risk factors for heart disease, the Mosca study had much lower rates (7-36% of major risk factors identified) versus this study with ranges of 82-100%. This difference

may be related to interview methodologies. This study used a paper survey with the various choices listed and asked participants to select “all that apply”; the Mosca study asked participants to “spontaneously identify” the causes of heart disease. Only 31% of Mosca’s women identified high cholesterol as a cause, with 1% reporting high triglycerides as a risk factor. This study had 100% of participants identifying high cholesterol, and 36.8% identifying high triglycerides. It is unclear whether the testing format, the span of 10 years since the Mosca study, or the combination of men and women participants resulted in the increased awareness of these risk factors. Both studies reported similar data for those activities that could potentially reduce one’s risk of getting heart disease. Finally, the Mosca study of only women found cancer rated as the greatest health threat (41%) with breast cancer= 35% and cancer in general = 16% as compared to this study where 34% selected heart disease/heart attack. Cancer in general was listed as the third greatest health threat (23%). Another major difference was the reporting of obesity was high in this study (26%) and only 6% in the Mosca study. These differences could be related to the setting in which the current study was conducted—a cardiovascular health screening event.

Discussion of Aim 1

Perception of risk requires some awareness and knowledge of risk factors for CVD. As just discussed, this sample reported being well-to-moderately informed about heart disease. In this section we will discuss the actual risk for CVD as related to the number and type of cardiac risk factors reported, and the relationship to risk perception using the CRIP tool. Further comparisons using both the Heart Health Score (HHS) and the Framingham Risk Score (FRS) will also be discussed.

Prevalence of CVD risk factors

The sample was knowledgeable about the causes/risk factors for heart disease in general and was also able to self-report personal behaviors and family history known to contribute to the development of heart disease. Overall this sample had a significant number of major risk factors, as 37% had two and 43% had three or more. Thus they would be expected to have some concerns about their "personal risk" for heart disease. This number is comparable to Barnhart's sample where 51.6% had three risk factors and were deemed to be at high risk for CHD. It is interesting to note that 74% of the sample was either overweight or obese (BMI> 25) and 62% reported low levels of activity performed per week. The majority of the sample was either overweight or obese with 12.4% reported being diabetic. The number of persons with normal fasting glucose levels and triglyceride levels was only 80% and 76% respectively, suggesting that more of the sample either does not know that they are pre-diabetic or diabetic or chose not to report being in either category.

Analysis of Risk Perception- CRIP

Risk perception was quantified using the Coronary Risk Individual Perception (CRIP) tool. This relatively new instrument was easy to administer and score. During the screenings there were no questions from the participants requiring clarification of items. Scoring for the instrument is logical with higher scores relating to increased levels of risk perception. Many of the item responses fell in "somewhat disagree" (3) and "somewhat agree" (4) categories with calculated item means near 3.5. While many scores on individual items did fall within this "middle range", several CRIP items warrant further discussion. For example, overall the sample somewhat agreed that their health was very

good (item four; X= 4.37) and compared to others their health was good (item ten; X= 4.16). They felt that personal efforts will help to control the risk of having a heart attack (item thirteen; X= 4.62) and they don't worry about dying from a heart attack (item 7; X= 2.94). These responses indicate that this sample felt positive and relatively optimistic about their health status and risk for a heart attack. While the participants were not made aware of the results of the screening lab tests conducted during the health screening, the results later did reveal that this was a relatively healthy group, with the majority at goal for glucose, LDL-C, HDL-C, and triglyceride levels. Thus their self-perceptions of overall "middle-level risk" were accurate.

The range of CRIP scores for this study was wide (16-91). A closer examination of the score frequencies revealed that the same number (eight) of participants reported scores on the low end (scores of 16, 24, 26, 29) as on the high end (scores of 69, 72, 75, 83, 91). Thus there were no clear outliers. It is interesting that the mean score on the CRIP for the sample (X= 50.2; SD 13.7) was similar the one reported by Barnhart and colleagues (X=53.9; SD 10.3) (2009). Although there were some differences between the two samples with respect to race/ethnicity and education levels (Barnhart sample was predominantly Hispanic, uneducated, and poor), one striking similarity was gender; both studies were approximately 70% female.

The data supports the accuracy of the sample's risk perception. As in Barnhart's study (2009), a simple index for risk of CHD was derived by summing the participant's number of major risk factors. The prevalence of these self-reported risk factors was significantly correlated with higher levels of risk perception as measured by the CRIP. Again—this is not a surprise, in that this sample was well-educated, employed, and had

primary health insurance. And they were seeking out a health screening opportunity—that may have contributed to their accurate risk perception.

The small sample size limited the number of analyses that could be made with the CRIP. In Barnhart's larger study, risk perception was correlated with individual risk factors such as diabetes, hypertension, and obesity. Barnhart (2009) used the median score (55) to divide her group into high vs low levels of risk perception. The same type of analysis was not conducted in this study since it did not match the aims of this study. However, additional analysis such as this will be planned for in a secondary analysis of data.

Heart Health Score (HHS). The HHS score reflects risk at the current time and is based on both self-reported and physiological measures. The summative scoring method is somewhat counterintuitive from other methods, with low scores indicating higher levels of risk and high scores indicating lower levels of risk. The HHS not only presents a numeric risk, but also a semantic descriptor. Since a large number of the sample had multiple risk factors, it was not surprising to see 17% of the sample categorized as "Needs Improving" and 38% categorized as "High Risk". Thus it was logical that the HHS scores were statistically correlated with risk perception on the CRIP since they were both measuring similar risk factors. Likewise the Chi square analysis showed a significant relationship between increased risk and increased risk perception scores.

Wellsource© has been a recognized leader in corporate health screenings for more than 30 years and it used extensively in cardiac rehabilitation programs as a tracking and motivational strategy. However, it was not possible to make any comparisons of data

from this study with other studies, as Wellsource© has not published any results as pooled data related to the HHS tool. The HHS tool has been primarily used to collect data from individuals and provide individualized risk scores. It is possible that due to health privacy laws and/or contracts with data sources (hospitals, corporations), Wellsource© has chosen not to make pooled data available.

Despite these limitations, the HHS tool seems useful in assessing patient's health risk. There is evidence that providing individuals with "current risk" data is more advantageous than using "future risk". Waldron, Weijden, Ludt, Gaalacher and Elwyn (2011) conducted a systematic review of risk communication strategies and found that when methods used long-term projected risk (10 years or longer as in the FRS) persons had less accurate risk perception and intention to change behaviors. Thus using this method may help those with increased levels of risk to perceive risk more accurately and plan health behaviors accordingly. Moreover, it may be vital in providing motivation for positive health behaviors.

Framingham Risk Scores (FRS). This scoring method also uses physiological measures and current risk factors; but unlike the HHS, it calculates a "projected" 10 year risk for CVD and cardiac events. In addition, the scores are gender-based, with women's cardiovascular risk typically underestimated due to the older age in which they exhibit coronary heart disease (Marma & Lloyd-Jones, 2009). Thus with the predominantly female sample, it is not surprising that so few participants were categorized as moderate to high risk based on a mean age of 58. Likewise, the FRS also underestimates risk in younger men, and this sample had an overall mean age of 58 years. It was not really

surprising that the FRS was not correlated with current risk perception (CRIP) since that is not the aim of the tool.

Analysis of the Relationship between CRIP Scores and HHS and FRS. When comparing HHS and FRS, it was interesting to find that the FRS revealed more of the sample to be at "low risk" while the HHS found the majority of the sample to be in the "high risk" and "intermediate risk" range. Given this fact, it was not surprising that only one of the methods (HHS) was correlated with risk perception. The explanation is likely due to the differences in the methods used for calculating current and projected risk, but may also be due to the large proportion of women in the study.

Discussion of Aim 2

The second aim of this study was to examine the relationship between perceived risk and key sociodemographic and psychological variables thought to influence risk perception. This section will begin with a discussion on the psychological variables of optimism, life satisfaction and depression.

Optimism: Life Orientation Test- revised (LOT-r)

Previous research has shown that optimism is linked to multiple positive outcomes including mental and physical well-being (Carver, Scheier, & Sergerstom, 2010), less incidence of depression (Chang, Wang, Li, & Liu, 2011; Giltay, Zitman, & Kromhout, 2006; Manjilovich, 2005; Tindle et al. 2012), decreased risk of CVD (Boehm, Peterson, Kivimaki, & Kubzansky, 2011; Kubzansky & Thurston, 2007), and even decreased mortality (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004).

