### DESCRIBING COLLEGE STUDENTS' HEALTH BEHAVIORS: A CLUSTER-ANALYTICAL APPROACH

#### DISSERTATION

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By

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#### ABSTRACT

The purpose of this study was to determine the health behavior lifestyles of college students and describe the characteristics of the differing lifestyles. The study used the leading indicators of health described by Healthy People 2010 to group college students into health lifestyle clusters. The clustering technique revealed three prominent groupings of students, named for the relative degree of risk indicated by their health-compromising behaviors: low risk, moderate risk, and high risk clusters.

Differences in personal and environmental factors were found among the clusters. Notably, the high risk cluster members tended to be upperclassmen, live off campus, have more safety issues and lower GPAs than the members of the other clusters. The moderate cluster members tended to exhibit less risky behaviors, with the exception of a higher likelihood of engaging in risky sexual encounters. The low risk cluster members were more likely to live on campus or with their parents, tended to be younger and have higher GPAs. The ability to profile college students based upon known variables provides an avenue for identifying at-risk students and tailoring health promotion messages specifically for them. Because student behaviors can be linked to environmental and personal factors, there may also be implications for either policy change or adoption connected with health promotion efforts. Differences were also found in the perceived norms of the three clusters, with more extreme norms associated with students with higher risk behaviors. The patterns of these differences indicate more support for the introduction of use of the constructs of the Social Cognitive Theory for explaining and predicting health behaviors based upon personal and environmental factors. The use of these known factors can help identify and augment health promotion efforts at the college level.

# DEDICATION

# To My Parents:

Who instilled in me a love of education

And led me to believe that anything is possible

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Wolf, K.N. & Clutter, J. Facilitating discussion on the web. 2000. Interdisciplinary Team Conference Abstracts, September.

Schiller, M.R. & Clutter, J. 1998. Conduct of Research: Instrumentation and Data Collection. <u>IN</u>: Research Skills in Allied Health Series. Bureau of Health Professions Grant through The Ohio State University, Columbus, OH.

Case-Smith, J., Bigsby, R. & Clutter, J. 1997. Perceptual motor coupling in the development of grasp. <u>American Journal of Occupational Therapy</u>. Vol. 52, pp. 102-110.

Dunlevy, C.L., Douce, F.H, Hill, E;, J. Clutter and S. Baez. 1994. Physiological and psychological effects of low impact aerobic exercise on young adults with cystic fibrosis. J. Cardiopulmonary Rehab. 14:47-51.

#### FIELD OF STUDY

Major Field: Education

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#### CHAPTER 1

#### INTRODUCTION

#### STATEMENT OF THE PROBLEM

In response to the current state of health in the United States, and building on the initiatives of the past 20 years, the Department of Health and Human Services launched a comprehensive health promotion and disease prevention effort, Healthy People 2010 (USDHHS, 2000). This initiative documented the state of the health of the people of the United States in 2000, and posed goals and objectives to be reached by 2010. One of the two overarching goals of HP2010 is to "increase the quality and years of healthy life" (p.8) of all people living in the United States. Of the ten leading health indicators posed by the document, five are directly related to lifestyle choices: physical activity; overweight & obesity; tobacco; substance abuse; and responsible sexual behavior. The remaining five health indicators can be influenced by lifestyle choices to some degree.

In spite of national educational efforts aimed at reducing chronic disease, many Americans continue to be at risk for morbidity and mortality due to lifestyle behaviors (CDC, 2005). Evidence would indicate that, in spite of the reality of the health risks, many are not motivated to modify or change health-compromising behaviors (Collins, Dantico, Shearer & Mossman, 2004; Meischke, Sellers, Robbins, Goff, Daya, Meshak, Taylor, Zapka & Hand, 2000). This is often compounded by the presence of other risk factors that are outside of a person's control, such as genetics, race, and gender (USDHHS, 2000). Often, misperceptions related to disease processes inhibit the public awareness of risk related to disease (Meischke et al, 2000). This can be particularly true in populations or individuals who consider themselves to be at low relative risk for chronic disease, such as college students, who are typically between 18 and 25 years of age (Collins, Dantico, Shearer, & Mossman, 2004; Green, Grant, Hill, Brizzolara & Belmont, 2003).

College aged students are often stretching the boundaries of their new-found independence, with many of them living away from home for the first time, and thus increasingly independent in their lifestyle choices. Additionally, several theories of cognitive development indicate young adulthood, particularly in terms of transition to college, as a time of conflict between the old ways of learning and the development of increasingly more complex means of knowledge construction (Kegan, 1982; Kitchener & King, 1990; Merriam & Caffarella, 1999; Perry, 1981). While young adulthood is prime time for development of health knowledge, beliefs and practices, college aged students may also be prime for engagement in behaviors that are counter to their health (Eisen, Pallitto, Bradner & Bolshun, 2000; Hornik, 2003; Jones, Oeltmann, Wilson, Brener, Hill, 2001; Wechsler, Lee, Kuo, Seibring, Nelson & Lee, 2002). Indeed, the primary risk factors for the three leading causes of death in the United States, cardiovascular disease, cancer and diabetes, are usually established during youth or young adulthood. The current trend in national health indicates the prevalence of earlier onset of unhealthy diets, inadequate physical activity, and drug and tobacco use (USDHHS, 2004).

Evidence would indicate wide variety in the college population in terms of health behaviors and risks (Haberman & Luffey, 1998; Huang, Harris, Lee, Nazir, Born, & Kaur, 2003; Wechsler et al, 2002), however, little exists that specifically describes the overall health lifestyle of this population. Health promotion messages and programs are known to be more effective if they are tailored to the specific populations involved (Glanz et al, 2002; Goldman, 2003; Goldman & Schmaltz, 2001). An accurate description of health-related parameters of this population of young adults would enable college and university educators and staff to design health promoting efforts targeting specific student subpopulations.

#### PURPOSE OF THE STUDY

Because young adulthood is considered an optimal period for establishment, and reinforcement of healthful lifestyles (Dinger & Waigandt, 1997), especially in light of college students' emerging self-sufficiency and reliance, it is important to gain insight into the health lifestyle and behaviors of this population. A more comprehensive picture of the health lifestyles of college-aged students could assist with the creation of multifaceted population-specific health program planning for a rather vulnerable population, resulting in more effective and cost-efficient health promotion efforts. Therefore, the purpose of this study is to describe the health lifestyles of college-aged students and determine the relationship between the health determinants, demographics, and health status.

Current literature regarding the health of college students often centers around alcohol consumption, concentrating most specifically on binge drinking (Jones,

Oeltmann, Wilson, Brener, & Hill, 2001; Wechsler, Dowdall, Davenport, & Castillo, 1995; Wechsler, Kuo, Seibring, Nelson, & Lee, 2002). The incidence and deleterious effects of binge drinking have heightened awareness of, and in some respects, response to the problem by college and university administrations. However, while definitely the most highly publicized risk behavior associated with college students, binge drinking often coexists with other high risk and health-related behaviors (Jones et al, 2001; Wechesler et al, 1995).

Huang and associates (Huang, Harris, Lee, Nazir, Born & Kaur, 2003) surveyed college students in a Midwestern university and found that, according to their Body Mass Index (BMI), over twenty percent of the students were already considered overweight. The majority of the respondents also reported relatively unhealthy dietary practices, and physical activity at less than the American College of Sports Medicine (ACSM) recommended levels. This evidence is corroborated by another study in which well over one-third of the college students lacked even the minimum suggested physical activity levels (Leendrs, Silver, White, Buckworth & Sherman, 2002) Indeed, there are indications that the highest rate of decline of physical activity occurs in Americans between the ages of 18 and 24 (Grubbs & Carter, 2002).

In addition, young adults typically ascribe more extreme norms of behavior to their peers than for themselves, resulting in their perception of having less health risk than others in their cohort (Perkins, 2003). In incidents of high-risk behaviors, such misperceptions of the population 'norms' may actually cause some college students to alter their own behaviors to approximate their perceptions. Since there are theoretical ties between a person's perception of health risk and their impetus toward behavior

change to improve or maintain health status (Glanz et al, 2002), it would seem that knowing the risk perceptions of college students would aid in development of interventions aimed to increase population health at this crucial stage. Indeed, Meischke et al (2001) indicate that a person's perception of vulnerability can be a strong predictor of preventive health behaviors. However, a study by Green and associates (Green, Grant, Hill, Brizzolara & Belmont, 2003) purports that college aged men and women do not accurately predict their risks for developing cardiovascular disease, indicating further misperceptions in terms of relative health status. Paradoxically, a recent study by Becker, McMahon, Etnier and Nelson (2002) indicates that college aged students have a marked preference for cognition and behaviors that promote health rather than those designed to prevent disease. This claim may raise concern due to many health behavior change theories that rely on risk perception as a primary or secondary motivating factor (Glanz et al, 2002).

Mixed messages in terms of college students' health-related perceptions and behaviors indicate a need for further clarification in this area. During this time, college students develop habits that will affect their health status across their lifespan (Dinger & Waigandt, 1997). The insidious nature of disease development, coupled with their relatively low perception of both short-term and long-term risk may create a false sense of security in terms of their current health habits. Since relative health status is a complex phenomenon, dependent on many factors, it is important to reliably describe the current health lifestyle of college students in an effort to effectively assess the associated factors and provide health-promoting messages and/or programming. Additionally, much of the current research on college students is performed at a single site, concentrating on

just one, or a few, select health indicators (Bray & Born, 2004; Grubbs & Carter, 2002; Jones, Oeltmann, Wilson, Brener & Hill, 2001; Wechsler, Dowdall, Davenport & Castillo, 1995; Wechsler, Rigotti, Gledhill-Hoyt & Lee, 1998). While these studies have definitely contributed to the understanding of college students' behaviors, evidence would indicate that a more all-inclusive effort would prove beneficial to both the application of theory and practice (Jones et al, 2001).

#### **RESEARCH QUESTIONS**

The research questions to be addressed are as follows:

In an undergraduate college population described by the National College Health Assessment (NCHA):

1. What are the health lifestyle clusters, based on the HP2010 leading behavioral health indicators of physical activity, overweight and obesity, tobacco use, substance abuse, alcohol use, and sexual behavior?

2. What is the relative contribution of each leading health indicator toward cluster prediction?

3. What are the differences in environmental factors (current housing situation, Greek Life, current relationship, health care access, injury and violence) by health lifestyle clusters?

4. What are the personal factors (age, gender, year in school, academic performance, routine preventive care, mental health and general health status) by health lifestyle clusters?

5. What are the differences in perceived norms of risky health behaviors by health lifestyle cluster?

#### THEORETICAL FRAMEWORK

In the practice of health education and promotion, the Social Cognitive Theory (SCT) has emerged as a particularly important and relevant theory. Developed primarily through the work of Albert Bandura (1977), the SCT was derived from the Social Learning Theory (SLT), which traces its roots back into social and behavioral psychology in the late1800's. The SCT is described by Bandura (1989) as a model of causation, based upon triadic reciprocal determinism, a dynamic interaction of personal factors, behavior, and the environment in which the behavior is performed (Figure 1). Proponents of the SCT purport that an individual's behavior is uniquely determined by the combination of these three factors, rather than the unidirectional models (Glanz et al, 2002). While the SCT supports the behaviorist notion that consequences mediate behavior, there exists an overriding influence of the cognitive processes.



Figure 1.1: Social Cognitive Theory overview

According to the SCT, individuals have the ability to use the consequences of related behavior to form their own predictions of outcomes prior to new behavior (Bandura, 1977). Through feedback and the reciprocal interaction of the three influential factors, individuals create their own reality, selectively encode information, and perform on the basis of values and expectations. Additionally, the SCT demonstrates flexibility, as individuals' cognitions change through maturation and experience. Beyond reciprocal determinism, several other key constructs have the potential to intervene in behavior, including environment, situation, behavioral capability, expectations, expectancies, self-control, observational learning, reinforcements, self-efficacy, and emotional coping responses (Baranowski, Perry & Parcel, 2002). These constructs will be further explained in the review of the literature.

The SCT has been used for decades as a theoretical framework for behavior prediction and change, as well as the basis of other behavioral models and theories (Glanz et al, 2002). The theory has exhibited versatility in the health care field, and has been used to study a wide variety of health problems, from rehabilitation compliance to substance abuse.

Perry, Baranowski and Parcel (1990) suggest some reasons for the theory's relevance. First, the theory provides for agreement between the cognitive, emotional, and behavioristic understandings of behavior change. It incorporates a concern for the environment, the person, and the behavior, thereby providing a framework for the development and implementation of comprehensive health behavior change programs. None of the pervious theories provided for a synthesis of these constructs. Also, the processes and constructs delineated in SCT suggest many avenues for behavioral research

and inquiry in health education. Finally, since Social Cognitive Theory was developed in other areas of psychology, health educators and researchers are able to apply theoretical models developed in another field to their own discipline. SCT facilitates the understanding of health behavior and the development of useful strategies to elicit positive health behavior change.

Social Cognitive Theory is an attractive theory for health educators to apply to health education programs because it provides direction to the development of intervention strategies to influence behavior change and it sheds some light on individual behavior dynamics (Perry, Baranowski and Parcel, 1990). This theory has been "widely applied to health behavior with respect to prevention, health promotion, and modification of unhealthy lifestyles for many different risk behaviors" (Redding et al, 2000, p. 185). As an example, a meta-analysis conducted by Holden (1991) found SCT constructs applied in studies of dental behavior, cigarette smoking, pain tolerance, physical activity/exercise, weight loss/management and treatment compliance, among others. There are a large number of intervention studies that support the effectiveness of Social Cognitive Theory as a theoretical base for promoting health behavior change (Baranowski, Perry & Parcel, 2002).

