Health Beliefs and Behaviors of College Women

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Abstract

Background: Lifestyle factors are known contributors to chronic disease states, a major factor in increasing health care costs. Promoting healthier lifestyles is a current emphasis worldwide. Emerging adulthood is an important window of opportunity since lifestyle patterns are often set during this time period. Women are more likely to make family health care decisions. Understanding factors affecting lifestyle patterns in a population of emerging adult women will support the design of interventions aimed at prevention of chronic disorders in this population, which may additionally have positive effects on lifestyles in their families.
Purpose: The purpose of this study was to investigate the factors that influence healthy lifestyle beliefs and behaviors in college women.
Design: This study used the Health Belief Model as a framework and employed a mixed methods design including surveys, pedometers, and nominal group technique (NGT). Women, 18 to 25 years of age, were recruited from an urban, women's centered university in Pittsburgh, PA.
R**esults:** Analysis of 109 completed data sets demonstrated that health beliefs of perceived benefits and barriers related to eating behavior and physical activity were more predictive of healthy behaviors than beliefs of perceived susceptibility and seriousness. Perceived diet benefits accounted for over 15% of the variance seen in eating behavior. Perceived exercise barriers accounted for 35% of the variance, and exercise benefits explained 4% of the variance in physical activity. The association between health beliefs and behaviors was increased when the effect of modifying factors was considered. Socioeconomic factors including race, income, living environment, medical supervision, and knowledge moderated the relationship between health beliefs and health behaviors increasing variance explained from 15% to 30% in eating behaviors and from 39% to 49% in physical activity behaviors. NGT results suggested that mood, aesthetics, and practical issues such as cost and availability, were important factors in decision making related to healthy eating behaviors and participation in physical activity.
Conclusions: Emerging adult (college) women are more motivated by higher perceived immediate benefits and lower perceived barriers to health behaviors. Framing interventions toward immediate benefit to the individual may be the most appropriate avenue in this population.

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PREFACE

I have a strong interest in health promotion and more importantly chronic disease prevention. This interest was sparked by a strong family history of diabetes and heart disease. I believe that the best intervention is prevention, so I wanted to explore ways to establish healthier lifestyles in young adults. This study is dedicated to my family, those who have died from chronic diseases and those in whom I hope to prevent or delay the diseases.

I would also like to acknowledge Carlow University for their support of this study, and give special thanks to all the members of my committee for their input and support. I would especially like to thank Dr. Elizabeth Schlenk for continual guidance and attention to detail, and Dr. Patrick who encouraged me to enroll in the doctoral program at the University of Pittsburgh and provided ongoing emotional support during the process of obtaining my Doctorate. I also wish to acknowledge Dr. Galen Switzer for his guidance in my statistical analysis.

1.0 INTRODUCTION

Lifestyle factors contribute to the risk of developing chronic diseases, such as cardiovascular disease (CVD), diabetes, osteoporosis, and cancer. Healthy People 2010 (U.S. Department of Health and Human Services [DHHS], 2000) set goals of decreasing the prevalence of preventable diseases by encouraging healthier lifestyle patterns. Eating behavior and levels of physical activity are lifestyle factors that are a key focus in chronic disease prevention interventions. Emerging adulthood, the ages between 18 and 25, is an important window of opportunity since lifestyle patterns are often set during this time period. Understanding factors leading toward healthy lifestyle patterns in this population is essential to give support to designing interventions aimed at prevention of chronic disorders. Since women are more likely to make family health care decisions, intervening for healthy behaviors in a population of women may additionally have a positive effect on their families. Little research has been done on health beliefs and behaviors in emerging adults.

1.1 Background

Health care costs in the United States (U.S.) are rising at an alarming rate. Health care costs per capita continue to rise at a rate greater than the growth of the U.S. economy, meaning that each year a greater percentage of costs are attributed to health care (Strunk & Ginsburg, 2004).

Management of chronic disorders accounts for more than 75% of the $1.4 trillion health care costs in the U.S. Thus, escalating health care costs cannot effectively be controlled without addressing the problem of chronic disorders (Centers for Disease Control and Prevention (CDC), 2005a). The cost of chronic disorders is not only financial. An additional consideration in disease cost is the contribution of chronic disorders to mortality and morbidity. CVD, diabetes, cancer, and chronic obstructive pulmonary disease (COPD) accounted for over two thirds of the deaths in the U.S. in 1999.

Poor health and disability are not necessarily coincident with aging. Lifestyle factors contribute significantly to the risk of disabling chronic disorders, such as CVD, diabetes, osteoporosis, and cancer. The CDC reports that healthy lifestyles are more influential than genetic factors in helping people avoid the deterioration traditionally associated with aging. Physical activity, healthy diets, tobacco avoidance, and other healthy lifestyle behaviors reduce by half the rate of disability of those who do not maintain a healthy lifestyle (CDC, 2005b).

Though women have a longer life expectancy than men, women older than 70 years are more likely to be disabled (CDC, 2005b). Weight bearing physical activity and adequate calcium intake are commonly encouraged in women to decrease the risk of osteoporosis, a common disabling factor in women. This chronic disease is not a cause of mortality, but is a significant contributor to morbidity, and may increase the risk of mortality. Hip fractures, a sequelae of osteoporosis, are associated with an increased risk of death within three months. In addition to hip fractures, spinal fractures and fractures of the forearm frequently result in loss of mobility and independence resulting in an increased rate of need for physical therapy, home health care, or living in long-term care facilities (U.S. DHHS, 2004).

Healthy People 2010 (U.S. DHHS, 2000) set goals of decreasing the prevalence of preventable diseases by encouraging healthier lifestyle patterns. Physical activity, healthy diets, and other health promoting activities are essential components to healthy aging and decrease the burden of health care costs. Physical inactivity coupled with excessive dietary intake results in obesity and increased risk of chronic disorders. Healthy lifestyles enhance the individual's ability to maintain allostasis, the ability to maintain stability through change (biological and psychosocial stressors) (McEwen & Wingfield, 2003).

In health care however, it is generally the absence of health that commands attention. Bortz (2005) proposes that health is determined by a summation of the effects of genes, external agency, internal agency, and aging. He points out the similarity to the life of a car depending on design, accidents, maintenance, and aging. Essentially, if maintenance is not kept up the car does not last or requires expensive repairs. If individuals do not participate in activities to preserve their health, eventually they will experience functional failure or require expensive repairs, also. It is easy to delay an oil change in a car as long as it is running without apparent problems; it is easy to shift the maintenance priority when all seems well. The true cost of this negligence is not readily apparent. Health maintenance is not a perceptible priority in apparently healthy emerging adults.

Traditionally, college students are bridging between adolescence and adulthood. They fall into a recently-labeled developmental category of emerging adults, individuals ranging in age from 18 to 25. In their review article, Shifren, Furnham, and Bauserman (2003) reported that the period of emerging adulthood has been identified as a time when individuals are most likely to explore their world for a variety of new experiences. They are also at the most risk of engaging in risky health behaviors. Arnette (2000) suggests that emerging adults are more similar to

adolescents than young adults in the attainment of developmental tasks and are exploring life possibilities before moving on to enduring decisions. Adolescence is described by Lerner (2002) as a "time of choices involving self-determination and social roles." It is a time when youth are exploring who they are and how they fit into society. In general, perceptions of concepts, such as "health" and "risk," are highly individualized and personal. If no harm has been witnessed or experienced personally, the perception of risk involved in particular behaviors may be skewed. Johnson, McCaul, and Klein (2002) suggest that adolescents engaging in risky behaviors do not have a complete appreciation of their exposure to harm. It is possible that the transition to adulthood is a window of opportunity for changing the life course (Masten et al., 2004).

For the most part, adolescents and emerging adults are generally healthy, with relatively low morbidity and mortality. The epidemiological profile of adolescents and emerging adults is quite different than that of older adults. Adolescents and emerging adults in general do not experience the lifestyle related chronic disorders of CVD, diabetes, osteoporosis, and cancer, which are major considerations in older adult health. However, adolescence is the developmental period that is pivotal with respect to lifestyle related health behaviors. It is during adolescence that many health promoting behavior choices (eating behavior and physical activity) and health risk behavior choices (alcohol, drug and tobacco abuse, and unsafe sexual practices) are first evident (Williams, Holmbeck, & Greenley, 2002). College students, who are generally adolescents emerging into adulthood, will continue the exploration of lifestyles and start the processes of establishing lifelong behavior patterns.

Women have been shown to be more likely than men to be active participants in making health related decisions and seek more knowledge related to health decisions (Arora & McHorney, 2000). Targeting women in college would address a population that is currently

known to have declining levels of physical activity and varying dietary habits at a time when they are developing lifestyle patterns. Examining college women provides the potential to positively modify physical activity and dietary patterns that could persist throughout life. There is an abundance of literature describing the success of appropriate diet and physical activity programs to prevent or control the chronic disorders of CVD, type 2 diabetes, osteoporosis, and cancer in a variety of populations.

The Health Belief Model (HBM) is commonly used to frame research examining health behaviors. Individual perceptions have been identified in the original HBM proposed by Becker (1974) as one of the major predictors involved in preventative health behavior (see Figure 1). In his account of the historical perspectives of the HBM, Rosenstock (1974a, p. 3) reports that for persons to take steps to prevent a disease they would have to believe that they are susceptible to that disease, that the disease would have at least a moderately severe effect on some component of their life, and that taking a particular action would be beneficial and have few barriers. Smalley, Wittler, and Oliverson (2004) found that adolescents possess knowledge of cardiovascular risk factors as reflected in their attitude assessments; however, their lifestyle choices contradict these beliefs. The authors concluded that it may be possible that their perception of risk is not accurate despite knowledge of disease related risk factors (Smalley, Wittler, & Oliverson, 2004). While the adolescent may recognize that obesity and high fat diets increase risk for CVD, it is not a serious enough threat to motivate behavioral change.

To date, a well established tool has not been developed to adequately measure health beliefs toward chronic disorders, specifically CVD, diabetes, osteoporosis, and cancer, in an adolescent population. A preliminary study conducted by this researcher at a small private university in a Mid-Atlantic city in 2003 resulted in a tool, the Health Belief Questionnaire

(HBQ), which was revised (HBQ-R) and re-tested in 2005 for use in this study to measure perceived susceptibility, perceived seriousness, and perceived benefits of prevention in a college aged population. Identification of the factors college women utilize in recognizing risk and making lifestyle decisions affecting their health would aid in constructing effective interventions to promote the establishment of lifelong healthy lifestyles.

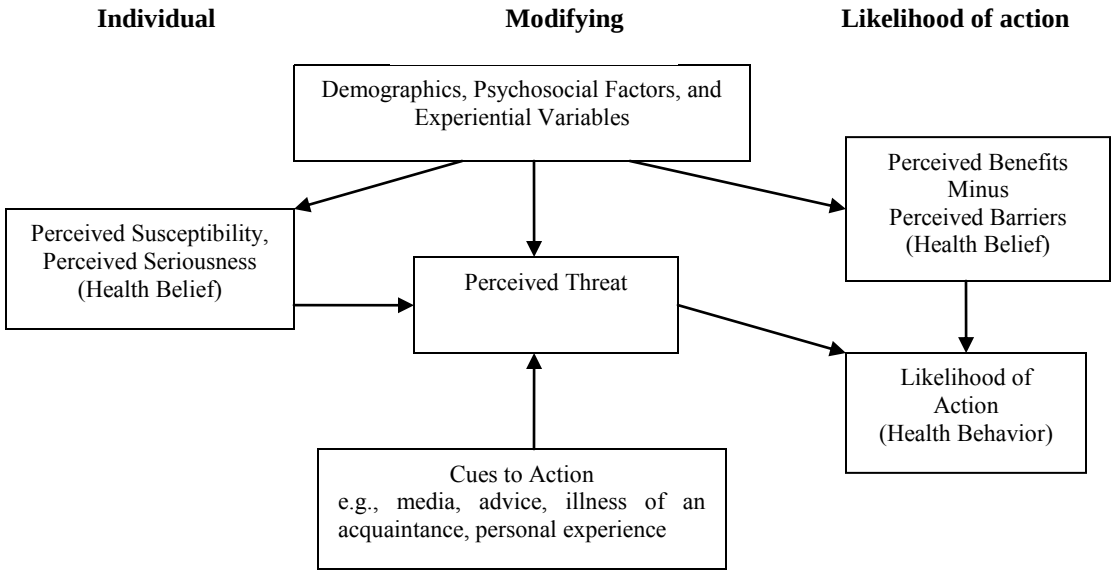

Figure 1 Becker's Health Belief Model

Becker, M. H. (1974). *The Health Belief Model and personal health behavior*. Thorofare, NJ: Charles B. Slack, Inc.

1.2 PURPOSE

While healthy college students often participate in pharmaceutical and other research studies, little research has been done focusing on the relationship between health beliefs and behaviors in

these emerging adults. The purpose of this study is to investigate the factors that influence healthy lifestyle beliefs and behaviors in college women.

The specific aims are:

1. To describe the health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers) and health behaviors (eating behavior and physical activity) in college women.
2. To examine the relationship between health beliefs and health behaviors in college women.
3. To examine the relationship between modifying factors (sociodemographic factors and knowledge) and health beliefs in college women.
4. To determine if modifying factors moderate the relationship between health beliefs and health behaviors in college women.
5. To identify factors in addition to health beliefs that contribute to healthy lifestyle behaviors in college women.

1.3 RESEARCH HYPOTHESES AND RESEARCH QUESTION

The hypotheses are:

1. Health beliefs are related to health behaviors in a population of college women.
2. Modifying factors are related to health beliefs in a population of college women.
3. Modifying factors (sociodemographic factors and knowledge) moderate the relationship between health beliefs and health behaviors in a population of college women.

The research question is: What factors in addition to health beliefs contribute to healthy lifestyle behaviors in a population of college women?

1.4 CONCEPTUAL AND OPERATIONAL DEFINITIONS

1.4.1 Health Beliefs

The HBM was designed to describe a model of disease prevention, not a model of disease treatment. Health beliefs include an individual's perception of susceptibility to and seriousness of diseases or disorders as well as the perception of benefits of and barriers to taking actions to prevent diseases or disorders. These perceptions can be modified by the physical, social, and cultural environment. The perceptions of susceptibility and seriousness combine to form a perceived threat of a disease or disorder. If the perceived benefits of taking preventive action to avoid a disease are viewed as greater than the perceived threat of the disease, the individual is likely to engage in health behaviors. If the perceived barriers to taking preventive action are viewed more negatively than the harm from the resulting disease or condition, the individual is unlikely to engage in health behaviors. The perceived benefits of health behaviors minus the perceived barriers to the health behavior determine the likelihood of taking preventative action.

1.4.2 Perceived Susceptibility

Perceived susceptibility is how likely individuals believe they are to get a disease. If persons perceive the chance of getting a disease as low, they do not view themselves at particular risk for

the disease. Individuals who do not perceive themselves at risk are not likely to engage in preventive behaviors. In essence, the energy spent on preventive behaviors would not result in a benefit.

In this study, the investigator developed HBQ-R measured perceived susceptibility to CVD, diabetes, osteoporosis, and cancer by the question, "What do you think the chances are of your getting the following diseases sometime in your life?"

1.4.3 Perceived Seriousness

Perceived seriousness is how likely individuals believe that a disease will have an impact upon them. If the impact of a disease is viewed as minimal, the likelihood of preventive behaviors decreases as the benefit does not outweigh the risk.

An example of this perception is the hesitancy of many parents to obtain the varicella vaccine for their children when it was first introduced. The parents viewed chicken pox as a relatively harmless childhood disease which, if contracted, would not have serious consequences. Educational programs demonstrating the potentially serious hazards of the disease increased the knowledge of the parents and increased the parent's level of worry about children contracting the disease and thereby increased the likelihood of them agreeing to the vaccination. Now the vaccination is required for admission to school in many states. The new vaccine presented a very minor hazard of an injection, and was available to prevent what was now perceived as a potentially serious impact of contracting chicken pox.

For this study, perceived seriousness of CVD, diabetes, osteoporosis, and cancer was measured by the HBQ-R question, "How worried are you about getting the following diseases?"

1.4.4 Perceived Benefits

Perceived benefits are the beliefs that a particular action or behavior will benefit the individual by contributing to disease avoidance or diminished impact of a disease. Perceived benefits are important beliefs affecting an individual's choice to engage in health behaviors. The greater the perceived benefit, the greater the likelihood of taking preventative action. The perceived benefit of disease preventability is the belief that taking a particular action or set of actions will result in preventing or reducing the impact of a disease or disorder. If persons have a perception that a disease is not preventable, they are not likely to engage in preventive action. If on the other hand, persons believe that a particular action is likely to prevent a disease, there is greater motivation to engage in the health behavior.

In this study perceived benefits of prevention of CVD, diabetes, osteoporosis, and cancer were represented in the HBQ-R by the question, "How preventable do you think the following diseases are?" Perceived benefits were also measured by the two questions assessing the perceived benefits of healthy foods (Glanz et al., 1993) and the Exercise Benefits subscale (Sechrist, Walker, & Pender, 1987).

1.4.5 Perceived Barriers

Perceived barriers are perceptions about potentially negative aspects of participating in health behaviors. Examples of negatively viewed aspects include inconvenience, cost, pain, or offensiveness, which would contribute to an avoidance of disease prevention by participating in health behaviors. Perceived barriers are important beliefs relating to an individual's choice to

engage in health behaviors. The greater the perceived barriers is, the lower the likelihood of taking preventative actions.

For this study, perceived barriers were measured by Perceived Barriers of Healthy Food Choices (Milligan et al., 1997) and Exercise Barriers subscale (Sechrist et al., 1987).

1.4.6 Modifying Factors

Modifying factors are factors that may have an impact on an individual's health beliefs. They may include demographic variables, such as age, race, or ethnicity; psychosocial variables, such as peer interactions, personality, or social class; and experiential variables, which could include knowledge about or exposure to a particular disease state. Modifying factors may enhance or detract from participation in health behaviors by modifying the perceived susceptibility to or seriousness of a disease or disorder, impacting the perceived threat of that condition, or by altering the perception of benefits of or barriers to participating in a health behavior. One of the strongest and most prevalent modifying factors is knowledge. It was represented in the HBQ-R by the question concerning knowledge about prevention of CVD, diabetes, osteoporosis, and cancer, "How knowledgeable are you about preventing the following diseases?"

The use of open-ended questions in the HBQ-R elicited information about how decisions are made relating to perceived susceptibility, perceived seriousness, benefits of disease preventability, and knowledge of diseases. They are intended to further explore modifying factors to health beliefs, which have not been previously identified. Understanding how modifying factors influence health beliefs and how they relate to subsequent health behaviors will significantly contribute to the ability to design effective health promotion interventions.

In addition to knowledge, this study measured the following modifying factors by questionnaire: race, personal and family income, living arrangements, presence of disease, college class level, employment status, and childhood living environment.

1.4.7 Health Behaviors

Health behaviors as described by Kasl and Cobb (1966) are activities undertaken by asymptomatic persons, who believe they are healthy, for the purpose of preventing or detecting disease in an early stage. This description, however, does not include behaviors that can negatively impact health. For this study, the term health behaviors will take a somewhat broader view and include any actions (or inactions) taken by individuals that affect their health status. Health behaviors can have a positive impact on the individual's health status, such as immunizations, participation in screenings, eating a low fat diet, and participating in appropriate levels of activity. Health behaviors can also have a negative impact on the individual's health status and increase the risk of disease. Examples of negative health behaviors include eating a high fat diet, being inactive, smoking, and avoiding screenings for diseases that can be cured with early detection.

In this study, eating behavior was measured subjectively by the Nutrition subscale from the Health Promoting Lifestyle Profile II (Walker, Sechrist, & Pender, 1987) and the MEDFICTS (National Cholesterol Education Program, 1993) as well as objectively by body mass index (BMI) and waist circumference, which will identify overweight and obesity, a marker of high risk eating behavior. Physical activity behaviors were measured subjectively by the Physical Activity subscale from the Health Promoting Lifestyle Profile II (Walker et al.,

1987) and the Modifiable Activity Questionnaire (Kriska et al., 1990) as well as objectively by electronic digital pedometers.

1.5 SIGNIFICANCE TO NURSING

Health promotion and disease prevention are important components of nursing practice. To prevent or delay the onset of chronic disease states including CVD, diabetes, osteoporosis, and cancer, health care providers must support the adoption of health promoting lifestyles in individuals. This means not only working with symptomatic persons, but also requires working with populations that currently have no diagnosed diseases to encourage healthy lifestyle patterns.

Dietary choices and activity levels are behaviors well known to affect health. According to the HBM, participation in health behaviors is influenced by beliefs about the likelihood of an action resulting in a perceived benefit. The positive value of the benefit must exceed the perceived barriers or cost of the action. In the emerging adult, the perception of susceptibility to chronic diseases may be perceived as very low; therefore, the advantage of health promoting behaviors is decreased. This population is generally healthy and therefore the threat of chronic disease is not apparent to them. Few studies have addressed the underlying beliefs of emerging adults as they relate to threat of chronic diseases and their ability to prevent them. This study will address that gap. Additionally, while the decreasing levels of activity and increasing BMI in this population have been documented, the factors contributing to this phenomenon have not been fully explored. An enhanced understanding of factors that influence health beliefs and behaviors will enable health care providers to construct more effective interventions for chronic disease

prevention in this population. Addressing women in particular has the added benefit of understanding health related beliefs in individuals most likely to be active in family health care decision making.

2.0 LITERATURE REVIEW

This chapter provides a concise overview of the literature of the concepts relating to health beliefs and behaviors of college women. The history, development, and use of the Health Belief Model (HBM) are reviewed. Literature relating to the HBM concepts (health beliefs, modifying factors, and health behaviors) used within this study is discussed especially as it relates to traditionally aged college students who are the emerging adult population. The concept of emerging adulthood and the impact of this stage on health related lifestyles and beliefs are outlined. The role of women in health decision making is described.

2.1 THEORETICAL FRAMEWORK: THE HEALTH BELIEF MODEL

2.1.1 History

The HBM was first developed in the 1950's by a group of investigators in the Public Health Service. The focus in the Public Health Service at that time was disease prevention as opposed to treatment of disease. The researchers developed a model to explain participation in health behaviors. The researchers who developed the original model, Hochbaum, Kegeles, Leventhal, and Rosenstock, were all trained as social psychologists and were influenced by the Lewinian tradition of value expectancy, focusing on current perceptions of the behaving individual.

Underlying the model, which was focused on beliefs, was the concept that individuals would be attracted by things viewed positively and repelled from things viewed negatively (Rosenstock, 1974a).

Lewin contended that persons exhibit a "phenomenological orientation," which is their perception of the world. Their perceptions have "valances" that are either positive or negative and actions will be taken to move toward the positive and away from the negative (Lewin, 1935). Perceptions or beliefs about health related actions are the key components of the HBM. The perceptions of susceptibility to and seriousness of health problems combine to form a perceived threat to health. A variety of factors can modify the perception of the health threat. The total of perceived benefits (positive valance) minus the perceived cost or barriers to taking action (negative valance) impacts the likelihood of taking action to prevent disease or promote health.

In its earliest form, the HBM proposed that in order for individuals to take action to avoid a disease, they would need to believe that they were personally susceptible to that disease, that the disease would have at least a moderately severe impact on some component of their life, and that taking action would result in a benefit either by reducing their susceptibility to or the severity of impact of the disease. Additionally, any benefit of a particular action must outweigh the perceived barriers, including cost, convenience, pain, or embarrassment (Rosenstock, 1974a).

The major concepts of this original model, perceived susceptibility, perceived seriousness, and perceived benefits of and barriers to action, are well suited to health behavior research. Numerous researchers have used the original model or some modification of the model in efforts to explain levels of participation in disease preventing or health promoting behaviors (Jacobs, 2002; Janz, 1988; Lee & Yuen Loke, 2005; Roden, 2004a; Williams-Avery & MacKinnon, 1996; Yarbrough & Braden, 2001) as well as in the development and validation of

instruments to measure the concepts contained in the model (Champion, 1984; Maiman, Becker, Kirscht, Haefer, & Drachman, 1977; Roden, 2004b; Walker et al., 1987).

One of the earliest additions to the HBM was the concept of cues to action. The initial model was essentially focused on the avoidance of disease; however, increasing health in an already healthy person did not result in a health behavior without some "trigger" prompting action (Rosenstock, 1974a). Becker's version of the HBM provides a parsimonious representation of the relationship between health beliefs and health behaviors, which includes cues to action as the motivational trigger (Becker, 1974).

In the 1980's, Rosenstock, Strecher, and Becker (1988) proposed a further expanded Health Belief Model to include the concept of self-efficacy. This expanded version of the HBM was not be utilized in this study, as the intention was simply to describe health beliefs and health behaviors and explore factors that affect them.

2.1.2 Uses of the Health Belief Model

Since its inception the HBM has been frequently used as a theoretical framework utilized to examine health behaviors. Studies using the HBM have examined behaviors related to chronic illness, tested the major concepts of the model, constructed and validated disease specific scales, and studied relationships among identified beliefs. The model is especially useful in examining concepts in primary care, preventive medicine, and public health. The model has been used to study health related beliefs and behaviors as they relate to primary, secondary, and tertiary prevention. Earlier studies focused primarily on primary and tertiary preventive behaviors. Janz and Becker (1984) reviewed the uses of the HBM in research from the early 1970's through 1984. Their review contained 46 studies including both prospective (n=18) and retrospective

(*n*=28) studies examining a mix of preventive health behaviors and sick role behaviors. Preventive health behaviors are actions taken by individuals without disease in an effort to prevent disease. This concept is essentially equivalent to primary prevention, a concept frequently used in community and public health practice. Sick role behaviors are actions taken by individuals with a disease to prevent further disease process or to restore good health. This concept is equivalent to the concept of tertiary prevention used in community and public health practice. The authors listed only one study that related to screening behaviors. Screening behaviors are actions taken to detect diseases at an early state. Screening is considered secondary prevention. They established that there was empirical support for the HBM. They found perceived barriers to be the most powerful concept across the studies. Perceived susceptibility was a stronger predictor for disease preventing behaviors whereas perceived benefits were a stronger predictor of sick role behaviors. Perceived seriousness was weakly associated with disease preventing behaviors and strongly associated with sick role behaviors. The authors analyzed studies across the four major concepts in the HBM, susceptibility, seriousness, benefits, and barriers, and reported the ratio of statistically significant findings for each concept to all studies using the concept. The results are summarized in Table 1 (Janz & Becker, 1984). The results suggest that the HBM concepts are valuable as predictors in studies examining health behaviors.

Table 1 Ratio of positively Statistically Significant Findings of HBM Concepts Across Studies

		Health Beliefs			
Study Type	Number of Studies	Susceptibility	Seriousness	Benefits	Barriers
Composite of all studies	46[a]	30/37 (81%)	24/37 (65%)	29/37 (78%)	25/28 (89%)
Preventive health behaviors	24	18/21 (86%)	9/18 (50%)	12/15 (80%)	13/14 (93%)
Sick role behaviors	19	10/13 (77%)	14/16 (88%)	12/15 (80%)	11/12 (92%)

Note[a]: Three studies related to clinic utilization and were not categorized as preventative health behaviors or sick role behaviors.

2.1.2.1 Use in Primary Prevention

In a longitudinal study of mothers' adherence to diet regimens for their obese children (*N*=199), Maiman et al. (1977) found that the model components were correlated with dietary adherence. They found that a mother's perception of a child's susceptibility to illness, overall health concern for the child, and perception of the seriousness of the child being overweight were significantly

correlated with successful weight loss in their obese children (p=.05). Their tool, based on the HBM, was able to predict 39% of the variance in weight change in a group of newly diagnosed obese children, thus, supporting the HBM. They successfully demonstrated internal consistency in the measurements of their tool with alpha levels for the susceptibility scale at .91 and the seriousness scale at .96. The mothers' beliefs regarding the treatment of their children's obesity were found to be associated with the mothers' adherence to the weight loss program over time. The correlations (reported as gamma coefficients) between perceived seriousness of being overweight and general health concerns for the child (.513), the child's susceptibility to illness (.595) and worry (seriousness) about the child's illness (.781) were highly significant (p=.01).

A more recent study examining women's health beliefs was performed by Wilcox and Stefanick (1999). They used the HBM to study knowledge and risk of diseases in middle aged women (N=200). They found that women overestimated the risk of death from breast cancer but underestimated the risks of colon and lung cancers. Only 34% of the participants correctly identified coronary heart disease as the leading cause of death in women aged 65 years and older. A higher percentage of participants believed breast cancer was the leading cause of mortality among women in each of the five age categories ranging from 45 to over 85. Participants perceived heart disease and lung cancer to be more preventable than breast or colon cancer (p's<.001). This study examined women's beliefs about diseases and their preventability but did not examine the relationship of their beliefs to their behaviors. Understanding levels of knowledge and perceived benefit of preventability of chronic diseases is an important step in designing effective primary prevention interventions; however, understanding the relationship between perceptions (beliefs) and behaviors is essential. The psychometrics of the tool used by Wilcox and Stefanick was not discussed in their report.

Chang (2006) used the HBM as a framework for her study of calcium intake in young Taiwanese women. She examined the relationship between beliefs surrounding osteoporosis and calcium intake. Included in the model were physiologic and demographic factors as well as a measure of knowledge related to osteoporosis. Osteoporosis health beliefs were measured by a five-point Likert scale. Cronbach's alpha was used to evaluate reliability of the scales in a pilot study and ranged between 0.80 and 0.90, which demonstrates good reliability. The results indicated that the young women viewed themselves at risk for osteoporosis but felt that prevention was difficult. A stepwise regression was conducted based on significant correlation of calcium intake with the measured variables. Seven of the modifying factors (knowledge, number of children, self-rated health, body mass index (BMI), education, having a bone density exam, and feeling kyphotic) were combined in a model, which explained a total of 31.8% of the variation in calcium intake. The authors concluded that calcium intake was predicted by a combination of cognitive and social factors. The inclusion of seven factors in the stepwise regression model, all with a $p<.01$, supports this conclusion.

