FACTORS CONTRIBUTING TO WEIGHT GAIN AMONG COLLEGE FRESHMEN AND BEYOND

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A

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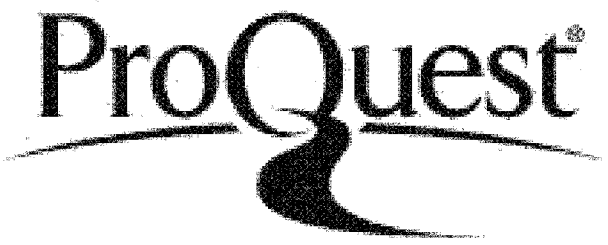

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Abstract

Background

Linked with a higher risk of life threatening illnesses, obesity in the United States has become an epidemic, with a prevalence rate of overweight and obese adults of nearly 68%. Obesity rates have accelerated over the past two decades and one crucial developmental period for weight gain is among emerging adults attending college. Using an explanatory mixed-method design, this study examined contributing factors to weight gain among college students, including eliciting university stakeholders' perceptions of supports and barriers to exercising and healthy eating among students.

Method

Data collection for the quantitative phase of the study consisted of two waves, baseline and 2-year follow-up. Students completed psychosocial and anthropometric measures (height, weight, and body fat percentage). Data collected for the qualitative phase of the study consisted of key informant interviews with university administrators (n=15) and seven student focus groups (n=34 students). Qualitative analyses were conducted with NVivo software and multiple coders, using a grounded theory approach to elicit major themes.

Results

Students gained 1.5lbs (p>.05), with 34% of participants gaining over 5 lbs and 17% over 10 lbs. Participants who gained weight were men, ate more calories from sweets or desserts, and consumed fewer calories from fats. Increase in calories from desserts or sweets increased odds of weight gain (OR=1.075, CI=1.01-1.14) and body fat (OR=1.106, CI=1.036-1.181). Contextualizing the quantitative findings, students and administrators identified several themes that support healthy living, including access to nutritious food and physical amenities. Both groups also identified barriers, including easy access to high-calorie foods, limited recreation facilities, and policy challenges. Administrators spoke of extant health promotion efforts; however, students did not perceive active health promotion initiatives on campus.

Conclusions

Dietary habits were identified drivers of weight gain among students. Extant campus supports and barriers to exercise and healthy eating among students were equally identified by students and administrators with great reliability. Implications for future health promotion efforts, food availability, recreation, and physical amenities are discussed in the context of clears sets of recommendations for stakeholder groups. Future research should explore specific dietary foods that are increasing weight and develop targeted preventions/interventions for individuals at risk.

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Chapter One: Introduction

Brief Overview of the Study

Over the past 30 years, obesity in the United States has become a health epidemic, with a combined prevalence of overweight and obese adults at nearly 68% (Flegal, Carroll, Ogden, & Curtin, 2010). Obesity is a public health concern given that it is associated with a higher risk of chronic illnesses such as type II diabetes, cardiovascular disease, stroke, liver disease, dyslipidemia, cancer, and poorer quality of life (Dixon, 2010; Ogden, Yanovski, Carroll, & Flegal, 2007). Obesity is associated with increased rates of mortality and is predicted to have a dramatic increase in medical costs for current and future generations (Cai, Lubitz, Flegal, & Pamuk, 2010). Obesity rates have been increasing over the past two decades nationwide and one crucial time period identified for weight gain is early adulthood, especially among emerging adults who are starting college (Anderson, Shapiro, & Lundgren, 2003).

The *Freshmen 15* is the term often used by popular media to describe the weight gained during the transition from high school to college. Although dubbed the *Freshmen 15*, multiple studies have documented varying levels of weight gain during the first year of college (Vella-Zarb & Elgar, 2009). For example, Hodge, Jackson, and Sullivan (1993) and Graham and Jones (2002) documented a non-significant change in weight during the first year of college over the duration of their studies (six and eight months, respectively). In sharp contrast to the two studies not documenting a significant change in weight during the first year in college, 22 other studies have demonstrated weight gain during the first year of college ranging from approximately two pounds (Morrow et al., 2006) to nearly nine pounds (Hovell, Mewborn, Randle, & Fowler-Johnson, 1985). Appendix A provides a brief summary of studies examining the weight gain among first-year university students in the United States and Canada since 1985. As demonstrated in Appendix A, as well as by a meta-analysis by Vella-Zarb and Elgar (2009), the *Freshmen 15* may be better termed the *Freshmen 5*. Despite the misnomer, weight gain for students entering college appears to be a valid and concerning phenomenon, especially for sub-groups in the overall population.

Multiple studies have documented that about 25% to 50% of the college freshmen population may be at greater risk for weight gain of five to 12 pounds during their first-year of college (Anderson et al., 2003; Economos, Hildebrandt, & Hyatt, 2008; Hovell et al., 1985; Megel, Wade, Hawkins, & Norton, 1994; Mihalopoulos, Auinger, & Klein, 2008; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005; Wengreen & Moncur, 2009). In fact, even in the two studies documenting an overall non-significant weight gain across their entire samples, both studies had sub-groups that gained a concerning amount of weight (Graham & Jones, 2002; Hodge et al., 1993). In other words, portions of the two samples did gain weight; however, the overall average change in weight was offset by students who lost weight, resulting in a non-significant change in weight for the overall samples. In the study by Hodge and colleagues (1993), 30% of the sample gained approximately seven pounds; in the Graham and Jones (2002) study, 60% of the sample gained an average of nearly five pounds, with 30% gaining over five pounds. Given that obesity rates have increased overall in the United States, and the transition from high school to college appears to be a time of significant weight gain, especially for some subgroups, it is important to examine the behavioral (e.g., nutrition, physical activity) and psychological (e.g., self-efficacy, motivation) variables that may be influencing weight gain during this transition period. Additionally, it is important to examine the contextual environment of these behaviors and psychological constructs related to weight gain.

Behavioral Considerations

Weight management involves controlling a delicate equation of energy intake and energy expenditure. Weight gain occurs due to an imbalance of increased energy intake and/or a decrease in energy output. In other words, individuals who consume more calories than they expend are likely to gain weight. Considering that multiple studies have documented weight gain during the first year of college, there appears to be a tipping of the scales towards an imbalance of energy intake and decrease output. For example, multiple studies have documented that freshmen who engage in physical activity less frequently (Kasparek, Corwin, Valois, Sargent, & Morris, 2008; Wengreen & Moncur, 2009) or decrease their activity over time (Jung, Bray, & Martin Ginis, 2008)

are more likely to gain weight compared to their peers who exercise regularly. Other researchers have found that college freshmen often consume calorically dense, nutrient-deficient food and have access to "all-you-can-eat" facilities, creating an environment primed for excessive caloric consumption and ultimately tipping the scales to weight gain (Anding, Suminski, & Boss, 2001; Levitsky, Halbmaier, & Mrdjenovic, 2004).

Although it appears that students who gained weight in the studies were consuming what appeared to be more calorically dense meals, those who gained more than 5% of their body weight in the Wengren and Moncor (2009) study mentioned above, consumed an average of 86 calories more per day, compared to those who either lost weight or gained less than 5. In short, these researchers found that the students who gained weight did eat less healthily, but calorically the difference was very little. Similarly, Hajhosseini and colleagues (Hajhosseini et al., 2006) found in their small sample of students (n = 27) the average caloric intake began at 1,905 calories and increased to 1,960 by the end of the semester. Although this change in caloric intake was not significant, it did account for the average weight gain of three pounds in a semester for their sample. Additionally, weight gain in this sample was accompanied by a significant increase in body fat percentage and body mass index. In looking at past research with freshmen students, it appears that even a slight change in the energy balance (i.e., averaging a 50 to 85 calorie surplus per day) can produce significant changes in body mass and composition. Conversely, it seems that there is potential for the balance to be tweaked toward weight loss for those at risk for gain. Therefore, it is important to explore other factors outside of behavioral elements related to weight gain during the first year of college. Specifically, it is important to explore psychological contributions to nutrition and exercise behaviors of first-year university students.

Psychological Considerations

Although multiple studies have examined the weight gain of first-year university students and its associated behavioral components, only two studies have examined self-efficacy (Butler, Black, Blue, & Gretebeck, 2004) and the transtheoretical model of change (Racette et al., 2005) related to physical activity and nutrition among college

students, both of which are key psychological constructs of health-related behavior change (Bandura, 1997; Prochaska & Velicer, 1997). As described by Bandura (1997), self-efficacy is an individual's self-perception of her or his ability to carry out an activity, regardless of actual ability. Self-efficacy is an important psychological construct in regard to health-related behaviors, as individuals must perceive themselves as capable of completing a task, before initiating change (Holloway & Watson, 2002). The construct of self-efficacy has been shown to be predictive of behavior change across a variety of health behaviors, including exercise among individuals with cardiovascular disease (Luszczynska & Tryburcy, 2008), healthier eating patterns (Strachan & Brawley, 2009), fruit and vegetable consumption (Luszczynska, Tryburcy, & Schwarzer, 2007), and weight management (Armstrong, Sallis, Hovell, & Hofstetter, 1993; Marcus, Selby, Niaura, & Rossi, 1992; Palmeira, et al., 2007). Self-efficacy is a component of being ready to make a behavior change, which is essential when considering the role motivation has in behavior change, as described by the Transtheoretical Model.

The Transtheoretical Model (TTM), proposed by Prochaska and DiClemente (1982), is a framework that examines how people navigate behavior change. TTM proposes that people may be in one of five stages of change when making a behavior change; namely, Pre-contemplation (i.e., not even thinking about the issues), Contemplation (i.e., thinking about the issues but not ready to take action), Preparation (i.e., beginning to think about taking action), Action (i.e., taking action), and Maintenance (i.e., adhering to the plan of action). Examining behavior change from a TTM perspective and initiating interventions based on TTM have shown to be effective across multiple health domains (cf., Prochaska & Velicer, 1997), including HIV prevention (Harvey et al., 2009), smoking cessation (Prochaska, Velicer, Fava, Rossi, & Tsoh, 2001), physical activity (Armstrong et al., 1993; Bosak, Yates, & Pozehl, 2010; Garber, Allsworth, Marcus, Hesser, & Lapane, 2008; Marcus et al., 1992), and dietary changes (Di Noia & Prochaska, 2010; Greene et al., 1999). Considering that TTM and self-efficacy appear to be essential components when examining behavior change, the application of the constructs are also essential to examining weight gain during the first

year of college. Although, two previous studies (Butler et al., 2004; Racette et al., 2005) have examined self-efficacy and TTM related to weight gain during the first-year of college, neither study examined the constructs simultaneously. It is important to examine both psychological constructs, as they each represent components of behavior change, namely, one's perceived ability to change (self-efficacy) and one's intention to change (TTM).

Significance of the Study

As noted above and demonstrated in Appendix A, multiple studies have examined weight gain among first-year university students; however, the previous studies have had numerous limitations. One major limitation of previous studies has been a primary focus on college women. Of the 24 studies identified since 1985, 70% (n = 17) relied on samples composed of only women (11 studies), or primarily women (six studies with 80% of sample identified as female). Another limitation has been the short duration of the past studies. To date, only two studies have prospectively examined weight gain longitudinally among first-year university students beyond the first year of college (Hovell et al., 1985; Racette et al., 2005). Study duration appears to be an important aspect of weight gain among college populations; as Vella-Zarb and Elgar (2009) noted, the longer the study duration, the greater the weight gain among study participants. Therefore, it is important to follow study participants over a longer period of time to examine the course of their weight change. An additional limitation of previous research has been the limited scope of health-related variables examined, including the psychological constructs of self-efficacy and the transtheoretical model of change.

A final limitation of previous research has been the lack of qualitative studies on the subject. To date, no qualitative examination has been completed with both university students and administrators to determine their perceived barriers and supports to healthy living during the transition to college. The inclusion of administrator groups are an essential aspect in the examination of prevention of weight-gain during the first-year of college, as these groups often have direct control or influence regarding policy changes and resource allocation to promote and support health promotion programs and services

at universities. The current study addressed the limitations noted in the literature by examining data collected from a more balanced sample of men and women, relying on a dataset with a 2-year follow-up data collection period with participants, exploring psychological variables related to stage of change and self-efficacy, assessing contextual barriers and supports, and combining quantitative and qualitative methods.

Study Purpose and Design

This study examined weight gain among students during the first two years of college based on the psychological constructs of self-efficacy and TTM as related to the specific behaviors of nutrition and physical activity. Further, the study gathered perceptions of students and administrators about the university's role in the creation and solution of the problem. Insights gleaned from the psychological, behavioral, and contextual factors related to weight gain were translated into a set of recommendations for students, university administrators, and campus healthcare and other service providers to attempt to enhance students' weight-related quality of life in their first year of college and beyond.

The overarching study design was a mixed-method approach, using quantitative (e.g., survey methods to collect data subjected to multivariate statistical analyses) and qualitative (e.g., focus groups and key informant interviews) methods. Examining phenomena with a mixed-method approach provides a more comprehensive picture, while maintaining research integrity (Johnson & Onwuegbuzie, 2004). To maximize the utility of a mixed-method approach, the study consisted of three distinct, interrelated phases. Phase I consisted of a *quantitative* analysis of longitudinal archival survey data collected from first-year university students. Archival data for Phase I was provided by the Center for Behavioral Health Research and Services (CBHRS). CBHRS collected anthropometric (height and weight), psychosocial (motivation and self-efficacy toward healthy living), and behavioral measures (physical activity and nutrition) of first-year university students. The longitudinal archival data were collected over a period of two years, with a baseline measure and a two-year follow-up. Analysis of these data provided a baseline estimate of obesity at a local university, as well as an examination of the

change in health-related behaviors over time, and relationships of the psychological constructs to health behaviors.

Phase II involved the collection and analysis of *qualitative* data through focus groups and key informant interviews, aimed at exploring the *barriers* and *supports* to living a healthy lifestyle during the first year of college and beyond. Student interviewees were recruited to attend one of seven focus groups. Students were recruited and categorized based upon class standing, age, and residence. Students from all class standings were recruited to gain a broader picture of students' perceived barriers and supports to healthy living during the transition to college

In addition to the student focus groups, university administrators and staff were recruited to participate in key informant interviews. The goal of these interviews was to gain an administrative perspective on the topic of weight gain during the transition to college. The key informants included participants representing student services related to physical health (e.g., university health center), behavioral health (e.g., university counseling and psychological services), and athletics (e.g., university sports center). Other key informants included staff from student development offices (e.g., student activities and residence life), student housing and dining, and policy makers (e.g., Office of the Dean of Students).

Following the quantitative and qualitative phases, Phase III integrated the findings from the previous phases to create a comprehensive overview of health-related behaviors of first-year university students, along with contextual barriers and supports to healthy living among college students. Based on these findings, a series of recommendations are offered for researchers, university service and care providers, and academic policymakers to address the health needs of new and continuing university students. In total, the three study phases developed a context for how future intervention and prevention efforts can be targeted at first-year university students and beyond. They also contribute to the peer-reviewed literature surrounding issues of health-related behaviors during the transitional period for emerging adults. Table 1 provides a brief summary of the study phases and their corresponding research aims.

Table 1

Phase Summary and Research Aims

Research Phase	*Questions or Domains of Interest*
Phase I: Quantitative Methods	1) At the start of college what is the relationship between students' BMI and body composition and their: a) nutrition b) physical activity c) self-efficacy for healthy eating d) self-efficacy for physical activity e) stage of change for healthy eating f) stage of change for physical activity 2) What are the similarities and differences of the health related variables between men and women at the start of college? 3) What are the similarities and differences of the health related variables between those who are in the healthy BMI range versus those who are overweight/obese at the start of college? 4) How do students' baseline levels of health related variables change across time? 5) What are the differences from baseline to follow-up, differentiated by gender, baseline BMI status, and weight gain status? 6) What are the baseline measures that significantly predict future weight gain and change in body composition?
Phase II: Qualitative Methods	1) What are university students' perceptions of: a) healthy living b) barriers to healthy living c) supports to healthy living d) how the university can promote healthy living 2) What are university administrators' perceptions of: a) healthy living for university students b) barriers to healthy living for university students c) supports to healthy living for university students d) the university's role in maintaining or promoting healthy living for students
Phase III: Integrated Findings and Dissemination	1) A summary of results from Phases I and II highlighting supports and barriers for healthy living encountered by first-year and continuing students 2) Empirically supported recommendations to address the health needs of new and continuing university students. Recommendations will be offered to: a) researchers b) university service and care providers c) academic policymakers 3) Manuscript(s) submitted to peer-reviewed journals addressing issues of health-related behaviors during the transitional period for emerging adults

Problem Statement of the Study

Obesity rates in the United States have increased over the past 30 years and are associated with numerous health complications (Dixon, 2010; Flegal et al., 2010; Ogden et al., 2007). The transition from high school to collegiate study has been identified as a time during which young adults are prone to gain weight (Anderson et al., 2003). Although this transition period has been studied by others, only two studies have examined the phenomenon longer than one year (Hovell et al., 1985; Racette et al., 2005) and only two studies have examined the roles of self-efficacy (Butler et al., 2004) and intention to change (Racette et al., 2005) in this specific population and transitional period. Additionally, no study has qualitatively examined the students' and university administrations' perceived barriers and supports to healthy living during the transition through college. To address these gaps in the literature, and build a foundation of information upon which to build prevention recommendations, this study:

1) examined weight gain and associated behaviors (e.g., physical activity and nutrition) and psychological constructs (e.g., self-efficacy and transtheoretical model of change) longitudinally over the course of two years;
2) explored university students' perceived barriers and supports to healthy living during their transition through college;
3) explored university students' perception of how the university can promote healthy living;
4) explored university stakeholder groups' perceived barriers and supports to healthy living for students transitioning through college;
5) explored university stakeholder groups' perceptions of the university's role and possibilities in supporting healthy living for students transitioning through college; and
6) developed empirically supported recommendations for healthy living for university policymakers and health professionals working with university students.

Chapter Two: Review of the Literature

Over the past 30 years, rates of obesity in general population in the United States have increased dramatically. As of 2008, 34% of American adults were classified as obese, compared to 15% in 1980. Additionally, approximately 34% of American adults are also classified as overweight, resulting in over two-thirds of the United States adult population as overweight or obese (Flegal et al., 2010). Similarly, nearly one in three adolescents (32%) in the United States can be classified as either overweight or obese based on the BMI-for-age data from the National Health and Nutrition Examination Survey (NHANES; Odgen, Carrol, & Flegal, 2008). This is a concerning trend, as the prevalence of obesity, while still high in childhood and adolescence, only increases through adulthood (see Table 2). Another concerning fact is that 90% of obese adolescents are still obese in their thirties (Gordon-Larsen, The, & Adair, 2010).

Table 2

Percent of Overweight and Obese US Children, Adolescents, and Adults

Age Group	*% Overweight*	*% Obese*	*% Overweight & Obese*
2-5*	12.0	12.4	24.4
6-11*	16.3	17.0	33.3
12-19*	16.5	17.6	34.1
≥20**	34.4	33.9	68.3

*Source: (Ogden, Carroll, & Flegal, 2008)
**Source: (Flegal, et al., 2010)

Definitions of Obesity and Overweight

An adult is classified as *overweight* if her or his calculated body mass index (BMI) ranges between 25.0 and 29.9, whereas an adult is classified as *obese* with a BMI of 30 or more. BMI is calculated by taking a person's weight in kilograms divided by her or his height in meters squared (kg/m^2), or by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703. For children and adolescents, there is not a simple score that is used to determine if a child is overweight or obese, but rather the child is compared to same-age peers and gender. That is, height and weight alone are not suitable to determine BMI for children and adolescents, as they are progressing through stages of development that might inappropriately categorize them

as underweight, normal weight, overweight, or obese. Further, considering that boys and girls have different developmental trajectories, it is essential to compare youth against their gender-matched, same-age peers to determine where they rank in regard to their body mass. Based on the NHANES data, a child or adolescent would be classified as overweight, if the child has a BMI greater than or equal to the 85th percentile for gender-matched, same-age peers. For a youth to be classified as obese, the child's BMI must be greater than or equal to the 95th percentile for gender-matched, same-age peers (Ogden et al., 2008). These classifications are determined using BMI-for-age growth charts. These charts were developed from national sampling of children from the years 1963-1994. It must be noted that the BMI-for-age growth charts excluded children over six years of age from the most recent national sample (1988-1994). They were excluded due to increases in weight over time. The increase in weight would have skewed the growth charts and result in underclassification of overweight children, due to overweight cutoff criteria based on weight- and BMI-for-age percentiles shifting upward (Kuczmarski, Odgen, & Guo, 2002).

It is important to note that an individual's BMI does not account for actual body composition, including fat-mass, fat-free mass (e.g., muscle, bones); therefore, it is not a direct measure or her or his adiposity (fatness), but rather serves as a proxy measure for excessive adipose tissue (fat). Although not a direct measure of adiposity, the BMI calculation has strong Pearson correlation coefficients to direct measures of adiposity in both adults and children, ranging from .68-.83 across genders and age groups (Flegal et al., 2009; Mei et al., 2002). Currently, there is no direct cut-off scores derived from adipose measures, such as the bioelectric impedance or dual x-ray absorptiometry (DXA) scans. In fact, a World Health Organization Expert Committee (WHO Expert Committee on Physical Status, 1995) has stated, "there is no agreement about cut-off points for the percentage of body fat that constitutes obesity" (p. 420). Although an agreement of body fat percentage cut-off points have not been determine, recent studies have determined percentiles for body fat percentage, which could help determine if an individual is in a normal range (within the 15th and 85th percentiles) for their own age group and gender

(Flegal et al., 2009). For example, men between the ages of 20 to 39, would need 15% to 30% body fat to be within the normal range, whereas women of the same age would need 27% to 45% body fat. Even though percentiles have been established, the authors of the study strongly caution against the use of the percentiles as cut-off scores, as there is much age, gender, and ethnic variability for both adults and youth (Borrud et al., 2010; Flegal et al., 2009).

Of special note, first-year university students (age 18 and 19) are at a crossroads regarding how to determine their BMI status, as they are considered adolescents in the national datasets (Borrud et al., 2010; Flegal et al., 2010; Ogden et al., 2008), yet are considered to be legal adults. All previous research on the population has used the adult BMI standards to categorize their obesity ranking (Vella-Zarb & Elgar, 2009). Therefore, for consistency and to aid in the ability to compare with previous research, this study used the adult BMI formula.

Health and Economic Burdens of High Overweight and Obesity Rates

An increase in the prevalence of obesity is cause for concern due to the health and economic consequences associated with excess weight. Obesity is a public health concern as it is associated with higher risk for a number of chronic and life threatening illnesses. That is, individuals categorized as overweight or obese are at increased risk for developing a range of disorders, such as type II diabetes, cardiovascular disease, stroke, liver disease, dyslipidemia, cancer, and poorer quality of life (Dixon, 2010; Field, Cook, & Gillman, 2005; Ogden et al., 2007). Increased rates of obesity in the US population are also associated with increased rates of mortality, as well as a 40% increase in the costs of Medicare for current and future generations (Cai et al., 2010).

