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Rebecca White

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THE EFFECTIVENESS OF AN INCENTIVIZED PROGRAM TO INCREASE
DAILY FRUIT AND VEGETABLE DIETARY INTAKE
BY LOW INCOME, MIDDLE-AGED WOMEN

A thesis submitted In
Partial Fulfillment of the Requirements
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at Minnesota State University, Mankato

by
REBECCA WHITE, B.S., RN

MAY 2012

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DAILY FRUIT AND VEGETABLE DIETARY INTAKE BY LOW INCOME,
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Rebecca White

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ABSTRACT

THE EFFECTIVENESS OF AN INCENTIVIZED PROGRAM TO INCREASE DAILY FRUIT AND VEGETABLE DIETARY INTAKE BY LOW INCOME, MIDDLE-AGED WOMEN

WHITE, REBECCA, B.S., RN, Minnesota State University, Mankato, 2012. 67pp.

Little is known about the effectiveness of the *SagePlus*' Smart Choices Fruits and Vegetables Program's influence on behavior change and the effects of that behavior change on the cardiovascular health of the participants. The purpose of this study was to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program at increasing the number of fruits and vegetables in participants' diets and decreasing their cardiovascular disease risk factors. A nonexperimental, descriptive correlational design was used in this study. The Minnesota Department of Health provided data from 327 *SagePlus* participants that had re-enrolled in the *SagePlus* Smart Choices Fruits and Vegetables Program. Baseline and re-enrollment Cardiovascular Disease risks and per day fruit and vegetables serving consumption was assessed on all participants. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 12. Findings revealed low participation in the incentive card return program. Of those that returned at least one card, only 31% reached the goal of 1,000 servings and thus received the gift card. The majority of participants did not change their daily consumption of fruits and vegetables through the participation year. An additional serving of fruit (28%) and vegetables (24%) were added to the daily consumption of approximately a third of

the participants at re-enrollment. There was not a statistically significant change in the Framingham Risk Scores from the initial enrollment to re-enrollment.

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CHAPTER I

INTRODUCTION

Background and Significance of the Problem

Cardiovascular disease (CVD) is a condition that affects blood flow and functioning of the heart. The most common type of heart disease is coronary artery disease (CAD). CAD accounts for more deaths in women than all cancers combined and is the leading cause of death in women throughout the United States [U.S.] (Villablanca et al., 2010). In Minnesota, approximately 19% of all deaths are due to heart disease, making it the second-leading cause of death in the state behind cancer (Minnesota Department of Health [MDH], 2011). Mortality rates from CAD in postmenopausal women are virtually equal to those of men (MDH, 2011).

In 2007, the U.S. total healthcare costs related to CVD exceeded \$177 billion. In Minnesota, healthcare costs for inpatient hospitalizations in 2008 were over \$1.79 billion due to CVD (MDH, 2011). Programs that promote health and prevent the incidence of CAD can potentially reduce these costs. The World Health Organization defines health promotion as a process, which enables people to increase control over their health and its determinants and thereby improve their overall health (Participants at the 6th Global Conference on Health Promotion, 2005).

WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) is a health promotion program aimed at removing disparities in health care by addressing the screening and intervention needs of midlife uninsured and underinsured

women. This program is funded by the Centers for Disease Control and Prevention [CDC] (Will, Farris, Sanders, Stockmyer, & Finkelstein, 2004). WISEWOMAN provides women with heart disease risk factor testing, lifestyle interventions, and referral to health providers at no or low cost. The CDC currently funds 21 WISEWOMAN programs, available in 19 states and 2 tribal organizations (CDC, 2011). CDC's sister program to the WISEWOMAN is the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). These programs were both born from the same public health act, however WISEWOMAN focuses on CVD and NBCCEDP on breast and cervical cancer screening and prevention. NBCCEDP provides access to breast and cervical cancer screening services to underserved women in all 50 states, the District of Columbia, 5 U.S. territories, and 12 tribes. Sage and Sage*Plus* are the Minnesota versions of the national NBCCEDP and WISEWOMAN programs.

Sage offers cervical and breast cancer screening for uninsured or underinsured women from 40 to 64 years of age with subsequent diagnostics and treatment (MDH, 2011). This program was developed in 1991 as part of the Center for Disease Control's (CDC) National Breast and Cervical Cancer Early Detection Program (NBCCEDP). Currently, Sage screening, diagnostic, and treatment services are performed at over 150 clinics throughout Minnesota. The Sage*Plus* program was established in 2004 as part of the Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMEN) developed by the CDC. Eligibility is determined by enrollment in the Sage program, having no insurance or being underinsured, and meeting age and income guidelines. Women who enroll in the Sage program may also enroll in the Sage*Plus*. They may not enroll in the Sage*Plus* independently from the Sage program. Women

enrolled must agree to learn about healthy lifestyle changes and consider making changes toward a healthier lifestyle. Participants are required to participate in cardiovascular screenings and encouraged to return for follow-up and annual screenings (MDH, 2011).

Women who agree to be part of the Sage*Plus* program receive free blood pressure measurement, body mass index calculation, and serum cholesterol and glucose screening. They also receive free lifestyle coaching in the areas of diet, exercise, and smoking cessation. Participants are encouraged to participate in a smart choices program in addition to the screenings. They can choose to enroll in the “steps program” which focuses on increasing activity and/or the “fruits and vegetables program” which focuses on increasing fruit and vegetable intake. Both programs have a tracking system using pre-addressed postage paid postcards for the participants to report their weekly activity level or fruit and vegetable serving intake. Both programs offer performance-based incentives for participation (MDH, 2011).

In the Sage*Plus* Smart Choices Fruits and Vegetables Program, participants try to increase the number of fruit and vegetable servings consumed per day. The goal is for the participants to consume the recommended five to nine daily servings by adding them to their diet or substituting them for a less healthy food (MDH, 2011). Weight control is very important for CVD risk reduction. Nearly 70% of midlife and older women are overweight or obese (Folta et al., 2009). Diet is a very important part of weight control. The current recommendation from the United States Department of Agriculture (USDA) is that half of your plate should be fruits and vegetables (USDA, 2011). The current recommendation for women is to consume 2-2.5 cups of vegetables and 1.5-2 cups of fruit per day (USDA, 2011). In Minnesota, 31.2% of the adult population consumes 2 or

more servings of fruit per day and 26.2% consume 3 or more vegetable servings per day (CDC, 2010). Both of these are below the national intake average for women, which are 36.1% and 30.9% respectively (CDC, 2010).

Persons at high risk of CVD can be effectively identified through the use of the Framingham Risk Equation. The Framingham Risk Equation is a predictive equation borne out of the Framingham Heart Study, which started in 1948 and has been operational for more than 60 years. This equation utilizes measurements of several known risk factors to predict CVD end point probabilities for the individual at multiple intervals of time (Anderson, Odell, Wilson, & Kannel, 1991).

Statement of the Problem

The *SagePlus* program utilizes the Smart Choices Fruits and Vegetables Program to reinforce diet modification teaching resulting in behavior change. As an incentive for the consumption of 1,000 servings of fruits or vegetables, participants receive a \$20 gift card. Little is known about the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program's influence on behavior change and the effects of that behavior change on the cardiovascular health of the participants.

Statement of the Purpose

The purpose of this study is to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program at increasing the number of fruits and vegetables in participants' diets and decreasing their cardiovascular disease risk factors. The five specific research variables to be studied are: the number of fruit and vegetable servings consumed on a daily basis, the percent of participants that reach the goal of 1,000 servings, the change and the direction of that change in the number fruit and vegetable

servings consumed following 1 year in the *SagePlus* program, and the relationship number of fruits and vegetables servings had on cardiovascular disease risk profile of the participants. The overall goal of this study is to determine the effectiveness of an incentive driven behavior modification program to increase fruit and vegetable intake and decrease CVD risk in socioeconomically challenged women.

Research Questions

The research questions for this study are:

1. What percent of *SagePlus* smart choice participants submit their fruit and vegetable serving postcards to completion of the 1,000 servings incentive receiving the \$20 gift card?
2. Did women who participated in the *SagePlus* Smart Choices Fruits and Vegetables Program report a change in the number of fruits and vegetables in their diet at the 1-year re-enrollments?
3. Is there a change in the Framingham Risk Score from the initial *SagePlus* enrollment to re-enrollment 1 year later in women who participated in the Smart Choices Fruits and Vegetables Program?
4. Is there a relationship between the reported fruit and vegetable intake at initial and re-enrollment and the Framingham Risk Scores in women who participated in the Smart Choices Fruits and Vegetables Program?

Definition of Terms

Behavior modification: A kind of therapy that involves the use of basic learning techniques, such as conditioning, reinforcement, or aversion therapy, to teach simple skills or alter undesirable behavior (Mosby's Medical Dictionary, 2006, p. 202).

Cardiovascular disease risk factors: Modifiable and nonmodifiable variables that increase or decrease a person's risk of developing cardiovascular disease (American Heart Association, 2011).

Diet modification: An alteration, adjustment, or limitation on acquired or learned food preferences or dietary habits.

Healthy lifestyle changes: Changes made in a person's daily life that will improve her health and well-being.

SagePlus: A health promotion program for eligible women between the ages of 40 to 64 at risk for CVD.

Self-efficacy: A self-judgment of one's capability to accomplish a certain level of performance (Chiou et al., 2009).

Assumptions

For the purposes of this study, the following assumptions are made.

1. All study participants have truthfully completed the program completion cards.
2. All study participants truthfully completed the enrollment application.
3. All study participants are at risk for heart disease.
4. All study participants are willing to learn about healthy lifestyles.