2.1.2.2 Screening Beliefs and Behaviors

Prior to 1984, the HBM was not frequently used to explain screening behaviors; however, in more recent years it has gained popularity for use in describing health screening behaviors. This increased use may be in part due to the work by Champion (1984) and her tool to measure the concepts of the HBM. Champion's focus was on breast cancer screening, including use of self-breast exam (Champion & Miller, 1992) and mammography (Champion, 1999). Since Champion's work, the HBM has been used in a variety of populations to study health beliefs and behaviors concerned with screening.

Jacobs (2002) utilized the HBM in the United States to examine the participation of first degree relatives of individuals with colorectal cancer (N=1081) in health maintenance visits. She used the Champion Health Belief Model Scale (Champion, 1984) modified to reflect beliefs about colon cancer, to measure susceptibility, seriousness, and benefits of and barriers to surveillance for colon cancer, as well as items to measure general health motivation, eating and exercise behaviors, and confidence level relating to performance of colon cancer screening. Champion's tool uses a five-point Likert scale with anchors and asks participants to rate levels of agreement with statements designed to measure the HBM concepts. Jacob's findings supported the concepts of perceived barriers and perceived seriousness as well as the sociodemographic variable of education as predictive of participation in health maintenance visits. Logistic regression resulted in a final model including perceived barriers (p=.0202), perceived seriousness (p=.0198), and level of education (p=.0232) as predictors of participation in colorectal cancer screening (Jacobs, 2002).

The HBM and Champion's tool have also been used to explore culturally related differences associated with screening behaviors. In a study of health beliefs and behaviors related to breast cancer, Cohen and Azaiza (2005) found that Arab (n=440) and Jewish (n=489) women had similar perceptions of susceptibility to breast cancer; however, Arab women viewed less benefits (t=2.03, p<.05) and more barriers (t=-7.70, p<.001) to performing self-breast exams than Jewish women. They had greater perceived barriers to participating in clinical breast exams (t=-7.42, p<.001) and mammography (t=3.39, p<.01) to screen for breast cancer as compared to Jewish women. The rates of preventive screening in Arab women were much lower than in Jewish women (mammography rates X^2=40.03, p<.001) and the survival rates for breast cancer were also lower in Arab women than Jewish women (63% vs. 71%), due to later stage at

diagnosis. The authors discuss increased perceived barriers to preventive screening in Arab women including cost, access, and cultural norms, and point out that the lower rates of breast exams in Arab women are paralleled in minority groups in the United States. They suggest that the influence of age related differences in beliefs and the mediation of factors, such as awareness of heightened risk, knowledge of early screening procedures, and cultural beliefs, are likely contributors to the increased barrier perception. The authors recommend that the effect of culturally sensitive education regarding the benefits of screening and efforts to reduce barriers to clinical breast exams and mammography in the Arab population should be studied. Increasing participation in screening procedures could result in better outcomes for these women. The authors of this study express how demographic and psychosocial factors can modify beliefs and therefore influence behaviors.

Gipsh, Sullivan, and Dietz (2004) used the HBM in a non-experimental exploratory survey to examine beliefs related to colorectal cancer screening in a group of individuals over the age of 50 (N=42). Sixty-nine percent of the participants were women. The investigators used a 14-item tool with established test-retest reliability of 0.87. The portion related to the HBM concepts were measured using an 11-item, 5-point Likert scale. They found that while the participants viewed the severity of colorectal cancer as high, as indicated by a high mean seriousness score (4.45 on a scale of 1 to 5), they viewed their susceptibility to it as low (2.31 on a scale of 1 to 5); therefore, they were less likely to participate in screening. The authors concluded that according to the HBM this population, which was susceptible to colorectal cancer by virtue of being over the age of 50, needed health education to trigger them into taking the preventive action of participating in screening for the disease. Reporting rates of participation in colorectal screening by the subjects would have strengthened this study and would have allowed

a more through examination of the relationships between beliefs and behavior described in the HBM.

While examining sick role behavior (tertiary prevention) and health beliefs is another use of the Health Belief Model it will not be discussed in this paper as the population was a group of young healthy individuals.

2.1.3 The Health Belief Model and Related Models

The HBM has been compared to and combined with several other models in an attempt to explain health behaviors. In a comparison of the HBM and Reversal Theory, Finfgeld, Wongvatunyu, Conn, Grando, and Russell (2003) proposed that behavior change in the HBM is based on a more linear process, while the Reversal Theory is more fluctuating and therefore more suited to studying health behavior change. This statement is in contradiction with the discussion pertaining to the use of the HBM and preventive behavior provided by Rosenstock (1974b). He described the model's usefulness in understanding the health decision making process and proposed that as individuals interact with persons and events, their likelihood of a particular response or behavior may increase or decrease. Increased understanding of factors that affect health beliefs and behaviors is the purpose of this study, thus making the HBM an appropriate choice.

Other investigations have modified the HBM by combining it with other commonly used health behavior models. In developing a model for cross-cultural research, Poss coupled the three concepts from the HBM with concepts of Theory of Reasoned Action (TRA). The HBM concepts of perceived susceptibility, perceived seriousness, and cues to action were blended with the TRA concepts of normative beliefs and motivations, which lead to subjective norms, and

behavioral beliefs and evaluations about behavioral outcomes, which lead to attitudes. In the blended model, the HBM concepts replace the singular concept of relative importance in the TRA. The rationale for this combination is that it allows for a more culturally specific approach to the analysis of screening behaviors (Poss, 2001).

The combination of the HBM and the TRA models was also used by Tussing and Chapman-Novakofski (2005) in their study of the effectiveness of an osteoporosis education program on dietary intake. Their lesson plans included topics about susceptibility to and seriousness of osteoporosis, overcoming barriers to reducing risk factors, and the benefits of calcium intake. They measured changes in perceptions of susceptibility and seriousness of osteoporosis (HBM), benefits of and barriers to calcium intake (HBM), self efficacy (revised HBM) related to calcium intake as well as intentions to take action to lower the risk of osteoporosis (TRA). There were statistically significant changes in perceived benefits of calcium intake ($p<.001$) and perceived susceptibility to developing osteoporosis ($p=.001$). Ninety-six percent of participants reported they intended to consume more dairy products within the next three months.

In the HBM, cultural specificity is addressed as a sociopsychologic variable, which is considered a modifying factor in the HBM. The HBM is able to account for influences of culture and social environment. In fact, a tool based on the HBM, created by Champion (1984), was successfully translated, validated, and utilized in a group of Jordanian women to examine breast self-exam beliefs and practices (Mikhail & Petro-Nustas, 2001).

Other models include concepts utilized in the HBM or, like Poss (2001), and Tussing and Chapman-Novakofski (2005), infuse concepts into the HBM from other value expectancy models. The Health Promotion Model includes the concepts of perceived benefits and perceived

barriers to health promoting behaviors as well as the concept of modifying factors; however, it does not include perceptions of susceptibility to or seriousness of diseases (Pender, Murdaugh, & Parsons, 2006). Roden (2004a) incorporated some of Pender's changes as well as the concept of behavioral intention borrowed from Ajzen's Theory of Planned Behavior (Ajzen, 1985) into her revision of the HBM for use in young families. Many of the value expectancy theories have common themes related to beliefs, including benefits and barriers to action.

2.2 MEASUREMENT OF HEALTH BELIEF MODEL CONCEPTS

One of the most persistent problems with the HBM is the inconsistency in measurement of the concepts. Many researchers are interested in a very narrow segment of an individual's health beliefs and behaviors. Hochbaum's original work was concentrated on understanding beliefs and behaviors related to tuberculosis (Hochbaum, 1958). Champion's measures were focused on beliefs and actions related to breast cancer (Champion, 1984). Kegeles (1963) used the HBM to study perceptions surrounding dental health. Therefore, the operational definitions of the HBM concepts in their studies were very narrow in focus, and in all likelihood were measuring concepts that varied from study to study. It is reasonable to assume that susceptibility (risk) perceptions may differ greatly from individual to individual and from population to population. A broader application of the HBM concepts may result in a more functional tool for a variety of situations.

2.2.1 Measurement of Health Belief Model Concepts in This Study

The HBQ and subsequent HBQ-R were developed to more broadly measure the concepts in the HBM. Both tools ask participants about four major disease states that have a strong component of preventability related to healthy behaviors. Using a broader range of disease states should provide a more stable measure of perceptions surrounding chronic disease threat and preventability. The HBQ-R also does not add or borrow concepts from other models. The HBQ-R was intentionally kept true to the original model proposed by Becker as the HBM is most inline with the research question and hypotheses being proposed. The HBM is a more parsimonious model, which serves well to guide a general understanding of the relationships between health beliefs and health behaviors.

2.3 HEALTH BELIEFS

The health beliefs, individual perceptions about health and risk for disease, which are examined in this paper are those proposed in the HBM, perceived susceptibility, perceived seriousness, and perceived benefits of and barriers to action.

2.3.1 Perceived Susceptibility

Several authors have operationalized perceived susceptibility in several ways. Maiman et al. (1977) asked mothers about the "likelihood" of their child getting an illness. A more easily understood term is that of chance. Wilcox and Stefanick (1999) asked participants about the

"chance" of getting a disease state. Weinstein (2000) used the term perceived probability but also described perceived likelihood, perceived susceptibility, perceived vulnerability, and perceived risk as synonyms for this concept.

Perceived susceptibility is a perception that individuals deal with on a daily basis, a factor considered in decision making processes regarding the future. For example, if individuals could be absolutely sure that they were going to win the lottery, they would gladly pay the cost of the ticket. That assurance is not generally present, so individuals weigh the advantage of potential wealth against the cost of the ticket, weighing the positively viewed outcome against the negatively viewed cost. Strict mathematical calculations are not the only factors included in the perception of chance or risk. Personalities (Zukerman & Kuhlman, 2000), feelings (Lowenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004; vanDijk et al., 2004), and previous experiences may alter perceptions of risks.

The review of Janz and Becker (1984) demonstrated perceived susceptibility to be a significant positive predictor of preventive health behaviors in 86% of the studies reviewed. These studies establish a relationship between perceived susceptibility and behavior; however, they are not considering the effect of age group in the perception of risk. None of the studies reviewed was specific to adolescents or early adults though this group was included within several studies as part of the population. Examining emerging adults exclusively may provide different results.

Halpern-Felsher et al. (2001) studied 577 adolescent and young adults (age range 10-30). Their findings challenge the notion that perceived susceptibility motivates behaviors in this population. Their study found that experiences associated with risky situations changed the risk perceptions (the chance of a negative outcome). Experience with a risky behavior, such as

unprotected intercourse, was viewed less likely to result in a negative outcome, such as sexually transmitted diseases, if the individual had experienced that risky behavior (r=.31, p<.001). Though the participants viewed the behaviors as risky, they participated in them anyway and that participation actually lowered their perceived risk of the behavior since a negative outcome was not realized. The implications of these findings suggest that the absence of immediate negative consequences of behaviors decreases perceived susceptibility of negative outcomes resulting from behaviors. Since physical inactivity and eating high fat foods actually show more immediate benefit than danger, it is understandable why these risky behaviors are becoming more prevalent. Since activity intolerance and obesity increase slowly over time in individuals, their negative effect is not readily perceived. The adolescent and emerging adult populations are known to be risk takers. Understanding the role of perceived susceptibility in influencing health behaviors can be invaluable in promoting healthier behaviors in this population.

2.3.2 Perceived Seriousness

Maiman et al. (1977) used the term worry in items utilized to measure the concept of perceived seriousness. To worry about something means that there is anxiety, uneasiness, doubt, or lack of confidence in future outcomes. Another term used to describe this concept is perceived severity. Worry is related to perceived severity of harm (Weinstein, 2000). Worry also is an indication of the perception of the seriousness or severity of a particular disease or condition. One way of approaching this concept is to specifically ask questions about how having a condition would impact an individual's life. Tussing and Chapman-Novakofski (2005) measured the HBM concept of seriousness by asking participants about how osteoporosis would affect their lives, lead to financial problems, or lead to broken bones. As with susceptibility, individuals' concern

about diseases may be modified by factors, such as socioeconomic status, previous experience, and environment. Janz and Becker (1984) found significance in the concept of perceived seriousness in only 65% of the 46 articles reviewed. The ratio of significant findings is even lower if the studies examining sick role behavior are excluded (50%). Perceived seriousness is a less significant predictor than perceived susceptibility. This finding was also supported by the results obtained by Tussing and Chapman-Novakofski (2005), in which perceived seriousness was not significantly affected by the educational intervention. Understanding the role of perceived seriousness in influencing health behaviors can be important in promoting healthier behaviors in this population. Perceived seriousness is definitely a component related to health beliefs; however, it is difficult to operationalize and is a complex concept that interplays with perceived susceptibility to create a perception of threat.

2.3.3 Interaction of Perceived Susceptibility and Perceived Seriousness (Threat)

Many of the value expectancy theories discuss the interaction between perceived susceptibility and perceived seriousness. These concepts are commonly combined to describe a concept of perceived threat. While it is generally agreed that there is an interaction between perceptions of susceptibility and seriousness, it is poorly supported in the literature. Weinstein (2000) addressed this gap in a small study of 12 individuals ranging in age from 20 to 74. He created a list of over 200 events that occupied a full range of susceptibility and seriousness from a standard compendium of diseases. He constructed scales to elicit the perceptions of susceptibility to and seriousness of the conditions and also constructed measures to evaluated likelihood of action based on financial costs and utilization of limited resources (barriers). Three dimensional graphs were constructed to visualize the relationships among susceptibility, seriousness, and motivation

for action. He found that motivation for action was non-existent if either susceptibility or severity was zero. This could be interpreted as no perceived threat. The data did show the expected interaction between susceptibility and seriousness, but the level of motivation for action was not predictable. There was insensitivity to individual variations in likelihood of action at higher levels of susceptibility. The authors reported that decision making was more variable at lower levels of susceptibility, but, as the levels of susceptibility increased to a level 50% susceptibility to a negative event, there was similar reaction as to a level 80% susceptibility to a negative event signifying a cut off point for reacting to perceived susceptibility at about 50%. The author suggests that it is possible that some other unmeasured variable co-varies with susceptibility or seriousness and influenced the results. Further investigation into health behavior motivation is needed to identify additional factors involved in the decision making process, which this study did through the use of a qualitative approach.

2.3.4 Perceived Benefits and Perceived Barriers

Perceived benefits of and barriers to health behaviors have been investigated by numerous researchers using a variety of frameworks. The two concepts are closely tied in the HBM and are included in the same text box with a singular arrow impacting health behaviors (see Figure 1, Chapter One). Using the value expectancy premise, the benefits are the positively viewed factors, which are offset by the barriers, which are the negatively viewed factors, and the tipping point between the two factors results in the likelihood of action. Because of this close relationship, studies examining these concepts are reported together, even though they are measured by different instruments.

2.3.4.1 Perceived Benefits and Perceived Barriers of a Healthy Diet

Few tools have been constructed to measure the perceived benefits of a healthy diet; however, two questions were used by Glanz et al. (1993) in their construction of a tool to measure psychosocial factors related to eating behavior in a population of adults. These two questions were added together to the diet barriers scale to construct a measure of perceived barriers and benefits to a healthy diet. Glanz et al. (1993) did not find predictive value in perceived benefits of a healthy diet at a level of p=.05.

The tool constructed by Milligan et al. (1997) to measure perceived barriers to a healthy diet is a 16-item, 6-point Likert scale. It asks participants to rate their perception of the importance of potential barriers to following a healthy diet. Using this tool, the authors were able to identify barriers to a healthy diet reported by a group of 18-year-old individuals. These barriers included lack of will power, lack of time, and lack of knowledge about the energy content of foods. Significant gender differences in the barriers were also identified. Items that were perceived as greater barriers by women included using food as treats, difficulty sticking to a diet, and difficulty choosing healthy foods when out with friends. The perceived barriers identified in this study were not related to the eating behavior of the participants with one exception. The scores of the healthy diet barriers scale were examined in relation to self-reported level of fat intake, using a cut point of >30% fat intake by gender. The following barriers were significant predictors (p<.05). Males who reported more home food control consumed less fat, while those reporting less willpower and less availability of healthy lunch food were more likely to consume greater than 30% of energy intake from fat. Females who reported more knowledge of reduction of fat and sugar consumed less fat, while those reporting less planning time for diet reported consuming >30% of fat intake. The levels of dairy, fruit, and fiber intake were not

described in relation to barriers to a healthy diet. A report of the relationships between perceived barriers to a healthy diet and self-reports of dairy, protein rich, and nutrient poor food may have been informative.

This study examined the perceived benefits of and barriers to eating a healthy diet using the two instruments discussed above (Glanz et al., 1993; Milligan et al., 1997). The results determined whether benefits and barriers are related to eating behavior in college women.

2.3.4.2 Perceived Benefits and Perceived Barriers of Physical Activity

Myers and Roth (1997) used the Transtheoretical Model to examine perceived benefits of and barriers to exercise in 432 college students. The findings suggest that benefits of and barriers to exercise are complex and multidimensional concepts. Their tool, the Benefits and Barriers to Exercise Questionnaire, contained 48 Likert scale items constructed from results of preliminary surveys of both exercisers and non-exercisers who were asked to list three benefits and three barriers associated with exercise. They also examined current literature to ensure inclusion of pertinent domains. The results were not effective in producing a parsimonious tool for use in prediction of exercise behaviors as measured by an exercise participation questionnaire. There were no significant differences in minutes exercised between subjects in the precontemplation and contemplation stages of exercise ($p>.05$) or between the participants in the action and maintenance stages ($p>.05$). It is likely the tool used to measure exercise benefits and barriers was not successful in accurately capturing these latent variables. A more exhaustive exploration of factors related to physical activity, such as the use of nominal group technique in active and non-active college students used in this study, can aid in revealing a more precise understanding of perceived benefits of and barriers to physical activity in this population.

Another tool used to measure exercise benefits and barriers is the Exercise Benefits/Barriers Scale (EBBS), a 43-item, 4-point Likert scale developed by Sechrist et al. (1987). Jones and Nies (1996) used the EBBS and found significant relationship between reported exercise levels and perceived benefits of and barriers to exercise (p<0.001) in a group of African American women. Grubbs and Carter (2002) used the tool to compare perceived benefits of and barriers to reported exercise behaviors in 147 college undergraduates (ages 18-24) in a large southern university. This sample was also predominately female (82%), with a mean age of 19.9 years. The study compared EBBS responses of regular exercisers versus those who did not exercise regularly. Mean scores for the benefits scale were higher in the exercisers (M=3.28, SD=0.38) versus the non-exercisers (M=2.94, SD=0.36, p<.001). Mean barriers scores were higher in the non-exercisers (M=3.18, SD=.38) versus the exercisers (M=2.80, SD=0.32, p<.001). The report of the findings does not clearly describe how the exercise habits were measured other than by self-report, with six of the participants not completing the measure. No discussion of demographic comparisons between those completing the exercise measure and those not completing the measure was provided. This is a limiting factor in the study as there may be an inherent characteristic (e.g., they do not want to admit to not exercising), which could bias the benefits and barriers comparison results. Brown (2005) used the EBBS in a sample of 398 college students and found that only benefits were able to significantly predict levels of physical activity (p<.05).

This study examined the perceived benefits of and barriers to physical activity using the EBBS. The findings determined whether benefits and barriers are related to physical activity in college women.

In summary, insight into the strength of the relationship between the perceptions of benefits and barriers and the health behaviors of eating behavior and physical activity in a group of emerging adult women is needed. While benefits of and barriers to action are a mainstay of the HBM, it is possible that in emerging adults the effects are not consistent with findings in other populations.

2.4 HEALTH BEHAVIORS

Healthy people 2010 listed health indicators that included 10 areas of health as targets for intervention aimed at improving overall national health. These indicators represented individual behaviors/characteristics (physical activity, obesity, tobacco use, substance abuse, sexual behaviors, and mental health) and physical and social/environmental factors (injury and violence, environmental quality, immunizations, and access to care) (U.S. DHHS, 2000). The individual behaviors are considered health behaviors in this study. Eating behavior and physical activity, which collectively contribute to obesity and numerous chronic disease states, were the major foci. The individual behavioral choices can collectively be term as lifestyle.

2.4.1 Healthy Lifestyles

The term “lifestyles” first appeared in 1939. “Lifestyle” is associated with the term subcultures described by Alvin Toffler as an increasing diversity resulting from post-industrial society. In pre-industrial society, different ways of living were viewed as different cultures and there was minimal variation within a culture. Lifestyles are described as variations in behaviors or beliefs,

which are accepted or partially accepted within a culture. In sociology, a lifestyle is the way a person or group of people live. It includes patterns of social relations, consumption, entertainment, and dress. A lifestyle also reflects an individual's attitudes, values, and worldview. Toffler proposed that the tolerance for differentiation was associated with increasing modernity and capitalism. As society moved from hunter gatherers through the agrarian revolution, industrialization, and now into a post-industrial, information age, older societies and cultures were pushed aside (information accessed at http://en.wikipedia.org/wiki/Lifestyles, 04/02/06).

Emerging adults can be viewed as a subculture. Several authors have described lifestyle behaviors of emerging adults (Hendricks & Herbold, 1998; Lee & Yuen Loke, 2005; Milligan et al., 1997); however, few have studied beliefs regarding risk for chronic disease, factors that contribute to those beliefs, and the relationship of beliefs to healthy lifestyles. One study (Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004) conducted in college students (N=161) explored predictors related to known risky behaviors and their relationship to perceived threat (susceptibility and seriousness). Perceived threat was calculated by multiplying the scores of perceived susceptibility and seriousness using tools the authors created. The items used to measure these concepts were related to known risky behaviors as follows: tobacco use (3 items for susceptibility, α=0.85, and 5 items for seriousness, α=0.90), alcohol use (8 items for susceptibility, α=0.89, and 6 items for seriousness, α=0.83), general safety (9 items for susceptibility, α=0.85, and 10 items for seriousness, α=0.79), and sun exposure (5 items for susceptibility, α=0.94, and 3 items for seriousness, α=0.88). The measurement of threat relating to physical activity and nutrition were combined with only 3 items measuring susceptibility α=0.95, and 3 items measuring seriousness, α=0.78. The tools appear to be measuring risky

lifestyle behaviors with closed ended Likert statements eliciting levels of agreement or levels of participation in risky behaviors as opposed to perception of risk or threat. The only predictive factor that was found related to less risky behavior was self-efficacy, which again was measured by a self-report item developed for the study (Von Ah et al., 2004).

Additionally, as Weinstein (2000) pointed out, the relationship between susceptibility and seriousness is not simply multiplicative but multidimensional, changing as the levels of perceived susceptibility and seriousness change. While Von Ah's work is informative, it does not provide needed insight into perceptions of risk and factors that affect those perceptions. The results merely describe levels of risky behaviors and their relationships to some of the factors that are already known to contribute to risky behaviors.

As stated in Chapter One, proper nutrition and adequate physical activity levels are considered part of a healthy lifestyle. These healthy lifestyle behaviors and their associated decreased risk of development of chronic disease are not routinely explored in this population; however, the results of poor diet and inactivity are noted (U.S. DHHS, 2000). While Healthy People 2010 demonstrates governmental concern about the seriousness of unhealthy eating behavior and levels of inactivity (U.S. DHHS, 2000), this level of worry is not translated into the general population, as evidenced by the increasing levels of obesity and inactivity. Data from the 2000-2003 Behavioral Risk Factor Surveillance Survey (BRFSS), reported by the CDC, shows that over 27% of adults in the state of Pennsylvania, over the age of 18, reported no physical activity in the previous month. This is an increase in inactivity from 23% in the 1997-2000 data. The prevalence of no physical activity is consistently higher for females than for males and increases with age category (CDC, 2006).

Examining lifestyles is a complex undertaking. Numerous factors contribute to a healthy lifestyle. The Health Promoting Lifestyle Profile II (HPLP II) developed by Walker et al. (1987) measures health promoting behaviors. The 52-item questionnaire has six subscales: nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and spiritual growth, which have been well validated and used in a variety of settings. The HPLP II has been shown to be a useful tool in examining lifestyle behaviors in a university setting. Larouche (1999) used the HPLP II in 151 university students in Boston, MA, to determine the relationships of their health promoting lifestyles to their perceived health status, and demographic factors of sex, grade point average, and majors. Students' perceived health status, which was measured by a single four-point Likert item, "How do you perceive your health at this time?", was significantly predictive of total HPLP II ($p<.001$), exercise ($p<.001$), stress management ($p<.01$), and spiritual growth ($p<.05$). College women had significantly higher total HPLP II scores than men ($p=.012$). The whole sample scored lower in stress management than any previous group studied. Male students, those reporting poor health, and all students were targeted for intervention and additional research to promote improved health behaviors in their deficient areas.

Cultural norms may have an effect on behaviors; however, lifestyle behaviors that promote health are of interest across all cultures. The HPLP II has been translated into several languages. Hulme et al. (2003) reported results of a study in a convenience sample of 545 Hispanic adults recruited in several Midwestern communities using the Spanish-language HPLP II. Of the six behavioral dimensions of the HPLP II, scores were lowest for physical activity and highest for spiritual growth. They differed by age, gender, employment status, marital status, and

acculturation. Perceived health status, demographics, and acculturation explained 12% of the variance in overall health promoting lifestyle.

Lee and Yuen Loke (2005) used the Chinese version of the HPLP II to study the relationship of health promoting behaviors and psychosocial well-being in a population of 247 university students in Hong Kong. The authors found that relatively few university students had a sense of "health responsibility" (range of percentages for individual items was 6.5-27.1%), engaged in any form of physical activity (31.2%), or exercised regularly (13.8%). Less than half ate fruits (35.2%) and vegetables (48.9%) every day. Scores on 5 of the 6 subscales of the HPLP II did not differ significantly by gender, but males scored better than females on the physical exercise subscale (p=.001). This study demonstrated the usefulness of this tool in studying perceptions and actions that maintain or enhance levels of wellness in this population. The study demonstrated that emerging adults in a Hong Kong university setting had a low level of health responsibility, did not engage in adequate physical activity, and had less than optimal dietary habits.

An additional use of the Chinese version of the HPLP II in a Hong Kong university student population was reported by Hui (2002). This study examined the effect of sociodemographic factors on health promoting lifestyles of 256 nursing students ranging in age from 19 to 21, of which 95% were women. HPLP II total and subscale scores were examined by class level (underclassmen versus upperclassmen) and socioeconomic status (parental income). No significant differences in health behaviors reported on the HPLP II were found to be associated with socioeconomic class level (p's were >.05). The under class educational level students demonstrated a significantly higher score on the exercise subscale (p=.001), the stress management subscale (p=.01), and the overall HPLP II score (p=.027) as compared to the upper

class educational level. The authors suggest that the increasing demands of the program may account for these differences. These trends may be common to all university students and may be one of the factors that contribute to increasing levels of physical inactivity, which are accelerated at age 18 (CDC, 2003).

Milligan et al. (1997) examined the relationships between health beliefs and psychosocial characteristics and a variety of health behaviors in a group of 583 18-year-old individuals in Australia. This descriptive study examined the relationships between perceived barriers to maintaining a healthy diet and two-week diet records and anthropometric measures as well as perceived barriers to adopting or maintaining physical activity and physical work capacity. This study did not follow a particular theoretical model, but instead included concepts from several different models. Research aims and hypotheses were not clearly stated making the results difficult to follow. The authors were able to describe some of the perceived barriers to health behaviors but outcomes related to perceived benefits were not clearly reported. The results related to barriers are discussed in detail in section 2.3.4.1 of this document.

2.4.2 Eating Behavior

Eating behavior is a modifiable health behavior. Food choices, like many other health behaviors, can be affected by a number of factors. The prevalence of increasing rates of obesity, which is a result of excessive caloric intake in relation to caloric output, is evident across all populations and is raising concern. Additionally, inadequate consumption of nutrients essential to health presents a risk to the nation's level of wellness (Hendricks & Herbold 1998).

2.4.2.1 Eating Behavior and Health

Malnutrition, the lack of essential nutrients in sufficient amounts to promote health, is a serious problem in many sections of the population. It is not necessarily related to caloric intake. Hendricks and Herbold (1998) constructed a report that summarizes data from the third National Health and Nutrition Examination Survey (NHANES III). The findings indicate an overall increase in rates of obesity, while demonstrating dietary patterns that are low in iron, folate, and calcium intakes. The low iron could result in anemia, low folate can contribute to birth defects, and low calcium is associated with development of osteoporosis. Obesity, which is a result of caloric intake greater than caloric output, a sequelae of inactivity coupled with overeating, can contribute to CVD (Dubbert et al., 2002), diabetes (Hu et al., 2001), and certain cancers (Bugianesi, 2005). The types of fat included in diets have also been shown to affect the incidence in chronic disease (Oh, Hu, Manson, Stampfer, & Willett, 2005). Hu and Willett (2002) reviewed 147 original research articles, which included prospective cohort studies, metabolic studies, and clinical trials examining the relationships between diet and coronary heart disease (CHD). The authors report that simply lowering the percentage of energy from total fat is unlikely to improve lipid profiles (decreased risk of CHD); modifying the types of fat ingested was also crucial. They concluded that there was substantial evidence that three strategies were effective in reducing CHD: substitute nonhydrogenated unsaturated fats for saturated and trans fat in the diet; increase intake of omega-3 fatty acids from fish and plant sources; and increase consumption of fruits, vegetables, nuts, and whole grains while reducing intake of refined grain products (Hu & Willett, 2002).

