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# A comparison of lifestyle intervention sessions and clinical screening as motivators in the South Dakota WISEWOMAN program

Jacy Clarke  
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# Walden University

COLLEGE OF HEALTH SCIENCES

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Jacy Clarke

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2009

ABSTRACT

A Comparison of Lifestyle Intervention Sessions and Clinical Screening as Motivators in  
the South Dakota WISEWOMAN Program

by

Jacy Clarke

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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## ABSTRACT

WISEWOMAN (WW) is a comprehensive program for medically underserved women in South Dakota (SD), aged 30 to 64, which aims to reduce morbidity and mortality from chronic diseases. Screening services include blood total cholesterol, blood pressure and blood glucose, and body mass index (BMI). Lifestyle intervention (LSI) sessions are also offered to address physical activity and nutrition. The purpose of this retrospective longitudinal study was to quantitatively examine whether the combination of LSI's and clinical screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI at rescreening 10 to 14 months from initial screening. Guided by the social ecological model, it was hypothesized that SD-WW participants attending the screening sessions as well as the intervention sessions would have greater reductions in blood pressure, total cholesterol, and blood glucose than participants who only received screenings. Participants included 653 low-income women aged 30 to 64 enrolled in the screening alone (N=423) and SD-WW program (N=230) from 2000-2005, who completed both the screening and rescreening 10 to 14 months later. Secondary data analysis using forced-entry multiple regression of the traditional measures employed in the screening alone control condition yielded significant predictive models for change scores in blood pressure, BMI, blood glucose, and cholesterol among all participants. Neither dummy variable regression nor ANOVA results indicated any significant impact of the SD-WW intervention on these same health outcome changes. Findings contribute to positive social change by demonstrating that screening alone is effective in predicting health outcomes, thus allowing more disadvantaged women to be served by public agencies that may face reduced funding for their array of programs.



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## Dedication

I dedicate this dissertation to my mom, Cynthia Walters, and my two wonderful children, Aidan and Zachary.

## ACKNOWLEDGEMENTS

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## CHAPTER 1

### INTRODUCTION TO THE STUDY

#### Introduction

Heart disease is the leading cause of death for South Dakota women, accounting for 24.7% ( $n = 865$ ) of all deaths in this group during 2006. Congestive heart failure in South Dakota mirrors the national rate. The age-adjusted rate of congestive heart failure in South Dakota women was 131.5 out of 100,000 (SD Vital Statistics Report, 2006), while the age-adjusted rate among women in the United States was 131.2 out of 100,000 (Centers for Disease Control [CDC], 2006). Among deaths from congestive heart failure in the state since 2002, 60% were women (SD Vital Statistics Report, 2006).

Among all female adults 18 and older in South Dakota, 3.2% reported having experienced myocardial infarction (a heart attack) in 2006 (CDC, 2006). Education level was a significant predictor of heart attack risk factor among South Dakota women: 8.4% of women with eighth grade or less education report having a heart attack compared with 1.8% of women with a college degree. Approximately 3% of South Dakota women have angina or coronary heart disease (CDC, 2006). Heart disease prevalence decreases as education level increases. Women with a college education were less likely to report diagnosis of coronary heart disease than women with an 8<sup>th</sup> grade or less education (2.1% vs. 7.8%; CDC, 2006). South Dakota's crude rate of coronary heart disease among women, is higher (179.7 / 100,000) than the United States average (163.7 / 100,000).

Trends in several major risk factors for cardiovascular disease are discouraging. In 2006, 19.1% of female respondents to South Dakota's Behavioral Risk Factors Surveillance System (CDC, 2006) survey stated they were current cigarette smokers.

Cigarette smoking is three times more common among American Indian women than White women (50.4% vs. 16.3%). Of South Dakota WISEWOMAN enrollees, 37% smoke; this is the highest incidence of smoking reported by any of the 15 currently funded WISEWOMAN projects. The percentage of the female population that is overweight and obese has increased dramatically over the past decade. In 2006, 54.7% of female South Dakotans were overweight or obese (Behavioral Risk Factor Surveillance System [BRFSS], 2006). Obesity is most prevalent among American Indian women: 77.1% are overweight or obese. Nationally, 61.8% of women are overweight or obese. About one quarter (24%) of all BRFSS respondents do not participate in any leisure-time physical activity. This risk factor is also more prevalent among American Indians females, of whom 38% report participating in no leisure-time physical activity, that is respondents that report no leisure time physical activity or exercise during the past 30 days other than the respondent's regular job. Nationally, 22% of all BRFSS respondents participate in no leisure-time physical activity.

In 2005, only 25% of women in South Dakota reported consuming at least the recommended five servings of fruits and vegetables per day (BRFSS, 2005). Nationwide, the rate is somewhat lower at 23.2%, a small but statistically significant difference (CDC, 2006). In 2005, 25% of women in South Dakota reported high blood pressure (SD BRFSS, 2005). Prevalence of hypertension among American Indian and White females is relatively similar (25.8% vs. 25%). Approximately one third (32.6%) of female BRFSS respondents indicated having been diagnosed with high blood cholesterol levels. There was no significant difference between American Indian women and White women (32.4% vs. 30.3%) in this risk factor.

According to the CDC (2006), 6.5% of South Dakota female BRFSS respondents reported having been diagnosed with diabetes. Diabetes is almost three times as prevalent among American Indian females as among White females (16.7% vs. 6%). Nationally, diabetes affects 7.5% of all women (CDC, 2006). Prevalence of diabetes decreases as education level increases. Women with a college education are one fourth more likely to report diagnosis with diabetes than women with an 8<sup>th</sup> grade or less education (3.9% vs. 13.8%; CDC, 2006).

Cardiovascular disease and risk factors leading to cardiovascular disease disproportionately affect American Indian women in South Dakota. Health disparities among American Indian populations in South Dakota are complex phenomena that are longstanding and require long-term commitment and comprehensive approaches.

### Background

The Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) is a comprehensive program for medically underserved women to reduce morbidity and mortality from chronic diseases. WISEWOMAN is an extension of the National Breast and Cervical Cancer Early Detection Programs (NBCCEDP) funded by the CDC. Screening services include blood cholesterol, blood pressure, and blood sugar. Nutrition and physical activity interventions are delivered through three individual, one-on-one sessions with the interventionist, that are based on A New Leaf-Choices for Healthy Living (University of North Carolina, 2001) and Active Living Every Day (Blair, Dunn, Marcus, Carpenter, & Jaret, 2001). The New Leaf curriculum is based on the transtheoretical model of behavioral change. The *Active Living* workbook was developed by the Cooper Aerobics Center in Dallas, TX, based upon a successfully tested cognitive-

behavioral approach to improving physical activity.

### Theoretical Foundation

The WISEWOMAN project was founded on the transtheoretical model of behavior change (Diclemente & Proschaska, 1983) and the health belief model (HBM) (Simons-Morton, Greene, & Gottlieb, 1995). The transtheoretical model of behavior change describes the five stages of behavior change in which individuals can enter and exit stages at any given time. The five stages of change include precontemplation, contemplation, preparation, action, and maintenance (Diclemente & Proschaska, 1983). According to Simons-Morton et al., the HBM is a value-driven theory in that it attempts to explain and predict health behaviors by focusing on the individuals desire to prevent illness or rehabilitate from an illness. The core elements addressed by the HBM include perceived threat, perceived sustainability, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

The theoretical foundation for which this research project is based upon is the socioecological model, which explains how individual behavior can be influenced at multiple levels: individual, interpersonal, organizational, community, and public policy (Institute of Medicine, 2003). The model combines individual behavior with social and physical environments, while recognizing the level of self-responsibility that individuals have to take for positive lifestyle change and the outside forces that influence individual behavior. The socioecological model acknowledges the interwoven relationship between the individual and their environment. The socioecological model explains how lifestyle choices are individual choices made in the midst of the various environments in which the individual is nested (Institute of Medicine, 2003). The WISEWOMAN program

targets the individual and interpersonal levels by focusing on what motivates the woman, while the interpersonal level is addressed in that the WISEWOMAN program provides social support for the woman. Addressing these levels is an essential program component, as they provide the fundamental support necessary for behavior change to occur.

On September 30, 2000, the South Dakota Department of Health received funds from the CDC's WISEWOMAN program to integrate cardiovascular disease (CVD) and diabetes screening services into the Department's existing National Breast and Cervical Cancer Early Detection Program (BCCEDP). The addition of the WISEWOMAN program in South Dakota reduces morbidity and mortality resulting from chronic disease among the medically underserved population. South Dakota's BCCEDP program serves women 30 to 64 years old. In order to create a system that is both patient and provider-friendly, the *AWC!* WISEWOMAN program also serves women aged 30 to 64. The population of low-income women in South Dakota aged 30 to 64 is 39,823 (South Dakota Department of Social Services, 2006).

The greatest need for WISEWOMAN services in the state is among low-income women. Table one indicates the percentage of women without insurance by race. About one in every ten South Dakota women (9.9%) is uninsured ( $N = 16,696$ ).

Table 1

*South Dakota Women Without Health Insurance by Race (CDC, 2006)*

Race / Ethnicity	% of women without health insurance
American Indian	1.10%
Hispanic	15.80%
White	10.20%
Total	9.90%

## Statement of the Problem

Adoption and maintenance of health behavior change is a public health challenge, particularly from those populations suffering from health disparities. While the quality of life and chronic disease risk reduction benefits of healthy eating and regular physical activity are well understood, the ability to promote adherence to a lifetime of these health behaviors is limited (Institute of Medicine, 2001). The major problem is that while intervention strategies that lead to adoption of healthy behaviors are well developed, knowledge of how to facilitate sustained health behavior is not readily available in the current body of research.

Cardiovascular disease and risk factors leading to cardiovascular disease disproportionately affect women in South Dakota's disparate populations. More research is needed related to cardiovascular disease and its risk factors among low-income women in South Dakota WISEWOMAN if health disparities are to be reduced..

## Purpose of the Study

The purpose of this retrospective longitudinal study was to quantitatively examine whether the combination of Lifestyle Intervention Sessions (LSI) sessions and clinical screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or body mass index (BMI) as measured at rescreening 10 to 14 months from initial screening. This study provides information to the SD WISEWOMEN program regarding the effectiveness of LSI support for clinical screening as opposed to clinical screening to improve health. The results effect future program implementation decisions and serve as a model of WISEWOMAN program evaluation for the CDC.

## Research Questions and Hypotheses

The primary research questions that are addressed in this dissertation include:

1. Is the change in blood glucose level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screening only?
2. Is the change in BMI, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?
3. Is the change in total cholesterol level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?
4. Is the change in blood pressure level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?

The primary research hypotheses addressed in this dissertation are:

1. Women attending at least one Lifestyle Intervention Session will experience a larger reduction in blood glucose than women receiving only clinical screening as measured at rescreening 10 to 14 months from initial screening.
2. Women attending at least one Lifestyle Intervention Session will experience a larger reduction in BMI than women receiving only clinical screening as measured at

rescreening 10 to14 months from initial screening.

3. Women attending at least one Lifestyle Intervention Session will experience a larger reduction in total cholesterol levels than women receiving only clinical screening as measured at rescreening 10 to14 months from initial screening.

4. Women attending at least one Lifestyle Intervention Session will experience a larger reduction in their blood pressure levels than women receiving only clinical screening as measured at rescreening 10 to14 months from initial screening.

#### Definition of Terms

*Participation in the South Dakota WISEWOMAN program:* was defined conceptually as either participation in the intervention sessions or participation in the screening and rescreen at 10 to14 months. An operational definition for participation in the *South Dakota WISEWOMAN*: according to the South Dakota WISEWOMAN program (2008) is the enrollment of an uninsured/underinsured woman aged 30 to 64 in the NBCCEDP program and All Women Count! (AWC!) chronic disease screening program by the medical provider, at initial screening session. The dependent variables in this dissertation study were BMI, total cholesterol, blood pressure, and blood glucose. In order to measure each variable, an index of unique identifiers such as dates, interventions, and rescreen results were made and then aggregate data was analyzed to determine if change occurred.

*High blood pressure:* is defined as having systolic blood pressure equal to or greater than 140 mmHg or diastolic blood pressure equal to or greater than 90 mmHg, or taking medication for high blood pressure.

*High cholesterol:* is defined as having total cholesterol equal to or greater than 240 mg/dl or taking medication for high cholesterol (CDC WISEWOMAN, 2005).

*Overweight:* is defined as having BMI of 25 to 29.9, while obese is defined as having a BMI equal to or greater than 30. BMI is calculated using CDC standards:  $BMI = \frac{\text{weight in pounds}}{(\text{ht in inches squared}) \times (703)}$ . Prediabetes is defined as a fasting blood glucose of 100 to 125mg/dl or a nonfasting glucose of 140 to 199 mg/dl (CDC WISEWOMAN, 2005).

*Diabetes:* is defined as a fasting blood glucose equal to or greater than 126mg/dl or a nonfasting glucose equal to or greater than 200 mg/dl or history of diabetes or taking medication for diabetes (CDC WISEWOMAN, 2005).

#### Significance

The study findings will impact social change by elucidating whether health outcomes among women who receive LSI sessions and screenings differ from women who only receive the clinical screening and rescreening in improving blood pressure, blood glucose, total cholesterol, and/or BMI. Understanding whether the more intensive intervention (screening sessions along with LSI) has greater influence on biological outcomes than the less intensive method (screening alone) will assist in the design of more effective public programs aimed at improving the health in population groups similar to those served in South Dakota. Since South Dakota's WISEWOMAN program includes a substantial number of at-risk women, the results of this study will be of value to other states that have similar proportions of this disparate population.

### Assumptions

There is an absence of medication histories for each participant in this study. The South Dakota Department of Health or MaxTrac chose not to include medications in the MDE (minimal data elements) that it collects because all participants in need of medications were referred to the Department of Social Services RX Access program. Medications would influence the variable if they are at all efficacious. There is no reason to believe, however, that medication use varied between women in the LSI groups and women who received clinical screening only. It was also assumed that all participants were South Dakota female residents that met the age and income requirements for program enrollment. However, to assess this assumption age was examined in the data analysis. It was also essential to assume that the lab results and measurements of blood pressure, blood glucose, BMI, and total cholesterol were accurate. However, it is recognized that there can be bias in self-reported health behaviors.

### Limitations

Methodological issues in the sample for this research limited the external validity of this study. Since clients were not randomly assigned to groups, unmeasured variables confound the results. Another limitation of the study was the absence of medication histories for each participant. The South Dakota Department of Health or MaxTrac chose not to include medications in the MDE (minimal data elements) that it collects because all participants in need of medications were referred to the Department of Social Services RX Access program. American Indian data are lacking in this dissertation study because of a simple billing issue. Indian Health Service (IHS) does not submit bills to the South Dakota WISEWOMAN program for screening. If the program does not pay the bill, then

the woman can not be enrolled in the WISEWOMAN program. This would appear to be a straightforward problem to fix; however, it has been ongoing since the program began.

### Summary

Cardiovascular disease is the leading cause of death among women in South Dakota. While cardiovascular disease is preventable, the adoption and maintenance of healthy behavior change is not well understood. More research is needed to quantitatively examine whether women enrolled in the lifestyle intervention sessions experience a greater reduction in blood pressure, blood glucose, total cholesterol, and/or BMI as compared to those women receiving only clinical screening, as measured at rescreening 10 to 14 months from the initial screening.

Current research conclusions and recommendations within the literature are reviewed and summarized in chapter 2. An exhaustive review of the literature yielded significant data to provide a theoretical framework and validate the outcomes presented in this dissertation. Research methodology and protection of human subjects will be detailed in chapter 3. The results are presented in chapter 4. Lastly, the recommendations and implications for social change are addressed in chapter 5.

CHAPTER 2:  
LITERATURE REVIEW

Introduction

This chapter reviews and summarizes lifestyle interventions research studies. It also reviews the researcher's theoretical framework, empirical WISEWOMAN studies, WISEWOMAN lifestyle interventions and the WISEWOMAN best-practices. The Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) is an extension of the National Breast and Cervical Cancer Early Detection Programs (NBCCEDP) funded by the CDC. Screening services include blood cholesterol, blood pressure and blood sugar. The LSI sessions offer women with elevated or alert screening values (CDC WISEWOMAN, 2005) up to four lifestyle interventions. The elevated value for blood pressure was classified as  $\geq 140/90$  but  $< 180/110$  mm Hg, while an alert value was  $\geq 180/110$  mm Hg. The elevated value for total cholesterol was  $\geq 200$  mg/dl, while the alert value was  $\geq 400$ mg/dl. The elevated value for blood glucose (Fasting Plasma Glucose Test) was  $\geq 126$ mg/dl, while the alert value was  $\geq 200$  mg/dl. A BMI between 25 and 29.99 was classified as overweight, while a BMI of 30 or above was classified as obese.

The 39 AWC! interventionists meet with women in person, by phone, or through self-study (by correspondence). The program is also developing web-based intervention support services using popular new internet media and communication technologies to reach out to its widely-distributed target population (South Dakota WISEWOMAN, 2008). Participating women complete rescreening between 10 and 14 months after baseline screening. AWC! has provided WISEWOMAN services to one third of South

Dakota's BCCEDP-eligible women.

The remainder of this chapter reviews the theoretical framework that guides both this study and the WISEWOMAN program. Evaluation studies published describing WISEWOMAN projects are reviewed, and the limitations of those studies, and the unanswered questions that will be addressed in this study.

### Theoretical Framework

The theoretical framework on which the South Dakota WISEWOMAN interventions are based includes the transtheoretical model of behavior change (Diclemente & Prochaska, 1983) and the health belief model (Simons-Morton et al., 1995). The theoretical foundation for which this research project is based upon is the socioecological model (Institute of Medicine, 2003). The transtheoretical model may be a key to impacting individual choices regarding lifestyle and health-related behaviors. The transtheoretical model was developed in the late 1970s and early 1980s by Prochaska and DiClemente at the University of Rhode Island. The transtheoretical model of behavior change describes the five stages of behavior change in which individuals can enter and exit stages at any given time. The five stages of change include precontemplation, contemplation, preparation, action, and maintenance (Diclemente & Prochaska, 1983). Using the transtheoretical model as a guide to individual behavior change, intervention strategies can be formulated that will assist and motivate individuals to change their lifestyles and make healthier choices. Lifestyle interventions are most effective when they match the individuals' readiness to change (Will & Loo, 2008). In the specific program explored in this dissertation, women receive counseling messages that facilitate their ability to advance from not thinking about healthy eating or physical activity

(precontemplation stage) or thinking about healthy eating or physical activity (contemplation stage) to taking small steps toward changing these health behaviors (preparation stage). The ultimate goal is regularly eating a heart healthy diet and participating in physical activity most days of the week (action stage). The assessment form used by the WISEWOMAN program assists program staff in determining interventions for each participant.

