

Exploring Perception of Cardiovascular Disease Risk in Female Nurses

by

Gurmeet Gujral

A Thesis submitted to the Faculty of Graduate Studies

The University of Manitoba

in partial fulfillment of the requirements of the degree of

MASTER OF NURSING

College of Nursing

Rady Faculty of Health Sciences

University of Manitoba

Winnipeg

Copyright © by Gurmeet Gujral

ABSTRACT

Statement of the Problem: Although an accurate perception of cardiovascular disease (CVD) risk may influence risk factor reduction behaviours, few studies have explored actual and perceived risk in healthy women of all ages. **Purpose:** To explore actual and perceived risk of CVD in women across the lifespan. **Methods:** This cross-sectional survey study included female registered nurses, with no history of CVD (N=816). **Results:** Perception of CVD risk was moderate, and significantly related to: age, fearing CVD as one's greatest health risk, discussing CVD risk with one's primary HCP, and a positive family history of CVD. There was also a significant positive correlation between actual and perceived risk of CVD. **Conclusions:** This study provided novel research evidence related to the perception of risk for CVD among women of all ages. Nurses are ideally situated to develop strategies to promote accurate risk perception among their adult female patients.

ACKNOWLEDGMENTS

There a number of people I would like to acknowledge and thank for their contributions to this thesis.

Thank you to my thesis advisor, Dr. Jo-Ann Sawatzky for your guidance, support, and patience throughout this journey. Not only have you been my advisor, but also a role model for your dedication to nursing and research. I am grateful for the opportunity to learn so much from you.

To my thesis committee members, Dr. Annette Shultz and Dr. Elizabeth Ready. Thank you for your time and insightful contributions to this project.

Thank you to Manitoba Centre for Nursing and Health Research for assisting in grant proposal writing and conducting the study. Especially thank you to James Plohman for your patience and guidance in statistical planning and analysis.

I would also like to acknowledge the financial support received from the Manitoba Centre for Nursing and Health Research, Irene E. Nordwich Foundation Award, and the H. Owen Jones Award. I am very grateful for this support during my studies.

Finally, thank you to the participants of this study. I appreciate your time and willingness to participate in research.

DEDICATION

To my parents - there are not enough words to express my gratitude for your continuous support in all my endeavors. You taught me the value of hard work and the importance of education. Thank you for always encouraging me and believing in my ability to succeed.

To my Sergio - thank you for your endless support and encouragement throughout this journey. The sacrifices you have made while patiently waiting for me to complete my thesis is something that I will never forget and always appreciate. I cannot wait for the next chapter of our lives together.

TABLE OF CONTENTS

| | |
|---|-------------|
| ABSTRACT | ii |
| ACKNOWLEDGMENTS..... | iii |
| DEDICATION | iv |
| LIST OF TABLES | viii |
| LIST OF FIGURES | ix |
| | |
| CHAPTER ONE: INTRODUCTION | 1 |
| Statement of the Problem | 2 |
| Cardiovascular Disease in Women | 2 |
| CVD Prevention in Women..... | 4 |
| Perception of CVD Risk Among Women | 6 |
| Purpose of the Study | 7 |
| Research Questions | 7 |
| Study Significance | 7 |
| Chapter Summary..... | 8 |
| | |
| CHAPTER TWO: CONCEPTUAL FRAMEWORK | 10 |
| Disease Prevention vs. Health Promotion | 10 |
| Models of Health Promotion and Disease Prevention..... | 13 |
| Health Promotion Model | 13 |
| Theory of Planned Behaviour | 15 |
| Risk Perception Attitude Framework | 17 |
| Health Belief Model..... | 18 |
| Background..... | 19 |
| Components of the Health Belief Model..... | 22 |
| Individual perception factors | 22 |
| Modifying factors..... | 23 |
| Likelihood of action | 24 |
| Model Assumptions..... | 24 |
| Model Limitations..... | 25 |
| Chapter Summary..... | 26 |
| | |
| CHAPTER THREE: REVIEW OF THE LITERATURE | 28 |
| Background: Cardiovascular Research in Women | 28 |
| Historical Perspective: Women in CVD Research | 28 |
| Cardiovascular Disease Research: Focus on Women | 32 |
| Cardiovascular disease research in young women..... | 34 |
| CVD Risk Factors: Gender Differences..... | 35 |
| Hypertension | 35 |
| Smoking..... | 36 |

| | |
|--|-----------|
| Diabetes | 36 |
| Menopause..... | 37 |
| Pregnancy..... | 37 |
| Polycystic Ovary Syndrome. | 38 |
| Progress in CVD Prevention..... | 39 |
| The Health Belief Model and Perception of Risk..... | 42 |
| Individual Perceptions..... | 43 |
| Perceived risk and health behavioural research. | 43 |
| Perceived risk and cardiovascular disease research. | 47 |
| Perceived risk and cardiovascular disease in women..... | 55 |
| Modifying Factors and Perceived Risk of CVD in Women..... | 60 |
| Demographic variables..... | 60 |
| Structural variables..... | 61 |
| Cues to action..... | 62 |
| Summary..... | 65 |
| Chapter Summary..... | 70 |
| | |
| CHAPTER FOUR: METHODOLOGY..... | 71 |
| Research Design | 71 |
| Sample and Setting..... | 71 |
| Measurement Instruments..... | 72 |
| Perception of Cardiovascular Disease Risk | 72 |
| Actual Cardiovascular Disease Risk | 74 |
| Demographic Variables/Modifying Factors | 75 |
| Data Collection Procedures | 75 |
| Data Analysis Procedures | 76 |
| Ethical Considerations..... | 77 |
| Informed Consent..... | 77 |
| Anonymity and Confidentiality | 77 |
| Voluntary Participation | 78 |
| Deception..... | 79 |
| Feedback/Debriefing | 79 |
| Risk and Benefits | 79 |
| Compensation | 80 |
| Chapter Summary..... | 81 |
| | |
| CHAPTER FIVE: RESULTS..... | 82 |
| Demographic Data | 83 |
| Analysis of Study Research Questions | 86 |
| Research Question #1..... | 86 |
| Research Question #2..... | 88 |
| Research Question #3..... | 91 |
| Chapter Summary..... | 94 |

| | |
|---|------------|
| CHAPTER SIX: DISCUSSION | 95 |
| Health Belief Model..... | 95 |
| Modifying Factors..... | 95 |
| Demographic variables | 95 |
| Structural variables..... | 97 |
| Cues to Action..... | 98 |
| Individual Perceptions..... | 100 |
| Modifying Factors and Perceived Risk of CVD | 102 |
| Perceived risk and age | 102 |
| Perceived Risk and Education..... | 103 |
| Perceived risk and socioeconomic status..... | 103 |
| Perceived risk and knowledge..... | 104 |
| Perceived risk and cues to action | 105 |
| Perceived Risk and Actual Risk of CVD | 107 |
| Implications for Nursing..... | 108 |
| Clinical practice | 109 |
| Education | 110 |
| Future Research..... | 111 |
| Conceptual Framework | 112 |
| Study Limitations..... | 113 |
| Chapter Summary..... | 115 |
| Conclusion | 115 |
| | |
| REFERENCES | 117 |
| LIST OF APPENDICES..... | 148 |

LIST OF TABLES

| | |
|---|----|
| Table 1: Summary of Perceived Risk and CVD Resesarch | 52 |
| Table 2: Summary of Perceived Risk and CVD in Women..... | 58 |
| Table 3: Summary of Modifying Factors and Perceived Risk of CVD in Women | 66 |
| Table 4: PRHDS Subcategotries Questions | 73 |
| Table 5: Sample Description: Demographic Factors | 84 |
| Table 6: Sample Description: Family History of CVD..... | 86 |
| Table 7: PRHDS: Mean and Standard Deivation for Continous Variables | 87 |
| Table 8: PRHDS by Age | 87 |
| Table 9: Mean and Standard Deviation of Risk Perception Associated with Demographic Characteristics..... | 89 |
| Table 10: Summary of Multiple Regression Analysis of Significant Predictors of Perception of Heart Disease Risk | 90 |
| Table 11: Multiple Regression Model Summary | 91 |
| Table 12: Sample Description: Risk Factors for CVD | 92 |
| Table 13: Sample Description: Actual CVD Risk Among Female RNs | 93 |

LIST OF FIGURES

| | |
|---|----|
| Figure 1: Health Promotion Model..... | 14 |
| Figure 2: Theory of Planned Behavior..... | 16 |
| Figure 3: Risk Perception Attitude Framework..... | 18 |
| Figure 4: The Health Belief Model..... | 19 |
| Figure 5: Flow Chart of Study Participants..... | 83 |

CHAPTER ONE: INTRODUCTION

Globally, cardiovascular disease (CVD) is the leading cause of death in men and women. CVD is defined as any disease of the heart or blood vessels including stroke, high blood pressure, coronary artery disease, coronary heart disease, cerebrovascular disease, peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure (Mendis, Puska, & Norrving, 2011). Although CVD is a major threat to women's health, it is often unrecognized and undertreated. Moreover, despite the longstanding evidence of increasing risk in the post-menopausal years, recent research suggests that young women are also at risk for CVD (Heart and Stroke Foundation, 2014; Wilmot, O'Flaherty, Capewell, Ford, & Vaccarino, 2015).

Prevention of disease focuses on risk factor reduction. Approximately 75% of CVD can be attributed to modifiable risk factors (MacKay & Mensah, 2004), supporting the contention that much can be done to reduce the incidence of CVD among women. Unfortunately, current trends reveal that the prevalence of major CVD risk factors, such as diabetes, is increasing for both men and women (Ng et al., 2014; Wild, Roglic, Green, Sicree, & King, 2004). More recent evidence also suggests that gender specific risk factors may lead to worse outcomes for women (Appelman, van Rijn, ten Haaf, Boersma, & Peters, 2015). In addition, despite the increase in CVD awareness campaigns in recent years, many women do not have an accurate perception of their CVD risk (McDonnell, et al., 2014).

In the context of health, perceived risk is an individual's subjective perception of risk for developing disease (Imes & Lewis, 2014). Importantly, risk perception has implications for preventative actions individuals will take to reduce their risk of disease (Wang et al., 2009). Despite an increase in awareness of CVD, many women still do not recognize that they are at risk (Mosca, Hammond, Mochari-Greenberger, Towfighi, & Albert, 2013).

Accurate perceptions of one's own risk predicts intent to engage in preventative behaviours and healthy lifestyles (Cainzos-Achirica & Blaha, 2015), which in turn, will ultimately reduce the burden of illness of CVD. Although there is an increasing body of literature examining women and CVD risk, much of this research focuses on awareness and knowledge of CVD risk factors. Minimal research has explored personal risk perception of CVD across the lifespan of women.

The purpose of this chapter is to outline the statement of the problem related to the thesis study. This chapter also highlights the purpose and significance of the study, thus establishing the foundation for the thesis project.

Statement of the Problem

Cardiovascular disease is the number one cause of mortality worldwide, accounting for 17.7 million deaths in 2015 (World Health Organization [WHO], 2017a). Globally, CVD is also the number one killer of women, contributing to 8.6 million annual deaths (World Heart Federation [WHF], 2012). This devastating number of cardiovascular related deaths in women exceeds the deaths caused by all cancers, tuberculosis, HIV/AIDS, and malaria, combined (WHF, 2012). While general awareness of CVD risk among women is improving (Mosca et al., 2013), this positive trend has not translated into an accurate understanding of one's actual personal perception of risk and engagement in risk reducing health behaviours (Kling et al., 2013). Early detection and management of CVD risk is crucial to decrease the prevalence and number of deaths caused by CVD. Therefore, accurate perception of risk is necessary to improve overall cardiovascular health outcomes in women.

Cardiovascular Disease in Women

In Canada, CVD accounted for more than 27% of all total deaths (69,260 deaths) and specifically, 27% of all female deaths (34,303 deaths), and male deaths (34,957 deaths) in 2014 (Statistics Canada, 2017). These disturbing statistics provide evidence that CVD is now

as prevalent and causes as many deaths in women as men. Moreover, the overall global incidence of CVD is expected to rise as the population ages and the prevalence of cardiovascular-related risk factors, such as obesity and diabetes increase (Dahlöf, 2010; Heidenreich et al., 2011).

In addition to the millions of lives lost every year, CVD also has significant individual, societal, and economic consequences. At the individual level, numerous psychological effects may be experienced after a cardiac event in both men and women. This includes feelings affecting attitude and mood, feelings of uncertainty for the future, guilt for previous behaviours that may have contributed to the cardiac event, and concern about future physical capabilities (Johns Hopkins Medicine, 2016). As well, depression and psychosocial issues, such as anxiety, poor quality of life, and social isolation are associated with individuals with CVD (Hare, Toukhsati, Johansson, & Jaarsma, 2014). Furthermore, depression is associated with a high risk of mortality in the one-year period following a cardiac event in both men and women (Frasure-Smith et al., 2000). Importantly, several individual consequences are more of a burden for women than men. Women have been found to not cope as well psychosocially, experience higher risk of psychosocial distress, and have a greater need for instrumental and social support after a cardiac event than their male counterparts (Davidson, et al., 2003).

While those coping with a CVD diagnosis may face individual challenges, there are also broader economic consequences. Heart disease and stroke costs the Canadian economy more than \$20.9 billion every year in physician services, hospital costs, lost wages, and decreased productivity (The Conference Board of Canada, 2010). Hypertension alone cost the Canadian economy \$13.9 billion in 2010; this cost is expected to rise to \$20.9 billion by 2020 (Weaver, et al., 2015). Currently accounting for 10.2% of the Canadian Healthcare budget,

the projected increase in CVD related expenditures is attributed to demographic changes, increased disease prevalence, and increasing individual costs (Weaver, et al., 2015).

Economic and societal consequences of CVD also include lost production and decreased productivity in the Canadian economy. Value of lost production is a term used to describe the estimated value lost due to premature death (Government of Canada, 2014). In 2010, the value of lost production was \$226,500 for a male and \$74,300 for a woman with CVD (Health Canada, 2014). However, Health Canada (2014) suggests this number does not account for lost production of individuals who continue to be present in the workplace but may be unavoidably less productive due to illness. As well, roles outside the formal workplace, or informal caregiving roles of health individuals who are away from the workplace caring for those who are ill are not accounted for in these statistics (Health Canada, 2014). Thus, although CVD may not be fatal, this disease is associated with significant individual, economic, and societal consequences.

CVD Prevention in Women

Contributing to 8.6 million annual deaths among women worldwide (WHF, 2012), prevention efforts are immediately required to help reduce the burden of CVD in this population. Women often underestimate their personal risk for CVD, assuming it is a man's disease and one they have "protection" from. Prevention of disease begins with accurate risk perception, which in turn may lead to individuals reducing their risk factors (Mosca, et al., 2013; Ramachandran, Wu, Kowitlawakul, & Wang, 2016; Schroetter & Peck, 2008; Wang, et al., 2011).

Over 300 modifiable and non-modifiable risk factors have been associated with CVD (MacKay & Mensah, 2004). Approximately 75% of CVD can be attributed to modifiable risk factors, which include high blood pressure, abnormal blood lipids, tobacco use, physical inactivity, obesity, unhealthy diet, and diabetes mellitus (MacKay & Mensah, 2004).

Examples of non-modifiable risk factors include; advancing age, family history, gender, and ethnicity or race (MacKay & Menah, 2004). In addition to traditional risk factors, there are, however, many other considerations when evaluating women's CVD risks. More recent literature has focused on the differences between men and women in regards to CVD. For example, levels of hormones during menopause contribute to an increase in hypertension in women (August, 2013); the risk of CVD from smoking is higher in women than men (Huxley & Woodward, 2011); and perhaps most remarkably, women with diabetes have a 50% higher risk of mortality from CVD than men with diabetes (Maas et al., 2011). As well, past, current, and future trends predict that the prevalence of major risk factors, such as diabetes and obesity, will rise among men and women (Ng et al., 2014; Wild et al., 2004). Furthermore, hormones and the female reproductive system contribute to the CVD risks that are exclusive to women. Lastly, young women face additional challenges to their CVD risk as their risk factors are often overlooked or risk estimation scales underestimate their lifetime risk, which in turn, may impact their long-term outcomes (Rodriguez & Foody, 2013).

Prevention is key to reducing the burden of disease. Many organizational efforts have been implemented to reduce CVD through preventive strategies. International awareness campaigns, such as the American Heart Association's *Go Red for Women* initiative, have been implemented to increase awareness of risk of CVD in women (WHF, 2012). The WHO (2013a) has set forth a mission to reduce the burden of CVD by 25% by year 2025 in an effort to reduce preventable diseases and obtain the highest standards of health. In forecasting the future of CVD, Heidenreich and associates (2011) stress that CVD is largely preventable and therefore, prevention must begin early in life. Reducing risk factors is essential to preventing disease and accurate risk perception is essential to improve outcomes for women at risk for CVD.

Perception of CVD Risk Among Women

Lack of knowledge, decreased awareness, and low personal perception of risk are now considered CVD risk factors that are often overshadowed by traditional risk factors among women (Moran & Walsh, 2013). It is important to study awareness and perception of CVD risks as these factors can influence a woman's decision to engage in health promoting behaviours (Moore, Kimble, & Minick, 2010). In general, the term *awareness* refers to having knowledge or perception of a situation or fact (Oxford Dictionary, 2017); whereas, perception of risk in the context of health is an individual's subjective perception of developing a disease in their own lifetime (Imes & Lewis, 2014). Importantly, individuals typically show "optimistic bias" when considering their risk for disease, and therefore, underestimate their risk (Webster & Heeley, 2010).

Current evidence related to perceived CVD risk in women is minimal; moreover, research conducted in this area has largely focused on women after they have received a CVD diagnosis and retrospectively assessed for their perceived risk prior to diagnosis. Based on this existing evidence, perceived CVD risk among women is reportedly poor (Everett, Salamonson, Rolley, & Davidson, 2014; Leifheit-Limson et al., 2015). Although current research suggests young women should start reducing their risk factors at a young age, there is a paucity of research on young women and CVD in general. Rather, the majority of research on women and CVD focuses on awareness and knowledge of risk factors. Interventions to improve CVD risk perception have been found to be effective (Koelewijn-van Loon et al., 2010), which supports the need to study women's perceived CVD risk and to develop strategies to improve risk perception of CVD in women of all ages.

The lack of research in this area contributes to the burden of CVD and the continued issue of inaccurate risk perception among women. Research that explores the factors affecting perceived CVD risk among women, may glean new insight on current knowledge

gaps among women, as well as strategies on how to best convince this population to engage in risk reducing behaviours.

Purpose of the Study

The purpose of this study was to explore perceived risk of CVD in the population of adult women. The study sample was female registered nurses (RNs) in the city of Winnipeg. Nursing is primarily a female profession with a broad span of ages, thus a convenient sample of the study population. As well, including only RNs will provide a relatively homogenous sample in terms of education, and knowledge of CVD risk and preventive health behaviours.

Research Questions

1. What is the perception of CVD risk in female RNs in Winnipeg, Manitoba, as measured by the Perception of Risk of Heart Disease Scale?
2. What is the relationship between perception of CVD risk and modifying variables, including demographic, sociopsychological and structural variables, and cues to action (i.e., education, greatest health fear, media influence, healthcare provider contact in regard to CVD risk, family history, and socioeconomic status), among female RNs in Winnipeg, MB?
3. What is the relationship between actual and perceived risk of CVD in female RNs in Winnipeg, Manitoba, as measured by a non-laboratory-based CVD risk assessment tool and the Perception of Risk of Heart Disease Scale?

Study Significance

Few studies have specifically explored CVD risk perception in healthy women and even less include young, healthy women in the target population. Individuals often mistakenly perceive their health risks as low, which may impede engaging in health behaviours. As well, exploring the relationship between actual and perceived risk is central to improving CVD outcomes in women. Moreover, Canadian studies in this area are lacking.

Therefore, the results from this study will provide novel evidence on the CVD risk perception in the female population. Studying this population in Canada will provide insight on their current risk perception and what factors correlate with risk perception, as well as their knowledge gaps. This study may also establish the foundation for future interventional research, which in turn may improve CVD risk perception and ultimately, reduce the global burden of CVD among women.

This study also has significant implications for RNs in clinical practice and nursing education. Nurses who have an accurate perception of their own CVD risks, and an awareness of the importance of accurate CVD risk perception in others, are in the ideal position to develop strategies to promote accurate risk perception among their female patients and to advocate for CVD risk assessment and education for women of all ages. Ensuring accurate CVD risk perception and encouraging risk reduction behaviours is crucial to decreasing the likelihood of developing this life-threatening disease. Nurses in all areas of practice are on the forefront of the healthcare system and, therefore, are ideally situated to assist in reducing the global burden of CVD among women.

Chapter Summary

CVD is now recognized the leading cause of death in women, as well as a growing global health burden. For a number of reasons, including an increased awareness of the burden of traditional risk factors, as well as their unique risk factors, this population has become a focus of CVD research. Prevention is key to reducing the incidence and prevalence of disease and decreasing risk factors is essential to that process. Accurate perception of risk is necessary to achieve successful risk reducing behaviours. However, minimal research on personal CVD risk perception has included women. Improving general CVD awareness and accurate risk perception among women of all ages is one step to successfully reducing the

burden of CVD among women. Examining factors that affect accurate risk perception may provide insight into new strategies to decrease CVD in this population.

CHAPTER TWO: CONCEPTUAL FRAMEWORK

Nursing theories provide the foundation for evidenced-based nursing practice and enable RNs to plan and implement research into their practice (Nilsen, 2015). Theories in nursing began as a means to describe the “nature of nursing” itself and have since evolved to philosophic and scientific theories that underlie the basis of nursing practice, education, and research (Kikuchi, 2003). The use of theory offers structure and organization to nursing knowledge, as a systematic approach to collecting data, and to explain and predict nursing practice (McEwen & Wills, 2014). This includes guiding RNs to provide efficient care, and understanding how information, findings, and data are related to providing effective interventions.

There are numerous nursing theories and health related theories that aim to provide structure and guidance to the phenomena of health and health-related research. Over the past two decades, research has aimed to gain insights into effective health behaviour change. Multiple theories have been used to examine health behaviours in the literature (Glanz, Rimer, & Viswanath, 2015). This chapter focuses on establishing sound rationale for using the Health Belief Model (HBM) as the theoretical framework in this thesis study.

Disease Prevention vs. Health Promotion

Disease prevention and health promotion are terms that are often included in the context of health research. Although these terms are often used interchangeably, they have different conceptual definitions and may be used in different contexts within healthcare. Therefore, the following brief overview is included to differentiate these concepts and to provide clarity for this thesis study.

Disease Prevention

Disease prevention is the process of using strategies and interventions to reduce the burden of illness and disease. Disease prevention continues to be a powerful means to

improve lifestyles and modify risk factors to reduce mortality. Businesses, educators, health care professionals, governments, communities, and most importantly, all individuals, share a responsibility in disease prevention and ensuring it is incorporated into all aspects of life (Centers for Disease Control and Prevention, 2014).

Disease prevention has evolved from large-scale strategies, such as reducing environmental pollution, to focusing on individual health behaviours, such as smoking cessation (Breslow, 1999). Disease prevention, as defined by the World Health Organization (WHO, 2017b), involves specific interventions at primary and secondary levels of prevention to reduce diseases and risk factors among individuals. Primary prevention aims to prevent disease, illness, or injury prior to its occurrence. This may include population level interventions, such as focusing on the social or economic determinants of health, or individual level interventions, such as immunizations and vaccinations (WHO, 2017b). Secondary prevention involves screening efforts for early detection to allow for immediate intervention. Prevention of congenital malformations, screening programs for early detection of disease, and preventive drug therapies are examples of secondary prevention strategies (WHO, 2017b).

Health Promotion

Health promotion focuses on encouraging individuals to take control of and improve their health. It is often argued that health promotion must exist to achieve disease prevention and that these two definitions share common goals and overlap in practice (Breslow, 1999; Tengland, 2010; WHO, 2005). However, health promotion and disease prevention are conceptually different. Health promotion is not only the process of preventing disease; rather, it is seen as a holistic process that involves many different aspects of an individual's wellbeing. Efforts in the area of health promotion are aimed to cause effective change in a

positive direction. This may range from progress in developing strategies to successfully changing behaviours (Galloway, 2003).

Historically, the term health promotion is derived from practices of personal hygiene, sanitizing, and obtaining clean water, dating back to 5000 BC (Raingruber, 2016). Health promotion continued in ancient Greeks times, with the belief that health provides a state of harmony and is considered a valuable asset in life (Raingruber, 2016). Continuing into modern times, health promotion became a public health term in early 1970s, incorporating education, training, research, legislation, policy coordination, and community development.

One of the most recognized definitions of health promotion was developed by the WHO and documented in the Ottawa Charter for Health Promotion. In these documents, health promotion is defined as:

... the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy life-styles to well-being (WHO, 1986, p.1).

In the same year, Health Canada (1986) envisioned health promotion as a central element in quality of life, a way to embark on facing health challenges, and a means to enable Canadians to take control of their own health and well-being. Health promotion was described as a concept that will strengthen the existing health care system and provide a means to assist Canadians in coping with health challenges (Health Canada, 1986).

While disease prevention aims directly at reducing the burden of disease and illness by specific population-based interventions (WHO, 2017b), health promotion focuses on empowering individuals to increase control over their health behaviours that influence modifiable risk factors, thereby leading to healthy living (Tengland, 2010; WHO, 2017b). Although it is still common to see discussions in the literature on how to differentiate between the two concepts, there is often clear overlap between health promotion and disease prevention. Tengland (2010) argues that, while the strategies used in health promotion and disease prevention differ, they both ultimately lead to the same results.

In summary, health promotion generally addresses the broader determinants of health, whereas disease prevention focuses on specific interventions to prevent disease. While often used interchangeably with similar results, health promotion and disease prevention have different conceptual definitions. As the context of this thesis study was primary prevention of CVD, disease prevention was examined in further detail. The following review of the health promotion model and several models of disease prevention established sound rationale for the framework selected to guide this thesis study.

Models of Health Promotion and Disease Prevention

This section provides an overview of common models and frameworks used when examining health promotion and disease prevention, including the Health Promotion Model, Theory of Planned Behaviour, Risk Perception Attitude Framework, and the HBM. The purpose of exploring multiple frameworks in this section is to establish strong rationale for choosing the HBM as the framework for this research.

Health Promotion Model

Developed in 1982 by Nola Pender, the Health Promotion Model is frequently used in research, education, and practice. According to Pender, Murdaugh, and Parsons (2015), this model assists health care professionals in supporting individuals to enhance their health. The

Health Promotion Model was derived from social cognitive theory and is aimed at any health behaviour when there is no threat or fear that may influence motivation to pursue better health (Pender et al., 2015). Therefore, this model is not designed to prevent illness; rather, it assists health care professionals in helping individuals make behaviour changes to achieve their ideal desired health. The original model, which included seven cognitive-perceptual factors and five modifying factors that predict health behaviours, was later revised in 1996 to include another three variables (Pender et al., 2015; see Figure 1).

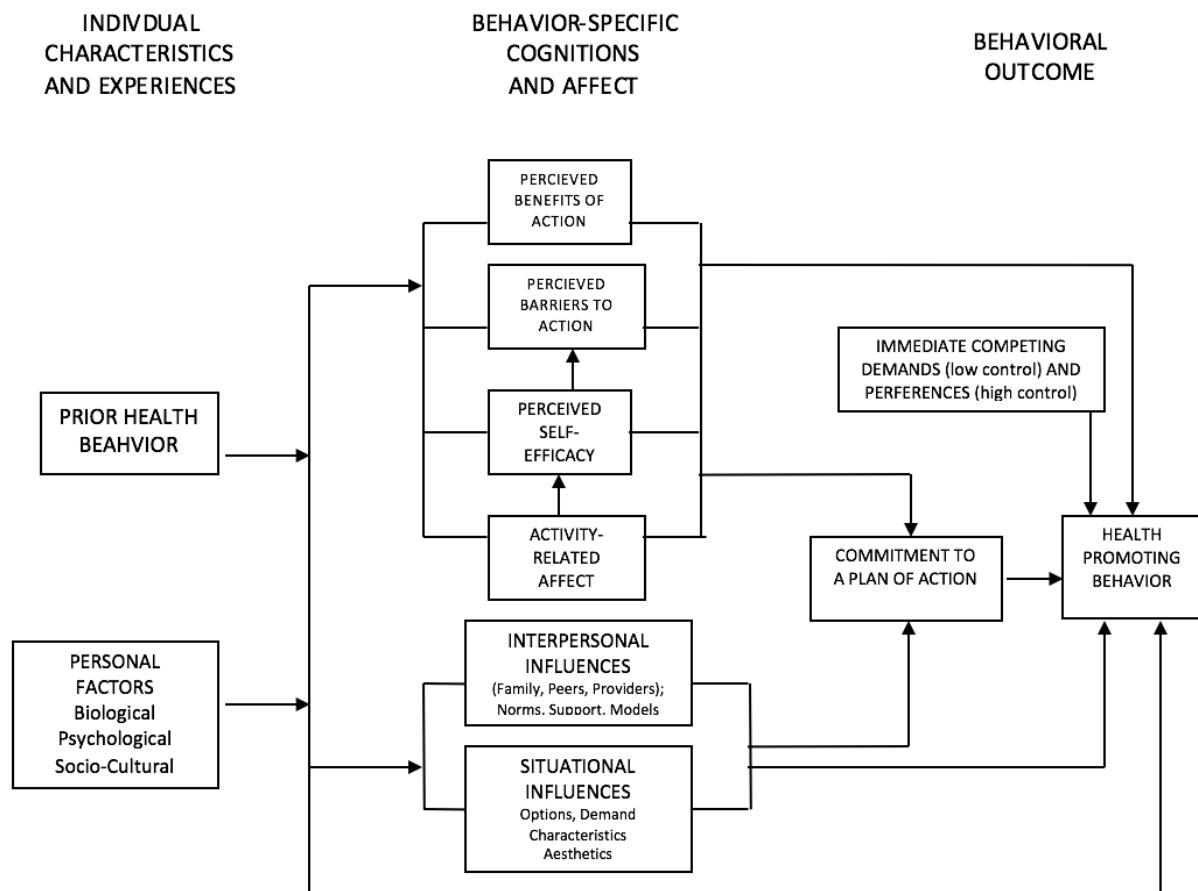


Figure 1: Health Promotion Model. Reprinted from *Health Promotion in Nursing Practice* (p. 35), by N. Pender, C. Murdaugh & M. Parsons, 2015, Boston, MA: Pearson.

Heydari and Khorashadizadeh (2014) reviewed 74 articles in which the Health Promotion Model was used as a framework to guide the research. They concluded numerous ways this model has been used effectively; for example: to predict facilitators or barriers in health behaviours, to assess effectiveness of health promotion interventions, to assess quality of life, and to predict factors that may interfere with health promoting strategies (Heydari & Khorashadizadeh, 2014). On the surface, the Health Promotion Model may seem to be appropriate to study health behaviour for this thesis research; however, this model does not address the concept of risk or perceived risk and focuses on promoting overall health rather than prevention of a disease. As well, it provides a means for developing an intervention rather than an assessment of risk for disease. Although developing interventions for health promotion among women at risk for CVD is certainly important, it is imperative to first examine the factors that correlate with accurate CVD risk perception.

Theory of Planned Behaviour

Commonly used to study health behaviours and persuasion, the Theory of Reasoned Action was developed by Martin Fishbein in 1967. This framework focuses on individual factors that determine an individual's likelihood to engage in a certain behaviour (Champion & Skinner, 2008). Fishbein and Ajzen revised the model in the late 1970s to address a limitation of the original model, which argued that all behaviour is voluntary and under control (Ajzen, 1991). Their modified Theory of Planned Behaviour model included behaviours and attitudes individuals felt they had little power over. As well, a new construct was added to the model, "perceived behavioural control" (see Figure 2).

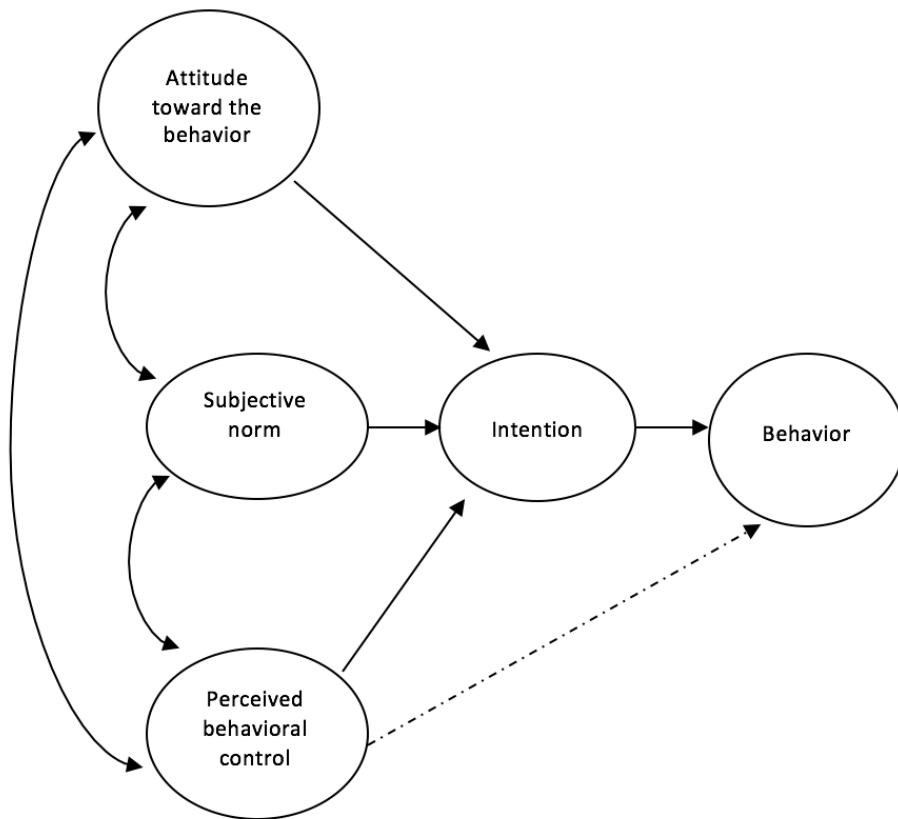


Figure 2: Theory of Planned Behavior. Reprinted from “The Theory of Planned Behaviour”,

*by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes*, 50(2),182.*

Copyright 1991 by Elsevier. Reprinted with permission.