There is an alarming trend in adolescent food consumption patterns. Cavadini, Siega-Riz, and Popkin (2000) analyzed results from national surveys from 1965 to 1996 (N=12,498) of

individuals between the ages of 11 and 18 years of age. They found that adolescents had a lower than recommended energy intake, their proportionate energy from fat was higher than recommended in both genders and showed an increasing trend, and the intakes of fiber, iron, and calcium were decreasing and lower than optimal for females in this group. The folate intake increased but was still below recommended levels. While the energy intake decreased over this time period and was in fact lower than recommended levels, the BMI increased over the past 40 years indicating an overall decreasing trend in calorie expenditure (physical activity). The authors state that these trends may compromise the health of the future U.S. population.

2.4.2.2 Factors Affecting Eating Behavior

Food choices like other health behaviors are affected by perceptions. Aikman, Min, and Graham (2006), examined the relationships between cognitive and affective information and individual attitudes toward a variety of foods as well as individuals' perceptions of the healthiness of foods (N=83). They found informational bases were significant predictors of food choice (p<.001) with taste being the strongest predictor of food choice (b=.46, SE=.02), followed by health (b=.36, SE=.02), feelings of guilt (b=-.12, SE=.03), and comfort (b=.07, SE=.02). They also found that individuals' perceptions of the healthiness of foods was not correlated to the rankings of corresponding nutrition labels suggesting that participants did not rely on the actual nutritional makeup of the food in deciding its level of healthiness.

A qualitative study by Furst, Connors, Bisogni, Sobal, and Falk (1996) in a group of 29 adults examined food choices in a grocery store utilizing emergent constant comparative research process. The researchers found people's life course experiences exerted major influences on food choice with ideals, personal factors, social contexts, and food content being considerations in the choice. Individuals' choices were made by value negotiation between sensory perceptions,

quality of the food, monetary considerations, convenience, health and nutrition, and managing relationships (considering other's preferences and needs).

Sociodemographic variables have also been found to affect food choices. Kuchler and Lin (2002) found, in their secondary data analysis of the Diet and Health Knowledge Survey (N=5,512 over the age of 20 years), that race, age, education, income, and gender had significant effects on food intake choices, and the consequential intake versus expenditure balance, as demonstrated by BMI (p's<.05). An additional finding in this study was that women who believed that their weight was not genetically predetermined had lower BMI values (reported as significant; however p value was not reported). This finding suggests that a perception that family history is not a predetermination for obesity may also influence food choices. It could however be argued that persons without a genetic predisposition toward obesity may not view genetics as an important factor related to obesity. Westenhoefer (2005) reported in a review article that age and gender do impact food choices. The reviewed studies found that health beliefs and weight control motivation may explain up to 50% of gender differences in food choice.

Emerging adults have been shown to have poor dietary habits. They choose foods that are high in fat and do not eat the recommended levels of fruits and vegetables (Hendricks & Herbold, 1998; Lee & Yuen Loke, 2005; Milligan et. al., 1997). The pattern of meal intake (skipping meals and high calories from snacks) has also been shown to have a significant relationship to clustering of less healthy lifestyle behaviors and nutrient intake in a group of 1,245 Swedish adolescents aged 15-16 years of age (Sjoberg, Hallberg, Hoglund, & Hulthen, 2003). It is reasonable to expect that this pattern may persist into the emerging adult population.

Convenience, quality of food, perceived health, and nutrition of food, as well as relationships with peers could be potential barriers to and benefits of healthy diet choices.

2.4.2.3 Measurement of Eating Behavior

Measurement of dietary intake can be accomplished in a variety of ways. Wylie-Rosett, Wassertheil-Smoller, and Elmer (1990) evaluated the advantages and disadvantages of four self-report methods commonly used to assess dietary intake: recalls, food records, food frequency questionnaires, and food histories. They found that while food frequency questionnaires are not accurate for caloric intake, they can be used to evaluate intake of targeted foods and require minimal skill to complete. Food frequency questionnaires and diet histories are relatively easy to use, but do have the limitations associated with self-report (Calfas, Zabinski, & Rupp, 2000; Jones, 2002; Westerterp & Goris, 2002). Another issue related to measurement of dietary intake is that the measurement technique can interfere with the usual dietary pattern and therefore the validity of the intended measure will be affected (Westerterp & Goris, 2002). Self-report methods of dietary or nutritional assessments can be validated using reference methods. The reference methods for nutritional assessment include urine nitrogen, total energy expenditure, resting metabolic rate and physical activity, total water loss, and doubly labeled water (Westerterp & Goris, 2002). These methods are expensive and tend to be intrusive; therefore, they are not appropriate for studies with large numbers of participants and were not used in this study. The consensus report from a workshop consisting of well known investigators, focusing in the areas of lifestyles and the prevention of chronic diseases, concluded that methods that combined multiple measurements would be helpful to evaluate lifestyles. Using specific instruments in cohort studies, such as food and physical activity recalls, diaries, frequency reports, and histories, was supported (Prentice et al., 2004).

This study used the MEDFICTS questionnaire (National Cholesterol Education Program, 1993), a food frequency questionnaire, and the Nutrition subscale of the HPLP II, which asks questions about food choices, to subjectively measure eating behavior. The MEDFICTS questionnaire is the result of work by Ammerman et al. (1991) and was designed to measure dietary atherogenic risk. The nutrition subscale of the HPLP II measures food choices including each of the major food groups.

Since objective measures of nutritional intake are expensive and intrusive, more general measures of BMI and waist circumference, which are commonly used in clinical practice to indicate increased risk and the need for nutritional counseling, were used to objectively measure eating behavior in this study.

2.4.3 Physical Activity

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Exercise is a subset of physical activity, which is planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness (U.S. DHHS, 2000). Physical activity can also include time spent in household, transportation, and leisure time activities, such as vacuuming, gardening, and heavy yard work, as well as the more recognized bicycling, running, swimming, and aerobics (Kriska et al., 1990).

2.4.3.1 Physical Activity and Health

Physical activity has declined in our society. Decreased activity levels coupled with excessive dietary intake results in an excess in energy balance, which culminates in obesity and increased risk of chronic disease. Physical activity, which used to be part of every day existence, has now

been shifted to a leisure time activity. As people shifted from hunting and gathering to agriculture, and eventually to industry, the required amounts of physical activity needed to survive and thrive has steadily decreased. (Paffenbarger, Blair, & Lee, 2001). Our Paleolithic genome, which once supported our survival, is now contributing to our demise (O'Keefe & Cordain, 2004). Unfortunately, now even leisure activities, for example watching television, are often sedentary (Fung et al., 2000). As a society, we have become more sedentary and the decreased activity has resulted in increased disease (Paffenbarger et al., 2001). A change in survival needs has resulted in inactive lifestyles for many. Evidence supporting the contribution of the escalating mismatch between activity and caloric intake, toward the ongoing epidemics of obesity, hypertension, diabetes, and atherosclerotic CVD is substantial (O'Keefe & Cordain, 2004). Koplan and Fleming (2000) list the integration of physical activity and healthy eating into daily lives as one of the ten future health challenges facing public health.

Almost a decade ago, the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) published a joint summary statement on the health benefits of physical activity in which they recommended an accumulation of at least 30 minutes of moderate intensity activities on most days (Pate et al., 1995). Consistent with this recommendation, one objective of Healthy People 2010 is to increase the proportion of adults who meet that goal (U.S. DHHS, 2000). The prevalence of no-leisure time activity in general has decreased from its peak in 1989, 32%, to about 25% in 2002. Population differences are present. Men decreased from 29% to 22%; women decreased from 32% to 28% (CDC, 2004). Not only are there gender differences in activity levels, racial differences also are present. The prevalence of inactivity is higher in Blacks and Hispanics with the gender differences preserved. Hispanic inactivity has actually increased since 1988 from 37% to 40% (CDC, 2004). Levels of physical

activity tend to decrease with age (CDC, 2003). This is a concern because physical inactivity contributes to many disease states common in aging individuals including not only the well known associations with diabetes, CVD, and hypertension, but also colon cancer, osteoarthritis, and osteoporosis (Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003).

Caspersen, Pereia, and Curran (2000) found that physical activity levels declined consistently from the age of 12, with a marked erosion occurring in the 18- to 29-year-old population. The activity levels for women are consistently lower than those for men across all age levels. The patterns of activity seem to stabilize from the age of 30. The implication is that decreasing the level of decline in persons prior to the age of 30 may indeed result in an overall increased lifetime activity level.

Raising levels of activity has a positive effect on health. Even in the absence of regular exercise and a weight-loss diet, relatively small amounts of routine physical activity within a normal lifestyle, slight increases in fitness, and less body fatness are associated with a better health-related quality of life and mood (Stewart et al., 2003). A review of 341 studies examining the biological determinants of healthy aging was performed. The appraisal resulted in eight studies meeting the selection criteria defined for a meta-analysis investigating associations between baseline behavioral risk factors, and subsequent healthy aging. Cohorts of people aged ≥60 years were examined for health outcome assessments. There was general consensus that high levels of physical activity (based on frequency of participation or energy expenditure in a range of household, leisure, or exercise activity) were associated with healthy aging with effect sizes for the association ranging from 1.27 to 3.09 (Peel, McClure, & Bartlett, 2005).

There is a strong incentive from a health promotion standpoint to develop effective strategies to increase physical activity. Healthier lifestyles, which include adequate physical

activity, have been associated with not only longer survival but also with postponed and compressed years of disability common to latter life. Vita, Terry, Hubert, and Fries (1998) studied a group of 1,741 university alumnae and followed them for over 30 years. Greater cumulative disability was associated with less exercise (r= -.011, p<.001). Understanding factors that contribute to the decline in physical activity, which is known to accelerate and continue a downward trend in the emerging adult population, will provide much needed insight into constructing effective interventions aimed a promoting healthy levels of activity throughout the lifespan.

2.4.3.2 Factors Affecting Physical Activity

Trost, Owen, Bauman, Sallis, and Brown (2002) reported in their review of 38 studies identifying correlates of adults' participation in physical activities that demographic and biological factors, psychological factors, behavioral attributes and skills, social and cultural factors, environmental factors, and physical activity characteristics (intensity or perceived effort) all impact levels of physical activity in adults. In the demographic characteristics, age was found to have a well demonstrated inverse relationship to physical activity levels. Being nonwhite demonstrated a negative relationship as well. Male gender, education, and income were all positively related to physical activity levels. The review of psychological variables is supportive of concepts of the HBM. The review demonstrated positive relationships between physical activity and enjoyment of exercise, expected benefits of exercise, and knowledge of health and exercise as well as negative associations between physical activity and barriers to exercise, such as lack of time (Trost et al., 2002).

Nelson, Gordon-Larsen, Adair, and Popkin (2005) described how various patterns of physical activity during adolescence impacted levels of activity in young adulthood. Participating

in sports with parents as well as participating in skating and gaming resulted in higher persistence of appropriate levels of physical activities in young adulthood. Activity types were grouped into seven clusters. Odds ratios of meeting recommended physical activity levels in young adulthood based on activities in adolescence ranged from 13.1 to 4.2. Independent of adolescent physical activity, absolute odds of meeting recommendations as young adults declined but were still relatively high in some clusters, indicating greater long-term physical activity sustainability. By young adulthood, however, overall physical activity declined dramatically.

2.4.3.3 Measurement of Physical Activity

There are numerous strategies to measure physical activity. The most commonly used measures in research are self-report tools, accelerometers, and pedometers. Self-reported physical activity questionnaires have the advantages of being relatively inexpensive to conduct and are applicable in studies of large samples and a variety of populations. They are a valid tool for gross classification of physical activity measurement, for example, low, medium, and high levels of activity. They are limited however by the self-report bias and are subject to error related to lack of specificity and the participant's recall. This study used the Modifiable Activity Questionnaire (MAQ) (Kriska et al., 1990) and the Physical Activity subscale of the HPLP II (Walker et al., 1987) as subjective measures of physical activity.

The use of objective measures of physical activity can provide validating evidence to self-reports (Vanhees et. al., 2005). Accelerometers measure various planes of movement and are therefore excellent in tracing patterns of movement; however, their expense precluded use in this study. Pedometers are fairly simple and inexpensive to use and provide a more objective measure of physical activity. Since various makes and models of pedometers may use slightly different

mechanisms to measure steps, it is important to use a consistent model and assure that its step count is of reasonable reliability. Schneider, Crouter, Lukajic, and Bassett (2003) found that for most of the models of pedometers, Cronbach's alpha within pedometer models was high, ranging from α>.80 to α>.99. These findings are consistent with findings by Melanson et al. (2004), who studied the accuracy of commercially available monitors and concluded that commercially available monitors are 96% accurate in those individuals with typical walking speeds of about 3 mph, an average rate for non-debilitated adults, but lose accuracy in individuals with slow gaits, such as elderly or morbidly obese individuals. This study used pedometers to provide validating evidence for the self-report tools of the MAQ and the HPLP II Physical Activity subscale.

2.5 MODIFYING FACTORS

The modifying factors explored in this study included race, personal and family income levels, living arrangements, educational (class) level, employment status, childhood living environment, and knowledge of disease prevention. As demonstrated in sections 2.4.2.2 (factors affecting eating behavior) and 2.4.3.2 (factors affecting physical activity), demographic and cultural/environmental factors do impact health behaviors.

Harris, Gordon-Larsen, Chantala, and Udry (2006) analyzed data from the National Longitudinal Study of Adolescent Health (Add Health) study. The Add Health study enrolled and followed a nationally representative sample of over 14,000 adolescents (aged 12-19) over seven years as they progressed into young adulthood (ages 18-26 years). They examined the impact of race, income, and education on the level of change in 20 health indicators in this large national prospective study. Their analysis found that 15 of the 20 health indicators demonstrated

increased health risk over time ($p<.05$). They examined the potential impact of race on health risk profiles and found that in general all races demonstrated increased health risks during the transition to adulthood. Although white adolescents had the most favorable profile during adolescence, they also experience the greatest decline in health indicators toward young adulthood. A further finding was that there was no change in levels of disparities over time when controlling for socioeconomic status. The authors suggest that factors beyond income and education may play a role in health behavior trends (Harris et. al., 2006).

Behaviors may be influenced by cultural norms and college campuses can create their own subculture. Within that subculture, peer influences and availability of resources can impact health behavior decision making. Each individual additionally comes to the campus with a set of values and beliefs that was formulated during childhood and adolescence. The integration of all these factors is likely to influence behaviors in this population.

Knowledge was demonstrated as an important factor in the initial pilot study of the HBQ. Participants reported that knowledge was a contributing factor to decisions relating to susceptibility to chronic disease, which accounted for 49% of the variance in susceptibility scores (Reiser, 2005, unpublished data).

Health education programs have consistently been utilized in attempts to influence health behaviors. Knowledge is gained through many avenues. Health related knowledge may not necessarily be related to knowledge in general. Persons who have personal experience with disease states, either through family members or personal experience with a particular disease, may perceive a greater knowledge level with regards to that disease. They may be more influenced to prevent or reduce the severity of the disease.

2.6 POPULATION CHOICE FOR THIS STUDY

There is appropriate rationale for using women who are in the emerging adult population. Women do have a disconnect between actual and perceived risks for diseases that are responsive to lifestyle interventions and are the most likely health related decision makers in families. The emerging adult period is when lifestyle decision making patterns are formulated so examining the relationships between health beliefs and health behaviors in women who are emerging adults can provide valuable insight into a population that will be making the family health related decisions in the future.

2.6.1 Women and Health

The relationship between health beliefs and behaviors is ongoing in women's health research. A recent survey commissioned by the Society for Women's Health Research found that women do not take their risk of heart disease seriously or personally, and despite the fact that heart disease presents a much higher risk, the fear of cancer out weighs the fear of heart disease. A recent survey of over 1,000 women found that only 9.7% listed heart disease, which includes heart attack, hypertension, and other heart-related disease except stroke, as the disease they fear most. Breast cancer remains the single most feared disease among women and cancer in general is the most feared. All cancer responses combined totaled 57.1%. Ovarian cancer (2.7%) was the second most feared cancer, followed by lung cancer (2.4%). The survey also found that women often fail to make the connection between risk factors, such as high blood pressure and high cholesterol, and their own chance of developing heart disease. Heart disease is the #1 killer of American women. In fact, one in four women die of heart disease, and heart disease can also lead

to disability and a significantly decreased quality of life. A new lifetime poll shows more than half of women know heart disease is their #1 killer, yet only one in three believe they are personally at risk. Although heart disease strikes women later in life than men, there are steps women can take at all ages to reduce their risk, such as exercising and eating a healthy diet, as well as recognizing and treating the condition when it develops (information accessed at http://www.nhlbi.nih.gov/health/hearttruth/professional/index.htm).

Women have long been viewed as the care providers for families and in that role have been instrumental in health related decision making. They are involved in dietary choices for families. Factors that significantly improved family diet were those influenced by the wife (Schafer, 1978). Women are reported to have higher intakes of fruits and vegetables, higher intakes of dietary fiber, and lower intakes of fat. Women usually attach greater importance to healthy eating. Weight control is a more prominent motivator in women; therefore, they are more likely to diet or restrain their eating behavior (Westenhoefer, 2005).

Dietary choices are not the only health promoting influence that women have in their families. Egeland, Tverdal, Meyer, and Selmer (2002) found that the level of a wife's education was inversely related to men being sedentary and overweight, having high diastolic blood pressure and high cholesterol, and smoking. These finding may explain the relationship between mortality rates being lower for married individuals. Umberson (1992) found that women are more likely to monitor their spouse's health than men. It is logical to target women in understanding factors influencing health behaviors since women exert an effect on health promotion within families.

2.6.2 Emerging Adults

The traditional college aged student is in a developmental stage recently described as emerging adulthood (Arnette, 2000). This stage encompasses persons from their late teens through mid-twenties and is a time of independent discovery of life's potentials. Emerging adulthood is marked by individuals leaving the reliance on parents and establishing autonomy. This process is highly variable with levels of employment and living situations changing more frequently than any other period in life (Cohen, Kasen, Chen, Hartmark, & Gordon, 2003). Demographic shifts in industrialized societies, including the increase in numbers of young adults in higher education as well as the delay of marriage and childbearing, has created this period where persons no longer consider themselves as adolescents but also do not consider themselves as adults (Arnette, 2000). Persons in their teens and early twenties are in the years of highest prevalence of risk taking behaviors (Arnette, 1999). The impulsivity and pleasure seeking choices are not accompanied by the brakes of reason. The development of wisdom, insight, and judgment about uncertain matters is occurring at this time. Pasupathi, Staudinger, and Baltes (2001) found that reasoning capacities and optimal decision making patterns increase through late adolescence and into the early twenties into an age normative adult level between 23 and 26 years of age.

The data from the Add Health study demonstrates that critical changes in health risk do occur during the time period between adolescence and young adulthood. While the term emerging adult was not utilized in this study, the age levels are comparable. Harris et al. (2006) found that health risks increased and access to care decreased as adolescents moved into young adulthood. Diet, inactivity, health care access, substance abuse, and reproductive health all worsened with age ($p<.05$). The findings support the premise that young adults are participating in behavioral patterns that put them at risk for adverse health in the future (Harris et al., 2006).

The workshop report by Millstein and Halpern-Felsher (2002), evaluated perceptions of risk in adolescents and young adults, and discussed risk judgment as a developmental-ecological perspective. They point out that adolescents do necessarily view themselves as invulnerable and that feelings of vulnerability appear to generalize beyond behavior related risks. In fact, experience with risky behavior may in fact decrease perceptions of risk. This principle was demonstrated in a study of 577 adolescents and young adults (age range 10-30), which found that adolescents in grades 5 through 9 were less likely to view themselves as invulnerable as young adults aged 20 to 30. There was a moderately negative relationship between age and feelings of vulnerability to alcohol (r=-.30, p<.01) and sexual risks (r=-.35, p<.01). The most significant finding was that engaging in a risky behavior resulted in a significantly decreased perception of risk related to that behavior (correlations ranging from r=-.17 to r=-.31 were found in 10 of the 12 behaviors, p<.01). This finding was observed even when controlling for age (Halpern-Felsher et al., 2001). These results suggest that the perception of risk in the late teens and early twenties may be skewed.

It is reasonable that with increasing age, increasing risk taking behaviors are experienced, and the negative consequences of risk taking behaviors do not negatively influence this population. This concept is supported by research by Goldberg and Fischoff (2000). They explored the misperception of long-term risks inherent in the short-term benefit of behaviors in a study of 42 college students. They found that estimates of benefits from drugs and alcohol were negatively correlated with reported problems from use (r=-.41, p<.01 and r=-.42, p<.01, respectively). In essence, those who experienced less negative effects related to their drug use, perceived the benefits of drug use as greater.

Johnson et al. (2002) in their study of late adolescents (N=223) found that the students engaging in risky behavior (smoking and unprotected intercourse) understood that the behavior was risky. They had a higher estimate of risk than non-participators (p<.01); however, when they were asked to rate their risk of a particular negative consequence (lung cancer or sexually transmitted diseases), their perception of a negative outcome resulting from the risky behavior was not significantly different than participants not engaged in the risky behavior (p>.10). For effective interventions to be designed and implemented, a more complete understanding of the factors affecting risk perception and the association with health behaviors must be achieved.

Behavior is a complex concept, which includes the interplay between biopsychosocial factors. Emerging adulthood is a period of social change, which is mirrored by biological changes. The hormonal changes that occur through puberty have long been associated with mood and behavior volatility in adolescents, although scholars in the area view the impact of hormones as small (Arnette, 1999). Recent advances in neurological imaging have allowed insight into brain development that may enhance understanding of the interplay between brain functioning, decision making, and behavior. Bennett and Bard (2006) found in an experimental controlled trial that significant age-related changes in brain structure occurred over time, in regions related to behavior, in a group of 18-year-old college freshmen. These changes were not evident in the control group of individuals past the age of 25 and were not evident in the methods control group, a group that had two successive scans without elapsed time to control for possible instrumentation errors. The authors suggest that these changes are responding to the environmental changes and demands during the freshman year and reflect improvements in conscious behavioral regulation needed to adapt to new environments. The brain is known to undergo remodeling through the adolescent period and alterations in that process have been

suggested as the pathology underlying the behavioral disorders of schizophrenia and certain depressive disorders that are know to have first onset between the ages of 18 to 25 (Bennett & Baird, 2006).

Ernst, Pine, and Harden (2005) proposed a model of neural bases of typical and atypical behaviors in adolescence. Their triadic model of motivated adolescent behavior is based on the assumption that there is a balance between reward-driven (approach) and harm-avoidant (avoidance) tendencies that is maintained by a regulatory control in the neurobehavioral system. The authors suggest that dopamine and the nucleus accumbens are key in the impulsivity and reward seeking behaviors while the amygdala and serotonin are vital in the avoidant system and harm avoidant behaviors. The circuits in the prefrontal cortex, which are responsible for cognitive control, coordinate the balance between approach and avoidance tendencies and essentially provide the cognitive control and the resulting behavior. In adolescence and young adulthood, the balance is tipped toward the reward system with increasing cognitive control occurring over time as the individual matures. This maturation process runs parallel to changes observed in neural structures and functioning during adolescence and young adulthood (Ernst et al., 2005).

The effect of neurological substances that are known to be associated with mood and emotion is important to consider. Lowenstein et al. (2001) propose that emotions inform decision making and that emotions often diverge from cognitive evaluations. Their "Risk as Feelings" hypothesis postulates that decision making results in part from direct emotional influences including feelings, such as worry, fear, or dread, and that emotional reactions guide responses, not only the first time a decision is made, but also result in conditioning that guides responses in the future. If participation in a pleasurable yet risky act is not met with negative consequences, it

may result in more risky behaviors and conversely, if risk reducing behavior is associated with negative feelings, such as dreading going up a flight of stairs and expending energy, or eating broccoli instead of chips, it can result in more persistent risky behaviors.

The similarities of the neurobiological model to the model of value expectancy with negatively and positively valanced perceptions and behavior initially proposed by Lewin in the 1930's is salient. Using the HBM, a value expectancy model, as a framework to understand health beliefs and behaviors in the emerging adult population is consistent with the theoretical principles proposed by Ernst et al. (2005). Strategies to discover previously unidentified or unexplored factors impacting the relationship between health belief and behaviors in this population will provide additional information to consider in creating successful interventions aimed at promoting healthy lifestyles.

2.7 PRELIMINARY STUDIES

Many tools using the HBM have been constructed and utilized to measure the relationship between specific health perceptions and actions taken to identify or avoid specific disease states. However, few tools have been designed to examine overall health beliefs, such as perceived susceptibility for preventable chronic diseases (see section 2.2). As a result, this researcher designed a simple survey to examine overall health beliefs as they relate to four chronic disease states, which have been shown to have a degree of preventability related to adoption of healthy lifestyles (eating behavior and physical activity). The Health Belief Questionnaire (HBQ) was initially developed and pilot tested in 2003 in a sample of 60 college women between the ages of 18 and 21. Sample characteristics are summarized in Table 2.

Table 2 Sample Characteristics in the HBQ Pilot Study

(*N*=60)

Characteristic	*n* (%)
Race:	
Caucasian	51 (85.0 %)
African American	7 (11.7 %)
American Indian	1 (1.7 %)
Unreported	1 (1.7 %)
Employment:	
None	27 (45.0 %)
<10 hrs/wk	16 (26.7 %)
10-19 hrs/wk	10 (16.7 %)
20-29 hrs/wk	5 (8.3 %)
30-39 hrs/wk	2 (3.3%)
Living arrangements:	
On campus (dorm)	40 (66.7 %)
Off campus with students	4 (6.7 %)
At home with family	15 (25.0%)
Other	1 (1.7%)

The original tool was patterned after a tool used by Wilcox and Stefanick (1999) to measure perceived susceptibility of major diseases in middle aged and older women. Open-ended questions were added to uncover factors related to decision making in relation to susceptibility to and seriousness of CVD, diabetes, osteoporosis, and cancer. The HBQ was designed to assess perceived susceptibility, perceived seriousness, and the perceived benefits of preventability of the four chronic diseases of CVD, diabetes, osteoporosis, and cancer. It contains 12 five-point Likert scale items. The two open-ended questions that were included were planned to collect information about the risk decision making process in this population. The open-ended questions asked “How did you decide on disease risk?” and “What factor affect your level of worry?” The HBQ provides three subscale sum scores with a possible range of 4 to 20 as

well as a total scale sum score with a possible range of 12 to 60. A higher score on this scale indicates a higher perceived threat of disease.

Scale statistics and reliability of the HBQ are summarized in Table 3. The HBQ total scale score demonstrated acceptable internal consistency reliability for an immature scale with a Cronbach's alpha coefficient of .74. Individual items in each subscale, Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability, also demonstrated significant relationships with their primary factor. The standard error of measurement (SEM) for the scales ranges from 1.81 to 1.99 for the three subscales and 3.53 for the total scale, indicating low measurement error. Exploratory factor analysis supported unidimensional factor structure of each subscale (Reiser, Schlenk, & Kim, 2005). Univariate analysis confirmed a significant relationship between the Perceived Susceptibility and Perceived Seriousness scores (r=.68, p=.001) and non-significant relationships between Perceived Benefits of Preventability and Perceived Susceptibility (r=.20, p>.05) and Perceived Seriousness (r=-.03, p>05), supporting the conceptual model and suggesting that susceptibility and seriousness combine to produce a perceived threat.

Table 3 Summary of HBQ Statistics and Reliability Measures

Scale	Mean	Variance	*SD*	Alpha	SEM
Total Score	31.48	47.90	6.92	.74	3.53
Perceived Susceptibility	9.51	9.43	3.07	.61	1.92
Perceived Seriousness	9.48	12.05	3.47	.67	1.99
Perceived Benefits of Preventability	12.49	7.94	2.82	.59	1.81
Threat (Higher Order Factor)	18.98	36.24	6.02	.79	2.76

Decision-making factors identified in the open-ended questions were examined to identify recurrent themes. See Table 4.

Table 4 Decision Making Factors from Open Ended Questions

Decision-Making Factor	Frequency	Percentage
Family History	54	90.0%
Personal History	22	36.7%
Behaviors	21	35.0%
Knowledge	19	31.7%
Beliefs	16	26.7%
Acquaintance History	3	5.0%

Independent *t*-tests were performed to examine possible significant differences in the three subscales between reporters vs. non–reporters of family history, personal history, behaviors, knowledge, beliefs, and acquaintance history as decision making factors in the open-ended questions. Also, independent *t*-tests were performed to examine potential differences in the three subscales related to demographic variables, including race (Caucasian vs. African American), living arrangements (dorm vs. non-dorm), and employment status (employed vs. unemployed). The only significant finding was that reporters of knowledge as a factor used in decision making had higher Perceived Susceptibility scores and higher Perceived Seriousness scores. Knowledge is a modifying factor in the HBM so this finding is supportive of the model (see Table 5).

Table 5 Relationship of Knowledge to Subscale Scores in the HBQ

Knowledge vs.	*t*	*df*	*p*	Mean Difference
Perceived Susceptibility	3.039	57	.004	2.433
Perceived Seriousness	4.618	58	.0001	3.837
Perceived Benefits of Preventability	-1.401	57	.167	-1.107

Based on the results of the pilot study and additional review of the questionnaire, the HBQ was revised to include knowledge as a distinct factor by adding four 5-point Likert items about knowledge relating to the prevention of CVD, diabetes, osteoporosis, and cancer, which increased the number of items from 12 to 16. Additionally, critical review of the HBQ resulted in a wording change in the items related to Perceived Seriousness. The response scale heading was changed by inserting the term "worried" in place of "likely" in the Likert scale.

A pilot test of the 16-item Health Belief Questionnaire-Revised (HBQ-R) was conducted in 2005 in a population of 100 college women 18 to 25 years of age. The demographics of the sample were similar to the pilot study of the HBQ, with 80% of the sample being Caucasian. The age range was expanded so that it would be consistent with the group identified as emerging adults (Arnett, 2000; Cohen et al., 2003).