Healthy People 2010 (HP2010) provides a comprehensive framework for viewing the overall health status of the nation (USDHHS, 2000). Indeed, health promoters and educators are encouraged to use this framework when planning and evaluating health promotion efforts. The leading ten health indicators outlined in HP2010 are the product of much collaboration and are considered highly relevant to current public health issues. The interdependency of the health indicators is acknowledged, and provides impetus for more broad-based health related projects. The health indicators are indicative of "individual behaviors, physical and social environments, and important health system issues that greatly affect the health of individuals" (USDHHS, p. 24). Additionally, the importance of "biology" as a determinant of health is also acknowledged. Thus, the health indicators as described by HP2010 fit into the triadic framework provided by the SCT that includes personal factors, environment, and behaviors. There are bound to be strong relationships among the leading health indicators and the determinants of health. The patterns and strengths of these relationships will be indicative of the utility of the SCT for future analyses.

#### **DEFINITION OF TERMS**

Health Behavior: "those personal attributes such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states and traits; and overt behavior patterns, actions, and habits that relate to health maintenance, to health restoration, and to health improvement" (Gochman, 1997)

Health-promoting/ health-directed behavior: actions taken for the protection or improvement of health (Green & Kreuter, 1999).

Health-risk behavior: actions taken by an individual for that increase the possibility of experiencing a health compromising condition. (Green & Kreuter, 1999).

Health Lifestyle: "the culturally, socially, economically, and environmentally conditioned

complex of actions characteristic of an individual...as a pattern of habituated behavior over time that is health related but not necessarily health directed" (Green & Kreuter, 1999)

Leading Health Indicators: those factors indicated in HP2010 that effect health status through their ability to motivate action, the availability of supporting data indicators, and their relevance to broad public health issues (USDHHS, 2000).

Operational definition: the answers to the following questions as indicated in the NCHA:

- Physical Activity: On how many of the past 7 days did you participate in vigorous exercise for at least 20 minutes or moderate exercise for at least 30 minutes? 0, 1, 2, 3, 4, 5, 6, 7 days.
- 2. Overweight and obesity: calculated BMI, from the questions "What is your height in feet and inches?" and "What is your weight in pounds?"
- Tobacco use: Within the last 30 days, on how many days did you use: cigarettes, cigars, smokeless tobacco? Never used; have used, but not in the past 30 days; 1-2 days; 3-5 days; 6-9 days; 10-19 days; 20-29 days; all 30 days. Combined and recoded to "never to rarely"; "sometimes"; "often or regular use"
- 4. Substance abuse: Within the last 30 days, on how many days did you use: alcohol, marijuana, cocaine, amphetamines? Never used; have used, but not in the past 30 days; 1-2 days; 3-5 days; 6-9 days; 10-19 days; 20-29 days; all 30 days. Combined and recoded to "never to rarely"; "sometimes"; "often or regular use"
- 5. Responsible sexual behavior: Within the last 30 days, how often did you or your partner(s) use a condom during: oral sex, vaginal intercourse, anal intercourse?

Never did this sexual activity; have not done this during the last 30 days; never; rarely; sometimes; mostly; always. Recoded to "never or rarely"; "sometimes"; "mostly or always"

#### LIMITATIONS AND DELIMITATIONS

- The National College Health Assessment (NCHA) database represents schools that elected to participate in the assessment, and is therefore, not generalizable to all college students in the United States. The participating schools had agreed to randomly selecting students or classrooms, so that the presenting sample should be indicative of each institution.
- 2. The information gathered was self-reported, requiring students to recall and report health-related behaviors and other personal data. The data were gathered under the assumption that the subjects responded as honestly and accurately as possible, which may not always be the case. Subjects had been assured that participation was voluntary and that confidentiality of the survey instrument's contents would be maintained.
- 3. When using a secondary data source, there are limitations on the researcher regarding the constituitive definitions of concepts, as well as the actual wording of both the survey questions and the answers. Development of the NCHA survey instrument was informed by several other national risk behavior and health assessment, and built on solid constructs as defined in health behavior theory.

 Only full-time undergraduate students in four-year colleges and universities will be included in the study. They are more likely to fall within the parameters of 'young adults' (18-25 years old). Additionally, the analysis included only fulltime, domestic students.

#### CHAPTER 2

#### **REVIEW OF LITERATURE**

Healthy People 2010 (USDHHS, 2000) has set forth guidelines and goals for health-related behaviors to be met during the current decade, including ones that are geared specifically to college-aged population, as well as those that encompass the adult population as a whole. Because the college years provide a plausible window for establishment of health promoting behaviors for young adults, it may prove beneficial to concentrate on this population in terms of messages and programs. It is important, then, to explore the health-related behaviors of college students to gain a better picture of the current situation in order to discern the patterns of behaviors for this population.

This chapter will begin with an overview of the Social Cognitive Theory, which is being used as a behavioral framework for the study. A discussion of health-related behaviors will follow, including the links between behaviors and health promotion and disease prevention. Further, the unique population of college students will be explored, including literature related to behaviors and risk factors, as well as programs aimed at modifying them.

#### SOCIAL COGNITIVE THEORY

Social Cognitive Theory (SCT) (Bandura, 1977) addresses health behavior change in terms of psychosocial dynamics. The emphasis of health behavior change lies in the interaction of cognitions (personal factors), behaviors and the environment. This concept, reciprocal determinism or triadic reciprocal causation (illustrated in Figure 1), posits that human behavior is explained in terms of "a triadic, dynamic and reciprocal model in which behavior, personal factors (including cognitions), and environmental influences all interact" (Perry et al, pg 161). This SCT construct states that behavior is not simply a bi-directional relationship between the person and environment, or the person and behavior, but an interaction of all three. These interactions act as the determinants of human behavior based on the characteristics of the person, characteristics of the environment and the nature of the behavior (Goldman & Schmalz, 2001).



B signifies behavior; P the cognitive, biological, and other internal events that affect perceptions and action; and E the external environment. Bandura, A (1986).

Figure 2.1 – Schematization of triadic reciprocal causation.

Reciprocal determinism, along with other constructs identified in SCT, for example modeling, self-regulation, self-efficacy, and outcome expectancy, have been valuable in designing health education programs. In health education, the likelihood of behavior change has often been increased through procedures and techniques influenced by the underlying cognitive and environmental variables of SCT. The use of SCT in health education addresses health behavior change by emphasizing the many cognitive mediators of behavior (Perry, et al, 1990). Perry et al (1990) also state: "the theory not only explains how people acquire and maintain certain behavior patterns but also provides the basis for intervention and learning strategies" (pg. 162).

The following will provide a brief history of the theory, describe the key concepts, and examine the application of the theory to health promotion. The goal of this section is to provide a comprehensive evaluation of SCT and its use as a theoretical framework in the field of health education and health promotion.

#### History of Social Cognitive Theory

Social Cognitive Theory (SCT) has a broad conceptual basis and encompasses a wide range of conceptual ideas that have been applied to many areas of practice in the past 40 years. Redding et al (2000) describe SCT as "the most comprehensive model of human behavior yet proposed" (pg 184). The SCT was an adaptation of the popular Social Learning Theory (SLT). The publication milestones in the development of SLT began in 1941 with the work of Miller and Dollard (1941), who sought to explain imitation behavior in humans and animals. Two major streams of research followed that linked the basic concepts of SLT to health-related theory. One of the first researchers to link SLT to health education was Julian Rotter. In 1954, Rotter introduced generalized

reinforcement and locus of control into clinical psychology. Wallston and Wallston later applied the constructs and formulated "health" locus of control (Perry, et al, 1990). The second major stream of research linking SLT to health education came from Albert Bandura (1977).

Bandura has been a leader in the efforts to develop SLT (Redding, et al, 2000, Perry et al, 1990). Bandura adjusted the name of his adaptation to the Social Cognitive Theory (SCT), because it focuses mainly on the how cognitions influence behavior and development in the social realm. He emphasizes the importance of modeling and observation of the emotional reactions, attitudes and behaviors of others. Bandura introduced several important concepts in SCT including modeling (vicarious learning), self-efficacy, expectations, and expectancies. Most recently, Bandura has contributed to the expansion of SCT through its application to health psychology. Many of these concepts are important to health promotion because SCT "not only illuminates the dynamics of individual behavior but also gives direction to the design of intervention strategies to influence behavior change (Perry, et al, 1990, pg.181). A brief description of some of these major concepts of SCT will now be addressed.

#### Major Concepts and Principles of SCT

One can examine the psychosocial dynamics underlying health behavior and the methods of promoting health related behavior change through understanding of the numerous constructs related to SCT. Table 2.1, adapted from Baranowski et al (2002), outlines the major concepts in SCT and their implications for intervention in health promotion and health behavior change.

Concept	Definition	Implications
Environment	Factors that are physically external to the person	Provide opportunities and social support
Situation	Person's perception of the environment	Correct misperceptions and promote healthful norms
Behavioral capability	Knowledge and skill to perform a given behavior	Promote mastery learning through skills training
Expectations	Anticipatory outcomes of a behavior	Model positive outcomes of healthful behavior
Expectancies	The values that the person places on a given outcome, incentives	Present outcomes of change that have functional meaning
Self-control	Personal regulation of goal-directed behavior or performance	Provide opportunities for self-monitoring and contracting
Observational Learning	Behavioral acquisition that occurs by watching the actions and outcomes of others' behavior	Include credible role models of the targeted behavior
Reinforcements	Responses to a person's behavior that increase or decrease the likelihood of reoccurrence	Promote self-initiated rewards and incentives
Self-efficacy	The person's confidence in performing a particular behavior	Approach behavior change in small steps; seek specificity about the change sought
Emotional coping Responses	Strategies or tactics that are used by a person to deal with emotional stimuli	Provide training in problem solving and stress management; include opportunities to practice skills in emotionally arousing situations
Reciprocal determinism	The dynamic interaction of the person, behavior, and the environment in which the behavior is performed	Consider multiple avenues to behavioral change including environmental, skill, and personal change

Adapted from Baranowski et al (2002)

# Table 2.1 Major Concepts in Social Cognitive Theory and Implications for Health

## **Promotion Interventions**

Although there are several versions of the SCT to which researchers currently subscribe, they all share three basic assumptions (Bandura, 1977; Baranowski, 2002):

- The likelihood that a person will perform a particular behavior again in a given situation is influenced by response consequences (such as rewards or punishments) and if it results in outcomes that they value.
- In addition to learning by participating in an act personally, humans can learn by observing others (vicarious learning).
- Individuals are most likely to model behavior that they observe in individuals that they can identify with. This identification is influenced by how the individual is perceived to be like oneself and the degree of emotional attachment felt toward the individual.

#### **HEALTH-RELATED BEHAVIORS**

Adverse changes in health behaviors have been noted across most sectors of the United States in recent years (USDHHS, 2002). In the literature, these changes are often linked to the increase in incidence and severity of chronic disease in the United States (Conroy, Cook, Manson, Buiring & Lee, 2005; Mokdad, Ford, Bowman, Dietz, Vinicor, Bales & Marks, 2003). For instance, based on NHANES data from 1999 – 2003, over 1/3 of adult Americans have some form of cardiovascular disease (CDC, 2005). That alone translates into a total estimated health care cost in 2006 of over 400 billion dollars. According to recent BRFFS data, 36.4% of adult females and 37.9% of adult males have at least two CVD risk factors, with some variance in subpopulations (Winkleby & Cubbin, 2004).

The HP 2010 determinants of health have been linked to demographics, both social and physical environments, and health behaviors and risks (Tones & Green, 2004; USDHHS, 2000). With heart disease, cancer, and stroke currently accounting for approximately 62% of the US mortality rate (USDHHS, 2000), it is pertinent to view the behavioral risk factors that are associated with this triad.

Substance use has the potential to have varied and profound effects upon the health of our nation (USDHHS, 2005). In terms of health behaviors, tobacco use is the leading preventable cause of death in the United States, with 1 out of every 5 deaths attributable to some form of tobacco use. Cigarette smoking alone has a strong predictive relationship with sudden cardiac death in persons with coronary heart disease (CHD), and it nearly doubles a person's risk for stroke. Over 70 million Americans (29%) age 12 or older used tobacco products in 2004, a slight decrease from previous years (CDC, 2005). Approximately 44.5 million (20.9%) American adults smoke, with nearly 4000 new smokers each day. While these numbers represent a decrease in some population sectors, there has been a recent increase in the percentage of youth and ethnic women who use tobacco. Due to the addictive qualities of nicotine, smoking cessation, at any age, is a difficult process which often results in relapse.

Tobacco use is often linked to other substance use, specifically alcohol and illicit drug use. According to the 2004 National Survey on Drug Use and Health (NSDUH),

about half (50.3%) of adolescent and adult Americans were current consumers of alcohol (CDC, 2005). Of that number, nearly half (22.8%) had experienced an incident of binge drinking (5 or more drinks during an episode) in the past 30 days. On a lesser scale, illicit drug use for the same cohort and time period was represented in slightly less than 8% of the population. Marijuana remained the most commonly used illicit drug for all age and ethnic categories. Substance abuse is quite often linked to other, riskier forms of behavior such as violence and physical abuse, risky sexual activities, and heavier drug abuse (Nelson, Naimi, Brewer, Bolen, & Wells, 2004).