The health belief model (HBM) attempted to explain and predict health behaviors by focusing on the individuals desire to prevent illness or rehabilitate from an illness (Simons-Morton et al., 1995). The HBM theorized why people fail to initiate and sustain positive change (Janz & Becker, 1984). The core elements addressed by the HBM include perceived threat, perceived sustainability, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Jointly, the core elements aim to predict whether a woman will adhere to a healthy lifestyle to decrease her overall risk for chronic disease.

Perceived threat refers to the belief that one is at risk for a specific health threat, while perceived susceptibility addresses that individual's risk perception. Perception varies greatly among people. A person's perceived benefits are influential in the adoption and continuance of the overall behavior change (Janz & Becker, 1984). Individual beliefs regarding the overall impact of a particular change differ. The perceived barriers to a positive behavior change/action can impede initiation and/or adherence to a particular program (Janz & Becker, 1984). Cues to action are events that initiate action. Self-efficacy is the belief that one can follow-through with the action (Strecher & Rosenstock, 1997).

The theoretical foundation for which this research project is based upon is the socioecological model. According to the socioecological model, individual behavior can be influenced at multiple levels: individual, interpersonal, organizational, community, and public policy (Institute of Medicine, 2003). The model combines individual behavior with social and physical environments, while recognizing the level of self-responsibility that individuals have to take for positive lifestyle change and the outside forces that influence individual behavior. The socioecological model acknowledges the interwoven relationship between the individual and their environment. Behavior is influenced largely by individual, intrapersonal, organizational, community, and public policy. Barriers to healthy behaviors are common within the community as a whole; however, as barriers are addressed or removed, behavior change among the women is achievable and sustainable. The physical and social environments in which people live play a large role in influencing individual behavior.

The socioecological model focuses upon the larger universe of influences on human behavior. It offers strategies for potential behavior changes at various levels. This model explains how lifestyle choices are individual choices made in the midst of the various environments in which the individual is nested (Institute of Medicine, 2003). The WISEWOMAN program targets the individual and intrapersonal levels by focusing on what motivates the woman, while the interpersonal level is addressed in that the WISEWOMAN program provides social support for the woman. Addressing these levels is an essential program component, as they provide the fundamental support necessary for behavior change to occur. Figure one illustrates the logic model for the WISEWOMAN program.

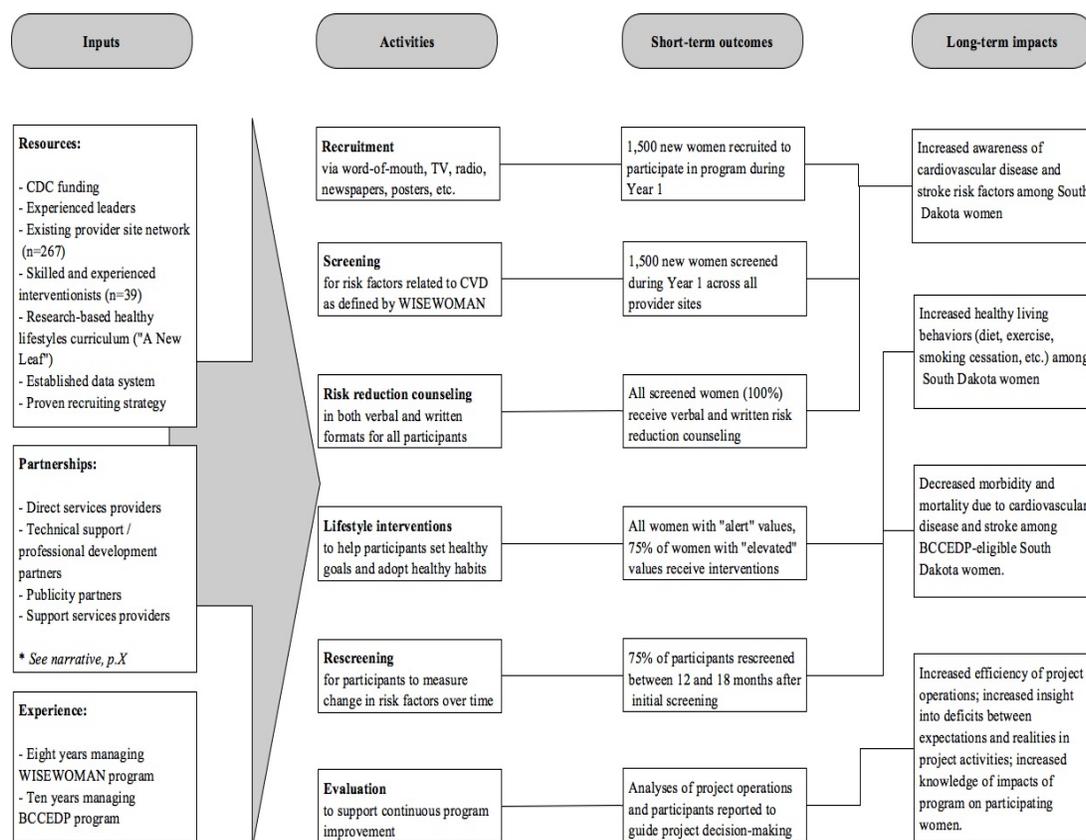


Figure 1. South Dakota WISEWOMAN logic model (South Dakota Department of Health, 2008).

An outcome evaluation is defined by the CDC (1999) as a “systematic collection of information to assess the impact of a program, present conclusions about the merit or worth of a program, and make recommendations about future program direction or development” (p. 2). Evaluation information is an essential part of evidence-based decision-making and the evaluator is most effective by focusing the evaluation based upon the needs of managers, policymakers, administrators, and practitioners (Fitzpatrick, Sanders, & Worthen, 2004). The framework for the South Dakota WISEWOMAN outcome evaluation will compare the change in blood pressure, blood glucose, total

cholesterol, and BMI between women attending screening sessions and lifestyle intervention sessions and women attending only clinical screening and rescreening at 10 to 14 months. This evaluation will assist project leaders by providing data to help improve the efficacy, reach, and cost-effectiveness of WISEWOMAN.

#### WISEWOMAN Study Procedures

The process used to screen participants for heart disease and stroke risk factors through South Dakota's WISEWOMAN program mirrors the national procedures. It is comprised of four steps. First, participants complete the program enrollment form. Completion of the form enrolls participants in both the BCCEDP and WISEWOMAN components of AWC! The form includes a brief description of the programs, a consent for release of information, personal data (e.g., name, demographic information, screening history, and medical treatment history), and eligibility determination questions (to be completed by the provider staff member verifying the woman's eligibility for BCCEDP). When a participant's eligibility for the program has been verified by a provider-site staff member, the participant moves into the office visit phase of the screening process. This phase includes blood pressure measurements, blood draws and weight and height measurements.

Next, the participant completes the AWC! assessment form. This form requests information about the participant's personal health history. Information requested includes previous diagnoses of high cholesterol, high blood pressure, or diabetes; smoking history; history of medically-recommended inactivity; exercise and stretching habits; fruit and vegetable consumption; and weight history. The form also asks participants to indicate which learning style suits them best (in-person counseling,

telephone counseling, or self-study). Program staff uses this information to plan interventions for each participant.

Participants move into the office visit phase of the screening process where blood pressure measurements, blood draws, and weight and height measurements are taken. Lab Summary Forms and Visit Summary Forms are the standard reporting forms for the Program. The Lab Summary Form is used to report blood lipids; blood glucose, quantitative or Glycated Hemoglobin (HbA1c). In some cases diagnostic tests may be needed such as; Calcium, Comprehensive Metabolic panel, Creatinine, Microalbumin, Potassium, Urinalysis, Oral Glucose Tolerance Test. The laboratory or screening clinic sends the Lab Summary Form directly to the Department of Health, AWC! Program. After the participant leaves the provider-site, provider staff complete lab work on the blood draws, complete the enrollment form by adding screening result values, and submits the form to the WISEWOMAN central office at the South Dakota Department of Health Laboratory.

South Dakota's AWC! WISEWOMAN program is unique in that all 267 screening provider sites are capable, qualified, and equipped to provide all necessary diagnostic services. After screening is complete, providers submit participants' enrollment forms (including screening values) to the AWC! central office. The Records Manager ensures that data from each form are entered into the project data system provided by external contractor MaxTrac. MaxTrac generates a referral notice for the assigned interventionist. The system emails a notice to the interventionist, who can then log into the secure data system from any web-connected computer and reviews all information about the participant (including screening values). Within one week, the

interventionist sends the participant a welcome letter and brochure about the intervention (South Dakota WISEWOMAN, 2008).

Between a week and 10 days later, the interventionist attempts to contact the participant by phone. The interventionist tries to contact the participant at least three times over a period of 2 weeks before closing the referral. When the interventionist contacts the participant by phone, they make arrangements for second and third intervention sessions in person, by phone, or through self-study. The LSI sessions offer women with elevated or alert screening values up to four lifestyle interventions in person, by phone, or through self-study.

South Dakota's lifestyle interventions are based on DiClemente and Prochaska's (1983) stages of change model. The interventionists differentiate and personalize intervention services offered to participating women based on the individual factors including risk factors, behavioral goals and willingness to change. Each factor is described in more detail below.

### *Risk Level*

The AWC! program staff divide women into three categories based on their level of risk. Low risk women are those that have screening values (BMI, blood pressure, and all labs) within normal ranges for all indicators. Moderate risk women have at least one screening value in the elevated range. High risk women have at least one value in the alert range (South Dakota WISEWOMAN, 2008). Based upon risk level the woman receives either minimal or enhanced intervention sessions (South Dakota WISEWOMAN, 2008). The minimal intervention involves screening, referral and on-site counseling (South Dakota WISEWOMAN, 2008). The enhanced intervention sessions

include screening, referral, and extended on-site counseling, plus skill building and facilitation of programs to improve diet and physical activity (South Dakota WISEWOMAN, 2008).

### *Behavioral Goals*

Interventionists assess women's conceptual understanding of behavioral goals during verbal risk reduction counseling and intervention sessions. Interventionists also assist women who have never or only infrequently set behavioral goals related to healthy behaviors learn how to choose goals that are reasonable and well-defined. Women who already understand how to set clear and attainable health goals for themselves are assisted with deciding what their short- and mid-range goals should be (South Dakota WISEWOMAN, 2008).

### *Willingness to Change*

AWC! assesses women's readiness to change in two ways. During the first intervention session, participants are asked to indicate their level of interest in taking part in free nutrition and physical activity education. The participant's response to this question gives the interventionists a preliminary indicator of her readiness to accept the idea that her health condition might call for lifestyle changes. Interventionists are trained to measure women's readiness to change during their initial telephone call using a motivational interviewing algorithm (South Dakota WISEWOMAN, 2008).

Based on participants' initial motivational interview, interventionists indicate which stage best describes each participant. Information about a woman's risk-level, behavioral goals, and readiness to change determines the intensity and emphasis of the woman's intervention program and the strategies used to work through her objections and

concerns about lifestyle changes. For example, women at the contemplation stage are encouraged to examine the pros and cons of adopting healthy lifestyle habits whereas interventionists help women at the action stage develop self-efficacy for dealing with obstacles.

The South Dakota Department of Health uses the evidence-informed, culturally appropriate curriculum called *A New Leaf: Choices for Healthy Living (New Leaf)*. This curriculum forms the core of every woman's AWC! lifestyle intervention program, regardless of the format in which she chooses to participate in intervention sessions. *New Leaf* comprises sections on ten topics: (a) food assessment and tips, (b) healthy eating, (c) physical activity assessment and tips, (d) keeping active, (e) weight assessment and tips, (f) a healthy weight, (g) diabetes prevention and management, (h) bone health assessment and tips, (i) smoking and quitting assessment and tips, and (j) stress and depression. The manual's authors wrote to a sixth-grade reading level so as not to overwhelm participants with limited literacy. Colorful graphics are used to organize the manual and call attention to summary material. Participants can choose to participate in interventions in person, over the phone, or via self-study. Participating women complete rescreening between 10 and 14 months after baseline screening.

Participants in South Dakota's AWC! WISEWOMAN program also have access to resources that support healthy lifestyles and behaviors through a statewide network of community coalitions. Each coalition receives funding from a statewide Federal Physical Activity and Nutrition grant from the CDC, to bring together healthy living resources in their communities. Most of the 267 AWC! provider sites are close to at least one healthy living coalition (South Dakota WISEWOMAN, 2008). The AWC! interventionists refer

participants they are assigned to serve to their local coalition for help accessing local resources (South Dakota WISEWOMAN, 2008). In addition, the Department of Health's Office of Community Health Services maintains an office in 63 of South Dakota's 66 counties (South Dakota WISEWOMAN, 2008). Each office maintains a registry of community healthy lifestyle resources in their county that WISEWOMAN participants can access (South Dakota WISEWOMAN, 2008). For example, the Department of Health (2007) forged a partnership with the South Dakota Department of Game, Fish, and Parks and all WISEWOMAN participants receive a pass enabling them to access every South Dakota state park free of charge. The Department of Health offers a wide array of healthy lifestyle resources to program participants online and over the telephone free of charge.

#### Review of Empirical Studies

A literature review, beginning with publications in 2001, was conducted using the following search engines: EBSCO, ProQuest, Ingenta, Medline Plus, PubMed, and Highwire Press. Using the keyword *WISEWOMAN* alone and in combination with *intervention, lifestyle intervention, behavioral intervention, chronic disease screening, cardiovascular disease, South Dakota, and woman/women*. Other terms, including *blood pressure and cholesterol screening, in combination with women and the United States* also were used.

Low-income populations are at-risk for chronic disease (Liao et al., 2004). Healthy behaviors are influenced by environment (Haber & Looney, 2003). Although intervention programs targeting low-income, lower socioeconomic neighborhoods and environments are rare, there are some community-based intervention programs targeted at disparate populations. Jilcott, Laraia, Evenson, Lowenstein, and Ammerman (2007)

synthesized WISEWOMAN research projects and current community-based intervention tools into one document. Both qualitative and quantitative research was included. A pilot study with women residing in the community was also conducted to assess the overall effectiveness of the materials provided in the intervention. The researchers concluded that barriers to healthy behaviors included access to fast food, crime, high cost of fitness centers, lack of child care, and lack of information about physical activity. Jillcott and her colleagues suggested that the WISEWOMAN program is capable of tailoring the intervention to address women's unique barriers to healthy behaviors within the community served.

Will et al. (2004) identified barriers to intervention sessions such as provider skepticism, social isolation, unsafe neighborhoods, and access to healthy foods. The WISEWOMAN program is currently revamping the structure of the intervention sessions and adopting the socioecological model into intervention planning.

#### Functioning of WISEWOMAN Programs

The WISEWOMAN program is being implemented in three phases. Phase one (1995-1998) focused on research, in phase two (1999-2007) funding was divided into two categories: research funding or standard projects funding. Implementation of phase three has just begun for fiscal year 2009. Will and Loo (2008) summarized the lessons learned and the challenges to be addressed in phase three. In phase one, the WISEWOMAN conducted randomized controlled trials, nonrandomized control trials, and quasi-experimental (pre/posttest), cross-sectional studies, case studies, as well as conducted interviews to obtain qualitative data. Using those collected data, phase two set performance indicators for the nonresearch WISEWOMAN sites. In phase three, Will

and Loo identified key challenges and recommendations. Some of the challenges identified were maximizing program reach in order to tailor the program resources to participants' needs, targeting at-risk/disparate populations using vital statistics and hospital discharge data, and providing theory driven behavioral counseling and interventions, increasing rescreening rates, and increasing community partnerships and collaborations. The program recommendations were focused primarily on clarifying and defining the vision of the WISEWOMAN program and increasing program reach and effectiveness. By addressing these challenges, it is hoped that the WISEWOMAN will be able to serve more women and provide more screenings, which will in-turn, reduce cardiovascular disease in the target population.

Sanders et al. (2001) conducted a needs assessment to identify training needs of WISEWOMAN project staff in relation to nutrition counseling and education development and implementation. WISEWOMAN staff received training that addressed the gaps identified in the needs assessment. At the 6-month follow-up, a majority of the participants indicated that the course increased their knowledge and skills in program planning. Using the evaluation of the course, the CDC WISEWOMAN team intends to further assess program training on topics addressed in the behavior counseling and education.

Mays et al. (2004) conducted a formative assessment of perceived opportunities, challenges, and strategies associated with integrating WISEWOMAN into community health center settings. In 2002, a panel of 21 stakeholders provided qualitative input to assist in the improvement of the WISEWOMAN capacity to reduce the burden of cardiovascular disease among WISEWOMAN participants. They found that the

stakeholders have issues with the integration of the WISEWOMAN program in community health centers. Barriers such as competing demands on health center resources, difficulties hiring new staff for new programs, and administrative burdens associated with data collection and reporting were identified.

The Community Change Chronicles was drafted by staff at the North Carolina Department of Health and Human Services (2009) to highlight policy change and the promotion of cardiovascular health. Lewis, Johnson, Farris, and Will (2004) set forth to explore the methods used in North Carolina's WISEWOMAN program and conducted an exhaustive review of literature to evaluate program strengths and weaknesses and promote research-based interventions. Their conclusions are summarized below.

The North Carolina WISEWOMAN program assessed the project staff attitudes, beliefs, and barriers to successful implementation of the program. Jilcott et al. (2004) conducted a cross-sectional baseline and one year follow-up of program staff to find out more information in regards to their beliefs about WISEWOMAN participants' motivation, diet, and physical activity behaviors. The results indicated that staff felt that a majority of the WISEWOMAN participants were not motivated to change their current lifestyle in regards to dietary change and physical activity. The staff felt that they had adequate resources to assist in behavior change. The staff also felt that time, access to low-cost medication, lack of attendance at follow-up sessions, and program implementation in clinic sites were challenges in sustaining the WISEWOMAN program.

In order to assess the maintenance of health behavior, 22 North Carolina WISEWOMAN sites, consisting of 511 participants, were randomly assigned to a computer-based post 12 month health messaging intervention or control group. Data were

obtained using telephone administered surveys, which introduces bias into the study because of self-report. Jacobs et al. (2004) found that the enhanced intervention participants were more likely to adhere to a healthy diet than the control group.