The reliability of the HBQ-R remained similar to the HBQ with a Cronbach's alpha of .72. Factor analysis of the HBQ-R revealed that Perceived Susceptibility and Perceived Seriousness remained stable and unidimensional (Table 6). However, Perceived Benefits of Preventability of chronic disease, which demonstrated a unidimensional factor structure in the HBQ, was no longer unidimensional. In the HBQ-R, Perceived Benefits of Preventability

demonstrated a two factor structure with the second factor having a strong loading associated with the item related to perceived benefits of preventability of cancer. Also, knowledge about preventability of chronic disease demonstrated a unidimensional factor structure in the HBQ-R.

Table 6 Factor Structure of the HBQ-R

Subscale	Factor 1 Eigenvalue	% Variance Explained	Factor 2 Eigenvalue	% Variance Explained	% Cumulative Variance Explained
Perceived Susceptibility	2.056	51.39	Not applicable	Not applicable	51.39
Perceived Seriousness	2.144	53.58	Not applicable	Not applicable	53.58
Perceived Benefits of Preventability	1.800	45.01	1.04	25.93	70.94
Knowledge of Disease Prevention	2.447	61.18	Not applicable	Not applicable	61.18

Since the subscale of Perceived Benefits of Preventability of chronic disease demonstrated a two factor structure, which was different from the results found in the pilot test of the HBQ and different from the other subscales in the HBQ-R, a secondary data analysis was performed to explore the relationships between Perceived Benefits of Preventability of cancer and (1) potentially related sociodemographic variables of class level, personal income, and family income, (2) knowledge of cancer, and (3) the perceived benefits of preventability of CVD, diabetes, and osteoporosis. Bivariate correlations were performed between perceived benefits of preventability of cancer scores and each of these variables. An independent sample *t*-

test was performed to compare mean perceived benefits of preventability of cancer scores between Caucasians and Non-Caucasians.

The results were not significant with one exception. There was a significant positive relationship between knowledge of preventability of cancer and perceived benefits of preventability of cancer (r=.492, p<.01). These findings support the addition of the knowledge subscale to the HBQ-R since it demonstrates the impact knowledge has on health beliefs related to cancer.

2.8 SUMMARY

The HBM is a well established model used to understand the interplay between health beliefs and health behaviors. Previous studies using the model have frequently concentrated on only one disease state or behavior. The HBQ-R was designed to measure the health beliefs of perceived susceptibility, perceived seriousness, perceived benefits of preventability, and the modifying factor of knowledge of the four chronic disease states of CVD, diabetes, osteoporosis, and cancer. Examining the relationship between beliefs and behaviors, as well as examining factors affecting this relationship, can be beneficial to health providers seeking to design primary prevention interventions. College women are an excellent population to target for primary prevention interventions to promote healthy lifestyles. This population of emerging adults is in the midst of developing lifestyles and lifelong habits amenable to intervention and is likely to have a powerful influence on the lifestyle choices of future family members.

3.0 RESEARCH DESIGN AND METHODS

3.1 DESIGN

Using a mixed methods design, 196 women 18 to 25 years of age were recruited from an urban, women's centered university in Pittsburgh, PA. The results will be used in constructing interventions aimed at establishing healthy lifestyles in this population. This multi-methods study was a cross-sectional, descriptive, correlational design with self-report questionnaires and objective measurements. Additionally, Nominal Group Technique (NGT) was used to capture potential cues to action, benefits, and barriers not assessed in the surveys. The theoretical framework utilized for this study is Becker's Health Belief Model (see Figure 1, Chapter 1).

3.1.1 Purpose and Specific Aims

The purpose of this study was to investigate the factors that influence healthy lifestyle beliefs and behaviors in college women.

The specific aims were:

1. To describe the health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers) and health behaviors (eating behavior and physical activity) in college women.

2. To examine the relationship between health beliefs and health behaviors in college women.
3. To examine the relationship between modifying factors (sociodemographic factors and knowledge) and health beliefs in college women.

4. To determine if modifying factors moderate the relationship between health beliefs and health behaviors in college women.
5. To identify factors in addition to health beliefs that contribute to healthy lifestyle behaviors in college women.

3.1.2 Research Hypotheses and Research Question

The hypotheses were:

1. Health beliefs are related to health behaviors in a population of college women.
2. Modifying factors are related to health beliefs in a population of college women.
3. Modifying factors (sociodemographic factors and knowledge) moderate the relationship between health beliefs and health behaviors in a population of college women.

The research question was: What factors in addition to health beliefs contribute to healthy lifestyle behaviors in a population of college women?

3.2 SETTING, TARGET POPULATION, AND SAMPLE

The setting for this research study is a small university in Pittsburgh, PA. There are a total of approximately 1,600 undergraduate students, 95% of whom are women. Eighty percent of the students are Caucasian with the remainder of the student population being predominantly Black non-Hispanic, which is proportional to the racial distribution of the greater Pittsburgh area. While the undergraduate student age range is 17 to 65 years, the majority of the students are between the ages of 18 to 25 years.

A convenience sample of 200 women enrolled in the university was targeted. A total of 196 were consented and enrolled. Inclusion criteria were: female, college student, and between the ages of 18 and 25. Efforts to enroll a representative sample included recruitment in a variety of settings on campus.

3.2.1 Justification of Sample Size

Adequate sample size is essential in assuring that there is adequate power generated from the data to make valid conclusions. The larger the sample size the more confident the researcher can be in the conclusions drawn; however, large samples incur large research costs. In establishing a sample size, it is generally considered prudent practice to over sample to assure adequate valid data for the planned analysis. A feasible sample size based on subject availability and available funding to complete the proposed research is also a consideration. It is considered acceptable to have a power of .80 meaning that there is 80% power to detect an R^2 at the desired alpha level, which is usually .05. NCSS/PASS was used to estimate the statistical sample size requirements for the planned analysis and final power analysis of the significant results (Hintze,2001). Taking

all of these factors into consideration, recruitment of 200 participants was the goal, with the expectation of 180 completed data sets. The targeted sample size of 180 achieves 90% power to detect an R^2 (the amount of variance that can be accounted for) of 0.10 attributed to 8 independent variables using an *f* test with a significance level (alpha) of 0.05.

3.3 DATA COLLECTION

3.3.1 Procedures for Quantitative Data Collection

Following Institutional Review Board approvals from all involved institutions, subjects were enrolled initially through recruitment tables located at university events and in the common areas of the university. Individuals were screened at the time of recruitment to assure that they met the inclusion criteria. Eligible participants were provided with the consent form, packet containing the questionnaires, and completion instructions (Appendix A), as well as a pedometer at the time of recruitment.

An appointment was made for anthropometric measurements and return of the questionnaires. Subjects completed the questionnaires measuring their health beliefs and health behaviors (eating behavior and physical activity) at their leisure; wore a pedometer for seven days during waking hours; and had their weight, height, and waist circumference measured at the return appointment. The return appointment was generally scheduled about one to two weeks following recruitment to allow for completion of the pedometer readings. Anthropometric data included weight measured on a balance beam scale, which was calibrated with a standardized weight each day prior to data collection, height using a wall mounted stadiometer, and waist

circumference measured in cm, at exhalation, at the level of the umbilicus using a standardized fiberglass tape. All anthropometric measurements were recorded by the principal investigator (PI) at the Advanced Practice Learning Lab at the university. Up to three attempts were made to contact those participants who failed to keep their appointment in an effort to reschedule collection of surveys and anthropometric data from them.

A subset of the sample composed of participants scoring in the upper and lower quartiles of the nutrition and physical activity subscale scores in the HPLP II (Walker et al., 1987) were asked to participate in focus groups designed to identify factors that contribute to healthy lifestyle behaviors not captured in the questionnaires. The participants for the focus groups were purposefully selected from the extremes of eating behavior and physical activity in an attempt to capture factors related to their eating behavior and physical activity levels. Understanding the extremes may provide greater insight by identifying group prioritized factors contributing to a lack of poor nutritional habits in the lower nutrition quartile, good nutritional habits in the upper nutrition quartile, low physical activity in the lower quartile, and high levels of physical activity in the upper quartile. Information gathered in the focus groups can provide potential target areas for future interventions aimed at improving nutritional and physical activity patterns in this population.

3.3.2 Procedures for Nominal Group Technique Data Collection

The focus groups were conducted using Nominal Group Technique (NGT). This methodology allowed for the free exchange of opinions, perceptions, and idea generation in a structured format, with predetermined questions, encouraging equivalent input from all participants. The researcher facilitated the group and guided the process but did not contribute to the generation of

ideas or the discussion. During the preliminary analysis of HPLP II scores a majority of the individuals scoring in the upper quartile of physical activity also scored in the upper quartile in the nutrition scores, indicating a high level of health promoting lifestyle behaviors. A similar phenomenon was observed for those scoring in the lower quartiles of physical activity and nutrition, indicating a low level of health promoting lifestyle behaviors. The decision was made to hold two focus groups, one including the individuals scoring high on the HPLP II physical activity and nutrition scores (n=14 invited), and the second including the individuals scoring low on the HPLP II physical activity and nutrition scores (n=16 invited). Efforts to maximize participant availability were made although it was difficult to find mutually convenient times. The NGT group sessions were held at times when at least seven subjects were available and agreeable to participation; however, only four individuals came to the high lifestyle group and three individuals came to the low lifestyle group. The two groups were first asked to describe factors that affect their level of physical activity. The NGT process was then completed for the physical activity question. Next the two groups were asked to describe factors that affect their choice in foods. The NGT process was then completed for the nutrition question. Scripts utilized in the groups are presented in Appendix B.

The NGT process outlined by Holtz and Olson (1976) was used. Each participant received a sheet of paper, a pencil, and five index cards. The NGT process was explained to the group. The question then was read. Participants were asked to silently generate thoughts on factors that influence the health behavior in question and write them on their sheet of paper. Participants were encouraged to record as many factors as they could since the purpose of this part of the research was to gain a greater understanding of potential cues to action as well as

perceived benefits of and barriers to the specific health behavior. About 10 minutes was allowed for the silent generation of factors contributing to the specified health behavior.

The second step in the NGT was a round robin listing of ideas. Each participant reported one factor from their list, which was then recorded by the facilitator on a flip chart. The process continued in a round robin fashion until all the factors are listed. Again, discussion was avoided. After all the ideas were listed, about 30 minutes was allowed for the group to discuss and clarify each of the listed ideas. This process assisted in assuring that the group members had a uniform understanding of the listed ideas and also allowed the group members to elaborate on or discuss the strengths and weaknesses of each of the ideas.

Following the discussion, the final step of NGT, factor ranking, occurred. On each of the five index cards, participants listed one of the top five factors that they believed to be most important. They then chose the factor from among those five that they felt was most important and placed the number 5 on that card. Next they chose the factor from the remaining four that they felt was least important and placed the number 1 on that card. From among the three remaining factors, the most important factor was selected and the number 4 was placed on that card. Of the two remaining unnumbered factors, the least important was chosen and the number 2 was placed on that card. The final card was numbered with a 3. This ranking process elicited the individual contribution of important factors from each participant.

The focus group sessions were recorded, and the poster sheets on which the group listings as well as the sheets on which individuals recorded their idea were saved. This allows for verification of the information presented and will provide rich data for future analysis. The note cards with the recorded prioritization of the named factors were collected and tabulated for each question from each focus group. For this study the numerical results on the index cards were

summed and rank ordered to identify the prioritized factors contributing to eating and physical activity behaviors.

3.4 MEASURES

3.4.1 Health Beliefs

Table 7 summarizes the instruments used to measure health beliefs in this study. Perceived susceptibility to the four chronic diseases of CVD, diabetes, osteoporosis, and cancer was measured by the Health Belief Questionnaire-Revised (HBQ-R) subscale of Perceived Susceptibility. This scale has four, 5-point Likert items, with a previously established Cronbach's alpha of .68 (Reiser et al., 2005). The Cronbach's alpha in this study was .67.

Perceived seriousness of the four chronic diseases of CVD, diabetes, osteoporosis, and cancer was measured by the HBQ-R subscale of Perceived Seriousness. This scale has four, 5-point Likert items, with a Cronbach's alpha of .71 (Reiser et al., 2005). The Cronbach's alpha for this study was .70.

Perceived benefits were measured using three instruments. (1) Perceived benefits of preventability of the four chronic diseases of CVD, diabetes, osteoporosis, and cancer was measured by the HBQ-R subscale of Perceived Benefits of Preventability. This scale has four, 5-point Likert items, with a Cronbach's alpha of .56 (Reiser et al., 2005). The Cronbach's alpha for this study was .70. (2) Perceived benefits of a healthy diet was measured using the Healthy Diet Benefits scale, which has two, 5-point Likert items. This instrument was used to measure perceived benefits of a healthy diet in a group of 636 healthy working adults participating in an

intervention trial. An alpha coefficient was not reported (Glanz et al., 1993). The Cronbach's alpha for this study was .49. (3) Perceived benefit of physical activity was measured using the Exercise Benefits subscale of the EBBS developed by Sechrist et al. (1987). This subscale has 29, 4-point Likert items. In a sample of 650 adults, the Cronbach's alpha was .95. Two-week test-retest reliability was .89 in 66 adults (Sechrist et al., 1987). The Cronbach's alpha for this study was .96.

Perceived barriers were measured with two instruments. (1) Perceived barriers to a healthy diet were measured using the 16-item Healthy Diet Barriers scale, which uses a 6-point Likert scale for responses. This instrument was developed by Milligan et al. (1997) to study health behaviors in 583 Australian 18-year-olds. A Cronbach's alpha was not reported by Milligan. The Cronbach's alpha for this study was .89. (2) Perceived barriers to physical activity were measured using the Exercise Barriers subscale of the EBBS developed by Sechrist et al. (1987). This 14-item scale uses a 4-point Likert response scale. When used as a free standing measure this scale is reverse scored. In a sample of 650 adults, Cronbach's alpha was .87. Two-week test-retest reliability was .77 in 66 adults (Sechrist et al., 1987). The Cronbach's alpha for this study was .83.

3.4.2 Modifying Factors

Table 8 summarizes the measurement of modifying factors in this study. Modifying factors in the HBM include demographic and psychosocial factors and knowledge of disease prevention, which may influence one's health beliefs. Modifying factors address "when" or "for whom" a variable most strongly predicts or causes an outcome variable. Modifying factors alter the direction or strength of relationship between a predictor and an outcome variable. The HBM suggests that

one's living environment, resources, experiences with and knowledge of disease states are likely to modify one's perception of the impact of an illness. Also, perceived benefits of preventability of an illness or perceived benefits resulting from taking an action is theorized to be affected by demographic and psychosocial factors (see Figure 1, Chapter 1). In this study, modifying factors include demographic variables, which are operationalized through a demographic questionnaire included in the questionnaire packet, and the HBQ-R subscale of Knowledge of Disease Prevention, which has four, 5-point Likert items. The Cronbach's alpha for this 4 item subscale in this study was .83.

Table 7 Measures of Health Beliefs

Instrument	Subscales	No. of Items	Psychometrics
Health Belief Questionnaire (Reiser et al., 2005)	4 subscales:	16	*N*=60 college women, α=0.74 for HBQ
Health Belief Questionnaire-Revised (HBQ-R) (Reiser, 2004 unpublished preliminary study)		16	*N*=100 college women, α=0.72 for HBQ-R
	Perceived Susceptibility	4	α=0.68
	Perceived Seriousness	4	α=0.71
	Perceived Benefits of Preventability	4	α=0.56
	Knowledge of Disease Prevention*	4	α=0.78
Healthy Diet Benefits (Glanz et al., 1993)	single scale	2	*N*=636 healthy adults Reported strong agreement between perceived benefits and eating behavior Cronbach's alpha not reported
Healthy Diet Barriers (Milligan et. al., 1997)	single scale	16	*N*=583 18-year-olds Demonstrated construct validity with eating behavior Cronbach's alpha not reported
Exercise Benefits/Barriers Scale (Sechrist et al., 1987)	2 subscales:	43	*N*=650 adults and *N*=66 for 2-week test-retest
	Perceived Benefits	29	α=0.95, *r*=.89 for test-retest
	Perceived Barriers	14	α=0.87, *r*=.77 for test-retest

*Note. Knowledge of disease prevention is considered a modifying factor. See Table 8 for additional information.

Table 8 Measures of Moderating Variables

Variable	Level of Measurement	No. of Categories	Category Labels
Race	Nominal	2	Caucasian Non-Caucasian
Personal income	Ordinal	6	Under $10,000 >$10,000 - $20,000 >$20,000 - $30,000 >$30,000 - $40,000 >$40,000 - $50,000 over $50,000
Family income	Ordinal	6	Under $10,000 >$10,000 - $20,000 >$20,000 - $30,000 >$30,000 - $40,000 >$40,000 - $50,000 over $50,000
Living arrangements	Nominal	4	Dorm Off Campus with students Off campus with family Other
Childhood living environment	Ordinal	3	Urban Suburban Rural
Presence of chronic disease	Nominal	2	Yes No
Class level	Ordinal	4	Freshman Sophomore Junior Senior
Employment status	Ordinal	5	Does not work 5 or less hours per week >5 to 10 hours per week >10 to 20 hours per week Over 20 hours per week
Knowledge of disease prevention	Ordinal with 4 items	5	1=Not knowledgeable to 5=Extremely knowledgeable

3.4.3 Health Behaviors

Health behaviors were the outcome of interest in this study and, thus, were the dependant variables. Both the subjective and objective measures of the health behaviors of eating behavior and physical activity were used in this study. The subjective measures included standardized self-report questionnaires. Psychometric properties of the subjective measures are outlined in Table 9. The objective measures, which have been used in a variety of empirical studies, are presented in Table 10. The objective measures were used in the analysis to validate the subjective measures in this study.

3.4.3.1 Eating Behavior

Eating behavior was measured with four assessment methods. First, the HPLP II Nutrition subscale is a 4-point Likert scale with six items related to food choices and dietary patterns. Cronbach's alpha was .76 in a group of 952 adults (Walker et al., 1987). See Table 9. Cronbach's alpha in this study was .79.

Second, the MEDFICTS is an 8-item food frequency questionnaire that was developed by Ammerman et. al. (1991) and used by the National Cholesterol Education Program (1993) to measure adherence with low fat diets (30%). While the MEDFICTS was originally developed to assess adherence with low fat diets, it has been shown to be a reasonable measure of a healthy diet. It is constructed in a way that researchers can determine the level of healthy versus non-healthy food choices by participants. Participants are asked to select their level of weekly consumption of eight categories of foods: meats, eggs, dairy foods, fried foods, industrial baked

goods, convenience foods, table fats, and snacks. In each of the categories there are two levels of choices, a higher fat choice versus a lower fat choice. While the scale is designed to result in a total score, which is reflective of adherence with a low fat diet, it may also provide insight into patterns of choices. It has the advantage of being a relatively quick and easy tool to administer and is well correlated with the percentage of energy intake from fat in the diet (*r'*s=.52 - .81, *N*=16) (Kris-Etherton et al., 2001). Also, it has been demonstrated to be a good tool to measure changes in fat intake (Holmes, Sanderson, Maisiak, Brown, & Bittner, 2005) and diets that exceed the American Heart Association's recommended levels of fat intake (Taylor et. al., 2003). See Table 9. Using two approaches to measure the eating behavior (HPLP II Nutrition subscale and MEDFICTS) provided validation for the findings.

Lastly, BMI and waist circumference are objective measures that can provide an indirect estimate of eating behavior. These measures are used as screening tools in health care practices to establish risk for CVD and diabetes related to obesity levels, and body configuration. A highly physically active person can consume a higher caloric diet without resulting in obesity as reflected by higher BMI and waist circumference. Conversely, a sedentary person can consume a relatively lower caloric diet and have an increased BMI or waist circumference. Another factor to consider is the relative muscle mass of an individual. Muscle weighs more than fat so the BMI of a very muscular person is elevated. Diet assessment alone, without considering physical activity, would be likely to lead to less accurate conclusions. See Table 10.

3.4.3.2 Physical Activity

Physical activity was measured in three ways. First, the HPLP II Physical Activity subscale is related to physical activity patterns (Walker et al., 1987). Cronbach's alpha was .81 in a group of

952 adults. It has been used in college age individuals (Larouche, 1999; Lee & Yuen Loke, 2005). See Table 9. Cronbach's alpha in this study was .88.

The second measure, the MAQ, was designed to maximize the ability to assess physical activity in a variety of populations. This questionnaire assesses occupational and leisure activities of the past year, as well as levels of inactivity and possible inactivity related to functional disabilities. It was originally designed for use in studying the Pima Indians but its use has been expanded to many other populations. It measures activity in metabolic equivalents (METs) or in hours of activity. One MET is the amount of oxygen consumed by a body while sitting quietly. Moderate activity levels range between 3 and 6 METs and vigorous activity is over 6 METs. The MAQ has test-retest correlations that range from 0.63 to .92. METs from the MAQ have been correlated with accelerometers with correlations that range from .59 to .66 (Kriska et al., 1990). See Table 9. This study examined correlations between MAQ hours of activity measurement and both the HPLP II Physical Activity subscale and average pedometer steps measures.

Third, the objective measure of pedometers provided an additional assessment of physical activity in this study. A pedometer is an inexpensive tool that provides insight into levels of physical activity. The seven-day pedometer log provided a comment area to allow recording of times and types of activities when the pedometer was not worn, for example if an individual was swimming or showering, See Table 10. Again, using several approaches to measure the same behavior (MAQ, HPLP II Physical Activity subscale, and pedometers) provided additional validation for the tools utilized.

Table 9 Subjective Measures of Eating Behavior and Physical Activity

Instrument	Measures/Subscales	No. of Items	Psychometrics
Health Promoting Lifestyle Profile II (HPLP II) (Walker, 1987)	4-point Likert scale with 6 subscales including: Nutrition Physical Activity	9 8	*N*= 952 adults *N*=63 for 2-week test-retest (*r*'s=.81-.91) α=0.76 α=0.81
MEDFICTS (National Cholesterol Education Program, 1993)	Food frequency questionnaire of food choices	8	N=16 adults Correlations with dietary fat range from .52 to .81
Modifiable Activity Questionnaire (MAQ) (Kriska et al., 1990)	MET-hours/week in past year	7	*N*=29 Pima Indians, test-retest correlations range from .63 to .92 *N*=17 Pima Indians, correlations with accelerometers range from .59 to .66

Table 10 Objective Measures of Eating Behaviors and Physical Activity

Measure	Data Obtained
Body mass index	Weight in kg/(Height in meter)^2 Weight is measured using a triple beam balance scale, which is zeroed prior to each weight Height is measured by a wall mounted stadiometer
Waist circumference	Measured in cm using a standardized fiberglass tape
Electronic digital pedometers	Step count: mean number of steps per day over 7 days

3.5 DATA MANAGEMENT AND ANALYSIS

3.5.1 Data Management and Screening

SPSS 12.0 was used to manage, screen, and analyze the data. While care was taken during the data collection phase to assure completeness of the questionnaires, missing data occurred. Initially, data were examined for completeness and accuracy, and subjects were contacted for missing data. Data were entered directly into Microsoft Excel using keystrokes. Double entry, by the PI and a trained research assistant, was used to assist in preventing and identifying data entry errors. Data were imported into SPSS 12.0. Range and frequency checks were used to insure that no variables were outside the range of possible values.

Univariate statistics including frequency tables and histograms were constructed for all variables to assess for missing values. The distribution of the data was examined for normality

and identification of possible outliers. Missing values were examined for systematic patterns. Missing values within scales were imputed using the median value for that variable provided no more than one value was missing within the scale. Scale scores were calculated in Excel then imported into SPSS.

Listwise deletion was used for data analysis. This process utilizes only those cases with complete data for the variables being analyzed. Cases with significant amounts of missing data were eliminated from final analysis. Square root or log transformations were considered for markedly skewed data following the recommendations of Tabachnick and Fidell (2001).

Data were then analyzed for outliers using box plots. Outliers were identified as those values more than three standard deviations from the mean. Outliers were examined to assess accuracy of data entry. If an outlier represents an actual value, data were analyzed with the outlier in the distribution as well as with the outlier removed. The effect, if any, of the outliers on the results was addressed in the discussion of results.

Box plots were also used to identify subjects falling in the upper and lower quartiles of the HPLP II Nutrition and Physical Activity subscale scores. These subjects were contacted and invited to be participants in the NGT focus groups as described previously. Purposeful sampling of the subjects in the extremes of eating behavior and physical activity assisted in identifying factors that are most influential in eating behavior and physical activity in this population of college women.

3.5.2 Descriptive Statistics

Descriptive statistics of demographic variables are helpful in describing the sample, which aids in evaluating generalizability of the findings. Descriptive statistics including frequencies and

measures of central tendencies (mean, median, mode) and dispersion (range and standard deviation) were used to explore and describe the demographic variables of age, race, personal and family income levels, living arrangements, class level, employment status, and childhood living environment. Tables with percentages, means, standard deviations, and ranges were used to summarize the data. The demographic results for the sample were compared to the demographics of the university population to assure that the sample was representative of the population being investigated.

Similarly, descriptive statistics were computed for the scores of the four HBQ-R subscales, the Healthy Diet Benefits Scale, the Healthy Diet Barriers Scale, the Exercise Benefits subscale, the Exercise Barriers subscale, the HPLP II Nutrition and Physical Activity subscales, the MEDFICTS, and the MAQ. The distributions of these scores were examined for normality. Additionally, descriptive statistics were calculated and the normality of the distributions of the objective measures of BMI, waist circumference, and step counts by pedometer were examined.

3.5.3 Hypothesis Testing

3.5.3.1 Hypothesis 1

Hypothesis 1: Health beliefs are related to health behaviors in a population of college women.

The relationships between health belief scores on the HBQ-R subscales (Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability), the Healthy Diet Benefits Scale, and the Healthy Diet Barriers Scale and health behavior scores from the HPLP II Nutrition subscale, MEDFICTS, BMI, and waist circumference were examined. Similarly, the relationships between health belief scores on the HBQ-R subscales (Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability), the Exercise

Benefits subscale, and the Exercise Barriers subscale and health behavior scores from the HPLP II Physical Activity subscale, MET-hours/week in the past year on the MAQ, and step counts by electronic digital pedometer were examined.

This hypothesis was tested using Pearson's product moment correlation coefficients or non-parametric Spearman's *rho* correlation coefficients, if indicated. Scatter plots of the potential relationships were used to examine the conformity of the data with the underlying assumptions for the statistical tests.

In addition, correlation coefficients were used to examine the convergent validity of the instruments used to subjectively and objectively measure eating behavior and physical activity. The MEDFICTS score was correlated with the HPLP II Nutrition subscale score, and the relationships were examined between each of these scores and BMI, and waist circumference and pedometer step counts. MET-hours/week in the past year from the MAQ was correlated with the HPLP II Physical Activity subscale score, and the relationships of each of these scores with the pedometer step counts, BMI, and waist circumference were examined. It was anticipated that if participants were accurately self-reporting physical activity, their pedometer step counts would verify those results. Additionally, if eating behavior and physical activity are within a healthy range, BMI and waist circumference should also be within a healthy range.

3.5.3.2 Hypothesis 2

Hypothesis 2: Modifying factors (socioeconomic factors and knowledge) are related to health beliefs in a population of college women.

The relationships between the modifying factors listed in Table 8 and scores on the HBQ-R subscales (Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability), the Healthy Diet Benefits Scale, the Healthy Diet Barriers Scale, the Exercise

Benefits subscale, and the Exercise Barriers subscale were examined. This hypothesis was tested using Pearson's product moment correlation coefficients for interval level data and ordinal level data that can be summed across scale items and evaluated in an interval level format. Non-parametric Spearman's *rho* correlation coefficients were used for ordinal level data and data that did not meet statistical assumptions of the parametric test. Scatter plots of the potential relationships were used to examine the conformity of the data with the underlying assumptions for the statistical tests. The correlation coefficients provide a mathematical description of the relationship that exists between two variables. Correlation coefficients describe both the strength and direction of the relationship.

Modifying factors with data at the nominal level were evaluated using *t*-tests, analysis of variance tests, or the non-parametric Mann-Whitney U test, if indicated. The analysis of group level data determined whether membership in a particular demographic group significantly affected health beliefs.

3.5.3.3 Hypothesis 3

Hypothesis 3: Modifying factors (socioeconomic factors and knowledge) moderate the relationship between health beliefs and health behaviors in a population of college women.

The following direct and indirect effects were examined in this hypothesis:

- The direct effect of modifying factors (sociodemographic factors and knowledge) on health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers)
- The direct effect of health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers) on health behaviors (eating behavior and physical activity)

- The indirect effect of modifying factors (sociodemographic factors and knowledge) on the relationship between health beliefs and health behaviors (eating behavior and physical activity)

This hypothesis was evaluated using stepwise multiple regression models to identify modifying factors that independently predict health beliefs, health beliefs that independently predict health behaviors, and modifying factors that moderate the relationship between health beliefs and health behaviors. Separate regression models were run for the variables used to measure eating behavior and physical activity. Variables that are at least marginally significantly ($p<.10$) related to each other in the analyses were considered for entry into the multiple regression models.

Multiple regression is an extension of correlation analysis, which allows the researcher to describe the strength, extent, and direction of the relationship between several independent variables and a continuous level dependent variable. In fact, regression makes use of the correlation between variables and the notion of a straight line to develop a prediction equation (Munro, 2005). Multiple regression is a useful tool when multiple independent variables combine to predict one dependant variable. These regression analyses identified the factors that make a significant contribution to the outcomes being evaluated. Figure 2 outlines the planned multiple regression analyses.