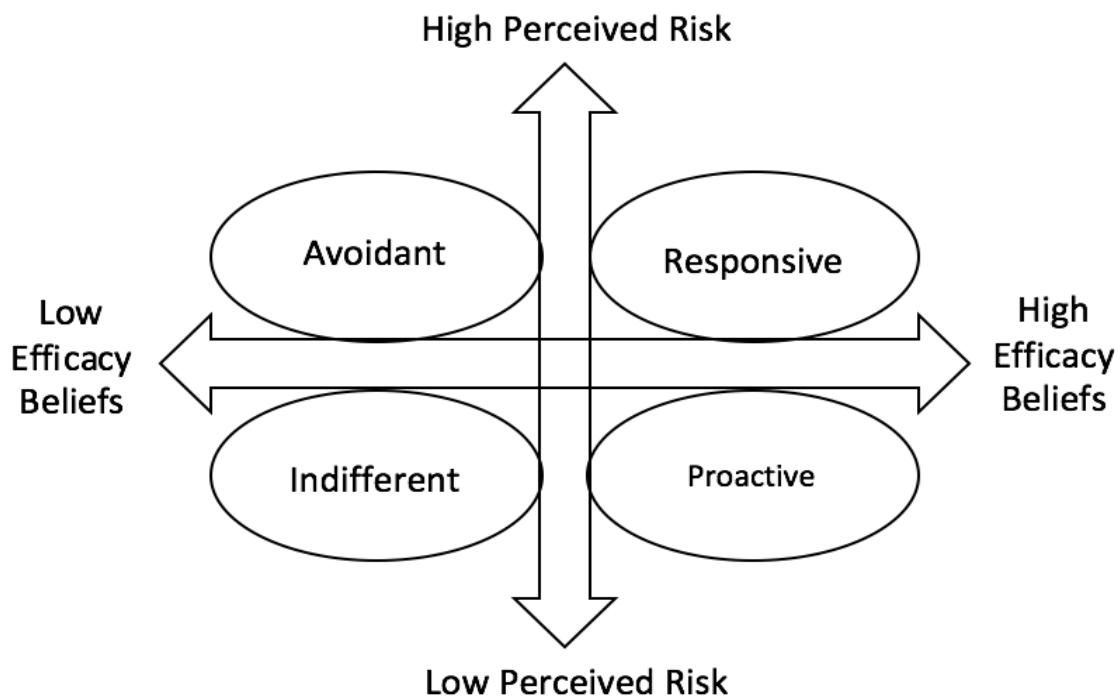
The main constructs of the Theory of Planned Behavior model including attitude, subject norm, and perceived control, contribute to understanding an individual's actions (Champion & Skinner, 2008). This framework has been used in numerous studies that examine a wide variety of behaviours; however, it is more often used in high-risk behaviour research. For example, it has been used to investigate behaviours in fast food consumption (Bagozzi, Wong, Abe, & Bergami, 2014), prediction of condom use (Muñoz-Silva, Sánchez-García, Nunes, & Martins, 2007), predicting adolescent smoking (Guo, et al., 2007), intention of whistle-blowing (Zakaria, Razak, & Yusoff, 2016), and college hazing (Richardson,

Wang, & Hall, 2012). In addition, the Theory of Planned Behaviour does not include the concept of perceived risk, a main concept in this thesis study.

Risk Perception Attitude Framework

The Risk Perception Attitude Framework offers a solution to inconsistent results found by other theorists using alternative risk perception frameworks (Rimal & Real, 2003). Rimal and Real (2003) contend that their framework can consistently test and personalize risk perception, based on an individual's history and prior behaviours. According to their framework, an individual's decision to partake in self-protective behaviours is dependent on both risk perception and efficacy beliefs (Skubisz, 2014). The Risk Perception Attitude Framework classifies individuals into four groups based on their perceived risk and efficacy beliefs (see Figure 3).

Most previous researchers who have used this framework have focused on specific risk reducing behaviours; for example, breast cancer screening (Rimal & Juon, 2010), HIV prevention (Rimal, Brown, Mkandawire, Folda, Bose, & Creel, 2009), nutrition related cancer prevention (Sullivan, Beckjord, Finney, & Hesses, 2008), texting while driving (Dillow, Walsh, Spellman, & Quirk, 2015), and individuals who are seeking health information (Grasso & Bell, 2015). Although this framework focuses on risk perception, the thesis study did not propose to examine individual, self-efficacy beliefs; therefore, it was not an ideal framework for this thesis study.

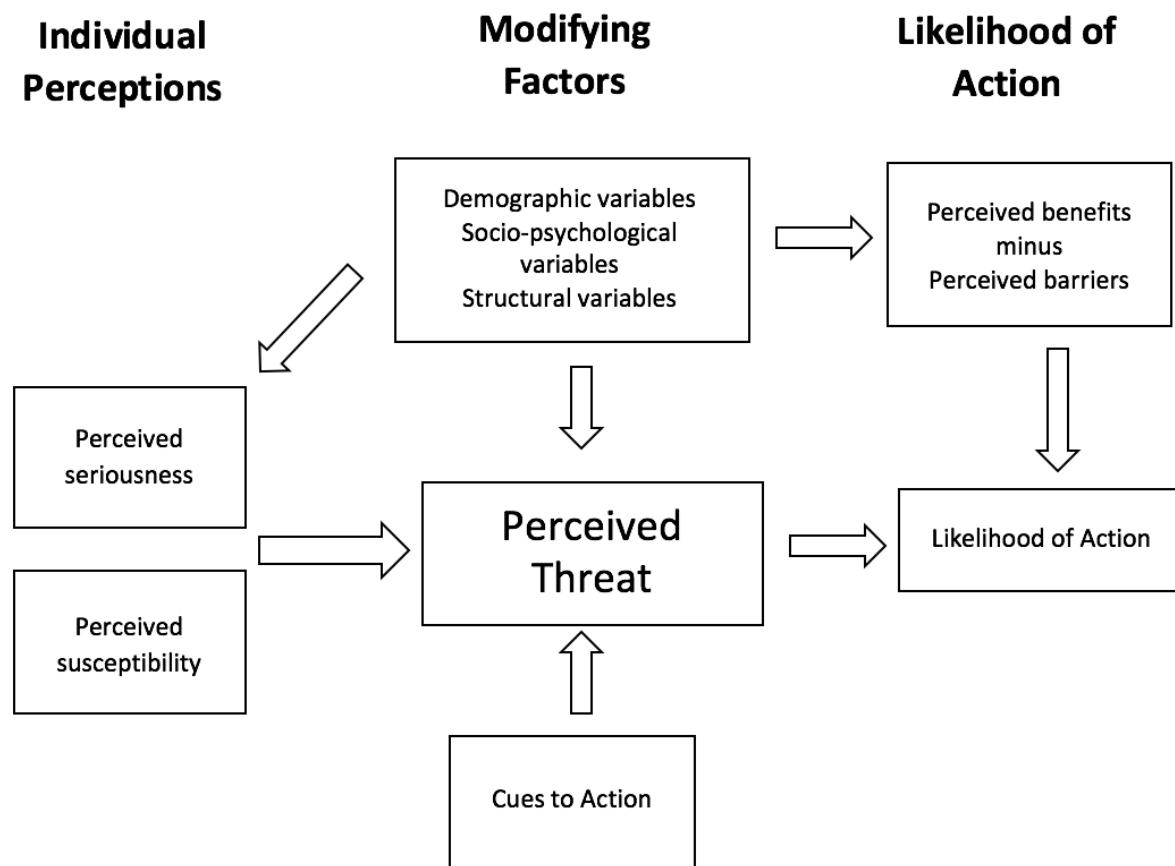


*Figure 3: Risk Perception Attitude Framework. Illus. Gurmeet Gujral, based on text from “Perceived Risk and Efficacy Beliefs as Motivators of Change”, by R. Rimal and K. Real, 2003, *Human Communication Research*, 29(3), 370-399.*

Health Belief Model

Selecting an appropriate theory or framework for research requires examination of its merit and relevance to the research question (Champion & Skinner, 2008). The HBM (see Figure 4), is a widely used psychological theory, and is known for its application of ideas into well laid out central concepts (Champion & Skinner, 2008). This model offers an approach to explain and predict health-related behaviours by focusing on individual attitudes and beliefs (Janz & Becker, 1984). The HBM analyzes an individual's motivation as a factor to achieve the goal of disease prevention (Maiman & Becker, 1974). The term *health-related behaviour* has been commonly used in literature and refers to a group of health, illness, sick-role, chronic illness, and risk behaviours (Mikhail, 1981). Now more than ever, health-related behaviour is an important issue for health care providers. Understanding and gaining the

ability to predict and influence health behaviours is historically considered to be essential to determine if an individual will cooperate and participate in healthy behaviours to prevent disease (Davidhizar, 1983).



*Figure 4: The Health Belief Model. Adapted from *The Health Belief Model and Personal Health Behavior* (p. 7), by M. Becker, 1974, Thorofare, New Jersey: Charles B. Slack.*

Background

The HBM is a psychological, health-related change model, created in 1952 by Irwin Rosenstock, Godfrey Hochbaum, Stephen Kegeles, and Howard Leventhal (Maiman & Becker, 1974). The HBM grew out of a set of independent research problems confronting a group of investigators in the Public Health Service between 1950 and 1960 (Rosenstock, 1974). During the 1950s, the Public Health Service was orientated around disease prevention

and not treatment of disease (Rosenstock, 1974). As a result, problems involving patient symptoms, compliance and physician communications were not a focus of public health. This caused a widespread failure of people to accept disease prevention strategies or to take part in screening tests for early detection (Rosenstock, 1974). One of the earliest examples of screening tests for early detection was for tuberculosis and later, for cervical cancer. Due to these factors, the need to explain preventive health behaviour is what influenced the development of the HBM (Rosenstock, 1974).

The basic components of the HBM were derived from social psychological theory, primarily the work of Lewin (Pender, 1996). Lewin conceptualized that the life space in which an individual exists is composed of regions, some of which have negative valence or positive valence, and others being relatively neutral (Pender, 1996). Lewin contended that health protecting behaviours are strategies for avoiding illness and disease (Pender, 1996). Influenced by principles of psychology, the earliest version of the HBM made assumptions that in order for an individual to take action to avoid disease, the following beliefs must be present: (1) belief of personal susceptibility to the disease; (2) belief that the occurrence of the disease would have at least moderate severity; and (3) belief that a particular action would be beneficial by reducing susceptibility or, if the disease has already occurred, it would not entail overcoming psychological barriers to reduce the severity (Rosenstock, 1974). According to the HBM, these beliefs predict the level of an individual's engagement in healthy behaviours to reduce disease.

The HBM is viewed as useful in predicting those individuals who would or would not use measures to prevent disease and to suggest interventions that might increase predisposition of resistant individuals to engage in health protecting behaviours (Pender, 1996). The first major study using the HBM involved participants undergoing medical radiography for the detection of tuberculosis. This study found that perceived susceptibility to

tuberculosis and the belief that people with the disease would be asymptomatic created a distinction between those who had and had not decided to get a chest x-ray (Rosenstock, 1974). The HBM continues to be used to examine areas of disease prevention, such as osteoporosis prevention (Nieto-Vazquez, Tejeda, Colin, & Matos, 2009), and promoting vaccination (Bigham et al., 2006; Coe, Gatewood, Mocygembba, Goode, & Beckner, 2012).

Application of the HBM has evolved to use in research involving complex behavioural risks, individual perceptions, and self-efficacy (Pender et al., 2015). For example, the HBM has been applied to understand behaviour change in response to illness (Aljasem, Peyrot, Wissow, & Rubin, 2001; Koch, 2002; Schmeige, Aiken, Sander, & Gerend, 2007), lifestyle change for healthier living (Daddario, 2007; Deshpande, M. Basil, & D. Basil, 2009) and compliance to treatments (Cerkoney & Hart, 1980; Farquharson, Noble, Barker, & Behrens, 2004; Peltzer, Onya, Seoka, Tladia, & Malema, 2002). This demonstrates the HBM can be used to understand health behaviours and provide insight into how interventions can best be developed to support disease prevention strategies.

Due to a paucity of literature in regard to women's cardiac health, one of the most notable studies that used the HBM was conducted by Ali (2002). In this study, Ali used the HBM to test several predictors of coronary heart disease (CHD) preventative behaviours in women. The findings of the study lend support for "the use of HBM variables to design intervention studies aimed at change of behaviours that increase risk for CHD development and also the continued use of the model with other health behaviours" (Ali, 2002, p. 93). Ali concluded that the HBM provides health care professionals and researchers with an effective way of addressing CHD prevention in women. Thus, this study supports the HBM's use to determine factors that affect the perceived risk of CVD in women, to provide insight as to how to motivate and encourage women to engage in health promoting activities to prevent this disease.

Components of the Health Belief Model

The HBM consists of individual perception factors, modifying factors, and factors likely to affect initiating action. Whereas individual perception factors, which include the beliefs an individual has about disease, and directly influence the tendency to act, modifying variables, such as age, gender, or economic status, affect behaviour undertaken indirectly (Ali, 2002). The perceived benefits or the barriers of the action influence the likelihood of taking action.

Individual perception factors. Perceived risk for disease is the subjective opinions individuals have in regard to their personal perception of risk for disease (Imes & Lewis, 2014). These factors include beliefs about personal susceptibility to a certain disease and perceptions of the seriousness of that disease. According to the HBM, if individuals consider themselves to be susceptible to a certain condition or believe a condition will result in serious consequences, they will be more likely take action to reduce their risk for disease.

Perceived susceptibility is the subjective belief that a person may acquire a disease or enter a harmful state as a result of a particular behaviour (Sharma & Romas, 2010). Individuals are believed to vary widely in their acceptance of personal susceptibility to a condition (Rosenstock, 1974). This varies from individuals denying any possibility of contracting a given condition, to admitting to the possibility of a disease occurrence, but believing that it is not likely to happen, to believing they are in real danger for contracting a condition (Rosenstock, 1974).

Perceived seriousness is defined as the belief in the extent of harm that can result from the acquired disease or harmful state as a result of a particular behaviour (Sharma & Romas, 2010). The degree of seriousness is a subjective opinion judged by the degree of emotional arousal created by the thought of the disease, as well as the kinds of difficulties individuals believe a given health condition will create for them (Rosenstock, 1974).

Modifying factors. Modifying factors are included in most expectancy value theories (Simons-Morton, McLeroy, & Wendel, 2011). In the HBM, modifying factors predict individual perceptions, as well as perceived benefits and perceived barriers. The modifying variables include, but are not limited to demographic, sociopsychological, and structural variables, as well as cues to action, and perceived threat of disease.

Demographic variables include factors such as age, gender, ethnicity, and education level. *Sociopsychological variables* include factors such as personality, socioeconomic status, and social support. Lastly, *structural variables* include factors such as knowledge of the disease, actual risk of the disease, or prior experience with the disease. The HBM suggests these variables may affect perceived seriousness, susceptibility, benefits, and barriers, and therefore, will affect the likelihood of engaging in health related behaviours (Glanz, Rimer, & Lewis, 2002).

Cues to Action are also considered modifying factors in the HBM. A cue to action is defined as the precipitating force that makes a person feel the need to take action (Sharma & Romas, 2010). Cues to action are believed to be necessary to complete the model. This contention is supported because while the combined levels of susceptibility and seriousness provide the force to act and contribute to perception of benefits or barriers (Rosenstock, 1974), cues to action are necessary to set the process in motion. Cues to action can be internal (e.g., uncomfortable symptoms), or external (e.g., mass media campaigns, newspaper articles) (Rosenstock, 1974).

Perceived threat is central to the HBM and implies that action is largely a matter of how a particular threat to health is perceived (Simons-Morton et al., 2012). The combination of perceived seriousness and perceived susceptibility establishes a subjective perception of the threat of disease (Strecher & Rosenstock, 1997). However, all surrounding concepts in the HBM are considered equally important as they either directly or indirectly influence

perceived threat. The HBM predicts that the higher level of perceived threat to disease, the more likely an individual will engage in health-promoting behaviours (Janz & Becker, 1984).

Likelihood of action. Likelihood of taking a specific action is the outcome of the different components of the model and means the individual is ready to act (Simons-Morton et al., 2012). These factors include beliefs about perceived benefits and perceived barriers to preventing disease. According to the HBM, individuals who believe they are susceptible to a disease, or that the disease is serious, perceive a greater threat of disease, and are therefore more likely to take action to reduce their risk factors for the disease. Similarly, individuals who believe that the benefit of engaging in healthy behaviours will ultimately outweigh potential barriers they may have to overcome will be more likely to strive to reduce their risk factors.

Perceived benefits include the beliefs about the advantages of the methods suggested for reducing the risk or seriousness of the disease or harmful state resulting from a particular behaviour (Sharma & Romas, 2010). This factor is influenced by beliefs regarding the relative effectiveness of known, available options in reducing the perceived disease threat (Rosenstock, 1974).

Perceived barriers include the beliefs concerning actual and imagined costs of performing the suggested behaviour (Sharma & Romas, 2010). An individual may believe that an action will be effective in reducing the threat of disease, but may also view that action as being inconvenient, expensive, unpleasant, painful, or upsetting (Rosenstock, 1974). These barriers to action are negative aspects of health action that arouse conflicting motives of avoidance (Rosenstock, 1974).

Model Assumptions

Assumptions are the basic givens or accepted truths that are fundamental to theoretic reasoning (Chinn & Kramer, 2011). These assumptions may include individual,

environmental, nursing, or health-related assumptions (Chinn & Kramer, 2011). Mikhail (1981) describes the HBM as having a phenomenological orientation. As such, it is assumed that the subjective world of the perceiver, rather than the objective environment determines behaviour and that people can only act on what they believe to exist (Mikhail, 1981). The HBM also assumes that motives selectively determine an individual's perception of the environment, and degree of interest in and concern about health matters (Mikhail, 1981).

According to Glanz et al. (2002), the HBM assumes that people are largely rational in their thoughts and actions and will take the actions to reduce their risk factors, if they feel that is possible to address a negative health issue. The HBM also assumes that having a positive expectation towards the proposed action will be effective in an individual taking action to address the issue (Glanz et al., 2002). Finally, there is an assumption of a causative relationship between the main concepts and health behaviour, assuming that health behaviour results from a health belief. However, beliefs may develop along with health behaviours as a result of experience with treatment, health care professionals, and individual encounters (Glanz et al., 2002).

Model Limitations

Although theories regarding health behaviour are important in research, they will not necessarily resolve or answer all health problems. Like most theories, the HBM has its limitations. An appealing feature of applying the HBM is its notable simplicity. However, this is also widely recognized as a limitation, with documented concerns regarding the unclear or complex underlying relationships between the constructs. For example, Champion and Skinner (2008) argue that although the coupling of perceived seriousness and susceptibility may be considered a strength (in comparison to other health models), it is questionable that a higher sense of severity is required before perceived susceptibility becomes a strong predictor of perceived threat.

The HBM has also been criticized for not testing all relationships and combinations between the different variables within the model. The model demonstrates that health beliefs will affect health behaviours; however, unclear relationships among the different constructs within the model may lead to uncertainty in how the HBM may be applied to research. The predictive power of one concept may depend highly on another concept and may not be taken into consideration with the use of the model. For example, the relationship between perceived benefits and barriers may be altered if perceived benefits are high and perceived barriers are low (Champion & Skinner, 2008). Moreover, while the model assumes relationships among the main concepts, health behaviours may develop for reasons unrelated to health beliefs and therefore, cannot be explained by use of the HBM (Glanz, et al., 2002). As well, some researchers have tested combinations of constructs that have not been validated for that specific use in the original model (Glanz, et al., 2015), supporting the continued testing and validation of the HBM.

Lastly, several key factors that are known to have a significant impact on health behaviours are not included in the HBM. For example, the model does not address personal history (i.e., actual risk) or previous experiences; rather, it focuses on the current subjective state (Mikhail, 1981). As well, the HBM is criticized for lack of any emotional considerations. For example, fear may influence many of the constructs in the HBM; however, fear is not a variable in the original model (Champion & Skinner, 2008).

Chapter Summary

Disease prevention is an important part of eliminating health problems. Although there are many models and frameworks that provide the foundation for disease prevention research, the HBM provides insight into why individuals behave in certain ways related to health matters and the factors that affect their decision-making process (Mikhail, 1981). Moreover, this model acknowledges the importance of individual perceptions of perceived

threat or risk of disease. The model's intuitive appeal has earned a sustained place in research and practice in adherence and health-related behaviours (Simon-Morton et al., 2012).

Although critiques in the literature identify several important limitations, the HBM provides a means for contributing to ongoing development of nursing knowledge. Furthermore, the HBM addresses the central concepts of interest in the current study and therefore, was appropriate to guide this thesis research.

CHAPTER THREE: REVIEW OF THE LITERATURE

The purpose of the following literature review was to establish sound rationale for my thesis research. An overview of the existing research related to cardiovascular disease (CVD) in women, will provide foundation for the discussion of the main study concepts related to risk perception. The review of the literature related to these concepts will be discussed in the context of the HBM. This includes: a historical perspective of CVD research, gender differences in CVD risk factors, progress in CVD prevention, and perception of CVD risk.

Background: Cardiovascular Research in Women

Cardiovascular disease research dates back to epidemiological studies first conducted in the mid-twentieth century. There is a vast amount of literature surrounding CVD, including research into the mechanism of disease, response to treatment and intervention, and primary and secondary prevention strategies. Cardiovascular disease is a major health concern for all individuals, and prevention is key to reducing the burden of this disease. Since the initiation of CVD research, a disparity in the inclusion of women is evident in literature. Although progress has been made in recent times, gaps in knowledge and research continue to exist. Health research is essential to reducing the burden of disease, and continued research will improve CVD outcomes in women. The following overview of the literature in regard to CVD and women will include a historical perspective of women in CVD related research, gender differences in CVD risk factors, and progress in CVD prevention in women.

Historical Perspective: Women in CVD Research

Women are historically underrepresented in cardiovascular research. Although the number of women participating in clinical trials has increased over time, it is important to review the history of CVD related research, as past results continue to dictate current research trends, and perceptions women have towards CVD.

The literature reveals numerous reasons why women have been excluded in past clinical trials. Dougherty (2011) indicates that during the 20th century, pregnant women and those of childbearing ages were excluded out of fear that medications would cause dangerous fetal exposures. As well, women's reproductive system and fluctuating hormones caused them to be "unpredictable research subjects" (McCormick & Bunting, 2002). Therefore, results from drug trials that included only men only were generalized in the treatment of women without consideration of anatomical and physiological differences that may impact the outcome of treatments.

Many studies have provided important evidence related to CVD prevention; however, the Framingham Heart Study (FHS), which was initiated in 1948, was one of the first major epidemiological CVD research studies (FHS, 2017a). During the time leading up to this study, death rates attributed to CVD in men had begun to steadily rise and researchers sought to determine common factors and characteristics that would explain this increase. The initial study recruited 5,209 men and women between the ages of 30 and 62 from the town of Framingham, Massachusetts (FHS, 2017a). In this longitudinal study, participants were enrolled for extended periods of time, providing periodic health information to the researchers. As well, adult children of the original cohort and their spouses made up a second generation of participants.

The "Omni Cohort" of the FHS ($N = 507$), which was established in 1994, addressed the need for diversity within participants (Mahmood, Levy, Vasan, & Wang, 2014). Although this cohort included diverse ethnicities, the age span of participants was between 20 and 39 years. This narrow age span in all Framingham cohorts, initially contributed to lower reported CVD rates in women compared to men, as women tend to develop CVD at a later age. This, in turn led to a widespread misconception that women had "protection" from the disease

(Banks, 2008); however, more recent evidence has established that women are at risk and that their risk for CVD simply begins later in life.

The FHS has however, made significant contributions to the area of cardiovascular research, including CVD prevention, and CVD risk factors. For example, longitudinal data from the FHS published in 1961 was the first to report that high blood pressure, smoking, and high cholesterol are major risk factors in developing heart disease (Kannel, Dawber, Kagan, Revotskie, & Stokes, 1961). Based on this development in CVD research, the concept of screening, assessing, and treating individual risk factors became a strategy for disease prevention. Furthermore, data obtained from this study was used to develop estimated individual 10 and 30-year risk prediction for CVD (Pencina, D'Agostino, Larson, Massaro, & Vasan, 2009). The FHS was also one of the first studies to document gender differences in CVD, an area of research that continues to be examined today. As well, data from the FHS emphasized the importance of considering multiple risk factor assessments in practice, and subsequently, became the foundation of evidenced based preventative strategies (Mahmood, et al., 2014).

Although the FHS included fairly equal representative samples of men and women in their research studies, women with CVD were under-represented. This may be one reason why many subsequent major CVD studies followed their lead in this regard. In fact, there has been a notable gender imbalance in past CVD research. For example, the Multiple Risk Factor Intervention Trail Research Group (Multiple Risk Factor Intervention Trial Research Group, 1982), the Coronary Drug Project (Canner, Berge, & Klimt, 1973), Lipid Research Clinic (Lipid Research Clinics Investigators, 1992), and the Physician's Health Study (Physicians' Health Study, 2009), included no female participants (Mastroianni, Faden, & Federman, 1994). The results of these studies misled the general public to believe that women have a lower risk of CVD. This contributed to further gender bias in subsequent research that

stemmed from the original studies, and therefore, had significant repercussions on the prevention and treatment of CVD in women (Mastroianni et al., 1994).

One of the first major female specific CVD research findings came from the original FHS (FHS, 2017a). This large study ($N = 5,209$) examined the incidence of CVD in men versus women. The findings revealed that men developed CVD at twice the rate of women, however, after age 60, women achieved similar rates of CVD. Furthermore, when comparing menopausal status and age in the female cohort ($n=2873$) over a 20-year period, premenopausal women aged 40-54 had significantly less cardiovascular events compared to the postmenopausal women (i.e., 20 versus 70 cardiovascular events respectively; Kannel, Hjortland, McNamara, & Gordon, 1976). This evidence that post-menopausal women experience greater rates of CVD in comparison to their pre-menopausal counterparts, was groundbreaking in that it set the stage for examining gender specific CVD risk (Kannel et al., 1976).

To determine female representation in CVD research, Melloni et al. (2010) reviewed 156 randomized clinical trials (RCTs), which had contributed to the 2007 AHA's guidelines for CVD prevention. Although they found that female enrollment in clinical trials had increased significantly over time (i.e., from 18% in 1970 to 41% in 2006), they concluded that representation of women remains low relative to the number of women with CVD. Furthermore, of the 156 clinical trials reviewed, only 31% discussed gender specific results (Melloni et al., 2010). This was an unfortunate oversight considering the significant amount of gender differences found in current research. These differences now have an impact on CVD risk factor assessment and management and are starting to provide new insights into CVD prevention strategies among women.

Harris and Douglas (2000) examined the enrollment of women in CVD trials funded by the National Heart, Lung, and Blood Institute (NHLBI) between the years of 1965 and

1998. They determined the overall enrollment rate of women in all studies was 54%. However, a large number of these participants were represented from two large gender specific studies, the Nurses' Health Study (NHS; Nurses' Health Study, 2016a) and the Women's Health Initiative (WHI; Women's Health Initiative Study Group, 1998). When excluding gender specific were excluded from the analysis, women represented only 38% of participants in CVD clinical trials between 1965 to 1998 (Harris & Douglas, 2000).

The need to include a greater number of women in clinical trials was mandated by the United States Federal Government in 1985. At this time, it had become evident that women differ in CVD presentation, treatment, and outcomes, and therefore, evidenced-based data was needed to improve treatment options and outcomes for women with CVD. As well, a societal shift began to occur as women demanded autonomy in health matters and equal inclusion in clinical trials (Harris & Douglas, 2000). As of 1985, researchers in the United States (US) had to provide justification for excluding women from clinical trials (Harris & Douglas, 2000). Unfortunately, this government act was found to have minimal impact on increasing the number of women in clinical trials, which prompted the National Institute of Health (NIH) Revitalization Act in 1993. This act established specific guidelines for the inclusion of women and minorities in research (Kim & Menon, 2009). Although the NIH Revitalization Act improved the number of women participating in clinical trials, women continue to be underrepresented in mixed-gendered cardiovascular trials and the increase of female participants continues to come from large gender specific studies (Chen, Lara, Dang, Paterniti, & Kelly, 2014; Kim & Menon, 2009).

Cardiovascular Disease Research: Focus on Women

The number of clinical trials and large epidemiological studies focusing exclusively on women have increased over time. Several landmark epidemiological studies, in particular,

the NHS and Women's Health Initiative (WHI), have made significant contributions to evidence related to women and CVD and CVD risk.

The NHS began in 1976 as a prospective cohort study ($N = 121,700$) to examine the relationship between contraception and breast cancer among female nurses between the ages of 30 and 55 in the United States (NHS, 2016a). Currently in its 41st year, the NHS is still ongoing and has expanded to include 3 cohorts. Nurses were chosen as participants due to their ability to complete health-related questionnaires with accuracy and their willingness to participate in a long-term research study (NHS, 2016a). Since the beginning, the NHS has made significant contributions to understanding factors that influence risk in many areas of women's health and illness, including CHD and stroke, by exploring risk factors such as cigarette smoking, oral contraception, postmenopausal hormones, and obesity (Colditz, Manson, & Hankinson, 1997). The NHS provides a unique understanding of disease and components of lifestyle that include valuable data on the causes and prevention of disease. Specifically, the NHS provided evidence that CVD in women can be prevented by smoking cessation, and maintaining regular physical activity, healthy diet, and normal BMI (NHS, 2016b).

The Women's Health Initiative (WHI; Women's Health Initiative Study Group, 1998) is considered the largest and most inclusive longitudinal study addressing major health concerns in post-menopausal women. Initiated in 1992, the WHI began with 161,000 participants from the US, between the ages of 50 and 79 (WHI Study Group, 1998). Consisting of clinical trials and a prospective cohort study, the WHI focuses on mortality and morbidity surrounding CVD, cancer, and osteoporosis (Hayes et al., 2003). The WHI has provided evidence related to diet, supplementation, and lifestyle recommendations to reduce risk factors and prevent chronic disease (Nabel, 2006). Although hormone trials in participants were unexpectedly discontinued when estrogen-based therapies were found to

have an unfavorable risk and benefit profile in participants (Nabel, 2006), those results supported prior research that hormone therapy does not provide protection against CVD.

Finally, although the FHS included younger women the vast majority of past CVD research, including the NSH and the WHI has not included young women. Development of cardiovascular risk factors begins at a young age and young women are less likely to engage in risk reducing behaviour. Yet, their long-term risk for developing CVD increases with age. Despite the steady increase in gender specific CVD research, the prevalence of CVD in women suggests more research is necessary. Improved methods of assessing risk factors, understanding CVD risk, routinely screening younger individuals, implementation of prevention strategies, and treatment of risk factors is required to reduce the burden of CVD in women (Nabel, 2015).

Cardiovascular disease research in young women. The amount of CVD research focusing on women has increased significantly since evidence has demonstrated gender differences in risk. However, the vast majority of CVD research still focuses on aging women and does not necessarily include young women. Risk factors for CVD can begin to develop by the age 20, reinforcing the argument that individuals should begin risk-reducing behaviours at a young age (Stone et al., 2014). In evaluating trends of CVD awareness over a 15-year period, Mosca et al., (2013) found that although the large gap of CVD awareness between young and older women is decreasing, the younger population is less likely to take steps to reduce their CVD risks. Moreover, the long-term risk for CVD in young adults is high. Clark and associates (2014) used data from the National Longitudinal Study of Adolescent Health participants ($N = 14,333$; mean age of 28.9 years) to determine 30-year CVD risk score. Two CVD outcomes were used as “hard” risk or “general” risk based on the form of CVD that would be predicted. Average 30-year risk for hard and general CVD risk was 10.4% and 17.3% respectively in men. In women, hard risk was found in 4.4% of women

and general risk in 9.2%. These findings support the contention stronger disease prevention, identification, and treatment of CVD risk factors is crucial among young adults.

In addition to long-term risk research, the literature identifies other aspects of CVD that demonstrates the significance and seriousness of CVD in young women. Although the CVD mortality rate in most women is declining, recent studies have found young women in particular have had the least improvements in mortality rates (Izadnegahdar et al., 2014; Wilmot et al., 2015). Yet, young women who engage in a healthy lifestyle have been shown to successfully reduce their CVD risk (Chomistek et al., 2015). Lastly, recent literature examining CVD risks in young female adults recommend primary prevention and risk reducing strategies are imperative to decrease the burden of CVD in this population (Chomistek et al., 2015; Chung, Toulomtzis, & Gooding, 2015; Clark et al., 2014; Levit, Reynolds, & Hochman, 2011; Nabel, 2015; Rodriguez & Foody, 2013). Although more recently young women have been included in research studies, the majority of these studies focus on CVD risk factors. More research in this population is required to continue examining disease risks, health beliefs, and ultimately, insights into early CVD prevention.

CVD Risk Factors: Gender Differences

As previously discussed, women have faced gender disadvantages in CVD research by their low representation in sampling and misrepresentation in results. One of the most significant gender differences associated with CVD is related to risk factors. Many common modifiable risk factors for CVD have a greater impact on women than men; as well, several risk factors are exclusive to women.

Hypertension. Due to an overall global increase in prevalence, high blood pressure is a major global public health issue, and the most common and preventable risk factor for CVD (WHO, 2013b). In part because of the loss of estrogen during menopause, the rate of hypertension among women exceeds that for men (August, 2013; Giralt et al., 2012;

Reckelhoff, 2001). High blood pressure has also been shown to have a more detrimental effect on women than men. For example, hypertension is more strongly associated with stroke, left ventricular hypertrophy, and diastolic heart failure in women than men (Maas et al., 2011).

Smoking. Based on data from the NHS (Willett et al., 1987), cigarette smoking is considered an independent cause of CVD in women. Tobacco can reduce blood flow, increase blood pressure, lower exercise endurance, and increase risk for stroke (World Heart Federation, 2017). In addition, the burden of smoking has been shown to be more detrimental among women than men. Studies support a higher relative risk for CHD among women due to greater number of cigarettes smoked daily, as well as longer duration of smoking due initiation of smoking at an earlier age (Giovino et al., 2012). In a systematic review and meta-analysis of prospective cohort studies published between 1966 and 2010, Huxley and Woodward (2011) examined gender, relative risk for CHD, and smoking patterns. Their analysis revealed that in nearly all age groups, women have a 25% increased risk for CHD due to smoking in comparison to men.