A quantitative and qualitative evaluation of the Iowa WISEWOMAN program was conducted by Gatewood and colleagues in 2008 to identify barriers to physical activity and nutrition. Participant's self-efficacy in relation to program participation was also examined in order to identify variables predictive of program participation. The random sample consisted of 339 WISEWOMAN participants in Iowa between March 2003 and January 2006. The sample was representative of women who attended six or more interventions; women attending only one intervention session; and women who did not attend any intervention sessions. A paper survey assessed barriers to intervention attendance, barriers to health behavior change, food security, and self-efficacy for nutrition and physical activity. The results of the survey indicated that women that did not attend intervention sessions or women who attended only one session were more likely to report perceived barriers to intervention attendance than those who attended at least six intervention sessions. Although this study had a small sample size, the results are helpful for health promotion planning. The authors concluded that interventions needed to fit better into the women's lives. The time, place, location were not sensitive to the program participants lifestyle. The intervention content also needs to address the participant's perceived risk (Gatewood et al., 2008).

Viadro, Farris, and Will (2004) conducted a review of case studies from three WISEWOMAN sites (Arizona, North Carolina, and Massachusetts) to assess phase one project design and implementation. Data were obtained from document review and

telephone interviews with project directors, coordinators, researchers, and a CDC project officer. Using those data, Viadro et al. identified themes across the project sites. The themes identified that a strong, research-based intervention and screening evaluation needed to be implemented, research and program services needed to be combined, and NBCCEDP and WISEWOMAN needed to be better integrated. All three project sites were deemed successful in serving at-risk women and strengthening partnerships to develop a comprehensive women's health model and develop linkages in the community to better serve and support the needs of the WISEWOMAN participants.

#### Review of the Lifestyle Interventions

The WISEWOMAN program provides chronic disease screenings and lifestyle interventions for disparate women aged 40 to 64 in the United States. In South Dakota, women aged 30 to 64 are eligible because of the small population base in the state (South Dakota WISEWOMAN, 2008). In the initial phase of the program, North Carolina, Massachusetts, and Arizona were awarded funding to conduct enhanced projects (CDC WISEWOMAN, 2003). These sites had both intervention and control groups (CDC WISEWOMAN, 2003). In phase two of the WISEWOMAN program, funding was awarded for standard projects (CDC WISEWOMAN, 2003). The standard projects did not have control groups (CDC WISEWOMAN, 2003). The aim of the standard projects was to assess the cost/benefit of the program. In 2004, Will, Farris, Sanders, Stockmyer, and Finkelstein conducted a study to assess the overall feasibility and effectiveness of the 12 WISEWOMAN project sites. Data were collected for 8164 participants in 2002. The outcome measures used were blood pressure, lipid levels, and tobacco use. Intermediate measures include self-reported diet and physical activity, measures of readiness for

change, and barriers to behavior change. The screening provided by the program resulted in 24% of women being newly diagnosed as having high blood pressure (24%) and high cholesterol (48%). Among the participants, 75% were obese, while 42% reported themselves as current smokers. Screening sessions clearly had an impact; however, the overall effectiveness of the intervention sessions was not as clear. This study illustrated that the WISEWOMAN program is reaching the target audience that are at risk for chronic disease.

WISEWOMAN participants have high BMI and there is a high prevalence of smoking among participants (Mobley, Finkelstein, Khavjou, & Will, 2004). The WISEWOMAN program offers lifestyle intervention sessions to improve participants' overall health and help the women quit smoking. Between January 2001 and December 2002, Mobley et al. conducted an analysis of WISEWOMAN participants from Connecticut, Michigan, Nebraska, North Carolina, and South Dakota to examine BMI and smoking behavior in conjunction to neighborhood socioeconomic characteristics. Using zip codes, the authors concluded that there is a link between economically disadvantaged neighborhood and rates of smoking and obesity ( $p < 0.05$ ). Although this study revealed spatial clustering in regards to cardiovascular risk factors, it is not inclusive of all WISEWOMAN sites, nor did the authors indicate the total number of participants in this particular study. There was also potential bias in that smoking rates were self-reported. This study provided the WISEWOMAN program with useful information to address chronic disease risk factor disparities in economically challenged communities across South Dakota.

WISEWOMAN participants with abnormal or alert lab values are able to obtain

medication to control blood pressure, cholesterol, and diabetes at free and reduced cost. In 2007, Khavjou, Finkelstein, and Will studied the impact of the medication access on coronary heart disease risk factors among 2385 WISEWOMAN participants in eight states. A pre-post analysis was used to estimate risk factor changes by medication status at 12 months. The participants who received medication had significant improvements in overall blood pressure and total cholesterol levels. The authors concluded that there was a reduction in coronary heart disease risk factors using the screening and lifestyle intervention sessions.

Will, Khavjou, Finkelstein, Loo, and Gregory-Mercado (2007) conducted a study to quantify the overall benefit of medicinal use on glucose, cholesterol, and ten year coronary heart disease risk among 29,387 WISEWOMAN participants from 1998 to 2005. Ten year coronary heart disease risk estimates a 10-year probability of developing a coronary heart disease. It is assessed using a formula developed by Anderson (1991) that uses sex, age, systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, smoking, and diabetes status as input risk factors to help explain the change in 10-year CHD risk. Will et al. (2007) used baseline and follow-up data for prediabetic ( $n = 688$ ) or diabetic ( $n = 338$ ) participants, the researchers employed a multilevel regression model. They found that that 2.9% of prediabetic participants experienced statistically significant improvements in their glucose, 2.1% improvement in cholesterol level, and 4.3% improvement in ten year coronary heart disease risk; 11.5% of newly diagnosed diabetics had statistically significant improvements in their glucose level, 3.1% to 3.5% had improvement in their blood pressure, and 6.4% of their total cholesterol levels improved. Among those with previously diagnosed diabetes, 1.9% to 3.4% had

significant improvement in their blood pressure, 3.8% had improvement in total cholesterol, and 8.5% had improvement in ten year coronary heart disease risk ( $p < .05$ ). The researchers concluded that comprehensive, patient driven interventions will effectively produce the same results as presented in the WISEWOMAN program, if replicated on a much broader scale.

The WISEWOMAN program addresses racial/ethnic disparities in cardiovascular disease. Finkelstein, Khavjou, Mobley, Haney, and Will (2004) assessed BMI, blood pressure, total cholesterol, diabetes, and smoking prevalence in relation to their 10 year cardiovascular disease risk. High total cholesterol, hypertension, and diabetes awareness and access to treatment were also examined. Baseline and rescreen data were collected, representing 5596 WISEWOMAN participants from January 2001 to December 2002. Using regression analysis, the results indicated a racial/ethnic disparity among the WISEWOMAN participants. African Americans were the most at-risk population with more obesity, higher blood pressure and diabetes rates, and a higher 10 year coronary heart disease risk ( $p < 0.05$ ).

In 2008 Feresu, Zhang, Puumala, Ullrich, and Anderson examined the Nebraska WISEWOMAN program to assess cardiovascular risk factors and changes in the 10-year coronary heart disease risk. Data were collected on 10,739 Nebraska WISEWOMAN participants' women between 2002 and 2004. Screening and rescreening results on age, race, education, residence, smoking status, disease history, medications and medical screening results for BMI, blood pressure, total cholesterol, and blood glucose were obtained. Feresu and colleagues found that age was the most significant factor in determining cardiovascular risk. Women aged 60 to 64 had a higher risk for high blood

glucose, blood pressure, and overweight/obesity. Women aged 50 to 59 and 60 to 64 had higher rates of high blood pressure. The authors concluded that race, age, and residence were related to cardiovascular disease risk. This study highlights the effectiveness of screening in decreasing the burden of cardiovascular disease.

The Massachusetts WISEWOMAN program conducted a randomized control study to assess the overall effectiveness of the WISEWOMAN program at reducing cardiovascular disease risk factors. Baseline data were collected between March and June 1996 on blood pressure, total cholesterol, fruit/vegetable consumption, and exercise levels for 1443 women. The women were assigned to minimum intervention or enhanced intervention. Women in the minimum intervention received lifestyle interventions focused primarily on nutrition and physical activity to reduce risk of cardiovascular disease. The enhanced interventions included the latter, plus one on one nutritional and physical activity assessments and counseling, individual and group education, and behavioral intervention activities. Mixed model logistic regression analyses were conducted to test the overall effectiveness comparing change in the outcome variables over time, odds-ratios were not reported. The analysis results indicated that in both groups blood pressure decreased significantly; total cholesterol did not change significantly in either group; in both groups, fruit/vegetable intake increased. Women in the enhanced intervention group also had a statistically significant increase in physical activity. The study results indicated that cardiovascular disease screening and interventions are effective at reducing risk factors for cardiovascular disease.

In an effort to assess the prevalence of obesity in low income African American and White women in North Carolina, Nelson et al. (2002) examined co-occurring risk

factors associated with coronary heart disease. There were 1284 White women and 754 African American women included in the study. Among White women, 69% were overweight or obese and 87% of African American women were overweight or obese. Age, BMI, total cholesterol, self-reported diabetes, smoking, and 10 year coronary heart disease risk were analyzed using means and frequencies. Overall, obese (17.7%) and nonobese (13.3%) African-American women had three or more co-occurring risk factors for cardiovascular disease. Among White women, obese (26.9%) women had more co-occurring risk factors than nonobese women (13%). This study is indicative of higher prevalence of co-occurring health risk factors for cardiovascular disease among African-American women ( $p < .05$ ). The authors concluded that more longitudinal studies are needed to solidify the effect of obesity on cardiovascular disease risk among African-American and White women.

The North Carolina WISEWOMAN program conducted a nonrandomized study to assess the overall effectiveness of the WISEWOMAN program in reducing cardiovascular disease risk factors. There were 31 local health departments in North Carolina selected, with 17 clinic sites conducting the minimum intervention and 14 clinics conducting the enhanced interventions. Baseline data were collected on blood pressure, total cholesterol, fruit/vegetable consumption, and exercise level for 2148 women. The women were assigned to minimum intervention or enhanced intervention. Women in the minimum intervention received lifestyle interventions focused primarily on nutrition and physical activity to reduce risk of cardiovascular disease. The enhanced interventions included the latter, plus three one-on-one nutritional and physical activity assessments and counseling, individual and group education, and behavioral intervention

activities. The results indicated that among the 2148 women screened, 40% had high total cholesterol, 63% had high blood pressure, and 76% were overweight or obese. Among the two groups, at the six month follow-up, change scores were calculated and the results revealed positive changes in total cholesterol, blood pressure, and BMI in both the enhanced intervention group and minimal intervention group ( $p < .05$ ). There were no significant differences between the two groups and the results were not statistically different from the minimal intervention group. This suggests that any level of intervention is effective at reducing cardiovascular disease risk factors.

#### *Identifying Best WISEWOMAN Practices*

Parra-Medina, Wilcox, Thompson-Robinson, Sargent, and Will (2004) reviewed 22 high-quality WISEWOMAN physical activity educational materials targeted at African-American WISEWOMAN participants. There were two expert panels and eight focus groups that evaluated the visual appeal and content of the educational materials used among the WISEWOMAN providers. Data were both quantitative and qualitative. It was concluded that the most appealing educational materials were those that were brief, colorful, simple, and applicable to the woman and her family. The authors recommended that the process could be replicated by other programs; however, the study's primary limitations were that the women were all from the Southeast part of the United States and African-American.

Farris, Will, Khavjou, and Finkelstein (2007) used Glasgow's (2006) REAIM (reach, effectiveness, adoption, implementation, and maintenance) framework to assess the impact of 14 WISEWOMAN sites in North Carolina from 2001 to 2003. Reach, efficacy/effectiveness, adoption, implementation, and maintenance identified high

performing and low performing sites. High performing sites have an extensive referral network, incentives, and lifestyle intervention protocols in place, on-going staff training, and evaluated yearly screening results of participants, while low performing sites do not. There were five high performing sites. The WISEWOMAN data collected helped assess cost-benefit and cost-effectiveness and provided appropriate outcome measurements to better define the impact of the WISEWOMAN program on reducing the burden of cardiovascular disease among women.

Besulides et al. (2006) used the REAIM framework to explore best practices used by WISEWOMAN program to implement lifestyle intervention sessions that target risk factors for cardiovascular disease. There were five WISEWOMAN sites selected from 15 total sites. The five sites were selected based on project longevity and the availability of quantitative rescreening data for at least 100 women at 10 to 14 months. Blood pressure, total cholesterol, BMI, and smoking status were assessed using a mixed-method approach. Theme tables were drafted by researchers to identify best practices. An algorithm was applied to each theme to assess how frequently it was used across the five sites. There were 87 best practices identified. Of the best practices, 13 were used by high performing sites. High performing sites had an extensive referral network, incentives, and lifestyle intervention protocols in place, on-going staff training, and evaluated yearly screening results of participants. The identification of these best practices will assist in program implementation to identify successful factors for WISEWOMAN programs.

Besulides et al. (2006) used the REAIM model and in-depth case studies to identify best practices for WISEWOMAN Programs. Five WISEWOMEN projects were included in the study and qualitative data was collected from each. More specifically,

semi-structured interviews were conducted with key informants and staff, while focus groups and observations were conducted with program participants. The overall goal of the study was to learn more about the best practices used to implement the program and the impact of the program on participants. All data was subject to thematic analysis and a standardized algorithm was used to identify how often certain practices were used by the program sites. Practices used most often by high-performing sites were considered best.

Besculides et al. (2008) conducted a study to describe the best practices for implementing lifestyle intervention sessions used in the WISEWOMAN program. Using a mixed-method approach, Besculides et al. used the RE-AIM framework for WISEWOMAN site selection to classify and analyze qualitative data. Five project sites were selected. In order to classify best practices, an algorithm was designed that specified when only high performing sites used a practice; it was then considered best. When low performing sites used a practice, it was not considered best. If both low and high performing sites used a practice, a case study was conducted to explain the implementation method used. A total of 87 best practices were identified. A subset of 31 best practices were used by high and low performing sites. These practices were further studied to identify the barriers to success among the low performing sites using the same practice as the high performing sites. The overall effectiveness was found to lie in staff training, use of incentives, having an implementation and evaluation plan, and the ability to adapt the plan as needed. This study identifies some of the key components in successful WISEWOMAN interventions. Using these data, other public health agencies can implement successful programs in their public health delivery.

The WISEWOMAN program uses an integrated healthcare approach to deliver

lifestyle interventions. Goldstein, Whitlock, and Depue (2004) gathered evidence to assess the overall evidence related to the efficacy of intervention programs addressing physical activity, diet, obesity, cigarette smoking, and alcohol use/abuse. This was done using the United States Preventive Services Task Force (USPSTF), the United States Public Health Service (PHS), and conducting a literature review. The authors found that the most efficacious interventions were in the areas of physical activity, diet, smoking, and risky alcohol use. They recommended that interventions should have systems support, consist of a multidisciplinary team of trained staff, make referrals for patients needing more intensive treatment, and use a collaborative community approach. Intervention programs utilizing the 5 A's approach of assess, advise, agree, assist, and arrange, have the most influence on lifestyle.

Lewis et al. (2004) set forth to find out more about the methods used in North Carolina's WISEWOMAN program and conducted an exhaustive review of literature to identify other methods of successful programs in order to identify project success stories from all the funded WISEWOMAN sites. The Alaska WISEWOMAN project was highlighted. There were 10 strategies used by the WISEWOMAN program in drafting a success story report. The 10 strategies included: identifying the target audience, develop a systematic process, develop a standardized form, collect success stories, conduct interviews, develop appealing format, write and revise stories, organize stories, design and print publication, and disseminate publication. WISEWOMAN Works was published in March 2003. The publication was used to educate staff about the WISEWOMAN program, shares lesson learned, raise program awareness, and identify challenges and opportunities. The success stories provide a venue for health promotion programs to

document success and evaluate program strengths/weaknesses and promote research-based interventions.

### *Cost Effectiveness*

The WISEWOMAN Workgroup, consisting of program directors, CDC project officers, and program staff, conducted an evaluation of the Massachusetts, Arizona, and North Carolina WISEWOMAN program. Data were obtained using the baseline screening, 6 months, and 12 months measures of blood pressure, total cholesterol, BMI, and physical activity from 4842 WISEWOMAN participants. The projects were divided into either enhanced intervention or minimum intervention groups. Risk factors for cardiovascular disease are common in all three states. Women in North Carolina (40%) and Massachusetts (40%) were more likely to have high total cholesterol; high blood pressure was more common among women in North Carolina (63%); women in Arizona were more likely to be overweight (83%). The authors concluded that more research needs to be conducted on cost-effectiveness in order to assess the long term effect on the reduction of risk factors using enhanced intervention method.

In 2004, Finkelstein et al. conducted an assessment of the overall cost-effectiveness of the WISEWOMAN program. Between June 2000 and December 2003, data were obtained using 3015 baseline and rescreening results at one year. Data collected included height, BMI, blood pressure, total cholesterol, and blood glucose levels. Program cost data were collected from the nine project sites for a 6 month period. Program cost included labor, outreach, screening, interventions, and materials. The average cost of providing WISEWOMAN activities was \$270 per participant. WISEWOMAN participants significantly improved their ten year coronary heart disease

risk, including cholesterol and blood pressure. Smoking rates also decreased. All the improvements resulted in a \$470 cost-effectiveness ratio for every percentage point reduction in coronary heart disease risk ( $p < .05$ ). The authors concluded that the WISEWOMAN program is cost-effective and for every life year gained, there was \$4400 saved in direct and indirect costs. The analysis was limited in that the sensitivity analysis is subject to interpretation based on many different variables. There was also no control group involved in the analysis.

Finkelstein, Troped, Will, and Palombo (2006) conducted an evaluation of the cost-effectiveness of the Alaska WISEWOMAN project. They found that the average cost of the intervention was \$487 per women for a minimum intervention and \$603 for an enhanced lifestyle intervention. It was estimated that for a full year of life gained, it save \$5000 in direct and indirect costs.

Hagberg and Lindholm (2006) conducted a literature review to assess the cost-effectiveness of healthcare-based interventions aimed at improving physical activity. A total of 26 articles were found. The following variables were used to categorize the physical activity intervention programs: primary intervention method, study design, cost-effectiveness ratios, and authors' conclusion regarding cost-effectiveness. Exercise efficacy, population penetration, and adherence to physical activity were analyzed to assess the overall treatment effect. The prevention effect was measured using decrease in risk of future poor health. The overall health effect assessed the quality life years. The authors concluded that there are many cost-effective interventions targeted at high risk groups, such as the elderly and those with coronary heart disease. There is insufficient research regarding the cost-effectiveness of prevention-based interventions targeting

sedentary people.

#### *Other WISEWOMAN Programs*

In 1999, the South-central Foundation in Alaska was awarded WISEWOMAN funding. Alaska has designed and implemented a program specific to Alaska native women, called Traditions of the Heart. Stefanich et al. (2005) summarized the development, adaptation, and implementation of this program. Extensive formative data collection was conducted to ensure that the interventions met the needs of the Alaska Native women. Diet, physical activity, topics of interest, barriers, and preferred learning venue were collected via survey of 43 Alaska Native women aged 40 to 64. It was concluded that small group settings and programs that were sensitive to Alaska Native culture were best.