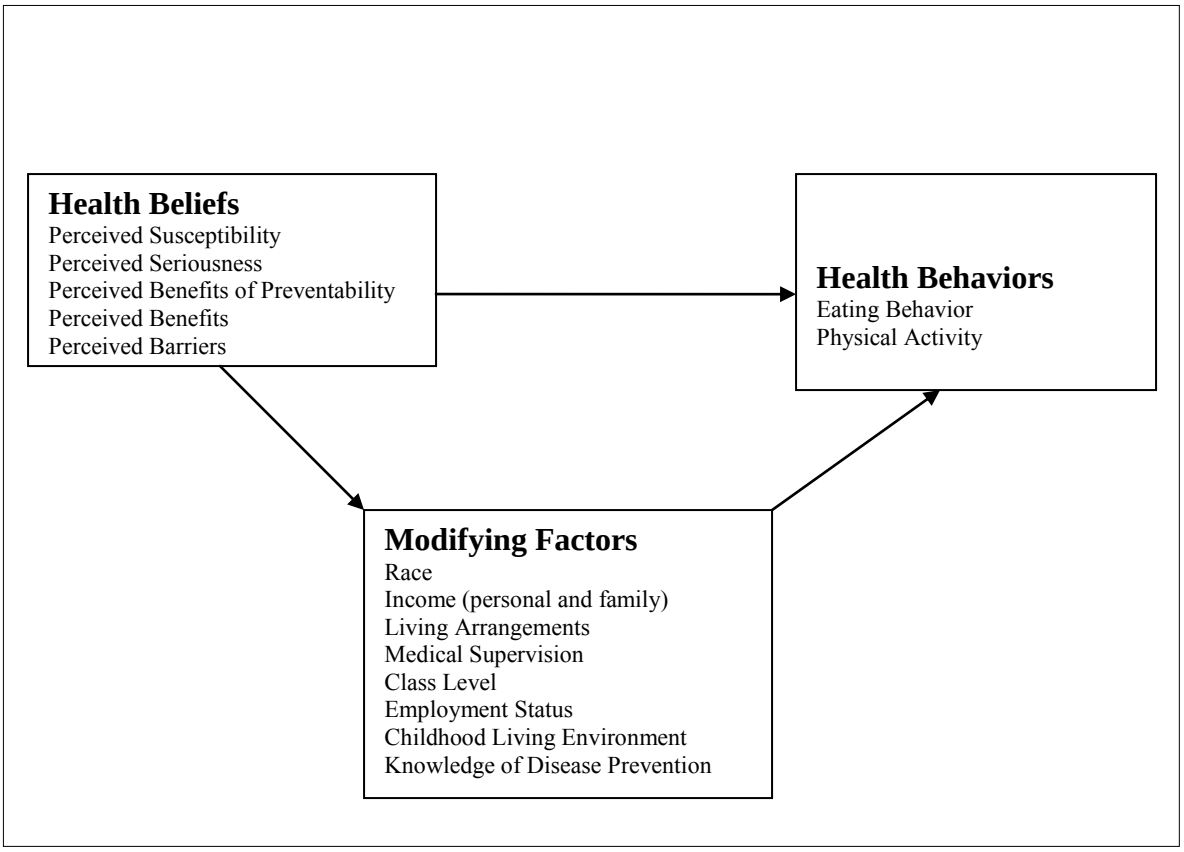

Figure 2 Planned Multiple Regression Analysis

3.5.4 Qualitative Data Analysis

Data from the Nominal Group Technique (NGT) focus groups were analyzed to identify factors in addition to health beliefs that contribute to healthy lifestyle behaviors in a population of college women. Scoring cards, which the participants utilize to prioritize factors affecting their health behavior decisions, were collected and the scores for identified factors were calculated. The numerical values the participants recorded on the scoring cards during the nominal group process were summed for each scored factor. The factors were rank ordered with the highest score considered the most predominant factor.

Validity and reliability of the qualitative data were assured by the following strategies. Poster sheets from flip charts recording all the identified factors were reviewed for accuracy and theme identification and saved for more in depth analysis in the future. Content from focus group audiotapes was reviewed to validate accuracy of the identified factors and also saved for transcription and more in depth analysis of recurrent themes and patterns in the future. An audit trail was maintained.

4.0 RESULTS

4.1 SAMPLE DESCRIPTION

The setting for this research was a university in Pittsburgh, PA. The university has a total of approximately 1,600 undergraduate students, 95% of whom are women. Eighty percent of the students are Caucasian with the remainder of the student population being predominantly Black non-Hispanic. The racial distribution of the student body is representative of the racial distribution of the greater Pittsburgh area. While the university undergraduate student age range is 17 to 65, the majority of the undergraduate students are between the ages of 18 to 25. The racial demographics of the sample are similar to the targeted population, with 84% Caucasian, 16% Non-Caucasian (Table 11). All of the sample participants were females between the ages of 18 and 25 by study design.

One hundred and ninety six potential participants were recruited, consented, and enrolled. A total of 110 completed data sets were collected, which represents a 56% completion rate. Of the 110 participants, one was found to be ineligible due to age requirements during data analysis. Thus, a sample of 109 was analyzed. Some of the participants chose not to complete all of the portions of the questionnaire data; however, a sample of at least 105 was achieved for each variable. All pairwise comparisons had an $n > 100$. Figure 3 summarizes the subject recruitment.

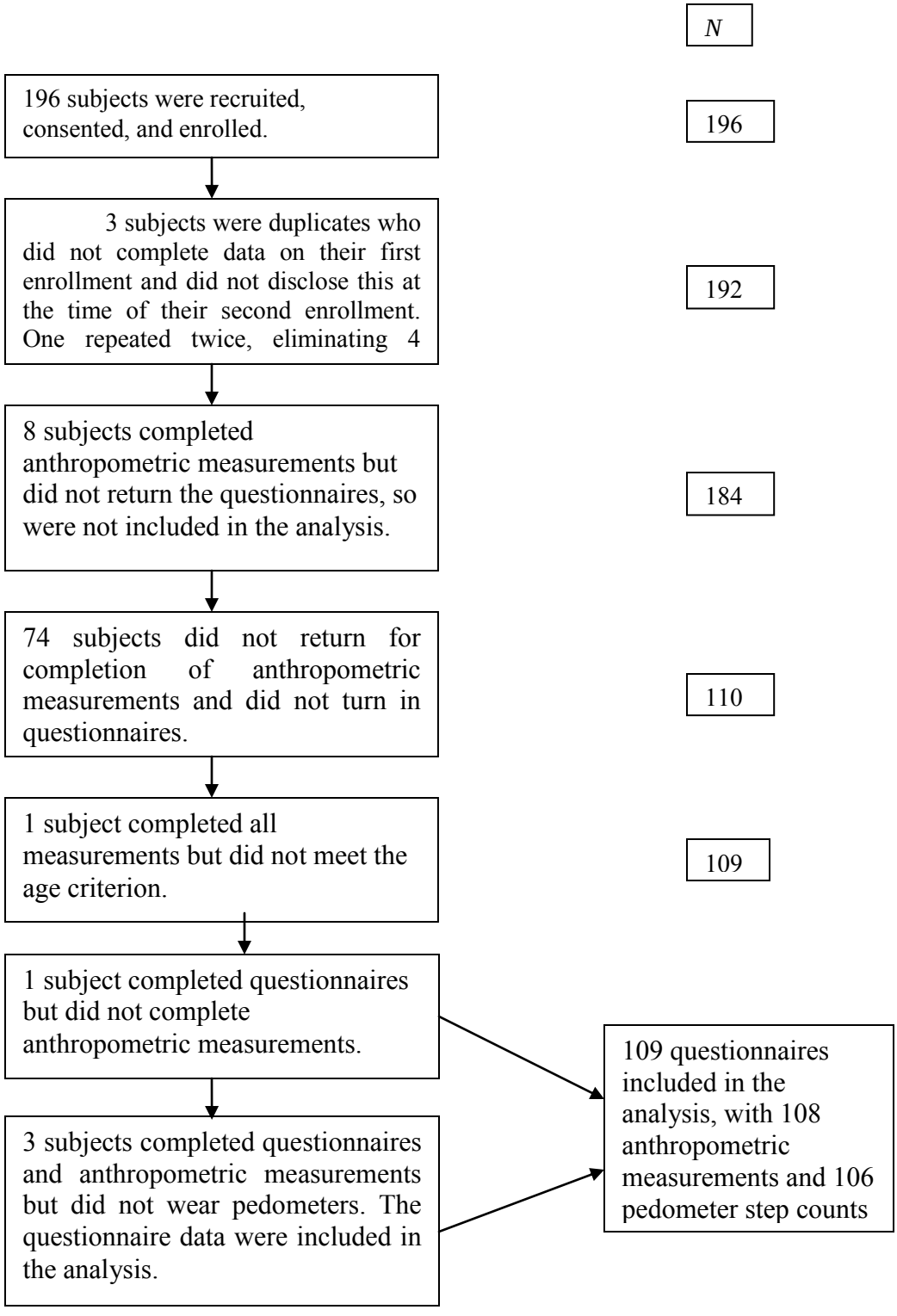

Figure 3 Recruitment Flow Chart

An interim analysis of the data collected from the 109 valid participants suggests that an adequate sample size was obtained. One hundred subjects is sufficient to detect a difference between the null hypothesis of no relationship and the alternative hypothesis of a correlation of $r = 0.20$. An r of 0.30 - 0.50 or more is considered a moderate effect size by Cohen (1987). A moderate effect size is acceptable since the expected relationships are based on a well established theory; thus, one would expect the effects to be readily observable.

Since the HBM proposes that demographic, psychosocial factors, experiential factors, and personal experience can modify perceived threat of disease, data about living conditions and socioeconomic status were collected. The overwhelming majority of students were undergraduates (n=106, 99%) and over half of the students lived on campus in the dorms (n=59, 55%). Approximately half of the students were raised in a suburban setting (n=51, 49%), 20% (n=21) in an urban setting, and 31% (n=32) in a rural setting. Most of the students had personal annual incomes less than $10,000 ($n$=81, 75%), skewing the distribution of the variable; however, reported parental income was more normally distributed. Many participants did not know or did not report their parents' income status (n=34, 32%).

Table 11 Demographic Characteristics

Characteristic	Total *N*=109
Caucasian [*n* (%)]	92 (84)
Age years [*M* (*SD*)]	19.8 (1.5)
Class Level[a] [*n* (%)]	
Freshman	41 (38.3)
Sophomore	10 (9.3)
Junior	39 (36.4)
Senior	16 (15.0)
Graduate	1 (0.9)
Annual Parental Income[b] [*n* (%)]	
< $10,000	4 (3.7)
$10,000 to $20,000	4 (3.7)
$20,000 to $30,000	11 (10.2)
$30,000 to $40,000	11 (10.2)
$40,000 to $50,000	10 (9.3)
> $50,000	34 (31.5)
Unknown	34 (31.5)
Living Arrangements[a] [*n* (%)]	
Dorms	59 (55.1)
Off campus student	23 (21.5)
Off campus family	17 (15.9)
Other	8 (7.5)
Childhood Living Environment[c] [*n* (%)]	
Urban	21 (20.2)
Suburban	51 (49.0)
Rural	32 (30.8)
Employed[a] [*n* (%)]	83 (77.6)
Has Children[a] [*n* (%)]	3 (2.8)

Note. [a]Missing *n*=2; [b]Missing *n*=1; [c]Missing *n*=5.

Individual health status is also likely to modify health beliefs. General data about diseases requiring medication or treatment more than five times per month as well as the diagnosed presence of any of the chronic disease states used in the HBQ-R were also elicited. Table 12 summarized these health related characteristics. One-fifth (*n*=21, 19.4%) reported having a condition requiring medications more than five times per month or requiring health care provider visits more than one time per year, creating the variable of frequent medical supervision. Only two participants reported a diagnosis with one of the chronic disease states specified in this study.

Table 12 Health Related Characteristics

Characteristic	Frequency
Frequent Medical Supervision[a] [*n* (%)]	
Yes	21 (19.4)
No	87 (80.6)
Presence of Chronic Disease[a] [*n* (%)]	
Diabetes	1 (0.9)
Cardiovascular Disease	1 (0.9)
None	106 (98.2)

Note. [a]Missing *n*=1.

4.2 VALIDATION OF MEASUREMENT TOOLS

Correlations between the subjective measures from the questionnaires and the associated objective measures of eating behavior and physical activity were performed to validate the subjective measures. Participants' reported levels of eating behavior (MEDFICTS and HPLP II Nutrition subscale) and their objectively measured BMI and waist circumference were compared. The subjective measures of the Physical Activity subscale of the HPLP II and the MAQ Questionnaire were compared with the objective measure of mean pedometer steps.

Examination of the eating behavior measures demonstrates that the MEDFICTS score was negatively correlated with the HPLP II Nutrition subscale score (r=-.297, p=.002). Significant negative relationships were also present between HPLP II Nutrition subscale score and BMI (r=-.244, p=.011), and between HPLP II Nutrition subscale score and waist circumference (r=-.253, p=.008). The MEDFICTS was not significantly correlated with BMI or waist circumference. The detailed results of this analysis are summarized in Table 13.

Table 13 Correlations Between Eating Behaviors

		HPLP II Nutrition	MEDFICTS	BMI
MEDFICTS	*r*	**-.297**		
	p	**.002**		
BMI	*r*	**-.244**	.041	
	p	**.011**	.672	
Waist Circumference (cm)	*r*	**-.253**	.057	**.942**
	p	**.008**	.561	**<.001**

Note. BMI=Body Mass Index.

The correlations between the physical activity measures demonstrates that the HPLP II Physical Activity subscale was correlated with pedometer step counts (r=.372, p<.001), the average hours per week spent in leisure time activity in the past year measured by the MAQ (r=.462, p<.001), and the average total active hours per week in the past year reported in the MAQ (r= .291, p =.002). The high level of correlation between the MAQ leisure hours and the MAQ total hours (r=.565, p<.001) is expected since the MAQ leisure hours are contained within MAQ total hours measurement; therefore, the measures should have a high level of covariance. A summary of the correlations between physical activity measures is found in Table 14.

Table 14 Correlations Between Physical Activity Measures

		HPLP II Physical Activity	MAQ Leisure Activity Hrs/Wk	MAQ Total Activity Hrs/Wk
MAQ Leisure Hrs/Wk	*r*	**.462**		
	p	**<.001**		
MAQ Total Activity Hrs/Wk	*r*	**.291**	**.565**	
	p	**.002**	**<.001**	
Mean Pedometer Steps	*r*	**.372**	.104	.192
	p	**<.001**	.290	.051

Note. MAQ=Modifiable Activity Questionnaire.

4.3 ANALYSIS OF AIMS, HYPOTHESES, AND RESEARCH QUESTION

4.3.1 Description of Health Beliefs and Health Behaviors

Specific Aim 1, to describe the health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers) and health behaviors (eating behavior and physical

activity) in college women is answered by examination of descriptive statistics of the scales used to measure health beliefs and health behaviors.

4.3.1.1 Health Beliefs Descriptions

Health beliefs reported by participants are summarized in Table 15. All of the scales with the exception of the Exercise Benefits scale were normally distributed, having skewness and kurtosis values below 1. The Exercise Benefits scale score was kurtotic with a value of 1.923. This value indicates a distribution curve that is more highly peaked than expected with a normal distribution and is related to one score of 107, which was reevaluated and found to be a valid score.

Table 15 Descriptive Statistics of Health Beliefs

	HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Diet Benefits	Diet Barriers	Exercise Benefits	Exercise Barriers
N	105	105	105	109	109	109	109
Mean	11.4381	10.6190	13.2190	4.9908	51.7064	53.0550	27.1101
Median	12.0000	11.0000	14.0000	5.0000	53.0000	53.0000	27.0000
Mode	12.00	13.00	15.00	4.00	54.00(a)	53.00(a)	28.00
Std. Deviation	3.02529	3.87889	2.71031	1.84338	20.74327	12.56084	5.68354
Skewness	-.287	.125	-.230	.158	.231	.589	.286
Kurtosis	.015	-.560	.278	-.167	.125	**1.923**	.483
Minimum	4	4	6	0	0	30	15
Maximum	18	19	20	10	96	107	47
Maximum Possible	20	20	20	10	96	116	56

Note. a=multiple modes exist, the smallest value is reported.

The health belief relationships measured by the HBQ-R subscales and the Diet and Exercise Benefits and Barriers subscales are reported in Table 16. Significant relationships were demonstrated between Perceived Susceptibility and Perceived Seriousness (r=.493, p<.001) and between Perceived Susceptibility and Exercise Benefits (r=.247, p=.011), Diet Benefits and Exercise Barriers (r=.350, p<.001), and Exercise Benefits and Perceived Benefits of Preventability (r=-.207, p=.034), Diet Benefits (r=.436, p<.001), and Exercise Barriers (r=.572, p<.001). Perceived Seriousness and Diet Barriers showed no significant relationships with any of the other health belief variables.

Table 16 Correlations Between Health Beliefs

		HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Diet Benefits	Diet Barriers	Exercise Benefits
HBQ-R Seriousness	*r*	**.493**					
	p	**<.001**					
HBQ-R Benefits of Preventability	*r*	-.146	.009				
	p	.139	.924				
Diet Benefits	*r*	.079	.044	-.072			
	p	.426	.658	.468			
Diet Barriers	*r*	-.063	.042	.136	.112		
	p	.521	.673	.167	.247		
Exercise Benefits	*r*	**.247**	.037	**-.207**	**.436**	.001	
	p	**.011**	.706	**.034**	**<.001**	.988	
Exercise Barriers	*r*	.139	.032	-.147	**.350**	.170	**.572**
	p	.156	.745	.134	**<.001**	.077	**<.001**

4.3.1.2 Health Behavior Descriptions

Descriptive statistics of the scales used to measure eating behavior are summarized in Table 17. The distribution curves of BMI and waist circumference are depicted in Figures 4 and 5. The distributions of both of these variables were both skewed and kurtotoic due to a few participants with very high values.

Table 17 Descriptive Statistics of Eating Behavior

	HPLP II Nutrition	MEDFICTS	BMI	Waist Circumference (cm)
N	109	108	108	108
Mean	22.7798	48.4444	25.1701	79.4000
Median	23.0000	45.0000	23.2750	74.9000
Mode	24.00	30.00	23.06	73.00(a)
Std. Deviation	5.00991	25.84799	7.00639	15.54355
Skewness	-.041	.363	**2.004**	**2.062**
Kurtosis	-.043	-.404	**4.827**	**5.792**
Minimum	9.00	.00	16.30	58.50
Maximum	34.00	115.00	53.64	150.00
Maximum Possible	36	NA	NA	NA

Note. a=multiple modes exist, the smallest mode is reported; NA=Not Applicable.

The current recommendation for the general public is to limit dietary fat to 30% of caloric intake. A score of 70 or less on the MEDFICTS is indicative of a dietary intake consistent with a 30% or lower fat intake. The majority of the participants, 78%, reported a diet consistent with this goal, with 22% reporting diets containing greater than recommended amounts of fats. A waist circumference greater than 35 inches or 88 cm in women is considered a risk factor for diabetes and CVD. The majority of participants, 82 %, had a waist circumference less than 35 inches or 88 cm, which means 18% were considered at risk.

A BMI of 25 or greater is considered a risk factor for diabetes and CVD. Over one-third (35.1%) of the participants had a BMI of 25 or greater indicating an increased risk for diabetes and CVD. Distribution of BMI by category is presented in Table 18 and illustrated in Figure 5.

Table 18 BMI by Category

BMI	*n* (%)
Underweight - < 18.5	8 (7.4%)
Normal weight - 18.5-24.9	62 (57.4%)
Overweight - 25.0-29.9	21 (19.4%)
Obesity - BMI of 30.0 or greater	17 (15.7%)

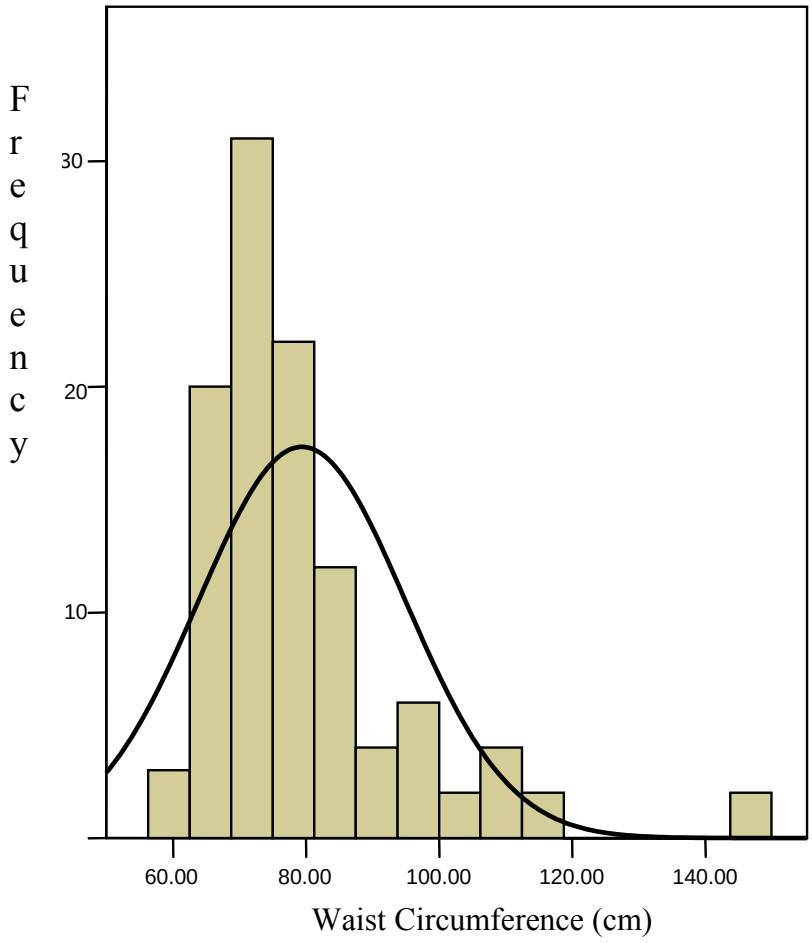

Figure 4 Waist Circumference Distribution

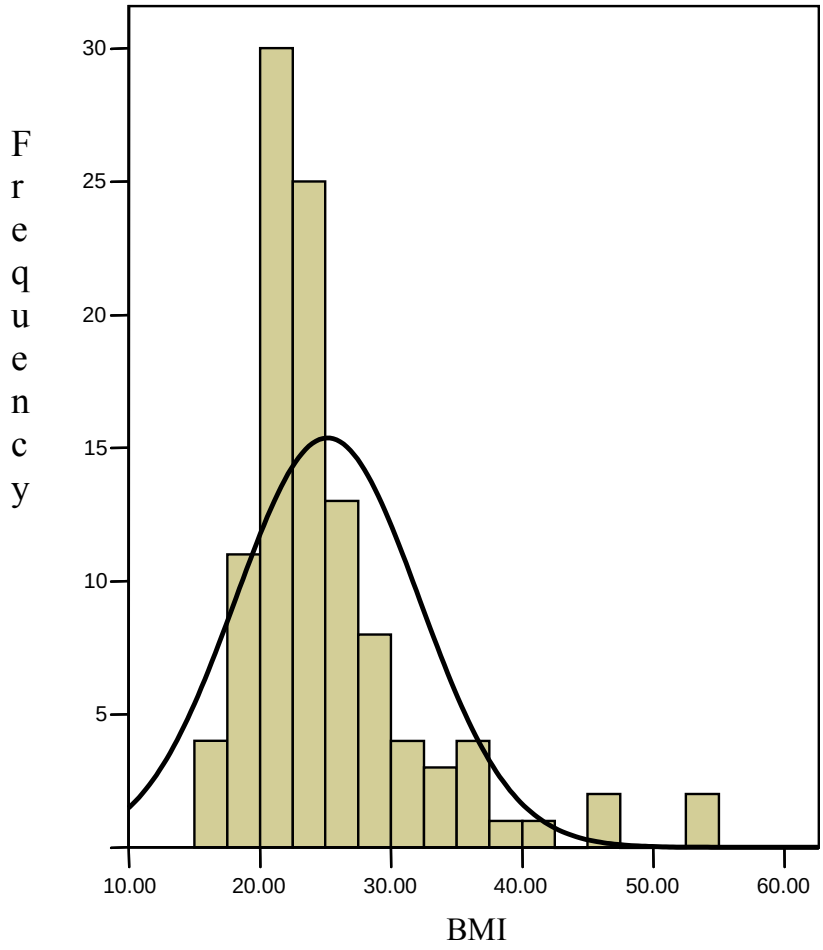

Figure 5 BMI Distribution

A summary of the descriptive statistics of physical activity measurements are presented in Table 19. The HPLP II Physical Activity subscale scores and the MAQ Total Activity hrs/wk demonstrate a normal distribution with both skewness and kurtosis values below 1. The distribution of MAQ Active Job hrs/wk was skewed due to one-third of the participants having either no employment or inactive jobs giving a value of 0 (*n*=37, 34%). The mean pedometer steps and MAQ Leisure Activity hrs/wk measure were both skewed and kurtotoic. The

distribution of mean pedometer steps is shown in Figure 6. The distribution of MAQ Leisure Activity hrs/wk is shown in Figure 7. Since the assumption of normality was not met for these variables, Spearman's *rho* correlation coefficients are reported for these variables. The MAQ Total Activity hrs/wk is more normally distributed with both skewness and kurtosis values falling below 1.0. The distribution of the MAQ Total Activity hrs/wk is shown in Figure 8.

Table 19 Descriptive Statistics of Physical Activity Behaviors

	HPLP II Physical Activity	MAQ Active Job Hrs/Wk	MAQ Leisure Activity Hrs/Wk	MAQ Total Activity Hrs/Wk	Mean Pedometer Steps
N	109	107	108	107	106
Mean	19.4954	11.7542	7.1761	18.7725	8594.1038
Median	18.0000	9.0000	3.7308	15.7750	8402.4286
Mode	13.00(a)	.00	.00	.00	2884.43(a)
Std. Deviation	6.08676	12.99851	9.53313	15.76214	3606.94926
Skewness	.410	**1.130**	**2.442**	.840	**1.170**
Kurtosis	-.848	.820	**7.190**	.018	**2.207**
Minimum	9.00	.00	.00	.00	2884.43
Maximum	32.00	53.30	55.48	58.63	22436.29
Maximum Possible	32	NA	NA	NA	NA

Note a=multiple modes exist, the smallest value is reported; NA = Not Applicable.

The recommended number of steps per day is 10,000; 72% of the participants fell below this recommended number of steps. The recommended amount of moderate intensity physical

activity is 150 minutes per week, which is 2.5 hours. Using MAQ Leisure Activity hrs/wk as a measurement of physical activity; 39% of the participants in this study did not meet this recommended level of physical activity. If the MAQ Total Activity hrs/wk, which also includes Active Job hrs/wk is used, 16% of the participants still did not meet this recommended level of physical activity.