Diabetes. Diabetes is one of the most significant gender differences among CVD risk factors. Women of all ages have a significantly higher risk of CVD compared to men due to increased rates of adiposity, insulin resistance, blood pressure, lipids, endothelial dysfunction, and systemic inflammation (Wannamethee et al., 2012). These risk factors contribute to women with diabetes having a 50% higher relative risk for fatal CHD than men (Huxley, Barzi, & Woodward, 2006). In addition, a greater burden of CVD risk factors may be present as women with diabetes are found to be less likely to achieve target goals for blood sugar levels (Franzini et al., 2013). As well, researchers have explained that some of the worse outcomes and CVD risk among diabetic women may be partially due to higher body mass

index, and higher rates of obesity (Franzini et al., 2013; Peters, Huxley, Sattar, & Woodward, 2015).

Menopause. Several gender differences in CVD risk factors are a consequence of women aging and going through menopause. For example, changes in body fat distribution, increased blood sugar, increased cholesterol levels, and increased blood pressure occur due to the reduced levels of estrogen that are associated with menopause (Banks, 2008; Rosano, Vitale, Marazzi, & Volterrani, 2007). At normal levels, estrogen has regulating effects on these risk factors; however, after menopause, a reduced level of estrogen contributes to an increase in these risk factors (Banks, 2008). These changes cause negative effects on insulin resistance and have a direct correlation to an increase risk of diabetes and hypertension in menopausal women (Rosano et al., 2007). As a result, the prevalence of CVD among postmenopausal women exceeds that of men (Bots, Peters, & Woodward, 2017). One of the first studies to compare CVD rates among pre and postmenopausal women was the FHS ($N = 2873$), which found that significantly more CVD events were diagnosed in postmenopausal women compared to premenopausal women (Kannel et al., 1976). More recently, additional evidence of increased CVD risk in postmenopausal women compared to pre-menopausal women has been noted in the literature (Haines & Farrell, 2010; Hale & Shufelt, 2015; Rosano et al., 2007).

Pregnancy. Pregnancy may present cardiovascular stress to a women's body and result in pregnancy-related cardiovascular complications. For example, in a retrospective, population-based cohort study of Canadian women between the ages of 20 and 49 who gave birth in a span of nearly four years, those with mild glucose intolerance or gestational diabetes were found to have increased rates of CVD over the following 12.3 years (Retnakaran & Shah, 2009). As well, gestational diabetes increases the relative risk of developing diabetes later in life by 7 to 12 times (Maas & Appelman, 2010). Preeclampsia, a

pregnancy complication resulting in hypertension, has been demonstrated to increase a woman's overall risk for CVD later in life (Lykke et al., 2009; van Rijn et al., 2013). Furthermore, hypertension during pregnancy is also associated with a higher risk for developing type 2 diabetes mellitus (Lykke et al., 2009). As well, in a retrospective study of women with preeclampsia, gestational hypertension or normal pregnancies, those with a history of preeclampsia or gestational hypertension were found to have increased blood pressure, BMI, and insulin resistance years after delivery (Mangos, Spaan, Pirabhahar, & Brown, 2012). Lastly, women who give birth to infants who are small for gestational age, have also been linked to higher rates of hospitalization or even death from CVD later in life (Bonamy, Parikh, Cnattingius, Ludvigsson, & Ingelsson, 2011).

Polycystic Ovary Syndrome. Polycystic ovary syndrome (PCOS) is a common endocrine disorder and complex genetic condition affecting women of reproductive age. Women with PCOS have an increased risk of reproductive abnormalities, as well as several other comorbidities, including obesity, increased insulin resistance, and CVD (Goodarzi, Dumesic, Chazenbalk, & Azziz, 2011). In a prospective cohort study of women aged 20 to 32 ($N = 1,127$), Wang and associates (2011) found that the women with PCOS ($n=53$) had almost twice the incidence of diabetes and dyslipidemia following 18 years of follow-up as the women without PCOS. Toulis and associates (2011) examined 130 studies in a meta-analysis of CVD risk markers in women with PCOS. Although the exact mechanism was unclear, women with PCOS had increased serum levels of CVD risk markers in comparison to those women without PCOS (Toulis et al., 2011), which supports the contention that PCOS is a significant risk for CVD.

This brief overview of gender specific differences in CVD risk factors highlights the significant and unique risks for CVD in women. Lack of awareness of these gender

differences may contribute to inaccurate perception of risk in women. Therefore, further research that focuses on women's perception of CVD risk is needed.

Progress in CVD Prevention

Mortality rates related to CVD have declined in the past twenty years (Roth et al., 2015) and arguably, this decrease is due, in part, to the implementation of global prevention strategies (Leong et al., 2017). Guidelines for CVD prevention have been developed over time using evidenced based data from research emphasizing that reducing risk factors will support preventative goals. Recent CVD prevention research has shifted to include prevention in women, as well as gender differences in disease prevention. This research is most often focused on risk factors, and risk factor reduction. In turn, this research has led to great strides in specific CVD prevention strategies and guidelines for women.

Primary prevention is key to reducing the incidence of CVD in all individuals. Prevention strategies have typically aimed to improve awareness and knowledge of CVD. However, these strategies have proven to be insufficient to successfully reduce CVD in women of all ages. Thompson and Daughtery (2017) reviewed factors that contribute to gender disparities in CVD prevention. They argue that screening for major risk factors is often overlooked in women, especially in young women. Women also fail to receive education on primary prevention of CVD from their primary physician. Rather, risk is often discussed for the first time once an individual has already developed a form of CVD and risk factors have been established. Thompson and Daughtery (2017) go on to suggest that these gender disparities in CVD care may have been attributed in part due to gender stereotypes and bias by physicians in regard to women and CVD. Nabel (2015) recommend several ways to improve primary prevention of CVD in young women, including screening, diagnosis, and treatment by a variety of health care professionals. Evidence based guidelines in CVD provide health care professionals with research-based recommendations for CVD prevention.

A review of the advances in these guidelines over the past several decades provides insight into the progress that has been made in strategies to reduce CVD in women of all ages.

One of the first sets of guidelines to address the gender differences in CVD was a guide to CVD prevention in women published by the AHA in 1999 (Mosca et al., 1999). This was followed by the publication of evidenced-based guidelines on the prevention of CVD in women in 2004 (Mosca et al., 2004). The 2011 updated version of these guidelines (Mosca et al., 2011), shifts the focus to “effectiveness-based guidelines,” and includes the evidenced based guidelines, as well as the benefits and risks of preventative therapies as observed in clinical practice. Moreover, the 2011 guidelines are the first preventative CVD guidelines and recommendations that are gender specific. While previous guidelines were based on clinical trials with the predominantly male participants, considered to be the “typical” CVD patient, the most recent guidelines were grounded in evidence from studies of women. These guidelines focus on strategies for assessing risk factors and reducing risk factors in women, as well as implementing these strategies in clinical practice. For example, the AHA guidelines recommend three types of interventions for CVD prevention in women: lifestyle interventions, major risk factor interventions, and preventative prescriptive drug interventions (Mosca et al., 2011).

Supported by findings from the NHS, the AHA guidelines recommended lifestyle interventions including smoking cessation, physical activity, healthy dietary intake, and maintenance of body weight (Mosca et al., 2011). Major risk factor interventions are appropriate for those women considered to be “at risk” or “high risk” for CVD and require blood pressure control, lipid management, or diabetes management. For example, research has demonstrated the use of statins is effective for primary prevention of CVD in women (Mora, Glynn, Hsia, MacFadyen, Genest, & Ridker, 2010). Preventative drug interventions are also recommended for preventing thromboembolism or stroke or delaying progression of

existing heart failure. This recommendation is supported by evidence that female gender is an independent risk factor for stroke in atrial fibrillation and anticoagulant treatment is beneficial (Cheng & Kong, 2016). Furthermore, medical management of atrial fibrillation is critical for women as their risk for stroke when not on anticoagulants is greater than their male counterparts (Cheng & Kong, 2016).

Although not gender specific, organizations worldwide have recognized and supported the need for greater CVD prevention. In addition to CVD prevention guidelines, the AHA has also set forth goals for CVD health promotion and disease prevention. Established in 2009, the AHA developed a goal to improve the cardiovascular health of Americans by 20%, as well as reducing the number of CVD related deaths by 20% (Lloyd-Jones et al., 2010). To achieve this goal by 2020, the AHA developed improved techniques in their research, clinical practices, public health, and programs supporting health promotion and disease prevention (Lloyd-Jones et al., 2010). Globally, the United Nations aimed to reduce 25% of cardiovascular diseases by 2025. Furthermore, this goal is supported by the WHO which set specific target goals in regard to lifestyle improvements to decrease CVD risk factors. Dungani and Gaziano (2016) contend this goal is achievable if appropriate focus is applied to certain areas of disease prevention. For example, tobacco control, reducing high blood pressure, increasing physical activity, improving diet, and treatment of high cholesterol are challenges that must be appropriately addressed to achieve such a goal. However, reaching this goal requires numerous complex strategies among health disciplines and governments, including improving accessibility and affordability of drugs, and continuous research in different regions of the world in regard to risk and risk factors (Yusuf, Wood, Ralston, & Reddy, 2015). Moreover, the importance of gender specific strategies cannot be overlooked.

In summary, there has been a vast amount of CVD prevention research, as well as progress in the development of gender specific guidelines and strategies to reduce CVD; however, current trends in CVD prevalence and mortality rates suggest that existing strategies do not suffice. Therefore, new perspectives in CVD research may glean new insights to disease prevention strategies, that may help to reduce the burden of CVD among women.

The Health Belief Model and Perception of Risk

The Health Belief Model (HBM) may be used to explain why an individual is likely to participate in disease prevention and health promoting activities (Ali, 2002). The original model included three beliefs individuals must possess to take action to avoid disease: the belief that they are personally susceptible to the disease, the belief that the occurrence of the disease would be at least moderate in severity, and the belief that taking a particular action would be beneficial in reducing the chances one would develop the condition (Rosenstock, 1974). Webster and Heeley (2010) describe the importance of using theories of health-related behavior to study an individual's perception of CVD risk:

Ideally, in order to prevent CVD, all you would need to do is present the general population with information relating to their risk of developing CVD including relevant risk factors followed by proven risk-factor-reduction strategies. Once given this information, an individual would look at it in a rational and logical manner and implement the discussed risk reduction strategies, thus minimizing his or her CVD risk. However, it is immediately apparent that this very rarely happens in reality. The factors that influence how individuals understand information and use that information to make decisions are many, and the decision pathway is complex. (p. 51).

Due to the complexly of influencing an individual's behavior, the use of theory provides guidance in health-related decision making. For the purpose of this study, the HBM was used as a guide to explore the relationship between individual perceptions of risk and modifying variables within the context of women's perceived risk of CVD. The literature surrounding the key study concepts will be reviewed, to include individual perceptions and modifying factors.

Individual Perceptions

The perceptions an individual has about a disease will have implications on the health promotion actions they may or may not take to reduce their risk of disease (Wang et al., 2009). Examining factors that affect individual perceptions is important when studying health behaviour as these variables influence the actions taken to reduce disease risk. Identifying these factors may also provide insight into the development of more effective strategies to promote disease prevention. The following section examines the literature related to perception of risk for disease in general, and perception of risk for CVD in women in particular. For the purpose of the thesis research study, perceived risk was used as the operational definition for the individual's perception of susceptibility and seriousness, as well as the modifying variable of perceived threat.

Perceived risk and health behavioural research. In general, perception of risk is a complex concept rooted in multiple disciplines, including nursing (Sjoberg, Moen, & Rundmo, 2004). Perceived risk is an important part of the decision-making process for taking action towards behaviour change and provides insight into how an individual assesses risk (Williams & Noyes, 2007). An essential part of understanding perceived risk includes how information is received and communicated to an individual (Williams & Noyes, 2007). The relationship between risk and decision-making is a complex process and the exact process

remains unclear. However, it is utilized in variety of research disciplines, including health, to understand an individual's risk management process (Vasvári, 2015).

This area of health research has been explored within the context of a number of chronic diseases, including cancer, diabetes, and Alzheimer's disease. Numerous factors that influence perception of risk are addressed in the literature, including: demographic variables, such as age and education, and knowledge of risk factors. Lastly, the importance of accurate risk perception is established by the evidence that individuals who have an accurate perception of risk are engaging in health screening and lifestyle modification to reduce disease risk (Everett et al., 2014; Fehniger et al., 2014; Griva et al., 2013; Thakkar et al., 2016; Williams, Herzog, & Simmons, 2011).

Consistent with the HBM, researchers have found that various modifying factors, such as demographic variables are important influencing factors in risk perception for disease. For example, in a cross-sectional study ($N = 1246$) of men and women's perception of skin cancer risk, ethnic minorities, the elderly, and those with less education were found to have poor perceptions of disease risk (Buster, You, Fouad, & Elmets, 2012). Similarly, in a cross-sectional study of perceptions of cardiac risk in diabetic individuals ($N = 143$), most of whom were low income, middle-aged, African American women, Allen, Purcell, Szanton, and Dennison (2010) reported an overly pessimistic perception of risk for future CVD events.

There is however, mixed evidence related to education as a strategy to enhance the likelihood of taking action to reduce health risk. The results of several studies support the contention that education may improve risk factor knowledge and awareness (Fehnigher et al., 2014; Hammond, Salamonson, Davidson, Everett, & Andrew, 2007; Hart, 2005; Homko et al., 2008; Johnson & Dickson-Swift, 2008; Perkins-Porras, Whitehead, & Steptoe, 2006); however, research evidence suggests that education does not necessarily correspond with perception of risk. For example, in a cross-sectional survey ($N = 454$), men and women aged

25 years and older, were asked about their risk factors, knowledge and information, and risk perception for osteoporosis (Clark & Lavielle, 2015). Fifty-three percent of participants were able to recognize risk factors and were considered to have adequate knowledge and information about osteoporosis. However, 87.7% of individuals had lower than the recommended levels of calcium in their diet or via supplementation. Yet, only half of individuals were concerned with being diagnosed with the disease (Clark & Lavielle, 2015). Similarly, in a survey study of women with a history of gestational diabetes mellitus (GDM: N = 217), 90% of women surveyed understood that GDM is a risk factor for future diabetes; however, only 16% believed that they were at high risk for developing diabetes themselves (Kim et al., 2008).

Family history is a risk factor for many diseases, and an important influencing factor on perceived risk. Acheson et al. (2010) used data collected from the cluster-randomized controlled Family Healthware Impact Trial, which collected data on healthy individuals (N = 3,344; Ruffin et al., 2011). Data collected included perceived risk and worry for developing numerous chronic diseases including, CHD, stroke, diabetes, and breast, ovarian, and colon cancers. When adjusted for personal risk factors such as age, education, BMI, smoking, diet, and physical activity, a strong association remained between family history and perceived risk for developing each disease among participants (Acheson et al., 2010). Similar findings have been reported in the literature in regard to breast cancer (Berry et al., 2015) and diabetes (Darlow, Goodman, Stafford, Lachance, & Kaphingst, 2012).

Research suggests that individuals may use their existing risk factors to assess their personal overall risk; however, most continue to underestimate their risk at baseline (Avis, Smith, & McKinlay, 1989). To examine why individuals fail to engage in health behaviours to promote their well-being, Clarke and associates (2000), randomly selected women aged 50 to 70 years to participate in a telephone interview (N = 164). In general, women had

optimistic bias in relation to their risk for breast cancer and severity of breast cancer (Clarke, Lovegrove, Williams, & Machperson, 2000); however, other research has found that certain characteristics lead to an overestimation of risk. For example, women with a family history of breast cancer, no history of childbirth, or those with higher exposure to media regarding breast health, have been found to overestimate their risk for breast cancer in comparison to women without those characteristics (Haas et al., 2005).

Providing individuals with personalized feedback in regard to their risk for a disease may influence personal perception and, in some cases, may assist in changing health behaviours (Avis, Smith, & McKinlay, 1989). This may be an important part of disease prevention as often individuals with established risk factors often do not realize their future risks.

Finally, the importance of having accurate personal risk perception for disease is supported by evidence in health research. For example, in a cross-sectional survey of women aged 40-74 years ($N = 1,261$) in regard to their risk perception and concern of developing breast cancer, Fehniger et al. (2014) found that only 18% of women who were at high risk for breast cancer accurately perceived themselves to be at risk. However, the women who did have accurate perceptions, also had an appropriate level of concern for their health. This demonstrates accurate risk perceptions may motivate at risk women to apply prevention strategies (Fehniger et al., 2014). Similarly, others have found that women with an accurate perception of breast cancer risk are more likely to adhere to early detection strategies, such as mammogram screening (Diefenbach, Miller, & Daly, 1999; Drossaert, Boer, & Seydel, 1996; Griva, Anagnostopoulos, & Potamianos, 2013; Katapodi, Lee, Facione, & Dodd, 2004; Seitz et al., 2017).

Accurate risk perception has also been shown to be beneficial in other areas of health research. For example, adult smokers ($N = 242$) were surveyed about their motivation to quit

smoking and risk perceptions for developing conditions associated with smoking, such as lung cancer, heart disease, emphysema, or circulatory problems (Williams et al., 2011). Williams et al. (2011) found that those with higher perceptions of risk had significant higher intention to quit. These studies demonstrate the importance of an accurate perception of risk in likelihood of action related to early detection, interventions, and adopting of health behaviours, which may ultimately reduce the incidence and mortality from disease (Griva et al., 2013; Williams et al., 2011).

Perceived risk and cardiovascular disease research. Within the context of CVD, Imes and Lewis (2014) define perceived risk as:

an individual's subjective risk for developing CVD in his/her lifetime or within a certain period of time (eg, 10-year coronary heart disease). An individual's perceived risk may accurately reflect his/her objective risk, based on CVD risk factors, or may be higher or lower than his/her objective risk. (p. 109)

Generally, both men and women tend to have inaccurate personal perceptions for CVD risks. This may be due to a number of reasons, such as over or underestimating health risks, and general optimism of health, especially in younger individuals.

The literature proposes numerous factors that may influence inaccurate perceptions of risk. Alwan et al. (2009) suggest that even individuals with medical exposure, may not be able to conceptualize their own CVD risk and therefore, may have inaccurate risk perceptions for CVD (Alwan et al., 2009). Alternatively, overestimation of perceived risk for disease may be due, in part to living with a chronic disease, which may provide a more realistic awareness of other diseases, or awareness that has been reinforced by their consultations with health care providers in regard to their illness (Asimakipoulou et al., 2008). High perceived risk has also been associated with recent hospitalizations (Thakkar et al., 2016). Consistent with the HBM, other modifying factors such as, older age, smoking, a family history of CVD and a

self-report of “poor health” is positively correlated with higher perceived risk (Frigling et al., 2004).

Underestimation of perceived risk for CVD is also evident in the presence of CVD risk factors. Using semi-structured interviews, Carroll, Naylor, Marsden, and Dornan (2003) interviewed diabetic patients aged between 52 and 77 years of age in regard to their perceived CVD risk and subsequent motivation for lifestyle change. Half of the participants had a history of CVD and the other half did not; both groups of individuals were unaware of how strong a risk factor diabetes is for CVD (Carroll et al., 2003). Those with CVD did perceive their risk to be higher than those without CVD; however, they attributed their risk to factors such as stress or family history versus objective medical risk factors such as diabetes, high cholesterol, or smoking (Carroll et al., 2003). Carroll et al noted that this disconnect between patients’ perceptions of health risk and actual risk underscores the importance of clinicians exploring individual health beliefs and perceptions (Carroll et al., 2003).

Those with high awareness of their CVD risk factors do not necessarily have an accurate perception of their CVD risks. In a cross-sectional study, men and women (mean age 55.3 years old) who were admitted for acute myocardial infarction (AMI), were surveyed on their awareness of AMI risk factors, perceived vulnerability, and actual risk factors for AMI (Abed, Khalil, & Moser, 2015). Only a weak positive correlation was found between actual and perceived risk for AMI and those who demonstrated high awareness for their risk factors, did not appropriately perceive their risks (Abed et al., 2015). This study demonstrated that cardiac patients underestimate their risk for future cardiac events and their perceived risk is only weakly associated to their awareness of cardiac risk factors (Abed et al., 2015).

The literature demonstrates that even individuals with preexisting cardiovascular conditions or risk factors for CVD, continue to have inaccurate perceptions of risk for future cardiac events. Based on a prospective study of male and female patients ($N = 220$) between

24 and 84 years of age, who were admitted for either a diagnostic or interventional coronary procedure, Everett, Salamonson, Rolley, and Davidson (2014) found that 50% of individuals considered themselves to be at low risk for CVD six months following the coronary procedure. Similar findings have been reported by others. In a recent cross-sectional survey of men and women ($N = 1453$) with a history of CVD, Thakkar et al. (2016) explored patient's self-perceptions, as well as their general practitioner's assessment for future CVD events. Only 11% of participants reported their chances of future CVD events as being high/very high. Interestingly, general practitioners categorized only 30% of the patients to be at high risk for future CVD events and underestimated all other participants (Thakkar et al., 2016). Not only do patients underestimate their risk for future cardiovascular events, their primary care providers do as well. Thus, more support is needed for health care providers and programs to help patients understand their risk and assist in secondary prevention behaviours (Thakkar et al., 2016).

In addition to research evidence of individuals underestimating their CVD risk, the literature also reveals that some individuals may overestimate their CVD risk. Alwan and associates (2009) used a survey questionnaire to measure actual and perceived risk among men and women aged 40-64 years old ($N = 816$), diagnosed with a variety of CVD risk factors such as hypertension, diabetes, dyslipidemia, or obesity. Their findings revealed that only half of the participants chose to participate in the "perceived risk" portion of the survey. Of those who did complete this component, 48% overestimated their perceived risk in comparison to their actual risk (Alwan, William, Viswanathan, Paccaud, & Bovet, 2009). Other studies report similar findings. For example, in a cross-sectional survey study of diabetic men and women ($N = 95$) with a mean age of 64 years of age, and no history of CVD, Asimakipoulou and associates (2008) found that participants were more likely to overestimate their risk for heart disease or stroke. Lastly, Frigling et al. (2004) reported

overestimation of risk in their study of men and women ($N = 1557$) with hypertension or diabetes and no history of CVD. When surveyed in regard to their perceived CVD risk and actual risk using the Framingham risk score, the majority of participants over estimated their risk.

Abed et al. (2015) contend that awareness of risk factors is important; however, it is insufficient to provide an individual with perception of risk that will align with their actual risk. Researchers have attributed lack of accurate risk perceptions to numerous reasons, including poor knowledge about the link between cardiac risk factors and the occurrence of actual cardiac events, or a coping strategy (Everette et al., 2014). Alwan and associates (2009) found a low perceived risk for CVD is more common in those with higher education, social economic status, and in women more than men. Accurate perceived risk for CVD was found in study participants who were being treated for cardiovascular risk factors (i.e., medications, adoption of a healthy lifestyle) as well in those who were physically inactive (Alwan et al., 2009).

Accurate perception of risk is important because it may lead individuals to make healthier lifestyle or other disease preventative decisions. In a prospective cohort study of men and women with heart disease ($N = 220$), Everette et al. (2014) collected data about demographic, clinical information, psychological status, physical activity, medical adherence, and cardiac rehabilitation. Those who reported lower risk perception were among the individuals who were less likely to attend cardiac rehabilitation and to adhere to their medical regimen (Everett et al., 2014). In another study, patients with accurate perceived risk for CVD are found to be more likely to quit smoking, and to follow health care providers recommendation for antiplatelet, blood pressure lowering therapy or statins, to reduce risk factors (Thakkar et al., 2016). This evidence further supports the contention that having an accurate perception of risk for disease is important.

The majority of CVD risk perception research focuses on the aging population and often neglects to include younger individuals. Although several studies reviewed included younger participants (Hamilton & Lobel, 2015; Jones, Weaver, & Friedmann, 2007; McDonnell et al., 2014), only one study focused exclusively on this population. Green and associates (2003) explored perceived risk of heart disease in a survey of male and female undergraduate college students ($N = 341$) with a mean age of 22.2 years. Sixty-eight percent of participants rated their risks as being considerably lower than their peers, suggesting an optimistic bias about their perceived risk for heart disease (Green, Grant, Hill, Brizzolara, & Belmont, 2003). As well, lower perceived risk for heart disease was associated with exercising at least three times a week. Green and associates concluded that lower perception of risk for disease in younger individuals may be attributed to general optimism youth have in regard to their health.

In summary, individuals tend to have inaccurate perceptions of their risk for CVD. Table 1 provides a summary of the research literature discussed in this chapter. Inaccurate perceptions of risk may be due to various reasons including, over or underestimating risk, or general optimism. Even those with high awareness of their CVD risk factors or a preexisting form of CVD do not have accurate perceptions for their own personal risk for subsequent cardiac events. Thus, further research is needed to explore the possible factors that may influence inaccurate perceptions of CVD risk.

Table 1

Summary of Perceived CVD Risk Research

| Reference & Title | Study Purpose | Methods | Participants (all male and female) | Key Findings | Conclusions |
|--|---|-----------------------------------|---|---|---|
| Abed et al., 2015 Awareness of modifiable acute myocardial infarction risk factors has little impact on risk perception for heart attack among vulnerable patients. | To assess the level of awareness of modifiable risks and perceived vulnerability for AMI among patients | Cross-sectional correlation study | N=231, mean age 55.3 years, 1 st hospitalization for AMI | - a weak positive correlation found between actual & perceived risk for AMI - accurate awareness did not translate to accurate perceived risk | - risk for developing AMI is underestimated among cardiac patients - risk is only weakly linked to awareness of AMI risk factors |
| Alwan et al., 2009 Perception of cardiovascular risk and comparison with actual cardiovascular risk | To explore perception of CVD risk compared to actual CVD risk | Cross sectional correlation study | N=816, ages 40-67 years; dx with CVD risk factors | - only 50% could provide an estimate of their perceived CVD risk, of which, 48% overestimated their perceived risk - accurate perception of risk is strongly associated with SES | - in general, findings of poor CVD perception are compatible with low compliance for treatment of risk factors - future studies should examine how to better impart one's ability to perceive CVD risk |
| Asimakopoulou et al., 2008 Unrealistic pessimism | To examine accuracy of diabetes patients risk estimate of heart disease and stroke secondary to | Cross-sectional correlation study | N=732, ages 25 to 65 years; with diabetes; no hx of CVD | - perception of risk for CVD and stroke over estimated by 3.5 – 5.5 times | - type 2 diabetic patients are unrealistically pessimistic re: risk for developing CVD |

| | | | | | |
|---|---|-----------------------------------|--|--|--|
| about risk of coronary heart disease and stroke in patients with type 2 diabetes. | diabetes | | | | - this may be in part to mood of patients, which improves after receiving accurate risk information |
| Carroll et al., 2003 How do people with Type 2 diabetes perceive and respond to cardiovascular risk? | To explore how people with Type 2 diabetes perceive CVD risk, and how those perceptions might affect their motivation to make lifestyle changes | Cross sectional correlation study | N=20, male and female with diabetes, ages 52 to 77 years, 50% with CVD diagnosis, | - n=7 with and n=3 without CVD accurately rated CVD risk - many not aware diabetes increased CVD risk - accurate risk perception in those with CVD attributed risk to stress, family hx. | - clinicians must explore individuals constructs and health beliefs when assessing risk and how one interprets the meaning of risk |
| Everett et al., 2014 Underestimation of risk perception in patients at risk of heart disease. | To determine if those undergoing a percutaneous coronary procedure is related to their engagement in risk-reducing behaviours | Prospective correlation study | N=221; ages 24 - 84 years, admitted for either a dx or interventional coronary procedure | - 50% considered themselves to be at low risk for CVD 6 months following the coronary procedure - overall underestimation of risk perception among "high risk" cardiac patients - those with lower risk perceptions are less likely to attend cardiac rehab and adhere to a medication regimen | - patients who report lower risk perceptions require additional support from clinicians - clinicians must take advantage of their time with patients to improve perception of risk and need to explore and alternative strategies to convey information |
| Frigling et al., 2004 Perceptions of cardiovascular risk | To examine risk perception in patients with HTN or diabetes | Cross sectional correlation study | N=1557, mean age of 52.4 years old, no hx of | - ~ 50% of participants over estimated their risk by at least 20% | - patients show inadequate perceptions of their risk for CVD |

| | | | | | |
|--|--|-----------------------------------|--|---|--|
| among patients with hypertension or diabetes. | without history of CVD | | CVD | - more women than men overestimated risk | - physicians should provide more information about risk and offer preventive therapy |
| Green et al., 2003 Heart disease risk perception in college men and women | To assess perception of risk for CVD in college men and women | Cross sectional study | N=341, mean age of 22.2 years old | - 68% rate their own risk lower than their peers | - college men and women do not accurately perceive their risks for developing heart disease - general optimistic bias re: CVD risk |
| Thakkar et al., 2016 Inaccurate risk perceptions contribute to treatment gaps in secondary prevention of cardiovascular disease | To examine patients perceived risk for a future secondary cardiovascular event | Cross sectional correlation study | N= 1453, aged 55+ years with known CVD | - 11% reported a high/very high chance for a future CVD event | - helping patients to understand their risk may influence their motivation towards lifestyle modification and risk factor control - support for general practitioners or additional resources may help patients understand their risks and provide opportunity for better secondary preventative behaviours |

Perceived risk and cardiovascular disease in women. Evidence has shown that over the last two decades, women have gained increased knowledge and awareness of their potential risk factors (Mosca et al., 2011). While several studies have examined self-perception of CVD risk versus actual CVD risk in men and women, the evidence is not consistent; as well, a limited number of studies have focused only on women or included women across the lifespan.

In a recent study, Monsuez and associates (2017) used an online survey, including the Framingham risk score and an 88-question survey to explore knowledge, awareness, and self-perception of CVD risk in a convenience sample of highly educated, young to middle-aged American women ($N= 5,882$; 30 to 65 years of age). Participants were recruited through advertisements on local TV and radio channels. The findings revealed that most of the participants perceived their risk for CVD as low to moderate (20.4% and 63.3% respectively). However, of the women who participated in the actual risk score component of the survey, ($n=3,340$), 40.8% were actually at a low risk for CVD, 25.2% were moderate risk and, 33.8% were at high risk (Monsuez et al., 2017). Monsuez et al. (2017) concluded that overall knowledge of CVD risk factors and perceived risk among women were inaccurate as women over or under estimated their actual CVD risk. Most concerning, was that those at high risk underestimated their CVD risk.

Similar findings have been reported by others. In a fairly recent Canadian study, McDonnell and associates (2014) surveyed women ($N = 1654$) to evaluate their heart disease knowledge, actual heart disease risk, attitudes towards responsibility for health, and motivations, barriers, and sources of health information. Despite random sampling, the response rate from women under 45 years of age was low. The findings revealed that women who were at highest risk, were most likely to underestimate their risk. As well, there was a disconnect between perceived and actual heart disease knowledge, with actual knowledge

scores being low to midrange for 23% for those at high risk, and 29% for women with a current heart disease diagnosis (McDonnell et al., 2014).

As previously highlighted, few studies in this area have included younger women; yet, young women are at risk for CVD because of a number of traditional risk factors, as well as risk factors that are exclusive to women, and young women in particular. In a recent prospective cohort study of women diagnosed with a hypertensive disorder in pregnancy, Traylor et al. (2016) surveyed women prior to hospital discharge after giving birth, and again two weeks after discharge. Of the 146 women, 28% were diagnosed with severe preeclampsia, 52.1% had mild preeclampsia; and 19.9% had severe hypertension. However, only those women with severe preeclampsia and those who gave birth preterm, were among the women who recognized themselves at risk for future hypertension or recurrent hypertension disorder in pregnancy (Traylor et al., 2016). As well, regardless of severity, participants did not identify themselves to be at risk for a CVD, such as stroke or myocardial infarction. Traylor et al. (2016) concluded that health education counselling in regard to potential CVD risks is essential for women during the post-partum delivery period to improve their long-term CVD outcomes.

Based on the context of the HBM, few studies have specifically explored perceived susceptibility or seriousness, and subsequent perception of risk for CVD in women. Humphries and associates (1997) examined factors that affect perceived susceptibility to CVD in a convenience sample of American women ($N = 193$) and found that women were aware of risk factors for CVD; however, only a family history of CVD and body mass index were significantly related to increased perceived susceptibility of CVD (Humphries, Krummel, Rye, & Simon, 1997). Although minimal research exists, researchers have examined these concepts using other variables. For example, Jones, Weaver, and Friedmann (2007) examined the perceived susceptibility of women ages 25 to 66 ($N = 48$) following a

pre-and post-test of heart disease knowledge. Fifty-eight percent of women improved their heart disease knowledge, and increased perception of susceptibility increased in 50% of the women. They concluded that this evidence supports health education programs for women to increase their knowledge of heart disease and subsequently, their perceptions to susceptibility for disease (Jones et al., 2007).

Although many women are aware that CVD is the leading cause of death, the magnitude of awareness doesn't necessarily translate into personal perception of risk or to understanding actual personal risk or lead to health promoting behaviours (Kling et al., 2013). Based on the findings of their study of perceived risk, Hamilton and Lobel (2012) explain a woman's accurate perception of disease risk is important for several reasons: women will feel prepared and less vulnerable if illness were to occur, provide better social support for others diagnosed with illness, have motivation to engage in healthy lifestyle and encourage others to do so as well, and lastly, their willingness to support initiatives to improve overall health, such as smoking bans.

In summary, a review of the research literature on perceived risk for CVD revealed inconsistent findings, and few studies have included women across the lifespan. Table 2 provides a summary of findings discussed in this section. Even among women with accurate knowledge of CVD risk, perception of risk for CVD is often inaccurate. Unfortunately, few studies have focused on women, and young women, in particular. Accurate perception of CVD risk is important for women's health and further research is needed to identify the modifying factors that influence perceived risk as a way to improve CVD risk perceptions among women.