Another health indicator that has a direct association with many health problems is overweight and obesity (Mokdad et al, 2003). Overweight and obesity has been linked to CHD, diabetes, high blood pressure, high cholesterol, asthma, arthritis. NHANES data from 1976 to 2004 indicates an increase of adults who are overweight or obese from 47% to 66.2% (CDC, 2005). The more alarming results indicate that the rate of obesity has more than doubled during that same time frame (15% - 32.9%). Disparities were evident in terms of age categories and ethnicities. Typically, overweight or obesity is the result of an imbalance between calorie intake and calorie expenditure, which rely mainly upon lifestyle, environment, culture, and genes. Therefore, dietary intake and physical activity may have a profound effect on a person's weight. Evidence indicates that the amount of physical activity that the average person gets per week, while not optimal, has not changed significantly in the past 30 years. Calorie consumption, on the other hand, has increased during that same time span. If more calories are consumed than expended, the residual 'calories' are stored by the body, most typically in the form of residual layers of fat.

Building upon health behavior research, Reeves and Rafferty (2004) constructed the Index of Healthy Lifestyles (IHL) which was a combination of four health characteristics; healthy weight (1=yes; 0=no), smoking (1=no; 0=yes), 5 fruits and vegetables/day (1=yes; 0=no), and regular physical activity (1=yes; 0=no). When applied to the 2000 BRFSS data, the results were quite telling. While about three-quarters of the population were nonsmoking, only 41% were of a healthy weight, and far fewer ate 5 fruits and vegetables/day (23%) or were regular exercisers (22%). Furthermore, the calculated IHL indicated that only 3% of the population had the desirable combination of all four health characteristics.

Because it is evident that health behaviors can be affected in youth, and because public and private schools provide fairly reliant and reasonable avenues for dissemination to elementary and secondary children, some effort has been put into programmatic ventures aimed at children and youth (Romer, 2003; Sparling, Owen, Lambert & Haskell, 2000). For the most part, school-based health promotion programs provide ageappropriate messages that may ultimately have some influence on health behaviors. While some school districts are attempting to follow the CDC guidelines for school health education programs (www.cdc.gov/nccdphp/dash), the long-term impact of such programming is difficult to measure. In fact, evidence suggests a very low correlation between physical activity during adolescence and during young adulthood (Taylor, Blair, Cummings, Wun, & Malina, 1999). A few researchers have attempted to explain differences in behaviors during the transition from adolescence to adulthood, with mixed results (Bray & Born, 2004). Recent analysis of the CDC's Behavioral Risk Factor Surveillance System (BRFSS) data revealed that young adults (18 and 24 years old) experienced a decline in health profiles during the decade 1990 – 2000 (Winkelby & Cubbin, 2004). Data indicated adverse changes in many areas, including smoking, obesity, sedentary behaviors, and low fruit and vegetable intake.

Most would agree that health promotion efforts are not a one-size-fits-all venture, and many theories have emerged in an effort to predict behavior or affect behavior change (Glanz et al, 2002; DiClemente, Crosby & Kegler, 2002). While some basic models or theories of behavior have existed for many years, there are some that appear more sensitive to societal, environmental and individual differences.

Regardless of the model or theory of behavior change engaged, evidence purports that health promotion efforts are most effective if tailored specifically to the needs of the population being served. However sound the theories, restrictions in resources (knowledge, time, money, etc.) often limit the reality in terms of health program planning and implementation. What is evident from research and practice, however, is that finding and effectively utilizing public venues for health programming becomes increasingly challenging for adult populations of almost any age.

#### COLLEGE STUDENT HEALTH

Nearly 12 million students attend colleges or universities in the United States. In spite of some variations in the demographic make-up, many of those students represent the 18-24 (young adult) age group. Faculty and staff are currently charged with promoting sustained efforts aimed at creating campus environments that are academically, emotionally, and physically healthy/sound. Research has indicated a comorbidity of risk behaviors, a confounding factor in intervention planning and implementation (Eisen, Pallitto, Bradner & Bolshun, 2000; Romer, 2003). Additionally,
campus-wide prevention programs may have different sponsors, causing a further fragmentation of efforts. While most campuses boast programs aimed at reducing the incidence of unhealthy behaviors in college-age students, evidence from the Harvard School of Public Health College Alcohol Study (CAS) study indicates there has not been a significant reduction in most risky behaviors in the past ten years (Wechsler, Lee, Kuo, Seibring, Nelson & Lee, 2002). Indeed, some indicators have shown an increase in risk behaviors in certain populations. While campus officials are charged with creating plans for total student body 'health', disparities exist in terms of the underlying theories, approaches and outcomes of their efforts.

While young adulthood is prime time for development of health beliefs and practices, college aged students are also 'prime' for engagement in risky behaviors, partly due to the relative freedom of the campus environment (Wechsler et al, 2002). Indeed, researchers have noted that college students are at higher risk for many behaviors than young adults who do not attend college (Jones, Oeltmann, Wilson, Brener & Hill, 2001).

Among college students, researchers have focused primarily on tobacco, drug and alcohol use, unprotected sex, and to a lesser degree, gambling and violence, although other factors regarding personal safety are sometimes included (Eisen et al, 2000; Kaiser Foundation, 2002; Licciardone, 2003; McNeal, Hansen, Harrington & Giles, 200; Romer, 2003). While many acknowledged the coexistence and confounding nature of these multiple behaviors, most were handled singly in terms of research and analyses, as well as program planning and implementation.

Recent literature regarding college students' risk factors focused on the one behavior that seems most prevalent on college campuses today: binge drinking

(Licciardone, 2003; Graham, Tatterson, Roberts, & Johnston, 2004; Jones et al, 2001; Wechsler & Kuo, 2000; Wechsler et al 2002; Ziemelis, Buckman & Elfessi, 2002). A recent study focusing on alcohol consumption patterns across the United States in any age-group indicated higher proportions of binge drinking in metropolitan areas that housed major colleges or universities (Nelson, Naimi, Brewer, Bolen & Wells, 2004). In fact, some have indicated that binge drinking is the primary source of preventable morbidity and mortality for college students in America (Jones et al, 2001). While legal efforts such as the National Minimum Purchase Age Act (1984) have had some effect on alcohol-related accidents for young adults, Wechsler et al (2002) acknowledge that binge drinking on American college campuses remains a huge problem, mostly due to lack of enforcement. While colleges are mandated to combat the problem of underage drinking, lack of funding and other resources often thwart the effort toward prevention services. There is also some concern that some prevention messages and programs that are used by colleges are funded by the alcohol industry, sending a mixed message to college-aged students. The sad fact is that 40% to 45% of college students continue to binge drink; a relatively constant proportion since the early 90s (Wechsler et al, 2002). Additionally, there is an increase in the prevalence of binge drinking among college-aged women.

Such high-risk drinking is the one factor consistently linked to other risky behaviors, such as use of other illegal drugs, risky sexual practices and violent behavior (Eisen et al, 2000; Graham et al, 2004; Jones et al, 2001; Kaiser Foundation, 2002; Romer, 2003; Wechsler et al; 2002). A study based on data from the 1995 National College Health Risk Behavior Survey by the CDC found that the more that students binge drank, the more likely they were to have used cigarettes, marijuana, cocaine, and other drugs (Jones et al, 2001). They also indicated the association between binge drinking and many other physical, psychological and educational problems. Although studies don't always indicate a causal linkage between binge drinking and other risky behaviors, there is often evidence that they coexist (Eisen et al, 2000; Wechsler et al, 2002). Some researchers honed in on empirically sound groupings of like unhealthy behaviors into domains such as "substance use" (Johnston, 2003), even indicating evidence of a hierarchy of involvement. Indeed, Jones et al (2001) found a significant dose-response relationship between the number of days spent binge drinking and the use of other substances among college students.

Hornick (2003) subscribe to the "gateway" theory in terms of substance use and abuse, indicating a natural progression from lower-stage substances to higher-stage substances. At each stage, the frequency of usage typically escalates prior to moving on to the higher-stage substance, providing a potential indicator of expanded substance use. Indeed, data from the National Parents and Youth survey indicated a strong association between the use of alcohol, cigarettes, and marijuana. Additionally, marijuana usage was rarely indicated without concurrent cigarette and/or alcohol usage, and their usage was a strong predictor of subsequent marijuana use.

In light of the associations between cigarette smoking and use or abuse of other substances, indications of increasing numbers of smokers among college students in the past 10 years is concerning. The 1997 CAS indicated that about a third of the students from representative colleges were cigarette smokers (Wechsler, Rigotti, Gledhill-Hoyt & Lee, 1998). This represented an increase of 28% since the prior survey (1993). Subsequent survey data indicated that the prevalence of smoking among college students

had remained about the same through the end of the decade. Halperin and Rigotti (2003) indicate that the campus environment has the potential for encouraging tobacco use due to the general lack of restrictions on smoking, coupled with the visibility and ease of obtaining cigarettes. The authors point to the increase of tobacco companies' representation on or near the campus environment as an indication of their more recent advertising ploys aimed at the young adult cohort.

While some researchers concentrate solely on the area of substance abuse, the Kaiser Family Foundation's National Survey of Youth Knowledge and Attitudes on Sexual Health Issues (2002) focused on the behaviors and attitudes of 15- to 24-year olds with regard to substance abuse and sexual activity. The results of the national survey indicate a close association between alcohol and drug use, and sexual decision making and risk taking. Many report having 'done more' sexually while under the influence of alcohol or drugs, and that they worried later about having unprotected sex and their likelihood of pregnancy or STDs. Kirby (2003) summarizes the general interpretations of the relationship between substance use and sexual activity in two categories: the general inclination towards risky behavior, and the diminished effect on rational decision-making brought about by drug and alcohol use.

Alcohol and substance abuse has also been linked to an increase in violence, including personal assault and property damage. Their usage also increases the likelihood of accidents; the leading cause of death among older adolescents and young adults (Wechsler et al, 2002). Binge drinking, in particular, is associated with a much higher risk for females in terms of physical abuse and sexual assault, with the large majority of the women knowing their attacker (Borsari, Bergen-Cico and Carey, 2003). As stated earlier, while most researchers focus on one or two risky behaviors, some have attempted to describe the behaviors more generally in terms of risk-taking (Romer, 2003; Johnston, 2003). The rationale for this approach is that many precursors of independent risky behaviors are the same, and that a more holistic viewpoint might be more parsimonious in terms of prediction of risk, as well as providing important guidance in terms of risk behavior interventions. In Romer's (2003) study, respondents were queried on their perception of prevalence of five risky behaviors (alcohol use, cigarette use, marijuana use, gambling, and seatbelt use) with regard to popularity. The data revealed that the youth involved indicated that the behaviors were likely to co-occur, and that the behaviors were associated with popularity. Consequently, the author projected that any intervention aimed at just one risk behavior may not be effective when the normsetters of this group are likely to engage in multiple risky behaviors. Another revelation from research aimed at multiple risk behaviors is that young people are likely to perceive their peers to be at higher risk from behaviors than themselves (Wechsler & Kuo, 2000).

Student involvement, at many levels, was indicated as a mediating factor in risk behaviors (Maney et al, 2002; Ziemelis et al, 2002). Active involvement in community service appears to have an inverse relationship with high risk behaviors. Similarly, involvement in faith-based organizations or activities was seen as a fairly strong indicator of such behavior. Ferron, Narring, Cauderay & Michaud (1999) found a strong correlation between involvement in sport activity and experimental risk behavior in adolescents. Conversely, active involvement in fraternities or sororities was found to have a rather strong direct correlation to activities involving higher risk behaviors (Carter & Kahnweiler; Steinman, 2003). In conjunction with the current risk behaviors, researchers often project many mediators, including personal, social, and environmental attributes and characteristics. Student involvement in terms of decision-making regarding possible risk reduction can also be deemed important (Ziemelis et al, 2002). The authors project that students who were involved in the development and operation of the programs were more likely to develop a positive association with the programs themselves. It was also indicated that students were more likely to have more positive feelings toward policy if they felt that they had some input into the decisions regarding its development and enforcement. While involvement in programmatic decisions might be a mediator of risk behaviors, personal decision-making abilities may not have an effect on a student's involvement in risk behaviors.

Certain demographics appear to be fairly stable predictors of risky behavior, especially in terms of alcohol and other drug use. Typically, white male students with an early onset of substance use were found the most likely to be involved in high risk activities (Carter & Kahnweiler, 2000; Jones et al, 2001). There has been some evidence to indicate that older students may be at higher risk for certain behaviors, but some will attribute this to age at onset rather than strictly the age. Little difference has been found in terms of students being full-time or part-time, but living on or near campus put those students at higher risk than commuters.

While the research is relatively inconclusive about the extent of the mediators, it is interesting to note that not one study advocated the need for more knowledge for students regarding risky behaviors themselves. In fact, Graham et al (2004) point out

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that, while underage students know that it is illegal to purchase, possess or consume alcohol, the majority will do just that. Clearly, lack of knowledge of knowledge of the 'facts' about the behaviors is not seen as an issue.

Many of the projected mediators of risk behaviors have emerged from the literature, based mainly on prediction models or intervention evaluation. One approach aimed at explaining unhealthy behaviors is that of peer influence, both direct and indirect (Borsari & Carey, 2001). Indirect peer influence translates into the more recently described 'social norming', that some claim is the 'peer pressure' of this decade. Social norms are the perceived normative behaviors of a person's peer group (Wechsler & Kuo, 2000). Invariably, college students perceive the prevalence of risky behaviors as being higher than they actually are, and almost always as riskier than their own. If they are striving toward this perceived norm, the theory is that they will adjust their behavior accordingly to reach it. Programs evaluated by Borsari & Carey (2001) based on this model indicated a modicum of success in changing perceptions of the behaviors of others, but is usually used in conjunction with other mediators in terms of behavior change. Indeed, McNeal et al (2004) indicated that normative beliefs, in conjunction with other mediating factors, had the potential to deter the onset of substance use and sexual activity.

