2010

Depressive Symptoms in Women Being Screened for Cardiovascular Disease Risk

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DEPRESSIVE SYMPTOMS IN WOMEN BEING SCREENED FOR CARDIOVASCULAR DISEASE RISK

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE GRADUATE SCHOOL

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

PROGRAM IN NURSING

BY

SUZANNE M. SAVOY

CHICAGO, ILLINOIS

MAY 2010

ACKNOWLEDGEMENTS

Many people have provided support during my doctoral studies and this dissertation endeavor. The following people went above and beyond with encouragement.

Dr. Jack Ferlinz, my husband, overcame his initial shock that I was returning to school and has been a marvelous support during the years of this doctoral education journey. His outstanding culinary skills were a great added value on those days when all I could manage was working on my dissertation. I owe you a trip to Egypt and to Europe for the summers when I was immersed in one thing or another related to my doctoral studies and then the dissertation.

My brother Dennis Savoy has encouraged me the whole way and never said "Why are you doing this?" Thank you for also showing me that a healthy lifestyle is not incompatible with writing a dissertation.

Dr. Sue Penckofer made all of this possible when she suggested that regardless of my age, I could be whatever age and still acquire a PhD. Her guidance is beyond measure. Your scholarly example and advice has changed my professional trajectory. Doing good research is one way of saying thank you but this isn't enough.

Drs. Gloria Jacobson, Barbara Velsor-Friedrich, and Ramon Durazo-Arvizu were a splendid and insightful committee through my preliminary examination,

proposal, and this dissertation. With your expertise, I knew I could not wander far from doing good science. Thank you.

The summer program at Loyola University Chicago was the perfect program for me. Being able to become immersed in course work for three summers was magical for me. The extraordinary faculty was inspirational. Our cohort set a standard which motivated us all and we still managed to laugh every day. Dr. Sue Hayden led our laughter therapy and never let us get too full of ourselves – especially when we were studying philosophy. Dr. Diane Ernst exhibited grace and demonstrated great humor dealing with "Shirley". Debbie Lazzara had the best laugh, and was a faithful defense celebrant. Two faithful correspondents from my cohort more than tolerated my interminable emails of progress and doubt, Dr. Patricia Wright, and Michelle Block. Meeting you is a great treasure from the doctoral program. You were there with encouragement all the way.

A special thank you to Debbie Best, MSN, RN. You made access to the women for my study not only possible, but a great experience. I look forward to years of collaboration advancing the cardiovascular wellness in our community.

I deeply appreciate the early support for my doctoral studies from the nursing leadership, my clinical nurse specialist colleagues, and the nursing staff at Covenant HealthCare.

Dr. Frank Dane, your patience with me struggling to be sure my statistics were done correctly is without peer. With great kindness and extraordinary expertise you put me on the right path. I know that heavenly forces made you available at the right time.

Thank you to the Columbia University-Presbyterian Hospital School of Nursing Alumni Association, Inc. for the very generous graduate scholarship, to the Theta Chi Chapter of Sigma Theta Tau for their research grant and to Saginaw Valley State University for the Professional Development grant. These funding sources helped to support my dissertation research.

And lastly, I appreciate the encouragement and times of stress-releasing laugher with my teaching colleagues at Saginaw Valley State University, Dr. Debra Wagner and Dr. Ava Lewis.

In memoriam for my parents, Dr. William J. and Mary M. Savoy.

Better to illuminate than merely to shine, to deliver to others contemplated truths than merely to contemplate.

St. Thomas Aquinas

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LIST OF ABBREVIATIONS

ACS	Acute Coronary Syndrome
AHA	American Heart Association
ASK	Assessing Depressive Symptoms Improves Knowledge of CVD Risk
BDI	Beck Depression Inventory
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CAD	Coronary Artery Disease
CES-D	Center for Epidemiological Studies-Depression Scale
CDC	Centers for Disease Control and Prevention
CHD	Coronary Heart Disease
CI	Confidence Interval
CR	Cardiac Risk
CVD	Cardiovascular Disease
CVS	Cardiovascular Services
DIS	Diagnostic Interview Schedule
DRR	Dose-Response Relationship
DS	Depressive Symptoms
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders-4th edition
ENRICHD	Enhancing Recovery in Coronary Heart Disease

FCI	Functional Comorbidity Index
HAD	Hospital Anxiety and Depression Scale
HDL-C	High-Density Lipoprotein Cholesterol
HLBs	Healthy Lifestyle Behaviors
HMO	Health Maintenance Organization
HPLP-II	Health Promoting Lifestyle Profile-II
HPM	Health Promotion Model
HR	Hazard Ratio
HRQOL	Health Related Quality of Life
IHD	Ischemic Heart Disease
IRB	Institutional Review Board
MDD	Major Depressive Disorder
MI	Myocardial Infarction
MMPI	Minnesota Multiphasic Personality Inventory
NIMH	National Institute of Mental Health
NCEP	National Cholesterol Education Program
NHANES	National Health and Nutrition Examination Survey
NHLBI	National Heart Lung and Blood Institute
OB-GYN	Obstetrics-Gynecology
OR	Odds Ratio
PCI	Percutaneous Coronary Intervention
QLI	Quality of Life Index ©

QOL	Quality of life
RA	Risk Awareness
RR	Relative Risk
SADHART	Sertraline Antidepressant Heart Attack Randomized Trial
SBDD	Sad, Blue, or Depressed Days
SCL	Symptom Checklist
SES	Socioeconomic Status
SF	Short Form
SSRI	Selective serotonin reuptake inhibitor
TC	Total Cholesterol
TLC	Therapeutic Lifestyle Change
USPSTF	United States Prevention Services Task Force
WHI-OS	Women's Health Initiative-Observational Study
WHO	World Health Organization
WISE	Women's Ischemia Syndrome Evaluation Study

ABSTRACT

Background: Depressive symptomology is an independent risk factor for cardiovascular disease, and remains under-diagnosed as well as under-treated by healthcare providers. Over 15% of persons with cardiovascular disease have depressive symptoms, and women are twice as likely to experience these symptoms when compared to men. Depressive symptoms significantly impact on an individual's overall quality of life. Depressive symptomology makes adherence to recommended risk reduction plans difficult, subsequently increasing risk for cardiovascular disease. Depressive symptoms are associated with greater cardiovascular morbidity and mortality, particularly for women. Assessment of depressive symptoms in women "at risk" for cardiovascular disease has not been well studied, and hence was the justification for the research undertaken.

Purpose: This study investigated the relationship between depressive symptoms, health-promoting lifestyle behaviors, heart disease risk awareness, cardiac risk, and quality of life in women. Whether the effect of depressive symptoms on quality of life was mediated by cardiac risk and/or health-promoting lifestyle behaviors was also examined, and is a unique contribution of this study.

Methods: Guided by the Wilson and Cleary Health-Related Quality of Life Model and the Health Promotion Model, a cross-sectional correlational descriptive study was conducted. Women who attended either individual or large-group cardiovascular

screening events in the Great Lakes region were recruited. One hundred fifty-one women were eligible and125 (82.8% participation rate) completed the study. The nonprobability convenience sample (calculated to a power of .80, an alpha of .05, and a .20 effect size) included women aged 30-75 years who were able to read, write, and speak English. The study was approved by the institutional review boards from Loyola University Chicago, the screening center hospital, and the university where the investigator is on faculty.

Measurements: The Center for Epidemiological Studies Depression Scale, the Framingham risk score, the Ferrans-Powers Quality of Life Index Generic Version-III, the Health-Promoting Lifestyle Profile-II, and a series of heart disease risk awareness, demographic and health history questions comprised the study measurements. Physical (e.g. body mass index and percent body fat) and serum measurements (e.g., lipid profile) which were part of the screening event were also measured. The Functional Comorbidity Index was used to determine the women's general health history.

Data Analysis: The SPSS version 15 was used to perform the statistical analyses. Spearman rho correlations determined the associations among the major variables. Logistic regression analyses were used to analyze the dose-response relationships between depressive symptoms and the study variables. Analysis for the possible mediation was conducted using simple linear regression analyses according to the methods outlined by Baron and Kenny (1986).

Results: Study participants were predominantly urban, non-Hispanic, white, married, with some college education, employed full-time, and a household income between

$25,000-49,999. The mean age was 57.7 (± 9.6). Risk awareness measurements identified three key findings. First, many women (67.2%) were aware of their risk of heart disease before attending the screening. Second, most (84.8%) said they had learned about heart disease risk in women either from their membership in the hospital's Heart Advantage program or the media. Third, just over half (56.8%) learned about their heart disease risk from their primary care provider. The cardiac risk profile revealed that the mean Framingham score was 3.3% (± 3.9) which placed 93.6% of the women in the "low risk" category. Despite the low Framingham risk score, individual risk factors were appreciably abnormal. Most of the women (83.2%) had the total cholesterol greater than 160 mg/dl and 40% had the high-density lipoprotein cholesterol below 50 mg/dl. Seventy percent had a systolic blood pressure above the recommended normal of 120 mmHg. More than half (56%) of the women had a body mass index equal to or greater than 30. Almost all (93.5%) had greater than 30% body fat, and 57.4% had a waist circumference equal to or greater than 35 inches. Using the American Heart Association's risk classification, 25% of the women were reclassified at "low risk". The change in risk classification was attributable to their physical inactivity. A quarter (25%) of the women reported that their stress level was high/chronic and over half (55%) indicated that they only sometimes performed stress management health-promoting behaviors.

Using the Centers for Epidemiological Studies Depression cut-score (equal to or greater than 16), over one third (33.6%) of the women reported significant depressive symptoms. Depressive symptoms were not associated with cardiac risk or with risk

awareness. Since these were generally “risk aware women”, it is not surprising that depressive symptoms were not associated with risk awareness. In addition, due to the fact that most of the depressed women were in the “at risk and high risk” groups, it may have been difficult to detect a significant relationship between depressive symptoms and risk status. However, depressive symptoms were inversely associated with health-promoting lifestyle behaviors (r_S = -.37, p < .01) and quality of life (r_S = -.51, p < .01). Furthermore, depressive symptoms had a dose-response relationship with health-promoting lifestyle behaviors (OR= .92, 95% CI .88, .97, p < .001) and quality of life (OR= .85, 95% CI .79, .92, p < .001). The higher the depressive symptoms score, the less likely were the women to follow health-promoting lifestyle behaviors and the less likely were they to report a good quality of life. Health-promoting lifestyle behaviors (b = 2.20, SE .83, t = 2.65, p < .01) but not cardiac risk mediated the effect of depressive symptoms on quality of life.

Conclusions: An inverse and dose-response relationship was found between depressive symptoms, health-promoting lifestyle behaviors, and quality of life. Since no relationship was found between depressive symptoms and cardiac risk, it was eliminated as a possible mediator. Health-promoting lifestyle behaviors were found to mediate the relationship between depressive symptoms and quality of life in these women being screened for cardiovascular disease risk.

Implications for Nursing Practice: Since nurses most often manage cardiovascular disease risk screening programs, it is important for them to understand the impact that depressive symptoms have on health-promoting lifestyle behaviors and quality of life.

The results of this study indicate that screening for depressive symptoms is important for cardiovascular disease risk assessments. It is recommended that education and implementation of depression assessment be incorporated into cardiovascular risk screening events. Finally, the inverse dose-response relationship between depressive symptoms and adherence to treatment plans should be an important consideration when designing risk reduction interventions for patients in the future.

CHAPTER ONE

PROBLEM STATEMENT

Cardiovascular disease (CVD) is the leading cause of death among women today (Rosamond et al., 2007). Depression has been identified as an independent risk factor for persons with CVD (Rugulies, 2002). In the general population, women are twice as likely to have depression as their male counterparts (Hasin, Goodwin, Stinson, & Grant, 2005; NIMH, 2005). For persons at risk for CVD or with diagnosed CVD, women are still twice as likely to have depression (Ferketich, Schwartzbaum, Frid, & Moeschberger, 2000). Depression has been clearly associated with increased morbidity and mortality in persons with CVD (Rozanski, Blumenthal, & Kaplan, 1999).

Depressive symptoms, a subclinical syndrome of depression (Table 1), have more recently been examined. Depressive symptoms have been associated with increased risk for CVD, nonadherence to treatment recommendations, and increased cardiac morbidity and mortality. A meta-analysis of the effect of depressive symptoms on incident CVD in healthy subjects concluded that depressive symptoms were indeed independent risk factors for CVD, and that there was a 64% increased risk of developing heart disease in depressed subjects (relative risk [RR] 1.64, 95% confidence interval [CI] 1.29-2.08) (Rugulies, 2002). A recent study reported that increasing severity of depressive symptoms was associated with higher blood-pressure, more CVD risk factors, greater stress and lower social support (Artinian, Washington, Flack,

Hockman, & Jen, 2006). In addition, the severity of depression was found to be a mediator between diastolic blood pressure and stress in a sample of urban African-American women (Artinian et al.)

Table 1.

Depressive Symptoms

▪ Persistent sad, anxious, or "empty" mood ▪ Loss of interest or pleasure in activities, including sex ▪ Restlessness, irritability, or excessive crying ▪ Feelings of guilt, worthlessness, helplessness, hopelessness, pessimism ▪ Sleeping too much or too little, early-morning awakening	▪ Appetite and/or weight loss or overeating and weight gain ▪ Decreased energy, fatigue, feeling "slowed down" ▪ Thoughts of death or suicide, or suicide attempts ▪ Difficulty concentrating, remembering, or making decisions ▪ Persistent physical symptoms that do not respond to treatment, such as headaches, digestive disorders, and chronic pain

NIMH (2005), p. 3-4.

Depressive symptoms have also been found to decrease one's ability to comply with recommendations to alter unhealthy behaviors and other aspects of a medical treatment plan (Barefoot & Schroll, 1996; DiMatteo et al., 2000; Katon, 2003; Vinkers, Gussekloo, Stek, van der Mast, & Westendorp, 2005). A meta-analysis concluded that there was also a dose-response relationship between depressive symptoms and decreased adherence, and that persons with depressive symptoms were three times more likely to exhibit decreased adherence (OR 3.03, 95% CI, 1.96-4.89) (DiMatteo et al.).

Besides adversely affecting adherence to a CVD risk modification program, depressive symptoms have been found to be a significant predictor for myocardial

infarction treatment-seeking delay (Bunde & Martin, 2006). In addition, in the Sertraline Antidepressant Heart Attack Randomized Trial (SADHART), 53% of persons admitted for acute coronary syndrome (ACS) had depression prior to their hospitalization (Glassman, Bigger, Gaffney, Shapiro, & Swenson, 2006). Most compelling was that 94% of the reported pre-hospitalization depressive episodes actually began more than 30 days prior to hospitalization (Glassman et al.). This finding is contrary to previous research that had reported that depression was a consequence following a heart attack and during the recovery from the acute event (Lesperance, Frasure-Smith, Talajic, & Bourassa, 2002). Depressive symptoms have also been reported to more than double the risk for a heart attack- OR 2.24, 95% CI, 1.37-3.60 (Barth, Schumacher, & Herrmann-Lingen, 2004). Depressive symptoms have been found to have a graded increased risk of death from heart disease; for each one unit increase in depressive symptoms scores the risk of death increased by 4% (RR=1.04, 95% CI, 1.01-1.07), (Anda et al., 1993). Furthermore, depressive symptoms can increase the risk of all-cause mortality by 59% (RR 1.59, 95% CI 1.26-2.00, $p < 0.001$; Barefoot & Schroll, 1996).

Nearly all women are now considered to be at risk - classified as optimal risk, at risk, and high risk- for CVD (Mosca, Banka et al., 2007). A woman who has depressive symptoms is particularly at risk for CVD because depressive symptoms are under-diagnosed in the overall population, and in those at risk for and with CVD (Huffman et al., 2006; NIMH, 2001; Ziegelstein et al., 2005). In addition to being under-diagnosed,

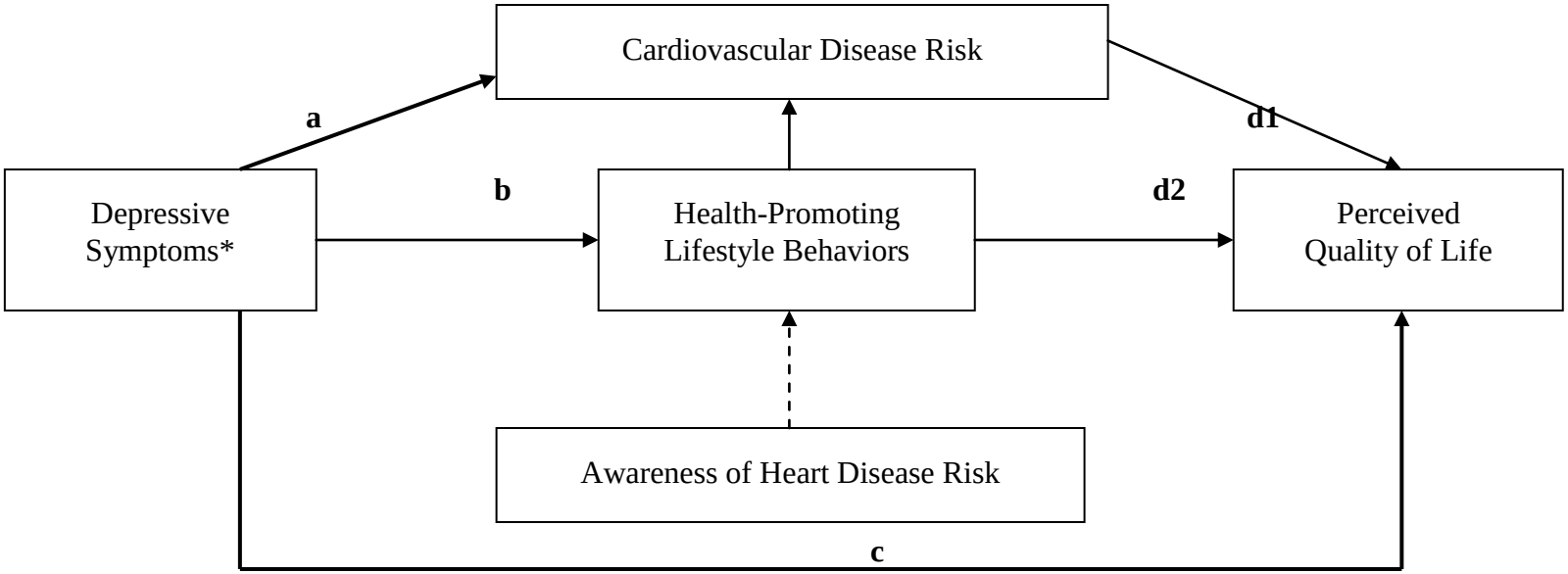
depressive symptoms have not been recognized as one of the traditionally described modifiable CVD risk factors - diabetes, hypertension, hyperlipidemia, obesity, smoking, and sedentary lifestyle, as evidenced by their absence in the most recent AHA report of heart disease statistics (Rosamond et al., 2007).

A woman's ability to adhere to a CVD risk modification program, therefore, could be diminished due to the presence of depressive symptoms. Screening for the presence of depressive symptoms should be part of screening for CVD risk. With an interest in the prevention of disease, earlier screening for depressive symptoms is prudent rather than waiting to screen for depressive symptoms until a woman has developed coronary heart disease (CHD) (Mosca, Banka, et al., 2007). In that way, we can tailor risk modification instructions to women with depressive symptoms. It is critical that we increase our understanding of the relationship of depressive symptoms to healthy lifestyle behaviors, to awareness of heart disease risk, and perceived quality of life (QOL) in women at risk for CVD. There has been no research - identified thus far - investigating the relationship of depressive symptoms to perceived QOL in women being screened for CVD risk.

There is also limited information regarding the dose-response relationship of depression and its effect on cardiac risk factors, adherence to treatment, as well as cardiac events. In other words, what is the level of depression that may cause these adverse outcomes? Most clinicians associate the concept of dose-response relationship to the nonlinear relationship between escalating drug dosage and the drug's increased

effect. In epidemiological studies, a dose-response relationship "refers to changes in the prevalence or incidence of a given effect associated with changes in the level of a possible cause" (OECD, 2001). This means that an increased level of exposure to a risk factor (the dose) is associated with an increased frequency or severity of a disease which in turn may indicate a causal relationship (Weed, 1997). A classic example of the dose-response causal relationship between a risk factor and disease is the association between smoking and lung cancer (Hulley et al., 2001). Given the literature regarding depression and CVD, it is logical to determine the dose-response relationship between the level of depression (i.e., depressive symptoms) and cardiovascular risk (Figure 1). In addition, since both depression and CVD impact one's QOL, it would be important to determine their effect independently and dependently on QOL. Because evidence indicates that depression impacts on health-promoting lifestyle behaviors, and health-promoting lifestyle behaviors impact on cardiovascular risk, this variable is also important to study.

Figure 1. Model of Study



Note: * - Sociodemographic variables and health history were statistically controlled. Line **c** indicates the direct relationship and lines **a** with **d1**, and **b** with **d2** indicate the mediational models that were investigated.

Purpose

The purpose of this study was to investigate the relationship of depressive symptoms to the status of health-promoting lifestyle behaviors, the awareness of heart disease risk, and cardiac risk and how these relationships affect perceived QOL. No study – identified thus far – had examined the relationship of: depressive symptoms, cardiac risk, health-promoting lifestyle behaviors, awareness of heart disease risk, and quality of life in women at risk for CVD.

Research Aims

The specific aims were:

1) To determine the relationship between depressive symptoms, the cardiac risk score, the health-promoting lifestyle behaviors, an awareness of heart disease risk, and the perceived QOL in women being screened for CVD risk.
2) To determine whether there is a dose-response relationship between depressive symptoms and:
    a) The cardiac risk score (Line a in Figure 1),
    b) the health-promoting lifestyle behaviors (Line b in Figure 1), and
    c) the perceived QOL (Line c in Figure 1).
3) To determine whether the effect of depressive symptoms on perceived QOL is direct or indirect (i.e., mediated by cardiac risk- d1 or health-promoting lifestyle behaviors-d2). (Figure 1).

Hypotheses

1) There is a relationship between increased depressive symptoms and:

a) The increased cardiac risk score,

b) A decreased awareness of heart disease risk,

c) Lower health-promoting lifestyle behaviors, and

d) The lower perceived QOL in women being screened for CVD risk.

2) There is a dose-response relationship between depressive symptoms and:

a) The cardiac risk score,

b) health-promoting lifestyle behaviors, and

c) the perceived QOL.

3) Depressive symptoms will have either a direct effect on perceived QOL or will have an indirect effect mediated by cardiac risk (d1) or health-promoting lifestyle behaviors (d2) (Figure 1).

CHAPTER TWO

LITERATURE REVIEW

The evidence to support the aims of the study is presented in the following sequence: (1) the relationship between depressive symptoms, CVD risk, and ischemic heart disease (IHD), (2) the relationship between depressive symptoms and health promotion behaviors, (3) the relationship between depressive symptoms and QOL, and (4) variables that impact QOL.

Methods

A series of searches in CINAHL, Ovid Medline, PsychInfo through December 2009 were conducted to identify the literature to support the aims of the study. Search terms included: heart disease, risk factors, depression, health promotion, health-related quality of life, and quality of life. Searches were refined for various combinations of these search terms and for English, humans, studies, and reviews. "Depressive symptoms" is not recognized as a keyword. Ancestry searches were conducted with all relevant references.

Results

Literature that supports the relationship between depressive symptoms and CVD risk, IHD, and health promoting behaviors in incident CVD, yielded five systematic reviews and a combination of 26 prospective and observational studies. The theme of a dose-response relationship between depressive symptoms and incident CVD was found

in 20 (77%) of these prospective and observational research studies along with one intervention study (Iosifescu et al., 2005), and two systematic reviews (Kubzansky & Kawachi, 2000; Rugulies, 2002).

Five groups of variables were found to have a dose-response relationship with depressive symptoms. A dose-response relationship was found between depressive symptoms and cardiac risk factors such as physical activity, the metabolic syndrome, and the presence of unhealthy behaviors. Nonfatal IHD along with fatal IHD and all-cause mortality were also identified as having dose-response relationships with depressive symptoms. Two proposed indicators of subclinical atherosclerosis, coronary calcium scoring and calculation of carotid intima-media thickness, were used in two studies that reported a dose-response relationship between depressive symptoms and these noninvasive cardiovascular assessments. Eight additional studies reported relationships between depressive symptoms and CVD albeit not a dose-response relationship. Lastly, a dose-response relationship was found between depressive symptoms and health promotion. Appendices A through E summarize the supporting research. Each table of studies presents the research in ascending chronological order listing the duration of follow-up, the samples' characteristics inclusive of the number of participants, mean age, percent female and the racial composition, the depression measurement instrument, and the leading findings.

The foundation for this study was found primarily in the literature describing the relationship between depressive symptoms and incident CVD. That literature summary is followed by a summary of the literature describing the relationship between

depressive symptoms and health promotion, then depressive symptoms and QOL, and will conclude with a summary of additional variables known to affect QOL.

The Relationship Between Depressive Symptoms and Cardiovascular Disease Risk

The literature describing the relationship between depressive symptoms and CVD covers the continuum from depressive symptoms as independent risk factors for CVD to the increased risk of experiencing IHD and IHD mortality. This review begins with a summary of the investigation of depressive symptoms and subclinical indicators of atherosclerosis. The review continues with the literature describing the relationship between depressive symptoms and CVD risk factors, and concludes with the relationship of depressive symptoms to health promotion behaviors.

Depressive Symptoms and Evidence of Subclinical Atherosclerosis

The noninvasive measurement of the thickness of the carotid arteries' intima-media and the extent of the calcification of the coronary arteries and the aorta are being promoted as indicators of subclinical atherosclerosis. The current AHA heart disease statistics (Lloyd-Jones et al., 2009) have now added tracking of subclinical atherosclerosis statistics. Both intima-media thickness and vessel calcification are vascular changes that are part of the complex blood flow limiting atherosclerotic process. Two relevant studies are summarized in Appendix A.

Carotid intima-media thickness was measured as an indicator of subclinical atherosclerosis in young Finnish participants (Elovainio et al., 2005). Although more women than men were found to be depressed, a relationship between reduced intima-media thickness and depressive symptoms was found at only the highest levels of

depressive symptoms in men. This could be because the women were still less than 30 years old at the time of the measurement of their carotid intima-media thickness. The investigators posited that high levels of depressive symptoms could serve as an early warning sign for the development of atherosclerosis.

The electron beam tomography measurement of coronary artery and aortic calcification was used to indicate subclinical atherosclerosis in a study of the association of vessel calcification with depressive symptoms (Agatisa et al., 2005). A group of perimenopausal women without any clinical evidence of CHD were recruited into the Study of Women's Health Across the Nation (SWAN) study. Coronary artery and aortic calcification were identified in 45% of the women. The women with higher calcification scores had higher levels of CVD risk factors. Women with any coronary artery calcification, which was more frequent in the African-American group, tended to have higher depressive symptoms scores. A dose-response relationship was also identified; the women with a history of recurrent depression had higher calcification scores than those with just one episode of depression.

This evidence for the relationship between depressive symptoms and subclinical atherosclerosis is important to elucidate the role of depressive symptoms to the development of atherosclerosis. The next section presents the data for the relationship between depressive symptoms and CVD risk factors.

The Relationship Between Depressive Symptoms and Cardiovascular Disease Risk

The investigation of the relationship between depressive symptoms and CVD risk factors is based on data that established the very concept of CVD risk factor

assessment. The concept of CVD risk factors was pioneered by the Framingham Heart Study which published in 1998 a currently used CHD risk assessment method (Redberg et al., 2009).The Framingham Heart Study was also a pioneer in the investigation of the relationship between psychological factors and CHD (Haynes, Feinleib, & Kannel, 1980).

The concept of CHD and CVD risk assessments is based on decades of epidemiological research. This research has established a relationship pattern among a cluster of what are now described as "life-habit risk factors" (National Cholesterol Education Program [NCEP], 2001) and the probability that they will increase the risk of developing CHD and CVD. Currently accepted life-habit risk factors are: obesity, physical inactivity, and a diet known to promote atherosclerosis. Additional modifiable CVD risk factors include: diabetes, hyperlipidemia, hypertension, and smoking. These risk factors are the bedrock for current CVD prevention, risk modification, and treatment guidelines. Non-modifiable risk factors are family history, age, gender, and prior heart attack.

The epidemiological studies of the Framingham Heart Study established the lexicon for heart disease assessment and validated the first global CHD risk assessment profile methodology (Wilson et al., 1998). The current approach to the assessment of CHD risk advocated by the NCEP (2001) uses the CHD risk assessment criteria generated by the Framingham Heart Study to calculate the gender-specific 10-year risk of having a cardiac event. Amid discussions of the limitations of the 1998 Framingham CHD risk assessment (Cooney, Dudina, & Graham, 2009; D'Agostino et al., 2008;

Sacco et al., 2009) it remains one of several acceptable global risk assessments (Redberg et al., 2009).

One of the points in the discussion of which is the best risk factor assessment method is that the 1998 Framingham risk assessment addresses "hard" CHD events such as an MI in contrast to the expanded current interest in "softer" CVD outcomes such as angina or stroke. Efforts to expand from CHD to CVD risk assessment have included the addition of diabetes and body mass index (BMI) particularly to enhance the ease of use in primary care (D'Agostino et al., 2008) or the addition of waist circumference, alcohol consumption, and physical activity (Sacco et al., 2009). For the purposes of this study, the term CVD risk assessment will be used since many investigators identified other than cardiac events as the outcomes in their studies.

Continuing the line of investigation of the early cardiac risk factor epidemiological studies, several studies have established the data to support the contention that depressive symptoms are independent risk factors for CVD. Furthermore, these prospective studies have established that there is a dose-response relationship between depressive symptoms and incident CVD (Rugulies, 2002). Rugulies meta-analysis concluded that depressive symptoms are independent risk factors for CVD and that depressive symptoms increase the risk of CVD by 64%.

Physical activity and the metabolic syndrome are the CVD risk factors that have been investigated in prospective studies of the relationship of depressive symptoms to CVD risk factors in incident CVD. The identification of risk factor profiles further elucidates the relationship between depressive symptoms and CVD.

Physical Inactivity

Four longitudinal studies found an inverse relationship between depressive symptoms and physical activity and are summarized in Appendix B. The first study to describe a dose-response relationship where higher depressive symptoms were associated with lower levels of physical activity was the Farmer et al. (1988) study of a cohort from the National Health and Nutrition Examination Survey (NHANES) data. Both gender and racial differences were found in the relationship between depressive symptoms and physical activity. Women with little or no recreational physical activity had higher BMI, higher heart rate, and higher diastolic blood pressure. These physically inactive white women had twice the likelihood of depressive symptoms and black women had over 19 times the likelihood of having depressive symptoms. White men with little or no recreational physical activity were twice as likely to have depressive symptoms while black men with little or no recreational physical activity were more than 16 times as likely to have depressive symptoms. A study limitation, however, was the small percentage of Blacks (8%) in the sample.

An inverse relationship between depressive symptoms and physical activity was identified in postmenopausal women by the Women's Health Initiative Observational Study (WHI-OS) (Wassertheil-Smoller et al., 2004). Depressed mood was identified at baseline in 15.8% of the women with another 12.3% reporting a history of depressed mood. Exercise was defined as episodes per week of moderate or strenuous physical activity for ≥ 20 minutes. Women who reported more than four episodes of exercise per week were at half the risk of developing depression.

Middle-aged women participated in the Australian Longitudinal Study of Women's Health (Brown et al., 2005) that also found an inverse relationship between depressive symptoms and physical activity. Regardless of exercise frequency, the likelihood of fewer depressive symptoms was the same with increasing levels of physical activity. Women who reported a high level of habitual physical activity were about as half as likely to develop depression compared to the women who reported a low level of habitual physical activity.

No race or gender differences were found in the inverse relationship between physical activity and depression in a younger cohort of African American and Caucasian men and women (Knox et al., 2006). Lipid profiles, however, did worsen only in Caucasians. Diabetes developed only in African American women, who also had the higher prevalence of the most frequent episodes of depression. The investigators concluded that even in this healthy cohort, depression was associated with CVD risk factors most particularly smoking, BMI, physical activity and diabetes.

The inverse relationship between depressive symptoms and physical activity is particularly relevant considering that sedentary lifestyle is frequently cited as a CVD risk factor. The adoption of sufficient exercise is probably the most frequently prescribed element to therapeutic lifestyle changes (TLC) for those identified at risk for CVD. Physical activity, however, is not the only CVD risk factor to be associated with depressive symptoms as evidenced by the findings of the following studies.

Metabolic Syndrome and Risk Profiles

Metabolic syndrome is an umbrella term for a cluster of CVD risk factors. Although there is some variability in the specific values for the included risk factors by organization or group (Johnson & Weinstock, 2006), there is consensus regarding the specific risk factors to be assessed. A person is considered to have the metabolic syndrome if they have three of the five defining risk factors: obesity, elevated triglycerides, decreased HDL-C, hypertension, and elevated fasting plasma glucose. The current guidelines for the diagnosis and management of the metabolic syndrome were published as a joint scientific statement by the American Heart Association and the NHLBI (Grundy et al., 2005). These diagnostic criteria are listed in table 2.

Table 2. Diagnostic Criteria for Metabolic Syndrome

Measure (Any 3 of 5 Criteria Constitute Diagnosis of Metabolic Syndrome)	**Categorical Cut Points (Women)**
Elevated waist circumference	≥ 35 inches
Elevated Triglycerides	≥ 150 mg/dl or Drug treatment
Reduced HDL-C	< 50 mg/dl or Drug treatment
Elevated BP	≥ 130 mmHg SBP or ≥ 85 mmHg DBP or Drug treatment
Elevated fasting glucose	≥ 100 mg/dl or Drug treatment

Grundy et al., 2005, p. e286. BP – blood pressure, DBP diastolic blood pressure, HDL-C – high density lipoprotein-cholesterol, SBP – systolic blood pressure

In a study of whether psychological variables could predict the development of the metabolic syndrome and also if the metabolic syndrome could predict psychological distress, perimenopausal women were enrolled in the Healthy Women's Study (Raikkonen et al., 2002). Evidence for a dose-response relationship was found between

the number of metabolic syndrome risk factors and depressive symptoms. Persons with higher depression scores were nearly a third more likely to develop more metabolic syndrome risk factors than those with low depression scores. The reciprocal relationship hypothesis was not supported; depression scores were not increased due to the metabolic syndrome over the course of the follow-up.

A female CVD risk profile was described by the NHLBI-sponsored Women's Ischemia Syndrome Evaluation (WISE) study which reported on the association of depression with cardiac symptoms (Rutledge, Reis, Olson, Kelsey et al., 2006). Women with higher BDI scores were found to have increased CVD risk factors, lower socioeconomic status, and more than twice the rate of smoking ($p < 0.01$). Surprisingly, women with higher BDI scores did not have different angiogram or ischemia test results. Adding to the surprise, women who were treated for depression had evidence of less severe coronary artery disease (CAD) and were less likely to have a positive ischemia test, regardless of age, history of smoking, diabetes or hypertension. This might indicate that when depression is treated cardiac risk is reduced. This effect might be related to improved healthy lifestyles, improved adherence to risk modification treatments, or possibly to alterations in the physiological mechanisms that have been described as linking depression and depressive symptoms to cardiac disease. Cardiac symptoms, however, were increased in women with higher BDI scores. Adjusted for age and CAD severity, women with higher BDI scores were 30% more likely to be hospitalized.

Whether the severity of depression was associated with high blood-pressure, more CVD risk factors, greater stress and lower social support was investigated in a sample of urban African-American women (Artinian et al., 2006). These investigators found that depression was a mediator between diastolic blood pressure and stress, and that women with more severe depression had higher diastolic blood pressures.

An international perspective on modifiable CVD risk factors and depression was provided by the INTERHEART study (Yusuf et al., 2004). This 52 country case-control study of myocardial infarction (MI) investigated the effect of CVD risk factors and whether they varied by country or ethnic group. Nine risk factors – smoking, diabetes, hypertension, abdominal obesity, and alcohol, physical activity, daily consumption of fruits and vegetables, psychosocial factors, and apolipoproteins (Apo) - accounted for more than 90% of the risk of an MI. The two strongest risk factors were: current smoking and raised ApoB/ApoA1 ratio. Adjusted for age, sex, and smoking status, psychosocial factors, which included depressive symptoms, increased the risk of an MI by two and a half times.