The LOT-r was administered and scored without any changes to either the contents or format. Participants completed the instrument easily without questions on

how to complete the instrument or on specific items. Scoring of the instrument was equally uneventful. The sample indicated that overall they were moderately optimistic about life (mean of 16.45, SD $\pm$ 4.55). Glazer, Emery, Frid, and Banyasz (2002) found that when controlling for age, higher levels of optimism and lower levels of both depression and neuroticism had a positive effect on adherence to exercise. However, this all male sample with known cardiac disease was much smaller with only 46 participants, thus limiting the generalizability of the results. Lastly, Matthews et al. (2004) used a prospective design to follow 209 middle- aged women for a total of 13.5 years and found that women with the highest reported levels of optimism showed less progression of CVD as measured by carotid intimal thickening. While both of these studies used the original LOT instrument, it should be noted that Scheier, Carver, & Bridges (1994) conducted an evaluation between the two instruments and found a correlation of 0.95 and stated there was no reason to believe that the revised scale would produce any appreciable differences in study findings. In addition, the authors of the LOT and LOT-r have never assigned cut points for either scale. Instead, they ascribe to the interpretation that higher scores represent increased levels of optimism whereas lower scores represent decreased levels of optimism. So it is therefore prudent to examine overall study results and the variables that correlate with optimism rather than focusing solely on mean study scores for any population.

It was surprising that in this study there was no significant inverse correlation between optimism and depression as has been noted in the literature (Chang, Wang, Li, & Liu, 2011; Giltay, Zitman, & Kromhout, 2006; Manjilovich, 2005; Tindle et al. 2012). However, there were differences between these studies and the current study that may

explain this result. For example, Giltay and colleagues (2006) did examine the same constructs but used different instruments to do so. Giltay used a 15 year prospective study of 464 men between 64 and 84 years, but used the dispositional optimism scale and the Zung depression scale. In addition, these authors disclosed that a major limitation for this study was that the dispositional optimism scale has not been validated against the LOT or LOT-r. So while these researchers did study the same constructs/variables, they used different scales with clear limitations to measurement validity.

Chang et al., (2011) studied 314 staff nurses in Taiwan exploring depression rates among nurses and reported that 52.5% of the nurses reported mild to moderate depressive symptoms. Chang and colleagues used the Center for Epidemiologic Studies-Depression Scale (CES-D), the LOT-r, and General Self-Efficacy Scare (GSES) and found depression to be significantly correlated to optimism ($r= -.50$, $p<0.01$) and self-efficacy ($r= -.43$, $p<0.01$). Multiple regression analysis showed that optimism (β -.38, $p< 0.01$) and self-efficacy (β -.44, $p< 0.01$) protected against depression. Since the CES-D and LOT-r instruments have been used widely and have acceptable psychometric properties, it is more likely results from the current study differ due to the population being studied, the smaller sample size, or the fact that the sample reported much lower levels of depression than the nurses in Taiwan, not to mention the possibility of cultural differences in these variables.

Life Satisfaction: Life Engagement Test (LET)

The concept of life satisfaction is similar to optimism in that both can be categorized as a positive emotion. Work completed in this area has shown that there is a positive relationship between emotional vitality and lack of CVD (Cohen & Pressman,

2006; Kubzansky & Thurston, 2007, Matthews, Owens, Lee & Kuller, 2006). However, research specifically related to the use of the life engagement test related to cardiovascular disease is somewhat limited (Matthews, Owens, Lee & Kuller, 2006). This might be explained by the fact that this is a relatively new tool.

The LET was administered and scored without any changes to either the contents or format. Participants found this brief instrument easy to complete. Scoring of the instrument was equally uneventful. The sample indicated high levels of life satisfaction (25.23, SD $\pm$ 3.53). These scores were similar to two recent cohort studies. Pearson et al. (2012) studied a cohort of 545 community dwelling adults ages 55-94 to establish normative data on a non-clinical sample of adults. The survey was administered twice, 12 months apart as part of a larger study on relocation to a residential retirement facility. These researchers found that scores on the LET at both time intervals were high (mean= 24.86, SD $\pm$ 4.16; mean= 23.43, $\pm$ 3.79). In addition, the scores for the designated age groups (55-64 years, 65-74 years, and >75 years) were all similar.

Both increased age and income were significantly correlated with increased levels of life satisfaction. This may be explained by the fact that as a person ages there is more certainty, stability and satisfaction in life. This may be especially true in this well-educated, largely employed and relatively healthy group of individuals.

Optimism was significantly correlated with life satisfaction. This finding is supported by the work done in the construction and validation of the LET instrument ($r= .39$, $p < 0.01$) (Scheier et al., 2006). It is logical that if someone is optimistic that they would also tend be satisfied with life. Since that time, this is the only study that has compared these two constructs at the same time. In the two studies by Matthews,

discussed in previous parts of this paper and also below, these constructs were studied separately with respect to the surrogate markers for CVD. Matthews et al. (2006) followed 155 healthy women enrolled in the Healthy Women Study and found that those with the highest scores on the LET had lower aortic calcium scores (p= 01). This is a follow up to their 2004 study that reported that women with the highest LOT-r scores had the least progression of CVD as measured by carotid intimal thickening. Thus optimism and life satisfaction seem to correlate with less evidence of CAD and may be acting as mediating variables.

Patient Health Questionnaire-8 questions (PHQ-8)

Depression is well recognized as a risk factor for CVD and a consequence of CVD (Baune, Stuart, Gilmour, Wersching, Arolt, & Berger, 2012; Borowicz et al., 2002; Grenon, Hiramoto, Smoderen, Vittinghoff, Whooley & Cohen, 2012). Previous research has shown that major depressive disorder (MDD) occurs in as many as 20% of those with CVD (Thombs et al., 2004). Furthermore, even in the absence of MDD, the presence of depressive symptoms has been shown to increase the incidence of CVD (Thombs et al., 2004) as well as morbidity and mortality associated with CVD (Stewart, et al., 2003).

The PHQ-8 was administered and scored without any changes to either the contents or format. Participants were able to complete this instrument without explanation or assistance. The instrument was scored without any difficulty. The sample generally reported low to mild levels of depression (mean= 3.27 $\pm$ 3.1) with more than 70% of the sample reporting no depression and 21% reporting mild depression. The mean score is comparable to a study by Pressler et al. (2010) who reported a score of: mean= 2.6 ($\pm$ 3.0) in 63 healthy persons, mean= 3.7 ($\pm$ 3.4) in 102 medical patients, and

mean=6.5 (± 5.5) in 249 patients with heart failure. So, while this sample fell between the healthy person and medical patients, keep in mind that scores below 5 indicate no depression. In addition to this comparison, it is noteworthy to highlight that scores on the PHQ-8 in this study were significantly correlated with risk perception. This will be further discussed in the following section.

Analysis of the Relationship between Predictor Variables and Risk Perception

It should be noted that although there were some significant correlations, none of them were particularly strong. In fact, they were all < .334. Despite this fact, there are several interesting relationships to discuss. For example, women had higher life satisfaction scores ($r = -.196$, $p < .05$). As previously discussed above those with increased levels of optimism also had higher life satisfaction scores ($r = .256$, $p < .01$). In addition, one unexpected finding was that optimism was not correlated with depression since this finding has been reported in previous studies (Giltay, Zitman, & Kromhout, 2006; Chang, Wang, Li, and Liu, 2010; Weber, Puskar, & Ren, 2010). Scheier et al. (2006) in an article describing the LET instrument stated "It is our belief that purpose in life represents an important but overlooked psychosocial predictor of health outcomes" (p. 291). In the construction of this instrument, Scheier and colleagues found that depression and LET scores were inversely correlated to depression in six separate samples including undergraduate students, community based samples of women, female osteoarthritis patients and their spouses, and women with various stages of breast cancer. However, the CES-D was used to operationalize the construct of depression.

One of the most surprising findings in this study was that although there is much written about optimism and positive health outcomes, it was not found to correlate with

risk perception as expected. Those with higher levels of education reported higher levels of optimism ($r = .187$, $p < .05$) which has also been noted in previous studies (Robb, Simon, & Wardle, 2009). In addition, those reporting higher levels of optimism also report lower depression levels ($r = -.188$, $p < .05$). This finding not only appears as a logical conclusion, but it supported by empirical findings as discussed in the above sections on optimism and depression.

An expected finding was that increased levels of reported depression was also correlated with increased risk perception ($r = .334$, $p < .01$). Since depression has been established as a risk factor for CVD (Baune, Stuart, Gilmour, Wersching, Arolt, & Berger, 2012; Grenon, Hiramoto, Smoderen, Vittinghoff, Whooley & Cohen, 2012), it is important that persons suffering from depressive symptoms recognize that they are at risk for CVD.

