

DISSERTATION

**EFFECTIVENESS OF A WEB-BASED NUTRITION EDUCATION
PROGRAM TO REDUCE CARDIOVASCULAR DISEASE RISK
AMONG U.S. ARMY PERSONNEL AND THEIR FAMILIES
("DEFEND YOUR HEART" STUDY)**

Submitted by

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In partial fulfillment of the requirements

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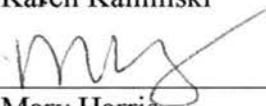
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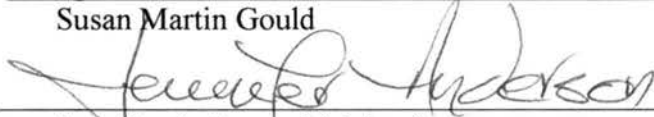
WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY ASMA S. BUKHARI ENTITLED EFFECTIVENESS OF A WEB-BASED NUTRITION EDUCATION PROGRAM TO REDUCE CARDIOVASCULAR DISEASE RISK AMONG U.S. ARMY PERSONNEL AND THEIR FAMILIES ("DEFEND YOUR HEART" STUDY) BE ACCEPTED AS FULFILLING, IN PART, REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

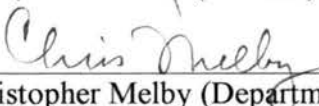
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ABSTRACT OF DISSERTATION

EFFECTIVENESS OF A WEB-BASED NUTRITION EDUCATION PROGRAM TO REDUCE CARDIOVASCULAR DISEASE RISK AMONG U.S ARMY PERSONNEL AND THEIR FAMILIES (“DEFEND YOUR HEART” STUDY)

Cardiovascular disease (CVD) continues to be the leading cause of mortality and morbidity in the United States. Military personnel are also vulnerable to this killer disease due to indulgence in unhealthy behaviors such as cigarette smoking, physical inactivity, poor nutrition, and high stress. Formative assessment identified a need for web-based resources for the Army registered dietitians (RDs) and for deployed or remotely located military beneficiaries. The purpose of the current study was to create and assess the effectiveness of a web-site “Defend Your Heart”. This web-site was targeted to two audiences: RDs and a self care program for the military beneficiaries. This self care program was created using the framework of Rosenstock’s Expanded Health Belief Model (EHBM).

The effectiveness of a web-based self care program was evaluated using a randomized 4- month study with participants either in the web-based group (n=17) or the usual care (n=13) at a U.S. Army hospital. Data were collected at baseline, two months and four months. Variables measured were anthropometric, blood pressure, lipid profile, fasting glucose, C - reactive protein, nutrient intake, physical activity, and EHBM constructs. Data were analyzed using analysis of covariance and using baseline means to adjust the two and four month data. Results indicated a significant reduction of total blood cholesterol, LDL-cholesterol, predicted body fat percent, and estimated body mass

index ($P<0.05$) in the web-based group. The usual group demonstrated a significant increase in self-efficacy score at month four ($p<0.05$).

Significant within group changes for both groups were demonstrated for the reduction in waist circumference and serum triglycerides ($p<0.05$). Due to a smaller sample size caution is required while interpreting the results. The results of the web-site usability showed that a majority of the RDs ($n=34$) and web-based participants ($n=8$) were satisfied with the content and ease of navigation. RDs and web-based groups suggested enhancing web-site eye appeal, interactivity, and printing capability. Web-based programs may serve as an effective alternate mechanism of delivering CVD risk reduction education. The U.S Army needs to invest in further research to launch an effective web-based program for military beneficiaries to reduce CVD risk factors.

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CHAPTER I

INTRODUCTION

Rationale for Research

Cardiovascular disease (CVD) continues to be the leading cause of mortality in the United States, with an estimated 80,700,000 adults diagnosed in 2005, according to the recent statistical update (1). The death rate from CVD declined by 24.7% from 1994 to 2004, which could be attributed to increased awareness of CVD and increased use of pharmacological lipid lowering treatments. Cardiovascular disease related deaths are still high and average to one death every 37 seconds. The increasing prevalence of CVD risk factors such as overweight, obesity and metabolic syndrome may dampen the declining trends observed in CVD related mortality. The estimated expenditure due to CVD continues to escalate and is projected to be \$440.5 billion in 2008 (1). Increased effort is warranted in the arena of primary prevention of CVD that focuses on reducing risk factors.

The Third National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III) identified serum cholesterol lowering therapy as a primary target for coronary heart disease risk reduction (2). Exploration of various means to enhance primary prevention efforts is crucial to improve an individual's quality of life and reduce healthcare costs. National and professional agencies have already set forth evidence based guidelines for identification, prevention and treatment of this disease (2, 3). The

challenge now lies in translating and delivering these guidelines to the public.

Translating messages, especially as related to changing old habits and behaviors, is a complex task. Clients with dyslipidemia need to understand the potential benefits to be gained with embracing healthful behaviors.

Military personnel also are vulnerable to CVD due to indulgence in unhealthful behaviors such as cigarette smoking, physical inactivity, poor nutrition, and high stress (4). These behaviors can negatively impact military readiness and mission accomplishment. The Department of Defense (DoD) is concerned about health related behaviors among military personnel and aims to reduce the risk of chronic diseases and avoid interference in military readiness. As a result, the DoD has conducted several surveys with active duty personnel over the past 25 years to identify various health impacting behaviors. These surveys have provided senior leadership with key health related information affecting the health and readiness of the active duty personnel. These surveys provide estimates and trends of alcohol, drug and tobacco use, stress, mental health, nutrition, physical activity, and weight management. The most recent survey was conducted in the Spring of 2008 and results are pending at the time this dissertation was written. The statistics discussed in this study are derived from 2005 DoD survey of Health Related Behavior Among Military Personnel (4).

The results of the 2005 survey indicated that only 57.2% of the personnel had serum cholesterol levels checked in the previous 5 years, 37.2% of the personnel above 20 years of age did not meet the healthy weight requirement, 44.5% indulged in binge drinking, only 54.7% took action to control high blood pressure, and 32.2% had smoked cigarettes in the past 30 days (4). The Department of Defense is utilizing the Healthy

People 2010 objects to compare risk factors that could lead to several chronic diseases and impact military readiness and quality of life.

A recent formative assessment of the Army registered dietitians identified the need for web-based resources for self-update and self-paced programs for deployed or remotely located soldiers (5). At most U.S. Army hospitals, the CVD risk reduction education takes place primarily through cholesterol lowering classes or through individual counseling conducted by dietitians. Use of research based Internet programs to reduce CVD in Army hospitals is almost non-existent. The use of web-based media may facilitate wider dissemination of heart healthy lifestyle information. This will be useful to deployed or remotely located soldiers and other military beneficiaries who can access information from anywhere, anytime and at their convenience.

The Healthy People 2010 objective on Health Communication recommends the use of multi-dimensional interventions using relevant information suited to the targeted segment (6). The Internet could be a valuable tool in the era of scarce resources and a high prevalence of risk factors for chronic diseases. Use of the Internet as a source for health and medical information ranked fourth among 79% of Internet users (7). Using the Internet as a mode to deliver tailored health information is a challenging task. Studies using web-based media to provide nutrition education have shown conflicting results since the new technology encompasses an additional barrier. A tailored Internet nutrition and fitness study conducted with the U.S Air Force enlisted men did not show significant changes in fitness levels, however, there were significant effects in reducing body mass index, percent body fat, and a higher adoption of positive nutritional practices (8).

The National Cancer Institute evaluated users' preferences for various formats of education delivery and found that 71.1% of participants ranked the Flash program as a preferred format regardless of their education level and age group, suggesting the need to explore the use of multimedia to attract patients (9). Another randomized controlled trial to reduce CVD indicated a low uptake of the web-based program with no significant changes in health outcomes (10). The results of several web-based interventions are unglamorous, but with the online revolution and increasing number of e-patients there is a dire need for further research to identify barriers in order to use this media effectively. E-patient term refers to "individuals who are equipped, enabled, empowered and engaged in their health and health care decisions"(11). The purpose of this study is to enhance the existing CVD reduction education programs at U.S Army hospitals by augmenting resources and providing accurate and current CVD information for registered dietitians to use with Army personnel and to enhance their own knowledge with the latest information on dyslipidemia.

Study Hypotheses

Hypothesis # 1 (Self Care Program)

The web-based program will be effective to improve dyslipidemia markers and improve perceptions, attitudes, and behavioral related variables over time in U.S. Army personnel and family members.

Hypothesis # 2 (Self Care Program)

The web-based program will be as effective as the usual care program to improve dyslipidemia markers and other health and behavioral related variables in U.S. Army personnel and family members

Hypothesis # 3 (Resources for Dietitians)

The web-based resources will serve as a useful site by providing easily accessible and credible CVD information for dietitians to self update and for educating military beneficiaries.

Study Objectives

This study was specifically designed to assess the effectiveness of a web-based cardiovascular disease (CVD) risk reduction program “Defend Your Heart”. Evaluation of the program by the target audience is critical to tailor disease prevention strategies promoting adoption of healthful behaviors. If successful, this program has the potential to be an effective supplement to the existing CVD reduction efforts. Furthermore, an effective alternate resource could be beneficial to the military beneficiaries who are deployed or remotely located.

Specific Study Objectives:

1. Create, implement and activate a web-site that supports the needs of two audiences (Army registered dietitians, and Army personnel and their families). Each audience specific section will contain four to five related topic areas.
2. Conduct process evaluations of both sections of the web-site to ensure content validity and usability; make changes to provide a final product that contains accurate information and is user friendly.
3. Conduct usability testing by Army registered dietitians to evaluate content validity and usability of the two sections (“Resources for registered dietitians” and “Self Care Program”) of the web-site “Defend Your Heart”.

4. Conduct a randomized study to evaluate the efficacy of a cognitive theory-based Five-Step “Self Care” program to improve dyslipidemia and changes in perceptions, attitudes, and behaviors towards a heart healthy lifestyle.
5. Conduct usability testing of the “Self Care” section of the web-site by the study participants (Army personnel and their families).
6. Conduct summative evaluation to assess the effectiveness of the web-site based on process evaluation and outcome measures.

Theoretical Basis

Cardiovascular disease is a chronic disease and requires extensive lifestyle changes for an extended time to reduce the risk factors. Changing a lifetime habit is a complex task and requires a strong understanding of the psychological aspects of an individual. Understanding individual motivation and readiness to adopt a lifestyle change is critical for successful reduction of risk factors. Cognitive based theories have been previously used for increasing immunizations, preventing high risk behaviors and to improve compliance to diseases such as diabetes and osteoporosis. The Expanded Health Belief Model (EHBM) provided a logical framework in creating the self care component of the web-site. The web-site needs to have the capability to reach individuals of varied demographic characteristics who are seeking CVD risk reduction information.

The EHBM provides an appropriate framework where individuals with varied attitudes, beliefs, knowledge, and perception can access and obtain the needed information. It first insures that the users understand the threat posed by CVD by

improving their understanding of disease susceptibility and severity. The framework provides guidance in identifying benefits of making changes and barriers to overcome while adopting a heart healthy lifestyle. The self care program can provide a cues to action and incorporates a self-efficacy construct to increase participant confidence to adopt a healthful lifestyle.

Study Assumptions

The study is based on the assumption that there is a need for credible evidence based prevention programs using web media. In the era of scarce resources and increased prevalence of chronic diseases, web-based media can serve as a useful and cost effective tool for wider dissemination of credible information. Web-based media may reduce barriers by improving access to patients who are seeking information.

A web-based education program will provide consistency of information provided to soldiers and their families regardless of the duty station location. Updating the web-site on a regular basis is easy and affordable. These updates can be disseminated expeditiously compared to site-specific programs and printed materials currently used at various Army installations. Developing and marketing research based programs will provide options needed for soldiers and their families to make healthful lifestyle behavior changes. Lifestyle behavior change is a complex task and requires multi-faceted approaches and techniques to meet unique individual needs.

Study Limitations

This alternate source of nutrition education may reduce barriers for an individual trying to perform self care. However, the technology can become a barrier to individuals lacking computer skills. This web-site does not include an interactive capability due to lack of technical expertise and insufficient resources. This is an exploratory study and the critical issue is to ensure content validity and sufficient usability for participants to navigate the various sections of the web-site and obtain the needed information. The other issues to consider with an interactive program would be insuring privacy of the participants, and security of the stored information. Creating a robust and secure web-site is expensive and the current study lacked sufficient funding to involve a professional web-site developer.

The small sample size in self care study is a limitation. This study was conducted with participants from a specific geographic location and may not be generalized to other locations. However, with the constant translocation of Army personnel, the participation may be reflective of other Army installations.

Making lifestyle changes is a long process and twelve weeks may not have captured the benefits that may occur in future. The study did not capture data on extent of information utilized by the participants. Changes in various constructs of the expanded health belief were used to judge compliance to the heart healthy lifestyle.

CHAPTER II

REVIEW OF LITERATURE

Prevalence of Cardiovascular Diseases among General Population

Cardiovascular disease (CVD) continues to be the leading cause of mortality and morbidity among adults in the U.S. Every day 2,400 Americans die from CVD, or an average of one death every 37 seconds (1). Even with a 24.7% decline in CVD related mortality rates, the burden of disease is still enormously high. The prevalence of CVD is estimated to be 80,200,000 American adults; and of these, an estimated 38,200,000 adults are older than 60 years. This prevalence accounts for one in every three medical diagnosis in adults. The incidence of CVD appears to rise with advancing age; in men the incidence from CVD rose from three per 1000 men at age 35-44 years of age to 74 per 1,000 men at 84-95 years of age. The incidence for women is comparable except that the rate is delayed by ten years with the gap narrowing as age advances. Gender differences are also seen with coronary heart disease with a higher proportion in men before 75 years and in women a higher proportion of stroke events. The estimated direct and indirect cost of CVD for 2008 is predicted to be \$448.5 billion per year.

The death rate according to 2004 data indicated a higher rate in males (341.7) compared to females (245.3). Thirty two percent of these deaths occurred before the age of 75 years of age, before the average life expectancy of 77.9 years. The death rates appear to be highest in Hispanic and Latino communities for both genders. Surveys conducted by the American Heart Association in women showed a significant increase in

awareness, perceptions, and knowledge of heart disease as the leading cause of death among women. This awareness was lower in Hispanic women compared to white women. The awareness of stroke in women was twice lower than that of heart disease in 2006 survey.

The 2003 CDC BRFSS survey indicated that the prevalence of risk factors of CVD for adults' ≥ 18 years increased to ≥ 2 risk factors. These risk factors were highest among Blacks and American Indians/Alaskan natives and lower among Asians. Prevalence of CVD was higher among lower income households ($\leq \$10,000$) and lower among households with income of $\geq \$50,000$. Unemployed adults have the highest prevalence followed by retirees, home makers, and employed persons. The survey indicted young adults (18-24 years) had poor health profiles due to prevalence of smoking, obesity, sedentary lifestyle, lower intake of fruits and vegetables. In Hispanic and Black men (65 to 75 years) there were positive changes by reduction in smoking. Both Hispanic women and Black men reduced sedentary lifestyles and increased in fruit and vegetable intake.

The key risk factors of CVD were identified to be high cholesterol, high blood pressure, smoking and total diabetes. According to Framingham Heart Study (FHS) researchers, optimal risks factor impact at age 50 was defined as blood pressure less than 120/80mmHg, total cholesterol less than 180mg/dL, absence of diabetes, and absence of smoking. Other healthful lifestyle factors identified in the Nurses' Health Study were $\frac{1}{2}$ glass or more consumption of wine per day, $\frac{1}{2}$ hour or more per day of moderate to vigorous physical activity, body mass index (BMI) below 25kg/m^2 and consumption of

diet low in trans fat, lower glycemic load, cereal fiber, marine omega-3 fatty acids, folate, and higher polyunsaturated to saturated fatty acid ratio.

Healthy People 2010 focus area #12 pertains to reducing heart disease and stroke. The goals are to “improve cardiovascular health and quality of life through prevention, detection, and treatment of risk factors; early detection and treatment of heart attacks and strokes; prevention of recurrent cardiovascular events” (12).

Healthy People 2010: Midcourse Review emphasized the importance of involvement at both national and community levels to promote healthy diet due to its link with several leading causes of morbidity and mortality. This Midcourse Review recognized metabolic syndrome as an emerging issue, the need for increased awareness among professionals and the public, and the first line of therapy as “lifestyle therapy” (13). According to recent studies, diabetes mellitus is identified as an independent factor of cardiovascular related mortality and morbidity and is called as a “cardiovascular equivalent” (14).

Prevalence of CVD Risk Factors among U.S. Military Personnel

The Department of Defense (DoD) recognizes the importance of health promotion among military personnel. Even though the military force consists of young and healthy individuals, they are not immune to unhealthful behaviors such as cigarette smoking, heavy alcohol consumption, illicit drug use, physical inactivity, poor nutrition, and excess stress. These behaviors can have a profound impact on the military readiness and mission accomplishment. Unhealthful behaviors, like illicit drug abuse can become grounds for dismissal of a military member and can have serious consequences later in life (4). The DoD selected a few relevant objectives from Healthy People 2010 to

improve the quality of life of military personnel. Objectives selected to reduce cardiovascular disease are those related to reduce of smoking among military personnel, improve healthy weight, increase physical activity, increase screening and treatment of military personnel with high blood pressure and high blood cholesterol.

The DoD Survey of Health Related Behaviors among Active Duty Personnel has been conducted every three years since 1980. These surveys provide baseline information and trends on health related behaviors and identify areas for future interventions. The results of the most current DoD survey in 2005 showed some similarities and differences between health behaviors in military and civilian groups. The survey had a 51.8% response rate with 16,806 military personnel completing the survey. The results of the DoD survey on health related behaviors showed that the rate of personnel who were overweight in the military was roughly half of what is prevalent in civilian communities. The prevalence of obesity was lower in military personnel compared to civilians 12.4%, versus 31%. However, the trend of overweight and obesity in military personnel shows a steady rise of 4% since 2002 (4).

The DoD behavioral risk assessment surveys showed that military personnel were well below the Healthy People 2010 baseline for fruit and vegetable intake. Consumption of two or more servings of fruits in military personnel was at a 28% baseline compared to a target of 75% baseline as noted in for Healthy People 2010. Less than 10% of military personnel consumed 3 or more servings of fruits and vegetables. Fruits and vegetables are key components of a healthful diet to reduce risk of certain chronic diseases and weight management. Twelve percent of the military personnel consumed whole grains and low fat milk products. The National recommendations for

whole grains is three one ounce servings of whole grain products and three cups per day of fat-free or low-fat choice of dairy or equivalent products. Only 10% of military personnel stated consuming leaner protein sources three or more times per week. The self-report nature of the surveys raises issues with under and/or over-reporting of certain foods. The survey showed that 38.2% of Army personnel reported skipping breakfast and 23.2% skipped lunch at least twice per week. Skipping lunch was highest for the Army compared to other military services (4).

Stress is another contributor of cardiovascular disease. In the 2005 DoD survey, 32.5% of the military personnel indicated their jobs were a source of stress followed by 18.9% who reported family as a source of stress. More men than women used alcohol (29.9% vs. 21.8%) and cigarettes (27.7% vs. 22.6%) as coping behaviors. An estimate of 4.3% military personnel considered suicide as an option of dealing with stress and depression (4).

Tai-Min et al (15) conducted a three month prospective study to assess alternations in lipid profiles during recruitment training in 930 healthy Chinese youth. Blood pressure and a lipid profile were conducted at the beginning and end of the training. Demographic information, use of tobacco and alcohol use was collected. The participants consumed a regular diet without any lipid restrictions. Results showed a significant increase in physical activity from before recruitment. The recruits reduced total cholesterol by 8.7%, low density lipoprotein (LDL) cholesterol by 15%, and a 13.4% decrease in ApoB . The TC/HDL-cholesterol ratio was reduced significantly. There was an increase in HDL-cholesterol but not at a statistically significant level.

Weight reduction appears to be the most important factor contributing to the reduction in total cholesterol, LDL cholesterol, and ApoB levels.

Naghii (16) provided an insight of weight management issues in military population. He suggested a need for a two phased weight management program that has components for weight loss and weight maintenance. There is a need to implement sound and effective strategies by incorporating sound diet, exercise, and behavior modification to maximize the effectiveness. Unsound weight loss practices such as fasting, sweating, fluid restriction, use of laxatives and diuretics results repeat cycles of weight gains, disordered eating, dehydration, nutrient imbalances, and psychological distress. This can also result in loss of lean muscle mass and poor military performance. It suggested identifying weight changes early in military career to facilitate individuals to learn various aspects of healthful eating such as energy balance, portion control, and caloric content along with other military tasks. Military appearance has psychological reasons because there is a perception of fitness as viewed by the general public. Appearance also affects an individual's self esteem and acceptance by peers.

Sakuta (17) investigated the relationship between rank in the Self-Defense Forces (SDFs) and risk factors of atherosclerosis in middle-aged men. Middle-aged male SDFs undergoing preretirement health checkups were classified into five groups based on their ranks with group 1 with lowest military rank and group 5 with highest rank. Lifestyle information was collected using self reported questionnaires. The results indicated higher smoking in the lower rank and higher intake of vegetables in the higher ranking SDFs. Physical activity did not differ in various ranks. Alcohol abstainers were lowest in group 5 and highest in group 1. Total alcohol consumption was comparable in all groups. The

increase prevalence of type 2 diabetes, high gamma glutamyltransferase, and high and high-normal WBC count was seen in the lowest ranking group. Prevalence of hypercholesterolemia, hypertriglyceridemia, and hypertension were not significantly different in various ranks. This study showed the impact of socioeconomic status based on military rank on risk factors of atherosclerosis disease.

Nelson et al. (18) conducted a six month, randomized control trial incorporating a comprehensive behavioral intervention to reduce risk factors in adults with or without diabetes at a military health care system. A majority of the participants were retirees and dependants with only 11% active duty service members. Intervention consisted of patient centered, personal risk counseling based on principles from the Transtheoretical Model of change, social cognitive theory, and the health education model. Participants in the usual care group did not receive individualized counseling and were eligible to attend group classes. The intervention group experienced a greater weight loss compared to the usual care group at six months (-5.6 lb vs. -0.9lbs, $p < 0.01$). The study showed that the stage matched intervention resulted in greater decreases in body weight, total cholesterol, and blood pressure.

Sigrist et al. (19) assessed the senior officers' concerns on various health topics, educational preferences for nutrition and health topics, eating habits, and barriers, and motivators for eating healthy and exercising regularly. The results of an electronic survey (n=58) showed that 80% of the officers wanted more information on eating healthfully on the run and 78% wanted more information on lowering blood cholesterol levels. Barriers to a healthful lifestyle were busy schedules, not a personal priority, non-availability of healthful choices, dislike cooking, and confusion from medical/research.

In this group, appearance, meeting military weight and body fat standard, and family were motivating factors.

Nutrition Education Strategies to Reduce CVD Risks

Agencies' Recommendations

Various federal agencies have recommended specific strategies for nutrition education. The National Heart Lung Blood Institute (NHLBI) launched the National Cholesterol Education Program (NCEP) in 1985 and has revised recommendations three times. Walden and colleagues in 1997 (20) assessed the effectiveness of NCEP Step II diet in hypercholesteremic men and women with triglycerides below 500mg/dL in a randomized controlled trial called the beFIT study. Participants were assigned randomly to an immediate intervention group or a delayed intervention group that served as a control group. Both groups had similar characteristics at baseline with dietary intake and serum lipid levels. The intervention group received eight weeks of instruction on the NCEP Step II diet with a follow up at one, two, three, and six months. The results showed a reduction in fat calories in the intervention group from 34% to 25.2%, saturated fats reduced from 12% to 7.6% and dietary cholesterol from 258 mg/day to 171mg/day. Low density lipoprotein cholesterol decreased from 7.6% to 8.8% after 6 months of dietary intervention. There was, however, an increase in carbohydrate intake from 47% to 55.2%. This study was based on a free living population with a potential of under-reporting and consisted of younger subjects who may have impacted the study results. The NCEP-ATP III guidelines were released in 2002 and it continued to emphasize the importance of identifying and treating elevated LDL cholesterol and suggested adults above 20 years of age obtain a lipid profile at least once in five years (21). Previous

studies have shown a strong link between elevated cholesterol, especially LDL cholesterol and CHD (22).

Adherence to NCEP-ATP III needs to be improved because less than half the persons at high risk for CHD are receiving treatment. Approximately one third of patients who are being treated are achieving their LDL cholesterol goal and less than 20% of CHD patients have LDL cholesterol maintained at optimal levels. An LDL cholesterol level of 130-159 mg/dL is considered borderline high, 160-189 mg/dL as high and 190 mg/dL and higher as very high. HDL cholesterol needs to be higher than 40mg/dL. Lower HDL cholesterol is considered to be a risk factor for heart disease and stroke. The mean HDL cholesterol levels for American adults age 20 and older is 51.3 mg/dl according to NHANES 1999-2002 (NCHS) (23).

Dietary Recommendations from USDA and USHHS

The USDA and USHHS *Dietary Guidelines of Americans* communicate the federal nutrition policy. Revised in 2005, this document provides science based information for Americans to promote good health and lower risk of chronic diseases. The messages from these National guidelines have been translated into an interactive educational tool called “MyPyramid”. MyPyramid food guidance system illustrates the dietary guidelines and is a valuable credible online tool for American consumers interested in pursuing dietary and physical activity behaviors (24).

Dietary Recommendations from Department of Defense (DoD)

The US DoD Health Survey of Health Related Behaviors among Active Duty Personnel (2005) showed approximately 57.2% of Army personnel reported having their cholesterol checked within the preceding five years. The Healthy People 2010 target is $\geq 95\%$ of adults having their cholesterol checked within five years. The DoD survey estimate is subject to recall bias because one in four personnel (24.7%) were unable to remember the date when their cholesterol was last checked (25).

The American Heart Association, Veterans Affairs, and Department of Defense (VA/DoD, 2006) dyslipidemia guidelines recognize that a healthy lifestyle is the foundation of primary prevention of CVD (21, 26). More healthful lifestyle includes components of diet, tobacco cessation and increased physical activity. Registered dietitians or qualified nutritionists play a critical role in providing medical nutrition therapy (MNT) to lower the risk factors of CVD (21). Sufficient evidence is available to support the effectiveness of MNT in managing dyslipidemia and reducing risk factors associated with CHD (27).

Varady et al. (28) conducted a critical review of studies with diet, exercise and supplementation. The purpose of the review was to examine the cholesterol lowering efficacy of low saturated fat diets combined with exercise and use of nutritional supplementation such as fish oil, oat bran and plant sterols combined with exercise. Lifestyle therapies including exercise and diet were found to result in a 7-18% reduction in total cholesterol and 7-15% reduction in LDL-cholesterol, 4-18% reduction in triglycerides and 5-14% increase in HDL cholesterol. These changes in the lipid profile were further enhanced in studies where nutrition supplements were combined with

exercise. It is therefore suggested that for patients requiring a 5-25% reduction in LDL cholesterol, a combination of interventions should be the primary measure, or, used as adjunct therapy to reduce the dose of lipid lowering drugs.

Kris-Etherton and colleagues (29) discussed the benefits of a Mediterranean-Style National cholesterol education program. The Lyon Diet Heart study demonstrated significant beneficial effects of lowering the risk of recurrent heart disease by 50-70%. The Mediterranean diet does not have a specific definition because variations exist in 16 different Mediterranean countries. This diet usually consists of large amounts of fruits, vegetables, breads, other forms of cereals, potatoes, nuts and seeds. Olive oil is an important source of fat with moderate consumption of dairy, fish and poultry. Eggs are consumed 0-4 times per week with small quantities of red meat and low to moderate intake of wine. The investigators suggested the need to recognize the enormous public health benefit of this diet and possible incorporation in primary and secondary prevention and the need for more research in this arena.

Studies on CVD Program Structure

Byers et al. (30) performed a randomized trial to evaluate the effects of a post-screening nutrition education program and the feasibility of being delivered by public health workers in small work-sites. This study was collaboratively conducted by State Health Departments in Colorado, Minnesota, Missouri, and Washington by the Center of Disease Control and Prevention. Forty worksites with less than 200 employees were selected and 20 sites were randomized to either a “usual” or “special” intervention group.