Summary. These long-term observational studies described the links between depressive symptoms and traditional CVD risk factors along with describing a dose-response relationship in particular between depressive symptoms and physical activity and the metabolic syndrome. Some investigators have also begun to outline the risk profile for women. Additional evidence linking depressive symptoms and CVD risk factors will be addressed in the section describing the relationship between depressive symptoms and health promotion behaviors. The next set of studies describes the

relationship of depressive symptoms and IHD which includes the increased risk of IHD mortality.

The Relationship Between Depressive Symptoms and Ischemic Heart Disease

The investigation of the relationship between depressive symptoms and IHD has deep historical roots. In their review of the epidemiology of comorbid coronary artery disease and depression, Rudisch and Nemeroff (2003) credited a report published in 1937 as the seminal work linking depression and heart disease. They cited Malzberg's finding that in patients hospitalized with "involutional melancholia… their age-adjusted mortality rate was approximately 6 times that of the general population, with 40% of these deaths due to 'diseases of the heart' " (p. 227).

Cassem and Hackett, working in the 1960's and 1970's, were pioneers in the investigation of the behavioral response to an MI (Rudisch & Nemeroff, 2003). Cassem and Hackett described "a stereotyped post-MI course … which included an anxious response for the first 2 days post-MI, followed by a depressive response" (Rudisch & Nemeroff, 2003, p. 228). Subsequent decades of research have investigated the relationship between depressive symptoms and the increased risk for IHD, IHD mortality, and the behavioral response to acute myocardial infarction (AMI) (Barth et al., 2004; Carney et al., 2003), heart failure (Rutledge, Reis, Linke et al., 2006), post coronary artery bypass surgery (Connerney et al., 2001), and post-percutaneous coronary interventions (PCI) (Astin, Jones, & Thompson, 2005).

Because women being screened for CVD risk were the population of interest for this study, the investigation of the relationship of depressive symptoms to incident CVD

studies is relevant. A series of prospective and observational studies linking depressive symptoms to incident CVD continue to provide evidence for the effect of depressive symptoms on IHD. This literature is divided into studies of the association of depressive symptoms in nonfatal IHD to be followed by the literature summary of the association of depressive symptoms to fatal IHD and all-cause mortality.

Depressive Symptoms and Nonfatal Ischemic Heart Disease

Fourteen studies, summarized in Appendix C, investigated the relationship between depressive symptoms and incident CVD and found an increased risk of experiencing nonfatal IHD. Ten of these studies reported a dose-response relationship between depressive symptoms and nonfatal IHD (Anda et al., 1993; Ariyo et al., 2000; Barefoot & Schroll, 1996; Ferketich et al., 2000; Gilmore, 2008; Hallstrom et al., 1986; Pratt et al., 1996; Sesso et al., 1998; Thurston & Kubzansky, 2007; Wassertheil-Smoller et al., 1996). Some of these studies also found an increased risk of fatal IHD and/or all-cause mortality and their review will follow this summary of the nonfatal IHD studies.

Three studies used some version of the NHANES data (Anda et al., 1993; Ferketich et al., 2000; Thurston & Kubzansky, 2007). The depressed 10.8% of the nearly 3,000 adults from the National Health Examination Follow-up Study (NHEFS) from the NHANES data (Anda et al., 1993) were found to have a 60% increased risk of experiencing a nonfatal IHD event such as angina or an MI. A gender difference in dose-response relationship was identified in another examination of the NHANES data (Ferketich et al.) Nonfatal events in women were associated with higher levels of

depression than in men with nonfatal cardiac event risks with each 1-point CES-D score over 20 for women and over 12 for men.

Using the first NHANES through the follow-up studies, a study of the multiple occurrences of psychosocial risks was undertaken to identify the effect on incident CHD (Thurston & Kubzansky, 2007). The psychosocial risks were education, employment, income, being a single parent, marital status, and depressive and anxious symptoms. While there was a dose-response relationship between increased numbers of psychosocial risks and incident CHD, this was more pronounced in women. Women also were found to have a graded increase in BMI alone or in combination with any other psychosocial risks. Single parents were found to have the strongest association between depressive symptoms and incident CHD, especially if they were divorced or widowed.

Three studies of elderly men and women free of documented CVD at baseline identified that more women than men were depressed at baseline (Ariyo et al., 2000; Barefoot & Schroll, 1996; Wassertheil-Smoller et al., 1996). These studies, however, reported different gender or racial patterns for an increased risk of developing CHD with increased depression scores. In the Ariyo et al. study, higher baseline depression scores were also found in nonwhite, less educated, lower income, and smoking participants with a history of diabetes, and those who had problems with activities of daily living or lower social support scores. In the Barefoot and Schroll study, depressed women were more likely to smoke, have higher BMI and be hypertensive. The participants in a randomized placebo controlled trial of the treatment of isolated systolic

hypertension, reported higher depressive symptom scores in Blacks and Hispanics than in Whites and Asians ($p \leq .001$) (Wassertheil-Smoller et al., 1996).

A report from the Normative Aging Study of all male participants (Sesso et al., 1998) added a unique dimension to the investigation of depression and the risk of incident CVD. The investigators used multiple depression scales to investigate whether higher depression scores were associated with increased risk of CVD. The two depression scales (MMPI-2 D and MMPI-2 DEP) from the revised version of the Minnesota Multiphasic Personality Inventory (MMPI-2), and the depression scale from the Symptom Checklist-90 (SCL-90) were correlated with the CES-D to test for convergent validity. The highest percentage of subjects across the tertiles who had a CES-D $\geq$ 16 also scored in the highest tertile of each scale. The authors reported that they found regardless of scale a "strong" dose-response relationship between depressive symptoms and the incidence of both angina and nonfatal MI.

A systematic community sample of women was recruited to investigate the relationships of personality factors, psychological stressors, mental disorder, and the experience of strain (all determined through psychiatric examinations), to the incidence of IHD (Hallstrom et al., 1986). High baseline passive dependency, neuroticism, strain experience, and the grade and severity of mental disorder including depression predicted IHD. A dose-response relationship was identified between depressive symptoms and IHD.

A unique sample in this group of studies recruited the Baltimore survivors of a national study of the prevalence and incidence of clinically defined psychiatric

disorders to investigate whether they had experienced an MI (Pratt et al., 1996). The study investigated whether the psychotropic medications they had been taking and the clinical diagnosis of a major depressive disorder (MDD) or dysphoria contributed to the incidence of an MI. Age and gender differences were found related to the severity of the depression, for example dysphoric participants tended to be younger and female than those without depression but were older than the MDD group. The dose-response relationship between depression and an MI was found for both dysphoria and MDD. The odds were similar across three models which differed by the inclusion of alcohol, panic disorder, phobia, and ever-use of psychotropic medications in addition to the covariates of age, sex, marital status and hypertension.

In the first ever Canadian study of the relationship between depression and the risk of heart disease, the risk of an incident heart disease event was significant only for depressed women (Gilmore, 2008). Depressed women tended to be in the low-to-middle income group, have high blood pressure, be diabetic, be current smokers, not partake in non-leisure physical activity, and be moderate to heavy drinkers.

Five studies found a relationship between depressive symptoms and IHD although not a dose-response relationship. The possible contributing factors to this absence of a dose-response relationship include the limited (55% was the maximum female enrollment in a study) to no female participants (Ford et al., 1998) and a slightly younger and narrower age range of the participants (age 55-66).

A European cohort of post-PCI patients was studied to establish the development of depression following a PCI (Astin et al., 2005). Compared to pre-PCI

baseline testing, depression scores were lower at 6-8 weeks and six months post-PCI but were higher at eight months post-PCI.

The Precursors Study enrolled male medical school graduates (Ford et al., 1998). They were followed for a median of 37 years to investigate whether clinical depression was an independent risk factor for incident CVD. In the depressed men, there was more than twice an increased risk of CHD and of an MI. The increased risk for a first MI was sustained for 10 years after the first depressive episode.

Scottish men and women were investigated to determine whether there was an increased risk of CHD in participants with psychological distress (Rasul, Stansfeld, Hart, & Davey-Smith, 2005). While there was a statistically increased risk of CHD events at five years in psychologically distressed men, the increased risk in psychologically distressed women was not statistically significant. One of the study limitations is that the General Health Questionnaire is a screening and not a diagnostic measurement. No structured interviews confirmed the specific type of mental disorder.

Two reports discussed the findings from the landmark INTERHEART study (Rosengren et al., 2004; Yusuf et al., 2004). Depression was found in 24% of the participants and was associated with an MI regardless of ethnicity and was increased with depression regardless of depression score (Rosengren et al.). Adjusted for age, sex, and smoking status, there was a two and a half increased likelihood of having an MI with the presence of depressive symptoms (Yusuf et al.).

Summary. The evidence supporting a dose-response relationship between depressive symptoms and nonfatal IHD was provided by 10 out of 14 long-term

observational studies in a variety of participant groups. Gender and racial differences were generally identified with higher risks for a nonfatal IHD being found in women and Blacks and in people with modifiable CVD risk factors such as obesity, hypertension, and smoking. The relationship of depressive symptoms to nonfatal IHD was also supported by five studies that did not report it as a dose-response relationship. Two of these reports were generated from the landmark 52 county INTERHEART study which substantially added to the generalizability of the overall findings. The next section extends the link between depression to fatal IHD and all-cause mortality.

Depressive Symptoms, Fatal Ischemic Heart Disease and All-Cause Mortality

Increased IHD mortality was found to be associated with depressive symptoms in three of the prospective studies of depressive symptoms in incident CVD and are summarized in Appendix D (Anda et al., 1993; Pennix et al., 2001; Wassertheil-Smoller et al., 1996). Increased all-cause mortality was found to be associated with depressive symptoms in five of these prospective studies (Ariyo, et al., 2000; Barefoot & Schroll, 1996; Ferketich et al., 2000; Gump et al., 2004; Wulsin et al., 2005) (Appendix D).

The studies that found an increased risk of IHD mortality in participants with depressive symptoms had large sample sizes in common and just over half of the participants were female. Most participants were White and the mean ages were just over 70 in two studies (Pennix et al.; Wassertheil-Smoller et al., 1996) and a younger cohort – mean age 57.5 years - in the Anda et al. (1993) study. The risks for increased IHD mortality were 25% (Wassertheil-Smoller et al.), 50% (Anda et al.) and 60% (Pennix et al.). A dose-response relationship between depressive symptoms and IHD

mortality was reported by Anda et al. who found 4% increased risk of IHD mortality for each unit increase in depressive symptom scores and by Pennix et al. also reported a 5-times increased risk with minor depression and a 10-times increased risk with major depression.

The studies that found an increased risk of all-cause mortality in participants with depressive symptoms also had study characteristics in common. The sample sizes were large, most study samples were comprised of over half female participants with one all male study (Gump et al., 2004). Four of the studies' mean ages were quite similar, ranging from 50 to 59.9 with one older participant group (Ariyo et al., 2000) with a mean age of 73. When race was reported, the racial composition was also mostly White.

The increased risks for all-cause mortality were 16% (Ariyo et al., 2000), 21% (Ferketich et al., 2000), and 59% (Barefoot & Schroll, 1996). A 3% increased risk of mortality for each higher quintile of depressive symptom scores was reported by Gump et al. (2004) in the unique Multiple Risk Factor Intervention Trial (MRFIT).

A dose-response relationship between depressive symptoms and mortality were also reported by a multi-generational Framingham Heart Study (Wulsin et al., 2005). This study, comprised of original study and offspring study participants, was designed to examine the relationship of depressive symptoms to CHD. Depressive symptoms were more likely to be seen in women, current smokers, and in younger participants (mean age 50 ± 13). Although depressive symptoms declined with advancing age,

women's scores were consistently higher than men's scores. No gender differences were found in the relation of depressive symptoms to IHD or all-cause mortality.

A narrative review of negative emotions and CHD posited that the data indicated that there was a dose-response relationship between depressive symptoms and mortality (Sirois & Burg, 2003). The reviewers suggested that mortality risk was higher when depression criteria included only emotional/cognitive symptoms than when somatic complaints were included in the depression diagnostic criteria for major depression. This suggestion adds a dimension to the concern for the somatic overlap measurement question between depression diagnostic criteria and comorbid medical illnesses somatic complaints.

Summary. While the risk percentage varied for both increased fatal IHD and all-cause mortality, increased depressive symptoms contributed to this increased risk regardless of age or gender. While the sample sizes were generally large, the racial composition was overwhelming White, which limits the generalizability to other racial and ethnic groups. When gender differences were reported, women experienced higher risk for fatal IHD and all-cause mortality associated with their depressive symptoms.

Given this review of the literature supporting the relationship between depressive symptoms, CVD risk, nonfatal IHD, fatal IHD, and all-cause mortality, it is important to examine the evidence linking depressive symptoms to health promotion. Most of this literature supports that depressive symptoms are associated with unhealthy behaviors and furthermore suggests that the presence of depressive symptoms lessen the probability of adopting and/or being able to maintain a health promoting lifestyle.

The Relationship Between Depressive Symptoms and Health Promotion Behaviors

The examination of the literature linking depressive symptoms to health promotion includes data from an ongoing national survey of health behavior patterns, and studies that report on the relationship of depressive symptoms to decreased health behaviors. The concept of awareness of heart disease risk will be discussed along with the data to support the link between depressive symptoms and the decreased ability to adhere to medical treatment plans, which for the CVD risk prone person would include TLC prescriptions.

The Centers for Disease Control and Prevention (CDC) in partnership with state health departments conducts surveys of United States adults through the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS compiles ongoing patterns of health risks, health-related behavior, and modifiable risk factors for CHD among other chronic diseases (Ashaye & Giles, 2003). Based on data from the year 2000 BRFSS, a study was designed to examine whether persons with CHD were more or less likely to engage in healthy lifestyle behaviors (HLBs).

The survey results described very low adherence to four basic HLBs: (1) maintaining an ideal body weight (BMI < 25.0), (2) eating five or more fruits and vegetables daily, (3) performing at least 30 minutes of leisure time physical activity, and (4) being a non-smoker (former and never smokers) (Ashaye & Giles, 2003). These are all key CVD health promotion behaviors. The pattern of following HLBs was very similar in both the CHD and non-CHD groups with less than 10% following all four HLBs. Coronary heart disease respondents were likely to be former smokers,

physically inactive, overweight or obese, and to consume fewer fruits and vegetables each day.

From the prospective literature reporting on the relationship of depressive symptoms to incident CVD, two studies (Appendix E) examined risk behaviors (Bonnet et al., 2004; Rosal et al., 2001) and one study provided a profile of participants least likely to participate in a healthy behavior (Farmer et al., 1988) (Appendix E).

Those who reported the lowest levels of non-recreational physical activity and depressive symptoms in the first NHANES data (Farmer et al., 1988) were more likely to be the less educated, lower income, black, and older participants. These older data present a similar profile of participants with the unhealthiest pattern from the BRFSS data.

To investigate how the co-occurrence of unhealthy behaviors can increase the risk of disease, Rosal et al. (2001) examined the pattern of four health risk behaviors (i.e., smoking, high-fat diet, sedentariness, and high-risk drinking) and psychosocial variables. Two or more risk behaviors were found in 43% of the participants. A high-fat diet and sedentariness were the most frequent risk behaviors' combination. Furthermore, a dose-response relationship was found between depressive symptoms and the number of risk behaviors so that as the depressive symptoms increased so did the number of risk behaviors.

Participants who were referred to a CVD risk factor prevention program were recruited to participate in an investigation of how adherence to heart healthy behavior guidelines was associated with depression and anxiety (Bonnet et al., 2004). A detailed

analysis was conducted of their diet, alcohol consumption, and laboratory assessment of dyslipidemia in addition to measurement of other CVD risk factors: BMI, blood pressure, smoking, recreational physical activity, and diabetes. A composite score of 0, 1, or 2 was created from these unhealthy behaviors to indicate the degree of adherence to guidelines. A score of zero represented adherence to guidelines while a score of two indicated a maximum guidelines deviation.

The participant profile revealed that women were more anxious and depressed (Bonnet et al., 2004). Grouped by depression severity, scores for diet, smoking, physical inactivity and a combined score were all increased from mild to marked depression for both men and women. Women scored worse than men only for physical inactivity. There was no gender difference for the dose-response relationship between depression and the odds of having unhealthy behavior. Men and women were both more than twice as likely to have unhealthy behaviors when they were mildly depressed and were five times as likely to have unhealthy behaviors when they were markedly depressed.

Summary. Depressed people and particularly depressed women lead unhealthy lifestyles. Physical inactivity and poor nutrition most likely contributed to the increased obesity. Evidence was presented to support the dose-response relationship between depressive symptoms and CVD most likely begins with the degree of an unhealthy lifestyle.

Given these relationships between depressive symptoms and CVD risk and the onset of IHD, what do we know about women's awareness of heart disease? While we

know that knowledge does not mean behavior will change, if one is not aware of her risk of developing a disease, what is the likelihood that risk modification behavior will be adopted?

Awareness of Heart Disease Risk

When discussing awareness of heart disease risk in women today, it is relevant to mention the role of health education directed to women to increase their awareness of heart disease. Since the early 1990's, government agencies such as the NHLBI and the National Women's Health Information Center (NWHIC), and professional organizations like the AHA, the Preventive Cardiovascular Nurses Association, and the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHON) have been actively involved in the development and dissemination of CVD health education for both the professional and lay education. It remains vital to increase the awareness of healthcare providers to advances in CVD primary and secondary prevention because women depend a great deal on the health education they receive during routine healthcare provider visits and attendance at CVD risk screening programs (Rosenfeld, 2006; Wenger, 2003).

The most recent AHA survey of women indicated that there has been an improvement in women's awareness of heart disease risk in the 12 years from the first survey in 1997. Despite the improvement, a large number of women (46%) remained unaware that heart disease is their number one killer with African-American and Hispanic women significantly less aware than White women (Mosca, Mochari-Greenberger, Dolor, Newby, & Robb, 2010). In the prior survey, a majority of the

survey's respondents could not state the health levels of risk factors (Mosca, Mochari et al., 2007). Most significantly, they were unable to correctly classify their own CVD risk (Mosca, Mochari et al.). A further finding from the 2007 survey sends a strong message to those providing CVD risk modification education to women. A majority of the women reported confusion about CVD risk prevention strategies (Christian et al.) which extended to the 2010 findings (Mosca et al., 2010). Most women's perception of their risk was associated with risk modification strategies being provided by their healthcare provider (Mosca, Mochari et al.). Two barriers to heart disease prevention were reported by about half of the current survey respondents: busy providing care to their families and confusing messages in the media (Mosca et al., 2010).

While an in-depth discussion of risk perception is beyond the scope of this review, there have been studies conducted investigating the awareness of heart disease risk and risk perception. Risk perception is a key concept to be considered when discussing the acquisition and implementation of health promotion strategies. Risk perception is also described as perceived risk, perceived vulnerability, or perceived susceptibility in the health-protection behavior literature (Gerend, Aiken, West, & Erchull, 2004).

Surprisingly only 35% of women who were interviewed following an elective coronary artery angiography procedure recalled having been told they were at risk for CHD (King et al., 2002). This is surprising considering the majority of the women (83.6%) had ≥ 3 risk factors; another 12.2% had one or two risk factors, with less than

1% having no risk factors. The women who did not recall having been told they were at risk for CHD did not perceive their CVD risk prior to their elective procedure.

The relationship between knowledge of CVD and risk perception was investigated in a sample considered to be at high risk for CVD (Homko et al., 2006). The participants were recruited to participate in a telemedicine program designed to reduce their CVD risk. This sample was an interesting blend of rural (56%) and inner-city (44%) men and women (44%). Overall, the women scored higher on CVD risk knowledge, had statistically lower actual CVD risk measured by the Framingham 10-year risk index, but had significantly higher perceived risk compared to the men. Inner city participants were significantly less knowledgeable with lower perceived risk which indicates a need to increase both their knowledge of heart disease and awareness of their risk of CVD.

How perceived risk is formed has been studied. Women from a mammography screening program and a hormone replacement therapy study were investigated (Gerend et al., 2004). The model generated by this study revealed that epidemiological factors explained a small to moderate amount of the perceived susceptibility variance. Perceived susceptibility can be measured as direct comparative risk and absolute risk. Direct comparative risk is comprised of how a woman perceives herself as being similar to a woman who has experienced CHD and her awareness of her actual disease risk. Perceived susceptibility explained more than the calculated cardiac risk.

As the women aged, their perceived risk decreased which was opposite to the age-perceived risk correlation in younger women. Gerend et al. (2004) examined this

surprising finding by examining possible mediators. Their analysis suggested that perceived prevalence, perceived similarity, and absent/exempt beliefs were the mediators between age and perceived risk. These findings about risk perception provide an important insight into health promotion programs. Although the Gerend et al. study did not measure affective mood such as depressive symptoms in their psychological factors items, examination of this variable may provide insight into one's risk perception. Might it be that someone who is depressed has a decreased perception of their cardiac risk?

Another important consideration in the complex analysis of health promotion behaviors is that of adherence to health promotion recommendations. Once we have made persons aware of their risk of CVD, the next step to improving health is outlining for them what they can do to reduce their risk. The next section presents a brief discussion of the relationship of depressive symptoms to adherence.

Depressive Symptoms and Adherence

Depressive symptoms decrease one's ability to adhere to/comply with recommendations to alter unhealthy behaviors and other aspects of a medical treatment plan (Barefoot & Schroll, 1996; DiMatteo et al., 2000; Katon, 2003; Vinkers et al., 2005). The authors of the often cited meta-analysis of the relevant literature for the link between depressive symptoms and nonadherence posited that nonadherence (also known as noncompliance) was a behavioral mediator that linked depression and complications of medical treatment (DiMatteo et al., 2000). They concluded that depressed patients were three times more likely to be noncompliant with treatment

plans.This finding contributes to the understanding of why there are less desirable medical outcomes in depressed and anxious patients. Nonadherence to a treatment plan, therefore, can contribute to increased morbidity and mortality regardless of the medical disorder. Nonadherence is amplified in CHD due to the higher rates of depression in this patient population (Katon, 2003). These findings support the advisability of screening for depression when one is proposing a health promotion plan to patients to reduce their CVD risk. What might the characteristics be of those who actually have adhered to a lifestyle intervention program?

The women who participated in a study of long-term participation in a lifestyle intervention program could be seen as exemplars of excellent adherence (Westerstahl et al., 2002). To examine if the awareness of CVD risk factors and CVD risk status influenced long-term participation in health promotion interventions, eight women who had participated in a community-based lifestyle intervention program were the subjects of a qualitative study (Westerstahl et al.). The investigators identified three core concepts which explained how the women dealt with their risk factors and sustained their high motivation for continuing long-term in the program: (1) there is no one but yourself to rely on, (2) resisting invasion, and (3) living with incompatibility. Resisting invasion represented feelings expressed about "taking control over uncertainty" (p. 25), and remaining on target with the prescribed intervention despite distractions. Living with incompatibility represented expressions of how the women essentially translated the medical information they had been given. Part of this challenge was dealing with

the professionals' use of disease risk language. The women did not understand the meaning of risk factors.

The participants in a post-operative cardiac rehabilitation program were asked to describe their adherence to the cardiac rehabilitation program's specific health behaviors and general recommendations (Spernak, Moore, & Hamm, 2007). Lower satisfaction with physician interactions and what was described as the participants "less constructive thinking" mediated the association found between greater depression and lower adherence. It would seem that these cardiac rehabilitation patients were dealing with a similar "incompatibility" as were the highly motivated women in the long-term intervention study.

The challenge for healthcare providers, particularly those who manage health promotion programs, is assisting participants to achieve this high level of self-efficacy and self-awareness. This should begin with using language that promotes understanding inclusive of the issues of health literacy which remain an identified healthcare disparity (AHRQ, 2009). Being "at risk" or even discussing "risk modification" may not communicate the positive perspective that will motivate adherence. The competence-orientation of the HPM which does not use fear or threat as the motivational basis for behavior change would seem to be supported by the themes identified in the Westerstahl et al. (2002) study.

Having considered the literature supporting the link between depressive symptoms along the continuum from depressive symptoms as independent risk factors for CVD to depressive symptoms increasing the risk for IHD and mortality, it is

relevant to examine how depressive symptoms relate to quality of life. Quality of life is the specified outcome for this proposed study and a basic precept of the Health Promotion Model (HPM).

The Health Promotion Model

The HPM (Appendix F) incorporates the complexity of human behavior. It is, therefore, a logical framework for investigating the relationship of variables where successful health promotion and improved perceived QOL are desired outcomes. Many studies have used the HPM to describe the factors that constitute the complex interactive tapestry of individual characteristics and experiences with behavior-specific cognitions and affect (Young, Taylor, & McLaughlin-Renpenning, 2001). These interactions lead to the desired behavioral outcome of adopting health promoting behavior after committing to a plan of action that can be mediated by immediate competing demands and preferences. No studies have been identified thus far, however, that used the HPM to investigate the relationship of depressive symptoms to CVD or evaluation of CVD risk modification strategies.

The HPM is constructed to assess the interrelated variables that can promote and hinder the desired outcomes of health promoting behavior. The variables for the study addressed the components of the individual characteristics and experiences along with the components of the behavior specific cognitions and affect. The study addressed the personal factors through measurement of biological factors (measured by the CVD risk profile), psychological factors (limited to the measurement of depressive symptoms and

risk awareness), and socio-cultural factors (measured by the socioeconomic variables). The behavioral outcome elements were investigated in this study.

The HPM is also a good fit for an investigation where QOL is the outcome measure. The authors of the HPM posited an inextricable link between health and QOL. They described health promotion and health protection as corresponding processes that are fundamental to QOL through all developmental stages (Pender et al., 2006). While the HPM can assist us with tailoring risk modification strategy education and programs for women expressing an interest in improving their health by taking the first step in attending a CVD risk screening program, we need to examine the relationship between depressive symptoms and QOL as the desired outcome to health promotion.

The Relationship Between Depressive Symptoms and Quality of Life

The phenomenon of quality of life is widely discussed, often measured, and avidly pursued with hopes that it shall be achieved and sustained. The impacts of disease, diagnosis, and treatment have been found to profoundly alter the person's perspectives of their QOL. Quality of life has been linked with health at least since the World Health Organization (WHO) 1947 definition of health "as a state of physical, mental and social well-being and not merely the absence of disease" (King & Hinds, 1998, p. xi) because well-being is often identified as a sub-concept of QOL. Quality of life was explicitly linked with health in 1978 when the WHO stated that individuals have a right to psychosocial care and an adequate QOL in addition to physiologic care (WHOQOL, 1995).

For over twenty years, it has been accepted that CVD investigations also include the measurement of QOL to indicate the outcome for a proposed intervention (Wenger, Matteson, & Furburg, 1984). In both nursing and medical research, QOL continues to be an important CVD outcome indicator (Delunas & Potempa, 1999; King, Porter, Norsen, & Reis, 1992; Penckofer, Ferrans, Fink, Barrett & Holm, 2005; Ruo et al., 2003; Spertus & Green-Conaway, 2004). Quality of life is also known to be compromised in people suffering from depressive symptoms (NIMH, 1999; Ruo et al., 2003).

For decades there have been theoretical discussions of what is QOL, what should be included in its measurement, and perhaps most significantly, which perspective will guide these decisions. The term health-related quality of life (HRQOL) has been proffered to differentiate QOL investigations in healthcare as distinct from QOL investigations in other disciplines. Wilson and Cleary (1995) defined HRQOL as "the aspects of quality of life that relate specifically to a person's health" (p. 60). Wilson and Cleary developed a model of HRQOL that was later revised by Ferrans and colleagues (2005) (Appendix G). The model has been used extensively in research in assessing QOL outcomes in various populations: women who have had CABG surgery (Penckofer, Ferrans, Fink, Barrett, & Holm, 2005), adults with stable CAD (Ruo et al., 2003), persons with heart failure (Heo, Moser, Riegel, Hall, & Christman, 2005), and AIDS (Sousa & Kwok, 2006).

One study using this model reported that emotions significantly impacted on QOL. Hofner et al. (2005) examined patients just before having a cardiac

catheterization and then again at one and three months post-catheterization. Physical functioning and anxiety were found to exert the greatest effect on global HRQOL. Global HRQOL was conceptualized as being comprised of emotional HRQOL, physical HRQOL, and social HRQOL. Depression, anxiety symptoms, and trait anxiety all were highly related to emotional HRQOL. Anxiety had a weak but positive correlation to symptom status which the investigators stated that with higher levels of anxiety the patients reported more severe symptoms. Studies of the effects that moods have on cardiovascular health and QOL have been reported.

Depressive Symptoms and Quality of Life in Cardiovascular Disease Research Studies

Quality of life in women with CVD and depressed mood has been investigated. Although different measures of QOL were used, the relationship between depressive symptoms or depressed mood and QOL was consistent. Depressive symptoms and depressed mood were associated with decreased satisfaction with life.

Women who have had an MI have reported decreased satisfaction with life while women who have had CABG surgery reported an overall improved satisfaction with life. Kamm-Steigelman et al. (2006) found that 49% of post-MI middle-aged women were depressed and they reported a very low satisfaction with life measured by Diener's five-statement Satisfaction with Life Scale. Another study of women nearly one year post their first MI, also reported that depression reduced the overall QOL measured by the SF-36 (White & Groh, 2007). A study investigated the response of women to CABG recovery (Penckofer et al., 2005). Measured by the Quality of Life Index (QLI), the overall improvement in QOL was primarily due to improved health

and functional status. Interestingly, although not statistically significant, depressed mood improved while troublesome psychological effects persisted in many of the women.

The link between depressive symptoms and QOL was studied in the 1995-2000 annual BRFSS surveys to describe the burden of mental distress in the United States (Kobau, Safran, Zack, Moriarty, & Chapman, 2004). Over the course of those surveys, over 166,500 respondents answered the question, "During the past 30 days, for about how many days have you felt sad, blue, or depressed?" The number of sad, blue or depressed days (SBDD) was the measure of depressive symptoms. Overall, the survey respondents reported a SBDD of 3 (95% CI, 2.9-3.1). Consistent with prevalence data for depression and depressive symptoms, women reported more SBDD. An increased frequency of SBDD was seen with decreased HRQOL, which the investigators posit as indicating the burden of decreased life satisfaction imparted by this measure of depressive symptoms. Additional understanding of the burden of depressive symptoms through a negative impact on QOL is provided by another large study.

The BRFSS data from 2004 was used to examine gender differences in CHD and HRQOL (Ford et al. 2008). The presence of CHD was associated with significantly worse HRQOL particularly in women. Four HRQOL questions have been developed by the CDC and were found to have good construct validity with the SF-36. One of the four questions asked about the frequency during the prior 30 days of mentally unhealthy days related to stress, depression, and problems with emotions. People with CHD reported worse HRQOL, particularly women. While the question regarding mental

health does not single out depressive symptoms, this survey of 50,573 adults from 10 states is particularly relevant from a public health perspective.

The socioeconomic burden of depressive symptoms as a function of impaired daily function was described in residents who participated in the NIMH Epidemiological Catchment Area Survey (ECA) (Judd, Paulus, Wells, & Rapaport, 1996). Ten functional domains which included social irritability, household strain, social contacts, major financial loss and financial strain, talking to someone about personal problems, and days with restricted activity from physical illness were examined. Significantly more of the sample with depressive symptoms (11.3% of the sample) reported disability on seven of the 10 functional domains. The greatest disability, defined as having high levels of impaired function, was reported in the following domains: social irritability, household strain, and financial strain. Mental health was also rated as poor by the depressive symptoms group.

An intriguingly entitled study, The Heart and Soul Study, recruited participants with CHD to explicitly investigate how depressive symptoms and cardiac function each contributed to health status measures, including QOL (Ruo et al., 2003). The authors said the Seattle Angina Questionnaire was used to measure QOL because it was based on the Wilson and Cleary HRQOL model. A dose-response relationship between depressive symptoms, as measured by the Physician Health Questionnaire-9 (PHQ-9), and all health status measures was reported. An inverse relationship was found between depressive symptoms and QOL, symptom burden and physical limitation. Depressive symptoms were found to be independently associated with all the health status measures

after adjusting for cardiac function measures (e.g., resting left ventricular ejection fraction and wall motion score index at peak exercise), and patient characteristics (age, sex, medical history, medications and known CVD risk factors).

In a contrasting sample of healthy adult twins, a prospective cohort study investigated the relationship between depressive symptoms and life satisfaction (Koivumaa-Honkanen, Kapiro, Honkanen, Viinamaki, & Koskenvuo, 2004). The study was designed to assist the screening for depression. The investigators concluded that the 4-item life satisfaction scale can identify people who have a high risk of having or developing depressive symptoms. The four life satisfaction items asked how the respondent would currently rate their life with regards to being interesting, happy, easy, and lonely. The investigators reported a strong linear correlation ($r = 0.6$) between the life satisfaction scale and the depressive symptoms scored by the BDI. Furthermore, the life satisfaction items explained 37.2% of the variance in BDI scores. Life satisfaction scores were also able to predict the risk of developing moderate to severe depressive symptoms. After adjusting for age, sex, marital status, social class, alcohol consumption, current smoking, and physical activity, a dose-response relationship was identified between increased dissatisfaction with life and the eevelopment of depressive symptoms.

Quality of life, measured by the SF-36 and the Assessment of Quality of Life, was examined in patients hospitalized with a cardiac diagnosis (unstable angina, MI, arrhythmia, heart failure, CABG, or PCI) (Cheok, Schrader, Banham, Marker, & Hordacre, 2003). The depressive symptoms group had a lower QOL.

Depressive symptoms are associated with diminished QOL in healthy subjects, subjects with confirmed CHD, and subjects hospitalized with a cardiac diagnosis. Depressive symptoms can increase the risk of socioeconomic burden mediated by diminished QOL. Diminished QOL can increase the risk of developing depressive symptoms. Given the increased prevalence of depressive symptoms in CVD, and the diminished QOL in CVD, it is important to examine variables beyond CVD that can affect QOL.

Variables Affecting Quality of Life

Investigations of the relationship of depressive symptoms to CVD have identified that depressive symptoms have an inverse relationship with physical activity and the number of health-promoting behaviors. As the severity of depressive symptoms increased the level of physical activity decreased as well as the number of health-promoting behaviors (Brown et al., 2005; Farmer et al., 1988; Raikkonen et al., 2002; Wassertheil-Smoller et al., 2004). Increased severity of depressive symptoms has also been associated with increased numbers of metabolic syndrome risk factors (Raikkonen et al., 2002). These and others studies have identified the CVD risk factors, which describe part of the health status of participants, that need to be included in adjusted models of the relationship between depressive symptoms and an outcome measure in a CVD population.

While geared for large epidemiological surveys, the CDC (2000) delineated variables of interest when investigating HRQOL. The CDC includes sociodemographic variables in investigations of HRQOL. Their current 4-item measurement of HRQOL

asks respondents about their general health, physical health (including illnesses and injury), mental health (including stress, depression and emotional problems), and ability to be involved in their usual activities (self-care, work and recreation) during the previous 30 days. The population variables that are used to describe the status of HRQOL in the nation are: sex, age, race, ethnicity, education, household income, employment status, and marital status. In addition to these sociodemographic variables, the following health variables are included: diabetes, hypertension, breast cancer, BMI, smoking status, alcohol use, and leisure-time physical activity. Respondents are also asked about their seatbelt use, how they would rate their health, and whether they have health insurance.

The results of prospective studies examining the relationship of depressive symptoms to CVD often reported gender and racial differences (Bonnet et al., 2004; Farmer et al., 1988; Wassertheil-Smoller et al., 2004). Gender and racial differences have also been reported in the BRFSS national surveys of the pattern of health risks, health-related behaviors, and modifiable CHD risk factors (Ashaye & Giles, 2003). The National Healthcare Disparities Report (AHRQ, 2005) reported that women had higher rates of arthritis, asthma, and depression. Higher rates of diabetes were reported by Black and Hispanic women. Limited activity and increased rates of depression, diabetes, hypertension, and obesity were reported by poor and near poor women. The most recent National Healthcare Disparities Report (AHRQ, 2009) focused on obesity as an underdiagnosed heart disease risk factor which is particularly problematic since 34% of adults have a BMI equal to or greater than 30. Two recent reports indicate that

obesity has overtaken smoking in reducing quality-adjusted life-years (Jia & Lubetkin, 2010; Stewart, Cutler, & Rosen, 2009).