One of the objectives of this study was to examine the variables thought to contribute to the formation of risk. Unfortunately, results from this study did not meet this objective. Multiple regression analysis showed that depression was the only variable found to be a significant predictor of risk perception ($\beta = .278$, $p = .003$). Perhaps the absence of optimism is not as powerful as the presence of depressive symptoms. Perhaps there are other sociodemographic and psychological variables that will provide more insight into this puzzle. So, while this study did not shed light in this area, it provides this researcher, as well as others the opportunity to examine other variables in the quest for a more viable model attempting to explain the perception of risk. Clearly, more research needs to be conducted in this area to understand how risk perception is formed.

Summary of Aim 2

The majority of the sample exhibited moderate levels of optimism, high levels of life satisfaction, and low levels of depression. In addition, while there were some interesting relationships found between variables, the relationships were weak at best. Lastly, depression was the sole predictor in the model examining factors that contributing to the formation of risk perception, accounting for a modest 11.3% of the model. Clearly, further exploration is needed to identify other variables that may contribute to the formation of risk perception.

Study Limitations

The limitations of any study are based on study design as well as threats to internal and external validity. A descriptive correlational design cannot establish causation between variables. Despite this fact, this study was able to highlight some of the relationships that exist between risk perception and several demographic and psychological variables. Thus, this study provides a solid foundation on which to build further studies in the area of risk perception. In addition, since this was a cohort study, data for risk perception was only collected at the time of screening *prior* to participants truly knowing their calculated risk. Therefore, this study cannot establish if or how much CRIP scores would change if individuals knew the results of their tests. Furthermore, the use of survey instruments limits the researcher's ability to gain insight into how persons express their personal risk.

There were threats to both internal and external validity identified in this study. The use of a convenience sample contributes to participant selection bias and limits generalizability of the results. Self-selection bias was also evident in the study. Although

many of the participants were referred by their primary care providers for screening as a cost-effective way to have lab work completed, the vast majority of the sample was self-selected and therefore, may represent "the walking well" or those who are at least more conscious about their health status. In addition, the sample was primarily women potentially contributing to gender bias in the results. The current sample was also well-educated, presently employed either part- or full-time, had health insurance and the majority were "at goal" for major risk factors, except for weight and physical activity. Exclusion criteria also limit applicability of the results. This study excluded those with established heart disease or diagnosed depression as well as those younger than 40 years. Therefore, results from the study can only be applied to similar groups.

While the instruments selected for this study had acceptable reported reliability and validity statistics, the information was self-reported which also introduces bias and limits generalizability of the findings. The CRIP and the LET are relatively new instruments. While both exhibit strong validity, there are fewer published studies and thus less normative data available for comparison. The same can be said for the HHS scores as Wellsource© has not published normative data, despite using current guidelines established for risk factor data as well as collecting health screening data for so many years.

Summary of Major Findings

Study participants had a mean age of 58 years, 69% were female, 70% were White Caucasian (non-Hispanic), and were predominantly married, well-educated, employed, and had private insurance. Overall the sample recognized heart disease as the leading cause of death for men and women and could identify the key prevention steps to

reduce personal risk. While physiological measurements obtained during the screenings also revealed a relatively healthy group, with the majority of participants at goal for glucose, LDL-C, HDL-C and triglyceride levels, the majority of participants were either overweight or obese and reported being physically inactive. Overall, 80% had 2 or more self-reported risk factors, and 43% had three or more.

The prevalence of risk factors (self-reported) was significantly correlated with higher levels of risk perception as measured by the CRIP ($r=.44$, $p < .01$). HHS scores showed that more than 55% of the participants were categorized as either "Needs Improving" or "High Risk", indicating the presence of multiple risk factors. HHS scores were also statistically correlated with risk perception ($r=.40$, $p < .01$). In addition, chi square analysis showed a significant relationship between increased risk (using HHS) and increased risk perception scores (using CRIP). Framingham Risk Scores, a measure of projected future cardiac risk, were not correlated with current risk perception.

The majority of the sample had increased levels of optimism and life satisfaction and low levels of depression. While three variables (having a friend with CVD, optimism, and depression) were correlated with risk perception, depression was found to be the single predictor of risk perception when entered into multiple regression analysis ($\beta = .278$, $p = .003$).

Implications for Providers

The sample in this study was knowledgeable about both CVD and risk factors. In addition, those with risk factors had an accurate perception of their risk. This knowledge may be related to their familiarity and participation in other wellness programs within this community hospital system. Hospital administrators should be encouraged to

continue with these successful primary prevention efforts. Perhaps 'having a friend with CVD" also helped raise their awareness. It may be useful for health care providers to explore such personal experiences with their patients as this may enhance attention to risk factor reduction.

The majority of the sample was "at goal" for most of the major risk factors with the exception of weight and physical activity. Those with lipid disorders and hypertension may be motivated to stay at goal, are compliant with their prescribed treatment regimes, and use the community screening opportunities to "check their status". This provides an excellent opportunity for health care providers to reinforce participants' efforts as a way to foster ongoing compliance.

It is possible that the group is "a work in progress" with regards to their weight and that while they are still categorized as either overweight or obese, they are attempting to address this risk factor. The lack of physical activity is of concern, however, since the majority of the group is either employed full or part-time and may not have made physical activity a priority, especially if they are otherwise doing well. While persons may understand that there are consequences to their health behaviors it is possible that they are not inclined to exercise or lose weight since subclinical atherosclerosis goes unnoticed. Thus health care providers should continue to use every opportunity, especially as related to community screenings, to counsel participants on effective methods for promoting physical activity and weight loss.

More than 80% of the sample reported having seen, read, or heard about CVD in the last 12 months, while only 35% reported having had a discussion about CVD in the last year. It is noteworthy that the general public is gaining more awareness and

knowledge about heart disease and the effects it has on health and well-being. However, this sample has shown that they are getting most of the information from mass media and not from health care providers. In addition, they have shown that they worry about heart disease, especially those that have risk factors. While it is positive that media campaigns are increasing health literacy, it is also very important that health care providers be more proactive about discussing heart disease with their patients. They need to take advantage of teachable moments when persons present with risk factors, and take every opportunity when reviewing results from routine lab work or from health screening events to reinforce that patients can reduce their risk of heart disease.

Depression needs to become more of a focus during screening events. Depression was the single predictor of risk perception in this study. In recent years, research has highlighted the relationship between depression and CVD and the need for depression screening. However, screening is only recommended for those who have been diagnosed with CVD (Lichtman et al., 2008) and not for the general public. It makes sense that if we believe that there is a relationship between depression and CVD, that screening should be part of primary prevention efforts and treated as a modifiable risk factor.

Lastly, there was a disparity in how the sample viewed smoking. While greater than 90% identified “quitting smoking” as an activity they believed could prevent or reduce the risk of getting heart disease, only 28% of the sample identified it as a major cause or risk factor for heart disease. This was a surprise since this sample was well educated. It is therefore very important for providers to make sure that discussions about smoking be included in health teaching.

Implications for Future Research

In order to learn more about risk perception in cardiovascular disease, more studies need to examine risk perception and must be designed so that the construct of risk perception is being measured. As demonstrated in the review of the literature, the term risk perception is often used when risk knowledge is being measured. Moreover, other instruments such as the LOT and LOT-r have been used to operationalize risk perception rather than the optimism and life satisfaction that they were designed to measure. Furthermore, studies should use validated instruments such as the CRIP to measure risk perception as opposed to one or two question items. Lastly, qualitative studies in this area may help to elucidate how persons think about their risk for CVD, thus providing more insight into formation of risk. Since depression was the only variable that contributed to risk perception in this study, it is important to plan further studies to examine different variables and constructs that may contribute to the formation of risk which may lead to more effective education measures and tailored interventions.