Some authors' criticism of the current research of the norms approach centers around the range of descriptors used for comparison; from 'your best friend' to 'an average student' (Borsari & Carey, 2001). They argue that a student's perception of their friend's actions is much more likely to be factually based than the perception of an average student. The authors indicate that, while the social norms approach appears promising, the inherent constructs need to be more clearly defined, and more rigorous evaluation will need to be conducted before it is adopted as a panacea for changing risk behaviors (Borsari & Carey, 2001; Licciadone, 2003).

One study, based on an intervention program at a mid-sized university, randomly assigned incoming freshmen to two groups; one for a norm-based intervention, and one for the usual campus psychoeducational prevention program (Werch, Pappas, Carlson, DiClemente, Chally & Sindar, 2000). Analysis of the posttest indicated no difference between the two groups in terms of alcohol use and associated risk factors. The authors suggest that this approach may need to be tailored to specific subgroups to be effective, and that longitudinal studies may prove more enlightening for measuring the effects in terms of prevention or behavioral change.

Another study based on a particularly susceptible student group in terms of substance abuse, fraternity men, indicated that the perceived social norms approach was not particularly successful with that high-risk population (Carter & Kahnweiler, 2000). The authors' indication is that there is not a healthy norm to attach to this particular population, which undermines the basic premise of the approach. Further, the authors indicated that the age of onset of drinking is most indicative of the current drinking behavior of this particular group. This finding is corroborated by a study testing the norm model to explain drinking behaviors in college athletes (Thombs, 2000). This author suggested that the norms model might be more effective with students of later onset of drinking.

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Another approach that shows some promise focuses on harm reduction techniques as outlined by Castro & Foy (2002). Harm reduction focuses on a more humanistic approaches which involve valuing others by "meeting them where they are" (p. 89). The end sought is not an eradication of the behavior, but a reduction in the harm of the related outcome of that behavior. Inherent in this approach is involvement of the students themselves, which was cited previously as an important mediating factor (Maney et al, 2002; Ziemelis et al, 2002). This approach could help foster such practices as dialogue, joint knowledge construction and empowerment.

One of the most promising evaluative studies of binge drinking prevention, in particular, was conducted using data from the Fund for the Improvement of Post-Secondary Education (FIPSE)- sponsored programs (Ziemelis et al, 2002). The researchers devised a systematic approach to discern the predictors of programs that were successful versus those that were not. By using the most important predictors of success, the authors developed three general prevention constructs: student participation; interaction between professionals and students; and regulatory or physical change efforts that also involved the students as decision-makers. While not without limitations, this study does show some promise in terms of social-environmental intervention strategies.

The fact is, in spite of university and college efforts to stem behavioral risk-taking in their student body, many of the reported efforts have not been particularly successful. Some of the criticisms that have been aimed at the current efforts revolve around the lack of systematic research to provide the empirical data necessary to support intervention initiatives (Borsari & Carey, 2001; Ziemelis et al, 2002). Others lay blame on campus officials who may use outdated or unproven programs, or lack of an integrated approach (Hornik, 2003).

The research presented is indicative of the many of the main factors, programs, and approaches that are currently being used. The complexity of the literature attests to the complex nature of the area of health-related behavior. There is some agreement noted in the literature sources, mostly that there needs to be more research in that area. Mediators and approaches that are found appropriate in one instance may not carry through to other applications.

Some areas explored seem ripe for consideration in terms of college students' involvement in risk behaviors. First, since risk behaviors tend to coexist, it seems important to think more globally in terms of universal programs aimed at promoting healthy development through all-risk reduction. Adjustments may need to be made to tailor to specific communities within the college or university setting. It also makes sense to think more globally in term of student involvement at all levels, including personal, community service and college communities. Perhaps then researchers will be able to better discern the salient factors which will guide them toward a more robust model of risk behavior intervention.

# CHAPTER 3

### **METHODS**

The purpose of this study is to determine the health behavior lifestyles of college students and describe the characteristics of these differing lifestyles. The study will measure variables that have been identified through Healthy People 2010 as being leading health indicators (USDHHS, 2000), as well as other variables that have been determined to be related to health behaviors. The five identified leading health indicators [physical activity, overweight and obesity, tobacco use, substance abuse, and sexual behavior] will be used to identify lifestyle 'clusters' that will then be used in subsequent analyses. Due to the exploratory nature of this type of analysis, the number and character of the clusters is unknown, but will emerge as a result of procedures and educated interpretation of the indices. Additionally, this study will determine the relationship of the lifestyle clusters to other health behaviors and perceived health status.

# **RESEARCH QUESTIONS**

The research questions to be addressed are as follows:

In an undergraduate college population described by the National College Health Assessment (NCHA): 1. What are the health lifestyle clusters, based on the HP2010 leading behavioral health indicators of physical activity, overweight and obesity, tobacco use, substance abuse, alcohol use, and sexual behavior?

2. What is the relative contribution of each leading health indicator toward cluster prediction?

3. What are the differences in environmental factors (current housing situation, Greek Life, current relationship, health care access, injury and violence) by health lifestyle clusters?

4. What are the personal factors (age, gender, year in school, academic performance, routine preventive care, mental health and general health status) by health lifestyle clusters?

5. What are the differences in perceived norms of risky health behaviors by health lifestyle cluster?

## DATA SOURCE

In an effort to promote research, the American College Health Association (ACHA) embarked upon the formation of a national database consisting of factors related to college life (www.acha.org). Questionnaire development was influenced by several large-scale surveys, including the National College Health Risk Behavior Survey (NCHRBS), the Student Health Survey, the College Alcohol Study, as well as the health objectives indicated in Healthy People 2000. The resultant survey questionnaire, the National College Health Assessment (NCHA) was pilot tested in 1998-1999. Beginning in the Spring of 2000, data have been collected every Spring and Fall using the NCHA. The NCHA consists of 300 questions that cover several content areas, including: alcohol, tobacco and other drug use; sexual health; weight, nutrition and exercise; mental health; injury and violence; and demographic information. The questionnaire is available in two forms; either printed or web-based. Each version has an introduction to the student, inviting them to participate, and assuring individual anonymity.

Since the schools who participate in the NCHA are self-selected, results cannot necessarily be considered indicative of students in all U.S. higher education institutions. Only schools that agreed to administer the survey questionnaire to randomly selected students, or randomly selected classrooms were allowed to participate. The NCHA has been used in both two-and four-year institutions in all regions of the U.S. As of Spring 2005, nearly 400 schools have participated in survey administration, resulting in over 240,000 participants.

Extensive evaluation has been performed on the resultant NCHA data from the 1998-1999 pilot studies and the Spring of 2000 administration to establish the reliability and validity of the data set in comparison to several previously-established studies. Comparisons were made using the1995 CDC National College Health Risk Behavior Survey, the 1999 Harvard School of Public Health College Alcohol Study (CAS), and the 2000 US Department of Justice National Women Sexual Victimization Study (NCWSV), all of which used representative sampling techniques. Using a variety of analyses, comparisons of relevant percentages, as well as validity analyses of measurement, items, and constructs were performed. The resultant analysis uncovered minimal differences between the NCHA data and that of the comparison data, strengthening the case for validity and reliability of the data, as well as the potential generalizability of the NCHA data to the larger population of college students. The database developers are careful, however, to refer to the data gathered as representative of a reference group, to which others might be compared.

Individual reports of the resultant data are made available to the participating institutions, and provide valuable information for program planning and evaluation. Upon request, data are also made available for research studies. Currently, research is being conducted on the NCHA database in the areas of nutrition, weight and eating disorders; BAC and binge drinking; alcohol and marijuana and academic performance; and depression and suicide. Initial contact with the coordinator of the data has yielded interest in this project. A formal proposal for use of the data will be sent to the coordinator immediately upon acceptance of this research proposal. The data can be imported into SPSS (version 14.0, SPSS Inc, Chicago, IL) which will be used for statistical analyses.

## ANALYSES

The initial analysis that will be used for this study is cluster analysis, a method of grouping the subjects by characteristics (Aldenderfer & Blashfield, 1984; Everitt, Landau & Leese, 2001; Hair, Anderson, Tatham & Black, 2005). This classification of the subjects (college students) is made by the cluster variate, which consists of the variables that represent the characteristics of interest (health behaviors). The pretext is that the resultant groups have a minimum of within-group variation, and maximum between-group variation. There are several methods of measuring this variation, but they basically are categorized into two types; those that are measured between the subjects by distance, or how far apart the subjects are, or by similarity, or how alike the subjects are.

Cluster analysis is most often used for exploratory purposes in research, but is also useful for subject profiling and market segmentation. Aldenderfer and Blashfield (1984) identify four basic goals for the formation of the homogeneous groups that are the result of cluster analyses, while Hair and associates (2005) described similar basic underlying objectives. Quite often, cluster analysis is employed to provide a classification matrix, or taxonomy, for a certain population. Viewing the natural structure of the resultant clusters provides a theoretical basis for groupings based upon the unique combination of variables, or cluster variate (Hair et al, 2005). Cluster analysis can also be viewed as a data simplification or reduction technique. The subjects, rather than being viewed individually, are seen as part of an exclusive group, defined by its own distinctive set of variables, which can help simplify data analyses or interpretation in large data sets. Cluster analysis also has the quality of displaying similarities or differences that are not apparent through other data analysis techniques.

The end number of groups depends upon the researcher, and is informed by the basic purpose of the data clustering (Everitt et al, 2001; Hair et al, 2005). If the researcher is looking for clusters that indicate the 'typical' groups, a solution with few groups would be the best indicator. If, however, the purpose is to discover the exceptional groups, a many-clustered solution would be most indicative. The statistical software used for cluster analysis has several options which aid the researcher in making informed decisions regarding the optimal number of groups, depending upon the variation of analysis used. The desirability of the resultant number of clusters is also judged by their interpretability (Everitt et al, 2001).

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There are several variations of cluster analysis, all with the same underlying premise, but with different clustering methods and data assumptions (Everitt et al, 2001; Hair et al, 2005). Hierarchical cluster analysis is usually performed by agglomeration, or aggregation of the subjects beginning with the two cases that are the most similar, and proceeding in such a one-step fashion until all of the subjects (cases) are in one big group. With the assistance of computer-generated indicators, the researcher can then make a decision on the 'best' multi-group decision for the data and the research purposes. K-Means cluster analysis uses the Euclidean distance among the variables as the basis for clustering. The researcher sets the desired number of groups (K) *a prior*. Initial cluster centers are formed on the first step of the procedure. Each additional step adds subjects to the groups on the basis of the nearest Euclidean distance to the mean of the cluster. Because of the addition of subjects or cases, the cluster centers change at each pass. The process continues until the predetermined cut-off point for the change in the cluster centers is reached.

SPSS (2006) has developed a TwoStep cluster analysis procedure that differs slightly from the traditional cluster analysis. This unique procedure starts with a preclustering, producing a cluster feature tree, a method of channeling the cases from the 'root node' toward the 'leaf node' that most closely matches. If none exist, a new node is started. As additional cases are added, the threshold distance between the nodes adjusts, reconfiguring the tree. This feature allows ease of use for a very large data set. The procedure automatically determines the optimal number of clusters for a given data set, or the number of clusters can be set *a priori*. The TwoStep cluster procedure is also able to analyze both categorical (nominal and ordinal) and continuous (interval and ratio)

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variables in the same analysis, making it ideal for mixed level data. This data flexibility, along with its utility with large data sets, makes the TwoStep cluster analysis ideal for use with the NCHA data set. The stability of the resultant clusters will be tested by splitting the data into two groups and rerunning the TwoStep cluster analysis (Hair et al, 2005). Additionally, the functionality of the clusters will be assessed by the researcher for their structure and interpretability.

Following the initial clustering, a multiple regression will be performed to evaluate the relative contribution of each of the five health behaviors on the clusters (research question 2). Research questions 3 - 7 will be answered using various statistical tests, including chi squares, Kruskal-Wallis, and ANOVAs. The a priori significance level is set at 0.05. A summary of the research questions, related variables, and analyses are presented below.

