Assessing Utility of a Lifestyle-based Tool in the Clinical Setting as a Primordial
Prevention Strategy: The Healthy Heart Score

A thesis presented to
the faculty of
the College of Health Sciences and Professions of Ohio University

In partial fulfillment
of the requirements for the degree
Master of Science

Samantha M. Buls

August 2018

© 2018 Samantha M. Buls. All Rights Reserved.

This thesis titled
Assessing Utility of a Lifestyle-based Tool in the Clinical Setting as a Primordial
Prevention Strategy: The Healthy Heart Score

by
SAMANTHA M. BULS

has been approved for
the School of Applied Health Sciences and Wellness
and the College of Health Sciences and Professions by

Mercedes Sotos-Prieto
Assistant Professor of Food and Nutrition Sciences

Randy Leite
Dean, College of Health Sciences and Professions

Abstract

BULS, SAMANTHA M., M.S., August 2018, Food and Nutrition Sciences

Assessing Utility of a Lifestyle-based Tool in the Clinical Setting as a Primordial

Prevention Strategy: The Healthy Heart Score

Director of Thesis: Mercedes Sotos-Prieto

Created and validated by a team at the Harvard T.H Chan School of Public Health, the Healthy Heart Score is an online risk prediction calculator that determines the user's 20-year risk for Cardiovascular Disease (CVD) based on nine modifiable lifestyle factors including smoking habits, body mass index, physical activity, alcohol consumption and a diet score that takes into consideration consumption of fruits, vegetables, whole grains, nuts and seeds, red and processed meats, and sugar sweetened beverages. Previous epidemiological research has shown that CVD risk determined by the Healthy Heart Score is correlated to the development of related clinical risk factors, although it remained unknown if the tool could be used in the primary care setting as a primordial prevention strategy to stimulate the conversation between patient and health care provider about lifestyle modification. We conducted a qualitative study by interviewing health providers and patients to better understand their thoughts and opinions about the Healthy Heart Score risk possible barriers to implementing the tool into the clinical setting with preliminary results presented previously (Buls, Berryman, Beverly, & Sotos-Prieto, 2018).

In the current study, a purposive sample of 20 people (i.e., "patients") with no self-reported CVD diagnoses (mean age = 33, 70% female) and 20 health care providers

(20% physician/ physician assistant, 35% nurse, and 45% dietitian) completed the risk assessment tool and participated in semi-structured interviews where they answered questions about CVD primordial prevention, their opinions of the tool, and thoughts on utility in the clinical setting. All interviews were transcribed verbatim. Three researchers independently coded the interviews, discussed codes to resolve any inconsistencies, and agreed on common themes. All participants suggested ways to modify the tool such as adding graphics for visual reference of serving size, and the best ways to utilize the tool with the most common idea being “use in the waiting room. Patients in particular showed interest in learning more about CVD primordial prevention and many said they would take the Healthy Heart Score prior to seeing their primary care provider. Providers said they would be willing to recommend the tool to their patients and use it in their practice. Providers stated few possible barriers to using the tool yet mentioned many barriers that they had experience when using general primordial prevention strategies. Our findings support the use of the Healthy Heart Score as a CVD primordial prevention tool in the primary care setting. Additional research is warranted to provide a deeper insight into how the tool may impact modifiable behavior change if used in the primary care setting.

Acknowledgments

I would like to express sincere gratitude to the faculty who were of paramount importance in the completion of this thesis. For without them, I could not have completed this research study and learned all that I did in the process.

To Dr. Mercedes Sotos-Prieto, as my thesis advisor and mentor thank you for sharing your knowledge and passion for research with me. I am so grateful for your guidance and mentorship during this research project and for the friendship we have developed. You have taught me so much more than you know and I truly appreciate the reassurance and constructive criticism that you provided as I continue to grow and a researcher and a person.

To Dr. Elizabeth Beverly, thank you for introducing me to qualitative research and for sharing your expertise in the field with me. Your feedback has been extraordinarily valuable during this learning process. I am so appreciative of your guidance and calming nature that helped me to see the bigger picture and the light at the end of the tunnel.

To Dr. Darlene Berryman, thank you for your support and willingness to share your research expertise with me throughout this process. I truly value your opinion and appreciate all your encouragement and direction during this challenging task.

To all the other faculty, staff and classmates that I have developed strong relationships with over the last 2 years, especially those in the College of Health Sciences and Professions, I am so grateful for all of your support. Thank you for a memorable graduate school experience.

Table of Contents

	Page
Abstract	3
Acknowledgments	5
List of Tables	10
List of Figures	11
Chapter 1: Introduction	12
Statement of the Problem	15
Research Questions	16
Significance of Study	16
Limitations/Delimitations	17
Definition of Terms	18
Cardiovascular disease	18
Data saturation	18
Primary care provider	18
Primordial prevention	19
Qualitative research	19
Thematic analysis	19
Chapter 2: Review of Literature	20
Overview of Cardiovascular Disease	20
Prevalence of cardiovascular disease	20
Atherosclerosis	21

	7
Coronary heart disease	22
Stroke	22
Financial burden.....	23
Cardiovascular Disease Risk Factors	24
Non-modifiable CVD risk factors	24
Age	25
Race and ethnicity	25
Socioeconomic status	26
Modifiable CVD risk factors	26
Metabolic syndrome and obesity	27
Hypertension	28
Diabetes mellitus.....	30
Dyslipidemia	32
Health Behaviors	33
Diet quality.....	33
Fruits and vegetables.....	36
Nuts and seeds.....	37
Cereal fiber.....	38
Sugar-sweetened beverages	40
Red and processed meat.....	41
Dietary fat	42
Omega-3 fatty acids	43

	8
Physical activity	45
CVD Prevention.....	45
Primordial prevention	46
Other forms of prevention.....	46
CVD Risk Prediction	48
The Healthy Heart Score.....	49
Primary Care Providers.....	50
Chapter 3: Methodology	53
Research Design.....	53
Qualitative Research	54
Approaches to Qualitative Research.....	55
Participants.....	56
Instruments.....	57
Data Collection	57
Data Analysis	58
Rigor	59
Chapter 4: Results	62
Patient Interviews.....	63
Participant suggested areas of improvement.....	63
Patients' prior CVD knowledge.....	65
Patients' perceived utility of the tool	66
Provider Interviews.....	68

Providers' suggested areas of improvement	68
Providers' perceived barriers to primordial prevention and implementing to the tool	70
Providers' recommendations for utilization.....	73
Chapter 5: Discussion and Conclusion	76
Conclusion	79
Future Research	83
References.....	86
Appendix A: Healthy Heart Score Risk Assessment Example – Physical Activity	115
Appendix B: Healthy Heart Score Risk Assessment Example – Fruits and Vegetables	116
Appendix C: Healthy Heart Score Risk Assessment – Whole Grains.....	117
Appendix D: Healthy Heart Score Risk Assessment – Results	117
Appendix E: Healthy Heart Score Assessment.....	119
Appendix F: Patient Interview Questions	122
Appendix G: Provider Interview Questions.....	123
Appendix H: Recruitment Flyer.....	124
Appendix I: Patient Consent Form.	126
Appendix J: Provider Consent Form.....	130
Appendix K: Patient Demographic Form	132
Appendix L: Provider Demographic Form	133

List of Tables

	Page
Table 1: 2017 American College of Cardiology Blood Pressure Guidelines	14
Table 2: 2018 American Diabetes Association Guidelines	15
Table 3: Participant Demographic Questions	72

List of Figures

Page

Figure 1: Chronic disease prevention progression.....	11
---	----

Chapter 1: Introduction

As the leading cause of death in the United States, Cardiovascular Disease (CVD) is to blame for more than 2,000 deaths every day (Benjamin et al., 2017). According to a 2016 report from the American Heart Association (AHA), CVD claims more lives each year than all other forms of cancer and chronic lower respiratory disease combined (Benjamin et al., 2017). Although deaths due to CVD have declined over the past 10 years, more than 90 million Americans are still currently living with a CVD diagnosis (Mozaffarian et al., 2016).

Various risk factors play a significant role in CVD development. According to data from the National Health and Nutrition Examination Survey, in 2010 47% of Americans were at risk for CVD because of either high blood pressure, high cholesterol, or regular smoking (Fryar, Chen, & Li, 2012). The number of people who had at least one of these three CVD risk factors decreased from the decade prior, although only in men aged 40 and over and in women aged 60 and older (Fryar et al., 2012) meaning that a significant number of young people are still at risk for CVD. People under the age of 40 are not fully recognizing the severity of long-term CVD risk when they are at a prime age for lifestyle modifications to lower risk.

Strong evidence suggests that healthy lifestyle habits can influence the severity of many CVD risk factors (Chomistek et al., 2015; Sisti et al., 2018; Sotos-Prieto et al., 2015). Individual components of a healthy lifestyle, including diet, physical activity and smoking habits, have a strong association with CVD mortality rates when assessed individually and in combination with one another (Li et al., 2018). In a cohort study

observing over 80,000 nurses, 90% of type 2 diabetes mellitus (T2DM) cases, 57% of hypertension cases, and 40% of hypercholesterolemia cases were attributed to lifestyle factors such as a poor diet, lack of physical activity, and regular smoking (Chomistek et al., 2015). This emphasizes the major impact that one's lifestyle has on CVD risk factor development.

Various comprehensive, behavioral intervention strategies exist to modify diet and improve physical activity levels targeted to those who are at risk for CVD because of the development of one or more known clinical risk factors (e.g., hypertension, hyperlipidemia and T2DM) (L. Chen et al., 2015; Elmer et al., 2006; Robbins et al., 2011). Primordial prevention, defined as the prevention of the risk factors themselves before the individual is negatively affected by the symptoms (Weintraub et al., 2011), is often underutilized. Research shows that long-term (i.e., 20-years) CVD risk can be reduced by implementing primordial prevention strategies during adolescence and early adulthood to create a normalized metabolic profile during these developmental years (Magnussen et al., 2012). Adolescents who can maintain a low-risk profile into middle age drastically reduce their long-term risk for life threatening CVD events as they continue to age (Lloyd-Jones et al., 2006). If the majority of the population could reach middle age with a low CVD risk profile, more than 90% of expected related deaths could be prevented (Lloyd-Jones et al., 2006). Despite these well-known benefits, primordial prevention is often forgotten and physicians spend little time advising patients on healthy lifestyle behaviors (Mosca et al., 2005).

Numerous risk prediction tools have been created and endorsed by the AHA or the American College of Cardiology (ACC) to estimate a patient's short-term (i.e., 10-year) risk of CVD (i.e., pooled cohort risk equation) (Goff et al., 2014). These risk prediction tools assess said known CVD risk factors to estimate short-term risk. If a patient appears to have a low short-term risk, health care providers often do not engage in the necessary discussion about lifestyle factors proven to decrease a patient's long-term risk (Mosca et al., 2005). It is important to recognize the relationship between healthy lifestyle maintenance and low CVD risk, particularly in those with a low short-term risk but high long-term risk, because these individuals may benefit from intensive lifestyle modification as the first form of risk factor management.

Created and validated by a team at Harvard T.H. Chan School of Public Health, the previously validated Healthy Heart Score (<https://healthyheartscore.sph.harvard.edu>) is as an online risk prediction calculator that uses nine different modifiable lifestyle factors to predict a patient's 20-year risk of CVD (Chiuve et al., 2014). Life style factors used to predict risk include: body mass index (BMI); physical activity; alcohol consumption; intake of fruits and vegetables; fiber; nuts; sugar-sweetened beverages; and red and processed meats. In a large cohort of 69,505 participants in the Nurses' Health Study II, previous research showed that the risk predicted by the Healthy Heart Score was strongly associated with the development of CVD risk factors (Sotos-Prieto et al., 2016). Those with a higher predictive CVD risk based on the Healthy Heart Score had 18-fold higher risk of T2DM, 5-fold higher risk of hypertension, and 3-fold higher risk of hypercholesterolemia (Sotos-Prieto et al., 2016).

Education is a key step to motivate people to make simple yet significant lifestyle and behavioral changes to improve or maintain cardiovascular health, but before education can be utilized, individual CVD risk must be identified. Therefore, identifying those who have a high long-term risk for CVD is the first step to help decrease CVD.

Statement of the Problem

Considering that 90 million people living in the United States are currently living with CVD, it is clearly a significant threat to our nation's public health (Mozaffarian et al., 2016). While acknowledging that it is unrealistic to believe that such a complex issue may be addressed in a single study, our goal is to explore a possible strategy to decrease the severity of this problem. We hope to increase the use of this primordial prevention strategy by catalyzing conversations between health care providers and their patients about healthy lifestyle choices using the Healthy Heart Score risk prediction tool.

Previous results have demonstrated that the Healthy Heart Score is predictive of the development of relevant clinical risk factors that proceed CVD events such as diabetes, high cholesterol, and hypertension (M. Sotos-Prieto et al., 2016). However, it is not yet known whether the implementation of the Healthy Heart Score in the clinical setting will help health care providers begin the conversation about heart health with patients who are at long-term risk for CVD, but may not currently present the known short-term risk factors (e.g., high blood pressure). The objective of this qualitative study is to determine the utility of the Healthy Heart Score in routine clinical practice by interviewing primary care providers and patients. Our goal is to then, if necessary,

modify and validate the modified Healthy Heart Score risk prediction tool for accuracy and reliability so it can be used in a future clinical intervention study.

Research Questions

This research study will include active primary care health providers and adult patients with no prior CVD diagnosis. Using open ended interview questions, we will address the following research questions:

- 1) How can the Healthy Heart Score risk assessment tool best be utilized in routine clinical practice?
- 2) What modifications need to be made to the existing Healthy Heart Score risk assessment tool for it to be efficiently utilized in routine clinical practice?

Significance of Study

The focus of this study is to evaluate the clinical utility of the Healthy Heart Score and gain a better understanding of the thoughts and opinions of primary care patients and health providers about the CVD risk assessment and any barriers to implementing it into the clinical setting. CVD risk awareness is necessary to improve primordial prevention in the primary care setting. The Healthy Heart Score is a CVD risk prediction assessment that estimates a patient's 20-year risk of CVD based on modifiable lifestyle factors (Chiuve et al., 2014). Over the last decade there has been an increase in the use of CVD risk prediction tools because of the improved accuracy of risk prediction equations and the significant number of people at risk. Yet it remains unknown how a CVD risk prediction tool should be used to actually improve CVD outcomes (Karmali et al., 2017)

and what the best communication strategies are if providers are to use such tools with their patients (Waldron, van der Weijden, Ludt, Gallacher, & Elwyn, 2011).

Despite the relationship between lifestyle choices and chronic disease risk (Chomistek et al., 2015; Veronese et al., 2016) health care providers have limited time to assess lifestyle factors (Moreno-Peral et al., 2015). Incorporating potentially lifesaving primordial prevention strategies into routine primary care visits remains a challenge; therefore to improve primordial prevention it is necessary to find a low cost, low maintenance and sustainable way to educate patients on healthy behaviors so that every person may have greater control of their own health outcomes.

This study will serve as the first step to implementing the Healthy Heart Score into the primary care setting as a primordial prevention tool to improve CVD prevention by starting the conversation between provider and patient about CVD risk.

To obtain the best outcomes when using the tool, we must first understand how patients and providers feel about the tool and how it can best be implemented. Results from this study will allow for strategic improvements to be made to the tool and will contribute to the development of a protocol for use in the primary care setting.

Limitations/Delimitations

1. The sample size of health care providers and patients was small (n=40) because of the nature of qualitative research and a pilot study.
2. Most health care providers interviewed were not physicians. Other members of the health care team including nurses and dietitians made up the majority of the provider sample.

3. The racial and ethnic diversity of the patients being interviewed was limited due to the location. The majority-white sample is not representative of the population affected by CVD, yet is reflective of the racial distribution in the Southeastern and Central Ohio region
4. The gender distribution was disproportional to the population as most patients and providers interviewed were female.
5. All participants were self-selected; therefore, patients may have been more interested in behavior modification because they volunteered to participate.
6. Participants may have responded differently to the interview questions because they were aware that they were being recorded.

Definition of Terms

Cardiovascular disease. A range of diseases and complications including coronary artery disease, myocardial infarction, hemorrhagic stroke and ischemic stroke that affect the heart and blood vessels. This is most often caused by atherosclerosis, or the build-up of plaque along the arterial wall (Lloyd-Jones et al., 2010).

Data saturation. No additional data are being found whereby the sociologist can develop properties of the category. The criterion for judging when to stop sampling the different groups pertinent to a category is the category's theoretical saturation (Glaser & Strauss, 1967).

Primary care provider. A licensed specialist who provides definitive and comprehensive care to a patient. This may occur in an in-patient or out-patient setting and includes chronic, preventive and acute care (American Academy of Family

Physicians, 2018). This practitioner may be a physician such as a medical doctor (MD) or doctor of osteopathic medicine (DO), or a non-physician primary care provider such as a physician's assistant, nurse, nurse practitioner or dietitian. These providers of primary care may meet the needs of specific patients as individuals and should provide services in collaborative teams in which the ultimate responsibility for the patient resides with the primary care physician (American Academy of Family Physicians, 2018).

Primordial prevention. Prevention of the clinical risk factors themselves (i.e., hypertension, dyslipidemia, type 2 diabetes) before the person is affected by the negative side effects. This often begins with a change in the behavior from which risk factors are known to develop (Gillman, 2015).

Qualitative research. Observations that are descriptive rather than statistical, and often aim to decode the meaning behind a phenomenon by understanding the knowledge, attitudes, perceptions, and intentions of the population of study (Al-Busaidi, 2008).

Thematic analysis. A method of qualitative data analysis that focuses on identifying themes that describe the implicit and explicit ideas found in the data using codes that represent the themes later used in analysis (Javadi & Zarea, 2016).

Chapter 2: Review of Literature

Overview of Cardiovascular Disease

CVD is the term used to describe a group of diseases and problems that affect the heart and blood vessels. The most common type being Coronary Heart Disease (CHD), also known as Coronary Artery Disease (CAD), killing over 370,000 people every year (Benjamin et al., 2017). CVD also includes myocardial infarction (MI) or heart attack, stroke and arrhythmias. Many of these complications are caused by atherosclerosis, a condition that develops due to plaque buildup in the arteries (Torres, Guevara-Cruz, Velázquez-Villegas, & Tovar, 2015). The prevalence of CVD is extraordinarily high, and complications are largely influenced by various modifiable and non-modifiable risk factors.

Prevalence of cardiovascular disease. The prevalence of CVD is widely recognized among both the medical community and general population. CVD is the number one cause of death for both men and women in the United State, which equates to more than 2,000 CVD-related deaths every day (Benjamin et al., 2017). Despite an increase in overall medical advances in the last two decades this statistic has remained evident among people over the age of 65.

According to a 2016 report from the AHA, CVD claims more lives each year than all forms of cancer and chronic lower respiratory disease combined. Of the 85.6 million American adults that are currently diagnosed with CVD, frequency increases with age and varies with race, ethnicity and socioeconomic status (SES) (Mozaffarian et al., 2016).

CVD is recognized as a preventable death. As defined by the Centers for Disease Control and Prevention (CDC), a preventable death is a “death from ischemic heart disease, stroke, chronic rheumatic heart disease, and hypertensive disease in people under age 75” (CDC, 2013). According to results published in a 2013 CDC Morbidity and Mortality Weekly Report, over 200,000 deaths from heart disease and stroke are preventable each year in the United States. Over half of those preventable deaths occur in people under the age of 65 (CDC, 2013).

Atherosclerosis. Atherosclerosis, caused by the buildup of fatty deposits called plaque in the arteries, is the most common cause for CVD development (Mozaffarian et al., 2016). Plaque is made up of cholesterol, cellular waste products, calcium and fibrin. It begins to accumulate when the endothelium, or inner lining of the artery, becomes damaged (Lusis, 2000). As plaque accumulates the arterial walls become thicker and blood flow that supplies oxygenated blood to cells is reduced. Recent epidemiological and clinical research has demonstrated that poor diet and lifestyle factors lead to elevated cholesterol, triglyceride, and blood glucose levels that are the driving force for this endothelial damage (Torres et al., 2015).

The effects of plaque accumulation vary by person depending on the artery that is affected. As the amount of plaque accumulated increases, blood flow is reduced. A partial or total blockage in an artery leading to the heart may lead to CHD, including angina, MI, or sudden death. If this obstruction occurs in the cerebral arteries, the result may be stroke, ischemic attack or irregular blood clotting (Lusis, 2000).

Coronary heart disease. CHD is a type of CVD in which plaque builds up inside the coronary arteries impairing the of supply oxygenated blood to the heart and muscles (Cassar, Holmes, Rihal, & Gersh, 2009). As the leading cause of death attributed to CVD in the United States, over 45% of CVD related deaths are due to CHD (Benjamin et al., 2017). The main forms of CHD include MI and angina. Although medical professionals often use the terms “Coronary Heart Disease” and “Coronary Artery Disease” interchangeably, CHD is the result of prolonged or untreated coronary artery disease (CAD) and atherosclerosis, or the buildup of plaque in the arteries as previously explained. Many years of untreated atherosclerosis and plaque accumulation can cause CHD (Cassar et al., 2009).