Stfanich et al. (2005) also conducted a 12-week randomized pilot study, using 44 women, to test the effectiveness of the intervention content, materials, and format. The women were assigned to the intervention or control group and a pre and posttests were used to assess behavior change. Following the pilot study, an overall program evaluation was conducted to determine whether the interventions were effective and relevant. Eighty- three percent of the participants felt that the intervention length, materials, and individual counseling sessions were effective. The information from the evaluation was used to make programmatic changes before broader scale implementation. The assessment tools were simplified and information regarding heart attack and stroke awareness were added to the curriculum. There were six overall themes identified by the authors as recommendations to other programs wanting to design intervention programs for specific populations. Those themes included: adapt current, research-based programs

to meet the needs of the target population; gather input from the target population and professionals serving the target population in the initial program planning; incorporate qualitative research into evaluation; use incentives; have a diverse strategic planning committee, and; use culturally appropriate materials.

In a follow-up pilot study, the Alaska WISEWOMAN program conducted a pilot randomized control trial to assess feasibility and cultural acceptability, as well as to develop enrollment procedures. Four clinical sites were selected and data were collected between October 2000 and April 2001. Initial screening data (blood glucose, blood pressure, total cholesterol, and height/weight) were obtained to determine overall impact. There were a total of 76 women enrolled in the program. Of the 76 participants, 44 were randomized to the intervention group. Mean individual changes were assessed at 12 weeks and women reported more physical activity and higher confidence in their ability to achieve regular physical activity. The results of the pilot study assisted in programmatic changes to better fit the Alaska Native population. The results of the pilot study suggest building on the strengths of the community and assist in refining population specific intervention programs.

The Massachusetts WISEWOMAN program was one of three project sites initially funded by the CDC. In 1996, Finkelstein et al. conducted an evaluation of the cost-effectiveness of the WISEWOMAN project. A group randomized control study design was used to collect data from 11 WISEWOMAN sites over a one year period. Women were assigned to either an enhanced lifestyle intervention or minimum intervention. The effectiveness of the program was assessed using blood pressure, blood glucose, total cholesterol, BMI, age, and smoking status to assess the overall 10 year

coronary heart disease risk. The women in the minimal intervention group had a 9.4% CHD risk. The women in the enhanced lifestyle interventions group had 9.8% CHD risk. After one year, both groups had a slight decline in CHD risk (0.5 vs. 0.2). The authors concluded that the results were not statistically significant; however, the Massachusetts WISEWOMAN program made changes to program delivery. The WISEWOMAN program streamlined intervention delivery and standardized protocol in effort to minimize program implementation differences among projects.

Feresu, Zhang, Puumala, Ullrich, and Anderson (2008) conducted a study to assess the overall 10 year CHD risk among Nebraska women enrolled in the WISEWOMAN program. Sociodemographic factors were examined in order to assess the relationship to CHD risk factors such as blood pressure, cholesterol, BMI, and diabetes. Between September 2002 and December 2004, a total of 10, 739 WISEWOMAN participant screening values were reviewed. Seventy-four percent of the women were located in rural areas; 54% were between the ages of 40 to 49; 83% were White; and 26% reported that they were current smokers. Sixty-six percent of the women had a previous diagnosis of high blood pressure, high total cholesterol or diabetes. The overall incidence rate of obesity was 44 out of 1000. The incidence rate for hyperglycemia was 31 out of 1000. The overall incidence rate for hypertension was 66/1000, while there was an incidence rate of 157 out of 1000 for high total cholesterol. Women aged 60 to 64 were most at risk for obesity, high total cholesterol and hyperglycemia. Women aged 50 to 59 were most at risk for high blood pressure. A total of 3416 women had both baseline and follow-up data, which indicates a barrier to follow-up sessions. Women that attended one versus two follow-up sessions were more likely to have hyperglycemia (6.86% vs.

4.96%) and high total cholesterol (19.99% vs. 19.47%) ( $p = .05$ ). This study suggests that sociodemographic factors increase risk of CVD among Nebraska WISEWOMAN participants. It also indicates the need to enhance intervention reach in order to increase follow-up sessions.

In 2004, Staten et al. conducted research on the Arizona WISEWOMAN program using an experimental design. This study's main purpose was to track the effectiveness of WISEWOMAN in increasing physical activity and fruit and vegetable consumption over a 12-month period. Three levels of intervention were used. Low intensity consisted of provider counseling. The second level of intensity included health education classes and a monthly newsletter, while the third level also included social support by community health workers. The study population consisted of Hispanic women, age 50 to 64, and data consisted of height, BMI, and blood pressure measurements. Participants were also asked to recall their diet over the last 24 hour period. Linear regression models were used to compare changes between the two groups, as well as interaction effects for the 217 women included in the analysis. The results indicated that overall, women in all three intervention groups demonstrated positive change and increased the number of minutes of moderate to vigorous physical activity over one year. Women in the most intensive intervention group increased fruit and vegetable consumption, compared with participants who only received the level one or level two intervention ( $p < .05$ ).

Staten and colleagues (2004) demonstrated the effectiveness of lifestyle intervention sessions in reducing cardiovascular disease risk factors; however, it lacked statistical power to interpret significant change between the groups. Furthermore, the sample size was very small, relative to the population served and finally, self-report diet

recall was also subject to bias.

In a follow-up study on the Arizona WISEWOMAN project, Gregory-Mercado et al. (2007) compared the 24-hour dietary recalls of Hispanic and nonHispanic White women enrolled in the program. Individual nutrient intakes were compared by the sociodemographic background characteristics thought to influence diet and predispose them to unhealthy eating. There were 260 Hispanic women and 88 White women in the sample. Nutrient intake including total caloric intake, total protein, total carbohydrate, total fat, cholesterol, and total dietary fiber was assessed among the two groups.

Hispanic women had a significantly lower intake of energy intake than White women. The comparison by the percent of calories from macronutrients indicated no difference; however, micronutrient intake was lower for Hispanic women. Both Hispanic and nonHispanic Whites were lacking in calcium intake. A higher intake of protein and potassium were associated with higher BMI and vitamin E and folate intake were associated with smoking. This study was based on self-reported dietary recall. The small sample size is also a limitation of this study. This study provides information useful to nutrition education programs targeting low-income, uninsured Hispanic women.

Oleson, Breheny, Pendergast, Ryan, and Litchfield (2008) conducted research on the Iowa WISEWOMAN participants to examine the impact of travel distance to an intervention session on overall intervention attendance. There were 787 women involved in the randomized control trial from October 2002 to July 2005. Driving distances were classified as rural or urban locations. An additive model suggested that distance from the intervention site was more of an issue for women residing in a rural area than those residing in an urban setting. Among women in an urban setting, 57.6% attended an

intervention session, while 53.8% of woman in a rural setting attended an intervention session. Also, women that were more educated, had health insurance, exercised less, had higher BMI, did not smoke, enrolled earlier, and had smaller families were more likely to attend the intervention sessions ( $p < .01$ ). This study illustrates the overall impact of distance traveled on the probability of attending the WISEWOMAN intervention sessions. This research suggested that feasibility of participant travel to intervention sessions is an important factor to consider when planning WISEWOMEN programs in rural versus urban areas.

The North Carolina WISEWOMAN program has an enhanced lifestyle intervention program that addresses behavior changes based on the chronic care model, including environmental and individual factors in a clinical setting. In an effort to evaluate the enhanced intervention's effectiveness, Jilcott et al. (2006) conducted a randomized trial from May 2003 to December 2004 to compare changes in moderate intensity physical activity and diet at the baseline level. A total of 204 participants were randomly assigned to control or enhanced intervention groups. Blood pressure, blood glucose, BMI and waist circumference, and total cholesterol were also assessed. Blood pressure was higher among the minimal intervention group than among those in the enhanced intervention group. Both groups had participants with high BMI (75%) and 25% of the total sample were current smokers. There was no significant difference in dietary consumption between the two groups. The enhanced and minimal intervention groups (40%) reported neighborhood characteristics as barriers to physical activity and healthy diet.

These initial data suggested the need for community linkages to facilitate healthy

behavior change. The Neighborhood Assessment and tip sheet, developed by the North Carolina WISEWOMAN program, facilitates community development and encourages policy change to improve community and environmental factors influencing health related behavior. Although this study only reports initial screening results, it is useful to other programs interested in developing a strategic plan to address environmental barriers to physical activity and healthy diet.

Keyserling et al. (2008) conducted a randomized trial to assess the impact of enhanced versus minimal WISEWOMAN intervention sessions on physical activity and diet. From May 2003 to December 2004, 236 WISEWOMAN eligible women were assigned to either enhanced intervention or minimal intervention sessions. The enhanced interventions (EI) took place over 6 months and were comprised of two individual counseling sessions, three group sessions, and three phone counseling sessions, followed by a maintenance phase that consisted of one individual counseling session and seven monthly phone counseling sessions. The minimal intervention (MI) sessions included a one-time mailing of informational pamphlets pertaining to diet and physical activity.

Measurements were taken at 6 months and 1 year using an accelerometer to track activity minutes, the Dietary Risk Assessment (DRA) to assess dietary intake of fruits and vegetables, and a self- assessment of physical activity. Keyserling et al. (2008) used descriptive statistics and outcomes were measured using ANCOVA. It was found that there was no statistical difference in accelerometer measurements at both 6 and 12 months between the EI ( $M = 30.6$ ,  $SE = 0.5$ ) and MI ( $M = 29.9$ ,  $SE = 0.4$ ) groups; the DRA score for side dishes (which was inclusive of fruit and vegetable intake) decreased more at six months for the EI group ( $M = 7.7$ ,  $SE = 0.2$ ) than for the MI group ( $M = 8.8$ ,

$SE = 0.2$ ), which was statistically significant. However, at 12 months there was no difference in scores among the EI ( $M = 8.0$ ,  $SE = 0.3$ ) and MI ( $M = 8.4$ ,  $SE = 0.3$ ) groups. The self-report physical activity scores from the EI baseline ( $M = 29.4$ ,  $SE = 0.8$ ) to 12 months ( $M = 30.0$ ,  $SE = 0.7$ ) increased. The opposite effect was demonstrated among the MI group baseline ( $M = 29.2$ ,  $SE = 0.8$ ) and 12 month ( $M = 28.4$ ,  $SE = 0.6$ ) scores. All values were age adjusted. The limitations of this study include the relatively small sample size and the self-report assessment; however, this study demonstrates the overall effectiveness of enhanced interventions in addressing barriers to healthy behavior change.

#### *Introduction to South Dakota WISEWOMAN*

South Dakota has administered a WISEWOMAN program called All Women Count! (AWC!) since 2000. AWC! also includes the state's Breast and Cervical Cancer Early Detection Program (BCCEDP). WISEWOMAN and BCCEDP are integrated in South Dakota; the result is a comprehensive chronic disease screening and prevention program that has served thousands of the state's most at-risk and medically underserved women (South Dakota WISEWOMAN, 2008). With continued funding for AWC! from the CDC the South Dakota Department of Health has built on its successful beginnings. The program remains committed to its three central objectives: (a) maximizing reach by serving as many eligible women as possible statewide; (b) maximizing integration between WISEWOMAN and BCCEDP so as to create a unified project that is as patient-friendly, provider-friendly, and cost-efficient as possible; and (c) maximizing outreach to the state's most underserved women (including the large American Indian population).

The AWC! program brings WISEWOMAN and BCCEDP under a single leadership team so that the recruitment and marketing efforts of both projects

complement one another. In this way, the marketing exposure of both projects is maximized. Methods of recruitment include word-of-mouth from providers, family, and friends, as well as radio, television, newspaper, Internet, posters, and booths at community health fairs and other activities (South Dakota WISEWOMAN, 2008).

The screenings are provided at 267 provider sites; AWC! provides WISEWOMAN-standard screening services to women across the state of South Dakota. The great majority of screening providers are private practitioners. AWC! elected to support such a large network of provider sites in order to overcome the barriers to participation associated with South Dakota's extreme rurality.

In 2005, a study on the maintenance of healthy eating and physical activity among the WISEWOMAN participants in South Dakota was conducted. Fahrenwald (2005) examined the maintenance of healthy eating and physical activity behaviors beyond the six month post counseling period and examined the barriers and facilitators of healthy behaviors. A process evaluation survey research design was used. There were 72 SD WISEWOMAN participants included in the study that completed a 15 minute telephone interview. Of the 72 interviews, 69 women received at least one face-to-face physical activity or dietary counseling session.

At the first follow-up (less than 6 months from baseline screening), more than 60% of the participants in this study maintained changes in healthy eating and improvements in healthy eating behavior were maintained by 65% of the women who reported that they were eating a heart healthy diet. Improvements in physical activity were maintained by 70% of the women who reported that they were regularly active at the first follow-up period. Seven facilitators of healthy behavior were identified

including: educational knowledge and awareness, the AWC! program, family support, personal health conditions, family health issues, cooking healthy foods, and feeling better. Barriers to healthy behavior maintenance included cost of healthy foods, personal preference for less healthy foods, time, eating out, cooking for others, availability of garden produce, and rural access to healthy choices. Four facilitators to maintenance of regular physical activity were identified. Those included support from others, enjoyable activity, occupational activity, and knowledge of the benefits of physical activity. Common barriers to physical activity maintenance included access, cost, personal health issues, time, weather and motivation.

The Women's Prison in Pierre, SD, is one of the NBCCEDP sites where the WISEWOMAN program trained prison staff to provide heart disease risk factor screenings and lifestyle interventions to incarcerated women beginning in 2004. The prison setting offers an opportunity to initiate a heart disease risk factor screening and intervention program in an environment conducive to high levels of participation, but low level of control in relation to physical activity and nutrition.

In 2005, Khavjou et al. (2007) conducted an analysis to assess the baseline heart disease risk profile of WISEWOMAN participants screened in the SD state prison and compared it with that of the general WISEWOMAN population of low-income, uninsured women in SD. Baseline prevalence of heart disease risk factors (hypertension, high cholesterol, smoking, and obesity) were assessed among incarcerated women in SD relative to the general WISEWOMAN population in SD from January 2004 to 2005. There were a total of 261 women in the SD state prison and 1,427 nonincarcerated women. The WISEWOMAN program also collected detailed information on each

lifestyle intervention session attended by the participants (intervention date, intervention setting, and contact type). The results indicated that there were a significantly higher percentage of incarcerated women (84.6%) than nonincarcerated women (53.6%) with high total cholesterol who were unaware of their condition. Incarcerated SD WISEWOMAN participants attended an average of two lifestyle intervention sessions, whereas nonincarcerated women attended an average of 0.4 sessions. Intervention take-up rates were 53.3% among incarcerated women and 22.6% among nonincarcerated women. Intervention completion rates were 42.5% among incarcerated women and 3.6% among nonincarcerated women ( $p < .01$ ).

The results of this analysis illustrate a need to implement heart disease screening and education programs, such as WISEWOMAN, in prisons. Specifically, screenings help to identify cases of abnormal blood pressure and total cholesterol that otherwise would go undiagnosed. Lifestyle interventions also provide an opportunity for incarcerated women to acquire knowledge and skills for developing healthier diets, increasing physical activity, and quitting tobacco use. Moreover, programs like WISEWOMAN have the potential to improve discharge planning and linkages between released women and community service.

This study cannot state with certainty whether the observed differences between incarcerated and nonincarcerated women were the result of differences between the two groups that existed before the women entered the prison system or whether they were caused by the incarceration period.

#### *Lifestyle Intervention Effectiveness*

Lifestyle intervention sessions and intervention programs that are tailored

according to a woman's readiness to change, culture, age, location, and access are a promising approach to improving the cardiovascular health of low-income uninsured women. Lifestyle interventions also provide an opportunity for underinsured women to acquire knowledge and skills for developing healthier diets, increasing physical activity, and decreasing tobacco use (South Dakota Department of Health, 2008). Moreover, programs like WISEWOMAN have the potential to improve linkages between women and community service providers (South Dakota Department of Health, 2008). A heart disease screening and intervention program is a promising strategy for reducing the burden of cardiovascular disease among women in the United States (South Dakota Department of Health, 2008). Many of the intervention programs used have a theoretical construct based on behavioral change models such as the health belief model, the transtheoretical model of change, and the socioecological model (South Dakota Department of Health, 2008). Many programs use motivational interviewing to identify individual risk-level, behavioral goals, and readiness to change (South Dakota Department of Health, 2008). An individual's readiness to change then determines the intensity and emphasis of the intervention program and the strategies that will be utilized to promote sustainable lifestyle changes (South Dakota Department of Health, 2008).

Lifestyle intervention programs targeting high blood pressure, blood glucose, and cholesterol are very successful in that they can provide free and/or reduced cost medication to control the elevated levels, while also focusing on individual behavior change and support. There is also diversity in the literature in terms of the intensity of the intervention (Ash et al., 2006; Feigenbaum et al., 2005; Jacobs et al., 2004; Keyserling et al., 2008; Lewis et al., 2004; Logue et al., 2005; Nelson et al., 2002; Pazoki et al., 2007;

Staten et al., 2004; Svetkey et al., 2008). The empirical evidence suggested that such intervention can be effective (Ash et al., 2006; Besculides et al., 2008; Feigenbaum et al., 2005; Goldstein et al., 2004; Logue et al., 2005; Opdenacker et al., 2008; Pazoki et al., 2007; Svetkey et al., 2008). Individual support and lifestyle interventions that are primarily focused upon reduction in BMI or weight loss are producing promising results as well, although reduction in BMI is not as pronounced as seen in blood pressure, blood glucose, and total cholesterol (Will & Loo, 2008). More research is needed in this area to determine what factors contribute to the positive effects of such interventions over an extended period of time.

#### *Summary of Methodological Differences in WISEWOMAN Studies*

Currently, eight studies have been reported, seven were randomized control trials and one was a case control study. All studies used the same biomarkers as dependent variables. Currently, there has not been any previous study has been a quasi experiment demonstrating how well the program works when translated into real-world practice.

Of the eight total WISEWOMAN studies that focused on change in biomarkers, six of them demonstrated positive results in that the interventions were effective. The methods used in previous WISEWOMAN studies differ greatly based on location, sample size, demographics, random assignment, intervention intensity, longevity and funding level, as well as the overall analysis.