Obesity is not only a concern for adults. Like their adult counterparts, adolescents categorized as overweight or obese are at increased risk for a litany of chronic physical disorders. The disorders include cardiovascular disease (Aglony, Acevedo, & Ambrosio, 2009; Goran, Ball, & Cruz, 2003), type II diabetes (Goran et al., 2003; Urbina et al., 2009), dyslipidemia (Jolliffe & Janssen, 2006), and metabolic syndrome (Duncan, Li, & Zhou, 2004). In addition to physical health concerns related to adolescent obesity, a

number of psychological and psychiatric concerns arise. Overweight and obese youth report higher levels of depression (Needham & Crosnoe, 2005), poorer health-related quality of life (Swallen, Reither, Haas, & Meier, 2005), and stigmatization by peers (Hebebrand & Herpertz-Dahlmann, 2009; Puhl & Latner, 2007). Additionally, overweight and obese youth have a higher likelihood of being diagnosed with a psychiatric diagnosis, particularly mood or anxiety-related disorders (Petry, Barry, Pietrzak, & Wagner, 2008). Janicke, Harman, Kelleher, and Zhang (2008) found that adolescents with obesity-related diagnoses (i.e., type II diabetes, metabolic syndrome) were more often diagnosed with a psychiatric disorder, compared to those with other chronic illnesses (i.e., cystic fibrosis, sickle cell disease) and had higher rates of health service usage, with associated poorer health and higher healthcare costs. Although it is concerning that youth experience numerous negative health consequences related to obesity, adolescent obesity is furthermore estimated to have significant health and economic burdens, as overweight and obese youth transition into adulthood (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Gordon-Larsen et al., 2010; Wang, Chyen, Lee, & Lowry, 2008).

Health concerns related to being overweight or obese as a youth include being overweight or obese as an adult (The, Suchindran, North, Popkin, & Gordon-Larsen, 2010), and developing cardiovascular disease, type II diabetes, or metabolic syndrome (Dietz, 1998; Field et al., 2001; Mattsson, Rönnemaa, Juonala, Viikari, & Raitakari, 2008). In fact, youth obesity was found to be the strongest predictor of metabolic syndrome for adults (Mattsson, Rönnemaa, Juonala, Viikari, & Raitakari, 2008). Additionally, Lightwood and colleagues (2009) estimated an economic drain of $254 billion related to cardiovascular disease and diabetes alone, subsequent to childhood obesity, with $208 billion lost due to productivity deficits from premature death or morbidity and $46 billion from direct medical costs. These findings are incredibly significant considering that 90% of obese adolescents remain obese through adulthood (Gordon-Larsen et al., 2010). Therefore, it is essential to intervene with adolescents and young adults who may be at risk for obesity or are currently obese.

Critical Periods for Weight Gain and Prevention Efforts

Due to the negative health effects and the increased prevalence of obesity, it is important to examine points in time when individuals are particularly susceptible to weight gain, as these critical periods may represent optimal times to initiate successful prevention and intervention efforts. One crucial time period identified for weight gain is early adulthood, especially among emerging adults who are starting college (Anderson et al., 2003; Gordon-Larsen et al., 2004). The term *Freshmen 15* is often used by popular media to described weight gain during the transition from high-school to college. Although the term, *Freshmen 15*, has been widely used in popular media, multiple studies have documented varying levels of weight gain during this transition period (Vella-Zarb & Elgar, 2009).

Of the 24 studies since 1985 that have examined the phenomenon of weight gain during the first year of college in US and Canada populations, only two have documented a non-significant weight gain. Hodge and colleagues (1993) and Graham and Jones (2002) both documented a non-significant change in weight over the duration of their studies; however, these findings are in sharp contrast to the other 22 studies that have documented significant changes in weight. For example, Hovell and colleagues (1985) documented an average weight gain of nine pounds among their college sample, which was significantly higher than their community control. A similar result was documented nearly 10 years later, when 30% of a sample of first-year female students gained five or more pounds over the course of a year and 40% of the sample were dissatisfied with their weight at the end of year (Megel et al., 1994). Continuing the trend in research findings, Racette and colleagues (2005) found that 70% of their sample gained weight, with average gain of approximately nine pounds. Similarly, in a more recent study, 80% of participants gained weight (average gain of nearly eight pounds), while 20% lost weight (average loss of nearly five pounds), with an average weight change of just over five pounds gained (Economos et al., 2008). Although there are reports of first-year students gaining over five pounds across samples, the norm of weight gain reaching significance across an entire sample appears to be between around three to five pounds (Kasparek et

al., 2008; Mihalopoulos et al., 2008; Vella-Zarb & Elgar, 2009; Wengreen & Moncur, 2009). As demonstrated in Appendix A (a brief summary of studies examining the weight gain among first-year university students in the US and Canada since 1985), as well as by the meta-analysis by Vella-Zarb and Elgar (2009), the *Freshmen 15* may be better termed the *Freshmen 5* due to the average increase of approximately five pounds across studies, rather than the assumed 15 pounds. Despite the misnomer, weight gain for students entering college appears to be a valid and concerning phenomenon, especially for sub-groups in the overall population.

Considering that the overall trend is an increase in weight during the first year of college, it is more concerning that multiple studies have documented that about 25% to 50% of the freshmen population may be at greater risk for weight gain of five to 12 pounds during their first year of college (Anderson et al., 2003; Hovell et al., 1985; Megel et al., 1994; Mihalopoulos et al., 2008; Racette et al., 2005). For example, in the study by Wengreen and Moncur (2009), in addition to the overall sample gaining weight, 23% of the sample gained a clinically significant amount of weight (more than 5% of body weight) with an average gain of nearly 10 pounds. Similarly, in the study by Economos and colleagues (2008), 80% of the sample gained nearly eight pounds over the course of the year. Additionally, students who are overweight when they enter college are more likely to gain weight and more of it during their first year of study. Kasparek and colleagues (2008) found students who were overweight at baseline gained an average of nearly 11 pounds compared to the six pounds for those not overweight at baseline. Sub-groups who gain weight also appeared in the two studies documenting an overall non-significant weight gain across their entire samples. In the study by Hodge and colleagues (1993), 30% of the sample gained approximately seven pounds, and in the Graham and Jones (2002) study, 60% of the sample gained an average of nearly five pounds, with 30% gaining more than five pounds. Although weight gain across entire samples of students may be mild to moderate (two to five pounds), there are sub-groups who are gaining more than five pounds, with some nearing the popular notion of the 'Freshman 15'.

Factors Contributing to College-Age Weight Gain

Given that obesity rates have increased overall in the United States, and that the transition through college appears to be a time of significant weight gain, especially for some subgroups, it is important to examine the contextual variables within which this phenomenon occurs. When students transition to college they enter into a setting in which they become independently responsible for their decisions, actions, and consequences. First-year university students often are living in physical environments that are independent of their parents, in close proximity with peers, and in a semi-closed, self-contained system where their basic needs are provided (e.g., housing and food). Along with this new independence comes a new set of challenges for first-year university students. The academic setting is often more rigorous than their prior educational environment (Meyer, Spencer, & French, 2009); those living in residence halls have new and sometimes challenging roommates (Boekeloo, Bush, & Novik, 2009); and they are navigating choices related to their own health risks, including alcohol and drug use (Dierker et al., 2008; Mallett, Bachrach, & Turrisi, 2009), sexual activity (Oswalt, 2010), and proper nutrition and exercise (Driskell, Kim, & Goebel, 2005; Furia, Lee, Strother, & Huang, 2009; Racette et al., 2005). All the while, freshmen often feel less supported by university staff and advisors than they were previously by families (Smith & Zhang, 2009). Given the context of college life and first-year students entering a new era of decision-making, several behavioral and psychological variables come into play that may influence weight gain during the transition period of early adulthood. Specifically, related to the potential for weight gain, there are behavioral considerations, such as physical activity and nutrition, as well as psychological considerations, such as students' self-efficacy and intention for change related to healthy eating and exercise.

Behavioral Components of Weight Gain

Weight management involves controlling a delicate equation of energy intake and energy expenditure, with weight gain occurring due to an imbalance of increased energy intake and decreased energy output. In other words, individuals who consume more calories than they expend are likely to gain weight. Given that nutrition (i.e., energy

intake) and physical activity (i.e., energy output) are key components to weight management, it is essential to examine how first-year university students engage in these behaviors and their relation to weight gain.

Nutrition. Although multiple studies have examined nutritional variables related to weight gain during the first year of college, only a few investigators have actually reported average caloric intake among their samples (Hajhosseini et al., 2006; Jung et al., 2008; Megel et al., 1994; Wengreen & Moncur, 2009). Estimates of the average caloric intake of first-year university students have ranged from 1,700 calories (Wengreen & Moncur, 2009) to 2,150 calories (Jung et al., 2008), whereas Megel and colleagues (1994) reported the range of calories within their sample ranged from about 750 to 3,150 calories per day, with an average of 1,835 calories. These average reported calorie ranges are nearly in line with those recommended for women, but lower than those recommended for men by the United States Department of Agriculture (USDA) and Department of Health and Human Services (DHHS) current dietary guidelines (USDA-DHSS, 2005). According to dietary guidelines, women who are entering adulthood (18 to 20 years of age) should consume approximately 1,800 to 2,000 calories, whereas men should consume between 2,200 and 2,400 calories. The average caloric intake reported in the extant literature may fall below the recommended amount for men due to the fact that samples represented in these studies were comprised either exclusively or primarily of women.

Equally likely, caloric intake may be under-reported. Under-reporting of caloric intake has been noted to be between 20% to 34% for adults and adolescents when self-report of caloric intake was compared to direct biological measures (Hill & Davies, 2001; Tooze et al., 2004; Trabulsi & Schoeller, 2001). Examining average caloric intake provides an estimate of nutrition and a valuable means for exploring this phenomenon; however, caution must be used when making research and clinical decisions based on self-reports of caloric intake. What may be more beneficial, would be to examine the macronutrient distribution (e.g., carbohydrates, fats, proteins) to determine the source of calories consumed.

The most recent study examining freshmen nutrition and reporting macronutrient distribution revealed that among their freshmen sample (n = 159, 63% women), 52% of calories came from carbohydrates, 33% from fats, and 16% from proteins (Wengreen & Moncur, 2009). These results are consistent with reports of macronutrient distribution dating back to 2004 and 1994, which ranged from 53% to 55% of calories from carbohydrates, 29% to 37% of calories from fats, and 14% to 17% from proteins (Butler et al., 2004; Megel et al., 1994). Therefore, over the past 15 years of research, first-year university students appear to have been consuming relatively the same distribution of macronutrients, all of which are in line with current dietary guidelines. According to the *2005 Dietary Guidelines for Americans*, total carbohydrate intake should be within 45% to 65% of total calories consumed; fat intake should represent 20% to 35% of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils; and protein intake should comprise 10% to 20% (USDA-DHSS, 2005). Considering that college freshmen are reporting appropriate levels of caloric intake and macronutrient distribution, yet are gaining weight, it is important to examine the types of foods freshmen are consuming in the context of their eating behaviors.

Multiple researchers have sought to explore whether first-year students are consuming the recommended amount of five servings of fruits and vegetables per day (USDA-DHSS, 2005). Based on their sample's self-report, Huang and colleagues (2003) found that nearly 70% of their freshman sample (n = 736, 48% women) consumed *fewer* than five servings of fruits and vegetables per day, with no difference between men and women. Similarly, Racette and colleagues (2005) reported that in a sample of 764 freshmen (53% women), 70% of the sample gave self-reports of not eating five or more fruits and vegetables per day. However, contrary to these studies, Wengreen and Moncur (2009) found that among their much smaller freshmen sample (n = 159), students reported an average of approximately five servings of fruits (M = 1.61) and vegetables (M = 3.53) per day, based on their own self-report. Therefore, at this point it remains unclear how many fruits and vegetables college freshmen are actually consuming. Although

unclear, it is unlikely that freshmen students are routinely eating five or more fruit and vegetable servings per day, given that two studies with large sample sizes found that only approximately 30% of their samples were consuming recommended amounts.

Beyond fruit and vegetable consumption, researchers have also examined first-year students' high-fat fried food consumption, frequency of going to "fast-food" eateries, and other eating habits. Racette and colleagues (2005) reported that in their sample of 764 freshmen, 41% were eating more than three fried food items per week and 46% were eating more than three meals per week from "fast-food" eateries. Similarly, Driskell and colleagues (2005) reported that 95% of their lower-level (freshmen/sophomore) student sample (n = 144, 79% women) and 91% of their upper-level (junior/senior) students (n = 114, 41% men) reported typically eating meals at "fast-food" restaurants six to eight times weekly. Although Driskell and colleagues did not specifically define "fast food," they did differentiate it from sit-down restaurants, dormitory/home meals, and vending snacks. Additionally, Driskell and colleagues (2005) reported that approximately 57% of their lower-level student sample typically ate breakfast, 87% ate lunch, and 95% ate dinner. In other words, nearly all freshmen and sophomore students ate lunch and dinner, but just over half ate breakfast. In regards to snacking, the most popular time to have a snack was during the evening or late at night (73%), followed by the afternoon (47%), and then the morning (20%). Wengren and Moncur (2009) found that students were consuming one "junk food" snack per day and nearly one sweetened-carbonated beverage per day. Considering past research, it appears that on average, students are meeting broad caloric and macronutrient recommendations; however, a large portion of carbohydrate and fat intake likely stems from "fast-food" establishments and foods that are associated with weight gain.

In examining nutritional factors related to weight gain during the first year of college, Wengren and Moncur (2009) found that students who gained more than 5% of their baseline weight ate fewer fruits and vegetables, consumed less milk, drank more sweetened beverages, ate more "junk food" snacks, and ate more meals at a dining hall and "fast-food" restaurants. Similarly, Levistky and colleagues (2004) identified

variables that accounted for most weight gain during the first-year of college as eating "junk food", eating more meals on the weekend, recent dieting, eating evening snacks, and eating at a restaurant. Additionally, these researchers found that meals eaten at an "all-you can eat" facility contributed to greater portion sizes and longer meal duration. Therefore, it appears that students who gain weight tend to eat more snacks, consume more "fast-food", select more high-fat items, and dine at restaurants and "all-you-can-eat" dining halls. Jackson, Berry, and Kennedy (2009) examined lifestyle factors and nutrition among Canadian university students and found that students who spent more time on campus ate more meals at fast food restaurants and spent more of their budget on food. The extant literature thus suggests that the act of pursuing a higher education and spending more time on campus put young adults at risk for weight gain.

Although students who gained weight in the Wengren and Moncur (2009) study were consuming what appeared to be more calorically dense meals, those who gained more than 5% of their body weight only consumed an average of 86 calories more per day than those who either lost weight or gained less than 5%. Similarly, Hajhosseini and colleagues (2006) found that in their small sample of students (n = 27) average caloric intake began at 1,905 calories and increased to 1,960 by the end of the semester. Although this change in caloric intake was not significant, it did account for the significant average weight gain of three pounds in a semester for their sample. Weight gain in this sample was accompanied by a significant increase in body fat percentage and body mass index. In short, their research supports the idea that even small changes in caloric intake can have significant changes in body mass and composition, likely related to the other half of the weight management equation, namely, physical activity.

Physical activity. Examining physical activity among first-year university students provides the second half of the weight management equation. Similar to investigating nutrition among first-year students, researchers have also explored physical activity within the population. Based on the two studies with the largest sample sizes, findings about physical exercise suggest less than optimal engagement. Racette and colleagues (2005) reported that 70% of their 764 freshmen sample participated in some

form of exercise, whereas 30% did not. More specifically, 59% of freshmen indicated they participated in aerobic exercise three to five days per week, 45% reported engagement in strength training two to three days per week, and 36% reported stretching two to three days per week. Similarly, Huang and colleagues (2003) found that nearly 70% of their freshman sample (n = 736, 48% women) participated in some form of physical activity; however, average number of days of activity was less than three per week. Although the majority of students engaged in some activity, 16% of the sample did not do any aerobic exercise and 33% did not do any strength training exercise during a one-week period. Based on the two studies described above, it appears that, overall, college freshmen are performing some level of physical activity each week. However, frequency, duration, and intensity (vigorous or moderate) of their physical activity were not described, thus limiting the utility of the information about freshmen physical activity.

Although the two studies described above did not discuss frequency, duration, or intensity, other researchers have helped fill those gaps in the literature. Driskell and colleagues (2005) examined physical activity among lower-level students (freshmen/sophomore; n = 144, 79% women) and found that nearly half reported participating in 20 to 30 minutes of physical activity per day, five to seven days per week. Similarly, Morrow and colleagues (2006) found that in their sample of 137 freshmen women, the average amount of activity was 60 minutes of moderate activity and 90 minutes of vigorous activity per week, based on their responses on the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003). On average, participants engaged in 60 minutes of moderate activity per week and 80 minutes of vigorous activity per week. Consistent with these studies, Pinto, Cherico, Szymanski, and Marcus (1998) found that their sample of 242 participants (62% women) engaged in approximately 180 minutes (three hours) of vigorous physical activity per week and 97 minutes of moderate activity per week. Although as a whole, their sample was active, they found that 42% of their students at baseline were not meeting physical activity guidelines of the time (20 minutes of moderate-vigorous activity, three days per week). Despite the variation in

frequency, duration, and intensity across samples, overall, approximately 50% to 60% of students were either moderately or vigorously active throughout the weeks during their first year of college. Although the studies reported a majority of students were active, each sample also contained a large portion of students who were inactive. Similar to nutrition studies, it is important to examine the correlates of weight gain, when looking at the physical activity aspect of weight management.

Butler and colleagues (2004) found in their small, women-only sample (n = 54) total physical activity decreased during their transition to college, particularly physical activity related to work and sports participation. Their overall sample had a significant increase in body fat, which was attributed to a decrease in physical activity, as their sample also reported a decrease in caloric intake during their first year of college. Similarly, Jung and colleagues (2008) found that a decline in physical activity seemed to be the primary driver of weight gain among their sample of freshmen women (n = 101). In their sample, both those who lost and gained weight reported a decline in caloric intake across the year. However, those who gained weight also reported a decline in physical activity, whereas those who lost weight maintained their same activity level. In contrast to the previously mentioned studies, Kasparek and colleagues (2008) found that students' activity level from the beginning of the year did not differ from when students entered into the spring of their freshmen year, although students who exercised infrequently were twice as likely to gain weight compared to those who regularly exercised. Therefore, it appears that students who do not exercise regularly are more likely to gain weight compared to peers who maintain an active regimen.

As mentioned previously, weight management is a delicate balance between energy intake and expenditure. In looking at past research with freshmen students it appears that even a slight change in the balance (i.e., averaging a 50 to 85 calorie surplus per day) can produce significant weight gain. Conversely, it seems that there is potential for the balance to be adjusted toward weight loss for those at risk for gain by means of similarly slight changes. Therefore, it is important to explore other factors outside of behavioral elements related to weight gain during the first year of college. Specifically, it

is important to explore psychological contributions to nutrition and exercise behaviors of first-year university students.

Psychological Components of Weight Gain

Transtheoretical model. Examining the behavioral contributions to weight gain during the first year of college only provides information about direct actions students perform that affect their weight, but does not explain why some students live healthier lifestyle than others. Exploring psychological constructs related to health behavior change is one avenue that may provide insight into why some students engage in healthier lifestyles. A current theory of health behavior change is the Transtheoretical Model (TTM) developed by Prochaska and DiClemente (1982). TTM posits that people progress through a series of stages when engaging in a change of behavior. The stages of change are as follows:

- Precontemplation: not even thinking about the issues
- Contemplation: thinking about the issues but not being ready to take action
- Preparation: beginning to think about taking action
- Action: taking action
- Maintenance: adhering to the plan of action

Examining behavior change from the TTM perspective and initiating interventions based on TTM have shown to be effective across multiple health domains (Prochaska & Velicer, 1997), including HIV prevention (Harvey et al., 2009), smoking cessation (Prochaska et al., 2001), physical activity (Armstrong et al., 1993; Bosak et al., 2010; Garber et al., 2008; Marcus et al., 1992), and dietary changes (Di Noia & Prochaska, 2010; Greene et al., 1999). Currently, few studies have examined physical activity and nutrition among college students from the TTM perspective and only one has examined health behaviors among first-year university students.

Levy and Cardinal (2006) found that in their undergraduate sample (n = 528, 54% women), individuals who scored in an active stage of the TTM (e.g., action or maintenance) were more likely to continue to be active when asked again nine weeks later. Similarly, they found that those who reported being in an inactive stage (e.g.,

precontemplation, contemplation, preparing) were more likely to be less active at the baseline measure and again at the follow-up assessment. In a related study that examined TTM and health-related variables among college women, participants who scored in the higher stages of the TTM reported greater levels of physical activity; consumption of more fruits, vegetables, and water; and less consumption of high-fat/high-calorie foods (Clement, Schmidt, Bernaix, Covington, & Carr, 2004). Additionally, Pinto and Marcus (1995) found that students who identified being in an action stage of activity were exercising more than students who reported being in a contemplative/preparation stage. Therefore, in a college population, stage-of-change assessment appears to correlate to health-related behaviors.

Although, these studies have demonstrated consistent findings in general college populations, only one study has examined TTM in a first-year university student sample. Racette and colleagues (2005) examined TTM related to nutrition and physical activity of first-year university students. They examined the TTM in a sample of 764 (53% women) freshmen at baseline and were able to collect data from 290 of the students one year later. The investigators asked students to rate their readiness to engage in three types of physical activities. The three activities were defined as engaging in aerobic exercise three to five days a week (e.g., jogging, swimming, brisk walking, cycling, rowing), engaging in strength training two to three days a week (e.g., free weights, weight machines, resistance bands), and stretching two to three days a week (any planned activity to improve flexibility, e.g., tai chi, yoga). At baseline, approximately 60% of students were in the action or maintenance stage of aerobic exercise, 45% in the action or maintenance stage for strength training, and 30% in the action or maintenance stage for stretching. At follow-up assessment, the investigators found a significant decline in the percentage of students in the maintenance phase for aerobic exercise, an increase in the percentage of students in the combined action and maintenance stages for stretching, and a corresponding decrease in the percentage of students in the contemplation stage for stretching. Thus, after one year of school, some participants decreased their readiness to be in a maintenance stage of aerobic exercise, while others changed from being

contemplative to being engaged in regular stretching activity. Unfortunately, Racette and colleagues (2005) did not differentiate subgroups who did not meet criteria to be in the action and maintenance stages related to physical activity; therefore, they did not report whether those students were at greater risk of weight gain or what challenges those students may face to be regularly active.

Racette and colleagues (2005) also examined dietary behavior and the TTM. They asked students if they were engaging in four healthy dietary behaviors, namely, eating five or more fruits/vegetables every day, limiting consumption of fried foods to less than twice per week, limiting consumption of high-fat "fast food" to less than twice per week, and drinking 64 ounces of non-caffeinated, non-alcoholic beverages per day. Over half (55%) of the students in the sample were in the precontemplation stage for adopting the four healthier eating behaviors at the beginning of freshman year and still at the end of sophomore year. In fact, by the end of the sophomore year, the percentage of students in the action and maintenance stages of healthy eating had decreased, with a corresponding increase in the number of students in the pre-contemplation and contemplation stages. Based on these results, a majority of students are not motivated to eat healthier (using the researchers' criteria) throughout their first years of university study and students' readiness to engage in healthy eating decreased over the same time. Similar to the physical activity measure, Racette and colleagues (2005) did not differentiate subgroups who did not meet criteria to be in the action and maintenance stages related to healthy eating; therefore, they did not report if those students were at greater risk of weight gain. Additionally, the researchers did not determine what specific aspects of healthy eating (e.g., consuming fruits and vegetables, eating fatty food, eating at fast-food restaurants, drinking 64 ounces of non-caffeinated, non-alcoholic beverages per day) were causing difficulties for students in non-action stages.

Overall, it appears that the TTM is a valid and reliable psychological construct through which to explore health-related behaviors among a first-year university sample. Although one study has examined the construct related to both nutrition and physical activity, that study did not differentiate subgroups in their sample that may have helped

determine why some students were in an action/maintenance stage related to exercise and nutrition, whereas others were not.