Table 2

Summary of Perceived Risk and Cardiovascular Disease in Women Research

| Reference & Table | Purpose | Methods | Participants (all women) | Key Findings | Conclusion |
|--|---|-----------------------------|-----------------------------|--|---|
| Humphries et al., 1997 Sex differences in cardiovascular disease—impact on care and outcomes | To explore perceived susceptibility or seriousness and subsequent perception of risk for CVD in women | A review of the literature | N=193 women | - women are aware of risk factors for CVD however, only a family hx of CVD and BMI were significantly related to increased perceived susceptibility of CVD | - more women need to be enrolled in clinical trials and those results should be reported by gender - heart care providers must increase awareness of women's risks - a necessity for a greater understanding of women's risks over the lifespan |
| Jones, Weaver & Friedmann, 2007 Promoting heart health in women: a workplace intervention to improve knowledge and perceptions of susceptibility to heart disease | To examine the perceived susceptibility of CVD in women after administering a pre- and post-test | Quasi-experimental design | N= 48, ages 25- 66 years | - 58% improved their heart disease knowledge - 50% increased perception of susceptibility to CVD | - perceived susceptibility is not related to knowledge about heart disease risk - health programs and education may be successful to improve knowledge and perceptions of CVD risk |
| McDonnell et al., 2014 Perceived vs actual | To evaluate heart disease knowledge, actual heart disease | Cross sectional correlation | N=1654, ages 25+ years | - women at highest risk are more likely to underestimate their risk | - knowledge of heart disease symptom is poor among most women |

| | | | | | |
|--|--|-----------------------------------|----------------------|---|---|
| knowledge and risk of heart disease in women: findings from a Canadian survey on heart health awareness, attitudes, and lifestyle | risk, attitudes towards responsibility for health, and motivations, barriers and sources of health information | study | | - those at high risk have poor knowledge for CVD risk - less than 50% of women knew major symptoms of heart disease | - a significant number are unaware of their personal risks - further education and interventions are necessary for risk and prevention |
| Monsuez et al., 2017 Awareness of individual cardiovascular risk factors and self-perception of cardiovascular risk in women | To explore knowledge, awareness, and self-perception of CVD risk | Cross sectional correlation study | N= 5882, 30-65 years | - most participants perceived their risk for CVD as low/moderate - overall knowledge of CVD risk factors and perceived risk is inaccurate due to a mix of over and underestimating risk | - knowledge of risk factors and perceived risk are inaccurate in women - greater educational interventions are required |
| Traylor et al. (2016) Risk perception of future cardiovascular disease in women diagnosed with a hypertensive disorder of pregnancy | To explore risk for future CVD in women with preeclampsia | Prospective correlation study | N= 146 | - only those with severe preeclampsia or who gave birth preterm were aware of their future CVD risk - those with mild preeclampsia or severe hypertension did not accurately perceive their future CVD risks | - interventions to improve health risks among women with hypertensive disorder of pregnancy is necessary |

Modifying Factors and Perceived Risk of CVD in Women

Numerous modifying factors can affect perceived risk of CVD in women. Previous research suggests that factors such as age, education level, socioeconomic status, social support, knowledge of the disease, awareness of disease through mass media campaigns or prevention strategies, physician involvement, or family history of disease may all influence perception of risk. Although having accurate risk perception for disease may improve health outcomes, there is a paucity of research literature surrounding this subject area that is specifically done on women of all ages. The following section will review the existing literature in regard to modifying factors and perceived CVD risk.

Demographic variables. Demographic variables included in several perception of risk studies include age, education, and socioeconomic status. Although the evidence related to age is quite consistent, most studies in this area have been conducted on older women. For example, Ammourri and associates (2010) explored perception of risk in men and women ($N = 300$) between 15 and 75 years of age, who had no prior history of CHD. Using the Perception of Risk of Heart Disease Scale (Ammouri & Neuberger, 2008), key findings related to demographic variables included older adults, those with higher levels of education, and the female gender perceived higher risk for CVD. Others have reported similar findings related to age. For example, Hamilton and Lobel (2015) examined factors that influence women's perceived risk for developing chronic disease, including CVD, breast cancer, and lung cancer. They studied 452 younger women (ages 18-25 years) and 167 middle-aged women (ages 40-64 years) and among their findings, middle-aged women had a greater number and variety of factors affecting their risk perception of CVD. Hamilton and Lobel (2015) speculate that increased knowledge and experience and ability to conceptualize disease may result in increased understanding among older women, whereas younger women may have had less informative experiences, decreased understanding of disease, and have

lived through less public health events than older women, thus contributing to the differences in factors affecting their perceived risk for CVD (Hamilton & Lobel, 2015).

Although higher levels of education are commonly found to significantly influence accurate perception of risk (Avis et al., 1989; Frijling et al., 2004), others have reported contrary results. In a cross-sectional survey ($N=805$), Dearborn and McCullough (2009) found poor risk perception and lack of primary prevention behaviours in women ages 50 to 73 years old, who all had at least one risk factor for stroke. The predominantly Caucasian women who had a higher income (33.1% earned $>\$75,000$ annually) and were well educated (28.6% attended graduate or professional school) did not identify their existing health condition as a risk for stroke (Dearborn & McCullough, 2009).

There are a number of other demographic variables that influence perception of risk for CVD among women. Alwan and associates (2009) found that reporting a higher perceived than actual CVD risk is associated with being treated for a CVD risk factor, older age, lower socioeconomic status, and higher BMI. Individuals who report a low perceived risk for CVD included males, those who are younger in age, have less education, a normal BMI, and who exercise regularly (Alwan et al., 2009). Similarly, in a cross-sectional study of perceptions of cardiac risk in diabetic individuals ($N = 143$), most of whom were low income, middle-aged, African American women, Allen et al., (2010) reported an overly pessimistic perception of risk for future CVD events. Their risk perception was attributed not only specific CVD risk factors, but also to perceptions of poor overall health, depressive symptoms, younger age, higher intake of dietary fat, and high BMI (Allen et al., 2010).

Structural variables. According to the HBM, structural variables that may influence perceived risk include knowledge and prior contact with a disease. However, research results in this area of study are variable. While several studies have reported that individuals with CVD demonstrate poor personal risk perception for further disease risk, (Abed, Khalil, &

Moser, 2015; Dearborn & McCullough, 2008; Evertte et al., 2014; Kim et al., 2008), others have found an accurate or overestimation of risk perception in these individuals (Asimakipoulou et al., 2008; Frigling et al., 2004).

Actual risk of CVD has also been explored within the context of a modifying variable for perceived risk and likelihood of taking action towards behaviour change. As discussed in the previous section, evidence regarding the relationship between actual and perceived risk is mixed. While several studies have reported a positive relationship, others have found an inverse relationship between these variables. Factors that may explain these findings include age, severity of risk factors, education level, and socioeconomic status (McDonnell et al., 2014; Monsuez et al., 2017).

Cues to action. The HBM suggests that a cue is necessary to prompt individuals to take action (Sharma & Romas, 2010). There are numerous cues that may occur in the context of health behaviours. For example, family history, media campaigns, advice from others, or the influence of a health care provider may affect health promoting behaviour.

One of the most notable variables that positively affects perceived risk of CVD is a positive family history. Family history is the medical and health information of family members that accounts for 50% of shared genes of first-degree relatives (i.e., parents, full siblings, children) and 25% of genes shared from second-degree relatives (grandparents, grandchildren, aunts, uncles, nephews, nieces, or half siblings) (Imes & Lewis, 2014). As well, there is strong epidemiologic evidence for familial aggregation of CVD (Imes & Lewis, 2014).

A positive family history of CVD and accurate risk perception for CVD has been consistently shown among women in numerous studies (Claassen, Henneman, van der Weijden, Marteau, & Timmermans, 2012; Hamilton & Lobel, 2015; Thanavaro, Moore, Anthony, Narasavage, & Delicath, 2006). However, these results are not always indicative of

health-related behaviours. Family history of CHD has been found to predict health promotion behaviours among women without any history of CVD (Thanavaro et al., 2006). However, Imes and Lewis' (2014) review of the literature on the relationship between a family history of CVD and individuals perceived risk for CVD and their subsequent health-related behavior revealed mixed results. In their review of 25 studies, a positive relationship was noted between those with a family history of CVD and their own personal perception of CVD risks; however, there was not a consistent relationship between those with accurate perception of CVD risk and health-related behaviours in high-risk populations. Similarly, Kip and associates (2002) found that AMI or stroke occurring in an immediate family member, did not appear to lead to any sustained lifestyle modifications in young adults (ages 18 to 30 years) who were assessed for risk factors over two consecutive 5-year periods. Others (Montgomery, Erblich, DiLorenzo, & Bovbjerg, 2003) found that a woman's perceived risk for disease is not only impacted by family history, but also by friends who have been diagnosed with a disease. Interestingly, this factor was not demonstrated to affect perceived risk of disease in the men participating in the same study.

Imes and Lewis (2014) suggest that family history of disease provides awareness to an individual; however, it is not sufficient to change health behaviour. This may be due to numerous reasons. For example, the ability to list family members with CVD is not the same as being aware of your family history or, that a family history is indicative a personal risk for CVD. As well, how family history influences awareness and personal perceived risk is not well understood. Further research is required to determine how positive family history can be used to influence health behaviour changes by including a variety of variables. These variables include, family history of CVD, awareness of family history and family risk, perceived personal risk for CVD, and health-related behaviours to minimize CVD risk (Imes & Lewis, 2014).

Numerous media campaigns in Canada and the United States have aimed to increase awareness of CVD and empower women to reduce their risk for disease. Mass media campaigns are routinely used to reach a wide variety of people over large populations. Often used to influence health behaviours, media campaigns have been effectively used in many health behaviour change areas, such as tobacco, alcohol, nutrition, physical activity, cancer screening, and CVD prevention (Wakefield, Loken, & Hornik, 2010). For example, Go Red for Women (American Heart Association, 2017), the Heart Truth Campaign (National Heart, Lung and Blood Institute, 2016), and Women Heart (Women Heart, 2016) are all campaigns aimed to reduce the burden of CVD among women. However, as Nabel (2015) noted, these campaigns have historically targeted older women. Although improvements in targeting a broader population have been made since the start of the campaigns, given the severity of CVD in women, more remains to be done (Nabel, 2015).

Berry et al. (2015) explored the difference in risk perception between breast cancer and heart disease in association with media representation, by analyzing print and web versions of newspapers and magazines targeted at women. Women were then surveyed and found to have seen significantly more breast cancer than heart disease related media. They also were found to have lower perceptions of seriousness, fearfulness, and extent to which family history determines risk of heart disease. As well, participants felt heart disease was more preventable and a disease they had more control over than breast cancer. However, older women felt more susceptible to heart disease than breast cancer (Berry et al., 2015).

Healthcare providers have an important role in educating individuals on their disease risk, risk factor management, and prevention strategies. Women have been found to believe they are largely responsible for their own health, yet many women rely on their health care professional for guidance and support (McDonnell et al., 2014). McDonnell and associates explored knowledge, perceptions, and lifestyle related to cardiovascular health in women

ages 25 to 75 years ($N = 1645$). Only half of the women reported that discussion of prevention and lifestyle practices were routinely discussed with their health care provider. However, most women (62%) indicated that they would prefer their source of health information be a health care provider (McDonnell et al., 2014).

The importance of health care providers discussing CVD risks and prevention strategies is evident in the literature. Assessing, calculating, and discussing CVD risk in clinical practice has been demonstrated to improve perceived CVD risk (Lu & Harris, 2013; Usher-Smith, Silarova, Schuit, Moons, & Griffin, 2015). Other studies have been found to support the notion that communication between health care providers and women in regard to CVD risk is lacking (Hart, 2005; Leifheit-Limson et al., 2015). Leifheit-Limson and associates (2015) recently examined healthcare provider discussions of CVD risk prior to AMI, in men and women ages 18 to 55 years ($N = 3,501$). Nearly all patients had at least one CVD risk factor and 64% of individuals had 3 or more risk factors. However, only 53% of individuals reported that their health care provider discussed heart disease risk or risk factor management (Leifheit-Limson et al., 2015).

Summary. Numerous modifying factors can affect perceived risk of CVD in women. These factors include: age, education level, socioeconomic status, awareness of disease through mass media campaigns, physician involvement, and family history of CVD. Table 3 provides a summary of the research literature discussed in this section. An accurate risk perception for disease may improve health outcomes; yet, there is a paucity of published literature on perceived risk for CVD among women of all ages. Research in this area may provide insights into how to improve perception of CVD risk among women, thus, improving their health outcomes.

Table 3

Summary of Modifying Factors and Perceived Risk of CVD Research

| Title & Reference | Purpose | Methods | Participants | Key Findings | Conclusion |
|--|--|-----------------------------------|--|--|---|
| Allen et al., 2010 Perceptions of cardiac risk among a low-income urban diabetic population | To determine perception of risk for CVD in an urban, low socioeconomic status population of patients with type 2- diabetes | Cross sectional study | N= 143, predominantly African American women | - those with depressive symptoms, poor perception of general health, and higher intake of dietary fat had significantly higher levels of perceived risk for CVD | - CVD risk needs to be especially evaluated and communicated to those in urban, poor communities as well as those with diabetes |
| Alwan et al., 2009 Perception of cardiovascular risk and comparison with actual cardiovascular risk | To examine perception of CVD risk among adults versus actual CVD risk | Cross sectional correlation study | N=816 men & women, ages 40-64 years | - those being treated with for a CVD risk factor, older age, lower socioeconomic status, and higher BMI resulted in high levels of perceived risk for CVD - males, younger in age, less educated, a normal BMI, and those who exercise regularly had lower perceived risk for CVD | - future studies should determine how risk related information can be best provided to at risk individuals |
| Ammouri et al., 2010 Perception of risk of coronary heart disease among Jordanians | To assess perceptions of risk for coronary heart disease and its association with demographic variables | Cross sectional correlation study | N=300, men & women; ages 15- 75 years | - older adults, those with higher level of education, and females perceived higher risk for CVD - no significant associations between perception of risk or heart disease and health | - education should target young adults, women and those with low education levels |

| | | | | behaviours among individuals | |
|---|---|-----------------------------------|-----------------------------------|--|---|
| Berry et al., 2015 Women's perceptions of heart disease and breast cancer and the association with media representations of the diseases | To examine the difference in perceptions of heart disease compared to breast cancer in regard to media presentations of the diseases | Quantitative content analysis | N = 1524 women, ages 18– 99 years | - women saw significantly more breast cancer than heart disease related media - women felt heart disease was more preventable and could be controlled versus breast cancer | - there is a need to develop strategies regarding the effects of media on healthy perceptions and behaviours |
| Dearborn & McCullough, 2009 Perception of risk and knowledge of risk factors in women at high risk for stroke | To present a theoretical model to understand risk perception in high risk women | Cross sectional correlation study | N=805 women, ages 50 -70 years | - predictors of risk perception included: other women's risk, worrying about stroke, having hypertension, having diabetes - women with higher income, well educated, could not identify their existing risk factor for stroke | - general risk perception was low among women, even those who had at least one risk factor for stroke - educational strategies must improve for high risk women |
| Hamilton & Lobel, 2015 Psychosocial factors associated with risk perceptions for chronic diseases in younger and middle-aged women | To examine factors that influence women's perceived risk for developing chronic disease, including CVD, breast cancer and lung cancer | Cross sectional study | N=452 women, ages 18-25 years | - young women are more likely to be influenced by family hx, perceived greater global perceptions of disease - middle aged women's risk perceptions were influenced by optimism, education and health locus of control | - women may base their risk estimates on factors beyond what healthcare providers may consider - notable differences exist between younger and middle ages women's risk perception |

| | | | | | |
|---|--|--------------------------------|---|---|---|
| Imes,& Lewis, 2014 Family history of cardiovascular disease, perceived cardiovascular disease risk, and health-related behavior: A review of the literature | To review and summarize the published research on the relationship between family history of CVD, perceived risk for CVD and health related behaviour. | A review of the literature | A review of 25 articles | - positive relationship between family hx of CVD and perceived risk - relationship between family hx of CVD and health related behaviour change has been demonstrated - perceived risk for CVD and behaviour change is inconsistent | - awareness of family hx alone is not a sufficient predictor for health behaviour change - future studies should aim to better explain the process of how risk factors may influence health behaviours |
| Kip et al., 2002 Absence of risk factor change in young adults after family heart attack or stroke: the CARDIA Study | To examine if occurrence of heart attack or stroke in an immediate family member increases one's perceived susceptibility | Longitudinal observation study | N= 3950 participants, men and women, ages 18 - 30 years | - MI or stroke did not appear to lead to any sustained lifestyle modifications in young adults who were assessed for risk factors over two consecutive 5-year periods | - interventions should be developed to motivate young adults who have a family hx of CVD |
| Leifheit-Limson et al., 2015 Sex differences in cardiac risk factors, perceived risk, and health care provider discussion of risk and risk modification among young patients with acute myocardial infarction: The VIRGO study | To compare cardiac risk factor prevalence, risk perceptions, and healthcare provider feedback on heart disease and risk modification | Longitudinal observation study | N = 3501 men and women, ages 18 -55 years | - nearly all patients had at least one CVD risk factor and 64% of individuals had 3 or more risk factors - only 53% of individuals reported that their HCP discussed heart disease risk or risk factor management | - young patients do not realize their risk for heart disease despite having significant risk factors - risk is not often enough discussed with healthcare providers, especially in women |

| | | | | | |
|--|--|-----------------------------------|---|---|---|
| Montgomery et al., 2003 Family and friends with disease: Their impact on perceived risk | To examine across a variety of disease, if family history or history of disease in a friend affects one's perceived risk | Cross sectional study | N=522 individuals, men and women, mean age 40 years | - woman's perceived risk for disease is impacted by family hx and friends who have been diagnosed with a disease - neither affected perceived risk among men | - interventions aimed to alter perceived risk should be gender specific - women appear to be impacted by who they know |
| Thanavaro et al., 2006 Predictors of health promotion behavior in women without prior history of coronary heart disease | To determine predictors of health promoting behaviours in women without prior history of CHD | Cross sectional correlation study | N= 119 women, ages 35- 60 years | - smoking history, family hx of CHD, CHD knowledge levels, and perceived barriers to CHD risk modification are best predictors of health behaviour promotion behaviours | - women lack CHD knowledge - women do not engage in health promoting behaviour on a regular basis - healthcare providers are key to examine barriers to healthy behaviours and promote health |

Although several studies have examined perceived risk of CVD in women, more research in this area is required as knowledge gaps still exist in regard to personal risk perception in women across the lifespan. A vast amount of the existing literature includes women who already have a form of CVD and generally focuses on older women. However, perceived risk research on healthy women of all ages is essential to early disease prevention. The results from research that examines risk perception of disease can inform health care providers of specific populations who may require more knowledge, and education to increase their awareness of CVD and associated risk factors. Determining factors that accurately influence risk perception of CVD in women may provide insight into disease preventatives strategies and fill in gaps in knowledge about individuals and the factors affecting perceived CVD risk.

Chapter Summary

Prevention of CVD is key to reducing the overall mortality and burden of this disease among women. As the rates of modifiable risk factors increase, strategies for primary and secondary prevention are of the upmost importance. Although numerous global strategies have been implemented, it is clear that improving knowledge and awareness of CVD is not sufficient, and new perspectives on disease prevention are needed to further reduce the burden of CVD. Now more than ever, health-related behavior is an important issue. Consistent with the HBM, the literature describes various modifying factors that influence perception of risk for CVD. These factors include age, education, knowledge level, family history, and media exposure. However, studies have inconsistent findings as to how these factors influence perception of CVD risk. As well, there is a gap of knowledge in the literature in regard to the perceived risk of CVD in healthy women of all ages. Although current literature continues to recommend women should be better informed of their CVD risks, further insight into perceived risk of CVD is needed so that effective evidenced based strategies can be developed to motivate women of all ages to reduce their risk.

CHAPTER FOUR: METHODOLOGY

This purpose of this chapter is to describe the methods and procedures utilized to explore perceived risk of CVD in female RNs. This includes a description of the research design, sample and setting, measurement instruments, data analysis procedures, ethical considerations, and the dissemination plan.

Research Design

The research design is the overall plan for obtaining answers to a proposed research question (Polit & Beck, 2012). This quantitative study utilized a cross-sectional survey design with random sampling. Cross-sectional designs are advantageous because they are an economical and time efficient method of gathering data at one point in time (Polit & Beck, 2012). With consideration of the benefits of this design and the specific research questions, a cross-sectional design was appropriate for this study. Guided by the Health Belief Model, the study operationalized individual variables to determine the factors that affect the perceived risk of CVD in women.

Sample and Setting

The population of interest was adult females with no history of CVD. The study sample was drawn from female RNs, in the central Canada, urban setting of Winnipeg, Manitoba (MB). Nursing is primarily a female profession, with a broad span of ages, thus providing a convenience sample of the target population. As well, including only RNs provided a relatively homogenous sample in terms of level of education, basic knowledge of CVD risk, and the ability to accurately complete a health-related questionnaire. According to the College of Registered Nurses of Manitoba (CRNM; personal communication with Lindsay Ridgley, Communications Specialist at the CRNM, March 10, 2017) 7801 female RNs in Winnipeg were registered with the CRNM in 2017. However, when study procedures were initiated in 2018, the CRNM no longer asked RNs to identify themselves by gender. As

well, the cost per email increased slightly. Therefore, due to funding constraints, invitation emails were randomly sent out by the CRNM to 7,000 male and female RNs in Winnipeg. Response rates in research depend on numerous factors, such as participant population, length of survey, method of administration, and type of incentive (Guo, Kopec, Cibere, Li, & Goldsmith, 2016). However, in general, when collecting data electronically, as in the current research, a response rate of 20% can be expected (Cottrell et al., 2015).

Inclusion criteria included female RNs currently registered with the CRNM, living in Winnipeg, Manitoba. Exclusion criteria included RNs who self-described as having been diagnosed with any form of CVD, including: ischemic heart disease (myocardial infarction), cerebrovascular disease (stroke), peripheral vascular disease, heart failure, rheumatic heart disease, heart arrhythmia, and congenital heart disease.

Measurement Instruments

Several instruments were selected to measure the variables identified in the research questions. The Perception of Risk of Heart Disease Scale (Ammouri & Neuberger, 2008) was used to determine participants' perceptions of risk for CVD. A non-laboratory-based, online CVD risk survey (Gaziano, Young, Fitzmaurice, Atwood, & Gaziano, 2008) was used to determine actual CVD risk. Lastly, a questionnaire including demographic information and other modifying factors was employed to determine factors that are related to perceived CVD risk. The online survey took approximately 10 minutes to complete, based on pilot testing of the survey by 3 volunteers.

Perception of Cardiovascular Disease Risk

The Perception of Risk of Heart Disease Scale (PRHDS; Ammour & Neuberger, 2008; see Appendix C1; see Table 4) was designed to measure an individual's perception of CVD risk. This 20-item questionnaire is measured on a 4-point Likert scale (i.e., 1 = strongly disagree; 4 = strongly agree). The PRHDS is composed of three subscales, dread risk,

unknown risk, and risk. These subscales are defined based on Slovic's (1992) work on the concept of perceived risk. "Dread risk" is defined at the highest end of perceived risk and associated with a lack of control, and feelings of dread or, fatal consequences. "Unknown risk" is defined as considering dangers or hazards that are not yet visible or known, or, are delayed in their potential cause for harm. "Risk" is associated with reflecting on a hazard that has minimal known outcomes and consequences (Slovic, 1992). These categories include concepts of risk perception that address knowledge, exposure, choices, consequences, and probability of death (Ammouri & Neuberger, 2008). Scoring of the instrument is done by calculating the sum of each subscale, as well as reverse scoring of negative response items (see Appendix D1). Although the categories of "dread risk," "risk," and "unknown risk" place individuals on a continuum from low to high perception of risk, these categories are not clearly defined. However, the research questions in this study could be answered by using the total scores from the scale. Higher total scores indicate higher perception of risk and lower total scores indicate a lower perception of risk for CVD.

Adequate internal consistency values have been reported for each subscale (i.e., .80 for "dread risk," .72 for "risk," and .68 for "unknown risk," and .80 for total scale reliability). Test-retest reliability estimates were .76 for the "dread risk" subscale, .70 for the "risk" subscale, and .61 for the "unknown risk" subscale (Ammouri & Neuberger, 2008). Based on initial psychometric analysis, the PRHDS was found to have face and content validity (Ammouri & Neuberger, 2008). The PRHDS has been used in several previous studies measuring perceived risk of heart disease (Cioe, Crawford, & Stein, 2014; Garza, Harris, & Bolding, 2013; Poomsrikaew, Berger, Kim, & Zerwic, 2012). Reliability of the instrument has been verified and estimated to be .90, .61, and .52 for "dread risk," "risk", and "unknown risk" respectively (Poomsrikaew, et al., 2012).

Table 4

PRHDS items measuring dread, risk, and unknown risk levels

|  | | |
|--|--|---|
| Dread | Risk | Unknown |
| 1. There is a possibility that I have heart disease 2. There is a good chance I will get heart disease during the next 10 years 4. I have a high chance of getting heart disease because of my past behaviors 5. I feel sure that I will get heart disease 7. It is likely that I will get heart disease 8. I am at risk for getting heart disease 9. It is possible that I will get heart disease | 3. A person who gets heart disease has no chance of being cured 11. I am too young to have a heart disease* 12. People like me do not get heart disease* 14. I am not worried that I might get heart disease* 15. People my age are too young to get heart disease* 16. People my age do not get heart disease* | 6. Healthy lifestyle habits is something unattainable* 10. I am not doing anything now that is unhealthy to my heart* 13. I am very healthy so my body can fight off heart disease* 17. My lifestyle habits do not put me at risk for heart disease* 18. No matter what I do, if I am going to get heart disease, I will get it* 19. People who don't get heart disease, are just plain lucky* 20. Heart disease has unknown cause* |

PRHDS = Perception of Heart Disease Risk Scale

*reverse scoring required

Actual Cardiovascular Disease Risk

Actual CVD risk was operationalized with the risk calculator developed by Gaziano et al. (2008; see Appendix C2). This non-laboratory-based CVD risk assessment tool can be used to predict the chances of an individual developing CVD over the next 10 years, in those who do not already have a diagnosis of heart disease or stroke. The risk score is calculated on a risk prediction chart for CVD developed by Gaziano (2008) and places an individual in a risk factor category from low to high (see Appendix D2). This efficient and uncomplicated

scale is similar to other existing CVD risk scales; however, it does not include the requirement of laboratory values, such as cholesterol levels. This is an advantage over other risk assessment scales, which require assessment in a clinical/laboratory setting. Therefore, this was an appropriate scale for this online survey research study.

Furthermore, the Gaziano CVD Risk Assessment tool has been compared to six versions of laboratory-based CVD risk scales and has been found to be comparable in accurately predicting CVD events (Gazinao, et al., 2013). This tool includes questions in regard to CVD risk including: age, blood pressure, smoking status, presence of diabetes or high blood sugar, weight, and height. Risk score is calculated using a prediction chart that involves each participants risk factor profile for CVD (see Appendix D2). Spearman correlation coefficients for this non-laboratory-based measure compared with the laboratory-based scores ranged from 0.88 to 0.986 and is therefore considered an effective primary CVD screening tool (Gazinao et al., 2013).

Demographic Variables/Modifying Factors

The Demographic Questionnaire (see Appendix C3) was developed by the researchers to include factors identified in the research literature that may influence CVD risk perception. These factors include: age, education, socioeconomic status, biggest perceived health threat and communication with health care providers about CVD risk.

Data Collection Procedures

The thesis study was initiated following ethical approval from the University of Manitoba's Education and Nursing Research Ethics Board (ENREB). An application for third party mailing was submitted to the CRNM. Certification of ethical approval was included in this request, as well as all email transcripts (see Appendix A), and the Qualtrics survey link included research subject information and consent forms (Appendix B). Upon approval, CRNM sent an email to a random selection of study participants, currently licensed RNs

living in Winnipeg (N = 7000), with a standard script (invitation email to participate; see Appendix A). A link on the e-mail directed potential participants to the Study Information and Consent Form (see Appendix B) and the online Questionnaire (see Appendix C). The online survey was estimated to take approximately 10 minutes to complete (note: timing based on pilot testing of the survey by 3 volunteers). Consent was implied based on the completion and submission of the online survey questionnaire.

Two recruitment strategies were implemented to encourage study participation. First, a reminder email was sent to potential study participants by the CRNM 10 days after the initial email is sent (see Appendix A2). Participants were told the survey would be available for another 10 days from the date of the reminder. Second, four incentive prizes were awarded to participants, including two “early bird” draws for a \$100 gift certificate and two additional draws for \$100 gift certificates, which were awarded at the end of study. To ensure participant anonymity, the Manitoba Centre for Nursing and Health Research (MCNHR) administered the prize draw by selecting the winners and distributing the incentive prizes, as well as sending out a summary report of the study to those who requested to receive one.

Data Analysis Procedures

The research coordinator for MCNHR was consulted and was actively involved in the data analysis plan and implementation. After extensive data cleaning, the data was analyzed using the SPSS Software program. Descriptive statistics were used to describe the study sample and the perception of CVD risk in female RNs (i.e. research question #1). Bivariate and multivariable analyses were used to answer research questions 2 and 3.

The relationships between CVD risk perception and modifying/demographic variables were initially examined by using bivariate analyses. Independent sample t-test and ANOVA tests were done to determine which variables had a significant relationship with the PRHDS score. As well, multivariate analyses were used to further examine interrelationships to allow

us to determine which variables significantly influenced perceived risk of CVD. For example, Spearman's rank-order correlation was used to determine the strength of the relationship between the modifying factors and perceived risk for CVD. Regression models were used to assess the effects of modifying factors on perceived risk and actual risk of CVD. These models produced adjusted estimates of interrelationships and thereby allowed us to determine which variables were significantly influential on perceived risk of CVD.

Ethical Considerations

This thesis study was initiated following ethical approval by the University of Manitoba's ENREB. Accordingly, the following ethical considerations were addressed.

Informed Consent

Informed consent is necessary in research because it ensures participants have and understand information about the research and are able to consent or decline participation (Polit & Beck, 2012). Research study information and consent forms were provided to all potential participants (see Appendix B). All required information about the survey and participant involvement was included on these forms. Survey consent which was implied by the return of the completed survey, was outlined on the study information and consent form. As stated in the invitation email to participate that was sent out to 7,000 RNs in Winnipeg, Manitoba (see Appendix A), participation in the proposed study was voluntary. Participants had the option to not participate without any consequence.

Anonymity and Confidentiality

Privacy, confidentiality, and anonymity of participants' information was carefully considered through the survey development, data analysis, and dissemination of results. Only the MCNHR managed the data collection and had access to a password protected survey on the Qualtrics Survey online account. Once data collection was complete, data was downloaded directly to an SPSS file. Only PHIA trained MCNHR staff reviewed the data

collected to ensure no personal identifiers were recorded. Researchers were provided with de-identified data in the form of a password protected SPSS file store on the University of Manitoba network drive, only accessibly by the researchers on a personal computer. No copies of the data were kept by the MCNHR. Only the identified researchers had access to the study data after data collection was complete. Any hardcopies of data analysis output will be kept in a locked filing cabinet in the office of the research supervisor (Room 281 Helen Glass Centre for Nursing; University of Manitoba).

Confidentiality was also ensured for participants who wished to be considered for the incentive prizes, as only the MCNHR received the requests and disseminated the prizes. Names were collected online and then stored in a Microsoft Excel file on the network drive, accessible only by the MCNHR staff in charge of conducting the draw and disseminating the summary report. The data collected was deleted from the Qualtrics account by the MCNHR staff after it had been downloaded and verified to be correct. A hardcopy form, including the names of those receiving the incentive prize and their signature acknowledging receipt of the incentives, was stored in a locked filing cabinet in the MCNHR. Online data stored on the University of Manitoba network drive will be deleted by researchers after a maximum of seven years. Hard copies of study data will be disposed of according to the University of Manitoba policies and procedures as confidential waste after the same amount of time. The anticipated date of data destruction is April 2025.

Voluntary Participation

As stated in the invitation email to participate that was sent out to all RNs in Winnipeg, Manitoba (see Appendix A), participation in the proposed study was voluntary. Participants had the option to not participate without any consequence.

Deception

Deception in research occurs when participants are not correctly informed of all the study details or, information about the study is withheld (Polit & Beck, 2012). No form of deception was used in this study. Participants were informed of the intent, duration, and inclusion requirements to participate.

Feedback/Debriefing

Researchers must show respect and mindfulness for the interactions they have with participants and show consideration for any potential concerns for their well-being (Polit & Beck, 2012). Participants had the option of receiving a summary of the study findings which will be emailed to them at the end of the study by a MCNHR staff member, in or around September, 2018. Due to the possible perceived suggestive nature of questioning participants about their perceived risk of CVD, possible feelings of anxiety, fear, or questions may have arisen from the participants. The cover letter provided with the questionnaire included contact information for the researcher. Participants were encouraged to use the contact information to address any immediate concerns or anxiety or to contact their employee resources department to seek assistance.

Risk and Benefits

Researchers must ensure that the benefit of research outweighs potential risks to protect participants, inform potential participants of any possible risks and benefits so they can decide to participant or not, and ensure the risk/benefit ratio is acceptable (Polit & Beck, 2012). There were minimal anticipated risks to the participants as a result of participating in this study. The questionnaire package included an information letter and consent form explaining the aim of the study and that minimal risk was anticipated. However, due to the possible perceived suggestive nature of questioning participants about their perceived risk of CVD, possibly feelings of anxiety, fear, or questions may have arisen from the participants

during their completion of the survey. The consent form provided with the questionnaire included contact information for the researcher. Participants were encouraged to use the contact information to address any immediate concerns or anxiety, or to contact their employee human resources department to seek assistance.

Participants were also informed that although there may be minimal benefit to the individual in this study, the aim is to benefit women in the future, by contributing to a better understanding of the perception of CVD risk among women. Although participants were not paid for their participation, they were eligible to win one of four \$100 Chapters bookstore gift cards.

Compensation

There was no cost to participate and no compensation was provided to study participants. All participants were given the opportunity to enter a draw to win one of four \$100 gift cards to Chapters bookstore. At the end of the survey, participants were asked if they would like to enter this draw and if so, to provide their name and email address. Two draws (an “early bird” draw for 2 of the \$100 gift cards, and a second draw for two \$100 gift cards at the end of data collection) were administered and awarded by the MCNHR at the end of data collection.