The researchers recruited 2,067 workers and found 846 workers with cholesterol of greater than 200mg/dL blood cholesterol levels who were randomly assigned to one of the groups. Usual intervention consisted of approximately five minutes of American Heart Association Step I diet education counseling immediately after cholesterol testing. The special intervention group received the same information as the “usual” group and two hours nutrition education delivered in multiple sessions at the worksite usually by a nutritionist over the following month. Cholesterol was checked by the finger prick method with capillary whole blood using Reflotron testing equipment at baseline, 6 and 12 months for both study groups. Cost was determined from each worksite using salaries of providers, workers preparation, travel, supplies and telephones. Compliance to 6 month follow up cholesterol testing was 62% for the usual group and 71% for the special intervention group. At 12 months, compliance to cholesterol retesting was 59% for both groups. Cholesterol reduction at 6 months for usual care was 0.4% and 1.2% for special education program. There was a significant ($p < 0.01$) reduction of cholesterol of 3.0% in the usual group and of 6.5% in the special education group. The difference of 3.5% reduction in the special education group was attributed to the intervention. Worksite health promotion programs need to justify the cost of implementation and the expected benefit. The total cost of cholesterol screening and education was approximately \$50 per person. The cost of this program to the employer was approximately \$75. A major cost contributor for the employer was worker salaries and for the education program it was the printed materials. The investigators concluded the need for continued future efforts to lower cholesterol by providing nutrition education programs that are cost effective at worksites (30).

Kotani and colleagues (31) conducted a study on the effects of different interval length in hypercholesteremia education class on participants' health behaviors and satisfaction levels. Comprehensive group education consisting of six sessions was delivered by a physician, dietitian and exercise instructor either once or twice a month. Intervention for both groups was based on the constructs of the Transtheoretical Model of Change (TTM) approach. The participants rated the program on a 100-point scale and stage level of change was determined using a questionnaire. Participants clinical characteristics at baseline for monthly group (n=45) and twice-monthly group (n=46) were found be not significant. At six month follow up, there was no significant difference in dietary changes among the two groups ($p < 0.05$). There was however, a 60-70% increase in the number of participants in the "action" stage with regards to diet changes in the twice-monthly group. The participants in the twice-monthly group were found to have significantly ($p < 0.05$) better understanding of diet (81.8 ± 11.5) compared to the monthly group (76.0 ± 10.8). In the area of exercise, a significant increase ($p < 0.05$) in "action" stage was found among twice-monthly group (76.1%) as compared to the monthly group (54.2%). The twice monthly group also showed significantly ($p < 0.01$) higher satisfaction levels (85.7 ± 12.4) compared to the monthly group (75.2 ± 11.3). The investigators concluded that the intensive twice-monthly TTM based classes were observed to be a superior education format.

Reid and coworkers (32) assessed the feasibility of a one-hour evening information session provided by the hospital dietitian and found that patients reported high levels of satisfaction. The session attendance increased from 79% initially to 87% after a reminder was sent to clients before the class. The group format showed benefits

of transfer of responsibility of making changes to the patient and attendance indicated readiness to make a change. The group environment also provided reinforcement with the potential for social compliance and reduced the waiting time for an individual appointment (32).

Role of Registered Dietitians in Management of CVD

Registered dietitians and registered diet technicians are leaders in delivering CVD preventive services. Primary prevention of chronic diseases is recognized as the most cost effective course of action for disease prevention (33). Registered dietitians can provide a cost effective means of managing cholesterol, weight and diabetes. By managing these conditions patients can lower risks for CVD (26). Even if drugs are used to prevent mortality and morbidity of CVD, medical nutrition therapy continues to improve patients' outcomes (34-37). Diet and lifestyle recommendations are complementary, not contradictory, in the management of chronic diseases. The best approach to manage these lifestyle behaviors is a person-to-person approach and registered dietitians are health professionals trained to implement changes at individual or population basis (38).

Sikand and colleagues (34) conducted a retrospective chart review on 73 men with hyperlipidemia and previous history of niacin noncompliance. These patients received MNT from a dietitian for 8 weeks before the initiation of statin therapy. The study showed an 11% ($p<0.001$) reduction in total cholesterol and a 4% increase in HDL cholesterol after MNT. Only 15 patients out of 30 required lipid-lowering drugs, resulting in a cost savings of \$638.35 per patient, \$3.03 in statin therapy for every dollar

spent on MNT. This study also found that at least three one-hour visits with the dietitians are needed to obtain the benefits.

Delahanty and coworkers (35) conducted a prospective study on 90 subjects with patients being randomly assigned to receive MNT or usual care. The purpose of the study was to assess patients' quality of life (QOL) and satisfaction with MNT. This study was conducted to dispel the preconceived notion and skepticism of poor QOL with a prudent diet. This study demonstrated a significant positive impact of MNT on cholesterol reduction and improvement of QOL and patient satisfaction when compared to patients receiving usual care.

In a prospective randomized controlled study, Nasser et al. (39) compared two nutrition education strategies by recruiting 212 hyperlipidemia clients. These clients were randomly assigned to an educational approach using Stages of Change or Usual Care by dietitians. Both groups received four weekly educational sessions and followed up at 16, 28 and 40 weeks. Regardless of the educational approach, registered dietitians were found to be effective in disseminating nutrition education. One hundred and forty one participants completed the study with 11% serum LDL cholesterol reduction in the Stages of Change approach group versus 8% reduction in the usual group from baseline to 40 weeks ($p<0.001$). Both groups reported approximately 30% fat intake ($p<0.001$) and reduced total serum and LDL cholesterol were sustained over 40 weeks. Usual care nutrition education activities can be enhanced by incorporating methods from the Stages of Change approach.

Herbert and colleagues (40) suggested a need for empirical data to demonstrate the effectiveness of dietitians in lowering the risks of coronary heart disease. This study

recruited 1,162 subjects who were randomized to either a physician delivered or dietitian based program. The dietitian based program (n=645) consisted of a 45 minute individual appointment followed by a two-hour group session and a final individual session. The study found that changes in dietary fat and serum lipids were related to the “dose” of intervention. There was a significant relationship between serum cholesterol reduction and time spent with the dietitian ($p<0.05$). At one year subjects who attended three or four nutrition sessions had significant reduction in outcome measures compared to subjects attending fewer than three sessions. This study addressed the need to educate physicians about the registered dietitians’ expertise to improve the rate of referrals.

Miller et al. (41) conducted a study to assess the efficacy of simultaneously implementing all the recommendations to prevent and treat hypertension. Forty four hypertensive and overweight participants on a single hypertensive medication were placed either in a lifestyle or control group for a period of nine weeks. The lifestyle group was fed a hypocaloric version of DASH diet and engaged in moderate intensity exercise program three times per week. The lifestyle group significantly reduced blood systolic (-9.5mmHg, $p<0.001$), diastolic blood pressure (-5.3mmHg, $p<0.002$) total cholesterol (-25mg/dL, $p<0.001$), low density lipoprotein level (-8mg/dL, $p<0.005$), and high density lipoprotein level (-5 mg/dL, $p<0.001$).

Additional Cardiovascular Disease Risk Identification and Assessment Markers

C - Reactive Protein

The Center for Disease Control and the American Heart Association has endorsed the measurement of C-reactive protein as part of CVD risk assessment (42). This

measurement is simple and inexpensive and is usually ordered along with the lipid profile. C-reactive protein (CRP) is made in response to an injury, inflammation, or trauma. Since atherosclerosis is considered to be a disease of inflammation, elevated markers of inflammation indicates higher risk for future heart disease. The level of circulating CRP depends on numerous environment and genetic factors. Elevated CRP is seen in people who smoke, are hypertensive, overweight, and sedentary. High CRP levels raised the risk for CVD by 2 to 3 times and this protein is considered to be a stronger overall predictor of heart disease and stroke than LDL cholesterol. It is suggested to combine CRP test along with cholesterol evaluation to improve prognostic evaluation. Along with predicting risk for CVD, CRP predicts the risk for developing type 2 diabetes and CRP is used to diagnose metabolic syndrome.

CRP levels can be lowered by aspirin and statin drugs. Desirable CRP level is less than 1mg/L and at this level the overall risk for CVD is low. A CRP level between 1 and 3 mg/L are considered to be moderate risk and above 3mg/dL, is high risk. Similar CRP levels are seen in males and females, except that postmenopausal women on standard estrogen or estrogen plus progesterone oral hormonal replacement seem to have elevated CRP levels.

Malik et al. (43) conducted a cross sectional study of 3,873 US subjects' ≥ 18 years to evaluate if elevated CRP levels modified the relationship of metabolic syndrome and diabetes with CVD. The results indicated that participants with diabetes and elevated CRP were seven times more likely to have CVD than those with neither metabolic syndrome nor diabetes. In participants with metabolic syndrome and high CRP levels, the likelihood of CVD was as high as participants with diabetes and low CRP levels. This

information adds to the suggestion of including CRP as a criterion for the diagnosis of metabolic syndrome.

Abdominal Adiposity

The widely used body mass index (BMI) does not accurately identify risks of chronic diseases in an individual. Measuring abdominal obesity is now recognized to be a powerful risk marker and can be easily and safely measured (3). Recent studies have indicated presence of varying degrees of abdominal obesity across all levels of BMI. Abdominal adiposity is an important component of the insulin sensitivity syndrome. The use of waist circumference is supported by national and professional organizations as a screening tool for health risk. The US National Institute of Health (NIH) advocate stratification of waist circumference into two levels of action: action level 1 for waist circumference ≥ 94 cm for men and ≥ 80 cm for women and action level 2 for waist circumference ≥ 102 cm for men and ≥ 88 cm for women. Level 1 action entails lifestyle modifications and level 2 would require professional help (44).

Okosun et al. (44) investigated the prevalence and trends in abdominal obesity in a nationally representative U.S. adult sample (n=23,654) for three time periods; 1960-1962, 1988-1994, and 1999-2000. This study revealed a gradual increase in waist circumference in both genders. The trend increased with increasing age and increasing BMI.

Role of Computer-Based Interventions in Primary Prevention of CVD

Healthy People 2010 provided detailed objectives on the impact of effective health communication. The environment for communication about health has changed tremendously with the expansion of communication channels and competition for people's time and attention. People have more opportunities to select topics of their interest and preference. Health communication from non-commercial and public sources have to withstand the marketing models of Internet commercialization (12).

To effectively implement strategies to lower the risk of CVD, it is critical to explore avenues to improve awareness of risk factors and implement programs. Internet use is rising with expanding technology. Internet can be a valuable tool in the era of scarce resources and an environment with rampant prevalence of risk factors for chronic diseases.

According to a Pew Internet and American Life Project survey in December 2006, 70% of adults used the Internet and account for approximately 141 million people (45). Highest Internet usage (83%) was seen in the 18-29 years age group. Internet use was lowest for the following groups: 58% of Non-Hispanic Blacks, 49% of people with household income less than \$30,000/year, 33% of the 65+ years age group and 36% of people with less than a high school education. Even with noted disparity in Internet use, it is a viable media to reach mass population. Use of Internet for health and medical information ranked fourth with 79% of Internet users (46). The top three reasons for Internet use are 91% for e-mail, 91% for search engine to find information and 84% for a map or driving directions. The use of the Internet for health advice is found to be used for reassurance and to confirm decisions rather than used independently.

Eight of ten Internet users looked for health information in 2006; this ratio was the same as in 2002 and 2004 (47). Forty nine percent of Internet users searched for information on diet, nutrition, vitamins or nutrition supplements. Searching for nutrition information ranked third in the health topics, with 64% searching for specific disease or a medical problem and 51% searching for a certain medical treatment or procedure. It is interesting to note that 66% of the health seekers initiate a search using a search engine and only 27% accessed health information directly from a health-related website. There appears to be a great demand for health information; 72% of the health seekers visited two or more websites during their last health information session. Among health seekers 53% indicated the information accessed had an impact on self-care or caring for someone else's health. This accounts for a substantial population who experience some type of impact due to information on the Internet. The experience with online information appears to be mostly reassuring for 74% of health seekers; but, for 18% the information was confusing, and 10% of health seekers were frightened by the serious and graphic nature of information found online.

An experimental study was conducted in 2004 (10) to evaluate the impact of Web-based nutrition counseling and social support in 146 individuals with CVD risk. Participants were recruited from Family Practice Clinics in Canada. No significant differences between the web-based intervention group and the usual care control group were seen. This study addresses the issue of lower uptake of Web-based interventions as mentioned in other studies. There is a potential for Web-based nutrition counseling to ease the burden of continuous care for patients with chronic disease like cardiovascular disease. This study strongly advocated that Web-based counseling was ineffective when

used independently. It was suggested that the World Wide Web should not fully replace the consultations by health professionals.

Physicians have time constraints but at the same time it is important to provide nutrition information to the patients. The University of Wisconsin designed a Medical Nutrition Handbook that can be accessed online (48). The website provides evidence based information and key counseling messages that can be quickly disseminated to the patients by the physicians during an acute care appointment. Availability of reliable nutrition materials on the computer can save a general practitioner's time when giving advice to patients. The general practitioners can print the needed information for their patients.

Internet use for disease management involves further research with website usability and user readiness to change and maintain improved behaviors. According to recent trends there is increased use of Internet for health and nutrition information; however, Health Behavior Change on the Internet (HBC-I) is in its early stages of development (49). Behavior change is a complex task; if the Internet is to assist people to change behavior, it needs to contain certain basic elements. Websites with programs on smoking and diet appear to be ahead in incorporating elements of behavior change compared to other medical conditions (49).

The other issue is readiness of people to access programs with improvement in self-efficacy. There appears to be a lack of intention among 62% of the Internet users to start a health behavior change program (49). There are only 24.7% using the Internet for health promotion and disease management indicating need for extensive research on improving health of more people through Internet use (50). The Internet can serve as a

cost-effective modality for a tailored communication for health behavior change (49). Effective health communication needs to be based on rigorous formative research and evaluation of outcomes (12).

The Healthy People 2010 objective on Health Communication provides a list of attributes for effective health communication because it has an impact on leading health indicators (12). The objective suggests a need for comprehensive health communication, which is derived from a systematic exploration of factors impacting health and how to influence these factors. The Healthy People 2010 suggests use of multidimensional interventions to reach diverse audiences using relevant information suited to the targeted segment. Internet use has made interactions between providers and patients possible online. This interactive nature makes Internet media an advantage compared to traditional media. Along with interactivity, customization and multimedia, the widespread information availability raises serious challenges due to consumers using poor quality information that can be misleading, inaccurate and inappropriate. Consumers are at increased risk of misinformation and potentially jeopardized in regards to privacy and confidentiality. There is an increased demand for rigorous evaluation of healthcare and public health delivery systems for evidence-based practices. Effective health communication using the Internet can facilitate informed decision making, promote health behavior, enhanced peer and emotional support, promote self care, manage increased demand for health service and support clinical care (12).

Extensive empirical research is warranted to evaluate the use of the Internet in larger health communication systems and incorporate communication concepts. The research should address 'net-gap' and quality of information provided (51). It is

important to take advantage of the “e-revolution” to enhance the current outdated health care system of the United States (52). The increased number of Internet users (among all ethnicities) makes it an influential force with the potential to revolutionize the health care industry. Groups such as minorities, seniors, and low-income persons who previously had poor access are now showing an increased usage; such trends result to narrow the “digital divide”. Internet can enhance provider-patient relationships by sharing the burden of responsibility for knowledge and shifting the locus of control from the doctor being the sole manager of patient care to being partners.

The Internet can serve as a valuable tool in self care endeavors such as a federally funded program on home glucose monitoring via Internet (52). An online support group facilitates disease specific information and provides a unique social and emotional support to patients. More studies are needed to assess the role and value of the Internet to improve patients’ health and behavior outcomes and the relationship between patients and providers.

Fox (53) from the Pew Internet and American Life Project reported the extent of Internet use by people with chronic diseases or disability. This report was based on a telephone survey with a sample of 2,928 responders. Health related topics were searched by 74% of the Internet users with chronic disability compared to 62% without a chronic health condition. Adults with chronic diseases were less likely to use Internet, but once online, they were avid consumers. Diet, nutrition, vitamins, and nutritional supplements ranked third among the various health related topics searched by both Internet users (with chronic diseases and with no chronic diseases). Internet user looking for health information, online information appeared to affect their treatment decision, interaction

with the doctor, ability to cope, and nutrition and exercise regimens. It was found, however, that most e-patients with chronic conditions did not check the date and source of the Internet information.

Murero et al. (54) conducted a telephone interview with 82 patients who underwent off-pump coronary-artery bypass grafting to assess accessibility, readability, and quality of Internet medical information. The results indicated that 35 participants, especially with more education used Internet (42.7%). Only 51.4% of the Internet users appeared to have used the Internet for medical purposes. The majority (83.3%) of participants indicated difficulty understanding the information and only 3 participants found the readability of the medical information acceptable. Despite readability barriers, 94.4% of the participants found the online information helpful to cope with stress and anxiety with the procedure. Participants suggested involvement of their immediate health care provider when developing online medical information and easier language for general public use as mechanisms to increase credibility and usability of online information.

Revere et al. (55) conducted a review of computer-generated or computer-operated therapeutic communications. The most commonly used cognitive theories were the Transtheoretic Model, HBM, and the theory of reasoned action/ theory of planned behavior (TRA). Studies selected were divided into three intervention types: personalized, targeted, and tailored. Personalized messages had the person's name without customizing the information. The targeted intervention had content customized to the specific group, did not account for personal differences, had the potential to be personalized. Tailored interventions were based on specific individual characteristics and

messages were presented based on individual needs. Improved outcomes were found in studies with tailored interventions, however, there is insufficient research comparing tailored and targeted interventions effectiveness. Multiple interventions were found to be more effective than a single tailored intervention. There is still lack of studies in various health conditions; most studies focused on smoking cessation.

It is important to utilize the technology to create alternate resources for health education. The technology is outpacing and has become a staple in everyday lives by enriching the learning process and is considered the next generation of learning media (56). To be effective, media emphasis needs to be placed on a user-centric design and decisions made using human factors and matching users' expectations and needs. Creation of multimedia learning modules consist of five phases: (1) understand the learning process and needs of the target audience, (2) design with a user centric concept, (3) build the content, (4) conduct usability testing, (5) evaluate and improve the design (56).

Wantland and colleagues, (57) conducted a meta-analysis of web-based and non-web-based self care interventions for chronic illness, 22 studies met the inclusion criteria. Web-based interventions indicated an improvement in knowledge and behavior change. The outcomes that appeared to improve were with exercise time, nutrition knowledge, program participation, body shape perceptions, and weight loss maintenance. Tailored interventions increased the web-site session time and chat rooms increased the social support scores. The long term effects of web-based programs and cost effectiveness requires continued evaluation.

Use of the Expanded Health Belief Model in Disease Prevention and Management

Burns (58) discussed the two major challenges faced by healthcare marketing practitioners in the arena of preventive health care services. The first challenge is to convince people they are at risk and secondly, obtaining long term behavioral adherence. It is critical for health care practitioners to remind people regarding future risks and adoption of preventive health care practices. The Expanded health belief model has been widely utilized to guide practice and help understand preventive healthcare behaviors.

The Expanded Health Belief Model (EHBM) lends itself to various acute and chronic disease prevention and management strategies. This model has evolved since the 1950s when a group of psychologists was trying to decipher the failure of people to take advantage of preventive services such as immunizations and tuberculosis screening. The theory was extensively studied and further refined by Dr. Irwin Rosenstock. In 1988, the self-efficacy construct was added resulting in the expanded version of the health belief model. This model attempts to understand the underlying reasons of behavior modification.

The EHBM stipulates the likelihood of a person adopting a preventive health care behavior depends on following perceptions of threat and value of action suggested to reduce the threat. The perceived threat in turn is the function of perceived susceptibility to the disease and perceived seriousness due to the disease in question. Perceived susceptibility refers to a subjective perception of an individual's risk of contracting the disease. This dimension also included acceptance of a disease condition and re-susceptibility. Perceived severity improves awareness of the seriousness of the medical

condition and its clinical, medical, and social consequences. The other important components of the EHBM model are the perceived benefits and perceived barriers.

Rosenstock (59) critiqued the existing medical model and the definition of compliance, which is described as the extent to which a person's behavior coincides with the medical or health advice. Rosenstock argues that the medical model may be suitable for certain medical problems such as ear infections or emergencies where the people are not blamed and the expert conducts diagnosis and provides advice. Chronic medical conditions requiring long term behavior modification will be ineffective unless there is a partnership between the client and the provider. Some of the existing models with suboptimal results are the moral model and enlightenment model. In moral problem the person is blamed for the condition and they have to find their own solution. Compliance in this model means to pick oneself up by one's bootstrap and giving up and changing lifestyle by an act of will. In the enlightenment model, people are made aware of their problem and help in behavior change is by an authority, for example, Alcoholics Anonymous; and compliance in this model means submitting to the discipline of the authoritative force. Rosenstock recommends the use of a compensatory model where people are not blamed for their conditions but are expected to acquire skills with the aid of experts. The solution to the problem is not mandated by a health care professional; but the person with the problem is responsible for the solution. This model focuses on "how can I help you" versus "do as I say" in the medical model. Compliance in the compensatory model is a partnership or therapeutic alliance and hurdles or slips in application of skills is not considered an occasion of guilt or recrimination and instead an identification of ways to avoid future slips. Compensatory model application will allow

providers to help clients freely set and achieve goals at their own pace. Relapses in behavior changes can be reduced by enhancing self-efficacy and coping skills. Coping skills can be acquired through practice and rehearsal. In challenging situations coping skills will enable improvement of self-efficacy and better self-control in tempting situations. There are ethical issues when dealing with behavior changes and clients have the right to choose a particular behavior. As a health professional, the key objective should be to encourage people making informed decisions of their own (59).

Bandura (60) discusses the role of cognitive processes in acquiring and retaining new behavior patterns. Major learning occurs through modeling and people process information from sequences of events gradually to achieve a desired outcome. Motivation is embedded in cognitive activities and refers to activation and persistence of behavior. Goal setting and self-evaluation can motivate an individual by self-inducement and persistent efforts to perform a certain behavior. An outcome expectancy refers to a person's estimation that a certain behavior would lead to a specific outcome. An efficacy expectation is the person's belief in the behavior and confidence to perform a behavior to produce a desired outcome.

Hollis et al. (61) evaluated a five year period family-based community approach to promote a low-fat, low-cholesterol eating plan to prevent coronary heart disease (CHD). The screening process identified 501 homes in Oregon eligible for participation and measurements were done three times per year. The intervention consisted of monthly small group meetings with dietitians and psychologists. Various health belief, health knowledge, and demographic variables were measured for joiners (n=233 families) and non-joiners (n=268 families). Perceived susceptibility of CHD, perceived severity of

CHD, and perceive barriers to dietary changes was not significantly different between the two groups. Perceived benefit of dietary change was significantly higher in joiners than non-joiners ($p < 0.001$). The joining families also scored significantly higher on internal health locus control, exposure to CHD information and knowledge of CHD. Occupational and educational levels were higher in the joiner group.

Troxell et al. (62) utilized the constructs of the Health Belief Model in designing education material to increase consumption of DHA among low income, high risk pregnant women. Specific materials were developed to target each construct of the HBM based on information obtained from focus groups with the target audience. Special attention was given to reduce barriers often seen in low-income population. Cost of recipes was reduced by using inexpensive and familiar ingredients, providing coupons to study participants, and providing materials to serve as motivators, for example, the magnet clip, recipe holder, stickers, shopping lists, and calendar pouch.

Wdowik et al. (63) conducted a cross-sectional explanatory study to determine factors predicting diabetes self-management among college students. A self care assessment instrument consisting of 92 questions was created using various components of the EHBM, Social Learning Theory (SLT), and Theory of Reasoned Action (TRA). Eighty three students participated in this study. The study found that barriers to diabetes self care among college student were Situational Factors and Emotional Response. This resulted in hindrance to self care behaviors even with positive attitudes. In this population, Threat was negatively correlated to cues to action and value of action and suggesting that adherence is better achieved with a low perceived Threat.

Aalto (64) conducted a cross sectional study to examine the relationship between diabetes self care practices and glycemic control and between socio-cognitive factors. This study created a scale using the Health Belief Model integrated with locus of control, health value, self-efficacy, and social support. The results showed that older respondents followed a stricter diet, perceived greater threat of complications and had stronger self-efficacy in self-monitoring blood glucose (SMBG). Women in the study appeared to have a higher perception of benefits of SMBG and a higher threat of complications. Perceived threat construct was not found to be associated with diet adherence and SMBG practices in this study. The researchers stated that providing information on importance and benefits of diabetic self care is essential but not sufficient. It is suggested that self-care in diabetes need to be individualized based on life circumstances and individual capabilities.

Rosenstock (65), discusses the ethical issues when planning and designing behavior change programs. It is critical to understand the motives and beliefs that increase an individual's willingness to adopt a particular pattern of behavior. The uniqueness of an individual should be recognized and include the concept of incremental learning. Other factors are the importance of reinforcement and that learning requires both knowledge and skills. There is human variability where it is not unusual to encounter people who are knowledgeable and continue with risky behaviors.

Charron-Prochownik (66), conducted a multisite, exploratory, case-controlled study on 80 adolescent females with type 1 diabetes. Constructs of EHBM were used to examine reproductive health behaviors and metabolic control. The specific reproductive health behaviors were preventing an unplanned pregnancy and seeking preconception

counseling. The study revealed that birth control methods were negatively associated ($p \leq 0.05$) with perceived susceptibility, perceived threat, barriers to actions, and positively associated with self-efficacy. Metabolic control was related to knowledge of preconception counseling.

Murray-Johnson (67) conducted a cross country analysis of Ghana, Nepal, and Nicaragua and compared utility of variables from four health theories to understand health behaviors related to responsible reproduction. The four theories assessed were the Health Belief Model, Theory of Reasoned Action, Social Learning Theory, and Parallel Process Model. Findings specific to the HBM were as follows: in Nicaragua, barriers to behavior were correlated with intention for behavior, fear control and danger control process. Benefits of responsible reproduction were correlated with exposure, knowledge, actual behavior, fear control, and danger control outcomes. Perceived susceptibility to reproductive health threat was correlated with exposure, knowledge, and danger control. Perceived threat was correlated with exposure, knowledge, attitudes, intention for behavior, and actual behavior. Self-efficacy did not correlate with other variables. In the Nepal barriers, benefits, attitudes, self-efficacy, and outcome expectations for responsible reproductive behaviors were correlated with all outcome variables. Susceptibility was correlated with exposure, knowledge, actual behavior, and danger control. In Ghana, barriers were correlated with knowledge, attitudes, actual behavior, and danger. Benefits correlated with exposure, knowledge, intention to behavior, and actual behavior. Susceptibility correlated with all behaviors except intentions for behavior. Severity was correlated with knowledge, intention, behavior, and fear control. The study concludes that behavior changes and other outcomes could be attributed to combination of

perceived susceptibility, attitudes, perceived benefits, perceived barriers, subjective norms, and outcome expectations.

Petrovici (68) conducted a cross sectional study in a Romanian population to understand people's motivation, beliefs with disease prevention behaviors. This study utilized the constructs of the Health Belief model and the Theory of Health Preventive Behavior. The constructs from HBM were perceived susceptibility, perceived severity, perceived threat, and perceived barriers. Information was obtained from 485 face-to-face interviews and the results indicated a significant association between demographic variables and perceived susceptibility. Variation in perceived susceptibility occurred based on type of disease, gender, and age. Women were more aware of the risk of liver disease, men were more optimistic regarding their health status, and young people believed they were unlikely to experience diseases such as high blood pressure or heart disease. Participants with higher levels of motivation had higher beliefs and knowledge of diet and disease prevention and performed Dietary Health Preventive Behaviors (DHPB). As significant numbers of participants demonstrated a low perceived susceptibility indicating a need to increase focus on this construct in future health promotion strategies. Perceived threat was found to have a negative effect on (DHPB), especially with diabetes.

Sedlak (69) utilized the Revised Health Belief Model (RHBM) to assess the changes in the Osteoporosis Preventing Behaviors (OPB) when young postmenopausal women received bone density information using the dual energy X ray absorptiometry (DXA). The OPB behaviors included increasing calcium intake, weight bearing exercise, and use of non-hormonal drug therapies. This longitudinal study enrolled 203 participant

placed either in the treatment group that received DXA or the control group and measurements done at months 3, 6, and 12. The RHBM is another term for EHBM since it contains the self-efficacy construct. The study utilized subscales to measure various constructs of the RHBM. The results indicated that the general knowledge of both groups increased; however, increased knowledge does not indicate increased adoption of disease prevention behaviors. The mean susceptibility to calcium intake of the treatment group increased and that of the control group decreased ($p < 0.011$). The control group showed a higher mean perceived barriers to calcium ($M = 12.99$) compared to the treatment group ($M = 11.84$, $p < 0.16$). The calcium intake significantly increased in the treatment group ($p < 0.001$). There was a positive correlation between perceived susceptibility and calcium intake ($r = .13$, $p < 0.01$). Perceived barriers were negatively related to calcium intake ($r = -1.77$, $p < 0.05$). The other RHBM constructs were related to one or both of the OPB (calcium intake and exercise). In this study, DXA appeared to be a motivator towards adopting OPB and preventing risks of osteoporosis.