Self-efficacy. Motivation for change is just one psychological construct related to behavior change. In regard to health-related behaviors, self-efficacy is an equally important psychological construct, as individuals must perceive themselves as able to complete a task before they initiate or maintain change (Holloway & Watson, 2002). As described by Albert Bandura (1997), self-efficacy is an individual's self-perception of her or his ability to carry out an activity, regardless of actual capacity. The construct of self-efficacy has been shown to be predictive of behavior change across a variety of health behaviors, including exercise among individuals with cardiovascular disease and diabetes (Luszczynska & Tryburcy, 2008), healthier eating patterns (Strachan & Brawley, 2009), fruit and vegetable consumption (Luszczynska et al., 2007), and weight management (Armstrong et al., 1993; Marcus et al., 1992; Palmeira et al., 2007). Individuals who report having a greater self-efficacy about their abilities to make a behavior change are more likely to engage successfully in the behavior. In fact, Palmeira and colleagues (2007) found that an increase in self-efficacy for weight management was the primary predictor of short-term weight loss during a 16-week weight management intervention. Furia and colleagues (2009) examined the role that self-efficacy played in college students' weight management. In a cross-sectional study of students ages 18 to 24 years, these researchers found that individuals who were of normal weight had higher levels of self-efficacy for weight management compared to those who were classified as overweight. However, the direction of putative causality between self-efficacy, weight, and weight management could be bi-directional, which was not clarified by the authors.

Although Furia and colleagues (2009) examined self-efficacy and weight management in a university population, currently, only one study has examined self-efficacy related to weight gain during the first year of college (Butler et al., 2004). Findings from this study indicated that self-efficacy related to exercise and healthy eating remained stable overtime. Unfortunately, due to sample size limitation, the study did not directly examine exercise and healthy eating self-efficacy as predictor variables for

weight gain during the first year of college. Therefore, it is unclear at this time if self-efficacy played a role in weight management during the first year of university study. However, based on combined results from Furia and colleagues (2009) and Butler and colleagues (2004), it can be hypothesized that first-year students with higher levels of self-efficacy in maintaining a healthy weight would most likely not be overweight and their reported self-efficacy and weight would remain stable overtime.

Current Limitations in Literature

Although the behavioral aspects of weight management have been widely examined among the freshmen population, little research has examined the psychological constructs of self-efficacy and the TTM with this population. Previous studies that examined the psychological constructs either placed little emphasis on them (i.e., ancillary analyses) in the course of their research or did not explore the constructs as predictor variables. Therefore, this study aims to address the limitations in those few specific studies by exploring the potential roles of motivation to change and self-efficacy, as well as attending to other limitations more broadly related to this topic.

In addition to the limitation of having little or no emphasis on the health-related psychological constructs, previous studies have had other limitations. One major limitation has been a primary (sometimes exclusive) focus on college women. Currently, only 30% (seven out of 24) of previous studies have had samples composed of mostly equal numbers of men and women. Since 1985, of the 24 published studies, 70% (n = 17) relied on samples composed solely (11 studies) or primarily of women (six studies with 80% of sample identified as female). Past studies have been of short duration, posing another limitation. Study duration appears to be an important aspect of the weight gain among college populations. Vella-Zarb and Elgar (2009) noted, the longer the study duration, the greater the weight gain among study participants. To date, only two studies have prospectively examined weight gain longitudinally among first-year university students beyond the first year of college (Hovell et al., 1985; Racette et al., 2005).

A final limitation of previous research has been the lack of qualitative studies on the subject. To date, no qualitative examination has been completed of first-year

university students' perceived contextual barriers and supports to healthy living during the transition to college. Similarly, no published literature has examined university stakeholders' (e.g., university administration, university health providers, and residence administrators) perception of weight gain during the first year of college. These additional stakeholder groups are an essential aspect in the examination of prevention of weight-gain during the first-year of college, as these groups often have direct control or influence regarding policy changes and resource allocation at universities, and can affect contextual factors that influence health behaviors.

Conclusion and Study Aims

The current study attempted to address the limitations noted in the literature by examining data collected from a more balanced sample of men and women, relying on a dataset with a 2-year follow-up data collection period with participants, exploring psychological variables related to stage of change and self-efficacy, assessing contextual supports and barriers, and combining quantitative and qualitative methods. To address these gaps in the literature, this current study:

1) examined weight gain and associated behaviors (viz., physical activity and nutrition) and psychological constructs (viz., self-efficacy and transtheoretical model of change) longitudinally over the course of two years;
2) explored university students' perceived barriers and supports to healthy living during their transition through college;
3) explored university students' perception of how the university can promote healthy living;
4) explored university stakeholder groups' perceived barriers and supports to healthy living for students transitioning through college;
5) explored university stakeholder groups' perceptions of the university's role and possibilities in supporting healthy living for students transitioning through college; and

6) developed empirically supported recommendations for healthy living for university policymakers and health professionals working with university students.

Chapter Three: Research Design and Methodology

Overarching Study Design

To achieve the aims outlined in Chapter Two, this study employed a mixed-method approach to explore weight gain among first-year university students. A mixed-method approach was chosen as it provided an opportunity to examine a phenomenon with greater breadth and depth (Johnson & Onwuegbuzie, 2004). To employ the mixed-method approach, three interrelated study phases were conducted. The study phases included a quantitative phase, qualitative phase, and a results-integration phase. The culminating results of these three phases provided a greater understanding of the psychological and behavioral aspects of weight gain during college, as well as the supports and barriers to living a healthy lifestyle during college.

The first phase (Phase I) was a *quantitative* examination of archival data collected from first-year university students over a period of two years. These data included anthropometric measurements, self-reported nutrition, physical activity, and psychosocial data (e.g., motivation and self-efficacy scores). The second phase (Phase II) involved collecting and analyzing *qualitative* data aimed at identifying barriers and supports to healthy living perceived by university students and university stakeholders. Additionally, this phase explored university stakeholders' perceptions of the university's role in supporting healthy living among students transitioning to college and suggestions for promotion of healthy living. Following the quantitative and qualitative phases, the third phase (Phase III) integrated findings from the previous two phases to create a comprehensive examination of health-related behaviors of first-year university students in the context of barriers and supports to healthy living among college students. Through this endeavor, this study provides additional insights into first-year university student weight gain, as well as suggestions for future prevention and intervention strategies during the transitional period for emerging adults.

Phase I – Quantitative Analysis of Longitudinal-Archival Data

Phase I of the study broadly addressed the relationship between students' body mass index, body composition, nutritional intakes, physical activity levels, and their self-

efficacy and motivation to live healthfully. It also explored how these relationships changed over time. The research questions were addressed through descriptive and inferential statistical analyses of archival data collected by researchers at the University of Alaska Anchorage Center for Behavioral Health Research and Services (CBHRS). Data collected for the first study phase consisted of two waves, a one-year-long baseline data collection wave that began in February 2007, and a 24-month follow-up data collection phase that began in February 2009 and ended in January 2010. Of note, this author, in his research associate position at the CBHRS, helped collect baseline data for this study and was the project coordinator for the follow-up data collection effort. Participant descriptions, study measures, and procedures for each wave are presented below.

Participants

Baseline participants. Potential participants were initially contacted about taking part in the study via email (with permission from the Dean of Students at the University of Alaska Anchorage; see below). To be eligible for the study, participants had to be a first-time university student between the ages of 18 and 20 years. Participants were recruited over a one-year period beginning in February 2007. Of 800 eligible students who were approached by email, 212 students volunteered to be in the study. Although 212 people completed the measures, 198 provided useable data. More specifically, 14 participants were removed from the data analyses due to either reporting a caloric intake of less than 800 (n = 12) calories per day (a biologically implausible amount) or being underweight (BMI. $\leq$ 18.5; n = 2). Study participants who provided usable data were 121 women (61%) and 77 men (39%), a gender distribution that is similar to the proportion of women and men in the overall university student body (60% and 40%, respectively). The ethnic distribution of the baseline sample was also similar to the university student body (within +/- 4%). The ethnic distribution is provided in Table 3.

Table 3

Demographic Information for Study Participants

	Baseline (N = 198)		*Follow-Up (N = 79)*	
Demographic Characteristic	*N*	*%*	*N*	*%*
Gender				
Male	77	38.9%	35	44.3%
Female	121	61.1%	44	55.7%
Primary Race or Ethnicity				
African American	3	1.5%	2	2.5%
Native American/American Indian	3	1.5%	-	-
Asian/Pacific Islander	22	11.1%	14	17.7%
Biracial/Mixed Heritage	9	4.6%	5	6.3%
Caucasian	132	66.7%	52	65.8%
Alaska Native	14	7.1%	1	1.3%
Aleut	2	1.0%	-	-
Athabascan	4	2.0%	1	1.3%
Inupiat	3	1.5%	-	-
Tlingit	2	1.0%	-	-
Tsimshian	1	0.5%	-	-
Yupik	3	1.5%	-	-
Other Alaska Native	5	2.5%	-	-
Other	15	7.6%	6	7.6%
Hispanic or Latino	14	7.1%	5	6.3%
Central American	1	0.5%	1	1.3%
Dominican	5	2.5%	2	2.5%
Mexican	6	3.0%	1	1.3%
South American	2	1.0%	1	1.3%

Two-year follow-up participants. Following a 2-year waiting period, participants who completed the baseline data collection wave of the study were re-contacted and asked to participate in the second portion of the study. Of the original 212 students participating in the baseline data collection, 90 (42.4%) completed the follow-up study. The other students who did not participate either declined future participation during the baseline informed consent process (see below), declined participation when re-contacted for the follow-up study, or were unable to be contacted during the follow-up recruitment period. Of the 90 participants who completed the follow-up measures, 79 provided useable data. Eleven participants were removed from the data analyses due to reporting a caloric intake of less than 800 calories per day. The gender distribution at follow-up was 55.7% women and 44.3% men, slightly different then the gender distribution of the overall student body (60% women / 40% men). The ethnic distribution

of the follow-up sample was similar to the overall student body with two exceptions. The sample had a smaller proportion of Alaska Native (1.2% versus 8%) students and a larger proportion of Asian/Pacific Islander students (17.7% versus 7.7%) compared to the university student body. The ethnic distribution of the follow-up sample is provided in Table 3 (see above).

Measures

Anthropometric measurements. Height and weight were measured and a body mass index (BMI) was calculated for each participant. BMI was calculated using the following standard formula:

$$BMI = [wt(lbs)/ht(in^2)] \text{ X } 703$$

Height was measured using a SECA 214 Road Rod Portable Stadiometer®, calibrated to a half an inch. Weight and body fat percentage were measured by a standardized scale (Tanita 2204 Ultimate Body Fat and Weight Scale®) on the same surface (wood platform), calibrated to 0.5 pounds (lbs). Using bioelectrical impedance, body fat percentage was estimated. Bioelectrical impedance sends an imperceptible electrical impulse through the body to estimate lean body mass versus fat percentage. Prior to using this measure, participants were asked if they had a pacemaker, as the bioelectrical impedance may be harmful to individuals with pace makers. Cautions were included in the informed consent regarding this issue. Participants were asked to remove their shoes and heavy clothing (e.g., jackets) for all anthropometric measures. The scale and stadiometer were disinfected between each use.

Physical activity measurement. The International Physical Activity Questionnaire (IPAQ) – Short Version (IPAQ-Short; Craig et al., 2003) was used to estimate participants' physical activity levels. The IPAQ-Short was developed to establish an international standard for the measurement of physical activity. The IPAQ-Short uses seven questions to inquire about frequency, duration, and intensity of physical activity in the past seven days. The measure asks participants to indicate how many days in the previous week they engaged in moderate or vigorous activity, and days they walked for at least 10 minutes. In addition to the number of days a person walked for

more than 10 minutes, the measure asks participants to indicate how many minutes each day they walked, as well as the number of minutes they performed moderate and vigorous activity. Additionally, the IPAQ-Short contains a single question that asks participants to indicate how much time they spend sitting on an average day.

Craig and colleagues (2003) examined the test-retest reliability, concurrent validity, and criterion validity of the IPAQ-Short in 12 countries. They found that the test-retest reliability (Spearman ρ correlation coefficient for non-parametric distribution) of the IPAQ-Short in Western nations (e.g., USA, Canada, United Kingdom) ranged from .66 to .88, indicating good test-retest reliability. Concurrent validity of the IPAQ-Short was obtained by comparing responses to the IPAQ-Short and IPAQ-Long versions. The Spearman pooled ρ value ranged from .61 to .71, indicating good concurrent validity among English-speaking Western nations. Criterion validity of the IPAQ measure was assessed by comparing individuals' scores on the measure versus their actual measured level of physical activity as indicated through their use of accelerometers. The criterion validity (Spearman pooled ρ) of the IPAQ ranged from .26 to .40 for the same Western nations, indicating fair to good criterion validity. Appendix B contains a copy of this measure.

Nutritional intake measurement. The students' nutritional intake was measured using the self-report *Brief Food Frequency Questionnaire* (BFFQ; Block, Hartman, & Naughton, 1990). The BFFQ is a shortened version of the full Block Food Frequency Questionnaire (FFQ), which was originally developed for the National Cancer Institute to examine dietary related factors and its effects on health (NutritionQuest, 2009). The BFFQ has been reduced to 70 items from 109 in the full FFQ version. In completing the BFFQ, participants indicate the frequency and quantity of 70 different foods items they typically consume per week for the past year. To help participants gauge their serving size, they are presented with pictures of the foods. Once completed, the BFFQ provides data on the number of calories consumed and recommended intake of macro- and micronutrients. Macronutrients include fat, protein, carbohydrates and fiber. Micronutrients include vitamin A, B-vitamins, vitamin C, vitamin E, calcium, sodium,

potassium, iron, and zinc. In addition to examining macro- and micronutrients, the BFFQ also provides recommended food group servings such as fruits, vegetables, dairy, meats, grains, fats, and sweets. A report is prepared for each participant based on their answers with details about the data outlined above. Appendix C contains a copy of this measure and a sample of a participant feedback report.

Reliability and validity measures have not been completed for the BFFQ; however, a development and validation study with an earlier version of the BFFQ was conducted (Block et al., 1990). The concurrent validity (Pearson *r*) of the BFFQ with the full version of the FFQ ranged from .97 to .99 for total calories, macronutrients, and micronutrients. Multiple reliability and validity studies have been completed on the full FFQ version. Test-retest reliability of the FFQ had a median Pearson correlation coefficient of .75, ranging from .75 to .90 for macronutrients and .65 to .88 for micronutrients (Boucher et al., 2006). The FFQ was found to be valid when compared to 24-hour diet recalls with median Pearson correlations coefficients of .59, ranging from .11 to .73 for macronutrients and .50 to .76 for micronutrients (Boucher et al., 2006). These findings indicate that although the BFFQ used in the collection of the archival data has not been validated or undergone any reliability estimates, its parent scale (FFQ) has been found to be both valid and reliable.

Stage-of-change measurement. Two brief scales were used to assess participants' motivation for change in the areas of nutrition and physical activity (Nigg et al., 1999). Each scale contains a single item that is rated on five dimensions (with a simple yes/no response) corresponding to the five stages of change proposed by Prochaska and DiClemente (1982). Specifically, participants were asked a single question about their motivation (Stage of Change) regarding healthy eating and a single question about their motivation regarding physical activity. The stages of change include Precontemplation (i.e., not even thinking about the issues), Contemplation (i.e., thinking about the issues but not ready to take action), Preparation (i.e., beginning to think about taking action), Action (i.e., taking action), and Maintenance (i.e., adhering to the plan of action). These scales are in the public domain and can be retrieved at

http://www.uri.edu/research/cprc/Measures/; copies are provided in Appendix D. Unfortunately, reliability and validity estimates were not provided by the authors. The estimates were alluded to in the authors' publication, but exact numbers were not provided. They reference a conference presentation and a State of California technical report for the estimates, both of which are not readily available in the literature.

Self-efficacy measurement. Participants' self-efficacy (perceptions of one's abilities to engage successfully in a behavior; Bandura, 1997) related to exercise and healthy nutrition was assessed by two short questionnaires. Each individual questionnaire (healthy eating and exercise) consists of five items rated on a 3-point scale ranging from 1 (*no*) to 3 (*yes*). Responses to the five items were summed to create a total score for each self-efficacy scale ranging from five to 15. The instruments were adapted from a 4-point scale developed by Schwarzer and Renner (2005) and are provided in Appendix D. The original instruments have been demonstrated to have good reliability and validity. For example, the internal consistency (Cronbach's alpha) for the nutrition and exercise self-efficacy measures were found to range from .74 (Renner, Knoll, & Schwarzer, 2000) to .79 (Schwarzer & Renner, 2000). The correlation of the nutrition and exercise scales were $r = .33$ and $r = .38$, respectively, when compared to participants self-reported engagement in healthy eating and exercise (Schwarzer & Renner, 2005). Thus, the correlations represent adequate construct validity. The original scales are in the public domain and can be retrieved at http://userpage.fu-berlin.de/~health/healself.pdf.

Procedures

Human subject protection. The original data collection procedures for this archival dataset were reviewed and approved by the University of Alaska Anchorage (UAA) Institutional Review Board (IRB). Prior to using this archival dataset for the current study, approval was sought from the UAA IRB. In adherence with the principles of ethical research, this project sought to fulfill the principles of respect for persons, beneficence, and justice in every aspect of the study. All persons associated with the data collection and analyses were required to complete, or had completed, the National Institute of Health and the Collaborative Institutional Training Initiative web-based

certification programs for the protection of human research subjects. All processes involved with participant recruitment, informed consent, and data collection, storage, and analysis were conducted in an ethical and confidential manner with oversight from the center directors and local IRB.

All aspects of archival data collection and storage adhered strictly to confidentiality policies and procedures that are in compliance with Federal Laws and Regulations (42 CFR, Part 2). These policies and procedures were maintained by the lead researcher for the study. For example, this study complied with all guidelines for the protection of data, including limited access, locked file rooms with locked fireproof file cabinets and a secure password-protected server accessible only by research team members. Additionally, the dataset itself did not include any participant names and all results from the study are reported in aggregate form only. Use of this archival dataset was permitted by Dr. Mark E. Johnson, Director, Center for Behavioral Health Research and Services, University of Alaska Anchorage (see Appendix E). The IRB approval letter for the use of the dataset for quantitative data analyses is presented in Appendix F.

Baseline data collection protocols. Potential participants were initially recruited via e-mail based on a mailing list containing all enrolled first-year students between the ages of 18 and 20. The researchers at CBHRS were provided the email list by the UAA's Dean of Students Office, with permission to use for the recruitment of participants. Students interested in being in the study were given an option to contact the researchers to meet and discuss the project in greater depth. At the meeting, the researcher provided an informed consent form to the student and verbally reviewed the form. If students gave consent to participate, they were asked if they would be willing to be re-contacted for a repeat administration of the research protocol in the future. If a student agreed, contact sheets were completed with the participant that included information such as primary and secondary telephone numbers, mailing and physical addresses, primary and secondary email addresses, and contact information for parents and one friend.

Following the collection of contact information, students were directed to a computer station and asked to provide demographic information and complete the

measures described above. In the following order, participants answered demographic questions and completed the self-efficacy measures, stage-of-change measures, physical activity measures, and Brief Food Frequency Questionnaire (BFFQ). Upon completion of the measures, anthropometric measures were taken (viz., height, weight, & body fat percentage) as described above. Sessions ended with students receiving a nutritional report derived from the information they provided in the BFFQ. Participants were given compensation for their time and effort in the form of a $20 gift card. The entire process from reviewing the informed consent to receiving the nutritional report and gift card took approximately 45 minutes.

Follow-up data collection protocols. Procedures for follow-up data collection efforts were similar to the baseline data collection process. The most notable difference was the recruitment effort. Instead of recruiting from the entire first-year sample pool, participants were recruited only if they participated in the baseline sample and agreed to participate in the future (see Participants section for number of students contacted). Research staff attempted to contact participants with the information they provided during the baseline informed consent process. When participants were contacted, they were invited to meet with the research staff and participate in the follow-up study. Similar to the baseline process, research staff reviewed the informed consent form and inquired if the participant had any questions. Upon answering any questions, each participant was directed to a computer terminal to complete identical measures as at the baseline process (i.e., demographics, stage-of-change measure, self-efficacy measure, physical activity measure, & BFFQ). Once the participant completed these measures, anthropometric measures were taken (i.e., height, weight, & body fat percentage) as described in the section above. Following the anthropometric measures, participants were thanked, given a $20 gift card as compensation, and provided another nutritional report based on their BFFQ responses. Similar to the baseline process, the follow-up process lasted approximately 45 minutes.

Research Questions, Data Preparation, and Data Analyses

To broadly address the relationship between students' body mass index, body composition, nutritional intakes, physical activity levels, and their self-efficacy and intention to live healthfully, and how these relationships may change over time, a series of specific research questions was examined. The specific research questions were as follows:

1. When first entering college, what are students' body mass index, body composition, physical activity level, nutrition, self-efficacy related to nutrition and physical activity, and stage of change related to nutrition and physical activity?
2. What are the similarities and differences of the health related variables between men and women at the start of college?
3. What are the similarities and differences of the health related variables between those who are in the healthy BMI range versus those who are overweight/obese at the start of college?
4. How do students' baseline levels of health related variables change across time?
5. What are the differences from baseline to follow-up, differentiated by gender, baseline BMI status, and weight gain status?
6. What are the baseline measures that significantly predict future weight gain and change in body composition?

To address these research questions, a series of descriptive and inferential statistics was utilized. Table 4 provides a brief summary of the corresponding research questions listed above, variables of interest, and statistical tests used to answer each research question. Following the table is a description of each analytic plan, including data preparation, preliminary analyses, and primary analyses.

Table 4

Quantitative Data Analysis Procedure

Corresponding Research Questions 1-3: What are the characteristics of the sample at baseline, differentiated by gender and BMI status?

Independent Variables	Dependent Variables		Statistical Tests
• Gender • BMI Status BMI<25 BMI ≥ 25	• Weight • BMI • %Body Fat • PA/SE • NU/SE • PA/SOC • NU/SOC	• Phys. Activity • Calories • % Protein • % Fat • % Carbs • % Kcal from Sweets, Desserts	• Descriptive Statistics • Independent Samples *t*-test

Corresponding Research Question 4: How did the sample change from baseline to follow-up?

Independent Variables	Dependent Variables		Statistical Tests
• Time (Baseline vs. Follow-up)	• Weight • BMI • %Body Fat • PA/SE • NU/SE • PA/SOC • NU/SOC	• Phys. Activity • Calories • % Protein • % Fat • % Carbs • % Kcal from Sweets, Desserts	• Descriptive Statistics • Paired-sample t-test

Corresponding Research Question 5: What are the differences from baseline to follow-up, differentiated by gender, baseline BMI status, and weight gain status?

Independent Variables	Dependent Variables		Statistical Tests
• Gender • BMI Status BMI<25 BMI ≥ 25 • Weight Change (+/- lbs) Weight Gain vs. Weight Neutral/Loss • Time (Baseline vs. Follow-up)	• Gender • Weight • BMI • %Body Fat • PA/SE • NU/SE • PA/SOC • NU/SOC	• Phys. Activity • Calories • % Protein • % Fat • % Carbs • % Kcal from Sweets, Desserts	• Mixed-Model Factorial ANOVA with Within-Subject Factor (Bonferroni Correction) • Chi-square Tests*

Corresponding Research Question 6: What are the significant predictors of weight gain and change in body composition?