Dissemination Plan

The first priority for dissemination will be to provide a study summary to the participants, which is anticipated to be in September 2018. An abstract will be submitted for presentation at the Scientific Sessions of the Canadian Council of Cardiovascular Nurses as part of the annual Canadian Cardiovascular Congress in 2019. As well, the findings may be presented at the annual Canadian Council of Cardiovascular Nurses (Manitoba Chapter) Educational Learning Event in 2019. The research findings will also be presented at the MCNHR Seminar Series, which uses Manitoba Telehealth videoconferencing technology to

disseminate research findings across the province. Opportunities to present study findings at educational sessions at healthcare facilities in Winnipeg will be explored. As well, after study completion, a manuscript will be submitted for publication to a peer reviewed cardiovascular nursing journal.

Chapter Summary

In summary, this chapter outlined the methodology for the thesis study. A quantitative approach utilized a cross-sectional survey design, with random sampling to explore perception of CVD risk in women. Measurement tools for perception of CVD risk, actual CVD risk, demographic and modifying factors were chosen to operationalize the key study concepts and answer the research questions. Ethical considerations were addressed throughout the planning, implementation, and evaluation procedures. Thus, sound methodology for this study was established.

CHAPTER FIVE: RESULTS

This chapter presents the findings of the thesis research study. Specifically, the data analysis related to the following research questions are discussed:

1. What is the perception of CVD risk in female RNs in Winnipeg, Manitoba, as measured by the Perception of Risk of Heart Disease Scale?
2. What is the relationship between perception of CVD risk and modifying variables, including demographic, socio-psychological and structural variables, and cues to action (i.e., education, greatest health fear, media influence, healthcare provider contact in regard to CVD risk, family history, and socioeconomic status), among female RNs in Winnipeg, MB?
3. What is the relationship between actual and perceived risk of CVD in female RNs in Winnipeg, Manitoba, as measured by a non-laboratory-based CVD risk assessment tool and the Perception of Risk of Heart Disease Scale?

Data for this study were collected over a 20-day period from April 24th, 2018 to May 9th, 2018. The survey was sent to a random sample of 7,000 registered nurses who were residing in Winnipeg, Manitoba. After accounting for emails that were not delivered for a variety of reasons (e.g., bounced back, blocked, or deferred), 6,809 were successfully delivered. A total of 884 questionnaires were completed and returned. The data from these questionnaires were entered into the Qualtrics internet survey program. With the guidance and support from the research coordinator from MCNHR, results were transferred to an excel spreadsheet, data cleaning and coding procedures were performed and statistical analysis was completed using SPSS computer software.

Although the invitation email stated the target population as female nurses without a history of CVD, the survey questionnaire included two questions to confirm both of these eligibility criteria. As such, nine participants stated they had a history of CVD and four

participants were male, and therefore ineligible to participate. After extensive data cleaning, 55 participants were found to have incomplete answers and removed from the data set. Therefore, 816 participants were included in the data analysis (see Figure 5).

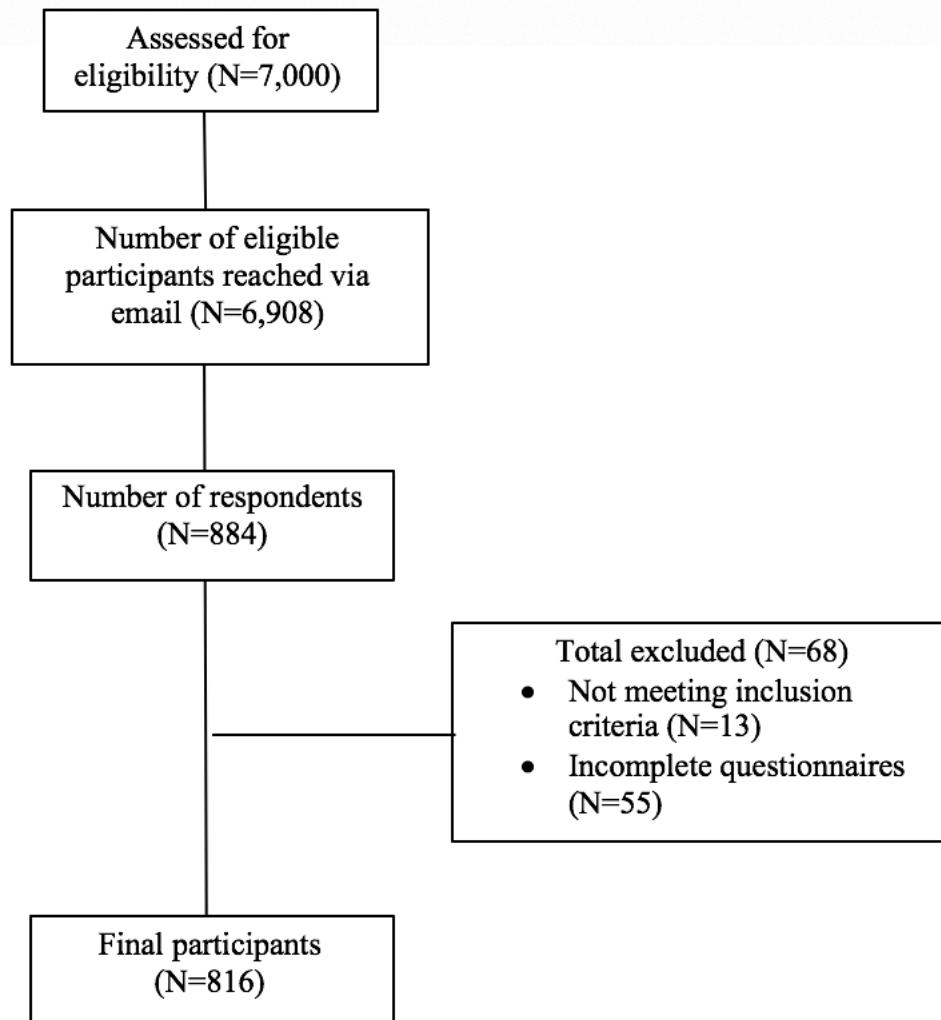


Figure 5: Flow Chart of Study Participants

Demographic Data

Table 5 presents a summary of the demographic data. Univariate analysis was used to describe the sample and provide a summary of the data set. Descriptive statistics are accomplished by describing measures of central tendency (i.e., mean, medium) or measures of variability (i.e., range, standard deviation; Morgan, Leech, Gloeckner, & Barrett, 2013).

The survey was successfully sent to a random sample of 6,809 RNs who resided in Winnipeg, Manitoba, with 816 complete and valid returned surveys. Therefore, the response rate for this study was 12%. The initial email had a 55.5% open rate (i.e., e-mail opened by the recipient) and the second reminder email had a 40.6% open rate (personal communication: Kristin Hancock, Manager of Communications, CRNM, 4/5/18).

The study participants ranged in age from 22 to 76 years, with a mean age of 45 years. Most participants were less than 65 years of age, with 30% in the lowest age category of 34 years and younger. The majority of participants were staff nurses ($n=540$; 66.2%) with a bachelor's degree in nursing ($n=502$; 61.5%), and a household income of \$75,001-\$125,000 ($n=340$; 41.6%).

Although criteria to participate in this study excluded those with a history of CVD, 13% of participants reported that they had been referred to a cardiologist. The mean age of those who had been referred to a cardiologist was 54.4 years and those who had not was 43.7. While most ($n=659$; 75.6%) of the participants reportedly had a family history of CVD (see Table 6), only 27.5% had discussed risk for CVD with their primary health care providers (HCP). The mean age of those who had a discussion in regard to CVD risk, was 51.7 years, and those who had not, was 42.6 years. Lastly, of those who were reportedly aware of CVD prevention campaigns (40.4%), the majority cited the Heart and Stroke Foundation of Canada (17.6%). Surprisingly, nearly 60% of participants were reportedly not aware of any CVD prevention campaigns. There was no significant age difference between those who were aware of any CVD campaigns ($M=47.4$) and those who were not ($M=43.5$).

Table 5

Sample Description: Demographic Factors (N=816)

| Factor | #/Mean/Medium/Range | %/SD |
|---|--|----------|
| Age | Mean= 45.1 Median= 46.5 Range= 22-76 | SD=13.18 |
| ≤34 years | n= 242 | 29.7% |
| 35-44 years | n= 133 | 16.3% |
| 45-54 years | n= 200 | 24.5% |
| 55-64 years | n= 202 | 24.8% |
| ≥65 years | n= 39 | 4.8% |
| Primary role as a registered nurse | | |
| Staff nurse | n= 540 | 66.2% |
| Administrator/manager | n= 79 | 9.7% |
| Educator | n= 62 | 7.6% |
| Other | n= 135 | 16.5% |
| Education | | |
| Diploma | n= 226 | 27.7% |
| Bachelor degree in nursing | n= 502 | 61.5% |
| Other undergraduate degree | n= 24 | 2.9% |
| Graduate degree | n= 64 | 7.8% |
| Greatest health fear | | |
| CVD | n= 346 | 42.4% |
| Breast Cancer | n= 150 | 18.4% |
| Other (e.g., all cancers, diabetes, dementia) | n= 314 | 38.5% |
| Discussed CVD with primary HCP | | |
| No | n= 592 | 72.5% |
| Yes | n= 224 | 27.5% |
| Cardiologist referral | | |
| No | n= 709 | 86.9% |
| Yes | n= 107 | 13.1% |
| Awareness of CVD prevention campaigns | | |
| No | n= 485 | 59.4% |
| Yes | n= 330 | 40.4% |
| Family history of CVD | | |
| No | n= 199 | 24.4% |
| Yes | n= 617 | 75.6% |
| Combined household income | | |
| ≤\$75,000 | n= 131 | 16% |
| \$75,001 - \$125,000 | n= 340 | 41.6% |
| \$125,001 - \$175,000 | n= 215 | 26.4% |
| ≥\$175,000 | n= 104 | 12.8% |

Table 6

*Sample Description: Family History of CVD **

| Relationship | n | % |
|--|-----|-------|
| Father | 301 | 36.9% |
| Mother | 173 | 21.2% |
| Grandparent | 300 | 36.8% |
| Other (e.g., sibling, aunt, uncle, etc.) | 164 | 20.1% |

*Note: not mutually exclusive

Analysis of Study Research Questions

The following is a summary of the statistical analysis for each of the primary study research questions.

Research Question #1. What is the perception of CVD risk in female RNs in Winnipeg, Manitoba, as measured by the Perception of Risk of Heart Disease Scale?

This research question was addressed by asking participants to complete the 20-item PRHDS questionnaire measuring perception of CVD risk on a 4-point Likert scale (i.e., 1= strongly disagree, 4 = strongly agree). Table 7 presents the frequency distribution of the responses. Standard deviation (SD) describes the amount of variation or dispersion of a dataset in regard to its mean (Bannon, 2013). In other words, the higher the standard deviation, the more the range of data. The PRHDS has a total possible range of scores between 20-80. The range for participants was 41-72, with a mean score of 53.5. Higher scores on the PRHDS scales indicate a higher perception of risk for heart disease. In addition to total PRHDS scores, sub-scores are summed across sub-scales described as: “dread risk”, “risk”, and “unknown risk” (see Table 4). As described in Table 7, the “unknown risk”

variable had a high mean, relative to the possible range, in comparison to the other categories, indicating participants scored high in the questions included in the “unknown risk” category.

Table 7

Perception of Heart Disease Risk: Mean and Standard Deviation for Continuous Variables (n=816)

| Variable | M | SD | Possible range | Actual range |
|--------------|-------|------|----------------|--------------|
| Total PRHDS | 53.5 | 4.72 | 20-80 | 41-72 |
| Dread Risk | 15.45 | 3.06 | 7-28 | 7-28 |
| Risk | 16.73 | 2.14 | 6-24 | 11-23 |
| Unknown Risk | 21.32 | 2.25 | 7-24 | 15-24 |

PRHDS = Perception of Risk for Heart Disease Scale

The relationship between participants’ ages and PRHDS scores was also examined and found to have a positive correlation ($p \leq .01$). Interestingly, the actual range of scores is similar among all the age groups (see Table 8). This indicates that women of all ages in this study had similar scores across the continuum of lowest to highest risk perception.

Table 8

Perception of Risk for Heart Disease Scores by Age

| Age Category | n | PRHDS Score (M) | Actual range |
|-----------------|-----|-----------------|--------------|
| ≤34 years | 242 | 52.5 | 42-69 |
| 35-44 years old | 133 | 53.9 | 42-68 |
| 45-54 years old | 200 | 54.1 | 42-66 |
| 55-64 years old | 202 | 53.7 | 41-72 |
| ≥65 years | 39 | 54.5 | 45-65 |

PRHDS = Perception of Risk for Heart Disease Scale

In summary, the perception of risk in women in this study was moderate on the PRHDS. Across the different age groups, the mean PRHDS and the range of scores was similar.

Among subscales of the PRHDS, scores were proportionately higher in the “unknown risk” category.

Research Question #2. *What is the relationship between perception of CVD risk and modifying variables, including demographic, sociopsychological and structural variables, and cues to action (i.e., age, primary nursing role, education, greatest health fear, HCP contact in regard to CVD risk, media influence, family history, and socioeconomic status), among female RNs in Winnipeg, MB?*

This research question was addressed by analyzing the responses from the PRHDS and the demographic survey, using bivariate analyses. Bivariate analysis is used to determine a relationship when there is more than one variable. The data was found to be normally distributed and passed all assumption tests. Therefore, independent t-tests, and one-way ANOVA tests were conducted to determine which variables were statistically significant in predicting perception of risk for CVD. The independent t-test determines if there is a difference between the mean score of two independent groups (Bannon, 2013). For example, the t-test was used to determine if there was a statistically significant difference between those who feared breast cancer and those who feared CVD, and their perception of risk for CVD. The second test used, one-way ANOVA, is a parametric statistical procedure that is used when there are two or more independent categorical variables (Bannon, 2013). For example, this was used to determine if there was any statistical significance between different levels of income on perception of risk for CVD.

Table 9 highlights the four variables that were found to have a statistically significant association to perception of risk for heart disease, as measured by the total PRHDS, including: age, fearing CVD vs breast cancer risk, discussion with HCP regarding CVD risk, and family history of CVD. All four variables were found to be significant at $p \leq .01$. Of note, those ages 45 to 64 years, were found to have a statistically significant higher perception of

CVD risk in comparison to those aged 34 years and younger. The oldest age group of those ages 65 years and older were not found to have statistical significant difference among the other age groups, likely due to the small sample size in that age category.

Table 9

Mean and Standard Deviation of Risk Perception Associated with Demographic Characteristics

| | PRHDS | PRHDS | PRHDS | Total Risk | n |
|--|------------------------|---------------------------|------------|---------------------------|-----|
| | Dread Risk | Risk | Unknown | PRHDS Risk | |
| Age Category⁺ | | | | | |
| ≤34 years | 14.9±3.1 ^b | 16.23±2.2 ^{a, b} | 21.34 ±2.2 | 52.5±4.22 ^{a, b} | 242 |
| 35 – 44 years | 15.77±3.2 | 16.95±2.2 | 21.18±2.1 | 53.9±4.39 | 133 |
| 45-54 | 15.74±2.9 ^b | 17.08±2.0 ^a | 21.25±2.2 | 54.1±4.28 ^a | 200 |
| 55-64 | 15.5±3.0 | 16.75±2.1 ^b | 21.4±2.3 | 53.7±3.89 ^b | 202 |
| ≥65 | 15.72±2.9 | 17.1±2.3 | 21.7±3 | 54.5±4.15 | 39 |
| Greatest Health Fear[^] | | | | | |
| CVD | 16.65±2.9 | 17.3±2.1 | 21.15±2.2 | 55±4.6* | 346 |
| Breast cancer | 14.48±3 | 16.2±2.2 | 21.51±2.4 | 52±4.7 | 150 |
| HCP discussion about CVD risk[^] | | | | | |
| No | 15.17±3.1 | 16.54±2.1 | 21.31±2.3 | 53±4.8 | 592 |
| Yes | 16.20±2.8 | 17.22±2.1 | 21.38±2.2 | 54.8±4.3* | 224 |
| Family history of CVD[^] | | | | | |
| No | 14.16±2.9 | 16.19±2.2 | 21.66±2.4 | 52.01±4.5 | 199 |
| Yes | 15.87±3 | 16.9±2.1 | 21.22±2.2 | 54±4.7* | 617 |

PRHDS = Perception of Risk for Heart Disease Scale

⁺ANOVA

[^]t-test

^a = statistically significant difference @ p ≤ .01

^b = statistically significant difference @ p≤ .05

* = significant @p≤.01

A multiple regression analysis was run to determine the significant predictors of perception of heart disease risk, as measured by the continuous dependent variable (i.e., the PRHDS). The independent variables included age, fearing CVD as one's greatest health risk, discussion of CVD risk with a primary HCP, and family history of CVD (see Table 10). A multiple regression analysis determines how much of the variation in the dependent variable can be explained by all independent variables in a linear combination (Bannon, 2013). This is advantageous over a simple linear regression that is used with only one continuous independent variable. Rather, a multiple regression is used with one dependent variable that is measured at a continuous level and two or more independent variables are measured at either a continuous or nominal level (Laerd Statistics, 2015).

Table 10

Summary of Multiple Regression Analysis of Significant Predictors of Perception of Heart Disease Risk

| Variable | B | SE _B | β |
|----------------------|--------|-----------------|--------|
| Intercept | 51.634 | .647 | |
| Age | .027 | .013 | .076* |
| Greatest health fear | -.841 | .141 | -.202* |
| HCP discussion | 1.143 | .374 | .108* |
| Family history | 1.558 | .369 | .142* |

B= unstandardized regression coefficient, SE_B = Standard error of the coefficient; β= standardized coefficients; HCP = health care provider

* p ≤ .05

The multiple regression model significantly predicted perception of CVD risk, F(4, 811) = 22.808, p < .05. $R^2 = 10.1\%$, with an adjusted R^2 of 9.7%. R^2 is a measure that explains the proportion of variation in the dependent variable that is explained by the independent variables (Laerd Statistics, 2015). In this analysis, the independent variables in the regression model explained 10.1% of the variability of the dependent variable. However, this result is

considered a positively-biased estimate of the proportion of the variance of the dependent variable. Therefore, to remove this bias and be generalized to a larger population, R^2 adjusted is considered (Laerd Statistics, 2015). In this sample, R^2 adjusted was 9.7%. All four variables contributed significantly to the variation in the dependent variable, $p < .05$. In other words, as age increased in the participants, so did their perception of risk for heart disease. Those who feared CVD at their greatest health risk, discussed CVD risk with their healthcare provider, and those who had a family history of CVD, were more likely to have a higher perception of risk. Regression coefficients and standard errors are highlighted in Table 10, as well as, the multiple regression model summary of the R^2 described in Table 11.

Table 11

Multiple Regression Model Summary^b

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------------------|----------|-------------------|----------------------------|
| .318 ^a | .101 | .097 | 4.48 |

^aPredictors (Intercept), age, fear of cardiovascular disease, healthcare provider discussion of CVD risk, family history of CVD

^bDependent variable: total Perception of Risk for Heart Disease Scale score

In summary, four variables were found to have a statistically significant association to perception of risk for CVD, as measured by the total PRHDS. These variables included: age, fearing CVD risk as one's greatest health fear, discussion with HCP regarding CVD risk, and a family history of CVD. A multiple regression model demonstrated these factors explained 9.7% of the variability in the dependent variable.

Research Question #3. *What is the relationship between actual and perceived risk of CVD in female RNs in Winnipeg, Manitoba, as measured by a non-laboratory-based CVD risk assessment tool and the Perception of Risk of Heart Disease Scale?*

This research question was addressed by analyzing the relationship between actual CVD risk and perception of CVD risk. Descriptive statistics were used to describe risk factors for CVD (see Table 12), as well as actual CVD risk among participants (see Table 13), as operationalized by the non-laboratory-based method for assessment of CVD risk (Gaziano, 2008). When analyzing a continuous and an ordinal variable, Spearman's rank-order correlation was used to measure the strength and direction of the relationship between actual CVD risk and perceived risk for CVD. This test was selected over the Pearson's correlation, which requires two continuous variables. The analysis identified a significant positive correlation between actual CVD risk and perception of risk, $r_s = .133$, $p < .05$.

Table 12

Sample Description: Risk Factors for CVD (N=816)

| Risk Factor | Subcategory | n (%) | PRHDS (M) |
|----------------|-----------------------|------------|-----------|
| History of DM | Yes | 45 (5.5) | 55.1 |
| | No | 771 (94.5) | 53.4 |
| Smoking | Yes | 36 (4.4) | 56.1 |
| | No | 780 (95.6) | 53.4 |
| History of HTN | Yes | 114 (14) | 54.9 |
| | No | 702 (86) | 53.3 |
| BMI | Underweight: >18.5 | 11 (1.3) | 52.3 |
| | Normal: 18.5 – 24.9 | 339 (41.5) | 52.6 |
| | Overweight: 25 – 29.9 | 245 (30) | 53.2 |
| | Obese: ≥30 | 221 (27.1) | 55.3 |

PRHDS = Perception of Risk for Heart Disease Scale; DM= diabetes mellitus; HTN= hypertension; BMI = body mass index

Table 13

Sample Description: Actual Cardiovascular Disease Risk Among Female Registered Nurses (N=816)

| Level of Risk | n | % | Age (M) | PRHDS (M) |
|------------------|-----|------|---------|-----------|
| Very low <5% | 372 | 45.6 | 33 | 52.9 |
| Low 5-10% | 240 | 29.4 | 51.4 | 53.7 |
| Moderate >10-20% | 160 | 19.6 | 58.3 | 54 |
| High >20-30% | 30 | 3.7 | 63.5 | 54.2 |
| Very high >30% | 14 | 1.7 | 67.5 | 57.2 |

PRHDS = Perception of Risk for Heart Disease Scale

As described in Table 12, the majority of women had low rates of diabetes, smoking or hypertension. As well, the majority of women had overall low risk for CVD (see Table 13). Age and PRHDS scores both had positive correlations with actual risk ($p \leq .01$). Interestingly, of the women who stated CVD was their greatest health fear ($n=346$), the majority (42.5%) were at very low (<5%) risk for CVD. Only 41.9% of those at moderate risk and 50% of those at high risk had discussed their risk with their HCP. On examination of the individual risk factors among the women who had discussed their CVD risk with their primary HCP, 75.6% reportedly had a family history of CVD, and 57.1 % were either overweight or obese. Lastly, 72% of those who were aware of CVD prevention campaigns were within the low CVD risk categories for actual CVD.

Finally, a multiple regression analysis was conducted to include the variable of actual CVD risk. However, actual risk for CVD was not a significant predictor for perception of CVD risk when included in the regression model, and discussion of CVD risk with a HCP and family history remained the two most significant predictors of CVD risk perception.

In summary, there was a positive correlation between perceived and actual CVD risk among the study participants. As well, both actual and perceived risk for CVD increased with

age in this sample. Overall, the majority of the participants in this study were at low risk for CVD.

Chapter Summary

This chapter reported the findings as they related to the research questions of this study. Univariate, bivariate, and multivariate tests were used to address these questions and determined the perception of risk for CVD among female nurses, modifying factors that influence perceived risk of CVD, and lastly, the relationship between actual and perceive risk of CVD among female nurses in Winnipeg, Manitoba.

Descriptive statistics were used to analyze the demographic data. A large proportion (75.6%) of participants reportedly had a family history of CVD; however, only 27.5% of participants had discussed their risk for CVD with their primary HCP. Surprisingly, almost two-thirds (60%) of participants were not aware of any CVD prevention campaigns.

This study sample had a moderate score ($M=53.4$) on the PRHDS. Bivariate and multivariate regression models with perception of CVD risk as the outcome, indicated a significant relationship between perception of CVD risk and age, fearing CVD as one's greatest health risk, having discussions about CVD risk with one's primary HCP, and a positive family history of CVD. These study findings highlight the key factors that may influence perception of CVD risk. Lastly, there was a significant low positive correlation between actual CVD risk and perception of risk. These results will be discussed in the next chapter.

CHAPTER SIX: DISCUSSION

This chapter provides a discussion of the research study findings, based on the results reported in Chapter Five. Specifically, the results related to the sample demographics and research questions will be addressed. Study limitations, strengths and weaknesses of the Health Belief Model as applied to the current research, and implications for nursing practice, education, and future research will also be discussed in this chapter.

Health Belief Model

The HBM provides insights into health behaviours and factors that affect the decision-making process and therefore, it was chosen as the framework to guide this thesis research. The results of this study will be discussed within the context of the HBM and the current pertinent literature in the area of perceived risk for CVD in women.

Modifying Factors

Consistent with the HBM, the literature describes various modifying factors that influence perception of risk for CVD. Based on this body of literature, the current study examined several of the key modifying factors, including: demographic variables (i.e., age, role as a nurse, education level, income), structural variables (i.e., greatest health fear), as well as cues to action (i.e., discussion of CVD risk with HCP, awareness of CVD prevention campaigns).

Demographic variables. This section will provide a summary of the demographics of this study's participants. Demographic information is important as it establishes the characteristics of the study sample and helps to determine if the sample is representative of a greater population of interest. Specific demographic statistics for RNs residing in Winnipeg, Manitoba were not accessible. Therefore, applicable data were drawn from the Canadian Nurses Association (CNA; 2016). This information provides a context for comparison of the study participants and RNs in Manitoba.

The study survey was sent to 7,000 RNs residing in Winnipeg. With 816 completed surveys, the response rate was 12%. This is considered to be somewhat low in survey research, as a typical response rate for an electronic survey is 20% (Cottrell et al., 2015). However, responses from over 800 nurses in the current difficult climate for nurses in Manitoba is better than anticipated.

To put the total number of RNs in perspective, in 2017 there were 13,682 practicing RNs in Manitoba, Canada (CRNM, 2017). In 2017, 7801 female nurses who were registered with the CRNM resided in Winnipeg. Therefore, with 7,000 emails sent out, most female nurses in Winnipeg would have had the opportunity to participate in this study. The CRNM no longer asks registrants to identify themselves by gender. Therefore, the survey had to be sent out to both males and females, with a description of the target population of females in the invitation email, as well as in the survey. Based on statistics from 2016, nursing is primarily a female profession with 91.3% registering as female (CNA, 2016). Thus, presumably, most of the 7,000 surveys were sent to female nurses.

The average age of the participants was 45.1 years, with a range from 22 to 76 years old, which was essentially the same as the average age of a RN in Manitoba of 45.2 years (CNA, 2016). While the majority of participants in this study were staff nurses (66.2%), the rest of the participants were made up of administrators or managers (9.7%), educators (7.6%), and 16.5% identified as “other.” Data regarding the nursing roles in the “other” category were not elicited. In 2016, 75.7% of Manitoban nurses self-identified as being a staff nurse, 6.0% as a manager and 17.3% were categorized as “other.” Thus, the sample was fairly representative of Manitoba nurses.

The current study sample was predominantly made up of RNs who had reportedly earned a bachelor’s degree in nursing (61.5%). Others reported a nursing diploma (27.7%), other undergraduate degree (2.9%), and graduate degree (7.8%). According to CNA (2016),

55.8% of RNs in Manitoba have earned a bachelor's degree, 41.2% have a diploma and lastly, 3% have a master's or doctorate. Not surprisingly with this population, the majority of participants (24.1%) stated they had a combined household income of \$75,000 - \$100,000.

Thus, overall, in terms of age, gender, primary role as a nurse, and type of nursing education, this study sample was representative of all nurses in Manitoba. The fairly large sample size recruited for the study also substantiates the representativeness of the sample.

Structural variables. While over 40% of participants selected CVD as their greatest health fear, 18.4% feared breast cancer. However, the "other" descriptive answers of their greatest health fear included more than 10% of participants who stated they feared cancer in general. Thus, overall, about 30% of the participants reported cancer as their greatest health fear. The mean ages of those who feared CVD, breast cancer, and any other cancer were similar at 45.6 years, 44.2 years and 43 years, respectively. These results differ from previous literature as women typically fear breast cancer over any other disease (Berry et al., 2015; National Heart, Lung, and Blood Institute, 2012). However, typically younger women fear increased susceptibility to breast cancer relative to CVD, and older women fear CVD over breast cancer (Berry et al., 2015), which may, in part, explain the findings in the current study.

This study's findings that over 40% of the participants considered CVD as their number one health fear, is inconsistent with previous research. Yet, their fears are appropriate, as five times as many women die from heart disease as breast cancer (Heart and Stroke Foundation, 2017). An AHA survey found that only 56% of women could accurately identify heart disease as the number one killer of women (Mosca et al., 2013). In addition, the literature also provides evidence that knowledge of CVD risks may not translate to an accurate understanding of true personal risk, thus, explaining why women are most often

found to fear breast cancer over any other disease (Kling et al., 2013; McDonnell et al., 2014).

Interestingly, in the previous research literature, perceived CVD risk is most often compared to perceived risk for breast cancer. This study provides evidence that women may fear cancer of all kinds, not just breast cancer. There are a few possible explanations for why the study participants selected CVD as their greatest fear. Given the high health literacy and the nursing education of the study population, these women may more accurately perceive general health risks. As well, the leading nature of the survey in itself, may have influenced participants to select CVD as their greatest health fear. Lastly, the large number of participants (75.6%) who had a family history of CVD, may have also been a factor that influenced their greatest fear.

Cues to Action. Less than 30% of study participants reportedly had discussions about their CVD risk with their primary healthcare provider. The mean age of the women who reported having a discussion with their healthcare provider was 51.7 years compared to 42.6 years in those women who had not, suggesting that age may be a factor in these discussions. Similarly, the Heart and Stroke Foundation of Canada (2017) reports only 20% of women's doctors talk to them regularly about heart health. As well, other studies have reported similar findings, supporting the contention that communication between health care providers and women in regard to CVD risk is lacking (Hart, 2005; Leifheit-Limson et al., 2015). Even more concerning, Thakkar and associates (2016) have found general practitioners to underestimate the risk for future CVD events among their patients, which may imply a lack of physician knowledge about women's risk for CVD.

While the overall actual CVD risk of the participants was low (see Table 12), assessing for individual CVD risk factors is an important primary prevention strategy. Women have been found to need the guidance and support from their healthcare

professionals in order to take responsibility for their own health (McDonnell et al., 2014).

Although the majority of this study sample was of low CVD risk, they still reported various risk factors (see Table 12). The low percentage of women who had discussed CVD risk with their HCP in this study was concerning but may be due to the relatively younger age of the participants. This may also be indicative of HCPs not addressing patients who have single CVD risk factors, versus those with an accumulation of risk factors. Lastly, as described in previous research, HCPs may underestimate CVD risk in women, and not include CVD prevention in their assessments and patient education (Thakkar et al., 2016).

Surprisingly, only 40.4% of participants in this study were reportedly aware of any CVD prevention campaigns and of these, most were not able to list or describe actual campaigns. Previous researchers have noted that women are more aware of breast cancer related media (Berry et al., 2015). As well, older women are more often found to be aware of CVD campaigns than their younger counterparts, likely due to the older women typically being featured in these campaigns. The mean age for those who were aware of CVD campaigns in this study was 47.4 years and slightly less (i.e., 43.5 years) for those who were not aware of CVD campaigns. However, based on the study population of RNs, one would assume that they may have heightened awareness for health-related campaigns.

Among those who stated they were aware of CVD prevention campaigns, the descriptions of the actual campaign names or topics were lacking. Less than 20% of participants cited the Heart and Stroke Foundation of Canada. Others (18.4%) cited various general campaigns, such as smoking cessation, importance of exercise and general wellbeing. In general, very few were able to specifically identify campaign names or organizations, such as: Go Red for Women, Think “FAST”, The Heart Truth Red Dress Campaign, My Heart Matters or Ottawa Heart Institute. The fact that the majority of the study participants were of low CVD risk may explain why they were not aware of CVD campaigns. Although these

participants were not questioned about any other health-related campaigns, other research has found that women are more likely to notice breast cancer than heart disease related media (Berry et al., 2015). In general, awareness of CVD prevention campaigns in this study was low and may be indicative of media campaigns not being effective at targeting this critically important population.

In summary, based on the demographic data and available data for comparison, the participants of this study were generally representative of the average RN in Manitoba. While 40% of participants cited CVD as their greatest health fear, breast cancer and other cancers were also feared by many women. These findings may be explained by the relatively low mean age of the participants; however somewhat surprising because of the nursing background of this population. Importantly, HCP discussions regarding CVD risk is clearly lacking among women, which may be related to a number of factors including lack of HCP knowledge and time. Lastly, there was a concerning lack of awareness of CVD prevention campaigns among the study participants. The insights from the findings related to the demographic and structural variables as well as cues to action, will facilitate the subsequent discussions in this chapter.

Individual Perceptions

This section will focus on a discussion of the study findings related to the perception of CVD risk in female nurses (i.e., research question #1). The PRHDS was used to determine perception of CVD risk among female nurses. This scale has a total possible range of 20-80, with higher scores on the PRHDS scales indicating a higher perception of risk of getting heart disease. The range of scores for participants in this study was 41-72, with a mean score of 53.5. Unfortunately, Ammour and Neuberger (2008), who developed the PRHDS do not define how to identify participants in the unknown, risk, and dread risk subcategories. However, by simply dividing the possible range of scores into tertiles, the women in this

study were predominantly in the mid-range risk categories for perception of CVD risk. Therefore, the results from this study suggest that the participants generally perceived their CVD risk as higher than the general female population.

In general, previous research literature finds that women generally underestimate their risk for CVD (Alwan et al., 2009; McDonnell et al., 2014; Monsuez et al., 2017). For example, Monsuez and associates (2017) studied 5,882 Canadian women from ages 30 to 65 years. They found the majority underestimated their risk and thought they were at low to moderate risk. Alwan et al. (2009) also found that women tended to underestimate their risk for CVD as they were more likely to fear breast cancer over CVD. As well, they associated CVD with men. The difference in perceived risk in this study may be due to baseline CVD knowledge nurses have acquired through nursing education, over the average Canadian female. As well, a greater number of the participants in this study feared CVD over breast cancer, which likely influenced their perceived risk for CVD.