RESEARCH QUESTION	TYPE OF VARIABLE	STATISTICAL ANALYSES
1. What are the health lifestyle clusters, based on the HP2010 leading behavioral health indicators?	<b>physical activity</b> : interval - # of days of physical activity/ week. <b>overweight and</b> <b>obesity</b> : interval – BMI calculated from weight (lbs) and height (in) <b>tobacco use:</b> ordinal – recode of a combination of cigarette, cigar, and smokeless tobacco use, coded as "never/rarely"; "sometimes"; "frequently/always" <b>substance use:</b> ordinal – recode of a combination of marijuana, cocaine, amphetamines, and rohypnol, coded as "never/rarely"; "sometimes"; "frequently/always" <b>alcohol use:</b> ordinal – recoded as "never/rarely"; "sometimes"; "frequently/always" <b>sexual behavior</b> : ordinal – recode as "abstain/always use condom"; "sometimes use condom"; "rarely/never use condom"	TwoStep Cluster Analysis
2. What is the relative contribution of each leading health indicator toward cluster prediction?	Physical activity: interval Overweight/obesity: interval Tobacco use: ordinal Substance use: ordinal Alcohol use: ordinal Sexual behavior: ordinal	Multiple regression
3. What are the differences in environmental factors by health lifestyle clusters?	Health lifestyle clusters: nominal – K clusters described by twostep cluster analysis Where currently living: nominal – "residence hall" "fraternity/sorority house" " other University housing" "off-campus" "parents/guardians home" Social fraternity/sorority member: nominal – "yes" "no" Health care access: Student insurance: nominal – "yes" "no" Physical violence in past year: nominal – coded "no" "yes"	ANOVA (interval) Kruskall-Wallis test (ordinal) Chi Square (nominal)

4. What are the	Health lifestyle clusters: nominal – K	ANOVA
differences in personal	clusters described by twostep cluster	(interval)
factors by health	analysis	Kruskall-Wallis
lifestyle clusters?	Age: interval	test (ordinal)
-	Gender: nominal – "male" "female"	Chi Square
	Year in school: interval – "1- 5"	(nominal)
	Mental health problems: ordinal -	
	combined hopelessness, overwhelmed,	
	exhausted, sad, depressed, considering	
	suicide and recode to "never" "sometimes"	
	"often"	
	Routine preventive care: interval (0-15)	
	combination of the following:	
	Immunization: interval – combination of	
	hepatitis B, meningitis, chicken pox, mmr,	
	influenza. Range= $0-5$ .	
	Seatbelt use: 1 "yes" 2 "no"	
	Helmet use: 1 "yes" 2 "no"	
	Fruit/vegetable servings consumed/day: 1	
	"yes" 2 "no"	
	Enough sleep to feel rested: 1 "yes" 2	
	"no"	
	Perceived general health status: ordinal –	
	"excellent"; "very good"; "good"; "fair";	
	"poor"	
5. What are the	Health lifestyle clusters: nominal – K	Kruskall-Wallis
differences in	clusters described by twostep cluster	test
perceived norms of	analysis	
health behaviors based	Perceived norms: ordinal –	
upon health lifestyle	Tobacco use norm= combination of	
clusters?	cigarette, cigars, smokeless tobacco "never	
	used" "used 1 or more days" "used daily"	
	Substance use norm= combination of	
	marijuana, cocaine, amphetamines,	
	rohypnol "never used" "used 1 or more	
	days" "used daily"	
	Alcohol use norm "never used" "used 1 or	
	more days" "used daily"	
	Binging norm = number of drinks/episode	
	of drinking	
	Risky sex norm "never" "rarely"	
	"sometimes" "mostly" "always"	

## CHAPTER 4

### STUDY RESULTS

The purpose of this study was to describe the health behavior lifestyles of college students and the characteristics of these differing lifestyles. The study measured variables that have been identified through Healthy People 2010 as being leading health indicators (USDHHS, 2000), as well as other variables that have been determined to be related to health behaviors. The five identified leading health indicators [physical activity, overweight and obesity, tobacco use, substance abuse, and sexual behavior] were used to identify lifestyle 'clusters' that then were used in subsequent analyses. Additionally, this study will determine the relationship of the lifestyle clusters to personal and environmental factors.

## DEMOGRAPHIC DESCRIPTION

Data from the American College Health Assessment (ACHA) maintained by the National College Health Association (NCHA) were used for the analyses involved in this study. Data gathered from Autumn of 2000 through Spring of 2005 were included, comprising eleven collection periods. To reduce the number of confounding variables, only data from full-time, undergraduate, domestic students between the ages of 18 and 24 were included in the analysis. The resultant data set included 178,115 undergraduate students, Which represented over 400 four-year institutions in the United States. The respondents were representative of institutions that were nearly equally distributed in the regions of the United States, including Northeast (25 %), Midwest (28 %), South (23 %), and the West (24 %). Comparisons were made among the eleven data gathering periods on the variables of interest. It should be noted that the data are not longitudinal, but from cohort reference groups, therefore, any variation in time period is not necessarily indicative of improvement or decline across time.

Demographic data indicate that the majority of the respondents were female (61.6%), with most identifying themselves as white, non-Hispanic (77%). Much smaller proportions of individuals indicated that they were Asian (7%), Hispanic (4.9%) and Black (4.8%).

RACE (How do you usually			
describe yourself?)	Frequency	Percent	
White	137,174	77.0	
Black	8,523	4.8	
Hispanic	8,714	4.9	
Asian	12,473	7.0	
Indian	519	.3	
Other	4,164	2.3	
Total	171,567	96.3	
Missing	6,548	3.7	
Total	178,115	100.0	

Table 4.1: Self-reported race of respondents

The respondents' ages ranged from 18 to 25 years, with the average age of 20.2 (1.77). Accordingly, the respondents were somewhat more representative of underclassmen (55.3) than upperclassmen (44.7), but the numbers were sufficient in each of the categories for subsequent analysis (see demographic tables 4.2 - 4.3).

When queried about their current relationship, the majority of the respondents indicated that they were single (59.5%). Over one-third (37.7%) of the respondents indicated that they were engaged, while a much smaller portion (2.3%) reported that they were married.

AGE (years)	Frequency	Percent
18	33,629	18.9
19	42,906	24.1
20	37,414	21.0
21	32,137	18.0
22	18,385	10.3
23	7,339	4.1
24	3,811	2.1
25	2,494	1.4
Total	178,115	100.0

Table 4.2: Self-reported age of respondents

YEAR	Frequency	Percent
1st year undergrad	56,547	31.7
2nd year undergrad	41,961	23.6
3rd year undergrad	39,249	22.0
4th year undergrad	30,568	17.2
5th year or more under	9,790	5.5
Total	178,115	100.0

Table 4.3: Self-reported year in school

	Frequency	Percent
single	105,717	59.4
married	4,170	2.3
engaged	67,190	37.7
separated	235	.1
divorced	314	.2
widowed	38	.0
Total	177,664	99.7
Missing	451	.3
Total	178,115	100.0

Table 4.4: Respondents' current relationship

	Frequency	Percent
residence hall	83,191	46.7
frat/sorority house	4,007	2.2
other university housing	7,126	4.0
off campus	54,991	30.9
with parents	24,710	13.9
other	3,612	2.0
Total	177,637	99.7
Missing	478	.3
Total	178,115	100.0

Table 4.5: Respondents' current living situation

Approximately one half (50.7%) of the respondents reported living in residence halls or other university housing. While only 14% reported living with their parents, nearly 31% said they lived in other "off campus housing". While nearly 10% (17,660) of the respondents had indicated that they belonged to a fraternity or sorority, less than one-fourth of those were living in sorority or fraternity houses (see table 4.5).

## **RESEARCH QUESTIONS**

1. What are the health lifestyle clusters, based on the HP2010 leading behavioral health indicators of physical activity, overweight and obesity, tobacco use, substance abuse, alcohol use, and sexual behavior?

Two Step cluster analysis was performed on the NCHA data, following the recommendations regarding the discovery of the most typical clusters (Everitt et al, 2001; Hair et al, 2005). The program was restricted to 2-, 3-, and 4-cluster solutions, and the resultant clusters were analyzed by the researchers for their qualities. The 3-cluster solution was the most conceptually meaningful of the three, and was, therefore, used for subsequent analyses. The numbers in each of the three clusters represent a reasonable proportion in each (see table 4.6). Nearly twelve percent of the total number of respondents was automatically omitted by SPSS from the analysis due to at least one missing variable from the cluster variate.

Defining the Clusters:

Clusters are usually named by the characteristics of the variables that shaped them; the variate (Everitt et al, 2001; Hair et al, 2005). In the following section, the individual variables will be described by cluster, and then the clusters will be described by their characteristics.

Tobacco use was measured using a combination of the answers to three questions regarding the use of cigarettes, cigars and smokeless tobacco in the last 30 days. The recoding of this combination yielded three categories: 'rarely or never used'; 'fewer than

CLUSTERS	Frequency	Percent
#1	57,136	32.1
# 2	56,335	31.6
# 3	43,476	24.4
Total	156,947	88.1
Missing	21,168	11.9
Total	178,115	100.0

Table 4.6: Results of 3-cluster solution

20 days per month'; and 'more than or equal to 20 days per month'. The members of both clusters 2 and 3 rarely, if ever use tobacco products (see figure 4.1). Nearly half (48%) of the cluster 3 respondents were characterized as occasional tobacco users, while the remainder were split between rare, if ever users (24%) and regular users (28%).

Because of the distinctive administrative, policy and health promotion efforts targeting college students' alcohol use and abuse (Borsari et al, 2003; Jones et al, 2001; Wechsler et al, 1995; Wechsler & Kuo, 2000; Wechsler et al, 2002; Wechsler et al, 2002b), alcohol use was viewed separately from other substance use. The responses from the question on alcohol use were recoded to 'rarely or never use', 'occasional use' (< 20 days/month), and 'regular use' (20 or more days/month). Over half (52 %) of cluster 2 and about one-third (31%) of cluster 3 respondents indicated rarely, if ever, using alcohol. Most of the respondents in clusters 1 (83%) & 3 (69 %) indicated occasional alcohol use, while less than half of the cluster 2 respondents were occasional users (48 %). The only regular alcohol users were from cluster 3 (11 %).



Figure 4.1: Tobacco use by cluster (Chi Sq=105238; df=4; p<.001)



Figure 4.2: Alcohol use by cluster (Chi Sq= 36261; df= 4; p<.001)

Substance abuse was represented by a combination of the use of marijuana, cocaine, amphetamines, and rohypnol, which was then recoded to 'rare or no use', 'occasional use' (less than 20 days/month) or 'regular use' (20 or more days/month). If a person used more than 1 substance on an occasional basis, they were coded as a regular user. Virtually the only respondents that were substance users in any capacity were in cluster 3 (see figure 4.3). While 43 % rarely, if ever, used substances, slightly more (44%) were occasional users and 13 % were regular users of illicit substances.

The concept of responsible sexual behavior is multi-faceted, including prevention of sexually-transmitted diseases (STDs) as well as prevention of unplanned pregnancies. Prevention of STDs was operationally defined by a combination of a question regarding the number of times a person had oral, vaginal or anal sex within the last 30 days, combined with a question regarding their use of a condom during these episodes. The responses were recoded as 'abstained', 'generally safe', or 'generally unsafe'. Cluster 2 respondents typically reported abstaining from sex during the last 30 days (91%) or had generally safe sex (9%). Nearly one-third (31%) of cluster 1 respondents indicated abstention, but the large majority (63 %) indicated that they had engaged in generally unsafe sex in the past 30 days. All of the respondents in cluster 3 indicated having had generally unsafe sex in the past 30 days.



Figure 4.3: Substance use by cluster (Chi Sq= 72076; df= 4; p<.001)



Figure 4.4: Safe sex by cluster (Chi Sq= 104579; df= 4; p<.001)

In addition to condom use, the survey questionnaire also queried respondents regarding forms of birth control, namely birth control pills, Depro Provera, Norplant, diaphragm, spermicide, fertility awareness, and withdrawal. Most of the respondents indicated using some form of birth control during their last sexual encounter, but 7 % of cluster 1 members and 10 % of cluster 3 members did not (see figure 4.5)

Physical activity was measured by adding the days of vigorous activity/week to the days of strength training/week. The respondents in all clusters reported an average amount of physical activity around 6.2 times per week (see table 4.7). Additionally, body mass indexes (BMIs) were calculated from reported height and weight. The average BMI was 23.5, with some slight variations among the clusters (table 4.7).

Cluster naming is accomplished after studying the variables collectively by cluster. While cluster 1 respondents reported moderate physical activity and were generally within the normal BMI range, they were at least occasional users of tobacco and other substances. They were more likely to be occasional or regular users of alcohol. Additionally, cluster 1 members exhibited generally unsafe sexual practices

Cluster 2 respondents also reported moderate levels of physical activity and were within normal BMI ranges. They rarely, if ever, used tobacco products or other substances, but had a moderate propensity for occasional alcohol use. In terms of sexual activity, most of these respondents indicated abstention. The small proportion who engaged in sexual activity was generally safe.

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Figure 4.5: Birth control use by cluster (Chi Sq= 5248; df= 2; p<.001)

	Cluster 1	Cluster 2	Cluster 3	df	F	Р
	(n=57,136)	(n=56,335)	(n=43,476)			
Body Mass	$23.7\pm4.2$	$23.6\pm4.6$	$23.3\pm4.0$	2, 156944	142	< 0.001
Index						
Physical	$6.2\pm3.59$	$6.2\pm3.66$	$6.3\pm3.64$	2, 156944	13.1	< 0.001
Activity						

\* Post Hoc: 1&2&3

\*\*Post Hoc differences: 1&3; 2&3

Table 4.7: Body mass index and physical activity by cluster

Cluster 3 respondents again indicated moderate levels of physical activity and BMIs within the normal range. They were not users of tobacco products or other substances, but indicated a higher occasional usage of alcohol than the cluster 2 respondents. Although they were likely to be using some sort of birth control, they were likely to be engaged in sexual activity without using a condom.

Based upon the propensity of the members toward more risky behaviors, cluster 1 will be named the "high risk". Cluster 2, with the most modest of behavioral characteristics, will be named the "low risk". Cluster 3 exhibits slightly more moderate behaviors than the liberals, but has a higher likelihood of engaging in unsafe sexual practices, and will be named "moderate risk".

# 2. What is the relative contribution of each leading health indicator toward cluster prediction?

To discern the relative contribution of each behavioral health indicator toward the cluster, multiple logistic regression was performed. The low risk cluster was used as the reference group for each of the other two clusters in the analysis. The results indicate that there is no single variable that contributes more than others to the prediction of cluster membership, with the exception of BMI contribution toward the high risk cluster (see table 4.8). Even the most conservative pseudo  $R^2$  (Cox and Snell) of .887 is indicative of a very good fit of the regression model. Additionally, the goodness of fit of the resultant prediction equation was tested using a classification table. Using the leading health indicators, the program was able to predict overall cluster membership with nearly 100 % accuracy.