When blood flow to the heart is significantly reduced because of atherosclerosis, an MI may occur resulting in damage or death to the heart tissue. Before this occurs the individual often experiences common symptoms such as fatigue, shortness of breath or chest pain and discomfort known as angina that occurs when the heart does not receive enough oxygenated blood. These symptoms are often undetected and can be misinterpreted for less serious problems such as indigestion (Zuchi, Tritto, & Ambrosio, 2013).

Stroke. Stroke is the second leading CVD-related cause of the death in the United States (Benjamin et al., 2017). Approximately 795,000 people experience a stroke each year and over 75% of these yearly occurrences are first attacks (Benjamin et al., 2017). The types of stroke include ischemic stroke, hemorrhagic stroke and transient ischemic attack (TIA). The most common type of stroke is an ischemic stroke (Benjamin et al.,

2017). This occurs when a blood vessel carrying oxygenated blood to the brain becomes blocked due to the collection of plaque along the arterial walls. Without oxygenated blood, nerve cells stop functioning properly within minutes causing distress on the brain (Yannoutsos, Dreyfuss Tubiana, Safar, & Blacher, 2017).

Hemorrhagic stroke, the second most commonly diagnosed form of stroke in the United States (Benjamin et al., 2017), occurs when a blood vessel ruptures in or near the brain. This causes blood to collect in the brain creating a toxic environment for brain tissue. The cells in the affected area quickly become weak and die off (Hansson, 2005).

Another common form of stroke is a Transient Ischemic Attack or a TIA. A TIA, commonly known as a mini stroke, is caused by a temporary blood clot in the artery and is considered a warning sign or risk factor for eventually having an ischemic stroke (Sorensen & Ay, 2011).

Financial burden. CVD related illnesses are among the most pervasive and costly health care problems in the United States (Dieleman, Baral, Birger, & et al., 2016). Consequently, related treatments are the primary source of our nation's health care spending and one of most expensive hospital discharge diagnosis (Dieleman et al., 2016). A 2017 conservative estimate from the AHA indicates that the current annual expenditure for CVD related health care treatment exceeds \$300 billion. This number has been slowly increasing over the last decade and is expected to reach over \$800 billion by the year 2030 (Nasir, Keeley, & Krumholz, 2017).

Individuals who are categorized as having a high short-term risk based on the assessment of clinical risk factors such as blood pressure, blood lipids and glucose levels

are primarily treated pharmacologically (Weintraub et al., 2011). This has led to drug therapy for hypertension, T2DM, and hyperlipidemia becoming three of the top diagnoses for direct health expenditures in the United States (Salami et al., 2017).

Cardiovascular Disease Risk Factors

CVD risk factors were first established by the Framingham Study when it began in 1948. By gathering data from over 5,209 men and women between the ages of 30 and 62, the Framingham Study helped determine which factors were most influential when predicting CVD risk (Wilson, Castelli, & Kannel, 1987). This research has led to the identification of major CVD risk factors including hypertension, hyperlipidemia, diabetes, metabolic syndrome, smoking, poor diet, and physical inactivity. By use of a mathematical algorithm, a 10-year CVD risk prediction “score” was developed based on this data and these non-modifiable (i.e., age, sex, race, ethnicity and SES) and modifiable (i.e., hypertension, hyperlipidemia and diabetes due to diet, physical activity and smoking habits) risk factors (Wilson et al., 1987).

Non-modifiable CVD risk factors. Non-modifiable risk factors are those that cannot be changed. With regards to CVD, age, sex, race and ethnicity are the most significant non-modifiable markers of CVD risk. SES and education are also recognized as having a positive correlation with CVD risk (Franks, Winters, Tancredi, & Fiscella, 2011). Although these factors independently cannot be modified, the effect they have on CVD can be controlled and reduced through lifestyle adaptations (Tabei, Senemar, Saffari, Ahmadi, & Haqparast, 2014).

Age. Research shows that age is the most influential non-modifiable CVD risk factor (Tabei et al., 2014). As the body ages, it becomes more susceptible to disease development, specifically chronic disease. The Jackson Heart Study evaluated the predictive 10-year CVD risk of a cohort of 1,115 people of the same race. Age alone accounted for 56% of the risk determination. Of the participants older than 50 years of age, 53% developed a high CVD risk over the course of the eight-year study, compared to only 6% of participants younger than 50 years of age (Bress et al., 2017). While aging is an independent and non-modifiable CVD risk factor, risk due to age can be reduced by decreasing other coexisting traditional CVD risk factors through lifestyle modification (Dhingra & Vasan, 2012).

Race and ethnicity. Differences in race and ethnicity may also significantly affect overall CVD risk. African Americans experience a greater risk for CVD. A recent statement released by the AHA stated that the higher CVD risk factor prevalence among African Americans is the reason for the high prevalence of premature onset CVD in this population (Carnethon et al., 2017). Among these risk factors, the prevalence of hypertension is particularly high among African Americans and contributes directly to the significant disparities in CVD (Carnethon et al., 2017). There is a strong age-related difference in CVD risk in American Americans compared to Caucasians. Data from the REGARDS study showed that risk for having a stroke among African Americans at the age of 45 was 5.41 times higher than among Caucasians of the same age (Howard et al., 2013). This risk difference decreased with age, although remained higher among African

Americans as the data showed that at the age of 65 there was a 1.25 times higher risk for African Americans (Howard et al., 2013).

Socioeconomic status. SES refers to an individual's social position in the community compared to other members of the community. This includes income, occupation and educational status. Those who are of lower SES are at a significantly higher risk for CVD (de Mestral & Stringhini, 2017). Research shows that people with lower SES can have as much as a 50% greater risk of developing CVD than those with higher SES (Franks et al., 2011). This association can be attributed to the effects of numerous behavioral and psychosocial factors observed in this population. Diet and lifestyle factors represent a significant explanatory factor for this relationship, as diet quality is often positively correlated with SES as the most privileged social groups often have the best diet quality and the lowest and more favorable CVD risk (Psaltopoulou et al., 2017). The interpretation of the differences in CVD risk observed among those with low SES compared to those with high SES is complex and attributed to a variety of social determinants of health. Additional research is warranted to establish a more direct causal relationship and improve the disparities.

Modifiable CVD risk factors. Risk factors that can be changed or controlled, often through behavior modification, are known as modifiable risk factors. Known modifiable clinical CVD risk factors include: metabolic syndrome, obesity, hypertension, T2DM and dyslipidemia. Various health behaviors such as a poor diet, limited physical activity and regular smoking are also modifiable CVD risk factors. The negative effects of these behavior-based modifiable risk factors are often unseen during adolescence, but

become apparent when presented as said clinical risk factors during adulthood (Ibekwe, 2015). Lifestyle improvements including the consumption of a healthy diet, little to moderate amounts of alcohol, not smoking and increasing daily physical activity can have a significant impact on CVD risk and development (Akesson, Larsson, Discacciati, & Wolk, 2014).

Metabolic syndrome and obesity. A metabolic syndrome diagnosis indicates that a patient possesses a combination of metabolic and CVD related risk factors including obesity, insulin resistance, hyperglycemia, dyslipidemia and hypertension (P. L. Huang, 2009). There is no set diagnostic criterion to define metabolic syndrome. Various organizations including the World Health Organization (WHO) and the National Cholesterol Education Program (NCEP) have their own criteria for a metabolic syndrome diagnoses (Lorenzo, Williams, Hunt, & Haffner, 2007). Although each definition differs slightly, all include glucose intolerance, insulin resistance, dyslipidemia and excess abdominal adiposity.

NCEP guidelines define metabolic syndrome as meeting the following criteria: (a) a waist circumference of > 40 inches for men and > 35 inches for women; (b) a fasting glucose of ≥ 100 mg/dl, triglycerides ≥ 150 mg/dl; (c) a high density lipoprotein (HDL) cholesterol of < 40 mg/dl for men and < 50 mg/dl for women; and (e) blood pressure measuring > 130 mmHg systolic or > 85 mmHg diastolic (P. L. Huang, 2009).

Worldwide, over 500 million people are currently classified as obese ($BMI \geq 30$ kg/m²), and it is estimated that over 40% of the U.S population will be obese by the year 2030 (Smith & Smith, 2016). Even in the absence of other cardiac-related comorbidities,

excess abdominal adiposity often induces dyslipidemia, hypertension and glucose intolerance (Poirier et al., 2006). While each of these components are known to increase CVD risk independently, the combination of these markers and the presence of metabolic syndrome itself is associated with a significant long-term risk of CVD (Grundy et al., 2005). In a study following 3,323 middle aged adults, the prevalence of metabolic syndrome increased with age and was positively correlated with incidence of CVD (Wilson, D'Agostino, Parise, Sullivan, & Meigs, 2005). Over the duration of this eight-year study, prevalence of metabolic syndrome increased from 13% of participants at baseline measurements to 31% of participants at follow-up.

In addition to a healthy BMI, recent research shows that the presence of three or more low-risk lifestyle factors is strongly associated with the lowest risk for CVD mortality (Li et al., 2018). Li et al. (2018) used data from the Nurses' Health Study and the Health Professionals Follow-up Study to define five low-risk lifestyle factors as: never smoking; body mass index of 18.5 to 24.9 kg/m²; ≥ 30 minutes per day of moderate to vigorous physical activity; moderate alcohol intake; and a high diet quality score. Using additional data from the 2013-2014 National Health and Nutrition Examination Surveys, researchers found that when compared to those who adhere to zero low-risk healthy lifestyle factors, people who adhere to the five healthy life style factors mentioned above can increase life expectancy by an average of 14 years for women, and 12 years for men (Li et al., 2018).

Hypertension. Blood pressure (BP) is considered high or abnormal when measured above 120/80 mm Hg (James et al., 2014). Evidence suggests that treatment

should be initiated when BP is continuously measured at or above 140/90 mm Hg (James et al., 2014). There is a strong recognized relationship between hypertension and CVD (Brunström & Carlberg, 2018; Franklin & Wong, 2013; Y. Huang et al., 2013). As reported by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (James et al., 2014) people 50 years or older with a systolic BP of over 140 mm Hg increase their CVD risk significantly.

Due to such evidence of high BP and its association with CVD risk, the ACC recently released updated guidelines that include a lower definition of hypertension to encourage earlier intervention and account for problems that may occur for those with BP slightly above 120/80 mm Hg (Whelton et al., 2018). One main study that supports the new guidelines is the SPRINT study, which proves that significant cardiovascular benefits are seen with intensive BP control to maintain a systolic BP of <120 mm Hg compared to routine BP control to maintain a systolic BP < 140 mm Hg (Johnson et al., 2018). Thus, the current guidelines depicted in Table 1 promote a normal BP measurement of < 120/80 mm Hg and consider any BP measured above this value to be elevated and a cause for concern (Whelton et al., 2018).

Table 1

2017 American College of Cardiology Blood Pressure Guidelines

Category	Blood Pressure
Normal	> 120/80 mm Hg
Elevated	Systolic between 120-129 <i>and</i> diastolic less than 80 mmHg
Stage 1	Systolic between 130-139 <i>or</i> diastolic between 80-89 mmHg
Stage 2	Systolic at least 140 <i>or</i> diastolic at least 90 mmHg
Hypertensive crisis	Systolic > 180 and/or diastolic > 120 mmHg

Note. Adapted from “2017 Guidelines for High Blood Pressure in Adults,” by P. K. Whelton et al., 2017, *Journal of the American College of Cardiology*, 72, p. 106. Copyright 2018 by the American College of Cardiology Foundation. Adapted with permission.

Diabetes mellitus. Diabetes mellitus (DM) is a chronic condition that affects the way the body processes glucose. There are two major types of DM, type 1 (T1DM) and T2DM. For those with T1DM, the body does not produce insulin, the hormone needed to allow the body to metabolize glucose to use as energy. This form of DM is usually diagnosed in childhood and requires the person to inject insulin daily. T2DM occurs if the body becomes insulin resistant and either does not produce enough insulin or is unable to use insulin as needed. Insulin resistance and impaired insulin secretion are the primary pathophysiological factors that contribute to the development of T2DM (NIDDK, 2017). Insulin resistance occurs when liver, muscle and fat cells do not properly utilize insulin for the purposes of absorbing glucose from the bloodstream. This in turn necessitates increased production of insulin by the beta cells of the pancreas

(Reaven, 2011). With the development of insulin resistance, the pancreas gradually loses its ability to keep up with the body's demand for insulin to counteract high blood glucose levels, resulting in hyperglycemia.

As indicated in Table 2, guidelines by the American Diabetes Association (ADA) suggests that DM may be diagnosed based on: fasting plasma glucose (FPG) measurements; two-hour plasma glucose (2-h PG) measurements during a 75-g oral glucose tolerance test (OGTT); Hemoglobin A1c (HbA1c) measurement (i.e., the glycated hemoglobin measurement used to identify the average plasma glucose concentration) or indication of repeat hyperglycemia (ADA, 2018).

Table 2

2018 American Diabetes Association Diagnostic Guidelines

Category	Blood Glucose
Fasting Plasma Glucose	≥ 126 mg/dL
2-hour Plasma Glucose	≥ 200 mg/dL during Oral Glucose Tolerance Test
Hemoglobin A1C	$\geq 6.5\%$
Hyperglycemia	Random plasma glucose ≥ 200 mg/dL

Note. 2018 American Diabetes Association diagnostic guidelines. Adapted from “Standards of Medical Care in Diabetes - 2018,” by The American Diabetes Association, 2018, *Diabetes Care*. 41, p. S13. Reprinted with permission under the terms of the License for Non-Commercial Re-Use, version 1.0. Retrieved May 5, 2018, from http://care.diabetesjournals.org/content/41/Supplement_1

T2DM is a major known risk factor for CVD (Mancia et al., 2013). According to the CDC, the death rate for CVD is 1.7 times higher among adults with T2DM than among those without (CDC, 2014). Patients with early-onset T2DM have a higher prevalence of CVD than those with late-onset T2DM (Leon & Maddox, 2015), suggesting that the longer diabetes is present, the higher the chance is that CVD will also develop.

Various factors force those with T2DM into a consistent prothrombotic and procoagulant state, which may account for the higher rates of MI often seen in these patients (Carr, 2001). A person with T2DM that has never had a MI has the same risk of having one in the future as a person without T2DM and a history MI. Data collected during the Diabetes Heart Study exemplifies the increased CVD risk for those with a T2DM diagnosis as results showed that people with elevated levels of coronary artery calcified plaque, an independent predictor of CVD outcomes (Hoff et al., 2003), had a CVD mortality risk 11-fold higher than people with normal levels (Agarwal et al., 2013).

Dyslipidemia. Dyslipidemia, or disordered lipoprotein metabolism, is defined as elevated low density lipoprotein cholesterol (LDL) with increased small dense LDL, elevated triglycerides (TG), or low HDL (Klop, Elte, & Cabezas, 2013). Elevated LDL has been identified as the lipid parameter most significantly associated with CVD development (Klop et al., 2013). Recent research suggests that there is insufficient evidence to conclude a best practice method for lowering LDL (Nelson, 2013). NCEP guidelines suggest that to prevent CVD, patients with one current CVD risk factor should maintain an LDL cholesterol level of less than 160 mg per dL (4.15 mmol per L)

(National Cholesterol Education Program (NCEP) Expert Panel on Detection, 2002). For those with two or more CVD risk factors, an LDL of 130 mg per dL (3.35 mmol per L) or less should be maintained and patients with documented CVD LDL should be reduced to less than 100 mg per dL (2.60 mmol per L) (National Cholesterol Education Program (NCEP) Expert Panel on Detection, 2002).

Health Behaviors

Diet quality. Over the last decade there has been a shift in the focus of nutritional epidemiology research from the study of single nutrients or foods groups to the study of dietary patterns as a more realistic method to evaluate the association between diet and health outcomes (Cespedes & Hu, 2015). Evidence supports the notion that adherence to healthy dietary patterns have been associated with lower CVD incidence and mortality (Chiuve et al., 2012; Fung et al., 2009; Martinez-Gonzalez & Bes-Rastrollo, 2014; Mursu, Virtanen, Tuomainen, Nurmi, & Voutilainen, 2014; Reedy et al., 2014; Sofi, Abbate, Gensini, & Casini, 2010; Mercedes Sotos-Prieto et al., 2017). This includes diets that score high according to the Alternative Healthy Eating Index-2010 (AHEI) (a prior-defined diet score based on recommendations for food and nutrient consumption with current scientific evidence of beneficial health effects) (Chiuve et al., 2012); the Alternative Mediterranean diet (AMED) score (comprises foods that are characteristic of the Mediterranean diet pattern) (Fung et al., 2009) and the Dietary Approach to Stop Hypertension (DASH) score (developed from the DASH dietary recommendations aiming to reduce blood pressure). (Chiuve et al., 2012; Fung et al., 2009; Martinez-

Gonzalez & Bes-Rastrollo, 2014; Mursu et al., 2014; Reedy et al., 2014; Sofi et al., 2010; Mercedes Sotos-Prieto et al., 2017).

Given such evidence, the 2015 Dietary Guidelines for Americans recommended the healthy dietary patterns mentioned above for the general population and emphasized that these patterns can be tailored to individuals' cultural and food preferences (Millen et al., 2016). Despite of evidence showing lower CVD deaths with higher adherence to diet quality, most recent studies have been limited to one-time measurement of diet. However, understating how dynamic changes in diet over time may influence CVD and mortality is very important. In this regard, research from Sotos-Prieto (2015) using repeated dietary measurements every four years from the Nurses' Health Study and Health Professionals Follow-up Study (two large cohorts that included more than 100,000 participants) showed that improved diet quality (according to Mediterranean-style diet, DASH, and AHEI scores) was consistently associated with a lower CVD risk in both the short-term (subsequent four years) and long-term (subsequent 20-years) (M. Sotos-Prieto et al., 2015). Specifically, compared with individuals whose diet quality remained relatively stable in each four-year period, those with the greatest improvement (11%-22%) in diet quality had a 7%-8% lower risk of CVD in the subsequent four-year period (M. Sotos-Prieto et al., 2015).

More recently the same research group found consistent associations between improved diet quality over 12 years as assessed by the AHEI, AMED, and DASH scores and lower risk of mortality in the subsequent 12 years (Mercedes Sotos-Prieto et al., 2017). A 20-percentile increase in diet quality scores (e.g., increase that can be achieved

by swapping out one serving of red or processed meat for one daily serving of nuts or legumes) was associated with an 8%-17% lower mortality rate (Mercedes Sotos-Prieto et al., 2017). In contrast, worsening diet quality over 12 years was associated with a 6%-12% increased mortality rate. Furthermore, maintaining a high adherence to any of the three dietary patterns over 12 years was significantly associated with a 9%-14% lower total mortality rate (Mercedes Sotos-Prieto et al., 2017). These results emphasize the importance of focusing on small changes to improve overall diet quality patterns such as increasing consumption of: whole fresh fruit and vegetables; nuts; legumes and seeds; fiber-rich whole grains (such as brown rice or whole grain pasta); and healthful fats (such as long-chain omega-3 fatty acids that can be found in fish or monounsaturated fatty acids (MUFA) that can be found in olive oil or avocados). Change can also include limiting sugar-sweetened beverages and red and processed meat. Despite the commonalities among the diets discussed above, the Mediterranean diet is often recommended for overall health benefits due to the sound evidence in support of it.

Mediterranean-style diets are similar to eating habits traditionally followed in countries bordering the Mediterranean Sea. The general pattern is characterized by: high consumption of olive oil, fruits, vegetables, unrefined (whole grain) breads and cereals, legumes and nuts; moderate consumption of fish and poultry; a relatively low intake of dairy products; and low consumption of red meat, processed meats and sweets (Davis, Bryan, Hodgson, & Murphy, 2015).

Numerous studies have demonstrated the effectiveness of Mediterranean diets in reducing cancer death, CVD morbidity and mortality and all-cause mortality (Dinu,

Pagliai, Casini, & Sofi, 2018; Salas-Salvadó et al., 2016; Widmer, Flammer, Lerman, & Lerman, 2015). The most notable primary prevention Mediterranean diet trial to date is the PREDIMED study that randomized over 7,000 Spanish participants at high CVD risk, but no known CVD diagnosis, to one of three intervention groups: a Mediterranean diet supplemented with extra-virgin olive oil, a Mediterranean diet supplemented with mixed nuts, or a low-fat diet (Estruch et al., 2013). After five years of follow-up, subjects given the Mediterranean diet with extra-virgin olive oil had a 40% reduction in the incidence rate of new-onset diabetes and a 30% decrease in major CVD events (Estruch et al., 2013) compared to control subjects prescribed a low-fat diet. Significant benefits were also found for the Mediterranean diet supplemented with nuts. Due to the clear benefits of the Mediterranean diet, the latest United States Department of Agriculture (USDA) nutritional guidelines recognize and recommend the Mediterranean diet as a healthy option for Americans (Millen et al., 2016).