Outcome Variables	Predictor Variables		Statistical Tests
• Weight Change (+/- lbs) Weight Gain vs. Weight Neutral/Loss • % Body Fat Change Increase in % Body Fat vs. Decrease in % Body Fat	• Gender • Weight • BMI • %Body Fat • PA/SE • NU/SE • PA/SOC • NU/SOC	• Phys. Activity • Calories • % Protein • % Fat • % Carbs • % Kcal from Sweets, Desserts	• Multiple Logistic Regression*

Note: % Body Fat = Body Fat Percentage, PA/SE = Physical Activity Self-Efficacy, NU/SE = Nutrition Self-Efficacy, PA/SOC = Physical Activity Stage of Change, NU/SOC = Nutrition Stage of Change
*Dichotomous recoding of variables used in analyses

Data preparation. Prior to calculating descriptive statistics and conducting a series of inferential statistical tests (i.e., repeated measures t-test, chi-squares, & mixed-model factorial ANOVAs), several variables were computed and transformed. Each self-efficacy measure was summed to create a total self-efficacy score for each behavior of interest. As a result, the nutrition self-efficacy score had a range of 5-15, as did the physical activity self-efficacy score. Cronbach's alpha values for the physical activity and nutrition self-efficacy measures were .67 and .71 respectively. The internal consistency correlation was lower than previous reports of .74 (Renner et al., 2000) to .79 (Schwarzer & Renner, 2000); however, they are still in an acceptable range (Hatcher, 1994).

The nutritional intake and physical activity variables also underwent data transformation. Due to consistent observations of under-reporting of caloric intake in self-report food frequency questionnaires (Hill & Davies, 2001; Tooze et al., 2004; Trabulsi & Schoeller, 2001), the nutritional variable (caloric intake) was increased by 20%. The macronutrient variables (viz., percentage of protein, fat, & carbohydrates) were not changed, as they are a proportion (percentage) of total calories. The range of under-reporting for adults and adolescents has been reported to be between 20%-34% when self-report of caloric intake was compared to the "gold standard" of doubly-labeled water (Hill & Davies, 2001; Tooze et al., 2004; Trabulsi & Schoeller, 2001). Therefore, to be conservative, a 20% increase was used, as a validation study comparing doubly-labeled water and the BFFQ with this particular population has not been completed. Doubly-labeled water (see below) is the ideal validity criterion, as it is an external, independent direct measure of caloric expenditure, which can then be compared to caloric intake (Schoeller, 1990).

Doubly-labeled water uses the stable isotopes ^{2}H and ^{18}O which are orally consumed by a person. After consumption of doubly labeled water, two fluid samples (e.g., urine, saliva, or blood) are taken from the person. The first sample is taken within 24 hours to ensure equilibrium of the isotopes have been reached in the body. The second sample is taken within 14 days. The samples undergo mass spectrometer

analysis, which provides the researcher the CO_2 production rate and ultimately the amount of energy the person has expended. The amount of energy can then be compared to the person's reported caloric intake and any changes in their weight/body composition (Schoeller, 1990).

Similar to the nutrition variable, the physical activity variable underwent a conversion to account for possible over-reporting of physical activity. Although Craig and colleagues (2003) validated the IPAQ-Short against an accelerometer criterion (a device that measures all activity during the day) and found the relationship to be adequate (Spearman correlation coefficient of .30), a more recent study has indicated that activity is overestimated, despite an adequate criterion validity estimate (Boon, Hamlin, Steel, & Ross, 2010). They validated the original IPAQ assessment (full version) against an accelerometer criterion and found their sample was over-reporting by 165%, despite having a similar Spearman correlation coefficient of .30. Therefore, the physical activity minutes were converted, reducing their reported amount by 65%.

It is important to note that all caloric and exercise values presented in Chapter 4 reflect the adjusted values for physical activity (reduced by 65%) and total caloric intake (increased by 20%). This was done in an effort to correct for self-report bias (Boon et al., 2010; Schoeller, 1990). By doing this, only descriptive values are affected, reflecting a more accurate estimation of caloric intake and physical activity measures. Caution must be exercised in using mean, mode, and median values that represent caloric intake and physical activity. However, because the values have been adjusted proportionally, as suggested in the extant literature, all inferential statistical analyses and corresponding conclusions are unchanged by the adjustment.

The variables representing stage of change, physical activity, and ethnicity were transformed into dichotomous variables for logistic regression analyses. Stage-of-change measures were re-coded to reflect participants who identified being in a non-action stage (e.g., pre-contemplation, contemplation, preparation), or an action stage (e.g., action, maintenance). The physical activity measure was re-coded to identify participants who met physical activity recommendations at the time of the study versus those who did not.

Recommended physical activity was defined as exercising at a moderate or vigorous intensity for 30 minutes or more, five or more days a week (USDA-DHSS, 2005). The ethnicity variable was recoded into Caucasian and non-Caucasian, as the largest proportion of participants self-identified as Caucasian and there was no other well-represented ethnic group. Following recoding, those who self-identified as Caucasian represented 65% of baseline and follow-up samples. The dichotomous variables were also used in chi-square analyses to be discussed in Chapter 4. Anthropometric data (viz., height, weight, BMI, body fat percentage) were not recoded, as they are continuous measures. Additionally, gender was not recoded. Following data preparation procedures, statistical analyses were completed.

Preliminary analyses. Prior to conducting primary data analyses, descriptive statistics and independent sample *t*-tests were used to examine baseline sample characteristics. Descriptive statistics included frequency distributions, means, standard deviations and ranges for all dependent variables of interest listed in Table 4. Additionally, independent samples *t*-tests were used to determine if significant differences exist between men and women, and across BMI status (viz., BMI < 25 versus BMI ≥ 25). Prior to exploring changes in the sample and factors contributing to weight gain across time, independent samples *t*-tests were conducted comparing baseline values for all dependent variables listed in Table 4 for participants who completed the follow-up study ($n = 79$) versus those who did not ($n = 114$), excluding demographic variables. Demographic variables were excluded due to the limited sample size within some racial and ethnic groups. Additionally, a logistic regression was conducted to determine if any variables significantly predicted who completed the follow-up assessment. No significant differences were found among any of the baseline values of the variables between those who completed the follow-up study and those who did not. Additionally, there were no significant predictor variables in determining who would complete the follow-up assessment. Results of preliminary analyses were used to address the initial research questions:

- When first entering college, what are students' body mass index, body composition, physical activity level, nutrition, self-efficacy related to nutrition and physical activity, and stage of change related to nutrition and physical activity?
- What are the similarities and differences of the health related variables between men and women at the start of college?
- What are the similarities and differences of the health related variables between those who are in the healthy BMI range versus those who are overweight/obese at the start of college?

Primary analyses. Considering that the participants who chose to complete the two-year follow-up study were not significantly different from those who did not complete the study, the primary analyses were conducted to address the remaining research questions. The specific research questions were as follows:

- How do students' baseline levels of health related variables change across time?
- What are the differences from baseline to follow-up, differentiated by gender, baseline BMI status, and weight gain status?
- What are the baseline measures that significantly predict future weight gain and change in body composition?

To determine how students' baseline levels changed across time, an initial examination of the follow-up sample was conducted through the use of descriptive statistics such as frequencies, means, standard deviations. Following the use of descriptive statistics, a series of inferential statistics were utilized. Paired-samples *t*-tests were used to determine how the overall sample changed from baseline to follow-up. After determining the overall change in the sample, a series of mixed-model ANOVAs was calculated to determine the differences from baseline to follow-up, differentiated by gender, baseline BMI status, and weight gain status. Finally, a series of multiple logistic regression analyses was completed to determine if there were any significant predictors of weight gain. Results for all analyses are presented in Chapter 4.

Phase II – Qualitative Data Collection and Analysis

Subsequent to Phase I quantitative data analyses, a qualitative analysis phase was implemented to contextualize the quantitative findings and expand upon the relationships revealed in the quantitative work (see Chapter 4 for study results). Notably, a discrepancy existed between students' reported self-efficacy and intention to live a healthy lifestyle and their anthropomorphic (i.e., weight & BMI) and behavioral (i.e., diet & physical activity) measures. Additionally, students' reported dietary habits had implications related to weight gain. To contextualize the findings, a series of research questions was examined in the qualitative phase. The research questions were as follows:

1. How do university students and administrators define healthy living for college students?
2. What are the supports and barriers to living a healthy lifestyle in college, as perceived by administrators and students?
3. How can a university promote healthy living among new and current college students, as perceived by administrators and students?
4. What are students' and administrators' perceptions of the identified dietary habits related to weight gain?

To explore these research questions, a series of focus groups and key informant interviews was initiated. The key informant interviews were conducted with university administrators and staff, whereas focus groups were conducted with students. Protocols for the focus groups and interviews were developed from the results obtained in the previous study phase to help identify specific strategies to improve the health of new and continuing students.

Participants

Student participants. Student participants were recruited and screened for a series of focus groups (see Procedures below and Appendix G). Students were screened and separated into focus groups based upon age, class standing, and current residence (i.e., on campus or off campus). For example, to meet the criteria to participate in the 'On-Campus Freshman' focus group, participants had to be between ages 18 and 20, have

completed 0 to 29 college credits, and live on campus. Similarly, for individuals to meet criteria to participate in the 'Off-Campus Junior' focus group, they had to be between the ages of 20 to 22, have completed 60 to 89 college credits, and live off campus. Conversely, students were excluded if they were 21 and only completed 12 credits, as they did not meet inclusion criteria for any of the groups. Student athletes were excluded from the study, as they likely had different experiences related to nutrition and exercise than the greater student body. In addition to being screened for age, class standing, and residence status, students were asked to provide information about their gender and course of study. Students from all class standings and majors were recruited to gain a broad picture of students' perceived barriers and supports to healthy living during the transition to college. Of note, traditional-aged students (i.e., students between the ages of 18-24) were recruited, as they have been shown to be making transitions in new-decision making responsibilities. These new transitions are certainly relevant to health-related decisions. Table 5 shows a summary of the inclusion criteria.

Table 5

Inclusion Criteria for Focus Groups

Group Number	*Class Standing*	*Age Range (Criterion 1)*	*Credit Range (Criterion 2)*	*Residence (Criterion 3)*
1	Freshmen	18-20	$0 \leq 29$	On Campus
2	Freshmen	18-20	$0 \leq 29$	Off Campus
3	Sophomore	19-21	$30 \leq 59$	On Campus
4	Sophomore	19-21	$30 \leq 59$	Off Campus
5	Junior Senior	20-22 21-24	$60 \leq 89$ ≥ 90	On Campus*
6	Junior	20-22	$60 \leq 89$	Off Campus
7	Senior	21-24	≥ 90	Off Campus

Note: Junior and Senior students residing on campus were combined into a single group due to limited number of students available for recruitment

Following recruitment and screening, it was intended to categorize students into eight focus groups based on age, class standing, and residence. Efforts were made to have a group per class standing and residence for a total of eight groups. However, Junior and Senior students residing on campus were combined into a single group due to the limited number of students at that level of class standing living on campus, thus leaving a total of seven focus groups.

A total of 122 students completed the initial screening measure over a 7-week period between October and December 2011. There were 91 students (female $n = 65$; 71.4%) eligible to participate in the focus groups based on the screening criteria. They were recruited via telephone and email to participate in the focus groups. A total of 34 students agreed to participate and attended the seven focus groups. There were 25 women (73.5%) and nine men (26.5%) with a mean age of 20.1 years who participated in the second phase of the study. Gender distribution of the focus groups included more women and fewer men compared to the university student body (58.1% women and 41.9% men). Most participants self-identified as Caucasian (64.7%), a slightly smaller proportion than in the greater student body (67.3%). A greater proportion of Asian/Pacific Islander students participated in the focus group as compared to the student body (14.7% versus 8.7%). The proportion of students who self-identified as African American (5.9%) and Alaska Native (8.8%) was similar as to that in the student body. None of the students self-identified as Hispanic or American Indian, which was divergent from the greater student body. Table 6 provides the demographics of the participants.

Table 6

Student Focus Group Demographics (n = 34)

Demographic	*N*	*%*
Gender		
Female	25	73.5%
Male	9	26.5%
Race/Ethnicity		
Caucasian	22	64.70%
Asian/Pacific Islander	5	14.70%
Alaska Native	3	8.80%
African-American	2	5.90%
Mixed Heritage	2	5.90%
Residence and Class Standing		
On Campus	15	44.1%
Freshmen	6	40.0%
Sophomore	6	40.0%
Junior/Senior	3	20.0%
Off Campus	19	55.9%
Freshmen	5	26.3%
Sophomore	5	26.3%
Junior	5	26.3%
Senior	4	21.1%

As demonstrated in Table 6, 19 (55.9%) students participated in the four off-campus groups with nearly equal distribution across the four class standings. There were 15 (44.1%) students who participated in the on-campus groups, with a smaller proportion of students in the 'Junior/Senior' group. Overall, students had completed an average of 49 (SD = 40.5) course credits, ranging from 0 to 150. Participants reported being enrolled in 18 distinct majors, with Psychology having the largest representation (n = 5; 14.7% of sample). Nursing, Accounting, and Elementary Education majors had the next highest representation with three (8.8%) students each.

University administration and staff. In addition to students, university administrators and staff were recruited to be key informant interviewees. The goal for interviewing university administrators and staff was to gain an administrative perspective on the topics of weight gain during the transition to college and perceived supports and barriers to healthy living that students encounter. Interview participants were recruited to represent student services related to physical health (e.g., University Health Center), behavioral health (e.g., University Counseling and Psychological Services), and athletics (e.g., University Sports Center). Additional participants were recruited from student development offices (e.g., Student Affairs and Residence Life), student housing and dining, and policy makers (e.g., Office of the Dean of Students).

A total of 38 (female n = 26, 68%) university staff and administrators were contacted between October and November 2011 to participate as key informants. Fifteen individuals (39.5%) agreed to complete the interview. Nine (23.7%) of the other identified recruits declined participation; 14 (36.8%) did not respond to multiple email and telephone requests for participation. Reasons for declining included not having an available schedule, having the perception of not being knowledgeable about the subject, and deferring to other staff within the same department.

To protect participants' confidentiality, few demographic variables were collected and reported. Specifically, age and ethnicity were not collected, as these demographic variables may have led to a breach in confidentiality. There was a broad base of representatives from each target group with no specific group underrepresented. There

was an overrepresentation of participants from the student development groups (33%), as well as an overrepresentation of women, with 13 female participants (86.7%). The mean length of employment at the university for the participants was 8.02 years (*SD* = 7.6; Median = 5) with a range of nine months to 25 years.

Measures

Protocols for focus groups and key informant interviews were informed by quantitative results from Phase I of the study. The protocols had a semi-structured format to allow for spontaneous responses from participants, while maintaining a core set of domains to facilitate data analysis across groups (Denzin & Lincoln, 1994). Questions for the protocols were initially developed based on the results of the first phase of the study and then pilot-tested.

Pilot-testing for the focus group protocol was conducted with a convenience sample of psychology graduate students. Although not a direct analog to undergraduate students, Psychology graduate students were able to speak to the topic of inquiry and provide recommendations to improve the protocol. Recommendations included simplifying the questions and including question prompts. The key informant protocol was piloted with the first five participants. Following the completion of the interview, these five participants were asked to provide feedback on the protocol. The participants did not offer any changes or recommendations, but rather expressed support for the initial question set, reporting that it was comprehensive and targeted. The final question sets are presented in Table 7 with the exclusion of the question prompts. One prompt that was consistent through all questions was the inquiry whether participants noted differences between students who lived on campus versus off campus.

Table 7

Focus Group and Key Informant Questions

Focus Group Questions Asked of Students
1. How would you define healthy eating and healthy exercise for college students?
2. What are the supports for students to eat healthfully and exercise regularly?
3. What are the challenges for students to eat healthfully and exercise regularly?
4. What are some things the university is currently doing to promote healthy eating and exercise?
5. What are some things the university could do differently to promote healthy eating and exercise among its students?
6. From our research we found that students who gained weight in college ate more sweets and desserts and ate fewer calories from fat. The research is consistent with other reports that limiting certain types of fat and increasing sugars in your diet can lead to weight gain. Does that information change the way you think about anything we've talked about today?
7. We've talked a lot about nutrition and exercise, is there anything else you would like to share on this topic?
Key Informant Questions Asked of University Administrators and Staff
1. First off, could you please tell me what your role is at UAA? Also, could you tell me how long you've been employed at UAA and how long you've been in your current position?
2. How would you define healthy eating and healthy exercise for college students?
3. What are the supports and challenges for students to eat healthfully and exercise regularly at the university?
4. From your perspective, what role does the university have in supporting healthy eating and exercise among its students?
5. From your perspective, what is the university doing to help promote healthy eating and exercise among its students?
6. From your perspective, what else could the university be doing to help promote healthy eating and exercise among its students?
7. From our research we found that students who gained weight in college ate more sweets and desserts and ate fewer calories from fat. The research is consistent with other reports that limiting certain types of fat and increasing sugars in your diet can lead to weight gain. Does that information change the way you think about anything we've talked about today?
8. We've talked a lot about nutrition and exercise for students, is there anything else you would like to share on this topic?

Procedures

Human subjects protection. All aspects of the qualitative data collection and analysis adhered strictly to confidentiality policies and procedures that are in compliance with Federal Laws and Regulations (42 CFR, Part 2). Prior to data collection, all procedures and measures were reviewed and approved by the UAA's IRB. During data collection, all participants were informed of the nature of the study, activities asked of them, efforts of research staff to maintain confidentiality, and limits of confidentiality; all were provided an opportunity to ask questions or withdraw. Additionally, if individuals agreed to be in the study, they were asked to sign an informed consent form and reminded that the study was voluntary and they could withdraw any time. Following data collection, the researcher upheld all guidelines for the protection of data, including limited access, locked file rooms with locked fireproof file cabinets, and a secure password-protected server accessible only by research team members. Finally, all identifying information was removed from the dataset (transcripts) and all results from the study are reported only in aggregate form. The IRB approval letter for the qualitative study phase is presented in Appendix F.

Recruitment and data collection.

Student recruitment and data collection. Student participants were recruited for the focus groups through fliers posted on campus, announcements on an electronic psychology department research portal, and presentations given during general education classes. Students were directed to an internet-based screening tool to determine if they met inclusion criteria to participate (www.healthyuaa.org). Appendix G contains the recruitment message and screening questionnaire. Recruitment occurred over a seven-week period between October and December 2011. A raffle of $100 was offered to provide an incentive for student completion of the screening instrument. Students who met eligibility criteria were recruited and scheduled to participate in the focus groups through a series of phone calls, emails, and text messages. A total of 34 students participated in seven focus groups.

Prior to the start of the focus groups, participants were informed of the purpose of the study and the voluntary and confidential nature of the study; then they were be asked to complete an informed consent form (see Appendix H). The focus group facilitator (lead researcher) reviewed all informed consent issues to give participants an opportunity to ask questions or choose to drop out of the study. Participants were then directed to complete a brief demographics questionnaire (see Appendix I). Following the collection of demographic information, the focus group protocol (see Appendix I) was initiated and audio-recorded with permission from the participants. Each focus group was audio-recorded and transcribed verbatim for data analysis. Duration of the focus groups ranged from 35 to 55 minutes, with an average time of 48.7 minutes (SD = 7.1 minutes). Upon completion, participants were thanked and given a $20 gift card for a local department store, as a token of appreciation for their participation.

University administrator recruitment and data collection. Prior to recruiting university administrators and staff for the key informant interviews, a review of the university administrative structure was conducted. Potential recruits were identified by their role as either direct service providers of physical or behavioral health services, or as associates with the athletics department. Other identified recruits included individuals potentially involved in shaping policy decisions related to nutrition and exercise (e.g., Dean of Student's Office, Residence Life, Student Affairs). A total of 38 administrators and staff were identified as potential key informants (see Participants section above).

Potential participants were contacted via email to their publically-provided university email addresses. If the recruiter (lead researcher) did not receive a reply within 48 hours, a phone contact was initiated to their publically-provided university telephone numbers, to maximize participant numbers and representativeness. The recruiter repeated the same email and phone contact if there was no response. If there was no response following five iterations of each communication, contact was discontinued. If an individual declined to participate, all contact was ceased. If an individual agreed to participate, an in-person interview time was scheduled.

During the scheduled interview, participants were informed of the purpose of the study and the voluntary and confidential nature of the study; then they were asked to complete an informed consent form (see Appendix H). The interviewer (lead researcher) reviewed all informed consent issues to give participants opportunity to ask questions or choose to decline participation. Following completion of informed consent, the key informant protocol was initiated and audio-recorded with permission from each participant (see Appendix J). Each interview was transcribed verbatim for data analysis. Interview duration ranged from 22 to 53 minutes, with an average time of 37.7 minutes (SD = 9.3 minutes). A total of 15 interviews were conducted.

Qualitative data analysis procedures. To complete the qualitative data analyses, all interviews were transcribed in an electronic Rich Text Format (RTF) and imported into NVivo 9®, a qualitative data analysis software package. Once all transcriptions were imported into NVivo, they were thematically coded by two independent coders. The focus group transcriptions were coded by the lead researcher and a doctoral-level researcher. The key informant transcripts were coded by the lead researcher and a doctoral student in clinical-community psychology. Each coding pair followed identical coding procedures. The coding process followed guidelines proposed by Strauss and Corbin (1998) for examining themes and domains in the data. Specifically, line-by-line, open coding thematic analysis was performed, as this process is considered more generative of thematic elements.

The qualitative data analysis was an iterative process that began with the identification of nodes that represented the thematic elements found in the data. An initial node list was developed by having each corresponding coder analyze multiple transcripts from each participant/group and subsequently comparing coding results. Discrepancies encountered in this initial coding process were discussed until a single codebook was developed. In coding the focus groups, the first two focus groups were examined to develop the codebook. In coding the key informant transcripts, the first five interviews were used to develop the codebook. The codebook was then used to double-code multiple transcripts (including the original transcripts used for node development)

by the two coders independently, line-by-line. For the focus groups, the first transcript and all even-numbered focus group transcripts were coded, thus having four of seven transcripts double-coded (57.1%). The odd-numbered transcripts were coded by the lead researcher. For the key informant interviews, the first five transcripts and all subsequent odd-numbered transcripts were double-coded, resulting in 10 of 15 transcripts double-coded (66.7%). The remaining even-numbered transcripts were coded independently, with the lead researcher coding three and the doctoral student coding two transcripts.

The researchers met regularly and merged their NVivo projects and checked for inter-coder reliability. If coding discrepancies arose during the regular meetings, each event was discussed to determine if a code was applied appropriately (subsequently coding it to both projects) or applied inappropriately (subsequently un-coding it from both projects). If the coders determined a new node was needed to capture a thematic element not found before, all previously coded transcripts were re-examined in an iterative process to ensure every transcript was examined with identical node structures. By utilizing this coding system, inter-coder reliability was .98 for the focus group coding and .97 for the key informant coding for the codebook development and subsequent revisions. Following the initial codebook development, inter-rater reliability ranged from .84 to .90 prior to meeting and discussing discrepant coding.

Upon completion of the initial coding, free nodes were organized based upon their conceptual underpinnings, thus developing hierarchical node structures. These hierarchical nodes encompassed the themes and domains expressed by study participants. Further analyses (e.g., axial and selective coding) were completed with the hierarchical nodes to examine similarities and differences across participant groups (Strauss & Corbin, 1998). Chapter Five presents the results from the qualitative study.

Phase III – Integration and Application of Findings

Findings from Phase I (quantitative data analysis) and Phase II (qualitative data analysis) were integrated into a comprehensive depiction of health-related behaviors and perceptions, in the context of environmental supports or barriers faced by first-year and continuing university students. Based on these findings, a series of recommendations

were developed and are offered to researchers, university service and care providers, and academic policymakers to address the health needs of new and continuing university students. These research-based recommendations can be used to promote health and wellness among the university's student body. Specific recommendations are documented in Chapter Six, and include strategies to tailor current intervention and prevention efforts to overcome barriers and to enhance supports for healthy living. The recommendations include directions to modify existing prevention and intervention programs currently found in the literature to better suit the needs of the university students and stakeholders. Additionally, recommendations include changes to physical structures or amenities offered at universities to better support the needs of students to live healthfully. In total, the three study phases developed a context for how future intervention and prevention efforts can be targeted at university students in their first-year and beyond.