#### Summary and Conclusion

The results of the research highlighted above illustrated a need to implement heart disease factor screening and education programs, such as WISEWOMAN, into state health departments in effort to expand the reach of the program and identify and serve

more at-risk women. Specifically, screenings help to identify cases of abnormal blood pressure and total cholesterol that otherwise would go undiagnosed. Lifestyle interventions also provide an opportunity for underinsured women to acquire knowledge and skills for developing healthier diets, increasing physical activity, and quitting tobacco use. Moreover, programs like WISEWOMAN have the potential to improve linkages between women and community service providers. A heart disease screening and intervention program is a promising strategy for reducing the burden of cardiovascular disease among women in the United States.

WISEWOMAN research has supported the effectiveness of the screening sessions and lifestyle interventions in preventing chronic disease at 10 to 14 months; however, no studies have quantitatively examined whether LSI sessions and screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI. There is also a gap in the research related to WISEWOMAN facilitated maintenance of health behavior beyond the 10 to 14 month follow-up screening. In addition, not enough is known about the effectiveness of lifestyle change programs in populations containing substantial numbers of American Indians. The purpose of this retrospective longitudinal study was to quantitatively examine whether LSI sessions and screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI in an especially vulnerable group.

CHAPTER 3:  
RESEARCH METHODS

Introduction

This chapter provides a description of the research methods used in this dissertation. The purpose of the study, research design and approach, conceptual and measurement models, statistical methods, as well as protection of human subjects is reviewed in chapter three. Cardiovascular disease and risk factors leading to cardiovascular disease disproportionately affect women in certain South Dakota populations, such as ethnic minority populations and those from low-income backgrounds, who have a greater burden of chronic disease and lifestyle related risk factors.

Maintenance of health behavior change is a public health challenge, particularly for those populations suffering from health disparities. While the quality of life and chronic disease risk reduction benefits of healthy eating and regular physical activity are well understood, the ability to promote adherence to a lifetime of these health behaviors is limited (Institute of Medicine, 2001). The major problem is that while intervention strategies that lead to adoption of healthy behaviors are well-developed, our knowledge of how to facilitate sustained health behavior is poorly understood. More research is needed in this area if health disparities among the South Dakota WISEWOMAN population are to be reduced or eliminated.

This research elucidated whether health outcomes among women who attend a combination of LSI sessions and clinical screenings or clinical screenings alone lead to statistically significant improvements in blood pressure, blood glucose, total cholesterol,

and/or BMI as measured at rescreening 10 to 14 months from initial screening.

Understanding which method (screenings sessions alone or screening sessions along with LSI) has the greater influence on biological outcomes, influences the design of more effective public programs aimed at improving the health in population groups similar to those served in South Dakota.

The purpose of this retrospective longitudinal study was to quantitatively examine whether the combination of LSI sessions and clinical screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI as measured at rescreening 10 to 14 months from initial screening.

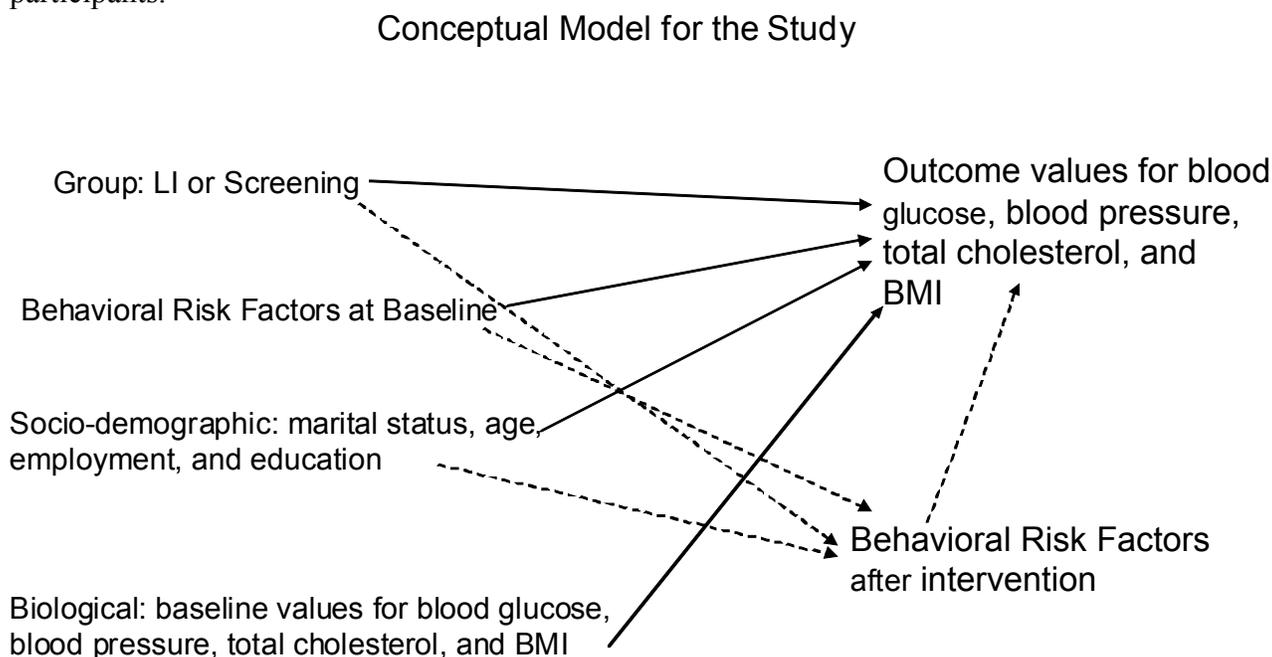
#### Research Design and Approach

This quantitative retrospective longitudinal study examined whether the combination of LSI sessions and clinical screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI as measured at rescreening 10 to 14 months from initial screening. The independent variable was participation in screening session and Lifestyle intervention sessions or only screening sessions. The dependent variables were blood glucose, blood pressure, total cholesterol, and BMI. This dissertation study used secondary data and as such, the researcher did not have any contact with participants; she only used previously collected data for analysis.

It was assumed that, within the context of this research study, all participants were South Dakota female residents that met the age and income requirements for program enrollment. However, to assess this assumption age was examined in the data analysis. It was also essential to assume that the lab results and measurements of blood pressure,

blood glucose, BMI, and total cholesterol were accurate, as all clinics receive on-going training and follow the guidelines set forth by the program.

The conceptual model for the study is shown in Figure 2. The diagram model is based on the socioecological model. Outcome biomarkers were hypothesized to be determined primarily by baseline values of the same measures. Health behaviors also affect biomarkers at follow-up, as do social and demographic factors. The intervention sessions were expected to impact the rescreening results among the women and therefore it was logical to assume that the interventions produce positive change among participants.

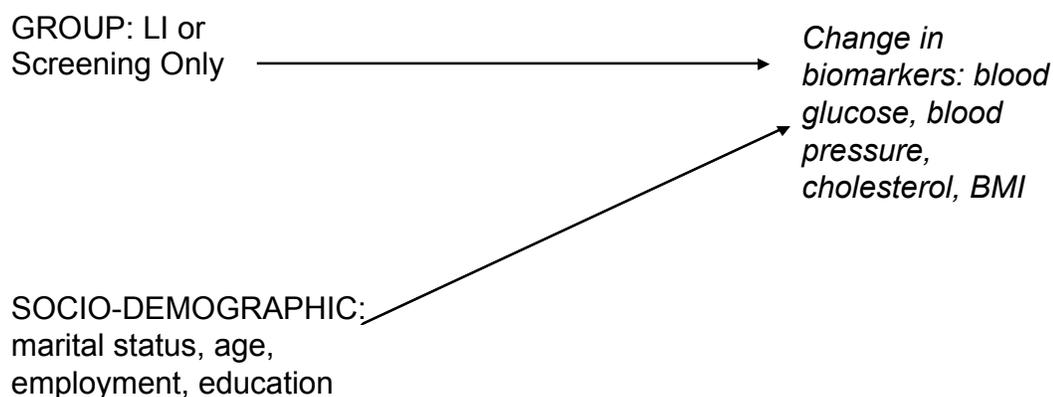


*Figure 2.* Conceptual model for the study.

The conceptual model has been converted into a measurement model that drives the analysis of the data (Figure 3). The effects of baseline values of the biomarkers were controlled using change scores. The interventions were assumed to affect change in

biomarkers independently. Social and demographic variables were used to adjust for potential confounding that arose because of their effects via unmeasured health behaviors. The relationship between socio-demographic variables and behavioral change is shown as a dashed line because it is unmeasured.

## Measurement Model for the Study



*Figure 3.* Measurement model for the study.

### *Study Limitations*

The lack of a random sample weakened external validity. Not using random assignment of subjects to groups weakens internal validity, as does omission of health behavior variables. The women self-select and without randomization to groups, it is difficult to discern the extent to which the intervention attendance truly impacted the outcomes.

### *Participant Inclusion/Exclusion Guidelines*

Eligible participants included 653 low income women aged 30 to 64 enrolled in the South Dakota AWC! program from 2000 to 2005 that participated in both the

screening and rescreening 10 to 14 months later. There were a total of 423 in the screening session only cohort and 230 in the intervention cohort. The women in the intervention cohort had to attend a minimum of one LSI session to be included in the intervention cohort. There were 69 women who did not have any elevated or alert levels for blood pressure, blood glucose, cholesterol and/or BMI. The inclusion criteria included South Dakota women aged 30 to 64 that met WISEWOMAN income guidelines for enrollment. The income guidelines are set by the Health and Human Services (HHS) and SD uses the 200% poverty level. The age guidelines were set by the CDC. South Dakota has been allowed to include women beginning at age 30 because of the smaller population base. In order to reach the number of women that the CDC mandates states to screen, South Dakota was granted permission to decrease the age for inclusion. The upper limit for inclusion was 64 years of age. This was because at age 65 a person is eligible for Medicare Part B. The exclusion criteria included non-South Dakota residents that did not meet enrollment guidelines and those who were not rescreened 10 to 14 months after initial screening. There were not any women excluded from this study because of ineligibility.

### *Sample Size*

A power analysis was conducted to determine the minimum number of participants needed in this study to detect statistical significance (Cohen, 1988). Several models were examined using simultaneous multiple regression. All models tested whether the independent variables (group, age, work status, full-time work status, marital status, number of dependents, education, income, race, ethnicity, smoking status) predicted the four dependent variables (change in blood pressure, change in BMI, change in total cholesterol, and change in blood glucose). A medium effect size was chosen for

the power analysis based on what had been found in previous WISEWOMAN evaluations and what was considered clinically relevant. The  $\alpha$  for the test of this model was set at .05. To achieve power of .80 and a medium effect size ( $f^2=.15$ ), a sample size of 123 was required to detect a statistically significant regression model ( $F(11,111) = 1.87$ ). The existing sample size of 653 women provided 100% power to detect significance ( $F(11, 641) = 1.80$ ). The study had enough statistical power to detect an effect, given that the effect actually exists.

### *Study Procedures*

This dissertation study used a census sample of all WISEWOMEN participants from 2000 to 2005. The data is obtained at initial screening and then at rescreen for women enrolled in the SD WISEWOMEN program. The method of inquiry used was to query the WISEWOMEN database that is developed and maintained by MAX TRAC Data Systems, Inc. located in Minneapolis, MN. MaxTrac has been South Dakota's data management contractor since 1997. The MaxTrac system provides a secure method of maintaining and tracking participants, decreasing loss to follow up. This dissertation study used secondary data analysis to assess change scores in blood pressure, BMI, blood glucose, and cholesterol among SD WISEWOMAN participants.

### Instrumentation

The dependent variables in this dissertation study were change in BMI, change in total cholesterol, change in blood pressure (both systolic and diastolic), and change in blood glucose level. These variables have previously been shown to be valuable indicators of cardiovascular disease risk and have been used in evaluations of lifestyle interventions, as shown in the literature review for this study. Independent variables

included items drawn from the AWC! assessment form, which addresses the participant's personal health history. Information requested included information about demographic variables such as age, race, marital status, ethnicity, education, employment, and insurance status. The researcher, the state of South Dakota's chronic disease epidemiologist, serves the SD WISEWOMAN program and is directly involved with data analysis and program evaluation, therefore having access to all WISEWOMAN data.

### *Data Recoding*

The strategy for recoding each variable included in the analysis can be found in Table 2 and Table 3.

Table 2

#### *Recoding of Independent Variables*

Variable	Measure	Recoding
Age	Age in years	Recoded Based upon distribution (18-34.9, 35-49.9, 50-64.9, 65 and over)
Marital Status	Married/Not Married	the unmarried categories were combined
Work Status	Employed? (Yes/No)	the unemployed categories were combined
Full-time work Status	Works full time (Yes/No)	None
Income	Yearly household income in dollars	Was recoded into categorical variables based on quartiles
Education	Highest education completed	Less than HS, High school degree, 2-yrs post HS, 4-year college degree or more.
Dependents	# of dependents in the household	None
Race	Asian, Black, American Indian, White, Other	Was recoded into White, American Indian, and Other
Ethnicity	Hispanic (Yes/No)	None
Group	Participation in LSI (Yes/No)	None
Smoking Status	Do you smoke (Yes/No)	None

Table 3

*Recoding of Dependent Variables*

Variable	Measure	Recoding
blood glucose	change in blood glucose from pre-posttest.	Blood glucose at follow-up – blood glucose at intake
blood pressure	change in systolic blood pressure from pre-posttest.	Systolic blood pressure at follow-up – systolic blood pressure at intake
blood pressure	change in diastolic blood pressure from pre-posttest.	Diastolic blood pressure at follow-up – diastolic pressure at intake
Total cholesterol	change in total cholesterol from pre-posttest.	Total cholesterol at follow-up - total cholesterol at intake
Body Mass Index	change in BMI from pre-posttest.	BMI at follow-up - BMI at intake

*Statistical Analysis*

Data were obtained from MaxTrac in Excel spreadsheets and imported into SPSS 15.0. The data were cleaned and any outliers were identified and removed. Data were recoded as necessary, especially in cases of skewness. Descriptive statistics (e.g., mean, standard deviation for continuous variables, frequency, and percentages for categorical variables) were computed for each variable. Change scores were computed for all dependent variables (change in blood glucose levels, change in BMI, change in total cholesterol levels, change in blood pressure). Pearson correlation was used to examine the degree of association between the continuous independent and dependent variables (e.g., age and blood pressure). The association between the dependent variables and the categorical variables were examined using ANOVA unless variances were unequal, in which case the Kruskal-Wallis analysis of ranks was employed.

Multiple linear regression analysis was used to examine the research questions and corresponding hypotheses. The first regression model examined the ability of the independent variables (group, age, work status, full-time work status, marital status, number of dependents, education, income, race, ethnicity, smoking status) to predict change in blood glucose levels. The second regression model examined the ability of the independent variables to predict change in BMI. The third regression model examined the ability of the independent variables to predict change in total cholesterol levels. The fourth and final regression model examined the ability of the independent variables to predict change in blood pressure. The regression models were run for those women who had elevated or alert blood pressure, blood glucose, total cholesterol, and/or BMI levels at the initial screening session. The elevated value for blood pressure is classified as  $\geq 140/90$  but  $< 180/110$  mm Hg, while an alert value is  $\geq 180/110$  mm Hg. The elevated value for total cholesterol is  $\geq 200$  mg/dl, while the alert value is  $\geq 400$  mg/dl. The elevated value for blood glucose (Fasting Plasma Glucose Test) is  $\geq 126$  mg/dl, while the alert value is  $\geq 200$  mg/dl. A BMI between 25 and 29.99 is classified as overweight, while a BMI of 30 or above is classified as obese or alert value includes blood pressure greater or equal to 140 systolic and/ or 90 diastolic (140/90), total cholesterol 200 mg/dl or greater, blood glucose 126 or greater, and BMI of 25 or greater. The modeling strategy retained all predictors in the equations. If the confidence interval was excessively broad for a particular coefficient, the variable was recoded to reduce sparseness in the data. If the model was unstable, variables with high p values were dropped. Quadratics were entered to test for nonlinear relationships.

*Protection of Human Subjects*

The raw data were provided to the researcher from MaxTrac, the contracted data manager for the SD WISEWOMAN program. The researcher was able to obtain those data because of her position as the Chronic Disease Epidemiologist (serving as epidemiological support for the SD WISEWOMAN program) for the South Dakota Department of Health. Those data did not include any unique identifying information such as names or addresses. To protect the rights of human subjects, institutional review board approval was sought at Walden University before any data analysis began. This dissertation study used secondary data and as such, the researcher did not have any contact with participants; she only used previously collected data for analysis.

In the original study on which this dissertation is based, all participants completed an informed consent form prior to participating in the intervention. The original consent form explained the purpose of the study, the potential risks, the voluntary nature of participation, and procedures to ensure participant confidentiality. The data were analyzed and results were reported at the group level. The CDC does not require additional IRB approval for the release of these data. The CDC, as well as the South Dakota Department of Health have already granted permission to use existing quantitative clinical data from 2000 to 2005. The dataset OMB number is 0920-0612 at CDC and it is a nonresearch dataset, so IRB approval is not needed.

All study records were kept private. Any report the researcher might publish will not include any information that could make it possible to identify the study participants. No names were used in any reports or publications generated from this dissertation and all data were reported at the group level. The electronic data files were kept in a password

protected file on a password-protected computer located in the researcher's office and data files will be saved for up to seven years; only the researcher has access to these files.

## CHAPTER 4:

### RESULTS

#### Purpose of the Study

The purpose of this retrospective longitudinal study was to examine quantitatively whether the combination of LSI sessions and clinical screenings or clinical screenings alone lead to improvements in blood pressure, blood glucose, total cholesterol, and/or BMI as measured at rescreening 10 to 14 months from initial screening. This study provided information to the SD WISEWOMEN program regarding the effectiveness of LSI support for clinical screening as opposed to clinical screening alone to improve health. The data obtained influence future program implementation decisions and serve as a model of WISEWOMAN program evaluation for the CDC.

#### *Research Questions and Hypotheses*

The primary research questions that were addressed in this dissertation include:

1. Is the change in blood glucose level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?
2. Is the change in BMI, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?
3. Is the change in total cholesterol level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?

only?

4. Is the change in blood pressure level, as measured at rescreening 10 to 14 months from initial screening, different for women enrolled in the South Dakota WISEWOMAN program lifestyle intervention than women receiving clinical screenings only?