Fruits and vegetables. Over the last decade, strong scientific evidence has shown an inverse relationship between fruit and vegetable consumption and CVD risk (Zhan et al., 2017). A recent meta-analysis confirmed that the consumption of green leafy vegetables is inversely associated with risk of T2DM and found that increased fruit intake, especially berries, was also inversely associated T2DM and CVD risk (Wang, Fang, Gao, Zhang, & Xie, 2016). An additional meta-analysis calculated the pooled relative risk for CVD of 47 independent cohorts. In assessing the highest versus lowest consumption, they found the risk ratio (RR) for fruit and vegetable consumption to be 0.83, 95% CI [0.79-0.86], and for fruit consumption to be 0.84, 95% CI [0.79-0.88], and for vegetable

consumption to be 0.87, 95% CI [0.83-0.91], providing strong support for an inverse relationship between CVD risk and fruits and vegetable consumption both independently and together (Zhan et al., 2017).

Among other nutrients, fruits and vegetables contain beta carotene, folate, vitamin C and vitamin E, all of which are individually associated with a significantly lower risk of CVD (Mente, de Koning, Shannon, & Anand, 2009). The USDA 2015-2020 Dietary Guidelines for Americans recommend consumption of two cups of fruit and 2.5 cups of vegetables every day for the average American (USDA, 2015). This recommendation is rarely followed. The average American adult consumes only 1.1 cups of fruit and 1.6 cups of vegetables per day, leaving many Americans at an increased risk for various nutrient deficiencies and chronic diseases (CDC, 2015).

Nuts and seeds. Evidence continues to mount in support of the consumption of nuts and seeds for the reducing chronic disease risk (Souza, Gomes, Naves, & Mota, 2015). Tree nuts, including almonds, cashews, hazelnuts, macadamias, pecans, pistachios and walnuts, are recognized for their health benefits and have been associated with a beneficial effect on CVD risk, lipid metabolism, and all-cause mortality (de Souza, Schincaglia, Pimentel, & Mota, 2017). The nutritional benefits vary by species, but all are energy-dense foods for which 50% of total calories come from fat including MUFA and polyunsaturated fatty acids (PUFA). A diet low in saturated fat and rich in MUFA, PUFA and omega-3 fatty acids is associated with a positive effect on health, specifically inflammation, in both healthy people and people at risk for CVD (Silveira et al., 2018). Tree nuts contain additional beneficial properties including dietary fiber, calcium,

potassium, folate, magnesium, selenium, vitamin E (Souza et al., 2015) and are naturally low in sodium and dietary cholesterol.

Due to the high fat content and caloric density, nuts are often mistakenly associated with an increase in fat mass. However, evidence suggest that consuming nuts does not increases weight gain, but instead the protein, fiber and unsaturated fat found in nuts can help to increase thermogenesis and resting energy expenditure (Bes-Rastrollo et al., 2009). The high amount of dietary fiber found in nuts may also delay gastric emptying and increase satiety, both of which are associated with long-term weight loss (Bes-Rastrollo et al., 2009). A 2014 meta-analysis concluded that there was no known association between a diet rich in nuts and seeds and an increase in body weight, BMI or waist circumference (Jackson & Hu, 2014). On the contrary, this analysis showed that regular nut consumption was associated with a decrease in BMI of 0.40, body weight of 0.47 kg and waist circumference of 1.25 cm (Jackson & Hu, 2014).

Cereal fiber. Dietary fiber is a type of carbohydrate consisting of plant-based compounds that are indigestible in the human intestinal tract. The average American consumes 16 grams of fiber per day (King, Mainous, & Lambourne, 2012). This is well below the total daily fiber recommendation of 38 grams and 25 grams for adult men and women aged 18-50 years and younger. Due to a decrease in food consumption, it is recommended that men and women over 50 years of age consume 30 grams and 21 grams of fiber per day, respectively (USDA, 2015)

Fiber is categorized into two groups, soluble and insoluble, based on stability in water. Common sources of soluble fiber include oatmeal, nuts, beans, lentils, apples and

blueberries (USDA, 2018). Insoluble fiber sources include whole grain and whole wheat bread, brown rice, couscous, legumes, carrots, cucumbers, and tomatoes. A grain is considered whole if it contains all three parts of the kernel including the endosperm, germ and bran (USDA, 2018). A refined grain is lower in fiber and protein due to the removal of the bran and germ.

Regular consumption of soluble and insoluble fiber is recommended for digestive regulation, obesity and chronic disease prevention, and overall wellbeing (J. W. Anderson et al., 2009; J. P. Chen, Chen, Wang, Qin, & Bai, 2017). Additional CVD related health benefits of fiber consumption including weight loss, improvement in lipid profile and the reduction of chronic and systemic inflammation (J. W. Anderson et al., 2009). Associated with CVD development, chronic inflammation can be stimulated by nutrient deficiencies from a diet lacking in fiber rich fruits, vegetables, whole grains, and legumes (Sears, 2015).

An increase in total dietary fiber consumption has been shown to lower CVD risk (T. Huang, Xu, Lee, Cho, & Qi, 2015; Y. Wu et al., 2015). Specifically, research shows that each 10 gram/day increment of total dietary fiber can be associated with a 14% decrease in risk of CVD related events and a 27% decrease in risk of CVD mortality (Pereira et al., 2004). More recent research also shows that when compared to individuals with none to low whole grain intake, those who ate 48-80 grams (or three to five servings) of fiber rich whole grains per day had a 21% lower risk of CVD (T. Huang et al., 2015).

Sugar-sweetened beverages. According to data from the National Health and Nutrition Examination Survey (NHANES), over the last decade 63% of adolescents and 50% of adults in the United States consumed at least one sugar-sweetened beverage (SSB) a day. This equates to adults and children consuming 143 and 145 empty calories from SSBs per day, respectively (Rosinger, Herrick, Gahche, & Park, 2017). This regular consumption of SSBs (i.e., one a day) is correlated with an increased risk for obesity (Malik, Schulze, & Hu, 2006), T2DM (Malik et al., 2010), and CVD (C. Huang, Huang, Tian, Yang, & Gu, 2014). The 2015-2020 USDA Dietary Guidelines for Americans define an SSB as a liquid that is sweetened with any form of added sugars including, brown sugar, corn syrup, dextrose, fructose, glucose, honey, lactose, malt syrup, maltose, molasses, raw sugar, and sucrose (USDA, 2015). This includes not only soda, but sports drinks, blended or frozen coffee beverages, energy drinks, and juice with added sugars.

Consumption of just one SSB per day can be significantly detrimental to overall health. A 2014 meta-analysis found that among Americans specifically, an increase in one SSB per day was associated with a 16% increased risk for CVD, 95%CI [10%, 23%] (C. Huang et al., 2014). In addition, results from a review of seven prospective cohort studies suggested that an increase in SSB consumption was correlated with a risk 13% times greater for stroke, 95% CI [2%, 24%] and a risk 22 times greater for MI, 95% CI [14%,30%] (Narain, Kwok, & Mamas, 2016).

As previously discussed, despite the known association with excess added sugars and metabolic and chronic disease, the attempt to focus on single nutrients in the diet before focusing on overall diet quality does not significantly decrease chronic disease risk

(Rippe & Angelopoulos, 2016). A recent review summarizing high impact research including systematic reviews, meta-analyses, and randomized controlled trials found that solely reducing added sugars without modifying other aspects of the diet is very unlikely to improve health and decrease chronic disease risk (Rippe & Angelopoulos, 2016).

Red and processed meat. As reported in epidemiological studies, strong evidence suggests that the excess consumption of red meat (i.e., beef, pork and lamb) and processed meat (i.e., meat that has been altered by smoking, curing or the addition of preservatives to extend shelf life or improve taste) is detrimental to cardiovascular health, (Abete, Romaguera, Vieira, Lopez de Munain, & Norat, 2014; Pan et al., 2011; Sinha, Cross, Graubard, Leitzmann, & Schatzkin, 2009) yet there is still controversy over the direct relationship between meat consumption and overall well-being (Micha, Wallace, & Mozaffarian, 2010).

Red meat is higher in total and saturated fat than white meat leading to the increase in concern about the relationship between over consumption and cardiovascular health (Abete et al., 2014). A 2014 meta-analysis assessing the relationship between all-cause mortality and total, processed, red, and white meat consumption found a positive association between CVD mortality and red and processed meat consumption. The RR per 100g increase in daily red meat intake was 1.5; 95% CI [1.05, 1.26] while the RR per 50g increase in daily processed meat intake was 1.24; 95% CI [1.09, 1.40] (Abete et al., 2014). On contrary they found no association between CVD mortality and lean or white meat consumption (Abete et al., 2014).

Considering the relationship between excess consumption and CVD risk, the Mediterranean diet discourages excess and encourages moderate red meat consumption (4-6 ounces or 113- 170 grams, no more than two times per week) as red meat is a source of niacin, vitamin B6, vitamin B12, zinc, riboflavin, iron, potassium, and phosphorus. A recent study found that among a sample of 2,025 overall healthy females aged 11-64 years old, those who consumed < 40 grams of red meat daily (< 280 grams per week) were more likely to be deficient in zinc, iron, vitamin B12 and potassium and vitamin D than females who consumed between 40 grams and 69 grams daily (Derbyshire, 2017). More remains to be known about the positive and negative effects of a diet with low red meat content in healthy people, although as mentioned above a strong body of scientific evidence supports limiting red meat consumption because of the known link between excess red and processed meat and chronic disease risk (Abete et al., 2014; Pan et al., 2011; Sinha et al., 2009).

Dietary fat. Dietary fat is an essential macronutrient in the human diet. Categorized as saturated, MUFA, PUFA or trans-fat, dietary fat is the most densely caloric macronutrient with 9 kcals per gram. MUFA can be found in vegetable oils such as olive, canola, peanut, and avocado oil (Liu et al., 2017). PUFA are also found in plant-based oils, such as soybean, corn, flaxseed, and sunflower oil. Although fat is an essential nutrient necessary for optimal health, the quality of dietary fat intake has been recognized as more important than the quantity (Ramsden et al., 2009). The AHA recommends limiting saturated fat to less than 6% of daily calories due to the known negative effects on heart health (Sacks et al., 2017). When addressing the effects of saturated fat on CVD

risk, recent research suggests that risk reduction is heavily dependent on the macronutrient that is replacing saturated fat in the diet (Siri-Tarino, Chiu, Bergeron, & Krauss, 2015). When saturated fat is reduced and replaced with PUFA, a significant risk reduction, as much as 14%, has been seen (Hooper et al., 2012). Although when saturated fat is replaced with carbohydrates, specifically sugar or simple carbohydrates, no CVD risk reduction or an increase in CVD risk has been seen (Mozaffarian, Micha, & Wallace, 2010). This may also be dependent on the glycemic-index of the carbohydrates that are replacing the saturated fat in the diet. The results of cohort study of analyzing the dietary patterns of 53,644 people suggests that a dietary pattern that limits saturated fats and replaces them with low-glycemic-index carbohydrates is associated with a lower risk of CVD event when compared to a dietary pattern in which saturated fats are replaced with high-glycemic-index carbohydrates (Jakobsen et al., 2010).

Omega-3 fatty acids. Omega-3 fatty acids are long-chain PUFA, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are considered the most beneficial type of PUFA. These essential fatty acids cannot be produced by the body on its own and must be consumed in foods such as fatty fish, (e.g., salmon and tuna) nuts (e.g., walnuts), and seeds (e.g., flax seeds) (Liu et al., 2017). The AHA recommends the consumption of two servings of fish per week for those with no history of CVD, and at least one serving of fish per day for those with a known CVD related diagnosis (Siscovick et al., 2017). Approximately 1 gram/day of EPA plus DHA is recommended for overall heart health, while higher dosages (i.e., approximated 2-4 grams/day) are recommended to reduce elevated serum triglyceride levels (NIH, 2018).

Several physiological mechanisms have been examined in experimental studies to explain how EPA and DHA consumption may reduce CVD risk. Elevated levels of EPA and DHA in the diet can improve inflammatory response by improving the production of anti-inflammatory mediators known as resolvins, protectins and maresins (Calder, 2017). In a cohort study of 2,837 American adults, increased consumption of EPA and DHA, but not a shorter chain omega-3 fatty acid known as alpha-linolenic acid (ALA), was inversely associated with inflammatory markers linked to CVD (de Oliveira Otto et al., 2013). Additional benefits that have been associated with EPA and DHA consumption include improved endothelial function, cell membrane fluidity and receptor response (Mozaffarian & Wu, 2011) all of which are known to aid in CVD risk reduction.

Most Americans consume a significantly greater amount of omega-6 fatty acids and omega-3 fatty acids. As a second essential fatty acid, these can be found in vegetable oils such as corn, safflower, sunflower and cotton seed oils. This shift in proportion has increased from an estimated dietary ratio of 1:1 (omega-6: omega-3) in the early human diet to approximately 10:1 in the typical modern American diet (Covington, 2004). Some experts believe that excess consumption of omega-6 fatty acids may negatively affect cardiovascular health, yet this has yet to be proven in human studies. Among others, data from the Health Professionals study did not show a link between omega-6 fatty acids and CVD, but instead found that the lowest CVD risk was evident with the highest levels of both of omega-3 and omega-6 fatty acids (J. H. Y. Wu et al., 2014).

Physical activity. An abundance of evidence exists in support of increased physical activity for CVD risk reduction and prevention regardless of one's age, race or ethnicity (Arija et al., 2017; Bennett et al., 2017; Kyu et al., 2016; Wahid et al., 2016). The current guidelines from the AHA suggest that there are substantial health benefits associated with moderate-intensity exercise and recommend at least 30 minutes of moderate-intensity aerobic activity at least five days per week for overall cardiovascular health (AHA, 2017). When observed over a lifetime, even minimal exercise can significantly reduce the prevalence of CVD risk factors. The most significant risk reduction can be seen in individuals who exercise at a moderate intensity for 171-245 minutes per week (Maessen et al., 2016).

Moderate-intensity physical activity (i.e., brisk walking) is strongly recommended to reduce CVD risk with age (Soares-Miranda, Siscovick, Psaty, Longstreth, & Mozaffarian, 2016). Among older adults, research shows that those who regularly walk at a pace of > 3 mph may lower their CVD risk by 50% compared to those who are sedentary (Soares-Miranda et al., 2016).

CVD Prevention

Continued initiatives are needed to improve public-knowledge of CVD risk factors and prevention (Bailey Merz et al., 2017; Kamimura et al., 2017). Lifestyle modifications that are considered to be preventative are equally if not more important for those who have already developed one or more clinical risk factors (Chomistek et al., 2015). Even among patients currently taking medication for hypertension or hyperlipidemia, healthy lifestyle can prevent future CVD events and significantly reduce

risk (Chomistek et al., 2015). The different forms of prevention include primordial, primary, secondary, and tertiary.

Primordial prevention. Primordial prevention is defined as the prevention of the risk factors themselves, before the individual is negatively affected by the symptoms (Weintraub et al., 2011). Those who don't currently exhibit concerning biomarkers may find this form of prevention radical or unnecessary. Primordial prevention differs from primary prevention in that the emphasis is on early dietary and lifestyle modifications to prevent the risk factors in the first place. This includes but is not limited to risk factors such as, hypertension, dyslipidemia, diabetes mellitus and metabolic syndrome, all of which are proven to lead to the onset disease (Grundy et al., 2005).

The first step in effective primordial prevention is recognizing long-term chronic disease risk. By assessing long-term risk rather than short-term risk, health care providers can encourage long-term lifestyle and behavior modifications. Even minor improvements to diet and physical activity levels have been significantly associated with lower blood pressure, improve lipid profile, and affect the efficiency of glucose metabolism and longevity (Johnston, Moreno, & Foreyt, 2014; Poirier et al., 2006; Mercedes Sotos-Prieto et al., 2017). Despite this, primordial prevention is often forgotten and physicians spend little time advising patients on the importance of long-term health and lifestyle behaviors (Mosca et al., 2005).

Other forms of prevention. Prevention strategies that fall under Primary, Secondary and Tertiary prevention are also commonly used in CVD care. As depicted in

Figure 1, as a disease or diagnosis changes, the prevention strategies necessary to stop the evolution of the disease change as well.

Figure 1. Chronic disease prevention progression.

Primary prevention includes interventions geared towards the prevention of the onset of disease in disease-free, at-risk individuals. The goal of primary prevention is to decrease the severity of the risk factors (e.g., weight loss, tobacco cessation programs, pharmacotherapy) (Offord, 2000). In addition to lifestyle modification, statins are often recommended to patients with high cholesterol as part of a primary prevention effort to reduce the likelihood that a CVD event will occur because of lipid levels. The U.S. Preventive Services Task Force (USPSTF) recommends that clinicians encourage adult patients aged 40-70 without a history of CVD who have one or more CVD risk factors to take a low-to-moderate-dose of statins if they have an apparent short-term CVD risk (Taylor et al., 2013).

Secondary Prevention is geared towards early detection, prompt treatment of disease, and prevention of disease progression or reoccurrence (Offord, 2000). Secondary prevention interventions are commonly used to care for patients who have survived a stroke and are therefore at a greater risk for recurrence. The fact that 25-30% of all

strokes that are reoccurring is an example of unsuccessful secondary prevention (Hankey, 2014).

Tertiary prevention follows the onset of disease. Interventions are geared towards minimizing the effects of the disease or disability by preventing complications and premature deterioration (Offord, 2000). This includes preserving the function of the effected organs and reducing disability in people with advanced disease.

CVD Risk Prediction

As previously stated, numerous risk prediction tools have been created to estimate a patient's short-term (i.e., 10-year) risk of CVD (i.e., pooled cohort risk equation) (Goff et al., 2014). The Framingham risk score (Wilson et al., 1987) calculates 10-year CVD risk based off current risk factors and is commonly used clinically. Traditional risk factors that are accounted for include age, sex, total cholesterol, HDL, BP, DM, medication use, and smoking habits.

The AHA currently recommends that Americans follow "Life's Simple 7" which defines cardiovascular health based on seven measurements including cholesterol, BP, serum glucose, diet, physical activity, body weight, and smoking habits (Folsom et al., 2015). By accessing data from the Atherosclerosis Risk in Communities (ARIC) study, researchers determined that these seven categories are associated with chronic disease risk (i.e., CVD and cancer) (Lloyd-Jones et al., 2010). They defined ideal cardiovascular health as the maintenance of the following ideal clinical factors: (a) untreated total cholesterol < 200 mg/dL; (b) untreated blood pressure < 120/ < 80 mm Hg; and (c) fasting blood glucose < 100 mg/dL. The definition also includes the following ideal

health behaviors: (a) healthy balanced diet; (b) not smoking; (c) BMI < 25; and (d) regular physical activity (Lloyd-Jones et al., 2010).

The Healthy Heart Score

The Healthy Heart Score is an online risk prediction tool that determines the user's 20-year risk for developing CVD based on nine modifiable lifestyle factors including: BMI; physical activity; smoking; and consumption of fruits and vegetables, whole grains, red meat, processed meat, nuts and seeds, sugar sweetened beverages and alcohol. (<https://healthyheartscore.sph.harvard.edu/>). In addition to demographic information including height, weight, sex and race, the risk assessment asks questions about the user's physical activity (Appendix A) and average consumption of fruits and vegetables (Appendix B), nuts, whole grains (Appendix C), red and processed meats, sugar sweetened beverages, and alcohol over the last year to determine a diet score.

After completing the risk assessment, results are calculated using a previously validated algorithm to determine overall CVD risk score based on the nine modifiable lifestyle factors mentioned previously (Chiuve et al., 2014). The Healthy Heart Score is a parsimonious rather than comprehensive model for CVD risk prediction that identifies the most critical factors that best estimate an individual's risk of developing CVD over 20 years (Chiuve et al., 2014). The initial model was developed in a random 2/3 sample of participants from the Nurses' Health Study and the Health Professional Follow-up Study cohorts. The performance model was tested in the remaining 1/3 of the cohort participants (Chiuve et al., 2014). In the validation datasets, the model demonstrated good

discrimination, fit and calibration. Model performance was greatest among individuals without elevated CVD risk factors.

After taking the risk assessment, users should better understand how their lifestyle habits affect their risk of heart attack and stroke to serve as the first step in behavioral change. The results of the risk assessment as seen in Appendix E are visually appealing and provide the user with a quick snapshot of the areas that need to be improved as well as practical tips for maintaining or improving behaviors. All results can be printed for the users' reference.

Previous findings using the Healthy Heart Score showed that when compared to women with the healthiest behaviors, women with the poorest health behaviors had a higher predicted risk of 18.1, 95% CI [14.4, 22.7] for diabetes, 5.1 95% CI [4.7, 5.6] for hypertension, 2.3, 95% CI [4.66, 5.6] for hypocholesteremia and 52.8 for all three risk factors combine, 95% CI [14.4, 22.7] (Mercedes Sotos-Prieto et al., 2016).

Primary Care Providers

A primary care provider is a health care practitioner who sees patients that have common medical problems and is often involved in patient care over the long-term (American Academy of Family Physicians, 2018). Care may take place in an inpatient or outpatient role is often from a MD or DO, although a nurse, nurse practitioner, physician's assistant and dietitian may also see patients in an in-patient or outpatient primary care setting for preventative, long-term or acute care.