Chapter 4: Quantitative Research Findings

Preliminary Data Analyses

Prior to conducting primary data analyses, descriptive statistics, independent sample *t*-tests, and Pearson correlation were used to examine the characteristics of the baseline sample. Descriptive statistics included frequency distributions, means, standard deviations and ranges for all variables of interest. Independent samples *t*-tests were used to determine if significant differences existed between men and women, and across BMI status (e.g., BMI < 25 versus BMI ≥ 25). Pearson correlation was used to determine the relationship between body fat percent and BMI.

Prior to exploring changes in the sample and factors contributing to weight gain across time, independent samples *t*-tests were conducted with the baseline values for all dependent variables (listed in Table 4) to determine if significant differences existed between participants who completed the follow-up study ($n = 79$) versus those who did not ($n = 114$), excluding demographic variables. Demographic variables were excluded due to limited sample size available in some of the racial and ethnic groups. A logistic regression was completed to determine if any variables significantly predicted who completed the follow-up. No significant differences were found among any of the variables, nor were there any significant predictor variables. The means and standard deviations for the two groups are presented in Table 8. As a reminder and as described in Chapter 3, the values presented throughout this chapter reflect the adjusted values for physical activity and total caloric intake (reduced by 65% and increased by 20%, respectively).

Table 8

Baseline Means and Standard Deviations for Follow-up Study Completers and Non-Completers

	Completers (n = 79)*		**Non-Completers (n = 114)**	
	Mean	*SD*	*Mean*	*SD*
Height	67.1	3.6	66.8	3.5
Weight	155	35.5	160	36.3
BMI	24.1	4.6	25.1	5.1
Body Fat %	25.2	10.2	28.1	10.2
Calories	2124.4	995.5	2058.3	1029.5
%Protein	17	3.2	17.3	3
%Fat	36.4	7.3	37.1	6.3
%Carbohydrates	48.9	8.1	48.6	7.6
% Desserts, Sweets	11.1	10.1	9.2	5.6
Physical Act. (METs Minutes/Week)	922.5	932.9	1200.3	1124.0
Nutrition SE	12.1	2.6	12.6	2.7
Physical Act. SE	11.7	2.4	12	2.6
Nutrition SOC	3.8	1.3	4	1.2
Physical Act. SOC	3.7	1.1	4	1

*Note: Five participants were removed from the follow-up due to reporting consuming <800 Kcal at follow-up

METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

Baseline sample characteristics. There were 198 participants who completed the baseline portion of this study. As displayed in Tables 9 and 10, the majority of the sample was within a normal BMI range (68.7%), with the remaining participants in the overweight (18.2%) and obese range (13.1%). Overall, participants had a mean BMI of 24.8 (SD = 4.9) and body fat percentage of 27.1% (SD = 10.2). A significant positive correlation (r = 0.71, p<.0001) was found between body fat percentage and BMI, thus indicating that BMI is an adequate analog to adiposity in the baseline sample.

Table 9

Frequencies of BMI Categories at Baseline

BMI Category	Participant Frequencies		
	Total (n = 198)	Male (n = 77)	Female (n = 121)
Normal (18.5 to <25)	136 (68.7%)	52 (67.5%)	84 (69.4%)
Overweight (≥25 to <30)	36 (18.2%)	15 (19.5%)	21 (17.4%)
Obese (≥30)	26 (13.1%)	10 (13.0%)	16 (13.2%)
Overweight/Obese (≥25)	62 (31.3%)	25 (32.5%)	37 (30.6%)

Table 10

Means, Standard Deviations, and Ranges for Baseline Variables by Gender

	Mean (SD)			Range		
	Total (n = 198)	*Male (n = 77)*	*Female (n = 121)*	*Total (n = 198)*	*Male (n = 77)*	*Female (n = 121)*
Height***	66.9 (3.6)	70.2 (2.1)	64.8 (2.7)	57-76	65-76	57-71
Weight***	158.1 (36.0)	174.2 (34.8)	147.9 (33.0)	102-285	126-285	102-274
BMI	24.8 (4.9)	24.9 (5.1)	24.7 (4.7)	18.5-44.6	18.6-44.6	18.5-41.6
Body Fat %***	27.1 (10.2)	19.1 (8.5)	32.2 (7.6)	8-54	8-47	17-54
Calories***	2092.2 (996.4)	2718.4 (1170.5)	1693.8 (592.1)	822-6453	984-6453	822-3757
% Protein	16.8 (3.1)	17.3 (2.9)	17.1 (3.2)	9.9-27.8	11.2-24.4	9.9-27.8
% Fat	37.1 (6.6)	38.3 (5.9)	36.2 (7.0)	18.1-57.3	24.5-52.6	18.1-57.3
% Carbohydrates***	45.5 (7.7)	46.9 (7.3)	49.6 (7.8)	25.9-68.3	28.4-63.6	25.9-68.3
% Desserts, Sweets	8.3 (7.5)	11.5 (6.9)	9.0 (7.7)	0-42.5	0-30.1	0.2-42.5
Physical Act. (METs Minutes/Week)***	1085.1 (1047.6)	1389.7 (1349.1)	891.3 (742.8)	0-6747	23-6747	0-3975
Nutrition SE	12.4 (2.7)	12.3 (2.8)	12.5 (2.6)	5-15	5-15	5-15
Physical Act. SE	11.8 (2.5)	12.0 (2.6)	11.7 (2.5)	5-15	5-15	5-15
Nutrition SOC	3.9 (1.2)	3.8 (1.4)	3.9 (1.1)	1-5	1-5	1-5
Physical Act. SOC	3.9 (1.1)	3.9 (1.1)	3.8 (1.1)	1-5	1-5	1-5

*p<.05. **p<.01. ***p<.001

METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

Participants' average reported caloric consumption was 2092 calories (SD = 996.4), with the majority of calories coming from carbohydrates (M = 45.5%, SD = 7.7%), followed by fats (M = 37.1%, SD = 6.6%) and proteins (M = 16.8%, SD = 3.1%). Participants also reported consuming 8.3% (SD = 7.5%) of their calories from sweets and desserts. In regard to physical activity, participants reported 1085.1 (SD = 1047.6) metabolic equivalent of task (METs) minutes/week of activity, which is nearly the

equivalent of walking 60 minutes daily, 50 minutes of moderate activity a day, or 25 minutes of vigorous activity (e.g., running, basketball) a day. Participants reported a high level of self-efficacy in both healthy nutrition ($M = 12.4$, $SD = 2.7$) and maintaining an active lifestyle ($M = 11.8$, $SD = 2.5$). Additionally, on the 5-point stage-of-change measures, participants reported high motivation for eating healthfully ($M = 3.9$, $SD = 1.2$) and exercising ($M = 3.9$, $SD = 1.1$).

As an overall sample, the majority of participants was within the normal BMI range, reported consuming and performing recommended amounts of total calories and regular exercise, respectively, and endorsed a high level of self-efficacy and motivation for healthy living. Despite the overall sample characteristics, differences existed between men and women, as well as between those within different BMI categories (e.g., BMI $<$ 25 versus BMI $\geq$ 25). Similar to the overall sample, the majority of men and women were in the normal BMI range, 68.7% and 67.5% respectively. As shown in Table 10, there was very little discrepancy between genders in the distribution of participants with BMIs in the overweight and obese range. Although overall BMI distribution at baseline was not significantly different, men and women had significantly different values for a multitude of variables; however, many of the differences are biologically consistent. As biologically expected, men were taller [$t(196) = -14.92$, $p<.001$], heavier [$t(196) = -5.36$, $p<.001$] , consumed more calories [$t(196) = -8.14$, $p<.001$], and had less body fat percentage than women [$t(196) = 11.31$, $p<.001$]. Beyond biologically consistent differences, men reported a significantly smaller proportion of calories from carbohydrates ($M = 46.9\%$, $SD = 7.3\%$) than women ($M = 49.6\%$, $SD = 7.8\%$), $t(196) = -3.35$, $p<.001$. Men also reported significantly more physical activity ($M = 1389.7$ METs, $SD = 1349.1$) than women ($M = 891.3$ METs, $SD = 742.8$), $t(196) = -3.35$, $p<.001$. There were no other significant differences across the remaining variables. Table 10 shows means, standard deviations, and range for all other variables examined.

In examining differences between participants who were in the healthy BMI range (BMI $<$ 25) versus those who were overweight or obese (BMI $\geq$ 25), a few significant differences existed consistent with the BMI grouping. Namely, participants with a BMI

< 25 weighed less [$t(196) = -14.09$, $p<.001$], and lower body fat percentage [$t(196) = -10.16$, $p<.001$] compared to those with a BMI ≥ 25. Participants with a BMI ≥ 25 also had a significantly lower mean on the nutrition stage of change item ($M = 3.5$, $SD = 1.2$) than those in the normal BMI range ($M = 4.0$, $SD = 1.2$), $t(196) = 2.82$, $p<.001$. Despite differences in weight, BMI, body fat percentage, and nutrition stage of change, the two groups did not report significant differences in total caloric intake, distribution of calories, physical activity, or self-efficacy in healthy nutrition and physical activity. Table 11 shows means and standard deviations differentiated by BMI status.

Table 11

Means and Standard Deviations for Baseline Variables by BMI Status

	Mean (SD)		
	Total (n = 198)	BMI<25 (n = 136)	BMI ≥25 (n = 62)
Height	66.9 (3.6)	66.7 (3.8)	67.2 (3.3)
Weight***	158.1 (36.0)	140.9 (18.4)	195.9 (36.5)
BMI***	24.8 (4.9)	22.2 (1.7)	30.4 (4.8)
Body Fat %***	27.1 (10.2)	23.1 (7.7)	35.9 (9.3)
Calories	2092.2 (996.4)	2068.4 (1039.3)	2144.6 (901.0)
%Protein	16.8 (3.1)	17.1 (3.0)	17.3 (3.4)
%Fat	37.1 (6.6)	37.3 (6.5)	36.2 (6.8)
%Carbohydrates	45.5 (7.7)	48.3 (7.6)	49.1 (8.0)
% Desserts, Sweets	8.3 (7.5)	9.8 (7.3)	10.5 (7.8)
Physical Act. (METs Minutes/Week)	1085.1 (1047.6)	1071.5 (1086.9)	1115.0 (963.7)
Nutrition SE	12.4 (2.7)	12.1 (2.8)	12.9 (2.2)
Physical Act. SE	11.8 (2.5)	11.6 (2.5)	12.2 (2.4)
Nutrition SOC**	3.9 (1.2)	4.0 (1.2)	3.5 (1.2)
Physical Act. SOC	3.9 (1.1)	3.9 (1.1)	3.8 (1.0)

*$p<.05$. **$p<.01$. ***$p<.001$

METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

Primary Analyses

To explore changes in the sample and factors contributing to weight gain over time, a variety of calculations and statistical tests were used. First, participants' weight change status and change in body fat percentage were calculated by taking the difference between the follow-up and baseline measures (i.e., Time 2 value – Time 1 value). After determining students' change in weight and body composition, descriptive statistics and a Pearson correlation were used to examine the overall characteristics of the follow-up sample and to determine if BMI and body fat percentage had a positive relationship.

Paired-samples *t*-tests were then conducted to examine changes from baseline to follow-up. Additionally, two chi-square analyses were conducted to determine if differences existed among the dichotomous variables between those who gained weight versus those who maintained or lost weight, and between those who had an increase in body fat percent, versus those who maintained their body fat percentage, or had reduction in body fat (see Chapter 3 for data preparation of dichotomous values). After examining overall sample differences, a series of mixed-model ANOVAs with time as the within-subjects factor was calculated for differences between men and women, those with differing BMI statuses (BMI < 25 versus BMI ≥ 25), and weight gain status (weight gain versus weight neutral/loss) for the dependent variables noted in Table 4 (see Chapter 3). Final analyses were two multiple logistic regressions to determine if there were any predictors for weight gain, or increase in body fat percentage. The predictor variables are noted in Table 4 (see Chapter 3).

Follow-up sample characteristics. As reported previously, 79 participants (55.6% women) completed the two-year follow-up study. As demonstrated in Table 12, the follow-up sample had a similar BMI distribution as the baseline sample, with 69.6% of the sample in the normal BMI range and 30.4% either overweight (20.3%) or obese (10.1%). Participants overall had a mean BMI of 24.2 ($SD = 4.5$) and body fat percentage of 25.6% ($SD = 10.0\%$). Similar to the baseline sample, there was a significant positive correlation between the students' BMI and body fat percentage at follow-up, $r = 0.67$, $p<.0001$.

Participants' average reported caloric consumption was 1832 calories ($SD =$ 723.3), with the majority of calories coming from carbohydrates ($M = 47.9\%$, $SD =$ 8.3%), followed by fats ($M = 37.6\%$, $SD = 6.7\%$) and proteins ($M = 17.9\%$, $SD = 3.3\%$). Participants reported consuming 8.6% of their calories from sweets and desserts ($SD =$ 7.5). In regard to physical activity, participants reported 1300 METs minutes/week of activity ($SD = 1299.1$), nearly the equivalence of walking 80 minutes most days of the week (i.e., five or more days), or 65 minutes of moderate activity most days, or 33 minutes of vigorous activity (e.g., running, basketball) most days. Participants reported a

high level of self-efficacy in both healthy nutrition (M = 12.4, SD = 2.7) and maintaining an active lifestyle (M = 11.2, SD = 2.8). Additionally, on the 5-point stage-of-change measures, participants reported high motivation for eating healthfully (M = 4.0, SD = 1.3) and exercising (M = 4.0, SD = 1.1). Overall, the majority of participants who completed the follow-up study was within the normal BMI range, reported consuming a recommended amount of total calories and regular exercise, and endorsed a high level of self-efficacy and motivation for healthy living.

Table 12

Frequencies of BMI Categories at Two-Year Follow-up Sample

BMI Category	Participant Frequencies		
	Total (n = 79)	Male (n = 35)	Female (n = 44)
Normal (18.5 to <25)	55 (69.6%)	23 (65.7%)	32 (72.7%)
Overweight (≥25 to <30)	16 (20.3%)	9 (25.7%)	7 (15.9%)
Obese (≥30)	8 (10.1%)	3 (8.6%)	5 (11.4%)
Overweight/Obese (≥25)	24 (30.3%)	12 (34.3%)	12 (27.3%)

Overall changes in sample from baseline to follow-up. The overall results were similar to the baseline sample; however, significant differences between the baseline and follow-up samples occurred across time. To determine what changes occurred among the participants, paired-samples t-tests were completed with each continuous variable. As displayed in Table 13, participants at follow-up reported consuming significantly fewer calories. Students reported reducing their average caloric intake from 2124 calories at baseline to 1821 calories at the follow-up (M = -292.6, SD = 725.7), $t(78) = -3.58$, $p<.0001$, $d = .34$, a small to moderate effect. Although their overall caloric intake decreased, students reported a .8% increase in their average proportion of calories from proteins (SD = 3.6%), $t(78) = 2.07$, $p<.05$, $d = .28$, a small to moderate effect. Students also reported a decrease of 2.5% (SD = 8.0%) in calories consumed from sweets desserts, $t(78) = -2.79$, $p<.01$, $d = .28$, a small to moderate effect. Beyond changes in dietary patterns, students reported an increase in physical activity from baseline to follow-up with an average increase of 377.7 METs/week (SD = 1133.2), $t(78) = 2.96$, $p<.01$, $d = .34$, a small to moderate effect. The change of physical activity is

nearly equivalent to engaging in 15 minutes of moderate physical activity for five or more days per week.

Overall, when compared to their baseline measures, the students who participated in the follow-up study were slightly taller, consumed fewer overall calories, increased their protein intake, decreased their consumption of sweets and desserts, and were more physically active. Although students reported healthier trends in their behavior at the follow-up study, their average weight, BMI, and body fat percentage did not significantly differ. Additionally, they reported similar proportions of fat and carbohydrate consumption as at baseline. Students continued to report high self-efficacy ratings regarding nutrition and physical activity, and high motivation to engage in healthy eating and physical activity.

Table 13

Means and Standard Deviation from Baseline to Follow-up – Overall Sample (n = 79)

	Baseline	**Follow-Up**	**Difference†**
Height**	67.1 (3.6)	67.2 (3.6)	0.1 (0.4)
Weight	155 (35.5)	156.5 (37.1)	1.5 (11.1)
BMI	24.1 (4.6)	24.2 (4.5)	0.1 (1.7)
Body Fat %	25.2 (10.2)	25.6 (10)	0.4 (4.5)
Calories***	2124.4 (995.5)	1831.7 (723.2)	-292.6 (725.7)
%Protein*	17.1 (3.2)	17.9 (3.3)	0.8 (3.6)
%Fat	36.4 (7.3)	37.6 (6.7)	1.2 (7.2)
%Carbohydrates	48.9 (8.1)	47.9 (8.3)	-1 (8.8)
% Desserts, Sweets**	11.1 (10.1)	8.6 (7.5)	-2.5 (8)
Physical Act. (METs Minutes/Week)**	922.5 (932.9)	1300.3 (1299.1)	377.7 (1133.2)
Nutrition SE	12.1 (2.6)	12.4 (2.7)	0.3 (3.2)
Physical Act. SE	11.7 (2.4)	11.2 (2.8)	-0.5 (2.6)
Nutrition SOC	3.8 (1.3)	4.0 (1.3)	0.2 (1.5)
Physical Act. SOC	3.7 (1.1)	4.0 (1.1)	0.3 (1.2)

Note: Difference calculated by follow-up value – baseline value
†Significance determined by paired-samples *t*-test
*$p<.05$, **$p<.01$, ***$p<.001$
METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

Change in weight and BMI. To determine the characteristics of the sample that contributed to the changes, additional calculations and analyses were completed. The difference between the participants' starting weight and ending weight was calculated to determine which participants gained weight versus lost weight or remained weight

neutral. Participants were subsequently categorized based on their weight change status. Participants' change in body fat percentage was also calculated to determine which participants had an increase in adiposity versus lost fat or did not change. Table 14 provides the distribution of weight change.

Overall change in weight was a 1.5 pound increase (SD = 1.1), a non-significant change. The range of weight change was from a loss of 26 pounds to a gain of 35 pounds, a difference of 61 pounds. Participants who lost weight, or remained weight neutral, accounted for 48.1% of the sample, and lost an average of 6.8 pounds (SD = 7.0). Participants who gained weight accounted for 51.9% of the sample and had an average increase of 9.1 pounds (SD = 8.4). Of the participants who gained weight, 63.4% of the group gained more than five pounds, and nearly a third of the group (31.7%) gained more than 10 pounds. Conversely, of those who lost weight, or were weight neutral, 50% lost five or more pounds, with 28.9% losing more than ten pounds. There was a significant positive correlation (r = 0.69, p<.0001) between change in weight and change in body fat percentage, indicating that weight change corresponded to change in adiposity. The cross tabulation and distribution of change in body fat is presented in Table 14.

Table 14

Distribution of Weight Difference from Baseline to Follow-Up

	Weight Neutral/Loss (n = 38)	**Weight Gain (n = 41)**
Mean (SD)	-6.8 (7.0)	9.1 (8.4)
Range	-26 – 0	1 – 35
Lost/Gain <5 lbs	50.0% (n = 19)	36.6% (n = 15)
Lost/Gain ≥5 lbs and ≤10 lbs	21.1% (n = 8)	31.7% (n = 13)
Lost/Gain >10 lbs	28.9 % (n = 11)	31.7% (n = 13)
Increase body fat %	15.8% (n = 6)	73.2% (n = 30)
Mean (SD)	1.5% (.8)	4.2% (2.8)
Range	1% – 3%	1% – 11%
Decrease body fat %	84.2 % (n = 32)	26.8% (n = 11)
Mean (SD)	-2.3% (2.6)	-2.3% (5.9)
Range	-9% – 0%	-20% – 0%

After determining participants' weight change status, the groups were cross tabulated with participants' change in BMI status (i.e., normal BMI range to overweight/obese range). Examining change in BMI status over the course of two years,

71 of 79 students' BMI status remained the same (89.8%). Eight students' BMI status changed from baseline to follow-up. Three students went from having an overweight/obese BMI status to a healthy BMI status. The average weight loss of those students was 11 pounds (SD = 4.4). Five students' BMI status change from a healthy status to being overweight/obese. Their average weight gain was 12.2 pounds (SD = 6.9). Table 15 provides the frequencies for the change in BMI status and the corresponding means and ranges for the change in weight.

Table 15

Weight Change by BMI Status from Baseline to Follow-up

BMI Status Baseline to Follow-Up	**N (%)**	**Mean Weight Change (SD)**	**Range**
Normal → Normal	52 (65.8%)	1.4 (8.9)	-16 - 35
Overweight/Obese → Overweight/Obese	19 (24.1%)	.7 (15.4)	-26 - 31
Normal → Overweight/Obese	5 (6.3%)	12.2 (6.9)	2 - 20
Overweight/Obese → Normal	3 (3.8%)	-11.0 (4.4)	-6 - -14
Total	79 (100%)	1.5 (11.1)	-26 - 35

Following cross-tabulation, a series of chi-square analyses were completed with the dichotomous categorical independent variables (i.e., gender, BMI status, stage-of-change measures, physical activity recommendations) and weight change status and change in body fat as dependent variables. Baseline (not follow-up) values were used for the independent variables in the analyses. As demonstrated in Table 15, of the dichotomous variables evaluated, gender was the only variable that yielded a significant difference, $X^2(1, N = 79) = 4.80, p < .05, \varphi = .24$, a small to moderate effect. Specifically, women were more likely to lose weight and men were more likely to gain weight at follow-up. No significant difference emerged between students who at baseline had differing BMI status, or differing stage of change in nutrition or exercise, or if they met physical activity recommendations. Additionally, there were no significant differences in change in body fat by any of the dichotomous variables. Tables 16 and 17 provide an overview of the frequency for each independent variable cross tabulated by weight change status and change in body fat percentage, respectively.

Table 16

Chi-square Analyses by Weight Change Status

	Weight Neutral/Loss (*n* = 38)		**Weight Gain (*n* = 41)**		**Sig. Level***
	N	%	*N*	%	
Gender					
Female (*n* = 44)	26	68.4%	18	43.9%	.03
Male (*n* = 35)	12	31.6%	23	56.1%	
BMI Status					
BMI<25 (*n* = 57)	26	68.4%	31	75.6%	.48
BMI ≥ 25 (*n* = 22)	12	31.6%	10	24.4%	
Nutrition Stage of Change					
No Action (*n* = 27)	15	39.5%	12	29.3%	.34
Action (*n* = 52)	23	60.5%	29	70.7%	
Physical Activity Stage of Change					
No Action (*n* = 28)	12	31.6%	16	39.0%	.49
Action (*n* = 51)	26	68.4%	25	61.0%	
Physical Activity Recommendations					
Did Not Meet Recommendations (*n* = 35)	16	42.1%	19	46.3%	.70
Met Recommendations (*n* = 44)	22	57.9%	22	53.7%	

*Significance determined by chi-square analyses

Table 17

Chi-square Analyses by Change in Body Fat Percentage

	Body Fat % Neutral/Loss (*n* = 43)		**Body Fat % Gain (*n* = 36)**		**Sig. Level***
	N	%	*N*	%	
Gender					
Female (*n* = 44)	26	60.5%	18	50.0%	.35
Male (*n* = 35)	17	39.5%	18	50.0%	
BMI Status					
BMI<25 (*n* = 57)	30	69.8%	27	75.0%	.61
BMI ≥ 25 (*n* = 22)	13	30.2%	9	25.0%	
Physical Activity Recommendations					
Did Not Meet Recommendations (*n* = 35)	20	46.5%	15	41.7%	.66
Met Recommendations (*n* = 44)	23	53.5%	21	58.3%	
Nutrition Stage of Change					
No Action (*n* = 27)	15	34.9%	12	33.3%	.89
Action (*n* = 52)	28	65.1%	24	66.7%	
Physical Activity Stage of Change					
No Action (*n* = 28)	15	34.9%	13	36.1%	.91
Action (*n* = 51)	28	65.1%	23	63.9%	

*Significance determined by chi-square analyses

2 X 2 mixed factorial ANOVAs with within-subject factors. To determine if significant differences existed between various groups across time, a series of 2 (Gender) X 2 (Time) mixed-model factorial ANOVAs were calculated with three difference groups. The three groups examined were men versus women; participants in the overweight/obese BMI range versus those in a healthy BMI at baseline; and students with a differing weight change status (weight gain versus weigh neutral/loss). A Bonferroni correction was applied to the three separate analyses to control for type I error. The correction entails dividing the alpha value ($p<.05$) by the number of tests (e.g., three tests). In this case, the significant alpha value was calculated to be .016 (.05/3 = .016). Following the analyses, post-hoc tests were conducted to determine the nature of differences.