The findings of these national epidemiological surveys support the necessity of analyzing and reporting healthcare studies according to race and ethnicity (Winker, 2004). The identification of lower levels of nitric oxide, a pro-atherogenic mechanism, has been found lower in Black women (Ferlinz, 2005) serving as another potent reason to analyze racial differences in a study investigating cardiac risk status in women. While the mechanism linking race, ethnicity, and socioeconomic status (SES) to CVD has not been completely determined, access to health care and living environment have been described as contributing factors. Thus, it will be significant to include race, ethnicity, and SES indicators (family income, marital status, employment status, and geographical location) as variables affecting QOL in this proposed study.

Summary

Evidence has been offered to support the relationship of depressive symptoms to cardiovascular disease risk factors, to increased risk of nonfatal and fatal ischemic heart disease, and to health promotion and quality of life. Depressive symptoms have been identified as an independent risk factor for CVD and increase the risk of decreased adherence to a healthy lifestyle. Quality of life is diminished by depressive symptoms in healthy subjects and in persons with CVD. What has not been investigated, however, is how depressive symptoms relate to CVD risk, health-promoting lifestyle and quality of life in women being screened for CVD risk. The literature has concentrated on the

impact of depressive symptoms and quality of life following a cardiac event such as an MI.

Therefore, this study will make a unique contribution in that the relationship between depressive symptoms and quality of life will be examined in women learning of their CVD risk. The study examined whether this relationship was influenced by the women's awareness of their heart disease risk, and/or their health-promoting lifestyle behaviors, and/or their estimated cardiac risk. Furthermore, the study examined whether there was a dose-response relationship between depressive symptoms and awareness of heart disease risk, health-promoting lifestyle behaviors, cardiac risk, and quality of life.

CHAPTER THREE

METHODOLOGY

The purpose of this study was to investigate the relationship of depressive symptoms to the status of health-promoting lifestyle behaviors, the awareness of heart disease risk, and cardiac risk and how these relationships affect perceived QOL in women being screened for CVD risk. The following aims were examined:

1) To determine the relationship between depressive symptoms, the cardiac risk score, the health-promoting lifestyle behaviors, an awareness of heart disease risk, and the perceived QOL in women being screened for CVD risk.
2) To determine whether there is a dose-response relationship between depressive symptoms and:
    a) The cardiac risk score (Line a in Figure 1),
    b) the health-promoting lifestyle behaviors (Line b in Figure 1), and
    c) the perceived QOL (Line c in Figure 1).
3) To determine whether the effect of depressive symptoms on the perceived QOL is direct or indirect (i.e., mediated by cardiac risk- d1 or health-promoting lifestyle behaviors-d2). (Figure 1).

Design

A cross-sectional correlational descriptive study design was used. A correlational design is appropriate for the investigation of the relationship between

variables generated by the theoretical and research literature (Brink & Wood, 1998). Cross-sectional data collection is appropriate when the researcher is interested in the status of a set of variables at one point in time (Brink & Wood; Hulley et al., 2001). The following are considered strengths of cross-sectional studies: there is no waiting for the results, there is generally no participant attrition, they are a logical first step to conducting a cohort or experimental study, they are geared for the study of networks of causal links through identification of predictor variables, and they are relatively inexpensive to conduct (Hulley et al.). However, the researcher must still account for the possibility of missing data.

An additional advantage of cross-sectional data collection is reduced participant burden due to the one-time versus longitudinal collection of data. The cross-sectional correlational descriptive design was appropriate to the aims of this study since no study thus far had investigated the relationship of depressive symptoms, CVD risk, health-promoting lifestyle behaviors, and perceived QOL in women being screened for CVD risk.

Setting

The study was conducted in an outpatient service of a large urban medical center (700 beds) in the Great Lakes region from August 2008 to May 2009. This medical center serves a mostly rural 15-country area and is located in a racially and ethnically diverse small urban community. Participants were recruited at the medical center through an established cardiac screening program, Covenant Heart Advantage.

Participants in the Heart Advantage heart health risk assessment program were recruited three ways.

The first method used direct mailings and spots in the local media (newspapers, radio, and television) to direct the public to a website which takes them directly to the Heart Advantage heart health risk assessment questions. At the completion of the risk assessment questions, the participant is asked to provide phone and mail contact information if they wish to have a personal review of their cardiac risk status. During the in-person 1:1 consultation conducted by a cardiovascular clinical nurse specialist, the woman's risk assessment is reviewed and then goals are set to mange her risk.

The second method for recruiting women to participate in the Covenant Heart Advantage heart health risk assessment program also used direct mailing and spots in the local media to invite the public to attend large group heart health risk assessment programs which were scheduled twice a year. The public were invited to complete the online heart health risk assessment questions. If they elected not to complete the online survey, they were mailed a copy of the heart health risk assessment questions. The heart health risk assessment needed to be completed prior to attending the large group risk assessment event.

The third method for recruiting participants in the Covenant Heart Advantage program was the introduction of the program during health fairs held in the area. Women who were interested in the program were again invited to either complete the online or paper version of the heart health risk assessment questions. The same process was followed as described above to invite interested women to attend either the next

large group screening event or a 1:1 counseling session when the risk assessment screening was completed.

The heart health risk assessment program began in 2005. Of the over 10,000 women enrolled in the Women's Heart Advantage at this medical center, over 2,000 women have been screened from February 2005 through April 2008 (Debbie Best, MSN, RN, Coordinator of the Covenant Heart Advantage Program, Covenant HealthCare, Personal Communication, May 12, 2008).

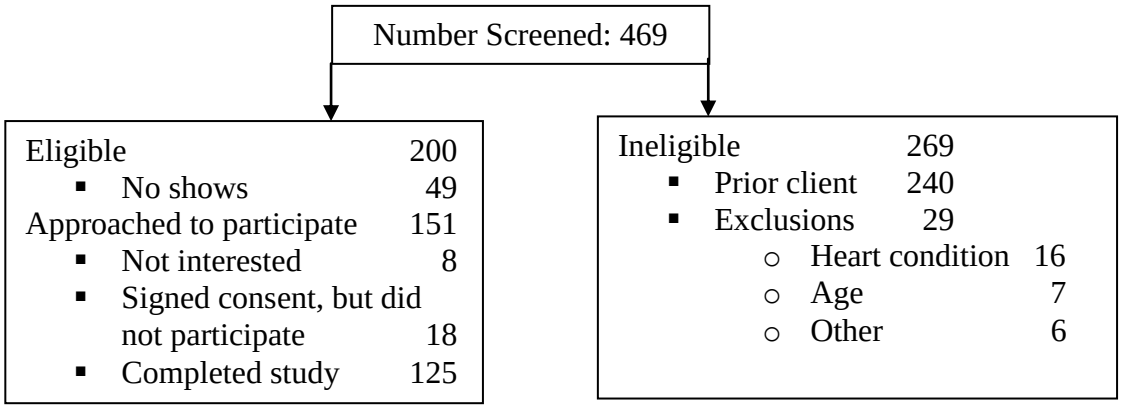
The in-person 1:1 counseling sessions took place in the outpatient cardiovascular services (CVS) area at the main campus of this healthcare organization. A separate office was available to the researcher to obtain consent and where the dissertation research study participants completed the dissertation research data collection booklet. The large group cardiac screening events took place in the same CVS area. This CVS area provided sufficient space for the participants to receive in private informed consent and to complete the data collection booklet. The outpatient CVS area is on the second floor of a building across the street from a parking lot. The entrance to the building is clearly marked and very well lit allowing for easy access. The elevator to the second floor is less than 50 feet from the ground floor entrance and exits on the second floor into the lobby of the CVS area. The lobby is adjacent to the registration area for the screening program.

Sample

A non-probability convenience sample of consecutive women who presented to the Covenant Heart Advantage screening was the sampling strategy. One hundred

twenty-five women completed the study. Figure 2 depicts the total number of screening center clients reviewed for study inclusion and exclusion criteria. The no-shows were potentially eligible women who did not come in for their scheduled CVD risk screening appointment, thus were not approached to participate in the study. The study participation rate was 82.8% of those 151 women who were approached to participate. Of those who refused to participate, four stated they did not have the time, four refused to participate after reading the consent form, and the 18 who signed the consent form but who did not participate in the study were women attending one of the two large group sessions. It is not possible to know their reason for not participating in the study.

Figure 2. Screening for Study Participants



The inclusion criteria were women age 30 – 75 years, who were able to read, write, and speak English, and were able to participate in the informed consent process. The mean age for the study sample was 57.7 (± 9.6). The age-range was based on the age of women who had presented to the cardiac screening program from the program's inception through May 2007 (Table 3). Since the inception of the online heart health risk assessment questions (February 2008), the number of women in the 30-40 year age

range had increased (Personal Communication, Debbie Best, May 12, 2008). The database used at the medical center did not specify age ranges beyond 60. In addition, given the evidence for CVD onset in women, the age range of 30-74 would capture those most at risk. The 2007 AHA Heart Disease and Stroke Statistics (Rosamond et al., 2007) reported the rate (7 per 100,000) and the age of onset for the first major cardiac event in women as being 45-54. In the study sample, the majority (n=40) of women who were aged 60 – 75 were between the ages of 60 and 69.

Table 3. Age Range of Women Screened by Heart Advantage and the ASK Study

Age	Heart Advantage (n, %)	ASK Study (n, %)
< 20	7 (0.4%)	n/a
20 - 29	61 (3.2%	n/a
30 - 39	110 (5.8%)	3 (2.4%)
40 - 49	329 (17.4%)	24 (19.2%)
50 - 59	583 (30.9%)	42 (33.6%)
60+	798 (42.3%)	56 (44.8%)
Total	1,888 (100.0%)	125 (100%)

Note: n/a – not applicable.

The study focused on women since there is a lack of awareness of CVD risk by women and by healthcare providers, and there is a higher prevalence of depressive symptoms in women. The exclusion criteria were the self-reported presence of pre-existing heart disease, stroke, peripheral vascular disease, dementia, drug dependency, alcoholism, and diagnosed mental illness other than depression. Drug dependency and alcoholism are known to have an increased association with depression (Kessler et al., 2003). Twenty-nine women were excluded: due to age (n = 7), or known cardiac condition (n = 22).

Power Analysis Calculations of Sample Size

The targeted sample size for the study was estimated using power analysis in order to increase the probability of finding a statistically significant effect, which in this case is the probability of finding the associations between depressive symptoms, cardiac risk, health-promoting lifestyle behaviors, and perceived quality of life. The sample size was based on the recommended minimum number per variable used in regression analysis and it was also calculated based on the relationship between depressive symptoms and life satisfaction.

With the aim of investigating whether depressive symptoms will have a direct effect on QOL or will have an indirect effect mediated by cardiac risk or health-promoting lifestyle behaviors a series of simple linear regression analyses was performed. Based on the recommendation of 15 participants per predictor variable (depressive symptoms, health-promoting lifestyle behaviors, BMI, family history, education, employment, income, and marital status) in multiple regression analyses, the estimated sample size was 120 with eight predictor variables (Stevens, 1999).

In examining the relationship between depressive symptoms and life satisfaction, a study by Koivumaa-Honkanen et al. (2004) was reviewed. In this study, 9,679 participants were studied and life satisfaction measured by a 4-item life satisfaction scale explained 37.2% of the variance in depressive symptoms measured by the Beck Depression Inventory. The online power analysis calculator G*Power 3 (Faul, Erdfelder, Land, & Buchner, 2007; G*Power 3, ND) was used to calculate the effect size based on the squared multiple correlation value of .372 producing an effect size of

0.59. Using the article by Rudy and Kerr (1991), this indicated a large effect size. With an effect size of .59, an alpha of 0.05, a power of 0.80 and eight predictors, G*Power 3 calculated that 34 subjects would be the sample size. Using these 2 techniques for estimating power analysis, the range of recommended subjects was from 34 to 120. Given this, the higher sample size was used.

Research Procedures

This section includes the description of staff training, the recruitment and consent of the participants, and procedures. Following sections will address measurements, data analysis, the protection of human subjects, and study limitations.

Research Assistant and Staff Training

One research assistant was used to assist with data collection during the large group events. About half way through the data collection this research assistant also was present on 1:1 counseling session days when the researcher was not able to be present. The researcher instructed the research assistant on the screening process related to the inclusion and exclusion criteria and how to obtain the study consent. Furthermore, the research assistant, who was an experienced cardiology staff nurse, completed the training program for protection of human subjects and this information was included in all the IRB applications.

Those who volunteered to staff the large group screening events were informed regarding the study, and were asked to refer all questions regarding the study to the researcher. Those who volunteered to staff the large group screening events were provided information about the research on the afternoon of the event. The researcher

was present to answer any questions before the women began to arrive. The cardiovascular clinical nurse specialist who provided the in-person 1:1 consultations was the only person who gave the study information sheet to the women.

Recruitment and Consent

All of the women who presented for the large group heart health risk assessment events had pre-registered for the program which means they had submitted the heart health risk assessment questions. Their registration confirmation assigned them an appointment for screening. The appointment helped with the flow of women during the large group screening events. During the screening events the following physical measurements were obtained: lipids, blood pressure, weight, percent body fat, and waist circumference. During the large group events, however, due to privacy issues, waist circumference was not obtained.

Before the two large group events, the researcher pre-screened the responses to the heart risk assessment questions. It was possible to pre-screen for gender, age, and history of cardiac conditions. Of the total 219 female registrants, 144 were ineligible at pre-screening. At registration, only women who preliminarily met the study selection criteria were given a card that contained a brief description of the research study (Appendix I). Adjacent to the registration desk, the researcher had a table where women who were interested in participating in the study were screened for final inclusion and the consent process was completed. Between the two events, only two women refused to participate. Thirty women (24%) from the study sample were recruited from two

large group events. They were instructed to go to the research study table in an adjacent hallway once their health screening was completed.

The majority of the study participants (n = 95) were recruited when they attended a 1:1 consultation. Women who had a 1:1 consultation were given the brief study (Appendix I) explanation by the nurse who conducted the counseling session. Women who expressed interest in the study were escorted to the office where the researcher determined final eligibility for the study and completed the consent process. The 1:1 counseling sessions were held twice a week and were usually scheduled one to two months in advance. After six months of data collection, the research assistant was trained to obtain consents and present the data booklets to participants on days when the researcher was not able to be present. The research assistant was used on two occasions.

Eligible women were provided a copy of the informed consent document (Appendix J). They were instructed to ask any questions they may have. Once these questions were answered, the informed consent document was signed, and a duplicate signed copy was given to each participant. The study participants then completed the study questionnaire booklet. The completion of the study questionnaire booklet was done in the presence of the researcher or the research assistant. It took 15-20 minutes to complete the data booklets. Once completed, women were compensated with a $10.00 gift card to a popular area store. Before leaving, all study participants were given a small brochure listing area psychological counseling services (Appendix K). The list of area psychological counseling services was obtained from the medical center's social

work service. The cardiac screening program likewise provided women with a referral for further evaluation of their CVD disease and information for risk modification.

Measurements

The list of study variables and corresponding measurements are delineated in Table 4. A description of each of these variables and how they were measured follows.

Table 4. Study Variables and Measurements

Variables	Measurement
Depression	▪ Center for Epidemiological Studies Depression Scale (CES-D)
Cardiovascular Disease Risk	▪ Heart Health Questions & risk assessment physical measures (lipid profile, blood pressure, body mass index, percent body fat, waist circumference) ▪ The ASK Study Questionnaire ▪ Estimate of 10-Year Risk (Framingham Point Score)
Quality of Life	▪ Ferrans and Powers Quality of Life Index © Generic Version-III
Health-Promoting Lifestyle Behaviors	▪ Health-Promoting Lifestyle Profile – II (HPLP-II)
Awareness of Heart Disease Risk	▪ The ASK Study Questionnaire
Demographics and Health History	▪ Heart Health Questions ▪ The ASK Study Questionnaire

Center for Epidemiological Studies Depression Scale

The Center for Epidemiological Studies Depression scale (CES-D) was used to measure depressive symptoms severity as the predictor variable in the study model (Figure 1).The CES-D (Appendix L) was developed in 1977 to be a user-friendly self-report scale to measure current levels of depressive symptoms in the general population

(Radloff, 1977). It has been reported to take five to ten minutes to complete the CES-D (Sharp & Lipsky, 2002). It was specifically designed to screen for depression in large epidemiological studies and is not associated with any specific theoretical framework (Pasacreta, 2004). The items included on the CES-D were culled from longer validated instruments, including the BDI, the Schedule for Affective Disorders and the depression subscale of the MMPI (Radloff), and this lends support for content validity.

The CES-D scale measures the frequency of the symptoms within the previous week. It is comprised of 20 items that are scored on a 0-3 scale: rarely or none of the time (less than 1 day) is scored 0, some or little of the time (1-2 days) is scored 1, occasionally or a moderate amount of time (3-4 days) is scored 2, and most or all of the time (5-7 days) is scored 3. To determine the depression score items 4, 8, 12, and 16 have to be reverse coded (0 = 3, 1=2, 2=1, and 3=0) before summing the score for all 20 items. These four items were reverse coded before they were entered into the statistical database. A score of 16 or higher classifies respondents as having depressive symptoms that have been content validated with the DSM-IV. Radloff used principal components factor analysis to establish the subscales of depressed affect (items 3, 6, 9, 10, 14, 17, 18), positive affect (items 4, 8, 12, 16), somatic and retarded activity (items 1, 2, 5, 7, 11, 20), and interpersonal (13, 15, 19).

Radloff (1977) provided very thorough psychometrics for the CES-D. Based on five administrations of the CES-D, the reliability scores were coefficient alphas of 0.84 to 0.90, split-halves of 0.76 to 0.85, and Spearman-Brown of 0.86 to 0.92. The coefficient alpha results far exceed the minimum for a new test and begin to approach

the clinical usage minimum of 0.90 (Bland & Altman, 1997). Inter-item correlations of > .30 were achieved in 24-55% across the samples with 34%-65% being in the range of .10-.30. Test-retest reliability was established in two, four, six, and eight week intervals yielding correlations of 0.51, 0.67, 0.59, and 0.59 respectively with a total test-retest correlation of 0.57. The CES-D was found to discriminate well between psychiatric inpatients and the general population samples. Criterion validity was established by correlating the CES-D with 12 other self-report scales. Construct validity was based on the clinical relevance of the items although a specific method for establishing the construct validity was not described. Construct validity was also established with the aforementioned factor analysis based on "what is known about the theory and epidemiology of depressive symptoms" (Radloff, p. 385).

Additional construct validity was provided by a meta-analysis (Shafer, 2006) of studies that conducted factor analyses of the CES-D in a wide variety of populations. Shafer's meta-analysis confirmed the four factors which were consistent with previous reports including Radloff's (1977) original study. Seven items (# 1, 2, 5, 7, 11, 13, & 20) loaded on the somatic factor; seven items (# 3, 6, 9, 10, 14, 17, & 18) loaded on the depressed affect factor; four items (# 4, 8, 12 & 16) loaded on the positive affect factor; and only two items (#15 & 19) loaded on the interpersonal problems factor (Shafer).

The internal reliability of the CES-D has been reported by Cronbach's alpha; the alpha scores have been reported in the range of 0.86 and 0.89 for elderly populations (Schein & Koenig, 1997) and 0.89 for a sample of women with breast cancer and an alpha of 0.87 for the comparison group of women without breast cancer (Hann, Winter,

& Jacobsen, 1999). Schein and Koenig reported that three previous studies had confirmed the original factor analysis for the subscales, with subscale reliabilities ranging from 0.57 to 0.85; they further reported the following alpha coefficients for their study: 0.86 for the full scale, 0.80 for depressed mood, 0.68 for psychomotor retardation, 0.65 for lack of well-being, and a low 0.40 for interpersonal difficulties. Only the alpha for depressed mood would be considered sufficient for clinical assessment. Cronbach's alpha for the study was .87.

In a study of stroke patients (Agrell & Dehlin, 1989), the CES-D Cronbach's alpha was found to be 0.64. Three items were found that did not correlate well with the sum of the scores: item 10 ("I felt fearful"), item 15 ("People were unfriendly"), and item 19 ("I felt that people disliked me"). The same study established the CES-D's construct validity to a global rating of 0.73. Concurrent validity was established with other rating scales evaluated: 0.82 with the Geriatric Depression Scale, 0.81 with the Zung Self-Rating Depression Scale (SDS), 0.74 with the Hamilton Rating Scale, 0.83 with the Comprehensive Psychopathological Rating Scale-Depression (CPRS-D) (all $p < 0.001$), and a low 0.32 ($p < 0.02$) for the Cornell Scale.

Strength of the CES-D is its emphasis on mood and affect rather than on the physical manifestations of depression. This is a CES-D advantage for assessment of depressive symptoms in the presence of co-morbid medical conditions (Hann et al., 1999) which is a consideration for a study that includes CVD risk factor assessment and health-promoting lifestyle behaviors such as the proposed study.

Additional clear strengths of the CES-D are that it was designed to be used in large epidemiological studies, that it has not been criticized for particular difficulty of use as a self-rating instrument, and its very low reading level. Using the Microsoft Word readability statistics option, the CES-D reading level was calculated to be grade 2.3 (Table 5). When compared to the BDI and the SDS, the CES-D has been judged to be the most balanced and representative test, most likely because it was developed from other tests even though it does not equally address all the symptom areas (Shafer, 2006). One of the described weaknesses of the CES-D is that its items do not correspond to the current DSM-IV depression criteria; the same criticism applies to the SDS (Shafer, 2006).

Table 5. CES-D Readability Statistics *

Counts	
▪ Words	280
▪ Characters	887
▪ Paragraphs	106
▪ Sentences	22
Averages	
▪ Sentences per paragraph	1.0
▪ Words per sentence	7.2
▪ Characters per word	3.9
Readability	
▪ Passive sentences	4%
▪ Flesch Reading Ease	90.8
▪ Flesch-Kincaid Grade level	2.3

* Used the Microsoft Word "Tools – Options – Spelling & Grammar" to perform these statistics.

Cardiovascular Risk

Cardiovascular risk was calculated based on responses to the Covenant Heart Health Questions and physical measures performed during the heart health risk assessment sessions. The calculated cardiovascular risk was performed once the woman's data were entered into the health risk assessment software. The risk assessment was that of the Framingham Estimate of 10-Year Risk for Women which is described is this section.

Covenant Heart Advantage Heart Health Risk Assessment

Data from the Covenant Heart Advantage heart health risk assessment program that were used in this study included the Covenant Heart Health Questions (Appendix H) and physical measures that are part of the calculation of CVD risk. The data that were used from the heart health risk assessment program were summarized on a data collection sheet for each participant (Appendix M).

The Covenant Heart Health Questions (Appendix H) were developed by HealthAware (nd), a well-established company known for the development of health risk assessment materials. HealthAware was selected by Covenant HealthCare as the vendor for the Covenant Heart Advantage heart health risk assessment program. All of the women participating in the Covenant Heart Advantage heart health risk assessment program completed the Heart Health questions before coming to the screening session.

The Covenant Heart Health Questions is a 22 item survey that includes height and weight (which are used to calculate the BMI), personal history of traditional CVD risk factors (smoking, cholesterol, aerobic exercise frequency, diabetes, and blood

pressure). Additional data include family history of heart disease, diabetes, high blood pressure, and high cholesterol as occurring before the age of 55. Family was specified as parent or sibling. The respondents are also asked if they have been diagnosed by a doctor with a cardiovascular condition (e.g., heart attack, chest pain, heart failure), take medications (e.g., arthritis, aspirin on a regular basis, blood pressure, high cholesterol), or if they have had a cardiovascular procedure (e.g., cardiac catheterization, balloon angioplasty, bypass surgery, or stent). The zip code from the person's address was used to track the general area for the participants to differentiate rural, and urban participants.

The physical measures that are part of the Covenant Heart Advantage heart health risk assessment program are blood pressure, lipid profile, weight, BMI, percent body fat, and waist circumference. Each woman had her blood pressure obtained using an electric digital noninvasive blood pressure device that was serviced periodically according to the organization's policies. Weights were measured using a scale that was periodically calibrated according to the organization's policies. The self-reported height and the measured weight were used to calculate the BMI. Waist circumference was measured in the standard fashion by trained staff. Due to the hectic pace and the lack of privacy during the large group events, it was not possible to obtain the waist circumference, thus this measurement is absent for 31 study participants.

An Omron Model HBF-306 Fat Loss Monitor (Omron, nd) device was used to measure the percent body fat. The lipid profile – total cholesterol (TC), HDL-C, and

LDL-C was obtained via a finger-stick and processed with the Cholestech LDX. Trained personnel from the sponsoring organization performed these assessments.

The Omron Model HBF-306 Fat Loss Monitor (Omron, nd) is a portable hand-held battery operated device. It uses bioelectrical impedance to estimate the body fat percentage. This technology has been found to be comparable to standard anthropometric measurement methods (Lintsi, Kaarma, & Kull, 2004). It also calculates the BMI with the following equation: (weight in pounds x 703) / height in inches / height in inches. Covenant HealthCare staff trained in the use of this device obtained the percent body fat and BMI measures.

The Cholestech LDX point-of-care system uses an enzymatic methodology and solid-phase technology to measure TC, HDL-C, LDL-C along with some other options not selected by the screening program (Cholestech Corporation, Hayward CA). Precision for the LDX ranges between 2% to 6%, with variation due to the cassette-housed analyst reagent lot number. The finger-stick method correlates with venous plasma values ($r \geq 0.95$) that meet the NCEP guidelines (Cholestech Corp.; Working Group, 1995). The quality controls for the devices are performed when the lot number for the cassettes changes. This approach to the device quality control is the standard authorized by the Laboratory Director at the cardiac screening program's sponsoring medical center (D. Best, Personal Communication, August 3, 2007).

Description of Cardiac Risk

Cardiac risk was described using two methods during the study. The first method was the Framingham Estimate of 10-Year Risk (Appendix N); this was

calculated by the HeartAware risk assessment program. The second method was the classification described in the AHA CVD prevention guidelines for women (Mosca, Banka et al., 2007); these guidelines described three levels of CVD risk in women as high risk, at risk, and optimal risk (Table 6). A combination of clinical criteria forms the basis for this classification schema. The Estimation of 10-Year Risk for Women uses the point scoring method originally developed for the Framingham Global Risk estimator. The Estimation of 10-Year Risk for Women (Framingham Point Scores) is utilized by the NCEP (NCEP, 2001).

The data obtained as part of the Covenant Heart Advantage heart health risk assessment which includes the Framingham risk score (summarized on the data collection form, Appendix M) were used to classify the women according to the AHA classification as described in Table 6. Women with a 10-year Framingham global risk greater than 20% or women with diabetes comprised the high risk group in this study, since the other criteria in the high risk category were considered study exclusion criteria.

Table 6. American Heart Association Classification of CVD Risk in Women

High Risk	At Risk	Optimal Risk
▪ Established CHD ▪ Cerebrovascular Disease ▪ Peripheral arterial disease ▪ Abdominal aortic aneurysm ▪ End-stage or chronic renal disease ▪ Diabetes mellitus ▪ 10-Year Framingham global risk > 20%	▪ ≥ 1 major risk factors for CVD including: ♦ Cigarette smoking ♦ Poor diet ♦ Physical inactivity ♦ Obesity, especially central adiposity ♦ Family history of premature CVD (CVD at < 55 years of age in males relative and < 65 years of age in female relative) ♦ Hypertension ♦ Dyslipidemia ▪ Evidence of subclinical vascular disease (e.g., coronary calcification) ▪ Metabolic syndrome ▪ Poor exercise capacity on treadmill test and/or abnormal heart rate recovery after stopping exercise	▪ Framingham global risk <10% ▪ A healthy lifestyle with no risk factors

Mosca, Banka et al. (2007), p. 1482.

Defining Obesity and Central Adiposity. Central adiposity is considered more atherogenic than total body fat (Everson-Rose, 2009). For a complete CVD risk assessment, it is considered most complete to measure for overweight, obesity and for central adiposity (AHA, 2009). The literature often differentiates between overweight and obesity, both of which are considered unhealthy for the specified individual's height highlighted by an AHA science advisory report addressing the overweight BMI

and mortality (Lewis et al., 2009). Overweight and obesity in adults are described by the BMI (CDC, 2009). A BMI (reported as kg/m^2) less than 18.5 kg/m^2 is considered underweight. A healthy weight is described by a BMI in the range of 18.5 to 24.9. A BMI between 25.0 and 29.9 defines overweight, and a BMI of 30 or more is considered obese. A BMI equal to or greater than 40 identifies extreme obesity.

Central adiposity is a defining factor of the metabolic syndrome although the cut-points for waist circumference differ among leading groups (Alberti, et al., 2009). Waist circumference is one measure advocated for the determination of central adiposity. The most recent AHA metabolic syndrome criteria stated that the desired waist circumference for women to be less than 35 inches (Grundy et al., 2005). Investigators seeking to refine the identification of CVD risk factors also advocate for the measurement of percent of body fat to add to the definition of obesity. One study investigating the relationship between types of body fat and depressive symptoms (Everson-Rose et al., 2009) identified that visceral adipose tissue was most highly associated with depressive symptoms rather than subcutaneous body fat. The measurement of these types of fat does not, however, currently lend itself to clinical practice. The current ideal percent of body fat for women is between 16 and 25% and measurements over 30% are classified as obese (CDC, 2009).

Ferrans and Powers Quality of Life Index© Generic Version-III

The Ferrans and Powers Quality of Life Index © (QLI) Generic Version-III (Appendix O) was used to measure the participant's perceived QOL (Ferrans & Powers, 1985, 1992). The domains addressed in the QLI correspond very well with the variables

of the HPM. The QLI measures overall life satisfaction as well as 37 areas of life that have been identified as having an impact on QOL. The QLI produces five scores: quality of life overall and in four domains: health and functioning, family, social and economic, and psychological/spiritual. Directions for scoring are provided by the authors and reproduced in Appendix O.

The QLI is available in several disorder specific validated versions, including a cardiac version. The Generic Version-III was selected because the sample for the study was women with no known cardiac disease. This selection decision was verified with Dr. Ferrans (Personal Communication, January 2008). Over 100 studies, with 41 in cardiovascular investigations, have been reported using the QLI along with established reliability and validity (Ferrans, 2004).

The QLI website reports that 48 studies have established the internal consistency reliability with Cronbach's alphas in the rage of .73 to .99 and that 19-24 studies have established the reliability for the subscales with alphas ranging from .70 to .94 for the health and functioning subscale, .78 to .96 for the psychological/spiritual subscale, .71 to .92 for the social/economic subscale, and .63 to .92 fir the family subscale. Ferrans and Powers (1985) reported that an extensive literature review initially established content validity which was further established using the Content Validity Index (Oleson, 1990). Several studies established the construct validity of the QLI with other life satisfaction measures (Ferrans & Powers, 1985) and factor analysis which established the current subscales (Ferrans & Powers, 1992). The factor analysis was confirmed by a study of Norwegian women (Rannestad et al., 2000) and using the

contrasted groups approach with groups self-reported pain, depression and successful coping (Ferrans, 1990). The responsiveness of the QLI was established by 27 studies that reported changes in the QLI pre- and post-intervention or treatment (www.uic.edu/orgs/qli/reliability/reliabilitymain.htm). The QLI website states the readability to be at the fourth grade reading level.

A recently reported study of the QOL in women after coronary artery bypass surgery used the QLI-Cardiac version to measure overall satisfaction with life and other variables which affect QOL (Penckofer et al., 2005). The investigators reported Cronbach's alpha preoperatively of .91 and postoperatively of .95 Overall, QLI improved postoperatively to 22.74 ± 4.64 from the preoperative average score of 21.37± 4.34 ($p = .004$), producing a standardized effect size of 0.32. This investigation of women with known CAD is the closest study identified thus far to this study of women learning of their CVD risk.

The Cronbach's alpha for the study for the QLI total score was .92. The study alpha scores for the four QLI subscales were: .85 for health and functioning, .73 for social and economic, .88 for psychological/spiritual, and .73 for family.

The domains addressed in the QLI correspond well to the HPM's individual characteristics and experiences of prior related behavior and the personal factors of biological, psychological and sociocultural etiology as well as the behavior-specific cognitions and affect of interpersonal influences (family, peers, providers); norms, support, models as well as situational influences, and the perceived benefits of action, perceived barriers to action, perceived self-efficacy, and the activity-related affect. "The

goal of nursing in health promotion is to maintain or enhance the client's health status and well-being" (Pender et al. 2002, p. 260) is an extension of this author's theoretical definition of QOL. The HPM's definition of the concept health promotion is also explicitly linked to this author's QOL theoretical definition: "Health promotion is behavior motivated by the desire to increase well-being and actualize human potential" (Pender et al. 2002, p. 7). Thus, the HPM is an excellent fit for a QOL study based on the model's health promotion concept and its theoretical propositions.

Health-Promoting Lifestyle Profile-II

The study variable, health-promoting lifestyle behaviors, was measured by the Health-Promoting Lifestyle Profile-II (HPLP-II) (Appendix P). The HPLP-II is a revision of an instrument designed to measure exercise benefits and barriers consistent with elements in the HPM (Walker, Sechrist, & Pender, 1987). The HPLP-II is a 52-item instrument that measures the multi-dimensional pattern of self-initiated health-promoting behaviors. These behaviors are intended to maintain or enhance the individual's health potential and wellness level (Acton & Malathum, 2000).

The four-point response scale measures the frequency of the self-reported health-promoting behaviors as never, sometimes, often and routinely. The HPLP-II can be scored providing an overall health-promoting lifestyle score as well as six subscale scores. The six subscales are: (1) health responsibility, (2) physical activity, (3) nutrition, (4) spiritual growth, (5) interpersonal relations, and (6) stress management. No studies using the HPLP-II in a similar population have been identified.

The HPLP-II has strong psychometrics. Using young and middle-aged adults, the Cronbach's alpha for the whole instrument is .94 and for the six subscales are: health responsibility (.86), physical activity (.85), nutrition (.80), spiritual growth (.86), interpersonal relations (.87), and stress management (.79) (Susan Noble Walker, PhD, RN, personal communication, July 11, 2005). A study of 84 community-dwelling adults designed to investigate health-promoting behaviors' association with the satisfaction of basic needs (Acton & Malathum, 2000) reported similar Cronbach's alpha with .90 for the total scale and .88, .86, .83, .90, .85, and .85 respectively for the six subscales as delineated by Walker.

The Cronbach's alpha for the study was .92 for the total mean score. The Cronbach's alpha for the six subscales were: .76 for health responsibility, .85 for physical activity, .79 for nutrition, .86 for spiritual growth, .81 for interpersonal relations, and .77 for stress management. These results on the whole are similar to those reported by Walker and then by Acton and Malathum (2000).

A shortcoming of the HPLP-II is that the nutrition items do not reflect the current dietary recommendations. Dr. Walker would not permit revisions to the HPLP-II (Dr. Susan Walker, Personal Communication, January, 2008).

Awareness of Heart Disease Risk, Demographics and Health History: The ASK Study Questions

A compendium of additional questions to supplement the variables collected in the above described measures was developed by the study researcher (Appendix Q). To aid in the identification of this set of questions and to brand identify the research study,

these questions bear the title of The ASK Study. ASK is an acronym for Assessing Depressive Symptoms Improves the Knowledge of CVD Risk. The term ASK corresponds to the researcher's belief that women being screened for CVD risk should also be screened for the presence and severity of depressive symptoms and to be referred for counseling and possible treatment.

There are five groups of questions included in this measurement; sociodemographic, mental health, awareness of heart disease, comorbidity, and some single items. The items included also correspond to the Wilson and Cleary HRQOL domains.

Sociodemographic Questions. The sociodemographic questions address race, ethnicity, educational level, family income, employment status, and marital status. The race and ethnicity items follow the NIH Policy on Reporting Race and Ethnicity Data (NIH, 2001). The educational level and marital status items are worded according to the census survey.

Mental Health. Four items were included to assess depression history. Women were asked if there is a family history of depression, whether they have ever been diagnosed with depression, if they have ever been treated for depression, and whether they are taking any medication for depression. The WISE investigators stated that the combination of depressive symptoms scoring and the depression treatment history were strong predictors of increased CVD risk profile (Rutledge, Reis, Olson, Owens et al., 2006),.