APPENDIX A

SUMMARY OF META ANALYSIS

Author	Type of Risk	Number of Items/Type of Measure	Effect Size (g)	Variable
Cole et al.	Comparative	1/Verbal	0.36	Mammography
Donovan & Tucker	Comparative	1/Verbal or Numerical	0.32 0.75	Race/culture Family History
Facione et al.	Comparative	1/Verbal	1.20	Optimistic bias
Hughes et al.	Comparative	1/Verbal	0.51 0.31 0.28 0.98	Mammography Age Education Worry
McDonald et al.	Comparative	1/Verbal	1.65	Optimistic bias
Bowen et al.	Subjective	1/Numerical	0.29	Family history
Clark et al.	Subjective	1/Numerical	5.08	Optimistic bias
Daly et al.	Subjective	1/Numerical	2.07 0.35	Optimistic Bias Race/culture
Dolan et al.	Subjective	1/Numerical	0.34	Optimistic bias
Erlich et al.	Subjective	1/Numerical	0.57	Family History
Jacobsen et al.	Subjective	1/Numerical	0.51	Genetic Testing
Lindberg & Wellisch	Subjective	1/Numerical	0.59 0.49	Mammography Breast self-exam
Meiser et al.	Subjective	1/Numerical	0.53 0.35 0.15	Optimistic bias Age Education
Metcalf & Narod	Subjective	1/Numerical	0.88 1.73	Optimistic bias Prophylactic Mastectomy
Schwartz et al.	Subjective	1/Numerical	0.48	Mammography
Stefanek et al.	Subjective	1/Numerical	0.71	Prophylactic Mastectomy
Audrain et al.	Subjective	1/Verbal	0.31 0.69 0.27	Education Race/culture Mammography
Culver et al.	Subjective	1/Verbal	0.40	Genetic testing
Diefenbach et al.	Subjective	1/Verbal	0.13	Mammography
Foxall et al.	Subjective	1/Verbal	0.12 0.52	Race/culture Mammography
Lipkus et al.	Subjective	1/Verbal	0.75 1.25 0.41	Family History Worry Perceived control
Vernon et al.	Subjective	1/Verbal	1.23 0.12 0.12 0.25 0.24 0.05	Family History Race/culture Age Breast symptom Mammography Breast self-exam
Absetz et al.	Subjective	2/Verbal	0.48	Optimistic bias
Andrykowski et	Comparative &	2/Numerical	0.59	Mammography

al.	Subjective			
McCaul et al.	Comparative & Subjective	2/Numerical	0.47	Worry
Aiken et al.	Comparative & Subjective	2/Verbal	0.45 0.56 0.45 0.79	Optimistic bias Family history Breast symptoms Breast self exam
Brain et al.	Comparative & Subjective	2/Verbal	0.26 0.69 0.19 0.07	Age Worry Breast self exam Mammography
Clemow et al.	Comparative & Subjective	2/Verbal	0.13	Mammography
Evans et al.	Comparative & Subjective	2/Verbal	0.35	Optimistic bias
Foster et al.	Comparative & Subjective	2/Verbal	2.17	Optimistic bias
Mouchawar et al.	Comparative & Subjective	2/Numerical & Verbal	0.79	Family history
Polednak et al.	Comparative & Subjective	2/Numerical & Verbal	0.72	Family history
Finney & Iannotti et al.	Subjective	3/Verbal	0.91	Family history
Lipkus et al.	Comparative & Subjective	3/Numerical & Verbal	0.74 0.67	Optimistic bias Worry
Drossaert et al.	Comparative & Subjective	4/Numerical & Verbal	0.38 0.18 0.32 0.18	Family history Age Anxiety Mammography
Lipkus et al.	Comparative & Subjective	4/Numerical & Verbal	0.22	Breast symptoms
Hatcher et al.	Comparative & Subjective	5/Numerical & Verbal	0.25	Prophylactic mastectomy
Black et al.	Comparative & Subjective	8/Quantitative & probability estimates	0.57	Education

APPENDIX B

LIFE ORIENTATION TEST REVISED

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

A = I agree a lot
B = I agree a little
C = I neither agree nor disagree
D = I disagree a little
E = I disagree a lot

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax.
3. If something can go wrong for me, it will.
4. I'm always optimistic about my future.
5. I enjoy my friends a lot.
6. It's important for me to keep busy.
7. I hardly ever expect things to go my way.
8. I don't get upset too easily.
9. I rarely count on good things happening to me.
10. Overall, I expect more good things to happen to me than bad.

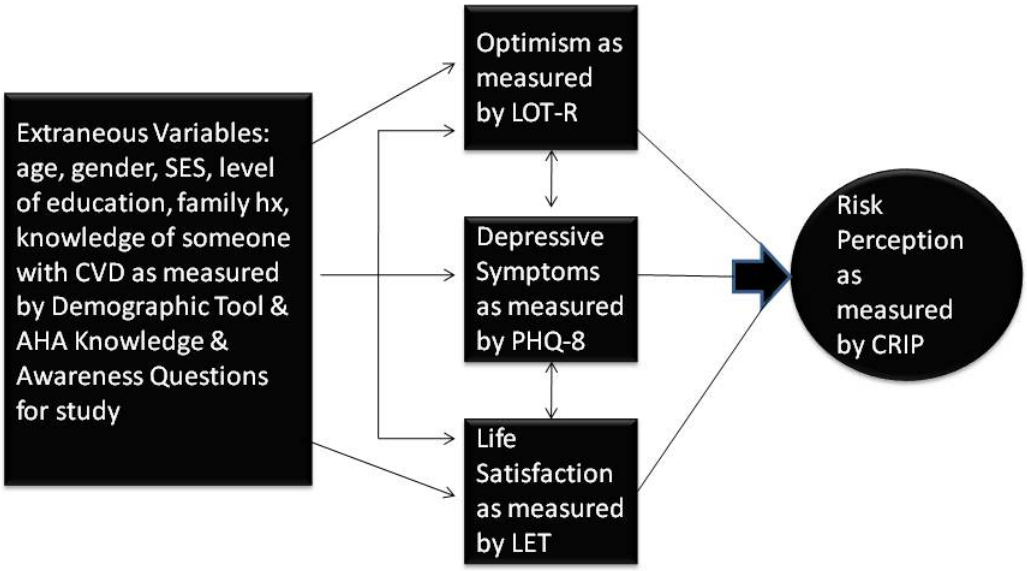
Note:

Items 2, 5, 6, and 8 are fillers. Responses to "scored" items are to be coded so that high values imply optimism. Researchers who are interested in testing the potential difference between affirmation of optimism and disaffirmation of pessimism should compute separate subtotals of the relevant items.

http://www.psy.miami.edu/faculty/ccarver/sclLOT-R.html

APPENDIX C

STUDY MODEL


Extraneous Variables: age, gender, SES, level of education, family hx, knowledge of someone with CVD as measured by Demographic Tool & AHA Knowledge & Awareness Questions for study
Optimism as measured by LOT-R
Depressive Symptoms as measured by PHQ-8
Life Satisfaction as measured by LET
Risk Perception as measured by CRIP

1

APPENDIX D

STUDY FLYER

Am I at Risk for heart Disease?

You are invited to participate in a research study that will look at how people view their risk for getting heart disease.

Study Description: This study, called *Risk Perception in Heart Disease* Study, will take about 20 minutes of your time. You will be asked to:

- Share the results of the blood tests from the Heart Health Appraisal you are taking today.
- Provide general information about yourself & complete a booklet with questions about your risk for heart disease, outlook on life and your health, your satisfaction with life, and how you have felt emotionally over the past few weeks.

You may be eligible to participate in this study if:

- You are attending one of the monthly Coronary Health Appraisals* offered by The Community Healthcare System
- You are at least 40 years of age
- You can read, write, and speak English
- You have NOT had a heart attack or coronary intervention, such as an angioplasty or open heart surgery
- You are NOT being treated for depression

If you are eligible to join this study and complete the study booklet, you will be given a $10 gift card to Meijer as a thank you for your time.

If you are interested in volunteering for this study or would like additional information regarding this study, please contact the investigator, Michelle Block, a PhD nursing student at Loyola University Chicago, at (219) 989-2847 or mblock@luc.edu

* Coronary Health Appraisal locations, dates, and times, can be found on the following website: http://www.comhs.org/community screenings.asp To schedule, call 219-836-3477 or 1 866-836-3477

APPENDIX E

INFORMED CONSENT

Study Title: Risk Perception in Heart Disease
Principal Investigator: Michelle Block
Phone Number: 219-989-2847

INTRODUCTION:

You are being asked to take part in a research study because you are over 40 years of age and want to take part in a Coronary Health Appraisal at one of the hospitals in The Community Healthcare System. You will not be able to participate if you have been diagnosed with depression, have experienced a heart attack or a heart intervention, such as an angioplasty, stent, or heart bypass surgery.

This study is being conducted by Michelle Block, Assistant Professor of Nursing, Purdue University Calumet, as part of a PhD dissertation at Loyola University Chicago.

Please read this form carefully and ask any questions you have before deciding if you want to take part in this study.

WHY IS THIS STUDY BEING DONE?