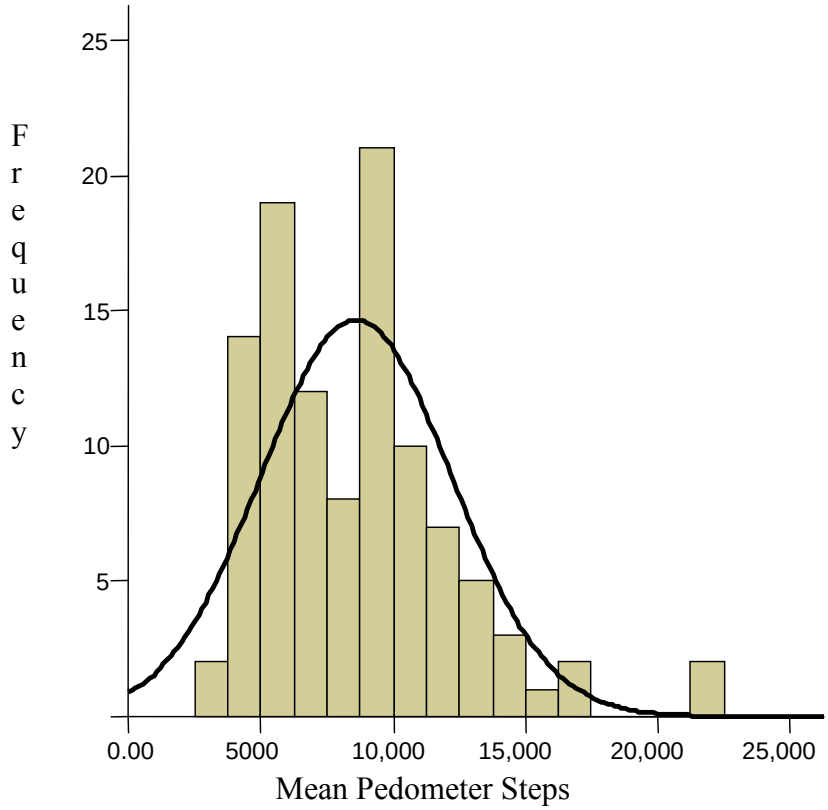

Figure 6 Mean Pedometer Steps Distribution

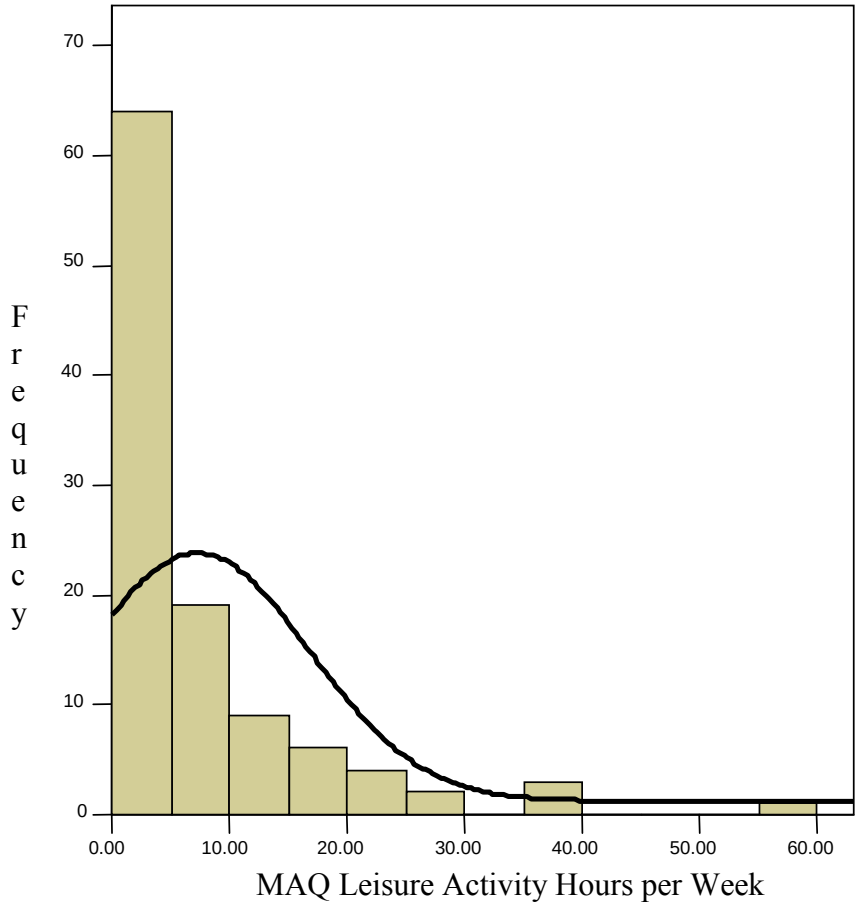

Figure 7 MAQ Leisure Activity Hours per Week Distribution

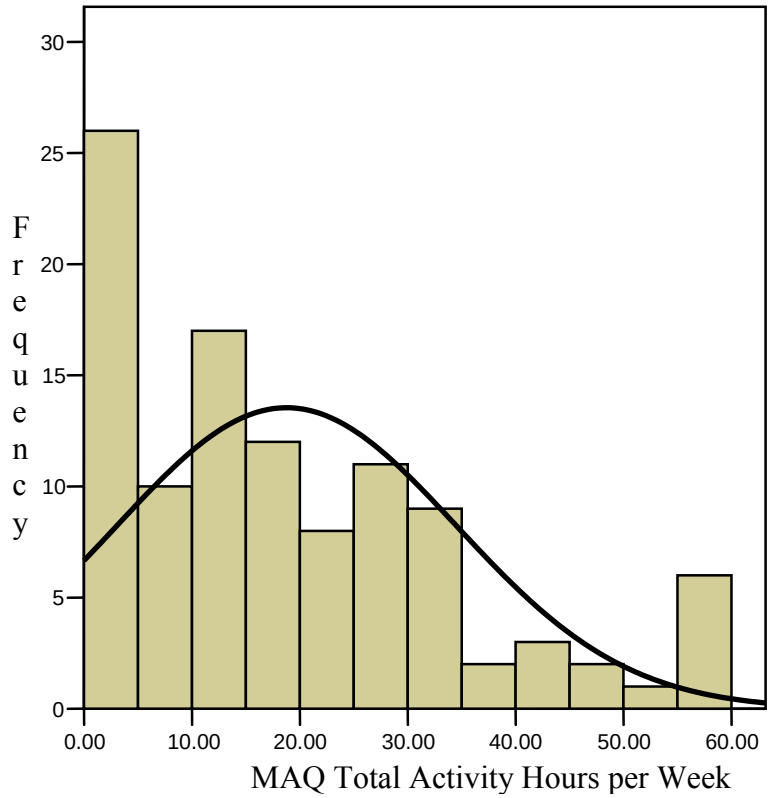

Figure 8 MAQ Total Activity Hours per Week

4.3.2 Research Hypotheses

4.3.2.1 Hypothesis 1

Testing Hypothesis 1, Health beliefs are related to health behaviors in a population of college women, also addresses Specific Aim 2, to examine the relationship between health beliefs and health behaviors in college women. The hypothesis was tested using bivariate correlations. The

relationships between health beliefs and eating behavior as well as health beliefs and physical activity are reported.

To examine the relationships between health beliefs and eating behavior, correlations were performed between scores on the HBQ-R subscales (Perceived Susceptibility, Perceived Severity, and Perceived Benefits of Preventability), the Healthy Diet Benefits Scale, and the Healthy Diet Barriers Scale, and scores from the HPLP II Nutrition subscale, MEDFICTS, BMI, and waist circumference. Results are summarized in Table 20. Statistically significant relationships were found between Diet Benefits and all of the eating behavior measures. Also, there were statistically significant relationships between Diet Barriers and BMI and waist circumference. No statistically significant relationships were found between the three HBQ-R subscales and the eating behavior measures.

Table 20 Correlations Between Health Beliefs and Eating Behaviors

		Health Beliefs				
Eating Behavior Measure		HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Diet Benefits	Diet Barriers
HPLP II Nutrition	*r*	-.186	-.054	.103	**-.378**	-.138
	p	.058	.586	.297	**<.001**	.151
MEDFICTS	*r*	.034	.126	-.105	**.256**	.181
	p	.733	.203	.288	**.008**	.061
BMI	*r*	.065	.026	-.031	**.189**	**.196**
	p	.512	.791	.755	**.050**	**.042**
Waist Circumference (cm)	*r*	.044	.056	-.030	**.200**	**.238**
	p	.655	.571	.764	**.038**	**.013**

To examine the relationships between health beliefs and physical activity, bivariate correlations were performed between the scores on the HBQ-R subscales (Perceived Susceptibility, Perceived Severity, and Perceived Benefits of Preventability), the Exercise Benefits subscale and the Exercise Barriers subscale, and the HPLP II Physical Activity subscale, MAQ Total Activity hrs/wk in the past year, MAQ Leisure Activity hrs/wk, and mean pedometer steps measured by electronic digital pedometers. Results of this analysis are summarized in Table 21. Statistically significant correlations were found between all of the physical activity measures and both Exercise Benefits and Exercise Barriers. Additional significant correlations were also found between Leisure Activity hrs/wk and Perceived Susceptibility (r=-.234, p=.017), and Leisure Activity hrs/wk and Perceived Seriousness (r=-.203, p=.039). There were no significant correlations between Perceived Benefits of Preventability and the physical activity measures.

Table 21 Correlations Between Health Beliefs and Physical Activity Measures

Physical Activity Measure		Health Beliefs				
		HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Exercise Benefits	Exercise Barriers
HPLP II Physical Activity	*r*	-.172	-.079	.077	**-.607**	**-.542**
	p	.079	.424	.436	**<.001**	**<.001**
Mean Pedometer Steps	*r*	-.132	.018	.101	**-.256**	**-.242**
	p	.187	.855	.311	**.008**	**.012**
MAQ Leisure Activity Hrs/Wk	*r*	**-.234**	**-.203**	.016	**-.315**	**-.278**
	p	**.017**	**.039**	.874	**.001**	**.004**
MAQ Total Activity Hrs/Wk	*r*	-.079	.001	.071	**-.345**	**-.296**
	p	.428	.989	.476	**.000**	**.002**

4.3.2.2 Hypothesis 2

Testing Hypothesis 2, Modifying factors are related to health beliefs in a population of college women, also answers Specific Aim 3, to examine the relationship between modifying factors (sociodemographic factors and knowledge) and health beliefs in college women.

The examination of the relationships between modifying factors and health beliefs was performed using correlations. Scatter plots revealed the absence of non-linear relationships. Distribution statistics of the variables were used to examine the conformity of the data with the underlying assumption of normality for the statistical tests. Since high skewness and kurtosis

were evident, the more conservative, Spearman's *rho* correlation was used to examine the relationships. The descriptive statistics of the scalable modifying factors are found in Table 22.

Table 22 Descriptive Statistics of Scalable Modifying Factors

	Age	Class Level	Employment Status	Personal Income	Parental Income
N	109	107	107	107	108
Mean	19.8073	2.3084	3.0187	1.8505	5.3796
Median	20.0000	3.0000	3.0000	1.0000	6.0000
Mode	18.00	1.00	3.00	1.00	6.00
Std. Deviation	1.54846	1.16077	1.42074	1.91224	1.70056
Skewness	.893	.109	-.114	**2.214**	-.998
Kurtosis	**1.096**	**-1.367**	**-1.264**	**3.278**	.017
Minimum	18.00	1.00	1.00	1.00	1.00
Maximum	25.00	5.00	5.00	7.00	7.00

Since the variable, Personal Income, was both highly skewed and kurtotic, the variable of Parental Income, which is more normally distributed, was used to signify income level in the final analysis. Parental Income may in fact be more representative of the income level experience by the participants since it is common for students between the ages of 18 to 25 to be supported at least in part by their parents during their college experience. The kurtosis that is present in Age, Class Level, and Employment Status is most likely related to the limited age range of the sample, making it more homogeneous than a typical normally distributed sample.

The Spearman's correlation coefficients between modifying factors and health beliefs are summarized in Table 23. A significant correlation was found between the modifying factor, Medical Supervision, and the health belief, Perceived Susceptibility (r=-.286, p=.003). The modifying factors of Race (r=.235, p=.014), Class Level (r=-.253, p=.009), Parental Income (r=-257, p=.007) and Knowledge (r=-.236, p=.018) were significantly related to the health belief,

Diet Benefits. The modifying factors of Parental Income and Medical Supervision were significantly related to the health belief of Exercise Barriers (r=-.224, p=.020 and r=-.204, p=.034, respectively). The modifying factor of Knowledge is also related to the health beliefs of Benefits of Preventability (r=.348, p<.001) and Exercise Benefits (r=-.227, p=.023).

Table 23 Correlations Between Modifying Factors and Health Beliefs

		Health Beliefs						
Modifying Factor		HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Diet Benefit	Diet Barriers	Exercise Benefits	Exercise Barriers
Race	*r*	-.147	-.074	-.053	**.235**	-.003	.026	.097
	p	.134	.455	.592	**.014**	.974	.787	.314
Class Level	*r*	.119	.003	.073	**-.253**	-.038	-.018	-.006
	p	.228	.973	.459	**.009**	.695	.854	.949
Employment Status	*r*	.108	.012	.021	-.065	.060	.108	-.001
	p	.276	.904	.830	.507	.540	.267	.994
Parental Income	*r*	.014	-.050	.020	**-.257**	-.128	-.121	**-.224**
	p	.885	.616	.842	**.007**	.185	.211	**.020**
Medical Supervision	*r*	**-.286**	-.045	-.186	.001	-.065	-.172	**-.204**
	p	**.003**	.652	.058	.997	.507	.076	**.034**
Chronic Disease	*r*	.129	.104	.042	-.041	-.090	.005	-.003
	p	.191	.289	.667	.675	.353	.958	.976
Knowledge	*r*	-.026	-.094	**.348**	**-.236**	-.022	**-.227**	-.188
	p	.800	.351	**<.001**	**.018**	.825	**.023**	.060

The variable of Childhood Living Environment was not significant when analyzed as a single nominal variable; however, when the categories within that variable were analyzed individually, using dummy coding indicator variables, there were significant findings. The health belief, Diet Barriers, was correlated with the urban childhood living situation (r=.268, p=.006)

and suburban childhood living situation (r=-.219, p=.026). Results of this analysis are summarized in Table 24.

Table 24Correlations Between Childhood Living Environment and Health Beliefs

Childhood Living Environment		Health Beliefs						
		HBQ-R Susceptibility	HBQ-R Seriousness	HBQ-R Benefits of Preventability	Diet Benefits	Diet Barriers	Exercise Benefits	Exercise Barriers
Rural	*r*	-.028	-.041	-.076	.089	-.004	.081	.027
	p	.777	.685	.450	.368	.967	.416	.782
Urban	*r*	-.098	-.089	.044	.072	**.268**	.085	.165
	p	.328	.372	.664	.469	**.006**	.389	.095
Suburban	*r*	.053	.035	-.105	.025	**-.219**	.006	-.107
	p	.597	.729	.295	.803	**.026**	.954	.280

The modifying factors with data at the nominal level, or those with readily identifiable cut points, were evaluated using *t*-tests to identify differences in mean health beliefs between levels of the modifying factors. A summary of these results is found in Table 25. Statistically significant differences were found for Diet Benefits by Race. Statistically significant differences were found for Perceived Susceptibility, Perceived Benefits of Preventability, and Exercise Barriers with the presence of Medical Supervision. Statistically significant differences were found for Diet Benefits, Exercise Benefits, and Exercise Barriers by Parental Income using a cut point of $30,000.

Table 25 *t*-tests of Differences in Mean Health Beliefs for Dichotomous Modifying Factors

Health Beliefs	Modifying Factor: Race		Modifying Factor: Medical Supervision		Modifying Factor: Parental Income (Cut Point $30,000)	
	t	*p*	*t*	*P*	*t*	*p*
HBQ-R Susceptibility	1.810	.073	**2.815**	**.006**	.444	.658
HBQ-R Seriousness	.649	.518	.439	.662	.115	.909
HBQ-R Benefits of Preventability	.460	.646	**2.285**	**.027**	-.825	.411
Diet Benefits	**-2.517**	**.013**	.030	.976	**-3.133**	**.002**
Diet Barriers	-.596	.552	1.096	.428	-.180	.857
Exercise Benefits	.124	.901	2.494	.067	**-2.237**	**.027**
Exercise Barriers	-1.264	.209	**2.233**	**.028**	**-2.736**	**.007**

An analysis of variance test was performed to evaluate differences in mean health beliefs by Employment Status. Statistically significant differences in Exercise Benefits were found by Employment Status. The remainder of the health belief variables showed no statistically significant differences by Employment Status. Detailed results of this analysis are summarized in Table 26.

Table 26 ANOVA of Differences in Mean Health Beliefs by Employment Status

Health Beliefs		Sum of Squares	df	Mean Square	*F*	Sig.
HBQ-R Susceptibility	Between Groups	35.655	4	8.914	.965	.430
	Within Groups	914.104	99	9.233		
	Total	949.760	103			
HBQ-R Seriousness	Between Groups	30.387	4	7.597	.491	.742
	Within Groups	1531.728	99	15.472		
	Total	1562.115	103			
HBQ-R Benefits of Preventability	Between Groups	51.065	4	12.766	1.785	.138
	Within Groups	707.925	99	7.151		
	Total	758.990	103			
Diet Benefits	Between Groups	12.670	4	3.168	.985	.419
	Within Groups	328.096	102	3.217		
	Total	340.766	106			
Diet Barriers	Between Groups	532.216	4	133.054	.314	.868
	Within Groups	43240.046	102	423.922		
	Total	43772.262	106			
Exercise Benefits	Between Groups	1853.742	4	463.436	**3.221**	**.016**
	Within Groups	14676.688	102	143.889		
	Total	16530.430	106			
Exercise Barriers	Between Groups	28.873	4	7.218	.219	.927
	Within Groups	3356.005	102	32.902		
	Total	3384.879	106			

Post hoc testing of Exercise Benefits scores using least squares difference demonstrates significant differences between individuals working > 20 hours per week (*M*=60.9) and individuals working ≤ 5, 6-10, and 11-20 hours per week [mean scores of 48.6 (*p*=.04), 51.9 (*p*=.014), and 49.8 (*p*=.033)]. There was not, however, a significant difference between individuals working 20 or more hours per week and individuals who were not employed

(M=54.7, p>.05). Individuals who worked 20 or more hours per week as well as individuals who were unemployed scored lower on the Exercise Benefits scale than the other three groups.

4.3.2.3 Hypothesis 3

Hypothesis 3, Modifying factors (sociodemographic factors and knowledge) moderate the relationship between health beliefs and health behaviors in a population of college women, was analyzed using linear regression. This analysis also addresses Specific Aim 4, to determine if modifying factors moderate the relationship between health beliefs and health behaviors in college women.

The following direct and indirect effects were examined in this hypothesis:

- The direct effect of modifying factors (sociodemographic factors and knowledge) on health beliefs (Perceived Susceptibility, Perceived Seriousness, Perceived Benefits, and Perceived Barriers)
- The direct effect of health beliefs (Perceived Susceptibility, Perceived Seriousness, Perceived Benefits, and Perceived Barriers) on health behaviors (Eating Behavior and Physical Activity)
- The indirect effects of modifying factors (sociodemographic factors and knowledge) on the relationship between health beliefs and health behaviors (Eating Behavior and Physical Activity)

The first part of this analysis, the direct effects of modifying factors on health beliefs, was examined using stepwise regression. All of the modifying factors were entered and stepwise analysis was used to identify the best predictive model of modifying factors for each of the health beliefs. A summary of the resulting models is presented in Table 27. No predictive models

resulted between the modifying factors and the health beliefs of Perceived Seriousness and Diet Barriers.

Table 27 Direct Effects of Modifying Factors on Health Beliefs

Health Belief	Modifying Factors in Predictive Model	R^2	R^2 Change	Sig *F* Change	Model Significance
HBQ-R Susceptibility	Medical Supervision	.074	.074	.006	.006
HBQ-R Seriousness	No significant predictive variables				
HBQ-R Benefits of Preventability	Knowledge Score	.121	.121	<.001	<.001
Diet Benefits	Class Level	.093	.093	.002	.002
	Parental Income	.165	.072	.004	<.001
	Knowledge Score	.210	.044	.021	<.001
Diet Barriers	No significant predictive variables				
Exercise Benefits	Medical Supervision	.052	.052	.021	.021
	Knowledge Score	.123	.105	.070	.006
Exercise Barriers	Parental Income	.067	.067	.009	.009
	Knowledge Score	.108	.041	.035	.003
	Medical Supervision	.150	.042	.031	.001

Part two of this hypothesis, the direct effects of health beliefs on health behaviors, was evaluated using multiple regression analysis to identify models of health beliefs that independently predict health behaviors. Initially, separate simple regression models were run for the variables used to measure eating behavior, as measured by the HPLP II Nutrition subscale, and physical activity, as measured by the HPLP II Physical Activity subscale. Variables that were at least marginally significantly (p<.10) related to each other in the simple regression

analyses were considered for entry into forward, backward. and stepwise multiple regression models. Stepwise regression resulted in the best predictive models of the direct effects; thus, these models are reported. This finding is consistent with recommendations by Mertler and Vannetta (2005) advocating stepwise regression for exploratory analysis where the researcher wants to identify which independent variables make meaningful contributions to the overall prediction of a dependant variable.

The regression analysis examining the direct effects of health beliefs on eating behavior is summarized in Table 28. The best predictive model contained Diet Benefits as a significant independent predictor (p<.001), producing an R^2 that accounted for 15.4% of the variance in the HPLP II Nutrition subscale scores. The addition of Perceived Susceptibility into the model did not produce a significant change in the F statistic (p=.086).

Table 28 Health Beliefs Predicting Eating Behavior

Model Variable	Unadjusted			Stepwise Model			
	b	*B*	*p*	*b*	*B*	*p*	R^2 Change
HBQ-R Susceptibility	-.305	-.186	.058				
HBQ-R Seriousness	-.069	-.054	.586				
HBQ-R Benefits of Preventability	.188	.103	.297				
Diet Benefits	-1.028	-.378	<.001	-1.060	-.380	<.001	.154
Diet Barriers	-.033	-.138	.151				

The regression analysis examining the direct effects of health beliefs on physical activity is summarized in Table 29. The model including Exercise Barriers with the addition of Exercise

Benefits was the most predictive, producing an adjusted R^2 total of 0.392. This model accounts for nearly 40% of the variance in the HPLP II Physical Activity subscale scores. The addition of Perceived Susceptibility did not produce a significant change in the model (p=.736).

Table 29 Health Beliefs Predicting Physical Activity

Model Variable	Unadjusted			Stepwise Model			
	b	*B*	*p*	*b*	*B*	*p*	R^2 Change
HBQ-R Susceptibility	-.343	-.172	.079				
HBQ-R Seriousness	-.122	-.079	.424				
HBQ-R Benefits of Preventability	.171	.077	.436				
Exercise Benefits	-.294	-.607	<.001	-.212	-.442	<.001	.044
Exercise Barriers	-.580	-.542	<.001	-.293	-.270	.005	.348

The third part of the hypothesis was analyzed in a two-step process. In the first step, the relationship between health beliefs and health behaviors was established using stepwise regression analysis to determine health beliefs that were at least marginally significantly related to health behaviors (p<.10). This process determined the model of health beliefs producing the best prediction of the health behavior scores (see Tables 28 and 29).

The second step of the analysis, the examination of indirect effects of modifying factors on the relationship between health beliefs and health behaviors, was conducted using the established best fit model then entering the group of modifying factors as a block. The change produced by entering modifying factors as a block into the best fit predictive model between health beliefs and health behaviors identified the indirect effect produced by modifying factors.

The addition of modifying factors increased the amount of variance explained in the relationship between health beliefs and Eating Behavior from 15% to 30%. The addition of modifying factors increased the amount of variance explained in the relationship between health beliefs and Physical Activity from 39% to 49%. The model summaries of these analyses are presented in Figures 9 and 10.

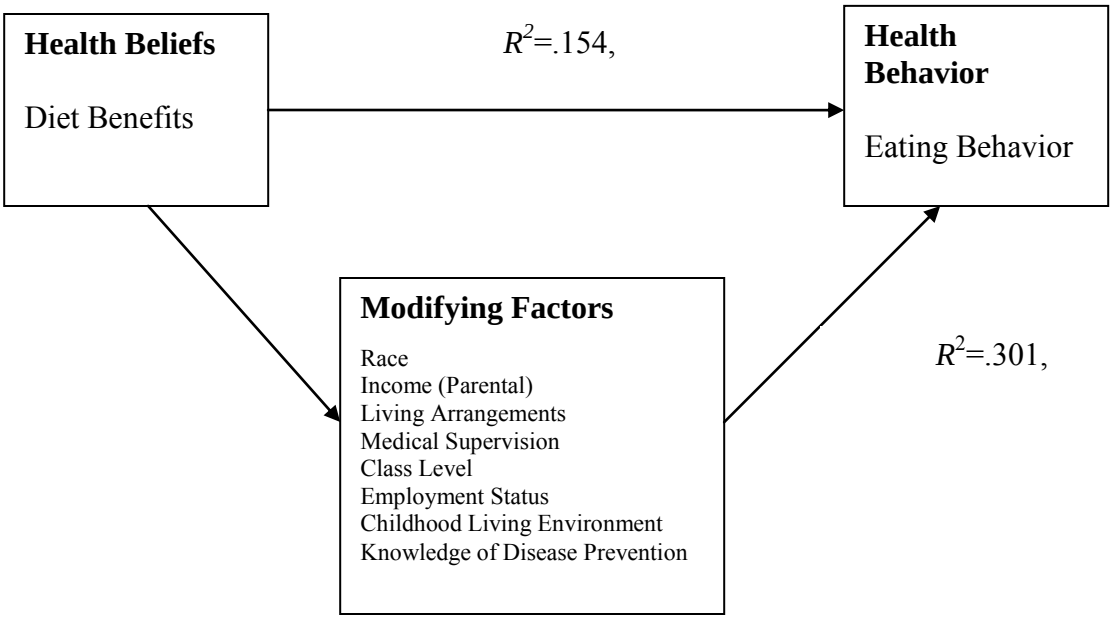

Figure 9 Effects of Modifying Factors on Health Beliefs

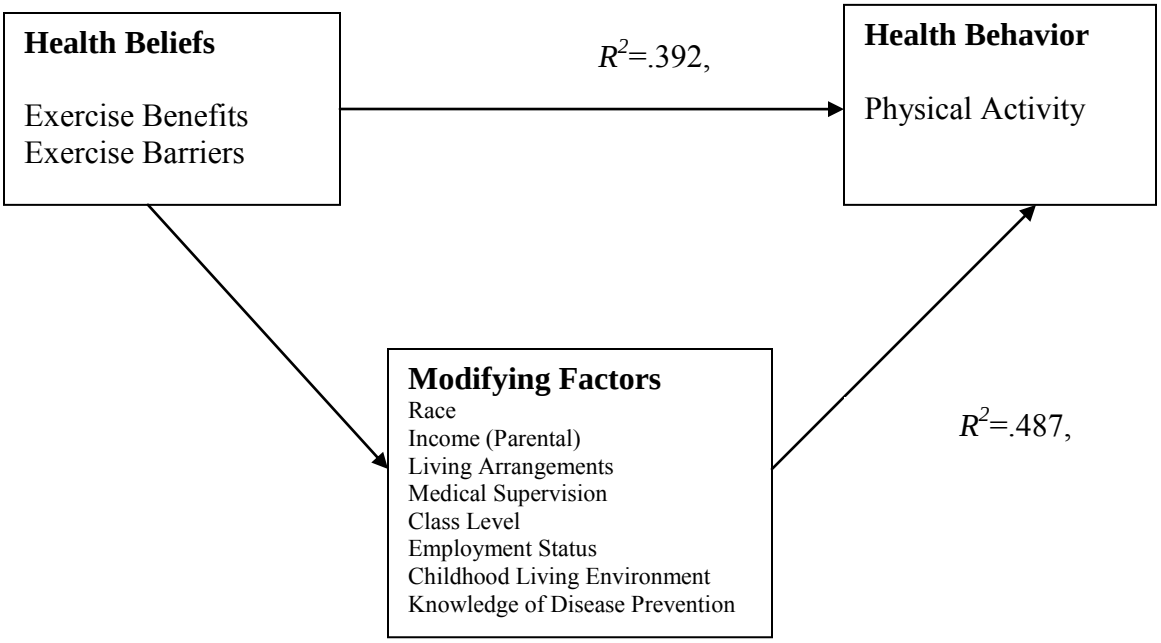

Figure 10 Effects of Modifying Factors on Health Beliefs and Physical Activity

4.4 THE RESEARCH QUESTION

The research question is: What factors in addition to health beliefs contribute to healthy lifestyle behaviors in a population of college women?

Analysis of the qualitative data was done to answer the research question. The results of this analysis also answer Specific Aim 5, to identify factors in addition to health beliefs that contribute to healthy lifestyle behaviors in college women.

4.4.1 Qualitative Results From the HBQ-R

The participants were asked open-ended questions about the factors they used in deciding upon their responses to the three subscales in the HBQ-R. The data were coded into common themes. Table 30 outlines the thematic responses to these open-ended questions. The overwhelming majority of participants (92%) identified family factors, such as family history of disease states, as instrumental in their decisions about their Perceived Susceptibility to chronic diseases. Family factors were also named by about half (52%) of the participants in their decisions about the Perceived Seriousness of the named disease states (CVD, diabetes, cancer, and osteoporosis).

The health behaviors theme was the next most prominent. This theme included qualitative responses, such as exercising, eating, and smoking. The majority of the participants (84%) identified health behaviors as contributing to their decisions about the Perceived Benefits of Preventability of chronic disease states. Over half of the participants (52%) also named health behaviors as a factor in their decisions about their Perceived Susceptibility to chronic diseases. Personal factors included responses, such as "I believe I am a healthy person," "I take care of myself," and "I don't think I am at risk." Knowledge was not a highly prevalent theme in the open-ended questions. The "Other" category was used to code responses that did not fit into the common themes.

Table 30 Reported Factors Affecting Health Beliefs

	Themes *n* (%)				
Health Belief	Family Factors	Personal Factors	Health Behaviors	Knowledge	Other
HBQ-R Susceptibility	99 (92%)	34 (32%)	57 (52%)	6 (6%)	1 (1%)
HBQ-R Seriousness	56 (52%)	36 (33%)	33 (30%)	12 (11%)	19 (18%)
HBQ-R Benefits of Preventability	19 (18%)	15 (14%)	91 (84%)	14 (13%)	6 (6%)

The HBQ-R additionally asks about the participant's source of knowledge regarding disease prevention. The responses to this question were categorized by common themes and are presented in Table 31. The most frequently cited sources of knowledge of disease prevention were school and the media. The category of media included printed materials, such as magazines, brochures, or posters.

Table 31 Source of Knowledge of Disease Prevention

(*N*=107)

Identified Source	*n* (%)
School	59 (55%)
Media	55 (51%)
Family or Friends	46 (43%)
Medical Provider	33 (31%)

4.4.2 Nominal Group Technique Results

In preparation for the Nominal Group Technique focus groups, the upper and lower quartiles of eating behavior and physical activity were identified. It was evident that the majority of individuals that fell into the upper quartiles of the HPLP II Nutrition subscale scores were also in the upper quartiles of HPLP II Physical Activity subscale scores. A similar finding was also evident in the lower quartiles of eating behavior and physical activity. Therefore, those individuals falling into the upper quartiles on both scales (n=14) were invited to a focus group examining factors contributing to eating behavior and physical activity. Likewise, those falling into the lower quartiles on both scales (n=16) were invited to a second focus group examining factors contributing to eating behavior and physical activity. The invitations resulted in eight individuals agreeing to attend the higher eating behavior and physical activity group and seven agreeing to participate in the lower eating behavior and physical activity group. Individuals who declined participation cited distance and availability as their reasons for not participating. At the time of the focus group, only four participants attended for the higher eating behavior and physical activity focus group and only three individuals attended the lower eating behavior and physical activity group. The top 10 prioritized factors are listed in descending order for each question and for each group are summarized in Tables 32 and 33. Among the top 10 factors identified by both the lower and higher eating behavior group are taste, mood, cost, calories, and availability. Among the top 10 factors identified by both the lower and higher physical activity group are motivation, time, and mood.