Limitations

Women may have been influenced by motivating factors other than the Smart Choices Fruit and Vegetable Program to increase their daily intake of fruits and vegetables. Extraneous variables such as an intentional weight loss diet, stress reduction, and/or medication may have played a role in reducing cardiovascular risks. Body Mass Index (BMI) may not accurately represent the amount of body fat a person has. Frame size or a low or high muscle mass may skew the interpretation of the BMI. Women involved in this study were self-selected through their enrollment in the *SagePlus* program, showing a pre-study interest in diet modification. Conclusions from the study are age specific and limited to *SagePlus* participants and are not applicable to the general population

Summary

The *SagePlus* program was established in 2004 as a way to provide screening and health promotion to decrease the CVD risk of low income, un- or underinsured women ages 40 to 64. Participants in the program learn to make healthy lifestyle changes through coaching related to diet, exercise, and smoking cessation. Little is known about the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program's influence on behavior change and the effects of that behavior change on the cardiovascular health of the participants. The purpose of this study is to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program as a method to increase fruits and vegetable in the diet of participants and thus influence the cardiovascular disease risk factors of these individuals.

CHAPTER II

REVIEW OF RELEVANT LITERATURE AND THEORETICAL FRAMEWORK

The purpose of this study is to evaluate the effectiveness of the Sage*Plus* Smart Choices Fruits and Vegetables Program at increasing the number of servings of fruits and vegetables in participants' diets and decreasing the cardiovascular disease risk factors of enrolled participants. The following literature review presents the current evidence regarding behavior modification to reduce cardiovascular disease risk factors, Framingham Risk Score, socioeconomic status, impact of diet on cardiovascular disease risk factors; fruits and vegetables diet modification, incentivized programs, and the theoretical framework for the study.

Literature pertaining to the study was reviewed for the years 1999 to 2011 using the following databases: Cumulative Index for Nursing and Allied Health Literature (CINAHL), ProQuest, Nursing & Allied Health Source, Medline (pubmed), review of cited articles, Centers for Disease Control (CDC), as well as general internet searches. Search terms were: cardiovascular disease risk factors, behavior modification, diet modification, fruits and vegetables, socioeconomic, incentive programs, Wisewoman, Sage, Sage*Plus* and women.

Behavior modification to Reduce Cardiovascular Disease (CVD) Risk

Reducing risk factors for CAD through behavior modification can improve health outcomes and reduce morbidity and mortality thus reducing medical costs associated with CAD (Chiou et al., 2009). Despite knowledge that maintaining an ideal body weight,

exercising at least 30 minutes per day, eating five servings of fruits and vegetables daily, and abstaining from smoking are all beneficial in cardiovascular health; only 6.3% of patients with coronary artery disease (CAD) maintain these healthy habits (Chiou et al., 2009).

Chiou et al. (2009) evaluated the factors associated with behavior modification for the reduction of cardiac risk factors. The subjects of this study included 125 northern Taiwanese men and women between the ages of 38 to 88, who had previously been diagnosed with CAD, with a mean age of 70 years. The subjects completed a structured questionnaire that included demographic information, clinical characteristics, knowledge of cardiovascular disease risk factors, a risk factor profile, cardiovascular risk factor modification behaviors, health beliefs, self-efficacy, and social support. Physiologic variables included blood pressure measurement, CAD severity (number of vessels involved), New York Heart Association functional class, and blood serum cholesterol level.

Modifying behavior potential was determined by self-efficacy, actual risk factors, work status, and health beliefs. Self-efficacy was found to be the strongest predictor of modifying behavior for cardiovascular disease risk factors. A significant correlation was also found between cardiovascular risk factor knowledge and modifying of behaviors to reduce these risk factors. Health beliefs were also found to be a significant predictor of behavior change. This study confirmed an individual's success in modifying behavior is significantly correlated to higher perceived benefit of the modified behavior and lower perceived barriers. However, no significant correlation was found between modifying behaviors and perceived threat of heart disease.

Eriksson, Westborg, and Eliasson (2006) conducted a randomized control trial within a primary care clinic in Northern Sweden. The goal of their behavior modification intervention was to reduce cardiovascular disease risk factors. A cohort of 151 middle-age men and women diagnosed with hypertension, dyslipidemia, type II diabetes, or obesity were enrolled in the trial.

Participants were placed in a control group or the intervention group. A total of 123 participants completed the 1-year follow-up. The intervention group was divided into six groups of 10 to 13 participants, grouped based on baseline fitness and age. During the first 3 months, the intervention groups participated in three weekly sessions of supervised exercise training. During this 3-month intervention period, the intervention groups had five 20-minute long sessions with a dietitian, receiving both written and verbal information. Following the initial 3 months, each intervention group was invited to attend six monthly follow-up meetings. Intervention groups also had an end-of-study meeting that focused on each individual participant's current physical activity and diet; and maintenance of a physical active lifestyle and new diet habits. The control group received usual care and treatment at the primary care clinic and was invited to a single meeting where they were educated on the relationship between lifestyle and CVD risk factors.

After 1 year, the intervention group significantly increased their maximal oxygen uptake, physical activity, and quality of life and significantly decreased body weight, waist and hip circumference, body mass index, waist-hip ratio, blood pressure, triglycerides, and glycosylate hemoglobin. There were significant differences between the control and intervention group in the areas of mean change in waist circumference,

waist-hip ratio, and diastolic blood pressure. Eriksson et al. (2006) found that a prevention program in primary care with a focus on supervised activity and diet counseling, followed by structured follow-up meetings, can favorably influence several risk factors for CVD and quality of life in high risk subjects.

Fleury and Sedikides (2007) utilized qualitative descriptive methods in an effort to understand the role self-knowledge played in the modification of cardiovascular disease risk factors. The study included 17 men and 7 women who had previously been diagnosed with CVD and were in the process of initiating or sustaining behavior modification programs in order to reduce the risk factors for CVD. The participants' ages ranged from 38 to 79, with a mean age of 58. Data collection involved the use of multiple structured interviews as the individuals attempted to implement health behavior change over 7 months. Interview data provided relevant information about the role of self-knowledge in guiding efforts to modify cardiovascular risk. The content of self-knowledge consisted of the delineation of valued goals, health outcomes, and outcome-consistent action statements. Participants described health-related self-knowledge in terms of three socially and contextually situated patterns: representational process, evaluative process, and behavioral action process. Participants generated plans for action, strategies for negotiating the social context, and mechanisms for self-regulation needed to achieve the desired behavioral change. These patterns of self-knowledge were interrelated rather than mutually exclusive and illustrate the complexity of self-knowledge in motivating behavior change.

Villablanca et al. (2010) focused their study on high-risk women. Target groups for this study included women older than 60 years of age, minority women, and women

who resided in rural communities. They utilized a model of comprehensive care involving medical screenings, health behavior counseling, risk behavior modifications, and evidence-based AHA/ACC guidelines for CVD prevention in women as enhancements to the usual heart care of women. Participating heart centers implemented enhanced care interventions in the areas of heart health education about gender differences in CVD symptoms, risk factor prevalence, and CVD as the leading killer of women. Educational interventions included instruction on heart healthy recipes, food preparation, and body mass index (BMI) goals specific for women. The heart centers implemented care with an awareness of gender issues in cardiac diagnostics and rehabilitation.

Villablanca et al.'s (2010) study sample included 1,310 women who had not been exposed to previous care at the participating heart centers. A pre and post-evaluation of an educational intervention was conducted between September 2005 and June 2008. Post-evaluation was conducted 6 months after intervention. Demographics, before and after knowledge surveys, clinical diagnoses, laboratory parameters, and Framingham Risk Scores were collected. Changes in CVD knowledge, awareness, and risk reduction outcomes were determined during post-evaluation.

Over half of the women in the cohort had an intermediate to high Framingham Risk Score at baseline. Nearly one quarter of the women were diabetic, and 15% had established CVD. Forty percent of the women were hypertensive and on antihypertensive medications, while an additional 34% reported poor blood pressure control. Over 38% of the women were obese (BMI >30 kg/m²), with a mean cohort BMI of 32.2. Nearly 40% of women were hyperlipidemic.

All knowledge of CVD and risk factors improved significantly by the 6-month post-evaluation. The effects of the interventions were evaluated on each of the six major CVD risk factors: obesity, physical activity, hypertension, diabetes, cholesterol, and smoking history. In post-evaluation a 4.1% increase was observed in participants whose blood pressure was controlled and below hypertensive levels of 140/90. A statistically significant 4.7% decrease was observed in the proportion of women with Total Cholesterol (TC) >240 mg/dL and a 4.5% decrease in the proportion of women with TC >200 mg/dL. The proportion with HDL-C <50 mg/dL decreased by 5.9%, and the proportion with HDL-C <40 mg/dL decreased by 4.4%. No significant reduction was observed in diabetic control and obesity. No significant increase in the proportion of women who engaged in physical activity was observed at the 6-month follow-up. Villablanca et al. (2010) found that CVD prevention built around a comprehensive heart care model program and AHA/ACC Evidence-Based Guidelines can be successful in improving knowledge and awareness, and in reducing CVD risk factors.

Framingham Risk Score

Kannel, McGee, and Gordon established the original Framingham risk function profile in 1976. They determined that a person at risk of CVD could be effectively identified from a measurement of serum cholesterol blood pressure, smoking history, an electrocardiogram, and a determination of glucose intolerance. Regression coefficients were determined for incidence of CVD for specific risk factors. These coefficients were then placed in an equation to determine the potential incidence of CVD. This principle is utilized in determining the individual potential risk of CVD.