This chapter provides the results of the data analysis. The results are presented in the following order: sample descriptive statistics for the entire sample, univariate, and multivariate findings; descriptive statistics for the elevated sample only, univariate, and multivariate findings. High blood pressure is defined as having systolic blood pressure equal to or greater than 140 mmHg or diastolic blood pressure equal to or greater than 90 mmHg, or taking medication for high blood pressure. High cholesterol is defined as having total cholesterol equal to or greater than 240 mg/dl or taking medication for high cholesterol. Overweight is defined as having a BMI of 25 to 29.9, while obese is defined as having a BMI equal to or greater than 30. BMI is calculated using CDC standards:  $BMI = (\text{weight in pounds}) / (\text{ht in inches squared}) \times (703)$ . Prediabetes is defined as a fasting blood glucose of 100 to 125 mg/dl or a nonfasting glucose of 140 to 199 mg/dl. Diabetes is defined as a fasting blood glucose equal to or greater than 126 mg/dl or a nonfasting glucose equal to or greater than 200 mg/dl or history of diabetes or taking medication for diabetes. The LSI sessions offer women with elevated or alert screening values up to four lifestyle interventions. The elevated value for blood pressure is classified as  $\geq 140/90$  but  $< 180/110$  mm Hg, while an alert value is  $\geq 180/110$  mm Hg. The elevated value for total cholesterol is  $\geq 200$  mg/dl, while the alert value is  $\geq 400$  mg/dl. The elevated value for blood glucose (Fasting Plasma Glucose Test) is  $\geq$

126mg/dl, while the alert value is  $\geq 200$  mg/dl. A BMI between 25 and 29.99 is classified as overweight, while a BMI of 30 or above is classified as obese or alert value includes blood pressure greater or equal to 140 systolic and/ or 90 diastolic (140/90), total cholesterol 200 mg/dl or greater, blood glucose 126 or greater, and BMI of 25 or greater.

#### *Replacement of Missing Values*

Missing values for independent variables that were measured on either a nominal or ordinal scale were replaced. Specifically, the median was used to replace the missing values. There were only seven cases with missing data. No comparisons were made between this subset and the entire sample. Replacement of missing values was implemented to be in compliance with other WISEWOMAN research studies.

#### Univariate Test Results

##### *WISEWOMAN Lifestyle Intervention and the Independent Variables*

Univariate tests for the independent variables are presented below.

*BMI.* The means and standard deviations for the BMI change scores across conditions, control (screening session only) vs. intervention (screening sessions with lifestyle intervention sessions) and BMI categories (i.e., overweight, obese, and morbidly obese) are displayed in Table 4. As can be gleaned from Table 4, the mean BMI change score for participants classified as overweight (in both control and intervention groups) was negative. The mean change score for participants classified as obese was negative only for those in the control group but was positive for those in the intervention group. Across both groups, the mean change score for participants classified as morbidly obese was positive.

The findings in Table 5 reveal that, first, BMI change scores did not vary significantly across conditions ( $F(1,453) = 2.509, p = .114$ ). The mean change score of the control group ( $M = .05$ ) was similar to the mean change score of the intervention group ( $M = .25$ ). Second, there was a significant main effect for BMI categories ( $F(1,453) = 4.727, p = .009$ ). Post-hoc Tukey test procedures reveal that the BMI change scores of overweight participants varied significantly ( $M = -.29$ ) from the change scores of obese participants ( $M = .25; p = .046$ ). Third, the effect of the intervention on BMI change scores did not vary across BMI categories ( $F(2,453) = 1.625, p = .198$ ).

Table 4

*Means and Standard Deviations of BMI Change Scores (N = 454)*

BMI Category	Control		Intervention	
	Mean	SD	Mean	SD
Overweight	-.23	2.11	-.43	1.60
Obese	-.04	1.82	.61	2.38
Morbidly obese	.11	1.96	.58	2.60

Table 5

*Two-Way ANOVA Results for BMI Change Scores*

Source	df	F	Sig.
Intervention	1	2.509	.114
BMI category	2	4.727	.009
Intervention x BMI category	2	1.625	.198
Error	453		

Table 6

*Independent t test Results for BMI Change Scores within BMI Categories*

BMI Category	<i>df</i>	<i>t</i>	Sig.
Overweight	177	.669	.504
Obese	129	-1.780	.077
Morbidly obese	149	-1.228	.222

*Cholesterol.* The means and standard deviations for the cholesterol change scores across conditions and cholesterol levels are presented in Table 7. As shown in Table 7, the mean cholesterol change score for subjects with normal cholesterol levels (in the control and intervention groups) was positive. However, the mean cholesterol change score for subjects with elevated cholesterol levels (in both groups) was negative.

The findings in Table 8 suggest that, first, cholesterol change scores did not vary significantly across conditions ( $F(1,646) = .000, p = .989$ ); thus, participants in both the control and intervention groups had similar change scores. Second, cholesterol level change scores varied significantly across cholesterol levels ( $F(1,646) = 69.754, p = .000$ ). In particular, the mean change score of participants classified as having a normal cholesterol level was significantly higher ( $M = 10.33$ ) than the mean change score of participants classified as having an elevated cholesterol level ( $M = -12.51$ ). Third, the findings indicate that the effect of the intervention on cholesterol level change scores did not vary across cholesterol levels ( $F(1,646) = .322, p = .571$ ).

Table 7

*Means and Standard Deviations of Cholesterol Change Scores (N = 647)*

Cholesterol Category	Control		Intervention	
	Mean	SD	Mean	SD
Normal	11.12	31.54	9.53	29.26
Elevated	-13.27	35.97	-11.75	32.83

Table 8

*Two-Way ANOVA Results for Cholesterol Change Scores*

Source	df	F	Sig.
Intervention	1	.000	.989
Cholesterol levels	1	69.754	.000
Intervention x cholesterol levels	1	.322	.571
Error	646		

*Systolic blood pressure.* The means and standard deviations for the systolic change scores across conditions and blood pressure levels are displayed in Table 9. As shown in Table 9, the mean systolic blood pressure change scores were negative; only the mean change score of participants classified as having normal systolic blood pressure in the intervention group was positive.

The findings in Table 10 reveal that systolic blood pressure change scores did not vary significantly across conditions ( $F(1,626) = .245, p = .621$ ). Similarly, systolic blood pressure change scores did not vary significantly across blood pressure groups ( $F(1,626) = .047, p = .828$ ). Further, the effect of the intervention on systolic blood pressure change

scores did not vary across blood pressure groups ( $F(1,626) = .428, p = .513$ ).

Table 9

*Means and Standard Deviations of Systolic BP Change Scores (N = 627)*

Blood Pressure Group	Control		Intervention	
	Mean	SD	Mean	SD
Normal	-1.11	12.55	.77	12.43
Elevated	-.40	21.25	-.66	28.42

Table 10

*Two-Way ANOVA Results for Systolic BP Change Scores*

Source	df	F	Sig.
Intervention	1	.245	.621
Blood pressure group	1	.047	.828
Intervention x blood pressure group	1	.428	.513
Error	626		

*Diastolic blood pressure.* The means and standard deviations for the diastolic change scores across conditions and blood pressure levels are presented in Table 11. As shown in Table 11, the mean diastolic blood pressure change scores were negative; only the mean change score of participants classified as having normal diastolic blood pressure in the intervention group was positive.

The findings in Table 12 indicate that diastolic blood pressure change scores did not vary significantly across conditions ( $F(1,626) = .071, p = .790$ ). Second, diastolic blood pressure change scores did not vary significantly across blood pressure groups ( $F$

(1,626) = .134,  $p = .714$ ). Lastly, the effect of the intervention on diastolic blood pressure change scores did not vary across blood pressure groups ( $F(1,626) = .636, p = .426$ ).

Table 11

*Means and Standard Deviations of Diastolic BP Change Scores (N = 627)*

Blood Pressure Category	Control		Intervention	
	Mean	SD	Mean	SD
Normal	-.56	9.75	.05	10.70
Elevated	-.06	11.44	-1.29	16.51

Table 12

*Two-Way ANOVA Results for Diastolic BP Change Scores*

Source	df	F	Sig.
Intervention	1	.071	.790
Blood pressure group	1	.134	.714
Intervention x blood pressure group	1	.636	.426
Error	626		

*Glucose.* The means and standard deviations for the glucose change scores across conditions and glucose levels are displayed in Table 13. The mean glucose change scores for participants classified as having normal glucose levels was positive – thus indicating an increase in glucose levels across time. The mean glucose change scores for participants classified as having elevated glucose levels was negative – thus indicating a decrease in glucose levels across time.

The findings in Table 14 reveal that, first, glucose change scores varied significantly across conditions ( $F(1,560) = 4.287, p = .039$ ). In particular, the mean change score of participants in the control group ( $M = -12.34$ ) varied significantly from the mean change score of participants in the intervention group ( $M = -2.81$ ); thus, glucose levels dropped more for participants in the control group. Second, glucose change scores varied significantly across glucose levels ( $F(1,560) = 20.867, p = .000$ ). The mean change score of participants with normal glucose levels ( $M = 2.94$ ) varied significantly from the mean change score of participants with elevated glucose levels ( $M = -18.08$ ); thus, glucose levels dropped only for participants with elevated glucose levels. Third, the findings indicate that the effect of the intervention on glucose change scores varied across glucose levels ( $F(1,560) = 4.597, p = .032$ ). As shown in Table 15, the intervention had a stronger (but not significant) effect on glucose change scores only for participants with elevated glucose levels ( $t(42) = -791, p = .433$ ). Contrary to expectations, however, a larger change was observed in the control condition ( $M = -27.78; SD = 91.51$ ) in comparison to the intervention condition ( $M = -8.38; SD = 71.07$ ).

Table 13

*Means and Standard Deviations of Glucose Change Scores (N = 561)*

Glucose Levels	Control		Intervention	
	Mean	SD	Mean	SD
Normal	3.11	18.12	2.77	21.50
Elevated	-27.78	91.51	-8.38	71.07

Table 14

*Two-Way ANOVA Results for Glucose Change Scores*

Source	<i>df</i>	<i>F</i>	Sig.
Intervention	1	4.287	.039
Glucose levels	1	20.867	.000
Intervention x glucose levels	1	4.597	.032
Error	560		

Table 15

*Independent t test Results for Glucose Change Scores within Glucose Levels*

Glucose Levels	<i>df</i>	<i>t</i>	Sig.
Normal	518	.189	.850
Elevated	42	-.791	.433

*The Relationship between Marital Status and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

The findings in Tables 16 and 17 reveal that BMI change scores did not vary significantly across marital status ( $t(605) = -.859, p = .391$ ). Cholesterol change scores varied significantly across marital status ( $t(648) = 2.185, p = .029$ ). The mean cholesterol change score for women who were not married was positive ( $M = 1.33; SD = 39.15$ ), thus indicating that the mean cholesterol score for these women increased postscreening. The mean cholesterol change score for women who were married was negative ( $M = -4.78; SD = 31.20$ ), thus indicating that the mean cholesterol score for these women decreased postscreening. Systolic blood pressure change scores did not vary significantly across

marital status ( $t(627) = .556, p = .578$ ); diastolic blood pressure change scores did not vary significantly across marital status ( $t(627) = 1.295, p = .196$ ); and glucose level change scores also did not vary significantly across marital status ( $t(562) = -.979, p = .328$ ).

Table 16

*Means and Standard Deviations of Change Scores across Marital Status Groups*

Change Score	Not Married		Married	
	Mean	SD	Mean	SD
BMI	-.15	2.11	-.02	1.73
Cholesterol level	1.33	39.15	-4.78	31.20
Systolic blood pressure	-.15	14.99	-.83	15.68
Diastolic blood pressure	.17	10.89	-.94	10.58
Glucose level	.36	22.60	2.78	35.36

Table 17

*Independent t test Results for Change Scores across Marital Status Groups*

Change Score	df	t	Sig.
BMI	605	-.859	.391
Cholesterol level	648	2.185	.029
Systolic blood pressure	627	.556	.578
Diastolic blood pressure	627	1.295	.196
Glucose level	562	-.979	.328

*The Relationship between Ethnicity and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

The findings in Tables 18 and 19 reveal that BMI change scores did not vary significantly across ethnic groups ( $t(606) = .334, p = .738$ ). Cholesterol change scores also did not vary significantly across ethnic groups ( $t(649) = -1.063, p = .288$ ). However, systolic blood pressure change scores varied significantly across ethnic groups ( $t(628) = 2.148, p = .032$ ). The mean systolic blood pressure change score for Non-White women was positive ( $M = 2.61; SD = 14.30$ ), thus indicating that the mean systolic score for these women increased postscreening. The mean systolic blood pressure change score for White women was negative ( $M = -1.02; SD = 15.42$ ), thus indicating that the mean systolic score for these women decreased postscreening. Diastolic blood pressure change scores; however, did not vary significantly across ethnic groups ( $t(628) = 1.453, p = .147$ ). Lastly, glucose level change scores did not vary significantly across ethnic groups ( $t(562) = 1.211, p = .226$ ).

Table 18

*Means and Standard Deviations of Change Scores across Ethnic Groups*

Change Score	NonWhite		White	
	Mean	SD	Mean	SD
BMI	-.03	1.97	-.10	1.93
Cholesterol level	-5.05	34.62	-.93	35.88
Systolic blood pressure	2.61	14.30	-1.02	15.42
Diastolic blood pressure	1.09	11.75	-.63	10.57
Glucose level	5.00	43.66	.85	25.83

Table 19

*Independent t test Results for Change Scores across Ethnic Groups*

Change Score	<i>df</i>	<i>T</i>	Sig.
BMI	606	.334	.738
Cholesterol level	649	-1.063	.288
Systolic blood pressure	628	2.148	.032
Diastolic blood pressure	628	1.453	.147
Glucose level	562	1.211	.226

*The Relationship between Level of Education and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

Although level of education initially consisted of six levels, due to small sample sizes in some categories, levels were collapsed to arrive at four levels. The first two levels (i.e., some high school and high school) were combined into a single category. The third and fourth levels (i.e., some technical school and some college) were grouped into a single category.

As shown in Tables 20 and 21, BMI change scores, systolic blood pressure change scores, diastolic blood pressure change scores; cholesterol change scores, and glucose level change scores did not vary significantly across levels of education.

Table 20

*Means and Standard Deviations of Change Scores across Levels of Education*

Change Score	Some High School or High School Graduate		Some Technical School or College		Technical School Graduate		College Graduate	
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>
	BMI	.03	1.90	-.26	1.81	-.32	2.18	.23
Cholesterol level	-4.63	38.20	4.33	30.44	.55	33.95	1.37	31.25
Systolic blood pressure	-.81	15.49	-.94	15.47	1.41	15.38	.46	13.93
Diastolic blood pressure	-.48	11.13	-.83	10.27	.45	9.90	.59	10.36
Glucose level	.39	31.59	4.14	32.15	2.02	18.02	1.49	11.62

Table 21

*ANOVA Results for Change Scores across Levels of Education*

Change Score	<i>MS</i>	<i>df</i>	<i>F</i>	Sig.
BMI				
Between groups	4.514	3	1.205	.307
Within groups	3.746	603		
Cholesterol level				
Between groups	3127.783	3	2.468	.061
Within groups	1267.203	646		
Systolic blood pressure				
Between groups	121.655	3	.518	.670
Within groups	234.873	625		
Diastolic blood pressure				
Between groups	43.059	3	.371	.774
Within groups	115.912	625		
Glucose level				
Between groups	447.659	3	.522	.667
Within groups	857.611	560		

*The Relationship between Age and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

Age was measured continuously but was transformed into a categorical variable. The whole sample was divided into three groups using the values at the 33<sup>rd</sup> and 66<sup>th</sup> percentiles. These percentiles were chosen so that the sample could be divided into three equal groups. Accordingly, women aged 38 years and younger were assigned to the first category; women between 39 and 48 were grouped into the second category; and women 49 years and older were assigned into the third category.

As can be gleaned from the findings in Tables 22 and 23, BMI change scores did not vary significantly across age groups ( $F(2,605) = .826, p = .438$ ). Second, cholesterol change scores varied significantly across age groups ( $F(2,648) = 3.327, p = .037$ ). The findings from a linear trend analysis reveal that cholesterol change scores increased across age groups ( $F(1,468) = 4.399, p = .036$ ). Third, systolic blood pressure change scores did not vary significantly across age groups ( $F(2,627) = 1.445, p = .237$ ). Fourth, diastolic blood pressure change scores also did not vary significantly across age groups ( $F(2,627) = 2.315, p = .100$ ). Lastly, glucose level change scores did not vary significantly across age groups ( $F(2,561) = .048, p = .953$ ).

Table 22

*Means and Standard Deviations of Change Scores across Age Groups*

Change Score	38 and Younger		39 to 48		49 and Older	
	Mean	SD	Mean	SD	Mean	SD
BMI	-.17	2.13	-.16	1.98	.05	1.68
Cholesterol level	2.35	29.03	-.40	33.37	-6.23	42.18
Systolic blood pressure	1.09	13.21	-1.20	15.79	-1.11	16.42
Diastolic blood pressure	1.01	9.47	-1.02	11.10	-.92	11.41
Glucose level	1.56	26.98	1.87	32.80	.98	27.36

Table 23

*ANOVA Results for Change Scores across Age Groups*

Change Score	<i>MS</i>	<i>df</i>	<i>F</i>	Sig.
<b>BMI</b>				
Between groups	3.101	2	.826	.438
Within groups	3.753	605		
<b>Cholesterol level</b>				
Between groups	4207.498	2	3.327	.037
Within groups	1264.805	648		
<b>Systolic blood pressure</b>				
Between groups	337.613	2	1.445	.237
Within groups	233.639	627		
<b>Diastolic blood pressure</b>				
Between groups	267.079	2	2.315	.100
Within groups	115.393	627		
<b>Glucose level</b>				
Between groups	41.062	2	.048	.953
Within groups	858.329	561		

*The Relationship between Smoking and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

The findings in Tables 24 and 25 indicate that, first, BMI change scores varied significantly across smoking groups ( $F(2,603) = 4.610, p = .010$ ). Post-hoc Tukey test findings; however, did not yield any significant group comparisons. Further examination of the means in Table 24 reveals, however, that the mean BMI score of participants who smoked occasionally dropped the most across time ( $M = -.72$ ) in comparison to participants who did not smoke at all ( $M = .05$ ) and participants who smoked everyday ( $M = -.41$ ). Second, cholesterol change scores did not vary significantly across smoking groups ( $F(2,645) = .718, p = .488$ ). Third, systolic blood pressure change scores also did not vary significantly across smoking groups ( $F(2,626) = .103, p = .902$ ). Fourth, diastolic blood pressure change scores did not vary significantly across smoking groups ( $F(2,626) = .201, p = .818$ ). Finally, glucose level change scores changed marginally across smoking groups ( $F(2,558) = 2.892, p = .056$ ). Examination of the means in Table 24 suggests that the mean glucose score of participants who did not smoke at all increased the least across time ( $M = .40$ ) in comparison to participants who smoked occasionally ( $M = 13.38$ ) and participants who smoked everyday ( $M = 3.29$ ).