Gender. To determine if significant differences were present between men and women, and if those differences changed across time, a 2 (Gender) x 2 (Time) mixed factorial ANOVA was conducted (see above). There were multiple significant between-group and within-group effects, but no significant interaction effects. Table 18 presents means, standard deviations, and changes from baseline to follow-up for men and women.

As demonstrated in Table 18, a number of significantly different, biologically consistent between group effects were present between men and women at baseline and follow-up. Men were taller [$F(1,77) = 100.05, p<.0001, \eta^2 = .57$], heavier [$F(1,77) = 9.70, p<.01, \eta^2 = .12$], and reported greater caloric consumption [$F(1,77) = 26.18, p<.001, \eta^2 = .25$] compared to women. Men reported consuming an average of 886 more calories at baseline and 707 more at follow-up. As biologically expected, women had a higher percentage of body fat (14% more at baseline and 12% more at follow-up) compared to men, $F(1,77) = 58.80, p<.001, \eta^2 = .43$. Effect sizes for the biologically expected differences are considered moderate ($\eta^2 > .058$) to large effects ($\eta^2 > .13$; Cohen, 1988).

Table 18

Means and Standard Deviations from Baseline to Follow-up by Gender

	Men (n = 35)			Women (n = 44)		
	Baseline	**Follow-up**	**Within Group Difference**	**Baseline**	**Follow-up**	**Within Group Difference**
Height	70.1 (2.2)*	70.2 (2.3)*	0.1 (0.4)	64.7 (2.5)*	64.8 (2.5)*	0.1 (0.3)
Weight	166.9 (32.2)*	171.3 (30.2)*	4.4 (11.4)	145.5 (35.6)*	144.7 (38.2)*	-0.8 (10.4)
BMI	23.8 (4.2)	24.4 (3.7)	0.5 (1.7)	24.3 (4.9)	24.1 (5.1)	-0.3 (1.7)
Body Fat %	17.4 (7.3)*	19 (6.6)*	1.5 (3.6)	31.4 (7.6)*	31.0 (9.1)*	-0.5 (4.9)
Calories	2617.8* (1148.5)	2225.8* (763.6)	-392.0** (894.7)	1731.8* (631.5)	1518.3* (510.7)	-213.6** (554.8)
%Protein	17.0 (3)	17.8 (3.2)	0.8 (3)	17.0 (3.4)	17.9 (3.3)	0.9 (4.0)
%Fat	37.4 (6.8)	38.3 (5.3)	0.9 (6.9)	35.7 (7.6)	37.1 (7.7)	1.5 (7.6)
%Carbohydrates	47.8 (7.8)	47.1 (6.7)	-0.7 (8)	49.8 (8.3)	48.5 (9.4)	-1.2 (9.4)
% Desserts, Sweets	13.5 (10.5)	10.6 (8.8)	-2.9 (8.3)**	9.2 (9.3)	7.0 (5.9)	-2.2 (7.8)**
Physical Act. (METs Minutes/Week)	1088.5* (1137.9)	1748.7* (1619.4)	660.1** (1384.6)	790.5* (717.2)	943.6* (833.0)	153.1** (834.8)
Nutrition SE	12.1 (2.1)	12.3 (2.8)	0.2 (3.4)	12.0 (2.9)	12.5 (2.6)	0.5 (3.1)
Physical Act. SE	11.8 (2.2)	11.4 (2.8)	-0.5 (2.7)	11.5 (2.5)	11.0 (2.9)	-0.5 (2.5)
Nutrition SOC	3.6 (1.5)	3.8 (1.4)	0.2 (1.8)	4.0 (1)	4.2 (1.2)	0.2 (1.2)
Physical Act. SOC	3.7 (1.2)	4.1 (1.2)	0.4 (1.4)	3.8 (1)	3.9 (1)	0.1 (1)

Note: Standard deviations in parentheses. Bonferroni correction used, therefore significant alpha = (.05/3 = p<.01). There were no significant interaction effects.
*between-group main effect
**within-group main effect
METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

In addition to the biologically consistent differences, men reported more physical activity compared to women (298 METs more at baseline and 806 METs more at follow-up), $F(1,77) = 6.64$ $p<.01$, $\eta^2 = .08$, a moderate effect. There were no significant differences between men and women in BMI, proportion of macronutrient consumption (e.g., fats, proteins, carbohydrates), consumption of sweets or desserts, nutrition self-efficacy, physical activity self-efficacy, physical activity stage of change, and nutrition stage of change. Further, there was not a significant interaction effect.

In addition to between-group differences, both men and women experienced changes across time. As noted in Table 18, from baseline to the two-year follow-up both

groups reported a reduction in calorie consumption, $F(1,77) = 13.61$, $p<.001$, $\eta^2 = .15$. Men reported consuming 392 fewer calories (SD = 894.7); women reported consuming 213.6 fewer calories (SD = 554.8) across time. Both groups reported a decrease in the consumption of sweets or desserts, $F(1,77) = 7.82$, $p<.01$, $\eta^2 = .09$. Men reported reducing their intake of sweets or desserts by 2.9% (SD = 8.3); women reduced their intake by 2.2% (SD = 7.8). In addition to reducing their caloric intake, both groups reported an increase in physical activity, $F(1,77) = 10.43$, $p<.01$, $\eta^2 = .11$. Men reported an increase of 660 METs (SD = 1384.6); women reported an increase of 153.1 METs (SD = 834.8). Effect sizes for the differences are considered moderate ($\eta^2 > .058$) to large ($\eta^2 > .13$; Cohen, 1988). Gender differences in physical activity approached significance for an interaction effect, $F(1,77) = 4.06$, $p = .0475$, but did not meet the Bonferroni correction criterion of $p<.016$. No significant differences across time emerged in weight, body fat percentage, BMI, proportion of macronutrient consumption (e.g., fats, proteins, carbohydrates), or the self-efficacy and stage-of-change variables.

BMI status. To determine if significant differences were present for the dependent variables listed in Table 4 (see Chapter 3) and displayed in Table 19 between those who were in the healthy BMI range (BMI<25) versus those in the overweight and obese range (BMI $\geq$ 25) at baseline and if differences existed across time, a 2 (BMI Status) x 2 (Time) mixed factorial ANOVA was conducted. Results revealed multiple significant between-group and within-group effects, but no significant interaction effects. Table 19 presents the means, standard deviations, and changes over time between those with a baseline BMI of either BMI<25 or BMI $\geq$ 25.

Table 19

Means and Standard Deviations from Baseline to Follow-up by Baseline BMI Status

	BMI<25 (n = 57)			BMI≥25 (n = 22)		
	Baseline	**Follow-up**	**Within Grp. Difference**	**Baseline**	**Follow-up**	**Within Grp. Difference**
Height	66.9 (3.7)	67.0 (3.7)	0.1 (0.3)	67.5 (3.4)	67.7 (3.5)	0.2 (0.5)
Weight	139.1 (18.6)*	141.5 (21.8)*	2.4 (9.2)	196.1 (36.2)*	195.3 (40.7)*	-0.9 (14.9)
BMI	21.8 (1.7)*	22.1 (1.9)*	0.3 (1.4)	30.1 (4.2)*	29.7 (4.7)*	-0.4 (2.3)
Body Fat %	21.5 (7.9)*	21.9 (7.5)*	0.5 (4.3)	35.0 (9)*	35.3 (9.5)*	0.3 (5)
Calories	2102.3 (1045.4)	1794.4 (715.5)	-307.9** (741.0)	2181.6 (873.0)	1928.5 (751.0)	-253.1** (699.7)
%Protein	17 (3.1)	17.8 (3.2)	0.9 (3.4)	17.2 (3.6)	17.9 (3.6)	0.7 (4.1)
%Fat	36.7 (6.9)	37.2 (6.8)	0.6 (7.1)	35.7 (8.3)	38.6 (6.5)	2.9 (7.4)
%Carbohydrates	48.6 (7.6)	48.4 (8.3)	-0.2 (8.4)	49.6 (9.5)	46.7 (8.5)	-2.9 (9.6)
% Desserts, Sweets	11 (9.9)	8.4 (6.1)	-2.6 (7.1)	11.5 (10.7)	9.2 (10.5)	-2.3 (10.1)
Physical Act. (METs Minutes/Week)	862.5 (964.3)	1240.5 (1142.3)	378.0** (945.4)	1078.0 (847.0)	1455.0 (1659.4)	376.9** (1544.7)
Nutrition SE	11.9 (2.7)	12.3 (2.8)	0.5 (3.5)	12.5 (2.1)	12.5 (2.3)	0.0 (2.4)
Physical Act. SE	11.8 (2.3)	11.1 (2.6)	-0.8 (2.5)	11.2 (2.6)	11.5 (3.3)	0.2 (2.7)
Nutrition SOC	3.9 (1.3)	4.0 (1.3)	0.1 (1.6)	3.5 (1.3)	4.0 (1.2)	0.4 (1.3)
Physical Act. SOC	3.8 (1.1)	4.0 (1.1)	0.3 (1.3)	3.7 (0.9)	3.9 (1.1)	0.2 (1)

Note: Standard deviations in parentheses, Bonferroni correction used, therefore significant alpha = (.05/3 = p<.01). There were no significant interaction effects.
*between-group main effect
**within-group main effect
METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

There were between-group differences that were expected based upon the categorization by BMI. Participants with a BMI ≥ 25 weighed more [$F(1,77) = 72.44$, $p<.001$, $\eta^2 = .48$] and had a higher body fat percentage [$F(1,77) = 46.68$, $p<.001$, $\eta^2 = .37$] than those with a BMI < 25. Effect sizes for the differences are considered large ($\eta^2 > .13$; Cohen, 1988). Compared to those with a BMI < 25, participants with a BMI ≥ 25 were 57 and 53.8 pounds heavier at baseline and follow-up, respectively. Participants with a BMI ≥ 25 had an average BMI of 30.1 ($SD = 4.2$) at baseline and 29.7 ($SD = 4.7$) at follow-up, versus those with a BMI<25 who had an average BMI of 21.8 ($SD = 1.7$) at baseline and an average of 22.1($SD = 1.9$) at follow-up. Compared to participants with a

BMI < 25, participants with a BMI ≥ 25 also had 13.5% and 13.4% more body fat at baseline and follow-up, respectively. Notably, participants were not significantly different on any of the other variables, beyond those based on the nature of categorization alone. Therefore, participants in each group reported similar amounts of exercise, calorie consumption, macronutrient proportion, consumption of sweets or desserts, and self-efficacy and stage of change for health-related behaviors.

There were significant differences within each group across time. Participants reported a decrease in caloric intake across time within each group, $F(1,77) = 9.38$, $p<.01$, $\eta^2 = .11$. Participants with a BMI < 25 reported consuming an average of 307.9 ($SD = 741.0$) fewer calories from baseline to follow-up and participants with a BMI ≥ 25 reported consuming an average of 253.1 ($SD = 699.7$) fewer calories across time. Within each group, participants reported an increase in physical activity from baseline to follow-up, $F(1,77) = 6.96$, $p<.01$, $\eta^2 = .08$. Participants with a BMI < 25 reported an increase in physical activity by 378.0 METs ($SD = 945.4$); participants with a BMI ≥ 25 reported an increase of 376.9 METs ($SD = 1544.7$). Although participants reported significant changes in physical activity and caloric intake across time, those differences were not translated into reductions in weight, BMI, or body fat percentage. Additionally, participants continued to reported similar proportions of macronutrient consumption, self-efficacy and stage of change for health related behaviors. Effect sizes for the differences are considered moderate ($\eta^2 > .058$) to large effects ($\eta^2 > .13$; Cohen, 1988). Notably, participants reported a reduction in their caloric intake from sweets and desserts across time (BMI < 25 = -2.6% and BMI ≥ 25 = -2.3%), $F(1,77) = 5.81$, $p = .018$, but the reduction did not meet the Bonferroni correction criterion of $p<.016$.

In summary, participants with a baseline BMI < 25 and BMI ≥ 25 did not differ from each other beyond their anthropomorphic measurements that determined their categorization. That is, participants did not differ in regard to nutrition, exercise, or self-efficacy and stage of change for health-related behaviors. Participants did report changes in behavior across time, particularly in reducing total caloric consumption, reducing consumption of sweets and desserts, and increasing physical activity; however, those

changes did not result in anthropomorphic changes. Additionally, the two groups did not report changes in their proportions of macronutrient consumption, self-efficacy and stage of change for health related behaviors.

Weight change status. To determine if significant differences were present for the dependent variables listed in Table 4 (see Chapter 3) and displayed in Table 20 between those who gained weight versus those who remained weight neutral or lost weight, a 2 (Weight Change) x 2 (Time) mixed factorial ANOVA. There were multiple significant between-groups effects, within-group effects, and interaction effects. Table 20 presents means, standard deviations, and changes across time for those who gained weight versus those who lost weight or were weight neutral.

There was a significant between-group effect in consumption of calories for sweets or desserts. Those who gained weight reported consuming more calories from sweets and desserts at baseline (M = 13.9%, SD = 11.9%) and follow-up (M = 10.0%, SD = 7.6%) than those who maintained or lost weight (baseline M = 8.1%, SD = 6.5%; follow-up M = 7.1%, SD = 7.2%), $F(1,77) = 6.36$ $p<.01$, $\eta^2 = .08$, a moderate effect. No other significant between-group effects emerged.

Similar to prior results, overall, participants in both groups reported a significant increase in physical activity across time, $F(1,77) = 8.80$, $p<.01$, $\eta^2 = .10$. Participants who maintained or lost weight reported an average increase of 447.5 METs (SD = 1159.0) over time, whereas those who gained weight reported an average increase of 313.1 METs (SD = 1119.2). Additionally, overall, participants within each group also reported a reduction in total calories from baseline to follow-up, $F(1,77) = 12.57$, $p<.001$, $\eta^2 = .14$. Participants who lost weight or were weight neutral reported an average caloric decrease of 195.7 calories (SD = 667.3); those who gained weight reported an average of 382.5 (SD = 773.2) fewer calories consumed. In addition to the reported reduction in overall calories, participants reported a decrease in calories from sweets and desserts $F(1,77) = 7.56$, $p<.01$, $\eta^2 = .09$. Participants who lost weight, or were weight neutral reported a reduction of 1.1% (SD = 5.5%) of calories from sweets and desserts, whereas those who gained weight reported a reduction of 3.8% (SD = 9.7%). Identified effect

sizes for the differences are considered moderate ($\eta^2 > .058$) to large effects ($\eta^2 > .13$; Cohen, 1988). Despite significant between-group and within-group differences in percent of sweets and dessert calories consumed, there was no interaction effect. Additionally, there were no changes across time in percent of protein calories consumed, percent of carbohydrates consumed, or the self-efficacy and stage-of-change variables.

Table 20

Means and Standard Deviations from Baseline to Follow-up by Weight Change Status

	Weight Neutral/Loss (n = 38)			Weight Gain (n = 41)		
	Baseline	**Follow-up**	**Within Grp. Difference**	**Baseline**	**Follow-up**	**Within Grp. Difference**
Height	66.2 (3.8)	66.3 (3.8)	0.1 (0.3)	67.9 (3.2)	68.0 (3.2)	0.1 (0.4)
Weight	153.3 (37.1)	146.6 (34.9)	-6.8 (7.0)†	156.5 (34.4)	165.6 (37.1)	9.1 (8.4)†
BMI	24.5 (4.8)	23.3 (4.3)	-1.2 (1.2)†	23.8 (4.3)	25.0 (4.7)	1.3 (1.3)†
Body Fat %	27.8 (10.2)	26.0 (9.7)	-1.7 (2.8)†	22.9 (9.7)	25.3 (10.4)	2.4 (4.8)†
Calories	1945.4 (709.7)	1749.7 (648.3)	-195.7** (667.3)	2290.3 (1186.6)	1907.8 (786.7)	-382.5** (773.2)
%Protein	17.4 (3.6)	17.6 (3.7)	0.2 (4.0)	16.6 (2.8)	18.1 (2.8)	1.5 (3.1)
%Fat	36 (6.7)	39.7 (7.2)	3.7 (7.2)†	36.8 (7.9)	35.7 (5.8)	-1.0 (6.5)†
%Carbohydrates	48.8 (8.0)	45.8 (9.3)	-2.9 (8.8)	49 (8.4)	49.8 (6.8)	0.8 (8.4)
% Desserts, Sweets	8.1 (6.5)*	7.1 (7.2)*	-1.1 (5.5)**	13.9 (11.9)*	10.0 (7.6)*	-3.8 (9.7)**
Physical Act. (METs Minutes/Week)	810.3 (641.7)	1257.9 (1239.5)	447.5** (1159.0)	1026.5 (1137.1)	1339.5 (1366.1)	313.1** (1119.2)
Nutrition SE	12.7 (2.4)	12.5 (2.3)	-0.2 (2.6)	11.5 (2.6)	12.3 (3)	0.8 (3.7)
Physical Act. SE	12.1 (2.3)	10.9 (3.2)	-1.2 (2.7)	11.3 (2.4)	11.4 (2.4)	0.1 (2.3)
Nutrition SOC	3.7 (1.3)	3.9 (1.4)	0.2 (1.6)	3.9 (1.3)	4.1 (1.1)	0.2 (1.4)
Physical Act. SOC	3.8 (1.1)	4.1 (1.0)	0.4 (1.1)	3.7 (1.1)	3.9 (1.2)	0.1 (1.3)

Note: Standard deviations in parentheses, Bonferroni correction used, therefore significant alpha = (.05/3 = p<.01)
*between-group main effect
**within-group main effect
† = interaction effect
METs = Metabolic Equivalent of Task, SE = Self-Efficacy, SOC = Stage of Change

Significant interaction effects were noted between weight change status and time. Interaction effects were identified for weight, BMI, body fat percentage, and proportion of fat calories consumed. By the nature of the group categorization, significant effects

related to change in weight and change in BMI would be expected. Notably, there was an interaction effect for both variables. As demonstrated in Table 20, participants who gained weight across time and those who lost weight or were weight neutral did not have significantly different weight or BMI at baseline; however, over time their weights diverged significantly from one another as expected based on their categorization. Participants who gained weight across time had an average weight gain of 9.1 pounds (SD = 8.4) and an average increase in BMI of 1.3 units (SD = 1.3). Participants who lost weight or were weight neutral lost an average of 6.8 pounds (SD = 7.0) and an average of 1.2 units (SD = 1.2) in their BMI.

Similarly, a significant interaction effect emerged between time and weight change status on body fat percentage. As demonstrated in Table 20, participants who gained weight had significantly less body fat at baseline, compared to those who maintained or lost weight. Across time, participants' body fat percentage values changed as expected based on their group categorizations. Participants who gained weight had an average increase in body fat percentage of 2.4% (SD = 4.8%), compared to a reduction in body fat by 1.7% (SD = 2.8%) among those who maintained or lost weight.

As shown in Table 20 and Figure 1, a significant interaction effect emerged between weight change status and time related to percentage of fat calories consumed, $F(1,77) = 9.18$, $p<.01$, $\eta^2 = .10$, a moderate effect. At baseline, there was no significant difference in consumption of fat calories between the participants who gained weight (M = 36.8%, SD = 7.9%) and those who maintained or lost weight (M = 36.0%, SD = 6.7%). However, across time those who gained weight reported an average decrease in fat calories of 1.0% (SD = 6.5%), versus a reported average increase of 3.7% (SD = 7.2) among those who maintained or lost weight. That is, those who lost weight ate more calories from fat across time than those who gained weight.

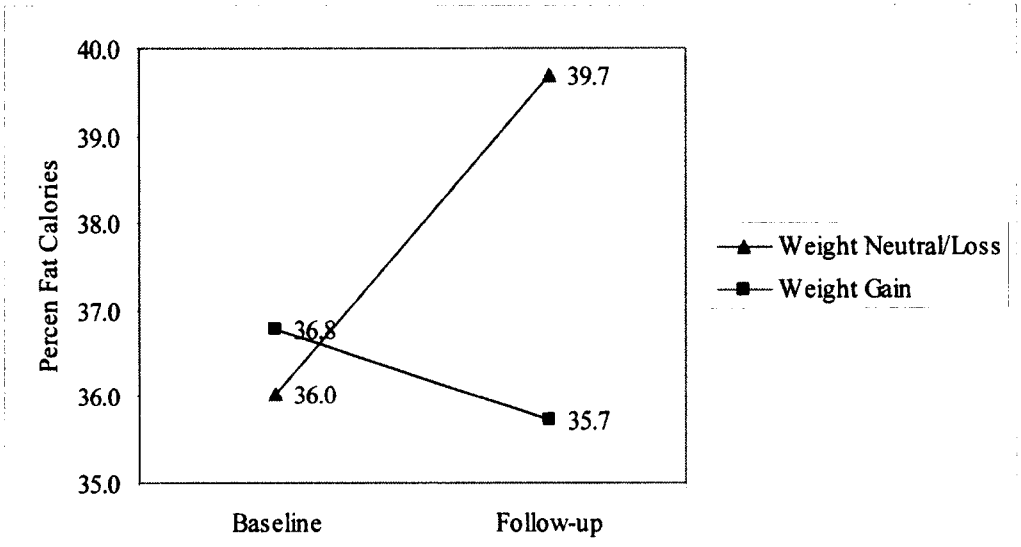

Figure 1: Percent of calories from fat from baseline to two year follow-up by weight change status.

Multiple logistic regression analyses. Two multiple logistic regression analyses were conducted to identify determine whether any variables at baseline significantly predicted future weight gain and change in body composition at the two-year follow-up. Prior to conducting the analyses, multiple variables were recoded into dichotomous variables to reduce the number of parameters for the logistic regression analyses. As described in Chapter 3, both stage-of-change measures were recoded to reflect participants who identified being in a non-action stage (e.g., pre-contemplation, contemplation, preparation) or an action stage (e.g., action, maintenance). The physical activity measure was recoded to identify participants who met physical activity requirements at the time of the study versus those who did not. The ethnicity variable was recoded into Caucasian and non-Caucasian, as the largest proportion of participants self-identified as Caucasian and there was not another well-represented ethnic group. Additionally, the multiple regressions were completed with stepwise backwards elimination to achieve the best fitting model. For the final model, the variable representing the proportion of carbohydrates consumed (% carbs) was removed to reduce colinearity with the other macronutrient variables.

As demonstrated in Table 21, the only significant predictor variable at baseline for both weight gain and change in body composition was the amount of sweet and dessert calories consumed at baseline. In regard to weight gain, students who consumed more calories from sweets and desserts had greater odds of weight gain (OR = 1.075, 95% Confidence Limit = 1.013-1.140). Similarly, students who consumed more calories from sweets and desserts had greater odds of increased body fat (OR = 1.106, 95% Confidence Limit = 1.036-1.181). Therefore, for each 1% increase in the percentage of calories from sweets or desserts, participants had a 1.075 and 1.016 higher odds of gaining weight and increasing body fat percentage, respectively. No other variables significantly predicted a change in weight or body composition.