DeFilippis et al. (2011) compared the Framingham Risk Score and the Reynolds risk scores with subclinical atherosclerosis, assessed by incidence and progression of coronary artery calcium (CAC). This multi-ethnic study of atherosclerosis was a prospective cohort study of 5,140 participants ages 45 to 84 recruited from six U.S. communities from 2000-2002. This cohort was 53% female and free of baseline CVD. All participants underwent risk factor assessment, as well as baseline and follow-up CAC testing. Among 53% of participants with no baseline CAC, 18% developed incident CAC. Both the Framingham Risk Score and the Reynolds risk score were significantly predicative of incident CAC and CAC progression, both with a 95% confidence interval.

Brindle et al. (2005) examined the accuracy of the Framingham Risk Score in different socioeconomic groups in a population with high rates of CVD. They assessed the ability of the Framingham Risk Score to predict 10-year cardiovascular and coronary heart disease death in individuals from different socioeconomic classes ranging from deprived to affluent. Brindle et al. did a secondary analysis of data that was collected by Refrew and Paisley, between 1972 and 1976. The subject cohort included 5,626 men and 6,678 women aged 45–64 years, from the general population of the cities of Renfrew and Paisley in the west of Scotland. These individuals were screened for cardiovascular disease risk factors. Social class was determined by home address and regular occupation. Participants were categorized into three groups, defined as affluent, intermediate, or deprived. To determine observed cardiovascular risk, participants were flagged at the General Register Office and CVD and coronary heart disease deaths were identified over 10 years of follow-up. The predicted probabilities of CVD and coronary heart disease mortality within 10 years were calculated for each participant using the

relevant Framingham equations. The average predicted mortality rates within each category of deprivation were compared with the observed 10-year rates.

Brindle et al. (2005) applied the Framingham CVD equation to the Renfrew and Paisley baseline data and identified 4.8% of the participants as being at a >40% 10-year CVD risk. The observed results were that 18.8% of the participants resulted in cardiovascular death. The Framingham score under predicted CVD risk in participants with nonmanual occupations by 31% compared to 48% in the manual occupation participants. There was a trend of worsening under prediction of CVD for participants in deprived areas. Brindle et al. found that the Framingham score underestimates the risk of CVD death in men and women from a population with high levels of socioeconomic deprivation and high rates of cardiovascular mortality. The underestimation is significantly greater in people from manual occupations and who live in deprived areas, than in more affluent people.

Tunstall-Pedoe and Woodward (2006) also found that deprived socioeconomic status is a predictor of underestimation of cardiac risk utilizing the Framingham risk score. Their study sample included 6,419 men and 6,618 women aged 30 to 74, free of CVD at baseline, followed for mortality and morbidity. Participants were allocated to population fifths of the Scottish index of multiple deprivation (SIMD), and their observed coronary risk was compared with that expected from the Framingham score for all coronary heart disease. The relative risk of observed 10-year coronary risk (sexes combined) analyzed across population fifths had a steep gradient, from least to most deprived, of 1.00, 1.81, 1.98, 2.22, and 2.57. Expected risk, calculated from baseline risk

factor values and the Framingham score, had one quarter of that gradient, with relative risks of 1.00, 1.17, 1.19, 1.28, and 1.36.

Tunstall-Pedoe and Woodward (2006) determined that cardiovascular risk estimated by the Framingham and related scores were misleading in guiding treatment decisions among people at different levels of social deprivation. Such scores foster relative under treatment of the socially deprived, exacerbating the social gradients in disease.

Women's Socioeconomic Status and its Impact on CVD Risk Factors

Shaw et al. (2008) evaluated the independent contribution of socioeconomic factors on the estimation of length of time from present to CVD-related death or myocardial infarction. Their secondary purpose included an examination of cardiovascular costs and quality of life within socioeconomic subsets of women. Data was collected from women enrolled in the National Institute of Health Women's Ischemia Syndrome Evaluation (WISE) program. The cohort included 819 women seeking evaluation of chest pain symptoms and those referred for clinically indicated coronary angiography. An entrance evaluation survey collected detailed demographic and medical history, blood pressure, and heart rate. Socioeconomic factors collected were ethnicity, marital status, highest level of education, retirement status, employment and vocational status, disability status, income, and health insurance coverage.

In follow-up, participants were contacted at 6 weeks and then yearly for 5 years. During contact, a scripted interview was used to determine cardiovascular hospitalizations or death. Causality of death was determined by evaluation of death

certificates or medical records. Data on medication use, office or community health clinic visits, and cardiac procedures was also collected.

Low-income women were defined as those with an annual household income of \$20,000 or less. Shaw et al. (2008) found that women earning <\$20,000 per year (i.e., low income) had a greater degree of comorbidity and symptom burden, including more typical angina and angiographic coronary disease. Fewer women from low-income households were married compared with women with a household income of \$50,000. Less than 1 in 10 higher-income women were non-Caucasian. Approximately one in three low-income women were African American. Women from low-income households more often perceived their health as fair/poor and had a reduced perceived quality of life.

Socioeconomic factors that were associated with an elevated risk of cardiovascular death or MI included: an annual household income <\$20,000; <9th grade education; being African American, Hispanic, Asian, or American Indian; on Medicaid, Medicare, or other public health insurance; unmarried; unemployed or employed part-time, or working in a service job. Of these socioeconomic factors, low income was the highest predictor of cardiovascular death or myocardial infarction in risk-adjusted models that controlled for angiographic coronary disease, chest pain symptoms, and cardiac risk factors. Low-income women were more often uninsured or on public insurance, yet had the highest 5-year hospitalization and drug treatment costs. Low-income women consumed more healthcare resources and had higher cardiovascular healthcare costs during follow-up. Given the higher risk status, greater risk factor burden, and more prevalent coronary disease in low-income women, this was expected.

Neighborhoods in which low income women live also play a role in healthy lifestyle choices. Jilcott et al. (2006) analyzed the responses of 236 North Carolina WISEWOMAN participants. In this clinic-based intervention, environmental factors related to a healthy lifestyle were assessed. Participants reported a variety of problematic neighborhood characteristics, including a scarcity of restaurants with healthy food choices (41% reported as a problem); not enough farmer's markets or produce stands (50%), not enough affordable exercise places (52%), not enough physical activity programs that met women's needs (42%), heavy traffic (47%), and speeding drivers (53%). Overall, women knew little about affordable exercise venues and nutrition classes. The results indicated the need for effective and feasible intervention strategies to address the environments in which uninsured or underinsured women are making behavior changes.

Ghaed and Gallo (2007) evaluated how the subjective perceptions of personal social status may relate to health beyond the effects of objective socioeconomic status. Ninety-two women (90.2% Caucasian) completed ladder-based, pictorial self-report measures of subjective social status relative to others in their community and in the United States. Psychosocial measures of depression, anxiety, pessimism, stress and social support, and behavioral risk factors of fruit and vegetable consumption, leisure physical activity, and BMI were obtained.

Ghaed and Gallo (2007) found that community subjective social status was significantly inversely related to anxiety, pessimism, stress, daytime ambulatory activity, and diastolic blood pressure after controlling for objective socioeconomic status. Women with lower perceived status showed less healthy dietary and exercise behaviors and,

contrary to predictions, lower clinic and ambulatory diastolic blood pressure. This study provided additional evidence that perceptions of one's position in the social hierarchy could have important health implications beyond the impact of objective socioeconomic status. The cardiovascular risk implications of perceived community versus U.S. social status appear to be distinct.

Khare et al. (2009) presented the baseline data of women recruited into the Illinois WISEWOMEN program (IWP). This program was designed to evaluate and subsequently decrease the CVD risk profile of lower socioeconomic status women in Illinois. Women were recruited from the Illinois breast and cervical cancer program, which serves uninsured and underinsured women ages 40 to 64, at or below 200% of poverty. Data collected at the baseline visit included: demographic information, health history assessment, an anthropometric assessment of height, weight, and waist circumference and a clinical assessment of fasting blood cholesterol, blood sugar and blood pressure. Baseline data comparison with national statistics showed that women within the IWP had a higher prevalence of obesity and smoking than similar national samples.

The Impact of Diet and CVD risk factors

Brunner et al. (2008) analyzed the prospective relationship of dietary patterns with incident chronic disease and mortality during the 15-year follow-up of the Whitehall II study. Respondents were recruited to the Whitehall II study in 1985–1988 from 20 civil service departments in London. During phase 3 of the Whitehall II study, respondents were sent a food-frequency questionnaire, with 7,935 individuals (92%) returning it fully completed. Respondents were divided into four clusters based on their

responses: unhealthy, sweet, Mediterranean-like, and healthy. Employment grade within the Civil Service, in 6 levels, was used as the measure of adult socioeconomic position. Annual salary in August 1992 was in the range of £6,483 to £87,620.

There were clear differences in the food intakes across the clusters. Fruit and vegetable intake was almost twofold higher among those with a healthy or Mediterranean-like pattern than among those with an unhealthy pattern. Nutrient intakes reflected food intakes, with a low ratio of unsaturated to saturated fat in the sweet pattern and a high ratio in the healthy pattern. The Mediterranean-like and healthy patterns had relatively high antioxidant and fiber densities. The prevalence of diabetes varied by cluster, but nonfatal myocardial infarction showed no variation. After adjustment for age, sex, ethnicity, and energy misreporting, the Mediterranean-like pattern was associated with low all-cause mortality. Fatal and nonfatal myocardial infarction event rates were lower in the Mediterranean-like and healthy diet groups.

Fung, Willett, Stampfer, Manson, and Hu (2001) examined the association between dietary patterns and CVD risk among 69,017 women aged 38 to 63 years, without history of major chronic diseases. Utilizing dietary information from a food frequency questionnaire from the Nurses' Health Study and the Health Professionals' Follow-up Study, two major dietary patterns were identified. The "prudent" dietary pattern which contained fruits, vegetables, whole grains, legumes, poultry, and fish. The "Western" dietary pattern was primarily refined grains, processed and red meats, desserts, high-fat dairy products, and French fries.