The purpose of this study is to look at how people perceive (look at) their risk for getting heart disease and to see if people can tell their own risk for developing heart disease.

HOW MANY PEOPLE WILL TAKE PART IN THE STUDY?

Approximately 120 people (participants) will be a part of this study. The participants will have all taken part in a Coronary Health Risk Appraisal screening at one of the hospitals in the Community Healthcare System.

WHAT IS INVOLVED IN THE STUDY?

If you agree to be in this study, you will be asked to:

- Complete a booklet of questions about your personal background, risk perception for cardiovascular disease, your outlook on life, your satisfaction about life issues, and how you have felt over the last few weeks.
- Give permission to share the answers you provided for the Coronary Health Appraisal and the results of the laboratory work that is part of the appraisal. This information will be used to calculate your chance of getting heart disease.

HOW LONG WILL I BE IN THE STUDY?

Participation in this study will take approximately 20 minutes and is voluntary. If you do not want to be in this study, you do not have to participate. Even if you agree to participate in this study, you do not have to answer any question if it makes you uncomfortable or you may withdraw at any time without penalty.

WHAT ARE THE RISKS OF THE STUDY?

There is minimal risk in participating in this study. It is possible that thinking about your health and risk for heart disease will be upsetting.

ARE THERE ANY BENEFITS TO TAKING PART IN THE STUDY?

You may benefit from participating in this research because it may help you to understand your views and risk for developing heart disease. Your participation in this study may help health professionals understand the factors that play a part in the formation of risk perception. This understanding may lead to new approaches in the prevention of heart disease.

CONFIDENTIALITY:

If you are eligible to take part in this study, you will be assigned a participant number. The data collected will be identified using this number and your name will be removed from all collected information. Records will be stored in a locked cabinet and the computer used to enter data will be password secured. Study information including your original records, research/clinic/hospital records may be reviewed by representatives of the Institutional Review Board (CHS CIRB), the board charged with the protection of human subjects involved in research at The Community Healthcare System.

Because these parties may inspect your study records, absolute confidentiality cannot be guaranteed. Results from this study may be published for scientific purposes, but your name will remain confidential. Study records will be kept confidential to the extent provided by law. The name of individual subjects or other identifying information will not be used in any publications of this study.

WHAT ARE THE COSTS?

There is no cost to participate in this study. In appreciation for taking time to participate and once the study question booklet is completed, you will be given a $10.00 Meijer gift card.

FINANCIAL DISCLOSURE

Michelle Block, the principal investigator, will not be receiving funds from outside companies to defray the costs to conduct this research study.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

For questions about your rights as a research participant, contact the Community Healthcare System Central Institutional Review Board (which is a group of people who review the research to protect your rights) or the Human Protections Administrator (the patient advocate) at 219-836-6862.

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. No matter what decision you make, leaving the study will not affect your medical care.

WHOM DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?
WHERE CAN I GET MORE INFORMATION?

You will get a copy of this form. You may also request a copy of the protocol (full study plan). Michelle Block is available to answer any questions you have. She can be reached at 219-989-2847.

Patient Statement

My signature on this consent form means the following:

- The study has been fully explained to me and all of my questions have been answered.
- I understand that I may ask questions at any time during the study by contacting Michelle Block at 219-989-2847.
- I understand what will be required of me to participate in this study.
- I understand that I may withdraw my consent at any time during the study.
- I agree to take part in this study.

_____ _____

Participant's Signature Date

_____

Participant's Printed Name

Statement of Investigator Obtaining Informed Consent

I have fully explained the details of this study to my patient. In my judgment, there was sufficient access to information, including risks and benefits, to make an informed consent.

_____ _____

Investigator Signature Date

_____

Investigator Printed Name

APPENDIX F

COMMUNITY HOSPITAL HIPAA FORM

HIPAA Authorization

The Community Hospital and its representatives are committed to protecting your health information. Protected health information is information in any form relating to the health care provided to you. By signing this form, you agree to permit the Community Hospital staff, and any member of the Community Hospital clinical research team to retrieve, use and disclose your health care information.

Your health care information will include any records that are retrieved and created during the extent of the research study in which you are participating in. The documents include but are not limited to:

- past, present and future health information in your medical records relevant to the research
- medical records from my primary care and consulting physicians relating to participation in research
- data created and recorded specifically for the research study

The Community Hospital, its staff, the sponsors of the research and their contractors will do everything possible to ensure the privacy of your personal health information. Any publications related to the research study will not contain any identifying information about you.

Participant Authorization Statement:

To the extent permitted by the applicable laws and regulations, I give my permission to release my personal health information to the following entities:

- Michelle Block, the principal investigator and her dissertation committee at Loyola University Chicago
- Members, consultants and staff of the Community Healthcare System Central Institutional Review Board
- Members, consultants and staff of Loyola University Chicago Institutional Review Board
- Community Hospital billing and quality assurance personnel
- Joint Commission of Accreditation of Health Care Organizations
- The Food and Drug Administration
- Other regulatory authorities to whom this research may be submitted

The researchers, Community Hospital staff, sponsor and other agents, may use and share my personal health information among themselves in order to conduct the

research. My health information may be used for verification of research procedures and data.

I understand that once my personal health information is disclosed to a third party, federal privacy laws may no longer protect the information from further disclosure.

I know that I do not have to sign this authorization; however, I have been told that if I do not sign this authorization, I may not be able to participate in this research study.

I may revoke my authorization at any time and for whatever reason. I will be asked to revoke this authorization in writing to the Principal investigator at:

Michelle Block, MS, RN
c/o Meg Gulanick, PhD, RN
Loyola University Medical Center
Bldg 105 Room 2840
2160 South First Avenue
Maywood, Illinois 60153

I realize that if I revoke this authorization, I will not be allowed to continue participation in the research study. I also am aware that the researchers and sponsor and their agents may continue to use and disclose any information that they have retrieved prior to my revoking the authorization.

I understand that while the research is being conducted, I will not be able to access or see my health information that was collected or created for the purposes of this research study because it may affect the integrity of the research. I, however, may access this information after the completion of the research study.

Who to contact if you have any questions about confidentiality:
If at any time before, during and after the study, you have questions about the use or disclosure of your study related information, you may contact the following person (s):

Community Healthcare System
Privacy Officer
219-836-3620

I give my authorization with no ending date, however, I understand that I may revoke this authorization at any time.

I will be given a copy of this authorization.

Participant Signature	Date and Time
Printed Name of Participant	
Legally Authorized Representative (If applicable)	Date and Time
Printed Name of Legally Authorized Representative	
Relationship of Authorized Representative to Participant	

APPENDIX G

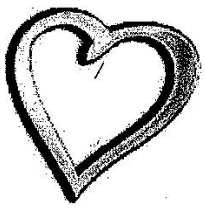
CORONARY RISK, INDIVIDUAL PERCEPTION SURVEY

Tell me how much you *disagree or agree* with each statement.

	Strongly Disagree n/%	Disagree n/%	Somewhat Disagree n/%	Somewhat Agree n/%	Agree n/%	Strongly Agree n/%
	1	2	3	4	5	6
1. I'm as healthy as anybody I know.						
2. Compared to others my age and sex, I am at lower risk of a stroke.						
3. I am at low-risk of a heart attack.						
4. In general, my health is very good.						
5. Following a low-fat diet takes too much effort.						
6. Compared to a year ago, my health is better now.						
7. I worry that I might die from a heart attack.						
8. I'm at low risk of having a stroke.						
9. Compared to others my age and sex, I am at lower risk of a heart attack.						
10. Compared to others my age and sex, I am in good health.						
11. I worry about having a heart attack.						
12. I worry that I might die from a stroke.						
13. I think my personal efforts will help control my risk of having a heart attack.						
14. I worry more about having a heart attack than a stroke.						
15. I don't mind the effort it takes to exercise.						
16. I have a low lifetime risk of a heart attack.						

APPENDIX H

DEMOGRAPHIC VARIABLES AND HEALTH HISTORY



Thank you for taking part in this research study: Risk Perception in Heart Disease.

The question booklet is made up of 6 sections. Feel free to ask the researcher if you have any questions while you are filling out the booklet.

Let's get started…….