Table 21

Logistic Regressions – Predicting Change in Weight and Body Fat Percentage from Baseline to Two Year Follow-up

Outcome	*Predictor*	*Beta*	*Beta SE*	*Wald* X^2	*df*	*Sig.*	*OR*	*OR 95% CL*
Weight Change Neutral/Loss = 0 Increase = 1	% Desserts, Sweets	0.0720	0.0303	5.6638	1	0.0173	1.075	1.013-1.140
Goodness of Fit Tests: -2 Log L = 102.079 Hosmer and Lemeshow Goodness-of-Fit Test: $X^2 = 8.5317$, $df = 8$, $p = .3833$								
Outcome	*Predictor*	*Beta*	*Beta SE*	*Wald* X^2	*df*	*Sig.*	*OR*	*OR 95% CL*
% Body Fat Change Neutral/Loss = 0 Increase = 1	% Desserts, Sweets	0.1009	0.0334	9.1113	1	0.0025	1.106	1.036-1.181
Goodness of Fit Tests: -2 Log L = 0.7183 Hosmer and Lemeshow Goodness-of-Fit Test: $X^2 = 3.9297$, $df = 8$, $p = .8634$								

Summary of Results

Overall the majority of students (68%) had a healthy range BMI, although 32% of the participants were overweight or obese at baseline and 30% at follow-up. Change in BMI for the overall sample was non-significant. Additionally, there was a non-significant weight gain overall from baseline to follow-up with an average increase of 1.5 pounds; however, 34% of participants gained over five pounds and 17% gained over 10 pounds. Subsequent to the change in weight, only 10% of participants had a change in

BMI status from baseline to follow-up. Additionally, women were significantly more likely to lose weight, whereas men were significantly more likely to gain weight.

In regard to health behaviors, participants overall reported a significant decrease in total calories, proportion of calories from sweets and desserts, increase in calories from protein, and increase in exercise. Participants who gained weight reported eating more calories from sweets and desserts. Participants who gained weight had less body fat at baseline compared to those who lost weight; however, across time, participants who gained weight experienced an increase in body fat percentage, whereas those who lost weight, experienced a decrease over time. The two groups did not differ from each other in regard to proportion of fat calories consumed at baseline; however, over time values diverged. Participants who gained weight also reported a reduction in calories from fat, whereas those who maintained or lost weight reported an increase in fat calories. Consistent with these findings, the increase in calories from sweets and desserts increased odds of weight gain and increased body fat. Indeed, calories consumed from sweets and desserts was the only significant predictor of weight gain and increased body fat.

The psychological constructs of self-efficacy and stage of change related to health behaviors were non-significant throughout all analyses, with the exception of those who were overweight or obese at baseline reporting significantly lower self-efficacy related to nutrition. Beyond this single exception, students reported high self-efficacy and indicated they were in an action or maintenance stage related to healthy eating and physical activity at baseline and follow-up.

Chapter 5: Qualitative Results

Following the quantitative data analyses of Phase I, a qualitative phase was implemented to contextualize the quantitative findings and build upon the relationships revealed in the quantitative work. As noted in Chapter 4, the majority of participants had a healthy BMI (BMI < 25); however, about one-third of participants were overweight or obese (BMI ≥ 25). Despite differing BMIs, participants overall reported a high level of self-efficacy and motivation to live a healthy lifestyle; however, a discrepancy existed between some students' reported self-efficacy and stage-of-change scores and their anthropomorphic (viz., weight & BMI) and behavioral (viz., diet & physical activity) measures. Specifically, for some students, their perceived ability and intention to live healthier did not necessarily translate into healthy behaviors. Additionally, participants overall reported a trend of improving their health by increasing their physical activity, reducing their calories from sweets and desserts, and reducing their total caloric intake, yet their behaviors did not correspond to an overall significant reduction in weight, body fat percentage, or BMI.

In addition to the discrepancies noted above, students' reported dietary habits had implications related to weight gain. Namely, students who reported eating more sweets and desserts had increased odds of gaining weight compared with those who did not. Students who gained weight also reported consuming fewer calories from fat across time. Therefore, it appears that students who gain weight are reporting significantly different dietary habits than those who did not gain weight. Specifically, they are reporting the consumption of more sweets and desserts, but less fat.

The qualitative phase was developed following Phase I and aimed at providing a context for the results. To contextualize the findings, a series of research questions was addressed with current university administrators[1] and students. The research questions were:

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[1] The term "administrator" used throughout the remainder of the document references both university administrators and staff interviewed as described in Chapter 3.

1. How do university students and administrators define healthy living for college students?
2. What are the supports and barriers to living a healthy lifestyle in college?
3. How can a university promote healthy living among new and current college students?
4. What are students' and administrators' perceptions of the identified dietary habits related to weight gain?

To explore the research questions, a series of focus groups and key informant interviews was initiated. There were seven student focus groups with a total of 34 participants. The key informant interviews were conducted with 15 university administrators and staff. The key informants were identified based on their role in either working directly with students (e.g., student health, residence life) or having the ability on policy that could directly alter students' environment related to exercise and nutrition (e.g., dining services, athletics, student affairs). Protocols for the focus groups and interviews were developed based on the results of the previous study phase. The protocols were aimed at acquiring information and experiences to help identify specific strategies to improve the health of new and continuing students. A full description of the study participants and protocols are provided in Chapter 3: Research Design and Methodology.

Defining Healthful Eating and Physical Activity.

To address how students and administrators defined healthful eating and exercise, both groups were asked, "*How would you define healthy eating and healthy exercise for college students?*" The question was developed due to the discrepancy noted in the quantitative results between students' anthropomorphic measurements and their perceived ability and intention to live healthfully. The question's aim was to target participants' perceptions of what behaviors they consider healthy, thus acting as a proxy for an examination of students' and administrators' knowledge about healthful behaviors. In addition to the overarching question, both groups were prompted to discuss what they thought were the correct amounts and types of fats, proteins, and carbohydrates to

consume for optimal health. Participants were also asked to discuss what they believed to be the correct duration and intensity of physical activity for students. Overall, students and administrators provided similar responses to the question with only a few noted differences.

Healthful eating. In regard to healthful eating, both sets of participants noted the need for a well-balanced diet, including a greater proportion of fruits and vegetables and minimal processed foods. The theme of balanced eating with the inclusion of more fruits and vegetables and unprocessed foods was dominant, as demonstrated by one administrator's comment, "*Eating a well-balanced diet focused mostly on fruits and vegetables, lean protein, complex carbs.*" A student highlighted his view of processed food in relation to healthful eating, stating that:

> *Judging by my roommates and who I live with and I'm around a lot, I must say that eating out and eating Hot Pockets®, or chimichangas, or whatever in excess is definitely not healthy. Things like Subway®, are the most that some of my roommates can even grasp for healthy food. Whereas there's other people who can cook salmon and steak dinner, just like, no problem, and I would consider that a much healthier decision.*

Beyond discussing the need for balance, a greater proportion of fruits and vegetables, and less processed foods, few students and administrators were able to define specific macronutrient distribution (e.g., proportion of fats, proteins, carbohydrates) as recommended by US Dietary Guidelines (USDA-DHSS, 2010). Although most participants were not able to define specific amounts, they did note that each macronutrient is vital and should be consumed in moderation, as noted by one administrator:

> *I know there's all those crazes, like...you're not supposed to have carbohydrates, but from what I've learned, I know that you do need carbohydrates to process certain enzymes -- I don't know. I'm not an expert in it, but I know that probably legumes and whole wheat are probably better for you than processed pastas and all that kind of stuff, but moderation is probably best.*

Additionally, some participants differentiated between the various types of fats and their relation to having health benefits versus health costs. As one administrator stated, "*Obviously trans-fats and saturated fats are probably not very good for you. Healthy fats like Omega-3s and things that come from fish and nuts are probably healthier for people.*"

Overall, students and administrators were similar in their perceptions of healthful eating, with one key difference. Compared to the student focus groups, administrators more often noted the need for regular, multiple meals throughout the day. Approximately 40% of administrators (six of 15 interviews) noted the need for regular meals, whereas the idea only surfaced in one student focus group. In that particular group, students noted the importance of regular meals, but also noted a perceived lack of time to eat regularly. The discrepancy is noted by a quote from each participant group, as one administrator stated, "*I would say healthy eating would be if a student would be eating three meals a day – at least three meals a day and healthy eating; not just a bag of chips, or a donut for breakfast.*" In contrast, one student stated, "*For breakfast, I think that's the most important meal for me, I barely eat because I'm so busy.*"

Physical activity. Students and administrators had similar definitions of a healthy level of physical activity. Similarities were noted across multiple themes. One theme included using exercise to balance out a sedentary lifestyle and expel excess calories. Participants also stated that students should engage in exercise most days of the week at a moderate intensity level (e.g., "*just enough to get your heart rate up*"), with varying types of activities (e.g., cardiovascular exercise, resistance training). Both students and administrators noted the importance of finding activities that fit students' lifestyles and that they find enjoyable. The theme of balance was noted by both participant groups, as each indicated that collegiate study is inherently sedentary (i.e., sitting in class, writing papers, reading textbooks).

Participants also described engaging in physical activity to control for excess caloric consumption, describing exercise as a means to prevent weight gain due to the sedentary nature of collegiate study and instances of over-eating. As one student stated:

> *I think, part of the importance of getting daily exercise to kind of like an outlet to just relieve some of that stress: cramming for finals, sitting all day reading books and at your computer. Even if it's just 15-20 minutes, get up, walk around.*

Students and administrators discussed their view of recommended physical activity for students. Both groups described similar levels of frequency and intensity. Most participants stated that students should be active most days of the week (e.g., four or more) and for at least 20 to 30 minutes at a time. Participants noted that the intensity should "*raise the heart rate*" but not be too strenuous. Other participants discussed the need for daily activity and trying to be active for an hour or longer. Participants recommended engaging in activities that fit within a given lifestyle and is not necessarily purposeful exercise. This theme was captured in statements made by an administrator (i.e., "*I think that if a student chose, instead of taking the shuttle, walking to class.*") and student (i.e., "*I was just going to say taking the stairs, that's a really simple way, especially if you're carrying an awesome backpack that weighs 80 pounds.*"). Additionally, both groups noted the need to enjoy physical activity. As one student noted:

> *I think that everyone has something different that they like. I think people should exercise, but I think it should be fun. I think that you should find something that you like whether it be swimming or biking or running or even lifting weights.*

It appears that students and administrators have similar views related to physical activity, particularly noting the need to maintain some activity level and find ways to incorporate activity into daily tasks or hobbies.

Summary of defining healthy nutrition and physical activity. Overall students and administrators were in agreement regarding how to define healthy nutrition and physical activity. For nutrition, similarities included eating balanced, non-processed meals with a greater proportion of fruits and vegetables. Both groups noted the need for moderation among the macronutrients and were able to identify health benefits of unsaturated fats versus saturated fats. The groups differed in their view of having regular meals. Administrators noted that regular meals were a part of healthy nutrition, whereas

students either did not acknowledge the importance or noted barriers to regular meals such as their busy schedules. In relation to exercise, both groups highlighted the theme of using exercise to balance out a sedentary lifestyle and the overconsumption of calories. Participants also stated that students should engage in regular exercise most days of the week, with varying types of activities, including those that fit a student's lifestyle.

Supports for Healthy Behavior

Following the request to define healthful nutrition and exercise, participants were asked to provide their view of supports for healthy behaviors at the university. Specifically, participants were asked, "*What are the supports and challenges for students to eat healthfully and exercise regularly at the university?*" This question was asked, as many students did report meeting physical activity and dietary guidelines in the previous study phase, yet others did not. Therefore, the focus groups and key informants were asked to provide their view of key supports to be able to target functioning systems for future promotion and prevention efforts.

Multiple themes were discussed by students and administrators, with themes often overlapping in regard to nutrition and physical activity. Themes that applied to both behaviors included access to healthier foods and physical amenities for exercise, availability of university resources to support healthful behaviors, administrative responsiveness to student needs, and a noted trend toward healthier living among students. There was one theme both groups discussed that applied directly to physical activity, which was the physical environment of the university and its surroundings (e.g., enclosed walkways, nearby city trails). In addition to themes discussed by both groups, administrators discussed their view that staff modeling is a positive support for healthy eating and exercise and that explicit efforts for health promotion were being implemented. In contrast, students did not acknowledge staff modeling as a support.

Access. Participants acknowledged the availability of healthier food options at the university, but noted that such options are limited. Additionally, they noted that the options offer little variety, particularly compared to less healthful options. Specific healthier options viewed by participants included two salad bars and a Subway®

restaurant. Participants noted the availability of fruit, granola bars, and instant oatmeal at coffee stands throughout the campus. In other words, participants acknowledged that options exist to support healthier eating; however, the options are neither plentiful nor varied. The statement by one student, "*there's a nice salad bar, but of course you're limited as to what's there*," highlights this sentiment. A similar notion was also expressed by a residential student, "*There is always a salad bar, and yes, the salad bar never changes so you only have 6 dressings to choose from the entire time you live on campus, but they do have it.*"

Administrators and students noted the presence of the university exercise facility, although they expressed dissatisfaction with its size and hours of operation. The interlacing theme of "limited access" is captured by a series of statements made by students and administrators. As one administrator stated, ""*I would say, definitely at the university, the recreation space for students is extremely limited and they are very frustrated with the hours that they can use the center and how small it is.*" The sentiment is underscored by comments from students:

> *The fact that they have those two gyms are pretty sweet but even when you go to the nice gym over here sometimes there's classes in it, things like that – just kind of a pain, but they do have open skate and stuff like that so it's positive.*
>
> *You go there [recreation center] and then find out that there's a class in session or that the hours aren't right. So it can be really frustrating.*

University resources. Although students and administrators expressed tepid attitudes about access to healthier foods and opportunity for recreation within the university, they did endorse efforts made by the university to support healthier behaviors through available resources on campus. Specifically, both groups consistently noted the availability of outdoor recreation equipment rentals (e.g., skis, canoes, kayaks, tents, sleeping bags, ice skates). As one student notes, "*I would like to point out at the Student Union we are able to rent gear, outdoor recreational gear.*" Additionally, students and administrators identified the availability of intramural sports as a support to engage students in activities. An additional resource noted by both groups was an outdoor

recreation program. The program is geared for residential students, as explained by one student, "*there are opportunities for students living in residence halls to pay a little bit of money...they would take you white water rafting, ice climbing, drive you out to the ski resort.*" The groups highly recommended the opportunity, but noted that it was limited to students living on campus and had a limit on the number of students who could participate.

A final resource noted by administrators was the partnership between different administrative groups to support education, promotion, or opportunities to support student health. Partnerships included coordination between Residence Life and the Housing and Dining departments to develop programs, or events targeting healthier behavior. Other partnerships included coordination of Student Affairs with the Student Health Center to sponsor educational events. This theme was highlighted by the comments from one administrator:

> *...bringing in people from the Student Health Center to come in and talk about that kind of stuff.[healthy living]...so we provide the space and sometimes the funding for that kind of stuff. Since we're not experts we try and bring people that maybe are a little bit more knowledgeable about it than we are.*

University responsiveness. Students and administrators discussed the responsiveness of the university to meet needs of students. Both groups discussed how the university tries to support student initiatives and requests for the availability of healthier foods and lifestyle. The description of the overall responsiveness of the university was captured by an administrator's comment:

> *One thing I really like about this university is that if there's an initiative and there's somebody willing to run it, they're usually willing to support it. That's one thing that's really neat about here, is that if you are really passionate about something and you want to implement a program or an initiative, they'll take in proposals and try and work with you. I think there's really not a good idea that would go unappreciated here. I don't see that at a lot of other institutions.*

In regard to responsiveness to students' requests for healthier food, administrators noted a trend of students requesting healthier options, including more plant-based diets (e.g., vegetarian, vegan). Given student requests, the university made changes in foods they provide at university sponsored events, described by one administrator:

> *We give significant thought to other people's needs: the vegan diets, the vegetarian diets. It's really a conscious effort especially the Residence Life Department. A lot of our student staff are vegetarians and so even when we feed them, we split it up and have options, so I believe the staff all over the university is trying their hardest to help students in that effort.*

Similarly, a student discussed her need for a specific diet that was met by the dining staff, stating, "*I have celiac disease and I'm allergic to like 58 things so I work really closely with Dining Services and I make sure that I eat the right stuff without dying.*" Concurrent with student requests for healthier options, both groups noted a trend of students seeking out healthier lifestyles.

Trend toward healthy living. Participants discussed a belief that students overall are seeking out healthier lifestyles and are becoming more aware of their own health. Each group noted students becoming more active, requesting healthier food options, and making healthier food choices. From these observations, administrators discussed how they have made changes to food purchases for university-sponsored events. The change within the student population was captured by the statements by two different administrators:

> Administrators Interview A: *One thing I notice about the students here [UAA], is that there is more of a culture of wanting to be aware of what they're eating and what they're putting into their bodies and to exercise, and I think [it's] for the benefit of being healthy versus the benefit of fitting into some sort of stereotype.*
>
> Administrators Interview B: *I think we do continue to hear it from students and more and more, in this day and age, than in previous years. We are hearing the organic or the healthy. The salad bar was a very important thing to students. So, I think that there is a lot of students out there that are still really defining healthy*

eating as truly healthy eating and getting the fruits and the vegetables and the low-fat types of protein in their diets.

An administrator discussed students' changes in attitude toward food and ways the menus were changed in response:

I have 18 student-staff members and we do a lot of trainings. We have a lot of days where we're doing trainings together and food provided for them and we ask them about what they want. I've seen us go from pizza every day, to sandwiches, salads, and soups and people wanting more healthy options.

The groups also noted increases in physical activity among students. Administrators discussed seeing more students active than before, with one administrator stating, "*I see a lot of students running and really involved in the outdoor activities so that's really good.*" Students confirmed administrators' perceptions of students being regularly active, with one student stating that:

There's so many people here who do sports and all types of stuff and just people who go to the gym on a daily basis and it's kind of motivating seeing everyone exercising or them saying, "Let's go to the gym, " or even them just telling you about it. It makes it a little bit easier sometimes.

Physical environment and amenities. Although many of the themes expressed by students and administrators overlapped with nutrition and physical activity, both groups highlighted one area of support that applied only to physical activity. The support identified by each participant group was the actual environment of the university campus and amenities located near campus. Near the university is an extensive system of paved trails. In winter, the same trail system is groomed for cross-country skiing. Participants noted that the trail system supports exercise, particularly with the limited space available in the sports complex. As one participant stated, "*we have a pretty good trail system around the city for running, biking in the summer, and they groom a lot of them for skiing in the winter.*"

In regard to the physical structure of the university, participants noted the residential units are in close proximity to the university educational building, thus

promoting walking. A student described the proximity, by stating, "*while you're living on campus you're living close enough to the campus where it's just a walking distance away. You don't have to take public transportation; you don't have to take a car. You can just walk there if you want.*" Additionally, participants described enclosed walkways that connect the buildings. These walkways allow students to walk from one section of campus to the other without having to go outdoors, promoting walking during the winter months. One administrator noted the advantage of the enclosed walkway, by stating, "*one of the big supports for exercise is that we've got this internal pass that goes all the way across campus so people can walk in the winter.*"

Modeling. Although students and administrators described similar supports for healthy nutrition and physical activity, they diverged on two prominent themes related to the view of staff modeling healthy living and the promotion of healthier behaviors. Administrators described their role in supporting healthy living by modeling healthier choices when in the presence of students and other staff. One administrator discussed an active modeling approach as follows:

> *I work really closely with my students and if they see me making healthier decisions, going to the exercise classes that we have, and making healthier choices while I'm eating at the dining hall and that kind of thing. It's amazing how much you get watched as a staff member and as a person who works on campus. Students kind of look up to you for a lot of decisions that they make in a sense, and so I think modeling is kind of one our responsibilities. So the way that we as staff and faculty can kind of get out there and show students that, "Hey, this is something that you should be doing," or , "Hey, let's all participate in this activity kind of thing," I think helps out a lot.*

Another administrator discussed a similar concept to modeling, though not through personal actions, but rather modeling by providing healthier choices at university sponsored events. The administrator indicated that:

> *I actually have times when it's easy to give donuts. I'm not happy about giving donuts because it doesn't promote wellness. I joke like everyone can have like a*

1/8 of a donut, but I think that's when we say, "Okay, so what choices do we make as professionals and the food we offer to the students?" So, we've actually changed things, where we'll have low-fat yogurt and fresh fruit. So we ourselves are trying to offer them up healthier options.

Although multiple administrators discussed modeling healthy behaviors for students, students did not discuss staff modeling as a support for healthier living. Therefore, a discrepancy was present between administrator and student perceptions of the importance of staff modeling. The administrators were explicit about being actively viewed by students; however, the students did not mention the role that individual staff plays in either promoting healthy or unhealthy behaviors. Although students did not address modeling, they did acknowledge efforts made by the university in being responsive to needs and requests of students. The noted responsiveness seems more consistent with an overall view of university administrators promoting healthier behaviors rather than individual staff actions.

Education and promotion. Another discrepancy noted between administrators and students was the view of health promotion at the university. Administrators described at length how promotional programs are implemented, whereas students acknowledged very few promotional activities. The promotional programs are discussed in greater depth below (see Current Health Promotion). Specifically, students only noted three discrete informational and promotional efforts. They noted the postings of caloric information for food served at the university, a promotional effort by the Student Health Center to provide healthy soup during finals week, and an aerobic dance course (i.e., zumba) that was open to the greater student body for one week. Therefore, there appeared to be a disconnect between administrators' perspectives on the breadth of promotional activities and students' awareness of the activities. The section, Current Health Promotion, provides additional description and analysis of this discrepancy.

Summary of supports for healthy eating and physical activity. Students and administrators discussed multiple supports for healthy nutrition and exercise provided by the university. The themes discussed for both nutrition and exercise included access to

healthier foods and physical amenities for exercise, university resources to support healthy behaviors, administrative responsiveness to student needs, and a noted trend toward healthier living among students. Both groups discussed how the physical environment of the university and its surroundings (e.g., enclosed walkways, nearby city bike trails) promoted physical activity. Despite overlap between student and administrator perspectives, the groups diverged regarding their views of staff modeling and health promotion programs. Notably, administrators discussed at length efforts made in health promotion and staff modeling, whereas students did not perceive these efforts.

Challenges for Healthy Behavior

Considering that the results from the quantitative results pointed to a trend for improved health behaviors, yet students' BMI, weight, and body fat percentage did not significantly change, barriers to health were explored. To investigate students' and administrators' perceived barriers they were asked, "*What are the challenges for students to eat healthfully and exercise regularly at the university?*" Participants noted many challenges, including limited access to healthy options, limited access to recreation opportunities, cost of healthy food, expense of a gym membership outside of university, limited motivation to eat healthier and exercise, and environmental difficulties (e.g., weather, geographic distance). Students and administrators discussed the challenge of transitioning to college, including decision-making, peer influences, and lifestyle demands such as busy schedules. Both groups discussed their perception that many people lack knowledge about unhealthy versus healthy foods. Additionally, administrators discussed concern about staff modeling unhealthy behaviors. As before, students did not note staff behaviors as a challenge in their own health-related behaviors.

Limited access and choices. Students and administrators described the challenge of not having regular access to healthier foods versus easy access to less healthful foods. Participants noted that not only was access limited by quantity and variety of healthy foods, but that unhealthy foods are regularly available through all hours of the day due to vending machines. The challenge of access related to healthy foods was exemplified by this student's experience:

I would say that no matter where you go on campus I can buy a candy bar. It's not the same for a salad. A vending machine or even like, the coffee shops have candy. Cheap candy, turnovers, and donuts...yum. If you are going to try to eat healthy on campus, you have to really be proactive about it like, "Okay, it's lunch. I would like a salad. Where can I go?" One of three places, you know. Whereas if you want a chocolate bar, you're like, "Okay, I can get one six feet up the hallway."