Participants with the high prudent-pattern scores tended to smoke less; use more vitamin supplements; drink more alcohol; consume more folic acid, fiber, and protein;

and consume less saturated and monounsaturated fats. They also had higher intakes of fruits, vegetables, whole grains, and low-fat dairy products. Western-pattern scores were more likely to be current smokers, use fewer vitamin supplements, consume more fat, and consume less folate and fiber. Their diets also contained more red and processed meats, eggs, butter, and refined grains.

After adjustment for age, a higher prudent dietary pattern was associated with a lower risk of CHD incidents. In contrast, a higher Western dietary pattern was associated with a higher risk of myocardial infarction. Fung et al. (2001) concluded that a diet high in fruits, vegetables, whole grains, legumes, poultry, and fish and low in refined grains, potatoes, and red and processed meats may lower risk of CHD in women.

Cicero, Dormi, D'Addato, and Borghi (2010) evaluated whether a nutritional educational intervention was able to balance the metabolic effects of incident menopause in a sample of perimenopausal women. Body mass index, blood pressure, plasma lipids, fasting plasma glucose, and prevalence of metabolic syndrome were measured in perimenopausal nondiabetic women involved in the Brisighella Heart Study, a general population cohort. These results were collected before and after implementation of a nutritional educational program aimed at improving cardiovascular risk profile of participants, following women through menopause. Prior to the intervention of the nutritional educational program, women undergoing menopause experienced a significant increase in BMI, systolic blood pressure, and plasma cholesterol. After the nutritional intervention, women undergoing menopause only experienced a statistically significant reduction in triglyceride plasma levels. However, a nonsignificant decrease was seen in BMI, systolic blood pressure, and LDL-cholesterolemia.

Fruits and Vegetables Impact on CVD Risk Factors in Women

A Harvard-based study (Hung et al., 2004), included 71,910 female participants in the Nurses' Health Study and 37,725 male participants in the Health Professionals' Follow-up Study, who were free of major chronic disease. Evaluating the relationship between fruit and vegetable intake and the incidence of cardiovascular disease. The Nurses' Health Study (NHS) was established in 1976, with the recruitment of 121,700 female registered nurses between the ages of 30 and 55 from 11 states. The Health Professionals' Follow-up Study was initiated in 1986 and consisted of 51,529 male dentists, optometrists, pharmacists, osteopathic physicians, podiatrists, and veterinarians who were between 40 and 75 years of age. At baseline, participants completed mailed questionnaires on lifestyle practices and medical history. Every 2 years, questionnaires were sent to update individual characteristics and behaviors and new occurrences of cancers, cardiovascular diseases, and other outcomes. Participants completed baseline semiquantitative food-frequency questionnaires and the health and dietary habits of these study participants were followed for 14 years. Hung et al. (2004) determined 1,964 cardiovascular events in women and 1,670 cardiovascular diseases in men during follow-up.

For men and women combined, participants in the highest quintile of total fruit and vegetable intake had a relative risk for major chronic disease of five times less than that of those in the lowest. Total fruit and vegetable intake was inversely associated with risk of cardiovascular disease. Participants eating at least five servings of fruits and vegetables daily had a 28% lower risk of cardiovascular disease than participants eating fewer than 1.5 servings per day.

Of the food groups analyzed, green leafy vegetable intake showed the strongest inverse association with cardiovascular disease. One serving per day of green leafy vegetables was associated with an 11% decrease risk of CVD.

Increased fruit and vegetable consumption was associated with a modest, although not statistically significant, reduction in the development of major chronic disease. The benefits appeared to be primarily for cardiovascular disease.

Liu et al. (2000) utilized a detailed food-frequency questionnaire to evaluate the eating habits of 39,876 female health professionals with no previous history of CVD in the evaluation of the hypothesis that higher fruits and vegetables intake reduces CVD risk. These women were then followed for an average of 5 years for incidence of nonfatal myocardial infarction, stroke, coronary angioplasty, coronary artery bypass graft, or death due to CVD. During the 5 years of follow-up, 418 incident cases of CVD, including 126 MIs, were documented within the cohort. After adjustment for age, randomized treatment status, and smoking, a significant inverse association between fruit and vegetable intake and CVD risk was observed. These findings support current dietary recommendations to increase the intake of fruit and vegetables as a primary preventive measure against CVD.

In the Arizona WISEWOMAN project, participants who received provider counseling, health education, and community health worker (CHW) support significantly increased the number of servings of fruits and vegetables consumed per day (Staten et al., 2004). A total of 217 women, of which three-fourths were Hispanic, were recruited from two Tucson clinics participating in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). Participants were randomly assigned to one of three

intervention groups: provider counseling, provider counseling and health education, or provider counseling, health education, and CHW support. At baseline and 12 months, participants were measured for height, weight, waist and hip circumference, and blood pressure. Blood serum analyses for glucose, cholesterol, and triglyceride levels were collected. At initiation and follow-up, participants completed a 24-hour dietary recall. Significantly more women in the intervention group that received the comprehensive intervention of provider counseling, health education, and CHW support progressed to eating five fruits and vegetables per day, compared with participants who received only provider counseling or provider counseling plus health education.

The Asian populations habitually consume a large amount of plant-based foods. Zhang et al. (2011) analyzed the effect that a plant-based diet has on all-cause mortality. The analysis included 134,796 Chinese adults who participated in either the Shanghai Women's Health Study or the Shanghai Men's Health Study. Dietary intake of plant based foods were assessed at baseline through interviews using food-frequency questionnaires. Deaths were ascertained by biennial home visits and state run vital statistics registries, over a period of 10 years for the women's health study and 4 years for the men's health study. Overall, fruit and vegetable intake was inversely associated with risk of total mortality in both women and men, and a dose-response pattern was particularly evident for cruciferous vegetable intake. Zhang et al.'s findings further support recommendations to increase consumption of vegetables, particularly cruciferous vegetables, and fruit to promote cardiovascular health and overall longevity.

Incentivized Programs

Incentive approaches based on behavioral economic concepts appear to be highly effective in inducing behavior change and weight loss (Klein, & Karlawish, 2010; Volpp et al., 2008a; Volpp et al., 2008b). Volpp et al. (2008a) conducted two pilot studies to determine whether a lottery-based daily financial incentive is feasible and to determine if addition of a financial incentive would improve Warfarin adherence and anticoagulation control. Subjects, whom had been on Warfarin for minimum of 3 months, participated in a pilot study with a lottery financial incentive with a 1 in 5 chance of a \$10 reward and a 1 in 100 chance of a \$100 reward, and were followed for 3 months. Each subject utilized a medication reminder system with a daily reminder chime and a record of when the pillbox was opened. Adherence to medication was measured by box openings on days that Warfarin should be taken and by no box opening on days that it should not be taken, and thus qualified participants for entrance into lottery for cash payout. If they were picked in the lottery to receive payout but did not meet compliance, they were notified that if they had been in medication adherence they would have received a financial reward.

The primary outcome measured was the proportion of out-of-range international normalized ratio (INR), based on the participant's prescribed INR range. The secondary outcome was patient adherence to medication as prescribed. The percent of out-of-range INRs decreased from 35.0% to 12.2% during the intervention, before increasing to 42% post-intervention. A daily lottery-based financial incentive demonstrated the potential for significant improvements in missed doses of Warfarin and time out of INR range (Volpp et al., 2008a).

Volpp et al. (2008b) found that incentives motivated people to lose weight. Fifty-seven healthy participants aged 30 to 70 years with a body mass index of 30 to 40 were randomized into three groups. Participants were placed in either the control group, a lottery group, with a chance to receive small or large financial rewards, or a deposit group, where they contributed their own money with matching funds and bonuses. Payouts were achieved when goal weight loss was met on a monthly basis. Those in the incentive group were able to win a lottery of \$10 to \$100 if they had met their weight loss goal for the month. The deposit group received their own contribution plus match when they met their goal weight or lost their contribution if they failed to meet their goal weight. The control group participated in a weight loss program with monthly weigh-ins. At the end of the 16 weeks, participants in both incentive groups lost significantly more pounds than the control group, with over half of the incentive group meeting the 16-pound weight loss goal, compared to 10% of the control group.

Finkelstein, Linnan, Tate, and Birken (2007) found that the addition of a modest financial incentive motivated employees to lose weight. Participants were randomly placed in three groups, control and two levels of financial incentives (\$7 and \$14 per percentage point of weight lost). Measurements were collected at baseline, 3 months, and 6 months. Payments were structured so that all participants had equal ability to obtain the incentives during the study period. At the 6-month duration of the study, when financial awards had equalized, weight loss in the two financially-rewarded groups were similar, however, they were significantly higher than the control group, revealing that modest financial incentives can be effective in motivating overweight employees to lose weight.

Theoretical Framework

The theoretical framework for this study was the Health Promotion Model developed by Pender. Pender defines health as a positive dynamic state, not just the absence of disease. Pender believed that health includes the disease process, but disease is not the principal element. Pender defines health as “the actualization of inherent and acquired human potential through goal-directed behavior, competent self-care, and satisfying relationships with others” (McCullagh, 2009, p. 292). This model’s definition of health encompasses the whole person and their lifestyle. This model presents health promotion as a means to increase a person’s well being (McCullagh, 2009, p. 292). Pender’s definition of health provides a wide view of optimal health; allowing interventions to not be limited to the decrease of disease risk, but on strengthening resources potentials and capabilities enhancing not only health but quality of life for the individual and the community.