The EHBM appears to be an appropriate framework to design effective health promotion programs. Research done so far indicates the importance of raising awareness toward a preventable health risk and making individuals realize the threat posed due to this risk. After increasing perceived susceptibility and seriousness of the disease, the next step involves resolving barriers towards healthful lifestyle. The benefits of adopting a healthful lifestyle are weighted against the barriers. An intervention can serve as a strong motivation cue by providing credible information. Self-efficacy of the EHBM enables a participant to transform the knowledge regarding healthful lifestyles into

behaviors. The outcomes of behavior changes reinforce repetition and trying more complex tasks. These actions raise the individual's self-efficacy towards a healthy lifestyle behavior.

Cardiovascular disease is a disease of massive magnitude; therefore, a multi-factorial approach in management of this disease should be considered. Patients who are unable to attend the traditional nutrition education classes or individualized counseling offered on outpatient basis need other avenues of information to improve awareness of the importance of CVD management. The use of computer technology will assist in reaching that segment of military beneficiaries who are ready to make a lifestyle changes and are motivated to use self-help methods. Utilization of Expanded Health Belief theory as a framework in creation of the web based program could potentially support and enhance healthy lifestyle behaviors. If proven effective, web-based programs can serve as a valuable tool in self care endeavors.

CHAPTER III

METHODS

Recently conducted formative assessment of the Army hospitals provided valuable suggestions to enhance strategies to reduce cardiovascular disease (CVD) risk (5). This study implements the recommendations and suggestions provided by several Army registered dietitians. Registered dietitians are the primary educators of lifestyle modification to reduce CVD risks among military beneficiaries. The two major recommendations from this formative assessment were to create a web-based resource center for dietitians and a web-based self-paced CVD risk reduction education program for deployed soldiers. This web-site has a potential to serve as a primary source of current information for the dietitians and facilitate management of CVD risks in military personnel and other populations who are remote and cannot attend a hospital offered education session.

The formative assessment results may have a potential bias since only registered dietitians were involved in the formative assessment. Regardless, in the era of on-line revolution and constant translocation of Army personnel there is a need to provide alternate resources to enhance primary and secondary CVD risks reduction efforts. This chapter discusses the process of web-site creation and establishing content validity and self care program effectiveness.

Development of “Defend Your Heart” web-site

The web-site for CVD risk reduction consisted of two major components: “Resources for registered dietitians,” and a 5 Step “Self Care” program. Web content was based on recently published guidelines by the following U.S national and professional organizations; National Heart Lung Blood Institute, US Department of Agriculture and US Health and Human Services, American Heart Association, and American Dietetic Association. Only established guidelines were utilized to create web-site content (2, 3, 70-73). When designing the web-site, guidance was obtained from the U.S Department of Health and Human Services Research-Based Web and Usability Guidelines published in 2006 (73). The primary concern was to ensure accuracy of the content and easy site navigation. The index page or homepage provided an introduction to the “Defend Your Heart” web-site. This page contained tabs to access the self care program, resources for the registered dietitians, contact information, and use and restriction information. Web-site graphics and layout were obtained from a preexisting template available free over the Internet. Microsoft FrontPage 2003 was used to create all other aspects of the web-site.

Self Care Section

The “Self Care” section was developed using the framework of the Expanded Health Belief Model (EHBM) (74). The constructs incorporated were perceived susceptibility, perceived severity, perceived threat, perceived benefits, perceived barrier motivational cues and self-efficacy (65, 75). Figure 1 provides a diagrammatic representation of various constructs of the EHBM.

Expanded Health Belief Model

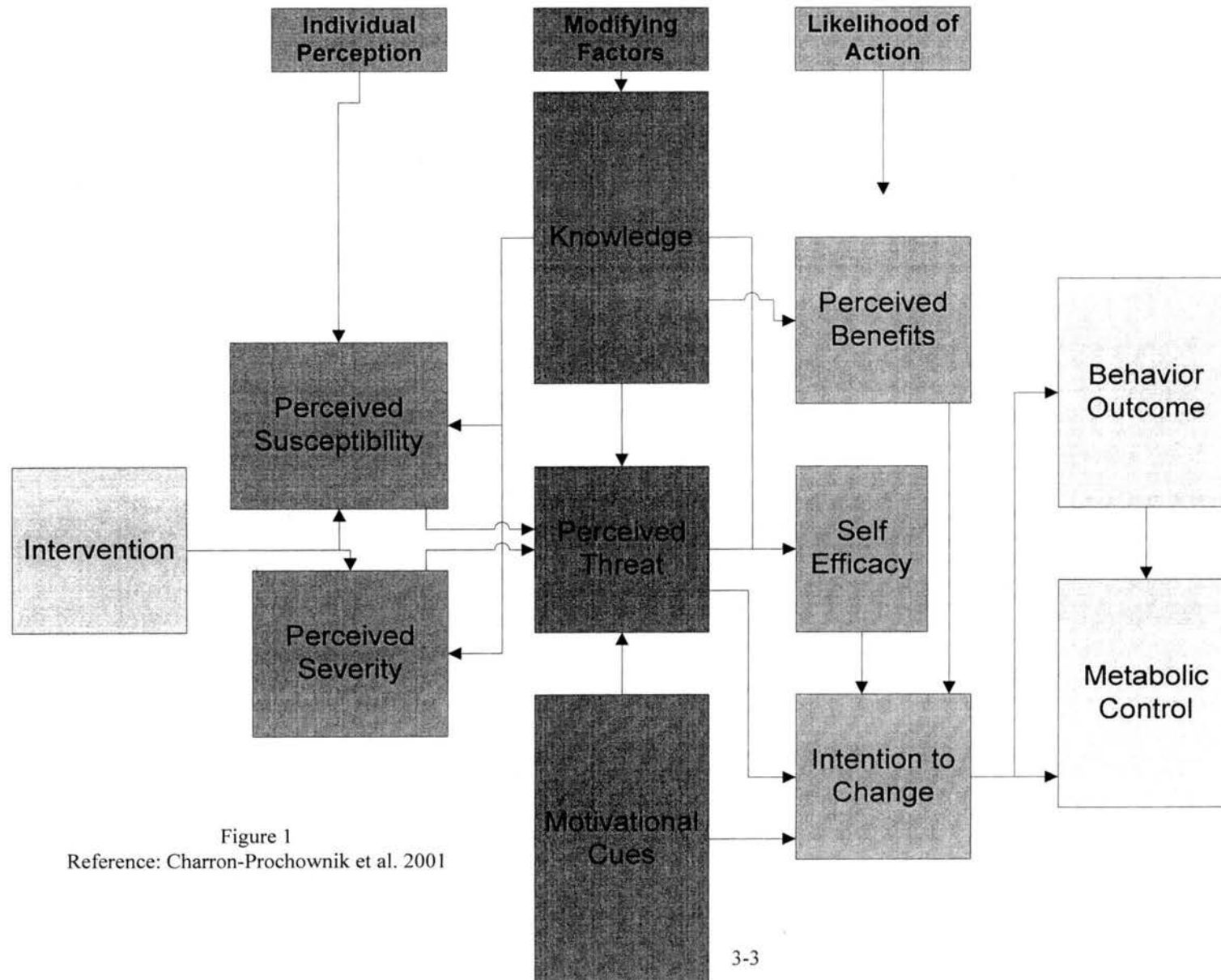


Figure 1

Reference: Charron-Prochownik et al. 2001

The self care program was divided into 5 steps to provide information in reasonable chunks to avoid fatigue and information overload. The constructs of the EHBM provided the framework and enabled systematic placement of information on the web-site to promote heart healthy behaviors. Table 3-1 provides a more details on the content covered in the 5-step program (Appendix A). Table 3-2 provides a matrix of EHMB constructs with corresponding education strategy, expected outcomes, and tools used to measure these changes.

Table 3-1 Self Care Program Steps and Content

Step#	Description	Content
1	Overview of heart disease	CVD statistics, prevalence, mortality and morbidity due to CVD, risk factors, lipid profile
2	Assess your risk for heart disease	More details on risk factors and allow participants are helped to understand their risk factors
3	Life style for a healthy heart	Benefits of a healthful lifestyle. Guidelines for a heart healthy lifestyle. Types of dietary fats and food sources.
4	More options towards a healthy heart	Dietary cholesterol, types of fiber, omega 3 fatty acids, guidance on fish intake, alcohol
5	Tools for healthful lifestyle	Food Guidance System and American Heart Association information. Links to use the tracking system to keep track of food intake and physical activity. Tips on healthful eating out, cooking, snacking and shopping.

Table 3-2. Matrix with Constructs of Expanded Health Belief Model

Constructs	Definitions	Strategy/Content Elements	Outcomes/Objectives	Measures & Tools
Perceived Susceptibility	Refers to an individual's subjective perception of the risk of contracting a health condition or disease or acceptance of a diagnosis	Discuss various risk factors for CVD Current statistics of CVD	Increase awareness of modifiable and non-modifiable risk factors Increase understand on the vulnerability (self and family member) of contracting this disease	Perceived Susceptibility Score (EHBM Scale) Lipid profile
Perceived Severity	Refers to an individual's feelings concerning the consequences of an untreated health condition. This includes patients perception that these health conditions could affect their work, family and social relationships	Discuss the impact of CVD events (MI, stroke, etc). This includes: - Disabilities - Reduced quality of life - Increased health care costs	Improve individuals understanding of the importance of prevention due to its medical, clinical and social consequences, both short and long term	Perceived Severity Score (EHBM Scale)

Table 3- 2. Cont. Matrix with Constructs of Expanded Health Belief Model

Constructs	Definitions	Strategy/Content Elements	Outcomes/Objectives	Measure
Perceived Benefits	An individual will not adopt a new/change behavior unless he/she deems it to be feasible and efficacious	Provide information on following concerns: - Reduction in risk with improvement of risk factors - Avoidance or improved management of disease - Cost savings - Increased well-being and quality of life	Improvement in physiological parameters (anthropometric and biochemical changes) due to behavioral changes	Perceived Benefits Score (EHBM Scale)
Perceived Barriers	Refers to an individual's perceived roadblocks to behavior change. As the individual's understanding of susceptibility, severity and benefits increase, there is a dramatic decrease in perceived barriers. Barrier could be cost of behavior change, difficulty, inconvenience, etc.	Discuss the consequences of poor prevention or management of this disease. Discuss the cost and impact on quality of life to self and entire family Provide a range of healthful lifestyle tips to include ones that are easy and affordable to various socioeconomic status groups Improve awareness recommendations by National and professional agencies Provide information in easy to understand language and avoid difficult medical jargon	Potential increase in motivation level to adopt healthful behaviors Potential increase in readiness to change with increase in knowledge about the health condition, benefits and willingness to overcome the barriers Individual potentially ready to receive information to change health behaviors	Perceived Barriers Score (EHBM Scale)

Table 3-2. Cont. Matrix with Constructs of Expanded Health Belief Model

Constructs	Definitions	Strategy/Content Elements	Outcomes/Objectives	Measures & Tools
Self-efficacy	Refers to an individual's confidence in adopting the healthful lifestyle	Able to successfully adopt diet and lifestyle recommendations Able to select healthful food choices and increase physical activity Initiate steps to modify other lifestyle habits such as tobacco and excessive alcohol use	Able to use food labels effectively Know what foods to reduce, substitute and include Understand the importance of physical activity Continue learning about risk factors management and prevention through follow up visits to clinic Follow up to clinic for timely lipid profile to assess any changes	Self-efficacy Score (EHBM Scale) Behavior Lipid profile Weight Waist circumference Exercise Alcohol and tobacco use Dietary intake
Cues to Action	Instigate action Anything that triggers readiness to adopt preventive behaviors. Example: Advice from physician, dietitian or other health care provider, family member, educational books, pamphlets, public media	Provide information on the website "Defend Your Heart" Or Provide usual care at the hospital	Provide a credible website for all information related to heart disease management Refer patients for diet counseling	Cues to Action Score (EHBM Scale) Use of "Defend Your Heart" web-site to cue participants towards healthy lifestyle

Table 3-2. Cont. Matrix with Constructs of Expanded Health Belief Model

Constructs	Definitions	Strategy/Content Elements	Outcomes/Objectives	Measures & Tools
Outcomes expectation Behavior Metabolic Dietary changes	Refers to improvement in parameter of behavior change and metabolic control of CVD management	Provide individuals with feedback on their improved physiological and metabolic parameter after measurements at baseline, month 2, and month 4	Potential reduction of risk factors Reduction in intensity of risk factors by better managing the condition Choosing healthy lifestyle behaviors Improved lipid profile and anthropometric measures	Changes in various EHBM subscale scores Changes in anthropometric, physiological measures Home and work activity survey Food frequency survey

Resources for Registered Dietitians Section

The “Resources for registered dietitians” section of the web-site contained information for self-update and patient education (Appendix B). These resources were designed with the primary intention of assisting the Army dietitians by providing current CVD information to allow them to tailor their existing programs to meet the needs of the target audience. Due to the lack of a preexisting web-site to improve, the first step involved transferring established guidelines in CVD management from paper-based to web-based. The content of this section was organized under four broad categories. Listed below in Table 3-3, are the main topic and sub-links to various topics. With the permission from author Dr. Jennifer Anderson, PhD, RD, information from the Leaders Guide to a Healthy Heart was utilized for background and patient education material (76). The Web content is also based on established guidelines from the American Heart Association, the National Cholesterol Education Program, and the American Dietetic Association.

Table 3-3 Registered Dietitian Web Page Content

Category	Specific Links
Overview of Cardiovascular Disease	Introduction, terminology, risk factors, lipoproteins, and atherogenesis
National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII)	Blood cholesterol classification, update to NCEP Blood cholesterol classification, update to NCEP-ATPIII treatment algorithm, relationship between LDL cholesterol and relative risk for coronary heart disease, LDL cholesterol considerations in different populations, role of dietitians and physicians in population vs. clinical approach, 2006 American Heart Association revised dietary and lifestyle recommendations
Medical Nutrition Therapy	Nutrient composition of Therapeutic Lifestyle Changes (TLC), estimating 10 year risk calculation for men and women, timelines for providing TLC, ways to improve adherence, elevated triglycerides, LDL-cholesterol lowering medications, trans fatty acids and metabolic syndrome
Patient Education	Risk factors of heart disease, food risk factors of heart disease, charts on 10 year risk assessment of CVD, cholesterol (dietary and blood), fat facts, omega-3 fatty acids, healthful eating out, tips for healthful eating, and food preparation

Web-site Content Validity

The web-site was initially reviewed by graduate research students and professors at Colorado State University. Two professors from the Food Science and Human Nutrition Department reviewed the web-site content and one professor from the Department of Journalism and Technical Communications reviewed the web-site and provided suggestions to improve the navigation. These changes were incorporated and the web-site was reviewed a second time by a graduate student research group in the Department of Food Science and Human Nutrition. Several graduate students reviewed various sections of the web-site and provided feedback. Changes suggested were

incorporated and the revised web-site was sent to three Army registered dietitians for review.

Feedback was obtained from two Army dietitians and these changes were made to the web-site. This web-site was then sent to all the U.S. Army registered dietitians and feedback was obtained using a usability survey. The usability survey also was completed by the study participants belonging to the web-based group.

Study Design

The study involved assessing the effectiveness of the web-based self care program and to establish the usability and content validity of the “Resources for Dietitians” section. The effectiveness of the self care program was established using a randomized study design. Interested and eligible volunteer participants were randomly placed into either of the two groups: “web-based” or “usual care” and data collection was performed at three time points (baseline, 2- months, and 4- months).

Human Subjects’ Approval

The research proposal, surveys and cover letters were approved by the Colorado State University Institutional Review Board (IRB) (Appendix C) and the Brook Army Medical Center IRB (Appendix D). A memorandum to support the four month study was obtained from the Evans U.S Army Community Hospital at Fort Carson which served as the research site (Appendix E). Amendments to the final survey were submitted to the IRB at Colorado State University for approval prior to implementation of the final survey. The cover letter and consent form provided the study participants with details on

the voluntary nature of the survey and issues related to confidentiality and participants' rights.

Sample Size

Sample size was determined using several outcome variables and a web-site called Java applets for power and sample size determination (77). Approval from the IRB was obtained for a sample size of 200 participants. This sample size was found to have 80% power to detect changes in serum total cholesterol between the two groups. The estimated sample size was lower for other outcome variables that were deemed useful for this study with the 12 week time period. Table 3-4 provides the various sample sizes for pertinent outcome variables.

Table 3-4 Study Sample Size Estimation

Variable	Mean	Desired changes Difference	Standard Deviation*(8)	Estimated Sample Size (paired t-test) To assess difference in 2 groups	Unpaired t-test to assess differences within groups
Total cholesterol	240mg/dL	-10	25	N1=100 N2=100	N1= 41 N2=41
LDL cholesterol	130mg/dL	-10	20	N1=64 N2=64	N1=29 N2=29
HDL cholesterol	45mg/dL	-5	12	N1=93 N2=93	N1=38 N2=38
Triglycerides	150mg/dL	-20	40	N1=65 N2=65	N1=27 N2=27
Weight	90 kg	-2	3	N1=37 N2=37	N1=15 N2=15
Dietary % fat intake	40% of energy	-10	6	N1=7 N2=7	N1=4 N2=4
Dietary cholesterol intake	280mg/day	-50	22	N1=5 N2=5	n/a

Veverka DV, Anderson J, Auld GW, Coulter GR, Kennedy C, Chapman PL. Use of the stages of change model in improving nutrition and exercise habits in enlisted Air Force men. *Military medicine* 2003;168

Target Audience

The study was conducted at the Evans U.S Army Community Hospital located at Fort Carson Army installation in Colorado Springs, Colorado. This hospital provided support with blood work, equipment, and space to conduct the study. The target audience for the “Self Care” program was the military beneficiaries eligible to receive care at the Army hospital. The eligibility criteria consisted of participants over 18 years of age, either gender, service member or family member, active duty or retired. Prior to recruiting, participants needed to have total blood cholesterol above 200 mg/dL or/and LDL cholesterol above 100 mg/dL.

The target audience for the “Resources for Registered dietitians” section of the web-site was the registered dietitians at various U.S. Army hospitals. The web-site link along with a cover letter was sent to the Chief, Army Dietitian office by the investigators (Appendix F). The Chief, Army Dietitian’s office disseminated the message to the dietitians in the entire Army. The web-site link and the cover letter were addressed to community and clinical dietitians at various Army medical facilities within and outside the U.S. The web content was reviewed and rated using an online usability survey.

Participants Recruitment

Advertisement flyers were posted at various locations at Fort Carson (Appendix G). The advertisement was expanded to include electronic mailing to the hospital staff and the entire Fort Carson community to improve the recruitment process. The study was also advertised in the installation’s local newspaper. The study was advertised for two months to increase enrollment. Appointments were scheduled when participants called with their interest to participate in this study. The participants enrolled in the study were

located at Ft. Carson during the study period and were not deployed. Two participants however, dropped out of the study at two months due to an upcoming deployment. Study period was from May to October 2008.

Randomization Procedure

The last digit of each participant's social security number was utilized to randomly place participants in the "usual care" group or the "web-based" group. The participants with an even last digit were placed in the "usual care" group and those with an odd last digit were placed in the "web-based" group. If a participant strongly preferred to be in a certain group, then they were assigned to the group of their choice.

Web-based Group

This group received the 5-Step "Self Care" program of the "Defend Your Heart" web-site. Participants were given the web-site link and were encouraged to complete viewing the "self care" information within two weeks. Participants had access to the web-site throughout the four month study period and were encouraged to check the web-site information at anytime. After completion of the study the participants in the web-based group were provided with information on the usual care provided at the hospital.

Usual Care Group

This group attended the cholesterol management class and counseling sessions offered by the Evans Army Community Hospital. Participants with dyslipidemia were enrolled in a Cholesterol Management Class "Your Nutrition Guide to Heart Health", which is offered twice a month. After group sessions the patients could follow up with a dietitian for individual counseling in six weeks. This group was encouraged to follow the

advice given by the hospital dietitian. After completion of the study period the usual care group was also provided the web-site link.

Informed Consent Process

The interested and eligible participants enrolled in the self care program were first briefed on the study using the consent form. Study participants read and signed the consent form and authorization of the use of protected health information to enroll in this study (Appendix H and I). The participants were involved in creating a secret password to use on surveys to avoid use of social security numbers. Consent was obtained to enable contact with participants for laboratory test results and permission to use e-mail to send reminders on future follow up visits and laboratory test orders and results. A signed copy of the consent form was kept in the participant's file and a copy was given to the participant for their records. Informed consent was waived for the "registered dietitian" section and a cover letter provided details of the research and completion of an anonymous usability survey indicated their consent to participate in the study.

Data Collection

The study to assess the effectiveness of the self care program was conducted over a four month period. Participants visited the hospital three times during the study period for measurements at baseline, month 2, and month 4.

Anthropometric measurements

The participants' weights and waist circumferences were measured at each visit. Participants' body weights were measured using an electronic scale. Heights were measured at the baseline only using a height rod. Waist circumferences were measured using a flexible non-stretchable tape. A waist circumference greater than 40 inches for

men and greater than 35 inches for women was defined as “high-risk” for CVD.

Participants were advised to wear light and loose or consistent clothing for these measurements. Efforts were made to conduct a majority of the measurements using the same equipment at each of the three data collection periods to increase reliability of the assessment.

Blood Pressure

Blood pressure was recorded using a manual sphygmomanometer. Calibration of the sphygmomanometer was frequently assessed ensuring the monitor needle stayed in the calibration range (shaded area on the monitor). Blood pressure was measured in a sitting position with the participants resting for a minimum of 15 minutes. The pressure cuff was placed on the left arm and the participant was asked to relax during the measurement. Participants were given advice not to consume caffeinated beverages, eat, smoke or exercise for at least 30 minutes before these measurements.

Laboratory tests

Blood tests were conducted in a 12-hour fasting state and analyzed by trained staff at the hospital laboratory. The tests performed were a lipid profile consisting of total plasma cholesterol, low density lipoproteins cholesterol, high density lipoproteins cholesterol, and risk ratio of cardiovascular disease, very low density lipoproteins, triglycerides, fasting plasma glucose and C-reactive proteins. The hospital dietitian ordered the laboratory tests retrieved the results. At the month four data collection two participants were unable to their complete blood tests at the Evans Army Hospital, one from the web-based and one from the usual care group. One participant completed a blood test at an Army hospital in Washington State and the other at the Buckley Air

Force Base. The equipment used to analyze blood test was different but validated instruments. The results had similar ranges except for C-reactive protein, which was mg/L instead of mg/dL at the Ft. Carson location. Due to the low sample size, data from these two participants were included as it was comparable to Ft. Carson.

Surveys

Self-administered paper-based surveys obtained information on participants' demographics, physiological status, and beliefs and behaviors towards heart healthy lifestyle. Paper-based surveys were used to maintain consistent data collection procedure between the two groups. Web-based participants and registered dietitians completed the online usability survey. Usability surveys were designed slightly different for the registered dietitians and self care participants.

Demographic survey

This survey consisted of fourteen questions and obtained information on age, gender, military service, ethnicity, educational level, current job, military rank, tobacco use, family history of chronic diseases, recent counseling with a registered dietitian, recent deployment, and use of cholesterol lowering medications (Appendix J). The content validity was established using information from review of literature and reviewed by the graduate research group. Reliability of this survey was not established.

Healthy Heart Expanded Health Belief Scale

A forty one question scale was created addressing various constructs of the EHBM (Appendix K). The surveys were reviewed by the CSU professor and graduate research students on questions formatting and content. Reliability of the surveys was established using internal consistency (Cronbach's alpha) on surveys completed at

baseline, month-2 and month-4. Questions with poor correlation coefficients were removed to improve reliability of the subscales. Cronbach's alpha was performed on each of the subscales and the impact of each question to the subscale reliability was assessed (78). Table 3-5 provides Cronbach's alpha coefficients for each subscale of the EHBm. The six subscales measuring each construct of the EHBm was found to be reliable. The Cronbach's alpha was above 0.70 for most of the scale and for at least one time period.

Table 3-5. Reliability Testing of EHBm Sub-Scales

Variable	# of Questions	Alpha	Decision
Perceived Susceptibility (PS)	6	Baseline: 0.87 2 month: 0.58 4 month:0.70	Dropped question #3 due to poor correlation coefficient ($r=0.0099$)
Perceived Severity (PSe)	8	Baseline: 0.65 2 month: 0.36 4 month:0.76	Dropped question #10 ($r= -0.019$)
Perceived Benefits (PB)	4	Baseline: 0.47 2-month: 0.45 4 month:0.72	Kept all questions
Perceived Barriers (PBa)	9	Baseline: 0.88 2-month: 0.80 4 month:0.79	Kept all questions
Cues to Action (CA)	5	Baseline: 0.73 2-month: 0.76 4 month:0.65	Kept all questions
Self-efficacy (SEF)	7	Baseline: 0.85 2-month: 0.88 4 month:0.86	Kept all questions
Knowledge	1	n/a	
Demographics	1	n/a	
Total # questions	41		

Questions with the poor alpha coefficients were removed from the analysis when scoring the various subscales. From the original scale question numbers 3 and 10 were eliminated when conducting reliability testing.

Table 3-6. Scoring EHB M Sub-Scales

Construct/Variable	# of questions	Total points	%	Interpretation
Perceived Susceptibility (PS) Question # 1,2,4,5,6	5	25	13.51	Higher score indicates participant's higher perception of susceptibility to heart disease
Perceived Severity (PSe) Question # 7,8,9,11,12,13,14	7	27	18.92	Higher score indicates a higher participant's perception of severity and seriousness of heart disease
Perceived Benefits (PB) Question #15,16,17,18	4	20	10.81	Higher score indicates participant's higher perception of reduction of risk factors of heart disease
Perceived Barriers (PBa) Question# 19,20,21,22,23,24,25,26,27	9	45	24.32	Higher score indicates higher perception of barriers towards a heart healthy lifestyle
Cues to Action (CA) Question #:28,29,30,31,32	5	25	13.51	Higher score indicates higher participants motivation in efforts towards a heart healthy lifestyle
Self-efficacy (SEF) Question #: 33,34,35,36,37,38,39	7	28	18.92	Higher score indicates a higher confidence of participants on their abilities toward making heart healthy choices
Total	37	170	100%	

Question # 40 and 41 were not included in scoring. Question #40 pertains to marital status and was used to see the association between marital status and various constructs of the EHB M. Question #41 asked about participants' knowledge about their blood cholesterol levels. Marital status and knowledge of cholesterol levels was analyzed as covariates.

Nutrient Intake and Energy Expenditure

The validated Block Food Frequency Questionnaire (79) was used to estimate the nutrient intake (Appendix L). Energy expenditure was obtained from a Home and Work Activity Survey designed by Block and Colleagues (80, 81) and utilized Compendium of physical activities compiled by Ainsworth and colleagues (82). The validity of the

Home and Work Activity Surveys in predicting percent body fat is pending publishing. The abstract along with the data collection tool is in Appendix M.

Usability Surveys

Two web-based surveys were created for the two audiences (self care participants and the registered dietitians). Questions on web-site usability were obtained from an existing valid website usability after obtaining author's permission (83). Both surveys asked web-site usability questions with open ended and Likert Scale questions on various aspects of the web-site (Appendix N and O). The survey included a few demographic questions on age, years of computer use, type of browsers used and gender. The only difference between the two surveys was that the registered dietitians reviewed and rated the entire web-site and the self care participants reviewed and rated only the "Self Care" program. Completed surveys were automatically emailed to the department's IT support staff. These data was imported into SPSS and analyzed for frequencies, means, and standard deviations.

Data Analysis

The data collected from various surveys, except for nutrient intake and physical activity, were maintained in Microsoft Excel and the results were analyzed using the SAS release 9.2 version and SPSS version 16. Data were analyzed with an analysis of covariance at two months and four months using baseline as the covariate. Baseline self care participants data were analyzed using McNemars Chi Square test for categorical and unpaired t-test for continuous data. Basic statistics including means, frequencies, and standard deviations was also calculated. Correlation coefficients were computed for selected baseline variables (Appendix P).

CHAPTER IV

RESULTS

Interested volunteers were screened for eligibility and thirty three participants were enrolled in this four month study. Table 4-1 specifies enrollment and drop outs during the study period. Baseline data were analyzed for 13 participants in the “usual care” group and 17 participants in the “web-based” group. One participant was removed due to lack of two repeat outcome measures. The primary reasons for drop outs were deployments, personal issues, and inability to complete study requirements due to difficult work schedule. A few surveys were missing at each of the three data collection time periods. The drop-out rate was 15% in the usual care group and 20% in web-based group respectively. Analysis was conducted for 30 participants at baseline and 2 months and 27 participants at month 4. .