Primary care practitioners face a variety of challenges when it comes to incorporating chronic disease prevention and health promotion into regular clinical

practice (Rubio-Valera et al., 2014). The United States Preventive Services Task Force (USPSTF) recommends that primary care physicians routinely provide every patient with a variety of preventative services. This includes numerous screenings for chronic diseases and cancers (USPSTF, 2014). Yarnall et al (2003) assessed the amount of time required for a primary care physician to provide these recommended preventive services to an average patient. The recommended services, frequency of performing each service, average number of people requiring each service, and the average time required to administer each service was accounted for. After evaluating over 2,500 average American primary care patients and patient visits, researchers concluded that to provide the recommended preventative services, a physician would need to spend four and-a-half hours of every working day on disease prevention alone (Yarnall, Pollak, Østbye, Krause, & Michener, 2003).

Few studies have assessed the actual time that primary care physicians spend providing preventive services to their patients. Research shows that many primary care physicians spend their one-on-one patient time addressing acute care issues and feel that they do not have enough time in the visit to address preventative care on top of the present health concerns (Moreno-Peral et al., 2015). Because chronic disease prevention is rarely discussed, many patients often are unsure of who to discuss preventative care with and when the right time to discuss it is, therefore the conversation never happens. Yet many patients do feel that preventative care should be addressed by the primary care provider, and believe the discussion should be accompanied by a personalized activities and detailed information on how to develop a preventative plan (Gale et al., 2011)

However, almost all patients perceive that their primary care provider already has a heavy workload and feel timid about asking for personalized information on a new topic of discussion.

Chapter 3: Methodology

Research Design

The purpose of this qualitative study was to assess the utility of the Health Heart Score risk assessment tool in the clinical setting through interviews with health care providers and patients. To complete this study, various health care providers and patients completed the online Healthy Heart Score Risk 20-year CVD risk assessment (Appendix E). One-on-one interviews were conducted to assess their opinions of the clinical utility of the Healthy Heart Score as a 20-year CVD risk prediction tool (interview questions found in Appendix F and G). Interviews were conducted in person on the campus of Ohio University, at the professional office of the health care provider or via telephone. All interviews were digitally audio recorded and transcribed for further assessment.

The specific focus of the semi-structured interviews was to assess participant feedback. Researchers evaluated the comments and opinions of participants after they completed the Healthy Heart Score risk assessment. Questions were asked regarding participant knowledge of CVD primordial prevention, opinions of the tool overall, specific questions about possible confusing points, and thoughts on practicality and utility in the clinical setting. If necessary, our intention is to use this feedback to modify the current risk assessment tool to increase the functionality so it can potentially be used by patients and physicians in routine clinical practice as a CVD primordial prevention tool in the future.

Qualitative Research

Qualitative research requires researchers to methodically gather, organize and interpret textual material (Grossoehme, 2014). This material is often derived from observation, discussions, and interactions that researchers have with the participants to learn more about their personal experiences (Grossoehme, 2014). This method of investigation seeks to describe, decode, translate and recognize the meaning of naturally occurring events. Qualitative research is used to generate new hypothesis and explain existing outcomes that are often the result of prior quantitative research. These data are particularly useful when studying human behavior (Grossoehme, 2014). By gathering non-numerical data, the emphasis is placed on the experiences and views of the participants being studied to gain a better understanding of the behaviors and perceptions of the group (Lakshman, Sinha, Biswas, Charles, & Arora, 2000). This differs from quantitative research, which often addresses numerical trends and frequencies rather than codes and descriptors to describe a phenomenon (Lakshman et al., 2000).

The use of qualitative research in health care has recently grown. The increase in use in the healthcare settings is due to the need to answer research questions that involve human interpretation rather than just numerical analysis (Cypress, 2015). Motivation to do so is often grounded in some form of quality improvement to assess how something can be changed and improved. To answer the proposed research questions, qualitative researchers commonly use face-to-face interviews, focus groups with a population subset, or observations of populations to collect data (Leung, 2015).

Approaches to Qualitative Research

Five theories are most commonly considered to be the main approaches to qualitative research. These approaches include ethnography, narrative, phenomenological, case study, and grounded theory (Lewis, 2015). The purpose of ethnography is to develop a better understanding of a culture or social group from the point of view of the subjects. This is often done through observation and by the researcher immersing themselves in the setting of interest for an extended period to improve understanding (Sofaer, 1999). When employing a phenomenological approach, the researcher explores a phenomenon from the perspective of the people who have already experienced it. This allows the researchers to better understand the participants' perceptions and feelings surrounding the experience of study (Lewis, 2015). In a narrative analysis approach, researchers are interested in analyzing prior communications to derive further meaning. Researchers may conduct a case study by analyzing interviews and documents to examine an occurrence through purposeful sampling (Lewis, 2015). A final approach, and the theory we used in this qualitative study, is known as grounded theory. Becoming increasingly popular in health care research, grounded theory aims to develop new theories and ideas "grounded" in the data being analyzed (Chapman, Hadfield, & Chapman, 2015). Commonly used when no ongoing hypothesis exists, this approach is most valuable when used to alter current clinical practice or guide future research (Glaser & Strauss, 1967). This approach was chosen for this study because we aimed for our results to help generate a hypothesis for future use of the Healthy Heart Score. According to Glaser and Strauss, this pragmatic

approach allows for hypotheses to be developed from the data, rather than data collection being a process of testing a pre-existing hypothesis (Glaser & Strauss, 1967). Grounded theory is an analytical approach for which researchers collect data while simultaneously analyzing it, then use the information learned to manipulate further data collection. This process continues until saturation is reached; that is, until no new codes have emerged (Grossoehme, 2014).

Participants

Subjects participating in this study included both patients and health care providers. In total, 40 participants were recruited to participate including 20 health care providers and 20 patients. Providers were recruited from the Southeast and Central Ohio area through word of mouth, e-mail recruitment and flyers (see Appendix H). The provider inclusion criteria states that to be eligible, providers must have been an active health care practitioner (i.e., physician, physician's assistant, nurse, nurse practitioner or dietitians) with experience practicing in a primary care setting. Patients were recruited using Research Match, e-mail blasts and word-of-mouth. The patient inclusion criteria states that to be eligible, patients must have been aged 18 years or older, able to read and write in English, and have no prior CVD diagnosis. This criterion was created because our goal is to improve cardiovascular disease primordial prevention, which requires patients to be free from CVD.

Participation in the study was voluntary. To encourage participation, participants were compensated for their time with an Amazon gift card valued at \$25.00. Participants

provided informed consent prior to participation. An IRB application (Protocol Number: 17-X-116) was submitted and approved in April of 2017.

Instruments

The research team devised a semi-structured interview guide. Based on the initial responses, the primary interview questions were followed with additional probing questions to allow participants to expand on their thoughts so that the researchers could gain a deeper understanding of their opinions and experiences. Interview questions were written specifically for this study. All interview questions have been IRB approved. Patient interview questions can be found in Appendix F, and provider interview questions in Appendix G.

Data Collection

Health care providers and patients who agreed to participate in this study read and signed an informed consent form at the time of the interview (see Appendix I and Appendix J). Participants were made aware that withdrawal from the study could occur for any reason at any time. Each participant was also asked to complete a short demographic form (See Appendix K and Appendix L) prior to participation so the research team has additional information on the participants being interviewed.

All patient interviews were held in a closed-door conference room in Grover Center on the Ohio University campus. Of the 20 providers interviewed, 17 of them were conducted in those same conference rooms while three were conducted via phone. All phone interviews were conducted while the researcher was in Grover Center on the Ohio University campus.

Each participant first completed the online Healthy Heart Score risk assessment on a computer prior to the interview. Participants were told that their predicated risk would not be documented or shared and that researchers were concerned with their opinion of the tool rather than their predicted CVD risk. Researchers recorded how many minutes it takes for participants to take the risk assessment.

After completion of the assessment, in person interviews with patients were conducted. Each interview lasted approximately 20 minutes. A research team member (SMB) facilitated the interviews. All interviews were audiotaped and transcribed upon completion.

Data Analysis

A multidisciplinary research team consisting of an epidemiologist, a health behaviorist and qualitative methodologist, two nutrition science graduate students, and a basic scientist/dietitian was employed for data analysis. Due to the nature of qualitative research, data collection and analysis occurred simultaneously. After the interview audiotapes were transcribed, the research team performed content analysis by coding the interviews until saturation was reached and no new themes emerge. To do this, interviews were first independently read and analyzed by three coders to categorize key words, phrases and text to illustrate any themes that appeared. The Cohen's kappa coefficient for interrater agreement was 0.954, indicating almost perfect agreement (Cohen, 1968; Landis & Koch, 1977). After all transcripts were coded and discussed, a fourth member of the research team (MSP) reviewed the codes to achieve researcher corroboration (Trochim, Donnelly, & Arora, 2016). A coder (SMB) then entered the agreed upon coded

transcripts into NVivo 10 software (QSR International, Victoria, Australia) to organize, sort, and structure the data to facilitate thematic analysis.

Rigor

The trustworthiness of qualitative data is often questioned because the concepts of validity and reliability cannot be addressed same way that it can during quantitative research (Leung, 2015). Ensuring validity and reliability are imperative to conducting an unbiased, credible and rigorous qualitative study. Validity refers to the honesty of the research. In a study with high validity, the data will create an accurate representation of what it was intended to represent (Anderson, 2010). Reliability refers to the reproducibility of a study. A study with high reliability have similar results if reproduced under similar conditions as the original (Anderson, 2010).

Rigor is the assessment of trustworthiness in qualitative data (Krefting, 1991). To avoid any possible doubt of the trustworthiness of qualitative research, Guba's (1981) validated model is often used as an assessment of trustworthiness or merit to ensure rigor in qualitative research (Guba, 1981; Krefting, 1991). Guba proposes four general criteria that researchers should considered in the evaluation of qualitative research. These four criteria aim to ensure trustworthiness and include: credibility, transferability, dependability, and confirmability (Guba, 1981).

Credibility is a key criterion to ensure internal validity, or that the study measures what it is intended to measure (Shenton, 2004). Merriam (1998) suggests that the creditability of qualitative research equates to how congruent are the findings with reality (Merriam, 1998). We ensured credibility by using a previously validated risk assessment

tool, the Healthy Heart score, and by confirming accuracy of interview questions among four researchers. Triangulation, a common technique used to minimize bias and enhance trustworthiness and rigor in qualitative research, was employed by analyzing data via multiple methods, having multiple researchers assess the data or by collecting data with multiple methods (i.e., observation and interviews) (Golafshani, 2003).

Transferability, also known as generalizability, refers to external validity (Leung, 2015). Merriam (1998) explains, that external validity is concerned with the extent to which the findings of one study can be applied to other situations. Although qualitative research is often concerned with examining a phenomenon in a specific population, transferability has recently become increasingly pertinent in qualitative research (Leung, 2015). Transferability was supported by conducting interviews with multiple populations, specifically multiple health care disciplines to ensure that the findings would be accurate across various health care professional populations.

Dependability can be described as consistency or reliability of the study. This can be evidenced through consistent data and research findings and evaluated through transparent research steps (Sullivan & Sargeant, 2011). Dependability was ensured by providing transparent research steps and completing identical steps as written in the approved protocol with each participant.

Finally, confirmability can be described as the assurance of objectivity due to a high level of confidence that the findings are based solely on participants' responses rather than any potential researcher biases (Shenton, 2004). We ensured confirmability because two of the researchers who participated in data analysis (EAB, KK) did not

participated in data collection, and an additional researcher (MSP) who participated in reviewing the results did not participate in collection or analysis. By taking additional steps to review and analyze the data with multiple people who were not invested in the outcomes of the projects and were not part of the data collection process, we reduced the likelihood that of bias may arise during data analysis.

Chapter 4: Results

In the present study, 40 participants (50% patients, 50% health providers) were enrolled for voluntary participation. Each participant took the online Healthy Heart Score risk assessment prior to participating in semi-structured interviews. Participants were categorized as either patients or providers. Of the 20 patients, the mean age was 33.1 ± 9.1 years, 70% ($n = 14$) were female, and 95% ($n=19$) identified as white (Table 3). Of the 20 health care providers, the mean age was 36.7 ± 10.4 years, 90 % ($n = 18$) were female, and 95 % ($n=19$) identified as white (Table 3). 20% were practicing as a licensed physicians or physician's assistant, 35% were practicing as a nurse, and 45% were practicing as a dietitian (Table 3). On average, the providers had worked in clinical practice for 11.5 ± 9.1 years. Participants completed the Healthy Heart Score risk assessment in an average time of 4 min and 53 s. Some participants completed the assessment in as few as 3 minutes while others took as long as 9 minutes.

All participants suggested ways to best utilize the tool with the most prominent way being "use in the waiting room". Participants also stated ways to improve the tool, including adding graphics for visual reference of serving size, and removing irrelevant food choices such as added wheat germ. Patients showed interest in CVD primordial prevention and expressed willingness to take the Healthy Heart Score prior to seeing a primary care provider. Providers said they would be willing to use the tool in practice and recommend it to their patients. Providers stated few barriers to using the tool but provided numerous examples of barriers to primordial prevention in general (Buls et al., 2018)

Table 3

Participant Demographic Characteristics n=40

Characteristic	
Patients (n=20)	
Average Age (years), mean $\pm$ SD	33.1 $\pm$ 9.1
Gender n (%)	
Female	14 (70)
Male	6 (30)
Race n (%)	
White	19 (95)
Black	1 (5)
Health Care Provider (n=20)	
Average Age (years), mean $\pm$ SD	36.7 $\pm$ 10.4
Average Time in Practice (years), mean $\pm$ SD	11.5 $\pm$ 9.1
Gender n (%)	18 (90)
Female	2 (10)
Male	
Race n (%)	19 (95)
White	1 (5)
Indian	
Profession n (%)	2 (10)
Physician	2 (10)
Physician's Assistant	7 (35)
Nurse	9 (45)
Dietitian	

Note. Continuous variables are reported as means $\pm$ SD (standard deviation) and categorical variables as percentages

Patient Interviews

Participant suggested areas of improvement. Patients answered interview questions regarding their opinion as a user and were asked to indicate any areas of

confusion among the six sections of the risk assessment tool (i.e., physical activity, whole grains, fruits, vegetables, nuts and nut butters, red meat, alcohol and sugar sweetened beverages). Three main opinions related to areas of improvement emerged upon data analysis including the “addition of graphics” to increase understand of serving sizes, adding “more diet examples” to better explain food choices and “removing irrelevant or unfamiliar food choices” to avoid confusion.

Most of the confusion was due to questions in the grains and physical activity sections of the assessment. Some participants thought it was necessary to reconfiguring the time increments available to answer the physical activity recall question “During the past year, what was your average time per week spent doing each of these activities?”, while others stated that they liked how it was set up and would not change anything. One participant commented that “it’s eye opening” (Patient [PT] 6) when discussing how they don’t think about how much or how little exercise they are getting daily.

Although numerous patients commented that assessment was “easy to use” and “visually appealing”, the most prominent suggestions were related to adding more graphics or visual examples throughout the assessment. Many participants said they used the examples currently on the assessment and thought they were helpful when trying to accurately recall what they ate.

Knowledge of serving size was a common topic of discussion for many participants. Patients suggested adding more visual representation to increase user understanding of what a serving size looks like. This patient suggested:

Maybe either pictures or examples of things that people would encounter in their everyday. It makes a little bit more sense than saying five ounces of meat. I think a lot of people don't know what that means. (PT 12)

Participants felt that they themselves could accurately estimate a serving size, but as commented below, many people thought that their peers or "the average person" could not:

I think a lot about serving size and what that is, but I do wonder for the average person if it might be hard to visualize cause I think a lot of people, when they pour a bowl of cereal, for example, it's more than a cup and they don't really think about it. (PT 8)

Confusion arose when discussing unfamiliar grain choices, particularly concerning wheat germ, fiber and specifying whole grain vs. refined grains foods. It was commonly noted that wheat germ was an irrelevant grain choice that no one would select in a recall and could be omitted to avoid confusion. One patient stated, "The average person off the street is not gonna know what germ is, besides don't spread them." (PT5)

Patients' prior CVD knowledge. Patients discussed prior knowledge of CVD related primordial prevention. Discussion included knowledge mainly related to diet and lifestyle modifications. Many patients were aware of the general recommendations for chronic disease prevention, including the patient who said the following, "Cardiovascular disease, that I know of, trying to prevent it would be exercise, eating healthy, keeping active, getting yearly checkups from your doctor, that type of thing." (PT4)

When discussing if their provider talked with them about CVD prevention, another patient stated:

I mean, not really. I'm a [young person], I don't go to the doctor very often.

Maybe if I was younger or older. But yeah, if they wanted to talk about it, if they thought it was an important part, I would definitely be game to talk about it and how to change a few things. (PT 12)

Patients were asked if their primary care provider had previously talked to them about the dangers of CVD or how diet and lifestyle modification can act as forms of chronic disease prevention. Most patients said their primary care provider had never discussed either with them. Patients acknowledged that providers often asked about family history, but the conversation about prevention rarely took place. One patient said:

I've been asked does anybody in your family have cardiovascular disease and they always ask me if I'm a smoker or – so I think they ask questions that relate to it, but it hasn't really gone beyond that. (PT8)

Numerous patients, all under the age of 30, commented that they thought their provider may not have discussed CVD prevention with them because they are young and already healthy, so it was not necessary. When asked if the person had talked to his primary care provider about CVD prevention in the last year, one patient commented:

“No, but maybe I'm just not old enough yet or have symptoms”. (PT3)

Patients' perceived utility of the tool. When discussing the best way to administer and utilize the tool, most patients noted that use of the tool in a waiting room prior to seeing a primary care provider would be most effective. Numerous patients

commented on the short amount of time it took them to complete the assessment. One patient noted that taking the assessment in the waiting room would not be an extra burden because they had to fill out paperwork anyway saying, “Well, it took me about five minutes. You have to fill out paperwork, anyway. So yeah, the length is fine. I don’t think it’s too long.” (PT 2)

When asked about their opinion of the length of the assessment, another patient commented, “I think it only took me maybe five minutes, so I think it would definitely be appropriate for a waiting room.” (PT 18)

When asked how the tool could best be utilized, almost all patients said that they would prefer “self-administration” rather than having a health care provider verbally administer it to them. Most patients said that this method would be easier and make the most sense, but patients also articulated reasons such as “less pressure.” Other patients commented on how self-administration may increase honesty and allow review their answers such as the patient who stated:

I think I’d rather take it myself, cause like seeing all the examples and there was a couple times like, I wanted to like check what the actual instructions were cause I thought it might’ve changed. So I wanted to go back and double check, and reread sections. (PT 11)

The majority of patients reported that they would be honest when answering a health assessment that was going directly to their provider. Some participants articulated that they recognized that they, not their provider, would be the one who directly benefited

from the results such as the patient who commented, “I’m the one that gonna benefit from it. I guess I don’t – I think physicians are there to help you, not to judge you.” (PT6)

The accuracy of a dietary recall was brought up during discussion. One patient said that they think they would try to be honest, but may subconsciously want to overestimate to improve results:

I do wonder if I would be a little bit – oh, yeah, I have three servings of fruits and vegetables every day. I do wonder if I would tweak some of them a little but just because – I don’t know. I guess it’s just the nature. (PT8)

Questions regarding thoughts on health literacy were asked, and most patients reported that the reading level was very acceptable for the general population such as this patient who said:

I think would most of them would be clear, because I think there was a lot of explanation. I think something like added germ or added bran, somebody who’s not necessarily food literate or a foodie may not understand what those two things are. I mean I know what they are, but a lot of people wouldn’t. But I like how it said like crackers and then gave examples of Triscuits or Saltines. (PT 14)

Provider Interviews

Providers’ suggested areas of improvement. Providers suggested possible improvements to the tool based on their professional experiences and interactions with patients in practice. Similar to patient interviews, the main suggestion regarding areas of improvement was the addition of graphics to better explain food choices, increase accuracy of diet recall and avoid overall confusion. Confusion regarding portion size,

both when completing a diet recall and during actual consumption, was commonly brought up in discussion. Many providers mentioned that adding visual references may help patients better estimate serving size, implying that doing so may lead to a more accurate diet recall and allow the patient to gain a better understanding of serving size.

This provider explained:

I think if you gave them, what did they say, three ounces is a deck of cards – I think if you gave them something to kind of work with, like an equivalent, I think they could do a good job estimating. (Provider [PVD] 15; Dietitian)

Many providers explained that they know their patients often have trouble accurately visualizing a recommended portion size:

I feel like they have issues with figuring out the size of a cup rather than – even a household item or something like that kind of helps a little better...to picture what a cup of cold cereal would look. (PVD 17; Dietitian)

Even when patients can accurately recall how much they consume, providers discussed how many patients have an inaccurate perception of what their recommended serving is:

People don't understand what a portion size is. They'll be like, 'I only had one piece of meat and it was on this big, I'm like, Well that's three ounces. That's a serving of meat, so their perception of serving sizes. (PVD 14; Dietitian)

Many providers thought that the assessment was visually appealing and liked the diet and lifestyle improvement tips presented throughout the assessment, such as the provider who commented the following:

I did really like the little did you know and side information, you know, about smoking, and about food, and that kind of stuff. I thought those were pretty interesting and could really hit home to patients that are going through it. (PVD 19; Nurse)

Suggestions were also made to change the layout so users were more inclined to read and remember the tips presented and some said they would have preferred to see more tips throughout the assessment. Similar to patients, providers also acknowledged that there may be confusion in the grains section and commented on the need to differentiate between whole and non-whole grains. When asked if they had any suggestions for modifications, this physician commented:

So fruits and vegetables, no problem there I understood all of those; they were straightforward. High-fiber cold cereal, fiber cold cereal, other cold cereal.