Please place an "X" next to the answer(s) you choose

1. What do you think is the one greatest problem today? (Choose only one)

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

2. As far as you know, what is the leading cause of death for men? (Choose only one)

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

3. As far as you know, what is the leading cause of death for women? (Choose only one)

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

4. Using the following scale, how much do you worry about getting each of the following health conditions?

	Worry a Lot (1)	Worry a Little (2)	Do not worry At all (3)	Don't know (4)
Cancer (in general)				
Heart Disease or Heart Attack				
AIDS				
Breast Cancer				
Lung Cancer				
Drug Addiction/Alcoholism				
Violent Crime				
Stroke				
Alzheimer's Disease				
Diabetes				
Osteoporosis				
Obesity				

5. Have you seen, heard, or read information about heart disease within the past 12 months?

- ☐ Yes
- ☐ No
- ☐ Don't Know

6. If you answered YES to Question 5, where did you see, hear, or read this information? (Choose ALL that apply)

- ☐ In a magazine
- ☐ In a book
- ☐ Information in a brochure
- ☐ In a newspaper
- ☐ On the radio
- ☐ On TV
- ☐ Library
- ☐ On the internet
- ☐ Provided by physician, nurse, or other healthcare provider
- ☐ From a friend or relative
- ☐ Other: Please be specific:

7. Have any of your doctors ever discussed heart disease with you when discussing your health?

- ☐ YES
- ☐ NO

8. How informed are you about heart disease?

- ☐ Very well informed
- ☐ Well informed
- ☐ Moderately informed
- ☐ Not at all informed
- ☐ Don't know

For questions 9, 10 and 11, indicate if you: "strongly agree", "somewhat agree", "somewhat disagree", "strongly disagree", or "don't know"

	Strongly Agree 1	Somewhat Agree 2	Somewhat Disagree 3	Strongly Disagree 4	Don't Know 5
9. When you think about heart disease, you most often think of someone having a heart attack and dying quickly.					
10. There is nothing you can do to prevent yourself from getting heart disease.					
11. You are comfortable talking with your doctor about preventive and treatment options regarding your health.					

12. Based on what you know, what are the major causes of heart disease? (Choose all that apply)

☐ A family history of heart disease
☐ Being overweight
☐ Drinking alcohol
☐ High Cholesterol
☐ Low levels of estrogen
☐ Not exercising
☐ Stress
☐ Don't know
☐ Aging
☐ Diabetes
☐ High Blood Pressure
☐ High Triglycerides
☐ Menopause
☐ Smoking
☐ Your racial Heritage
☐ Other, please specify: _____
_____
_____

13. Which of the following activities do you believe can prevent or reduce the risk of getting heart disease? (Choose all that apply)

☐ Quitting smoking
☐ Losing weight
☐ Reducing stress
☐ Taking multivitamins with folic Acid
☐ Taking aspirin regularly (daily)
☐ Getting physical exercise
☐ Reducing dietary cholesterol intake
☐ Maintaining a healthy blood pressure
☐ Reducing dietary sodium or sale
☐ Maintaining a healthy cholesterol level
☐ Taking special vitamins like C, D & E
☐ Taking hormone replacement therapy (for women)
☐ Reducing animal products in your diet such as meats, whole milk, butter and Cream
☐ Aromatherapy (the practice of using natural plant oils, such as lavender or Lemongrass, for psychological and physical well-being)

For questions 14 through 25, indicate if you: "strongly agree", "somewhat agree", "somewhat disagree", "strongly disagree", or "not sure".

	Strongly Agree 1	Somewhat Agree 2	Somewhat Disagree 3	Strongly Disagree 4	Not Sure 5
14. You know how much exercise you need to prevent heart disease.					
15. You know what type of diet is best to protect your heart.					
16. You know how to stop smoking.					
17. You know how to control your cholesterol.					
18. You know how to control your blood pressure.					
19. You know how to control your weight.					
20. You know if fish oils are recommended to prevent heart disease.					
21. You know if you should take aspirin routinely					
22. You know if you should take antioxidant vitamin supplements to prevent heart disease.					
23. You know how depression affects your heart.					
24. You know how stress affects your heart.					
25. You know how to take the medications prescribed to you.					

YOU HAVE COMPLETED THE FIRST SECTION……..Please continue to the next section.

Section 2: This section asks a few questions about you. This information is for research purposes only. No one will be able to identify you based on your answers to these questions. **Everything is kept confidential.**

1. What is your age? _____

2. Gender: ☐ Male ☐ Female

3. What is your occupation: _____

4. Are you currently?

☐ Employed (full or part-time)
☐ Retired
☐ Homemaker, raising children, caretaker for others
☐ Disabled, unable to work
☐ Other, please specify: _____

5. How worried are you about your employment status at this time?

☐ Worried a lot ☐ Worried a little ☐ Not worried at all

6. What is your health insurance now? (Mark all that apply)

☐ Pre-paid private insurance (for example: HMO, HIP, etc.)
☐ Other private insurance (for example: Blue Cross, Aetna, etc.)
☐ Medicaid or Public Assistance (for example: DPA or ADCC)
☐ Medicare
☐ No Insurance
☐ Other, Please specify: _____

7. What is your marital status?

☐ Married
☐ Divorced or separated
☐ Never married
☐ Living in a marriage-like relationship
☐ Widow/Widower
☐ Other, please specify:_____

8. How would you describe your race/ethnicity? Are you?

☐ Hispanic/Latino culture
☐ Black/African American (non-Hispanic)
☐ Causasian/White (non-Hispanic)
☐ Asian/Pacific Islander
☐ Other, please specify: _____

9. What is the highest grade or year in school that you completed? If less than a high school diploma, fill in two digits to indicate the last grade completed (e.g. 07 for 7th grade).

   - ☐ ___grade
   - ☐ High school diploma or GED
   - ☐ No formal schooling
   - ☐ Vocational school, some college or Associate degree
   - ☐ College graduate/degree or higher
   - ☐ Other, please specify: _____

10. Household Income: What is the total annual income before taxes of everyone living in the household?

    - ☐ Under $20,000 a year
    - ☐ $20,000 to less than $35,000
    - ☐ $35,000 to less than $50,000
    - ☐ $50,000 to less than $75,000
    - ☐ $75,000 to less than $100,000
    - ☐ $100,000 to less than $150,000
    - ☐ $150,000 to less than $200,000
    - ☐ $200,000 or more a year

11. Activity Level: Aerobic exercise means activities that are continued for a least 20 minutes at a time and that raise the heart rate. This can include things like jogging, walking, riding a bike, and raking leaves. How much aerobic activity are you doing?

    - ☐ Less that 20-30 minutes at a time, 5 days per week or less (Less than 150 minutes per week)
    - ☐ 20-30 minutes of aerobic activity, 5 days per week (150 minutes per week)
    - ☐ More than 20-30 minutes, 5 or more days per week or more (Greater than 150 minutes per week)

Personal and Family History: Do you or any of your blood relatives have any of of the following:

Has a healthcare provider (or doctor) said that YOU have or ever had…	
12. High Blood Pressure	_____Yes _____No
13. Diabetes (sugar) in your blood	_____Yes _____No
14. Congestive Heart Failure	_____Yes _____No
15. Angina (Chest pain with exertion)	_____Yes _____No
16. Stroke	_____Yes _____No
17. Trans-ischemic attacks (TIAs or mini-strokes)	_____Yes _____No
18. Peripheral Artery Disease (Blockage in the legs)	_____Yes _____No
19. Depression	_____Yes _____No

Now we want to know about your family history…..

Have any of the following relatives had…	Who?
20. High Blood Pressure… if YES, then who?	_____Father _____Mother _____Brother or Sister
21. Diabetes (sugar in the blood)…if YES, then who?	_____Father _____Mother _____Brother or Sister
22. Congestive heart failure…if YES, then who?	_____Father _____Mother _____Brother or Sister
23: Angina (chest paid with exertion)…if YES, then who?	_____Father _____Mother _____Brother or Sister
24. Stroke…if YES, then who?	_____Father _____Mother _____Brother or Sister
25. Transischemic attacks (TIAs or ministrokes)… if YES, then who?	_____Father _____Mother _____Brother or Sister
26. Peripheral Artery Disease (Blockage in the legs)…if YES, then who?	_____Father _____Mother _____Brother or Sister
27. Depression…if YES, then who?	_____Father _____Mother _____Brother or Sister

Health Treatment:

28. How often do you see your primary care provider?

☐ Every year ☐ When I have a health concern

29. How often do you visit your dentist?

☐ Every 6 months ☐ Every year ☐ When I have a dental problem

30. Do you receive a flu vaccine every year?

☐ Always ☐ Sometimes ☐ Never

31. Do you know anyone living with heart disease? ☐ Yes ☐ No
If so, are they a: ☐ friend ☐ relative

32. When was the last time you had the following checked:

Blood Pressure_____ ☐ I am unsure
Lipid Levels (Cholesterol)_____ ☐ I am unsure
Blood Sugar_____ ☐ I am unsure

Please list any additional health problems.