		В	Std. Error	Wald	df	Sig.	Exp(B)
High Risk	Intercept	280.767	18285.485	.000	1	.988	
	Physical activity	084	.101	.695	1	.405	.919
	BMI	434	.093	21.97	1	.000	.648
	[tobacco=1.00]	-92.193	4861.253	.000	1	.985	9.14E-041
	[tobacco=2.00]	1.428	4808.269	.000	1	1.000	4.172
	[tobacco=3.00]	0(c)			0		
	[alcohol=1.00]	-93.519	8684.758	.000	1	.991	2.43E-041
	[alcohol=2.00]	-70.327	8602.599	.000	1	.993	2.87E-031
	[alcohol=3.00]	0(c)			0		
	[substuse=1]	-91.876	2872.244	.001	1	.974	1.26E-040
	[substuse=2]	-19.769	.000		1		2.60E-009
	[substuse=3.00]	0(c)			0		
	[safesex=1.00]	-58.130	13629.047	.000	1	.997	5.68E-026
	[safesex=2.00]	-39.869	13504.015	.000	1	.998	4.84E-018
	[safesex=3.00]	0(c)			0		
	[otherbcmethod=.0]	71.474	8314.242	.000	1	.993	1.09E 036
	[otherbcmethod=1]	0(c)			0		
Moderate Risk	Intercept	126.200	46597.903	.000	1	.998	
	PAtotal	101	460.967	.000	1	1.000	.904
	BMI	212	112.984	.000	1	.999	.809
	[tobacco=1.00]	-33.799	11857.086	.000	1	.998	2.09E-015
	[tobacco=2.00]	.412	8212.520	.000	1	1.000	1.510
	[tobacco=3.00]	0(c)			0		
	[alcohol=1.00]	-33.651	17237.292	.000	1	.998	2.43E-015
	[alcohol=2.00]	-17.207	14612.410	.000	1	.999	3.37E-008
	[alcohol=3.00]	0(c)			0		
	[substuse=1.00]	-26.187	18334.304	.000	1	.999	4.24E-012
	[substuse=2.00]	-12.073	11367.506	.000	1	.999	5.71E-006
	[substuse=3.00]	0(c)			0		
	[safesex=1.00]	-70.079	12915.851	.000	1	.996	3.68E-031
	[safesex=2.00]	-94.805	11709.199	.000	1	.994	6.71E-042
	[safesex=3.00]	0(c)			0		
	[otherbcmethod=.0]	69.312	11069.157	.000	1	.995	1.06E 036
	[otherbcmethod=1]	0(c)	-		0		

Table 4.8: Logistic regression analysis to predict contribution of the leading health indicators to health behavior clusters.

3. What are the differences in environmental factors (current housing situation, Greek Life, current relationship, health care access, injury and violence) by health lifestyle clusters?

The variety in current housing situation was evident in the 3 lifestyle clusters (see figure 4.6). The low risk members were far more likely to live in residence halls (58 %) or with parents (15 %) than representatives of the other two clusters. They were also much less likely to live in off-campus housing (21 %) than those in the high risk (38 %) or the moderate risk clusters (34 %).

While rather small proportionally, the number of high risk individuals living in fraternity or sorority houses was twice as much as those in the low risk cluster. Accordingly, approximately 14 % of the high risk members are affiliated with a sorority or fraternity, while half as many low risk are involved (see figure 4.7). Ten percent of moderate risk individuals indicated such an affiliation.

When looking at current relationships, the majority of the both the high risk (61 %) and the low risk (79 %) clusters indicated that they were single, while less than onethird (30 %) of moderate risk members specified that category (see figure 4.8). Conversely, most of the moderate risk individuals indicated that they were in relationships of either engagement (64 %) or marriage (5 %), while only 38 % of the high risk and 20 % of the low risk members were currently in such relationships.

Either violence or abuses were indicated by combining the answers to relationship abuse, sexual abuse, or violence or assault. The combination of these indicators revealed that high risk individuals (34 %) were more than twice as likely as

low risk ones (16 %) to be involved in violent or abusive incidences (Chi Sq= 2583; df= 2; p< .001). Slightly more than one-fourth (27 %) of the moderate risk individuals were similarly involved.

The availability of health insurance is one indicator of access to proper health care. Most of the students (92 - 93 %) in all three clusters indicated that they had health insurance coverage of some sort. However, this still indicates that over ten thousand students had no health care coverage during the survey period.

4. What are the differences in personal factors (age, gender, year in school, academic performance, routine preventive care, mental health and general health status) by health lifestyle clusters?

While the ages of students in all clusters ranged from 18 to 24, the mean age of the low risk cluster (19.7) was slightly lower than that of the other two clusters (20.1-20.2). There were more females than males in each of the clusters, however, the high risk cluster had the highest proportion of males (42 %). Males represented approximately one-third of the respondents in each of the other two clusters (see figure 4.9).

In terms of year in school, the low risk cluster (37 %) was representative of a higher proportion of first-year students than the other clusters (see figure 4.10). Approximately the same proportion of second year students were represented in each of the three clusters (22-23 %). The upper classmen were more likely to be members of the high or moderate risk clusters than the low risk cluster.



Figure 4.6: Current housing situation by cluster (Chi Sq= 5830; df= 10; p< .001)



Figure 4.7: Fraternity/Sorority affiliation by cluster (Chi Sq= 1146; df= 2; p< .001)



Figure 4.8: Current relationship status by cluster (Chi Sq= 25022; df= 10; p< .001)



Figure 4.9: Gender by cluster (Chi Sq=1388; df = 2; p< .001)
As a measure of academic performance, respondents were asked to indicate their overall GPA in college so far. Low risk (38 %) and moderate risk (34 %) individuals were much more likely than their high risk counterparts (25 %) to report having GPAs in the "A" range (see figure 4.11). Over half of each cluster (51-57 %) reported their GPA as being in the "B" range. A larger proportion of high risk cluster members (18 %) indicated an overall average of "C" or below than the other two clusters.

The respondents were queried regarding routine preventive care including: various immunizations, dental exams, self-exams, blood pressure and cholesterol checks, and sunscreen use. The combined score for routine preventive care ranged from 0 ('none') to 12 ('yes to all'), with an overall mean of 5.8. While the cluster means were rather close, the moderate risk individuals (m= 6.1) had a slightly higher propensity toward routine preventive care than those in the either the high risk (m= 5.9) or low risk (m= 5.7) clusters (F=414; df = 2,156944; p< .001). In terms of mental health, respondents were asked if they had ever been diagnosed with depression. The high risk cluster members (16 %) were more likely to have indicated such a diagnosis than either the low risk (9 %) or the moderate risk cluster members (11 %).

In terms of overall health, respondents were asked to indicate their general health status. While most responded "good" to "excellent" (92.6 %), there were some variations in responses by cluster (see figure 4.12). Members of the low risk and moderate risk clusters were more likely than those in the high risk cluster to indicate their health status as "very good" or "excellent". High risk cluster members were more likely to indicate "good" (35 %) or "fair" to "poor" (9 %, combined) than members of the other two clusters.



Figure 4.10: Year in school by cluster (Chi Sq=2142; df = 8; p< .001)



Figure 4.11: GPA by cluster (Chi Sq=2694; df = 6; p< .001)



Figure 4.12: General health status by cluster (Chi Sq=2177; df = 8; p< .001)

# 5. What are the differences in perceived norms of risky health behaviors by health lifestyle cluster?

In addition to asking about the respondents' own behaviors, the survey instrument also queried the students regarding the risky health behaviors of the "typical student at your school". When asked to indicate the percentage of students that they thought used cigarettes, alcohol, and rohypnol, both the high risk and moderate risk cluster members indicated higher levels of usage than the low risk cluster members, except for the use of rohypnol (see table 4.9). High risk individuals also indicated a slightly higher number of sexual partners for the 'typical' student than those in the other two clusters.

		n	Mean	Std. Dev.
% of students cigarettes	High Risk	56,368	49.5	21.07
	Low Risk	55,341	43.0	21.98
	Moderate Risk	42,857	47.5	21.37
(F=1314; df=2, 154563; p< .001)	Total	154,566	46.6	21.66
% of students alcohol	High Risk	55,590	72.7	16.19
	Low Risk	54,987	68.4	19.44
	Moderate Risk	42,466	72.1	16.63
(F=942; df=2,153040; p< .001)	Total	153,043	71.0	17.65
% of students rohypnol	High Risk	55,062	11.0	12.17
	Low Risk	53,264	11.6	12.89
	Moderate Risk	41,629	12.2	12.88
(F=97.1; df=2, 149952; p< .001)	Total	149,955	11.6	12.64
# of student partners	High Risk	56,510	3.6	4.79
	Low Risk	55,170	3.3	5.82
	Moderate Risk	43,011	3.5	4.42
(F=72.1; df=2, 154688; p<.001)	Total	154,691	3.5	5.09

Table 4.9: Perceptions of behavior of the 'typical' student at college by cluster

# SUMMARY

The analysis of the 2000-2005 ACHA data revealed three clusters: named for their distinct health behavioral characteristics as "high risk", "moderate risk" and "low risk". The low risk cluster members exhibited low to no risk in most areas, except that nearly half were occasional users of alcohol. Additionally, a small percentage (9 %) was engaged in sexual encounters, although they were generally safe in their practices. Moderate risk cluster members were likely to be occasional alcohol users, and exhibited a high propensity for generally unsafe sex. High risk cluster members were likely to be at least occasional, if not regular users of tobacco products. They were also likely to be at least occasional users of illicit substances, including a very high likelihood of alcohol use. High risk individuals are also likely to be practicing generally unsafe sexual activities. Analysis of the contribution of the six individual health behaviors toward cluster formation indicated that they were all of relatively equal importance.

In terms of environmental factors, the low risk cluster members tended to be more likely than the other respondents to either live in residence halls or with their parents. Members of the moderate and high risk clusters were more likely to live in off-campus housing than their low-risk counterparts. A much higher proportion of high-risk than low-risk individuals are members of Greek life, with some using sorority or fraternity housing. Slightly lower proportions of the moderate risk cluster were similarly involved. The majority of both the low risk and the high risk clusters indicated that they were single. Conversely, the majority of the moderate risk individuals indicated that they were in a committed relationship, either of engagement or marriage. About one-third of the high risk cluster members and one-fourth of the moderate risk cluster members indicated that they had been the victim of either abuse or violence. The rate of abuse or violence for the low risk cluster was much less.

In terms of personal factors, the low risk group members were more likely to be first year students than either of the other clusters, and consequently, were also slightly younger in age as well. The high risk cluster had a higher proportion of males than the other two clusters. While the largest proportion of all clusters indicated a B average GPA, the low risk and moderate risk cluster members were more likely to have A averages than the high risk cluster members. The moderate risk cluster members were slightly more likely to engage in routine preventive care than those in either the high risk or low risk clusters. The high risk individuals were more likely to have been diagnosed with depression than those in the other two clusters. They were also more likely to indicate lower overall general health status than the other two cluster members.

When queried about the percentage of students that they thought used cigarettes, alcohol, and rohypnol, both the high risk and moderate risk cluster members indicated higher levels of usage than the low risk cluster members, except for the use of rohypnol. High risk cluster members also indicated a slightly larger number of sexual partners per year than their counterparts in the other clusters.

# CHAPTER 5

#### SUMMARY, CONCLUSIONS & RECOMMENDATIONS

# INTRODUCTION

The purpose of this study was to determine the health behavior lifestyles of college students and describe the characteristics of the differing lifestyles, in order to better target the health needs of this unique population. College student data were available from the American College Health Association's (ACHA) National College Health Assessment (NCHA). This database included data collected from Autumn of 2000 to Spring of 2005, from over 400 colleges and universities across the nation. To reduce the number of confounding variables, only data from full-time, undergraduate, domestic students between the ages of 18 and 24 were included in the analysis.

Cluster analysis was selected as a statistical method due to its ability to group subjects based upon the similarities in their characteristics. The current study used the five leading health indicators identified in Healthy People 2010 that reflect individual behavior (USDHHS, 2000) as the cluster basis. Indicators of college students' physical activity, overweight and obesity, tobacco use, alcohol and substance use, and sexual behavior were used to identify behavioral 'clusters'. Corresponding to the main concepts of the Social Cognitive Theory (SCT), relationships of the behavioral clusters to both personal and environmental factors were then explored. Additionally, the relationships of the clusters to students' perceptions of behaviors of their peers were explored. The specific research questions were:

In an undergraduate college population described by the National College Health Assessment (NCHA):

1. What are the health lifestyle clusters, based on the HP2010 leading behavioral health indicators of physical activity, overweight and obesity, tobacco use, substance abuse, alcohol use, and sexual behavior?

2. What is the relative contribution of each leading health indicator toward cluster prediction?

3. What are the differences in environmental factors (current housing situation, Greek Life, current relationship, health care access, injury and violence) by health lifestyle clusters?

4. What are the personal factors (age, gender, year in school, academic performance, routine preventive care, mental health and general health status) by health lifestyle clusters?

5. What are the differences in perceived norms of risky health behaviors by health lifestyle cluster?

The remainder of this chapter includes summary of findings, conclusions & discussion of study results, limitations, implications for practice, and recommendations for future research.

## SUMMARY OF FINDINGS

Based upon the interpretation and exclusivity of the cluster properties, the 3cluster solution was the one most appropriate, and was, therefore, used for subsequent analyses. The variate properties indicated that there were three distinct patterns of health behaviors; one of relatively healthy behaviors; one of relatively risky health behaviors; and one with a combination of some healthy yet some risky behaviors. Consequently, the three clusters were named for their combined relative health risk based on the leading health indicators as "low risk", "moderate risk" and "high risk", as described below.