Okay...You know I thought here the pasta, here's where some of the grains maybe don't show. I eat all whole grain pasta, so that wasn't discriminated there. Bagels, English muffins, and rolls. Well there again, there's different varieties out there. (PVD 8; Physician)

Providers' perceived barriers to primordial prevention and implementing to the tool. Providers were asked to discuss possible barriers to implementing the Healthy Heart Score into their practices, as well as barriers they personally came across when implementing general primordial prevention strategies. Providers were quick to think of barriers they had experienced in the past implementing prevention strategies with their patients but thought of only a few barriers to implementing the tool specifically. The

most common barriers that were discussed were “patient lack of compliance” in follow-through with behavior change. Providers also discussed how patients often expressed confusion when discussing behavior modification as a form of primordial prevention because of a knowledge deficit and constantly receiving conflicting information about diet and exercise from outside sources. One provider stated the following, “I think that a lot of people get a lot of different information that's kind of conflicting, and so, it gets confusing for people. So, really, you know, I wish we would just keep it simple for people.” (PVD 4; Nurse)

Many providers, physician included, agreed that patients are more inclined to change if instructed to by their physicians over any other member of the health care team. Providers suggested that if lifestyle modifications were discussed with the support of a physician, patients would be more inclined to comply. This provider commented the following when referring to the physician as the “provider,” “If they would hear their provider say it, it was - I mean, it just opened so many doors for the providers who were supportive versus the ones who were really more into medication as opposed to lifestyle.” (PVD 4; Nurse)

During provider interviews, specifically with physicians and physician’s assistants, lack of time and ability to truly discuss lifestyle modifications with patients was commonly discussed barrier. Providers commented on how if patients come to see them for a specific issue, there is often not enough time in each appointment to ask in-depth questions about diet and physical activity. One provider commented, “Unfortunately in family practice [we] don't have as much time as we would like

to...sometimes we only have three to five minutes, maximum, to spend with a patient, if that, to counsel them on dietary changes.” (PVD 16; Physician’s Assistant)

Similar to the above comment, many providers commented on how physicians and physician’s assistant often have a lot to cover with each patient. One provider expressed the following opinion on how physicians often prefer to move quickly during patient visits:

I mean, in all honesty, providers want something that's easy, something that's not gonna require them to do anything additional on what they're already doing, and if this is, I mean, if the patient really can go through that themselves and something kind of spit out to the provider, I don't see why there would be any problem implementing as long as it worked easily for them. (PVD 12; Dietitian)

When asked if they commonly discussed prevention strategies with their patients, some providers said they did, but most said that they knew that their patients could benefit from more. The answer to this question varied based on profession. Due to scope of practice, all the dietitians interviewed said that they discussed diet and lifestyle modification with their patients and that education was a key part in their patient visits. Many of the nurses, physicians and physician’s assistants said that it depended on the patient. This physician’s assistant commented:

I mean it just I think it depends on what they come in for. But I try to you know for the ones that come in. And I’ve had just a couple, not very many, but who they actually asked do you have suggestions about diet, that kind of thing. But yeah, I

try to. I probably should do a better job at that, but I try to. (PVD 9; Physician's Assistant)

Another physician acknowledged that they do spend time discussing prevention with their patients, but focus more on it if they seem to be at risk:

If they're normal and they're not overweight, then they're probably doing a pretty good job of following a well-balanced diet. Otherwise I do recommend the low fat, low cholesterol, and avoiding a lot of sugars as well. (PVD 7; Physician)

Providers' recommendations for utilization. Providers discussed how they think the tool could be best utilized in the primary care setting, if they would be willing to use the tool in their practice and if they would feel comfortable recommending it to their patients. Similar to the opinions of patients, the prominent topics that emerged when discussing utilization were “use in waiting room,” meaning the patient would take the assessment before seeing their primary care provider was the most suggested place for patients to take the assessment. “Self-administration” meaning that the patient would take the assessment themselves on a provided electronic device or paper copy as opposed to a provider verbally administering it to them was also highly suggested. This method of utilization was suggested by the majority of the providers such as this person who commented the following:

So, I mean, if they're coming in for an appointment, I think that would be the most appropriate time, while they're sitting in the waiting room before they go in and talk to the doctor, and then, the doctor can kind of go through and discuss points of things. 'Cause this scores immediately, which is nice. (PVD 11; Dietitian)

Providers felt that the tool would work best in the primary care setting if it were self-administered. Providers felt that with this method patients would feel less rushed and more comfortable, and therefore would be more honest about their habits. One provider suggested having someone available to answer questions if needed:

I think if they sat and did it themselves, they might not feel pressured to answer a certain way right in front of the physician, they might be able to focus more. But then again, if they had questions, it would be nice if someone was kind of explaining and talking them through it. (PVD 4; Nurse)

Most providers thought that the current assessment length was appropriate for use in a waiting room and believed that it would take less time to complete than patients commonly have to wait. Comments were made that some individuals may have trouble if it were administered via an electronic device or that possible waiting room distractions such as children may prolong the completion time.

Providers were enthusiastic about the tool and stated that they would be willing to use the tool in their practice. If used correctly many believed that it could be utilized to start a deeper conversation about healthy lifestyle and behavior modification in the primary care setting:

Yeah, I think it could. I think definitely in the right setting. I think putting it in that area and trying to catch people with risk factors. I mean, the doctor asks, 'Do you smoke? Do you drink? Do you have a family history of heart stuff?' But they don't get into the details of the diet as much, and exercise as much, and the other

factors that really do influence our health. So I think it could be beneficial, if used correctly. (PVD 10; Dietitian)

Providers had various positive comments about the results section of the assessment, including comments on how the tool may make the user more aware of their lifestyle habits:

I think it helps the provider and the patient to just kind of you know think about what they are eating and what their activity level is and how that can help. But yeah, definitely. It's like something different to get them talking about it and giving you a chance to talk to them about it. (PVD 9; Physician)

When asked if they would be willing to recommend the tool to their patients, one provider commented the following, indicating how it could be beneficial to both the patient and the provider:

Oh, definitely, definitely, and I think the color coding, and showing patients that, like, 'Oh, that's, you know, that's interesting. Maybe I'm not getting enough of this, or more of this.' And I think it could even help physicians, too, like, it's amazing how many of them do not know what a serving size is. (PVD 13; Dietitian)

Providers also commented that this tool may help lead to appropriate referrals from physicians to other health care professionals (i.e. dietitian, exercise physiologist, physical therapist) to further discuss results and necessary primordial prevention lifestyle modifications.

Chapter 5: Discussion and Conclusion

The Healthy Heart Score risk assessment was designed and validated using epidemiological data to assess long-term CVD risk based on modifiable lifestyle factors (Chiuve et al., 2014). In addition, the Healthy Heart Score has shown to be associated with the development of clinical risk factors in observational studies (M. Sotos-Prieto et al., 2016). To assess the possibility of expanding the use of the Healthy Heart Score into the clinical setting, a qualitative study was deemed necessary to gain a better understanding of if and how the tool can be best utilized. To do so, semi-structured interviews were conducted with patients and health care providers who had taken the assessment. During the interviews we discussed their opinions of the tool, possible ways to utilize the tool in the primary care setting, and barriers to primordial prevention. From these discussions, we gained a better understanding of the strengths and weakness of the tool, strategies for how the tool may best be utilized, possible modifications for future use, and participant experiences with primordial prevention in the primary care setting. This qualitative study allowed us to better understand the opinions of those who may use the tool was a necessary first step to implementing it into the primary care setting for regular patient and provider use. The results of our interviews suggest that use of the Healthy Heart Score in the primary care setting would be accepted by health care providers and patients.

Discussion about the Healthy Heart Score lead to more specific conversation about topics that participants felt were relevant to primordial prevention. Portion size was a topic heavily discussed during both patient and provider interviews. Patients expressed

a lack of knowledge about the serving sizes of commonly consumed foods and the ability to accurately recall what and how much they ate. Those who said that they cooked regularly expressed less confusion and many patients were quick to say that even if they themselves were not confused about serving size, others that they know often are. Patients commented on how the tool made them think about their diet in ways that they normally would not, including how much or how little of something they were eating on a regular basis. The literature shows that recognizing serving size can significantly reduce over consumption of empty calorie foods (Versluis, Papies, & Marchiori, 2015). When attempting to recognize serving size, size comparison visuals such as common household objects are preferred over the use of weight or measurement tools (Faulkner et al., 2016). Because portion control recognition plays such a large role in overconsumption, the addition of size comparison visuals to the Healthy Heart Score risk assessment, as suggested by participants, may not only improve diet recall accuracy, but may also help patients to gain a better understanding of what a recommended portion size looks like in comparison to how much they are eating. Thus, considering that confusion about serving size often leads to overconsumption (Ledikwe, Ello-Martin, & Rolls, 2005), relaying an accurate depiction of one's intake to the provider is imperative to having an effective conversation about proper dietary choices.

Participants discussed patient knowledge of CVD and the various components that lead to a successful discussion about CVD primordial prevention. Research shows that patients feel that preventative care should be addressed by the primary care provider and believe the individualized discussion and preventative care resources can be

beneficial (Gale, Greenfield, Gill, Gutridge, & Marshall, 2011). The participants we interviewed exemplified these results, expressing similar beliefs. Despite this, many patients also said that their provider had not talked to them about CVD prevention, and many providers acknowledged that this discussion did not happen as often as it should because of many common barriers such as time constraints.

Providers, specifically physicians and physician's assistants, commented on how they would like to incorporate more primordial preventing strategies into their routine clinical practice, but it was challenging due to the number of patients they see in a day and the large amounts of information expected to be covered during each patient visit. Therefore, regardless of the effectiveness of a tool, to be used in the primary care setting it had to be easy, quick and not require much additional work for either party.

It took participants anywhere from 3 min to 9 min to complete the risk assessment, but on average participants completed the assessment in 4 min and 53 sec. This was said to be an acceptable amount of time for the assessment to be completed in the waiting room prior to seeing a provider. As suggested by both patients and providers, if the Healthy Heart Score was taken prior to seeing the provider then the results that indicate what specific lifestyle components need improvement could be used in. This would allow for individual CVD risk to be addressed in a timely fashion by giving the provider a snapshot of the patient's modifiable behaviors prior to stepping into the room.

Providers also commented that an additional barrier was how often patients gather health information from social groups and media sources. This lead to confusion because of conflicting health information from various, often unreliable, sources. A 2010 study

recognized that for many Americans, family and friends were the most common sources for health and medical information and community organizations, which are often the most reliable, were the least common (Redmond, Baer, Clark, Lipsitz, & Hicks, 2010). More recent research suggests that adolescents, those who benefit most from recognizing their long-term CVD risk, are even more likely to turn to digital sources for health advice. Almost one-third of young people said that they have changed their behavior because of digital health information (Wartella, Rideout, Montague, Beaudoin-Ryan, & Lauricella, 2016). Using the Healthy Heart Score online risk assessment tool in combination with guidance from a provider allows for the ideal combination of technology use and provider guided medical advice.

Conclusion

Our findings support the utilization of the Healthy Heart Score risk assessment as a CVD primordial prevention tool in the primary care setting. Considering the increase in prevalence of CVD risk factors nationwide and the lack of knowledge about chronic disease prevention, now is an opportune time to improve and implement this tool. The qualitative nature of this study allowed for a comprehensive understanding of the strengths and weaknesses of the Healthy Heart Score and an ideal way to utilize the risk assessment in clinical practice based off the opinions of those who matter most, the users.

As evidence by the patient and provider conversations we had during this study, CVD primordial prevention is lacking in the primary care setting and the Healthy Heart Score has the potential to help improve this. We received ample positive feedback from

both patients and providers about the risk assessment. Participants also proposed simple and realistic ways to modify the tool for future use. By hearing from the population that we hope will be using the assessment during clinical practice in the future, we can modify the tool and develop a protocol to utilize the Healthy Heart Score in the most effective way.

It is necessary to increase the time spent focusing on chronic disease prevention in the primary setting rather than waiting until dangerous risk factors present themselves to talk about the problem. When considering the significant prevalence of chronic disease and the abundance of literature supporting lifestyle modifications for the prevention of chronic disease (Johnston et al., 2014; Poirier et al., 2006; Mercedes Sotos-Prieto et al., 2017) one would think that there would be more of an emphasis placed on diet, physical activity and long-term risk in the primary care setting. We are convinced that after the suggested modifications are made, the Healthy Heart Score has the potential to help start the conversation between provider and patient about CVD risk and positively impact modifiable behavior change.

The Healthy Heart score is unique in that it assesses CVD risk before risk clinical factors are present. Despite harmful lifestyle habits, of the younger patients that we talked to (i.e., aged 22-30), many did not feel that they were at risk for CVD because of their youth and were shocked when their risk was not ideal. Although after reading through their results, many of these patients acknowledged the negative impact that their diet and physical activity habits were having on their overall health and CVD risk. Among this younger population specifically, now is an opportune time to use the PFD print out of

their Healthy Heart Score results (Appendix D) to have a discussion with their provider about their long-term CVD risk and what lifestyle changes they can make to improve it. The Healthy Heart Score results (Appendix D) explain the user's risk and provide goals and concise evidenced based recommendations for each lifestyle factor in a color-coded print out. Use of this results page can help the provider overcome the previously discussed time constraint barrier because the print out allows them to have the patient's lifestyle information and recommendations in a single user-friendly document that the patient can take home with them after their visit. The providers and patients that we talked to were excited about the tool and both groups acknowledged the positive impact that the tool could have in the primary care setting if used correctly.

This study has limitations that should be declared. This includes a small sample size, homogeneity of the study sample with regards to race and ethnicity, and the use of participant self-selection and self-reported data. Our findings represent the perceptions of a small sample of primary care patients and health care providers who live in the Southeast Ohio region, or work in healthcare in either the Southeast or Central Ohio region. The small sample size may limit the generalizability of our findings. Although, due to the nature of qualitative research, a small sample size is not a significant limitation because data is analyzed until saturation is reached, therefore decreasing the likelihood that new information will be learned from subsequent interviews (Guest, Bunce, & Johnson, 2006).

The majority-white study sample is reflective of the racial distribution in this region; however, because many of our patient participants were recruited via Research

Match and through word of mouth at the university, our patient participants were more educated than the general population of Southeast Ohio.

Self-reported data are vulnerable to social desirability bias (Van der mortel, 2008). Patients may have also been more health-conscious and interested in modifiable behavior change than the general population in this region because of self-selection for participation. To minimize bias, the researchers emphasized that participation was voluntary and that all responses were confidential and could not be linked back to the participants. Participants were financially compensated to participate and were aware of the compensation prior to the consent process and completing the interview.

Interviews were conducted with all members of the healthcare team because decreasing CVD prevalence on a community and individual level requires an interdisciplinary approach. We recognize that most patients view their physician as their primary care provider and acknowledge that a limitation of this study is that the majority of provider interviews conducted were with other member of the healthcare team who are not physicians. Despite this, the literature suggests that an interdisciplinary team, including dietitians and registers nurses, is key to successful chronic disease prevention (Hammick, Freeth, Koppel, Reeves, & Barr, 2007). Recent research suggests that the most successful primary care practice teams include RNs as providers of not only preventative care but also chronic illness management and regular clinical practice operations (Flinter, Hsu, Crompt, Ladden, & Wagner, 2017; Smolowitz et al., 2015). The Healthy Heart Score can be utilized by a variety of health care providers to improve modifiable behaviors to reach the goal of decreasing CVD risk. Initial use by a primary

care physician may lead to necessary referrals to other health care providers such as dietitians or exercise physiologists for additional preventative care also prompting to a multi-disciplinary approach.

Future Research

The data collected are invaluable to the development of the Healthy Heart Score and the future utilization by primary care providers as a primordial prevention tool. We now know that providers and patients have shown interest in the Healthy Heart Score, however use of the assessment tool in the primary care setting has yet to be tested.

Over the last decade there has been an increase in the accuracy of CVD risk prediction tools, yet it remains unknown if use of any CVD risk prediction tool can actually improve CVD outcomes (Karmali et al., 2017). Using the information gathered in this qualitative study, we are now able to expand our research questions and dig deeper into how the Healthy Heart Score can impact behavior change to improve CVD risk outcomes. In doing so we also hope to decrease the knowledge deficit about the best communication strategies for providers to use to when discussing CVD risk with patients (Waldron et al., 2011).

To further assess the clinical utility of the Healthy Heart Score and how it may improve modifiable behavior change we will conduct a pilot by implementing the tool into two primary care clinics. One clinic will serve a primarily low SES status population in a rural Appalachian area, while the other will serve a population of upper-middle SES in a more urban metropolitan area. By implementing in the Healthy Hear Score into two different populations, we will be able to see how these differences may impact the

effectiveness of the tool and improvements in modifiable behavior change. It is necessary to evaluate the use of the tool in both populations because those who are of low SES and living in the rural Appalachian region are more likely to be impacted by chronic disease and have limited access to necessary health education (Mensah et al., 2018). In Ohio specifically, when compared to the state overall the prevalence of heart disease and stroke is greater in the rural Appalachian region by 8% and 5% respectively (Schwartz et al., 2009).

Patients thought the tool was easy to use and could be completed without problem in a waiting room. Because of these opinions, the assessment will be self-administered and a health professional will be available to answer questions if needed. All patients will take the Healthy Heart Score to assess their risk. After the completion of the risk assessment, the results will be printed and results will ideally be recorded in the patient's electronic medical record for future reference. The intervention group will review their results with a medical professional and discuss ways that they can improve their risk. The control group will receive no additional information from a provider about their CVD risk. Ideally after said future research is completed, during future use in the primary care setting results will be available to the patient and the provider simultaneously so both parties could be aware of the patients CVD risk prior to having a discussion. This way, both parties will be able to review the results before and form their own opinions which may improve outcomes by increasing patient engagement and shared decision making about changes that can be made to reduce risk (de Haes, 2006).

To assess how the Healthy Heart Score may impact behavior change, said patients in the intervention and control groups will return after three months to take the assessment again to determine how their behaviors may have changed. We hypothesize that the results of future research will show how the Healthy Heart Score risk assessment tool can lead to favorable changes in behaviors (i.e., diet and physical activity habits) and in clinical biomarkers (i.e., BMI, blood pressure, lipids, and HA1c) compared with usual care.

In conclusion, these data are crucial for the future development of the Healthy Heart Score and successful implementation in the near future. Identifying and preventing CVD risk in individuals of all ages is of paramount importance in the attempt to decrease CVD prevalence improve outcomes. Education is a key factor when motivating people to make lifestyle and behavioral changes necessary to improve or maintain cardiovascular health. The challenge remains to find a way to achieve low cost, sustainable intervention to educate patients on healthy behaviors so that everyone may be in control of their own health care and healthy lifestyle maintenance. With warranted additional research, the Healthy Heart Score has the potential to be start this necessary intervention.