Awareness of Heart Disease Questions. Since many women remain unaware that heart disease is their number one killer, it is important to ascertain whether the women coming to this cardiac risk screening program had awareness of their risk status before the screening program. If they were aware of their risk status, it would be helpful to determine the source of their awareness particularly considering that the Covenant Heart Advantage program sends each woman who is a member a quarterly newsletter which discusses some aspect of achieving or maintaining a heart healthy lifestyle.

Four items asked the participant about her awareness of her risk of CVD. The participant was asked if she knew about her risk for getting heart disease before attending the screening program and if she learned about her risk from her primary healthcare provider. Then she was asked if she was surprised to learn that all women should be evaluated for their risk of heart disease and how she might have learned about this need for CVD risk assessment.

Comorbidity Status. Medical conditions that exist along with a primary diagnosis or disorder are important to determine because they can effect treatment decisions and can influence the onset and progression of complications. Most significantly for this study, determination of participants' comorbidities is crucial to the statistical analysis.

One comorbidity index was found that described physical function rather than prediction of mortality as its outcome, the Functional Comorbidity Index (FCI) (Groll, To, Bombardier, & Wright, 2005). This self-administered index was incorporated into the ASK Study questions with the series of medical disorders listed on the second page

(Appendix Q). Permission to include the FCI has been obtained (Dr. Groll, Personal Communication, August 3, 2007).

The FCI was developed from an extensive review of the literature regarding functional status risk factors and a survey of existing comorbidity indices with physical function as the outcome (Groll et al., 2005). A series of focus groups of chronically ill participants and healthcare professionals reviewed the list of medical disorders. The results of the literature review and the focus groups were then organized according to standard diagnostic codes which then would lend the use of the index to the analysis of large administrative data sets. Using the SF-36 physical function subscale as the dependent variable, a series of regression analyses began to reduce the number of medical diagnoses that eventually became the FCI.

In an evaluation of three comorbidity indices, the FCI performed well as a multi-morbidity measure where HRQOL is considered the outcome of interest, as it is in this study (Fortin et al., 2005). These investigators also used the SF-36 to evaluate the performance of the selected comorbidity indices. An advantage they identified was the ease of scoring the FCI. The final FCI score is the sum of identified comorbidities. Groll et al. (2005) also reported on the advantage of non-weighted scoring as there was very little advantage from weighting the scores.

Single Items. The medication list has been added as another strategy to elicit relevant medical disorders history. Since the Covenant Heart Health Questions ask the respondents if they have had a cardiac catheterization, a balloon angioplasty, a stent, or bypass surgery (Appendix H), only whether they have had a stress test has been added

to validate that the women attending the cardiac screening program have no known CHD history. The snoring item was added as a proxy for sleep apnea. This is one item from a CVD risk factor analysis in a study investigating depressive illness patterns in a group of 77 participants with documented CAD to identify predictors of early onset of CHD (Ketterer et al., 2006) that had not been captured on the ASK Study items or the Women's Heart Advantage Heart Health Questions. These investigators found that snoring was among a set of predictors for early onset CHD.

Ethical Considerations

The ethical conduct of this study was grounded in the traditional bioethical principles of autonomy, beneficence, justice, and nonmalfiesence (Beauchamp & Childress, 2001), which were further developed into seven ethical principles for research (Emanuel, Wendler, & Grady, 2000). The application of these ethical principles assured that the following were addressed in this research endeavor: (a) that the study have social or scientific value, (b) that the study have scientific validity, (c) that the subjects are fairly selected, (d) that the risk-benefit ratio is favorable, (e) that there is an independent review of the study protocol, (f) that the subjects are afforded informed consent, and (g) that potential and enrolled subjects be treated with respect. Additionally, the protection of human subjects participating in a correlational design includes the use of valid and reliable instruments, which are an essential element for the scientific validity of the study, so that the participants' time is not wasted (Brink & Wood, 1998).

The next section summarizes the institutional review boards that were included in this process along with the description of the study to prospective participants, and a discussion of the study's potential risks. Additional ethical considerations presented are the referral sources for depression counseling, steps to insure the confidentiality of the participants, and the researcher's conflicts of interest.

Institutional Review Board Review

Before beginning data collection, the proposed research protocol was submitted for institutional review board (IRB) approval through Loyola University Chicago Lake Shore Campus, to the IRB for Covenant HealthCare (the research setting) and to Saginaw Valley State University IRB (the researcher's faculty appointment). These IRB reviews helped to assure that the design was scientifically sound and that all necessary steps for the protection of human subjects and ethical conduct of the protocol from recruitment of subjects through the publication and dissemination of the findings were clearly delineated. The Covenant HealthCare and Saginaw Valley State University IRBs require that studies anticipating publication must have IRB approval. A letter of organization cooperation (Appendix R) was obtained from Covenant HealthCare giving permission to access the heart health risk assessment data and to recruit women participating in heart health risk assessment events.

Study Explanation to Prospective Participants

Women who expressed an interest in participating in the study had the purpose, the procedures, the anticipated risks and potential benefits of the study explained to them before asking them to read and sign the consent form (Appendix J). The consent

form contains the following elements: a description of the study's purpose and procedures, a description of the risks and benefits, statements regarding compensation, confidentiality, and voluntary participation. The consent includes contact information for the researcher, the supervising faculty, and the IRB offices.

During the consent process, prospective participants were informed that the study was not part of the cardiac screening and that refusal to participate in the study would in no way alter their ability to participate in the cardiac screening or alter any other aspect of their healthcare. The prospective participants were assured that all data would be collected and maintained in accordance with procedures protecting their confidentiality. Women were informed that the study questionnaire booklet as well as the information that was gathered during their cardiac screening would be used for the research study.

Potential Risks

The only potential psychological risks were that of learning of their CVD risk of having a cardiac event within the next 10 years and responding to the CES-D, the depressive symptoms instrument. Given the nature of scoring the CES-D it was not possible to perform the scoring at the time of administration. Although it was anticipated that some women may have found the CVD risk status information new and unsettling, when asked at the completion of the data collection if the participant had any questions or concerns, no participants described any. Learning their CVD risk, however, is part of the Covenant Heart Advantage heart health risk assessment

program, thus would have occurred regardless of the research and was an intended beneficial outcome of the screening program.

As a precaution for near-term concerns being raised by participation in the study, all participants were given a list of referral resources for psychological counseling (Appendix K). The list was approved by a social worker at the organization where the research was conducted.

The only physical risks were related to the finger-stick aliquot of blood used for the non-fasting lipid profile that was part of the screening program. These data were used to calculate the Framingham Point Score and categorize the cardiac risk. The likelihood of significant pain, discomfort or physical damage from the finger-stick was extremely low. Furthermore, only trained staff performed the finger-stick and operated the analyzer, thus reducing the likelihood of having to repeat the finger-stick.

The risks to the subjects were reasonable and were essential to determine each participant's cardiac risk factors. The cardiac screening program provided each woman with a copy of her results and strategies for reducing the risk factors. The advantage of the screening program was that the women learned their CVD risk factors and received instruction how to reduce their risk and received referrals to area cardiologists for further evaluation and treatment as necessary. The individual risk from the research study was minimal particularly with regards to the knowledge of the association of depressive symptoms to QOL, the health-promoting lifestyle pattern in depressive symptoms and also according to cardiac risk status. This knowledge will add to our

understanding of the experience of women with depressive symptoms at risk of CVD and of having a cardiac event within the next 10 years.

Researcher Conflict of Interest

The only conflict of interest for the study was that it was a requirement for the completion of a PhD in nursing. The researcher was vested in the completion of the study. The ethical conduct of the study ultimately rested with the researcher, and her adherence to the code of professional ethical conduct.

CHAPTER FOUR

RESULTS

The purpose of the study was to investigate the relationship of depressive symptoms to the status of health-promoting lifestyle behaviors, the awareness of heart disease risk, and cardiac risk, and how these relationships affect perceived quality of life. The study aimed to not only identify these relationships, but to identify whether there was a dose-response relationship between depressive symptoms and the study variables of cardiac risk, health-promoting lifestyle behaviors, and quality of life in women presenting for CVD risk screening. The final study aim was to determine whether the effect of depressive symptoms on perceived quality of life was direct or indirect being mediated by either or both cardiac risk and health-promoting lifestyle behaviors.

Description of the Sample

One hundred twenty-five women completed the study. The study sample can be described as urban, non-Hispanic, white, and married, employed full-time, with a household income between $25,000-49,999 who had some college education but did not earn a degree. Anecdotally, most women who indicated that they were not seeking employment said they were retired. The sociodemographics of the study sample are summarized in Table 7.

Table 7. Demographics of Study Sample

Variable		N (Percent)
Age	Mean (Standard Deviation)	57.7 (± 9.6)
	Median (Range)	58 (39 – 75)
Ethnicity		
	Hispanic Origin	6 (4.8%)
	Not of Hispanic Origin	119 (95.2%)
Race		
	American Indian or Alaskan Native	1 (0.8%)
	Black or African-American	16 (12.8%)
	White	107 (85.6%)
	Missing	1 (0.8%)
Education		
	Less than 9th Grade	1 (0.8%)
	9th to 12th Grade, no diploma	4 (3.2%)
	High school graduate (includes equivalency)	32 (25.6%)
	Some college, no degree	38 (30.4%)
	Associate degree	17 (13.6%)
	Bachelor's degree	17 (13.6%)
	Graduate or professional degree	16 (12.8%)
Total Family Income		
	Less than $15,000	7 (5.6%)
	$15,000 – 24,999	23 (18.4%)
	$25,000 – 49,999	50 (40%)
	More than $50,000	43 (34.4%)
	Missing	2 (1.6%)
Marital Status		
	Never married	10 (8%)
	Now Married	75 (60%)
	Separated	3 (2.4%)
	Divorced	26 (20.8%)
	Widowed	11 (8.8%)
Employment Status		
	Employed full-time	49 (39.2%)
	Employed part-time	15 (12%)
	Unemployed	19 (15.2%)
	Not seeking employment	42 (33.6%)

Because the women voluntarily presented for CVD risk screening from the community, it was anticipated that the sample would closely resemble the racial and ethnic composition of the surrounding community. Although the medical center serves a 15-county area, the vast majority of patients (n = 104, 83.2%) participating in the study came from within 15 miles of the study setting, from just two of the area urban counties. Table 8 displays the geographic distribution of the sample generated from the zip codes and the June 2003 U.S. Office of Management and Budget designation of Michigan counties as rural or urban (Michigan League for Human Services, 2005).

Table 8. Geographic Distribution

Distance from Study Site (Range in Miles)	Frequency	County Classification (# Counties)
0 – 4.9	62 (49.6%)	Urban (1)
5.0 – 9.9	8 (6.4%)	Urban (2)
10 – 14.9	35 (28%)	Urban (2)
15 – 19.9	3 (2.4%)	Urban (1)
20 – 24.9	8 (6.4%)	Urban (1), Rural (3)
25 – 29.9	1 (0.8%)	Rural (1)
41 – 111	8 (6.4%)	All rural

The three major counties served by the medical center are a blend of small urban, suburban, and rural communities. According to the year 2000 census, the 3-county total population was 403,070 persons. The racial composition for the 3-counties was skewed: 75.3% was White, 18.6% was Black, nearly 7% was Hispanic or Latino, and nearly 1% each was Native American, or Asian. The racial composition for the city where the medical center is located was more racially balanced in the year 2000: 47% White and 43.3% Black. The Hispanic population was 11.7% (Census bureau note:

Some Hispanics may have reported more than one race, hence, the total percent is more than 100). The racial composition for the sample was also skewed: White (85.6%), Black (12.8%), and non- Hispanic ethnicity (95.2%). Related to the geographic distribution of the sample, the racial composition of the study sample more closely resembles the racial composition for the 3-county area which also corresponds to the geographic composition of the study sample

Data Matching and Security

Data were abstracted from the Covenant Heart Advantage Heart Health Questions and from the online Health Aware database on to the archival data collection sheet (Appendix M) after participants completed the study questionnaire booklet. Data were then matched with the women's corresponding study questionnaire booklets.

Stripped of all individual identifiers, all data from the archival data collection sheet and the questionnaire booklet were entered into a statistical software database (SPSS Windows Version 15.0, SPSS, Chicago, IL). All data were checked manually for errors and data entry errors were corrected. The database was stored in a password-protected file and a protected backup system. Once the data were entered, only participant codes identified the raw data. All paper data and computer file backup data were secured in a locked cabinet in the researcher's office.

Missing Data

Before the women left the study area attempts to verify completion of the data were performed. This was not consistently done which may have contributed to missing data for some women. Data were considered missing if there was no response to an item

or the woman scored two responses to one item. Eleven participants had missing data (8.8% of sample) on the HPLP-II instrument. Two women missed responding to one item each on the CES-D. The patterns of missing data on the QLI were the job question, the children, spouse/lover/partner, sex life, and family's happiness items. The missing data were to be expected; if you don't have a job, then it is realistic to not answer the item. While the scoring on these missing items doesn't require the replacement of missing data, the missing data were replaced as described below.

One of the metabolic syndrome variables, waist circumference, had a large amount of missing data. Thirty-one women (24.8%), all who attended one of the large group screening events, did not have waist circumference values most likely due to insufficient privacy for physical measurement. Two women did not have a body fat percentage value. Two women did not report income level, and one woman did not indicate her race. Two women did not indicate if they had had a stress test, snored, or had been diagnosed with sleep apnea. All other demographic and CVD risk factor variables were complete.

The data were manually screened for missing or potentially erroneous data responses. The few data entry errors were corrected and frequencies were run again before continuing the data analysis. Missing data were imputed only for data missing on the CES-D, HPLP-II and QLI instruments. The PRELIS program (Jöreskog & Sörbom, 1996) was used to estimate values for the missing data. As opposed to substituting mean item scores, PRELIS imputes values on the basis of like-responses. According to Little and Rubin (1987), this method is preferable to substitution with item mean values

that can obscure between group differences. Imputed data were estimated at less than 1% of usable data.

Data Analysis

Data were analyzed for normality, outliers, and extreme scores that may exert undue influence. Normality was initially evaluated by examining histograms. Variables which appeared skewed were then analyzed for the presence of significant skewness. The following variables were found to be significantly negatively skewed: (1) whether the women knew their CVD risk before attending the screening program, (2) the percent body fat, (3) the presence of a positive family history, (4) family income, and (5) the total QLI score. The following variables were found to be significantly positively skewed: (1) marital status, (2) whether or not they had diabetes, (3) their calculated Framingham risk score, and (4) the total CES-D score.

Although these variables were skewed, they are representative of what would be expected with the sample (for example, lower cardiac risk score, less depression, and fewer persons with diabetes since the sample was relatively healthy). In addition, because data normality is not an assumption for Spearman rho correlation analysis or for predictors used in multiple linear regression analysis (Field, 2009), no data transformations were performed to correct skewness. The creation of dichotomized variables eliminated significant skewness.

The next segments of data analysis will summarize the findings for the major study variables. This discussion will begin with the cardiac profile. Following the cardiac profile discussion will be the responses to the heart disease awareness items, the

health-promoting lifestyle behaviors, depressive symptoms, and conclude with the perceived quality of life. Following these data will be a series of group comparisons based on depressive symptoms status, the frequency of performing health-promoting lifestyle behaviors, and quality of life. The presentation of the results of the study aims follows the discussion of the study variables.

Cardiac Risk Profile

The cardiac profile section will address the traditional CVD risk factors according to the Framingham point score method. The next profile analysis will be that of the metabolic syndrome profile for the sample. The cardiac profile section concludes with the samples' results according to the AHA risk status classification for women.

Estimate of Risk with Framingham Point Scores

The estimate of 10-year risk for women (Framingham risk score, Appendix N) was used to describe the calculated cardiac risk. The vast majority of the sample (n=117, 93.6%) scored less than 10% for their calculated cardiac risk score. Table 9 summarizes the CVD risk factors assessed in the sample according to the Framingham point scoring system. In order to score a 10% risk, a woman would have to have a total of over 19 points. Using the mean risk factor values for this sample, a 57 year old woman with a TC of 196 mg/dl, an HDL-C of 53 mg/dl, who does not smoke with a SBP of 128 mmHg who is on an antihypertensive medication would get 8 points for age, 2 points for TC, no points for HDL-C or smoking, and 3 points for SBP. Her total points would be 13 giving her a 2% 10-year Framingham risk score. Therefore, most of the points are due to age. Nearly half of the sample could add a maximum two

additional points for an HDL-C less than 50 mg/dl, 4-7 additional points for a TC greater than 200 mg/dl and 4-6 additional points for a treated SBP greater than 129.

It is noteworthy that the majority of women (n=90, 72%) had TC in the range of 160-239 (although this was a non-fasting value) but only half of these women (n=47, 37.6% of the sample) reported taking a cholesterol lowering medication. Considering the target for normal SBP is 120 mmHg, two-thirds (n=87, 69.6%) of the women exceeded that value and only half of them (n=45, 51.7% of the sample) reported taking an antihypertensive medication.

Table 9. Cardiovascular Disease Risk Factors per the Framingham Point Score System

CVD Risk Factor		N (Percent)
Age	Mean (Standard Deviation)	57.7 (± 9.6)
	Median (Range)	58 (39-75)
	30-39	3 (2.4%)
	40-49	24 (19.2%)
	50-59	42 (33.6%)
	60-69	40 (32%)
	70-75	16 (12.8%)
TC	Mean (Standard Deviation)	196 mg/dl (± 40.5)
	Median (Range)	193 (118-327)
	< 160	21 (16.8%)
	160-199	45 (36%)
	200-239	44 (35.2%)
	240-279	12 (9.6%)
	≥ 280	3 (2.4%)
HDL-C	Mean (Standard Deviation)	53 mg/dl (± 14.8)
	Median (Range)	53 (17-97)
	< 40	23 (18.4%)
	40-49	29 (23.2%)
	50-59	32 (25.6%)
	≥ 60	41 (32.8%)
Smoking		
	No	120 (96%)
	Yes	5 (4%)
SBP	Mean (Standard Deviation)	128 mmHg (± 16)
	Median (Range)	128 (88-170)
	< 120	38 (30.4%)
	120-129	27 (21.6%)
	130-139	24 (19.2%)
	140-159	31 (24.8%)
	≥ 160	5 (4%)
Framingham Risk Score		
	Mean (Standard Deviation)	3.3% (± 3.9)
	Median (Range)	1.0 (< 1% - 30%)

Note: HDL-C = high density lipoprotein cholesterol; SBP = systolic blood pressure; TC = total cholesterol.

Other CVD risk factors beyond the Framingham point score system are worthy of consideration: diabetes, diastolic blood pressure, presence of a positive family history for CVD, and obesity measures - BMI, percent body fat, and waist circumference. Excluding family history, these risk factors define the metabolic syndrome. A majority of women (n=96, 76.8%) reported a positive family history of CVD.

Metabolic Syndrome

The cardiac risk profiles were examined to determine the number of women with possible metabolic syndrome (Grundy, et al., 2005). Since triglycerides and fasting glucose were not obtained, metabolic syndrome was determined by having diabetes, increased waist circumference, decreased HDL-cholesterol, and/or hypertension (Table 10). Self-reported type 1 and type 2 diabetes were used as proxies for elevated blood sugar. Frequencies were calculated to determine the number of women who met the criteria of having three metabolic syndrome variables. Twelve women met the criteria for having the metabolic syndrome. An additional 26 women had two of the criteria which suggest that had there not been missing waist circumference data, the total women with metabolic syndrome might exceed 12.

Table 10. Metabolic Syndrome

Variables	Number	Percent of Sample
Diabetes		
Type I	2	1.6%
Type II	11	8.8%
Waist ≥ 35 inches [a]	54	57.4%
HDL-C < 50 mg/dl or Drug treatment	53	42.4%
Elevated BP or Drug treatment	60	48%

Note. BP = blood pressure; HDL-C = high-density lipoprotein-cholesterol.
a = missing data for 31 women

American Heart Association Risk Classification Assessment

With the introduction of the AHA risk classification system for women (Table 5; Mosca, Banka, et al., 2007) this streamlined approach may help to identify women "at risk" of developing heart disease and to do so in a more meaningful fashion. This is particularly relevant from the perspective of maximizing CVD risk modification. It is noteworthy that it takes a point score of greater than 19 points to reach the 10% threshold of having a 10-year risk of a cardiac event according to the Framingham point score method. Given the age range for the majority of women in this sample, most of the points were associated with their age. Therefore, it was important to extend the cardiac risk profile analysis of this sample to determine how they would be classified using the current AHA level of risk for women. How might the presence of CVD risk factors which constitute the AHA "at risk" group alter the risk group assignment of the

study women? Table 11 lists the number of women who had each of the CVD risk factors that could make them eligible for being classified as "at risk".

Table 11. Sample Reclassification of American Heart Association Cardiac Risk Profile for Women

Risk Factors	**High Risk**	**At Risk (N / Percent)**	**Optimum Risk**
Framingham Score	1 (0.8%)	7 (5.6%)	117 (93.6%)
Diabetes	13 (10.4%)	n/a	n/a
"At Risk" [a]			
≥ 1 major risk factor for CVD including: [b]			
Physical inactivity		89 (71.2%)	
Obesity, especially central adiposity		72 (57.6%)	
Hypertension		60 (48%)	
Dyslipidemia		52 (41.6%)	
Poor diet		41 (32.8%)	
Metabolic syndrome		12 (9.6%)	
Cigarette smoking		5 (4%)	
Risk Class Total [c]	**14 (11.2%)**	**80 [d] (64%)**	**31 (24.8%)**

Note. a= number of women who have one or more of the listed risk factors and or the metabolic syndrome; b = number (percent) of women who do have these risk factors; c = number of women reclassified after calculating the "at risk" group; d = total "at risk" adjusted for low physical activity women who were diabetics and those already identified as "at risk" by Framingham score; n/a = not applicable.

The first criterion in this schema is the Framingham risk score. The values in Table 10 are the calculated risk scores for the sample. The majority of the participants (n= 117, 93.6%) had calculated Framingham risk scores less than 10% which placed them in the "optimum risk" classification. Based on a Framingham risk score less than 20% but greater than 10%, seven women were classified in the "at risk" category. With

a Framingham risk score of 30%, one woman in this sample would be classified in the "high risk" category.

Diabetes is the next AHA criterion. An assessment of the CVD risk factors for the sample revealed that 13 women reported having diabetes. Twelve of these diabetic women had a Framingham risk score in the "optimum risk" category, and one was classified in the "at risk" category. Diabetes was the only CVD risk factor to shift women into the AHA "high risk" category. The addition of these 13 diabetic women increased the number considered at "high risk" to be 14.

The next consideration was then how might the classifications shift further by the presence of at least one of the major CVD risk factors which place a woman in the "at risk" category? The values in the table in the "at risk" column represent the total numbers of women with each of these risk factors in descending frequency. Since women often reported more than one risk factor, these totals exceed 100%.

Physical inactivity was defined by a score of 1 ("never") or 2 ("sometimes") on the HPLP-II item number 10 questioning vigorous exercise for 20 or more minutes at least three times per week. The presence of this one risk factor - physical inactivity - increased the number of women to be considered "at risk"; the percent "at risk" increased more than 11-fold from 5.6% to 64%. The shift of these previously classified "optimum risk" women reduced the number who would now be considered to be at "optimum risk" level to just one-quarter (n = 31) of the sample as compared to 94%.

Obesity was defined by a BMI $\geq$ 30. Table 12 lists the accepted estimates of obesity. Since all women did not have waist measurements, BMI was selected as the indicator for obesity.

The metabolic syndrome definitions (Grundy et al., 2005) were used to classify women as having hypertension and dyslipidemia. Women were considered to have hypertension if they reported being treated for hypertension (n= 53, 42.4%) or had a measured systolic or diastolic blood pressure meeting the categorical cut points for the metabolic syndrome. Sixty women had a measured systolic blood pressure that was equal to or greater than 130 mmHg indicating those with possible hypertension. Fifty-two women with an HDL-C less than 50 mg/dl indicated those with dyslipidemia. A slightly lower number of women (n= 47, 37.6%) reported taking cholesterol lowering medication.

For the purposes of this study, poor diet was defined by a score of 1 ("never") or 2 ("sometimes") on the self-report nutrition subscale of the HPLP-II instrument. Items on the nutrition subscale question eating habits such as the number of servings of food that correspond to the food pyramid. Although the number of servings on the HPLP-II does not fully correspond to the current food pyramid guidelines, the developer of the HPLP-II would not grant revisions to the instrument.

Table 12. Estimation of Obesity

Measure	Mean (SD)	Median (Range)
Body Mass Index (BMI)	31.4 (± 6)	31.3 (18 - 48)
Percent Body Fat [a]	41.0 (± 5.8)	42 (26 - 50)
Waist circumference [b]	36 (± 6)	35.5 (23 - 54)
	Number	**Percent of Sample**
BMI ≥ 30	70	56%
Body Fat > 30% [a]	115	93.5%
Waist Circumference ≥ 35 inches [b]	54	57.4%

Note. SD = standard deviation. a= missing data for 2 women; b= missing data for 31 women

The next criterion in the AHA classification schema is the presence of the metabolic syndrome. As discussed earlier, 12 women were determined to meet the metabolic syndrome criteria. Therefore, the number of women considered to be "at risk" due to the presence of these risk factors is the number of women estimated to be physically inactive, the most frequently occurring risk factor once deleting those who were also diabetic. Thus, over half of the women (n = 73, 58.4%) were reclassified into the "at risk" category based on their low physical activity risk factor after adjusting for those who were diabetic and already classified as at risk. The final criterion was the least frequently occurring risk factor for this sample - the self-report of cigarette smoking which was only reported by five women.

The next sections address additional data that were collected for information that have relevance to cardiac risk. These data are concerning stress testing; the possibility of sleep disordered breathing, and selected medications.

Stress Testing, Snoring, and Sleep Apnea

Three additional questions were asked which relate to cardiac risk (Table 13). A surprising number of women reported having had a stress test. When directly questioned, all of these women reported that the stress test was negative, so they didn't consider themselves as having diagnosed heart disease. The mean age for those who had a stress test was 58.7 (± 8.4), median was 58 (39-75). The stress tested subgroup is only 1-year older than the mean for the entire sample with identical median ages. Although more than half (59.2%) reported that they snored, fewer than 14% reported having been diagnosed with sleep apnea.

Table 13. Stress Testing, Snoring, and Sleep Apnea

ASK Item	Yes (N/Percent)	No (N/Percent)
Have you ever had a stress test?	65 (52%)	58 (46.4%)
Do you snore?	74 (59.2%)	49 (39.2%)
Have you ever been diagnosed with sleep apnea?	17 (13.6%)	106 (84.8%)
Missing	2 (1.6%)	2 (1.6%)

ASK = Assessing Depressive Symptoms Improves the Knowledge of CVD Risk.

Medication History

The women were asked to report whether they were taking three types of medication relevant to basic risk modification management – aspirin, cholesterol lowering, and anti-hypertensive, and if they were taking hormone replacement therapy. Most women (n = 78, 62.4%) were not taking aspirin but were taking some form of medication to manage their cholesterol. Most women were not taking medication to

manage their blood pressure (n = 72, 57.6%) and were not taking hormone replacement therapy (n = 104, 83.2%).

With this summary of the cardiac profile data for the sample, the presentation of results moves on to the summary of the major study variables. The first to be addressed will be awareness of heart disease, followed by the health-promoting lifestyle behaviors' data, the major study predictor of interest, depressive symptoms, and concludes with the outcome variable of interest, the perceived quality of life.

Awareness of Heart Disease

Overall, the women were aware of their risk of developing heart disease and believed that all women should be evaluated for cardiac risk (Table 14). Less than half reported learning about heart risk from their primary healthcare provider, and most reported learning about it from the Heart Advantage Program or other media (Table 13).

Table 14. Awareness of Heart Disease

ASK Item	Yes (N/%)	No (N/%)
Did you know your chances/risk of getting heart disease before this screening?	84 (67.2%)	41 (32.8%)
Did you know that all women should be evaluated for their chances/risk of getting heart disease?	96 (76.8%)	29 (23.2%)
Did you learn about your heart disease risk from your primary healthcare provider?	54 (43.2%)	71 (56.8%)
Did you learn about heart disease in women from information you have received from being a member of the Women's Heart Advantage program or coverage on television, radio, or in the newspaper?	106 (84.8%)	19 (15.2%)

Note. ASK = Assessing Depressive Symptoms Improves the Knowledge of CVD Risk.

Health-Promoting Lifestyle Behaviors

The health-promoting lifestyle behaviors were measured by the HPLP-II. Table 15 lists the frequency response for the HPLP-II total and subscale scores. Table 15 lists the mean scores for the total and for the subscales. The mean score for the total and for the six subscales are based upon a Likert scale of 1 ("never") to 4 ("routinely").

Table 15. Health-Promoting Lifestyle Profile-II – Frequency Results

Scale	Never (1) (N/%)	Sometimes (2) (N/%)	Often (3) (N/%)	Routinely (4) (N/%)
Total Score	0	43 (34.4%)	79 (63.2%)	3 (2.4%)
Subscales:				
Interpersonal Relations	0	18 (14.4%)	75 (60%)	32 (25.6%)
Spiritual Growth	0	27 (21.6%)	71 (56.8%)	27 (21.6%)
Nutrition	3 (2.4%)	38 (30.4%)	73 (58.4%)	11 (8.8%)
Health Responsibility	0	55 (44%)	60 (48%)	10 (8%)
Stress Management	1 (0.8%)	69 (55.2%)	47 (37.6%)	8 (6.4%)
Physical Activity	21 (16.8%)	62 (49.6%)	38 (30.4%)	4 (3.2%)

A review of the mean scores for the women gives a sense of the overall status of the health-promoting lifestyle behaviors (Table 16). A mean total score of 2.63 indicates that on average the sample performed health-promoting lifestyle behaviors in the sometimes-to-often range. The highest scoring subscales were interpersonal relations (mean = 3.07) and spiritual growth (mean = 3.03). These scores indicate that on average, the study sample women were "often" performing these health-promoting lifestyle behaviors. The health responsibility (mean = 2.62) and nutrition (mean = 2.72) subscale scores indicate that on average, the study sample women were sometimes-to-

often addressing health responsibility and nutrition activities. The lowest scoring subscale was physical activity (mean = 2.13) followed by stress management (mean = 2.43). These results indicate that on average, that most women were only slightly more than sometimes performing physical activity behaviors or addressing management of their stress. The physical activity and nutrition subscales are worth examining on an individual item basis as they are particularly relevant to CVD risk status.

Table 16. Health-Promoting Lifestyle Profile-II (HPLP-II) and Subscale Scores

	Mean Score (Standard Deviation)	**Median (Range)**
HPLP-II Total Score	2.63 (± .384)	2.67 (2 – 4)
Subscales		
Interpersonal Relations	3.07 (± .498)	3.11 (2 – 4)
Spiritual Growth	3.03 (± .547)	3.00 (2 – 4)
Nutrition	2.72 (± .559)	2.78 (1 – 4)
Health Responsibility	2.62 (± .520)	2.56 (2 – 4)
Stress Management	2.43 (± .533)	2.38 (1 – 4)
Physical Activity	2.13 (± .683)	2.00 (1 – 4)

Note. Scores: 1 = never, 2 = sometimes, 3 = often, 4 = routinely.

The individual item analysis of the physical activity subscale revealed that on average, the women in this sample only sometimes followed a planned exercise program, or exercised vigorously for 20 or more minutes three times a week. They only sometimes exercised moderately five or more times a week, performed any leisure time physical activity such as dancing, or exercised during usual daily activities such as taking the stairs, walking during lunch breaks. Stretching exercises were only sometimes performed at least three times a week. Only sometimes did the women on

average check their pulse or reach their target heart rate when exercising, and only sometimes did the women park further away from their destination.

An examination of the individual nutrition subscale items indicated that women only sometimes selected a low saturated fat and low cholesterol diet. They also reported only sometimes: limiting the use of sugar and consumption of sugar containing foods, eating the recommended portions of fruit, vegetables, and dairy products each day, limiting the portions of carbohydrates, meat, poultry, fish, dried beans, eggs or nuts each day, and eating eat breakfast each day, or reading the nutrient contents on labels.

Health History and Depressive Symptoms

Health history information was obtained in addition to assessment of depressive symptoms. The health history data include the Functional Comorbidity Index (FCI), the medical history self-reported assessment, a selected medication survey, four mental health history items, and a one-item stress level question. The health history data will precede the results of the CES-D.

Health History and Medications

An area of concern in the depression assessment literature is the potential confounding nature of co-morbid medical illnesses biasing the accuracy of self-report instruments to accurately detect depression and depressive symptoms. The FCI was used to obtain a self-report brief survey of coexisting diagnosed medical problems. The FCI total score, which is a simple sum of the number of checked items, includes the addition of the final item of whether the BMI was greater than or equal to 30. Items

checked by any participants plus the BMI, calculated as part of the CVD screening program, are listed in Table 17.

No participants reported having angina, heart failure, myocardial infarction, neurological disease, stroke, and peripheral vascular disease; however, these were exclusionary study criteria. Nineteen participants (15.2%) reported no co-morbidities. The FCI total scores of 1 (n = 29, 23.2%), 2 (n = 30, 24%), 3 (n = 20, 16%), and 4 (n = 15, 12%) accounted for 75.2% of the sample. The most frequent items in order were BMI > 30, presence of arthritis, upper gastrointestinal disorder, and depression.

Table 17. Functional Comorbidity Index (FCI) Sample Results

FCI Item	
FCI Total Score	
Mean (Standard Deviation)	2.2 (± 1.6)
Median (Range)	2.0 (0 – 7)
Individual Items	**(N, Percent)**
BMI	72 (57.6%)
Arthritis	43 (34.4%)
Upper GI Disease	30 (24%)
Depression	29 (23.2%)
DJD	18 (14.4%)
Anxiety	16 (12.8%)
Asthma	15 (12%)
Osteoporosis	15 (12%)
Visual Impairment	14 (11.2%)
Diabetes	13 (10.4%)
Respiratory Disorder	3 (2.4%)
Hearing Impairment	2 (1.6%)
Panic Disorder	2 (1.6%)
TIA	2 (1.6%)

Note. BMI = body mass index; DJD= degenerative joint disease; GI = gastrointestinal; TIA = transient ischemic attack.

Medication Data

Nearly one-quarter of the sample (n = 30, 24%) reported taking medications for depression. While just over one-third of the sample reported a diagnosis of arthritis, only 18 (14.4%) women reported taking medication to manage their arthritis. The other medications in the history were discussed in the cardiac profile section.

Mental Health History and Stress Level

Data regarding depression history are presented in Table 18. Almost half of the sample (47%) reported a family history of depression. Over one third (38%) reported being told at some point in their life they had depression. Although 40% reported that at some point in their life they were treated for depression, only 25% reported taking medication for depression.

Table 18. Response to Mental Health Items

ASK Item	Yes (N/Percent)	No (N/Percent)
Is there a family history of depression?	59 (47.2%)	66 (52.8%)
Have you ever been told you have depression?	47 (37.6%)	78 (62.4%)
Have you ever been treated for depression?	50 (40%)	75 (60%)
Are you taking any medication for depression?	30 (24%)	95 (76%)

Note: ASK = Assessing Depressive Symptoms Improves the Knowledge of CVD Risk.

Although women were asked to list all of their specific medications, nine women were unable to recall their anti-depression medications. Of those who could provide their current medication list, Prozac, Wellbrutin, Paxil and Zoloft were the most frequently taken anti-depressive medications (five, four, three and three women respectively).

The Heart Aware questionnaire asked the women to rank their stress level. Most women (n= 81, 64.8%) reported their stress level as average. A quarter of the women (n = 31, 24.8%) ranked their stress level as high/chronic, and only 13 women (10.4%) ranked their stress level as low. A statistically significant inverse relationship was found between the reported stress level and the stress management subscale of the HPLP-II

(r_S = -.28, p <.01). This inverse relationship indicates that as the reported stress level increased the frequency of performing stress management behaviors decreased.

Depressive Symptoms

Depressive symptoms were measured using the self-report CES-D twenty-item instrument. Four items, numbers 4, 8, 12, and 16, are reverse-coded before tabulating the score. The CES-D scoring is the simple sum of the item scores and can range from 0-60. There are no subscales. A score equal to or greater than 16 is used most frequently in the literature to indicate depressive symptoms.

The mean score for the sample was 14 (SD ± 9). The median score was 12 with a range of 1 to 41. Table 19 displays the scores for the individual items. The values for the four asterisked items are the reverse coded values as recorded by the participants. Using the recommended CES-D guidelines (score $\geq$ 16), one third of the women (n = 42, 33.6%) reported significant depressive symptoms.