Pender based the model on two main theories of health behavior: social cognitive and expectancy value theory. A major principle of the social cognitive theory is self-efficacy. Self-efficacy is the faith a person has in his or her own ability to be successful. The higher a person’s self-efficacy for a behavior the higher the likelihood that that behavior will be continued when obstacles are met (McCullagh, 2009, p. 293).

The Expectancy theory believes that people are more likely to work toward goals that are of value to them. Expectancy value theory also explains that people are more likely to invest time and energy into goals that they believe they can achieve. Pender believed if a person has confidence and understands the value of the behavior they are trying to achieve, they are motivated to meet their goals (McCullagh, 2009, p. 293).

The Health Promotion Model focuses on three areas: individual characteristics and experiences, behavior specific cognitions and affect, and behavioral outcomes. The Health Promotion Model respects that each individual has unique personal characteristics and experiences that affect subsequent actions. Within this model these characteristics and experiences are systematically assessed and the individual's self-efficacy, perceived barriers and benefits, situational influences and interpersonal influences that are relevant to the desired health behavior. Second, this concept identifies prior behaviors and perceived health status, thus offering a base to begin tailoring of the desired behavior to the current state of the individual. Finally, the Health Promotion Model portrays that nursing interventions can be designed to alter prior health perceptions and give means to facilitate successful behavior change (McCullagh, 2009, p. 295).

Summary

Behavior modification is a process or method that is used to modify a person's behavior to one that is beneficial for that person. Research was consistent in finding that involving a person in a behavior modification process improves self-advocacy and encourages self-awareness. Efforts to prevent or delay CVD development in women through behavior modification has the potential of significantly benefiting the individual woman's health and also the health of women in general.

Increasing the number of fruit and vegetable servings consumed on a regular basis will not only decrease the risk of CVD, but can also assist in weight management. Research findings indicate that providing structured culturally-sensitive dietary education to low-income women is successful at increasing heart healthy lifestyle patterns.

Incentive programs, especially those with financial rewards, appear to be highly effective in inducing behavior change and weight loss.

CHAPTER III

METHODOLOGY

The purpose of this study was to evaluate the effectiveness of the Sage*Plus* Smart Choices Fruits and Vegetables Program at increasing the number of fruits and vegetables in participants' diets and decreasing the CVD risk factors, as measured by their Framingham Risk Score, at re-enrollment. This chapter will present the methodology surrounding the research and will discuss the research design, sample, ethical considerations, measurement, data collection, data analysis, and limitations.

Research Design

A nonexperimental, descriptive correlational design was used to guide data collection for this study. A descriptive design is used to examine characteristics of a single study sample to gain knowledge on an area that little is known about. A descriptive design identifies a phenomenon of interest and the variables within that phenomenon, providing description and knowledge of the variables (Burns & Grove, 2009). In a nonexperimental design the researcher does not control any variables. Descriptive designs do not suggest causality and are utilized to obtain knowledge in an area of research. A correlational design examines relationships between the variables in a single group to determine if a positive or negative relationship exists between the variables as well as the strength of that relationship (Burns & Grove, 2009). This design was chosen because a descriptive correlational design provides the researcher with insights on the relationships between variables in a given situation and determines the

degree and direction of correlations between variables of interest. However, this design does not establish a definitive cause and effect relationship between variables. The specific research variables to be studied are intake of fruits and vegetables in diet, fruits and vegetables program completion, and cardiovascular disease risk of women enrolled in *SagePlus* Smart Choices Fruits and Vegetables Program.

Sample

The sample population for this study includes low-income women who have participated in the *SagePlus* Smart Choices Fruits and Vegetables Program and subsequently re-enrolled in the *SagePlus* program. These women are between the ages of 40 and 64 years old, uninsured or underinsured, and have an annual household income of less than \$2,269 per month with an additional \$796 per person living in the house. Participants are also receiving screening under the Sage program. The desired sample size for this study was a minimum of 100 *SagePlus* participants.

Ethical Considerations

Inclusion in this study will not affect an individual's participation in the *SagePlus* Program. The MDH assigns each *SagePlus* enrollee a numeric code in an effort to separate identifiable information from participant data, protecting participant confidentiality. Participant identifying information will be held by the MDH and this researcher will only have access to the MDH assigned numeric code. For this study, an additional alphanumeric code will be assigned to the identifying MDH numeric code to facilitate further de-identification of *SagePlus* participants included for analysis. The *SagePlus* number and the assigned study number key will be kept on a password-protected computer by the researcher through the duration of the analysis and then will be

deleted. No participant identifying information will be included in publications or reports generated by this study.

Upon initial enrollment and subsequent re-enrollments, women in the Sage and Sage*Plus* program give permission for release of information to the MDH's Sage and Sage*Plus* screening program. Informed consent for this study is not necessary as there will be no contact with participants. IRB approvals will be obtained from Minnesota State University, Mankato and the MDH prior to data collection.

This study focuses on a very small portion of the complete Sage and Sage*Plus* programs and in no way represents the success or detriment of the complete program. Findings from this study can represent positive ideations to the program, but does not represent the program as a whole. The MDH will utilize information found in the study in the manner that they see fit.

Measurement

During enrollment in the Sage*Plus* program, participants complete a screening form at the initial appointment with the healthcare provider. Demographic variables, including age, race, language spoken, health insurance status, highest level of education, and monthly income, are recorded on this screening form. Baseline nutritional assessment is also documented on this form. Participants are asked, 'How many times each day do you have the following food items: fruit, vegetable, fats, and sweets?' These questions are asked again at the time of re-enrollment. With each item they are given the choices: 0, 1, 2, 3-5, 6-8, and >8. Participants also complete a lifestyle intervention contract at the initial visit. If they desire to make a change in their eating behavior, they may choose to enroll in the fruits and vegetables incentive program. After

the baseline visit and upon re-enrollment, the woman's CVD risk is calculated using the Framingham Risk Score. Blood pressure, total cholesterol, high-density lipoprotein, LDL, smoking, and glucose intolerance are utilized to calculate this score. This method has been previously described by Anderson et al. (1991). Fruit and vegetable serving consumption data was retrieved from the postcards women return to the MDH, with recorded daily servings from the previous week. Upon reaching the goal of 1,000 servings of fruits and vegetables identifies completion of the incentive program, and the woman receives a \$20 gift card.

Data Collection

Demographic data collected includes race, primary language spoken, health insurance status, age, monthly income, and education level. This information will be retrieved from the MDH *SagePlus* participants' database. Date range of data will be between July 2008 and January 2011. Fruit and vegetable servings at baseline and re-enrollment, weekly postcard report of fruits and vegetable intake, completion of incentive program, and Framingham Risk Scores at baseline and re-enrollment will also be gathered from the database and entered into an excel spreadsheet. Data will be collected from the MDH database with the assistance of an MDH employee.

Data Analysis

Descriptive and correlational statistics will be calculated using the Statistical Package for the Social Sciences (SPSS) version 12. Race, primary language spoken, and health insurance status are at the nominal level of measurement and will be analyzed utilizing frequency counts. Age and monthly income are at the interval level of measurement and will be analyzed utilizing means, standard deviations, and range.

Education level is at an ordinal level of measurement and will be analyzed by use frequency counts.

The fruit and vegetable servings and Framingham Risk Score are at the interval level of measurement. A paired *t*-test will be used to calculate the change in mean of the Framingham Risk Score from baseline to re-enrollment at 1 year. A Pearson Product Moment Correlation Coefficient will be used to determine if a relationship exists between the fruit and vegetable intake and the Framingham Risk Scores. A *t*-test will be utilized to determine if change in fruits and vegetable serving from enrollment to re-enrollment was statistically significant.

Limitations

Women may have been influenced by motivating factors other than the Smart Choices Fruit and Vegetable Program to increase their daily intake of fruits and vegetables. Extraneous variables such as diet, stress reduction, and/or medication may have played a role in reducing cardiovascular risks. BMI may not accurately represent the amount of body fat a person has. Frame size or a low or high muscle mass may skew the interpretation of the BMI. Women involved in this study have self-selected, showing a pre-study interest in diet modification. Conclusions from the study are age specific and limited to *SagePlus* women and are not applicable to the general population.

Summary

A nonexperimental, descriptive correlational design will be used to guide data collection for this study. The sample population for this study includes a minimum of 100 women who have participated in the *SagePlus* Fruits and Vegetables Program and who have re-enrolled in the *SagePlus* program between July 2008 and January 2011. After

obtaining IRB approval, a numeric code will be used to de-identify information to protect participants' confidentiality and data will be locked in the principal investigator's office for a period of 2 years after completion of the study and then destroyed. Demographic data collected includes race, primary language spoken, health insurance status, age, monthly income, and education level. Initial fruit and vegetable intake, intake at re-enrollment, completion of incentive program, and Framingham Risk Scores at baseline and re-enrollment will be also gathered. This data will be analyzed using descriptive and inferential statistics. Conclusions from the study are limited to women participating in the *SagePlus* program.

CHAPTER IV

RESULTS OF ANALYSIS

The purpose of this study was to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program at increasing the number of fruits and vegetables in participants' diets and decreasing their cardiovascular disease risk factors. The overall goal of this study is to determine the effectiveness of an incentive-driven behavior modification program to increase fruit and vegetable intake and decrease CVD risk in socioeconomically challenged women. This chapter describes the sample of the *SagePlus* participants, data analysis process, results, and summary of the research findings.

Sample

The MDH provided data from 327 *SagePlus* participants. These participants were enrolled in the Smart Choices Fruits and Vegetables Program and returned for re-enrollment between the dates of January 2008 and January 2011.