References

- Abete, I., Romaguera, D., Vieira, A. R., Lopez de Munain, A., & Norat, T. (2014). Association between total, processed, red and white meat consumption and all-cause, CVD and IHD mortality: A meta-analysis of cohort studies. *British Journal of Nutrition*, 112(5), 762-775. doi:10.1017/S000711451400124X
- Agarwal, S., Cox, A. J., Herrington, D. M., Jorgensen, N. W., Xu, J., Freedman, B. I., . . . Bowden, D. W. (2013). Coronary calcium score predicts cardiovascular mortality in diabetes: diabetes heart study. *Diabetes Care*, 36(4), 972-977. doi:10.2337/dc12-1548
- Akesson, A., Larsson, S. C., Discacciati, A., & Wolk, A. (2014). Low-risk diet and lifestyle habits in the primary prevention of myocardial infarction in men: a population-based prospective cohort study. *Journal of the American College of Cardiology*, 64(13), 1299-1306. doi:10.1016/j.jacc.2014.06.1190
- Al-Busaidi, Z. Q. (2008). Qualitative research and its uses in health care. *Sultan Qaboos University Medical Journal*, 8(1), 11-19. <https://squ.pure.elsevier.com/en/publications/qualitative-research-and-its-uses-in-health-care>
- American Academy of Family Physicians. (2017). *Primary Care*. Retrieved from <https://www.aafp.org/about/policies/all/primary-care.html>
- American Heart Association. (2007). *Prevention of Cardiovascular Disease, Guidelines for Assessment and Management of Cardiovascular Risk*. Retrieved January 5, 2018, from http://www.heart.org/HEARTORG/Conditions/What-is-Cardiovascular-Disease_UCM_301852_Article.jsp#.WyJ6dqdKiUk

- Anderson, C. (2010). Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education*, 74(8). <https://www.ajpe.org/doi/10.5688/aj7408141>
- Anderson, J. W., Baird, P., Davis, R. H., Ferreri, S., Knudtson, M., Koraym, A., . . . Williams, C. L. (2009). Health benefits of dietary fiber. *Nutr Rev*, 67(4), 188-205. doi:10.1111/j.1753-4887.2009.00189.x
- Arija, V., Villalobos, F., Pedret, R., Vinuesa, A., Timón, M., Basora, T., . . . group, P.-a.-P. r. (2017). Effectiveness of a physical activity program on cardiovascular disease risk in adult primary health-care users: the "Pas-a-Pas" community intervention trial. *BMC Public Health*, 17(1), 576. doi:10.1186/s12889-017-4485-3
- Bairey Merz, C. N., Andersen, H., Sprague, E., Burns, A., Keida, M., Walsh, M. N., . . . Robinson, B. (2017). Knowledge, attitudes, and beliefs regarding cardiovascular disease in women: The women's heart alliance. *Journal of American College of Cardiology*, 70(2), 123-132. doi:10.1016/j.jacc.2017.05.024
- Benjamin, E. J., Blaha, M. J., Chiuve, S. E., Cushman, M., Das, S. R., Deo, R., . . . Muntner, P. (2017). Heart disease and stroke statistics—2017 update: A report from the American Heart Association. *Circulation*. doi:10.1161/cir.0000000000000485
- Bennett, D. A., Du, H., Clarke, R., Guo, Y., Yang, L., Bian, Z., . . . Group, C. K. B. S. C. (2017). Association of physical activity with risk of major cardiovascular diseases in Chinese men and women. *Journal of American Medical Association Cardioogyl*, 2(12), 1349-1358. doi:10.1001/jamacardio.2017.4069

- Bes-Rastrollo, M., Wedick, N. M., Martinez-Gonzalez, M. A., Li, T. Y., Sampson, L., & Hu, F. B. (2009). Prospective study of nut consumption, long-term weight change, and obesity risk in women. *The American Journal of Clinical Nutrition*, 89(6), 1913-1919. doi:10.3945/ajcn.2008.27276
- Bress, A. P., Colantonio, L. D., Booth, J. N., 3rd, Spruill, T. M., Ravenell, J., Butler, M., . . . Muntner, P. (2017). Modifiable risk factors versus age on developing high predicted cardiovascular disease risk in blacks. *Journal Of The American Heart Association*, 6(2). doi:10.1161/JAHA.116.005054
- Brunström, M., & Carlberg, B. (2018). Association of blood pressure lowering with mortality and cardiovascular disease across blood pressure levels: A systematic review and meta-analysis. *Journal of American Medical Association Internal Medicine*, 178(1), 28-36. doi:10.1001/jamainternmed.2017.6015
- Buls, S., Berryman, D. E., Beverly, E. A., Sotos Prieto, M. (2018, April 11-14). *Assessing utility of a lifestyle-based tool in the clinical setting as a primordial prevention strategy: The healthy heart score*. Poster session presented at Society of Behavioral Medicine 39th Annual Meeting & Scientific Sessions, New Orleans, LA.
- Calder, P. C. (2017). Omega-3 fatty acids and inflammatory processes: from molecules to man. *Biochemical Society Transactions*, 45(5), 1105-1115. doi:10.1042/BST20160474
- Carnethon, M. R., Pu, J., Howard, G., Albert, M. A., Anderson, C. A. M., Bertoni, A. G., . . . Council, a. S. (2017). Cardiovascular health in African Americans: A

- scientific statement from the American Heart Association. *Circulation*, 136(21), e393-e423. doi:10.1161/CIR.0000000000000534
- Carr, M. E. (2001). Diabetes mellitus: a hypercoagulable state. *Journal of Diabetes and its Complications*, 15(1), 44-54. doi.org/10.1016/S1056-8727(00)00132-X
- Cassar, A., Holmes, D. R., Rihal, C. S., & Gersh, B. J. (2009). Chronic coronary artery disease: diagnosis and management. *Mayo Clin Proceedings*, 84(12), 1130-1146. doi:10.4065/mcp.2009.0391
- Centers for Disease Control and Prevention. (2015). Adults Meeting Fruit and Vegetable Intake Recommendations — United States, 2013. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6426a1.htm>
- Centers for Disease Control and Prevention. (2013). Morbidity and Mortality Weekly Report. Retrieved January 10, 2017, from <https://www.cdc.gov/mmwr/index2013.html>
- Centers for Disease Control and Prevention. (2017). National Diabetes Statistics Report. Retrieved June 12, 2017 from <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>
- Cespedes, E. M., & Hu, F. B. (2015). Dietary patterns: from nutritional epidemiologic analysis to national guidelines. *The American Journal of Clinical Nutrition*, 101(5), 899-900. doi:10.3945/ajcn.115.110213
- Chapman, A. L., Hadfield, M., & Chapman, C. J. (2015). Qualitative research in healthcare: an introduction to grounded theory using thematic analysis. *The Journal of the Royal College of Physicians of Edinburgh*, 45(3), 201-205. doi:10.4997/JRCPE.2015.305

- Chen, J. P., Chen, G. C., Wang, X. P., Qin, L., & Bai, Y. (2017). Dietary fiber and metabolic syndrome: A meta-analysis and review of related mechanisms. *Nutrients*, *10*(1). doi:10.3390/nu10010024
- Chen, L., Pei, J. H., Kuang, J., Chen, H. M., Chen, Z., Li, Z. W., & Yang, H. Z. (2015). Effect of lifestyle intervention in patients with type 2 diabetes: a meta-analysis. *Metabolism*, *64*(2), 338-347. doi:10.1016/j.metabol.2014.10.018
- Chiuve, S. E., Cook, N. R., Shay, C. M., Rexrode, K. M., Albert, C. M., Manson, J. E., . . . Rimm, E. B. (2014). Lifestyle-based prediction model for the prevention of CVD: The healthy heart score. *Journal of the American Heart Association*, *3*(6), e000954. doi:10.1161/JAHA.114.000954
- Chiuve, S. E., Fung, T. T., Rimm, E. B., Hu, F. B., McCullough, M. L., Wang, M., . . . Willett, W. C. (2012). Alternative dietary indices both strongly predict risk of chronic disease. *The Journal of Nutrition*, *142*(6), 1009-1018. doi:10.3945/jn.111.157222
- 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 American College of Cardiology*, *65*(1), 43-51. doi:10.1016/j.jacc.2014.10.024
- Cohen, J. (1968). Weighted kappa: nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological Bulliten*, *70*(4), 213-220. doi.org/10.1037/h0026256

- Covington, M. B. (2004). Omega-3 fatty acids. *American Family Physician*, 70(1), 133-140. <https://www.aafp.org/afp/2004/0701/p133.html>
- Cypress, B. S. (2015). Qualitative research: the "what," "why," "who," and "how"! *Dimensions of Critical Care Nursing: DCCN*, 34(6), 356-361.
doi:10.1097/DCC.0000000000000150
- Davis, C., Bryan, J., Hodgson, J., & Murphy, K. (2015). Definition of the mediterranean diet: A literature review. *Nutrients*, 7(11), 9139-9153. doi:10.3390/nu7115459
- de Haes, H. (2006). Dilemmas in patient centeredness and shared decision making: a case for vulnerability. *Patient Education and Counseling*, 62(3), 291-298.
doi:10.1016/j.pec.2006.06.012
- de Mestral, C., & Stringhini, S. (2017). Socioeconomic status and cardiovascular disease: An update. *Current Cardiology Reports*, 19(11), 115. doi:10.1007/s11886-017-0917-z
- de Oliveira Otto, M. C., Wu, J. H. Y., Baylin, A., Vaidya, D., Rich, S. S., Tsai, M. Y., . . . Mozaffarian, D. (2013). Circulating and dietary omega-3 and omega-6 polyunsaturated fatty Acids and Incidence of CVD in the Multi-Ethnic Study of Atherosclerosis. *Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease*, 2(6). doi:10.1161/JAHA.113.000506
- de Souza, R. G. M., Schincaglia, R. M., Pimentel, G. D., & Mota, J. F. (2017). Nuts and human health outcomes: A systematic review. *Nutrients*, 9(12).
doi:10.3390/nu9121311

- Derbyshire, E. (2017). Associations between red meat intakes and the micronutrient intake and status of UK females: A secondary analysis of the UK national diet and nutrition survey. *Nutrients*, 9(7). doi:10.3390/nu9070768
- Dhingra, R., & Vasan, R. S. (2012). Age as a cardiovascular risk factor. *The Medical Clinics of North America*, 96(1), 87-91. doi:10.1016/j.mcna.2011.11.003
- Dieleman, J. L., Baral, R., Birger, M., & et al. (2016). Us spending on personal health care and public health, 1996-2013. *Journal of the American Medical Association*, 316(24), 2627-2646. doi:10.1001/jama.2016.16885
- Dinu, M., Pagliai, G., Casini, A., & Sofi, F. (2018). Mediterranean diet and multiple health outcomes: an umbrella review of meta-analyses of observational studies and randomised trials. *European Journal of Clinical Nutrition*, 72(1), 30-43. doi:10.1038/ejcn.2017.58
- Elmer, P. J., Obarzanek, E., Vollmer, W. M., Simons-Morton, D., Stevens, V. J., Young, D. R., . . . Group, P. C. R. (2006). Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Annals of Internal Medicine*, 144(7), 485-495.
- Estruch, R., Ros, E., Salas-Salvadó, J., Covas, M.-I., Corella, D., Arós, F., . . . Investigators, P. S. (2013). Primary prevention of cardiovascular disease with a Mediterranean diet. *The New England Journal of Medicine*, 368(14), 1279-1290. doi:10.1056/NEJMoa1200303
- Faulkner, G. P., Livingstone, M. B., Pourshahidi, L. K., Spence, M., Dean, M., O'Brien, S., . . . Kerr, M. A. (2016). An evaluation of portion size estimation aids:

- precision, ease of use and likelihood of future use. *Public Health Nutrition*, 19(13), 2377-2387. doi:10.1017/S1368980016000082
- Flinter, M., Hsu, C., Crompton, D., Ladden, M. D., & Wagner, E. H. (2017). Registered nurses in primary care: Emerging new roles and contributions to team-based care in high-performing practices. *Journal Ambulatory Care Management*, 40(4), 287-296. doi:10.1097/JAC.0000000000000193
- Folsom, A. R., Shah, A. M., Lutsey, P. L., Roetker, N. S., Alonso, A., Avery, C. L., . . . Solomon, S. D. (2015). American Heart Association's Life's Simple 7: Avoiding heart failure and preserving cardiac structure and function. *The American Journal of Medicine*, 128(9), 970-976.e972. doi:10.1016/j.amjmed.2015.03.027
- Franklin, S. S., & Wong, N. D. (2013). Hypertension and cardiovascular disease: contributions of the framingham heart study. *Global Heart*, 8(1), 49-57. doi:10.1016/j.gheart.2012.12.004
- Franks, P., Winters, P. C., Tancredi, D. J., & Fiscella, K. A. (2011). Do changes in traditional coronary heart disease risk factors over time explain the association between socio-economic status and coronary heart disease? *BMC Cardiovascular Disorders*, 11(1), 28. doi:10.1186/1471-2261-11-28
- Fryar, C. D., Chen, T. C., & Li, X. (2012). Prevalence of uncontrolled risk factors for cardiovascular disease: United States, 1999-2010. *NCHS Data Brief*(103), 1-8.
- Fung, T. T., Rexrode, K. M., Mantzoros, C. S., Manson, J. E., Willett, W. C., & Hu, F. B. (2009). Mediterranean diet and incidence of and mortality from coronary heart

disease and stroke in women. *Circulation*, 119(8), 1093-1100.

doi:10.1161/CIRCULATIONAHA.108.816736

Gale, N. K., Greenfield, S., Gill, P., Gutridge, K., & Marshall, T. (2011). Patient and general practitioner attitudes to taking medication to prevent cardiovascular disease after receiving detailed information on risks and benefits of treatment: a qualitative study. *BMC Family Practice*, 12, 59. doi:10.1186/1471-2296-12-59

Gillman, M. W. (2015). Primordial prevention of cardiovascular disease. *Circulation*, 131(7), 599-601. doi:10.1161/CIRCULATIONAHA.115.014849

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory*. Chicago: Aldine.

Goff, D. C., Lloyd-Jones, D. M., Bennett, G., Coady, S., D'Agostino, R. B., Gibbons, R., . . . Wilson, P. W. F. (2014). 2013 ACC/AHA guideline on the assessment of cardiovascular risk.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. In (Vol. 8, pp. 597-606).

Grossoehme, D. H. (2014). Research methodology overview of qualitative research. *Journal of Health Care Chaplaincy*, 20(3), 109-122. doi:10.1080/08854726.2014.925660

Grundey, S. M., Cleeman, J. I., Daniels, S. R., Donato, K. A., Eckel, R. H., Franklin, B. A., . . . National Heart, L. a. B. I. (2005). Diagnosis and management of the metabolic syndrome: An American Heart Association/National Heart, Lung, and

Blood Institute scientific statement. *Circulation*, 112(17), 2735-2752.

doi:10.1161/CIRCULATIONAHA.105.169404

Guba, E. (1981). Criteria for assessing the trustworthiness of naturalistic inquiry.

Educational Communication and Technology Journal(29), 75-91.

doi:10.1007/BF02766777

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An

experiment with data saturation and variability. *Field Methods*, 18(1), 59-82.

Hammick, M., Freeth, D., Koppel, I., Reeves, S., & Barr, H. (2007). A best evidence

systematic review of interprofessional education: BEME Guide no. 9. *Medical*

Teacher, 29(8), 735-751. doi:10.1080/01421590701682576

Hankey, G. J. (2014). Secondary stroke prevention. *The Lancet. Neurology*, 13(2), 178-

194. doi:10.1016/S1474-4422(13)70255-2

Hansson, G. K. (2005). Inflammation, atherosclerosis, and coronary artery disease. *The*

New England Journal of Medicine, 352(16), 1685-1695.

doi:10.1056/NEJMra043430

Hoff, J. A., Quinn, L., Sevrakov, A., Lipton, R. B., Daviglus, M., Garside, D. B., . . .

Kondos, G. T. (2003). The prevalence of coronary artery calcium among diabetic

individuals without known coronary artery disease. *Journal of the American*

College of Cardiology, 41(6), 1008-1012.

Hooper, L., Summerbell, C. D., Thompson, R., Sills, D., Roberts, F. G., Moore, H. J., &

Davey Smith, G. (2012). Reduced or modified dietary fat for preventing

- cardiovascular disease. *The Cochrane Database of Systematic Reviews*(5), CD002137. doi:10.1002/14651858.CD002137.pub3
- Howard, G., Cushman, M., Howard, V. J., Kissela, B. M., Kleindorfer, D. O., Moy, C. S., . . . Woo, D. (2013). Risk factors for intracerebral hemorrhage: the REasons for geographic and racial differences in stroke (REGARDS) study. *Stroke*, 44(5), 1282-1287. doi:10.1161/STROKEAHA.111.000529
- Huang, C., Huang, J., Tian, Y., Yang, X., & Gu, D. (2014). Sugar sweetened beverages consumption and risk of coronary heart disease: a meta-analysis of prospective studies. *Atherosclerosis*, 234(1), 11-16. doi:10.1016/j.atherosclerosis.2014.01.037
- Huang, P. L. (2009). A comprehensive definition for metabolic syndrome. *Disease Models & Mechanisms*, 2(5-6), 231-237. doi:10.1242/dmm.001180
- Huang, T., Xu, M., Lee, A., Cho, S., & Qi, L. (2015). Consumption of whole grains and cereal fiber and total and cause-specific mortality: prospective analysis of 367,442 individuals. *BMC Medicine*, 13. doi:10.1186/s12916-015-0294-7
- Huang, Y., Wang, S., Cai, X., Mai, W., Hu, Y., Tang, H., & Xu, D. (2013). Prehypertension and incidence of cardiovascular disease: a meta-analysis. *BMC Med*, 11, 177. doi:10.1186/1741-7015-11-177
- Ibekwe, R. U. (2015). Modifiable risk factors of hypertension and socio-demographic profile in oghara, delta state; prevalence and correlates. *Annals of Medical and Health Sciences Research*, 5(1), 71-77. doi:10.4103/2141-9248.149793

- Jackson, C. L., & Hu, F. B. (2014). Long-term associations of nut consumption with body weight and obesity¹²³⁴. *The American Journal of Clinical Nutrition*, 100(1), 408S-411S. doi:10.3945/ajcn.113.071332
- Jakobsen, M. U., Dethlefsen, C., Joensen, A. M., Stegger, J., Tjønneland, A., Schmidt, E. B., & Overvad, K. (2010). Intake of carbohydrates compared with intake of saturated fatty acids and risk of myocardial infarction: importance of the glycemic index. *The American Journal of Clinical Nutrition*, 91(6), 1764-1768. doi:10.3945/ajcn.2009.29099
- James, P. A., Oparil, S., Carter, B. L., Cushman, W. C., Dennison-Himmelfarb, C., Handler, J., . . . Ortiz, E. (2014). 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA*, 311(5), 507-520. doi:10.1001/jama.2013.284427
- Javadi, M., & Zarea, K. (2016). Understanding thematic analysis and its pitfall. *Journal of Client Care*(1), 33-39. doi:10.15412/JJCC.02010107
- Johnson, K. C., Whelton, P. K., Cushman, W. C., Cutler, J. A., Evans, G. W., Snyder, J. K., . . . Group, S. R. (2018). Blood pressure measurement in SPRINT (systolic blood pressure intervention trial). *Hypertension (Dallas, Tex.: 1979)*, 71(5), 848-857. doi:10.1161/HYPERTENSIONAHA.117.10479
- Johnston, C. A., Moreno, J. P., & Foreyt, J. P. (2014). Cardiovascular effects of intensive lifestyle intervention in Type 2 Diabetes. *Current Atherosclerosis Reports*, 16(12), 457. doi:10.1007/s11883-014-0457-6

- Kamimura, A., Nourian, M. M., Chernenko, A., Rathi, N., Oslund, M. A., & Ashby, J. (2017). Beliefs and knowledge of cardiovascular-related disease among uninsured primary care patients: A cross-sectional study. *Chronic Illness*, 1742395317746469. doi:10.1177/1742395317746469
- Karmali, K. N., Persell, S. D., Perel, P., Lloyd-Jones, D. M., Berendsen, M. A., & Huffman, M. D. (2017). Risk scoring for the primary prevention of cardiovascular disease. *Cochrane Database Systematic Review*, 3, CD006887. doi:10.1002/14651858.CD006887.pub4
- King, D. E., Mainous, A. G., & Lambourne, C. A. (2012). Trends in dietary fiber intake in the United States, 1999-2008. *Journal of the Academy of Nutrition and Dietetics*, 112(5), 642-648. doi:10.1016/j.jand.2012.01.019
- Klop, B., Elte, J. W., & Cabezas, M. C. (2013). Dyslipidemia in obesity: mechanisms and potential targets. *Nutrients*, 5(4), 1218-1240. doi:10.3390/nu5041218
- Krefting, L. (1991). Rigor in qualitative research: the assessment of trustworthiness. *The American Journal of Occupational Therapy: Official Publication of the American Occupational Therapy Association*, 45(3), 214-222. doi:10.5014/ajot.45.3.214
- Kyu, H. H., Bachman, V. F., Alexander, L. T., Mumford, J. E., Afshin, A., Estep, K., . . . Forouzanfar, M. H. (2016). Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the global burden of disease study 2013. *BMJ*, 354, i3857. doi:10.1136/bmj.i3857.