Table 4-1. Study Participation and Drop-Out Rate

Time Period	Usual Care Group (n)	Web-based Group (n)
Baseline • N= 30	Enrolled:13 Drop out: 0 Missing surveys: 1	Enrolled: 20 Drop out: 2 - Reason: due to job schedule Missing surveys: 3
Month-2 • N=30	Drop out: 0 Missing surveys: 1 Missing blood test: 1	Drop out: 1 (deployment) Missing surveys: 0 Missing blood test: 1
Month -4 • N=27	Drop out: 2 -Reason: 1deployed, 1surgery Missing surveys:1	Drop out: 1 - Reason: Personal issues Missing surveys: 2
Sample size at month-4	11 (85%) Drop out = 15%	16 (80%) Drop out = 20%

Table 4-2, shows at baseline the demographic variables except ethnicity, were homogeneous in both groups. The average age of study participants in the usual care group was 51 years and web-based group was 48 years. In both groups there were a higher numbers of male participants compared to female. The participants in both groups were primarily active duty service members or military retirees. A majority of the study participants belonged to the Army component. There was a significant difference with ethnic mix in both groups ($\chi^2=0.0129$, $p<0.05$). The web-based group had majority of the participants (88%) as Caucasians compared to the usual care group, which had 38% of the participants as Caucasians, 38% Hispanic, and 15% African American. Both groups had similar education levels with participants having some college or college level education. There were no significant differences between the two groups for military rank and number of years of active duty military service.

Table 4-2. Baseline Demographics of the Usual Care and Web-based Groups

Variable	Usual Care Group (n=13)	Web-based Group (n=17)	Student t-test/ Chi Square Test
Q1: Age, years ($\pm$ SD)	50.62 (9.39)	47.18 (9.33)	t= 0.3239 NS
Q2: GENDER n (%)			$\chi^2=0.6568$ NS
Male	9 (69.23%)	13 (76.47%)	
Female	4 (30.77%)	4 (23.53%)	
Q3: MILITARY COMPONENT			$\chi^2=0.6917$ NS
Active Duty	4 (30.77%)	6 (35.29%)	
Reserve/National Guard	0	1 (5.88%)	
Retired	5 (38.46%)	7 (41.18%)	
Family member	3(23.08%)	3(17.65%)	
Other	1(7.69%)	0	
Q4: MILITARY SERVICE			$\chi^2=0.4152$ NS
Army	12 (92.31%)	15 (88.24%)	
Navy	0	1 (5.88%)	
Air Force	1 (7.69%)	0	
Other	0	1 (5.88%)	
Q5: ETHNICITY			$\chi^2=0.0129^*$
Caucasian	5 (38.46%)	15 (88.24%)	
African American	2 (15.38%)	0	
Native American	0	1(5.88%)	
Hispanic	5 (38.46%)	0	
Other	1 (7.69%)	1 (5.88%)	
Q6: EDUCATIONAL LEVEL			$\chi^2=0.8460$ NS
High School	2 (15.38%)	1 (5.88%)	
Some College	5 (38.46%)	7 (41.18%)	
College	5 (38.46%)	7 (41.18%)	
Graduate College	1 (7.67%)	2 (11.76%)	
Q8: RANK			$\chi^2=0.3915$ NS
Officer	2 (15.38%)	2 (11.76%)	
Enlisted	3 (23.07%)	6 (35.29%)	
Civilian	1 (7.69%)	3 (17.65%)	
Not applicable	7 (53.85%)	6 (35.29%)	
Q9: ACTIVE DUTY SERVICE			$\chi^2=0.6512$ NS
0 years	3 (23.07%)	2 (11.76%)	
1-10 years	1 (7.69%)	3 (17.65%)	
11- 20 years	4 (30.77%)	6 (35.29%)	
21-30 years	3 (23.07%)	6 (35.29%)	
Missing data	2 (15.38%)	0	

NS: Not significant *Significant at p<0.05 level

Risk factors of cardiovascular disease (CVD) among the two groups were compared in Table 4-3.. None of the variables were significantly different at baseline. More than 80% of the participants in both groups did not use tobacco and 70% indicated presence of family history of heart disease. Seventy seven percent of the participants in the usual care and 82% in the web-based group indicated not receiving registered dietitian counseling in the previous six months. Deployment status was in 23% of the usual care group and 11.8% in the web-based group. Approximately 60% of the participants in both groups indicated not taking any cholesterol lowering medications.

Table 4-3. Risk Factor of CVD in the Usual Group and Web-based Group

Variable	Usual Care Group (n=13)	Web-based Group (n=17)	Chi Square
Q10: Tobacco use			
a. Yes	2 (15.38%)	3 (17.65%)	$\chi^2=0.8691$ NS
b. No	11 (84.62%)	14 (82.35%)	
Q11: Family history of chronic disease:			
a. Cancer	8 (61.54%)	10 (58.82%)	$\chi^2=0.8804$ NS
b. Heart disease	9 (69.23%)	12 (70.59%)	$\chi^2=0.9359$ NS
c. Diabetes	7 (53.85%)	9 (52.94%)	$\chi^2=0.9607$ NS
d. Other	3 (23.08%)	1 (5.88%)	$\chi^2=0.1698$ NS
Q12: Counseling by registered dietitian in last 6 months			
a. Yes	3 (23.08%)	3 (17.65%)	$\chi^2=0.7125$ NS
b. No	10 (76.92%)	14 (82.35%)	
Q13: Deployed in last 2 years			
a. Yes	3 (23.08%)	2 (11.76%)	$\chi^2=0.5605$ NS
b. No	6 (46.15%)	11 (64.71%)	
c. Not applicable	4 (30.77%)	4 (23.53%)	
Q14: Taking cholesterol lowering medications			
a. Yes	5 (38.46%)	6 (35.29%)	$\chi^2=0.8584$ NS
b. No	8 (61.54%)	22 (64.71%)	

Table 4-4 shows changes in anthropometric variables over time and between and within the two groups. At baseline body weights between the two groups were significantly different with higher average body weight among the web-based group. The analysis of covariance (ANCOVA) was performed using baseline measurements as covariate to adjust the month 2 and month 4 data. Body weight loss was seen among both groups, but these changes were not significant between and within the two groups at month 2 and month 4.

Waist circumference was not significantly different between the two groups at baseline and at month four. However, within each respective group, there was a significant reduction in waist circumference from baseline to month 4. The predicted percent body fat reduced significantly more in the web-based group compared to the usual care group. There was a significant reduction of predicted percent body fat within the web-based group.

Table 4-4. Changes in Anthropometric Variables in the Usual Care Group and Web-based Group from Baseline to Month 4

Variable	N	Usual Care	Web-based	Between Groups ANCOVA p-value
HEIGHT (inches)				
0- Month (mean $\pm$ SE)	30	66.88 $\pm$ 1.02	68.68 $\pm$ 1.18	0.28
BODY WEIGHT (pounds)				
0- Month (mean $\pm$ SE)	30	185.20 $\pm$ 8.17	214.70 $\pm$ 10.18	0.04*
2-Month adjusted mean $\pm$ SE	30	201.91 $\pm$ 1.21	200.71 $\pm$ 0.97	0.44
4-Month adjusted mean $\pm$ SE	26	205.85 $\pm$ 2.30	203.80 $\pm$ 1.95	0.52
Within Groups				
Difference (0-4 month)		-0.57 $\pm$ 2.31	-2.63 $\pm$ 1.95	
ANCOVA treatment p-value		0.81	0.19	
WAIST CIRCUMFERENCE (inches)				
0- Month (mean $\pm$ SE)	30	38.88 $\pm$ 1.66	42.32 $\pm$ 1.44	0.13
2-Month adjusted mean $\pm$ SE	30	40.49 $\pm$ 0.28	40.85 $\pm$ 0.24	0.36
4-Month adjusted mean $\pm$ SE	26	39.59 $\pm$ 0.45	40.09 $\pm$ 0.38	0.41
Within Groups				
Difference (0-4 month)		-1.48 $\pm$ 0.45	-0.98 $\pm$ 0.38	
ANCOVA treatment p-value		0.003*	0.018*	
Body Mass Index (BMI)* *				
0- Month (mean $\pm$ SE)	27	28.67 $\pm$ 1.98	31.94 $\pm$ 1.69	0.22
2-Month adjusted mean $\pm$ SE	27	30.61 $\pm$ 0.49	30.89 $\pm$ 0.40	0.67
4-Month adjusted mean $\pm$ SE	22	31.25 $\pm$ 0.32	30.36 $\pm$ 0.26	0.048*
Within Groups				
Difference (0-4 month)		0.22 $\pm$ 0.34	-0.54 $\pm$ 0.28	
ANCOVA treatment p-value		0.52	0.071	
Predicted Body Fat %**				
0- Month (mean $\pm$ SE)	28	27.91 $\pm$ 2.61	30.38 $\pm$ 2.07	0.46
2-Month adjusted mean $\pm$ SE	27	29.58 $\pm$ 0.55	29.16 $\pm$ 0.46	0.43
4-Month adjusted mean $\pm$ SE	22	29.64 $\pm$ 0.44	28.25 $\pm$ 0.37	0.026*
Within Groups				
Difference (0-4 month)		0.33 $\pm$ 0.45	-1.15 $\pm$ 0.37	
ANCOVA treatment p-value		0.46	0.0055*	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level. **Data obtained from self reported physical activity surveys

Table 4-5 shows blood pressure results of the study participants. There was a slight reduction in systolic blood pressure, but these changes were not significant within or between the two groups.

Table 4-5. Changes in Blood Pressure Within and Between the Usual Care Group and Web-based Group from Baseline to Month Four

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Systolic Pressure (mm Hg)				
0- Month (mean $\pm$ SE)	30	125.10 $\pm$ 4.44	120.50 $\pm$ 2.26	0.37
2-Month adjusted mean $\pm$ SE	30	123.74 $\pm$ 1.88	122.84 $\pm$ 1.64	0.72
4-Month adjusted mean $\pm$ SE	26	122.15 $\pm$ 2.08	121.49 $\pm$ 1.77	0.81
Within Groups				
Difference (0-4 month)		- 0.78 $\pm$ 2.08	- 1.43 $\pm$ 1.8	
ANCOVA treatment p-value		0.71	0.42	
Diastolic Pressure(mmHg)				
0- Month (mean $\pm$ SE)	30	79.38 $\pm$ 2.60	78.84 $\pm$ 1.57	0.74
2-Month adjusted mean $\pm$ SE	30	79.79 $\pm$ 1.1	80.98 $\pm$ 0.96	0.42
4-Month adjusted mean $\pm$ SE	26	80.94 $\pm$ 1.38	79.71 $\pm$ 1.18	0.51
Within Groups				
Difference (0-4 month)		2.39 $\pm$ 1.38	1.18 $\pm$ 1.18	
ANCOVA treatment p-value		0.09	0.33	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-6 shows changes in lipid profile for the two groups. At baseline, there were no significant differences seen among any of the blood lipid levels. Web-based group participants showed a significantly higher decline in the total cholesterol and LDL cholesterol. Significant reduction in serum triglyceride level was seen within each of the two groups. HDL cholesterol significantly dropped in the usual care group. Cholesterol:HDL ratio showed a declining trend, but this change was not significant within or between the two groups.

Table 4-6. Changes in Lipid Profile in the Usual Care and Web-based Groups

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Total Blood Cholesterol (mg/dL)				
0- Month (mean $\pm$ SE)	30	222.70 $\pm$ 8.55	218.40 $\pm$ 12.52	0.79
2-Month adjusted mean $\pm$ SE	28	208.12 $\pm$ 10.35	190.97 $\pm$ 8.97	0.22
4-Month adjusted mean $\pm$ SE	27	213.91 $\pm$ 7.91	191.63 $\pm$ 6.55	0.04*
Within Groups				
Difference (0-4 month)		-7.5 $\pm$ 7.9	-29.78 $\pm$ 6.55	
ANCOVA treatment p-value		0.35	0.0001*	
Triglycerides (mg/dL)				
0- Month (mean $\pm$ SE)	30	169.90 $\pm$ 33.33	229.60 $\pm$ 79.11	0.49
2-Month adjusted mean $\pm$ SE	28	174.02 $\pm$ 24.97	132.10 $\pm$ 21.6	0.26
4-Month adjusted mean $\pm$ SE	27	145.54 $\pm$ 16.16	163.38 $\pm$ 13.38	0.41
Within Groups				
Difference (0-4 month)		-61.94 $\pm$ 16.16	-44.10 $\pm$ 13.38	
ANCOVA treatment p-value		0.0008*	0.0030*	
High Density Lipoproteins (mg/dL)				
0- Month (mean $\pm$ SE)	30	50.77 $\pm$ 3.07	48.06 $\pm$ 3.80	0.60
2-Month adjusted mean $\pm$ SE	28	46.06 $\pm$ 1.29	47.02 $\pm$ 1.12	0.58
4-Month adjusted mean $\pm$ SE	27	45.37 $\pm$ 1.51	46.69 $\pm$ 1.25	0.51
Within Groups				
Difference (0-4 month)		-3.71 $\pm$ 1.51	-2.38 $\pm$ 1.25	
ANCOVA treatment p-value		0.021*	0.067	
Very Low Density Lipoproteins (mg/dL)				
0- Month (mean $\pm$ SE)	30	28.75 $\pm$ 4.59	30.50 $\pm$ 3.41	0.76
2-Month adjusted mean $\pm$ SE	28	30.38 $\pm$ 3.42	26.81 $\pm$ 2.79	0.43
4-Month adjusted mean $\pm$ SE	25	28.42 $\pm$ 2.43	31.12 $\pm$ 1.98	0.39
Within Groups				
Difference (0-4 month)		-0.78 $\pm$ 2.43	1.92 $\pm$ 1.98	
ANCOVA treatment p-value		0.75	0.34	
Low Density Lipoproteins (mg/dL)				
0- Month (mean $\pm$ SE)	30	156.50 $\pm$ 8.77	147.50 $\pm$ 8.43	0.47
2-Month adjusted mean $\pm$ SE	28	140.97 $\pm$ 9.03	128.76 $\pm$ 7.82	0.32
4-Month adjusted mean $\pm$ SE	27	152.04 $\pm$ 8.39	128.66 $\pm$ 6.98	0.043*
Within Groups				
Difference (0-4 month)		0.15 $\pm$ 8.39	-23.23 $\pm$ 6.95	
ANCOVA treatment p-value		0.99	0.0027*	
Cholesterol:HDL Ratio				
0- Month (mean $\pm$ SE)	29	4.56 $\pm$ 0.34	4.85 $\pm$ 0.35	0.57
2-Month adjusted mean $\pm$ SE	28	4.59 $\pm$ 0.31	4.37 $\pm$ 0.26	0.58
4-Month adjusted mean $\pm$ SE	27	4.47 $\pm$ 0.38	4.50 $\pm$ 0.31	0.94
Within Groups				
Difference (0-4 month)		-0.32 $\pm$ 0.38	-0.28 $\pm$ 0.31	
ANCOVA treatment p-value		0.41	0.38	

*Significant at $p < 0.05$ level.

Table 4-7 shows there were no significant changes from baseline to month 4 for within and between groups for glucose and C-reactive proteins. There was a significant drop in blood glucose levels in the usual care group at month 2 but this level did not hold until month 4. High sensitive C- reactive protein reduced slightly in both groups. These changes were not statistically significant within or between the two groups.

Table 4-7. Changes in Fasting Plasma Glucose and High Sensitive C-Reactive Proteins in the Usual Care and Web Base Group.

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Fasting Glucose (mg/dL)				
0- Month (mean $\pm$ SE)	30	100.50 $\pm$ 3.21	93.19 $\pm$ 2.06	0.06
2-Month adjusted mean $\pm$ SE	27	92.44 $\pm$ 2.83	100.71 $\pm$ 2.50	0.046*
4-Month adjusted mean $\pm$ SE	26	99.03 $\pm$ 2.89	100.57 $\pm$ 2.44	0.69
Within Groups				
Difference (0-4 month)		2.22 $\pm$ 2.89	3.77 $\pm$ 2.44	
ANCOVA treatment p-value		0.44	0.13	
C-Reactive Protein (mg/dL)				
0- Month (mean $\pm$ SE)	30	0.26 $\pm$ 0.04	0.32 $\pm$ 0.05	0.40
2-Month adjusted mean $\pm$ SE	28	0.25 $\pm$ 0.04	0.29 $\pm$ 0.04	0.36
4-Month adjusted mean $\pm$ SE	24	0.26 $\pm$ 0.06	0.29 $\pm$ 0.05	0.63
Within Groups				
Difference (0-4 month)		-0.037 $\pm$ 0.06	-0.012 $\pm$ 0.045	
ANCOVA treatment p-value		0.52	0.77	

Note: ANCOVA analysis was used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-8 shows changes in macronutrient intake among the usual care and web-based groups. At baseline, both groups consumed approximately 2,000 calories per day and the average protein and fat intake were slightly higher in the web-based group. Carbohydrate intake was slightly higher in the usual care group at baseline. At month 4, usual care reduced showed a higher calories reduction compared to the web-based group. In both groups there was a reduction in the total protein, fat and carbohydrate intake.

Except for a significant decrease in total carbohydrates within the usual group, none of the changes were statistically significant for both within and between groups ($p < 0.05$).

Table 4-8. Changes in Macro-Nutrient Intake in the Usual Group and Web-based Group

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Caloric Intake/day				
0- Month (mean $\pm$ SE)	28	1975.05 $\pm$ 221.1	2036.95 $\pm$ 231.3	0.85
2-Month adjusted mean $\pm$ SE	27	1571.41 $\pm$ 199.95	1895.31 $\pm$ 65.78	0.22
4-Month adjusted mean $\pm$ SE	22	1630.24 $\pm$ 284.42	1985.96 $\pm$ 236.65	0.34
Within Groups				
Difference (0-4 month)		-482.73 $\pm$ 248.11	-101.15 $\pm$ 218.92	
ANCOVA treatment p-value		0.11	0.59	
Total protein (grams/day)				
0- Month (mean $\pm$ SE)	28	66.38 $\pm$ 8.02	81.02 $\pm$ 8.89	0.26
2-Month adjusted mean $\pm$ SE	27	67.66 $\pm$ 5.460	68.59 $\pm$ 4.51	0.89
4-Month adjusted mean $\pm$ SE	22	74.31 $\pm$ 12.91	73.14 $\pm$ 10.69	0.95
Within Groups				
Difference (0-4 month)		-3.83 $\pm$ 12.92	-4.99 $\pm$ 10.69	
ANCOVA treatment p-value		0.77	0.65	
Total Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	71.98 $\pm$ 7.64	78.84 $\pm$ 8.81	0.58
2-Month adjusted mean $\pm$ SE	27	61.37 $\pm$ 7.61	69.50 $\pm$ 6.30	0.42
4-Month adjusted mean $\pm$ SE	22	63.06 $\pm$ 12.64	74.32 $\pm$ 10.52	0.50
Within Groups				
Difference (0-4 month)		-14.83 $\pm$ 12.64	-3.58 $\pm$ 10.52	
ANCOVA treatment p-value		0.26	0.74	
Total Carbohydrates (grams/day)				
0- Month (mean $\pm$ SE)	28	265.54 $\pm$ 33.82	251.90 $\pm$ 31.28	0.77
2-Month adjusted mean $\pm$ SE	27	186.03 $\pm$ 29.69	249.89 $\pm$ 24.58	0.11
4-Month adjusted mean $\pm$ SE	22	197.47 $\pm$ 35.52	255.35 $\pm$ 29.52	0.23
Within Groups				
Difference (0-4 month)		-76.99 $\pm$ 35.52	-19.12 $\pm$ 29.52	
ANCOVA treatment p-value		0.043*	0.52	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-9 shows a significant higher intake of calories from protein in the web-based group at baseline compared to the usual care group. The usual care group had a

significant reduction in percent calories from sugar at month 4. Both groups had a slight, but not significant reduction in percent calories from carbohydrates and alcohol.

Table 4-9. Changes in Percent Calories from Macro-Nutrient, Sugar, and Alcohol Intake in the Usual Group and Web-based Group

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Percent Calories from Fat				
0- Month (mean $\pm$ SE)	28	33.75 $\pm$ 2.32	35.31 $\pm$ 1.51	0.56
2-Month adjusted mean $\pm$ SE	27	34.95 $\pm$ 1.39	32.84 $\pm$ 1.14	0.26
4-Month adjusted mean $\pm$ SE	22	34.03 $\pm$ 1.61	33.81 $\pm$ 1.33	0.94
Within Groups				
Difference (0-4 month)		0.39 $\pm$ 1.61	0.23 $\pm$ 1.33	
ANCOVA treatment p-value		0.81	0.86	
Percent Calories from Protein				
0- Month (mean $\pm$ SE)	28	13.39 $\pm$ 0.91	16.10 $\pm$ 0.63	0.02*
2-Month adjusted mean $\pm$ SE	27	16.49 $\pm$ 0.86	15.68 $\pm$ 0.69	0.49
4-Month adjusted mean $\pm$ SE	26	16.23 $\pm$ 0.91	16.26 $\pm$ 0.73	0.98
Within Groups				
Difference (0-4 month)		1.39 $\pm$ 0.91	1.43 $\pm$ 0.73	
ANCOVA treatment p-value		0.14	0.07	
Percent Calories from Carbohydrates				
0- Month (mean $\pm$ SE)	28	52.99 $\pm$ 2.99	48.77 $\pm$ 1.78	0.21
2-Month adjusted mean $\pm$ SE	27	48.14 $\pm$ 1.81	51.95 $\pm$ 1.47	0.13
4-Month adjusted mean $\pm$ SE	22	49.51 $\pm$ 2.31	50.65 $\pm$ 1.89	0.72
Within Groups				
Difference (0-4 month)		-2.01 $\pm$ 2.31	-0.88 $\pm$ 1.89	
ANCOVA treatment p-value		0.39	0.65	
Percent Calories from Sugar				
0- Month (mean $\pm$ SE)	28	25.23 $\pm$ 5.92	15.95 $\pm$ 2.02	0.16
2-Month adjusted mean $\pm$ SE	27	11.59 $\pm$ 3.20	18.11 $\pm$ 2.62	0.14
4-Month adjusted mean $\pm$ SE	22	11.92 $\pm$ 2.97	18.20 $\pm$ 2.24	0.13
Within Groups				
Difference (0-4 month)		-10.12 $\pm$ 2.97	-3.84 $\pm$ 2.42	
ANCOVA treatment p-value		0.003*	0.13	
Percent Calories from Alcohol				
0- Month (mean $\pm$ SE)	28	2.53 $\pm$ 1.18	3.12 $\pm$ 0.82	0.67
2-Month adjusted mean $\pm$ SE	27	3.86 $\pm$ 0.61	2.20 $\pm$ 0.51	0.047
4-Month adjusted mean $\pm$ SE	22	3.11 $\pm$ 1.01	2.19 $\pm$ 0.85	0.49
Within Groups				
Difference (0-4 month)		-0.006 $\pm$ 1.02	-0.93 $\pm$ 0.85	
ANCOVA treatment p-value		0.96	0.29	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate.*p <0.05 level.

Table 4-10 shows there was a slightly higher decrease in saturated, monounsaturated, and polyunsaturated fat in the usual care group compared to the web-based group. These changes were not significant.

Table 4-10. Changes in Dietary Fatty Acids Types in the Usual Care and Web-based Group

Variable	n	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Saturated Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	21.30 $\pm$ 2.19	24.69 $\pm$ 2.84	0.38
2-Month adjusted mean $\pm$ SE	27	19.49 $\pm$ 2.76	21.03 $\pm$ 2.28	0.67
4-Month adjusted mean $\pm$ SE	22	19.42 $\pm$ 4.90	22.65 $\pm$ 4.07	0.62
Within Groups				
Difference (0-4 month)		-4.59 $\pm$ 4.90	-1.36 $\pm$ 4.67	
ANCOVA treatment p-value		0.36	0.74	
Monounsaturated Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	28.55 $\pm$ 3.37	30.80 $\pm$ 3.44	0.65
2-Month adjusted mean $\pm$ SE	27	23.41 $\pm$ 2.81	27.38 $\pm$ 2.33	0.29
4-Month adjusted mean $\pm$ SE	22	24.30 $\pm$ 5.05	29.81 $\pm$ 4.20	0.41
Within Groups				
Difference (0-4 month)		-6.39 $\pm$ 5.05	-0.88 $\pm$ 4.20	
ANCOVA treatment p-value		0.22	0.84	
Polyunsaturated Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	15.95 $\pm$ 1.82	17.34 $\pm$ 2.14	0.64
2-Month adjusted mean $\pm$ SE	27	13.62 $\pm$ 1.73	15.53 $\pm$ 2.15	0.40
4-Month adjusted mean $\pm$ SE	22	14.58 $\pm$ 2.29	16.00 $\pm$ 1.90	0.63
Within Groups				
Difference (0-4 month)		-2.29 $\pm$ 2.29	-0.87 $\pm$ 1.90	
ANCOVA treatment p-value		0.33	0.65	
Trans Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	2.45 $\pm$ 0.29	2.21 $\pm$ 0.26	0.56
2-Month adjusted mean $\pm$ SE	27	1.84 $\pm$ 0.35	2.32 $\pm$ 0.29	0.31
4-Month adjusted mean $\pm$ SE	22	1.34 $\pm$ 0.66	2.85 $\pm$ 0.54	0.09
Within Groups				
Difference (0-4 month)		-1.05 $\pm$ 0.66	0.46 $\pm$ 0.54	
ANCOVA treatment p-value		0.13	0.41	
Omega 3 Fat (grams/day)				
0- Month (mean $\pm$ SE)	28	1.48 $\pm$ 0.17	1.68 $\pm$ 0.17	0.44
2-Month adjusted mean $\pm$ SE	27	1.57 $\pm$ 0.19	1.69 $\pm$ 0.16	0.67
4-Month adjusted mean $\pm$ SE	22	1.89 $\pm$ 0.36	1.78 $\pm$ 0.30	0.80
Within Groups				
Difference (0-4 month)		0.22 $\pm$ 0.36	0.11 $\pm$ 0.30	
ANCOVA treatment p-value		0.20	0.81	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Both groups showed a reduction in dietary sodium and cholesterol levels; the usual care group had slightly higher reductions (Table 4-11). Dietary fiber increased slightly in the usual care and decreased slightly in the web-based group. These changes were not significant between and within the groups.

Table 4-11. Changes in Types of Dietary Sodium, Fiber, and Cholesterol Intake in the Usual Group and Web-based Group

Variable	n	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Sodium (grams/day)				
0- Month (mean ±SE)	28	2977.28 ± 371.8	3319.42 ± 361.7	0.52
2-Month adjusted mean ±SE	27	2869.21 ± 279.91	2906.93 ± 231.97	0.93
4-Month adjusted mean ±SE	22	3039.45 ± 265.04	3145.42 ± 467.09	0.89
Within Groups				
Difference (0-4 month)		-283.52 ± 562.04	-177.56 ± 467.09	
ANCOVA treatment p-value		0.62	0.71	
Dietary Fiber (grams/day)				
0- Month (mean ±SE)	28	15.03 ± 2.26	18.77 ± 2.68	0.32
2-Month adjusted mean ±SE	27	15.80 ± 1.36	17.06 ± 1.12	0.48
4-Month adjusted mean ±SE	22	18.49 ± 2.52	17.29 ± 19.79	0.65
Within Groups				
Difference (0-4 month)		1.02 ± 2.16	-0.26 ± 1.79	
ANCOVA treatment p-value		0.64	0.88	
Dietary Cholesterol (grams/day)				
0- Month (mean ±SE)	28	305.68 ± 39.96	248.65 ± 34.25	0.29
2-Month adjusted mean ±SE	27	229.35 ± 31.60	224.73 ± 26.15	0.91
4-Month adjusted mean ±SE	22	220.07 ± 56.75	244.60 ± 47.21	0.74
Within Groups				
Difference (0-4 month)		-43.38 ± 56.75	-18.84 ± 47.20	
ANCOVA treatment p-value		0.45	0.69	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at p<0.05 level.

Table 4-12 shows the food group servings consumed by the two study groups. The web-based group appeared to consume a significantly higher number of servings of dairy product at baseline. Vegetable intake was slightly higher in the web-based group, but was not significant. Both groups increased the servings of fruits and vegetables at

month four. Meat and grains servings reduced in both groups. However, these changes were not significant.