The majority (51%) of the *SagePlus* participants in this study self-identified as Hispanic. The remainder of the sample self-identified themselves as Caucasian (35%) or African American (9%). Six percent of the participants self-reported as other races or did not report their race (see Table 1). Only 5% of Minnesotans report themselves as Hispanic according to the 2010 census (see Table 2) (Minnesota Department of Administration, 2011). The racial composition of the sample population is very different from the general population in Minnesota. The primary languages spoken by the

participants in this study are English (37%), Spanish (30%), and other language (5%); however, 27% did not report their primary language (see Table 2). According to U.S. Census Bureau 2005-2007 estimates, 9.5% of Minnesotans speak a language other than English at home. Spanish, Hmong, Somali, Vietnamese, Russian, and Laotian are the six most common languages spoken in Minnesota homes, after English (Minnesota Department of Administration, 2011).

The mean income of the sample was at 99% of the Federal Poverty Level with a range from 0 to 250%. In contrast, only 9% of Minnesota is represented at 100% of the Federal Poverty Level (McMurry, 2007).

Table 1

Race

Race	SagePlus (N = 327) %	Minnesota %
African American	9	5
Caucasian	35	85
Hispanic	51	5
Other	3	5
Did Not Answer	3	

Table 2

Primary Language Spoken

Primary Language	SagePlus (N = 327) %
English	37
Spanish	30
Other	5
Did Not Answer	27

The mean age of the participants was 51 with a range from 40 to 64 years of age. Review of the highest educational level achieved by the 327 sample participants (of those who listed their education) revealed that 23.5% had less than an eighth grade education, and 13.1% had some high school education, but had not achieved a diploma or equivalent. Thus, over 36% of the sample achieved less than a high school diploma, compared to 6% of Minnesotans who have less than a high school diploma or equivalent (Minnesota Office of Higher Education, 2011). The highest education achieved by 17% of the sample was a high school diploma or equivalent, and 36% had greater than a high school diploma as their highest achieved education (see Table 3). A high school diploma or equivalent is the highest education level achieved by 28% of Minnesotans, and 63% of Minnesotans age 25 and older had attained greater than a high school education. There is a 47% gap between the prospected 4-year high school graduation rate of white students (84%) and the prospected graduation rate of Hispanic students (37%) in Minnesota. This

racial disparity continues after high school graduation. In Minnesota, 33% of Hispanics and 47% of African Americans achieve a degree past high school, compared with 74% of Caucasians (Minnesota Office of Higher Education, 2011).

Table 3

Highest Achieved Education

Highest Level of Education	SagePlus (N = 327) %	Minnesota*
Grade 8 or Less	23.5	2
Some High School	13.1	4
High School Graduate or Equivalent	17.1	25
Postgraduate	2.8	
Some College	16.2	23
Associates Degree	4.3	11
Bachelors Degree	12.8	23
Did Not Answer	10.1	

*Education attained by Minnesotan age 25-64 (Minnesota Office of Higher Education, 2010).

Baseline and re-enrollment CVD risk were assessed for all women that participated in the Smart Choices Fruits and Vegetables Program. The average BMI at initial enrollment was 31.67 (>30 classified as obese), and at re-enrollment 12 months later, the average BMI was 31.50. Thirty percent of the sample was classified as overweight (BMI 25-30). Fifty-five percent of the sample was classified as obese (BMI 30-40). Ten percent of the sample was classified as morbidly obese (BMI >40) at initial evaluation and 8.3% at re-enrollment. Sixty-three percent of Minnesota adults are classified as overweight or obese. Compared to Minnesota, the sample had a much higher percentage that was classified as being obese.

At the initial and re-evaluation, the mean systolic blood pressure was 122 mm Hg and diastolic 76 mm Hg. Using the standard definition of hypertension (>140/90) at initial evaluation, 15% of the participants were classified as hypertensive, and at re-evaluation 14% were hypertensive. The average total serum cholesterol at initial evaluation was 208 mg/dL with a range of 108 to 372 mg/dL; this decreased to 200 mg/dL at re-evaluation, with a range of 109 to 348 mg/dL. The average HDL was 50 mg/dL, at both the initial enrollment and re-enrollment. The mean LDL was 126 mg/dL at the initial enrollment and 120 mg/dL at re-enrollment and triglycerides were 150 mg/dL at the initial evaluation and decreased to 140 mg/dL at the time of re-enrollment. Using the standard definition for elevated cholesterol (>200 mg/dL, HDL <50 mg/dL, LDL >160 MG/DL, and triglycerides >150 mg/dL), 92% of this population would be considered to have high cholesterol at the time of their initial enrollment and 85% at the time of their re-enrollment, when fasting prior to lab blood draw was taken into consideration.

The Framingham Risk Score was utilized to establish the CVD risk score. The average percent of possibility that an individual will develop any form of CVD in the next 10 years was 8.3% on initial evaluation and 8.1% on re-evaluation. The range of values was 0.6-44.9% on initial evaluation and 0.5-42.6% on re-evaluation.

Table 4

CVD Risk Status

	Initial Percent or Mean (N = 327)	Re-enrollment Percent or Mean (N = 327)
Weight, #	173.93	172.95
BMI	31.67	31.50
Blood Pressure:		
Systolic	122	122
Diastolic	76	76
Total Cholesterol:		
HDL	51	51
LDL	126	120
Triglycerides	150	140
Glucose	101.76	100.89
Current Smokers, %	13.0	12.5
CVD Risk Score	8.3	8.1

Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 12. The research questions and results for each question are as follows.

Research Question 1

What percent of SagePlus smart choice participants submit their fruit and vegetable serving postcards to completion of the 1,000 servings incentive receiving the \$20 gift card?

The Smart Choices Fruits and Vegetables Program was the health behavior modification program chosen by 327 SagePlus participants between July 2008 and January 2011. Of these 327 participants, 130 (39.8%) returned at least one serving record postcard in the participation time period (see Table 5). Of these 130 participants, 40 (31%) reached the goal of 1,000 servings and thus received the gift card.

Table 5

Participation in Smart Choices Fruits and Vegetable Program Card Return

Returned Cards	Frequency	Percent
No	197	60.2
Yes	130	39.8
<1,000 Servings	90	27.5
>1,000 Servings	40	12.2

The first and the final week of the program yielded the highest return frequency of the serving report postcards at 130 participants each week (see Table 6). As the program

progressed, the return rate dropped to a low of 54 cards returned in the 24th week of the program. Though the return frequency markedly dropped with program progression, the average serving intake remained relatively stable with a range of 29.8-32.4 servings per week reported by participants throughout the enrollment year. Each participant returned at least one serving report card and returned servings reports for an average of 21 weeks scattered within the program years. Participants that met the 1,000 serving goal returned an average of 40 cards with a range of 24-50 cards returned.

Table 6

Card Return by Week

Week of Program	Frequency	Average Fruit and Vegetable Servings
1	130	29.8
4	111	31.8
12	78	32.4
24	54	32
Final	130	31.2

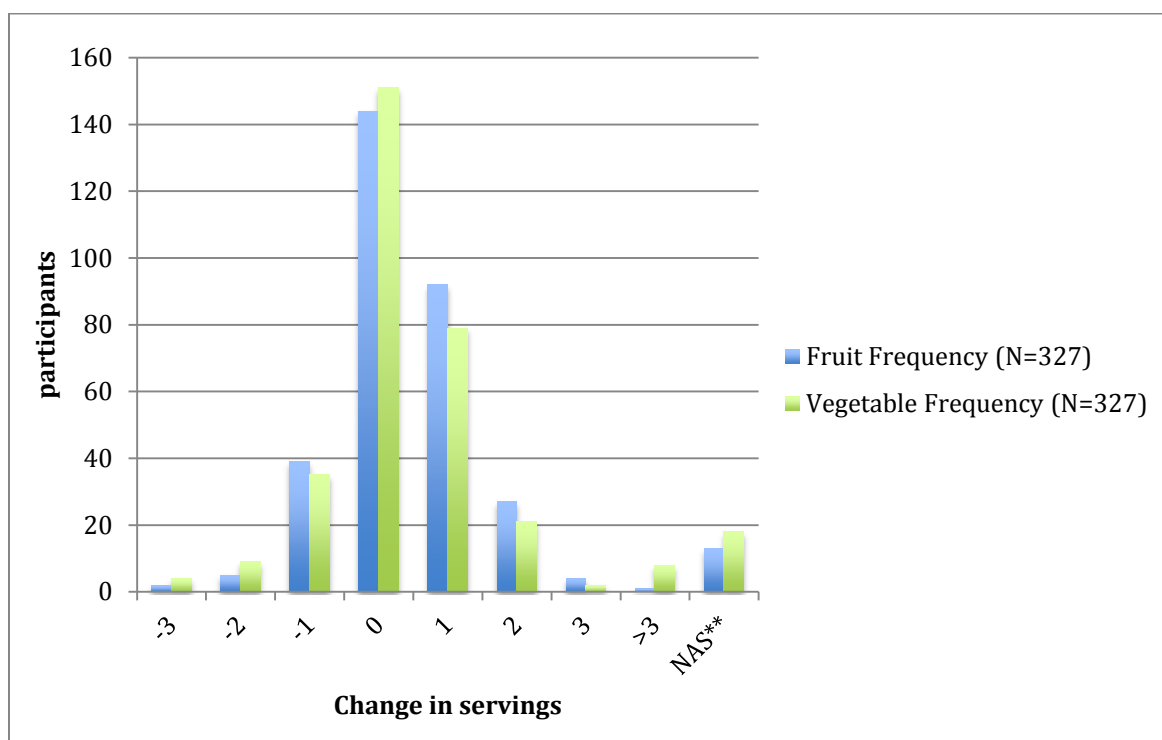
Research Question 2

Did women who participated in the SagePlus Smart Choices Fruits and Vegetables Program report a change in the number of fruits and vegetables in their diet at the 1-year re-enrollments?