The low risk cluster members averaged Body Mass Indexes (BMIs) in the normal range, and indicated physical activity on most days. They rarely, if ever, used tobacco or other substances. They were nearly evenly split between nonuse and occasional use of alcohol. Low risk individuals typically abstained from sex, but when they engaged in sexual encounters (9 %), they were generally safe.

The moderate risk cluster members were also generally within normal levels of physical activity and BMI. They also rarely, if ever, used tobacco products or other substances. They were more frequent users of alcohol than the low risk group, but tended not to be regular users. Moderate risk cluster members tended to be rather sexually active, but were not particularly safe about their encounters in terms of STD protection.

The high risk cluster members also were fairly normal in terms of physical activity and BMIs, but they exhibited greater tendencies toward more extreme behavior than the other two clusters. They tended to be at least occasional users of tobacco and other substances, and were highly likely to be either occasional or regular users of alcohol. Additionally, they exhibited generally unsafe sexual practices.

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Logistic regression was performed to discover the relative importance of each of the variables in the cluster formation. Analysis of the contribution of the six individual health behaviors toward cluster formation indicated that they were all of relatively equal importance (p>.05), and that the unique combination of factors was very accurate in cluster prediction (~100%).

In terms of environmental factors, the low risk cluster members tended to be more likely than the other respondents to either live in residence halls or with their parents. Members of the moderate and high risk clusters were more likely to live in off-campus housing than their low-risk counterparts. A much higher proportion of high-risk (14%) than low-risk (6.7%) individuals are members of Greek life, with some using sorority or fraternity housing. Slightly lower proportions of the moderate risk cluster (10%) were similarly involved. The majority of both the low risk and the high risk clusters indicated that they were single. Conversely, the majority of the moderate risk individuals indicated that they were in a committed relationship, either of engagement or marriage. About onethird of the high risk cluster members and one-fourth of the moderate risk cluster members indicated that they had been the victim of either abuse or violence. The rate of abuse or violence for the low risk cluster was much less.

In terms of personal factors, the low risk group members were more likely to be first year students than either of the other clusters, and consequently, were also slightly younger in age as well. The high risk cluster had a higher proportion of males than the other two clusters. While the largest proportion (50 - 56%) of all clusters indicated a B average GPA, the low risk and moderate risk cluster members were more likely to have A averages than the high risk cluster members. The moderate risk cluster members were slightly more likely to engage in routine preventive care than those in either the high risk or low risk clusters. The high risk individuals were more likely to have been diagnosed with depression than those in the other two clusters. They were also more likely to indicate lower overall general health status than the other two cluster members.

When queried about the percentage of students at their institution that they thought used cigarettes, alcohol, and rohypnol, both the high risk and moderate risk cluster members indicated higher levels of usage than the low risk cluster members, except for the use of rohypnol. High risk cluster members also perceived that their college peers had a slightly larger number of sexual partners per year than their counterparts in the other clusters.

#### **CONCLUSIONS & DISCUSSION**

The conclusions to be gleaned from the results of this study are as follows: there are distinct clusters of health behaviors in college students; the personal and environmental factors, as suggested by the Social Cognitive Theory, are different by these health lifestyle clusters; and the perceived norms also vary by cluster. Other studies have used an array of perspectives in an attempt to either describe or link behaviors (Callahan, 2003; Ferron et al, 1999; Jones et al; 2003; Reeves & Rafferty, 2005), or predict either health behaviors (Von Ah et al, 2004; Yarcheski et al, 2004) or health-promoting lifestyles (Larouche, 1998; Pender, Murdaugh & Parsons, 2002). However, the current study had the unique perspective of linking, or clustering, students by patterns of health behaviors, then, in looking at the corresponding personal and environmental

factors, parallel to the main components of the SCT. Each of the conclusions has implications for educational and health program planning in college and university settings which will be discussed below.

The clusters, described in the above section, were named for the relative riskiness of their health behaviors. It should be noted that the behaviors were distinct to the clusters, not necessarily based on a sliding scale for each behavior. The resultant clusters of health behaviors exhibited robustness in terms of utility by their statistical properties. The clustering process and the logistic regression indicate that these health behaviors form three distinct patterns for the college students. This allows viewing of the health lifestyle in total rather than by certain health behaviors (Borsari & Carey, 2001; Licciardone, 2003) or individual health behaviors and their correlates (Dinger & Waigandt, 1997; Habberman & Luffey, 1998; Huang et al, 2003; Jones et al, 2001; Kaiser Foundation, 2002; Wechsler et al, 1995). This provides a broader perspective on the interplay of factors that may affect behavior.

Additionally, the current study used the Social Cognitive Theory (SCT) as the theoretical framework. The theory purports that individuals can form their own predictions of outcomes of new behavior on the basis of values and expectations formed through the interaction of personal factors, behaviors and environment (Bandura, 1989). Particularly, Glanz and associates (2002) indicate that the SCT demonstrate flexibility as individuals' cognitions change through maturation and experience. This is particularly important since college students are in a transitional period, often thought of in terms of stages (Kegan, 1982; King & Kitchener, 1998) or as positions (Perry, 1981) in adult

development. No other studies were found that used the SCT specifically on the college population, which makes this type of study an important link in establishing the feasibility and utility of the theory for this sector.

Following the triadic relationship indicated by the SCT, the results of the Chi Square tests and ANOVAs indicate that there are differences in the personal and environmental factors by the health lifestyle clusters (p<.05). Previous studies have linked personal and environmental factors to individual behaviors (Baronowski et al, 2002) or to alcohol use in particular (Wechsler et al, 1995). The results of this study again substantiate the use of known factors, many personal or environmental, to predict the health behaviors of college students, although on a much broader scale. This perspective allows a more amalgamated approach to health promotion on college campuses, and suggests a method for identifying at-risk subpopulations within the college community.

A recent meta-analysis of 37 studies on health practice predictors by Yarcheski et al (2004) disclosed fourteen specific health predictors. Of these health predictors, individual demographic variables, including personal and environmental factors, were found to have the least influence on health behavior. Their findings do indicate that using personal or demographic variables alone would not be particularly telling in terms of health lifestyles. It should be noted, however, that Yarcheski's study did not concentrate specifically on college students. The results of the current study challenge Yarcheski's findings by indicating significant differences (p<.05) in all of the personal and environmental factors based on cluster membership. In particular, housing arrangements, participating in Greek life, and safety issues were found to vary widely in terms of the

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low risk versus the moderate and high risk clusters members. In terms of the SCT, alteration in any one of these three factors should potentially affect the health behaviors of college students. Since these environmental factors have the potential for being controlled, to some extent, by college and university administrators, alteration of these factors would augment any health promotion efforts. This would provide a more integrated approach to health promotion at the college level as is suggested by Romer and associates (2003).

Personal and demographic variables are the most readily available information that institutions have for their students, typically through registrar or academic databases. The results of the current study afford college administrators and health educators the ability to profile the students based on combinations of these factors, making the at-risk subpopulations much easier to identify and target for promotional health education messages and programming.

Many colleges and universities are currently using social norms concepts when attempting to affect the health behaviors of college students (Carter & Kahnweiler, 2000; Perkins, 2003; Ziemelis et al, 2002). This approach involves measuring the students' perceptions of health behaviors at their respective institutions. Student perceptions are then compared to the actual institutional data. Health promotion campaigns are typically aimed at trying to 'correct' the students' perceptions of the schools' norms through mass marketing advertisement on the campus. Several studies have pointed to the inefficiency of such a wide-based approach, especially when norms of subpopulations may be quite different (Borsari & Carey, 2001; Carter & Kahnweiler, 2000; Thombs, Dotterer, Olds, Sharp & Raub, 2004; Werch, Pappa, Carlson, DiClemente, Chally & Sinder, 2000). In

particular, Carter and Kahnweiler (2000) indicate that some of the subpopulations (fraternity men, in their case) may either exhibit behavior so extreme that it has reached the ceiling of behaviors, or feel that they are so atypical of the university norm that the indications don't apply to them. Their findings are corroborated by the systematic review of Borsari & Carey (2001), although these authors further indicate that the effects of norming may be modulated by other factors, such as gender, living arrangements and social relationships. The current study supports this finding by the indication that the high risk cluster held a more extreme perception of the risky actions of their peers than the other clusters. Like the Carter and Kahnweiler (2000) findings, the members of this cluster were more likely to be male and affiliated with Greek life, including living in Greek housing. Since health promotion efforts for college students based solely upon social norms have has questionable results (Carter & Kahnweiler, 2000; Thombs et al, 2004; Werch et al, 2000), the current study strengthens the argument for use of more than one approach to health promotion, feasibly through health messages and programming, as well as administrative policy change.

The findings from the current study indicate that the addition of the main concepts of the SCT may strengthen the ability to connect behaviors with demographic characteristics, thus providing another potential avenue for effecting health behaviors. In spite of health promotion efforts in colleges, the presence of deleterious health behaviors still exits (Wechsler et al, 2002). Using the constructs provided by the SCT allows for identification of at-risk subpopulations, and provides the basis for an integrated approach to health promotion at the college level.

## LIMITATIONS

Several limitations were acknowledged in this study. First, the study population, while large, may not be representative of national college data. While this is readily indicated by the data managers, there were steps taken to compare the data to several nationally-representative samples, mostly for validation of the instrument (ACHA, 2003). While many institutions are involved in the study, they are not identifiable to the researchers, beyond their general location and their status as a 2- or 4-year institution. This limits the generalizability of the results to the study population.

Other limitations of using a secondary data source are inherent as well. Obviously, the researcher is limited by the scope and properties of the variables represented on the data source. In any secondary data study, the operational definitions are dictated by the instrument. This effect can manifest itself both in the analytical possibilities as well as the interpretation of the results. Careful planning of research design and research questions can help alleviate some of these effects (see chapter 3).

Researchers using secondary data sources are also limited to the specific data that were collected, which may not be indicative of all of the desired data points. Difficulties sometimes arise when trying to account for intervening variables, missing data, or followup data. The researcher contacted the data manager regarding questions of data coding and interpretation.

#### IMPLICATIONS AND RECOMMENDATIONS

While it has been acknowledged that health educational efforts are most successful if aimed at the specific target audience (Glanz et al, 2002; Goldman & Schmaltz, 2001), most health promotion efforts at the college level are campus-wide. Individual or small group programs targeting specific behavioral change can be beneficial only if the individuals seek help and volunteer to participate, for the most part. Therefore, often the messages and programs are disseminated using a "buck-shot" approach; spraying the campus with the message, hoping that at least one "shot" will hit a desired target. Such an approach is both time-consuming and often, non-productive in terms of affecting health-related behaviors. Additionally, dissemination of health-related information alone is rarely sufficient to initiate behavior change (DiClemente et al, 2002; Tones & Greene, 2004).

Using established health behavior clusters can allow educators to capture the most vulnerable audience through known demographic factors, which theoretically would be available through institutional databases. Thus, students won't have to self-identify in terms of perceivably risky and perhaps self-incriminating information. While students are more likely to anonymously answer questions regarding health behaviors, they are not as likely to personally identify with their behaviors.

Further, by linking the health behaviors to other factors, students who do selfidentify or seek assistance in one area may be susceptible to other risk factors. The identified patterns of behavior will provide a more efficient means of referral to additional information or services. Since health related behaviors are often hierarchical in nature in terms of prevention, the linkages could aid in the sequencing of health promotion efforts.

This method of profiling could be used for other types of clustering as well. For example, students might be clustered on their dietary behaviors to describe their nutritional lifestyle. In addition to physical behaviors, there could be clustering by developmental or emotional factors as well. Such an approach could identify at-risk students in the early stages, before the indicators manifest themselves in adverse or risky behaviors, or irreparable harm. This allows student clusters to be identified rather than singling out individual students. For students to self-identify is often a long process, and may not actually occur for many who are at-risk.

Because of the nature of the relationship among health behaviors, personal and environmental factors, college and university administrators would be wise to pay attention to the aspects of this triad over which they have some degree of control. To this extent, college administrators may look to improvements in terms of environmental factors, such as housing, Greek life, and safety. Attention to these factors could have an effect upon the overall health and well being of their student populations.

College and university administrators and health educators should establish institutional databases which are either integrated, or can be interfaced from academic, demographic, financial and health perspectives. This would allow the cross-referencing of student information, providing a more holistic approach to student wellness.

#### **RECOMMENDATIONS FOR FURTHER RESEARCH**

A recommendation for future research would be to further define the relationships between behaviors, personal and environmental factors through better definition of the factors involved. Specifically, the Social Cognitive Theory describes twelve concepts which are directly related to health promotion and health behavior change (Baranowski et al, 2002). Using a secondary data source allows the benefit of large numbers of participants and a wide variation of possible data points. It is, however, limiting as far as the operational definitions of the factors are concerned. A new, smaller-scale study aimed at refining the factors would allow more precision in measurement, and better opportunity to discern the extent of the relationships. It may then be possible to at least acknowledge, if not statistically account for, the effects of additional mediating factors in the secondary data base.

Individual participating institutions could compare their individual results to the national data, particularly to institutions with similar characteristics to theirs. This information could provide the baseline and impetus for initiation of health behavior programming at the institution. Likewise, the replication of this study at an institution will indicate the trends of health lifestyles across time. This is particularly important if steps are being taken by administration to improve the health and well-being of the student population.