Table 4-12. Changes in Servings of Food Groups in the Usual Group and Web-based Group

Variable	n	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Number of Servings of Vegetables/day				
0- Month (mean $\pm$ SE)	28	1.75 $\pm$ 0.38	3.27 $\pm$ 0.77	0.09
2-Month adjusted mean $\pm$ SE	27	2.44 $\pm$ 0.31	2.78 $\pm$ 0.26	0.42
4-Month adjusted mean $\pm$ SE	22	3.43 $\pm$ 0.69	2.87 $\pm$ 0.57	0.55
Within Groups				
Difference (0-4 month)		0.68 $\pm$ 0.69	0.13 $\pm$ 0.57	
ANCOVA treatment p-value		0.34	0.82	
Number of Servings of Fruits/day				
0- Month (mean $\pm$ SE)	28	1.32 $\pm$ 0.36	1.38 $\pm$ 0.25	0.89
2-Month adjusted mean $\pm$ SE	27	1.19 $\pm$ 0.18	1.57 $\pm$ 0.15	0.13
4-Month adjusted mean $\pm$ SE	22	1.60 $\pm$ 0.23	1.56 $\pm$ 0.19	0.92
Within Groups				
Difference (0-4 month)		0.27 $\pm$ 0.23	0.24 $\pm$ 0.19	
ANCOVA treatment p-value		0.26	0.22	
Number of Servings of Grains/day				
0- Month (mean $\pm$ SE)	28	5.52 $\pm$ 0.93	5.32 $\pm$ 0.91	0.88
2-Month adjusted mean $\pm$ SE	27	5.16 $\pm$ 0.72	4.84 $\pm$ 0.59	0.73
4-Month adjusted mean $\pm$ SE	22	4.72 $\pm$ 0.70	5.41 $\pm$ 0.58	0.46
Within Groups				
Difference (0-4 month)		-0.81 $\pm$ 0.70	-0.12 $\pm$ 0.59	
ANCOVA treatment p-value		0.27	0.84	
Number of Servings of Meat/day				
0- Month (mean $\pm$ SE)	28	2.45 $\pm$ 0.30	2.61 $\pm$ 0.34	0.72
2-Month adjusted mean $\pm$ SE	27	2.31 $\pm$ 0.29	2.21 $\pm$ 0.24	0.78
4-Month adjusted mean $\pm$ SE	22	2.46 $\pm$ 0.51	2.50 $\pm$ 0.46	0.95
Within Groups				
Difference (0-4 month)		-0.22 $\pm$ 0.51	-0.17 $\pm$ 0.42	
ANCOVA treatment p-value		0.68	0.69	
Number of Servings of Dairy/day				
0- Month (mean $\pm$ SE)	28	0.77 $\pm$ 0.18	1.73 $\pm$ 0.28	0.007*
2-Month adjusted mean $\pm$ SE	27	1.14 $\pm$ 0.19	1.15 $\pm$ 0.17	0.96
4-Month adjusted mean $\pm$ SE	22	1.45 $\pm$ 0.24	1.39 $\pm$ 0.19	0.46
Within Groups				
Difference (0-4 month)		-0.22 $\pm$ 0.23	0.02 $\pm$ 0.19	
ANCOVA treatment p-value		0.32	0.93	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Fat servings per day were significantly reduced in the usual care group at month four; however, this change was not significantly different from the web-based group (Table 4-13). Whole grains servings reduced slightly in both groups but was not significant between or within the groups.

Table 4-13. Cont: Changes in Servings of Food Groups in the Usual Group and Web-based Group

Variable	n	Usual Care Group	Web-based Group	ANCOVA Treatment p-value
Number of Servings of Fat/day				
0- Month (mean $\pm$ SE)	28	3.87 $\pm$ 0.55	3.02 $\pm$ 0.38	0.20
2-Month adjusted mean $\pm$ SE	27	2.34 $\pm$ 0.489	2.94 $\pm$ 0.40	0.36
4-Month adjusted mean $\pm$ SE	22	1.15 $\pm$ 0.23	1.38 $\pm$ 0.19	0.46
Within Groups				
Difference (0-4 month)		-1.29 $\pm$ 0.50	-0.39 $\pm$ 0.41	
ANCOVA treatment p-value		0.02*	0.37	
Number of Servings of Whole Grains				
0- Month (mean $\pm$ SE)	28	0.75 $\pm$ 0.37	0.82 $\pm$ 0.22	0.87
2-Month adjusted mean $\pm$ SE	27	1.06 $\pm$ 0.26	0.67 $\pm$ 0.22	0.27
4-Month adjusted mean $\pm$ SE	22	2.25 $\pm$ 0.49	3.15 $\pm$ 0.41	0.19
Within Groups				
Difference (0-4 month)		-0.16 $\pm$ 0.18	-0.04 $\pm$ 0.15	
ANCOVA treatment p-value		0.39	0.81	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-14 shows estimated energy expenditure and minutes in used in sleep and job. At baseline, web-based group had significantly higher estimated energy expenditure. The slight decreases in energy expenditure at month 2 and month 4 when adjusted with baseline were not statistically different between and within the groups.

Table 4-14. Changes in Energy Expenditure, MET minutes from Job and Sleep in the Usual Care Group and Web-based Group

Variable	n	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Estimated Energy Expenditure (Kcal/day)				
0- Month (mean $\pm$ SE)	28	2841.80 $\pm$ 157.8	3740.70 $\pm$ 306.7	0.016*
2-Month adjusted mean $\pm$ SE	27	3263.60 $\pm$ 238.47	3309.34 $\pm$ 194.22	0.89
4-Month adjusted mean $\pm$ SE	22	3084.72 $\pm$ 258.72	3373.81 $\pm$ 211.94	0.42
Within Groups				
Difference (0-4 month)		-114.89 $\pm$ 263.10	-101.15 $\pm$ 218.92	
ANCOVA treatment p-value		0.67	0.65	
MET** Minutes from Job				
0- Month (mean $\pm$ SE)	28	493.8 $\pm$ 122.4	771.9 $\pm$ 135.5	0.15
2-Month adjusted mean $\pm$ SE	27	709.06 $\pm$ 155.89	560.02 $\pm$ 128.58	0.47
4-Month adjusted mean $\pm$ SE	22	609.09 $\pm$ 128.68	654.01 $\pm$ 106.97	0.79
Within Groups				
Difference (0-4 month)		-15.44 $\pm$ 132.92	3.77 $\pm$ 110.59	
ANCOVA treatment p-value		0.91	0.97	
MET Minutes from Sleep				
0- Month (mean $\pm$ SE)	28	319.5 $\pm$ 21.49	357.8 $\pm$ 15.09	0.14
2-Month adjusted mean $\pm$ SE	27	334.47 $\pm$ 9.26	340.42 $\pm$ 7.64	0.63
4-Month adjusted mean $\pm$ SE	22	372.55 $\pm$ 18.76	344.39 $\pm$ 15.59	0.26
Within Groups				
Difference (0-4 month)		30.00 $\pm$ 20.11	-2.08 $\pm$ 17.73	
ANCOVA treatment p-value		0.15	0.90	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level. **MET: Metabolic Equivalent to estimate energy expenditure

(1MET=kcal.kg⁻¹.body weight.h⁻¹)(81)

Table 4-15 shows the MET minutes from moderate intensity job was significantly higher in the usual care compared to the web-based at month 2. These changes were not significant at month 4. MET minutes from less than moderate intensity job activities reduced slightly in both groups. Both groups appeared to engage a majority of their time in either moderate intensity job or non-job activities. Vigorous activity increased slightly in both groups. These changes in physical activities were not statistically significant.

Table 4-15. Changes in MET Minutes from Various Physical Activities Intensities in the Usual Care Group and Web-based Group

Variable	n	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
MET Minutes from Moderate Non--job Activities				
0- Month (mean $\pm$ SE)	28	397.0 $\pm$ 171.51	462.8 $\pm$ 99.76	0.72
2-Month adjusted mean $\pm$ SE	27	335.82 $\pm$ 29.26	400.81 $\pm$ 77.38	0.61
4-Month adjusted mean $\pm$ SE	22	305.22 $\pm$ 101.39	398.08 $\pm$ 83	0.50
Within Groups				
Difference (0-4 month)		73.78 $\pm$ 129.63	-63.23 $\pm$ 107.85	
ANCOVA treatment p-value		0.57	0.56	
MET Minutes from Vigorous Non-Job Activities				
0- Month (mean $\pm$ SE)	28	98.66 $\pm$ 30.66	126.6 $\pm$ 34.63	0.57
2-Month adjusted mean $\pm$ SE	27	110.60 $\pm$ 27.84	134.64 $\pm$ 27.84	0.51
4-Month adjusted mean $\pm$ SE	22	128.03 $\pm$ 49.49	124.75 $\pm$ 41.18	0.96
Within Groups				
Difference (0-4 month)		15.67 $\pm$ 50.69	13.15 $\pm$ 42.18	
ANCOVA treatment p-value		0.76	0.76	
MET Minutes from Jobs Less Active than "Moderate"				
0- Month (mean $\pm$ SE)	28	359.8 $\pm$ 94.29	381.4 $\pm$ 66.08	0.85
2-Month adjusted mean $\pm$ SE	27	330.86 $\pm$ 73.90	389.16 $\pm$ 61.27	0.49
4-Month adjusted mean $\pm$ SE	22	319.47 $\pm$ 105.55	377.36 $\pm$ 87.80	0.67
Within Groups				
Difference (0-4 month)		-82.11 $\pm$ 116.84	-10.15 $\pm$ 97.21	
ANCOVA treatment p-value		0.49	0.92	
MET Minutes from Moderate Jobs				
0- Month (mean $\pm$ SE)	28	134.0 $\pm$ 94.49	291.9 $\pm$ 142.3	0.39
2-Month adjusted mean $\pm$ SE	27	342.39 $\pm$ 104.36	45.85 $\pm$ 86.35	0.04*
4-Month adjusted mean $\pm$ SE	22	284.69 $\pm$ 164.89	280.06 $\pm$ 137.04	0.98
Within Groups				
Difference (0-4 month)		66.67 $\pm$ 176.03	13.92 $\pm$ 146.47	
ANCOVA treatment p-value		0.79	0.93	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-16 shows changes in scores in the six constructs of EHB. At baseline, the web-based group had significantly higher perception of disease severity compared to the usual care. At month four, there was a significant improvement in the mean Self-efficacy score of the usual care group. Both groups slightly increased in perceived benefits and decreased in perceived barriers, but these changes were not significant.

Table 4-16. Score Changes in Expanded Health Belief Constructs during Study Period for the Usual Care Group and Web-based Group

Variable	N	Usual Care Group	Web-based Group	Between Groups ANCOVA p-value
Perceived Susceptibility (%)				
0- Month (mean $\pm$ SE)	26	54.00 $\pm$ 5.18	63.14 $\pm$ 3.75	0.16
2-Month adjusted mean $\pm$ SE	25	60.65 $\pm$ 3.23	54.91 $\pm$ 2.84	0.21
4-Month adjusted mean $\pm$ SE	21	60.65 $\pm$ 3.54	58.18 $\pm$ 3.02	0.62
Within Groups				
Difference (0-4 month)		5.33 $\pm$ 3.88	-2.33 $\pm$ 3.36	
ANCOVA treatment p-value		0.19	0.49	
Perceived Severity (%)				
0- Month (mean $\pm$ SE)	26	90.74 $\pm$ 2.26	96.03 $\pm$ 0.91	0.047*
2-Month adjusted mean $\pm$ SE	25	94.57 $\pm$ 1.66	93.15 $\pm$ 1.46	0.54
4-Month adjusted mean $\pm$ SE	21	93.14 $\pm$ 2.53	94.94 $\pm$ 2.51	0.62
Within Groups				
Difference (0-4 month)		2.47 $\pm$ 2.60	0.31 $\pm$ 2.26	
ANCOVA treatment p-value		0.35	0.89	
Perceived Benefits (%)				
0- Month (mean $\pm$ SE)	26	90.83 $\pm$ 4.03	91.43 $\pm$ 2.31	0.89
2-Month adjusted mean $\pm$ SE	24	92.35 $\pm$ 2.17	94.55 $\pm$ 1.99	0.46
4-Month adjusted mean $\pm$ SE	21	91.28 $\pm$ 3.37	91.12 $\pm$ 2.91	0.97
Within Groups				
Difference (0-4 month)		2.77 $\pm$ 4.00	0.83 $\pm$ 3.47	
ANCOVA treatment p-value		0.49	0.81	
Perceived Barriers (%)				
0- Month (mean $\pm$ SE)	26	53.89 $\pm$ 4.651	49.84 $\pm$ 4.91	0.56
2-Month adjusted mean $\pm$ SE	25	53.39 $\pm$ 2.90	49.32 $\pm$ 2.57	0.31
4-Month adjusted mean $\pm$ SE	21	45.05 $\pm$ 3.82	47.14 $\pm$ 3.30	0.69
Within Groups				
Difference (0-4 month)		-7.90 $\pm$ 4.26	-3.52 $\pm$ 3.69	
ANCOVA treatment p-value		0.08	0.35	
Cues to Action (%)				
0- Month (mean $\pm$ SE)	26	86.67 $\pm$ 2.12	86.00 $\pm$ 4.41	0.89
2-Month adjusted mean $\pm$ SE	25	87.58 $\pm$ 3.39	82.04 $\pm$ 3.01	0.23
4-Month adjusted mean $\pm$ SE	21	87.62 $\pm$ 2.14	89.29 $\pm$ 1.83	0.56
Within Groups				
Difference (0-4 month)		-0.00 $\pm$ 3.36	2.67 $\pm$ 2.91	
ANCOVA treatment p-value		1.0	0.37	
Self-efficacy (%)				
0- Month (mean $\pm$ SE)	26	60.12 $\pm$ 5.05	64.29 $\pm$ 5.11	0.57
2-Month adjusted mean $\pm$ SE	25	65.67 $\pm$ 2.54	69.32 $\pm$ 2.25	0.29
4-Month adjusted mean $\pm$ SE	21	71.49 $\pm$ 3.66	69.59 $\pm$ 3.17	0.70
Within Groups				
Difference (0-4 month)		8.73 $\pm$ 3.65	5.95 $\pm$ 3.16	
ANCOVA treatment p-value		0.03*	0.08	

Note: ANCOVA analysis is used to adjust 2 and 4- month mean using baseline month as covariate

*Significant at $p < 0.05$ level.

Table 4-17. Correlation among EHBM Construct and other Study Variables.

Variable	Correlation Type	Variables
Perceived Susceptibility	Positive	Perceived barriers, tobacco, predicted % body fat, VLDL cholesterol, MET minutes vigorous job activities
	Negative	Self-efficacy, ethnicity, fruit servings, LDL-cholesterol
Perceived Severity	positive	Perceived barriers,
	Negative	Percent calories from sweets, LDL-cholesterol,
Perceived Benefits	Positive	
	Negative	Percent calories from sweets
Perceived Barriers	Positive	MET minutes sleeping
	Negative	Cues to action, self-efficacy, vegetables servings, fruit servings, dietary fiber intake
Cues to Action	Positive	Self-efficacy, dietary calcium intake, dietary potassium intake, dairy servings
	Negative	MET minutes in vigorous job activities
Self-efficacy	Positive	Dietary potassium intake, meets 2005 guidelines for physical activity, vegetable servings, fruit servings
	Negative	
Knowledge of blood cholesterol levels	Positive	Dietary potassium, dietary sodium, dietary protein, percent calories from protein
	Negative	Age, systolic blood pressure, diastolic blood pressure, triglycerides, percent calories from sweets

Web-site Usability Test by the Army Registered Dietitians

The online usability survey was sent electronically to approximately 190 Army dietitians. Thirty four registered dietitians (RDs) reviewed the web-site and responded to the usability survey. The purpose of the survey was to establish content validity and identify web-site usability issues. Table 4-18 contains demographic information of the RDs' responses. Broadband connection was the primary type of Internet connection. Eighty two percent used the Microsoft Internet Explorer browser. A majority of the RDs

responding were females (91.2%), and the 8.8% of respondents possessed graduate level education.

Table 4-18. Demographic Information of the Registered Dietitian Responding to the Usability

Questions # 21 to 26	% Responses
Q21: Do you have access to computer	100% (34)
Q22: Type of connection to Internet	
• Broadband connection	100% (34)
○ DSL	23.5% (8)
○ Cable	32.4% (11)
○ Wireless	26.5% (9)
○ Satellite	2.9% (1)
○ Other	14.7% (5)
Q23: Browser used to search the Internet	
• Microsoft Internet Explorer	82.4% (28)
• Firefox	5.9% (2)
• Yahoo	2.9% (1)
• Other	8.8% (3)
Q24: Age (mean $\pm$ SD)	39.03 $\pm$ 9.6 years
Q25: Gender	
Female	91.2% (31)
Male	8.8% (3)
Q26: Education level	
• Bachelors degree	91.2% (31)
• Masters degree	8.8% (3)

Table 4-19 provides information on the participating RDs' number of years of computer experience and level of experience with the two other areas of computer use. The RDs reported appeared to have an average of 16.88 ± 4.49 years of computer use experience.

Table 4-19. Computer Experience of the Registered Dietitians Responding to the Survey

Question # 20	N	Mean Years $\pm$ SD
a. Using personal computer	34	16.88 $\pm$ 4.49
b. Using the WWW	34	12.47 $\pm$ 2.91
c. Filling out forms online	34	9.88 $\pm$ 3.91

Table 4-20, shows the web-site content rating by the RDs. The web-site content was rated on a seven point Likert scale with “1” being excellent and “7” indicating poor. The majority of the RDs rated all aspects of the web-site content at level one and two (excellent to very good). Few RDs selected level three and four (good and fair). One RD rated self care content at level six and seven (poor).

Table 4-20. “Defend Your Heart” Web-site content rating by Army Registered Dietitian

Web-site Content Area	Percentage (n=34)						
	Excellent-----		Fair-----		Poor		
	1	2	3	4	5	6	7
a. Self Care: Step 1	29.4	41.2	14.7	8.8		2.9	2.9
b. Self Care: Step 2	29.4	47.1	5.9	11.8		2.9	2.9
c. Self Care: Step 3	23.5	55.9	2.9	11.8		2.9	2.9
d. Self Care: Step 4	23.5	52.9	5.9	11.8		2.9	2.9
e. Self Care: Step 5	29.4	50.0	5.9	11.8			2.9
f. RD Section: 1 st Link	41.2	44.1	5.9	8.8			
g. RD Section: 2 nd Link	41.2	38.2	11.8	8.8			
h. RD Section : 3 rd Link	44.1	35.3	8.8	11.8			
i. RD Section: 4 th Link	32.4	38.2	17.6	11.8			
j. Home: Related sites	35.3	44.1	14.7	8.8			

Table 4-21, shows the RDs satisfaction with web-site usability. A seven point Likert scale was used with “1” as strongly agree and “7” as strongly disagree. Overall, the usability survey results were positive and RDs generally liked the web-site. The majority of RDs were satisfied with the website. They found the information useful, easy to understand and current, and found the site layout understandable and pages loaded easily. The majority of users did not find the site too confusing or font size hard to read. Based on further comments by RDs’ the site can be enhanced in all areas of usability, especially the site design, which was rated neutral by 14.7% and a lower rating by 21% of RDs. Very few RDs disagreed with all aspects of web-site usability.

Table 4-21. Web-site satisfaction and usability rating by the Army RDs

Web-site Content Area	Percentage (n=34)						
	Strongly Agree-----			-----Strongly Disagree			
Questions	1	2	3	4	5	6	7
7. Satisfied with experience	29.4	47.1	14.7	8.8			
8. Links hard to understand	2.9	2.9	8.8	8.8	8.8	26.5	41.2
9. Site confusing to use	5.9		8.8	5.9	8.8	26.5	44.1
10. Information easy to understand	41.2	38.2	14.7		2.9	2.9	
11. Site layout easy to understand	38.2	29.4	14.7	8.8	2.9	5.9	
12. Pages loaded quickly	41.2	29.4	5.9	5.9	2.9	8.8	5.9
13. Site not interesting		5.9	17.6	5.9	17.6	26.5	26.5
14. Font hard to read	2.9	8.8	5.9	8.8	8.8	29.4	35.3
15. Site design is attractive	17.6	14.7	32.4	14.7	5.9	11.9	2.9
16. Like web-site name	26.5	26.5	38.2	2.9	2.9	2.9	
17. Current Information	41.2	44.1	11.8			2.9	
18. Useful Information	47.1	38.2	11.8			2.9	

The responding RDs were encouraged to provide comments on the web-site experience. Dietitians overall commented the information on the web-site was excellent/ good resource, concise, detailed, current, user friendly, and easy to navigate. The areas not liked in the web-site were lack of animation, not too colorful, inability to access steps of self care program. Nineteen RDs did not find any difficulty navigating the web-site and twelve RDs had no additional suggestions for improvements. Dietitians suggestion enhancing the web-site by improving ease of navigation, increase visual appeal, add frequently asked questions and quiz section, include recipes, grocery list, functional foods information, and printable patient education materials.

Web-site Usability Test by the Self Care Study Participants

Eight participants (50%) from the self care program completed the online usability survey. The purpose of the survey was to identify web-site usability issues. Table 4-22 shows that all respondents had access to the computer and a majority used broad band cable connection.

Table 4-22. Demographic Information of Participants' from the Web-based Group Responding to the Usability Survey

Question # 21 to 26	
Q21: Do you have access to computer	100% (8)
Q22: Type of connection to Internet	
• Telephone	12.5 % (1)
• Broadband connection	87.5% (7)
○ DSL	25.0% (2)
○ Cable	62.5% (5)
○ Other	12.5% (1)
Q23: Browser used to search the Internet	
• Microsoft Internet Explorer	75% (6)
• Firefox	25% (2)
Q24: Age (mean $\pm$ SD)	
51.38 $\pm$ 8.74 years	
Q25: Gender	
• Female	25% (2)
• Male	75% (6)
Q26: Education level	
• Bachelors degree	12.5% (1)
• Masters degree	25.0% (2)
• PhD	37.5% (3)
• Other	25.0% (2)

Table 4-23 shows that the average experience using computer was 16 years.

Table 4-23. Computer Experience of Web-based Group Participants Responding to Usability Survey.

Question # 20	n	Mean Years $\pm$ SD
a. Using personal computer	8	16.38 $\pm$ 5.45
b. Using the WWW	8	12.00 $\pm$ 5.13
c. Filling out forms online	8	9.50 $\pm$ 5.53

Table 4-24 reveals that the majority of the participants (87.5%) rated the content as excellent or very good and a small percent indicated fair.

Table 4-24. Web-site content rating by the Web-based Group Participants Responding to Usability Survey.

Web-site Content Area	Percentage (n=8)						
	Excellent-----		Fair-----			Poor-----	
Question 4	1	2	3	4	5	6	7
4a. Self Care: Step 1	37.5	50.0		12.5			
	(3)	(4)		(1)			
4b. Self Care: Step 2	37.5	50.0		12.5			
	(3)	(4)		(1)			
4c. Self Care: Step 3	37.5	50.0		12.5			
	(3)	(4)		(1)			
4d. Self Care: Step 4	37.5	50.0		12.5			
	(3)	(4)		(1)			
4e. Self Care: Step 5	37.5	50.0		12.5			

Table 4-25 provided detailed information on the usability aspect of the web-site by the target audience. A majority of participants were satisfied with the web-site experience using the self care program and did not find links hard to understand or the site too confusing to use. The information and layout were easy to understand by the majority of the participants. The rating was slightly lower in the area of site attractiveness (75%). The majority of the participants indicated information to be current and useful.

Table 4-25. Web-site satisfaction and usability rating by the Web-based Group Participants Responding to Usability Survey.

Web-site Content Area	Percentage (n=8)						
	Strongly Disagree			Strongly Agree			N/A
Questions # 7 to 18	1	2	3	4	5	6	7
7. Satisfied with experience	12.5 (1)		12.5 (1)		12.5 (1)	37.5 (3)	25.0 (2)
8. Links hard to understand	50.0 (4)	25.0 (2)	12.5 (1)		12.5 (1)		
9. Site confusing to use	37.5 (3)	37.5 (3)			12.5 (1)	12.5 (1)	
10. Information easy to understand	12.5 (1)					37.5 (3)	50.0 (4)
11. Site layout easy to understand	12.5 (1)				12.5 (1)	37.5 (3)	37.5 (3)
12. Pages loaded quickly	12.5 (1)				25.0 (2)	12.5 (1)	50.0 (4)
13. Site not interesting	37.5 (3)	25.0 (2)		12.5 (1)	12.5 (1)	12.5 (1)	
14. Font hard to read	50.0 (4)	37.5 (3)	12.5 (1)				
15. Site design is attractive	12.5 (1)			12.5 (1)	25.0 (2)	25.0 (2)	12.5 (1)
16. Like web-site name	12.5 (1)			12.5 (1)	12.5 (1)	12.5 (1)	37.5 (3)
17. Information was current	12.5 (1)				12.5 (1)	37.5 (3)	37.4 (3)
18. Information was useful	12.5 (1)				12.5 (1)	25.0 (2)	50.0 (4)

Participants from the web-based group were asked to comment on the web-site experience. The majority of comments were favorable and indicated liking towards the web-site. Participants liked the ideas of getting information at their own pace. Some specific comments were that the web-site was easy to read, visually appealing, and

provided good information. Some participants had problem with links, repetitive and lengthy information, and completing the usability survey. All eight respondents indicated no difficulty with the web-site use. Three self care respondents had no further suggestions to improve the web-site. Other participants suggested including statistics on users' progress, exercise regimen, better color, and need for specific goals and targets for improvement.

CHAPTER V

DISCUSSION

Based on the results of the formative assessment, an evidence based web-site was created and evaluated for its effectiveness and usability by the target audience. The results of the self care program and web-site usability demonstrated the future potential of a web-based program in cardiovascular disease (CVD) reduction efforts. The study to assess the effectiveness of the web-based program was unable to recruit the desired number of participants; however, the low drop-out rate of the participants (less than 20%) shows favorable acceptance to this study. A study conducted by Sigrist et al. on the senior Army officers identified the need for cholesterol lowering information (84). The two groups of the study were homogeneous in the majority of demographic and other variables and this facilitated the identification of changes due to the intervention. The analyses of covariance further adjusted the baseline measurements and improved the assessment of changes at month four.

Changes in CVD Risk Factors between the Two Groups

The web-based intervention significantly reduced total blood cholesterol, LDL cholesterol, body mass index, and predicted percent body fat, compared to the usual care group. The usual care showed a significantly higher self-efficacy score compared to the web-based group at month four. The predicted percent body fat and body mass index were derived from self reported physical activity survey and a potential exists with over

or under reporting weight and height. The web-based group showed a higher weight loss compared to the usual care group. These changes in the weight loss were not statistically significant within and between the two groups. The association between weight loss and blood lipids lowering is well recognized (3, 15).

The web base group showed a significantly greater reduction in total cholesterol and LDL cholesterol. The medication use at baseline was not significant different between the two groups. One participant from each group initiated lipid lowering medication during the study period. The reduction in total cholesterol may have been a result of combined improved compliance to cholesterol lowering medication and Therapeutic Lifestyle Changes (TLC). The lowering of LDL cholesterol is a well established primary target in reducing the risk for coronary heart disease (CHD) which accounts for more than 50% of the CVD (1). A 1% reduction of total cholesterol lowers the risk for CHD by approximately 2% and a 1% reduction in LDL cholesterol lowers the risk of CHD by 1% (2). A 2004 update report after establishment of NCEP-ATP III guidelines, suggest a more stringent LDL cholesterol control to as low as 70mg/dL in high risk individual. At every risk level, TLC continues to be the cornerstone in management of CVD (85).

Previous lifestyle studies also demonstrated similar changes in blood lipids. The study by Nasser et al. (39) showed a 11% decrease in LDL cholesterol in the intervention group and an 8% decrease in usual care. HDL-cholesterol in this study reduced at four weeks rebounded at 16 weeks. Varady et al. (28) showed a 7 to 18% reduction in total blood cholesterol, 7 to 15% reduction in LDL-cholesterol, 4 to 18% reduction in triglycerides and 5-14% increase in HDL cholesterol. Study by Varady et al. showed a

much higher reduction to blood lipids when functional foods such as fish, oats, bran, or plant sterol were added. Walden et al. (86) showed a 7.6 to 8.8% reduction in LDL cholesterol. Medical nutrition therapy showed a 6% decrease in total and LDL cholesterol (37). The web-site and usual care content has several components of the Mediterranean diet. The Mediterranean-style diet in Lyon Diet Heart study showed a 50 to 70% reduction in recurrent heart disease (29). A study of shorter duration (8 weeks) showed an 11% decline in LDL cholesterol and a 4% increase in HDL cholesterol (34). The implementation of Therapeutic Lifestyle Changes (TLC) continues to be the cornerstone in management of dyslipidemia (2, 3) . The reduction of total blood cholesterol appears to be within the range of other lifestyle intervention studies.

Changes in CVD Risk Factors within the Two Groups

The current study found several significant changes within each group due to TLC education. Both groups significantly reduced waist circumference in month four and showed a positive correlation with blood pressure, VLDL cholesterol, C-reactive protein, predicted percent body fat, BMI equivalent, and energy expenditure. Waist circumference was found to be inversely correlated with fruits and grains servings. Abdominal obesity as measured by waist circumference is emerging as a stronger predictor of chronic diseases and changes in this measure is linked to lowering the risk for CVD, diabetes, and metabolic syndrome (2, 3, 87). The Army regulation also uses waist circumference in men to determine percent body fat in an active duty service member and non compliance to the standards results in placement in the Army Weight Control program or disciplinary actions.(16).