Table 24

*Means and Standard Deviations of Change Scores across Smoking Groups*

Change Score	Not at All		Some Days		Everyday	
	Mean	SD	Mean	SD	Mean	SD
BMI	.05	1.95	-.72	2.00	-.41	1.76
Cholesterol level	-2.66	36.07	.11	30.06	1.55	34.93
Systolic blood pressure	-.63	15.50	.36	12.71	-.15	15.28
Diastolic blood pressure	-.53	10.79	-.06	9.53	.12	11.02
Glucose level	.40	27.16	13.38	46.85	3.29	30.81

Table 25

*ANOVA Results for Change Scores across Smoking Groups*

Change Score	<i>MS</i>	<i>df</i>	<i>F</i>	Sig.
BMI				
Between groups	16.938	2	4.610	.010
Within groups	3.675	603		
Cholesterol level				
Between groups	909.982	2	.718	.488
Within groups	1267.521	645		
Systolic blood pressure				
Between groups	24.257	2	.103	.902
Within groups	234.838	626		
Diastolic blood pressure				
Between groups	23.297	2	.201	.818
Within groups	116.111	626		
Glucose level				
Between groups	2459.772	2	2.892	.056
Within groups	850.545	558		

*The Relationship between Income and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

As shown in Table 26, BMI change scores were not significantly correlated with income ( $r = -.03, p = .435$ ). Cholesterol change scores were not significantly correlated with income ( $r = -.01, p = .893$ ). Systolic blood pressure change scores were not significantly correlated with income ( $r = -.03, p = .414$ ). Diastolic blood pressure change scores were not significantly correlated with income ( $r = .00, p = .988$ ). Glucose level change scores were not significantly correlated with income ( $r = -.01, p = .763$ ).

Table 26

*Pearson Correlations between Change Scores and Income*

Change Score	<i>r</i>	Sig.
BMI	-.03	.435
Cholesterol level	-.01	.893
Systolic blood pressure	-.03	.414
Diastolic blood pressure	.00	.988
Glucose level	-.01	.763

*The Relationship between Number of Dependents and BMI, Cholesterol Levels, Blood Pressure, and Glucose Levels*

The findings in Table 27 reveal that, first, BMI change scores were significantly correlated with number of dependents ( $r = .10, p = .014$ ). The more dependents women had, the lesser was their reduction in BMI. Cholesterol change scores were not significantly correlated with number of dependents ( $r = -.03, p = .529$ ). Third, systolic blood pressure change scores were also not significantly correlated with number of

dependents ( $r = -.00, p = .952$ ). Similarly, diastolic blood pressure change scores were not significantly correlated with number of dependents ( $r = -.01, p = .738$ ). Lastly, glucose level change scores were not significantly correlated with number of dependents ( $r = .01, p = .780$ ).

Table 27

*Pearson Correlations between Change Scores and Number of Dependents*

Change Score	<i>r</i>	Sig.
BMI	.10	.014
Cholesterol level	-.03	.529
Systolic blood pressure	-.00	.952
Diastolic blood pressure	-.01	.738
Glucose level	.01	.780

### Multivariate Results

The multivariate results are presented in this section.

#### *Overall Procedure*

Since level of education was a categorical variable with four groups, three dummy variables were created. The first category (i.e., those who had some high school or who graduated from high school) served as the anchor. Second, since age was a categorical variable with three groups, two dummy variables were created. The first category (i.e., the youngest group) served as the anchor. Finally, since smoking was a categorical variable with three groups, two dummy variables were created. The first category (i.e., the nonsmokers) served as the anchor.

A forced-entry procedure was used. Specifically, all demographic variables and

preintervention screening weight were entered into the equation first. The intervention variable (with the control serving as the anchor) was entered into the equation last.

Outliers on both the x- and y-space were detected using Cook's D. Cases whose Cook's D values were two standard deviations greater than the Cook's D mean were deleted from the analysis. Since the regression results without the two outliers were similar to the regression results with the outliers, the latter regressions were retained.

The assumptions of normality, linearity, and homoscedasticity were also verified. The normal probability plots indicated that the distributions were only slightly skewed. Plots of the standardized predicted values against the dependent variable revealed that linearity was not violated. Lastly, plots of the standardized predicted values against the studentized deleted residuals indicated that homoscedasticity was not violated.

#### *Change in BMI Scores*

The linear regression findings are shown in Table 28. The number of dependents women had significantly predicted change in BMI scores ( $B = .15$ ;  $F(1,594) = 7.563$ ,  $p = .006$ ). The more dependents women had, the lesser was their reduction in BMI postscreening. Second, BMI prescreening scores also significantly predicted change in BMI scores ( $B = .09$ ;  $F(1,594) = 4.737$ ,  $p = .030$ ). The higher the BMI prescreening score, the higher the BMI change score.

After controlling for income, number of dependents, marital status, level of education, age, smoking status, and prescreening BMI, the WISEWOMAN intervention did not significantly predict change in BMI scores ( $B = .03$ ;  $F(1,594) = .465$ ,  $p = .495$ ).

Table 28

*Multiple Linear Regression Results for BMI Change Scores (N = 607)*

Variable	Beta	F	Sig.	R <sup>2</sup>
Income	-.03	.245	.621	.000
Number of dependents	.15	7.563	.006	.013
Married vs. not married	-.05	1.067	.302	.002
Some technical/college vs. high school	-.06	1.746	.187	.003
Technical school graduate vs. high school	-.04	1.117	.291	.001
College graduate vs. high school	-.05	1.283	.258	.002
39 to 48 vs. 38 and younger	.05	.914	.339	.002
49 and older vs. 38 and younger	.10	3.814	.051	.006
Occasional smoker vs. nonsmoker	-.07	2.953	.086	.005
Daily smoker vs. nonsmoker	-.05	1.442	.230	.002
Prescreening BMI	.09	4.737	.030	.008
Intervention	.03	.465	.495	.000
Overall model		2.230	.009	.043

*Change in Cholesterol Level Scores*

The linear regression findings in Table 29 show that level of education significantly predicted change in cholesterol scores ( $B = .11$ ;  $F(1,609) = 7.088$ ,  $p = .008$ ). Women who took some high school classes or had graduated from high school had lower change in cholesterol scores than women who took some technical school or college classes. Age also significantly predicted change in cholesterol scores ( $B = -.12$ ;  $F(1,609) = 5.421$ ,  $p = .020$ ). Women aged 38 years and younger had lower change in cholesterol scores than women aged 49 and older.

After controlling for income, number of dependents, marital status, level of

education, age, smoking status, and prescreening BMI, the WISEWOMAN

intervention did not significantly predict change in cholesterol scores ( $B = -.06$ ;  $F(1,609) = 2.288$ ,  $p = .131$ ).

Table 29

*Multiple Linear Regression Results for Change in Cholesterol Level Scores (N = 622)*

Variable	Beta	F	Sig.	R <sup>2</sup>
Income	.03	.354	.552	.000
Number of dependents	-.05	.849	.357	.003
Married vs. not married	-.06	1.458	.228	.004
Some technical/college vs. high school	.11	7.088	.008	.008
Technical school graduate vs. high school	.04	.899	.343	.002
College graduate vs. high school	.05	1.384	.240	.003
39 to 48 vs. 38 and younger	-.05	.889	.346	.003
49 and older vs. 38 and younger	-.20	5.421	.020	.040
Occasional smoker vs. nonsmoker	.01	.092	.762	.000
Daily smoker vs. nonsmoker	.03	.364	.547	.000
Prescreening BMI	.04	.970	.325	.002
Intervention	.06	2.288	.131	.004
Overall model		1.956	.026	.037

*Change in Systolic Blood Pressure Scores*

The findings in Table 30 reveal that none of the demographic variables significantly predicted change in systolic blood pressure scores. Further, after controlling for the effects of the demographic variables, the WISEWOMAN intervention did not significantly predict change in systolic blood pressure scores ( $B = .04$ ;  $F(1,596) = 1.057$ ,  $p = .304$ ).

Table 30

*Multiple Linear Regression Results for Change in Systolic Blood Pressure Scores (N = 609)*

Variable	Beta	F	Sig.	R <sup>2</sup>
Income	-.03	.476	.491	.000
Number of dependents	.01	.017	.897	.000
Married vs. not married	-.00	.003	.955	.000
Some technical/college vs. high school	-.01	.031	.860	.000
Technical school graduate vs. high school	.05	1.393	.238	.003
College graduate vs. high school	.03	.456	.500	.000
39 to 48 vs. 38 and younger	-.08	2.563	.110	.006
49 and older vs. 38 and younger	-.07	1.743	.187	.005
Occasional smoker vs. nonsmoker	-.01	.054	.816	.000
Daily smoker vs. nonsmoker	.02	.145	.703	.000
Prescreening BMI	-.04	1.045	.307	.002
Intervention	.04	1.057	.304	.002
Overall model		.675	.776	.013

*Change in Diastolic Blood Pressure Scores*

As shown in Table 31, none of the demographic variables significantly predicted change in diastolic blood pressure scores. Similarly, after controlling for the effects of the demographic variables, the WISEWOMAN intervention did not significantly predict change in diastolic blood pressure scores ( $B = .02$ ;  $F(1,609) = .193$ ,  $p = .661$ ).

Table 31

*Multiple Linear Regression Results for Change in Diastolic Blood Pressure Scores (N = 609)*

Variable	Beta	F	Sig.	R <sup>2</sup>
Income	.03	.282	.595	.000
Number of dependents	-.03	.218	.640	.000
Married vs. not married	-.04	.820	.365	.002
Some technical/college vs. high school	-.02	.270	.603	.000
Technical school graduate vs. high school	.03	.475	.491	.000
College graduate vs. high school	.03	.373	.542	.000
39 to 48 vs. 38 and younger	-.09	3.677	.056	.008
49 and older vs. 38 and younger	-.09	3.090	.079	.008
Occasional smoker vs. nonsmoker	.01	.013	.908	.000
Daily smoker vs. nonsmoker	.02	.198	.656	.000
Prescreening BMI	-.03	.527	.468	.000
Intervention	.02	.193	.661	.000
Overall model		.668	.783	.013

### *Change in Glucose Level Scores*

The linear regression findings in Table 32 indicate that smoking significantly predicted change in glucose level scores ( $B = .12$ ;  $F(1,531) = 6.909$ ,  $p = .009$ ). Women who occasionally smoked cigarettes had higher glucose change scores than women who did not smoke cigarettes. After controlling for the effects of the demographic variables, the WISEWOMAN intervention did not significantly predict change in glucose level scores ( $B = -.00$ ;  $F(1,531) = .006$ ,  $p = .941$ ).

Table 32

*Multiple Linear Regression Results for Change in Glucose Level Scores (N = 544)*

Variable	Beta	F	Sig.	R <sup>2</sup>
Income	-.04	.574	.449	.000
Number of dependents	.00	.005	.946	.000
Married vs. not married	.07	2.022	.156	.005
Some technical/college vs. high school	.07	2.153	.143	.005
Technical school graduate vs. high school	.01	.016	.898	.000
school	.02	.304	.582	.000
College graduate vs. high school	-.00	.007	.933	.000
39 to 48 vs. 38 and younger	-.00	.001	.969	.000
49 and older vs. 38 and younger	.12	6.909	.009	.014
Occasional smoker vs. nonsmoker	.07	2.244	.135	.004
Daily smoker vs. nonsmoker	.08	3.078	.080	.006
Prescreening BMI	-.00	.007	.934	.000
Intervention		1.125	.337	.025
Overall model				

### Summary

The results of this analysis did not support hypotheses 1 through 4. The WISEWOMAN screening session identifies cases of abnormal blood pressure, blood glucose, total cholesterol, and BMI that otherwise would go undiagnosed; however, the overall effectiveness of the LSI on blood pressure, blood glucose, total cholesterol, and BMI is not supported by the analysis.

## The Relationship between Conditions and Outcomes

*BMI*

There was no significant difference in BMI by condition (intervention vs. control). The intervention did not have a significant effect on BMI change; however, there were marginal (but not significant) differences in BMI change scores across the three BMI categories.

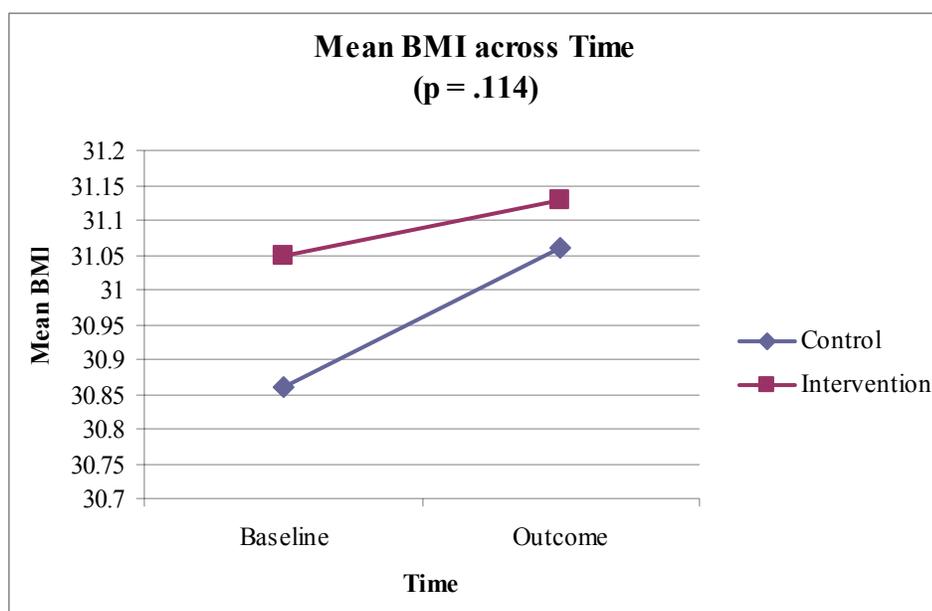


Figure 4. Mean BMI across time.

*Total Cholesterol*

There was no significant difference in cholesterol by condition (intervention vs. control); however, there were differences in cholesterol change scores across the two cholesterol change categories.

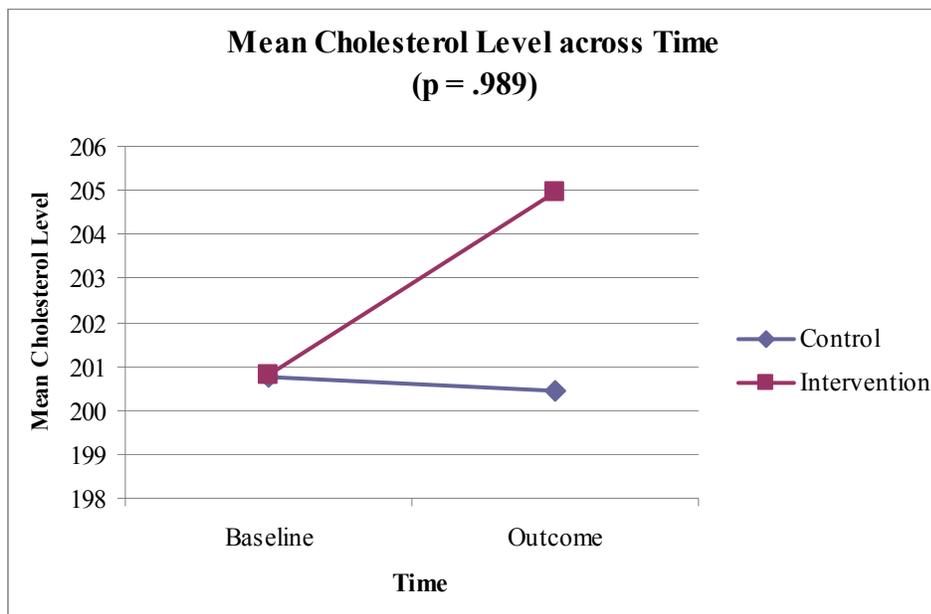


Figure 5. Mean cholesterol level across time.

### *Systolic Blood Pressure*

There was no significant difference in systolic blood pressure change by condition (intervention vs. control). There were no differences in systolic blood pressure change scores across the two systolic categories (normal and elevated).

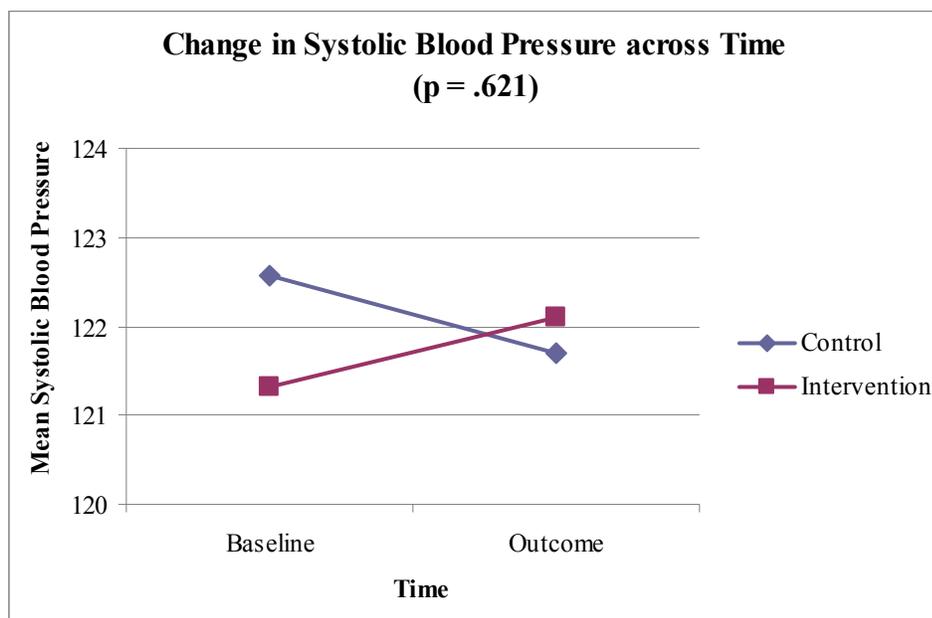


Figure 6. Change in systolic blood pressure across time.

#### *Diastolic Blood Pressure*

There was no significant difference in diastolic blood pressure change by condition (intervention vs. control). There were no differences in diastolic blood pressure change scores across the two diastolic categories (normal and elevated). In addition, none of the diastolic blood pressure groups changed significantly from pre to post.