With the rising cost of higher education, there is an increase in matriculation of recent high school graduates into community colleges for the first year or two of college. This has altered the demographics of many community colleges, especially in terms of student age. Since a portion of these students are intent on tracking into four-year institutions for completion of their degrees, it may be important to include young adults (18-24 years) from two-year institutions in the analysis to see if there are differences in the patterns of behavior, and related factors.

#### SUMMARY

The purpose of this study was to determine the health behavior lifestyles of college students and describe the characteristics of the differing lifestyles. Cluster analysis revealed three prominent groupings of students, named for the relative degree of risk indicated by their behaviors: low risk, moderate risk, and high risk clusters.

Differences in personal and environmental factors were found among the clusters.

Notably, the high risk cluster members tended to be upperclassmen, live off campus, have more safety issues and lower GPAs than the members of the other clusters. The moderate cluster members tended to exhibit less risky behaviors, with the exception of a higher likelihood of engaging in risky sexual encounters. The low risk cluster members were more likely to live on campus or with their parents, tended to be younger and have higher GPAs. Differences were also found in the perceived norms of the three clusters, with more extreme norms associated with higher risk behaviors. The patterns of these differences indicate support for the use of the Social Cognitive Theory for explaining and predicting health behaviors based upon personal and environmental factors. This approach provides more flexibility in terms of using known factors to predict behaviors and provide integrated avenues for affecting college students' health-related behaviors.

#### LIST OF REFERENCES

- Aldenderfer, M. & Blashfield, R. (1984). Cluster Analysis. Beverly Hills, CA; Sage Publishing.
- Bandura, A. (1977). Social learning theory. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1989). Social cognitive theory. In: Annals of Child Development;6; 1-60. Greenwich, CT: Jai Press LTD.
- Baranowski, T., Perry, C.L., & Parcel, G.S. (2002). How individuals, environments, and health behavior interact: Social Cognitive Theory. In K. Glanz, B.L. Rimer, & F.M. Lewis (Eds.), *Health behaviors and health education: Theory, research and practice* (3<sup>rd</sup> ed.). San Francisco: Jossey-Bass.
- Becker, C.M., McMahan, S., Etnier, J., & Nelson, J.R. (2002). The potency of health promotion versus disease prevention messages in a college population. *American Journal of Health Studies*, 18(1), 26-30.
- Borsari, B., Bergen-Cico, D. & Carey, K.B. (2003). Self-reported drinking-game participation of incoming college students. *Journal of American College Health*; 51, 149-154.
- Borsari, B. & Carey, K.B. (2001). Peer influence on college drinking: A review of the research. *Journal of Substance Abuse*. 13, 391-424.
- Bray, S. R. & Born, H. A. (2004). Transition to university and vigorous physical activity: Implications for health and psychological well-being. *Journal of American College Health*, 52(4), 181-187.
- Callaghan, D. (2003). Health-promoting self-care behaviors, self-care selfefficacy, and self-care agency. *Nursing Science Quarterly*, 16(3), 247-254.

- Callaghan, P. (1995). A preliminary survey of nurses' health-related behaviors. International Journal of Nursing Studies, 32(1), 1-15.
- Carter, C.A. & Kahnweiler, W.M. (2000). The efficacy of the social norms approach to substance abuse prevention applied to fraternity men. *Journal of American College Health*; 49, 66-71.
- Clare, J., Wilson, D. & Clore, J. (2004). Assessing the health of future physicians: An opportunity for preventive health. *Journal of Continuing Education in the Health Professions*, 24(2), 82-93.
- Collins, K.M., Dantico, M., Shearer, N.B. & Mossman, K.L. (2004). Heart disease awareness among college students. *Journal of Community Health*, 29 (5), 405-420.
- DiClemente, R.J., Crosby, R.A. & Kegler, M.C. (2002). *Emerging theories in health promotion practice and research*. San Francisco, CA; Josey-Bass.
- Dinger, M. & Waigandt, A. 1997. Dietary intake and physical activity behaviors of male and female college students. *American Journal of Health Promotion*; 11(5), 360-362.
- Eisen, M., Pallitto, C., Bradner, C. & Bolshun, N. (2000). *Teen risk-taking: Promising prevention programs and approaches*. Washington DC: Urban Institute.
- Everitt, B., Landau, S. & Leese, M. (2001). *Cluster Analysis (4<sup>th</sup> ed.)*. New York, NY; Oxford University Press.
- Ferron, C., Narring, F., Cauderay, M. & Michaud, P.A. (1999). Sport activity in adolescence: associations with health perceptions and experimental behaviors. *Health Education Research*, 14, 225-233.
- Glanz, K., Rimer, B. & Lewis, F. (2002). Health Behavior and Health Education : Theory, Research and Practice (3<sup>rd</sup> ed.). San Francisco, CA; Josey-Bass.
- Gochman, D.S. (1997). Health behaviors research: Definitions and diversity. In D.S. Gochman (ed.) *Handbook of Health Behavior Research, Vol I. Personal and Social Determinants.* New York: Plenum Press.
- Goldman, K.D. (2003). Social marketing concepts. In R.J. Bensley & J. Brookins-Fisher (eds.) *Community Health Education Methods: A Practical Guide*. Sudbury, MA; Jones and Bartlett Publishers.

- Goldman, K. D. & Schmalz, K. J. (2001). Theoretically speaking: Overview and summary of key health education theories. *Health Promotion Practice*, 2(4), 277-281.
- Graham, J.W., Tatterson, J.W., Roberts, M.M. & Johnston, S.E. (2004). Preventing alcohol-related harm in college students: Alcohol-related Harm Prevention program effects on hypothesized mediating variables. *Health Education Research*, 19, 71-84.
- Green, J.S., Grant, M., Hill, K.L., Brizzolara, J., & Belmont, B. (2003). Heart disease perception in college men and women. *Journal of American College Health*, 51, 207-211.
- Grubbs, L. & Carter, J. (2002). The relationship of perceived benefits and barriers to reported exercise behaviors in college undergraduates. *Family* & Community Health, 17(14), 76-84.
- Haberman. S. & Luffey, D. 1998. Weighing in college students' diet and exercise behaviors. *Journal of American College Health*; 46(4), 189-191.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. & Tatham, R. L. (2005). Multivariate Data Analysis (6<sup>th</sup> Edition). New Jersey; Prentice Hall.
- Hornik, R. (2003). Alcohol, tobacco, and marijuana use among youth. In D. Romer (Ed.), *Reducing Adolescent Risk: Toward an Integrated Approach* (pp. 335-343). Thousand Oaks, CA; Sage Publications.
- Huang, T., Harris, K.J., Lee, R.E., Nazir, N., Born, W. & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health*, 52(2), 83-86.
- Johnston, L.D. (2003). Alcohol and illicit drugs: The role of risk perception. In D. Romer (Ed.), *Reducing Adolescent Risk: Toward an Integrated Approach* (pp. 56-74). Thousand Oaks, CA; Sage Publications.
- Jones, S.E., Oeltmann, J., Wilson, T.W., Brener, N.D., & Hill, C.V. (2001). Binge drinking among undergraduate college students in the United States: Implications for other substance use. *Journal of American College Health*, 50, 33-38.
- Kaiser Family Foundation. (2002). Substance use and risky sexual behavior: Attitudes and practices among adolescents and young adults. *American Journal of Health Education*, 33, 278-282.

- Kegan, R. (1982). The evolving self: Problems and process in human development. Cambridge, MA; Harvard University Press.
- Kirby, D. (2003). Risk and protective factors affecting teen pregnancy and the effectiveness of programs designed to address them. In D. Romer (Ed.), *Reducing Adolescent Risk: Toward an Integrated Approach* (pp. 265-283). Thousand Oaks, CA; Sage Publications.
- Kitchener, K.S. & King, P.M. (1990). The reflective judgment model: Transforming assumptions about knowing. In J. Mezirow and Associates, *Fostering Critical Reflection in Adulthood*. San Francisco, CA; Jossey-Bass.
- Larouche, R. (1998). Determinants of college students' health-promoting lifestyles. *Clinical Excellence for Nurse Practitioners*, 2(1), 35-44.
- Licciardone, J.C. (2003). Perceptions of drinking and related findings from the Nationwide Campuses Study. *Journal of American College Health*, 51, 238-245.
- Maney, D.W., Mortensen, S., Powell, M.P., Lozinska-Lee, M., Kennedy, S. & Moore, B. (2002). Alcohol-free alternative activities for university students: Modeling associated drinking behavior. *American Journal of Health Education*, 33, 225-233.
- McNeal, R.B., Hansen, W.B., Harrington, N.G. & Giles, S.M. (2004). How All Stars works: An examination of program effects on mediating variables. *Health Education & Behavior*, 31, 165-178.
- Meische, H., Sellers, D.E., Robbins, M.L., Goff, D.C., Daya, M.R., Meshack, A., Taylor, J., Zapka, J. & Hand, M.M. (2000). Factors that influence personal perceptions of the risk of an acute myocardial infarction. *Behavioral Medicine*, 26(1), 4-10.
- Merriam, S.B. & Caffarella, R.S. (1999). *Learning in Adulthood: A Comprehensive Guide* (2<sup>nd</sup> ed.). San Francisco, CA; Jossey-Bass.
- Mokdad, A.H., Ford, E.S., Bowman, B.A., Dietz, W.H., Vinicor, F., Bales, V.S. & Marks, S. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors. *Journal of the American Medical Association*, 289(1), 76-79.
- Nelson, D.E., Naimi, T.S., Brewer, R.D., Bolen, J. & Wells, H.E. (2004). Metropolitan-area estimates of binge drinking in the United States. *American Journal of Public Health*, 94, 663-671.

- Perkins, H.W. (2003). The emergence and evolution of the social norms approach to substance abuse prevention. In: Perkins H. W. (ed). *The Social Norms Approach to Preventing School and College Age Substance Abuse: A Handbook for Educators, Counselors, and Clinicians* (3-17). San Francisco, Jossey-Bass.
- Perry, W. G. (1981). Cognitive and Ethical Growth: The Making of Meaning. In A. W. Chickering (ed.), *The Modern American College*. San Francisco, CA; Jossey-Bass.
- Redding, C.A., Rossi, J.S., Rossi, S.R., Velicer, W.F. & Prochaska, J.O. (2000). Health Behavior Models. *The International Electronic Journal of Health Education*, 3, 180-193.
- Reeves, M.J. & Rafferty, A.P. (2005). Healthy lifestyle characteristics among adults in the United States. *Archives of Internal Medicine*, 165; 854-857.
- Romer, D. (Ed.) (2003). Prospects for an integrated approach to adolescent risk reduction. In: *Reducing Adolescent Risk: Toward an Integrated Approach* (1-10). Thousand Oaks, CA; Sage Publications.
- Sparling, P., Owen, N., Lambert, E., & Haskell, W. (2000). Promoting physical activity: The new imperative for public health. *Health Education Research*; 15(3); 367-376.
- Steinman, K.J. (2003). College students' early cessation from episodic heavy drinking: Prevalence and correlates. *Journal of American College Health*, 51, 197-204.
- Taylor, W.C., Blair, S.N., Cummings, S.S., Wun, C.C., & Malina, R.M. (1999). Childhood and adolescent physical activity patterns and adult physical activity. *Med Science Sports Exercise*, 31(1); 118-123.
- Tones, K. & Green, J. (2004). Health promotion: Planning and strategies. Thousand Oaks, CA; Sage Publications.
- U. S. Department of Health and Human Services. 2004. 28<sup>th</sup> annual report on the health status of the nation.
- U. S. Department of Health and Human Services. 2000. Healthy People 2010: Conference edition, vol. 1 & 2. US Government Printing Office, Washington, D.C.

- Von Ah, D., Ebert, S., Ngamvitroj, A., Park, N. & Kang, D. 2004. Predictors of health behaviors in college students. *Journal of Advance Nursing*; 48(5), 463-474.
- Wechsler, H., Dowdall, G.W., Davenport, A., & Castillo, S. (1995). Correlates of college student binge drinking. *American Journal of Public Health*, 85, 921-926.
- Wechsler, H., Kelley, K., Seibring, M., Kuo, M. & Rigotti, N.A. (2001). College smoking policies and smoking cessation programs: Results of a survey of college health center directors. *Journal of American College Health*; 49, 205-212.
- Wechsler, H. & Kuo, M. (2000). College students define binge drinking and estimate its prevalence: Results of a national survey. *Journal of American College Health*, 49, 57-64.
- Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard School of Public Health College alcohol study surveys: 1993-2001. *Journal of American College Health*, 50, 203-217.
- Wechsler, H, Lee, J.E., Nelson, T.F. & Kuo, M. (2002b). Underage college students' drinking behavior, access to alcohol, and the influence of deterrence policies. *Journal of American College Health*, 50, 223-236.
- Wechsler, H., Rigotti, N, Gledhill-Hoyt, J. & Lee, H. (1998). Increased level of cigarette use among college students. *Journal of the American Medical Association*; 280, 1673-1678.
- www.acha.org American College Health Association website (Retrieved 10/28/05).
- www.cdc.gov/nccdphp/dash. Center for Disease Control Department of Preventive Health Publications website (Retrieved 11/22/05).
- Yarcheski, A., Mahon, N.E., Yarcheski, T.J. & Cannella, B.L. (2004). A metaanalysis of predictors of positive health practices. *Journal of Nursing Scholarship*; 102- 108.
- Ziemelis, A., Bucknam, R.B. & Elfessi, A.M. (2002). Prevention efforts underlying decreases in binge drinking at institutions of higher education. *Journal of American College Health*, 50, 238-252.