Significant reduction in serum triglycerides and waist circumference were seen in both the usual care and web-based group. Elevated levels of serum triglyceride levels(>150mg/dL) is considered to be an independent risk factor of coronary heart disease (2). Elevated triglycerides are atherogenic and showed a positive correlation with coronary heart disease. Hypertriglyceridemia is found to be associated with low HDL cholesterol levels, abdominal obesity, hypertension, insulin resistance, high small dense LDL particles, elevated apo B, and prothrombotic state (88). Factors contributing to elevated triglycerides are excess body weight, physical inactivity, cigarette smoking, excess alcohol intake, excess carbohydrate intake (>60% calories), diseases, drugs, and genetics. This study's participants consumed less than 60% of calories from carbohydrates and the usual care significantly reduced carbohydrates and percent of calories from sweets and alcohol. This may have contributed to a much higher reduction in triglycerides in the usual care group compared to the web-based group. It is important to note that the surveys were self reported and there is a tendency to over or under report nutrient intake.

HDL cholesterol was reduced in both groups, but was significantly lowered in the usual care group. The HDL-cholesterol is considered as a therapeutic target in CVD risk reduction and has an inverse relationship to coronary heart disease. The recommended level for men is >40mg/dL and for women >50mg/dL. Risk for CVD is reduced due to reverse cholesterol transport and non-cholesterol dependent mechanisms such as anti-inflammatory and antioxidant effect. For every increase in HDL cholesterol by 1mg/dL there is a 2-3% reduction in coronary artery disease risk. It is also established that when therapeutic lifestyle changes are incorporated, the HDL cholesterol levels drop to some

extent and later increase with continued weight loss, increase physical activity, and improvement in insulin resistance. (89, 90).

At baseline, total protein intake (grams/day) between the two groups was not statistically different; however, the percent calories from protein were significantly higher in the web-based group. These differences were not seen at month four. The usual care group significantly reduced average carbohydrate intake, percent calories from sugar, and servings from fat from the baseline amount. There was a reduction in total carbohydrates, percent calories from sugar, and fat servings in the web-based group; however, these changes were not significant. The nutrient intake is based on a self reported questionnaire and may not have captured all food intake however, repeat outcome measures provides trends and changes from baseline. The usual care is face to face group and individual counseling with the registered dietitian (RD) on heart healthy lifestyle. The effectiveness of the RDs use of medical nutrition therapy in reducing CVD risk factors is well established. (33-37).

Other favorable, but not significant, trends in both groups were decline in systolic blood pressure, total cholesterol to HDL cholesterol ratio, C-reactive protein, caloric intake, dietary sodium, saturated fat, dietary cholesterol, and percent calories from alcohol. In both groups there was a slight increase in fruits and vegetable servings, but this change was not statistically significant. These changes seen in the groups are similar to those recommended by the TLC.

Saturated fat intake is one of the key nutrients incriminated in dyslipidemia. Reduction in saturated fat may result in desirable changes in lipid profile. The usual group experienced a higher decline in HDL-cholesterol and this could be due to a higher

reduction in saturated fat compared to the web-based group. The higher reduction of fat in the usual care could be due to higher reduction in monounsaturated and polyunsaturated fat versus just saturated fat. This may have contributed to a smaller reduction in LDL cholesterol. A heart healthy diet recommends increasing intake of monounsaturated and polyunsaturated fatty acids as it enhances LDL cholesterol reduction and does not lower HDL cholesterol or increase serum triglycerides. (2, 70). The usual care group not only reduced saturated fats but also polyunsaturated and monounsaturated fat intake.

In both groups, the estimated energy expenditure exceeded the energy intake. At month four, the energy intake reduced along with the energy expenditure in both groups. The usual care group was able to restrict much greater caloric intake, but the impact may have been negated by a simultaneous decline in energy expenditure resulting in a smaller weight loss over the four month period. One participant in the web-based group reduced physical activity due to injury and two participants in the usual care reduced physical activity due to medical reasons. The usual care group was engaged in higher MET minutes of moderate and vigorous non-job physical activities along with reduction in metabolic equivalent (MET) minutes of jobs-less active than moderate. These changes in intensities in physical activities along with other behavior changes may have resulted in a significant reduction of waist circumference in the usual care group. The web-based group reduced caloric intake by approximately half of the usual care. There were changes in intensities in physical activity similar to the usual care but were lower than usual care. The web-based group had a higher reduction in minutes engaged in moderate

non job physical activities; however, there was a higher MET minutes in vigorous non-job activities.

Changes in Expanded Health Belief Constructs

There was a significant improvement in the self-efficacy score in the usual care group compared to the web-based group. The susceptibility scores at baseline for the usual care and web-based group were at 54% and 63% and showed no significant change between and within groups at month four. Perceived susceptibility was positively correlated to perceived barriers, and negatively correlated with LDL cholesterol and self-efficacy. This indicates a need for program improvement to improve the perceived susceptibility of CVD. Studies using the EHBM found perceived susceptibility to play a key role in motivating individuals (67-69). At baseline, both groups had higher perception towards severity of CVD and benefits of making a healthful lifestyle. This may be due to the selection bias in the study. Perceived benefits were found to be significantly higher in a study comparing the various construct of HBM with people joining or not joining a CHD prevention program (61).

The perceived severity of CVD in the web-based group was significantly higher at baseline. This may have resulted in higher level of motivation towards reducing risk factors of CVD. Perceived severity also appears to have a negative correlation with LDL cholesterol and percent calories from sweets. Reduction in simple carbohydrates may have contributed to a significant reduction in serum triglyceride levels. Perceived barriers declined in both groups but were not statistically significant. Perceived barriers were found to be inversely correlated to self-efficacy, cues to action, fruits, vegetables

and dietary fiber intake. Future program improvements to focus on strategies to effectively reduce the perception of barriers towards a healthful lifestyle. In this study the perceived barriers and benefits had an inverse relationship as discussed in other studies but the program did not reduce the perceived barriers significantly. One study utilized focus groups to identify barriers among target audience (62). In two studies on diabetes self care, perceived threat was either not found to be associated with diet adherence and self monitoring blood glucose practices (64) and also that compliance was better in a low perceived threat environment (63). In the current study, perceived threat was not measured, but it was considered to be a product of perceived susceptibility and perceived severity. The construct of perceived threat needs to be further explored to avoid negative impact by overemphasis of threat in CVD.

Web-based media appeared to increase the cues to action score greater than the usual care, however this change was not found to be significant. Cues to action showed a positive correlation to self-efficacy, dairy products, and potassium intake. The self-efficacy score increased in the web-based group also, but was not significant ($p=0.08$). Self-efficacy was found to be positively correlated to fruits and vegetable intake, and meeting the 2005 guidelines on physical activity level, but this was not statistically significant.

Knowledge of blood cholesterol levels was positively correlated with dietary potassium, sodium, and protein and negatively correlated with age, blood pressure, triglycerides, and percent calories from sweet. Pre and post study knowledge of reducing CVD risks was not measured in this study due to previous research that indicated that change in knowledge does not guarantee change in behavior. However, in the future, it

would be useful to assess changes in knowledge because behavior change results after acquiring the knowledge from credible sources (61, 66, 69). Study participants were provided with results from blood tests, food intake, and physical activity survey. This information may have increased participants' knowledge towards current behavior and enhance motivation toward a healthful lifestyles.

The strength of the study lies with the group being homogeneous, with majority of the baseline demographic, physiologic, dietary, physical activity, and behavioral variables. Significant baseline differences were present in ethnicity, weight, protein intake, and perceived severity. The baseline differences were adjusted using ANCOVA.

Web-Site Usability

The usability survey results from the registered dietitians and the self care participants showed an overall satisfaction with the web-site content and good usability. Specific areas identified by a few participants as areas to improve were web-site design, links, more interactive, and printer friendly. According to the literature, health care information is one of the topics that Internet users seek (47). There is also an issue with Internet users failing to check the site for credible sources of information. The information on the Internet has appeared to have affected treatment decision, interaction with the physician, ability to cope, and nutrition and exercise regimen (53). Availability of a credible web-site will ensure patient safety and potential reduction in risk factors of CVD.

The current study provided valuable information on designing and enhancing web-based education to reduce cardiovascular disease (CVD) risk for target audience. This study is an attempt to understand the feasibility of an alternate media in providing a

motivational cue towards adopting healthy lifestyle behaviors. The risk factors of CVD in the military personnel are similar to that of a general population, with active duty personnel posing slightly lower risk due to lower prevalence in obesity, overweight, and inactive lifestyle (4). There are, however, other factors with higher prevalence in military such as tobacco use and increased job related stress. It is critical to include the target population when designing and testing the effectiveness of a health promotion and disease prevention program (5, 78).

The study found that web-based education can be successfully incorporated into the existing Army health care system. The study utilized existing resources from the Army hospital and provided the flexibility to the participants to obtain CVD risk reduction information at their own pace and convenience. It is critical to explore ways to enhance self-efficacy through the web-based media. Future research should include assessment of knowledge and skills of participants towards heart healthy behaviors. Focus group can be utilized to understand barriers and preferences of the target audience. Use of chat room can provide on-going social support and reinforcement of healthy behaviors. Obtaining feedback from participants will provide information on what aspects of the program made a difference in their lifestyle and barriers towards heart healthy lifestyle. A successful web-based program will require continued usability testing and updating to ensure ease of navigation and draw participant to use this resource frequently.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

There is an urgent need to address the ever increasing risk factors of CVD, the leading killer of Americans. The U.S military personnel have similar CVD risk factors as the general population. Emphasis is required to maintain optimal health of the military personnel due to its profound impact on readiness and mission accomplishment. The current study was based on a formative assessment of the existing CVD nutrition education in US Army hospitals. The registered dietitians (RDs) were identified to be the primary educators of CVD risk reduction in Army hospitals. The formative assessment identified two key areas for program enhancement by providing web-based current information for dietitians and establishment of an alternate mechanism of CVD risk reduction education for deployed and remotely located soldiers.

The RDs should be involved in program development due to their vast first hand experience with patient counseling on CVD risk reduction. The American Dietetic Association position states that RDs and registered dietetic technicians are the leaders in primary prevention and facilitating research in chronic disease prevention and health promotion (91). The RDs are trained to implement health promotion strategies on an individual and population basis (92). Urge to lower LDL cholesterol continues to be the primary target to lower the risk for CVD and the use of cholesterol lowering medication in primary prevention is constantly being evaluated (85). Several pharmacological lipid

lowering trials have demonstrated significant reduction in hypercholesterolemia and reduction in CVD events (93-95), but there are also issues with drug adherence with higher mortality among low adherers (96).

Dietitian provided interventions have demonstrated cost savings incurred due to medications and improved quality of life (34-36). The escalating cost of healthcare warrants increased emphasis on nutrition interventions as the initial, effective, and low cost approach to manage patients with mild to moderate hypercholesterolemia (97). Poor adherence is seen in both areas of medication use and healthful lifestyle. However, efforts to improve mechanisms of providing effective nutrition and lifestyle interventions should be on the forefront. Medication may be targeted to a specific condition compared to implementation of healthy behaviors that results in a plethora of lifelong benefits associated with improved health and quality of life.

Cardiovascular disease is a multi-factorial disease and requires a multi-faceted approach to improve awareness and reduce the risk of this disease. A web-based program to reduce CVD risks is currently not available for the Army population. The need for the web-based program was fulfilled by this study. An evidence based, cognitive theory based, web-site “Defend Your Heart” was created for two specific audiences and further testing was conducted to evaluate its effectiveness and web-site usability. The self care component was unable to recruit the desired sample size and requires caution when interpreting the results. The strength of the study was the homogeneity among the usual care and the web-based group and a small attrition rate. The study showed that the web-based program showed a significant reduction in the total blood cholesterol, LDL cholesterol, estimated body mass index, and predicted percent

body fat. Both groups were successful in significantly reducing the serum triglyceride levels and waist circumference. The usual care significantly increased the self-efficacy towards heart healthy behaviors.

The study used a population approach and some aspects of a clinical approach to reach the target population; however, based on few self care participants it appears the program needs to incorporate the ability to be tailored based on an individual's needs. Participants accessing the program differ in readiness to change, motivation, and knowledge level. The incorporation of usability testing provided useful feedback on further enhancing the program.

The study researchers concluded that the web-based program to reduce CVD has a potential to be an effective alternate mechanism of delivering CVD risk reduction education to Army personnel and their families. Programs of such nature will be useful to a specific target audience who are deployed, remotely located, or need the convenience of self-paced care.

Recommendations

1. The U. S. Army needs to invest in further research to launch an effective web-based program for military beneficiaries to reduce CVD risk factors with lifestyle changes.
2. Ongoing longitudinal research is needed using a larger sample size from different geographic locations to validate the findings of the current study.
3. Resources need to be allocated to involve a professional web designer to improve interactive, navigation, use of chat rooms, and printing capability available in the web media.
4. Other cognitive and social theories need to be explored and included to enhance motivational cues and environment to promote long term behavior changes.
5. Dietitians need to lead research efforts in CVD and involve other healthcare disciplines to incorporate all aspects of CVD risk reduction management.

The implication of such a web-based program could be tremendous to the health and wellness among military beneficiaries. Military beneficiaries will have access to credible, theory-based information regardless of duty location. The Army dietitians will have easy access to credible information at their fingertips. Updating a web-based resource will be less expensive and provides an opportunity for widest dissemination to those individuals seeking CVD risk reduction information.

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Appendix A - Self Care Program Steps and Content

“Defend Your Heart” Web-site

Defend Your Heart

[Home](#)[Self Care Program](#)[Registered Dietitians](#)[Contact Us](#)

Welcome to our website

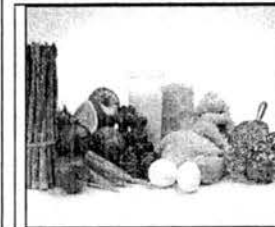
Did you know that the leading cause of death and disability in Americans is heart disease? Heart disease occurs due to several risk factors and many of these risk factors are related to our lifestyle habits. Lifestyle habits are difficult to change, but it is worthwhile to reduce your chances of getting a heart attack or stroke. High blood cholesterol is a major cause of heart disease, and for most people is due to certain food choices and other lifestyle habits. Even if medications are used to treat high blood cholesterol, there are strong recommendations to adopt healthy lifestyle habits.

We invite you to access and use this web site "Defend Your Heart". You will find credible information based on scientific evidence. Your participation is tremendously appreciated since you are facilitating creation of a useful web based program. This information is not a substitute for advice from your physician or a registered dietitian.

If you have any questions about the information provided, [feel free to contact MAJ Asma Bukhari](#), the registered dietitian who created this program. Principal Investigator: Dr. Jennifer Anderson, PhD, RD, Professor at Colorado State University, Fort Collins, Colorado.

IMPORTANT: *This website is not intended to be a substitute for consultation with your personal physician and/ or health care provider. Before engaging in any diet or physical activity program, please consult your physician. The purpose of this website is to improve your current health habits and protect yourself from heart disease.*

Need to Know

[Use & Restrictions](#)[Related Links](#)

Defend Your Heart

[Home](#)[Self Care Program](#)[Registered Dietitians](#)[Contact Us](#)

"Self Care" Program to Combat Heart Disease

Dear Participants,

- Welcome to the "**Self Care**" program for the "**Defend Your Heart**" web site. The goal of the self care program is to provide heart healthy lifestyle information.
 - The 5-Steps below are designed to provide systematic and complete information to reduce heart disease. It is recommended that first time users follow the steps in the order listed below. Thank you!
 - [Step 1](#) Overview of heart disease
 - [Step 2](#) Assess your risk for heart disease
 - [Step 3](#) Lifestyle for a healthy heart
 - [Step 4](#) More options towards a healthy heart
 - [Step 5](#) Tools for healthy lifestyle
 - **IMPORTANT:** This website is not intended to be a substitute for consultation with your personal physician and/ or health care provider. Before engaging in any diet or physical activity program, please consult your physician. The purpose of this website is to improve your current health habits and protect yourself from heart disease.
-

**Appendix B - Resources for the Registered Dietitian
Content “Defend Your Heart” Web-site**

Defend Your Heart

[Home](#)[Self Care Program](#)[Registered Dietitians](#)[Contact Us](#)

Resources for Registered Dietitians

Dear Dietitians,

- The need for a web based resource was identified during a recent conducted formative assessment of current strategies used for cholesterol management in various Army medical facilities. This web site contains information to manage cardiovascular disease. Hopefully, you may find these resources a beneficial addition to existing programs offered at your site.

■ Table of Content

■ Overview of Cardiovascular Disease

- Introduction
- Terminology
- Risk Factors
- Lipoproteins
- Understanding Atherogenesis

■ National Cholesterol Education Program Guidelines (NCEP-ATP-III)

- Introduction
- ATP III Classification of Blood Cholesterol
- Risk Factors that Modify LDL Cholesterol Goals

- Update to ATP III Treatment Algorithm
- ATP III LDL Cholesterol and Cut Points for Therapeutic Lifestyle Change
- Relationships between LDL Cholesterol level and Relative Risk for Coronary Heart Disease
- LDL Cholesterol Considerations in Different Population Groups
- Role of Physician and Registered Dietitian (Population vs. Clinical Approach)
- 2006 American Heart Association Revised Dietary and Lifestyle Recommendations

■ **Medical Nutrition Therapy**

- Nutrient Composition of Therapeutic Lifestyle Changes
- Estimated 10 Year Risk Calculations for Men and Women
- A model of Steps in Therapeutic Lifestyle Changes
- Heart Healthy Lifestyle Recommendations
- Ways to Improve Adherence to LDL Cholesterol Lowering Therapy
- Elevated Triglycerides
- LDL Cholesterol Lowering Medications
- Low HDL Cholesterol
- Trans Fatty Acids and Cardiovascular Disease
- Metabolic Syndrome

■ **Patient Education**

- Risk Factors of Heart Disease
- Food Risk Factors of Heart Disease

- o Chart: Estimation of 10 Year Risk for of Cardiovascular Disease in Men
- o Chart: Estimation of 10 Year Risk for of Cardiovascular Disease in Women
- o What is Cholesterol?
- o Fat Facts
- o Omega 3 Fatty Acids
- o Tips for Healthy Eating
- o Heart Healthy Dining Out Tips
- o Heart Healthy Food Preparation

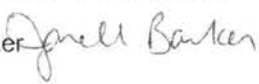
Overview of Cardiovascular Disease

Introduction

Cardiovascular disease (CVD) is a collective term for the chronic disease in which plaque and sometimes blood clots develop within major arteries. The result is impaired blood circulation which leads to organ and tissue damage. Heart attack and stroke are two of the most devastating consequences of this disease.

Appendix C - Colorado State University Investigation Review Board Approval

Notice of Approval for Human Research

Principal Investigator: Jennifer Anderson, FSHN, 1571
Asma Bukhari, FSHN, 1571
Title: Effectiveness of a Web-Based Nutrition Education Program to Reduce
Cardiovascular Disease Risk among Army Personnel and their Families
Protocol #: 08-079H **Funding Source:** n/a
Number of Participants/Records: 200 participants
Board Action: **Approval Date:** April 4, 2008 **Expires:** March 29, 2009
IRB Administrator: Janell Barker 

Consent Process:

The above-referenced project was approved by the Institutional Review Board with the condition that the attached Army/CSU approved consent form is signed by the subjects and each subject is given a copy of the form. *NO changes may be made to this document without first obtaining the approval of the IRB.*

Condition:

Upon receipt of IRB approval from the Army, a copy of the approval and final consent form must be submitted.

Investigator Responsibilities:

- It is the PI's responsibility to obtain this consent form from all subjects.
- It is the responsibility of the PI to immediately inform the IRB of any serious complications, unexpected risks, or injuries resulting from this research.
- It is also the PI's responsibility to notify the IRB of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators must obtain PI approval for any changes prior to submitting the proposed changes to the IRB for review and approval.
- The PI is ultimately responsible for the conduct of the project.
- A status report of this project will be required within a 12-month period from the date of review. Renewal is the PI's responsibility, but as a courtesy, a reminder will be sent approximately two months before the protocol expires. The PI will be asked to report on the numbers of subjects who have participated this year and project-to-date, problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary continuation form (H-101) is available from the RICRO web page <http://ricro.research.colostate.edu>.
- Upon completion of the project, an H-101 should be submitted as a close-out report.
- If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.
- **Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.**

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647.
Please direct any questions about the IRB's action on this project to me for routing to the IRB.

Attachment Date of Correspondence: 4/8/08

COURSE COMPLETION CERTIFICATE

CITI PRESENTS THIS CERTIFICATE TO

Asma Bukhari

FOR THE SUCCESSFUL COMPLETION
OF ALL REQUIRED MODULES FOR
BIOMEDICAL RESEARCH

IN Version 4.0 OF THE UNIVERSITY OF MIAMI,
CITI WEB BASED COURSE ON THE PROTECTION
OF HUMAN RESEARCH SUBJECTS ON 17 MAR 08.

THIS DOCUMENT WAS PREPARED BY:
The Department of Clinical Investigation
Brooke Army Medical Center
Fort Sam Houston, TX
210-916-2000

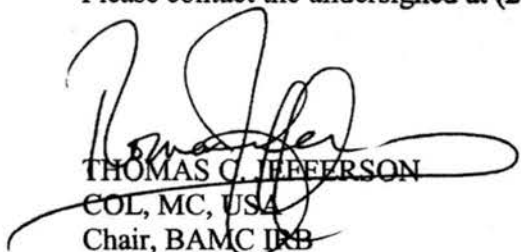
Appendix D - Brooke Army Medical Center IRB Approval

01 MAY 2008

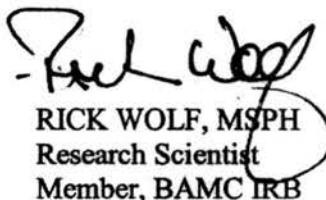
MEMORANDUM FOR LTC Melanie Craig, C, Nutrition Care Division, Evans Army Community Hospital, Ft Carson, CO

SUBJECT: **Expedited** research status of protocol entitled: "Effectiveness of a Web-Based Nutrition Education program to Reduce Cardiovascular Disease Risk Among Army Personnel and Their Families ("Defend Your Heart" Study)"

1. A subcommittee of the Brooke Army Medical Center (BAMC) Institutional Review Board (IRB) reviewed the aforementioned protocol and judged it to qualify for **Expedited** Research status IAW 32 CFR 219.110 and 45 CFR 46.110, under Category F-2 (Collection of blood samples by...venipuncture...from healthy, nonpregnant adults). The research is judged to constitute no more than **minimal risk**. The investigators plan to study the effect of a web-based teaching program on participants' blood lipid levels.. The specific goal of the study is to determine the validity of the web site and to see if its use by participants results in health-promoting changes in their perceptions, attitudes, and behaviors.
2. The protocol has been assigned control number **C.2008.127d**. Please refer to this designation in all correspondence. A Continuing Review report will be due to this office by **1 APR 2009**. Please inform this office when the protocol is completed or terminated and forward any significant findings.
3. An Informed Consent Document and a HIPAA Authorization Form have been submitted and both are approved.
4. The required CITI training has been completed by all investigators.
5. No funding is requested from the Department of Clinical Investigation.
6. Any manuscripts resulting from the research described must be submitted through the Department of Clinical Investigation for approval prior to publication.
7. The BAMC IRB will be **informed** of this action at the next regularly scheduled meeting. Please contact the undersigned at (210) 916-4495 with any questions.



THOMAS C. JEFFERSON
COL, MC, USA
Chair, BAMC IRB



RICK WOLF, MSPH
Research Scientist
Member, BAMC IRB

PI Department / Service: Div of Nutrition Care, EACH
Research Performance Site: Ft Carson, CO
Secondary Performance Site: Colorado State University, Fort Collins, CO

**Appendix E - Memorandum of Support from the Evans
Army Community Hospital, Ft. Carson**

APPENDIX

IMPACT STATEMENT

PROTOCOL TITLE: Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families

PRINCIPAL INVESTIGATOR: Dr. Jennifer Anderson, Professor, PhD, RD, Department of Food Science and Human Nutrition, Colorado State

Co Investigator: Major Asma S. Bukhari, PhD Candidate, MS, RD, Colorado State University. (719) 310-6708

Associate Investigator LTC Melanie Craig, MS, RD, Chief, Nutrition Care Division, Evans Army Community Hospital, Fort Carson, CO

LOCATION OF STUDY: Evans Army Community Hospital, Fort Carson, CO

ASSISTANCE REQUESTED: Access to the Army personnel and their family members older than 18 years of age with elevated cholesterol levels (total cholesterol above 200mg/dl, LDL above 100mg/dL) located at Fort Carson. Permission to post flyers for recruitment, inside the Evans Army Community Hospital, Wellness Center, Welcome Center, Commissary and Post Exchange. Request dietitians to order blood tests and provide results (lipid profile, C - reactive protein, fasting plasma glucose and triglycerides tests) and laboratory support to conduct these blood tests.

TOTAL NUMBER OF PATIENTS/SUBJECTS TO BE STUDIED: 200.

LENGTH OF STUDY: 4 months.

NUMBER OF SAMPLES/ACTIVITIES PER MONTH: This is a completely randomized design with repeated measures. The study will consists of two groups: "web-based" and "usual care" measured at three time points (baseline, 2 months, and 4 months).

FUNDING REQUIREMENT: Currently this study has no outside funding. Submitted application for the Retired Army Medical Specialist Corps Association (RAMCA) Endowment for Scholarly Activity (Funding range available \$100 to 2000).

☒ Approved, no comment.

☐ Approved with comment.

☐ Disapproved cannot support activity.



JAMES D. TERRIO
COL, MC
Deputy Commander Clinical Services

Appendix F - Cover Letter to the Army Registered Dietitians

Department of Food Science and Human Nutrition

College of Applied Human Sciences

234 Gifford Building

502 West Lake Street

1571 Campus Delivery

Fort Collins, Colorado 80523-1571

Office: (970) 491-3663 FOOD

Office: (970) 491-3819; Fax: (970) 491-7252

website: www.caahs.colostate.edu/fshn

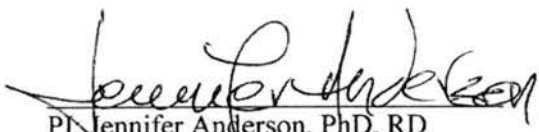
MEMORANDUM Through COL George Dilly, Chief, Army Dietitian

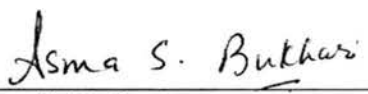
TO: Clinical and Community Registered Dietitians

SUBJECT: Survey to test the usability of "Defend Your Heart" a web site to address cardiovascular disease reduction efforts

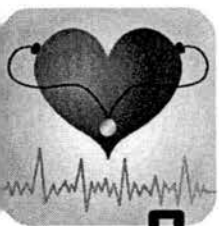
DATE: October 14, 2008

1. You are invited to complete a usability survey as part of a research project entitled "The Effectiveness of a web based program to reduce cardiovascular disease risk among military personnel and their families" (Defend Your Heart Study) for MAJ Asma Bukhari, an active duty Army dietitian, who is currently pursuing PhD at Colorado State University. The purpose of this survey is to assess various usability aspects of the web site and to ensure content validity. The information provided by the web site can be used independently or supplemented to the existing cardiovascular disease reduction programs. Dietitians in clinical and outpatient settings are highly encouraged to participate in this study. Your feedback will be critical in enhancing this alternate resource for heart disease prevention.
2. Participation in this research study is strictly voluntary. Completing and returning the survey implies your consent to participate in this study. There are no known risks and electronically submitted surveys remains anonymous since it does not disclose sender's name. Confidentiality will be maintained and only the investigator will have access to survey responses. The data will be securely stored and reported as aggregate data without identifying any participant or site.
3. The survey will take approximately 30 minutes to complete and two reminders will be sent to ensure adequate responses. If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, at 970-491-1655. Please note that it is not possible to identify all potential risks in an experimental procedure, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks. Questions related to the research study may be directed to the principal investigator, Jennifer Anderson, Ph.D., Professor in the Department of Food Science and Human Nutrition at 970-491-7334, or to the co-principal investigator, Major Asma Bukhari, at 970-669-1932 or via e-mail at abukhari@lamar.colostate.edu.


PI, Jennifer Anderson, PhD, RD
Professor and Extension Specialist
Dept. of Food Science & Human Nutrition
Colorado State University


Asma S. Bukhari
Major, SP
Ph.D. Candidate
U.S. Army

Appendix G - Study Recruitment Flyer



Help Soldiers in Remote Areas
Access Education to

Combat Heart Disease

This 4-month study is looking at different approaches to educate our community in helping to reduce the risk of the #1 Killer of Americans — Heart Disease!

The benefits of participation will be the results of your blood lipids, blood pressure, and dietary analysis, and will help determine the effectiveness of a Web-Based Nutrition Education Program focusing on Heart Disease.