At enrollment in the SagePlus program, the average number of reported fruit servings consumed per day was 1.6. This average increased to 1.9 servings per day at re-

enrollment. The average number of vegetable servings per day at the initial enrollment was 4.7, which decreased to 4.2 servings of vegetable per day at re-enrollment. These results varied slightly between the participants that returned at least one serving report card. As represented in Table 7, average initial fruit servings per day was equal at 1.6 servings and increased to 2.1 servings per day. Average vegetable daily serving consumption by those that returned at least one card was 1.7 and increased to 2.2 vegetable servings per day. For report serving consumptions that involved range values, the low number in the range was used for calculation.

The majority of the participants did not report a change in their fruit and vegetable servings consumption per day. An additional serving of fruit was added to the daily consumption of 28% of the participants, and an additional serving of vegetables was added to the daily consumption of 24% of the participants at re-enrollment.



*For changes that involved range values, the low number in the range was used for calculation.

**Did not answer one or both serving assessments, so change was not able to be calculated.

Figure 1. Reported Change in Fruit and Vegetable Servings From Initial Evaluation to Re-enrollment.

Table 7

Fruit and Vegetable Servings Reported at Initial and Re-enrollment

Servings	All Participants	Participants that Returned at Least One Serving Report Card
Fruit Initial	1.6	1.6
Fruit Re-enrollment	1.9	2.1
Vegetable Initial	4.7	1.7
Vegetable Re-enrollment	4.2	2.2

Research Question 3

Is there a change in the Framingham Risk Score from the initial Sage*Plus* enrollment to re-enrollment 1 year later in women who participated in the smart choices program?

The mean Framingham Risk Score at initial enrollment was 8.26 and had a range of 0.6-44.9. At re-enrollment, the mean Framingham Risk Score was 8.13 and had a range of 0.5-42.6 (see Table 8). The mean Framingham Risk Score of participants that sent at least one serving report card was 7.9, both on initial enrollment and on re-enrollment. The paired sample correlation of the initial Framingham Risk Score and rescreen risk score was 0.739 (see Table 9). This indicates a strong correlation between the two measurements; that is, people who had a higher Framingham Risk Score at the first measurement also had a high score on the second measurement. Paired sample correlation of the initial Framingham Risk Score calculation and the rescreening Framingham Risk Score calculation of all participants enrolled in the Smart Choices Fruit and Vegetables Program has a significance value of 0.651, which indicates that there was not a significant difference between the initial Framingham Risk Score value and the rescreening Framingham Risk Score value.

Table 8

Framingham Risk Score at Initial and Re-evaluation of SagePlus Participants

	Mean	N	Std. Deviation	Std. Error Mean
Initial Framingham Risk Score	8.2630	316	6.92176	0.38939
Rescreen Framingham Risk Score	8.1361	316	6.86980	0.38646

Table 9

Paired Sample Correlation of Initial Framingham Risk Score and Rescreen Framingham Risk Score

	Correlation	Mean	Sig.
Initial Framingham Risk Score and Rescreen Framingham Risk Score	0.739	0.1269	0.651

Research Question 4

Is there a relationship between the reported fruit and vegetable intake at initial and re-enrollment and the Framingham Risk Scores in women who participated in the smart choices program?

The Pearson Product Moment Correlation coefficient was utilized to examine the relationship between the reported fruit and vegetable servings and the Framingham Risk Score at both the initial enrollment and re-enrollment. The lower the Framingham Risk Score, the lower the probability of CVD development within the next 10 years. Negative relationships were shown in three of the four correlations (see Table 10). Though not

statistically significant, these negative relationships indicate a relationship between an increased consumption of fruits and vegetables and a decrease in the Framingham risk. An extremely weak, statistically significant positive relationship was found between the re-enrollment Framingham Risk Score and the reported fruit servings intake per day at re-enrollment (see Table 10). This positive relationship indicates that as people consume more fruits, their Framingham Risk Score increases

Table 10

Correlation of Framingham Risk Score and Fruit and Vegetable Servings

	Pearson Correlation
Initial Framingham and Fruit	-0.032
Initial Framingham and Vegetable	-0.016
Re-enrollment Framingham and Fruit	0.198*
Re-enrollment Framingham and Vegetable	-0.039

*Correlation is significant at the 0.01 level (2-tailed).

Summary

The MDH provided data from 327 SagePlus participants that enrolled in the Smart Choices Fruits and Vegetables Program and re-enrolled in the SagePlus program. Baseline and re-enrollment CVD risks and per day fruit and vegetables serving consumption was assessed on all participants. The sample population was middle-aged, English and Spanish speaking, primarily Hispanic and Caucasian women who reside in the State of Minnesota.

Data was analyzed using SPSS version 12 software, paired *t*-test evaluation, and Pearson Product Moment Correlations. The data analysis revealed that 39.8% returned at least one serving record postcard in the participation year, and 31% of those that returned at least one card reached the goal of 1,000 servings and thus received the gift card. The majority of the participants did not report a change in their fruit and vegetable servings consumption per day from the initial enrollment to their re-enrollment 1 year later. However, 28% of the participants indicated an additional daily fruit serving and 24% reported an additional daily vegetable serving at the time of re-enrollment. No statistically significant difference was found between the initial Framingham Risk Score and the re-enrollment Framingham Risk Score. An extremely weak positive correlation was found between the re-enrollment Framingham Risk Score and the reported daily fruit serving intake.

CHAPTER V

DISCUSSION AND CONCLUSIONS

The purpose of this study was to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program at increasing the number of fruits and vegetables in participants' diets and decreasing their cardiovascular disease risk factors. The overall goal of this study was to determine the effectiveness of an incentive-driven behavior modification program to increase fruit and vegetable intake and decrease CVD risk in socioeconomically challenged women. Research questions guiding the results of the analysis were: (a) What percent of *SagePlus* smart choice participants submit their fruit and vegetable serving postcards to completion of the 1,000 servings incentive receiving the \$20 gift card? (b) Did women who participated in the *SagePlus* Smart Choices Fruits and Vegetables Program report a change in the number of fruits and vegetables in their diet at the 1-year re-enrollments? (c) Is there a change in the Framingham Risk Score from the initial *SagePlus* enrollment to re-enrollment 1 year later in women who participated in the smart choices program? (d) Is there a relationship between the reported fruit and vegetable intake at initial and re-enrollment and the Framingham Risk Scores in women who participated in the smart choices program? Discussion and conclusions, scope and limitations, and implications for practice and research are included in this chapter.

Research Question One

What percent of Sage*Plus* smart choice participants submit their fruit and vegetable serving postcards to completion of the 1,000 servings incentive receiving the \$20 gift card?

The Smart Choices Fruits and Vegetables Program was the health behavior modification program chosen by 327 Sage*Plus* participants between July 2008 and January 2011. Of these 327 participants, 39.8% returned at least one serving record postcard in the participation year, and only 31% of those that returned at least one card in the Smart Choices Fruits and Vegetables Program reached the goal of 1,000 servings and thus received the gift card. Thus, only 12.2% of the total 327 Sage*Plus* participants who enrolled in this program were able to reach the goal of 1,000 servings.

Fewer than half of the participants that enrolled in the fruits and vegetables program returned at least one serving report card throughout the study time period. At enrollment, participants receive fruit and vegetable serving educational information, and fruit and vegetable serving information was also included in the newsletter received by all Sage*Plus* participants. Participants that did not return cards may have been increasing fruit and vegetable serving consumption but not returning the serving report card. This can be seen in the overall participant increase in average consumption of fruit servings at re-enrollment. However, the average serving consumption of vegetables did decrease at re-enrollment. Participants that did return at least one serving report card increased both fruit and vegetable serving consumption on average by 0.5 servings per day.

The first and the final week of the program yielded the highest return frequency of the serving report postcards at 130 participants each week. As the program progressed,

the return rate progressively dropped to a low of 54 cards returned in the 24th week of the program. Though the return frequency markedly dropped with program progression, the average serving intake remained relatively stable with a range of 29.8-32.4 servings per week reported by participants. On average, participants returned serving report cards for 21 weeks scattered throughout the program. Participants that met the goal of 1,000 servings and received the gift card returned cards at an average of 40 weeks reported, double that of those that did not meet the goal. Greater participation equaled greater success at receiving the incentive.

These findings of nonparticipation are contrary to research on incentive program utilization for behavior change. Volpp (2008b) and Finklesen et al. (2007) found that incentive programs based on behavioral economic concepts were highly effective in inducing behavior change. These medication-adherence and weight loss studies utilized incentive programs that had positive goal achievements and incorporated monthly, tri-monthly, or quarterly rewards (Finkelstein et al., 2007; Klein, & Karlawish, 2010; Volpp et al., 2008b). The Smart Choices Fruits and Vegetables Program may achieve greater success of participants reaching goal by the addition of monthly, tri-monthly, or quarterly rewards in addition to the gift card at completion of 1,000 servings.

Research Question Two

Did women who participated in the SagePlus Smart Choices Fruits and Vegetables Program report a change in the number of fruits and vegetables in their diets at the 1-year re-enrollments?

The majority of the participants did not report a change in their daily fruit and vegetable serving consumption. Twenty-eight percent of the participating women added

an additional fruit serving to their daily consumption and 24% added an additional vegetable serving. Although this was not statistically significant, it is important to recognize the positive dietary behavior change in some of the participants. In addition to the fruit and vegetable information received at enrollment, all *SagePlus* participants received a monthly newsletter during their enrollment year. In the newsletter, articles focus on heart healthy living, including fruit and vegetable consumption, and recipes that encourage fruit and vegetable consumption. This additional information may play a role in the increase of fruit and vegetable servings consumed daily.