Table 19. Responses to the Center for Epidemiological Studies–Depression (CES-D)

During the past week:	**Rarely** or none of the time (less than 1 day)	**Some** or a little of the time (1-2 days)	**Occasionally** or a moderate amount of time (3-4 days)	**Most** or all of the time (5-7 days)
Item Response Score	0	1	2	3
1. I was bothered by things that usually don't bother me.	57 (45.6%)	45 (36%)	20 (16%)	3 (2.4%)
2. I did not feel like eating; my appetite was poor.	84 (67.2%)	23 (18.4%)	15 (12%)	3 (2.4%)
3. I felt that I could not shake off the blues even with the help from my family or friends.	86 (68.8%)	17 (13.6%)	18 (14.4%)	4 (3.2%)
4. I felt that I was just as good as other people. *	65 (52%)	21 (16.8%)	16 (12.8%)	23 (18.4%)
5. I had trouble keeping my mind on what I was doing.	37 (29.6%)	41 (32.8%)	38 (30.4%)	9 (7.2%)
6. I felt depressed.	71 (56.8%)	32 (25.6%)	19 (15.2%)	3 (2.4%)
7. I felt that everything I did was an effort.	53 (42.4%)	40 (32%)	22 (17.6%)	10 (8%)
8. I felt hopeful about the future. *	61 (48.8%)	30 (24%)	22 (17.6%)	12 (9.6%)
9. I thought my life had been a failure.	103 (82.4%)	13 (10.4%)	9 (7.2%)	0
10. I felt fearful.	83 (66.4%)	26 (20.8%)	12 (9.6%)	4 (3.2%)
11. My sleep was restless.	27 (21.6%)	49 (39.2%)	30 (24%)	19 (15.2%)
12. I was happy. *	11 (8.8%)	10 (8%)	30 (24%)	74 (59.2%)
13. I talked less than usual.	62 (49.6%)	41 (32.8%)	17 (13.6%)	5 (4%)
14. I felt lonely.	69 (55.2%)	34 (27.2%)	15 (12%)	7 (5.6%)
15. People were unfriendly.	80 (64%)	32 (25.6%)	11 (8.8%)	2 (1.6%)
16. I enjoyed life. *	11 (8.8%)	11 (8.8%)	25 (20%)	78 (62.4%)
17. I had crying spells.	85 (68%)	29 (23.2%)	8 (6.4%)	3 (2.4%)
18. I felt sad.	59 (47.2%)	49 (39.2%)	14 (11.2%)	3 (2.4%)
19. I felt that people disliked me.	96 (76.8%)	22 (17.6%)	4 (3.2%)	3 (2.4%)
20. I could not get going.	66 (52.8%)	33 (26.4%)	22 (17.6%)	4 (3.2%)

Note: * = items that are reverse coded for scoring.

The relationship between the CES-D total score and the depression history items was analyzed (Table 20). Spearman rho (r_S) was used to analyze these correlations due to the nominal level of measurement of the history items. The strongest correlation was between the CES-D score and taking medications to manage depression ($r_S = .33$, $p < .01$). Also significant were the relationships between being treated for depression as well as having co-morbid conditions. The relationship between the CES-D total score and a family history of depression was low ($r_S = .17$) and approached statistical significance (p=.053).

Table 20. Correlation Between Center for Epidemiological Studies Depression (CES-D) and Depression History Items

Depression History Item	Correlation with CES-D
Functional Comorbidity Index	.28**
Takes Depression Medication	.33**
Has Been Treated for Depression	.28**
Has Been Diagnosed with Depression	.20**
Family History of Depression	.17 (p = .053)

Note. **= $p < .01$

Based on the number of women who were found to be depressed, these results were examined according to their cardiac risk status. Table 21 depicts the distribution of the women by depressive symptom score (depressed = CES-D score equal to/greater than 16) and the cardiac risk assessment using the traditional Framingham risk score and the AHA risk reclassification described earlier. Briefly, the number of women presenting with at least one CVD risk factor that would put them in the AHA "at risk" group reduced the number of women who should be considered in the optimum risk

group. Based on only the Framingham risk score, the majority of the sample would be considered in the optimum risk group (n = 117, 93.6%). Once accounting for the presence of CVD risk factors, only a quarter of the women should be classified as at optimum risk.

Table 21. Depressive Symptoms by Risk Classification: Framingham Score Compared to the American Heart Association (AHA) Risk Groups

Risk Class Method	High Risk	At Risk	Optimum Risk
	(N / Percent)		
Framingham Score [a]	1 (0.8%)	7 (5.6%)	117 (93.6%)
Depressed [b]	0	2 (4.8%)	40 (95.2%)
Not Depressed [c]	1 (1.2%)	5 (6%)	77 (92.8%)
AHA Risk Classification [d]	14 (11.2%)[e]	80 (64%)	31 (24.8%)
Depressed [b]	2 (4.8%)	30 (71.4%)	10 (23.8%)
Not Depressed [c]	12 (14.5%)	50 (60.2%)	21 (25.3%)

Note. a = number of women per AHA class solely based on their Framingham risk score; b = Depressed equals CES-D score ≥ 16; c = Not depressed equals CES-D score < 16; d = number of women reclassified after calculating the "at risk" group based on risk factors identified in the study sample; e = women with diabetes added to high risk group.

Based on just the Framingham risk score, most of the 42 depressed women were in the optimum risk group (n = 40). Following the AHA reclassification, nearly three-quarters of the depressed women were in the at risk group (n = 30).

Perceived Quality of Life

Perceived quality of life was measured by the Ferrans and Powers Quality of Life Index (QLI) – Generic Version-III. All QLI scores – the QLI total score and the subscale scores - can range from 0-30. A score of less than 19 indicates a poorer quality

of life (Dr. Ferrans, Personal Communication). The results are listed in Table 22. Most women reported an overall favorable quality of life reflected by the low number of women with a total score of less than 19. Health and functioning was reported as the lowest subscale. This scale asks about the satisfaction with and the importance of their health, health care, pain level, energy for everyday activities, independent self-care ability, control over their lives, chances of living as long as they would like, their sex life, ability to care for family responsibilities, their usefulness to others, what they do for fun, and their chances for a happy future.

Table 22. Quality of Life Index (QLI) and Subscales' Results

	Score (Standard Deviation)	**Median (Range)**	**Number Scoring Less Than 19 (%)**
QLI Total Score	22.4 (± 4)	22.7 (9-30)	16 (12.8%)
Subscales			
Psychological/ Spiritual	23.2 (± 4.9)	24.4 (6-30)	19 (15.2%)
Family	23 (± 5.3)	24 (6-30)	23 (18.4%)
Social & Economic	22.7 (± 4.5)	23 (11-30)	21 (16.8%)
Health & Functioning	21.5 (± 4.6)	21.8 (3-30)	25 (20%)

Summary of the Descriptive Data Findings

A group of women (n = 125) attended a CVD risk screening program and volunteered to participate in this study to investigate the relationship of depressive symptoms to the status of health-promoting lifestyle behaviors, the awareness of heart disease risk, cardiac risk, and how these relationships affect perceived QOL. The study sample (Table 6) was middle aged (mean age 57.7 years, ± 9.6), mostly urban, non-

Hispanic, white, married, and employed full-time, with a household income between $25,000-49,999, who had some college education and most lived within five miles of the CVD screening center. The women mostly reported being aware of their individual cardiac risk and believed that all women should be evaluated for cardiac risk. Less than half of the women reported learning of their cardiac risk status from their primary care provider. They learned about cardiac risk from the media or from being members of the screening center's heart disease screening and education program (Table 13).

The cardiac profile indicated that despite the majority (n = 117, 93.6%) having a Framingham risk score of less than 10%, the frequency of traditional CVD risk factors according to the AHA risk classification for women, indicated that the majority (n = 80, 64%) should be reclassified as "at risk" with only a quarter of the women (n = 31, 24.8%) being classified in the "optimum risk" class (Table 10). Nearly half of the women were found to be hypertensive (n = 60, 48%), dyslipidemic (n = 52, 41.6%), obese (n = 72, 57.6%), and almost three-quarters were generally physically inactive (n = 89, 71.2%). The high percentage of infrequently performed regular physical activity was the CVD risk factor which increased the number of women who should be classified as "at risk". Perhaps of more concern is that 12 diabetic women with low Framingham risk scores in the "optimum risk" class should actually be classified in the "high risk" group according to the AHA classification system.

Associated cardiac profile findings included that a majority of women (n = 74, 59.2%) reported that they snored but only 13.6% (n = 17) reported being diagnosed with sleep apnea (Table 12). Most women were not taking aspirin (n = 78, 62.4%) but

nearly an equal number reported taking some form of cholesterol lowering medication. Sixty women had a measured SBP of equal to or greater than 130 mmHg but most women were not taking anti-hypertensive medication (n = 72, 57.6%).

No more than a quarter of these generally cardiac risk aware women reported that they routinely performed health-promoting lifestyle behaviors (Table 14). Interpersonal relations' behaviors and spiritual growth behaviors were the most consistently performed. The group of physical activity behaviors were the least frequently performed. Based on the self-reported FCI health history, three-quarters of the women (75.2%) reported 4 or fewer co-morbidities with a mean FCI score of 2.2 (± 1.6) and a median score of 2.0 (range = 0 – 7). By far the most frequent co-morbidity was obesity indicated by a BMI ≥ 30 (57.6%), with arthritis the next most frequent co-morbidity reported by one-third of the women (Table 16).

Nearly half of this generally healthy group of women reported a family history of depression, over one-third (n = 47, 37.6%) reported having been told they had depression and having been treated for depression (n = 50, 40%), and one-quarter were taking depression medication (Table 17). Based on a cut-score of ≥ 16, the CES-D total score indicated that one-third of the women (n = 42, 33.6%) of these generally healthy risk-assessment seeking women had depressive symptoms. The CES-D total score was found to be positively correlated with most of the depression history items and the FCI (Table 19). The majority of the depressed women were found to be classified in the AHA at risk group due to the low level of regular physical activity (Table 20).

With a total QLI score of ≤ 19 indicating a low perceived QOL, only 16 (12.8%) women reported they were dissatisfied with their QOL (mean = 22.4, ± 4; median = 22.7, range = 9-30) (Table 22). The lowest scoring QLI sub-scale was health and functioning and the highest scoring sub-scale was psychological/spiritual.

Data Analysis for Study Aims

The purpose of the study was to investigate the relationship of depressive symptoms to cardiac risk, the status of health-promoting lifestyle behaviors, the awareness of heart disease risk, and how these relationships affect perceived quality of life. The next sections will present the results for the three study aims which explored these relationships. The first to be reported will be the bivariate correlations, followed by the assessment of a possible dose-response relationship between depressive symptoms and the major study variables, and will conclude with the determination of whether cardiac risk and/or the health-promoting lifestyle behaviors mediate the relationship between depressive symptoms and the perceived quality of life in this group of women being assessed for CVD risk.

Aim 1- Description of the Relationships Among the Major Study Variables

The first study aim was to determine the relationship between depressive symptoms and: (1) cardiac risk, (2) health-promoting lifestyle behaviors, (3) an awareness of heart disease risk, and (4) perceived QOL in women being screened for CVD risk. Spearman correlation coefficient (r_S) analysis was selected because it is a non-parametric statistic, therefore, it can be used when the data to be analyzed violate the assumptions of parametric data: normal distribution, homogeneity of variance, and

interval level data (Field, 2009, p. 180). The CES-D total score and the calculated Framingham risk score are interval level data. The HPLP-II and the QLI total score are ordinal level data. The awareness of heart disease risk and the AHA risk groups are nominal level data. The first data to be presented are the relationships between depressive symptoms and the awareness of heart disease questions (Table 23). Following these data are the correlations between the CES-D and the other study variables (Table 24).

Table 23. Correlation Between Center for Epidemiological Studies Depression (CES-D) and Awareness of Cardiac Risk

Awareness of Cardiac Risk Item	Correlation with CES-D
Were aware of chances of getting heart disease before this screening.	.06 (p = .50)
Learned about your heart disease risk from your primary healthcare provider.	.06 (p = .53)
Knew that all women should be evaluated for risk of getting heart disease.	-.09 (p = .35)
Learned about heart disease in women from Covenant Heart Advantage program or coverage on television, radio, or in the newspaper.	.10 (p = .27)

No statistically significant correlation was found between the depressive symptoms score and whether the women were aware of their own cardiac risk, or whether women should be evaluated for CVD risk. There was also no correlation between depressive symptoms and how women learned about their cardiac risk or about heart disease in women (Table 23).

The first study aim was to examine if there was a relationship between depressive symptoms and calculated cardiac risk (the Framingham risk score), health-

promoting lifestyle behaviors, and the outcome of interest, perceived quality of life. These data are depicted in Table 24. With the Bonferroni correction for multiple comparisons (alpha .05 divided by the total of 15 correlations), the alpha .05 level is corrected to $p = .003$. Thus, the asterisked significant correlations remain significant. Based on the shift in the numbers of women considered at risk of heart disease, the AHA risk groups were added to this analysis. The single risk awareness item was also included in this analysis. Significant correlations found were between health-promoting lifestyle behaviors and AHA risk groups, the quality of life and depressive symptoms. The strongest correlation was found between the major predictor variable, depressive symptoms, and the outcome variable, quality of life measured by the QLI. Neither the Framingham risk score nor risk awareness were correlated with any of the other predictor variables or with quality of life.

Table 24. Correlation of Major Study Variables

	Framingham Risk Score	**AHA Risk Groups**	**HPLP-II**	**QLI**	**CES-D**
Risk Awareness	.04	-.03	-.07	-.12	.06
Framingham Risk Score	___	.16	.01	.11	-.09
AHA Risk Groups		___	-.26**	-.06	-.07
HPLP-II			___	.46**	-.37**
QLI				___	-.51**

Note. AHA = American Heart Association; CES-D = Center for Epidemiological Studies Depressions; HPLP-II = Health- Promoting Lifestyle Profile-II; QLI = Quality of Life Index. **= $p < .01$.

Summary of Aim 1 Findings

Depressive symptoms were not found to be associated with whether women were aware of their CVD risk or with how they learned of this risk. Risk awareness was also not associated with the calculated risk score, the AHA Risk Groups, health promoting lifestyle behaviors, or quality of life. The frequency of performing health-promoting lifestyle behaviors was found to be inversely correlated with AHA risk status, i.e. the less frequently health-promoting lifestyle behaviors were performed, the higher the AHA risk group status.

Depressive symptoms were inversely associated with health-promoting lifestyle behaviors, i.e., as depressive symptoms increased, the frequency of performing health-promoting lifestyle behaviors decreased. An inverse relationship was also identified between depressive symptoms and quality of life so that quality of life was lower as depressive symptoms worsened.

Aim 2- Examination of Dose-Response Relationship

The second study aim was to determine whether there is a dose-response-relationship between depressive symptoms and: (1) cardiac risk, (2) the health-promoting lifestyle behaviors, and (3) the perceived quality of life. Logistic regression, specifically binary logistic regression, was selected as the method to examine for a possible dose-response relationship because the outcome for this statistical analysis are the odds (i.e., the predicted probability) of whether the presence or absence of a dichotomous outcome variable can be predicted. Binary logistic regression requires the outcome variable have only two categories. A categorical outcome violates a linear

regression assumption. Predictor variables may be continuous or categorical but are limited to two categories. For the purposes of these analyses, all the categorical variables were dichotomized.

Due to the very low number of women with a Framingham risk score of greater than 10%, the AHA reclassified risk data were used in this analysis. The dichotomized AHA risk groups were the optimum risk category and the combined at risk and high risk women. The outcome of health-promoting lifestyle behaviors was dichotomized at a score of 2.5. This split was based on the 1("never") to 4 ("routinely") scale for the mean HPLP-II score with 2.5 as the median score. The quality of life outcome was dichotomized at the recommended QLI score of 19.

Covariates (i.e., the predictor variables) were selected from the literature as being relevant to the analysis of depressive symptoms and quality of life. The covariates were the categorical socioeconomic variables of education, employment, income, and marital status and the CVD risk factors of BMI entered as a continuous variable, and family history of CVD (present or absent) entered as a categorical variable. Other CVD risk factors were considered (age, TC, HDL-C, and SBP) but were then eliminated as covariates because they are the factors which constitute the Framingham risk score and, therefore, define cardiac risk. The socioeconomic variables were dichotomized as outlined in Table 25. The creation of the dichotomous variables was based on a logical grouping of the categories per variable.

The dichotomized variables produced group sizes which all had sufficient data when subjected to crosstabulation analysis. Sufficient data are the first condition for

logistic regression. Sufficient data are defined by the expected frequencies in each cell in the crosstabulation's table "to make sure they are greater than 1 and no more than 20% are less than 5" (Field, 2009, p. 274). Each predictor variable was entered into a crosstabulation with the outcome variable, quality of life delineated by the split of the QLI scores at 19, the HPLP-II mean score split at 2.5, and the two AHA cardiac risk groups. Sufficient data were identified in all crosstabulations.

Table 25. Creation of Dichotomous Socioeconomic Variables

Dichotomous Variables Created	Original Variables
Education	
Not College Graduate (n = 75)	▪ Less than 9th Grade, High school graduate, Some college
College Graduate (n = 50)	▪ Associate Degree, Bachelors Degree, Graduate or Professional Degree
Employment	
Employed (n = 64)	▪ Fulltime & Part-time
Not Working (n = 61)	▪ Unemployed & Not Seeking Employment
Income	
Income < $25,000 (n = 30)	▪ Less than $15,000, $15,000 – 24,999
Income > $25,000 (n = 93)	▪ $25,000—49,999, More than $50,000
Marital Status	
Married (n = 75)	▪ Married
Not Married (n = 50)	▪ Never Married, Separated, Divorced, Widowed

Four logistic regression analyses were performed to determine whether there was a graded increased severity of the dependent variable depressive symptoms with the independent variables: (1) an increased likelihood of increased cardiac risk, (2) a decreased frequency of performing health-promoting lifestyle behaviors, and (3) a decreased perceived quality of life. Depressive symptoms were analyzed as a continuous variable in three models. A fourth model entered the CES-D score split at 16

to determine whether a dose-response relationship could be identified with cardiac risk when the initial model did not. The logistic regression data are presented in the following order: (1) review of the tests of logistic regression analysis conditions, assumptions, and outliers; and (2) the results of the logistic regression analyses particularly regarding the possibility for a dose-response relationship.

Review of Logistic Regression Conditions, Assumptions, and Outliers

Following standard procedures, the conditions, assumptions and determination of any outlier cases that may have exerted undue influence were examined for all logistic regression models. Three necessary considerations were examined: (1) sufficient data for examination of all combinations of the variables, (2) complete separation, and (3) overdispersion. Three assumptions were examined: (1) a linear relationship between the continuous predictors and the logit of the outcome variable, (2) the independence of the errors, and (3) no perfect multicollinearity. A review of the casewise diagnostics of the residuals was used to determine the presence of any outlier cases.

Summary. The crosstabulations' analyses verified that there were sufficient data to support the logistic regression models. The examination of the classification tables verified that there were no problems with complete separation. Among the four models, concerns were raised for possible overdispersion in the QLI and AHA risk groups' models. Overdispersion "tends to limit standard errors and results in narrower confidence intervals for test statistics of predictors in the logistic regression model" (Field, 2009, p. 276). Narrower confidence intervals can lead to the conclusion that a

predictor is significant when indeed it is not (Field, 2009, p. 276). Examinations of the confidence intervals in these two models did not indicate they were unusually narrow, thus the predictors are significant.

The review of the assumptions revealed that none of them were violated. The examination of the residuals revealed that there was no evidence for exertion of undue influence. The examination of the residuals, and leverage indicated there were cases that might not fit the model but these findings do not question the models' conclusions.

Results of the Logistic Regression Analyses

Evidence for a dose-response relationship was found between depressive symptoms and quality of life and health-promoting lifestyle behaviors. As depressive symptoms increase, there is a graded worsening in quality of life and a graded decrease in the frequency of performing health-promoting lifestyle behaviors. As depressive symptoms increased the odds for a higher perceived quality of life were reduced (OR = .85, 95% CI .79, .92, $p < .001$) (Table 26).

Table 26. Logistic Regression Results: Depressive Symptoms Predicting Quality of Life

		95% CI for Odds Ratio		
	b (SE)	Lower	Odds Ratio	Upper
Constant	7.50 (2.09)			
CES-D	-.16*** (0.04)	.79	.85	.92

Note: R^2 = .35 (Hosmer & Lemeshow), .27 (Cox & Snell), .45 (Nagelkerke). Model χ^2 = 38.24 (7), $p < .01$; *** $p < .001$. CES-D = Center for Epidemiological Studies Depression, entered as a continuous variable; CI = confidence interval; quality of life entered as Quality of Life Index total score entered split at 19; SE = standard error.

An increase in depressive symptoms was also associated with a reduced odds of performing health-promoting lifestyle behaviors (OR = .92, 95% CI .88, .97, $p < .001$)

(Table 27). Thus, as depressive symptoms worsen, there is a decreased performance of health-promoting lifestyle behaviors.

Table 27. Logistic Regression Results: Depressive Symptoms Predicting Health-Promoting Lifestyle Behaviors

		95% CI for Odds Ratio		
	b (SE)	Lower	Odds Ratio	Upper
Constant	4.67 (1.36)			
CES-D	-.08** (0.03)	.88	.92	.97

Note: R^2 = .18 (Hosmer & Lemeshow), .22 (Cox & Snell), .29 (Nagelkerke). Model χ^2 = 29.822 (7), $p < .001$; ** $p < .01$. CES-D = Center for Epidemiological Studies Depression, entered as a continuous variable; CI = confidence interval; health-promoting lifestyle behaviors entered as the mean HPLP-II score split at 2.5; SE = standard error.

There was no evidence for a dose-response relationship between depressive symptoms and cardiac risk entered as the dichotomized AHA risk groups. The initial analysis entered depressive symptoms as a continuous variable with the CES-D total scores (Table 28).

Table 28. Logistic Regression Results: Depressive Symptoms Not Predict AHA Cardiac Risk

		95% CI for Odds Ratio		
	b (SE)	Lower	Odds Ratio	Upper
Constant	-2.83 (1.44)			
CES-D	-.02[a] (0.03)	.94	.99	1.04

Note: R^2 =.08 (Hosmer & Lemeshow), .09(Cox & Snell), .13 (Nagelkerke). Model χ^2 = 11.019 (7), p =.14; a = Not significant; AHA = American Heart Association; CES-D = Center for Epidemiological Studies Depression, entered as a continuous variable; CI = confidence interval; AHA cardiac risk entered as optimum risk and at/high risk; SE = standard error.

When no dose-response relationship was found when depressive symptoms were entered as a continuous variable with the CES-D total scores, the AHA cardiac

risk model was run again with the CES-D total scores split at 16 (Table 29). This did not improve the model findings.

Table 29. Logistic Regression Results: Depressive Symptoms Group Not Predict AHA Cardiac Risk

		95% CI for Odds Ratio		
	b (SE)	Lower	Odds Ratio	Upper
Constant	-2.9 (1.43)			
DS Group	-.11[a] (0.48)	.09	.89	1.05

Note: R^2 = .08 (Hosmer & Lemeshow), .08 (Cox & Snell), .12 (Nagelkerke). Model χ^2 = 10.74 (7), p = .15; a = Not significant. AHA = American Heart Association; CI = confidence interval; DS = depressive symptoms entered as CES-D cut-score of 16; AHA cardiac risk entered as optimum risk and at/high risk; SE = standard error.

Comparison of Quality of Life and Health-Promoting Lifestyle Behavior by Depressive Symptom Status. With these dose-response relationship findings, it is helpful to examine the scores for quality of life (measured by the QLI) and health-promoting lifestyle behaviors (measured by the HPLP-II) for depressed and not depressed women (Table 30). With the Bonferroni correction, the alpha 0.05 is corrected to p = .01 for the QLI and p = .007 for the HPLP-II comparisons. With these corrections, the depressed women have a significantly lower perceived quality of life overall and for all subscales. With the corrected significance level, the depressed women less frequently performed health-promoting lifestyle behaviors overall and specifically less frequently performed stress management, spiritual growth, and interpersonal relations behaviors.

Summary of Aim 2 Findings

A dose-response relationship was found between depressive symptoms and the frequency of performing health-promoting lifestyle behaviors and quality of life but not with estimates of cardiac risk. Depressive symptoms were found to decrease the odds

for a good perceived quality of life and to decrease the odds for performing health-promoting lifestyle behaviors. Depressed women had lower quality of life scores and less frequently performed health-promoting lifestyle behaviors.

Table 30. Quality of Life and Health-Promoting Lifestyle Behaviors Compared by Depression Status.

	CES-D < 16 (N = 83)	**CES-D ≥ 16 (N = 42)**	***p***
Quality of Life Index (QLI)			
Total Score	23.8 (± 2.9)	19.9 (± 4.6)	.00
Psychological/ Spiritual	25 (± 3)	20 (± 6.2)	.00
Family	24 (± 4.6)	21 (± 6)	.01
Social & Economic	24 (± 3.8)	21 (± 5)	.00
Health & Functioning	23 (± 3.8)	18.9 (± 5.3)	.00
Health-Promoting Lifestyle Profile-II (HPLP-II)			
Total Score	2.8 (± .36)	2.48 (± .36)	.00
Physical Activity	2.2 (± .67)	2.1 (± .71)	.51
Stress Management	2.6 (± .50)	2.2 (± .51)	.00
Health Responsibility	2.7 (± .51)	2.46 (± .50)	.01
Nutrition	2.8 (± .54)	2.6 (± .57)	.03
Spiritual Growth	3.2 (± .48)	2.7 (± .55)	.00
Interpersonal Relations	3.2 (± .47)	2.8 (± .47)	.00

Note: CES-D = Center for Epidemiological Studies Depression scale. All QLI scores range 0-30. QLI scores < 19 indicate a poorer quality of life. The scale for the HPLP-II is 1= never to 4 = routinely. All scores are reported a mean ± standard deviation. Independent *t*-tests were used to analyze depressive symptoms and quality of life; the Mann- Whitney test was used to analyze depressive symptoms and health-promoting lifestyle behaviors.

Aim 3 – Model of Mediators Between Depressive Symptoms and Quality of Life

The third study aim was to determine whether the effect of depressive symptoms on perceived quality of life is direct or indirect (i.e., mediated by cardiac risk – d1 or health-promoting lifestyle behaviors –d2), (Figure 1). To accomplish this, a series of multiple linear regression analyses (regression analyses) were performed. The questions were whether depressive symptoms directly influence perceived quality of life (line c in Figure 1) or whether the relationship of depressive symptoms to perceived quality of life was influenced by the association of depressive symptoms mediated by cardiac risk (lines a plus d1 in Figure 1) and/or health-promoting lifestyle behaviors (lines b plus d2 in Figure 1). The data are presented in the following order: (1) summary of the tests of regression analysis assumptions, diagnostics, and outliers; (2) presentation of the regression analysis data; and (3) presentation of the mediator analysis.

The power analysis was repeated for the regression and mediation analyses. Based on the method suggested by Green (1991) using Cohen's (1988) calculations of sample size, a sample of $n = 123$ with seven predictor variables was able to achieve 80% power to detect a large effect size ($R^2 \geq .26$). The n of 123 reflects two women who did not indicate their income.

Summary of Regression Analysis Assumptions, Diagnostics, and Outliers

Following standard procedures, the assumptions for regression analysis for each model were examined as were the regression and residuals diagnostics for each model. Seven assumptions were examined for each regression analysis: (1) the variable types, (2) no perfect multicollinearity, (3) presence of homoscedasticity, which indicates

constant variance across the range of all the predictor variables, (4) independent errors, (5) normally distributed errors, (6) independence of the outcome variable values, and (7) a linear relationship between the predictors and the outcome variable.

There were no violations of the assumptions. Evidence was identified that there may be some suppression in the socioeconomic variables but this finding does not affect the significance of the predictability of the major predictor – depressive symptoms measured by the CES-D – to the possible mediator health-promoting lifestyle behaviors or the quality of life outcome variable. A review of the case diagnostics revealed that there was one potential outlier case. This case was examined and it was left in the analyses as there was no justification for its elimination.

Presentation of the Regression Analysis Data

The hierarchical/multiple block entry method was used to enable examination of the contribution of the sets of predictors since the final block produced the same data found when the simultaneous entry method is used. Simultaneous entry was the method recommended by Baron and Kenny (1986) to conduct the mediation analysis.

The predictor variables were selected from the literature and are considered possible covariates when examining depressive symptoms. Block one entered the dichotomized categorical socioeconomic variables of: education, employment, income, and marital status and the CVD risk factors of BMI entered as a continuous variable and family history entered as a dichotomous categorical variable. In each model, the final block was depressive symptoms as the predictor of interest. In the final model, the

possible mediator, health-promoting lifestyle behaviors, was entered in the block before depressive symptoms.

Correlations. Two sets of regression analysis Pearson's correlations (*r)* are presented. The first set examined the relationships between the predictor variables (Table 31), and the second set of correlations examined the relationships between the predictor variables and the outcome variables (Table 32).

Table 31 presents the correlations between the socioeconomic and CVD risk factor predictor variables and the major predictor of interest, depressive symptoms. The majority of the predictor correlations were very small with Pearson *r's* less than .15, none of which were significant. With the Bonferroni correction for multiple comparisons, the alpha 0.05 level is corrected to $p = .001$. Therefore, the actual significant correlations are income with education and marital status, BMI with health-promoting lifestyle behaviors, and depressive symptoms with health-promoting lifestyle behaviors.

Table 31. Covariate Predictor Variables' Correlations

	2	**3**	**4**	**5**	**6**	**7**	**8**
1. Education	.07	.24***	-.14	-.04	.02	.18*	-.21**
2. Employment	___	.18*	-.08	-.05	-.02	-.15*	-.09
3. Income		___	.35***	-.12	.10	.01	-.05
4. Marital Status			___	-.10	.03	-.03	.10
5. BMI				___	.02	-.31***	.17*
6. Family History					___	-.07	.05
7. HP						___	-.37***
8. DS							___

Note. * = $p < .05$, ** = $p < .01$, *** = $p < .001$. BMI = body mass index, DS = depressive symptoms, HP = Health-promoting lifestyle behaviors.

Table 32 presents the correlations between the predictor variables and the outcome variables per model step in the mediation model determination. With the Bonferroni correction for multiple comparisons, the alpha 0.05 level is corrected to $p = .002$. Therefore, the examination of the regression analyses correlations between the predictor variables and each of the outcome variables for each of the four steps reveals that four of the 21 sets of correlations are significant correlations. Depressive symptoms were significantly and inversely correlated with two variables: (1) quality of life, as measured by the QLI ($r = -.61$) indicating that as the depressive symptoms worsen, quality of life tends to be lower, and (2) health promoting lifestyle behaviors ($r = -.36$) indicating that that as healthy lifestyle behaviors were less frequently performed, depressive symptoms worsened. Health-promoting lifestyle behaviors were positively correlated with quality of life ($r = .45$), indicating that as the frequency of health-promoting lifestyle behaviors increase, so does the quality of life. Health-promoting lifestyle behaviors were found to have an inverse relationship with BMI ($r = -.31$), indicating that higher BMI's are related to a lower frequency of performing health-promoting lifestyle behaviors.

Table 32. Socioeconomic and Cardiovascular Disease (CVD) Risk Factor Predictor Variables with Depressive Symptoms and Outcome Variables per Mediation Model Analysis

Outcome and Predictor Variables	HPLP-II	QLI	CES-D
QLI	.45***	___	
CES-D	-.36***	-.61***	____
Education	.18*	.12	-.21**
Employment	-.15*	.09	-.09
Income	.01	.12	-.05
Marital Status	-.03	-.04	.10
Body Mass Index	-.31***	-.26**	.17*
Family History	-.07	-.08	.05

Note. * = $p < .05$, ** = $p < .01$, *** = $p < .001$; CES-D = Center for Epidemiological Studies Depression total score; HPLP-II = health promoting lifestyle behavior –II mean score; QLI = Quality of Life Index total score. HPLP-II is both a predictor and an outcome variable depending on the mediation step.

Contribution of the Predictors in the Final Regression Model. To be able to estimate the relative contribution of the predictor variables to the final model, a hierarchical/multiple block data entry method was employed (Table 33). The combination of the socioeconomic and CVD risk factor variables (Model 1) significantly explained 12% of the variance in this sample for quality of life as measured by the QLI. The addition of the health promoting lifestyle behaviors, as measured by the HPLP-II mean score (Model 2), added 12% to the variance ($p < .001$). The greatest addition to the variance in QLI was in the third model with the addition of depressive symptoms, as measured by the CES-D Total Score. The CES-D added a further 23% ($p < .001$) so that the final model explained 47% of the variance in quality of life.

Table 33. Model Summary Predicting Quality of Life

Model	R^2	SE	F (df)	*Sig.*
1	.12	3.87	2.57 (6)	.02
2	.24	3.61	5.22 (7)	.00
3	.47	3.04	12.41 (8)	.00

Note. df = degrees of freedom, SE = standard error, Sig. = significance.

The predictors examined for the third model for quality of life are displayed in Table 34. Not surprisingly following the summary of the hierarchical models' data, the CES-D was the strongest individual predictor (β = -.52, $p < .001$). In this final model, controlling the other predictors, the health-promoting lifestyle behaviors was the only other significant predictor (β = .21, $p < .01$).

Table 34. Model 3 Predictors of Quality of Life

	Unstandardized Coefficients		Standardized Coefficient		
	b	**SE**	**Beta**	***t***	***Sig.***
(Constant)	20.17	3.55		5.69	.00
Education	-.26	.30	-.06	-.85	.40
Employment	-.54	.29	-.13	-1.86	.07
Income	1.29	.74	.14	1.75	.08
Marital Status	-.24	.31	-.06	-77	.45
Body Mass Index	-.07	.05	-.11	-1.48	.14
Family History	-.44	.66	-.05	-.67	.50
HPLP Mean Score	2.20	.83	.21	2.65	.01
CES-D Score	-.23	.03	-.52	-6.92	.00

Note. Constant: Quality of Life total score; CES-D = Center for Epidemiological Studies Depression; SE = standard error; sig = significance.

Presentation of the Mediator Analysis

To examine the proposed mediation model (Figure 1), the analysis followed the analytical recommendations of Baron and Kenny (1986). To determine the effect of depressive symptoms on perceived quality of life as possibly being mediated by cardiac risk and/or health-promoting lifestyle behaviors, four conditions were examined through three multiple linear regression analyses for each of these possible mediators (Holmbeck, 1997). The results of these analyses are displayed in Table 35.

Compared to Figure 1, the first step and the first condition in the analysis is line a; step and condition 2 examined the direct effect of depressive symptoms as the independent variable on quality of life as the dependent variable depicted by line c. Step 3 examined the a plus d1 paths and also the b plus d2 paths. Conditions three and four are examined in step three. For all of these regression analyses, the following predictors were controlled: the dichotomous socioeconomic variables of education, employment, income, and marital status; and the CVD risk factors of BMI, and family history.

The first condition to be met is that the independent variable, depressive symptoms, needs to be significantly related to the proposed mediator. The first possible mediator to be examined was the AHA cardiac risk score. Depressive symptoms were not related to the risk score; therefore, the first condition was not met (Step 1A in Table 35). This finding eliminated the risk score as a possible mediator between depressive symptoms and quality of life.

This first condition was met, however, when the independent variable, depressive symptoms, was regressed with the proposed mediator, health promoting

lifestyle behaviors (Step 1B in Table 35). The second condition was met because depressive symptoms was found to be significantly related to quality of life (b = -.26, $p < .001$ (Step 2 in Table 35). The third condition requires that the proposed mediator be significantly associated with the outcome variable, quality of life in this investigation. As a proposed mediator, the HPLP mean score was found to be associated with quality of life (b = 2.20, $p < .01$) (Step 3B in Table 35). Holmbeck (1997) described the fourth condition as a corollary of Baron and Kenny's (1986) three-step method. The fourth condition was supported by the finding that the independent variable, depressive symptoms, had a reduced impact on quality of life when controlling the proposed mediator, health promoting lifestyle behaviors. In the third step, the depressive symptoms unstandardized regression coefficient (b = -.23, $p < .001$) is reduced when compared to its coefficient (b = -.26, p < .001) when the HPLP is not in the regression equation in step 2.