Eligibility: You must meet the following criteria:

- Active duty, retired, and family members (over 18 years of age)
- Have elevated total cholesterol (above 200mg/dL) or elevated LDL cholesterol or bad cholesterol (above 100mg/dL).

This is a no-cost study conducted by Colorado State University in conjunction with Evans Army Community Hospital.

For your convenience, the study is taking place right here on Fort Carson.



- Your participation will benefit Soldiers.
- Don't Delay! The recruitment for this project ends May 23, 2008.
- The data collection for this study will take no more than 2-3 hours of your time. This data will be collected at 3 different time periods during the 4-month study.

Contact: MAJ Asma Bukhari

abukhari@lamar.colostate.edu

(719) 310-6708

Principal Investigator: Dr. Jennifer Anderson, PhD. RD

Professor, FSHN, CSU, Fort Collins, CO

Phone: (970)491-7622

Colorado
State
University

Take advantage of
this great
opportunity to
reduce your risk
for heart disease!



Appendix H - Informed Consent Document

**EVANS ARMY COMMUNITY HOSPITAL
INFORMED CONSENT DOCUMENT
(ICD Template Version 4, Jul 02)**

Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

OVERALL**PRINCIPAL INVESTIGATOR:**

Dr. Jennifer Anderson, Professor, PhD, RD
Professor and Extension Specialist
Department of Food Science and Human Nutrition
Colorado State University, 200 Gifford Bldg,
Fort Collins, CO 80523-0001.
Office: (970) 491-7622

LTC Melanie Craig, MS, RD & LD (**On-Site Principal Investigator for EACH**)

Chief, Nutrition Care Division
Fort Carson, Colorado Springs, CO 80913
Office: (719) 526-7968

Associate Investigator (AI):

Major Asma S. Bukhari, MS, RD & LD
PhD Candidate (LTHET, 32nd Med BDE, AMEDD Student Detachment), Colorado State University. Fort Collins, CO
Cell phone: (719) 310-6708.

If you choose not to participate in this research study, your decision will not affect your eligibility for care or any other benefits to which you are entitled.

DESCRIPTION/PURPOSE OF RESEARCH:

You are being asked to consider participation in this research study. Heart disease is the leading cause of death and disability for Americans. Early detection of risk factors will reduce the future burden due to this disease and the negative impact on your family and career. Your participation in this study will help us identify effective strategies to reduce the risk of this disease. The purpose of this study is to assess the effectiveness of a web-based program to lower your risk



factors of heart disease. The study will consist of two groups: web-based and usual care group. Both groups will receive heart healthy information. This study will enroll approximately 200 subjects. This four month study will be conducted at the Evans Army Community Hospital (EACH), Fort Carson.

During your participation in this study, you will be asked to make approximately 3 outpatient visits with Major Asma Bukhari. It may be necessary for you to visit EACH at the beginning of the study, at month 2 and month 4.

You have been selected to participate in this study because your total cholesterol level is _____ mg/dL, and low density lipoprotein (LDL) cholesterol is _____ mg/dL, and you have clearance from your Health Care Provider to participate in this study.

PROCEDURES:

If you are interested in participating in this study, we will conduct a brief telephone interview to find out your eligibility to participate in this study. You should be older than 18 years of age, not pregnant or lactating, active duty, retired or family members. You should also have elevated total cholesterol above 200mg/dL or LDL (bad) cholesterol above 100mg/dL and a Health Care Provider's (HCP) approval to participate. You will be read the informed consent process and sign this consent form. Data collection will be conducted at the beginning of the study and at month 2 and month 4. You will be asked to complete 5 surveys, blood test for cholesterol levels, blood glucose and c-reactive proteins. Other measurements include checking your blood pressure, weight, height and waist circumference, You will need to fast at least 12 hours without intake of sugary drink.

You will be randomly assigned to one of the group. Randomization is a process like flipping a coin and means you will have a chance of being assigned to either of the groups. The two groups are "web-based" and "usual care" group. Web-based group will be offered heart healthy information using the web-site "Defend Your Heart" and usual care group will also receive useful heart healthy information using hospital based group classes and individual appointments with the Registered Dietitian. After the completion of study, both groups will be offered information provided to the other group, if desired by the participant. You will receive a brief electronic message to notify about availability of blood tests result and to attend the follow up data collection session (at 2 months and 4 months).

You will be assigned to a study group based on the last digit of your social security number. If this number is even you are assigned to the "usual care" group and if the number is odd than you



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

are assigned to the "web-based group". If you have a specific preference discuss with the investigator prior to signing the consent form.

It will take approximately 2 to 2.5 hours to complete the surveys and measurements indicated above. If you need to take the surveys with you due to lack of time, please coordinate with the researcher for a suitable time to return the completed surveys. Blood tests may require a visit to the Evans Army Community Hospital laboratory and these are to be conducted in a 12 hours fasting state. You may decide to get blood test done on different day and can be completed early in the morning before breakfast. The time taken for blood test varies due to the wait time in the laboratory, depending on the time of the day. The actual blood draw will take less than 15 minutes.

RISKS OR DISCOMFORTS:

This study does not carry substantial risk to you as a participant. You may experience bruising and soreness at the site where blood is drawn. There is also a slight possibility of infection at the site where the blood is drawn. There is a potential for breach in confidentiality. The investigator will use the code number and data will be kept securely and confidentially. The data will be presented as group data without disclosing any participants' identity. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, and unknown, risks.

If you become pregnant or feel you might be pregnant, contact your provider and the study investigator listed in the voluntary participation section. There may also be unforeseen risks associated with this study.

BENEFITS:

The possible benefit of your participation in this study is you will know your blood cholesterol levels, blood pressure, and eating habits. This will help you identify areas for future changes towards a healthy lifestyle. Both groups will receive useful heart healthy information during the study period.



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

PAYMENT (COMPENSATION):

You will not receive any compensation (payment) for participating in this study.

ALTERNATIVES TO PARTICIPATION:

Choosing not to participate in this study is your alternative to volunteering for the study. There may be other research studies involving experimental treatments that could be helpful to your condition.

CONFIDENTIALITY OF RECORDS OF STUDY PARTICIPATION:

Records of your participation in this study may only be disclosed in accordance with federal law, including the Federal Privacy Act, 5 U.S.C.552a, and its implementing regulations. DD Form 2005, Privacy Act Statement - Military Health Records, contains the Privacy Act Statement for the records.

By signing this consent document, you give your permission for information gained from your participation in this study to be published in medical literature, discussed for educational purposes, and used generally to further medical science. You will not be personally identified; all information will be presented as anonymous data.

Your records may be reviewed by the U.S. Food & Drug Administration (FDA), other U.S. government agencies, the BAMC Institutional Review Board, Colorado State University Human Review Committee and by EACH.

Complete confidentiality cannot be promised, particularly for military personnel, because information regarding your health may be required to be reported to appropriate medical or command authorities.

To maintain confidentiality, the surveys will utilize a unique code created by you and not your social security number. To create your unique code and to facilitate remembering, please follow the three steps listed below:

1. Please write three letters that you easily remember, example you initials here _____
 2. Write the last four digits of you phone number _____
 3. Now combine the letters from step 1 and numbers from step 2 _____
- This will be your unique code that will be used to code your surveys and data storage through out the study.



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

Your contact information will be utilized to provide information on your blood tests and dietary analysis after the data is collected at each time period (initial, month 2 and month 4). The contact information (address, phone #, and e-mail address) will be kept in a locked cabinet and will not be used for any other purposes.

ENTITLEMENT TO CARE:

In the event of injury resulting from this study, the extent of medical care provided is limited and will be within the scope authorized for Department of Defense (DoD) health care beneficiaries. Your entitlement to medical and dental care and/or compensation in the event of injury is governed by federal laws and regulations, and if you have questions about your rights as a research subject or if you believe you have received a research-related injury, you may contact the

Brooke Army Medical Center Protocol Coordinators, (210) 916-2598 or BAMC Judge Advocate General, (210) 916-2031 and Colorado State University, Human Review Committee Administrator, Janell Barker 970-491-1655. The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

BLOOD SAMPLES:

All specimens kept at EACH will be handled and disposed of in accordance with federal regulations.

_____ I do not wish to be notified by investigators in the event of research findings of potential clinical consequence to my family members or myself.

_____ I wish to be notified by investigators in the event of research findings of potential clinical consequence to my family members or myself. I understand that my local principal investigator may use my social security number to locate me in the future.

_____ (Yes/No) consent to use your e-mail to notify you about availability of blood results and a reminder to visit EACH for follow up measurements for the study at 2 months and 4 months. If yes, please write your e-mail address here: _____

Email messages format:

#1: "Your blood test results are available; please contact Major Bukhari at (970) 669-1932 on a convenient time to obtain them".



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

#2: "We appreciate your participation in "Defend Your Heart" study. Please visit EACH on one of these days _____ for testing. If none of these times and dates are convenient for you, please contact Major Bukhari at (970) 669-1932 or at abukhari@lamar.colostate.edu".

Signature of Research Subject

VOLUNTARY PARTICIPATION:

The decision to participate in this study is completely voluntary on your part. No one has coerced or intimidated you into participating in this project. You are participating because you want to. The Principal Investigator or one of his/her associates has adequately answered any and all questions you have about this study, your participation, and the procedures involved. If significant new findings develop during the course of this study that may relate to your decision to continue participation you will be informed.

You may withdraw this consent at any time and discontinue further participation in this study without affecting your eligibility for care or any other benefits to which you are entitled. Should you choose to withdraw, you must follow up with Nutrition Care Division at EACH for counseling with the Registered Dietitian to lower your cholesterol level and reduce your risk for heart disease.

The investigator of this study may terminate your participation in this study at any time if he/she feels this to be in your best interest.

CONTACT INFORMATION:

Principal Investigator (PI)

The Principal Investigator (Dr. Jennifer Anderson) or the Co-Investigator (Major Asma Bukhari) from the Department of Food Science and Human Nutrition, Colorado State University will be available to answer any questions concerning procedures throughout this study.

Principal Investigator: Dr. Jennifer Anderson, Professor, PhD, RD
Office: (970) 491-7622

Co-Investigators: Major Asma S. Bukhari, MS, RD &LD, PhD candidate
Cell phone: (719) 310-6708 or @ abukhari@lamar.colostate.edu



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

Your consent to participate in this study is given on a voluntary basis. All oral and written information and discussions about this study have been in English, a language in which you are fluent.

A copy of this form will be given to you.

Volunteer's Signature

Phone #

Date

Volunteer's Printed Name

Volunteer's Address (street, city, state & zip code)

Advising Investigator's Signature

Date

Phone Number

Advising Investigator's Printed Name

Witness' Signature
(Must witness ALL signatures)

Date

Witness' Printed Name



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families ("Defend Your Heart" Study)

Tear off section

MEMORANDUM FOR LTC Melanie Craig, Chief, Nutrition Care Division, Fort Carson, CO.

SUBJECT: Consent for blood work and review of results

1. I consent to provide my last 4 of SSN to use for ordering of my blood tests for the "Defend Your Heart" Study by the Registered Dietitians at Nutrition Care Division at EACH, Fort Carson.

2. I authorize, MAJ Bukhari, Dr. Anderson and LTC Craig, to have access to the blood test results and review them with me when completed.

3. My last name is: _____ First Name: _____ MI: _____

Sponsor's last 4 of SSN: _____ FMP: _____

Signature of Research Participant: _____ Date: _____



Appendix I - Authorization to Use and Disclose Protected Health Information for Research

Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families

**EVANS ARMY COMMUNITY HOSPITAL
AUTHORIZATION TO USE AND DISCLOSE PROTECTED HEALTH
INFORMATION FOR RESEARCH**

(APHI Template Version 3, February 04)

You are being asked for permission to use or disclose your protected health information for research purposes in the research study entitled **Effectiveness of a web-based nutrition education program to reduce cardiovascular disease risk among Army personnel and their families.**

The Health Insurance Portability & Accountability Act of 1996, Public Law 104-109 (also known as HIPAA), establishes privacy standards to protect your health information. This law requires the researchers to obtain your authorization (by signing this form) before they use or disclose your protected health information for research purposes in the study listed above.

Your protected health information that may be used and disclosed in this study includes:

- Self reported information on demographic and background Information for example age, sex, race, service, job, tobacco use, deployment and stress level.
- Self reported information on your medical History/surgical History
- Laboratory tests: lipid profile, triglycerides, C-reactive proteins, fasting plasma glucose.
- Survey to assess your perceptions, attitudes and behaviors towards healthy heart behaviors.

Your protected health information will be used for:

- You are being asked to consider participation in this research study. Heart disease is the leading cause of death and disability for all Americans. Early detection of risk factors will reduce the future burden due to this disease and the negative impact on your family and career. Your participation in this study will help us identify effective strategies to reduce the risk of this disease. The purpose of this study is to assess the effectiveness of a web-based program to lower your risk factors of heart disease.

The disclosure of your protected health information is necessary in order to be able to conduct the research project described. Records of your participation in this study may only be disclosed in accordance with state and federal law, including the Privacy Act (5 U.S.C. 552a) and the Health Insurance Portability and Accountability Act of 1996 and its implementing regulations (45 CFR 160 & 164). Note: Protected health information of military service members may be used or disclosed for activities deemed necessary by appropriate military command authorities to ensure the proper execution of the military mission.



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease² risk among Army personnel and their families

By signing this authorization, you give your permission for information gained from your participation in this study to be published in medical literature, discussed for educational purposes, and used generally to further medical science. You will not be personally identified; all information will be presented as anonymous data.

The Principal Investigator may use and share your health information with:

- The BAMC Institutional Review Board
- State and Federal Government representatives, when required by law
- EACH or Department of Defense representatives

The researchers and those listed above agree to protect your health information by using and disclosing it only as permitted by you in this Authorization and as directed by state and federal law.

You need to be aware that some parties receiving your protected health information may not have the same obligations to protect your protected health information and may re-disclose your protected health information to parties not named here. If your protected health information is re-disclosed, it may no longer be protected by state or federal privacy laws.

You do not have to sign this Authorization. If you decide not to sign the Authorization:

- It will not affect your treatment, payment or enrollment in any health plans or affect your eligibility for benefits.
- You may not be allowed to participate in the research study.

After signing the Authorization, you can change your mind and:

- Notify the researcher that you have withdrawn your permission to disclose or use your protected health information (revoke the Authorization). If you revoke the Authorization, you will send a written letter to either;

Dr. Jennifer Anderson, Professor, PhD, RD
Professor and Extension Specialist
Department of Food Science and Human Nutrition
Colorado State University, 200 Gifford Bldg,
Fort Collins, CO 80523-0001.
Office: (970) 491-7622



Effectiveness of a web-based nutrition education program to reduce cardiovascular disease³ risk among Army personnel and their families

Major Asma S. Bukhari, MS, RD & LD
PhD Candidate (LTHET, 32nd Med BDE, AMEDD Student Detachment),
Colorado State University, Fort Collins, CO
Cell phone: (719) 310-6708.

LTC Melanie Craig, MS, RD & LD
Chief, Nutrition Care Division
Fort Carson, Colorado Springs, CO 80913
Office: (719) 526-7968

- Inform either Major Bukhari or Dr. Anderson of your decision.
- If you revoke this Authorization, researchers may only use and disclose the protected health information already collected for this research study.
- If you revoke this Authorization your protected health information may still be used and disclosed should you have an adverse event (a bad effect).
- If you withdraw the Authorization, you may not be allowed to continue to participate in the study.

During your participation in this study, you will not be able to access your research records. This is done to ensure the study results are reliable. After the completion of the study, you have the right to see or copy your research records related to the study listed above. A Request for Access must be made in writing to Major Asma Bukhari @ abukhair@colostate.edu.

If you have not already received a copy of the brochure entitled "Military Health System Notice of Privacy Practices," you may request one. DD Form 2005, Privacy Act Statement - Military Health Records (located on your medical records jacket), contains the Privacy Act Statement for the records. If you have any questions or concerns about your privacy rights, you should contact the Brooke Army Medical Center Privacy Officer at phone number (210) 916-9259 or Wilford Hall Medical Center Privacy Officer at (210) 292-4599.

This Authorization does not have an expiration date.



**Effectiveness of a web-based nutrition education program to reduce cardiovascular disease⁴
risk among Army personnel and their families**

You are the subject or are authorized to act on behalf of the subject. You have read this information, and you will receive a copy of this form after it is signed.

**Volunteer's Signature or
Legal Representative**

Volunteer's SSN

Date

**Volunteer's Printed Name or
Legal Representative**

Sponsor's SSN

Relationship of Legal Representative to Volunteer

Signature of Witness

Date



Appendix J - General Demographic Survey

General Demographic Survey
"Defend Your Heart"

Code # : (3 initials and last 4 of your telephone #) _____ Today's Date: _____

Note: Please remember to use the same code numbers for other surveys related to this study. Thank you!

This survey will ask for general information pertaining to your background. Please answer the questions below to the best of your knowledge and understanding. The information obtained from this survey will be kept confidential and will be utilized only for research purposes and presented as aggregate data.

This survey contains 14 questions and will take approximately 15 minutes to complete.

1. Age: _____ years
2. Gender (circle your answer)
 - a. Male
 - b. Female
3. Component: (circle one)
 - a. Active Duty
 - b. Reserve/ National guard
 - c. Retired
 - d. Family member
 - e. Other. Please specify: _____
4. Service (circle one)
 - a. Army
 - b. Navy
 - c. Air Force
 - d. Marine
 - e. National guard
 - f. Other. Please specify: _____
5. Ethnicity: (circle one)
 - a. Caucasian
 - b. African American
 - c. Native American
 - d. Asian
 - e. Hispanic
 - f. Other. Please specify: _____

6. Educational level completed (circle one)
- a. High school
 - b. Some college
 - c. College
 - d. Graduate college (Masters, Doctorate, etc.,)
 - e. Other. Please specify: _____
7. Current job: (Please specify) _____ (Please indicate "n/a" if not applicable)
8. Current rank (Please specify): _____ (Please indicate "n/a" if not applicable)
9. Years of service on active duty: _____ years. (Please indicate "n/a" if not applicable)
10. Are you currently using tobacco product (including smokeless products)?
- a. Yes
 - b. No
11. Is there any history of chronic disease in your family? Circle all conditions that apply.
- a. Cancer
 - b. Heart disease
 - c. Diabetes
 - d. Other. Please specify: _____
12. In the last 6 months, have you met with a Registered Dietitian for heart healthy diet counseling or attended cholesterol education classes?
- a. Yes
 - b. No
13. Have you been deployed in the last 2 years?
- a. Yes
 - b. No
 - c. Not applicable
14. Are you taking any medications to lower your cholesterol levels?
- a. Yes
 - b. No
 - i. If yes, please list them: _____

Thank you for completing this important survey!
Contact: MAJ Bukhari, Ph D Candidate, Colorado State University
abukhari@lamar.colostate.edu

Appendix K - Expanded Health Belief Scale

Today's Date: _____

Survey code: _____

Colorado State University
"Defend Your Heart" Study

Healthy Heart Expanded Health Belief Scale

The purpose of this survey is to obtain information on various factors affecting heart healthy behaviors. This information will assist in designing effective disease prevention programs. Your beliefs and opinions are very important and will be kept confidential. Only the investigators will have access to this information and the data will be presented as overall group scores. We appreciate your participation and your contributions to enhance health programs to service members and their families. Thank you!

This survey contains 41 questions and will take approximately 30 minutes to complete.

1. Do you think you are at a high personal risk of getting heart disease?
Circle one response.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

2. Do you think your family members have risk factors for heart disease?
Circle one response.
 - a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

3. Do you have any of the following "uncontrollable" risk factors? Circle all factors that apply to you.
 - a. I have a family history of heart disease
 - b. I am a man above 45 years of age
 - c. I am a woman above 55 years of age
 - d. I am a male
 - e. None

4. Do you have any of the “controllable” risk factors listed below? Circle all factors that apply to you.
- a. Abnormal blood cholesterol levels
 - b. High blood pressure
 - c. Tobacco use
 - d. Diabetes
 - e. Poor food habits
 - f. Physical inactivity
 - g. Tobacco use
 - h. None
5. Do you consider yourself at greater risk for heart disease compared to other diseases? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
6. Do you know your likelihood of getting heart disease? Circle one response.
- a. Yes
 - b. No
 - c. Don't know
7. Do you agree that heart disease is serious? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
8. Do you think heart disease can cause serious life-long disabilities? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

9. How serious an effect do you think a heart attack or stroke would have on your health? Circle one response.
- a. Very serious
 - b. Somewhat serious
 - c. Not sure
 - d. Not that serious
 - e. Not at all serious
10. Have you or a family member experienced heart disease personally (or first-hand)? Circle one response.
- a. Yes
 - b. No
11. Do you know the potential damage caused by heart disease? Circle one response.
- a. Yes
 - b. No
12. Do you have any previous knowledge or experience with heart disease? Circle one response.
- a. Yes
 - b. No
13. How interested are you to know more about heart disease prevention? Circle one response.
- a. Very interested
 - b. Somewhat interested
 - c. Neutral
 - d. Not interested
14. Most risk factors for heart disease can be identified early on and modify to lower chances of heart disease. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
15. Poorly managed risk factors for heart disease could affect my military career and family life. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

16. Early detection and prevention of risk factors for heart disease is more effective than later treatment of the disease. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
17. Because I am young and physically active, it does not matter what I eat. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
18. Changing lifestyle to reduce the risk for heart disease also reduces the risk for other conditions (examples: high blood pressure, diabetes, overweight, etc). Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
19. Medication use is easier and better than lifestyle changes to prevent heart disease. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
20. Eating healthy and being physically active take too much time. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

21. Healthy foods are difficult to prepare. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
22. Healthy foods are expensive. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
23. Making lifestyle changes is very confusing. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
24. My food selection at the grocery store is based on pricing instead of health concern. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
25. I find food labels difficult to read and understand. Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
26. How confident are you about making healthy lifestyle changes? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident

27. Circle all the choices that apply as factors that might interfere with your intentions to make lifestyle changes (example: eat healthy, quit tobacco, increase physical activity, visit doctor to find your risk for heart disease).
- a. Time
 - b. Expense
 - c. Transportation
 - d. Lack of skills
 - e. Lack of motivation
 - f. Do not think it is necessary
 - g. Other: Please specify: _____
28. How motivated are you to seek information on a heart healthy lifestyle? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
29. Are you motivated to start a heart healthy lifestyle? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
30. Do you place high value on taking care of your health? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
31. If you received heart healthy information from a credible source, would you be willing to make changes towards a heart healthy lifestyle? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree

32. If your significant other also participated in programs for a heart healthy lifestyle, would this help you with your risk reduction efforts? Circle one response.
- a. Strongly agree
 - b. Somewhat agree
 - c. Neither agree or disagree
 - d. Somewhat disagree
 - e. Strongly disagree
33. How confident do you feel about identifying the risk factors of heart disease? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
34. When you go out to eat, do you feel confident that you can select heart healthy choices (example: low fat, low saturated fats, low sugar, high fiber, etc foods)?
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
35. When you go to the grocery store, how confident do you feel about making food selections based on what is healthy versus what is being promoted? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
36. How confident are you about your skills in preparing healthy meals for yourself? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
37. How confident are you about not giving in to temptations of eating high calorie food items sometimes seen in the workplace (example: donuts, cakes, etc)? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident

38. How confident are you about making changes to improve your blood cholesterol levels? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
39. How confident are you in asking your health care provider (physician, nurse, and dietitian) about heart healthy guidance based on self assessment of your risk factors for heart disease? Circle one response.
- a. Least confident
 - b. Somewhat confident
 - c. Confident
 - d. Very confident
40. Indicate your marital status.
- a. Married
 - b. Not married
41. Do you know your blood cholesterol levels or your lipid profile?
- a. Yes, please indicate cholesterol levels if you remember:
 - i. Total cholesterol: _____
 - ii. Low density lipoprotein cholesterol (LDL): _____
 - iii. Do not remember: _____
 - b. No

Thank you for completing this important survey!
Contact: MAJ Bukhari, Ph D Candidate
abukhari@lamar.colostate.edu

Appendix L - Block Food Frequency Questionnaire

FOOD QUESTIONNAIRE

RESPONDENT ID #

[illegible]

TODAY'S DATE

Jan	DAY		YEAR
Feb			
Mar	0	0	2005
Apr	1	1	2006
May	2	2	2007
Jun	3	3	2008
Jul	4		2009
Aug	5		2010
Sep	6		2011
Oct	7		2012
Nov	8		2013
Dec	9		2014



ABOUT YOU

ABOUT THIS SURVEY

**This form is about the foods you usually eat.
It will take about 30 - 40 minutes to complete.
Please answer each question as best you can.
Estimate if you aren't sure.**

- **USE ONLY A NO. 2 PENCIL.**
- **Fill in the circles completely, and erase completely if you make any changes.**

Please write your name in this box.

1000

SEX

- ☐ Male
- ☐ Female

If female, are you pregnant or breast feeding?

- ☐ No
- ☐ Yes
- ☐ Not female

AGE

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

WEIGHT
pounds

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

HEIGHT
ft. in.

0
1
2
3
4
5
6
7
8
9

INSTRUCTIONS

There are usually two kinds of questions to answer for each food.

1. **HOW OFTEN**, on average, did you eat the food during the past year?
*Please DO NOT SKIP any foods. Mark "Never" if you didn't eat any of the food in the question.
2. **HOW MUCH** did you usually eat of the food?
*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
*Sometimes we ask "how much" as A, B, C or D. **LOOK AT THE ENCLOSED PICTURES.**
For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)
3. **EXAMPLE:** This person drank apple juice twice a week, and had one glass each time.
Once a week he ate a "C"-sized serving of rice (about 1 cup).

		HOW OFTEN IN THE PAST YEAR								HOW MUCH ON THOSE DAYS SEE PORTION SIZE PICTURES FOR A-B-C-D					
		NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
Apple juice	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	How many glasses each time	☒ 1	☐ 2	☐ 3	☐ 4
Rice	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	How much each time	☐ A	☐ B	☒ C	☐ D

PLEASE DO NOT WRITE IN THIS AREA

[illegible]

This section is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. We will ask you about different TYPES (low-fat, low-carb) at the end of the survey. Include all types (like low-fat, sugar-free). Later you can tell us which type you usually eat.