_____
_____
_____

Current Medications. Please list all medications you are currently taking.

_____
_____
_____
_____

YOU are Doing Great!

APPENDIX I

LIFE ENGAGEMENT TEST

Instructions and Items:

Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

(1) = strongly disagree
(2) = disagree
(3) = neutral
(4) = agree
(5) = strongly agree

Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

1. There is not enough purpose in my life.

2. To me, the things I do are all worthwhile.

3. Most of what I do seems trivial and unimportant to me.

4. I value my activities a lot.

5. I don't care very much about the things I do.

6. I have lots of reasons for living.

Scoring:

1. Reverse code items 1, 3 and 5 prior to scoring.

2. Sum six items together to obtain an overall score

Citation: Scheier, M. E, Wrosch, C., Baum, A, Cohen, S., Martire, L M., Matthews, K. A., Schulz, R., & Zdaniuk, B. (2006). The Life Engagement Test: Assessing purpose in life. *Joumal ojBehavioral Medicine, 29,* 29!-298.

APPENDIX J

PATIENT HEALTH QUESTIONNAIRE-8

	Not At All N (%)	Several Days N (%)	More than half the days N (%)	Nearly Every day N (%)
Item Response Score	1	2	3	4
1. Little interest or pleasure in doing things.				
2. Feeling down, depressed, or hopeless.				
3. Trouble falling or staying asleep, or sleeping too much.				
4. Feeling tired or having little energy.				
5. Poor appetite or over-eating.				
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down.				
7. Trouble concentrating on things, such as reading the newspaper or watching TV.				
8. Moving or speaking so slowly that other people could have noticed? Or the opposite- being so fidgety or restless that you have been moving around a lot more than usual.				
	Not at all difficult	Somewhat difficult	Very Difficult	Extremely difficult
If you checked off ANY problems, how difficult have these problems made it for you to do your work, take care of things at home or get along with other people?				

APPENDIX K

FRAMINGHAM RISK SCORE

Worksheet to Calculate Framingham Point Scores

Men

Age	Points
20-34	-9
35-39	-4
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	11
70-74	12
75-79	13

Points

Total Cholesterol	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	0
200-239	7	5	3	1	0
240-279	9	6	4	2	1
≥280	11	8	5	3	1

Points

	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Nonsmoker	0	0	0	0	0
Smoker	8	5	3	1	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	0	1
130-139	1	2
140-159	1	2
≥160	2	3

Point Total	10-Year Risk%
<0	<1
0	1
1	1
2	1
3	1
4	1
5	2
6	2
7	3
8	4
9	5
10	6
11	8
12	10
13	12
14	16
15	20
16	25
≥17	≥30

10-Year risk____%

Women

Age	Points
20-34	-7
35-39	-3
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	12
70-74	14
75-79	16

Points

Total Cholesterol	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	1
200-239	8	6	4	2	1
240-279	11	8	5	3	2
≥280	13	10	7	4	2

Points

	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Nonsmoker	0	0	0	0	0
Smoker	9	7	4	2	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	1	3
130-139	2	4
140-159	3	5
≥160	4	6

Point Total	10-Year Risk%
<9	<1
9	1
10	1
11	1
12	1
13	2
14	2
15	3
16	4
17	5
18	6
19	8
20	11
21	14
22	17
23	22
24	27
≥25	≥30

10-Year risk____%

NIH Publication No. 05-3290. Revised June 2005

APPENDIX L

WELLSOURCE©

HEART HEALTH

HEALTH GUIDE & REPORT

HEALTH AWARENESS SERIES

A Guide to Understanding Heart Health

Coronary heart disease is the number one killer of men and women in the United States. More than 1.5 million Americans will have heart attacks this year and 500,000 of them will die. Another 500,000 Americans will suffer strokes.

Extensive studies have identified a number of factors that contribute to an increased risk of heart and blood vessel disease. No single risk factor is the cause of heart disease, but the more risk factors you possess, the greater your chances become for developing a heart problem. Although you may have some risk factors you can't directly control, it is in your best interest to change those risk factors that you can control.

Risk Factors ♥ ♥ ♥

You Can Control

- ✔ *Smoking*
- ✔ *High Blood Pressure*
- ✔ *High Blood Cholesterol*
- ✔ *High Blood Sugar or Diabetes*
- ✔ *Obesity*
- ✔ *Physical Inactivity*

You Cannot Control

- ✔ *Age*
- ✔ *Heredity*
- ✔ *Prior Heart Attack or Stroke*

Heart Attack

When the blood supply to your heart is severely restricted or blocked, you can have a heart attack, also called a myocardial infarction. It can be caused by hardening of the arteries or a blood clot. If the blood supply is blocked or reduced for a long time, the heart muscle can experience irreversible injury and die. Heart attack can occur at any age; 5 percent of all heart attacks happen to people under 40, and nearly half of all heart attacks occur in people less than 65. When a heart attack happens, it is critical to get help fast. Studies have shown that half of all heart attack victims wait more than two hours before getting help, reducing their chances for survival and recovery.

Angina

Angina is a condition where there is an insufficient blood supply to the heart and there is often severe chest pain. Sometimes angina occurs during or right after physical activity. Even though blood circulation to your heart may be sufficient for normal needs, your heart may be unable to get enough blood when your energy needs increase. Angina can be a warning sign of myocardial ischemia (insufficient blood flow) and possible heart attack.

Stroke

When a blood vessel in your brain bursts or is severely restricted, you can have a stroke, also called a brain attack. Without sufficient blood, nerve cells in the brain cannot function and quickly die. When nerve cells cease to function, the part of the body controlled by those cells becomes disabled. The effects of stroke are often permanent because the dead brain cells are not replaced. More than one-fourth of all strokes occur in people under age 65.

Interpreting Your Score

The risk of heart disease can depend on many factors. Your score is an indication of your current health status and health risks. A high score is a good score. A score in the Doing Well category indicates that you are probably taking care of your heart health. A score in the Needs Improving category tells you that there are changes you can make in your lifestyle to improve your health and lower heart disease risks.

Smoking

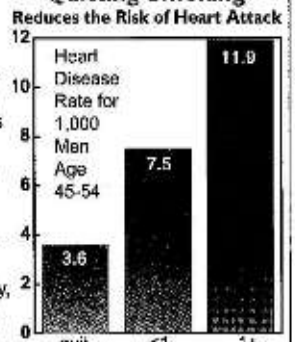
The average nonsmoker lives seven to eight years longer than a smoker.

Cigarette smoking is the most important preventable cause of premature death in the United States. Smokers' risk of heart attack is more than twice that of nonsmokers. Cigarette smoking is the biggest risk factor for sudden cardiac death. Smokers have two to four times the risk of nonsmokers. Studies have shown cigarette smoking to be an important risk factor for brain attack (stroke). Available evidence also indicates that chronic exposure to environmental tobacco smoke (secondhand smoke, passive smoking) may increase the risk of heart disease by up to 90 percent.

Nine million American children under age 5 live with at least one smoker and are exposed to secondhand smoke almost the whole day. Studies have shown that children (especially infants) of smoking parents have more lung illnesses, such as bronchitis and pneumonia, and are more likely to develop asthma. Exposure to tobacco smoke also increases the risk of heart disease in children.

A group of smokers in the famous Framingham Heart Study was followed for many years.

Some quit smoking during the time of the study. Those who continued to smoke developed heart disease three times more often than those who quit. For information about a smoking cessation program near you, contact your local American Heart Association, American Cancer Society, your doctor, or a hospital health promotion department.



High Blood Pressure

A normal blood pressure is less than 120/80.

High blood pressure, also called hypertension, is a health risk for about one in four adults in America. Because high blood pressure has few observable symptoms, it has been called the "silent killer." The only way to know if your blood pressure is high is to have it checked.

An elevated blood pressure indicates that your heart is working too hard, putting strain on your heart muscle and arteries. The extra workload placed on your heart can lead to damage and eventual heart failure. High blood pressure can cause damage to artery walls and increase cholesterol buildup (atherosclerosis). If your blood pressure is 140/90 or higher, you have high blood pressure and need to lower it to protect your health.

Ten ways to keep blood pressure low

1. Do not smoke.
2. Achieve and maintain a healthy weight.
3. Get regular physical activity, such as walking.
4. Avoid excessive stress and take time to relax.
5. Limit alcohol intake, if you drink at all.
6. Limit the use of caffeinated beverages.
7. Take blood pressure medicine when prescribed.
8. Get adequate potassium in your diet from eating five to nine servings of fruits and vegetables daily.
9. Limit your intake of salt and salty foods.
10. Have your blood pressure checked regularly by a health professional.