The authors of the PRHDS provide a scoring mechanism for the subscales of dread risk, risk, and unknown risk (Ammouri & Neuberger, 2008). While the instrument does not explicitly state if each respondent should be placed in one category, subscale scores can be calculated based the sum of the questions that represent each subcategory. The most notable result in the subscales was in the “unknown risk” subscale. Among all participants, the mean score in this subcategory was proportionately higher than the other subscales. According to the authors, the unknown risk subscale seeks to identify respondents who perceive CVD as unknown, new, unobservable, or delayed in their manifestation of harm (Ammouri & Neuberger, 2008).

Examining the questions that indicate unknown risk (see Table 4) reveals that these questions generally reflect a lack of knowledge for CVD risk. A high score among these responses is surprising in this study sample of RNs with a strong baseline of health education.

In comparison with previous literature, there are different interpretations for unknown or low perception of CVD risk. For example, Alwan et al. (2009) used a semi-quantitative approach and asked participants “in your opinion, how do you see your risk for getting a heart attack or a stroke in the next 10 years?” They found those whose responses corresponded to low perceived risk, were of higher socioeconomic status, education, and exercised on a regular basis. They concluded that these participants were leading a healthier life and had realistic knowledge about their CVD risk. This may, in part, also explain the findings in this current study. Further discussion of the perception of risk scale used in this thesis study will be addressed in the limitations section of this chapter.

Modifying Factors and Perceived Risk of CVD

This section will focus on the study results of perceived risk for CVD and influencing variables in the context of the HBM (i.e., research question #2). Specifically, the findings related to the relationship between age, education, socioeconomic status, knowledge, various cues to action and perception of risk for CVD, will be discussed.

Perceived risk and age. Age has been consistently found to affect perceived risk of CVD. More specifically, older adults tend to perceive CVD risk as higher and often more accurately in regard to their actual risk (Ammouri & Neuberger, 2008; Hamilton & Lobel). Similarly, in this study, the age of participants had a significant effect on their perception of risk for CVD. This was expected as older adults may have a greater understanding of their risk due to experiences, greater knowledge of health-related information, and are more likely to act on their health concerns. As well, in this thesis study, older nurses may have had more clinical experience related to caring for patients with CVD, thus gaining more insights into health risks that may translate to awareness of their own risk. Older women may also have a greater number of known CVD risk factors, thus, increasing their awareness and perception of risk. On the other hand, as Hamilton and Lobel (2015) found, younger women may be

more influenced by optimism in regard to their perceived health risks. As well, younger women have been found to have less ability to identify risk factors in general (McDonnell et al., 2014). Although all the participants in this current study presumably have significant health knowledge, this knowledge or areas of expertise may fluctuate depending on the different areas nurses work in. Nonetheless, the findings that older women tend to perceive higher CVD risk are consistent with research literature.

Perceived Risk and Education. Level of education is often cited in the literature as having a significant effect on perception of risk (Buster et al., 2012; Fehnigher et al., 2014; Hammond, Salamonson, Davidson, Everett, & Andrew, 2007; Hart, 2005; Homko et al., 2008; Johnson & Dickson-Swift, 2008; Perkins-Porras, Whitehead, & Steptoe, 2006). For example, Buster and associates (2012) found those with less education (i.e., minimum high school education) had poorer perceptions of disease risk in comparison to those with higher levels of education. According to Alwan and associates (2009), those with higher levels of education, have a greater ability to use abstraction skills to access and use information to formulate their perception of health risks. The current study participants were all female registered nurses who had a baseline education of either a diploma or degree in nursing. Therefore, it was not surprisingly that the different levels of education in this study did not impact perception of disease risk. As well, the PRHDS mean scores were similar among all education levels ($M = 53.4\text{-}54.7$). This is likely because all participants would be considered to have similar, relatively high education levels.

Perceived risk and socioeconomic status. Socioeconomic status has been strongly associated with accurate perception of risk for CVD in previous research (Alwan et al., 2009; McDonnell et al., 2014; van der Weijden et al., 2007). Nurses in the current study generally had a relatively high household income with the majority (84%) earning more than \$75,000 a year. Therefore, similar to education, finding that socioeconomic status did not have a

significant effect on perception of CVD risk was anticipated. Previous literature that reported a significant difference in socioeconomic status and perception of CVD risk included participants who had a greater range of annual income. For example, McDonnell et al. (2014) found those with an annual household income of \$40,000 or less, had lower perceptions of risk versus those who had an annual income of \$100,000 or more. Those with higher annual household incomes are likely able to afford a healthier lifestyle and have greater access to educational resources; for example, a gym membership or the ability to purchase healthy foods. As well, those of higher socioeconomic status are more likely to have higher levels of education, a variable that is also associated with more accurate perception of CVD risk in the research literature.

Perceived risk and knowledge. As previously discussed, knowledge is a complex variable in its effect on perception of risk as it may not necessarily translate to accurate perception of one's own risk. However, in considering women's greatest health fear, there was a significant relationship between those who reported CVD as their greatest fear as a health risk, and their perception of CVD risk. Moreover, this factor was one of the two most significant factors among all of the other influencing factors in the multivariate perception of risk regression analysis. While this finding is inconsistent with several previous studies (McDonnell et al., 2014; Monsuez et al., 2017), others have reported similar findings (Jones et al., 2007; Meischke et al., 2000). There are a number of possible reasons for these disparate findings. The current study sample included well-educated RNs, with a variety of clinical experiences. These factors would certainly have impacted their knowledge of CVD and consequently, their health fears. In general, the translation of knowledge or fear into accurate perception of risk is likely different for each individual person. While some may deny or avoid their health fears, others may proactively take charge of their health and gain

meaningful insights to their actual health risks. However, knowledge is undoubtedly central to an accurate perception of disease risk.

Perceived risk and cues to action. There are numerous cues to action that may influence health-related behaviour. These cues are thought to be necessary to prompt individuals to action (Sharma & Romas, 2010). The current study examined several possible cues, including discussion of CVD risk with one's HCP, referral to cardiologist, awareness of CVD prevention campaigns, and a family history of CVD.

Discussion of CVD risk with a HCP is generally essential for women to be knowledgeable and aware of their personal health risks. Interestingly, less than 30% of the women in this study reportedly had this discussion with their HCP. Importantly, this variable was significant in the multivariate analysis of perception of risk. The literature also cites low rates of HCP discussion about CVD risk in women (McDonnell et al., 2014). In general, the literature supports the contention that the role of HCPs in CVD risk reduction is lacking (Hart, 2005; Leifheit-Limson et al., 2015). Not only do women prefer their source of health information be from their HCP, they also rely on them for their professional guidance and support (McDonnell et al., 2014). The regression analysis findings highlight how important it is for HCPs to discuss risk factors for CVD with their female patients. There are undoubtedly barriers to be considered, such as time constraints during health care appointments; however, with CVD being the leading cause of death for all women, this conversation during appointments should be a priority for both women and their HCPs.

Although a history of CVD was an exclusion criterion for the current study, 13.1% ($n= 107$) stated they had been referred to a cardiologist. These referrals may have occurred for a number of reasons including, consultation, testing, prevention, discussions of risk factors, or prior to surgery. This group of participants may have had risk factors for CVD yet do not have a diagnosis of CVD. Conversely, they may be unaware their diagnosis is indeed

considered a form of CVD. Regardless, this variable did not have a significant effect on perception of risk for CVD in this sample.

Seventy-six percent of the study participants reportedly had a family history of CVD. This variable was also the most significant predictors of perception of risk for CVD in the multivariate perception of risk regression analysis, a finding that is consistent with the research literature (Frijling et al., 2004; Hamilton & Lobel, 2015; Imes & Lewis, 2014; Montgomery et al., 2013). Interestingly, in the bivariate analysis, the mean PRHDS scores were similar among those with and without a family history of CVD. Those who had a family history of CVD had a mean PRHDS score of 54, and those without family history had a score of 52. This is inconsistent to the literature that finds family history of CVD to have a greater significance on perception of CVD, in comparison to those who do not (Claassen et al., 2012; Humphries et al., 1997). The mean PRHDS score was similar for women in the study who stated whether their father had CVD ($M = 53.3$) versus those who reported that their mother had CVD ($M = 55$). However, it is important to note that categories were not mutually exclusive and some participants may have had both a mother and a father with a history of CVD. Moreover, this did not change when accounting for the mean PRHDS in those who selected only father ($M = 53.6$) or only mother ($M = 54.2$). Regardless, research has found individuals consider the severity, consequences, cause and controllability, and not necessarily the gender of a family member when considering their own perception of risk (Walter & Emery, 2006). As well, younger women in particular have been found to have increased perceptions of CVD risk when they have a family history of CVD (Hamilton & Lobel, 2015). Consistent with those findings, the majority of this current study participants were relatively young. In addition, as health care professionals, this study sample may more accurately perceive a greater seriousness and severity when their family members experience a form of CVD thus, increasing their own perception of risk.

Perceived Risk and Actual Risk of CVD

To address research question #3, perceived risk for CVD was examined in relation to actual CVD risk among the study participants. Previous reports of differences between perceived and actual CVD risk are limited in the literature and therefore, limit the comparability for the findings of this present study. However, in general women are found to underestimate their CVD risk (Abed et al., 2015; Hammond et al., 2007; McDonnell et al., 2014; Monsuez et al, 2017). In the current study, actual CVD risk was determined by using a non-laboratory-based CVD assessment tool developed by Gaziano and associates (2008). According to this scale, the majority of participants were in the very low or low categories of actual risk for CVD. The data analysis did reveal a positive correlation between actual CVD risk and perception of risk; however, it was found to be a low correlation.

As previously mentioned, there is very little published research literature that has examined the relationship between perceived risk for CVD and actual risk for CVD. In one study, Alwan and associates (2009) found that half of their participants actually overestimated their risk for CVD in comparison to their actual risk. However, this study included predominantly older men and women (ages 40-64) with existing CVD, and they used a 10-year CVD risk calculator based on the WHO/International Society of Hypertension risk predictions. Although another study (McDonnell et al., 2014) included only women, with the majority of respondents aged 45 years and older, the results differed from the current study in that many of those who were at high risk for CVD had low perception of risk. A significant difference among current literature, is the age and current health status of the women in the current study. The majority of women were 44 years and younger, without a history of CVD, and predominantly of low CVD risk. As well, the current study population was comprised of well-educated healthcare professionals who may have a more accurate perception of risk, based on their knowledge of actual risk factors for CVD.

Although the overall CVD risk for the majority of the current study participants was low, over 50% of participants were overweight or obese. This risk factor in particular was found to be associated with higher perception for CVD risk in the literature (Alwan et al., 2009). There are a number of possible reasons for this finding. As Alwan and associates suggest, obesity may be a foreseeable CVD risk factor and one that is often highlighted in media and health education programs. As well, those who do not exercise or follow a healthy diet, have been found to have higher perceived risk for CVD (Alwan et al., 2009). Although specific factors, such as diet and exercise were not surveyed in this current thesis project, these factors are generally associated with BMI, which was significantly related to perceived risk in the current study (see Table 12).

In summary, previous research literature in the area of actual and perceived CVD risk among women of all ages is limited. This study demonstrated that among female RNs, across a wide span of ages, there was a weak-positive correlation between actual and perceived CVD. A weak correlation is surprising for a population that presumably has a strong baseline of health knowledge. However, this may have occurred for a number of reasons. As previously mentioned, knowledge does not always translate to accurate perception risk. Although nurses are health care professionals, they work in a variety of fields with various experiences, and perhaps not as aware of CVD risks as one may assume. As well, perception of risk is a complex concept that is not fully understood in the context of health and one cannot make assumptions as to what may influence perception of risk. This demonstrates the importance of CVD awareness, risk assessment, and education in all women.

Implications for Nursing

Prior to this study, there was a gap in the literature regarding the factors that affect perceived risk of CVD, and the relationship between perceived and actual risk for CVD, among women of all ages. Findings from this study have contributed to the existing

knowledge of the relationship between these two concepts. These results can be utilized in different areas of nursing, as perception of risk can influence risk-reducing behaviours. This section will focus on implications for nursing in the areas of clinical practice, education, and future research.

Clinical practice. Accurate risk perception is necessary to make an informed decision regarding behaviour change. Therefore, it is imperative nurses routinely evaluate the factors that impact on perception of risk along with CVD risk factors in all women. This study demonstrated significant effect of age, fearing CVD as a greatest health risk, HCP discussion of risk, and family history on influencing perception of risk for CVD. Therefore, these factors should be included in health assessments of women of all ages.

One of the strongest risk factors for CVD is older age; however, young women at risk should not be overlooked. As a matter of fact, CVD risk assessments should begin at age twenty (Heart and Stroke Foundation (2014). Although the majority of younger women were at low risk for CVD in this study, it is crucial that women of all ages should engage in healthy lifestyles and risk reduction. Assessing older women for their CVD risk is especially important as risk factors accumulate when women reach menopause and increases four-fold over the first 10 years from onset of menopause (Abernethy, 2008). The best approach to evaluate CVD risk in women is routine testing for risk factors and overall CVD risk (Gill, 2015). Nurses make up the largest group of health professionals and as such they have a unique opportunity to provide individualized patient screening, assessment, and education in many different areas of practice, but in primary care, in particular. Ensuring women are aware of their risk is the ideal way to influence their perception of risk and encourage risk reducing behaviours.

Only 27% of study participants reported they had discussed CVD risk with their primary HCP. There may be various reasons for this finding including, physician's lack of

time allotted to disease prevention and health promotion during appointments, general underestimation of risk in women, and/or lack of knowledge of CVD risk in women. These factors highlight the important role for nurses in primary care. Nurses in primary care provide a holistic approach to care, which includes gathering patients' full health information in a risk assessment, providing education, based on identified gaps in knowledge, and developing individualized strategies for prevention. This will help empower women to gain a sense of control over their own health. Primary care nurse practitioners (NPs) in particular, play an important role in providing comprehensive patient care. NPs use an evidenced-based, holistic approach that provides a focus on health promotion, and overall wellness of their patients. This may include interventions to control major risk factors and to develop strategies for lifestyle modifications (Roberts & Davis, 2013). In summary, clinical practice nurses have the opportunity to optimize cardiovascular health in their female patients and can play an important role in primary CVD prevention in this population.

Education. Perception of risk for CVD can influence health-related decisions individuals make throughout their lifetime. As already discussed, this study revealed several significant factors that influence perceived risk of CVD among women. Given these findings, it is imperative for nurses and other health care providers to seize opportunities to educate women about CVD risk factors. As Weijden and associates (2007) suggest, effective and feasible strategies for explaining CVD risk must be considered within clinical practice. Both RNs and NPs should seize opportunities to educate their female patients about their CVD risk and lifestyle interventions to prevent CVD. This may include smoking cessation counselling, importance of physical activity, weight reduction strategies, and dietary planning (Roberts & Davis, 2013).

Educating nurses on a woman-focused, evidence-based approach to CVD risk assessment is central to ensuring optimal cardiovascular risk reduction in this population.

There is a direct correlation between nurses' awareness, knowledge of evidenced based guidelines, and recommendations for CVD prevention and their intentions and ability to educate their female patients (Kiamco-Millman & Pinto-Zipp, 2013). As the importance of women-specific guidelines for assessment, risk factors, and treatment are emerging in the research literature, nurses must be educated about these guidelines so they can integrate them into their practice. This education must begin in undergraduate nursing program curricula and reinforced in continuing education programs.

Given the low number of participants in this study who were aware of any CVD prevention campaigns provides evidence that current women's heart health promotional campaigns may be insufficient and/or not be reaching their target audience. Importantly, mass media campaigns have been demonstrated to produce positive changes or prevent negative changes in health-related behaviours (Wakefield, Loken, & Hornik, 2010). Therefore, consideration of the type and source of educational CVD content for the specific population is an important approach for primary prevention. For example, print and broadcast media have been found to be preferred by older women, whereas younger women prefer online sources and websites (McDonnell et al., 2014). Nurses are ideally situated to advocate for more effective CVD prevention campaigns for the target audience of women.

Finally, as members of a health profession with the highest proportion of women, working in a broad range of areas, from clinical practice, to education, and research, and as sisters, daughters, mothers, and grandmothers, as well as friends of other women, nurses have a tremendous opportunity to educate a vast number of women about CVD prevention. Seizing this opportunity can only happen if nurses are well-informed about the current evidence related to CVD risk, diagnosis and treatment. Therefore, education is key.

Future Research. This study provided novel evidence into the perception of risk for CVD among female RNs. However, there is much more to be examined in the area of CVD

risk and women. While this study identified several key factors that affect perception of risk, these variables only accounted for a small number of the possible factors that may influence perception of risk. Although the variables used in this current study were guided by previous research, only a small portion of the variance in the regression analysis was explained by the variables used in this study. Future research should aim to explain more factors that influence perception of CVD risk, such as, self-efficacy, ethnicity, or other constructs of the HBM, including perceived benefits and perceived barriers to accurate risk perception. Furthermore, how these variables can be used to identify strategies to increase the accurate perception of risk for CVD among women, may assist women in more accurately perceiving their CVD risks. As well, future research should examine the effect of risk perception on the likelihood of women taking risk reducing behaviours. This would provide further insight into strategies to increase accurate risk perception and CVD risk reduction.

In general, CVD research in women is lacking in many areas. As recommended by the Heart and Stroke Foundation of Canada (2017), funders of health research need to invest in women's heart research including all levels of biomedical, clinical, health systems, and population health. Although recent research has documented the significant gender differences in CVD risk and risk factors, this area continues to be poorly understood (Heart and Stroke, 2017). Future research must collect and report data based on gender, as well as, developing strategies to encourage women to participate in clinical trials. These strategies will assist in resolving the research gap in the area of women and CVD.

Conceptual Framework

The HBM was chosen as the conceptual framework for this study. The goal of conceptual frameworks is to guide research and the study questions. This section will highlight how this framework achieved this goal, as well as the strengths and limitations of its use in this study.

An adapted version of the HBM was used in this study as several model constructs, such as perceived benefits, perceived barriers and likelihood of action were not relevant to the study purpose and the research questions. The purpose of this thesis study was to examine perception of CVD risk among female nurses. The adapted framework provided guidance as to what factors may have an effect on perceived risk. However, the HBM did have some limitations in this study. For example, the modifying factors did not explain a large portion of the variance in perceived risk. While this may, in part be related to the variable section and/or the tools used to measure the variables, it may also be related to gaps in the model. For example, the HBM does not account for attitudes or beliefs of health-related behaviour. Rather, it assumes everyone is at the same baseline for beliefs and knowledge of the health-related behaviour in question. Examining these other aspects, may account for more variance in explaining perceived risk. Overall, however, the HBM was an appropriate framework for addressing this study's specific purpose and the research questions.

Study Limitations

This study had several limitations. Cross-sectional designs capture data at a fixed period of time and do not provide data about change over time. Alternatively, a longitudinal design collects data at more than one period of time, often over an extended period of time; however, this design was not feasible due to time and funding constraints. Nonetheless the design used for this thesis research was appropriate as it successfully addressed the study purpose and answered the research questions.

Another limitation is that the results of this study may not be applicable to the population of all women. Given the high health literacy of RNs, it would be expected the general female population may have different insights in regard to their perception of risk for CVD. Although an underlying assumption was that RNs would or should have a higher degree of CVD risk knowledge and perceptions, important insights were gleaned from the

findings that this is not always true. Including a survey about baseline knowledge of CVD may have provided further insights related to perception of risk for CVD in this population. As well, perception of CVD risk literature often finds the most influencing variables to be socioeconomic status and education level. This study equalized these factors by choosing a sample that had relatively the same education and income. Importantly, this study also achieved a reasonably large sample of women, with a broad range of ages, which has been lacking in the research literature to date.

Instrumentation may have been a limitation in this study. The PRHDS has had limited use in previous research and this scale presented some challenges with the interpretation of use for the subcategories. Although definitions for the different subcategories are included in the resource describing the development of the tool (Ammouri & Neuberger, 2008), the questions coinciding with each subcategory suggest alternative interpretations. For example, the questions associated with “risk” are predominantly associated with being of young age (see Table 4). As the majority of this study sample was 44 years and under, this may be the reason for the majority of the PRHDS scores being mid-range in the continuum of low to high risk perception.

The non-laboratory-based CVD risk assessment tool has also not been widely used in previous literature. As shown in Appendix D2, a chart is used to determine a woman’s CVD risk. However, the youngest age category on the chart is 35-44 years of age. Despite attempts to contact, the tool designer was not available to discuss options to address this limitation. Therefore, we decided to categorize those 44 and younger into the same category to account for the entire sample in this thesis study.

In summary, although there were a number of limitations in this study, the participants appeared to be representative of Manitoba nurses and a relatively large study sample of women with a wide range of ages was accomplished. Although the instruments had

not been widely used in previous literature, the results were meaningful and successfully answered the research questions.

Chapter Summary

The discussion chapter examined the main findings of this study, related to perception of risk for CVD among female RNs, modifying factors affecting perceived risk for CVD, and the correlation between actual and perceived risk in this population. The perception of risk in women in this study was moderate, based on the PRHDS scores. Among the different modifying factors that may influence perceived risk of CVD, age, fearing CVD vs breast cancer risk, discussing with HCP regarding CVD risk, and family history of CVD were significant. Overall, there was a positive correlation between perceived and actual CVD risk among study participants. Implications for nursing, including clinical practice, education, and future research were discussed. Primary care nurses are in the ideal position to assess their female patients' overall risk for CVD using a holistic approach, and to discuss their risks, as well as individualized strategies for prevention. Nurses also need to be educated on a woman-focused, evidenced-based approach to CVD prevention in order to integrate best practice guidelines into their practice. Future research must continue to focus on women and CVD, including gender specific variables that affect perceived risk for CVD, and how these variables can be integrated into clinical practice to reduce the risk of CVD in women.

Finally, the adapted version of the HBM was an appropriate fit for this study as it successfully guided the research questions. While this study has some limitations, the findings appear valid, and thus make an important contribution to the current dearth of research literature in this area.

Conclusion

The overall purpose of this study was to explore perception of risk for CVD among females and its influencing factors, as well as the correlation between actual and perceived

risk. This was accomplished by using the Health Belief Model as a framework to guide this study. Accurate perception of risk for disease is essential for individuals to engage in risk reducing health behaviours, thus, reducing the burden of CVD among women. The Perception of Risk for Heart Disease Scale and a non-laboratory-based CVD risk assessment tool were used to address the research questions. Descriptive statistics, and bivariate and multivariate regression analysis revealed significant relationships among the main concept and several key influencing factors. Therefore, the chosen framework and surveys were an appropriate for this thesis research.

This study provided novel research evidence related to the perception of risk for CVD among women of all ages. Furthermore, this study highlighted the importance of exploring variables that may influence perception of risk. Previous research examining perception of risk for CVD often concluded that education level and socioeconomic status were factors that influence perception of risk. This study equalized these factors among the participants as the target population were all registered nurses. Therefore, this study contributes new evidence to a relatively small body of existing literature related to the main study concepts. Future research should continue to examine CVD risk factors in women, factors that may influence their perceived risk for CVD, and how these factors can be utilized as primary prevention strategy to reduce risk factors to reduce the burden of CVD among all women.

REFERENCES

- Abed, M. A., Khalil, A. A., & Moser, D. K. (2015). Awareness of modifiable acute myocardial infarction risk factors has little impact on risk perception for heart attack among vulnerable patients. *Heart & Lung: The Journal of Acute and Critical Care*, 44(3), 183-188. doi:10.1016/j.hrlng.2015.02.088
- Abernethy, K. (2008). How the menopause affects the cardiovascular health of women. *Primary Health Care*, 18(6), 41-47. Retrieved from <http://journals.rcni.com/journal/phc>
- Acheson, L. S., Wang, C., Zyzanski, S. J., Lynn, A., Ruffin, M. T., Gramling, R., ... & Nease, D. E. (2010). Family history and perceptions about risk and prevention for chronic diseases in primary care: a report from the Family Healthware™ Impact Trial. *Genetics in Medicine*, 12(4), 212-218. doi:10.1097/GIM.0b013e3181d56ae6
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. Retrieved from <https://www.journals.elsevier.com/organizational-behavior-and-human-decision-processes/>
- Ali, N. S. (2002). Prediction of coronary heart disease preventive behaviors in women: A test of the health belief model. *Women & Health*, 35(1), 83-96. doi:10.1300/J013v35n01_06
- Aljasem, L., Peyrot, M., Wissow, L., & Rubin, R. (2001). The impact of barriers and self-efficacy on self-care behaviors in type 2 diabetes. *The Diabetes Educator*, 27(3), 393-404. Retrieved from <http://journals.sagepub.com/home/tde>
- Allen, J. K., Purcell, A., Szanton, S., & Dennison, C. R. (2010). Perceptions of cardiac risk among a low-income urban diabetic population. *Journal of Health Care for the Poor and Underserved*, 21(1), 362. doi:10.1353/hpu.0.0241

- Alwan, H., William, J., Viswanathan, B., Paccaud, F., & Bovet, P. (2009). Perception of cardiovascular risk and comparison with actual cardiovascular risk. *European Journal of Cardiovascular Prevention & Rehabilitation*, 16(5), 556-561.
doi:10.1097/HJR.0B013e32832d194d
- American Heart Association. (2017). *Go red for women*. Retrieved from
<https://www.goredforwomen.org/>
- Ammouri, A. A., & Neuberger, G. (2008). The perception of risk of heart disease scale: Development and psychometric analysis. *Journal of Nursing Measurement*, 16(2), 83-97. doi:10.1891/1061-3749.16.2.83
- Ammouri, A. A., Neuberger, G., Mrayyan, M. T., & Hamaideh, S. H. (2010). Perception of risk of coronary heart disease among Jordanians. *Journal of Clinical Nursing*, 20(1-2), 197-203. doi:10.1111/j.1365-2702.2010.03192.x
- Appelman, Y., van Rijn, B., ten Haaf, M., E., Boersma, E., & Peters, S. A. E. (2015). Sex differences in cardiovascular risk factors and disease prevention. *Atherosclerosis*, 241(1), 211-218. doi:10.1016/j.atherosclerosis.2015.01.027
- Asimakopoulou, K. G., Skinner, T. C., Spimpolo, J., Marsh, S., & Fox, C. (2008). Unrealistic pessimism about risk of coronary heart disease and stroke in patients with type 2 diabetes. *Patient Education and Counseling*, 71(1), 95-101.
doi:10.1016/j.pec.2007.12.007
- August, P. (2013). Hypertension in women. *Advances in Chronic Kidney Disease*, 20, 396-401. <http://dx.doi:10.1053/j.ackd.2013.07.002>
- Avis, N. E., Smith, K. W., & McKinlay, J. B. (1989). Accuracy of perceptions of heart attack risk: what influences perceptions and can they be changed?. *American Journal of Public Health*, 79(12), 1608-1612. Retrieved from <http://ajph.aphapublications.org/>

- Bagozzi, R. P., Wong, N., Abe, S., & Bergami, M. (2014). Cultural and situational contingencies and the theory of reasoned action: Application to fast food restaurant consumption. *Journal of Consumer Psychology*, 9(2), 97-106. doi:10.1207/S15327663JCP0902_4
- Banks, A. D. (2008). Women and heart disease: missed opportunities. *Journal of Midwifery & Women's Health*, 53(5), 430-439. doi:10.1016/j.jmwh.2008.04.008
- Bannon, Jr. W. M. (2013). *The 7 steps of data analysis: A manual for conducting a quantitative research study*. Brooklyn, New York: StatsWhisperer Press.
- Becker, M. H. (1974). The health belief model and personal health behavior. Thorofare, New Jersey: Charles B. Slack.
- Berry, T. R., Stearns, J. A., Courneya, K. S., McGannon, K. R., Norris, C. M., Rodgers, W. M., & Spence, J. C. (2015). Women's perceptions of heart disease and breast cancer and the association with media representations of the diseases. *Journal of Public Health*, 38(4), 1-8. doi:10.1093/pubmed/fdv177
- Bigham, M., Remple, V.P., Pielak, K., McIntyre, C., White, R., & Wu, W. (2006). Uptake and behavioral and attitude determinants of immunization in an expanded routine infant hepatitis B vaccination program in British Columbia. *Canadian Journal of Public Health*, 97(2), 90-95. Retrieved from <http://www.jstor.org/stable/41994691>
- Bonamy, A. K. E., Parikh, N. I., Cnattingius, S., Ludvigsson, J. F., & Ingelsson, E. (2011). Birth Characteristics and Subsequent Risks of Maternal Cardiovascular Disease. *Circulation*, 124, 2839-2846. doi:10.1161/CIRCULATIONAHA.111.034884
- Bots, S. H., Peters, S. A., & Woodward, M. (2017). Sex differences in coronary heart disease and stroke mortality: A global assessment of the effect of ageing between 1980 and 2010. *BMJ Global Health*, 2(2), e000298. doi:10.1136/bmjgh-2017-000298

- Breslow, L. (1999). From disease prevention to health promotion. *JAMA*, 281(11), 1030-1033. Retrieved from <http://jamanetwork.com/journals/jama>
- Buster, K. J., You, Z., Fouad, M., & Elmets, C. (2012). Skin cancer risk perceptions: a comparison across ethnicity, age, education, gender, and income. *Journal of the American Academy of Dermatology*, 66(5), 771-779. doi:10.1016/j.jaad.2011.05.021
- Cainzos-Achirica, M., & Blaha, M. J. (2015). Cardiovascular risk perception in women: True unawareness or risk miscalculation?. *BioMed Central Medicine*, 13, 112. <http://dx.doi.org/10.1186/s12916-015-0351-2>
- Canadian Nurses Association. (2016). Registered nurses profiles (including Nurse Practitioners), Manitoba, 2016. Retrieved from <https://cna-aiic.ca/en/nursing-practice/the-practice-of-nursing/health-human-resources/nursing-statistics/manitoba>
- Canner, P. L., Berge, K. G., & Klimt, C. R. (1973). The coronary drug project: Design, methods, and baseline results. *Circulation*, 47(1), 1-50. doi:10.1161/01.CIR.47.3S1.I-1
- Carroll, C., Naylor, E., Marsden, P., & Dornan, T. (2003). How do people with Type 2 diabetes perceive and respond to cardiovascular risk?. *Diabetic Medicine*, 20(5), 355-360. doi:10.1046/j.1464-5491.2003.00910.x
- Centers for Disease Control and Prevention. (2014). *National prevention strategy: America's plan for a better health and wellness*. Retrieved from <https://www.cdc.gov/features/preventionstrategy/>
- Cerkoney, K., & Hart, L. (1980). The relationship between the health belief model and compliance of persons with diabetes mellitus. *Diabetes Care*, 3(5), 594-8. Retrieved from <http://care.diabetesjournals.org/>

- Champion, V. L., & Skinner, C. S. (2008). The Health Belief Model. In Glanz, K., Rimer, B., & Viswanath, K. *Health Behavior and Health Education: Theory, Research and Practice* (4th ed.). San Francisco, CA: Jossey-Bass.
- Chen, M. S., Lara, P. N., Dang, J. H., Paterniti, D. A., & Kelly, K. (2014). Twenty years post-NIH Revitalization Act: Enhancing minority participation in clinical trials (EMPaCT): Laying the groundwork for improving minority clinical trial accrual. *Cancer*, 120(S7), 1091-1096. doi:10.1002/cncr.28575
- Cheng, E. Y., & Kong, M. H. (2016). Gender differences of thromboembolic events in atrial fibrillation. *The American Journal of Cardiology*, 117(6), 1021-1027. doi:10.1016/j.amjcard.2015.12.040
- Chinn, P., & Kramer, M. (2011) *Integrated knowledge development in nursing* (8th ed.). St. Lois: Mosby.
- Chomistek, A. K., Chiuve, S. E., Eliassen, A. H., Mukamal, K. J., Willett, W. C., & Rimm, E. B. (2015). Healthy lifestyle in the primordial prevention of cardiovascular disease among young women. *Journal of the American College of Cardiology*, 65(1), 43-51. doi:10.1016/j.jacc.2014.10.024
- Chung, R. J., Touloumtzis, C., & Gooding, H. (2015). Staying young at heart: cardiovascular disease prevention in adolescents and young adults. *Current Treatment Options in Cardiovascular Medicine*, 17(12), 61. doi:10.1007/s11936-015-0414-x
- Cioe, P. A., Crawford, S. L., & Stein, M. D. (2014). Cardiovascular risk-factor knowledge and risk perception among HIV-infected adults. *Journal of the Association of Nurses in AIDS Care*, 25(1), 60-69. doi:org.uml.idm.oclc.org/10.1016/j.jana.2013.07.006
- Claassen, L., Henneman, L., Van der Weijden, T., Marteau, T. M., & Timmermans, D. R. M. (2012). Being at risk for cardiovascular disease: perceptions and preventive behavior

- in people with and without a known genetic predisposition. *Psychology, Health & Medicine*, 17(5), 511-521. doi:10.1081/13548506.2011.644246
- Clark, C. J., Alonso, A., Spencer, R. A., Pencina, M., Williams, K., & Everson-Rose, S. A. (2014). Predicted long-term cardiovascular risk among young adults in the national longitudinal study of adolescent health. *American Journal of Public Health*, 104(12), e108-e115. doi:10.2105/AJPH.2014.302148
- Clark, P., & Lavielle, P. (2015). Risk perception and knowledge about osteoporosis: Well informed but not aware? A cross-sectional study. *Journal of Community Health*, 40(2), 245-250. doi:10.1007/s10900-014-9923-x
- Clarke, V. A., Lovegrove, H., Williams, A., & Machperson, M. (2000). Unrealistic optimism and the health belief model. *Journal of Behavioral Medicine*, 23(4), 367-376. Retrieved from <https://link.springer.com/journal/10865>
- Coe, A. B., Gatewood, S. B., Moczygemba, L. R., Goode, J. V. R., Beckner, J. O. (2012). The use of the health belief model to assess predictors of intent to receive the novel (2009) H1N1 influenza vaccine. *Innovations in Pharmacy*, 3(2), 1-11. Retrieved from <http://pubs.lib.umn.edu/innovations/>
- Colditz, G. A., Manson, J. E., & Hankinson, S. E. (1997). The Nurses' Health Study: 20-year contribution to the understanding of health among women. *Journal of Women's Health*, 6(1), 49-62. Retrieved from <http://www.liebertpub.com/jwh>
- College of Registered Nurses of Manitoba. (2017). Annual report. Retrieved from <https://www.crnmb.ca/uploads/ck/files/CRNM%20Annual%20Report%202017%20FINAL.pdf>
- Cottrell, E., Roddy, E., Rathod, T., Thomas, E., Porcheret, M., & Foster, N. E. (2015). Maximising response from GPs to questionnaire surveys: Do length or incentives

make a difference?. *BMC Medical Research Methodology*, 15(1), 3.