The effect of depressive symptoms on quality of life as being mediated by the health promoting lifestyle behaviors was found to be significant (Sobel test statistic = 2.14, $p = .03$) (Baron & Kenny, 1986; Sobel, 1982). An interactive online calculator for the Sobel test was used to test that the health promoting lifestyle behaviors do carry the influence of the independent variable, depressive symptoms, to the dependent variable, quality of life (http://www.people.ku.edu~preacher/sobel.htm).

Table 35. Mediation Analysis of Quality of Life

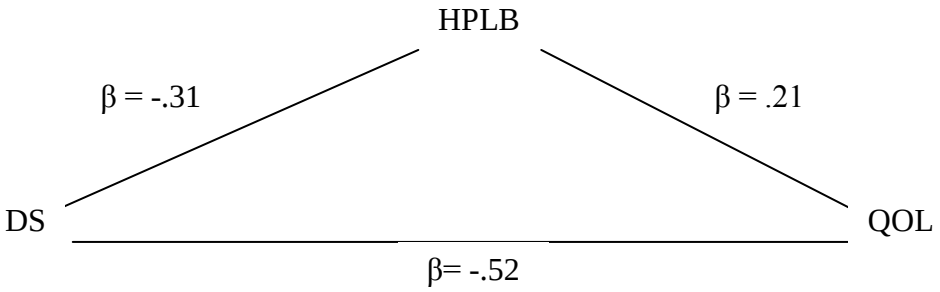
Step 1 A. Effect of Depressive Symptoms on AHA Risk Score; R^2 = .06 (*SE* = .59); *F (7, 122) 1.04*[a]				
Variable	*b*	*SE*	*Beta*	*t*
Depressive Symptoms	-.01	.01	-.09	-.96[a]
Step 1 B. Effect of Depressive Symptoms on Health Promoting Lifestyle Behaviors; R^2 = .25 (*SE* = .34); *F (7, 122) 5.48****				
Variable	*b*	*SE*	*Beta*	*t*
Depressive Symptoms	-.01	.004	-.31	-3.63***
Step 2. Effect of Depressive Symptoms on Quality of Life; R^2 = .43 (*SE* = 3.12); *F (7, 122)12.53****				
Variable	*b*	*SE*	*Beta*	*t*
Depressive Symptoms	-.26	.03	-.59	-7.99***
Step 3 B. Effect of Depressive Symptoms and Health Promoting Lifestyle Behaviors on Quality of Life; R^2 = .47 (*SE* = 3.04); *F (8, 122) 12.41****				
Variable	*b*	*SE*	*Beta*	*t*
Health Promoting Lifestyle Behaviors	2.20	.83	.21	2.65**
Depressive Symptoms	-.23	.03	-.52	-6.92***

Note. ** $p < .01$; *** $p < .001$. a = Not significant. Covariates: Continuous variables - body mass index; dichotomous categorical variables - education, employment, family history, income, and marital status. AHA = American Heart Association.

Revised Model

With the results of the mediation analysis, Figure 3 depicts the data-based model. The values depicted on the paths are the standardized coefficient (Beta) values which are also listed in Table 35 from Steps 1B and 3B so that the beta value for the depressive symptoms to quality of life path includes controlling for health-promoting lifestyle behaviors.

Figure 3. Revised Data-Based Mediation Model



Note: DS = depressive symptoms; HPLB = health-promoting lifestyle behaviors; QOL = quality of life.

Summary of Aim 3 Findings

Health-promoting lifestyle behaviors were found to be a significant mediator between depressive symptoms and the perceived quality of life. When depressive symptoms were not significantly associated with the cardiac risk score, the first condition for the examination of cardiac risk as a potential mediator was violated.

Aims Summary

Three aims and related hypotheses were investigated in this study. Data analysis yielded the following results.

Aim 1. Relationship Among the Major Study Variables

The hypothesis for this aim was mostly supported by the study findings. Depressive symptom status was not found to be associated with whether the women in this sample were aware of their CVD risk or with how they learned of this risk. Depressive symptoms status was inversely associated with health-promoting lifestyle

behaviors indicating that as the depressive symptoms increased the frequency of performing health-promoting lifestyle behaviors decreased. An inverse relationship was also found between depressive symptom status and quality of life. As the depressive symptoms increased the perceived quality of life decreased.

Aim 2. Dose-Response Relationship Between Depressive Symptoms and the Major Study Variables

The findings of the study mostly supported the associated hypothesis for this aim. Depressive symptoms were found to decrease the odds for a good perceived quality of life and to decrease the odds for performing health-promoting lifestyle behaviors. There was no evidence to support a dose-response relationship between depressive symptoms and either method for describing cardiac risk, i.e., the Framingham risk score and the reclassified AHA cardiac risk status. This is due to the lack of variance in the risk scores between the depressed and not depressed women.

Aim 3. Determination of Mediators Between Depressive Symptoms and Quality of Life

The hypothesis was that depressive symptoms would have either a direct or mediated effect on quality of life. The findings revealed that depressive symptoms does not have a direct effect on quality of life but rather is mediated by health promoting lifestyle behaviors. These results can be described as a partial mediation since the depressive symptoms' coefficient remained significant when the health promoting lifestyle behaviors were being controlled. Perfect mediation would exist if the independent variable, depressive symptoms, did not still have an effect on quality of life when health promoting lifestyle behaviors were being controlled (Baron & Kenny,

1986). The AHA reclassified risk status was found not to be a mediator in the relationship between depressive symptoms and quality of life. This occurred because depressive symptoms did not significantly predict the cardiac risk which violated the first condition in the mediation analysis (Baron & Kenny, 1986; Holmbeck, 1997), and thus no further analysis was warranted.

CHAPTER FIVE

DISCUSSION

Overview

This study identified that in a group of women being screened for their CVD risk, there was an inverse relationship between depressive symptoms and both health-promoting lifestyle behaviors and quality of life. Furthermore, this was a dose-response relationship so that as depressive symptoms increased, the frequency of performing health-promoting lifestyle behaviors decreased and quality of life was perceived as poorer. It was also identified that health-promoting lifestyle behaviors mediated the relationship between depressive symptoms and quality of life. Regardless of method used, calculated cardiac risk was not related to depressive symptoms in this CVD risk aware group of women. No relationship was identified between risk awareness and depressive symptoms.

The Health Promotion Model and the modified Wilson and Cleary health-related quality of life model guided the design of this cross-sectional study of depressive symptoms in women being screened for CVD risk. The HPM (Appendix F) addresses the complexity of human behavior to achieve the ultimate outcome of health promoting behavior. The current study addressed the personal factors through measurement of biological factors (measured by the CVD risk profile), psychological factors (limited to the measurement of depressive symptoms and risk awareness), and socio-cultural

factors (measured by the socioeconomic variables). The HPLP-II was designed to measure exercise benefits and barriers consistent with two of the behavior-specific elements in the HPM. Furthermore, the HPM is a good fit to a study of quality of life as its authors (Pender et al., 2006) posited there is an inextricable link between health and quality of life.

For decades quality of life has been considered essential to CVD investigations (Wenger et al., 1984). Clarity to the concept of QOL for health related investigations was provided by the Wilson and Cleary HRQOL model (Spertus & Green-Conaway, 2004; Wilson & Cleary, 1995) which was further clarified by Ferrans et al. (2005) (Appendix G). Several "Characteristics of the Individual" were measured in this study. The measurement of the CVD risk factors and determination of the CVD risk profile addressed the "Biological Function" of the women in this study. The CES-D measured one dimension of "Symptoms". The HPLP-II addressed the "Functional Status" of the women. The "General Health Perceptions" were addressed by the risk awareness questions as well as the Health and Functioning QLI subscale. The "Overall Quality of Life" was measured by the QLI.

Discussion of the Sample

The mean age of the 125 women who were also free of CVD disease was 57.7 (± 9.6) which is the median of the reported ages for the depressive symptoms studies cited in Appendices A – E. The sample was drawn from women presenting for CVD risk screening which is similar to the samples in the depressive symptoms studies of CVD risk factors summarized in Appendix B (Brown et al., 2005; Farmer et al., 1988;

Raikkonen et al, 2002; Wassertheil-Smoller et al., 2004). The women were predominantly white and non-Hispanic which reflects the vast majority of studies cited in Appendices A – E. The racial composition of the sample corresponds to the racial composition of the three counties primarily serviced by the screening center but under-represents the Black and Hispanic women in the screening center city. Given the mission of the screening center to service their widest geographic area, the results of this study provide significant insights into the women participating in the screening center's health improvement efforts.

Cardiovascular Risk Profile

The concern raised by the proportion of abnormal results for the individual CVD risk factors – lipid profile, SBP, and obesity - is that they indicate that the women were at a higher CVD risk than reflected by their Framingham risk score. The low mean Framingham risk score (3.3% ± 3.9) matches the 1999-2004 NHANES Framingham score for women for the 1988 to 1994 NHANES data (Towfighi, Zheng, & Ovbiagele, 2009). The one very favorable CVD risk profile finding was that nearly all the women did not smoke.

Most of the women (83.2%) had a TC at or over the Framingham risk score target of 160 mg/dl and 40% had an HDL-C less than the target of 50 mg/dl. It should be noted that the lipid testing was non-fasting which may have influenced the total cholesterol score. It is recommended that when a non-fasting TC equals or is higher than 200 mg/dl, or the HDL-C is less than 40 mg/dl, a fasting lipid profile should be obtained (Wong, Malik, & Kashyao, 2005). Nearly half of the women had a non-fasting

TC greater than 200 mg/dl while only 18.4% had an HDL-C less than 40 mg/dl (Table 9). Fortunately, all women who participated in the screening program were given a voucher for a fasting lipid profile. The current NCEP (2004) guidelines target treatment based on low-density lipoprotein cholesterol (LDL-C) levels and secondarily target HDL-C for high risk persons. Although the LDL-C was not measured and the women were not questioned regarding their pre-treatment lipid profile, two-thirds of the women reported taking a cholesterol lowering medication. It was not a goal of this study to investigate treatment gaps yet it is interesting to note that despite treatment, less than half of the women were at desired TC levels.

A SBP of less than 120 mmHg was set as normal by the most current report on the prevention, detection, evaluation, and treatment of high blood pressure (Chobanian et al., 2003). Seventy percent of the women had a SBP greater than 120 mmHg and only half of these women reported taking an anti-hypertensive medication. So while some women were being treated for hypertension there appears to be a treatment gap for this CVD risk factor as well.

Although only 12 women met the criteria for having the metabolic syndrome, their obesity measurements suggest that had a fasting glucose and triglycerides been measured, the actual number of women designated as having the metabolic syndrome might have been higher. Over half of the 94 women who had their waist circumference measured had a waist circumference equal to or greater than 35 inches. The mean waist circumference in this study matches the overall study mean for a recent investigation that recommended the addition of waist circumference to the Framingham-based

models to improve the CVD predictability (Sacco et al., 2009). Over half of the women had a BMI of equal to or greater than 30 and 12% had BMIs equal to or greater than 40. An alarming 93.5% of the women had a body fat measurement greater than 30%. This sample of women matches the trend exposed by the current NHANES data for women which revealed that the mean BMI was 34.1 (SE 1.4), a significant increase from the prior data (Towfighi et al., 2009). Given the large number of women in this study reflecting the increasing obesity trends in the population, it is of further concern that the number of metabolic syndrome risk factors has also been found to have a dose-response relationship with depressive symptoms. Women with higher depression scores were nearly a third more likely to develop more metabolic syndrome risk factors (Raikkonen et al., 2002).

Given the low mean Framingham score and the CVD risk profile of the women, the CVD risk status was reexamined using the AHA cardiac risk profile for women (Mosca, Banka, et al., 2007) yielding a rather dramatic shift in how these women would be classified. Two CVD risk factors were responsible for the shift in their CVD risk status. Twelve optimum risk women with diabetes were now considered to be in the high risk group. Women who were physically inactive increased the number of at risk women from 5.6% to 64%, leaving only 24.8% of the women in the optimum risk group, a reduction of 68.8% in this classification. These findings add support to the discussion of the inadequacies of the traditional Framingham risk score to depict risk status in women particularly since it is directed narrowly at CHD and not the more global CVD risk (D'Agostino et al., 2008; Sacco et al., 2009).

Revisions of the Traditional Framingham Risk Score

In an effort to increase the use of risk prediction methods in primary care and to also broaden it to a CVD risk assessment, D'Agostino et al. (2008) added diabetes to their recalibration of the 1998 Framingham CHD risk score. The net effect with the addition of diabetes is that a lower number of points correspond to a higher CVD risk percent.

Another study to improve global CVD risk assessment (Sacco et al., 2009) concluded in addition to waist circumference, alcohol consumption, and physical activity significantly added to the predictive ability of the 1998 Framingham risk profile. Support for the inclusion of physical activity to risk profiling is further provided by a study of the NHANES data from 1999 to 2004 (McGuire, Janssen, & Ross, 2009) which concluded that physical activity, independent of common cardiometabolic risk factors, predicted the likelihood of CVD (OR 1.52, 95% CI 1.16-1.98, $p < .05$). These studies support the reclassification based on physical inactivity performed for this study.

Another important revision to traditional risk scoring is shifting away from linking the point allocation of individual risk factors to age. D'Agostino et al. (2008) included in their recalibration that points are allocated at a younger age, and total cholesterol, smoking, and SBP are allocated points regardless of age. Support for altering the age-linked point allocation proposed by D'Agostino et al. (2008) is provided by Marma and Lloyd-Jones (2009). These investigators emphasized that increasing age alone with all other risk factors held at normal levels significantly

predicted 10-year risk and that this risk was more accelerated after the age of 60. Marma and Lloyd-Jones added that "a 10-year risk estimate of ≥ 20% is not predicted by the tool for a man with average risk factor values until 70 years of age and is never predicted (through 74 years of age, even with treated blood pressure) for a woman with average risk factor values" (p. 385-386). The heavy scoring for age seems to discount widely abnormal other risk factors.

The gender perspective on risk scoring was highlighted by the publication of the Reynolds risk score that proposed to increase the accuracy of risk estimation for women (Ridker, Burning, Rifai, & Cook, 2007). The Reynolds risk score adds family history of premature MI, high sensitivity C-reactive protein, and hemoglobin A1C for diabetics to the variables measured by the Framingham CHD risk profile. The addition of two laboratory tests, however, may be seen as adding to the complexity and cost of the primary care setting's screening which was the case for the center where this study was conducted, hence this information was not available due to cost (D. Best, Personal Communication).

From a risk reduction perspective, a low Framingham score might diminish a woman's concern for her overall CVD risk status. Recent discussions in the literature have addressed two concerns related to the use of risk assessment tools: low risk scores delay the initiation of risk factor treatment (Vasan & Kannel, 2009) and the use of risk scores must be augmented as we attempt to motivate women to modify their risk burden (D'Agostino et al., 2008; Marma & Lloyd-Jones, 2009). Given the association between depressive symptoms and health-promoting lifestyle behaviors and quality of life, this

study adds to the literature that risk identification must go beyond describing risk solely based on the traditional Framingham risk score but to also do so in a fashion congruent with primary care and particularly risk screening programs. In addition to the more traditional CVD risk factors, this study identified other CVD risk vulnerabilities in an apparently healthy group of women.

Over half of the women reported that they snored yet only a fraction of the women reported they had been diagnosed with sleep apnea (Table 12). This suggests that sleep-disordered breathing screening assessments should be added to the screening center's CVD assessments and follow-up information should be provided to women who snore. While all people who snore may not have sleep-disordered breathing, the CVD risks associated with sleep-disordered breathing should not be ignored since they include a higher risk for fatal cardiovascular events (Takama & Kurabayashi, 2009). In a study of 135 people with CVD, those diagnosed with obstructive sleep apnea ($n = 43$, 31.8%) had a significantly lower survival rate (OR 2.45, 95% CI, 1.26-5.08, $p < .01$) compared to those without obstructive sleep apnea (Takama & Kurabayashi). Snoring was added to this study based on an investigation of early CHD predictors that identified snoring among the early predictors (Ketterer et al., 2006).

While the assessment for sleep-disordered breathing is an opportunity for improvement, the frequency of exercise stress testing may be a reflection of the emphasis on cardiovascular health in women that has been promoted by the screening center and a large cardiovascular practice in the area. While there are no absolute indications for an exercise stress testing in asymptomatic persons, the most recent AHA

scientific statement regarding this (Lauer, Froelicher, Williams, & Kligfield, 2005) did cite a study that supported a Framingham score of > 2% as a criterion. Each woman who indicated a stress test was asked about the results. All the women said the results were normal, thus they felt they did not have heart disease. There seems to be a disconnect between the number of women who had a stress test and how they learned of the CVD risk status.

Awareness of CVD Risk

Although there is room for much improvement, compared to the national data (Christian et al., 2007) a larger percentage of these women were aware of the risk for heart disease in women. A lingering concern, however, is that over half of the women said that they did not learn about their heart disease risk from their primary care provider but from the media or from being a member of the screening center's Women's Heart Advantage program. This would suggest that many primary care providers in the area of the screening center may have low awareness of heart disease risk in women or believe that women are already knowledgeable about this topic (Mosca et al., 2005).

While primary care provider practices seem to be lagging behind, the efforts to increase the awareness of women in the community served by the screening center that began four years prior to the beginning of this study had been effective. Those efforts were further extended to all participants in the screening program when they were provided individual realistic risk modification targets and strategies to reach these

targets along with the continuing supportive publications and events sponsored by the screening center.

Discussion of Lifestyle Behaviors, Depressive Symptoms, and Quality of Life

The three major study measurements were the Health-Promoting Lifestyles Profile-II developed to address the multi-dimensional pattern of self-initiated health promoting behaviors consistent with the HPM, the Center for Epidemiological Studies Depression scale, and the Quality of Life Index. The results of these measurements provide additional insight into the women.

Health-Promoting Lifestyle Behaviors

The measurement of the health-promoting lifestyle behaviors indicates there is much room for improvement in the frequency of self-initiated health promotion behaviors and, therefore, the CVD risk modification recommendations and support provided the women attending this program is encouraging. Overall, these women were physically inactive and performed physical activity below the recommended levels to reduce CVD risk (Table 14). Recent investigations have added to the evidence for the relationship between physical activity and CVD risk. Physical inactivity has been identified to independently predict CVD risk (McGuire et al., 2009) and has been recommended to be added to the traditional CVD risk assessment (Sacco et al., 2009). Thus, the finding that low physical activity increased the CVD risk assessment classification in this group of women coming for CVD risk assessment support the data on physical activity and CVD risk particularly in women.

In addition to being generally physically inactive, these women had room to improve the frequency of performing healthy nutrition behaviors as only a small fraction routinely performed these behaviors. The number of women who generally did not follow a heart healthy diet and were physically inactive is consistent with the large number of women who were obese reflected by their BMI, percent body fat, and waist circumference and their abnormal lipid profiles. All women attending the program are provided guidance to improve their nutrition.

Another area for improvement was identified by a small fraction of women who routinely performed stress management behaviors. Somewhat surprising, only a quarter of the women reported their stress level was high or chronic. An inverse relationship was found between the women's self-reported stress level and the performance of stress management behaviors ($r_S = -28$, $p < .01$). The addition of stress management behaviors could be added to the risk reduction strategies provided women attending the CVD risk screening program.

Only a small fraction of women reported routinely performing the health responsibility behaviors. Being a member of the center's Heart Advantage program and attending a CVD screening program would indicate an interest in health promotion. This may help explain the relatively high number of women who were already aware of the risks of heart disease in women although they may have just been learning how they could improve their own risk status through participation in the Heart Advantage program. Anecdotally, many women, when agreeing to participate in the study, said

they were finally having time to do positive things for themselves like finding out more about how to live healthier lives.

The most positive health-promoting lifestyle behaviors for the women were that the majority reported that they often performed the spiritual growth and interpersonal relations behaviors. Anecdotally, often women said they learned of the CVD risk screening program from a friend or family member who often accompanied them to the large group screening events. The Heart Advantage program provided them the knowledge to make healthier lifestyle changes. With these insights into their health-promoting lifestyle behaviors, the next question is about their mood.

Depressive Symptoms

The literature addressing the self-reported measurement of depressive symptoms discusses the confounding issue of the presence of co-morbid medical conditions particularly somatic complaints common in CVD (Simon & von Koroff, 2006). While the CES-D emphasizes mood and affect more than the physical dimensions of depression (Hann et al., 1999), it was nevertheless important to identify the co-morbid health status with an instrument designed to measure functional status and one that has worked well with studies of HRQOL. The FCI met those criteria.

Based on the scores of the FCI, these women were healthy with a mean score of 2.2 (± 1.6). An elevated BMI was the most frequent item (57.6%) with one-third of the women reporting they had arthritis and a quarter saying they had upper GI disease. Less than 15% indicated any other medical conditions. Women with a history of CVD were excluded from the study. Thus, the presence of confounding medical conditions was not

a concern for the self-reported depressive symptoms assessment. Furthermore, it was not the intent of this study to make a clinical diagnosis of depression.

Identifying that one-third of these apparently healthy women had significant depressive symptoms is alarming. This prevalence of depression is more than six times the rate of major depression identified in a national study (Hasin et al., 2005) and is twice the incidence reported in studies investigating the relationship of depression to incident CVD in women (Wassertheil-Smoller et al., 2004). What may be placing these women at higher risk for depression?

Examining the individual CES-D items and the pattern of responses per the CES-D factors, only three individual items were reported by more than a quarter of the participants as occurring at least 3 days in the past week and all three items were from what Radloff (1977) named the somatic and retarded activity group. These items were: "I felt that everything I did was an effort" (25.6% checked as occurring 3 or more days in the past week), "I had trouble keeping my mind on what I was doing" (37.6% checked as occurring 3 or more days in the past week), and "My sleep was restless" (39.2% checked as occurring 3 or more days in the past week). Recall that almost 60% of the women indicated that they snored which may indicate a physical reason for their restless sleep.

The mental health history items in this study (Table 17) identified that nearly half of the women reported a family history of depression. Nearly equal numbers of the women reported ever being told they had depression or were ever treated for depression. The number of women reporting having been treated for depression is

nearly identical to that found in the WISE study (Rutledge, Reis, Olson, Kelsey et al., 2006). A quarter of the women were currently being treated for depression. These mental health history items and the FCI score were all modestly correlated with the CES-D scores (Table 19) although the family history of depression was just approaching statistical significance ($r_S = .17$, $p = .053$).

Some antidepressants have been found to increase the risk for CVD. The women in this study reported taking a variety of anti-depressants with a selective serotonin reuptake inhibitor (SSRI) the most often reported. The results of a study of the effects of antidepressant use on CVD (Smoller et al., 2009), the largest study of its kind, are particularly relevant. Smoller et al. (2009) reported that of the 136, 293 women at baseline who were not taking an antidepressant, only 4% were taking an antidepressant at follow-up while more than double this amount (9.2%) were depressed at the follow-up visit.

These data lend support to the reports that depression is under-diagnosed and under-treated (Huffman et al., 2006; NIMH, 2001; Ziegelstein et al., 2005). Half of the women in the WHI study (Smoller et al.,) who were taking an antidepressant were taking a SSRI. The SSRI drug class was found not to be associated with CHD. Unfortunately, women taking SSRIs had an increased risk of stroke (HR = 1.45, 95% CI 1.08-1.97) and all-cause mortality (HR = 1.32, 95% CI 1.10-1.59). These authors caution that women taking an antidepressant should have their CVD risk factors vigilantly controlled (Smoller et al.)

The depressed women tended to be younger, obese, have a lower TC and lower HDL-C, and were at higher AHA risk for CVD. Although there was no statistically significant difference between the depressed and not depressed women compared by the Framingham risk score or the AHA risk classification, nearly three-quarters of the depressed women were calculated to be in the AHA at risk group (depressed women: 71.4%, not-depressed women: 60.2%) (Table 21).

Among the socioeconomic factors, only education approached statistical significance ($p = .06$) which revealed that women who were not depressed tended to be better educated. Among the individual CVD risk factors, the only statistically significant differences between the depressed and not depressed women were age (depressed women: 55.4 ± 10 years, not-depressed women: 59 ± 9 years, $p = .05$), and total cholesterol (depressed women: 183 ± 37.4 mg/dl, not-depressed women: 203 ± 40.5 mg/dl, $p = .01$) with HDL-C approaching statistical significance (depressed women: 50 ± 13.9 mg/dl, not-depressed women: 55 ± 15 mg/dl, $p = .06$). Waist circumference was the only statistically different metabolic syndrome factor with the depressed women having the larger waist circumference (depressed women: 38 ± 6 inches, not-depressed women: 35 ± 6 inches, $p = .02$). This might be due to the fact that most of the women were obese (depressed women: BMI 32.8 ± 6.7, not-depressed women: BMI 30.7 ± 5.6, $p = .07$), and only thirteen women self-reported having diabetes. Given the prevalence of obesity in this group, it would have been interesting to have the results of even a random blood glucose measurement to screen for diabetes.

Depressed women significantly less frequently performed health-promoting lifestyle behaviors (Table 30). The physical activity subscale scores were essentially identical for both groups thus it is not surprising this was the one subscale that was not statistically different between the depressed and not depressed women. Clearly, all the women had room for improvement in their physical activity behaviors.

Women in the higher AHA risk groups were less physically active, and less frequently followed good nutritional and health responsibility behaviors. This pattern of behaviors is consistent with their metabolic syndrome status.

The large percentage of low physical activity in this sample that had depressive symptom scores equal to or greater than 16 supports the finding of an inverse relationship between physical activity and depressive symptoms. Thus, women who were less active had more depressive symptoms. This has previously been reported in four studies (Brown et al., 2005; Farmer et al., 1988; Knox et al., 2006; Wassertheil-Smoller et al., 2004). Farmer et al. (1988) found this relationship more pronounced in women while Knox et al. (2006) did not find a gender difference. The other two studies only enrolled women. The unique aspect of this study was the measurement of a comprehensive span of health-promoting lifestyle behaviors which revealed that these risk-aware women were at a higher AHA cardiac risk status than revealed by their Framingham risk score. The other contribution of this study was the investigation of the relationship of depressive symptoms and health-promoting lifestyle behaviors to perceived quality of life.

Quality of Life

These women who were essentially healthy albeit with significant cardiac risk factors, generally perceived their quality of life as acceptable. Quality of Life Index total scores above 19 are considered to indicate a better perceived QOL (Dr. Ferrans, Personal Communication). While the mean total score was in the acceptable range (22.4 ± 4), it was only three and a half points above the cut-score of 19 that indicates a poor quality of life (Table 21). Furthermore, all the subscale scores were close to the poorer quality of life cut score. The subscale scores ranged from 21.5 (± 4.6) for health and functioning to 23.2 (± 4.9) for the psychological/spiritual subscale. There was a narrow difference of only 1.7 points for the subscale scores for the whole sample. Consistent with the health-promoting lifestyle behaviors' scores, the health and functioning QLI subscale was the lowest scoring subscale.

Women who tended to less frequently perform health-promoting lifestyle behaviors (HPLP mean score of ≤ 2.5) had a statistically lower quality of life than women who more frequently performed health-promoting lifestyle behaviors (QLI mean score of 20.4, ± 4.4 compared to 24, ± 3, $p < .01$). The statistical differences for the QLI subscale scores persisted for all but the family subscale which approached statistical significance where women who less frequently performed health-promoting lifestyle behaviors tended to have a lower family subscale score (21.6, ± 4.7 compared to 24, ± 4, $p = .06$). Women who had the lowest frequency of performing health-promoting lifestyle behaviors had the lowest subscale score for the health and

functioning subscale at 19 (± 5.3). No studies were identified that investigated health-performing lifestyle behaviors and quality of life in women prior to a cardiac event.

Depressed women tended to have a poorer quality of life overall and particularly on the health and functioning subscale which was just below the QLI cut-score of 19 at 18.9 (± 5.3). There was a statistical difference of 3.9 points on the total QLI score between the groups: depressed women's mean score was 19.9 (± 4.6) versus a mean of 23.8 (± 2.9) for not-depressed women ($p < .01$). The statistical difference continued for each of the subscales as well with the depressed women consistently scoring lower than the not-depressed women. No studies were identified that investigated quality of life and depressive symptoms in women prior to a cardiac event. Depression has been found to be associated with a poorer quality of life in women who have had an MI (Kamm-Steigelman et al., 2006) which may extend as long a one-year post MI (White & Groh, 2007). However, women who have had a CABG reported an improved quality of life primarily attributed to an improved health and functional status (Penckofer et al., 2005).

Discussion of Major Findings

There were three study aims and three related hypotheses. Overall, the hypotheses were supported by the findings.

Aim 1. Relationship Among the Variables

The first study aim was to determine the relationship between depressive symptoms, the cardiac risk score, the health-promoting lifestyle behaviors, an awareness of heart disease risk, and the perceived QOL in women being screened for CVD risk. The related hypotheses had a mixed outcome. The findings revealed inverse

and moderate to strong relationships between depressive symptoms and health-promoting lifestyle behaviors (r_S = -.37, p < .001) and perceived quality of life (r_S = -.51, p < .001) (Table 24). No relationship was found between depressive symptoms and cardiac risk described by the Framingham risk score or the AHA risk groups (Table 24).

Since three-quarters of the depressed women were in the at risk and high risk groups (Table 21), the absence of a relationship between depressive symptoms and risk status might be explained by the fact that two-thirds of the women were not depressed. Although low physical activity increased the number of women considered to be in the at risk AHA group, the majority of low physically active women had depressive symptom scores below the depression cut-score of 16. No relationship was found between depressive symptoms and risk awareness (r_S = .06, p =.50; Table 23). These were, however, a predominantly risk aware group of women.

The literature investigating depressive symptoms in incident CVD did not report Framingham risk scores. They investigated individual risk factors. Consistent with the findings in this study, certain CVD risk factors were the dominant elements. Low physical activity has been linked to depressive symptoms in four investigations of incident CVD (Brown et al., 2005; Farmer et al., 1988; Knox et al., 2006; Wassertheil-Smoller et al., 2004). The NHANES data (Farmer et al., 1988) also reported a higher BMI in the less physically active women. An investigation of perimenopausal women identified those with higher depression scores were nearly a third more likely to develop more metabolic syndrome risk factors (Raikkonen et al., 2002). The Seasons

Study (Rosal et al., 2001) investigated the co-occurrence of unhealthy behaviors – smoking, high-fat diet, sedentariness, and high-risk drinking - and psychosocial variables. The higher the depression score, the higher were the number of risk behaviors. Other investigators identified that the higher the depression score the less likely was adherence to heart healthy behavior guidelines regardless of gender (Bonnet et al., 2004).

Although not identified as part of the original hypothesis, two additional interesting relationships were examined (Table 24). A strong positive relationship was found between quality of life and health-promoting lifestyle behaviors ($r_S = .46$, $p < .001$). Women who more frequently performed health-promoting lifestyle behaviors also reported an overall favorable perceived quality of life. An inverse relationship was identified between AHA risk groups and health-promoting lifestyle behaviors $r_S = -.26$, $p < .001$). Women who least frequently performed health-promoting lifestyle behaviors tended to have a higher risk status.

Aim 2. Dose-Response Relationship

With these patterns of relationships, the findings for the second hypothesis for a dose-response relationship between depressive symptoms and health-promoting lifestyle behaviors and perceived quality of life were not surprising. Also not surprising was the absence of a dose-response relationship between depressive symptoms and cardiac risk regardless of risk determination method. Based on the depressive symptoms and CVD literature, the same sets of covariates were used in these logistic regression analyses: the socioeconomic variables of education, employment, income and marital

status, and two CVD risk factors that are not part of the Framingham risk calculations: BMI and family history of CVD. Body mass index was included as an indicator of obesity which is considered a modifiable CVD risk factor. Family history was included as it is a traditional non-modifiable CVD risk factor. Since the Framingham risk score was one of the variables being investigated, the individual CVD risk factors which comprise it (age, HDL-C, TC, SBP, and smoking) were eliminated as covariates.

As depressive symptoms increased, there was a graded decrease in perceived quality of life (Table 26) and a graded decrease in the frequency of performing health-promoting lifestyle behaviors (Table 27). To try to elicit a dose-response relationship between depressive symptoms and cardiac risk, the depressive symptoms score was entered first as a continuous variable (Table 28) and then dichotomized at the CES-D cut-score of 16 (Table 29). Neither approach detected a significant relationship. As discussed above, two-thirds of the women were not depressed (CES-D < 16) and these women out-numbered the depressed women regardless of AHA risk status: there were only 32 depressed women between the at risk and high risk groups compared to 62 not-depressed women in these same AHA risk groups (Table 21). Furthermore, no statistical relationship was detected between depressive symptoms and AHA risk status (r_s = -.07, p = not significant). No studies were identified that reported the relationship between depressive symptoms and either the Framingham risk score or the AHA risk groups.

Investigations of quality of life and cardiac disease have been numerous but have addressed changes in quality of life in persons with heart disease (Ford et al.,

2008; Ruo et al., 2003), persons who have had a diagnostic cardiac procedure (Cheok et al., 2003; Hofner et al., 2005), or following a cardiac event such as an MI (Kamm-Steigelman et al, 2006), a treatment for heart disease such as a CABG (Cheok et al., 2003; Penckofer et al., 2005) or a heart disease complication, such as heart failure (Heo et al., 2005). No studies have been identified that investigated the association between depressive symptoms and quality of life in women prior to a cardiac event. Only one study of depressive symptoms and an aspect of quality of life in healthy participants was identified. Koivumaa-Honkanen et al. (2004) found in their investigation of twins a strong linear relationship between the life satisfaction scale and depressive symptoms. This investigation reported that the life satisfaction scores were able to predict moderate to severe depressive symptoms and to explain 37.2% of the variance in depressive symptoms scores. One BFRSS survey reported on depressive symptoms and quality of life in healthy participants using a one-item assessment for depressive symptoms, the number of sad, blue or depressed days and a 4-item assessment of quality of life (Kobau et al., 2004). The more frequently the respondents experienced sad, blue or depressed days the worse was their HRQOL.

The bulk of the literature investigating depressive symptoms in incident CVD identified a dose-response relationship between depressive symptoms and the risk for CVD (Appendices B and E), IHD (Appendix C), and IHD mortality and sometimes with all-cause mortality (Appendix D). While the literature reported dose-response relationships between depressive symptoms and physical activity, the number of metabolic syndrome elements, the frequency of performing health promoting behaviors

and specific CVD risk factors such as blood pressure (Artinian et al., 2006), none of the literature reported the calculated CHD or CVD risk scores. Despite less of the population having lower Framingham scores (Lloyd-Jones et al., 2009), somewhat paradoxically the majority of reports indicate that low Framingham scores still predominate (Marma & Lloyd-Jones, 2009; Sacco et al., 2009). While there are dose-response relationships between some CVD risk factors and depressive symptoms, it is not clear why this dose-response relationship does not apply to the actual risk score and depressive symptoms. Some recent publications argue that the components of the traditional Framingham risk scores, even when expanded from the CHD to the CVD models, do not sufficiently discriminate cardiac disease risk status.

Aim 3. Model of Mediators Between Depressive Symptoms and Quality of Life

The final study aim was to determine whether the effect of depressive symptoms on perceived quality of life was direct or indirect (i.e., mediated by cardiac risk –d1, or health-promoting lifestyle behaviors – d2 in Figure 1). Following the absence of a relationship between depressive symptoms and cardiac risk, cardiac risk was eliminated as a potential mediator (Table 34). In the series of linear regression analyses in the mediation analysis, the same sets of covariates were used in each model; the socioeconomic variables were education, employment, income, and marital status, and the CVD risk factors were BMI and family history of premature CVD.

Health-promoting lifestyle behaviors were found to mediate the relationship between depressive symptoms and perceived quality of life (Table 34). The mediation is described as a partial mediation because even with the inclusion of health-promoting

lifestyle behaviors, depressive symptoms remained a significant predictor of quality of life in a reduced amount (Baron & Kenny, 1986; Holmbeck, 1997). In the final regression analysis model with both the mediator and the predictor entered, depressive symptoms was the stronger predictor ($\beta = -.52$, $p < .001$) contrasted to health-promoting lifestyle behaviors ($\beta = .21$, $p < .01$). The revised study model depicts the path values (Figure 3). The analysis of the explanation of the variance in quality of life (Table 32) identified that the covariates explained 12% of the variance; the addition of the health-promoting lifestyle behaviors explained 24% of the variance; and the introduction of the depressive symptoms increased the explanation of the variance to 47%. So while controlling for socioeconomic variables and CVD factors, and then for health-promoting lifestyle behaviors, depressive symptoms explain most of the variance in perceived quality of life.