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	
Breakfast sandwiches with eggs, like Egg McMuffins	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many sandwiches in a day 1 ☐ 2 ☐
Other eggs like scrambled, boiled or omelets (not egg substitutes)	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many eggs a day 1 ☐ 2 ☐ 3 ☐
Breakfast sausage, including in sausage biscuits, or in breakfast sandwiches	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many pieces 1 ☐ 2 ☐ 3 ☐
Bacon	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many pieces 1 ☐ 2 ☐ 3 ☐ 4 ☐
Pancakes, waffles, French toast or Pop Tarts	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many pieces 1 ☐ 2 ☐ 3 ☐
Cooked cereals like oatmeal, grits or cream of wheat	☐	☐	☐	☐	☐	☐	☐	☐	☐	Which bowl ☐ B ☐ C ☐
Cold cereals, ANY KIND, like corn flakes, fiber cereals, or sweetened cereals.	☐	☐	☐	☐	☐	☐	☐	☐	☐	Which bowl ☐ B ☐ C ☐ D
Milk or milk substitutes on cereal	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Yogurt or frozen yogurt	☐	☐	☐	☐	☐	☐	☐	☐	☐	Which bowl ☐ B ☐ C
Cheese, sliced cheese or cheese spread, including on sandwiches	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many slices 1 ☐ 2 ☐ 3 ☐
How often do you eat the following foods all year round? Estimate your average for the whole year.										
Bananas	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many each time 1/2 ☐ 1 ☐
Apples or pears	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many each time 1/2 ☐ 1 ☐ 2 ☐
Oranges or tangerines	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many each time 1/2 ☐ 1 ☐ 2 ☐
Grapefruit	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A little ☐ 1/2 ☐ 1 ☐
Peaches or nectarines, fresh	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many 1/2 ☐ 1 ☐ 2 ☐
Other fresh fruits like grapes, plums, honeydew, mango	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐
Canned fruit like applesauce, fruit cocktail, canned peaches or canned pineapple	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐
How often do you eat each of the following 3 fruits, just during the summer months when they are in season?										
Cantaloupe, in season	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much 1/8 ☐ 1/4 ☐ 1/2 ☐
Strawberries or other berries, in season	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐
Watermelon, in season	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐ D ☐
How often do you eat each of the following vegetables all year round, including fresh, frozen, canned or in stir-fry, at home or in a restaurant?										
Broccoli	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐
Carrots, or mixed vegetables with carrots	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐
Corn	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much A ☐ B ☐ C ☐

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY		HOW MUCH ON THOSE DAYS SEE PORTION SIZE PICTURES FOR A-B-C-D			
Lunch meat like bologna, sliced ham, turkey bologna, or any other lunch meat	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many slices	☐ 1	☐ 2	☐ 3	☐ 4
Meat loaf, meat balls	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Steak, roast beef, or beef in frozen dinners or sandwiches	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Tacos, burritos, enchiladas, tamales, with meat or chicken	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Ribs, spareribs	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Pork chops, pork roasts, cooked ham (including for breakfast)	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Veal, lamb, deer meat	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Liver, including chicken livers or liverwurst	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Pigs feet, neck bones, oxtails, tongue	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Menudo, pozole, caldo de res, sancocho, ajiaco	☐	☐	☐	☐	☐	☐	☐	☐	☐	Which bowl		☐ B	☐ C	☐ D
Any other beef or pork dish, like beef stew, beef pot pie, corned beef hash, Hamburger Helper	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Fried chicken, including chicken nuggets, wings, chicken patty	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many medium pieces	☐ 1	☐ 2	☐ 3	☐ 4
Roasted or broiled chicken or turkey	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Any other chicken dish, like chicken stew, chicken with noodles, chicken salad, Chinese chicken dishes	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Oysters	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Shellfish like shrimp, scallops, crabs	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	☐ D
Tuna, tuna salad, tuna casserole	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much of the tuna	☐ A	☐ B	☐ C	
Fried fish or fish sandwich	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
Other fish, <u>not</u> fried	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much	☐ A	☐ B	☐ C	
BREADS														
Biscuits, muffins, croissants (<u>not</u> counting breakfast sandwiches with eggs)	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many	☐ 1 sm	☐ 1 med	☐ 2	
Hamburger buns, hotdog buns, hoagie buns, submarines	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many	☐ 1	☐ 2		
Bagels, English muffins, dinner rolls	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many	☐ 1/2	☐ 1		
Tortillas (<u>not</u> counting those eaten in tacos or burritos)	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many in a day	☐ 1	☐ 2	☐ 3	☐ 4
Corn bread, corn muffins, hush puppies	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many pieces in a day	☐ 1/2	☐ 1	☐ 2	
Any other bread or toast, including white, dark, whole wheat, and what you have in sandwiches	☐	☐	☐	☐	☐	☐	☐	☐	☐	How many slices in a day	☐ 1	☐ 2	☐ 3	☐ 4
Rice, or dishes made with rice	☐	☐	☐	☐	☐	☐	☐	☐	☐	How much in a day	☐ A	☐ B	☐ C	☐ D

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY		HOW MUCH ON THOSE DAYS SEE PORTION SIZE PICTURES FOR A-B-C-D				
Margarine (not butter) on bread or on vegetables	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many pats (tsp)	☐ 1	☐ 2	☐ 3	☐ 4
Butter (not margarine) on bread or on vegetables	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many pats (tsp)	☐ 1	☐ 2	☐ 3	☐ 4
Energy bars, like Power Bars, Clif bars, Balance, Luna, Atkins bars	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many	☐ 1	☐ 2		
Breakfast bars, cereal bars, granola bars (not energy bars)	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many	☐ 1	☐ 2		
Peanuts, sunflower seeds, other nuts or seeds	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much	☐ A	☐ B	☐ C	
Peanut butter	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many tablespoons	☐ 1/2	☐ 1	☐ 2	☐ 3
Snack chips like potato chips, tortilla chips, Fritos, Doritos, popcorn (not pretzels)	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much	☐ A	☐ B	☐ C	☐ D
Crackers, like Saltines, Cheez-Its, or any other snack cracker	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much	☐ A	☐ B	☐ C	
Jelly, jam	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many tablespoons	☐ 1/2	☐ 1	☐ 2	
Mayonnaise, sandwich spreads	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many tablespoons	☐ 1/2	☐ 1	☐ 2	
Catsup, salsa or chile peppers	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many tablespoons	☐ 1/2	☐ 1	☐ 2	☐ 3
Mustard, barbecue sauce, soy sauce, gravy, other sauces	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many tablespoons	☐ 1/2	☐ 1	☐ 2	☐ 3
Donuts	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many	☐ 1	☐ 2	☐ 3	
Cake, or snack cakes like cupcakes, Ho-Hos, Entenmann's, or any other pastry	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many pieces	☐ 1 sm	☐ 1 med	☐ 2	☐ 3
Cookies	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many	☐ 1-2	☐ 3-4	☐ 5-6	☐ 7+
Ice cream, ice cream bars	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much		☐ B	☐ C	☐ D
Chocolate syrup or sauce (like in milk or on ice cream)	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶					
Pumpkin pie, sweet potato pie	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many pieces	☐ 1/2	☐ 1	☐ 2	
Any other pie including fast food pies or snack pies	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many pieces	☐ 1/2	☐ 1	☐ 2	
Chocolate candy like candy bars, M&Ms, Reeses	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much	☐ 1 mini	☐ 1 med	☐ 1 lrg	☐ 1 king
Any other candy, not chocolate, like hard candy, Lifesavers, Skittles, Starburst	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How much in a day	☐ 1-2 pcs	☐ 1/2 pkg	☐ 1 pkg	

	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY		HOW MUCH on the days you drink it?			
Glasses of milk (any kind, including soy), not counting on cereal or coffee	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many GLASSES	☐ 1	☐ 2	☐ 3
Drinks like Slim Fast, Sego, Slender, Ensure or Atkins	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many CANS OR GLASSES	☐ 1	☐ 2	
Tomato juice or V-8 juice	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many GLASSES	☐ 1/2	☐ 1	☐ 2
Real 100% orange juice or grapefruit juice. Don't count orange soda or Sunny Delight	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many GLASSES	☐ 1/2	☐ 1	☐ 2
Apple juice, grape juice, pineapple juice or fruit smoothies	☐	☐	☐	☐	☐	☐	☐	☐	☐	▶	How many GLASSES	☐ 1/2	☐ 1	☐ 2

If you eat the following foods, what type do you usually eat? MARK ONLY ONE ANSWER FOR EACH QUESTION

- Milk** ☐ Whole milk ☐ Low-fat 1% milk ☐ Soy milk ☐ Don't drink
☐ Reduced-fat 2% milk ☐ Non-fat milk ☐ Rice milk
- Slim Fast, Sego, Slender or Ensure** ☐ Low-Carb like Atkins ☐ Regular ☐ Don't drink
- Orange juice** ☐ Calcium-fortified ☐ Not calcium-fortified ☐ I don't know ☐ Don't drink
- Soda or pop** ☐ Diet soda, low-calorie ☐ Regular ☐ Don't drink
- Iced tea** ☐ Homemade, no sugar ☐ Homemade, w/sugar ☐ Bottled, no sugar ☐ Bottled, regular ☐ Don't drink
- Beer** ☐ Regular beer ☐ Light beer ☐ Low-Carb beer ☐ Non-alcoholic beer ☐ Don't drink
- Hamburgers or cheeseburgers** ☐ Hamburgers ☐ Cheeseburgers ☐ Don't eat
- Hot dogs** ☐ Low fat or turkey dogs ☐ Regular hot dogs ☐ Don't eat
- Lunch meats** ☐ Low-fat or turkey lunch meats ☐ Regular lunch meats ☐ Don't eat
- Spaghetti or lasagna** ☐ Meatless ☐ With meat sauce or meatballs ☐ Don't eat
- Cheese** ☐ Low Fat ☐ Not Low Fat ☐ Don't eat
- Salad dressing** ☐ Low-Carb ☐ Low-fat ☐ Regular ☐ Don't use
- Energy bars like Power Bar, Clif, Atkins** ☐ Low-Carb, low sugar ☐ Low-fat ☐ Regular ☐ Don't eat
- Breakfast bars, cereal bars, or granola bars** ☐ Low-Carb, low sugar ☐ Low-fat ☐ Regular ☐ Don't eat
- Bread** ☐ 100% whole wheat ☐ Low-Carb ☐ Regular ☐ Don't eat
- Tortillas** ☐ Corn ☐ Flour ☐ Don't know, or don't eat
- Chocolate candy or chocolate candy bars** ☐ Low-Carb, low sugar ☐ Low-fat ☐ Regular ☐ Don't eat
- Cookies** ☐ Low-Carb, low sugar ☐ Low-fat ☐ Regular ☐ Don't eat
- Cake, snack cakes, and other pastries** ☐ Low-Carb, low sugar ☐ Low-fat ☐ Regular ☐ Don't eat
- Ice cream** ☐ Low-Carb, low sugar ☐ Low-fat or ice milk ☐ Regular ☐ Don't eat
- Jelly or jam** ☐ Low-Carb, low sugar ☐ Regular ☐ Don't use
- Beef or pork** ☐ Avoid eating the fat ☐ Sometimes eat the fat ☐ Often eat the fat ☐ Don't eat
- Chicken or Turkey** ☐ Avoid eating the skin ☐ Sometimes eat the skin ☐ Often eat the skin ☐ Don't eat

What kinds of fat or oil do you usually use in cooking? MARK ONLY ONE OR TWO

- ☐ Don't know, or Pam ☐ Stick margarine ☐ Corn oil, vegetable oil ☐ Lard, fatback, bacon fat
☐ Butter ☐ Soft tub margarine ☐ Olive oil or canola oil ☐ Crisco
☐ Butter/margarine blend ☐ Low-fat margarine

If you eat cold cereals, what do you eat? Choose one or two that you eat most often. (If you usually just eat one kind, just choose one.)

- ☐ Low-carb cereals like Atkins, ☐ Total ☐ Other fiber cereals like Raisin Bran, Fruit-n-Fiber
Low-Carb Special K ☐ Fiber One ☐ Sweetened cereals like Frosted Flakes, Froot Loops
☐ Cheerios, Grape Nuts, Shredded ☐ Product 19, Complete ☐ Other cold cereals, like Corn Flakes, Rice Krispies,
Wheat, Wheaties, Wheat Chex ☐ All Bran, Bran Buds ☐ Special K

Appendix M - Block Work and Home Activity Survey

Work and Home Activities Survey

INSTRUCTIONS

- Please answer each question as best you can. Estimate if you aren't sure.
- **USE A NUMBER 2 PENCIL ONLY**
- Fill in the circles completely, and erase completely if you make any changes.

ABOUT YOU

RESPONDENT ID NUMBER

0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9

SEX

- ☐ Male
☐ Female

If female, are you pregnant or breast feeding?

- ☐ No
☐ Yes
☐ Not female

AGE years

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

WEIGHT pounds

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

HEIGHT ft. in.

	00
	01
	02
3	03
4	04
5	05
6	06
	07
	08
	09
	10
	11

YOUR JOBS

The first questions are about what you do on the job, for pay. (If you are a student, count that as a job)

1 Do you have a job outside the home, or a paid job you do from your house?

- ☐ Yes ☐ No (IF NO, SKIP TO THE NEXT PAGE)

2 How many days a week do you go to your job?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

3 How many hours a day do you usually spend at your job?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10+

4 Please mark the job that is most like your job. If you do two different jobs, you may mark two job descriptions. If your exact job isn't listed below, please choose the one that is closest to your job.

- | | |
|---|--|
| ☐ Working in an office | ☐ Feeding or working with large animals, livestock |
| ☐ Work in a plant or factory | ☐ Farm work, like baling hay, picking, planting |
| ☐ Work at a construction site | ☐ Moving boxes, packing |
| ☐ Driver, like bus driver, truck driver, taxi | ☐ Mechanic |
| ☐ Teacher | ☐ Painter |
| ☐ Student | ☐ Jobs involving some very heavy work, like firefighter, oil well work |
| ☐ Daycare, taking care of children, as a job | ☐ Any other jobs involving walking, like real estate, mail carrier, inspector |
| ☐ Cleaning staff, janitor, house cleaning | ☐ Any other jobs involving standing, like store clerk, hair stylist, bartender, cook |

- Activities, NOT counting the time on your job.
- Other things you do when you're not on the job

Going to and from your job in a car or bus, (not counting during your job)

Other driving or riding in a car or bus for other reasons, like going shopping, going out

Watching TV or movie

On the Internet, email, video games or computer work (Not counting your job)

Just sitting: for example, reading the paper or a book, or writing

Taking care of a child, such as feeding, bathing, dressing

Food preparation: for example, cooking, baking, setting table

Shopping for food, putting groceries away

Shopping for other things, not food, like clothes

Washing dishes, cleaning the kitchen

Any other house cleaning: for example, sweeping, making beds, cleaning bathroom

	HOW OFTEN in the past year?						How much time, ON THOSE DAYS?						
	Rarely or Never	A few times a MONTH	1-2 times a WEEK	3-4 times a WEEK	5-6 times a WEEK	EVERY DAY	Less Than 30 Minutes	30-59 Minutes	1 Hour	1½ Hours	2 Hours	3-4 Hours	More Than 4 Hours
Going to and from your job in a car or bus, (not counting during your job)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other driving or riding in a car or bus for other reasons, like going shopping, going out	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Watching TV or movie	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
On the Internet, email, video games or computer work (Not counting your job)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Just sitting: for example, reading the paper or a book, or writing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taking care of a child, such as feeding, bathing, dressing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Food preparation: for example, cooking, baking, setting table	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Shopping for food, putting groceries away	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Shopping for other things, not food, like clothes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Washing dishes, cleaning the kitchen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Any other house cleaning: for example, sweeping, making beds, cleaning bathroom	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

MM254737-1 654321

Activities, NOT counting the time on your job.
Other things you do when you're not on the job

Working outside (not on the job): for example, yard work, mowing, weeding

House repairs, maintenance, painting, workshop

Talking with friends, socializing, visiting, in person or on the phone

Attending meetings, social events, church, temple, PTA and so forth

Any other home or leisure activity not mentioned

How often? →

What was it? _____

Was it ☐ Not vigorous ☐ Somewhat vigorous ☐ Very vigorous

HOW OFTEN in the past year?

Rarely or Never	A few times a MONTH	1-2 times a WEEK	3-4 times a WEEK	5-6 times a WEEK	EVERY DAY
☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐

How much time, ON THOSE DAYS?

Less Than 30 Minutes	30-59 Minutes	1 Hour	1½ Hours	2 Hours	3-4 Hours	More Than 4 Hours
☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐

YOUR SLEEP

On average, how many hours a night do you sleep (from lights out to when you get up)?

☐ 4 ☐ 4½ ☐ 5 ☐ 5½ ☐ 6 ☐ 6½ ☐ 7 ☐ 7½ ☐ 8 ☐ 8½ ☐ 9 ☐ 9½ ☐ 10+

THANK YOU for filling out this survey.

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A PHYSICAL ACTIVITY QUESTIONNAIRE PREDICTS PERCENT BODY FAT

Gladys Block, Christopher Jensen, JoAnn Johnson, Torin Block, Ellen Fung, Tapashi Dalvi

Purpose: To evaluate the association between estimates of physical activity and percent body fat (%BF), and investigate whether meeting various definitions of adequate activity is predictive of %BF.

Methods: Baseline data from a randomized trial were examined in 200 men and women, mean age 41.9. %BF was assessed by dual energy x-ray absorptiometry. Participants self-administered the Block Work and Home Activities Survey (WAHAS). Job, leisure and home activities were characterized by their MET value, and summary estimates calculated for moderate, vigorous and sedentary activities in those domains. Based on WAHAS responses, participants were characterized as meeting or failing to meet physical activity recommendations based on the 2005 Dietary Guidelines (DG). Multiple regression methods were used, and prediction equations for %BF were evaluated.

Results/findings: A composite score for activity related to jobs, leisure activities and sedentary behaviors was inversely associated with %BF in men ($p=0.02$) and women ($p<0.0001$). Moderate home activities (e.g., cleaning, mowing) were not significantly associated, but moderate and vigorous leisure activities (e.g., fast walking, sports) were inversely associated with %BF in men ($p=0.008$) and women ($p=0.04$). Women and men who met the DG had %BF levels that were 2.68% ($p=0.05$) and 3.43% lower ($p=0.04$), respectively, than those not meeting the DG (adjusted for age and moderate or vigorous jobs). Using existing equations combined with responses to the WAHAS, predicted %BF was strongly correlated with observed %BF for women ($r=0.88$) and men ($r=0.77$).

Conclusions: The Block activity questionnaire appears to be useful in evaluating physical activity and predicting %BF.

Appendix N - Dietitians Usability Testing for “Defend Your Heart”

Dietitians Usability Testing for "Defend Your Heart" Web Site

The purpose of this survey is to assess the layout, design and content of the "Defend your Heart" web site. Your feedback w web site. We appreciate your participation. Thank you!

This survey contains 26 questions and will take approximately 25 minutes to complete.

Today's Date type as - (04/06/2008):

1. What did you like about this website?

2. What did you dislike about this website?

3. Which sections did you find most difficult to use? Why?

4. Rate the following sections of the web site. Think about the content, layout, flow of information and design of these sections and provide specific suggestions in the next question. (please check in the appropriate box).

		Excellent----- Fair -----Poor							
	Various sections of web site	1	2	3	4	5	6	7	Comments
a.	Step -1: Overview								
b.	Step -2: Risk factors								
c.	Step -3: Healthy lifestyle								
d.	Step -4: More options								
e.	Step -5: Tools for Healthy lifestyle								
f.	RD section- CVD overview								
g.	RD section - NCEP Guidelines								
h.	RD section - MNT								
i.	RD section - Patient Education 5								
j.	Home Page - Related web sites								

5. What would make the web site easier to use? Please specify

For each of the following items below, please tell us how much you agree or disagree with each statement. Use 1 to 7 scale where 1= strong agree.

		Strongly Agree-----					
		1	2	3	4	5	6
7.	I was satisfied with my experience using the website.						
8.	I found links between pages hard to understand.						
9.	I found the web site confusing to use.						
10.	I found the information easy to understand.						
11.	The site layout was easy to understand.						
12.	The pages loaded quickly.						
13.	The site was not interesting to use.						

14.	The font was hard to read.						
15.	The site design is attractive.						
16.	I like the name of this Web site.						
17.	The information on the Web-site was current.						
18.	The information on the Web site was useful.						

19. What kinds of information would you like to see added to the "Defend Your Heart" Web site? (Please specify)

20. Indicate the number of years of using

A personal computer years
 World Wide Web years
 Filling out forms online years

21. Do you have access to computer?

Yes
 No

22. Are you connected to the World Wide Web (Internet) via telephone modem or broadband connections?

Telephone modem
 Broadband connection

If broadband, is it by

DSL
 Cable
 Wireless
 Satellite
 Other

23. What browser do you use to search the World Wide Web (Internet)?

Microsoft Internet Explorer
 Netscape
 Firefox
 AOL
 MSN
 Yahoo
 Other If other, please specify:

24. Your current age is (years).?

25. What is your gender?

Female
 Male

26. Your education (please check the highest level of education completed).

Bachelor's degree
 Master's degree
 Ph D
 Other

Thank you for completing the usability testing and helping us assess the Web site - PLEASE click the "submit" button.

Contact: MAJ Bukhari, Ph D Candidate
 abukhari@lamar.colostate.edu

Submit

Appendix O - Self Care Usability Testing for “Defend Your Heart” Web-site

Usability Testing for "Defend Your Heart" Web Site

The purpose of this survey is to assess the layout, design and content of the "Defend your Heart" web site. Your feedback w web site. We appreciate your participation. Thank you!

This survey contains 26 questions and will take approximately 25 minutes to complete.

Code # Today's Date type as - (04/06/2008):

1. What did you like about this website?

2. What did you dislike about this website?

3. Which sections did you find most difficult to use? Why?

4. Rate the following sections "Self Care" program. Think about the content, layout, flow of information and design of these sections and provide specific suggestions in the next question. (Please check in the appropriate box).

		Excellent			Fair		Poor		
	Steps	1	2	3	4	5	6	7	Comments
a.	Step -1								
b.	Step -2								
c.	Step -3								
d.	Step -4								
e.	Step -5								

5. What would make the web site easier to use? Please specify

For each of the following items below, please tell us how much you agree or disagree with each statement. Use 1 to 7 scale where 1= strong agree.

		Strongly Disagree-----					
		1	2	3	4	5	6
7.	I was satisfied with my experience using the website.						
8.	I found links between pages hard to understand.						
9.	I found the web site confusing to use.						
10.	I found the information easy to understand.						
11.	The site layout was easy to understand.						
12.	The pages loaded quickly.						
13.	The site was not interesting to use.						
14.	The font was hard to read.						
15.	The site design is attractive.						
16.	I like the name of this Web site.						
17.	The information on the Web-site was current.						
18.	The information on the Web site was useful.						

19. What kinds of information would you like to see added to the "Defend Your Heart" Web site? (Please specify)

20. Indicate the number of years of using

A personal computer years
World Wide Web years
Filling out forms online years

21. Do you have access to computer?

Yes
No

22. Are you connected to the World Wide Web (Internet) via telephone modem or broadband connections?

Telephone modem
Broadband connection

If broadband, is it by

DSL
Cable
Wireless
Satellite
Other

23. What browser do you use to search the World Wide Web (Internet)?

Microsoft Internet Explorer
Netscape
Firefox
AOL
MSN
Yahoo
Other If other, please specify:

24. Your current age is (years).?

25. What is your gender?

Female
Male

26. Your education (please check the highest level of education completed).

Less than high school
High school
Some college
College and above

Thank you for completing the usability testing and helping us assess the Web site - PLEASE click the "submit" button.

Contact: MAJ Bukhari, Ph D Candidate
abukhari@lamar.colostate.edu

Submit

**Appendix P - Summary of correlation coefficients
among various variables**

**Correlation among Various Demographic, Anthropometric, Physiologic, Nutrients,
and Physical Activity Variables**

Variable	Correlation Type	Variables
Perceived Susceptibility	Positive	Perceived barriers, tobacco, predicted % body fat, VLDL cholesterol, MET minutes vigorous job activities
	Negative	Self efficacy, ethnicity, fruit servings, LDL-cholesterol
Perceived Severity	positive	Perceived barriers,
	Negative	Percent calories from sweets, LDL-cholesterol,
Perceived Benefits	Positive	
	Negative	Percent calories from sweets
Perceived Barriers	Positive	MET minutes sleeping
	Negative	Cues to action, self efficacy, vegetables servings, fruit servings, dietary fiber intake
Cues to Action	Positive	Self efficacy, dietary calcium intake, dietary potassium intake, dairy servings
	Negative	MET minutes in vigorous job activities
Self Efficacy	Positive	Dietary potassium intake, meets 2005 guidelines for physical activity, vegetable servings, fruit servings
	Negative	
Marital Status	Positive	Dietary potassium, dietary protein, dietary sodium, dietary calcium, dietary carbohydrates, percent calories from fat, dietary fiber, dietary omega 3 fatty acids, vegetable servings, fruit servings, meat servings, grain servings, whole grain servings
	Negative	
Knowledge of blood cholesterol	Positive	Dietary potassium, dietary sodium, dietary protein, percent calories from protein
	Negative	Age, systolic blood pressure, diastolic blood pressure, triglycerides, percent calories from sweets
Age	Positive	Deployment status,
	Negative	Dietary protein, dietary total fat, dietary sodium, dietary monounsaturated fat, grain servings, meat servings, HDL cholesterol, MET minutes in vigorous activity
Gender	Positive	
	Negative	Deployment, systolic blood pressure, VLDL cholesterol, predicted percent body weight
Ethnicity	Positive	Total blood cholesterol, triglycerides, risk ratio for CVD, percent calories from alcohol
	Negative	Dietary protein, dietary total fat, dietary calcium, dietary saturated fat, dietary omega 3 fat, percent calories from fat, percent calories from protein, dairy servings
Education	Positive	MET minutes in jobs below moderate intensity
	Negative	Waist circumference, systolic blood pressure, VLDL-cholesterol, C-reactive protein, BMI equivalent, predicted percent body fat, energy expenditure

Tobacco	Positive	MET minutes in leisure activities
	Negative	HDL cholesterol
Body weight	Positive	Waist circumference, VLDL cholesterol, C-reactive protein, BMI equivalent, predicted percent body fat
	Negative	None
Waist circumference	Positive	Systolic blood pressure, diastolic blood pressure, VLDL cholesterol, C-reactive protein, BMI equivalent, predicted percent body fat, energy expenditure
	Negative	Fruit serving, grain serving,
Systolic blood pressure	Positive	Diastolic blood pressure, VLDL cholesterol, predicted percent body fat
	Negative	Grain servings, meat servings, dietary sodium, dietary monounsaturated fat, dietary polyunsaturated fat, dietary cholesterol, dietary trans fat
Diastolic blood pressure	Positive	Triglycerides, VLDL cholesterol, C-reactive protein,
	Negative	LDL cholesterol
Total blood cholesterol	Positive	Triglycerides, risk ratio for CVD, LDL cholesterol,
	Negative	Total fat, dietary sodium
Triglycerides	Positive	Risk ratio for CVD, VLDL cholesterol, C-reactive protein, percent calories from alcohol
	Negative	Dietary trans fat, dietary sodium, percent calories from fat, dietary omega 3 fat, grain servings
HDL cholesterol	Positive	
	Negative	Risk ratio for CVD, energy expenditure
Risk Ratio	Positive	C-reactive protein, percent calories from alcohol
	Negative	None
VLDL cholesterol	Positive	C-reactive protein, BMI equivalent, predicted percent body fat
	Negative	
LDL cholesterol	Positive	
	Negative	MET minutes in moderate physical activity,
C-reactive protein	Positive	Percent calories from alcohol, BMI equivalent, predicted percent body fat,
	Negative	None
Dietary total protein	Positive	Dietary fat, carbohydrates, calcium, sodium, potassium, saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, vegetable serving, fruit serving, grain serving, meat serving, dairy serving, MET minutes in jobs of moderate intensity
	Negative	None
Dietary total fat	Positive	Dietary carbohydrates, calcium, sodium, potassium, saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, grain serving, meat serving, dairy serving
	Negative	None
Dietary carbohydrates	Positive	Dietary calcium, sodium, potassium, saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, fruit

		serving, grain serving, meat serving, fat serving
	Negative	Percent calories from fat
Dietary calcium	Positive	Dietary sodium, potassium, saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, percent calories from protein, vegetable serving, fruit serving, grain serving, meat serving, dairy serving
	Negative	none
Dietary sodium	Positive	Dietary potassium, saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, vegetable serving, fruit serving, grain serving, meat serving, dairy serving, MET minutes in jobs of moderate intensity
	Negative	None
Dietary potassium	Positive	Dietary saturated fat, monounsaturated fat, polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, vegetable serving, fruit serving, grain serving, meat serving, dairy serving, MET minutes in jobs of moderate intensity
	Negative	
Dietary saturated fat	Positive	Dietary polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, fruit serving, grain serving, meat serving, dairy serving, fat serving
	Negative	None
Dietary monounsaturated fat	Positive	Dietary polyunsaturated fat, dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, fruit serving, grain serving, meat serving, fat serving, whole grains serving
	Negative	None
Dietary polyunsaturated fat	Positive	Dietary cholesterol, fiber, sugar, trans fat, omega 3 fat, fruit serving, meat serving, whole grain serving
	Negative	None
Dietary cholesterol	Positive	Dietary trans fat, omega 3 fat, grains serving, meat serving, dairy serving, MET minutes in job of moderate intensity
	Negative	None
Dietary fiber	Positive	Dietary omega 3 fat, vegetable serving, fruit serving, grains serving, meat serving, whole grains serving
	Negative	None
Dietary sugar	Positive	Dietary trans fat, dietary omega 3 fat, percent calories from carbohydrates and sweets, grains serving, meat serving, fat serving
	Negative	Percent calories from fat and protein
Dietary trans fat	Positive	Omega 3 fat, grains serving, meat serving, fat serving, whole grain serving,
	Negative	None
Dietary omega 3 fat	Positive	Grains serving, meat serving, MET minutes in jobs of moderate intensity
	Negative	MET minutes in jobs of vigorous intensity

Percent calories from fat	Positive	Percent calories from protein, MET minutes in leisure activities, MET minutes in jobs of moderate intensity
	Negative	Percent calories from carbohydrates and sweet
Percent calories from protein	Positive	Vegetable serving
	Negative	Percent calories from carbohydrates, sweet, fat serving
Percent calories from carbohydrates	Positive	Percent calories from sweets
	Negative	MET minutes in leisure activities and moderate intensity activities
Percent calories from sweet	Positive	Fat serving,
	Negative	None
Vegetable serving	Positive	Fruit serving,
	Negative	None
Fruit serving	Positive	Grains serving
	Negative	BMI equivalent, predicted percent body fat
Grains serving	Positive	Meat serving
	Negative	None
Meat serving	Positive	Dairy serving
	Negative	
Whole grains	Positive	Energy expenditure
	Negative	
Meets HP 2010 guidelines	Positive	MET minutes in leisure activity, MET minutes in moderate intensity activities
	Negative	
MET minutes sleeping	Positive	
	Negative	Leisure activities, MET minutes in moderate intensity activity
MET minutes in leisure activities	Positive	MET minutes moderate intensity activity
	Negative	None
MET minutes in jobs of moderate intensity	Positive	Energy expenditure
	Negative	