- Lakshman, M., Sinha, L., Biswas, M., Charles, M., & Arora, N. K. (2000). Quantitative vs qualitative research methods. *Indian Journal of Pediatrics*, 67(5), 369-377.
<https://link.springer.com/article/10.1007/BF02820690>
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174. doi: 10.2307/2529310
- Ledikwe, J. H., Ello-Martin, J. A., & Rolls, B. J. (2005). Portion sizes and the obesity epidemic. *The Journal of Nutrition*, 135(4), 905-909. doi:10.1093/jn/135.4.905
- Leon, B. M., & Maddox, T. M. (2015). Diabetes and cardiovascular disease: Epidemiology, biological mechanisms, treatment recommendations and future research. *World Journal of Diabetes*, 6(13), 1246-1258.
doi:10.4239/wjd.v6.i13.1246
- Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care*, 4(3), 324-327. doi:10.4103/2249-4863.161306
- Lewis, S. (2015). Qualitative inquiry and research design: choosing among five approaches. *Health Promotion Practice*, 16(4), 473-475.
doi:10.1177/1524839915580941
- Li, Y., Pan, A., Wang, D. D., Liu, X., Dhana, K., Franco, O. H., . . . Hu, F. B. (2018). Impact of healthy lifestyle factors on life expectancies in the US population. *Circulation*. doi:10.1161/CIRCULATIONAHA.117.032047
- Liu, A. G., Ford, N. A., Hu, F. B., Zelman, K. M., Mozaffarian, D., & Kris-Etherton, P. M. (2017). A healthy approach to dietary fats: understanding the science and

taking action to reduce consumer confusion. *Nutrition Journal*, 16.

doi:10.1186/s12937-017-0271-4

Lloyd-Jones, D. M., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., . . . American Heart Association Strategic Planning Task Force and Statistics, C. (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

Lloyd-Jones, D. M., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., . . . Committee, A. H. A. S. P. T. F. a. S. (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

Lloyd-Jones, D. M., Leip, E. P., Larson, M. G., D'Agostino, R. B., Beiser, A., Wilson, P. W. F., . . . Levy, D. (2006). Prediction of lifetime risk for cardiovascular disease by risk factor burden at 50 years of age. *Circulation*, 113(6), 791-798.

doi:10.1161/CIRCULATIONAHA.105.548206

Lorenzo, C., Williams, K., Hunt, K. J., & Haffner, S. M. (2007). The National Cholesterol Education Program - Adult Treatment Panel III, International Diabetes Federation, and World Health Organization definitions of the metabolic syndrome as predictors of incident cardiovascular disease and diabetes. *Diabetes Care*, 30(1), 8-13. doi:10.2337/dc06-1414

- Lusis, A. J. (2000). Atherosclerosis. *Nature*, 407(6801), 233-241. doi:10.1038/35025203
- Maessen, M. F. H., Verbeek, A. L. M., Bakker, E. A., Thompson, P. D., Hopman, M. T. E., & Eijsvogels, T. M. H. (2016). Lifelong exercise patterns and cardiovascular health. *Mayo Clinic Proceedings*, 91(6), 745-754. doi:10.1016/j.mayocp.2016.02.028
- Magnussen, C. G., Koskinen, J., Juonala, M., Chen, W., Srinivasan, S. R., Sabin, M. A., . . . Raitakari, O. T. (2012). A diagnosis of the metabolic syndrome in youth that resolves by adult life is associated with a normalization of high carotid intima-media thickness and type 2 diabetes mellitus risk: the Bogalusa heart and cardiovascular risk in young Finns studies. *Journal of the American College of Cardiology*, 60(17), 1631-1639. doi:10.1016/j.jacc.2012.05.056
- Malik, V. S., Popkin, B. M., Bray, G. A., Després, J. P., Willett, W. C., & Hu, F. B. (2010). Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. *Diabetes Care*, 33(11), 2477-2483. doi:10.2337/dc10-1079
- Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: a systematic review. *American Journal of Clinical Nutrition*, 84(2), 274-288. doi:10.1093/ajcn/84.1.274
- Mancia, G., Fagard, R., Narkiewicz, K., Redon, J., Zanchetti, A., Böhm, M., . . . Wood, D. A. (2013). 2013 ESH/ESC guidelines for the management of arterial hypertension: The task force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of

Cardiology (ESC). *European Heart Journal*, 34(28), 2159-2219.

doi:10.1093/eurheartj/eh151

Martinez-Gonzalez, M. A., & Bes-Rastrollo, M. (2014). Dietary patterns, mediterranean diet, and cardiovascular disease. *Current Opinion in Lipidology*, 25(1), 20-26.

doi:10.1097/MOL.0000000000000044

Mensah, G. A., Cooper, R. S., Siega-Riz, A. M., Cooper, L. A., Smith, J. D., Brown, C.

H., . . . Pérez-Stable, E. J. (2018). Reducing cardiovascular disparities through community-engaged implementation research: A National Heart, Lung, and Blood Institute Workshop Report. *Circulation Research*, 122(2), 213-230.

doi:10.1161/CIRCRESAHA.117.312243

Mente, A., de Koning, L., Shannon, H. S., & Anand, S. S. (2009). A systematic review of the evidence supporting a causal link between dietary factors and coronary heart disease. *Archives of Internal Medicine*, 169(7), 659-669.

doi:10.1001/archinternmed.2009.38

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education*: Jossey-Bass Publishers, San Francisco, CA.

Micha, R., Wallace, S. K., & Mozaffarian, D. (2010). Red and processed meat consumption and risk of incident coronary heart disease, stroke, and diabetes mellitus: a systematic review and meta-analysis. *Circulation*, 121(21), 2271-2283.

doi:10.1161/CIRCULATIONAHA.109.924977

Millen, B. E., Abrams, S., Adams-Campbell, L., Anderson, C. A. M., Brenna, J. T.,

Campbell, W. W., . . . Lichtenstein, A. H. (2016). The 2015 dietary guidelines

advisory committee scientific report: development and major conclusions.

Advances in Nutrition, 7(3), 438-444. doi:10.3945/an.116.012120

Moreno-Peral, P., Conejo-Cerón, S., Fernández, A., Berenguera, A., Martínez-Andrés,

M., Pons-Vigués, M., . . . Rubio-Valera, M. (2015). Primary care patients'

perspectives of barriers and enablers of primary prevention and health

promotion—A meta-ethnographic synthesis. *PLoS ONE*, 10(5).

doi:10.1371/journal.pone.0125004

Mosca, L., Linfante, A. H., Benjamin, E. J., Berra, K., Hayes, S. N., Walsh, B. W., . . .

Simpson, S. L. (2005). National study of physician awareness and adherence to

cardiovascular disease prevention guidelines. *Circulation*, 111(4), 499-510.

doi:10.1161/01.CIR.0000154568.43333.82

Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., . . .

. Turner, M. B. (2016). Executive summary: Heart disease and stroke statistics—

2016 update. *Circulation*, 133(4), 447. doi:10.1161/CIR.0000000000000366

Mozaffarian, D., Micha, R., & Wallace, S. (2010). Effects on coronary heart disease of

increasing polyunsaturated fat in place of saturated fat: a systematic review and

meta-analysis of randomized controlled trials. *PLoS medicine*, 7(3), e1000252.

doi:10.1371/journal.pmed.1000252

Mozaffarian, D., & Wu, J. H. Y. (2011). Omega-3 fatty acids and cardiovascular disease:

effects on risk factors, molecular pathways, and clinical events. *Journal of the*

American College of Cardiology, 58(20), 2047-2067.

doi:10.1016/j.jacc.2011.06.063

- Mursu, J., Virtanen, J. K., Tuomainen, T.-P., Nurmi, T., & Voutilainen, S. (2014). Intake of fruit, berries, and vegetables and risk of type 2 diabetes in Finnish men: the kuopio ischaemic heart disease risk factor study. *The American Journal of Clinical Nutrition*, 99(2), 328-333. doi:10.3945/ajcn.113.069641
- Narain, A., Kwok, C. S., & Mamas, M. A. (2016). Soft drinks and sweetened beverages and the risk of cardiovascular disease and mortality: a systematic review and meta-analysis. *International Journal of Clinical Practice*, 70(10), 791-805. doi:10.1111/ijcp.12841
- Nasir, K., Keeley, B., & Krumholz, H. M. (2017). Living Longer in Good Cardiovascular Health. *Circulation*, 135(18), 1702. doi:10.1161/CIRCULATIONAHA.117.027960
- National Cholesterol Education Program (NCEP) Expert Panel on Detection, E. a., and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). (2002). Third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III) final report. *Circulation*, 106(25), 3143-3421.
- Nelson, R. H. (2013). Hyperlipidemia as a risk factor for cardiovascular disease. *Primary Care*, 40(1), 195-211. doi:10.1016/j.pop.2012.11.003
- Offord, D. R. (2000). Selection of levels of prevention. *Addiction Behavior*, 25(6), 833-842. doi.org/10.1016/S0306-4603(00)00132-5
- Pan, A., Sun, Q., Bernstein, A. M., Schulze, M. B., Manson, J. E., Willett, W. C., & Hu, F. B. (2011). Red meat consumption and risk of type 2 diabetes: 3 cohorts of US

adults and an updated meta-analysis. *American Journal of Clinical Nutrition*, 94(4), 1088-1096. doi:10.3945/ajcn.111.018978

Pereira, M. A., O'Reilly, E., Augustsson, K., Fraser, G. E., Goldbourt, U., Heitmann, B. L., . . . Ascherio, A. (2004). Dietary fiber and risk of coronary heart disease: a pooled analysis of cohort studies. *Archives of Internal Medicine*, 164(4), 370-376. doi:10.1001/archinte.164.4.370

Poirier, P., Giles, T. D., Bray, G. A., Hong, Y., Stern, J. S., Pi-Sunyer, F. X., . . . Obesity Committee of the Council on Nutrition, P. A. a. M. (2006). Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association scientific statement on obesity and heart disease from the obesity committee of the council on nutrition, physical activity, and metabolism. *Circulation*, 113(6), 898-918. doi:10.1161/CIRCULATIONAHA.106.171016

Psaltopoulou, T., Hatzis, G., Papageorgiou, N., Androulakis, E., Briasoulis, A., & Tousoulis, D. (2017). Socioeconomic status and risk factors for cardiovascular disease: Impact of dietary mediators. *Hellenic journal of cardiology*, 58(1), 32-42. doi:10.1016/j.hjc.2017.01.022

Ramsden, C. E., Faurot, K. R., Carrera-Bastos, P., Cordain, L., De Lorgeril, M., & Sperling, L. S. (2009). Dietary fat quality and coronary heart disease prevention: a unified theory based on evolutionary, historical, global, and modern perspectives. *Current Treatment Options in Cardiovascular Medicine*, 11(4), 289-301. doi:10.1007/s11936-009-0030-8

- Reaven, G. M. (2011). Insulin resistance: the link between obesity and cardiovascular disease. *The Medical Clinics of North America*, 95(5), 875-892.
doi:10.1016/j.mcna.2011.06.002
- Redmond, N., Baer, H. J., Clark, C. R., Lipsitz, S., & Hicks, L. S. (2010). Sources of health information related to preventive health behaviors in a national study. *American Journal of Preventative Medicine*, 38(6), 620-627.e622.
doi:10.1016/j.amepre.2010.03.001
- Reedy, J., Krebs-Smith, S. M., Miller, P. E., Liese, A. D., Kahle, L. L., Park, Y., & Subar, A. F. (2014). Higher diet quality is associated with decreased risk of all-cause, cardiovascular disease, and cancer mortality among older adults. *The Journal of Nutrition*, 144(6), 881-889. doi:10.3945/jn.113.189407
- Rippe, J. M., & Angelopoulos, T. J. (2016). Relationship between added sugars consumption and chronic disease risk factors: Current understanding. *Nutrients*, 8(11). doi:10.3390/nu8110697
- Robbins, C. L., Dietz, P. M., Bombard, J., Tregear, M., Schmidt, S. M., & Tregear, S. J. (2011). Lifestyle interventions for hypertension and dyslipidemia among women of reproductive age. *Preventing Chronic Disease*, 8(6), A123.
http://www.cdc.gov/pcd/issues/2011/nov/11_0029.htm
- Rosinger, A., Herrick, K., Gahche, J., & Park, S. (2017). Sugar-sweetened beverage consumption among U.S. youth, 2011–2014. *National Center for Health Statistics*. Atlanta, GA Retrieved from
<https://www.cdc.gov/nchs/products/databriefs/db271.htm>

- Rubio-Valera, M., Pons-Vigués, M., Martínez-Andrés, M., Moreno-Peral, P., Berenguera, A., & Fernández, A. (2014). Barriers and facilitators for the implementation of primary prevention and health promotion activities in primary care: a synthesis through meta-ethnography. *PLoS One*, 9(2), e89554. doi:10.1371/journal.pone.0089554
- Sacks, F. M., Lichtenstein, A. H., Wu, J. H. Y., Appel, L. J., Creager, M. A., Kris-Etherton, P. M., . . . Association, A. H. (2017). Dietary fats and cardiovascular disease: A presidential advisory from the American Heart Association. *Circulation*, 136(3), e1-e23. doi:10.1161/CIR.0000000000000510
- Salami, J. A., Valero-Elizondo, J., Ogunmoroti, O., Spatz, E. S., Rana, J. S., Virani, S. S., . . . Nasir, K. (2017). Association between modifiable risk factors and pharmaceutical expenditures among adults with atherosclerotic cardiovascular disease in the United States: 2012-2013 medical expenditures panel survey. *Journal of the American Heart Association*, 6(6). doi:10.1161/JAHA.116.004996
- Salas-Salvadó, J., Guasch-Ferré, M., Lee, C.-H., Estruch, R., Clish, C. B., & Ros, E. (2016). Protective effects of the mediterranean diet on type 2 diabetes and metabolic syndrome. *The Journal of Nutrition*. doi:10.3945/jn.115.218487
- Schwartz, F., Ruhil, A. V. S., Ruhil, A., Denham, S., Shubrook, J., Simpson, C., & Boyd, S. L. (2009). High self-reported prevalence of diabetes mellitus, heart disease, and stroke in 11 counties of rural Appalachian Ohio. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, 25(2), 226-230. doi:10.1111/j.1748-0361.2009.00222.x

- Sears, B. (2015). Anti-inflammatory diets. *Journal of the American College of Nutrition*, 34 Suppl 1, 14-21. doi:10.1080/07315724.2015.1080105
- Shenton, A. K. (2004). *Strategies for Ensuring Trustworthiness in Qualitative Research Projects*. Amsterdam: IOS Press. Nieuwe Hemweg 6B.
- Silveira, B. K. S., Oliveira, T. M. S., Andrade, P. A., Hermsdorff, H. H. M., Rosa, C. O. B., & Franceschini, S. D. C. C. (2018). Dietary pattern and macronutrients profile on the variation of inflammatory biomarkers: Scientific Update. *Cardiology Research and Practice*, 2018, 4762575. doi:10.1155/2018/4762575
- Sinha, R., Cross, A. J., Graubard, B. I., Leitzmann, M. F., & Schatzkin, A. (2009). Meat intake and mortality: a prospective study of over half a million people. *Archives of Internal Medicine*, 169(6), 562-571. doi:10.1001/archinternmed.2009.6
- Siri-Tarino, P. W., Chiu, S., Bergeron, N., & Krauss, R. M. (2015). Saturated fats versus polyunsaturated fats Versus carbohydrates for cardiovascular disease prevention and treatment. *Annual Review of Nutrition*, 35, 517-543. doi:10.1146/annurev-nutr-071714-034449
- Siscovick, D. S., Barringer, T. A., Fretts, A. M., Wu, J. H. Y., Lichtenstein, A. H., Costello, R. B., . . . Mozaffarian, D. (2017). Omega-3 polyunsaturated fatty acid (Fish Oil) supplementation and the prevention of clinical cardiovascular disease. *Circulation*, 135(15), e867. doi:10.1161/CIR.0000000000000482
- Sisti, L. G., Dajko, M., Campanella, P., Shkurti, E., Ricciardi, W., & de Waure, C. (2018). The effect of multifactorial lifestyle interventions on cardiovascular risk factors: a systematic review and meta-analysis of trials conducted in the general

population and high risk groups. *Preventive Medicine*, 109, 82-97.

doi:10.1016/j.ypmed.2017.12.027

Smith, K. B., & Smith, M. S. (2016). Obesity statistics. *Primary Care*, 43(1), 121-135, ix.

doi:10.1016/j.pop.2015.10.001

Smolowitz, J., Speakman, E., Wojnar, D., Whelan, E. M., Ulrich, S., Hayes, C., & Wood, L. (2015). Role of the registered nurse in primary health care: meeting health care needs in the 21st century. *Nursing Outlook*, 63(2), 130-136.

doi:10.1016/j.outlook.2014.08.004

Soares-Miranda, L., Siscovick, D. S., Psaty, B. M., Longstreth, W. T., & Mozaffarian, D. (2016). Physical activity and risk of coronary heart disease and stroke in older adults: The cardiovascular health study. *Circulation*, 133(2), 147-155.

doi:10.1161/CIRCULATIONAHA.115.018323

Sofaer, S. (1999). Qualitative methods: what are they and why use them? *Health Services Research*, 34(5 Pt 2), 1101-1118.

Sofi, F., Abbate, R., Gensini, G. F., & Casini, A. (2010). Accruing evidence on benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis. *The American Journal of Clinical Nutrition*, 92(5), 1189-1196.

doi:10.3945/ajcn.2010.29673

Sorensen, A. G., & Ay, H. (2011). Transient ischemic attack: definition, diagnosis, and risk stratification. *Neuroimaging Clinics of North America*, 21(2), 303-313, x.

doi:10.1016/j.nic.2011.01.013

Sotos-Prieto, M., Bhupathiraju, S. N., Mattei, J., Fung, T. T., Li, Y., Pan, A., . . . Hu, F.

B. (2015). Changes in diet quality scores and risk of cardiovascular disease among US men and women. *Circulation*, 132(23), 2212-2219.

doi:10.1161/circulationaha.115.017158

Sotos-Prieto, M., Bhupathiraju, S. N., Mattei, J., Fung, T. T., Li, Y., Pan, A., . . . Hu, F.

B. (2017). Association of changes in diet quality with total and cause-specific mortality. *The New England Journal of Medicine*, 377(2), 143-153.

doi:10.1056/NEJMoa1613502

Sotos-Prieto, M., Mattei, J., Hu, F. B., Chomistek, A. K., Rimm, E. B., Willett, W. C., . . .

Chiuve, S. E. (2016). Association between a healthy heartscore and the development of clinical cardiovascular risk factors among women: potential role for primordial prevention. *Circulation. Cardiovascular Quality and Outcomes*, 9(2 Suppl 1), S77-85. doi:10.1161/CIRCOUTCOMES.115.002372

Sotos-Prieto, M., Mattei, J., Hu, F. B., Chomistek, A. K., Rimm, E. B., Willett, W. C., . . .

Chiuve, S. E. (2016). Association between a healthy heart score and the development of clinical cardiovascular risk factors among women: Potential role for primordial prevention. *Circulation: Cardiovascular Quality Outcomes*, 9(2 Suppl 1), S77-85. doi:10.1161/circoutcomes.115.002372

Souza, R. G. M., Gomes, A. C., Naves, M. M. V., & Mota, J. F. (2015). Nuts and legume

seeds for cardiovascular risk reduction: scientific evidence and mechanisms of action. *Nutrition Reviews*, 73(6), 335-347. doi:10.1093/nutrit/nuu008

- Sullivan, G. M., & Sargeant, J. (2011). Qualities of qualitative research: Part I. *Journal of Graduate Medical Education*, 3(4), 449-452. doi:10.4300/JGME-D-11-00221.1
- Tabei, S. M. B., Senemar, S., Saffari, B., Ahmadi, Z., & Haqparast, S. (2014). Non-modifiable factors of coronary artery stenosis in late onset patients with coronary artery disease in southern Iranian population. *Journal of Cardiovascular and Thoracic Research*, 6(1), 51-55. doi:10.5681/jcvtr.2014.010
- Taylor, F., Huffman, M. D., Macedo, A. F., Moore, T. H. M., Burke, M., Davey Smith, G., . . . Ebrahim, S. (2013). Statins for the primary prevention of cardiovascular disease. *The Cochrane Database of Systematic Reviews*(1), CD004816. doi:10.1002/14651858.CD004816.pub5
- Torres, N., Guevara-Cruz, M., Velázquez-Villegas, L. A., & Tovar, A. R. (2015). Nutrition and Atherosclerosis. *Archives of Medical Research*, 46(5), 408-426. doi:10.1016/j.arcmed.2015.05.010
- Trochim, W., Donnelly, J., & Arora, K. (2016). *Research Methods: The Essential Knowledge Base* (2 ed.). Boston, MA: Cengage Learning.
- U.S. Department of Health and Human Services; U.S. Department of Agriculture. (2015, December). 2015-2020 Dietary Guidelines for Americans. Retrieved from <https://health.gov/dietaryguidelines/2015/guidelines/>
- U.S. Department of Health and Human Services; U.S. Department of Agriculture. (2018, April). USDA National Nutrient Database for Standard Reference. Retrieved from <https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville->

human-nutrition-research-center/nutrient-data-laboratory/docs/usda-national-nutrient-database-for-standard-reference/

Veronese, N., Li, Y., Manson, J. E., Willett, W. C., Fontana, L., & Hu, F. B. (2016).

Combined associations of body weight and lifestyle factors with all cause and cause specific mortality in men and women: prospective cohort study. *BMJ (Clinical research ed.)*, 355, i5855.

Versluis, I., Papies, E. K., & Marchiori, D. (2015). Preventing the pack size effect:

exploring the effectiveness of pictorial and non-pictorial serving size recommendations. *Appetite*, 87, 116-126. doi:10.1016/j.appet.2014.12.097

Wahid, A., Manek, N., Nichols, M., Kelly, P., Foster, C., Webster, P., . . . Scarborough,

P. (2016). Quantifying the association between physical activity and cardiovascular disease and diabetes: A systematic review and meta-analysis.