High Cholesterol

Research has shown that for every 1 percent you lower your blood cholesterol level, your risk for a heart attack drops by 2 percent.

High blood cholesterol is another major risk factor for heart and blood vessel disease. Cholesterol is a fat-like substance found in all body cells. Cholesterol can enter your blood in two ways. First, your own body produces all the cholesterol it needs. Second, you can acquire cholesterol by eating animal foods, such as meat, eggs, and dairy products. Plants do not contain cholesterol.

Cholesterol is an important and essential body component. Too much cholesterol, however, can lead to serious health problems. A blood cholesterol level of 200 or more is considered elevated.

High levels of cholesterol in the blood increase the chance of cholesterol buildup on artery walls, eventually plugging the blood vessels. This process is known as "hardening of the arteries" or atherosclerosis.

Recommended blood cholesterol ..... below 200
Ideal blood cholesterol ..... 160 or less

Your cholesterol level can be lowered by eating a diet low in saturated fat and high in dietary fiber and by getting regular physical activity. If you have a more serious cholesterol problem, your doctor may prescribe cholesterol-lowering medication along with diet and exercise recommendations.

Reduce Saturated Fat and Cholesterol Levels

Choose more of these	Eat less of these
Fruits & Vegetables • Fresh, frozen, canned, dried	***Fruits & Vegetables*** • Prepared in butter or sauces
Breads & Cereals • Whole grain breads and cereals • Brown rice and pasta • Low fat baked products • Baked goods containing unsaturated oils	***Breads & Cereals*** • Breads with eggs as a major ingredient • Egg noodles • Commercially baked products: pies, cakes, doughnuts, pastries, croissants, etc.
Fats & Oils • Unsaturated vegetable oils: corn, olive, canola, safflower, sesame, soybean, and sunflower • Regular or diet transfat free margarine • Low fat mayonnaise and salad dressings of recommended oils • Baking cocoa • Seeds and nuts	***Fats & Oils*** • Butter, coconut oil, palm oil, lard, and bacon fat • Dressings made with egg yolk • Chocolate • Coconut
Fish, Poultry, Meat, & Vegetable Protein • Fish, poultry without skin, lean meats, and vegetable proteins such as beans, peas, and tofu	***Fish, Poultry, Meat, & Vegetable Protein*** • Fatty cuts of meat, cold cuts, sausage, hot dogs, bacon, sardines, roe, and beans prepared with lard
Dairy Products • Skim or 1% milk, low fat buttermilk • Nonfat or low fat yogurt and cottage cheese • Low fat cheeses, farmer or pot cheeses (labeled no more than 2 to 6 grams of fat per oz.) • Sherbet or sorbet, nonfat ice cream, or frozen yogurt	***Dairy Products*** • Whole or 2% milk, half and half, imitation milk products or creamers, and whipped toppings • Whole milk yogurt and cottage cheese • All natural cheeses, low fat or "light" cream cheese, and sour cream • Ice cream
Eggs • Egg whites (2 whites = 1 whole egg in recipes) • Cholesterol-free egg substitutes	***Eggs*** • Egg yolks

Diabetes

Diabetes, or high blood sugar, is a serious condition that significantly increases the risk of coronary heart disease. Eighty percent of diabetics die from some form of cardiovascular disease, often a heart attack. There is no cure for diabetes, but you can take steps to prevent or control it. Eighty-five percent of people who have type 2 diabetes are at least 20 percent overweight. Obesity and advancing age seem to promote the development of diabetes. Maintaining a healthy weight, increasing physical activity, and limiting calories and saturated fat in your diet will help in the prevention and control of diabetes.

Physical Inactivity

Regular physical activity can help you reduce your risk of heart disease. The American College of Sports Medicine and the Centers for Disease Control and Prevention recommend that every adult be physically active at least 30 minutes a day. Physical activity helps to take off extra pounds, control blood pressure, and lower blood cholesterol levels. Walking, jogging, swimming, bicycling, aerobic dancing, tennis, and hiking are good activities to strengthen your heart and improve your health.

Most people can begin a moderate physical activity program without medical clearance. However, if you have heart disease or another serious disease condition, or if you are over 40 and have been sedentary for a long time, see your doctor for medical clearance before beginning a vigorous activity program.

Managing Your Weight

For many people, weight management is an important and necessary step in heart health. Excess weight increases strain on the heart and increases the risk of high blood pressure, high cholesterol, and diabetes. Losing weight, if needed, helps reduce high blood fats and blood pressure, reduces your risk of heart disease, and makes physical activities easier.

Weight control tips

- Limit your consumption of foods high in saturated fat.
- Choose low-calorie, high-fiber foods.
- Use only nonfat or low-fat dairy products.
- Choose only lean meats, fish, skinless poultry, and low-fat vegetarian protein.
- Eat a variety of fresh fruits and vegetables.
- Keep serving sizes moderate and avoid second helpings.
- Get regular physical activity such as walking, 30 to 60 minutes daily.
- Limit your intake of high-calorie, low-nutrient foods such as desserts, soft drinks, and snack foods.

Risks from being overfat

Excess weight can increase your risk or serious heart problems. Many diseases that affect the heart are directly related to being overfat.

- ***Heart Disease***
  Heart disease is the leading cause of death in the United States. Being overweight and eating a high-fat, high-cholesterol diet are major contributors.
- ***High Blood Pressure***
  Increased body weight puts extra strain on your heart and blood vessels. Excess weight is a major cause of high blood pressure.
- ***Diabetes***
  Excess weight makes the body resistant to insulin and is a major contributing factor to type 2 diabetes.
- ***Stroke***
  Strokes are associated with high blood pressure and a tendency for increased blood clotting. Excess weight increases both of these risk factors.
- ***Arthritis***
  Excess fat puts added strain and wear on muscles, ligaments, and joints.

APPENDIX M

MULTIPLE REGRESSION ANALYSIS STATISTICS

Regression Analysis Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.359[a]	.129	.105	13.01435	.129	5.388	3	109	.002	
2	.337[b]	.113	.097	13.07210	-.016	1.978	1	109	.162	2.036

a. Predictors: (Constant), PHQtotal, FriendCVD, LETtotal
b. Predictors: (Constant), PHQtotal, FriendCVD
c. Dependent Variable: CRIPTOT_RC

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2737.786	3	912.595	5.388	.002[b]
	Residual	18461.683	109	169.373		
	Total	21199.469	112			
2	Regression	2402.688	2	1201.344	7.030	.001[c]
	Residual	18796.781	110	170.880		
	Total	21199.469	112			

a. Dependent Variable: CRIPTOT_RC b. Predictors: (Constant), PHQtotal, FriendCVD, LETtotal
c. Predictors: (Constant), PHQtotal, FriendCVD

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	52.540	10.849		4.843	.000	31.038	74.041					
	FriendCVD	4.111	2.588	.144	1.589	.115	-1.018	9.239	.192	.150	.142	.968	1.033
	LETtotal	-.505	.359	-.129	-1.407	.162	-1.217	.207	-.202	-.134	-.126	.943	1.060
	PHQtotal	1.132	.406	.255	2.792	.006	.328	1.936	.295	.258	.250	.957	1.045
2	(Constant)	38.609	4.448		8.680	.000	29.795	47.424					
	FriendCVD	4.632	2.572	.163	1.801	.074	-.466	9.730	.192	.169	.162	.989	1.012
	PHQtotal	1.234	.401	.278	3.078	.003	.439	2.028	.295	.282	.276	.989	1.012

a. Dependent Variable: CRIPTOT_RC

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VITA

Michelle Block earned a BSN from Valparaiso University in 1985 and a MS from Purdue University Calumet in 1993. Her clinical background includes work in the areas including: cardiac and critical care, open heart ICU, cardiac rehabilitation, and catheterization lab recovery. Her experience working as a clinical preceptor and time spent providing patient education as a cardiac rehabilitation nurse lead to the decision to pursue a position in nursing education. From 2000 until 2004 she held a lecturer position at Indiana University Northwest teaching a variety of classes. In 2004 Block began classes at Loyola University Chicago to fulfill a long term goal of pursuing doctoral education. At the same time, she accepted a clinical faculty position at Purdue University Calumet. In 2006 she accepted a position as an Assistant Professor and in 2012 promoted to Associated Professor with tenure. She currently teaches in both undergraduate and graduate nursing programs and regularly teaches graduate research, graduate and undergraduate ethics, medical surgical nursing, pathophysiology, and undergraduate theories.

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