Doi:10.1186/1471-2288-15-3

Daddario, D. K. (2007). A review of the use of the health belief model for weight

management. *Medsurg Nursing*, 16(6), 363. Retrieved from

<http://www.medsurgnursing.net/cgi-bin/WebObjects/MSNJournal.woa>

Dahlöf, B. (2010). Cardiovascular disease risk factors: epidemiology and risk

assessment. *The American Journal of Cardiology*, 105(1), 3A-9A.

doi:10.1016/j.amjcard.2009.10.007

Darlow, S., Goodman, M., Stafford, J., Lachance, C., & Kaphingst, K. (2012). Weight

perceptions and perceived risk for diabetes and heart disease among overweight and

obese women, Suffolk County, New York, 2008. *Preventing Chronic Disease*, 9, E81.

doi:10.5888/pcd9.110185

Davidhizar, R. (1983). Critique of the health-belief model. *Journal of Advanced*

Nursing, 8(6), 467-472. doi:10.1111/j.1365-2648.1983.tb00473.x

Davidson, P. M., Daly, J., Hancock, K., Moser, D., Chang, E., & Cockburn, J. (2003).

Perceptions and experiences of heart disease: A literature review and identification of

a research agenda in older women. *European Journal of Cardiovascular*

Nursing, 2(4), 255-264. doi:10.1016/S1474-5151(03)00056-2

Dearborn, J. L., & McCullough, L. D. (2009). Perception of risk and knowledge of risk

factors in women at high risk for stroke. *Stroke*, 40(4), 1181-1186.

doi:10.1161/STROKE.AHA.108.543272

Deshpande, S., Basil, M. D., & Basil, D. Z. (2009). Factors influencing healthy eating habits

among college students: An application of the health belief model. *Health Marketing*

Quarterly, 26(2), 145-164. doi:10.1080/07359680802619834

- Diefenbach, M. A., Miller, S. M., & Daly, M. B. (1999). Specific worry about breast cancer predicts mammography use in women at risk for breast and ovarian cancer. *Health psychology, 18*(5), 532. Retrieved from <http://journals.sagepub.com/loi/hpq>
- Dillow, M., Walsh, A., Spellman, F., & Quirk, M. (2015). Testing the risk perception attitude framework in the context of texting while driving. *Communication Research Reports, 32*(2), 132-142. doi:10.1080/08824096.2015.1016144
- Dougherty, A. H. (2011). Gender balance in cardiovascular research: Importance to women's health. *Texas Heart Institute Journal, 38*(2), 148. Retrieved from <http://www.texasheart.org/Education/THIJournal/>
- Drossaert, C. C., Boer, H., & Seydel, E. R. (1996). Perceived risk, anxiety, mammogram uptake, and breast self-examination of women with a family history of breast cancer: the role of knowing to be at increased risk. *Cancer Detection and Prevention, 20*(1), 76-85. Retrieved from <http://www.cancerprev.org/Journal/>
- Dugani, S., & Gaziano, T. A. (2016). 25 by 25: Achieving global reduction in cardiovascular mortality. *Current Cardiology Reports, 18*(1), 1-6. doi:10.1007/s11886-015-0679-4
- Everett, B., Salamonson, Y., Rolley, J. X., & Davidson, P. M. (2014). Underestimation of risk perception in patients at risk of heart disease. *European Journal of Cardiovascular Nursing, 15*(3), e2-e9. doi:10.1177/1474515114556712
- Farquharson, L., Noble, L. M., Barker, C., & Behrens, R. H. (2004). Health beliefs and communication in the travel clinic consultation as predictors of adherence to malaria chemoprophylaxis. *British Journal of Health Psychology, 9*(2), 201-217. Retrieved from [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)2044-8287](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)2044-8287)
- Fehniger, J., Livaudais-Toman, J., Karliner, L., Kerlikowske, K., Tice, J. A., Quinn, J., ... & Kaplan, C. P. (2014). Perceived versus objective breast cancer risk in diverse women. *Journal of Women's Health, 23*(5), 420-427. doi:10.1089/jwh.2013.4516

- Framingham Heart Study. (2017a) *History of the Framingham heart study*. Retrieved from <https://www.framinghamheartstudy.org/about-fhs/history.php>
- Franzini, L., Ardigò, D., Cavalot, F., Miccoli, R., Rivellese, A. A., Trovati, M., ... & Vaccaro, O. (2013). Women show worse control of type 2 diabetes and cardiovascular disease risk factors than men: results from the MIND. IT Study Group of the Italian Society of Diabetology. *Nutrition, Metabolism and Cardiovascular Diseases*, 23(3), 235-241. doi:10.1016/j.numecd.2011.12.003
- Frasure-Smith, N., Lespérance, F., Gravel, G., Masson, A., Juneau, M., Talajic, M., & Bourassa, M. G. (2000). Social support, depression, and mortality during the first year after myocardial infarction. *Circulation*, 101(16), 1919-1924. doi:org.uml.idm.oclc.org/10.1161/01.CIR.101.16.1919
- Frijling, B. D., Lobo, C. M., Keus, I. M., Jenks, K. M., Akkermans, R. P., Hulscher, M. E., ... & Grol, R. P. (2004). Perceptions of cardiovascular risk among patients with hypertension or diabetes. *Patient Education and Counseling*, 52(1), 47-53. doi:10.1016/S0738-3991(02)00248-3
- Galloway, R. D. (2003). Health promotion: causes, beliefs and measurements. *Clinical Medicine & Research*, 1(3), 249-258. doi:10.3121/cmr.1.3.249
- Garza, K. B., Harris, C. V., & Bolding, M. S. (2013). Examination of value of the future and health beliefs to explain dietary and physical activity behaviors. *Research in Social and Administrative Pharmacy*, 9(6), 851-862. doi:org/10.1016/j.sapharm.2012.12.001
- Gaziano, T. A., Young, C. R., Fitzmaurice, G., Atwood, S., & Gaziano, J. M. (2008). Laboratory-based versus non-laboratory-based method for assessment of cardiovascular disease risk: the NHANES I Follow-up Study cohort. *The Lancet*, 371(9616), 923-931. doi.org.uml.idm.oclc.org/10.1016/S0140-6736(08)60418-3

- Gill, S. K. (2015). Cardiovascular Risk Factors and Disease in Women. *Medical Clinics of North America*, 99(3), 535-552. doi:10.1016/j.mcna.2015.01.007
- Giovino, G. A., Mirza, S. A., Samet, J. M., Gupta, P. C., Jarvis, M. J., Bhala, N., ... & Palipudi, K. M. (2012). Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys. *The Lancet*, 380(9842), 668-679. doi:10.1016/S0140-6736(12)61085-X
- Giralt, D., Domingues-Montanari, S., Mendioroz, M., Ortega, L., Maisterra, O., Perea-Gainza, M., ... & Montaner, J. (2012). The gender gap in stroke: A meta-analysis. *Acta Neurological Scandinavica*, 125(2), 83-90. doi:10.1111/j.1600-040.2011.01514.x
- Glanz, K., Rimer, B. K., & Lewis, F. M. (2002). *Health behavior and health education: Theory, research, and practice* (3rd ed.). San Francisco, CA: Jossey-Bass.
- Glanz, K., Rimer, B., & Viswanath, K. (2015). *Health behavior: Theory, research, and practice* (5th ed.). San Francisco, CA : Jossey-Bass.
- Goodarzi, M. O., Dumesic, D. A., Chazenbalk, G., & Azziz, R. (2011). Polycystic ovary syndrome: Etiology, pathogenesis and diagnosis. *Nature Reviews Endocrinology*, 7(4), 219-231.doi:10.1038/nrendo.2010.217
- Government of Canada. (2014). *Economic Burden of Illness in Canada, 2005-2008 – EBIC value of lost production due to premature mortality, 2004-2008*. Retrieved from <https://www.canada.ca/en/public-health/services/reports-publications/economic-burden-illness-canada-2005-2008/economic-burden-illness-canada-2005-2008-13.html>
- Grasso, K., & Bell, R. (2015). Understanding health information seeking: A test of the risk perception attitude framework. *Journal of Health Communication*, 20(12) 1406-1414. doi:org/10.1080/10810730.2015.1018634

- Green, J. S., Grant, M., Hill, K. L., Brizzolara, J., & Belmont, B. (2003). Heart disease risk perception in college men and women. *Journal of American College Health, 51*(5), 207-211. doi:10.1080/07448480309596352
- Griva, F., Anagnostopoulos, F., & Potamianos, G. (2013). Time perspective and perceived risk as related to mammography screening. *Women & Health, 53*(8), 761-776. doi:10.1080/03630242.2013.836140
- Guo, Q., Johnson, C. A., Unger, J. B., Lee, L., Xie, B., Chou, C. P., ... & Pentz, M. (2007). Utility of the theory of reasoned action and theory of planned behavior for predicting Chinese adolescent smoking. *Addictive Behaviors, 32*(5), 1066-1081. doi:10.1016/j.addbeh.2006.07.015
- Guo, Y., Kopec, J. A., Cibere, J., Li, L. C., & Goldsmith, C. H. (2016). Population survey features and response rates: a randomized experiment. *American Journal of Public Health, 106*(8), 1422-1426. doi:10.2105/AJPH.2016.303198
- Haas, J. S., Kaplan, C. P., Des Jarlais, G., Gildengoin, V., Pérez-Stable, E. J., & Kerlikowske, K. (2005). Perceived risk of breast cancer among women at average and increased risk. *Journal of Women's Health, 14*(9), 845-851. doi:10.1089/jwh.2005.14.845
- Haines, C. J., & Farrell, E. (2010). Menopause management: A cardiovascular risk-based approach. *Climacteric, 13*(4), 328-339. doi:10.3109/13697130903450154
- Hale, G. E., & Shufelt, C. L. (2015). Hormone therapy in menopause: An update on cardiovascular disease considerations. *Trends in Cardiovascular Medicine, 25*(6), 540-549. doi:10.1016/j.tcm.2015.01.008
- Hamilton, J. G., & Lobel, M. (2012). Passing years, changing fears? Conceptualizing and measuring risk perceptions for chronic disease in younger and middle-aged women. *Journal of Behavioral Medicine, 35*(2), 124-138. doi:10.1007/s10865-011-9342-8

- Hamilton, J. G., & Lobel, M. (2015). Psychosocial factors associated with risk perceptions for chronic diseases in younger and middle-aged women. *Women & Health, 55*(8), 921-942. doi:10.1080/03630242.2015.1061094
- Hammond, J., Salamonson, Y., Davidson, P., Everett, B., & Andrew, S. (2007). Why do women underestimate the risk of cardiac disease? A literature review. *Australian Critical Care, 20*(2), 53-59. doi:10.1016/j.aucc.2007.02.001
- Hare, D. L., Toukhsati, S. R., Johansson, P., & Jaarsma, T. (2014). Depression and cardiovascular disease: A clinical review. *European Heart Journal, 35*. 1365-1372 doi:10.1093/eurheartj/eht462
- Harris, D. J., & Douglas, P. S. (2000). Enrollment of women in cardiovascular clinical trials funded by the National Heart, Lung, and Blood Institute. *New England Journal of Medicine, 343*(7), 475-480. Retrieved from <http://www.nejm.org/>
- Hart, P. L. (2005). Women's perceptions of coronary heart disease: an integrative review. *Journal of Cardiovascular Nursing, 20*(3), 170-176. Retrieved from <http://journals.lww.com/jcnjournal/pages/default.aspx>
- Hayman, L., & Hughes, S. (2006). Progress in prevention: Dietary modification and cardiovascular disease prevention: Lessons learned from the Women's Health Initiative. *The Journal of Cardiovascular Nursing, 21*(4), 249-50.
- Hays, J., Hunt, J. R., Hubbell, F. A., Anderson, G. L., Limacher, M., Allen, C., & Rossouw, J. E. (2003). The Women's Health Initiative recruitment methods and results. *Annals of Epidemiology, 13*(9), S18-S77. doi:10.1016/S1047-2797(03)00042-5
- Health Canada. (1986). *Health and welfare Canada*. Retrieved from <http://www.hc-sc.gc.ca/hcs-sss/pubs/system-regime/1986-frame-plan-promotion/index-eng.php>

Health Canada. (2014). *Economic burden of illness in Canada (2005-2008)*. Retrieved from

<http://www.phac-aspc.gc.ca/publicat/ebic-femc/2005-2008/assets/pdf/ebic-femc-2005-2008-eng.pdf>

Heart and Stroke Foundation. (2014). *Women and heart disease and stroke*. Retrieved from

http://www.heartandstroke.com/site/c.ikIQLcMWJtE/b.3484041/k.D80A/Heart_disease_Women_and_heart_disease_and_stroke.htm

Heart and Stroke Foundation. (2017). Ms. Understood: Heart & Stroke 2018 Heart Report.

Retrieved from <http://www.heartandstroke.ca/heart/what-is-heart-disease/types-of-heart-disease/women-and-heart-disease>

Heidenreich, P. A., Trogdon, J. G., Khavjou, O. A., Butler, J., Dracup, K., Ezekowitz, M. D., ... & Lloyd-Jones, D. M. (2011). Forecasting the future of cardiovascular disease in the United States a policy statement from the American heart association. *Circulation*, 123(8), 933-944. doi:10.1161/CIR.0b013e31820a55f5

Heydari, A., & Khorashadizadeh, F. (2014). Pender's health promotion model in medical research. *Journal of Pakistan Medical Association*, 64(9), 1067-1074. Retrieved from <http://jpma.org.pk/>

Homko, C. J., Santamore, W. P., Zamora, L., Shirk, G., Gaughan, J., Cross, R., ... & Bove, A. A. (2008). Cardiovascular disease knowledge and risk perception among underserved individuals at increased risk of cardiovascular disease. *Journal of Cardiovascular Nursing*, 23(4), 332-337. doi:10.1097/01.JCN.0000317432.44586.aa

Humphries, D., Krummel, D., Rye, S., & Simon, K. (1997). Factors that Affect Perceived Susceptibility to Cardiovascular Disease in Women. *Journal of the American Dietetic Association*, 97(9), A12. doi:10.1016/S0002-8223(97)00364-7

- Huxley, R., Barzi, F., & Woodward, M. (2006). Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. *BMJ*, 332(7533), 73-78. doi:10.1136/bmj.38678.389583.7C
- Huxley, R. R., & Woodward, M. (2011). Cigarette smoking as a risk factor for coronary heart disease in women compared with men: A systematic review and meta-analysis of prospective cohort studies. *The Lancet*, 378, 1297-1305. http://dx.doi:10.1016/50140-6736(11)60781-2
- Imes, C., C., & Lewis, F.,M. (2014). Family history of cardiovascular disease, perceived cardiovascular disease risk, and health-related behavior: A review of the literature. *Journal of Cardiovascular Nursing*, 29(2), 108-129. doi:10.1097/JCN.0b013e31827db5eb
- Izadnegahdar, M., Singer, J., Lee, M. K., Gao, M., Thompson, C. R., Kopec, J., & Humphries, K. H. (2014). Do younger women fare worse? Sex differences in acute myocardial infarction hospitalization and early mortality rates over ten years. *Journal of Women's Health*, 23(1), 10-17. doi:10.1089/jwh.2013.4507
- Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education & Behavior*, 11(1), 1-47. doi:10.1177/109019818401100101
- Johns Hopkins Medicine. (2016). *Depression and heart disease*. Retrieved from http://www.hopkinsmedicine.org/heart_vascular_institute/clinical_services/centers_excellence/womens_cardiovascular_health_center/patient_information/health_topics/depression_heart_disease.html
- Johnson, N., & Dickson-Swift, V. (2008). It usually happens in older women: Young women's perceptions about breast cancer. *Health Education Journal*, 67(4), 243-257. doi:10.1177/0017896908097068

- Jones, D. E., Weaver, M. T., & Friedmann, E. (2007). Promoting heart health in women: a workplace intervention to improve knowledge and perceptions of susceptibility to heart disease. *AAOHN Journal*, 55(7), 271-276. Retrieved from <http://aaohn.org/page/wh-and-s-journal>
- Kannel, W., Dawber, T., Kagan, A., Revotskie, N., Stokes, J. (1961). Factors of Risk in the Development of Coronary Heart Disease—Six-Year Follow-up Experience. *Annals of Internal Medicine*, 55(1), 33-50. doi:10.7326/0003-4819-55-1-33
- Kannel, W. B., Hjortland, M. C., McNamara, P. M., & Gordon, T. (1976). Menopause and risk of cardiovascular disease. *Annals Internal Medicine*, 85(4), 447-452. doi:10.7326/003-4819-85-4-447
- Katapodi, M. C., Lee, K. A., Facione, N. C., & Dodd, M. J. (2004). Predictors of perceived breast cancer risk and the relation between perceived risk and breast cancer screening: A meta-analytic review. *Preventive Medicine*, 38(4), 388-402. doi:10.1016/j.ypmed.2003.11.012
- Kiamco-Millman, F., & Pinto-Zipp, G. (2013). Factors associated with nurses' intentions to educate female patients on heart disease risk and prevention. *Journal of Cardiovascular Nursing*, 28(6), E9-E17. doi:10.1097/JCN.0b013e318283b9fb
- Kikuchi, J. F. (2003). Nursing theories: relic or stepping stone?. *Canadian Journal of Nursing Research*, 35(2), 3-7. Retrieved from <https://www.mcgill.ca/cjnr/home>
- Kim, C., McEwen, L. N., Piette, J. D., Goewey, J., Ferrara, A., & Walker, E. A. (2007). Risk perception for diabetes among women with histories of gestational diabetes mellitus. *Diabetes Care*, 30(9), 2281-2286. doi:10.2337/dc07-0618
- Kim, E. S., & Menon, V. (2009). Status of women in cardiovascular clinical trials. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 29(3), 279-283. doi:10.1161/ATVBAHA.108.179796

- Kim, S. E., Pérez-Stable, E. J., Wong, S., Gregorich, S., Sawaya, G. F., Walsh, J. M., & Kaplan, C. P. (2008). Association between cancer risk perception and screening behavior among diverse women. *Archives of Internal Medicine*, 168(7), 728-734.
doi:10.1001/archinte.168.7.728
- Kip, K. E., McCreath, H. E., Roseman, J. M., Hulley, S. B., & Schreiner, P. J. (2002). Absence of risk factor change in young adults after family heart attack or stroke: the CARDIA Study. *American Journal of Preventive Medicine*, 22(4), 258-266.
doi:10.1016/S0749-3797(02)00416-6
- Kling, J., M., Miller, V., M., Mankad, R., Wilansky, S., Wu, Q., Zais, T., G., ... Mulvagh, S., L. (2013). Go red for women cardiovascular health-screening evaluation: The dichotomy between awareness and perception of cardiovascular risk in the community. *Journal of Women's Health (15409996)*, 22(3), 210-218.
doi:10.1089/jwh.2012.3744
- Koch, J. (2002). The role of exercise in the African-American woman with type 2 diabetes mellitus: Application of the health belief model. *Journal of the American Academy of Nurse Practitioners*, 14(3), 126-130. Doi:10.1111/j.1745-7599.2002.tb00103.x
- Koelewijn-van Loon, M. S., van der Weijden, T., Ronda, G., van Steenkiste, B., Winkens, B., Elwyn, G., & Grol, R. (2010). Improving lifestyle and risk perception through patient involvement in nurse-led cardiovascular risk management: a cluster-randomized controlled trial in primary care. *Preventive Medicine*, 50(1), 35-44.
doi:10.1016/j.ypmed.2009.11.007
- Laerd Statistics (2015). *Statistical tutorials and software guides*. Retrieved from <https://statistics.laerd.com/>
- Leifheit-Limson, E. C., D'Onofrio, G., Daneshvar, M., Geda, M., Bueno, H., Spertus, J. A., ... & Lichtman, J. H. (2015). Sex differences in cardiac risk factors, perceived risk,

and health care provider discussion of risk and risk modification among young patients with acute myocardial infarction: The VIRGO study. *Journal of the American College of Cardiology*, 66(18), 1949-1957.

<http://dx.doi.org.uml.idm.oclc.org/10.1016/j.jacc.2015.08.859>

Leong, D., Joseph, P., McKee, M., Anand, S., Teo, K., Schwalm, J., & Yusuf, S. (2017).

Reducing the global burden of cardiovascular disease, part 2: Prevention and treatment of cardiovascular disease. *Circulation Research*, 121(6), 695-710.
doi:10.1161/CIRCRESAHA.117.311849

Levit, R. D., Reynolds, H. R., & Hochman, J. S. (2011). Cardiovascular disease in young women: A population at risk. *Cardiology in Review*, 19(2), 60-65.

doi:10.1097/CRD.0b013e31820987b5

Lipid Research Clinics Investigators. (1992). The lipid research clinics coronary primary prevention trial: Results of 6 years of post-trial follow-up. *JAMA Internal Medicine*, 152(7), 1399-1410. doi:10.1001/archinte.1992.00400190041009

Lloyd-Jones, D., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L., Van Horn, L., . . .

Rosamond, W. (2010). Defining and setting national goals for cardiovascular health promotion and disease reduction: The American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation*, 121(4), 586-613.
doi:10.1161/CIRCULATIONAHA.109.192703

Lu, S., & Harris, M. F. (2013). Prevention of diabetes and heart disease: Patient perceptions on risk, risk assessment and the role of their GP in preventive care. *Australian Family Physician*, 42(5), 328-331. Retrieved from <https://www.racgp.org.au/afp>

Lykke, J. A., Langhoff-Roos, J., Sibai, B. M., Funai, E. F., Triche, E. W., & Paidas, M. J. (2009). Hypertensive pregnancy disorders and subsequent cardiovascular morbidity

and type 2 diabetes mellitus in the mother. *Hypertension*, 53(6), 944-951.

doi:10.1161/HYPERTENSIONAHA.109.130765

Maas, A. H. E. M., & Appelman, Y. E. A. (2010). Gender differences in coronary heart disease. *Netherlands Heart Journal*, 18(12), 598-603. Retrieved from <http://www.cardiologie.nl/netherlands-heart-journal/>

Maas, A. H., van der Schouw, Y. T., Regitz-Zagrosek, V., Swahn, E., Appelman, Y. E., Pasterkamp, G., ... Stramba-Badiale, M. (2011). Red alert for women's heart: The urgent need for more research and knowledge on cardiovascular disease in women. *European Heart Journal*, 32, 1362-1368.

<http://dx.doi:10.1093/eurheartj/ehr048>

Mackay, J., & Mensah, G. A. (2004). The atlas of heart disease and stroke. *The Atlas of Heart Disease and Stroke*. World Health Organization.

Mahmood, S. S., Levy, D., Vasan, R. S., & Wang, T. J. (2014). The Framingham Heart Study and the epidemiology of cardiovascular disease: a historical perspective. *The Lancet*, 383(9921), 999-1008. doi.org/10.1016/S0140-6736(13)61752-3

Maiman, L. A., & Becker, M. H. (1974). The health belief model: Origins and correlates in psychological theory. *Health Education & Behavior*, 2(4), 336-353. doi: 10.1177/109019817400200404

Mangos, G. J., Spaan, J. J., Pirabhahar, S., & Brown, M. A. (2012). Markers of cardiovascular disease risk after hypertension in pregnancy. *Journal of Hypertension*, 30(2), 351-358. doi:10.1097/HJH.0B013e32834e5ac7

Mastroianni, A. C., Faden, R., & Federman, D. (Eds.). (1994). *Women and health research: Ethical and legal issues of including women in clinical studies* (Vol. 1). National Academies Press.

- McCormick, K. M., & Bunting, S. M. (2002). Application of feminist theory in nursing research: The case of women and cardiovascular disease. *Health Care for Women International*, 23(8), 820-834. doi:10.1080/07399330290112344
- McDonnell, L. A., Pipe, A. L., Westcott, C., Perron, S., Younger-Lewis, D., Elias, N., Nooyen, J., & Reid, R. D. (2014). Perceived vs actual knowledge and risk of heart disease in women: findings from a Canadian survey on heart health awareness, attitudes, and lifestyle. *Canadian Journal of Cardiology*, 30(7), 827-834. doi:10.1016/j.cjca.2014.05.007
- McEwen, M. & Wills, E.M. (2014) *Theoretical basis for nursing* (4th ed.). Philadelphia: Lippincott Williams & Wilkins.
- Meischke, H., Sellers, D., Goff, D., Daya, M., Meshack, A., Taylor, J., . . . Hand, M. (2000). Factors That Influence Personal Perceptions of the Risk of an Acute Myocardial Infarction. *Behavioral Medicine*, 26(1), 4-13. doi:10.1080/08964280009595748
- Melloni, C., Berger, J. S., Wang, T. Y., Gunes, F., Stebbins, A., Pieper, K. S., . . . & Newby, L. K. (2010). Representation of women in randomized clinical trials of cardiovascular disease prevention. *Circulation: Cardiovascular Quality and Outcomes*, 3(2), 135-142. doi:10.1161/CIRCOUTCOMES.110.868307
- Mendis, S., Puska, P., & Norrving, B. (2011). *Global atlas on cardiovascular disease prevention and control*. World Health Organization.
- Mikhail, B. (1981). The health belief model: A review and critical evaluation of the model, research, and practice. *Advances in Nursing Science*, 4(1), 65-82. Retrieved from <http://journals.lww.com/advancesinnursingscience/Pages/default.aspx>
- Monsuez, J. J., Pham, T., Karam, N., Amar, L., Chicheportiche-Ayache, C., Menasché, P., . . . & Weill, I. (2017). Awareness of individual cardiovascular risk factors and self-

perception of cardiovascular risk in women. *The American Journal of the Medical Sciences*, 354(3), 240-245. doi:10.1016/j.amjms.2017.05.008

Montgomery, G. H., Erblich, J., DiLorenzo, T., & Bovbjerg, D. H. (2003). Family and friends with disease: Their impact on perceived risk. *Preventive Medicine*, 37(3), 242-249. doi:10.1016/S0091-7435(03)00210-8

Moore, L.C., Kimble, L.P., & Minick, P. (2010). Perceptions of cardiac risk factors and risk-reduction behavior in women with known coronary heart disease. *The Journal of Cardiovascular Nursing*, 25(6), 433-443. doi:10.1097/JCN.0b013e3181defd58

Mora, S., Glynn, R. J., Hsia, J., MacFadyen, J. G., Genest, J., & Ridker, P. M. (2010). Statins for the primary prevention of cardiovascular events in women with elevated high-sensitivity C-reactive protein or dyslipidemia. *Circulation*, 121(9), 1069-1077. doi:10.1161/CIRCULATIONAHA.109.906479

Moran, B., & Walsh, T. (2013). Cardiovascular Disease in Women. *Nursing for Women's Health*, 17(1), 63-68. doi:10.1111/1751-486X.12008

Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C. (2013). *IBM SPSS for introductory statistics: Use and interpretation* (5th ed). New York, NY: Routledge.

Mosca, L., Appel, L. J., Benjamin, E. J., Berra, K., Chandra-Strobos, N., Fabunmi, R. P., ... & Keenan, N. L. (2004). Evidence-based guidelines for cardiovascular disease prevention in women. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 24(3), e29-e50. doi:10.1161/01.CIR.0000114834.85476.81

Mosca, L., Benjamin, E. J., Berra, K., Bezanson, J. L., Dolor, R. J., Lloyd-Jones, D. M., ... & Zhao, D. (2011). Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: A guideline from the American Heart Association. *Journal of the American College of Cardiology*, 57(12), 1404-1423. doi:10.1016/j.jacc.2011.02.005

- Mosca, L., Grundy, S. M., Judelson, D., King, K., Limacher, M., Oparil, S., ... & Winston, M. (1999). Guide to preventive cardiology for women. *Circulation*, 99(18), 2480-2484. doi: 10.1161/01.CIR.99.18.2480
- Mosca, L., Hammond, G., Mochari-Greenberger, H., Towfighi, A., & Albert, M. A. (2013). Fifteen-year trends in awareness of heart disease in women results of a 2012 American Heart Association National Survey. *Circulation*, 127(11), 1254-1263. doi:10.1161/CIRCOUTCOMES.109.915538
- Multiple Risk Factor Intervention Trial Research Group. (1982). Multiple risk factor intervention trial: Risk factor changes and mortality results. *JAMA*, 248(12), 1465-1477. doi:10.1001/jama.1982.03330120023025
- Muñoz-Silva, A., Sánchez-García, M., Nunes, C., & Martins, A. (2007). Gender differences in condom use prediction with theory of reasoned action and planned behaviour: The role of self-efficacy and control. *Aids Care*, 19(9), 1177-1181. doi:10.1080/09540120701402772
- Nabel, E. G. (2006). The women's health initiative. *Science*, 313(5794), 1703-1703. doi:10.1126/science.1134995
- Nabel, E. G. (2015). Heart disease prevention in young women. *Journal of American Heart Association*, 132(11), 989-991. doi:10.1161/CIRCULATIONAHA.115.018352
- National Heart, Lung, and Blood Institute. (2012). Women's fear of heart disease has almost doubled in three years, but breast cancer remains most feared disease. Retrieved from <https://www.nhlbi.nih.gov/health/educational/hearttruth/about/fear-doubled.htm>
- National Heart, Lung and Blood Institute. (2016). *The heart truth campaign*. Retrieved from <https://www.nhlbi.nih.gov/health/educational/hearttruth/>
- Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... Ammar, W. (2014). Global, regional, and national prevalence of overweight and obesity in

- children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 384(9945), 766-781. doi:10.1016/S0140-6736(14)60460-8
- Nieto-Vazquez, M., Tejeda, M.J., Colin, J., & Matos, A. (2009). Results of an osteoporosis educational intervention randomized trial in a sample of Puerto-Rican women. *Journal of Cultural Diversity*, 16(4), 171-177. Retrieved from <https://www.questia.com/library/p587/journal-of-cultural-diversity>
- Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, 10(1), 53. doi:10.1186/s13012-015-0242-0
- Nurses' Health Study. (2016a). *History*. Retrieved from <http://www.nurseshealthstudy.org/about-nhs/history>
- Nurses Health Study. (2016b). Key contributions to scientific knowledge. Retrieved from <http://www.nurseshealthstudy.org/about-nhs/key-contributions-scientific-knowledge>
- Oxford Dictionary. (2017). *Awareness*. Retrieved from <https://en.oxforddictionaries.com/definition/awareness>
- Peltzer, K., Onya, H., Seoka, P., & Tladi, F. M., Malema, RN. (2002). Factors at first diagnosis of tuberculosis associated with compliance with the Directly Observed Therapy (DOT) in the Limpopo Province, South Africa. *Curationis*, 25(3), 55-67. Retrieved from <http://www.curationis.org.za/index.php/curationis>
- Pencina, M. J., D'Agostino, R. B., Larson, M. G., Massaro, J. M., & Vasan, R. S. (2009). Predicting the 30-year risk of cardiovascular disease. *Circulation*, 119(24), 3078-3084. doi:10.1161/CIRCULATIONAHA.108.816694
- Pender, N., Murdaugh, C., Parsons, M. (2015). *Health promotion in nursing practice* (7th ed.). Boston, MA. Pearson.