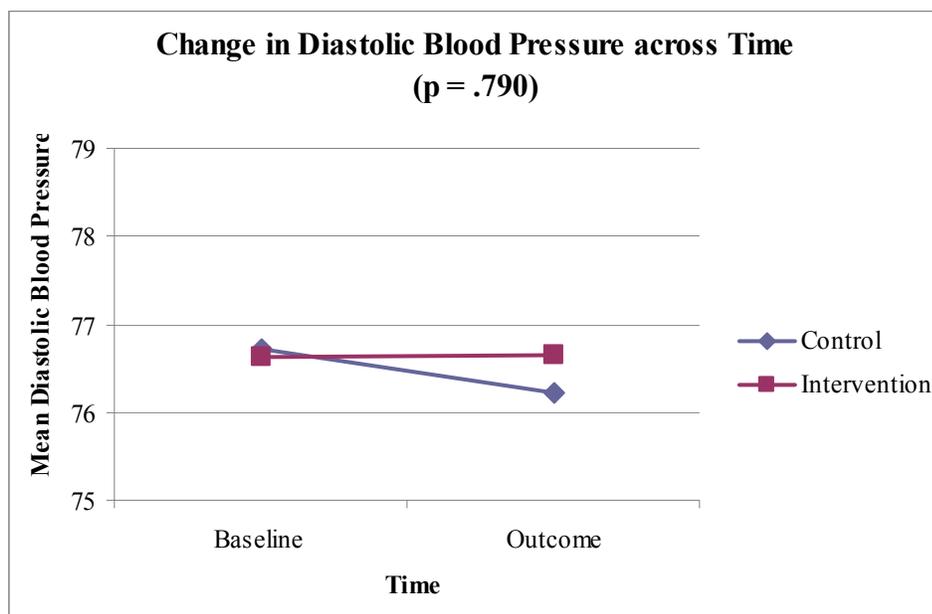
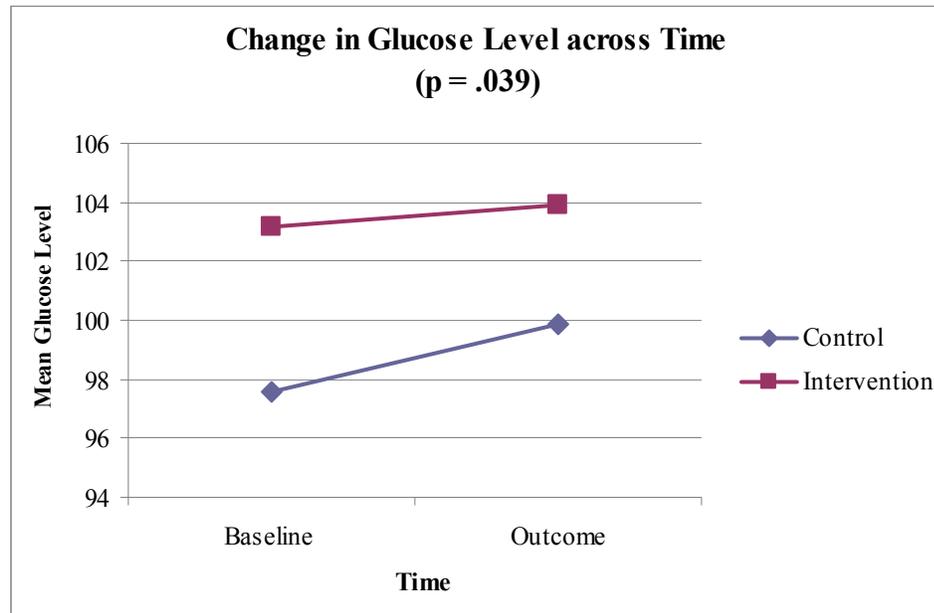


Figure 7. Change in diastolic blood pressure across time.

### Glucose

Glucose change scores varied significantly across conditions (treatment vs. control) and across glucose levels (normal vs. elevated). The intervention had a stronger effect, although not statistically significant, on glucose change scores only for participants with elevated glucose levels. Over time there was a bigger change in the control condition ( $M = -27.78$ ) than in the intervention condition ( $M = -8.38$ ).



*Figure 8.* Change in glucose level across time.

The following chapter will review the study and present conclusions about the outcomes. Chapter 5 will also discuss the social change implications of these findings, the limitations of this study, and future recommendations for continued research in this area.

## CHAPTER 5:

### DISCUSSION

#### Introduction and Summary of the Multivariate Results

In regard to BMI, significant variables emerged as predictors of change in BMI. The number of dependents women had significantly predicted change in BMI in that the more dependents women had; the less was their reduction in BMI. The initial screening BMI significantly predicted change in that the higher the woman's BMI was at the initial screening, the greater the decrease in BMI at rescreening. When income, number of dependents, marital status, education level, age, smoking status, and prescreening BMI were included in the regression model, the WISEWOMAN intervention did not significantly predict change in BMI scores, suggesting no differences between the comparison versus intervention group.

The linear regression indicated that the level of education significantly predicted change in total cholesterol scores. Women who took some high school classes or had graduated from high school had less change in cholesterol than women who took some technical school or college classes. Age also significantly predicted change in cholesterol scores, in that women aged 38 years and younger had lower change in cholesterol scores than women aged 49 and older. When income, number of dependents, marital status, level of education, age, smoking status, and prescreening BMI were included in the regression model, the WISEWOMAN intervention did not significantly predict change in cholesterol scores.

The linear regression revealed that smoking significantly predicted change in glucose level scores. Women who occasionally smoked cigarettes had higher change

scores than women who did not smoke cigarettes; however, the WISEWOMAN intervention did not significantly predict change in glucose level scores.

The demographic variables did not significantly predict change in either systolic or diastolic blood pressure scores.

#### Comparison to Previously Published Studies of Similar Interventions

The results of this analysis contribute to the knowledge of heart disease risk factor prevalence among women enrolled in the South Dakota WISEWOMAN program. It was hypothesized that SD WISEWOMAN participants attending the screening sessions, as well as the intervention sessions, would have lower levels of blood pressure, blood glucose, total cholesterol, and obesity at clinical rescreening 10 to 14 months later. Contrary to expectations, the data revealed that differences in blood pressure, blood glucose, total cholesterol, and BMI were not observed. One possible explanation for this finding is that the WISEWOMAN screening session alone initiated a woman's motivation to change. Other possible explanations for these findings include differences in study methods, flaws in the transtheoretical model, or lack of perfect fidelity to the transtheoretical model. The methods included in this study differ from other WISEWOMAN studies in that there was no assignment to groups (screenings sessions only or screening sessions with interventions). The women self-selected without randomization to groups, therefore it is difficult to discern the extent to which intervention attendance truly impacted the outcomes. Recently there has been an increase in research denouncing the transtheoretical model because of analytic, conceptual, and methodological issues. The transtheoretical model of behavior change is a relatively new behavior theory that does not have the longevity of research to support it, in comparison

to other theoretical constructs (Bandura, 1997). The WISEWOMAN program is completely based on the provider site staff and the interventionists. Although numerous training sessions are provided, as well as a WISEWOMAN policy and procedure manual, clinicians and interventionists' adherence to the theoretical foundation of the WISEWOMAN program is questionable. The WISEWOMAN program administrators are not able to monitor program fidelity (Hutchison, Breckon, & Johnston, 2008).

Between January 2001 and December 2005, 653 women were screened and rescreened by the program. Additionally, implementation of programs, such as WISEWOMAN, is becoming more important as the female population in SD grows older and the burden of chronic disease increases. This research illustrates the potential value of additional screening to identify women with abnormal blood glucose, blood pressure, total cholesterol, and BMI who would not have otherwise been diagnosed. These results confirm that the WISEWOMAN program presents a unique opportunity to reach financially vulnerable populations at high risk for chronic and communicable diseases (Glaser & Greifinger, 1993).

The women in this study self-selected without randomization to groups, therefore it is difficult to discern the extent to which the intervention attendance truly impacted the outcomes. Mercer and her colleagues (2007) concluded that utilizing a pre-post in a quasi-experimental study is useful in investigating the feasibility of an intervention and are better than a randomized post test. Vandenbroucke et al. (2007) suggested that the overall generalizability or external validity of a study is significant only with regard to specific circumstances. Diversity in population, severity of disease, co-occurring disorders, and exposure all impact external validity. Vandenbroucke et al. also

acknowledged that using data collected in the past poses as a threat to external validity in that it is questionable how applicable the results are to the current population. In six of the eight WISEWOMAN studies, women were randomly assigned to a control versus intervention group. Furthermore, the rigor of randomized trials is unlikely to be replicated in real-world situations, which significantly weakens their external validity. This point is supported by the less impressive findings that were produced from this natural experiment, which is more realistic than a randomized trial would be. In short, the design of this study is weaker than most of the others in regard to internal validity but stronger in regard to external validity.

The sample size for this study consisted of 653 women, which is mid-range compared to other WISEWOMAN sample sizes. The WISEWOMAN workgroup (1999) had the largest sample consisting of 4842 women from Massachusetts, Arizona, and North Carolina. The smallest sample consisted of 217 women from the Arizona WISEWOMAN project (Staten et al., 2004). This research project categorized the women into groups based on biomarker results. Women were classified as normal, meaning there were no elevated levels at time of initial screening or elevated, meaning that they had a minimum of one elevated biomarker level. To date, there are no other WISEWOMAN studies that have used this classification in their analysis.

This dissertation evaluated a lifestyle intervention that primarily targeted nutrition and physical activity to reduce risk of cardiovascular disease, while the other studies compared and contrasted the minimal versus the enhanced interventions. The enhanced intervention includes the former, plus one-on-one nutritional and physical activity assessments and counseling, individual and group education, and behavioral intervention

activities. Data analysis was similar to other WISEWOMAN studies in that use of descriptive statistics and regression analysis was a common approach. The dependent variables (change in blood glucose levels, change in BMI, change in total cholesterol levels, and change in blood pressure) were constant across the studies, as the WISEWOMAN program has a standard Minimal Data Element (MDE).

The WISEWOMAN program addresses racial/ethnic disparities in cardiovascular disease. NonWhite women in the South Dakota WISEWOMAN program exhibit more health disparities than White women. Systolic blood pressure change scores varied significantly across ethnic groups. NonWhite women experienced less change in systolic blood pressure, as compared to White women. Finkelstein et al. (2004) concluded that BMI, blood pressure, total cholesterol, blood glucose, as well as smoking prevalence was greater among minority populations than among the White population.

A woman's age is suggestive of the overall change a woman will experience from screening to rescreening. This research suggests that total cholesterol change scores varied significantly across age groups. South Dakota women aged 49 years and older experienced more cholesterol change than women 38 years and younger. This is in line with the work of Feresu et al. (2008) who found that among Nebraska WISEWOMAN participants, age was the most significant factor in determining cardiovascular risk.

Overall, the results of this dissertation did not confirm the findings of other similar WISEWOMAN studies. Of the eight total WISEWOMAN studies that focused on change in biomarkers, six of them demonstrated positive results in that the interventions were effective. The methods used in previous WISEWOMAN studies differ greatly based on location, sample size, demographics, random assignment, intervention intensity,

longevity and funding level, as well as the overall analysis. The results of this dissertation do not support the research hypotheses and therefore are not supportive of the current WISEWOMAN intervention component in promoting change among underinsured and uninsured women residing in South Dakota.

### Limitations

The results of this study are limited in that regional and cultural differences, as well as participation in the South Dakota WISEWOMAN program may influence perceived barriers to intervention attendance and health behavior change. Women in the more remote areas of the state are less likely to participate in the face to face intervention sessions than those women residing in more urban areas (South Dakota Department of Health, 2009). In addition, the sample was limited to participants eligible to participate in the South Dakota WISEWOMAN cohort and subjects were not randomly assigned to group (comparison vs. intervention). The implementation of the WISEWOMAN program in this state did not take into account a woman's readiness to change and differing levels of risk. Participants were assigned to an LSI according to their bio-marker levels, not in relation to a woman's risk, perceived risk, and readiness to change. Many women do not attend an LSI because they do not perceive their risk to be elevated.

Participants were advised to fast before blood tests, but no means of verification was available. Consequently, some measurement error may have been introduced into laboratory tests, thus increasing random fluctuation. Any such error would have been randomly distributed between groups and should not have introduced systematic bias.

The results of this dissertation study did not take into account confounding variables that were not measured or analyzed. The reality that attendance of intervention

sessions is crowded out by other obligations highlights the difficulty of attracting women to attend intervention sessions. In 2001, Krummel and colleagues recommended that public health programs target broad environmental influences on health. Rural communities are challenged in providing fresh fruits and vegetables in the local grocery stores. These same communities also lack environments where women can walk safely in extreme weather conditions. Nearly two-thirds of SD WISEWOMAN participants are working (South Dakota Department of Labor, 2007), therefore making childcare an issue. Other variables that were not taken into account include other co-occurring health issues, motivation, cultural beliefs/norms, cost (both monetary and time), transportation, weather, and support from family and friends.

Methodological issues in the sample for this research limit the external validity of this study. Since clients were not randomly assigned to groups, unmeasured variables could confound the results. Another limitation of the study is the absence of medication histories for each participant. The South Dakota Department of Health or MaxTrac chose not to include medications in the MDE (minimal data elements) that it collects because all participants in need of medications were referred to the Department of Social Services RX Access program.

American Indian data are lacking in this dissertation study because of a simple billing issue. Indian Health Service (IHS) does not submit bills to the South Dakota WISEWOMAN program for screening. If the program does not pay the bill, then the woman can not be enrolled in the WISEWOMAN program. This is a relatively straightforward problem to fix; however, it has been ongoing since the program began.

### Recommendations for Future Research

More research is needed in order to confirm or dispute the findings reported here. A randomized experiment should be undertaken to test the assumption that selection bias did not affect the conclusions of this observational study. Specifically, the possibility that women who attended the lifestyle sessions were clinically, socially or psychologically different from those who only participated in screening should be investigated.

### Recommendations for Action and Implications for Social Change

The results of this dissertation indicated that programs intending to promote improved lifestyles among disadvantaged women should rely heavily on screenings to identify diseases that otherwise would go undiagnosed. The data presented here do not support continued reliance on the full WISEWOMAN program package, since the lifestyle change sessions appear to not offer an incremental improvement in biomarkers.

### Dissemination Plan

Dissertation results will be disseminated in a timely, responsible, and respectful manner to the South Dakota WISEWOMAN program, the South Dakota Department of Health, CDC, State of South Dakota legislators, as well as other stakeholders and community coalitions that could be potentially impacted by the research results and conclusions. The results will be shared via state and national poster/oral presentations, peer reviewed journal articles, and special executive summaries.

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## CURRICULUM VITAE

### Education

Doctoral Candidate- Public Health/Community Health Promotion and Education  
Walden University  
2005-2009

Masters Degree in Community/Public Health  
University of Northern Iowa, Cedar Falls, Iowa  
Certificate in Global Health  
2000

B.A. Degree in Health Education  
University of Northern Iowa, Cedar Falls, Iowa  
Concentration in Maternal and Infant Health/International Health  
1999

### Career History & Accomplishments

#### **Chronic Disease Epidemiologist South Dakota Department of Health --2005-present**

- Assess present chronic disease/MCH data and define the impact of chronic disease on state residents and the health care system
- Assist the department in the use of health data, specifically population-based data, to plan and evaluate health promotion and disease prevention efforts
- Design and maintain continuous surveillance systems related to morbidity, mortality, quality of life and health care for selected chronic disease or MCH and risk factors of epidemiologic importance for chronic disease
- Conduct evaluations of state chronic disease control efforts and MCH programmatic activity; Determine if programs are having intended effect; Evaluate program efforts to ensure they meet established disease prevention, control, and health promotion objectives
- Translate findings from epidemiologic analyses into prevention and control recommendations to ensure appropriate public health measures
- Assist in evaluation of the collection, interpretation and utilization of health information, data, and statistics to support department planning, priority setting and policy making.
- Make recommendations for revisions in statute, law or regulation as needed to address public health issues
- Provide input into legislative process Evaluate health legislation on MCH an chronic disease or its risk factors

- Write scientific manuscripts for newsletters, professional journals, reports, newsletters, peer-reviewed journal publications, etc.  
2005-present

**Provider Service Coordinator, Pathways Behavioral Services, Waterloo, IA-- 2001-2005**

- Worked directly with Executive Director and senior management in large substance abuse treatment agency serving all of northeast Iowa.
- Researched and wrote grants, financial, and feasibility reports concerning new programming acquisitions and acquisition prospects.
- Played key role in preparing a successful \$5 million federal grant proposal to provide the company's substance abuse services to all of northeast Iowa.
- Prepared all outcome measurement reports and service contracts for the CEO.

**Decatorization/Empowerment Coordinator, Iowa State University--2001-2002**

- Handled administrative functions for the Iowa State University children's programming located throughout the state of Iowa. The programs served youth ages 0-18.
- Grant writer for the State of Iowa
- Program oversight and management of all service contracts.
- Established the Children's Welfare Reform Report for the State of Iowa

**Public Health Educator, Black Hawk County Health Department—1999-2000**

- Public health educator on topics including safe sexual practices, sexually transmitted diseases, tuberculosis, HIV/AIDS, and alcohol/tobacco prevention.
- Grant writer for the Black Hawk County Health Department
- Program presentation and evaluation reports

**Public Health Administrator, St. Jude's Hospital—St. Lucia, West Indies--1998-1999**

- Establishment of prevention programs targeting citizens of rural St. Lucia.
- Program oversight of public health outreach programming including diabetes check-ups, eye exams, blood pressure screenings, breastfeeding instruction, and hygiene programs.

**Founder/Director, New Frontier Crisis Center, St. Lucia, West Indies--1998-1999**

- Handled all administrative functions for an internationally funded domestic violence shelter for women in St. Lucia.
- Created longstanding volunteer based employees through the United States Peace Corps.

**Project Director, Global Health Corps, Cedar Falls, Iowa--1995-2000**

- Executive management position for Global Health Corps, a non-profit, humanitarian aide agency housed at the University of Northern Iowa. Handled all administrative functions for domestic/international health promotion planning, implementation, and evaluation. Served as research assistant during my undergraduate and graduate training while at the University.

**Publications**

Khavjou, O., Clarke, J., Hofeldt, R., Lihs, P., Loo, R., Prabhu, M., Schmidt, N., Stockmyer, C., & Will, J. (2007). A captive audience: Bringing the WISEWOMAN program to South Dakota prisoners. *Women's Health Issues, 17*(4), 193-201.

Winter, C., Ahrendt, L., Clarke, J., & Moline, H. (2009). Tobacco use among South Dakotans. *South Dakota Medicine: Special Issue, 29-34*.

**Memberships & Affiliations**

- Member, Council of State and Territorial Epidemiologists
- Member, American Public Health Association
- Member, South Dakota Public Health Association
- Member, National Association of Chronic Disease Directors