Journal of the American Heart Association, 5(9). doi:10.1161/JAHA.115.002495

Waldron, C. A., van der Weijden, T., Ludt, S., Gallacher, J., & Elwyn, G. (2011). What

are effective strategies to communicate cardiovascular risk information to patients? A systematic review. *Patient Education and Counseling*, 82(2), 169-

181. doi:10.1016/j.pec.2010.04.014

Wang, P. Y., Fang, J. C., Gao, Z. H., Zhang, C., & Xie, S. Y. (2016). Higher intake of

fruits, vegetables or their fiber reduces the risk of type 2 diabetes: A meta-

analysis. *Journal of Diabetes Investigation*, 7(1), 56-69. doi:10.1111/jdi.12376

- Wartella, E., Rideout, V., Montague, H., Beaudoin-Ryan, L., & Lauricella, A. (2016). Teens, health and technology: A national survey. *Media and Communication*, 4(3), 13-23. doi:10.17645/mac.v4i3.515
- Weintraub, W. S., Daniels, S. R., Burke, L. E., Franklin, B. A., Goff, D. C., Hayman, L. L., . . . Whitsel, L. P. (2011). Value of primordial and primary prevention for cardiovascular disease. *Circulation*, 124(8), 967. doi:10.1161/CIR.0b013e3182285a81
- Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Dennison Himmelfarb, C., . . . Wright, J. T. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Journal of the American College of Cardiology*, 71(19), e127. doi:10.1016/j.jacc.2017.11.006
- Widmer, R. J., Flammer, A. J., Lerman, L. O., & Lerman, A. (2015). The Mediterranean diet, its components, and cardiovascular disease. *The American Journal of Medicine*, 128(3), 229-238. doi:10.1016/j.amjmed.2014.10.014
- Wilson, P. W., Castelli, W. P., & Kannel, W. B. (1987). Coronary risk prediction in adults (the Framingham Heart Study). *The American Journal of Cardiology*, 59(14), 91G-94G. doi:10.1016/j.amjmed.2006.05.054
- Wilson, P. W. F., D'Agostino, R. B., Parise, H., Sullivan, L., & Meigs, J. B. (2005). Metabolic syndrome as a precursor of cardiovascular disease and type 2 diabetes

mellitus. *Circulation*, 112(20), 3066-3072.

doi:10.1161/CIRCULATIONAHA.105.539528

Wu, J. H. Y., Lemaitre, R. N., King, I. B., Song, X., Psaty, B. M., Siscovick, D. S., & Mozaffarian, D. (2014). Circulating omega-6 polyunsaturated fatty acids and total and cause-specific mortality: The cardiovascular health study. *Circulation*.

doi:10.1161/CIRCULATIONAHA.114.011590

Wu, Y., Qian, Y., Pan, Y., Li, P., Yang, J., Ye, X., & Xu, G. (2015). Association between dietary fiber intake and risk of coronary heart disease: A meta-analysis. *Clinical Nutrition*, 34(4), 603-611. doi:10.1016/j.clnu.2014.05.009

Yannoutsos, A., Dreyfuss Tubiana, C., Safar, M. E., & Blacher, J. (2017). Optimal blood pressure target in stroke prevention. *Current Opinion in Neurology*, 30(1), 8-14.

doi:10.1097/WCO.0000000000000407

Yarnall, K. S. H., Pollak, K. I., Østbye, T., Krause, K. M., & Michener, J. L. (2003).

Primary Care: Is there enough time for prevention? *American Journal of Public Health*, 93(4), 635-641.

Zhan, J., Liu, Y.-J., Cai, L.-B., Xu, F.-R., Xie, T., & He, Q.-Q. (2017). Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. *Critical Reviews in Food Science and Nutrition*, 57(8), 1650-1663. doi:10.1080/10408398.2015.1008980

Zuchi, C., Tritto, I., & Ambrosio, G. (2013). Angina pectoris in women: focus on microvascular disease. *International Journal of Cardiology*, 163(2), 132-140.

doi:10.1016/j.ijcard.2012.07.001

Appendix A: Healthy Heart Score Risk Assessment Example – Physical Activity

Physical Activity

HEALTHY HEART SCORE
Cardiovascular Health Calculator

2/6

Did you know?

It takes a 154-pound, 5'10" person 8 miles to walk off the 650 calories from a double-patty cheeseburger.

Cutting back on "sit" time is just as important as increasing "fit" time. Even among physically active adults, greater hours spent watching TV increased risk of mortality.

[Start Over](#)

During the past year, what was your average time per week spent doing each of these activities?

Slow walking (slower than 3 miles per hour)

0

Brisk walking (3 mph or faster) or hiking outdoors

0

Jogging (slower than 10 min/mile)

4-6 hours

Running (10 min/mile or faster)

5-19 min

Bicycling (including stationary machine)

2-3 hours

Lap swimming

Appendix A. Healthy heart score risk assessment example- physical activity. Reprinted with permission from creators of the Healthy Heart Score at the Harvard T.H. Chan School of Public Health. Retrieved from <https://healthyheartscore.sph.harvard.edu/>

Appendix B: Healthy Heart Score Risk Assessment Example – Fruits and Vegetables

Dietary Intake - Fruits & Vegetables

HEALTHY HEART SCORE
 Cardiovascular Health Calculator

3/6

Did you know?

Nuts make a great quick and portable snack. One serving is just a handful of about 20 almonds.

[Start Over](#)

During the past year, how often, on average, do you eat a serving of fruit?

Do not count fruit juice. One serving is, for example, 1 small apple, ½ cup strawberries or 10 grapes

1 per week

[More about fruit >>](#)

During the past year, how often, on average, do you eat a serving of vegetables?

Do not count potatoes (baked or french fried). One serving is, for example, ½ cup string beans or cooked broccoli or 1 cup lettuce

2-4 per week

[More about vegetables >>](#)

Typically, how often do you eat a serving of nuts or nut butter?

One serving = 1 ounce of nuts (i.e. peanuts, almonds, pistachios, walnuts, etc) or 1 tablespoon of nut butter

1-3 per month

[<< Back](#)
[Next >>](#)

Appendix B. Healthy heart score risk assessment example- fruits and vegetables. Reprinted with permission from creators of the Healthy Heart Score at the Harvard T.H. Chan School of Public Health. Retrieved from <https://healthyheartscore.sph.harvard.edu/>

Appendix C: Healthy Heart Score Risk Assessment – Whole Grains

Dietary Intake - Whole grains

4/6

Did you know?

Oatmeal is a whole grain. Try using steel-cut oats rather than instant oatmeal packets, which are often full of sugar.

Brown rice and whole wheat pasta aren't the only dinnertime whole grain options. Experiment with other great options like quinoa, barley, or whole wheat berries.

During the past year, how often, on average, do you eat these grain foods?

High fiber cold cereal (≥ 8 grams of fiber)

Serving size = 1 cup

1-3 per month

[Examples of high fiber cereals >>](#)

Low fiber cold cereal (≤ 1 gram of fiber)

Serving size = 1 cup

1-3 per month

[Examples of low fiber cereals >>](#)

Other cold cereal

Serving size: 1 cup

4+ per day

[Examples of cold cereals >>](#)

Oatmeal/oat bran

Serving size = 1 cup, cooked

Never

Appendix C. Healthy heart score risk assessment example- whole grains. Reprinted with permission from creators of the Healthy Heart Score at the Harvard T.H. Chan School of Public Health. Retrieved from <https://healthyheartscore.sph.harvard.edu/>

Appendix D: Healthy Heart Score Risk Assessment – Results

You've completed your Healthy Heart Score survey!

Below is your health summary.

See personalized Heart Healthy recommendations

<p>NUTS AND SEEDS</p> <p>Why are nuts and seeds important?</p> <p>Increasing your intake of nuts and seeds to at least 1 oz/day can provide additional health benefits.</p>	<p>Moderate intake</p> <p>Your Goal: 1 serving/day or more</p>	<p>score for nuts and seeds?</p> <p>Choose unsalted or lightly salted varieties of nuts.</p> <p>Try a variety of nuts, including almonds, pistachios and cashews</p> <p>Choose nut butters with 0 grams of trans fats and no hydrogenated oils. The healthiest nut butters have maximum of two ingredients (nuts, salt).</p> <p>If you have a nut allergy, seeds are a great alternative and have similar health benefits.</p>
<p>SUGAR-SWEETENED BEVERAGES</p> <p>Why are sugar-sweetened beverages important?</p> <p>You are in the healthiest category for sugar-sweetened beverage intake.</p>	<p>No intake</p> <p>Your Goal: 0 servings/day</p>	<p>What steps can I take to maintain or improve my score for sugar-sweetened beverages?</p> <p>Be an example to family, friends, and coworkers.</p> <p>Get more information on the amount of sugar in different beverages.</p>

Appendix D. Healthy heart score risk assessment example- results. Reprinted with permission from creators of the Healthy Heart Score at the Harvard T.H. Chan School of Public Health. Retrieved from <https://healthyheartscore.sph.harvard.edu/>

Appendix E: Healthy Heart Score Assessment

Age:

Male or female:

Weight:

Height:

Diseases diagnosis

Have you had a prior heart attack or stroke?

Have you been diagnosed with diabetes by your physician?

Do you smoke cigarettes?

- a. Current smoker
- b. Former smoker
- c. Non-smoker

During the past year, what was your average time per week spent doing each of these activities?

0	1-4 min	5-19min	20-59 min	1 h	1-1.5h	2-3h
	4-6h	7-10h	+11h			
a.	Slow walking (slower than 3 miles per hour)					
b.	Brisk walking (3 mph or faster) or hiking outdoors					
c.	Jogging (slower than 10 min/mile)					
d.	Running (10 min/mile or faster)					
e.	Bicycling (including stationary machine)					
f.	Lap swimming					
g.	Tennis					
h.	Calisthenics/Aerobics/Aerobic Dance/Rowing Machine					
i.	Squash or racquet Ball					
j.	Yoga					
k.	Strength training					
l.	Other moderate and vigorous intensity activity					

During the past year, how often, on average, do you eat a serving of fruit? (Do not count fruit juice. One serving is, for example, 1 small apple, ½ cup strawberries or 10 grapes)

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

During the past year, how often, on average, do you eat a serving of vegetables? (Do not count potatoes (baked or French-fried). One serving is, for example, ½ cup string beans or cooked broccoli or 1 cup lettuce)

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

Typically, how often do you eat a serving of nuts or nut butter? One serving = 1 ounce of nuts (i.e. peanuts, almonds, pistachios, walnuts, etc.) or 1 tablespoon of nut butter

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

During the past year, how often, on average, do you eat these grain foods?

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

a. High fiber cold cereal (≥ 8 grams of fiber)

Serving size = 1 cup

b. Low fiber cold cereal (≤ 1 gram of fiber)

Serving size = 1 cup

c. Other cold cereal

Serving size: 1 cup

d. Oatmeal/oat bran

Serving size = 1 cup, cooked

e. Other cooked breakfast cereal (cream of wheat, corn grits, etc)

Serving size: 1 cup

f. Whole wheat, oatmeal, or other whole grain bread

Serving size = 1 slice

g. Rye or pumpernickel bread

Serving size = 1 slice

h. White bread

Serving size = 1 slice

i. Pasta

Serving size = 1 slice

j. Bagels, English muffins, rolls

Serving size= 1 whole roll

k. Pancakes

Serving size = 2 medium pancakes

l. Crackers (triscuits, saltines, ritz, etc)

Serving size = 6 crackers

m. Popcorn, low-fat or fat free

Serving size = 3 cups

n. Brown rice

Serving size = 1 cup, cooked

o. Added bran

Serving size = 1 tablespoon

p. Other grains (barley, quinoa, etc)

Serving size = 1 cup, cooked

q. Added germ Serving size = 1 tablespoon

During the past year, how often, on average, do you eat a serving of red meat? Serving size = 1 hamburger patty, Beef, pork, or lamb as a main dish, e.g. steak, roast, ham (4-6 oz)

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

During the past year, how often, on average, do you eat a serving of processed meat?

Serving size = 1 slice or piece of bologna, salami, sausage, 2 strips of bacon, or 1 hot dog

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

During the past year, how often, on average, do you consume a serving of alcohol? One drink = 4 ounces of wine, 12 ounces of beer/malt beverage, or 1.5 ounces of spirit

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

During the past year, how often, on average, do you consume a serving of sugary drinks? One serving = 1 glass, bottle or can of soda with sugar (e.g. Coke, Pepsi, Sprite, etc.) or other sugar-sweetened beverage.

Never	1-3 per month	1 per week	2-4 per week
5-6 per week	1 per day	2-per day	+ 4 per day

Appendix F: Patient Interview Questions

Describe what you know about prevention of cardiovascular diseases.

After completing the Healthy Heart Score, what is your initial opinion of the Health Heart Score as a cardiovascular disease risk prediction tool?

What is your opinion about the length of the assessment?

Probe: Do you think it would be realistic for you to complete this assessment in the waiting room at a primary care office?

Where would be the best place to take this assessment? (i.e. in waiting room, in examination room, as a follow up at home)

What are your thoughts on the food frequency questions?

Probe: What do you think about the number of choices that are given in the section about grain consumption?

What are your thoughts on the physical activity related questions?

Probe: What do you think about the number exercises that are included in the question?

Would you feel more comfortable taking the assessment yourself, or having a health care provider administer the assessment to you? Why?

How would you rate your understanding of the questions being asked in this assessment if 1 is little understanding and 5 is fully understanding?

Probe: Would the addition of images help to improve your understanding of serving sizes?

Would you be interested in using a tool like this if it were recommended to you by your physician?

Are you interested in modifying your lifestyle choices?

Probe: Would a tool like this help make you more aware of your lifestyle choices?

Appendix G: Provider Interview Questions

Describe your role in the primordial prevention of cardiovascular diseases.

Probe: What is your role in promoting healthy lifestyle to prevent cardiovascular disease?

After completing the Healthy Heart Score, what is your initial opinion of the Health Heart Score as a cardiovascular disease risk prediction tool?

What is your opinion about the length of the assessment for patient use?

Probe: Do you think it would be realistic for a patient to complete this assessment in your waiting room at this length?

Where would be the best place to utilize this assessment? (i.e. in waiting room, in examination room, as a follow up at home)

What are your thoughts on the food frequency questions?

Probe: What do you think about the number of choices a participant is given in the section about grain consumption?

What are your thoughts on the physical activity related questions?

Probe: What do you think about the number exercises a participant is asked about?

What would be the most effective way to proctor this assessment? (i.e. patients take assessment directly, provider reads assessment to patient)

What is your opinion of the health literacy level of this assessment?

Probe: Do you think that there is a need for pictures to exemplify portion sizes?

If utilized correctly, do you think that this tool could be a valuable part of CVD risk education?

Probe: Would you feel confident recommending this tool to your patients?

Do you feel that this cardiovascular risk tool can be used in your practice to educate your patients in healthy lifestyles to prevent the development of clinical risk factors?

Can you foresee any barriers against using this tool in your primary care clinic?

Probe: Do you think patients will be interested and willing to take this assessment?

Appendix H: Recruitment Flyer

PROVIDERS

Are you a health care provider working in the primary care setting?

Researchers from the College of Health Sciences and Professions at Ohio University are conducting interviews to identify the clinical utility of the validated Healthy Heart Score.

What is the Healthy Heart Score?

The Healthy Heart Score is an online 20-year cardiovascular disease predictive risk assessment tool based on modifiable behaviors.

We invite you to take the risk assessment and participate in a brief interview about your opinion.

Participants will receive \$25.00 for their time and effort

Interested? Please Contact:

Samantha Buls: sb400211@ohio.edu

or

Mercedes Sotos Prieto: sotospri@ohio.edu

740-593-9943

Appendix I: Patient Consent Form.

Ohio University Adult Consent Form With Signature

Title of Research: Qualitative Assessment of the Healthy Heart Score Implementation in the Clinical Care Setting

Researchers: Mercedes Sotos Prieto, PhD, Samantha Buls, BS

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study

This study is being done because we want to identify strengths and weakness of the previously validated Healthy Heart Score and to determine best practices for utilization in a clinical environment.

If you agree to participate, you will be asked to complete a short demographic form and the Healthy Heart Score questionnaire. Then you will be asked to participate in an individual interview. The interview will take approximately 15 to 25 minutes. You will first take the Healthy Heart Score risk assessment. We will then ask you questions about your opinion of the Healthy Heart Score assessment.

Your participation in the study will last approximately 35 minutes.

Risks and Discomforts

Risks or discomforts that you might experience are that the audiotaping may cause some discomfort and distraction. You may withdraw from the study at any time for any reason. Such a decision will not adversely affect your subsequent work with or relationship with Ohio University.

Benefits

This study is important to science/society because the information and insights derived from this study may be useful to improve cardiovascular disease care and resources for patients, providers, and administrators.

You may not benefit personally by participating in this study.

Confidentiality and Records

Records relating to your participation as a research subject will remain private. All the information given by you will be labeled with an identification number and not your name. We will place your identification number on the audio recording; your name will never appear on the audio recording or any information produced from this study. You will receive a copy of this consent form for your reference.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with the representatives of the Ohio University Institutional Review Board as part of their responsibility to oversee research.

Compensation

There are no costs to you to participate in this study. You will receive a \$25 gift card for completing the entire study. To receive payment, Ohio University will need to collect your personal information related to tax regulations. The study team keeps track of the compensation that was provided for the Ohio University Finance division's records. Because the \$25 gift cards

are paid through University funds, the names and addresses will be shared with the Office of Finance, but Finance will not know your individual responses.

Contact Information

If you have any questions regarding this study, please contact Samantha Buls via e-mail at sb400211@ohio.edu or Mercedes Sotos Prieto via e-mail at sotospri@ohio.edu or via phone at 740-593-9943.

If you have any questions regarding your rights as a research participant, please contact Chris Hayhow, Director of Research Compliance, at Ohio University, (740) 593-0664.

By signing below, you are agreeing that:

you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered

you have been informed of potential risks and they have been explained to your satisfaction.

you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study

you have not been previously diagnosed with cardiovascular disease.

you are 18 years of age or older

your participation in this research is completely voluntary

you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Signature_____ Date_____

Printed Name_____

Witness Signature_____ Date_____

Witness Printed Name_____

Version Date: [03/02/17]

Appendix J: Provider Consent Form

Ohio University Adult Consent Form With Signature

Title of Research: Qualitative Assessment of the Healthy Heart Score Implementation in the Clinical Care Setting

Researchers: Mercedes Sotos Prieto, PhD, Samantha Buls, BS

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study

This study is being done because we want to identify strengths and weakness of the previously validated Healthy Heart Score and to determine best practices for utilization in a clinical environment.

If you agree to participate, you will be asked to complete a short demographic form and the Healthy Heart Score questionnaire. Then you will be asked to participate in an individual interview. The interview will take approximately 15 to 25 minutes. You will first take the Healthy Heart Score risk assessment. We will then ask you questions about your opinion of the Healthy Heart Score assessment.

Your participation in the study will last approximately 35 minutes.

Risks and Discomforts

Risks or discomforts that you might experience are that the audiotaping may cause some discomfort and distraction. You may withdraw from the study at any time for any reason. Such a decision will not adversely affect your subsequent work with or relationship with Ohio University.

Benefits

This study is important to science/society because the information and insights derived from this study may be useful to improve cardiovascular disease care and resources for patients, providers, and administrators.

You may not benefit personally by participating in this study.

Confidentiality and Records

Records relating to your participation as a research subject will remain private. All the information given by you will be labeled with an identification number and not your name. We will place your identification number on the audio recording; your name will never appear on the audio recording or any information produced from this study. You will receive a copy of this consent form for your reference.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with the representatives of the Ohio University Institutional Review Board as part of their responsibility to oversee research.

Compensation

There are no costs to you to participate in this study. You will receive a \$25 gift card for completing the entire study. To receive payment, Ohio University will need to collect your personal information related to tax regulations. The study team keeps track of the compensation that was provided for the Ohio University Finance division's records. Because the \$25 gift cards are paid through University funds, the names and addresses will be shared with the Office of Finance, but Finance will not know your individual responses.

Contact Information

If you have any questions regarding this study, please contact Samantha Buls via e-mail at sb400211@ohio.edu or Mercedes Sotos Prieto via e-mail at sotospri@ohio.edu or via phone at 740-593-9943.

If you have any questions regarding your rights as a research participant, please contact Chris Hayhow, Director of Research Compliance, at Ohio University, (740) 593-0664.

By signing below, you are agreeing that:
 you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
 you have been informed of potential risks and they have been explained to your satisfaction.
 you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study
 you are a practicing health care professional
 you are 18 years of age or older
 your participation in this research is completely voluntary
 you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Signature_____ Date_____

Printed Name_____

Witness Signature_____ Date_____

Witness Printed Name_____

Version Date: [03/02/17]

Appendix K: Patient Demographic Form

ID: _____

Date: _____

Patient Demographic Information

What is your gender? (Please circle)

Male

Female

Prefer not to answer

If another choice better describes your gender, please describe _____

How old are you? _____

Do you consider yourself Hispanic or Latino? (Please circle)

Yes

No

What do you consider your race? (Please circle)

White

Hispanic or Latino

Black or African American

Native American or American Indian

Asian / Pacific Islander

Other

Have you been diagnosed with cardiovascular disease? (Please circle)

Yes

No

Have you ever discussed cardiovascular disease with a clinician? (Physician, nurse, physical assistant, dietitian, ect.) (Please circle)

Yes

No

Appendix L: Provider Demographic Form

ID: _____

Date: _____

Provider Demographic Information

What is your gender? (Please circle)

Male

Female

Prefer not to answer

If another choice better describes your gender, please describe _____

How old are you? _____

Do you consider yourself to be Hispanic or Latino? (Please circle)

Yes

No

What do you consider to be your race? (Please circle)

White

Hispanic or Latino

Black or African American

Native American or American Indian

Asian / Pacific Islander

Other

What is your highest degree? _____

What is your role in your clinical practice (e.g., physician, physician's assistant, nurse, dietitian)?

How many years have you been in clinical practice? _____

What county do you work in? _____

What type of practice/organization? _____

Are you employed full time or part time? _____

In your professional opinion, what percentage of your patients are at high risk, moderate risk, low risk, no risk for cardiovascular disease?

High risk _____% Moderate Risk _____% Low Risk _____% No Risk _____%

OHIO
UNIVERSITY

Thesis and Dissertation Services