- Pender, N. (1996). *Health promotion in nursing practice* (3rd ed.). Stamford, CT.: Appleton & Lange.
- Perkins-Porras, L., Whitehead, D. L., & Steptoe, A. (2006). Patients' beliefs about the causes of heart disease: Relationships with risk factors, sex and socio-economic status. *European Journal of Cardiovascular Prevention & Rehabilitation*, 13(5), 724-730. Retrieved from <http://journals.sagepub.com/home/cpr>
- Peters, S. A., Huxley, R. R., Sattar, N., & Woodward, M. (2015). Sex differences in the excess risk of cardiovascular diseases associated with type 2 diabetes: potential explanations and clinical implications. *Current Cardiovascular Risk Reports*, 9(7), 36. doi:10.1006/s12170-015-0462-5
- Physicians' Health Study. (2009). *Physicians' health study I*. Retrieved from <http://phs.bwh.harvard.edu/phs1.htm>
- Polit, D., & Beck, C. (2012). *Nursing research: Generating and assessing evidence for nursing practice* (9th ed.). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.
- Poomsrikaew, O., Berger, B. E., Kim, M. J., & Zerwic, J. J. (2012). Age and gender differences in social-cognitive factors and exercise behavior among Thais. *Western Journal of Nursing Research*, 34(2), 245-264. doi:10.1177/0193945911424170
- Raingruber, B. (2016). *Contemporary health promotion in nursing practice*. Jones & Bartlett Publishers.
- Ramachandran, H., Wu, V., Kowitlawakul, Y., & Wang, W. (2016). Awareness, knowledge and healthy lifestyle behaviors related to coronary heart disease among women: An integrative review. *Heart & Lung.*, 45(3), 173-185.
<http://dx.doi.org.uml.idm.oclc.org/10.1016/j.hrtlng.2016.02.004>
- Reckelhoff, J. F. (2001). Gender differences in the regulation of blood pressure. *Hypertension*, 37(5), 1199-1208. doi:10.1161/01.HYP.37.5.1199

- Retnakaran, R., & Shah, B. R. (2009). Mild glucose intolerance in pregnancy and risk of cardiovascular disease: a population-based cohort study. *Canadian Medical Association Journal, 181*(6-7), 371-376. doi:10.1503/cmaj.090569
- Richardson, B., Wang, Z., & Hall, C. (2012). Blowing the whistle against Greek hazing: The theory of reasoned action as a framework for reporting intentions. *Communication Studies, 63*(2), 172-193. doi:10.1080/10510974.2011.624396
- Rimal, R., Brown, J., Mkandawire, G., Folda, L., Böse, K., & Creel, A. (2009). Audience segmentation as a social-marketing tool in health promotion: Use of the risk perception attitude framework in HIV prevention in Malawi. *American Journal of Public Health, 99*(12), 2224-9. doi:10.2105/AJPH.2008.155234
- Rimal, R., & Juon, H. (2010). Use of the risk perception attitude framework for promoting breast cancer prevention. *Journal of Applied Social Psychology, 40*(2), 287-310. doi:10.1111/j.1559-1816.2009.00574.x
- Rimal, R., & Real, K. (2003). Perceived risk and efficacy beliefs as motivators of change. *Human Communication Research, 29*(3), 370-399. doi:10.1111/j.1468-2958.2003.tb00844.x
- Roberts, & Davis. (2013). Cardiovascular Disease in Women: A Nurse Practitioner's Guide to Prevention. *The Journal for Nurse Practitioners, 9*(10), 679-687. doi:10.1016/j.nurpra.2013.08.018
- Rodriguez, F., & Foody, J. M. (2013). Is cardiovascular disease in young women overlooked?. *Women's Health, 9*(3), 213-215. doi:10.2217/whe.13.18
- Rosano, G. M. C., Vitale, C., Marazzi, G., & Volterrani, M. (2007). Menopause and cardiovascular disease: the evidence. *Climacteric, 10*(1), 19-24. doi:10.1080/13697130601114917

- Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education & Behavior*, 2(4), 328-335. doi:10.1177/109019817400200403
- Roth, G. A., Huffman, M. D., Moran, A. E., Feigin, V., Mensah, G. A., Naghavi, M., & Murray, C. J. (2015). Global and regional patterns in cardiovascular mortality from 1990 to 2013. *Circulation*, 132(17), 1667-1678. doi:org.uml.idm.oclc.org/10.1161/CIRCULATIONAHA.114.008720
- Ruffin, M., Nease, D., Sen, A., Pace, W., Wang, C., Acheson, L., . . . Gramling, R. (2011). Effect of preventive messages tailored to family history on health behaviors: The Family Healthware Impact Trial. *Annals of Family Medicine*, 9(1), 3-11. doi:10.1370/afm.1197
- Schmiege, S., Aiken, L., Sander, J., & Gerend, M. (2007). Osteoporosis prevention among young women: Psychosocial models of calcium consumption and weight-bearing exercise. *Health Psychology*, 26(5), 577-587. doi:10.1037/0278-200709000-00011
- Schroetter, S. A., & Peck, S. D. (2008). Women's risk of heart disease: promoting awareness and prevention-a primary care approach. *Medsurg Nursing*, 17(2), 107-113. Retrieved from <http://www.medsurgnursing.net/cgi-bin/WebObjects/MSNJournal.woa>
- Seitz, H. H., Schapira, M. M., Gibson, L. A., Skubisz, C., Mello, S., Armstrong, K., & Cappella, J. N. (2017). Explaining the effects of a decision intervention on mammography intentions: The roles of worry, fear and perceived susceptibility to breast cancer. *Psychology & Health*, 1-19. doi:10.1080/08870446.2017.1387261
- Sharma, M., & Romas, J., A. (2010). *Theoretical foundations of health education and health promotion* (2nd ed.). Sudbury, MA: Jones & Bartlett Learning.
- Simons-Morton, B., McLeroy, K.R., & Wendel, M.L. (2011). *Behavior theory in health promotion practice and research*. Burlington, MA: Jones & Bartlett Learning.

- Sjoberg, L., Moen, B. E., & Rundmo, T. (2004). Explaining risk perception: An evaluation of the psychometric paradigm in risk perception research.
- Skubisz, C. (2014). Risk Perception Attitude Framework. In Thomson, T. *Encyclopedia of Health Communication*. Thousand Oaks, California: SAGE Publications, Inc.
- Slovic, P. (1992). Perception of risk: Reflections on the psychometric paradigm. In S. Krimsky & D. Golding (Eds.), Social theories of risk (pp. 117–152). New York: Praeger.
- Statistics Canada. (2017). *Deaths, by cause, Chapter IX: Diseases of the circulatory system (100 to 199), age group and sex, Canada*. Retrieved from <http://www5.statcan.gc.ca/cansim/a47>
- Stone, N., Robinson, J., Lichtenstein, A., Bairey Merz, C., Blum, C., Eckel, R., . . . Wilson, P. (2014). 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, 63(25), 2889-934.
doi:10.1161/01.cir.0000437738.63853.7a
- Strecher, V. J., & Rosenstock, I. M. (1997). *Cambridge handbook of psychology, health and medicine*. Cambridge, United Kingdom. Cambridge University Press.
- Sullivan, H., Beckjord, E., Finney, L., & Hesse, B. (2008). Nutrition-related cancer prevention cognitions and behavioral intentions: Testing the risk perception attitude framework. *Health Education & Behavior*, 35(6), 866-879.
doi:10.1177/1090198108326164
- Tengland, P. A. (2010). Health promotion or disease prevention: A real difference for public health practice?. *Health Care Analysis*, 18(3), 203-221. doi:10.1007/s10728-009-0124-1

- Thakkar, J., Heeley, E. L., Chalmers, J., & Chow, C. K. (2016). Inaccurate risk perceptions contribute to treatment gaps in secondary prevention of cardiovascular disease. *Internal Medicine Journal*, 46(3), 339-346. doi:10.111/imj.12983
- Thanavaro, J. L., Moore, S. M., Anthony, M., Narsavage, G., & Delicath, T. (2006). Predictors of health promotion behavior in women without prior history of coronary heart disease. *Applied Nursing Research*, 19(3), 149-155. doi:10.1016/j.apnr.2005.07.006
- The Conference Board of Canada. (2010). *The Canadian heart health strategy: Risk factors and future cost implications*. Retrieved from <http://www.conferenceboard.ca/elibrary/abstract.aspx?did=3447>
- Thompson, L. E., & Daugherty, S. L. (2017). Gender disparities in cardiovascular disease prevention. *BMJ*, 103(7), 479-480. doi.org.uml.idm.oclc.org/10.1136/heartjnl-2016-310788
- Toulis, K. A., Goulis, D. G., Mintziori, G., Kintiraki, E., Eukarpidis, E., Mouratoglou, S., ... Tarlatzis, B. C. (2011). Meta-analysis of cardiovascular disease risk markers in women with polycystic ovary syndrome. *Human Reproduction Update*, 17(6), 741-760. doi:10.1093/humupd/dmr025
- Traylor, J., Chandrasekaran, S., Limaye, M., Srinivas, S., & Durnwald, C. P. (2016). Risk perception of future cardiovascular disease in women diagnosed with a hypertensive disorder of pregnancy. *The Journal of Maternal-Fetal & Neonatal Medicine*, 29(13), 2067-2072. doi:10.3109/14767058.2015.1081591
- Usher-Smith, J. A., Silarova, B., Schuit, E., Moons, K. G., & Griffin, S. J. (2015). Impact of provision of cardiovascular disease risk estimates to healthcare professionals and patients: a systematic review. *BMJ open*, 5(10), e008717. doi:10.1136/bmjopen-2015-008717

- van Rijn, B. B., Nijdam, M. E., Bruinse, H. W., Roest, M., Uiterwaal, C. S., Grobbee, D. E., ... & Franx, A. (2013). Cardiovascular disease risk factors in women with a history of early-onset preeclampsia. *Obstetrics & Gynecology*, 121(5), 1040-1048. doi:10.1097/AOG.0b013e31828ea3b5
- Vasvári, T. (2015). Risk, risk perception, risk management—a review of the literature. *Public Finance Quarterly*, (60)1, 29-48. Retrieved from <https://econpapers.repec.org/article/pfqjournl/>
- Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet*, 376(9748), 1261-1271. doi:10.1016/S0140-6736(10)60809-4
- Walter, F. M., & Emery, J. (2006). Perceptions of family history across common diseases: a qualitative study in primary care. *Family practice*, 23(4), 472-480. doi:10.1093/fampra/cml006
- Wang, C., O'Neill, S. M., Rothrock, N., Gramling, R., Sen, A., Acheson, L. S., ... & Ruffin, M. T. (2009). Comparison of risk perceptions and beliefs across common chronic diseases. *Preventive Medicine*, 48(2), 197-202. doi:10.1016/j.ypmed.2008.11.008
- Wang, E. T., Calderon-Margalit, R., Cedars, M. I., Daviglus, M. L., Merkin, S. S., Schreiner, P. J., ... Bibbins-Domingo, K. (2011). Polycystic ovary syndrome and risk for long-term diabetes and dyslipidemia. *Obstetrics and Gynecology*, 117, 6. <http://dx.doi.org/10.1097/AOG.0b013e31820209bb>
- Wannamethee, S., Papacosta, G., Lawlor, O., Whincup, D., Lowe, A., Ebrahim, P., & Sattar, H. (2012). Do women exhibit greater differences in established and novel risk factors between diabetes and non-diabetes than men? The British Regional Heart Study and British Women's Heart Health Study. *Diabetologia*, 55(1), 80-87. doi:10.1007/s00125-011-2284-4

- Weaver, C. G., Clement, F. M., Campbell, N. R., James, M. T., Klarenbach, S. W., Hemmelgarn, B. R., ... & McBrien, K. A. (2015). Healthcare Costs Attributable to Hypertension Canadian Population-Based Cohort Study. *Hypertension*, 66(3), 502-508. doi:10.1161/HYPERTENSIONAHA.115.05702
- Webster, R., & Heeley, E. (2010). Perceptions of risk: understanding cardiovascular disease. *Risk Management and Healthcare Policy*, 3(4), 49-60. doi:10.2147/RMHP.S8288
- Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care*, 27(5), 1047-1053. doi:10.23337/diacare.27.5.1047
- Willett, W. C., Green, A., Stampfer, M. J., Speizer, F. E., Colditz, G. A., Rosner, B., ... & Hennekens, C. H. (1987). Relative and absolute excess risks of coronary heart disease among women who smoke cigarettes. *New England Journal of Medicine*, 317(21), 1303-1309. doi:10.1056/NEJM198711193172102
- Williams, D. J., & Noyes, J. M. (2007). How does our perception of risk influence decision-making? Implications for the design of risk information. *Theoretical Issues in Ergonomics Science*, 8(1), 1-35. doi:10.1080/14639220500484419
- Williams, R. J., Herzog, T. A., & Simmons, V. N. (2011). Risk perception and motivation to quit smoking: A partial test of the Health Action Process Approach. *Addictive Behaviors*, 36(7), 789-791. doi:10.1016/j.addbeh.2011.03.003
- Wilmot, K. A., O'Flaherty, M., Capewell, S., Ford, E. S., & Vaccarino, V. (2015). Coronary heart disease mortality declines in the United States from 1979 through 2011 evidence for stagnation in young adults, especially women. *Circulation*, 132, 997-1002. http://dx.doi:10.1161/CIRCULATIONAHA.115.015293
- Women Heart. (2016). *Women heart*. Retrieved from <http://www.womenheart.org/>

- Women's Health Initiative Study Group. (1998). Design of the women's health initiative clinical trial and observational study. *Controlled Clinical Trials*, 19(1), 61-109.
doi:10.1016/S0197-2456(97)00078-0
- World Health Organization (1986). *Ottawa charter health promotion*. Retrieved from
<http://www.phac-aspc.gc.ca/ph-sp/docs/charter-chartre/pdf/charter.pdf>
- World Health Organization (2005). *Constitution of the world health organization (55th edition)*. Retrieved from http://www.who.int/governance/eb/who_constitution_en.pdf
- World Health Organization. (2013a). *Global action plan for the prevention and control of noncommunicable diseases 2013-2020*. Geneva: World Health Organization.
- World Health Organization. (2013b) *A Global Brief on Hypertension: Silent Killer, Global Public Health Crisis*. Retrieved from <http://www.thehealthwell.info/node/466541>
- World Health Organization. (2017a). *Cardiovascular Diseases*. Retrieved from
<http://www.who.int/mediacentre/factsheets/fs317/en/>
- World Health Organization (2017b). *Health promotion and disease prevention through population-based interventions, including action to address social determinants and health inequity*. Retrieved from <http://www.emro.who.int/about-who/public-health-functions/health-promotion-disease-prevention.html>
- World Heart Federation. (2012). *Cardiovascular disease in women*. Retrieved from
<https://www.world-heart-federation.org/resources/women-cvd-facts-tips/>
- World Heart Federation. (2017). Tobacco: totally avoidable risk factor for CVD. Retrieved from <https://www.world-heart-federation.org/resources/tobacco-totally-avoidable-risk-factor-cvd/>
- Yusuf, S., Wood, D., Ralston, J., & Reddy, K. S. (2015). The World Heart Federation's vision for worldwide cardiovascular disease prevention. *The Lancet*, 386(9991), 399-402.
doi:10.1016/S0140-6736(15)60265-3

Zakaria, M., Razak, S. N. A. A., & Yusoff, M. S. A. (2016). The theory of planned behaviour as a framework for whistle-blowing intentions. *Review of European Studies*, 8(3), 221. doi: 10.559/res.v8n3p221

LIST OF APPENDICES

Appendix A1: Invitation Email to Participate

Appendix A2: Email Reminder

Appendix B: Research Information and Consent Form

Appendix C: Questionnaires

Appendix C1: Perception of Risk of Heart Disease Scale

Appendix C2: Non- Laboratory Based CVD Risk Assessment Tool

Appendix C3: Demographic Survey

Appendix D1: Instrumentation Scoring Information: Perception of Risk for Heart Disease

Scale

Appendix D2: Instrumentation Scoring Information: Non- Laboratory Based CVD Risk

Assessment Tool

Appendix A: Invitation Email to Participate**ATTENTION: REGISTERED NURSES**

You are invited to participate in a research project entitled: Exploring Perceived Cardiovascular Disease Risk in Female Nurses. This project is designed to gather information about risk perception of cardiovascular disease (CVD) among female nurses.

This email is being sent by the CRNM on behalf of a graduate student (Gurmeet Gujral) and her thesis advisor /researcher (Dr. Jo-Ann Sawatzky) from the College of Nursing at the University of Manitoba. Our goal is that this research project will provide insight into perception of risk for CVD in women. Ideally, the findings of this study will result in the development of new strategies for CVD prevention in women.

Participation in this study is voluntary and researchers will receive your anonymous responses.

You are eligible to participate in this study if you are a female, RN residing in Winnipeg, Manitoba. You are NOT eligible to participate if you have a personal history of a CVD (i.e., ischemic heart disease [myocardial infarction], cerebrovascular disease [stroke], peripheral vascular disease, heart failure, rheumatic heart disease, heart arrhythmia, and congenital heart disease)

If you are interested, and agree to participate, it will involve completing the attached questionnaire package. Completing the questionnaires will take approximately 10 minutes of your time.

Study participants are invited to enter their names to win 1 of 4 Chapters Bookstore gift certificates for \$100 each. Two **“early bird” draws** will be held (*one week after you have received this email*) and the final 2 names will be drawn at the end of the study (*end of study date*)

Thank-you for taking the time to read this information. You can make a difference! It is through research projects such as this one, that researchers will gain better understanding of how to reduce the risk for CVD among women of all ages.

Please click on the following link for more study information, the consent form, and the online survey questionnaire (*insert survey link*).

Sincerely,

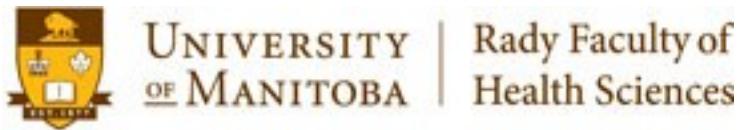
Gurmeet Gujral, RNBN*
Graduate Student/Principal Investigator
College of Nursing, University of Manitoba



* contact for further information

Jo-Ann V. Sawatzky RN, PhD
Thesis Advisor/ Research Supervisor
College of Nursing, University of Manitoba

Note: this study is approved by the University of Manitoba's Education and Nursing Research Ethics Board (ENREB). Concerns and complaints can be directed to the Human Ethics Coordinator @ 204-474-7122 or email: humanethics@umanitoba.ca

Appendix A2: Email Reminder**ATTENTION: REGISTERED NURSES**

This email is being sent to you on behalf of a graduate student and researcher from the College of Nursing, University of Manitoba.

Approximately 10 days ago you were sent an email via the CRNM, on behalf of the researchers, to request your participation in a confidential online survey of all RNs in Winnipeg. The survey will gather information from you about the factors that affect risk perception of cardiovascular disease among female nurses. You are asked to complete an online **confidential and anonymous questionnaire**, which should take only about 10 minutes to complete. Your response to this survey is important to gather information that can be used in the development of strategies to improve perception of cardiovascular disease among women. If you complete the survey prior to the end of data collection (*insert end of survey date – 10 days from this reminder*), you will have the opportunity to enter into a draw to win 1 of 2 remaining **\$100 gift cards to Chapters Bookstore**.

We look forward to receiving your valuable input. If you are interested in completing the survey questionnaire and/or would like more information, please go to the following link:
[Insert Survey Link]

Sincerely,

Gurmeet Gujral, RNBN*
Graduate Student/Principal Investigator
College of Nursing, University of Manitoba



* contact for more information

Jo-Ann V. Sawatzky RN, PhD
Thesis Advisor/ Research Supervisor
College of Nursing, University of Manitoba



Note: this study is approved by the University of Manitoba's Education and Nursing Research Ethics Board. Concerns and complaints can be directed to the Human Ethics Coordinator @ 204-474-7122 or email: humanethics@umanitoba.ca

Appendix B: Research Information & Consent Form

UNIVERSITY
OF MANITOBA | Rady Faculty of
Health Sciences

RESEARCH SUBJECT INFORMATION & CONSENT FORM

Project Title: Exploring Perceived Cardiovascular Disease Risk in Female Nurses

Researcher(s): Gurmeet Gujral, RNBN
Graduate Student/Principal Investigator
College of Nursing, University of Manitoba
[REDACTED]

Jo-Ann V. Sawatzky RN, PhD
Thesis Advisor/Research Supervisor
College of Nursing, University of Manitoba
[REDACTED]

Sponsor: Manitoba Centre for Nursing and Health Research

This consent form, a copy of which you can print for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Study Purpose

The purpose of this study is to explore perception of risk for cardiovascular disease (CVD) among adult female registered nurses (RNs). A nursing graduate student and nurse researchers from the College of Nursing, University of Manitoba, are conducting the study. Our goal is that the knowledge and insights gained from this research will lead to the development of strategies to improve CVD risk perception and risk reduction among women.

Participants

We are asking Registered Nurses in Winnipeg to participate in this study.

You are eligible to participate in this study if you are a female, RN residing in Winnipeg, Manitoba. You are NOT eligible to participate if you have a personal history of/have been diagnosed with CVD (i.e., ischemic heart disease [myocardial infarction], cerebrovascular disease [stroke], peripheral vascular disease, heart failure, rheumatic heart disease, heart arrhythmia, and congenital heart disease)

Your participation will involve completing a confidential and anonymous online survey located in a password protected account at qualtrics.com. The survey is expected to take about 10 minutes to complete. Please consider participating in this study.

Risks/Benefits

There are minimal anticipated risks to you for participating in this research. If at any time during the completion of the questionnaire, you become upset, please discontinue completing the survey immediately and contact the researcher or your employee human resources department to seek assistance. If you exit the survey prior to submission, your responses will not be part of the survey/study. However, it will not be possible to delete the responses you have provided once you submit your completed survey as your responses are recorded anonymously. You may not benefit directly from participation in this research; however, the study results will contribute to a better understanding of the perception of CVD risk among women. There will be no financial costs for you to participate; the only cost is your time to complete the survey. Although you will not be paid for your participation, **study participants are invited to enter their names to win one of 4 Chapters Bookstore gift certificates for \$100 each. The first 2 ‘early bird’ draws will be held on (7 days post-email) and the final 2 names will be drawn at the end of the study.** You will enter this draw by following a link at the end of the survey which will lead to a separate data collector, that is not linked to the answers you have provided throughout this survey.

Confidentiality

All information you provide to this study will be kept strictly confidential. The link you follow to complete the survey is a general link common to all survey participants. As such, completion of this survey is anonymous. If you wish to enter the draw for a \$100 gift card and/or receive a summary report of the study results, you will be asked to provide your email or mailing address through a separate data collector for these purposes only. Only employees of the Manitoba Centre for Nursing and Health Research (MCNHR) located in the College of Nursing, University of Manitoba, will know you have participated (Note: All MCNHR staff sign a pledge of confidentiality). The MCNHR will be managing the data collection. Only MCNHR employees will have access to the password protected survey account on qualtrics.com. Once data collection is complete, the MCNHR will review the data collected to ensure no personal identifiers were recorded. All such identifiers will be removed from the data before the data is given to the researchers in the form of a password protected electronic file that will be stored on a password protected network drive housed at the University of Manitoba. No copies of the data will be kept by the MCNHR. The MCNHR will only keep a record of the email address of participants who have indicated they would like to receive a summary report and/or be entered in the draw for a \$100 gift certificate. Only the identified researchers will have access to the study data after data collection is complete. Any hardcopies of data analysis output will be kept in a locked filing cabinet in the office of the research supervisor (Room 281 Helen Glass Centre for Nursing; University of Manitoba). All electronic data will be kept for a maximum of 7 years and then deleted. Hardcopies of study data will be disposed after the same time period, **according to the University of Manitoba policies and procedures** as confidential waste. The anticipated date of all data destruction is April 2025.

Dissemination

The results of this study may be published in peer-reviewed journals and presented at nursing conferences. If you would like to receive a summary of the study results, please indicate your willingness to receive this report by answering the applicable question provided at the end of the survey. The MCNHR will send you a copy of the summary report by email when it becomes available on or about September 2018. After the summary report is sent to you, the MCNHR will delete your email address from their records.

Consent

Completion of this survey indicates that you have understood to your satisfaction the information regarding participation in the research project and consent to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. You may choose to discontinue your participation in this survey at any time by exiting the survey and your responses will not be part of this study. However, once you have submitted the survey it will not be possible to remove or change your responses because they are recorded anonymously. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Education and Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (204) 474-7122 or humanethics@umanitoba.ca. Print a copy of this consent form to you to keep for your records and reference.

If you agree to participate in the survey, we ask that you please click on the next button at the bottom of the page to be taken to the first survey questions.

Do not complete the Qualtrics Survey Questionnaire unless you have a chance to ask questions and have received satisfactory answers to all of your questions.

****NOTE: Contact information is only required if you are interested in receiving a summary of the study results or wish to enter the draw for a \$100 gift card to Chapters Bookstore.**

For further information, please contact:

Gurmeet Gujral RN, BN
Graduate Student/Principal Investigator


Jo-Ann V. Sawatzky RN, PhD
Thesis Advisor/Research Supervisor


Appendix C: Questionnaire

PERCEIVED RISK OF CARDIOVASCULAR DISEASE SURVEY

GENERAL INSTRUCTIONS:

The following 3 pages include a series of questionnaires. Completing these questionnaires should take no more than 10 minutes of your time. Please complete all the components of the survey. If at any time during the completion of the questionnaire, you become upset, please discontinue the survey immediately by closing your web browser and contact your employee human resources department for assistance. If any of the questions are unclear, please do not hesitate to contact Gurmeet Gujral [REDACTED] or her thesis advisor and research supervisor, Dr. Jo-Ann Sawatzky [REDACTED]

To proceed, please note you are **NOT eligible** to participate if you have a personal history of /have been diagnosed with CVD (i.e., ischemic heart disease [myocardial infarction], cerebrovascular disease [stroke], peripheral vascular disease, heart failure, rheumatic heart disease, heart arrhythmia, and congenital heart disease)

Appendix C1: Questionnaire

Perception of Risk of Heart Disease Scale

PART I

This part of the questionnaire includes statements about perceptions of cardiovascular disease risk. **For each statement, please indicate whether you agree/disagree that this statement is true.** Please click the most appropriate response, using the following scale:

| | Strongly Disagree | Disagree | Agree | Strongly Agree |
|---|-------------------|----------|-------|----------------|
| 1. It is possible that I have heart disease | 1 | 2 | 3 | 4 |
| 2. I am likely to get heart disease in the next 10 years | 1 | 2 | 3 | 4 |
| 3. I am likely to get heart disease because of my past behaviours | 1 | 2 | 3 | 4 |
| 4. I feel sure that I will get heart disease | 1 | 2 | 3 | 4 |
| 5. It is likely that I will get heart disease | 1 | 2 | 3 | 4 |
| 6. I am at risk of getting heart disease | 1 | 2 | 3 | 4 |
| 7. It is possible that I will get heart disease | 1 | 2 | 3 | 4 |
| 8. Heart disease has no chance of being cured | 1 | 2 | 3 | 4 |
| 9. I am too young to have heart disease | 1 | 2 | 3 | 4 |
| 10. People like me do not get heart disease | 1 | 2 | 3 | 4 |
| 11. I am not worried that I might get heart disease | 1 | 2 | 3 | 4 |
| 12. People my age are too young to get heart disease | 1 | 2 | 3 | 4 |
| 13. People my age do not get heart disease | 1 | 2 | 3 | 4 |
| 14. Healthy lifestyle habits are unattainable | 1 | 2 | 3 | 4 |
| 15. I am not doing anything now that is unhealthy to my heart | 1 | 2 | 3 | 4 |
| 16. I am healthy so my body can fight heart diseases | 1 | 2 | 3 | 4 |
| 17. Lifestyle habits don't put me at risk for heart disease | 1 | 2 | 3 | 4 |
| 18. If I am going to get disease, I will get it | 1 | 2 | 3 | 4 |
| 19. People who don't get heart disease are just plain lucky | 1 | 2 | 3 | 4 |
| 20. The causes of heart disease are unknown | 1 | 2 | 3 | 4 |

Appendix C2: Questionnaire**Non-Laboratory Based CVD Risk Assessment Tool****PART II**

This part of the questionnaire includes questions about your cardiovascular disease risks. Please answer all questions. **Remember that all information provided will be kept strictly confidential.**

1. How old are you? _____ years
2. Are you currently on medications for high blood pressure? Yes ____ No ____
3. Has a doctor or other healthcare provider ever told you that you have diabetes or high blood sugar? Yes ____ No ____
4. Are you a current smoker? Yes ____ No ____
5. How much do you weigh? _____ kg OR _____ pounds
6. How tall are you? _____ cms OR _____ inches
7. What is your approximate systolic blood pressure value? _____

Gaziano, T. A., Young, C. R., Fitzmaurice, G., Atwood, S., & Gaziano, J. M. (2008). Laboratory-based versus non-laboratory-based method for assessment of cardiovascular disease risk: the NHANES I Follow-up Study cohort. *The Lancet*, 371(9616), 923-931.
doi.org.uml.idm.oclc.org/10.1016/S0140-6736(08)60418-3

Permission received to use this scale for the purposes of the proposed research received via email communication from Shafika Abrahams-Gessel on behalf of T. Gaziano on January 2, 2018.

Appendix C3: Questionnaire**Demographic Survey****PART III**

Responses to the following questions are a very relevant and key part of this study. Please answer all questions. **Remember that all information provided will be kept strictly confidential.**

1. What is your primary role as a registered nurse? PLEASE CHECK (✓)
 - a. RN – staff nurse.....()
 - b. RN – manager()
 - c. RN – educator()
 - d. RN – nurse practitioner()
 - e. RN – other (e.g., PHN, homecare, etc.)()

2. What is your highest level of education? PLEASE CHECK (✓)
 - a. RN – diploma()
 - b. RN – bachelor degree in nursing (BN)()
 - c. RN – other undergraduate degree()
 - d. RN – graduate degree (i.e., MN, NP, PhD)()

3. What do you fear is your number one health risk? Breast cancer ____ Cardiovascular disease ____ other, please list: _____

4. Has your primary care provider (i.e. MD/NP) discussed your risk for cardiovascular disease with you? Yes ____ No ____

5. Have you ever been referred to a cardiologist? Yes ____ No ____

6. Are you aware of any cardiovascular disease prevention campaigns?
Yes ____ No ____
If yes, please describe/list _____

7. Do you have a family history of cardiovascular disease? Yes ____ No ____
If yes, please indicate which family members:

Mother () Grandfather () Female sibling () Aunt ()
Father () Grandmother () Male sibling () Uncle ()

Other (please list) _____

8. What is your approximate annual combined household/family income? Please check (✓) the most appropriate response.
 - a. \$50,000 or less()
 - b. \$50,001 – \$75,000.....()
 - c. \$75,001 - \$100,000.....()
 - d. \$100,001 - \$125,000.....()

- e. \$125,001 - \$150,000.....()
- f. \$150,001 - \$175,000.....()
- g. \$175,001 - \$200,000.....()
- h. over \$200,000..... ()

*You have now completed the survey!
Thank you for participating in this research!*

If you wish to enter into the draw for a chance to win a \$100 Chapters gift card and/or receive a summary report of the study findings, please click on the following link [Insert link to separate Qualtrics data collector]

If you wish to receive a brief summary report of the study and/or would like to be entered into the draw for the \$100 gift card, please check the box(es) below and provide your name and address below.

The draw for 2 - \$100 gift cards will be held on [*insert date*] and the final 2 gift cards will be awarded in a draw to be held at the end of the data collection on [*enter date*]. Staff at the Manitoba Centre for Nursing and Health Research will conduct and manage this draw and send out the summary report.

Yes, I would like to receive a summary report

Yes, I would like to be entered into the draw for the \$100 gift card to Chapters Bookstore

Name: _____

E-mail Address: _____

OR

Mailing Address: _____

Appendix D1: Scoring Information for Instrumentation**Perception of Risk for Heart Disease Scale**

| | | | |
|--------------------|-------------------|---|---|
| Item are scored as | Strongly disagree | = | 1 |
| | Disagree | = | 2 |
| | Agree | = | 3 |
| | Strongly agree | = | 4 |

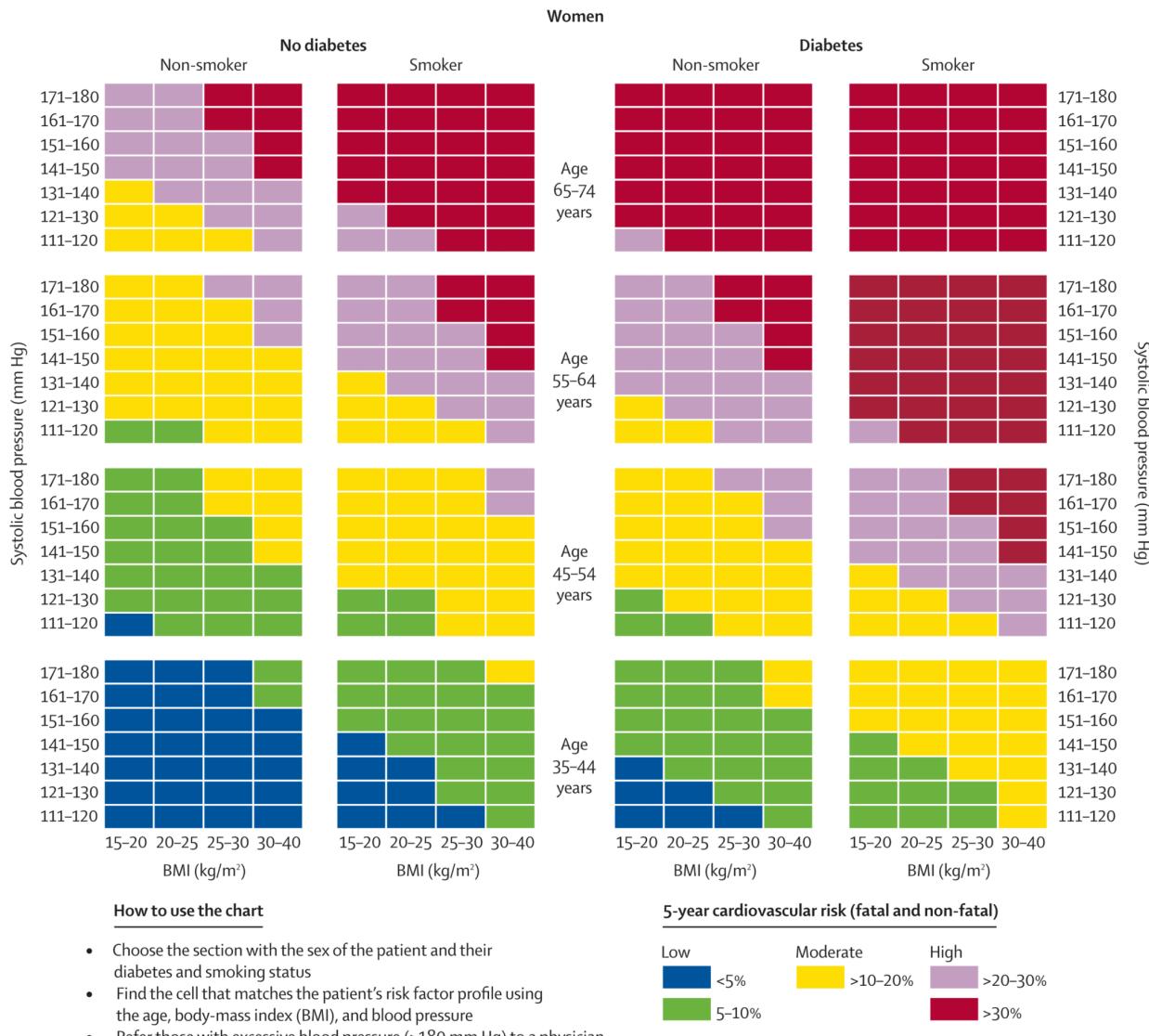
To score the instrument, item scores are summed for each subscale, as well across subscales for a total scale score. Higher scores on PRHDS subscales indicate a higher perception of risk of getting heart disease. The Items included on each scale are as follows:

| | |
|--------------|---------------------------|
| Dread Risk | 1, 2, 4, 5, 7, 8, 9 |
| Risk | 3, 11, 12, 14, 15, 16 |
| Unknown Risk | 6, 10, 13, 17, 18, 19, 20 |

Note: Reverse scoring of the following items is required (item 6, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20)

Appendix D2: Scoring Information for Instrumentation

Non-Laboratory Based CVD Risk Assessment Tool



Risk prediction chart for cardiovascular disease using non-laboratory-based measures for women. Reprinted from “Laboratory-based versus non-laboratory-based method for assessment of cardiovascular disease risk: the NHANES I follow-up study cohort” by T.A. Gaziano, C.R. Young, G. Fitzmaurice, S. Atwood, & J.M. Gaziano, 2008, *The Lancet*, 371(9616), 937. Reprinted with permission.