Table 32 Identifed Factors Contributing to Eating Behaviors

Lower Eating Behavior Score Group	Higher Eating Behavior Score Group
Taste	Fat Content
Mood	Cost
Cost	Calories
On a diet	Availability
Calories	How hungry I feel
Family eating habits	Taste
Location	Sugar content
Smell	Time of day
Availability	Mood
Appearance	Premenstrual syndrome

Table 33 Identified Factors that contribute to Physical Activity

Lower Physical Activity Score Group	Higher Physical Activity Score Group
Medical Advice	Motivation
Motivation	Time
Time	Jeans are too tight
The look I want to achieve	Amount of stress
How I feel	The guy I am dating is fit
Media	What must I do today
Liking the activity	How much I have eaten
Location	Mood
Mood	Weather
Convenience	Someone to work out with

4.5 ANCILLARY ANALYSES

A lower fat diet is also a common disease prevention recommendation (Hu & Willett, 2002; Oh, Hu, Manson, Stampfer, & Willett, 2005). Using a *t*-test, significant differences in mean health beliefs were found between individuals reporting lower fat intake (<30% of calories from fat) versus higher fat intake as measured by the MEDFICTS (cut point 70). There were statistically significant differences in Diet Benefits (p=.045) and Diet Barriers (p=.026) between individuals meeting and not meeting this fat intake recommendation. A summary of this analysis is presented in Table 34.

Table 34 *t*-tests of Differences in Mean Health Beliefs by Fat Intake Level

Health Belief	*t*	*P*
HBQ-R Susceptibility	-1.312	.193
HBQ-R Seriousness	.491	.624
HBQ-R Benefits of Preventability	.167	.867
Diet Benefits	**2.028**	**.045**
Diet Barriers	**2.254**	**.026**
Exercise Benefits	-.587	.559
Exercise Barriers	.220	.826

A *t*-test analysis was done to examine differences in mean health beliefs between individuals who meet and do not meet the recommended level of at least 150 minutes of moderate intensity physical activity per week (U.S. DHHS, 2000). The results of this analysis are presented in Table 35. There were statistically significant differences in Diet Benefits, Exercise Benefits, and Exercise Barriers between individuals meeting and not meeting this physical activity recommendation ($p<.001$).

Table 35 *t*-test of Difference in Mean Health Beliefs by Physical Activity Level

Health Belief	*t*	*P*
HBQ-R Susceptibility	-.081	.936
HBQ-R Seriousness	.318	.751
HBQ-R Benefits of Preventability	-.520	.604
Diet Benefits	**-3.296**	**<.001**
Diet Barriers	-1.718	.058
Exercise Benefits	**-3.283**	**<.001**
Exercise Barriers	-3.477	**<.001**

5.0 DISCUSSION

The establishment of healthy lifestyle behaviors is a current emphasis for our nation. The U.S. Department of Health and Human Services (U.S. DHHS, 2000) set goals of decreasing the prevalence of preventable diseases by encouraging healthier lifestyle patterns. Eating behavior and levels of physical activity are lifestyle factors that are a key focus in chronic disease prevention interventions, and were the focus of this study with a special emphasis on examining factors that contribute to healthier eating behavior and physical activity in a population known to be establishing lifelong habits. The HBM provided the framework for the study. This chapter discusses the key findings and their relationship to previous research, the limitations of the study, the recommendations for future study, and the implications for practice.

5.1 SUMMARY OF KEY FINDINGS

5.1.1 Sample Representation of the Population

The target population is emerging adult women in an educational institution. The sample for this study adequately represented the population from which it was selected. The ethnic, gender, and age mix was consistent with the university from which the population was drawn. Additionally the racial mix was representative of the Greater Pittsburgh area.

5.1.2 Convergent Validity of Measures

The use of subjective measures can be a threat to internal validity. In this study, subjective measures were used in conjunction with objective measure to validate the subjects' responses and demonstrate convergent validity of the subjective measures.

5.1.2.1 Convergent Validity of Eating Behavior Measures

Convergent validity of the eating behavior measures was demonstrated by the significant, negative correlations between the HPLP II Nutrition subscale and the MEDFICTS (r= -.297, p=.002), BMI (r=-.244, p=.011), and waist circumference measures (r=-.253, p=.008). These findings suggest that the HPLP II Nutrition subscale is a valid measure of eating behavior. A higher score on the HPLP II Nutrition subscale indicates healthier eating behavior. Healthier eating behavior would be negatively correlated with higher MEDFICTS scores, which indicate higher percentages of fat intake in the diet. Higher HPLP II Nutrition subscale scores would also be expected to result in lower BMI and a decreased waist circumference.

The high correlation between BMI and waist circumference (r=.942, p=<.001) is an expected finding and suggests that these variables are essentially measuring the same factor. The BMI is a commonly used screening tool in primary care practice since it is easily obtained from height and weight measurements. However, waist circumference, which requires an additional measurement, is considered a more accurate indicator of risk for CVD and diabetes (Schneider et al., 2007).

The MEDFICTS is not significantly correlated with BMI or waist circumference. Possible explanations for this finding include the insensitivity of the MEDFICTS to caloric

count, possible participant reporting inaccuracy, or the possible interplay between physical activity and dietary intake. Highly active individuals may have a higher fat diet but also expend more calories resulting in no net weight gain or increase in waist circumference. Additionally, if eating behavior and physical activity are within a healthy range, BMI and waist circumference should also be within a healthy range.

5.1.2.2 Convergent Validity of Physical Activity Measures

It is anticipated that if participants are accurately self-reporting physical activity, a correlation should exist between the subjectively reported measures of the HPLP II Physical Activity subscale, the MAQ, and the objectively measured pedometer step counts. The pedometer step counts were positively associated with the subjective measure of the HPLP II Physical Activity subscale score (r=.372, p<.001). An even higher correlation existed between the HPLP II Physical Activity subscale score and the MAQ average Leisure Activity hrs/wk (r=.462, p<.001). These correlations support the convergent validity of these measures and suggest that the HPLP II is a valid measure of physical activity.

5.1.3 Description of Health Beliefs and Behaviors of College Women

According to the HBM (Becker, 1974), health beliefs impact the likelihood of engaging in health behaviors. This study described the health beliefs and health behaviors (eating behavior and physical activity) of college women. Individual perceptions about health, specifically, perceived susceptibility to selected chronic diseases, perceived seriousness of those diseases, and perceived benefits of preventability of those diseases as well as perceived benefits of and barriers to eating behavior and physical activity were described in this emerging adult population.

5.1.3.1 Health Beliefs of College Women

Specific Aim 1 of this study was to describe the health beliefs and behaviors of college women. A score of 12, that is a mean score of 3 out of 5 on each of the four disease state items in the perceived susceptibility, perceived seriousness, and perceived benefits of preventability subscales of the HBQ-R, would indicate a neutral perception, not particularly high or low, toward the identified health belief.

This sample of college women had a neutral perception of their susceptibility to chronic disease with both the mode and the median score equaling 12. The mean perceived susceptibility score was 11.4, with a standard deviation of 3.0, also indicating an essentially neutral perception of their susceptibility to chronic disease. This neutral perception indicates that this population did not perceive an increased susceptibility for the chronic diseases of CVD, diabetes, cancer, or osteoporosis.

The mean score on the perceived seriousness of disease subscale was slightly below neutral (10.6). However, the standard deviation was large (3.9) and the 95% confidence interval crossed the neutral perception line. This finding indicates that this sample of college women was not particularly concerned about the possible impact that CVD, diabetes, cancer, or osteoporosis could have on their lives. They were not worried about these chronic diseases and did not perceive them as serious.

The perceived benefits of preventability of CVD, diabetes, cancer, and osteoporosis was above neutral with the mean, median, and mode benefits of preventability scores all falling above 12. This sample of college women perceived the benefits of preventability of the chronic diseases of CVD, diabetes, cancer, and osteoporosis as high; therefore, actions aimed toward preventing these diseases could be viewed as potentially beneficial.

The results suggest that these college women did not perceive themselves as having an increased susceptibility for the identified chronic disease states and were not particularly worried about the seriousness of these chronic diseases. This sample of college women tended to perceive the benefits of preventability of these chronic diseases as high. The HBM (Becker, 1974) would predict that the lack of perceived susceptibility to and perceived seriousness of the diseases of CVD, diabetes, cancer, and osteoporosis would not increase the likelihood of engaging in health behaviors. The increased recognition of the benefits of preventability of these chronic diseases indicates a possible perceived benefit from health behaviors and may be associated with an increase in healthy eating behavior and physical activity.

The health beliefs of Perceived Benefits of and Perceived Barriers to health behaviors are posited to impact the likelihood of engaging in health behaviors according to the HBM (Becker, 1974). In this sample, perceived benefits of and barriers to healthy eating behavior and physical activity were measured using established tools. The Diet Benefits score and the Exercise Benefits and Exercise Barriers subscale scores are all scaled so that low scores indicate high levels of perceived benefits and low levels of perceived barriers. The scores obtained for the Diet Benefits scale as well as the Exercise Benefits and Exercise Barriers subscales were at or slightly below the neutral point on each of the scales. This finding indicates somewhat neutral Diet Benefits of engaging in healthy eating behavior. Similarly, the results indicate relatively neutral Exercise Benefits of and Exercise Barriers to engaging in physical activity.

The Diet Barriers scale asks about the influence of certain barriers on eating behavior. A higher score on this scale indicates greater perceived barriers. The results from the Diet Barriers scale were above the neutral point with the mean, median, and mode all above the neutral score, indicating high perceived Diet Barriers to engaging in healthy eating behavior. The standard

deviation for this scale, however, was quite large (20.7 on a total scale of 96), indicating a large amount of variation in the scale scores. Therefore, there is a higher risk for error in prediction related to this scale.

The descriptive data from Health Belief scales suggest that this emerging adult sample did not currently perceive themselves as especially susceptible to chronic diseases and did not perceive chronic diseases as particularly serious or threatening to them. They perceived the benefits of preventability of chronic diseases as high. They perceived neutral Diet Benefits but high Diet Barriers to engaging in healthy eating behavior. They perceived neutral Exercise Benefits and Exercise Barriers to engaging in physical activity. Using the HBM as a framework, with little perceived susceptibility to and seriousness of chronic diseases combined with minimal perceived benefits of health behaviors; there would be minimal motivation to engage in health behaviors. The decreased motivation may be one of the reasons for the increase in obesity and decline in physical activity that is seen in the emerging adult population.

The decreased motivation is also possibly explained by the brain structure and function studies by and Baird (2006) and neurobehavioral work by Ernst et al. (2005). These authors suggest that the neurobiological control system in this age group is more reward driven and is less sensitive to harm avoidance behaviors. This population is more sensitive to immediate reward and benefit than potential future consequences. The emerging adult population is engaging in behaviors that are known to put them at increased risk for adverse health in the future (Harris et al., 2006). It is possible that their judgment regarding risk is skewed since their immediate feedback from engaging in health risk behaviors does not produce an immediate negative consequence (Goldberg & Fischoff, 2000; Johnson et al., 2002).

While this population may know about health related risks, they do not feel at risk personally (perceived susceptibility). They are more motivated by their feelings than their knowledge (Halpern-Felsher et al., 2001; Millstein & Halpern-Felsher, 2002). Feelings about risk may be more sensitive than the knowledge about risk (Lowenstein et al., 2001) when considering decision making in this population. Additional support for the impact of mood and feeling in this population is provided by the results of the focus groups in this study, in which mood was named as a factor in decision making in all of the sessions. Mood was one of the top ten factors in decisions about eating behavior and physical activity in both the higher scoring and lower scoring groups.

Additional support for the HBM is contained in the moderate positive correlation found between the level of perceived susceptibility to and level of perceived seriousness of chronic diseases. The HBM proposes that perceived susceptibility and perceived seriousness combine to produce a perceived threat of a disease. The correlation between susceptibility and seriousness would be an expected finding within the HBM.

The positive correlation found between Exercise Benefits and Perceived Susceptibility to chronic disease in this study indicates a likely recognition of the relationships between physical activity and disease prevention and is consistent with the relationships predicted by the HBM. The positive correlation shown between Diet Benefits and Exercise Benefits may indicate a general appreciation for healthier lifestyle patterns. The positive correlation reported between Exercise Benefits (a low score indicates higher perceived benefits) and Exercise Barriers (a low score indicates lower perceived barriers) may indicate a belief that high perceived benefits from exercise are associated with low perceived barriers to exercise. The inverse relationship between Perceived Benefits of Preventability of chronic diseases and Exercise Benefits is also reasonable

and consistent with the HBM. This finding indicates that higher perceived Benefits of Preventability of chronic diseases are associated with higher Exercise Benefits. Individuals who perceive the benefits of preventing chronic diseases also perceive greater benefits to exercise.

5.1.3.2 Health Behaviors of College Women

The Behavioral Risk Factor Surveillance System report (McCracken, Jiles, & Blanck, 2007) demonstrated that 78.4% of individuals in this age group do not eat the recommended levels of fruits and vegetables and 43.2% of individuals between the ages of 18 to 24 do not meet the recommended levels of physical activity. This high level of inadequate fruit and vegetable intake is mirrored in the participants of this study. Data from the HPLP II Nutrition subscale indicate that 64.2% percent of the participants in this study reported that they never or rarely eat 2-4 servings of fruits, and 72.5% never or rarely consume 3-5 servings of vegetables daily. Data on the mean pedometer steps and the MAQ Leisure Activity hrs/wk indicate that 72% of the participants did not meet the recommendation of at least 10,000 steps per day, and 39% did not meet the recommendation of at least 150 minutes of moderate intensity physical activity per week, respectively. This finding confirms that many participants in this study, similar to the analogous national cohort, were not engaging in healthy lifestyles. Additional supportive data for this phenomenon is the finding that 37% of the participant had a BMI greater that 25 indicating an increased risk for diabetes and CVD.

5.1.4 Discussion of Results of Hypothesis Testing

5.1.4.1 The Relationship Between Health Beliefs and Health Behaviors

Hypothesis 1 (Specific Aim 2), health beliefs are related to health behaviors in a population of college women, was partially supported. Partial support for this hypothesis in turns lends support for several relationships predicted by the HBM. Specifically, perceived benefits motivate the individual and increase the likelihood of engaging in healthy eating behavior. The hypothesized relationship between health beliefs and eating behavior was supported by the statistically significant relationships present between Diet Benefits scores and HPLP II Nutrition subscale scores, MEDFICTS scores, waist circumference, and BMI. The negative relationship found in the correlational analysis between Diet Benefits scores and HPLP II Nutrition subscale scores was predicted by the HBM, since a low score on the Diet Benefits scale indicates higher perceived benefits of a healthy diet, and a high score on the HPLP II Nutrition subscale indicates healthy eating behavior.

Added support for the hypothesized relationship between health beliefs and eating behavior was provided by the statistically significant positive correlation between the health belief, Diet Barriers, and the objective measures of waist circumference and BMI. These findings indicate that increased perceived barriers to a healthy diet are associated with less healthy eating behavior as evidenced by increased BMI and waist circumference.

No statistically significant relationships were found between the health beliefs measured by the HBQ-R (Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability) and eating behavior. As discussed previously, the population of emerging adults does not perceive themselves as susceptible to selected chronic diseases or these chronic disorders as serious to them; therefore, it is unlikely that a significant relationship between

perceived susceptibility and perceived seriousness and healthy eating behavior would exist. In this sample, benefits of preventability of selected chronic disorders were not related to eating behavior, either.

Consistent with the HBM, perceived benefits and barriers motivate the individual and increase the likelihood of engaging in physical activity. The hypothesized relationship between health beliefs and physical activity was supported by the statistically significant correlations found between Exercise Benefits scores and Exercise Barriers scores with all of the measures of physical activity (HPLP II Physical Activity subscale scores, mean pedometer steps, MAQ Leisure Activity hrs/wk, and MAQ Total Activity hrs/wk). Lower scores on the Exercise Benefits and Exercise Barriers scales, which indicate higher perceived benefits of and lower perceived barriers to exercise, respectively, were correlated with higher scores on all the physical activity measures. These findings are consistent with work by Trost et al. (2002) who found that higher perceived exercise benefits and lower perceived exercise barriers were related to physical activity.

Additional significant correlations between health beliefs and physical activity behaviors were demonstrated by the statistically significant negative correlations between Perceived Susceptibility and Perceived Seriousness of chronic diseases and MAQ Leisure Activity hrs/wk. These findings suggest that lower perceived susceptibility to and lower perceived seriousness of the chronic disease states of CVD, diabetes, cancer, and osteoporosis were related to higher physical activity in this sample. In this sample, benefits of preventability of selected chronic disorders were not related to physical activity.

These results demonstrating the relationships between health beliefs and health behaviors also provide support to the overriding tendency for this sample to be motivated by positively

valenced factors. Perceived benefits, which are positively valenced beliefs, are the most likely health belief to be related to health behaviors. These findings lend support to the work of Ernst et al. (2005) suggesting that the emerging adult control system is tipped toward reward seeking behaviors.

5.1.4.2 The Relationship Between Modifying Factors and Health Beliefs

Hypothesis 2 (Specific Aim 3), modifying factors are related to health beliefs, was partially supported. The health belief, Diet Benefits, had statistically significantly relationships with race, class level, parental income, and knowledge. White race, higher class level, higher parental income, and higher knowledge of disease prevention were associated with higher Diet Benefits. These relationships are similar to results reported by Kuchler and Lin (2002) who found that race, age, income, and education affect food choices.

Additional support for the relationship between modifying factors and eating behavior is the statistically significant relationship that was found between Diet Barriers and Childhood Living Environment. Not unexpectedly, living in an urban environment as a child was related to an increased perception of Diet Barriers, whereas living in a suburban environment was related to a decreased perception of Diet Barriers.

Additional confirmation of the proposed relationship between modifying factors and health beliefs was provided by a significant negative relationship between the modifying factor of Medical Supervision and the health beliefs of Perceived Susceptibility and Exercise Barriers. These negative correlations indicate that the exposure to medical supervision is associated with lower perceived susceptibility and lower perceived barriers to exercise. *T*-test results were consistent with these two correlations. It is likely that the frequent exposure to a medical provider provides the opportunity to engage in health education, including discussion of

susceptibility to chronic disease and strategies to decrease susceptibility, such as exercise. Again, these findings may be due to encouragement from medical providers or from a sense of personal responsibility for health behaviors. *T*-test results also showed that those with frequent medical supervision had higher perceived Benefits of Preventability of chronic disease compared to those without frequent medical supervision. Interactions with a medical provider may result in increased perception of benefits of disease prevention perhaps related to health knowledge obtained from these interactions. Indeed, higher knowledge of disease prevention was statistically significantly related to higher Benefits of Preventability.

The modifying factor of knowledge of disease prevention was also significantly correlated with other health beliefs. Higher knowledge of disease prevention was associated with higher Diet Benefits, as noted above, as well as higher Exercise Benefits. This finding is consistent with preliminary work by this author showing that knowledge was an important factor in the formation of health beliefs in college women (Reiser et al., 2005).

The modifying factor of Parental Income was significantly negatively correlated to Exercise Barriers. Higher level of parental income was associated with lower perceived Exercise Barriers. A higher level of parental income may be an instrumental factor in decreasing perceived Exercise Barriers by providing financial assets for exercise and allowing increased access to exercise facilities and equipment. The use of a *t*-test with a cut point at $30,000/year provided additional support for the influence of parental income on multiple health beliefs. Those with higher parental income had statistically significantly greater Diet Benefits, as noted above, as well as greater Exercise Benefits and lower Exercise Barriers and than those with lower parental income.

Lack of finances and lack of time are potential barriers to engaging in physical activity. Employment can provide increased financial advantage, but may also decrease available time to engage in physical activity. The ANOVA analysis examining the differences in mean health beliefs between levels of employment revealed a significant difference in Exercise Benefits between employment levels. Post hoc analysis of the results demonstrated that individuals who worked more than 20 hours per week had significantly lower Exercise Benefits than individuals who were employed between 5 and 20 hours per week; however, there was not a significant difference in Exercise Benefits between those who were employed more than 20 hours per week and those who were unemployed. This difference could be related to time and economics. Individuals who do not work extensive hours (<20 hours per week) may have more time to engage in physical activity, or may choose to decrease employment while in college so that they can participate in physical activity. Individuals who work more hours than 20 hours per week may be more motivated to obtain income than to participate in physical activity.

5.1.4.3 Modifying Factors as Moderators of the Relationship Between Health Beliefs and Health Behaviors

Hypothesis 3 (Specific Aim 4), modifying factors moderate the relationship between health beliefs and health behaviors in a population of college women, was supported. The linear regression analyses produced parsimonious models with one to three of the eight modifying factors (Race, Class Level, Parental Income, Living Arrangements, Childhood Living Environment, Employment Status, Medical Supervision, and Knowledge of Disease Prevention) being significant predictors for each of the examined health beliefs. The influence of individual modifying factors on health beliefs was small with R^2 changes ranging from .041 to .121.

Support for the hypothesis that modifying factors have a direct effect on health beliefs was demonstrated by several predictive models. Medical Supervision, Knowledge of Disease Prevention, and Parental Income were significant predictors across several of these models. The presence of Medical Supervision explained 7.4% of the variance in the Perceived Susceptibility to chronic disease scores. While the exact number of visits to medical providers was not documented in this study, it is likely that simply having ongoing contact with a health care provider allows opportunities for health education and intervention that could lower one's Perceived Susceptibility.

Knowledge of Disease Prevention explained 12.1% of the variance observed in the Perceived Benefits of Preventability of chronic disease. Higher knowledge of chronic disease prevention resulted in an increased perception that the chronic diseases indeed could be prevented.

The combination of Class Level, Parental Income, and Knowledge of Disease Prevention explained 20.9% of the variance in the health belief, Diet Benefits. It seems reasonable that higher Class Level, suggesting greater education and life experience, would predict higher Diet Benefits. Further, higher income would determine higher Diet Benefits, since higher income could enhance access to healthy foods within the family and may support the belief that there are benefits to a healthy diet. Knowledge was acknowledged as a theme affecting health beliefs in the HBQ-R, and school was a highly identified source of knowledge of disease prevention.

The combination of Medical Supervision and Knowledge of Disease Prevention accounted for 15.7% of the variance in the health belief, Exercise Benefits. As stated earlier, frequent contact with a health care provider allows opportunities for health education and intervention, increasing one's knowledge and raising one's perception of the benefits of exercise.

Lastly, the combination of Medical Supervision, Knowledge of Disease Prevention, and Parental Income accounted for 15.0% of the variance in the health belief, Exercise Barriers. Again, contact with a medical provider may serve to decrease perceived barriers to exercise, more knowledge can reduce perceived exercise barriers, and income is likely to be instrumental in decreasing perceived barriers to exercise.

The health beliefs of Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability of chronic diseases were not significant independent predictors of eating behavior in this sample. The health belief, Diet Benefits, accounted for over 15% of the variance in eating behavior. A low score on the Diet Benefits scale (higher perceived benefits of healthy eating behavior) predicted a higher score on the HPLP II Nutrition subscale, which indicated healthy eating behavior. This was a valuable singular predictor of eating behavior. It is interesting to note that Diet Benefits can be viewed as a positively valenced factor in decision making, again, supporting the premise that emerging adults are more motivated by positively valenced factors.

Similarly, the health beliefs of Perceived Susceptibility, Perceived Seriousness, and Perceived Benefits of Preventability of chronic diseases were not significant independent predictors of physical activity in this sample. The combination of the health beliefs, Exercise Benefits and Exercise Barriers, accounted for almost 40% of the variance in physical activity. Lower scores on the Exercise Benefits and Exercise Barriers scales (higher perceived benefits of exercise and lower perceived barriers to exercise) were predictive of a higher score in the HPLP II Physical Activity subscale, which indicated greater physical activity. Again, the positively valenced beliefs were determinants of increased likelihood of physical activity, supporting the

HBM and the premise that behaviors in emerging adults are motivated by positively valenced factors.

Thus, the best fit direct effect models between health beliefs and the associated health behaviors included only perceived benefits and/or perceived barriers. The examination of the moderating effects of modifying factors on the relationship between health beliefs and health behaviors demonstrated that the group of modifying factors did produce a significant indirect effect on the relationship between health beliefs and health behaviors. The amount of variance explained in the relationship between health beliefs and eating behavior (represented by the best fit predictive model containing Diet Benefits) was doubled from 15% to 30% by including the indirect effect of modifying factors. The change in variance produced by entering the indirect effect of modifying factors into the best predictive model of physical activity (containing the health beliefs of Exercise Benefits and Exercise Barriers) was less pronounced but still increased from 39% to 49%. To examine specific effects of individual modifying factors would require a much larger sample size and the use of more complex analyses, such as path analysis or structural equation modeling.

5.1.4.4 Additional Factors Contributing to Healthy Lifestyle Behaviors

The responses to the open-ended questions contained on the HBR-Q indicate that family factors were the most frequently identified factors used when deciding about Perceived Susceptibility and Perceived Seriousness of chronic disease states. It is reassuring that health behavior was identified by an overwhelming majority of the participants as a factor affecting the Benefits of Preventability of chronic diseases. Further, more than half reported that behavior influences Perceived Susceptibility to chronic diseases. Less reassuring were the qualitative findings surrounding the theme of knowledge. Knowledge was not a frequently cited factor in their

decision making about Perceived Susceptibility, Perceived Seriousness, and Benefits of Preventability.

The identified sources of knowledge about chronic disease prevention are of interest. Medical providers, the individuals with the most knowledge about disease prevention, were the least likely source of knowledge about disease prevention. School, media, and family and friends all were identified as greater sources of knowledge. This piece of evidence is a clear clue that medical providers may be missing a great opportunity for disease prevention in this population. A more in depth evaluation of this phenomenon, evaluating the health education that occurs during medical interactions with emerging adults, is recommended.

NGT was used to obtain complementary and supportive data about factors that contribute to eating behavior and physical activity. The rich qualitative data from this study provides some insights that can be used to develop successful interventions aimed at establishing healthy lifestyles in emerging adult women. The finding that mood, aesthetics, and practical issues were recurring themes in the focus groups is important information.

The identification of mood by all of the focus groups lends support to the work of Lowenstein et al. (2001) proposing that emotions inform decision making. Other potentially emotionally related factors identified in the focus groups include "motivation," which was ranked in both of the physical activity focus groups, and "how I feel," which the lower physical activity focus group identified as the fifth highest factor.

Aesthetics, i.e., visual aspects of food or one's appearance, was another prevalent theme in the focus groups. Factors associated with aesthetics of the food were prioritized only in the lower eating behavior focus group: "taste," "smell," and "appearance." These aesthetic factors could also be described as more emotionally driven choices. Factors associated with aesthetics of

one's appearance were identified by both of the physical activity focus groups: "the look I want to achieve," "jeans too tight," and "the guy I am dating is fit." Appealing aesthetics are a perceived benefit and will promote healthy behaviors.

Practical issues were cited as well across the focus groups. For example, both eating behavior focus groups identified availability, calories, and cost. In addition, the higher eating behavior group identified more detailed food label information, such as fat content and sugar content. Both physical activity focus groups identified the pragmatic concern of time for exercise. Lack of time for exercise and cost of foods are potential barriers to healthy behaviors.

5.2 LIMITATIONS

This study had several limitations. First, was the lack of information regarding individuals who chose not to participate in this study, and the large percentage of individuals who dropped out of the study prior to completion of questionnaires (44%). It is therefore difficult to examine differences between non-participants, completers, and dropouts. The high drop out rate is a likely source of bias and therefore lessens the validity of conclusions. Future studies should attempt to collect basic data about those who choose not to participate and demographic data about participants at the time of enrollment. These methods would allow for analysis of possible selection bias and comparisons between those who complete the study and the dropouts.

A second limitation, which may introduce bias, was the use of a convenience sample. A more varied recruitment strategy in the future may decrease this bias. Possible strategies include recruiting from several college campuses within the area or even expanding the recruitment to the tri-state region. These methods are more difficult to coordinate and much more expensive.

A third limitation was the narrow population chosen for study. The sample was recruited from one university; had a gender bias by design, and had a narrow age range; however, the sample represents an important and understudied population. Targeting women at a developmentally crucial stage in lifestyle patterning has great potential for a rippling effect for their future families. Performing initial exploratory work in this limited sample has the potential to provide groundwork for examining larger more diverse samples of emerging adults with possible extension to a broader age range.

A fourth limitation was the sample size. The sample size in this study was adequate to detect significant correlation greater than .20; however some of the relationships may not be quite that strong. A larger sample size would allow detection of more subtle correlations and more complex analytic techniques, including path analysis or structural equation modeling.

A fifth limitation was bias associated with the use of self-report measures, for example recall bias, response bias, and social desirability; however, the inclusion of objective measures of eating behavior and physical activity established convergent validity with the subjective instruments and lessened this limitation. The Diet Barriers scale did have a large standard deviation, which decreased its predictive ability. Factor analysis of this scale and further refinement of this tool would be recommended prior to use in future studies.

Sixth, the HBQ-R is an immature tool; however, it has been tested in this population. Additional testing in more varied populations may lead to a more refined tool to measure health beliefs. The Diet Barriers measure is also a tool that may benefit from further refinement. It was also used in a college aged population initially and does not have a well established record of validity and reliability. Continued refinement would enhance the usefulness of both of these measures.

Seventh, the cross-sectional, descriptive correlational design did not permit causal inferences. A larger study with more participants may provide data for path analysis or structural equation modeling. These techniques are more suited to examining causal effects with cross-sectional data. Another alternative would be to design a longitudinal cohort study to examine change in health beliefs and health behaviors over time.

A final limitation was the limited size of the focus groups. While the few students who did attend the focus groups provided many factors that influence their eating behavior and physical activity, slightly larger group sizes may have provided even more data and would have lent more confidence in the prioritization of factors by group members.