Study Limitations

The limitations of any study are based on threats to internal and external validity. Three threats to internal validity were identified in this study: participant selection bias, missing data on the study questionnaires, and possible instrumentation errors.

Participant selection bias occurred because the sample was a nonrandom convenience sample of women who voluntarily presented to a free heart disease screening program. This sampling strategy is also a threat to external validity, thus reducing the generalizability of the results. Further, the sample was not powered to analyze the findings according to the race and ethnicity, thus reducing the

generalizability of the findings. Half the sample came from within 5 miles of the screening center in a community where race was fairly evenly divided between White (47%) and Black (43.3%) in the year 2000. However, the study sample was disproportionately White and only 4.8% Hispanic women (where the census reported 11.7% Hispanic in 2000). While there was not purposive sampling to achieve a racial and ethnic balanced sample as has been suggested by the AHA "Minority Health Summit 2003" (Benjamin et al., 2005), the number of Black and Hispanic women presenting to the free screening program may be related to the fact that there was no racial or ethnic targeted advertising for this program. Increasing the racial and ethnic participation rate in clinical research remains a challenge.

This is problematic in light of the results of the Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) study (Finkelstein, Khavjou, Mobley, Haney, & Will, 2004). The WISEWOMAN study findings concluded that racial/ethnic risk factor disparities were statistically significant and that the greatest risk of CVD was found in black women; these findings were only partially explained by community characteristics.

There was minimal missing data on the CES-D, the QLI, and the HPLP-II with the largest percentage of missing data being waist circumference. Thirty-one women did not have a waste circumference measurement when they attended a large group screening event. This was due to the lack of privacy at the large group screening events (D. Best, Personal Communication). The other missing data might have been decreased had the screening of completed questionnaire booklets been consistently done. During

the busy large group events and on the busiest individual screening days, the review of individual's responses was not consistently performed. The pattern of missing data was random and thus should not have impacted the study findings.

There did not appear to be instrumentation errors with either the body-fat measurement device or the lipid measurement device. The instrument used to test for the cholesterol profile, the Cholestech LDX, is powered by electricity, and requires quality controls are performed on the testing cassettes. Controls are run according to accepted laboratory standards when a new lot number of testing cassettes is used (Debbie Best, personal communication, August 2, 2007). The researcher verified that the quality controls were performed as specified. There were no electrical or operational failures during the study period. The screening center staff who performed the cholesterol and body-fat checks during the large group events were all competency-verified to do the testing as was the nurse specialist who conducted the individual screenings.

There are potential threats to external validity in addition to the sample as described above. There may have been interactions between the setting and the testing and the voluntary participation of the women in a heart screening program. The women who decided to present for the program may not be representative of women who are not interested in finding out about their heart health status and/or are so significantly depressed that they would not consider participation is such a health-oriented program. There was also the potential that the setting in an outpatient clinic of a hospital may have influenced the women who presented. Women may have come to the screening

center because they or their families are used to receiving their inpatient hospital care at the facility. Thus women used to going to one of the other area hospitals may not have attended the CVD screening program which could also reduce the representative nature of the sample.

A final external validity threat relates to the study exclusion criteria. The results of this study may not apply to women with: (a) a known cardiac history, defined as having had a cardiac event, (b) a psychiatric diagnosis other than depression, (c) dementia, or (d) known substance abuse as these are the exclusion criteria for the proposed study.

The inability to establish causal relationships is a leading limitation of the correlational design. The study, however, did illuminate the relationship of depressive symptoms, cardiac risk, and health-promoting lifestyle behaviors to perceived quality of life and in so doing added to the knowledge of the health status of women being screened for CVD risk.

Summary of Major Findings

Depressive symptoms have a strong inverse relationship with health-promoting lifestyle behaviors and quality of life. There is a strong positive relationship between health-promoting lifestyle behaviors and quality of life. Depressed women less frequently perform health-promoting lifestyle behaviors. Women who less frequently perform health-promoting lifestyle behaviors report a lower quality of life. An inverse dose-response relationship was found between depressive symptoms and health-promoting lifestyle behaviors and quality of life. The link between depressive

symptoms and quality of life is partially mediated by health-promoting lifestyle behaviors.

While no association was found between Framingham risk score or AHA risk status and depressive symptoms, many more depressed women were in the AHA at and high risk groups compared to the few women in the optimum risk group. Low frequency of performing physical activity behaviors increased the number of women who would be classified in the AHA at risk group compared to those classified as at risk based on their Framingham risk score

Implications for Nursing Knowledge and Practice

Nurses are at the forefront in many settings where screening programs are made available to the public. Considering the relationship between depressive symptoms and adherence to medical treatment plans, screening for depressive symptoms should be encouraged with baseline CVD risk assessment and not delayed until a cardiac event has occurred. Considering the link between treatment delay for cardiac symptoms in women found to be depressed (Bunde & Martin, 2006), nurses who provide cardiac health screening should be aware of the links between depressive symptoms and CVD particularly in women. Nurses who work in emergency departments and clinical decision units who care for patients coming with complaints of chest pain, need to be aware that over half of the people admitted for acute coronary syndrome were depressed prior to their hospitalization and 94% of these depressed people reported that they were depressed more than 30 days prior to their hospitalization (Glassman et al., 2006) regardless of gender.

In addition to adding depression screening to CVD risk assessment, CVD risk screening programs should add questions regarding the use of anti-depressants and screen for snoring and sleep-disordered breathing. Clients who present with snoring should be told to bring this to the attention of their primary care provider as a CVD risk factor warranting additional assessment. Cardiovascular disease risk modification programs should consider the use of a health-promotion lifestyle assessment to expand the understanding of self-care behaviors. Based on the data from this assessment, these CVD risk modification programs could minimally provide stress management interventions in addition to the information provided to modify nutrition, physical activity, and knowledge of all modifiable CVD risk factors.

Implications for Future Research

The release of the AHA advisory to include screening for depression and referral for treatment when depression is identified (Lichtman et al., 2008) has increased the attention to depression and depressive symptoms. This advisory, however, was for persons with CHD and did not address persons who are being screened for CVD risk. Over the last six years there has been a modest up-tick in the number of research studies addressing depression conducted by nurses and physicians. The studies, however, remain predominantly focused on people who have had a cardiac event or live with chronic heart failure. Therefore, this remains the first study thus far identified that has investigated the relationship of depressive symptoms to cardiac risk, health-promoting lifestyle behaviors and quality of life in women being screened for CVD risk.

Given the nature of the association between depressive symptoms and CVD risk, it would be realistic to design longitudinal CVD risk modification programs that consistently measure for depressive symptoms. Based on the health-promoting lifestyle behavior scale responses, it would be logical to begin with a physical activity and stress management intervention. There is a potentially easily accessible sample at the screening center facility. The organizational wellness program sponsors events which might be amenable to adding short depressive symptoms screening items such as the PHQ-2 to their tracked data. The addition of depressive symptom screening questions could also be added to the ongoing Heart Advantage program and track participants who return for follow-up assessments where the baseline data is repeated. It would be interesting to identify any reduction in depressive symptoms in those who have improved their heart healthy lifestyles inclusive of improved nutrition and exercise frequency. These investigations will expand the understanding of the relationship of depressive symptoms to adherence to treatment programs. All delay to treatment investigations should include the assessment of depressive symptoms.

When designing intervention studies, the demographics of the community served by an existing CVD risk screening program should be taken into consideration. Research programs need to be racially balanced since the majority of programs continue to be skewed toward White participants. Strategies to recruit more non-White participants needs to be a priority, particularly in communities that are not predominantly White. Recruitment of non-white participants will likely require targeted community outreach activities such as recruiting from other community agencies such

as the public health department and faith-based health initiatives. Other nursing research strategies include academic nurse researchers establishing research partnerships with existing healthcare organization's health-promotion activities and employee wellness programs.

APPENDIX A

RESEARCH STUDIES: DEPRESSIVE SYMPTOMS AND PRECLINICAL ATHEROSCLEROSIS

Depressive Symptoms and Preclinical Atherosclerosis

Author (Year)	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Agatisa (2005)	n/a	Study: SWAN N = 210 Age* = 51.0 Female = 100% White = 72.4% AA = 27.6%	SCID-IV & CES-D	▪ Elevated DS more common with any coronary calcification (14.6%) than with no calcification (6.5%), p = .06. ▪ Women with history of recurrent depression: o OR (95% CI) = 2.46 (1.06-5.67; p = .04) - coronary calcium scores > 0 < 10 o OR = 2.71 (1.08-6.81; p = .03) - coronary calcium score > 10 o OR = 3.39 (1.34-8.63; p = .01) - aortic calcium score > 100
Elovainio et al. (2005)	9 years	Study: CV Risk in Young Finns N = 1,126 Age* = 31.4 Female = 64%	BDI	Only high DS scores were related to carotid intima media thickness & only in men.

AA = African American; Age* = mean age for sample; BDI = Beck Depression Inventory; CES-D = Center for Epidemiological Studies-Depression Scale; CI = confidence interval; CV = cardiovascular; DS = depressive symptoms; n/a = not applicable; OR = odds ratio; SCID-IV = Structured Clinical Interview for Depression, DSM-IV criteria; SWAN = Study of Women's Health Across the Nation.

APPENDIX B

RESEARCH STUDIES: DEPRESSIVE SYMPTOMS AND CARDIOVASCULAR DISEASE RISK

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Farmer et al. (1988)	Mean 8 years	Study: NHANES N = 1,497 Age* = NR Female = 54.5% White = 92% Black = 8%	CES-D	▪ OR (95% CI) = 2.2 (1.2-4.2) for DS for white men with little or no recreational physical activity ▪ OR = 16.5 (2.1-128) for DS for black men with little or no recreational physical activity ▪ OR = 2.1 (1.1-4.0) for DS for white women with little or no physical activity apart from recreation ▪ OR = 19.2 (2.3-160) for DS for black women with little or no physical activity apart from recreation ▪ OR = 1.9 (1.1-3.2) for DS for men and OR = 1.3 (0.5-3.1) for DS for women for physical activity at follow-up with CES-D < 16 ▪ OR = 12.9 (1.7-98.9) for DS for men and OR = 2.0 (0.8-14.5) for DS for women for physical activity at follow-up with CES-D ≥ 16.

Continued on next page

Appendix B *(continued)*

Author (Year) §	**Follow-up Duration**	**Sample Characteristics**	**Depression Instrument**	**Findings**
Raikkonen et al. (2002)	7.4 years	Study: Healthy Women's Study N = 425 Age* = 50.4 Female = 100% White = 90.6%	BDI	▪ No metabolic syndrome-risk factors: BDI mean score 4.3 (± 4.6) ▪ 1 metabolic syndrome-risk factor: BDI mean score 4.5 (± 4.9) ▪ 2 metabolic syndrome-risk factors: BDI mean score 6.5 (± 6.3) ▪ 3 – 5 metabolic syndrome-risk factors: BDI mean score 7.1 (± 7.2), $p < 0.002$ ▪ HR = 1.29 (95% CI, 1.03-1.62) for the higher baseline BDI risk of developing the metabolic syndrome.
Wassertheil-Smoller et al. (2004)	Mean 4.1 years	Study: WHI-OS N = 93,676 Age: 60-69 = 44% Female = 100% White = 83.3% AA = 8.2%	CES-D (6 items)	▪ OR = 0.78 (0.74-0.82) for DS and some exercise ▪ OR = 0.67 (0.62-0.71) for DS and 2-4 episodes of exercise ▪ OR = 0.56 (0.53-0.59) for DS and > 4 episodes of exercise.

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Appendix B *(continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Brown et al. (2005)	15 years	Study: ALSWH N = 9,207 Age* = 45-50 Female = 100% Race = NR	CESD-10 & SF-36 Mental Health Subscale	CESD-10 ≥ 10 (95% CI for all OR were less than 1.0): ▪ OR = 0.6 DS & high habitual physical activity ▪ OR = 0.78 DS & moderate habitual physical activity ▪ OR = 0.8 DS with low habitual physical activity
Knox et al. (2006)	15 years	Study: CARDIA N = 5,115 Age* = 33-45 Female = 54.5% White = 48.5% AA = 51.5%	CES-D	▪ AA women experienced most episodes of depression ▪ Significant association between depression and diabetes in African Americans only ▪ History of depression was positively associated with smoking and BMI and inversely associated with physical activity ▪ History of depression was positively associated with HDL and negatively associated with LDL only in Caucasians with same LDL pattern regardless of gender and HDL only significant in men.

§ = studies in ascending chronological order; AA = African-American; Age* = mean age for sample; ALSWH = Australian Longitudinal Study on Women's Health; BDI = Beck Depression Inventory; CES-D = Center for Epidemiological Studies-Depression Scale; CESD-10 = 10 item version of CES-D; CI = confidence interval; DS = depressive symptoms; HR = hazard ratio; NHANES = National Health and Nutrition Examination Survey; NR = reported; OR = odds ratio; SF = short form; WHI-OS = Women's Health Initiative Observational Study.

APPENDIX C

RESEARCH STUDIES: DEPRESSIVE SYMPTOMS AND NONFATAL ISCHEMIC HEART DISEASE

Depressive Symptoms and Nonfatal Ischemic Heart Disease

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Hallstrom et al. (1986)	12 years	N = 795 Age* = NR Female = 100% Race = NR	HRS	▪ RR = 1.2 for myocardial infarction with one factor ▪ RR = 3.6 for myocardial infarction with 2 factors ▪ RR = 5.4 for myocardial infarction with 3 factors $p \leq 0.05$; no confidence intervals reported.
Anda et al. (1993)	Mean = 12.4 years	Study: NHEFS N = 2,832 Age* = 57.5 Female = 52.4% White = 87.8% Black = 12.2%	GWB-depression subscale	▪ RR = 1.6 (1.1 – 2.4) for nonfatal IHD ▪ RR = 1.05 (1.02-1.08) for nonfatal IHD - when depression subscale was entered into the model as a continuous variable.
Barefoot & Schroll (1996)	27 years	N = 730 Age* = 50 Female = 44% Race = NR	MMPI	▪ RR = 1.71 (1.19-2.44; p = .005) for depression scores predicting incidence of acute MI.

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Appendix C . *(continued)*

Author (Year) §	**Follow-up Duration**	**Sample Characteristics**	**Depression Instrument**	**Findings**
Pratt et al. (1996)	13 years	Study = Baltimore ECA Follow-up N = 1551 Age* = < 65 at entry Female = 62% Black = 34.5%	DIS	▪ OR = 2.06 (95% CI, 1.15-3.72) for MI with a history of dysphoria (2 weeks of sadness) ▪ OR = 4.14 (95% CI, 1.48-11.62) for MI with a history of major depressive disorder
Wassertheil-Smoller et al. (1996)	5 years	Study: SHEP N = 4,367 Age* = 72 Female = 53% White = 86.1% Black = 13.9%	CES-D; Short Care Depressive Symptoms Scale	▪ RR = 1.18 (.08-1.30; p ≤ 0.001) for stroke or MI (adjusted for gender and other CVD risk factors) ▪ RR = 1.25 (p ≤ 0.001) for MI for women ▪ RR = 1.29 (1.13-1.48, p < 0.001) of stroke for women

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Appendix C. *(continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Ford et al. (1998)	37 years (median)	Study = Precursors N = 1190 Age* = 66 Female = 0% White = 98%	DSM-III based self-report tool; diagnosis confirmed by 5 blinded physicians.	▪ RR = 2.12 (95% CI, 1.24-3.63 for CHD associated with depression ▪ RR = 2.12 (95% CI, 1.11-4.06) for MI associated with depression ▪ RR = 2.1 (95% CI, 1.1-4.0) for MI 10 years after first depressive episode.
Sesso et al. (1998)	7 years	Study: Normative Aging Study N = 1,305 Age* = 61.8 Female = 0% Race = NR	MMPI-2 D & DEP, SCL-90, CES-D	All depressive symptom scores measured by MMPI-2 D Score: ▪ RR for scores in the mid and highest DS tertiles: o RR = 2.15 (0.72-7.44); 2.40 (0.74-7.85), trend p value 0.19 - for nonfatal MI ▪ RR for scores in the mid and highest DS tertiles: o RR = 1.51 (0.69-3.30); 2.30 (1.00-5.28), trend p value 0.039 for angina RR = 1.46 (0.82-2.53); 2.07 (1.13-3.81), trend p value 0.016 for total CHD & angina.

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Appendix C. *(continued)*

Author (Year) §	**Follow-up Duration**	**Sample Characteristics**	**Depression Instrument**	**Findings**
Ariyo et al. (2000)	6 years	Cardiovascular Health Study N = 4,493 Age* = 73 Female = 61% White = 84%	CESD-10	▪ CHD risk increased with increased DS scores ▪ HR = 1.15 (1.04-1.27, p < 0.006) for CHD ▪ HR = 1.20 (1.05-1.38) for angina without concurrent MI.
Ferkeitch et al. (2000)	Mean 8.3 years (Range 0.02-11.1 years)	Study: NHANES N = 7,893 Age = 53.7 (female), 55.9 (male) Female = 63% White = 88.1% Black/other = 11.9%	CES-D	▪ The RR = 1.25 (read from a figure) for women for a nonfatal CHD event when CES-D of 10, ▪ RR = 1.6 when the CES-D reached 20 ▪ RR > 2.0 when the CES-D exceeded 25

Continued on next page.

Appendix C. *(continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Rosengren et al. (2004)	NA – Case-control design.	Study = INTERHEART N = 11,119 Age* = 58.2 ± 12 (Cases) Female = 24.2% (Cases) Ethnicity = 52 countries	One depression screening question. Severity graded by seven yes-no questions.	▪ Depression was associated with MI regardless of ethnicity. ▪ Depression was found in 24% of the participants. ▪ Stated did not find a dose-response relationship between risk of MI and increased number of items on the depression scale. ▪ MI risk was increased with depression regardless of depression score.
Astin et al. (2005)	6-8 months	N = 140 Age* = 62 ± 10.7 Female = 25% European ethnicity = 98%	CDS	▪ Mean depression scores were lower at 6 - 8 weeks and at 6 months post-procedure compared to pre-procedure, but were higher at 8 months post-percutaneous angioplasty.

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Appendix C. *(continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Rasul et al. (2005)	5-10 years	N = 6,575 Age* = 55 Female = 55% Race = NR (Scotland)	GHQ	▪ RR = 1.78 (95% CI, 1.15-2.75) for CHD events at 5 years in men ▪ RR = 1.60 (95% CI, 0.74-3.44) for CHD events at 5 years in women
Thurston & Kubzansky (2007)	Mean 15 years	Study = NHANES N = 6,025 Age* = 50 Female = 54.4% White = 87% Black = 12% Other = 1%	GWB	▪ Increased risk of incident CHD with increased number of psychosocial risks, especially in women. ▪ Women: 1 risk factor HR 1.45 (95% CI, 1.12-1.87) to ≥ 4 risk factors HR 2.18 (95% CI, 1.53-3.12). ▪ Women only: graded increase between BMI and almost all other psychosocial risks.

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Appendix C. *(continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Gilmore (2009)	12 years	N = 4,948 Age* = 55 Female = 57.6% Race = NR (Canada)	CICI-SF	▪ Higher incidence of depression in women (16.8% versus 10.9%, p < .001) ▪ Incident heart disease event in depressed women. HR = 1.8, 95% CI=1.3, 2.7) but NS in men.

§ = studies in ascending chronological order; Age = mean age for sample; CDS = Cardiac Depression Scale; CES-D = Center for Epidemiological Studies-Depression Scale; CESD-10 = 10 item version of CES-D; CHD = coronary heart disease; CI = confidence interval; CIDI-SF = Composite International Diagnostic Interview; DSM-III = Diagnostic & Statistical Manual third edition; CVD = cardiovascular disease; DIS = Depression Interview Schedule; DS = depressive symptoms; ECA = Epidemiological Catchment Area; GHQ = General Health Questionnaire; GWB = General Well Being Schedule; HAD = Hospital Anxiety and Depression scale; HR = Hazard Ratio; HRS = Hamilton Rating Scale; IHD = ischemic heart disease; MI = myocardial infarction; MMPI = Minnesota Multiphasic Inventory; MMPI-2 D = depression scale of second version of MMPI; MMPI-2 DEP = depressive thoughts scale of MMPI-2 ; n/a = not applicable, NHANES = National Health and Nutrition Examination Survey; NHEFS = National Health Examination Follow-up Study; NR = not reported; NS = not significant; OR = Odds Ratio; RR = relative risk; SCL-90 = Symptom Checklist 90; SHEP = Systolic Hypertension in the Elderly Program.*

APPENDIX D

RESEARCH STUDIES: DEPRESSIVE SYMPTOMS AND FATAL ISCHEMIC HEART DISEASE AND ALL-CAUSE MORTALITY

Depressive Symptoms and Fatal Ischemic Heart Disease and All-Cause Mortality

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Anda et al. (1993)	Mean = 12.4 years	Study: NHEFS N = 2,832 Age* = 57.5 Female = 52.4% White = 87.8% Black = 12.2%	GWB-depression subscale	▪ RR (95% CI) = 1.5 (1.0 – 12.3) for fatal IHD ▪ RR = 1.04 (1.01-1.07) for each unit increase in CES-D score for fatal IHD, when depression subscale was entered into the model as a continuous variable.
Barefoot & Schroll (1996)	27 years	N = 730 Age* = 50 Female = 44% Race = NR	MMPI	▪ RR = 1.59 (1.26-2.00; $p < .001$) for depression scores predicting total mortality.
Wassertheil-Smoller et al. (1996)	5 years	Study: SHEP N = 4,367 Age* = 72 Female = 53% White = 86.1% Black = 13.9%	CES-D; Short Care Depressive Symptoms Scale	▪ RR = 1.25 (1.15-1.36, $p < 0.001$) for death (adjusted for stroke and MI)

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Appendix D. *(Continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Ariyo et al. (2000)	6 years	Cardiovascular Health Study N = 4,493 Age** = 73 Female = 61% White = 84%	CESD-10	▪ All-cause mortality increased with increased DS scores ▪ HR (95% CI) = 1.16 (1.04-1.28, p < 0.006) for mortality
Ferkeitch et al. (2000)	Mean 8.3 years (Range 0.02-11.1 years)	Study: NHANES N = 7,893 Age = 53.7 (female), 55.9 (male) Female = 63% White = 88.1% Black/other =11.9%	CES-D	▪ Results in women: o RR = 0.74 (0.40-1.61) for fatal IHD o RR = 1.21 (0.90-1.61) for all-cause mortality ▪ RR = 1.6 when the CES-D reached 20 ▪ RR > 2.0 when the CES-D exceeded 25

Continued on next page

Appendix D. *(Continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Pennix et al. (2001)	4 years	Study: Longitudinal Aging Study Amsterdam N = 2,847 Age* = 70.5 Female = 52% Race = NR	▪ CES-D ▪ DIS when CES-D > 16.	▪ Cardiac mortality for participants without cardiac disease o RR = 1.6 (1.0-2.8) for minor depression o RR = 3.8 (1.4-10.6) for major depression ▪ Cardiac mortality for participants with cardiac disease o RR = 5.1 (3.1-8.6) for minor depression o RR = 10.5 (4.1-26.7) for major depression
Gump et al. (2004)	18.43 years (median)	Study = MRFIT N = 11,216 Age* = 46.5 Men = 100% White = 89.8%	CES-D	▪ HR = 1.03 (95% CI, 1.01-1.06; p = 0.011) for all- cause mortality for each higher CES-D quintile ▪ HR = 1.20 (95% CI, 1.07-1.34, p = 0.002) for stroke mortality for each higher CES-D quintile

Continued on next page.

Appendix D. *(Continued)*

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Wulsin et al. (2005)	> 6 years	Study: Framingham Heart Study N = 3,634 Age* = 52 Female = 55% Race = predominantly Caucasian	CES-D	▪ HR (95% CI) = 1.46 (0.95-2.23) and 1.33 (0.86-2.04) for second tertile in the age-adjusted and the multivariable-adjusted models respectively ▪ HR=2.07 (1.34-3.18) and 1.88 (1.22-2.91) for the third tertile in the age-adjusted and multivariate-adjusted models ▪ HR=1.44 (1.16-1.78) and 1.37 (1.10-1.71) across tertiles for the age-adjusted and for the multivariate-adjusted models respectively. ▪ HR=1.66 (0.98-2.82; p= 0.06) for CES-D scores of 4-8 ▪ HR=1.72 (0.97-3.02; p= 0.06) for CES-D scores of > 9 ▪ HR=1.30 (0.99-1.71; p= 0.55) trend across CES-D scores.

§ = studies in ascending chronological order; Age* = mean age for sample; CES-D = Center for Epidemiological Studies Depression Scale; CESD-10 = 10-item version of CES-D; CHD = coronary heart disease; CI = confidence interval; DIS = Depression Interview Schedule; DS = depressive symptoms; GWB = General Well-Being Schedule; HR = hazard ratio; IHD = ischemic heart disease; MI = myocardial infarction; MMPI = Minnesota Multiphasic Inventory; n/a = not applicable; MRFIT = multiple risk factor intervention trial; NHANES = National Health and Nutrition Examination Survey; NHEFS = National Health Examination Follow-up Study; NR = not reported; RR = relative risk; SHEP = Systolic Hypertension in the Elderly Program.

APPENDIX E

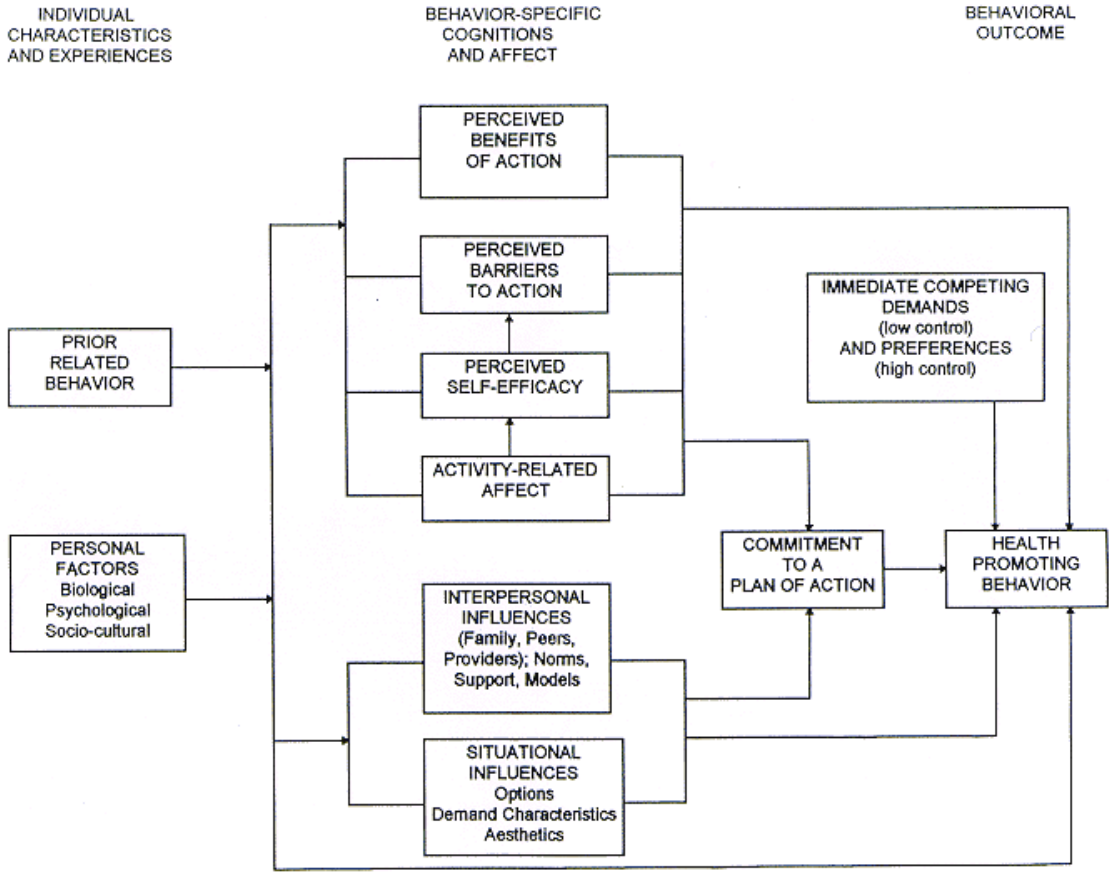
RESEARCH STUDIES: DEPRESSIVE SYMPTOMS AND HEALTH PROMOTION

Author (Year) §	Follow-up Duration	Sample Characteristics	Depression Instrument	Findings
Rosal et al. (2001)	1 year	Study: Seasons N = 496 Age* = 48 Female = 49% White = 95%	BDI	▪ No RBs were found with BDI mean score 4.2 (± 3.5) ▪ 1 RB was found with BDI mean score of 5.6 (± 4.9) ▪ ≥ 2 RBs were found with BDI mean scores from 6.8 (± 5.8) to 7.6 (± 6.0), $p < 0.0001$. ▪ OR = 1.06 (95% CI, 1.02-1.09) for prediction of the number of RBs for depression
Bonnet et al. (2005)	NA: Cross-sectional design.	N = 1612 Age* = 50.8 ± 12.8 (females); 49.2 ± 10.6 (males) Female = 38.8% Ethnicity = FR	HAD	▪ OR = 2.14 (95% CI, 1.16-3.94; p = 0.01) for mildly depressed women to have unhealthy behaviors ▪ OR = 5.95 (95% CI, 1.83-19.29; p = 0.003) for markedly depressed women to have unhealthy behaviors. ▪ OR = 2.23 (95% CI, 1.27-3.90; p = 0.005) for mildly depressed men to have unhealthy behaviors ▪ OR = 5.18 (95% CI, 2.09-12.84, p = 0.0004) for markedly depressed men to have unhealthy behaviors.

§ = studies in ascending chronological order; Age*= sample mean age; BDI= Beck Depression Inventory; DRR= dose-response relationship; FR= France; HAD= Hospital Anxiety and Depression Scale; OR= odds ratio; RB= risk behaviors; Seasons = Seasonal Variation of Blood Cholesterol Level.

APPENDIX F

HEALTH PROMOTION MODEL



Revised Health Promotion Model

* From Pender, N. J., Murdaugh, C. L., & Parsons, M. A. (2006). *Health promotion in nursing practice*. (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall. Copyright 2006. All Rights Reserved. Page 50.

APPENDIX G

WILSON AND CLEARY HEALTH-RELATED QUALITY OF LIFE MODEL

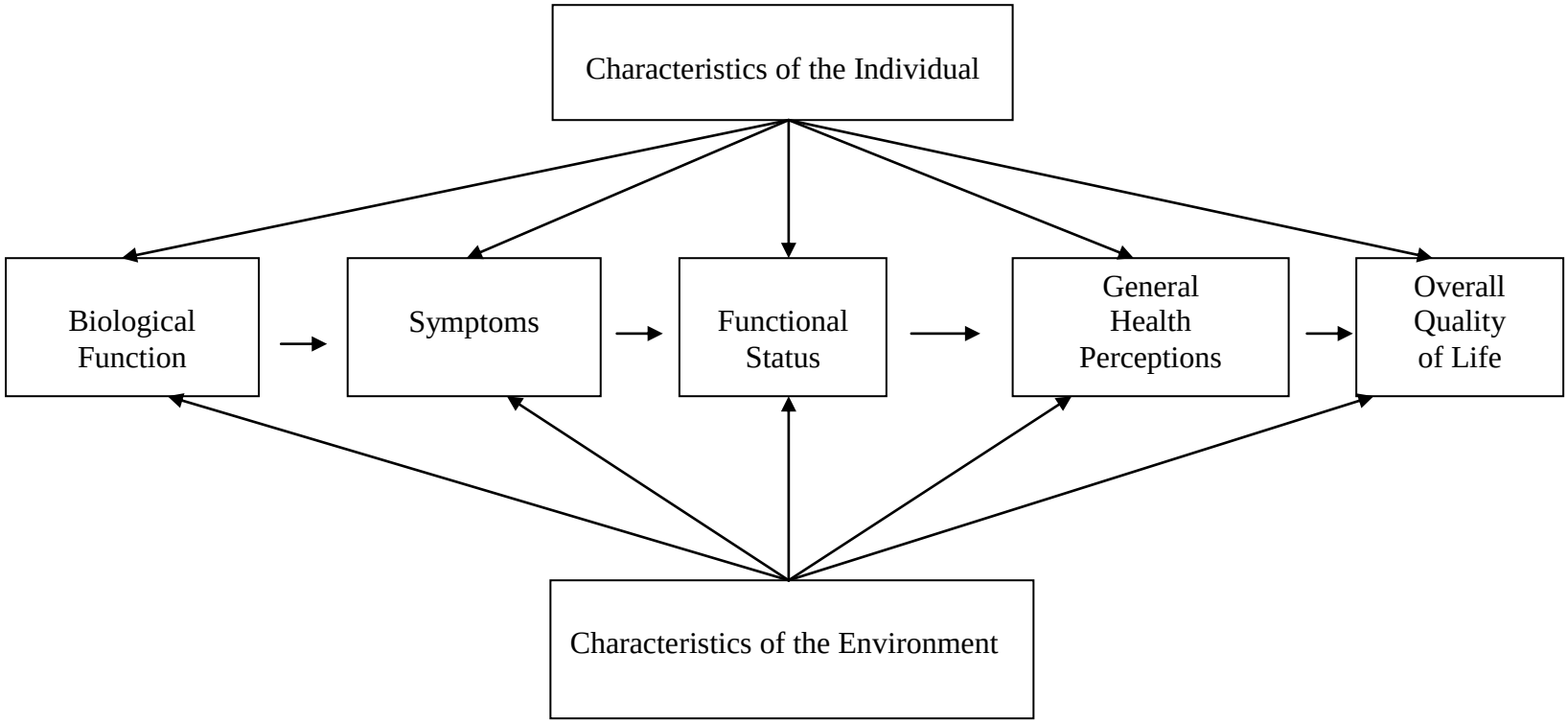


Figure 2. Revised Wilson and Cleary model for health-related quality of life. Ferrans et al., (2005) page 338.

APPENDIX H

COVENANT HEART ADVANTAGE HEART HEALTH ASSESSMENT QUESTIONS

Covenant Heart Health Risk Assessment Questions

Title: Mr. _____ Mrs. _____ Dr. _____

First name: _____ MI: _____

Last name: _____

Address _____

City/State/Zip _____

Birth date: _____/ _____/ _____

Email: _____

Daytime phone: (_____) _____

Do you have a primary care doctor? _____ Yes _____ No

I would like to receive by email the following topics:

[_] Heart Health [_] Fitness [_] Nutrition [_] Smoking Cessation

We're glad you are taking an active interest in your heart health. This assessment is quick, simple, and FREE. Answer these simple questions to find out if you're at risk.

1. Are you: [_] Male [_] Female (Females, see questions 1a and 1b)
   1a. Are you postmenopausal? [_] Yes [_] No
   1b. Are you on estrogen replacement therapy? [_] Yes [_] No
2. What is your age? _____
3. What is your zip code? _____
4. What is your ethnic origin? (optional)
   [_] Caucasian [_] African-American [_] Hispanic, Asian/Pacific Islander
   [_] American Indian/ Alaska Native [_] Other
5. What is your height? _____ feet _____ inches
6. What is your weight? _____ pounds
7. Do you use tobacco products or smoke cigarettes? [_] Yes
   [_] No (skip to question 13) [_] No, but I have smoked before (skip to question 10)
8. How long have you been smoking?
   [_] Less than 1 year [_] 1 to 9 years [_] 10-19 years [_] 20 years or more

9. How many cigarettes do you smoke per day?

[_] Less than 1 pack [_] 1 pack [_] 2 packs [_] More than 2 packs

[_] I smoke cigars or chew tobacco

10. How long ago did you quit using tobacco or stop smoking?

[_] Less than 1 year [_] 1 to 9 years [_] 10-19 years [_] 20 years or more

11. How long had you been using tobacco or smoking?

[_] Less than 1 year [_] 1 to 9 years [_] 10-19 years [_] 20 years or more

12. How many times per week do you "aerobically exercise" (increase your heart rate)?

[_] None [_] 1-2 times [_] 3-4 times [_] 5 or more times

13. How much stress do you "feel" you have in your life?

[_] Low [_] Average/normal [_] High/chronic

14. What is your blood pressure?

Systolic	Diastolic
[_] < 120	[_] < 80
[_] 120-129	[_] 80-84
[_] 130-139	[_] 85-89
[_] 140-159	[_] 90-99
[_] 160-199	[_] 100-114
[_] > 199	[_] > 114
[_] Unsure	[_] Unsure

14a. When was the last time you had your blood pressure checked?