Participant demographics indicate that the program participants were primarily Hispanic (51%) with an average income at 99% of the Federal Poverty Level. Jilcott et al. (2006) reported a variety of problematic neighborhood characteristics, including scarcity of restaurants with healthy food choices, lack of access to fresh fruits and vegetables, and lack of transportation affecting diet choices of low-income women. *SagePlus* participants showed an interest in diet modifications by enrolling in the Smart Choices Fruits and Vegetables Program; however, their motivations may not have been able to be fulfilled by the pressures of extenuating circumstances.

The Harvard-based Nurses' Health Study and Health Professionals Follow-up Study found that the higher the average daily intake of fruits and vegetables, the lower the chances of developing cardiovascular disease (Hung et al., 2004). This indicates that even small increases in the number of fruit and vegetable servings can positively affect the CVD risk of the participant. In the Arizona WISEWOMAN project, participants who received provider counseling, health education, and additional community-based support reported significant increases in the number of servings of fruits and vegetables

consumed daily (Staten et al., 2011). Increasing the community support, diet education, and continued encouragement throughout the year may result in increased fruit and vegetable servings consumed by the participants over the enrollment year.

Research Question Three

Is there a change in the Framingham Risk Score from the initial SagePlus enrollment to re-enrollment one year later in women who participated in the smart choices program?

The average Framingham Risk Score was 8.26 at initial enrollment and 8.13 at re-enrollment. This slight decline was not statistically significant. These Framingham Risk Scores indicate that these women have on average an 8% probability that they will develop any form of CVD within the next 10 years. The average Framingham Risk Score of participants that returned at least one serving report card was 7.9 both on initial evaluation and on re-enrollment. Paired sample correlation of the initial Framingham Risk Score calculation of all participants and the rescreening Framingham Risk Score found no significant difference between the initial Framingham Risk Score value and the rescreening Framingham Risk Score value.

The Framingham Risk Score is a multi-factor equation. Addition of fruits and vegetables indirectly affects many of these variables within the calculation to some degree, such as weight, cholesterol, and blood pressure. Any one behavior modification action independently, such as the addition of fruits and vegetable to the diet, may have a minor effect on the whole calculation.

Brindle et al. (2005) and Tunstall-Pedoe and Woodward (2006) found that the Framingham Risk Score underestimates the CVD risk in low socioeconomic populations

that live in deprived areas, have manual occupations, and have high rates of cardiac mortality. The majority of the population in this study was low-income Hispanic women. A Hispanic woman's risk of cardiovascular disease is similar to that of a Caucasian woman about a decade older (Kreimer, 2007), making Hispanic women a higher-risk population than Caucasian women.

Chiou et al. (2009) found that despite knowledge that maintaining a CVD-savvy lifestyle and an ideal BMI, exercising 30 minutes a day, eating at least 9 servings of fruits and vegetables daily, and abstaining from smoking are all beneficial, only 6.3% of people with CVD maintain these habits for extended period of time. Results of programs with a year-long intervention may have improved outcomes with increased interaction and support for the participants.

Research Question Four

Is there a relationship between the reported fruit and vegetable intake at initial and re-enrollment and the Framingham Risk Scores in women who participated in the smart choices program?

The Pearson Product Moment Correlation was utilized to examine the relationship between the reported daily fruit and vegetable serving intake and the Framingham Risk Score used to measure the CVD risk factors. Non-significant negative relationships were found between the initial Framingham Risk Score and initial daily fruit servings, initial Framingham Risk Score and initial vegetable servings, and re-enrollment Framingham Risk Score and re-enrollment vegetable servings. Though not significant, these negative relationships indicate that a decrease in the Framingham Risk Score is associated with an increase in the reported daily fruit and vegetable serving consumption. An extremely

weak, statistically significant positive relationship was found between the re-enrollment Framingham Risk Score and the reported daily fruit servings intake per day at re-enrollment. This positive relationship indicates that an increase in daily fruit serving intake is associated with an increased Framingham Risk Score at the time of re-enrollment. This is in sharp contrast to what has been found by other researchers; which have found that the more fruits and vegetables consumed the lower the CVD risk (Brunner et al., 2008; Hung et al., 2004; Liu et al., 2000). This finding may be the result of the large sample size or to an over-reporting of daily fruit intake by the participants.

The three non-significant negative correlations represent the expected trend that increasing the daily consumption of fruits and vegetables results in a decrease in Framingham Risk Score, thus a decrease in the probability of CVD. The significant positive correlation, though small, is an unexpected trend of the Framingham Risk Score and its association with fruit intake.

Pender's Model of Health Promotion

Pender's model of health promotion helps guide the provider in helping people achieve a better quality of life based on their individual beliefs and potential by tailoring interventions for that person. The study supports the Pender model in determining if the *SagePlus* Smart Choices Fruits and Vegetables Program is tailored to improve the quality of life of the participants. This model has been used in several clinical studies including schools, workplaces, treatment facilities, jails, and rehabilitation facilities and across a diverse range of people in race, age, and gender (McCullagh, 2009). The *SagePlus* program serves women with diverse backgrounds, which supports the Pender model. Pender's model articulates if a person has confidence and understands the value of the

behaviors they are trying to achieve, they are more likely to have success in meeting their goals (McCullagh, 2009). The *SagePlus* Smart Choices Fruits and Vegetables Program provides participants with information to help them understand the value of additional fruit and vegetable servings in their diet. When evaluating the effectiveness of a program such as the *SagePlus* Smart Choices Fruits and Vegetable Program, it is important to have a model that examines the total health of the person and tailors an intervention that is effective in behavior change for that person. The results of this study support the use of the Health Promotion Model by showing that the *SagePlus* Smart Choices Fruits and Vegetables Program did impact the daily serving consumption of fruits and vegetables in a positive way, with the hopes of achieving a better quality of life in the participant. The *SagePlus* Smart Choices Fruits and Vegetable Program supported the efforts of the participants in meeting their goals of diet change and supports Pender's theoretical framework.

Scope and Limitations

Results of this study are not applicable to the general populations other than those studied because the study was carried out with a specific group. As each participant self-selected to participate in the Smart Choices Fruits and Vegetables program, their initial degree of motivation cannot be determined. Other motivational factors may influence their daily consumption of fruits and vegetables. Biological patterns vary with each participant, so each intervention does not affect each person the same. Data was gathered by self-reporting, thus it is not possible to know if the information shared by the participants accurately reflects their daily consumption of fruits and vegetables.

Data was collected from *SagePlus* participants that selected the Smart Choices Fruits and Vegetables Program from June 2008 through January 2011 and re-enrolled in the *SagePlus* program between 12 and 13 months of their last enrollment. Eligibility criteria for participation in the *SagePlus* program included women ages 40 to 64 years, no insurance or underinsured, and a monthly income less than \$2,269 with an additional \$796 per person living in the house. Income may have been a limiting factor in the accessibility of fruits and vegetables for the participants.

The education level of the participants may have played a role in the understanding of the effects of additional fruits and vegetables in their diet and their association with CVD risk. Education level may also have been a limiting factor in the understanding of the monthly newsletter received by all *SagePlus* participants.

Implications for Practice

This study found that the *SagePlus* Smart Choices Fruits and Vegetables Program was mildly effective in motivating people to increase their daily fruit and vegetable intake. For a behavior modification program to be an effective intervention, it needs to be tailored to the group or individual. More research needs to be conducted to determine if additional incentives or more support throughout the enrollment year would improve the results.

Primary prevention is aimed at the prevention of health problems and disease before they occur. Health promotion and primary prevention often overlap in healthcare education and interventions. Interventional programs such as the *SagePlus* Smart Choices Fruits and Vegetables Program can be used in primary prevention of health problems and disease in the clinical setting.

Implications for Research

Further research needs to be completed on the seasonal effect of fruit and vegetable consumption and availability of choices for low-income populations. Further studies could be completed by analyzing the servings per week in relation to the month of the year.

Further research is needed on the cultural influence on the effectiveness of incentive programs. Further studies could be completed in the areas of participation and successful goal completion within short-term, long-term, and continued reward incentive programs and the effects of culture on completion of goal within specific time frames of completion.

Of the 327 *SagePlus* participants that self-selected the Smart Choices Fruits and Vegetables behavior modification program, only 60.2% returned at least one serving record, and only 12% reached the 1,000 serving goal. Identifying factors or barriers other than motivation that influence behavior change could also be studied in future research.

Summary

Participants in the *SagePlus* program are encouraged to make healthy lifestyle changes through coaching related to diet, exercise, and smoking cessation. The purpose of this study was to evaluate the effectiveness of the *SagePlus* Smart Choices Fruits and Vegetables Program as a method to increase fruits and vegetables in the diets of participants and thus influence the cardiovascular disease risk factors of these individuals.

Baseline and re-enrollment CVD risks and daily fruit and vegetable intake were assessed for all *SagePlus* participants enrolled in the Smart Choices Fruits and Vegetables Program. The sample population was middle-aged, English and Spanish

speaking, primarily Hispanic and Caucasian women who reside in the State of Minnesota. Low participation was observed in the findings that only 39.8% returned at least one serving record postcard in the participation year. Of those that returned at least one card, only 31% reached the goal of 1,000 servings and thus received the gift card. The majority of participants did not change their daily consumption of fruits and vegetables through the participation year. An additional serving of fruit (28%) and vegetables (24%) were added to the daily consumption of approximately a third of the participants at re-enrollment. The goal of achieving the recommended daily intake of 5-9 servings of fruits and vegetables was not completed by the end of the incentive cycle. No statistically significant change was observed in the Framingham Risk Scores from initial enrollment and re-enrollment. Efforts to prevent or delay CVD development in women through behavior modification have the potential to significantly benefit the individual woman's health and also the health of women in general.

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