5.3 RECOMMENDATIONS FOR FUTURE RESEARCH

Recommendations for future research include larger studies with more varied populations, which will expand the knowledge about the relationship between health beliefs and health behaviors. This knowledge is essential for developing effective tools and interventions to encourage healthier lifestyles that will persist through life. Based on the findings from this study, interventions that reduce barriers and focus on immediate benefits have the greatest likelihood of succeeding in this population. Population comparisons, for example non-college emerging adults versus the currently studied college population, or gender based differences, would provide additional knowledge that could be used for targeted disease prevention programs in a broader range of emerging adults. A longitudinal cohort study exploring the impact of health beliefs on

health behaviors would be valuable in evaluating the change in health beliefs and behaviors over time.

An additional area for future research is the examination of age related differences in health beliefs and health behaviors and the relationship between these HBM concepts. The emerging adult population, because of its tendency to underestimate risk, is likely to have different perceptions of susceptibility to and seriousness of chronic diseases compared to other age cohorts, which can in turn influence motivation toward health behaviors. Studies exploring age related differences in health beliefs and health behaviors and the relationship between these HBM concepts would be informative and provide direction for more targeted interventions promoting healthy behaviors based on age.

5.4 IMPLICATIONS FOR PRACTICE

Promoting healthy behaviors in emerging adults is an opportunity to facilitate lifelong healthy living. This study has shown support for the HBM, indicating that health beliefs are related to health behaviors; and health beliefs and modifying factors do predict healthy lifestyle behaviors. College women do not have an increased likelihood of engaging in health behaviors based on their perceptions of susceptibility to and seriousness of chronic diseases. They do not appreciate how lifestyles at this point in their lives impact their future health status. Instead, they are more motivated by higher perceived immediate benefits and lower perceived barriers to health behaviors. Framing interventions in a positively valenced (immediate benefit to the individual) approach may be the most appropriate avenue in this population. Programming that highlights the positive effects of healthy eating on mood, academic performance, and appearance would be

more acceptable and have a greater chance of improving eating behavior. Encouraging physical activity as a forum for stress reduction, improved appearance, and mood enhancement would be more likely to increase physical activity than programming aimed at disease prevention far in the future.

College health and student services should attempt to decrease barriers to healthy eating behavior by making healthy food choices readily available. Opportunities to engage in more physical activities should be encouraged by providing time and facilities in convenient locations for the students, thus, decreasing exercise barriers. Decreasing barriers will increase the likelihood of healthy eating behavior and physical activity.

Consideration of integrating healthy lifestyles programs into college core curricula may be advantageous, as more than half of the participants in this study identified school as a source of knowledge about disease prevention. Programming aimed at immediate results are more likely to be successful than programming aimed at long-range outcomes. Enhancing the establishment of healthy lifestyle patterns in this population will have long-term benefits, but long-term benefits are not part of the current decision making process in this population. “Building a happy, beautiful you” will have more traction than “preventing heart disease and diabetes.” Colleges and universities are in a unique position to aid in the prevention of chronic disease. If there is success in promoting the establishment of healthy lifestyle patterns as well as developing the mind, the rates of preventable chronic diseases could be greatly impacted. Programming to promote and positively frame healthy alternatives to the risk behaviors commonly associated with college students should be a primary consideration.

APPENDIX A. MEASUREMENT TOOLS

Participant instructions

Thank you for agreeing to participate in this study.

In this packet you will find six different questionnaires and a pedometer log. These items are designed to measure health related beliefs and behaviors. If you have any questions regarding these items please feel free to contact Lorraine Reiser at 412-578-6305 or at reiserlm@carlow.edu.

You should complete the questionnaires and the 7 day pedometer diary prior to your physical measurement appointment.

Instructions for pedometer use are as follows:

The pedometer is an activity monitor that counts the number of steps that you take over a period of time. We are asking you to wear this monitor every day during your waking hours for a seven-day period. The monitor is to be clipped snuggly to your clothes or on a belt at your waist and worn on your dominant (right if you are right handed) hip near the middle of your thigh. When you wake up and get dressed, you will put on the monitor in the upright position. You will remove the monitor just before bedtime.

It is important that you do not let the monitor get wet. Please do not wear it in the rain or while bathing or swimming.

Don't forget that before you put on the monitor, the monitor should read "0." After you take off the monitor, a reading should be taken and recorded in your pedometer diary.

Please repeat the following steps over the next seven days.

SPECIFIC INSTRUCTIONS FOR WEARING THE ACTIVITY MONITOR

1. Every day, just before you put on the monitor, push the reset button and make sure that the monitor reads “0.”
2. When you put on the monitor, make sure that you record the time that you put on the monitor in the pedometer diary.

3. Remember to put the monitor ON YOUR DOMINANT HIP (right hip, if you are right handed, and left hip, if you are left handed) in an UPRIGHT position, and make sure that it is FIRMLY held against your body so that it does NOT move around freely.
4. The monitor should be worn at your waist near the middle of your thigh. If the monitor does not stay UPRIGHT, you can move the monitor to the side of your waist.
5. Keep the monitor on all day, except when bathing (either a bath or shower), when going swimming, or in the rain. DO NOT GET THE MONITOR WET!
6. If you take the monitor off for any reason for longer than ½ hour, please record the length of time that it was off (in minutes) in your diary and the reason you took it off.
7. Remove the monitor just before bedtime and record the time that you took off the monitor and the number of steps on the monitor in the pedometer diary.
8. PLEASE DO NOT TOUCH THE BUTTON ON THE MONITOR (except when you reset the monitor when you put it on). You may accidentally erase some of the information stored in the monitor if you touch the button.
9. Keep the cover of the monitor closed at all times while you are wearing it. Steps will not be recorded if the cover is left open.
10. Please do NOT keep the monitor in a pants, shirt, or coat pocket. In order for the monitor to work properly, it needs to be tightly fitted against your body.
11. Do NOT wear it sideways. The monitor will only work if it is in an upright position.

Follow these steps during the seven-day period that you have the monitor. If you have any questions, please call Lorraine Reiser at 412-578-6305 or at reiserlm@carlow.edu

Your physical measurement appointment time is:_____

Please report to Room 405 Curran Hall for your appointment.

Pedometer Diary

Day # (DATE)	Time on	Time off	Number of steps	List any times that the monitor was removed for more than 1/2 hour and describe activity during that period.
1				
2				
3				
4				
5				
6				
7				

LIFESTYLE PROFILE II

DIRECTIONS: This questionnaire contains statements about your *present* way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate the frequency with which you engage in each behavior by circling:

		Never	Sometimes	Often	Routinely
1.	Discuss my problems and concerns with people close to me.	N	S	O	R
2.	Choose a diet low in fat, saturated fat, and cholesterol.	N	S	O	R
3.	Report any unusual signs or symptoms to a physician or other health professional.	N	S	O	R
4.	Follow a planned exercise program.	N	S	O	R
5.	Get enough sleep.	N	S	O	R
6.	Feel I am growing and changing in positive ways.	N	S	O	R
7.	Praise other people easily for their achievements.	N	S	O	R
8.	Limit use of sugars and food containing sugar (sweets).	N	S	O	R
9.	Read or watch TV programs about improving health.	N	S	O	R
10.	Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).	N	S	O	R
11.	Take some time for relaxation each day.	N	S	O	R
12.	Believe that my life has purpose.	N	S	O	R
13.	Maintain meaningful and fulfilling relationships with others.	N	S	O	R
14.	Eat 8-11 servings of bread, cereal, rice and pasta each day.	N	S	O	R
15.	Question health professionals in order to understand their instructions.	N	S	O	R
16.	Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times.	N	S	O	R
17.	Accept those things in my life which I can not change.	N	S	O	R
18.	Look forward to the future.	N	S	O	R
19.	Spend time with close friends.	N	S	O	R
20.	Eat 2-4 servings of fruit each day.	N	S	O	R
21.	Get a second opinion when I question my health care provider's advice.	N	S	O	R
22.	Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).	N	S	O	R
23.	Concentrate on pleasant thoughts at bedtime.	N	S	O	R
24.	Feel content and at peace with myself.	N	S	O	R
25.	Find it easy to show concern, love and warmth to others.	N	S	O	R
26.	Eat 3-5 servings of vegetables each day.	N	S	O	R

	Never	Sometimes	Often	Routinely
27. Discuss my health concerns with health professionals.	N	S	O	R
28. Do stretching exercises at least 3 times per week.	N	S	O	R
29. Use specific methods to control my stress.	N	S	O	R
30. Work toward long-term goals in my life.	N	S	O	R
31. Touch and am touched by people I care about.	N	S	O	R
32. Eat 2-3 servings of milk, yogurt or cheese each day.	N	S	O	R
33. Inspect my body at least monthly for physical changes/danger signs.	N	S	O	R
34. Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away from destination and walking).	N	S	O	R
35. Balance time between work and play.	N	S	O	R
36. Find each day interesting and challenging.	N	S	O	R
37. Find ways to meet my needs for intimacy.	N	S	O	R
38. Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day.	N	S	O	R
39. Ask for information from health professionals about how to take good care of myself.	N	S	O	R
40. Check my pulse rate when exercising.	N	S	O	R
41. Practice relaxation or meditation for 15-20 minutes daily.	N	S	O	R
42. Am aware of what is important to me in life.	N	S	O	R
43. Get support from a network of caring people.	N	S	O	R
44. Read labels to identify nutrients, fats, and sodium content in packaged food.	N	S	O	R
45. Attend educational programs on personal health care.	N	S	O	R
46. Reach my target heart rate when exercising.	N	S	O	R
47. Pace myself to prevent tiredness.	N	S	O	R
48. Feel connected with some force greater than myself.	N	S	O	R
49. Settle conflicts with others through discussion and compromise.	N	S	O	R
50. Eat breakfast.	N	S	O	R
51. Seek guidance or counseling when necessary.	N	S	O	R
52. Expose myself to new experiences and challenges.	N	S	O	R

Modifiable Activity Questionnaire

ID#_____

1. Please circle all activities listed below that you have done morn than 10 times in the past year:

Jogging (outdoor, treadmill)	1	Football/soccer	14	Stair Master	27
Swimming (laps, snorkeling)	2	Racquetball/Handball/Squash	15	Fencing	28
Bicycling (indoor, outdoor)	3	Horseback riding	16	Hiking	29
Softball/Baseball	4	Hunting	17	Tennis	30
Volleyball	5	Fishing	18	Golf	31
Bowling	6	Aerobic Dance/Step Aerobic	19	Canoeing/Rowing/Kayaking	32
Basketball	7	Water Aerobics	20	Water skiing	33
Skating (roller, ice, blading)	8	Dancing (Square, Line, Ballroom)	21	Jumping rope	34
Martial Arts (karate, judo)	9	Gardening or Yard work	22	Snow skiing (X-country/Nordic track) (downhill)	35
Tai Chi	10	Badminton	23		
Calisthenics/Toning exercises	11	Strength/Weight training	24	Snow shoeing	37
Wood Chopping	12	Rock climbing	25	Yoga	38
Water/coal hauling	13	Scuba Diving	26	Other	39

Walking for exercise (outdoor, indoor at mall or fitness center, treadmill) 40

List each activity that you circled in the "Activity" box below, check the months you did each activity over the past year (12 months) and then estimate the average amount of time spent in that activity.

Activity	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average # of Times Per Month	Average # of Minutes Each Time
														I

2. In general, how many HOURS per DAY do you usually spend watching television? _____hrs.
3. Over this past year, have you spent more than one week confined to a bed or chair as a result of an injury, illness or surgery? Yes _____ No _____
   If yes, how many weeks over this past year were you confined to a bed or chair? _____weeks
4. Do you have difficulty doing any of the following activities?
   a. getting in or out of a bed or chair? Yes _____ No _____
   b. walking across a small room without resting? Yes _____ No _____
   c. walking for 10 minutes without resting? Yes _____ No _____
5. Did you ever compete in an individual or team sport (not including any time spent in sports performed during school physical education classes)? If yes, how many total years did you participate in Competitive sports? _____

6. Have you had a job for more than one month over this past year, from last _____ to this _____?

List all JOBS that the individual held over the past year for more than one month. Account for all 12 months of the past year. If unemployed/disabled/retired/homemaker/student during all or part of the past year, list as such and probe for job activities of a normal 8 hour day, 5 day week.

						Out of the total # of "Hrs/Day" the individual reported working at this "job," how much of this time was usually spent sitting? Enter this # in "Hrs Sitting" column, then place a check in the category which best describes their job activities when they were not sitting.			
		Walk or bicycle to/from work	AVERAGE JOB SCHEDULE			Hrs spent sitting at work	Check the category that best describes job activities when not sitting		
Job Name	Job Code	Min/Day	Mos/Yr	Day/Wk	Hrs/Day	Hrs Sitting	A	B	C

Category A

(includes all sitting activities)

Sitting
Standing still w/o heavy lifting
Light cleaning - ironing, cooking, washing, dusting
Driving a bus, taxi, tractor
Jewelry making/weaving
General office work
Occasional/short distance walking

Category B

(includes most indoor activities)

Carrying light loads
Continuous walking
Heavy cleaning - mopping, sweeping, scrubbing, vacuuming
Gardening - planting, weeding
Painting/Plastering
Plumbing/Welding
Electrical work
Sheep herding

Category C

(heavy industrial work, outdoor construction, farming)

Carrying moderate to heavy loads
Heavy construction
Farming - hoeing, digging
- mowing, raking
Digging ditches, shoveling
Chopping (ax), sawing wood
Tree/pole climbing
Water/coal/wood hauling

JOB CODES

Not employed outside of the home:

1. Student
2. Home Maker
3. Retired
4. Disabled
5. Unemployed

Employed (or volunteer):

6. Armed Services
7. Office worker
8. Non-office

ID#_____

MEDFICTS QUESTIONNAIRE

Meats **E**ggs **D**airy **F**ried Foods **I**nd. Baked Goods **C**onvenience Foods **T**able Fats **S**nacks

Directions: For each food category for both group 1 and group 2 listings; please check a box in the "Weekly Consumption" and "Serving Size" column. If you rarely or never consume foods from a particular group please check only the "Weekly Consumption" Box.

Food Category	*Weekly consumption*			*Serving Size*		
	Rarely/ Never	3 or less servings/wk	4 or more servings/wk	Small	Average	Large
M **Meats** **Group 1** • **Average amount per day = 6 oz (about 2 decks of playing cards)** • **Base your estimates on foods you consume the most of** **Beef**: Ribs, Steak, Chuck Blade, Brisket, Ground Beef, Meatloaf, Corned Beef **Processed meats**: Hamburger, Fast food hamburger, Bacon, Lunchmeat, Sausage, Hotdogs, Knockwurst **Pork & Others**: Pork chops, Pork Shoulder, Ground pork, Ham, Lamb, steaks, ribs, chops, Organ meats, Poultry with skin	☐	☐	☐	☐	☐	☐
Group 2 **Lean beef cuts**: Sirloin tips, Flank steak, Round steak, Rump roast, Chuck arm roast **Low-fat Processed meats**: Low-fat lunchmeat, Low-fat hotdogs, Canadian bacon **Poultry, Fish, and lean cuts**: Poultry without skin, Fish, seafood, Lamb flank, shank sirloin, roast, Lean ham cured or fresh, Pork loin chops, tenderloin, Veal, chops, cutlets, roast, Venison	☐	☐	☐	☐	☐	☐
E **Eggs** • **Weekly consumption expressed as times/wk** • **Serving size expressed as number of eggs** **Group 1** Whole eggs, yolks	☐	☐	☐	<1	2	3
Group 2 Egg Whites, Egg Substitute (1/2 cup = 2 eggs)	☐	☐	☐	<1	2	3
D **Dairy** • **Average serving = 1 cup** **Milk** **Group 1** Whole milk, 2% milk, 2% buttermilk, whole milk yogurt	☐	☐	☐	☐	☐	☐
Group 2 Skim milk, 1% milk, skim-buttermilk Low-fat & non-fat yogurt	☐	☐	☐	☐	☐	☐
Cheese • **Average serving = 1 oz.** **Group 1** Cream cheese, Cheddar, Monterey jack, Colby, Swiss, American processed, Blue Cheese, Regular Cottage Cheese & Ricotta (1/2 cup)	☐	☐	☐	☐	☐	☐
Group 2 Low-fat & fat free cheeses, Skim milk mozzarella & String cheese, Low-fat and nonfat cottage cheese & ricotta (1/2 cup)	☐	☐	☐	☐	☐	☐
Frozen desserts • **Average serving = 1/2 cup** Ice cream, Milk shakes	☐	☐	☐	☐	☐	☐

ID# _____

Food Category	*Weekly consumption*			*Serving Size*		
	Rarely/ Never	3 or less servings/wk	4 or more servings/wk	Small	Average	Large
F **Fried Foods** • **Average serving see below** **Group 1** French fries, Fried vegetables (1/2 cup = 1 serving) Fried Chicken, fish or meat (3 oz. serving) (count as a meat serving also)	☐	☐	☐	☐	☐	☐
Group 2 Vegetable not fried Meats that are prepared by baking, broiling, grilling, poaching, roasting, stewing	☐	☐	☐	☐	☐	☐
I **Ind. Baked goods** • **Average serving = 1 piece** **Group 1** Doughnut, biscuit, butter rolls, cake, pie, sweet rolls, Danish, muffins, croissants, coffee cakes, cookies	☐	☐	☐	☐	☐	☐
Group 2 Angel food cake, fruit bars, low-fat cookies and pastries, home made baked goods with vegetable oil	☐	☐	☐	☐	☐	☐
C **Convenience Food** • **Average serving see below** **Group 1** Canned, Packaged or Frozen dinners, e.g. Pizza, (1 slice) Macaroni & Cheese (1 cup), Pot pie (1), Canned soup (1 cup)	☐	☐	☐	☐	☐	☐
Group 2 Diet /reduced calorie or reduced fat dinners (1 dinner)	☐	☐	☐	☐	☐	☐
T **Table Fats** • **Average serving see below** **Group 1** Butter , Stick margarine: 1 pat Regular Salad dressing or mayo, sour cream: 1-2 Tbsp.	☐	☐	☐	☐	☐	☐
Group 2 Diet or tub margarine, low fat & fat free salad dressings Low fat and fat free mayo	☐	☐	☐	☐	☐	☐
Snacks • **Average serving see below** **Group 1** Chips (potato, corn, taco), cheese puffs, snack mix, nuts, regular crackers, regular popcorn, candy (chocolate, caramel, coconut)	☐	☐	☐	☐	☐	☐
Group 2 Air-popped or low fat popcorn, low fat crackers, hard candy, licorice, fruit rolls, bread sticks, pretzels, fat free chips, fruit	☐	☐	☐	☐	☐	☐

EXERCISE BENEFITS/BARRIERS SCALE

DIRECTIONS: Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree, or SD for strongly disagree.

		Strongly Agree	Agree	Disagree	Strongly Disagree
1.	I enjoy exercise.	SA	A	D	SD
2.	Exercise decreases feelings of stress and tension for me.	SA	A	D	SD
3.	Exercise improves my mental health.	SA	A	D	SD
4.	Exercising takes too much of my time.	SA	A	D	SD
5.	I will prevent heart attacks by exercising.	SA	A	D	SD
6.	Exercise tires me.	SA	A	D	SD
7.	Exercise increases my muscle strength.	SA	A	D	SD
8.	Exercise gives me a sense of personal accomplishment.	SA	A	D	SD
9.	Places for me to exercise are too far away.	SA	A	D	SD
10.	Exercising makes me feel relaxed.	SA	A	D	SD
11.	Exercising lets me have contact with friends and persons I enjoy.	SA	A	D	SD
12.	I am too embarrassed to exercise.	SA	A	D	SD
13.	Exercising will keep me from having high blood pressure.	SA	A	D	SD
14.	It costs too much to exercise.	SA	A	D	SD
15.	Exercising increases my level of physical fitness.	SA	A	D	SD
16.	Exercise facilities do not have convenient schedules for me.	SA	A	D	SD
17.	My muscle tone is improved with exercise.	SA	A	D	SD
18.	Exercising improves functioning of my cardiovascular system.	SA	A	D	SD
19.	I am fatigued by exercise.	SA	A	D	SD
20.	I have improved feelings of well being from exercise.	SA	A	D	SD
21.	My spouse (or significant other) does not encourage exercising.	SA	A	D	SD

EXERCISE BENEFITS/BARRIERS SCALE

DIRECTIONS: Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for Strongly agree, A for agree, D for Strongly agree, A for agree, D for disagree, or SD for strongly disagree.

22.	Exercise increases my stamina.	SA	A	D	SD
23.	Exercise improves my flexibility.	SA	A	D	SD
24.	Exercise takes too much time from family relationships.	SA	A	D	SD
25.	My disposition is improved with exercise.	SA	A	D	SD
26.	Exercising helps me sleep better at night.	SA	A	D	SD
27.	I will live longer if I exercise.	SA	A	D	SD
28.	I think people in exercise clothes look funny.	SA	A	D	SD
29.	Exercise helps me decrease fatigue.	SA	A	D	SD
30.	Exercising is a good way for me to meet new people.	SA	A	D	SD
31.	My physical endurance is improved by exercising.	SA	A	D	SD
32.	Exercising improves my self-concept.	SA	A	D	SD
33.	My family members do not encourage me to exercise.	SA	A	D	SD
34.	Exercising increases my mental alertness.	SA	A	D	SD
35.	Exercise allows me to carry out normal activities without becoming tired.	SA	A	D	SD
36.	Exercise improves the quality of my work.	SA	A	D	SD
37.	Exercise takes too much time from my family responsibilities.	SA	A	D	SD
38.	Exercise is good entertainment for me.	SA	A	D	SD
39.	Exercising increases my acceptance by others.	SA	A	D	SD
40.	Exercise is hard work for me.	SA	A	D	SD
41.	Exercise improves overall body functioning for me.	SA	A	D	SD
42.	There are too few places for me to exercise.	SA	A	D	SD
43.	Exercise improves the way my body looks.	SA	A	D	SD

Healthy Diet Barriers Scale

Below are listed some things that can make it difficult to change eating habits. Please circle a number from 1 to 6 with **1** being not at all relevant **(unimportant)** and **6** being very relevant **(important)** in influencing you to change or keep to a healthier diet.
Please answer each statement.

1. Foods that fit into a healthier diet are not available at home.	1	2	3	4	5	6
2. I have no control over the foods available at home.	1	2	3	4	5	6
3. My family does not support my efforts to change to a healthier diet.	1	2	3	4	5	6
4. I have trouble knowing how much I should eat.	1	2	3	4	5	6
5. I do not know how much energy is in different foods I am offered.	1	2	3	4	5	6
6. I know I should reduce fat and sugar in my diet but I do not know which foods are best to do this.	1	2	3	4	5	6
7. I know I should increase fiber in my diet but I do not know which foods are high in fiber.	1	2	3	4	5	6
8. I find it difficult to will myself to eat a healthy diet.	1	2	3	4	5	6
9. I use food as a treat or reward for myself.	1	2	3	4	5	6
10. It is difficult to find time to plan healthy meals.	1	2	3	4	5	6
11. I don't see any benefits from my efforts to eat a healthier diet.	1	2	3	4	5	6
12. It is difficult for me or my family to shop for the foods I need.	1	2	3	4	5	6
13. I have trouble sticking to a healthy diet.	1	2	3	4	5	6
14. I have trouble choosing healthy foods when I am out with family or friends.	1	2	3	4	5	6
15. I find that a healthy diet is expensive.	1	2	3	4	5	6
16. I find it difficult to choose healthy foods when I buy lunch.	1	2	3	4	5	6

Healthy Diet Benefits Scale

Below are two statements relating to beliefs about diet. Please rank your level of agreement with the statements with 1 = Strongly Agree and 5 = Strongly disagree.

	Strongly Agree				Strongly Disagree
1. What I eat is one of the most important things for my health.	1	2	3	4	5
2. Low-fat food taste good.	1	2	3	4	5

HBQ-R

We would like to ask you a few questions about your beliefs relating to your health. Your answers to these questions are intended to help us understand you better.

The following definitions may be helpful:

Diabetes – A blood glucose level that is elevated and requires treatment with insulin, oral medications or a prescribed diet and exercise regimen to achieve normal levels.

CVD (Cardiovascular Disease) – This includes high blood pressure, high cholesterol levels, heart disease, heart attacks or stroke.

Cancer – A disease in which cells grow abnormally.

Osteoporosis – A disease in which the density of bones is decreased making bone fractures more likely.

Please indicate your responses by completely filling only one circle for each question. Responses to the open-ended questions do not need to be in complete sentences.

1. What do you think the chances are of **you** getting the following diseases sometime in your life?

	NOT LIKELY **1**	**2**	**3**	**4**	EXTREMELY LIKELY **5**
a. Diabetes	O	O	O	O	O
b. CVD	O	O	O	O	O
c. Cancer	O	O	O	O	O
d. Osteoporosis	O	O	O	O	O

2. How did you decide on **your** level of risk for these diseases?

3. How worried are **you** about getting the following diseases?

	NOT WORRRIED **1**	**2**	**3**	**4**	EXTREMELY WORRRIED **5**
a. Diabetes	O	O	O	O	O
b. CVD	O	O	O	O	O
c. Cancer	O	O	O	O	O
d. Osteoporosis	O	O	O	O	O

4. What factors affect **your** level of worry?

5. How preventable do **you** think the following diseases are?

	NOT PREVENTABLE				EXTREMELY PREVENTABLE
	1	**2**	**3**	**4**	**5**
a. Diabetes	O	O	O	O	O
b. CVD	O	O	O	O	O
c. Cancer	O	O	O	O	O
d. Osteoporosis	O	O	O	O	O

6. What factors contribute to disease prevention?

7.How knowledgeable are **you** about preventing the following diseases?

	NOT KNOWLEDGEABLE				EXTREMELY KNOWLEDGEABLE
	1	**2**	**3**	**4**	**5**
a. Diabetes	O	O	O	O	O
b. CVD	O	O	O	O	O
c. Cancer	O	O	O	O	O
d. Osteoporosis	O	O	O	O	O

8. What are **your** sources for information about disease prevention?

Demographic Questionnaire

1. What is your Sex? _____Male _____Female
2. What is your race? _____Caucasian _____Non-Caucasian
3. What is your age (in years) as of your last birthday? _____
4. What is your current student level? _____Freshman _____Sophomore

   _____Junior _____Senior

   _____Other (explain)_____
5. How many years have you been out of high school? _____
6. Where do you live currently? _____Dorm

   _____Off campus with other students

   _____Off campus with family

   _____Other (explain)_____
7. In what type of area did you live most of your childhood?

   _____Urban

   _____Suburban

   _____Rural
8. What is your current employment status?

   _____Do not work

   _____Work 5 or less hours/wk

   _____Work between 5 and 10 hours per/wk

   _____Work between 10 and 20 hours/wk

   _____Work more than 20 hours per week
9. Do you have any children? _____Yes _____No

1. Please Identify **<u>your own</u>** income level.

_____Under $10,000

_____$10,000 to $20,000

_____$20,000 to $30,000

_____$30,000 to $40,000

_____$40,000 to $50,000

_____Over $50,000

_____Unknown

2. Please identify **<u>your family</u>** income level.

_____Under $10,000

_____$10,000 to $20,000

_____$20,000 to $30,000

_____$30,000 to $40,000

_____$40,000 to $50,000

_____Over $50,000

_____Unknown

3. Do you currently have any diseases for which you are treated on a regular basis (take medication more than 5 times per month or are seen by a health care provider more than once per year for treatment).

_____Yes _____No

4. Please circle any of the following conditions you personally have.

Diabetes Cardiovascular Disease Cancer Osteoporosis

APPENDIX B. NOMINAL GROUP TECHNIQUE SCRIPTS

NOMINAL GROUP TECHNIQUE SCRIPTS

Introduction for all Groups:

This focus group is being conducted to help gather information about health beliefs and their association to health behaviors in college women. The group proceedings will be audio taped to insure collection of all relevant data. If you desire to have your responses remain anonymous during the taping you may use an alias during a taping.

Diet Focus Group Script:

Numerous studies have shown that diet is an important factor in maintaining health. In this group I would like your help in identifying factors that affect your dietary habits. The group should last about one hour and will be audio taped to help in capturing all the factors discussed. The audiotapes will be kept in a secure area and will be accessed only by members of the research team. The group process will have three phases: listing, clarifying, and voting. First, you will be asked to take a few moments to silently list (on provided cards) all the factors that influence your dietary choices. The group members will then take turns listing all the factors that have been identified. After all the factors are listed, the group members will discuss and clarify all the listed factors to assure that there is a mutual and clear understanding of the factors. Each member will then vote on the factors using index cards. Are there any questions?

Let's begin. Please take the next few minutes to silently answer the following question: "What factors influence your choices in foods?"

Activity Focus Group Script:

Numerous studies have shown that physical activity is an important factor in maintaining health. In this group, I would like your help in identifying factors that affect your physical activity patterns. The group should last about one hour and will be audio taped to help in capturing all the factors discussed. The audiotapes will be kept in a secure area and will be accessed only by members of the research team. The group process will have three phases: listing, clarifying, and voting. First, you will be asked to take a few moments to silently list (on provided cards) all the factors that influence your level of physical activity. The group members will then take turns listing all the factors that have been identified. After all the factors are listed, the group members will discuss and clarify all the listed factors to assure that there is a mutual and clear understanding of the factors. Each member will then vote on the factors using index cards. Are there any questions?

Let's begin. Please take the next few minutes to silently answer the following question: "What factors influence your level of physical activity?

Nominal Group Technique (NGT) Voting Process

Voting Process:

Each member will be given 5 cards for voting. They will be asked to choose the five factors that they feel are most influential in their dietary/physical activity choices and write them on the cards provided (one factor on each card). They will then be asked to choose the most important of the five and place #1 on that card. Next they will be asked to choose the least important of the five factors and place a #5 on that card. Then the members will be asked to choose the most important of the remaining three factors and place #2 on that card. Then the members will choose the least important of the remaining 2 factors and place a #4 on that card. Finally, they will be asked to place a #3 on the last card. All cards will be collected at the end of the focus group session.

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