[_] Less than 1 year ago [_] More than 1 year ago [_] Never or unsure

15. What is your cholesterol?

Total	HDL	LDL
[_] < 160	[_] > 59	[_] < 100
[_] 160-199	[_] 50-59	[_] 100-129
[_] 200-239	[_] 45-49	[_] 130-159
[_] 240-279	[_] 35-44	[_] 160-189
[_] > 279	[_] < 35	[_] > 189
[_] Unsure	[_] Unsure	[_] Unsure

15a. When was the last time you had your cholesterol checked?

[_] Less than 1 year ago [_] More than 1 year ago [_] Never or unsure

16. Are you taking any of the following medications?

[_] Arthritis [_] Blood pressure [_] Cholesterol

[_] Aspirin on a regular basis

[_] None

17. Has your immediate family (parent and/or sibling) had any of the following conditions before age 55?

[_] Cardiovascular disease [_] Stroke [_] High blood pressure

[_] Diabetes [_] High cholesterol

[_] None [_] Unsure

18. Are you diabetic? [_] No [_] Yes, Type 1 diabetes (juvenile)

[_] Yes, type 2 diabetes (adult-onset)

[_] Pre-diabetes [_] Unsure

19. Have you been diagnosed by a doctor as having any of the following conditions?

[_] Abdominal aortic aneurysm

[_] Angina (chest pain) [_] Acute MI (heart attack)

[_] Atrial Fibrillation [_] Cardiac arrest (sudden loss of heart function)

[_] Claudication (leg pain) [_] CHF (congestive heart failure)

[_] Renal Artery Stenosis [_] Stroke

[_] None of the above

20. Have you ever had any of the following cardiovascular procedures?

[_] Cardiac catheterization [_] Balloon angioplasty

[_] Bypass surgery [_] Stent

[_] Other [_] None of the above

21. Have you experienced pain in either leg during the past year?

[_] Yes (if yes, see question 21a.) [_] No

21a. When did you experience the pain in your leg?

[_] Only when exercising [_] Both during exercise and at rest [_] Only at rest

22. Have you experienced any of the following in the past year (check all that apply)?

[_] A shade or curtain down over one eye

[_] Brief episode of weakness of an arm or leg

[_] Darkening of the vision in one eye

[_] Momentary loss of vision

[_] Slurring or difficulty with speech

[_] Dizziness

[_] None of the above

23. Do you have a cardiologist?

[_] Yes [_] No [_] Unknown

APPENDIX I

STUDY INFORMATION SHEET

Study Information Sheet

Study Title: Depressive Symptoms in Women Being Screened for Cardiovascular Disease Risk

Researcher: Suzanne M. Savoy, MN, RN, ACNS-BC; Nursing Doctoral Student, Loyola University of Chicago; Assistant Professor of Nursing, Saginaw Valley State University.

The purpose of this study is to see if there is a link between depressive symptoms, heart disease awareness, a healthy lifestyle, and measured heart disease risk to quality of life.

If you agree to be in the study,

- You will be asked to complete a booklet of questions. The questions ask about heart disease awareness, health history, healthy behaviors, life satisfaction, how you have felt or behaved during the last week, and general information. It takes about 15-20 minutes to complete the booklet of questions.
- You give permission to the researcher to use the responses you gave the heart health risk assessment questions and to use the risk assessment summary information you were given as part of the Covenant Heart Advantage program. This information tells us about your chances/risks of getting heart disease. This information will be matched to your booklet of questions. All identifying information will be removed and replaced by a code.

This study is separate from the heart health risk assessment activities of the Covenant Heart Advantage program.

When you complete the research study booklet of questions, you will be given a $10.00 gift card.

If you are interested in being in this study, please come to the research study office/information table.

APPENDIX J

CONSENT FORM

CONSENT TO PARTICIPATE IN RESEARCH

Project Title: Depressive Symptoms in Women Being Screened for Cardiovascular Disease Risk
Researcher: Suzanne M. Savoy, MN, RN, ACNS-BC
Faculty Sponsor: Sue M. Penckofer, Ph.D., RN

Introduction:
You are being asked to take part in a research study by Suzanne Savoy (Assistant Professor of Nursing, Saginaw Valley State University) for a dissertation supervised by Sue Penckofer, Ph.D., RN, Professor of Nursing, School of Nursing at Loyola University of Chicago.

You are a woman who wants to learn about your chances/risks of heart disease. About 150 women coming to the Covenant Heart Advantage program will be asked to be in this study. Women who have been told by their healthcare provider that they have heart disease, stroke, peripheral vascular disease, dementia, drug dependency, alcoholism, and diagnosed mental illness other than depression will not be asked to take part.

Please read this form and ask any questions you have before taking part in the study.

Purpose:
The purpose of this study is to see if there is a link between depressive symptoms, heart disease awareness, a healthy lifestyle, and measured heart disease risk to quality of life.

Procedure:
If you agree to be in the study,

- You will be asked to complete a booklet of questions. The questions ask about heart disease awareness, health history, healthy behaviors, life satisfaction, how you have felt or behaved during the last week, and general information. It takes about 15-20 minutes to complete the booklet of questions.
- You give permission to the researcher to use the responses you gave to the heart health risk assessment questions and to use the risk assessment summary information you were given as part of the Covenant Heart Advantage program. This information tells us about your chances/risks of getting heart disease. This information will be matched to your booklet of questions. All identifying information will be removed and replaced by a code.

Risks/Benefits:
There are no known risks of being in this study beyond those experienced in everyday life. You will be given a list of local counseling services. You can contact them if you have questions about your emotions. You should talk to your healthcare provider if you need help with managing your emotions.

As in all research, there may be unknown risks to you. If an accidental injury occurs, the right emergency measures will be taken. You will not be paid except as stated in this consent form.

There are no direct benefits to you from being in this study. Your part in this study may help health professionals learn about how depressive symptoms in women are linked to their health promoting lifestyle behaviors according to their level of heart disease risk and satisfaction with life.

Compensation: To thank you for your time, when you finish the research study booklet of questions, you will be given a $10.00 gift card.

Confidentiality:
No information collected for this study will identify you. Your heart health information will be given to the researcher. This information will be matched with your booklet of questions. All your personal identifying information will then be removed and a code will be assigned. All paper records will be stored in a locked cabinet in the researcher's office. The paper records will be destroyed when the study is completed. Coded data from the paper records will be entered into a password-secured computer file that only the researcher can enter.

The results of this study will be presented to my faculty sponsor and my dissertation committee. The study results will be submitted for publication to advance nursing knowledge. You will not be identified by name or by any other identifying information in any publication or report about this study.

Voluntary Participation:
Being in this study is voluntary. This study is not part of the Covenant Heart Advantage program. If you do not want to be in this study, you can say no. If you decide to be in this study, you do not have to answer any question and you can stop at any time without penalty. If you decide to stop being in this study, you can still be part of the Covenant Heart Advantage program.

Contacts and Questions:
If you have questions about this study, call Suzanne Savoy at 989-964-7026 or call the faculty sponsor, Sue Penckofer, PhD, RN at 708-216-9303.

If you have questions about your rights as a research participant, you may contact the Compliance Manager in Loyola's Office of Research Services at 773-508-2689, Dr. Dennis Boysen, Chairman of the Covenant HealthCare Institutional Review Board at 989-583-6098, or Dr. Frank Dane, the Chair of the SVSU HSIRB at 989-964-2046; fadane@svsu.edu.

Statement of Consent:
Your signature below says that you have read and understood the information above, that you have had a chance to ask questions, and that you agree to be part of this research study. You will be given a signed copy of this form to keep for your records.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not sign this document if the corner does not show a stamped date and signature.

_____ _____

Participant Signature **Date**

_____ _____

Researcher Signature **Date**

APPENDIX K

INFORMATION AND PSYCHOLOGICAL COUNSELING REFERRAL SOURCES

Information and Tri-City Psychological Counseling Referral Sources

Thank you for participating in a study designed to find out about your chances/risk of heart disease. You were asked to answer a set of questions about depressive symptoms which may have raised some concerns about whether you have depressive symptoms.

Depressive symptoms are a subclinical subset of depression. If you have any questions or concerns about whether you are experiencing depression or depressive symptoms, please talk to your primary healthcare provider or please consult any of the following list of psychological counseling services.

All phone numbers 989 area code unless other listed.

Bay City

Bay Arenac Behavioral Health 895-2300
201 Mulholland St.

Bay Psychological Associates, PC 686-1990
Suite 300, 3941 Traxler Ct
1420 Center Ave. 686-1990

- Accepts most insurance.
- Offers psychotherapy & psychiatric services.

Catholic Family Services 892-2504
915 Columbus Ave.

- Accepts most insurance.
- Has sliding fee scale.
- Offers psychotherapy

Delta Psychological & Neuro Behavioral Services 895-0788
200 S. Wenona

- Accepts most insurance.
- Offers psychotherapy & psychological testing.

List Psychological Services PLC
126 Washington 460-1000
3741 E. Wilder 684-7977

- Accepts most insurance.
- Offers psychotherapy & psychiatric services.

Lutheran Child and Family Services 686-7650
6019 West Side Saginaw Rd.

- Accepts some insurance.
- Has sliding fee scale.
- Offers Psychotherapy.

Bay City (continued)

Michigan Psychiatric and Behavioral Assoc. (MPBA) 922-4900
690 S. Trumbull
- Accepts most insurance.
- Offers psychotherapy, psychiatric services & case management.

MPA Group Mental Health Services 667-9661
1217 S. Euclid Ave.
- Accepts most insurance.
- Offers psychotherapy & psychiatric services.

Shindling, Shindling, & Haller 667-5654
2355 ½ Delta Rd
- Offers psychotherapy.
- Eating Disorders therapist: Pamela Kohn, LMSW

Midland

Family and Children's Services of Midland 631-5390
1714 Eastman Road
- Accepts most insurance.
- Offers psychotherapy and other services.

Midland County Community Mental Health Services Crisis Line 631-4450
Midland County Mental Health
200 McDonald St.
- Accepts some insurance, Medicaid and Indigent.

Psychiatric Associates of Midland PC 636-7120
2726 N. Saginaw Rd.

S.W. Zimostrad & Associates 839-6565
728 W. Wackerly St., Ste. 101
- Accepts most insurance.
- Offers psychotherapy & psychiatric services.

Saginaw

Affiliated Behavioral Consultants 791-1151
3195 Christy Way

Catholic Family Services 753-8446
710 N. Michigan
- Accepts most insurances, has sliding fee scale.
- Offers psychotherapy.

Saginaw (continued)

Child & Family Services of Saginaw County 790-7500
2806 Davenport Ave.
- Accepts most insurance.
- Offers crisis and sexual assault counseling, psychotherapy & psychiatric services.

HealthSource Outpatient Behavioral Services 790-7742
3340 Hospital Road
- Accepts most insurance, some HMO Medicaid.
- Psychotherapy & psychiatric services.

List Psychological Services PLC 790-3130
5024 N. Center
- Accepts most insurance.
- Psychotherapy & psychiatric services.

Saginaw County Community Mental Health Authority 800-258-8678
500 Hancock
CMH Crisis Services- 24 hour Crisis Services 792-9732
Saginaw County Mental Health Access Line 797-3559
- Phone access for Saginaw County Medicaid recipients/ uninsured.

Saginaw Psychological Services, Inc. 799-2100
2100 Hemmeter
- Accepts most insurance (not Blue Cross).
- Psychotherapy & psychiatric services

St. Marys Cathedral 752-8119
615 Hoyt Ave.
- Out-patient mental healthcare for those underinsured or uninsured.

Synergy Medical Education Alliance – Counseling 583-7910
1000 Houghton

Westlund Guidance Clinic 793-4790
3253 Congress
- Accepts most insurance.
- Psychotherapy & psychiatric services.

APPENDIX L

CENTER FOR EPIDEMIOLOGICAL STUDIES DEPRESSION SCALE

Centers for Epidemiological Studies Depression (CES-D)

Below is a list of some ways you may have felt or behaved. Please indicate how often you have felt this way during the last week by checking the appropriate space.

During the past week:	**Rarely** or none of the time (less than 1 day)	**Some** or a little of the time (1-2 days)	**Occasionally** or a moderate amount of time (3-4 days)	**Most** or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	0	1	2	3
2. I did not feel like eating; my appetite was poor.	0	1	2	3
3. I felt that I could not shake off the blues even with the help from my family or friends.	0	1	2	3
4. I felt that I was just as good as other people.	0	1	2	3
5. I had trouble keeping my mind on what I was doing.	0	1	2	3
6. I felt depressed.	0	1	2	3
7. I felt that everything I did was an effort.	0	1	2	3
8. I felt hopeful about the future.	0	1	2	3
9. I thought my life had been a failure.	0	1	2	3
10. I felt fearful.	0	1	2	3
11. My sleep was restless.	0	1	2	3
12. I was happy.	0	1	2	3
13. I talked less than usual.	0	1	2	3
14. I felt lonely.	0	1	2	3
15. People were unfriendly.	0	1	2	3
16. I enjoyed life.	0	1	2	3
17. I had crying spells.	0	1	2	3
18. I felt sad.	0	1	2	3
19. I felt that people disliked me.	0	1	2	3
20. I could not get going.	0	1	2	3

Scoring: Score is the sum of the 20 item weights. Possible range is from 0-60. If more than four questions are missing answers, do not score the CES-D. A score of 16 or more is considered depressed.

Radloff, L. S., (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385-401.

APPENDIX M

ARCHIVAL DATA COLLECTION SHEET

Archival Data Collection Sheet

Research Study Participant Code
_____

Data to be abstracted from Covenant Heart Advantage Heart Health Risk Assessment.

Last Name _____ First Name _____

Age _____

Zip Code _____

Date of Screening _____

Height (Ht) (inches) _____ Weight (Wt) (pounds) _____

BMI _____

% Body Fat _____ Waist Circumference (inches) _____

Lipid Profile: TC _____ HDL _____

Framingham Risk Score _____

Stress Level: Low [_] Average [_] High/Chronic [_]

CV Risk Factors:

Smoke [_] BP: _____ / _____ Diabetes: Type 1 [_] Type 2 [_]

Verify: No cardiac conditions: [_] No PVD [_]

Family Hx: Diabetes [_] HC [_] HBP [_] CVD [_]

Cardiovascular Procedures: Cath [_] Plasty [_] Stent [_] CABG [_]

Medications: Aspirin [_] Arthritis [_] Cholesterol [_] HBP [_] HRT [_]

Note: BMI = body mass index; BP = blood pressure; Cath = cardiac catheterization; CABG = coronary artery bypass graft surgery; CVD = cardiovascular disease; HBP = high blood pressure; HC = high cholesterol; HTN = hypertension; HRT = hormone replacement therapy; Plasty = coronary artery balloon angioplasty, PVD = peripheral vascular disease.

APPENDIX N

ESTIMATE OF 10-YEAR RISK FOR WOMEN

Estimate of 10-Year Risk for Women (Framingham Point Scores)

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

Total Cholesterol	Points 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

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

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

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

APPENDIX O

FERRANS AND POWERS QUALITY OF LIFE INDEX © GENERIC VERSION-III

Ferrans and Powers
QUALITY OF LIFE INDEX© GENERIC VERSION - III

PART 1. For each of the following, please choose the answer that best describes how satisfied you are with that area of your life. Please mark your answer by circling the number. There are no right or wrong answers.

HOW *SATISFIED* ARE YOU WITH:		Very Dissatisfied	Moderately Dissatisfied	Slightly Dissatisfied	Slightly Satisfied	Moderately Satisfied	Very Satisfied
1.	Your health?	1	2	3	4	5	6
2.	Your health care?	1	2	3	4	5	6
3.	The amount of pain that you have?	1	2	3	4	5	6
4.	The amount of energy you have for everyday activities?	1	2	3	4	5	6
5.	Your ability to take care of yourself without help?	1	2	3	4	5	6
6.	The amount of control you have over your life?	1	2	3	4	5	6
7.	Your chances of living as long as you would like?	1	2	3	4	5	6
8.	Your family's health?	1	2	3	4	5	6
9.	Your children?	1	2	3	4	5	6
10.	Your family's happiness?	1	2	3	4	5	6
11.	Your sex life?	1	2	3	4	5	6
12.	Your spouse, lover, or partner?	1	2	3	4	5	6
13.	Your friends?	1	2	3	4	5	6
14.	The emotional support you get from your family?	1	2	3	4	5	6
15.	The emotional support you get from people other than your family?	1	2	3	4	5	6

(Please Go To Next Page)

HOW *SATISFIED* ARE YOU WITH:		Very Dissatisfied	Moderately Dissatisfied	Slightly Dissatisfied	Slightly Satisfied	Moderately Satisfied	Very Satisfied
16.	Your ability to take care of family responsibilities?	1	2	3	4	5	6
17.	How useful you are to others?	1	2	3	4	5	6
18.	The amount of worries in your life?	1	2	3	4	5	6
19.	Your neighborhood?	1	2	3	4	5	6
20.	Your home, apartment, or place where you live?	1	2	3	4	5	6
21.	Your job (if employed)?	1	2	3	4	5	6
22.	Not having a job (if unemployed, retired, or disabled)?	1	2	3	4	5	6
23.	Your education?	1	2	3	4	5	6
24.	How well you can take care of your financial needs?	1	2	3	4	5	6
25.	The things you do for fun?	1	2	3	4	5	6
26.	Your chances for a happy future?	1	2	3	4	5	6
27.	Your peace of mind?	1	2	3	4	5	6
28.	Your faith in God?	1	2	3	4	5	6
29.	Your achievement of personal goals?	1	2	3	4	5	6
30.	Your happiness in general?	1	2	3	4	5	6
31.	Your life in general?	1	2	3	4	5	6
32.	Your personal appearance?	1	2	3	4	5	6
33.	Yourself in general?	1	2	3	4	5	6

(Please Go To Next Page)

PART 2. For each of the following, please choose the answer that best describes how important that area of your life is to you. Please mark all your answers by circling the number. There are no right or wrong answers.

HOW *IMPORTANT* TO YOU IS:		Very Unimportant	Moderately Unimportant	Slightly Unimportant	Slightly Important	Moderately Important	Very Important
1.	Your health?	1	2	3	4	5	6
2.	Your health care?	1	2	3	4	5	6
3.	Having no pain?	1	2	3	4	5	6
4.	Having enough energy for everyday activities?	1	2	3	4	5	6
5.	Taking care of yourself without help?	1	2	3	4	5	6
6.	Having control over your life?	1	2	3	4	5	6
7.	Living as long as you would like?	1	2	3	4	5	6
8.	Your family's health?	1	2	3	4	5	6
9.	Your children?	1	2	3	4	5	6
10.	Your family's happiness?	1	2	3	4	5	6
11.	Your sex life?	1	2	3	4	5	6
12.	Your spouse, lover, or partner?	1	2	3	4	5	6
13.	Your friends?	1	2	3	4	5	6
14.	The emotional support you get from your family?	1	2	3	4	5	6
15.	The emotional support you get from people other than your family?	1	2	3	4	5	6

(Please Go To Next Page)

HOW *IMPORTANT* TO YOU IS:		Very Unimportant	Moderately Unimportant	Slightly Unimportant	Slightly Important	Moderately Important	Very Important
16.	Taking care of family responsibilities?	1	2	3	4	5	6
17.	Being useful to others?	1	2	3	4	5	6
18.	Having no worries?	1	2	3	4	5	6
19.	Your neighborhood?	1	2	3	4	5	6
20.	Your home, apartment, or place where you live?	1	2	3	4	5	6
21.	Your job (if employed)?	1	2	3	4	5	6
22.	Having a job (if unemployed, retired, or disabled)?	1	2	3	4	5	6
23.	Your education?	1	2	3	4	5	6
24.	Being able to take care of your financial needs?	1	2	3	4	5	6
25.	Doing things for fun?	1	2	3	4	5	6
26.	Having a happy future?	1	2	3	4	5	6
27.	Peace of mind?	1	2	3	4	5	6
28.	Your faith in God?	1	2	3	4	5	6
29.	Achieving your personal goals?	1	2	3	4	5	6
30.	Your happiness in general?	1	2	3	4	5	6
31.	Being satisfied with life?	1	2	3	4	5	6
32.	Your personal appearance?	1	2	3	4	5	6
33.	Are you to yourself?	1	2	3	4	5	6

Items for Subscales for the Quality of Life Index (QLI) – Generic Version - III

Five scores are calculated for the Ferrans and Powers Quality of Life Index: (1) Total Quality of Life Score, (2) Health and functioning subscale score, (3) Social and economic subscale score (4) Psychological/spiritual subscale score, and (5) Family subscale score. Items listed below are from both Part 1 (Satisfaction) and Part 2 (Importance). For exams, A1. Health refers to question #1 in Part 1 *and* question #1 in Part 2.

Total Quality of Life Score

All of the items are used to calculate the total score, which reflects overall quality of life.

Health and Functioning Subscale

1. Health
2. Health care
3. Pain
4. Energy (fatigue)
5. Ability to take care of yourself without help
6. Control over life
7. Chances for living as long as you would like
11. Sex life
16. Ability to take care of family responsibilities
17. Usefulness to others
18. Worries
25. Things for fun
26. Chances for a happy future

Social and Economic Subscale

13. Friends
15. Emotional support from people other than your family
19. Neighborhood
20. Home
21/22. Job/not having a job
23. Education
24. Financial needs

Psychological/Spiritual Subscale

27. Peace of mind
28. Faith in God
29. Achievement of personal goals
30. Happiness in general
31. Life satisfaction in general
32. Personal appearance
33. Self

Family Subscale

8. Family health
9. Children
10. Family happiness
12. Spouse, lover, or partner
14. Emotional support from family

Description of Scoring for the Ferrans and Powers Quality of Life Index (QLI)

NOTE: *This is a description of the steps for calculating the five scores of the Quality of Life Index: total scale, health and functioning subscale, social and economic subscale, psychological/spiritual subscale, and family subscale. To calculate the scores, we recommend using the computer syntax for SPSS-PC, which is included in this web site.*

STEPS	DESCRIPTION
OVERALL QLI SCORE (overall quality of life)	
1. Recode satisfaction scores	To center the scale on zero, subtract 3.5 from satisfaction response for each item. (This will produce responses of -2.5, -1.5, -.5, +.5, +1.5, +2.5.)
2. Weight satisfaction responses with the paired importance responses.	Multiply the recoded satisfaction response by the raw importance response for each pair of satisfaction and importance items.
3. Obtain preliminary sum for the overall (total) score.	Add together the weighted responses obtained in step 2 for all of the items.
4. Obtain final overall (total) QLI score.	To prevent bias due to missing data, divide each sum obtained in step 3 by the number of items answered by that individual. (At this point the possible range for scores is -15 to +15.) Next, to eliminate negative numbers for the final score, add 15 to every score. This will produce the final overall (total) QLI score. (Possible range for the final scores = 0 to 30.)
SUBSCALE SCORES *The same steps are used to calculate subscale scores as total scores. The only difference is that the calculations are performed using subsets of items, rather than on all of the items.*	
1. Recode satisfaction scores	To center the scale on zero, subtract 3.5 from the satisfaction response for each item. (This will produce responses of -2.5, -1.5, -.5, +.5, +1.5, +2.5.) *This is exactly the same step as #1 above*.
2. Weight satisfaction responses with the paired importance responses.	Multiply the recoded satisfaction response by the raw importance for each pair of satisfaction and importance items. *This is exactly the same step as #2 above*.
3. Obtain preliminary sum for the subscale score.	Add together the weighted responses obtained in step 2 *<u>for the items that compose the subscale</u>*.
4. Obtain final subscale score.	To prevent bias due to missing data, divide each sum obtained in step 3 by the number of items answered *<u>in that subscale</u>* for that individual. (At this point the possible range for score is -15 to +15. *This is the possible range for all four of the subscales and for the overall (total) score. The possible range is the same for all five scores even though they have different numbers of items, because we have divided the preliminary sum by the number of items answered for each one.*) Next, to eliminate negative numbers for the final score, add 15 to every score. *It is always the number 15 that is added, regardless of which subscale score is being calculated.* This will produce the final subscale score. (Possible range for the final scores = 0 to 30.) *The possible range for the final scores is the same for all four subscales and for the overall (total) score.*

APPENDIX P

HEALTH-PROMOTING LIFESTYLE PROFILE-II

Health-Promoting Lifestyle Profile-II

Directions: This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate the frequency with which you engage in each behavior by **circling the number** under Never, Sometimes, Often, or Routinely:		NEVER	SOMETIMES	OFTEN	ROUTINELY
1.	Discuss my problems and concerns with people close to me.	1	2	3	4
2.	Choose a diet low in fat, saturated fat, and cholesterol.	1	2	3	4
3.	Report any unusual signs or symptoms to a physician or other health professional.	1	2	3	4
4.	Follow a planned exercise program.	1	2	3	4
5.	Get enough sleep.	1	2	3	4
6.	Feel I am growing and changing in positive ways.	1	2	3	4
7.	Praise other people easily for their achievements.	1	2	3	4
8.	Limit use of sugars and food containing sugar (sweets).	1	2	3	4
9.	Read or watch TV programs about improving health.	1	2	3	4
10.	Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).	1	2	3	4
11.	Take time for relaxation each day.	1	2	3	4
12.	Believe that my life has purpose.	1	2	3	4
13.	Maintain meaningful and fulfilling relationships with others.	1	2	3	4
14.	Eat 6 – 11 servings of bread, cereal, rice, and pasta each day.	1	2	3	4
15.	Question health professionals in order to understand their instructions.	1	2	3	4
16.	Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times a week).	1	2	3	4
17.	Accept those things in my life which I cannot change.	1	2	3	4
18.	Look forward to the future.	1	2	3	4
19.	Spend time with close friends.	1	2	3	4
20.	Eat 2 – 4 servings of fruit each day.	1	2	3	4
21.	Get a second opinion when I question my health care provider's advice.	1	2	3	4
22.	Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).	1	2	3	4
23.	Concentrate on pleasant thoughts at bedtime.	1	2	3	4
24.	Feel content and at peace with myself.	1	2	3	4
25.	Find it easy to show concern, love, and warmth to others.	1	2	3	4
26.	Eat 3 – 5 servings of vegetables each day.	1	2	3	4
27.	Discuss my health concerns with health professionals.	1	2	3	4

Continued on next page.

Health-Promoting Lifestyle Profile-II *(Continued)*

Directions: This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate the frequency with which you engage in each behavior by **circling the number** under Never, Sometimes, Often, or Routinely:		NEVER	SOMETIMES	OFTEN	ROUTINELY
28.	Do stretching exercises at least 3 times per week.	1	2	3	4
29.	Use specific methods to control my stress	1	2	3	4
30.	Work toward long-term goals in my life.	1	2	3	4
31.	Touch and am touched by people I care about.	1	2	3	4
32.	Eat 2 – 3 servings of milk, yogurt, or cheese each day.	1	2	3	4
33.	Inspect my body at least monthly for physical changes/danger signs.	1	2	3	4
34.	Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away from destination and walking).	1	2	3	4
35.	Balance time between work and play.	1	2	3	4
36.	Find each day interesting and challenging.	1	2	3	4
37.	Find ways to meet my needs for intimacy.	1	2	3	4
38.	Eat only 2 -3 servings from the meat, poultry, fish, dried beans, eggs, and nut group each day.	1	2	3	4
39.	Ask for information from health professionals about how to take good care of myself.	1	2	3	4
40.	Check my pulse rate when exercising.	1	2	3	4
41.	Practice relaxation or meditation for 15 – 20 minutes daily.	1	2	3	4
42.	Am aware of what is important to me in life.	1	2	3	4
43.	Get support from a network of caring people.	1	2	3	4
44.	Read labels to identify nutrients, fats, and sodium content in packaged foods.	1	2	3	4
45.	Attend educational programs on personal health care.	1	2	3	4
46.	Reach my target heart rate when exercising.	1	2	3	4
47.	Pace myself to prevent tiredness.	1	2	3	4
48.	Feel connected with some force greater than myself.	1	2	3	4
49.	Settle conflicts with others through discussion and compromise.	1	2	3	4
50.	Eat breakfast.	1	2	3	4
51.	Seek guidance or counseling when necessary.	1	2	3	4
52.	Expose myself to new experiences and challenges.	1	2	3	4

Health-Promoting Lifestyle Profile-II – Scoring Instructions

A score for overall health-promoting lifestyle is obtained by calculating a mean of the individual's responses to all 52 items; six subscale scores are obtained similarly by calculating a mean of the responses to subscale items. The use of means rather than sums of scale items is recommended to retain the 1 to 4 metric of item responses and to allow meaningful comparisons of scores across subscales. The items included on each scale are as follows:

Health-Promoting Lifestyle	1 to 52
Health Responsibility	3, 9, 15, 21, 27, 33, 39, 45, 51
Physical Activity	4, 10, 16, 22, 28, 34, 40, 46
Nutrition	2, 8, 14, 20, 26, 32, 38, 44, 50
Spiritual Growth	6, 12, 18, 24, 30, 36, 42, 48, 52
Interpersonal Relations	1, 7, 13, 19, 25, 31, 37, 43, 49
Stress Management	5, 11, 17, 23, 29, 35, 41, 47

APPENDIX Q

ASSESSING DEPRESSIVE SYMPTOMS IMPROVES THE KNOWLEDGE OF CVD RISK: THE ASK STUDY QUESTIONS

Assessing Depressive Symptoms Improves the Knowledge of CVD Risk **(The ASK Study)**

Dear Participant,

Thank you for your willingness to participate in this study about the experience of depressive symptoms and quality of life. Would you kindly complete this booklet of questions? Remember, all your information will be kept totally confidential and no information in this booklet will be connected with you as an individual in any way.

When you complete this booklet you will be given a $10.00 gift card to the Fashion Square Mall in appreciation for your time.

If you have any questions regarding the questions in this booklet or anything else about the study, please feel free to ask me.

Suzanne Savoy, MN, RN. PhD in Nursing Student, Loyola University of Chicago;
Assistant Professor of Nursing, Saginaw Valley State University.
Phone: 989-964-7026.

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What is your ethnicity?
- ☐ Hispanic origin
- ☐ Not of Hispanic origin

What is your race?
- ☐ American Indian or Alaskan Native
- ☐ Asian or Pacific Islander
- ☐ Black or African-American
- ☐ White

Please check your highest level of education:
- ☐ Less than 9th grade
- ☐ 9th to 12th grade, no diploma
- ☐ High school graduate (includes equivalency)
- ☐ Some college, no degree
- ☐ Associate degree
- ☐ Bachelor's degree
- ☐ Graduate or professional degree

Please indicate your total family income:
- ☐ Less than $15,000
- ☐ $15,000-$24,999
- ☐ $25,000-$49,999
- ☐ More than $50,000

What is your marital status?
- ☐ Never Married
- ☐ Now Married
- ☐ Separated
- ☐ Divorced
- ☐ Widowed

What is your employment status?
- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Unemployed
- ☐ Not seeking employment

Mental Health
- Is there a family history of depression? ☐ Yes ☐ No
- Have your ever been told you have depression? ☐ Yes ☐ No
- Have your ever been treated for depression? ☐ Yes ☐ No
- Are you taking any medication for depression? ☐ Yes ☐ No

Please continue to the next page.

Which of the following medical problems do you have? Check off those that apply to you.

- Arthritis (rheumatoid and osteoarthritis)
- Osteoporosis
- Asthma
- Chronic obstructive pulmonary disease (COPD), acquired respiratory distress syndrome (ARDS), or emphysema
- Angina
- Congestive heart failure (or heart disease)
- Heart attack (myocardial infarction)
- Neurological disease (such as multiple sclerosis or Parkinson's)
- Stroke or Transient Ischemic attack (TIA)
- Peripheral vascular disease
- Diabetes types 1 and 2
- Upper gastrointestinal disease (ulcer, hernia, reflux)
- Depression
- Anxiety
- Panic disorder
- Visual impairment (such as cataracts, glaucoma, macular degeneration)
- Hearing impairment (very hard of hearing, even with hearing aids)
- Degenerative disc disease (back disease, spinal stenosis or severe chronic back pain)

[Functional Comorbidity Index]

Heart Disease

Did you know your chances/risk of getting heart disease before this screening? ☐ Yes ☐ No

Did you learn about your heart disease risk from your primary healthcare provider? ☐ Yes ☐ No

Did you know that all women should be evaluated for their chances/risk of getting heart disease? ☐ Yes ☐ No

Did you learn about heart disease in women from information you have received from being a member of the Women's Heart Advantage program or coverage on television, radio, or in the newspaper? ☐ Yes ☐ No

Have you ever had a Stress test/ Exercise stress test? ☐ Yes ☐ No

Do you snore? ☐ Yes ☐ No

Have you ever been diagnosed with sleep apnea? ☐ Yes ☐ No

Please list the medications you are taking:

- _____
- _____
- _____
- _____
- _____
- _____
- _____

Continue on the reverse side if necessary.

Please continue with the rest of the questions in this booklet.

APPENDIX R

LETTER OF ORGANIZATION COOPERATION FROM COVENANT

HEALTHCARE WOMEN'S HEART ADVANTAGE

[Original signed copy submitted to Loyola IRB.]

March 7, 2008

Suzanne M Savoy
4039 Parsons Walk
Saginaw, MI 48603

Dear Ms. Savoy,

I have reviewed the purpose of your proposed study, "Depressive Symptoms in Women Being Screened for Cardiovascular Disease", and the research procedures (recruitment, consent, and data collection) outlined in your research protocol. I understand that you are asking to recruit women to participate in your research study when they come to a Women's Heart Advantage screening program. I also understand that you are asking for copies of the women's Heart Health questions and the results of their Heart Health Profile. The information from each woman will be released with their name so that you can match this information with each woman's research study data collection booklet. Furthermore, I understand that once these data sets have been matched, all personal identifying information will be removed or blocked out.

We look forward to you beginning your study once you have obtained the approval from the following Institutional Review Boards: Loyola University Chicago, Covenant HealthCare, and Saginaw Valley State University.

Sincerely,

Kevin Birchmeier
Director, Cardiovascular Services

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VITA

Suzanne Savoy graduated with a BS in Nursing from Columbia University in 1970. She worked as a critical care nurse in Miami and southern California and graduated with a MN in nursing as a cardiology clinical nurse specialist from the University of California, Los Angeles in 1978. She worked as a cardiology and critical care clinical nurse specialist for four years in a southern California trauma hospital where she began her interest in neuro trauma. After moving to Chicago, Suzanne became a Practitioner-Teacher on faculty at Rush University College of Nursing where neurosurgery was her clinical specialty and where she added neuroscience nursing certification to her critical care nursing certification. While at Rush University she participated in two published research studies. One study investigated a pump infused treatment for Alzheimer's disease and the second study was the seminal research on the use of intrathecal baclofen for the management of spasticity of spinal etiology. After moving to southeast Michigan, Suzanne continued her work with intrathecal baclofen working for the Medtronic Corp. helping to establish intrathecal baclofen clinical centers in North America. Shortly after the FDA approval of intrathecal baclofen, Suzanne joined the nursing faculty at Wayne State University in Detroit where she helped to establish the critical care clinical nurse specialist and then the critical care acute care nurse practitioner programs directed by Dr. Nancy Artinian while holding a joint appointment as the Surgical Trauma Clinical Nurse Specialist at the Detroit

Receiving Hospital. During that time she became certified as an adult health clinical nurse specialist. A move to central Michigan brought Suzanne back to clinical practice first as a critical care clinical nurse specialist and then back to cardiology before returning to school at Loyola University Chicago for a PhD in Nursing. While a doctoral student Suzanne returned to teaching when she joined the faculty at Saginaw Valley State University as an assistant professor and where she became tenured in 2010. She teaches professional issues and professional role development at the undergraduate level, and teaches health system nurse specialist content to graduate nursing students. She leads the Clinical Nurse Leader track and is a certified clinical nurse leader.

DISSERTATION APPROVAL SHEET

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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

3/16/10
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