Related to residential dining, participants described having access to "all-you-can-eat" dining, which may promote excessive caloric consumption. Additionally, participants noted a late-night eating option in the residence halls, which they felt promoted unhealthy behaviors. A structural challenge related to dining for students who live in dorm rooms was the lack of a kitchen, which is discussed in more depth under the heading Residential Differences. The challenges of all-you-can-eat and late-night dining were described by an administrator's experience of eating at the dining hall:

I think some of the challenges would be, and that I've been guilty of, is when I eat at the residence dining. It is all-you-can-eat. So you know I'm like "wow, that cookie was really good", so then I'll go back for more. So I would say that that is definitely a challenge for students. Also they [dining services] open it up late at night for students to study, so it's kind of encouraging students to then go eat french-fries when they're cramming for their exams.

In addition to the access barriers to eating healthfully, participants described access concerns related to engaging in physical activity. The primary barriers described were limited size and the hours of operation of the recreational facility. Beyond the limited size, students and administrators discussed that competing demands for the facilities create scheduling difficulties. The concerns were underscored by one student's experience:

I know this campus is like what, 15,000-16,000 students. They have one gym, it's tiny; it's booked a lot because of athletics and other events that they have in there. There's five treadmills. I mean, when you have a student body of this size...

Financial barrier. In addition to access barriers, students and administrators discussed the expenses of healthier food and local gym membership as a challenge. Participants focused on the expense of fruits and vegetables compared to processed foods. Each group noted the expense of healthier foods is a barrier for food purchased on campus and at local grocers, highlighted by one student's comment:

> *I think another barrier is cost. It's cheaper to go in the vending machine and get a bag of chips than it is to go and get the $8.00 vegetable tray with the hummus from Starbucks®. Also, my twenty dollars would go way farther if I just go and buy macaroni and Ramen®. I might get a few vegetables and some fruits and maybe a loaf of bread for twenty dollars. It just doesn't go as far. I understand why people choose to just go for the unhealthy options because they're way cheaper but, overall, to keep a healthy diet, it's really not a good choice at all.*

Participants noted an environmental barrier related to food costs for students at this particular university. Given its geographic location and limited agricultural industry, the vast majority of foods are shipped from outside growers and distributors. Therefore, both students and administrators acknowledged that shipping expenses contribute to the higher cost of agricultural goods (i.e., fruits and vegetables.) A student who had the perspective coming from another university described the challenge:

> *If things are expensive in the lower 48, it's expensive for us to ship the stuff up here. Coming from another university from the lower 48, there was a lot more variety and it's harder up here because things have to be shipped.*

Barriers related to finances and exercising were similarly discussed. Students and administrators discussed the expense of a gym membership in relation to limited financial means of students. Participants noted limited access and northern climate as drivers of students needing to seek out other recreational facilities. The climate barrier is illustrated by one administrator's comment, "*I think the northern climate is a challenge for a lot of folks. For some folks it's just the right fit, but I'd say for the majority of people I talk to, the northern climate presents a barrier.*" The balance between the expense and access of an external gym membership was described by another administrator:

Yeah, you know if you're earning your way through school, you probably can't afford a gym membership. I think that those that are trying try to work it in and find those facilities much more accessible because you have a lot more options to work out.

Motivation. In addition to the previously-noted barriers, students and administrators discussed the limited motivation of students to actively engage in healthier living. Participants discussed the university providing access to healthy food and a recreational facility, albeit limited, but also noted that students still have to choose to live healthier. In regard to being motivated to eat healthfully, one administrator revealed that:

I know that our food service is trying to create healthy options for the students so that they can eat healthy, but I would say it's on the student to be able to make those choices and figure out how it works for them.

The statement by the administrator regarding actively choosing be healthier was mirrored by the following student comment regarding not being physically active after class:

I find it really hard to [exercise] after being at school all day, I'm just really unmotivated to even think about working out when I just want to go home and relax after being at school and all that all day.

Another challenge related to motivation and physical activity was the desire to spend time with friends, rather than exercising. Participants discussed choosing less healthful behaviors over exercising. For example, one student admitted, "*You finish all your classes; instead of going to the gym you want to go hang out with your friends if they happen to be doing something more exciting than going to the gym.*"

Therefore, participants described a confluence of limited access and motivation resulting in consuming less healthful foods and getting less exercise. Social pressures also are present, guiding students away from physical activity. The theme of limited motivation and social pressure is connected to students' development as they transition into adulthood.

Life transition. Students and administrators discussed the theme of students transitioning to college and eventually adulthood as a potential barrier to exercising and

eating healthfully. Although the transition itself is not inherently problematic, both groups described challenges many college students face related to their lifestyle during the transition. Participants discussed challenges for healthy living related to making new decisions, normalized unhealthy behaviors, and a perceived lack of time.

Both groups discussed the challenge for students making new decisions regarding daily behavior that affects health. Specifically, participants discussed students learning to create their own daily routine that includes purchasing food, cooking food, deciding to exercise, time management strategies, and sleep schedules. Participants noted that prior to college, students typically have an authority figure guiding their decision-making; upon entering college they become their own decision makers. These challenges were captured by an administrator's and student's comments:

> Administrator's Comment: *I think you're looking at a general student population that has lived at home for the first 18 years of their lives and when they move out they don't know how to do things. They have a general idea of what food is and where you get it from, but I don't know if they have that idea of how to budget properly in order to purchase the right kind of food. I don't know if they have the experience and the time to sit down and say have a breakfast or lunch, dinner, and budget their time to prepare something accordingly.*
>
> Student's Comment: *When you're under the eyes of your parents so they can tell you what not to eat, and they sort of tell you how much you can eat. Coming to college you're on your own, so you can pick and choose how much, and what you want to eat; when you want to eat it. So, I mean, it makes sense that we want to eat more donuts; we want to eat more ice cream and we don't want to eat as many vegetables or potatoes or stuff that our parents would make us eat.*

Related to the challenge of students learning to make their own decisions regarding food, both groups described how some unhealthy behaviors are normalized and promoted within the university. Participants discussed how poor sleep schedules, alcohol consumption, irregular eating, and excessive eating have been normalized for students.

For example, one participant discussed poor sleep routines and the use of stimulants as normalized behavior during college:

> *You're supposed to stay up all night before finals and not sleep and drink 8 million cups of coffee and maybe pop an Adderall® or two. I think a lot of media and television has promoted a very unhealthy view of what college is supposed to be like, not that it's their fault, but I don't think it helps at all.*

In addition to students choosing to engage in normalized unhealthy behaviors, participants also described how the university is normalizing unhealthy eating patterns among students who eat in the dining hall. Specifically, participants noted the types of food offered, time of day the food is offered, and style of eating (e.g., "all-you-can-eat"). One administrator's comments highlighted the scenarios student often face when eating at the dining hall:

> *I see all the students who just come out of high school and they don't have their parents cooking their meals anymore saying, "This is what we're eating." Now they have the option to pick whatever it is that they want to eat. So you see a lot of the "Freshman 15". A lot of freshmen say that because when they go to the dining hall it's all you can eat, and you can go there and eat whatever you want. Nobody's going to tell you anything different and you can eat there for the whole time that the meal's open, and so some people take advantage of that, and that kind of sets them up for how they're going to pick and choose their meals in the future.*

Participants concluded that students' new decision-making responsibilities and the normalization of unhealthy behaviors led students to practice more unhealthy behaviors. Additionally, the combined challenges and lifestyle demands led many participants to describe how students perceive a lack of time to participate in healthier behaviors. Participants described having a lack of time as a driver of students choosing not to engage in healthier eating or regular physical activity. One student discussed this barrier, stating:

I would say it's a time thing as well. I live at home. I have access to better foods, but if I'm working and then doing homework, and up late studying it's not like I'm going to go upstairs and make myself something nice and healthy. I'm going to just go grab some chips and shove them in my face while I'm reading a book.

Additionally, perceived lack of time was often seen as a barrier for students who go to school and work part-time, as one student revealed:

The time necessary to exercise if they work half, part-time or full-time, there's that. There's study time for their finals, there's project time, term paper time. It's just, there's a lot on our plate already and that, we probably should find a better way to associate 30 to 45 minutes of exercise per day, but we just don't because we're too caught up in work-related or school-related activities.

It appears that the transition to greater independence and adulthood creates burdens that affect students' health. Specifically, students' new responsibility in decision-making, normalized unhealthy behaviors, and perceived lack of time are setting up dynamics resulting in poor choices for health. Interconnected with the challenge of transitioning to greater independence and decision-making was participants' view that students have limited knowledge regarding healthy nutrition.

Limited nutrition knowledge. Students and administrators expressed the belief that students have limited knowledge regarding nutrition, particularly related to excess sugars and portion size. Of note, participants did not report students having limited knowledge of physical activity, only nutrition. Participants described how students are eating larger portions of food, combined with large servings of sugar-laden foods. These sentiments were captured by one administrator's comment:

Serving size, that's a big problem too with students. They don't have a clue how much they should eat and everything is super-sized, you know the energy drinks are just huge. Or they'll have one of the big drinks, like one of the natural fruit juices or something and it's like, that's like three servings in there and you're drinking the whole thing.

Modeling. A final challenge noted only by administrators was concern about modeling or promoting unhealthy behaviors. In contrast to their comments about modeling healthy behaviors, participants discussed activities by many groups throughout the campus that may unintentionally promote unhealthy behaviors. Specifically, administrators discussed giving out free unhealthy food to draw students to their booths or programs. One administrator highlighted this example by stating:

> *So, next week I'm doing an educational booth. In order to get students to come over to my booth we'll do things like we'll have donuts, or, you know what I mean. So we'll have sweets to give away. It's not just me, but it's a lot of people who do outreach on campus. In order to get the students to come, we gotta have the muffins or the -- you know what I mean? -- but it works. Cause if you have celery, or you know whatever, they aren't gonna want to come.*

Although administrators noted modeling poor nutritional choices as a potential challenge, students did not discuss staff modeling as a determinant toward unhealthy choices. However, students did acknowledge that the dining hall may create an environment leading to unhealthy nutritional choices (e.g., late night fried food, all-you-can-drink soda), as discussed above.

Summary of challenges. Students and administrators noted many barriers students face in trying to live a healthy lifestyle. The barriers included limited access to healthy foods and recreational facilities, excessive access to nutritionally poor foods (e.g., candy bars), and the expense of healthful foods and non-university recreation facilities. In conjunction with limited recreational facilities, participants noted that weather in a northern climate plays a role in limiting students' physical activity. Both groups acknowledged that students have to be motivated to live healthier, a motivation often lacking. The theme of transitioning to college and adulthood was discussed as a challenge to live healthfully, particularly in relation to decision-making, normalized unhealthy behaviors, and perceived lack of time. In conjunction with the challenge of being new to decision-making related to food, participants discussed their belief that college students have limited knowledge regarding healthy nutrition. A final challenge

discussed by administrators was concern that staff members were promoting poor nutritional choices, as food used in program promotion is often calorie-dense and nutrient deficient. Although administrators expressed this concern, students did not perceive staff behavior as influencing their decision to choose unhealthy food. In addition to general challenges and supports for the larger student body, participants provided information about unique challenges and supports for commuter students (who live off campus) and students in residence (who live on campus).

Differences between Residence Students and Commuter Students

Throughout the focus groups and key informant interviews, participants were asked to discuss potential differences between students in residence (live on campus) versus commuter students (live off campus). Participants described multiple differences related to nutrition, exercise, health promotion, and general trends. Although differences were described between student groups, study participants were quick to note that the commuter student group was very diverse. Therefore, they cautioned their responses may not be representative of the greater commuter student body. Students and administrators did not differ in their discussion of differences between commuter students and residential students.

Age and transition to independence. Participants described an overall difference between commuter students and students in residence, expressing the belief that students in residence were typically younger and transitioning to independence. Consistent with the challenges noted above, participants discussed that students in residence may struggle with healthier living due to age and transition. This theme was captured by one administrator's comment:

> *Well, I see the differences in the students who live in residence life are typically younger and maybe first year, second year students, and so those transitions are new to them versus the commuter students who maybe aren't tasked with that kind of transition. They live off campus for a reason whether it be living with their parents or with a different community of folks, so it seems like maybe the*

Residence Life students are a little more challenged in terms of just one extra thing [transition to independence].

Beyond the general trend noted between the two student groups, participants discussed differences related to nutrition, exercise, and engagement in promotion activities.

Nutrition. Participants described different supports and challenges for eating healthfully between the two student groups. Overall, participants offered that commuter students are more likely to eat healthier due to access to healthier foods and opportunities to cook their own meals. Consistent with previous comments regarding access to healthful foods on campus, the two groups discussed limited access as a challenge for those living on campus. The access difference was captured by two students' comments:

Student A: I think just the biggest difference is that when you don't live on campus you are more able to pack a healthy lunch. I generally like to pack all my food mainly because I think that food here is really expensive. And they also don't have a lot of vegetarian options.

Student B: I think living off campus you have more options. When you don't live on campus you don't have to have a meal plan, and it gives you the opportunity and the choices to go to the grocery store and buy good food like vegetables and organic stuff, and here you don't really have that option.

Although the overall belief was that off-campus students have the opportunity to eat healthier, they still face the remaining challenge of choosing to eat healthfully. However, this topic was not raised by the participants.

Participants described another challenge faced by those who live on campus was lack of access to a kitchen. Participants discussed not having a private kitchen or a community kitchen in the dormitories as a barrier to preparing fresher, healthier meals. Both groups elaborated that dorm rooms only have a microwave or single hot plate to prepare foods. Additionally, they discussed a lack of storage space for foods and limited water sources (i.e., bathroom sink) to wash vegetables and fruits. The theme described by study participants was exemplified by the following student comments:

Student A: I think that, as far as a difference from living in the dorms or living at home or something, just how you can store food, how you can cook food. If you're limited to microwaveable meals, it's going to limit a lot on what you can eat.

Student B: Just preparing healthy food. Like let's say you get vegetables, and you have to wash them and cut them up. It's kinda hard to do in a bathroom sink.

In addition to challenges noted about access to healthful foods and food preparation space, participants discussed the challenge of having less healthful food available throughout the day. One participant relayed his experience while living on campus at another university, describing that:

I lived on campus at a different university and I found that living on campus and having a meal plan just encouraged me to eat constantly. You're constantly near the food, going to the cafeteria with your friends, you're there, you have your little swipe card. You're just like, 'oh, I'm bored.' You don't really think about it and we joke about the freshman fifteen, but it's actually like a serious concern for a lot of incoming students who don't . . . maybe like haven't learned from, or don't want to follow those patterns that their parents hopefully taught them. I think that's actually a serious concern that doesn't really get addressed.

Participants described a policy issue related to students with meal plans (pre-paid food plans). The issue described included not being able to carry any left-over monies; therefore, students are required to spend the money before the end of the year or lose the money. One student discussed his experience with the policy, indicating that:

I had some friends my freshman year that lived in the dorms and I know they have a little store that you can buy stuff, and they had to spend their money before the semester got over. So what they did was go to the store and literally get laundry baskets full of Cheetos® and Snickers® and tons of different candy bars just to spend their money. So that kind of shows you what the options were for food there, and like Hot Pockets® and burritos - just horrible processed foods.

In regard to nutrition, participants noted many differences between students in residence versus commuter students. Overall, participants stated that students who live off campus are more likely to eat healthfully compared to on-campus students. Participants noted a key difference related to access to a kitchen and food preparation areas for those living off campus. Additionally, participants discussed their view that those who live on campus have easy access to less healthful foods and that some policies may promote the purchasing of less healthful foods.

Exercise. Although participants believe commuters students have advantages that lead to healthier nutrition compared to residential students; the reverse was noted in regard to physical activity. Participants suggested that the students who live on campus have greater access to a recreational facility and are more likely to be active. Specifically, participants noted that students in residence are within walking distance to a recreational facility and that this convenience provides greater opportunity to exercise. One student suggested that:

> *I guess if you do live on campus you can take the shuttle or walk to the university sports complex, as opposed to if you live off campus it's a little bit difficult to drive. It's not as convenient. You're sitting at home, you decide you want to work out; it's a little bit more motivation to get yourself to the gym.*

Despite the predominant view that the convenience of living on campus served to create opportunities for students to be more active, some participants found that living off campus might create greater access to exercise due to longer and more convenient hours of operation at non-university facilities. Participants further noted that there are many recreational facilities throughout the city; therefore, students may be near a convenient location. An administrator highlighted the theme, stating, "*Well, I do know some students who have off-campus gym memberships and they're more prone to having off-campus gym membership because the gym might be closer to their house, or open different times.*"

Engagement. In addition to differences noted about nutrition and exercise between the two student groups, students and administrators discussed differences in

engaging these groups in health promotion. Participants discussed the greater challenge of capturing the attention of off-campus students. Both students and administrators described that commuter students' primary focus while physically on campus was to go to classes, not to engage in social activities. One student expressed this idea when describing attempts to be actively engaged in the university community. The student elaborated that:

> *I actually, I don't live on campus and I only spend time here when I'm at school here so maybe that's why I haven't heard about a lot of the programs. I think that's the way for a lot of people at the university. We're not here on campus a whole lot, other than when we have to be, so maybe that's another disconnect. I try to read the bulletin boards and I read the university paper. You try to keep up but . . . that could be a reason why I haven't heard of some of these.*

The sentiment is echoed by an administrator, who discusses the pull of responsibilities outside of the campus, commenting that:

> *I know it's kind of a chronic challenge for a big public university to engage off-campus students because one of the things that often happens, is that they work fulltime and they are off campus and they don't have any time other than when they come to class.*

In contrast to off-campus students, participants described the students in residence as a captive audience for administrators' promotional efforts. Participants discussed being more likely to be exposed to promotional efforts when living on campus due to being in the vicinity of promotional activities or knowing other students who are engaged in the activities. This theme was highlighted by the following administrator comments:

> *It seems like in terms of Residence Life we can get their attention more often. Like there's this alcohol awareness day and they do big things in the dorms, so if they're on campus you can kind of saturate them with educational stuff without missing many of them. But off-campus I think has always been kind of hard to connect with that way.*

Summary of residential and commuter student differences. Participants identified a number of key differences between students who live on campus and those who commute. One such difference was a general and challenging trend of on-campus students being younger and transitioning to more independence. Other differences emerged in regard to nutrition and exercise. Study participants described commuter students as having more opportunities to eat healthier foods due to access to a variety of foods and preparation facilities (i.e., kitchen, sink). Conversely, participants described residential students as more likely to exercise due to their proximity to recreational facilities. Participants noted that students who live off campus are harder to engage in promotional efforts due to their limited time on campus and focus on only course work. In contrast, participants noted that residential students were readily engaged by promotion activities due to the amount of time they spend on campus and their proximity to promoted events and exposure to others who are participating.

Role of University in Health Promotion

Considering that university administrators have the influence to shape policy, control funding priorities, and affect university priorities, they were asked to discuss their perspectives on the university's role in supporting healthful behaviors. Specifically, university administrators were asked, "*From your perspective, what role does the university have in supporting healthy eating and exercise among its students?*" Overall, all administrators expressed the view that the university as a whole has a large role in supporting healthful living. Participants described aspects of extant policy that support this function. They believed that the university was providing a physically healthy environment with healthy choices but noted that a culture of health needed to be further promoted within the extant system. Beyond tangible and intangible environments of health, administrators discussed the role of providing health education and promotion related to students' lives outside of academic coursework. Although administrators agreed about the role of a university in supporting healthy students, they acknowledge that not all administrators, faculty, staff, or greater public would feel as they did. The key themes are discussed in-depth below.

Policy. As discussed above, administrators expressed the view that the university system as a whole already supports the promotion of student health. Administrators discussed that the primary objective of the university is to train future professionals. Consistent with that belief, they described that if students are not physically healthy, they are unlikely to be able to learn adequately. In fact, administrators described inclusion of wellness into departmental policy statements, as exemplified by the following comment:

> *I think it has a huge role and the Division of Student Affairs just revamped its core themes. We developed four or five core competencies that so every program, every initiative that we conduct has to focus on them, and one is on wellness now. We - some of us really pushed for that to be one of the core themes because if students are not healthy they're not going to be able to perform in class, get their degrees and go off and be productive citizens in society so I think that wellness should be incorporated into really every area of the university.*

Providing a healthy environment. Consistent with inclusion of wellness in policy statements, administrators asserted that the university should provide a healthy environment, described as one offering healthful choices and instilling a "*culture of wellness.*" One key informant described the importance of a healthy environment as follows:

> *I think it's a big role. I think that the university is tasked with providing classes in a progression toward a degree, but also I think the environment that is fostered all around that can totally affect someone's wellbeing I think as people become better, healthier, it just circles back to having more energy, being more engaged in classes, being more excited about maybe extracurricular activities.*

Administrators described the emphasis on healthy living for residential students. They asserted that a number of aspects of a residential student's life revolve around healthy lifestyles. One administrator expressed:

> *I think they [the university] should play a big role. Even though the students here are here to go to school – but I think that they spend the majority of their time, of their day, on campus and for the students who live on campus, they live and go to*

school here and so I think that we should play a role in healthy eating and exercise and making sure that people leave the university healthier.

Congruent with providing a healthy environment, administrators discussed including healthier food options. Participants described their aspirational goal of providing more healthful choices in the future, thus fostering a healthier environment. For example:

I think giving students the option to pick a healthy meal is kind of our responsibility. I would like to see the university go towards a menu that was kind of half-and-half. It would be nice to have half, "This is the under a certain amount of calories type meals, and this is your other meals." Right now I think we're at a kind of 80/20 kind of thing, and that can be tough because 80% of the time you're probably going to make a decision that's not as healthy so I think it's our role as the university to have those options available for students.

Health education and promotion. In accordance with fostering an environment and culture of healthy living, administrators discussed the need for health education and promotion. Participants expressed the idea that such activities prepare students for future health decisions. In essence, participants described health promotion as providing knowledge for students to invest in their health. For example, one administrator stated:

Help them [students] create a culture of kind of wellness, and not judgment like, "Ugh, you're fat, you're not smart," or whatever but kind of, "Hey, here's some options." I kind of equate it to when you start a job and they say, "Hey, start saving for retirement and just put a little bit away." It's like what can you do for traditional students, what can you do in the early years that could make a difference in your 40s and 50s and later?

Ambivalence. Despite overwhelming agreement among administrators that the university has a role in providing a healthy environment, a few participants suggested others within the university and the public-at-large may have not perceived this as part of the university's responsibility. They may view healthful lifestyles as a personal choice and responsibility. Although participants rejected this belief, they acknowledged that the

university's prime function is to teach, not promote an agenda of healthy living. Administrators emphasized, however, that many students are transitioning to adulthood and may require guidance to support healthy decision-making. As one participant stated representatively:

> *That kind of goes all the way down to public school. Is it our responsibility to make sure your kids eat well or study well or do well? [long pause] That's a hard one. On the one hand I want to say it's responsible to be able to offer alternatives or to be able to notice if all the alternatives are crappy. On the other hand you're talking about non-minors. You wouldn't go into an apartment building and say, "You guys have to start eating right," and then on the other hand...the third hand it's like you have people sending their babies, their 18 year-old babies to you and hoping that you'll take care of them. It's almost like there's that middle age between adolescence and young adult.*

Summary of the role of the university. Administrators consistently expressed the belief that the university has a role and obligation to provide a healthful environment to promote active learning. In conjunction with creating a healthy environment, administrators believed in active health promotion and education efforts to foster long-term health among students. Although all the key informants stated that the university has a role in the health of its students, they did acknowledge that other administrators or the general public may have conflicting beliefs and opinions.

Current Health Promotion

Given that administrators owned the importance of creating and promoting a healthful environment, students and administrators were asked to comment on how the university is promoting healthy nutrition and physical activity. Specifically, the participants were asked, "*From your perspective, what is the university doing to help promote healthy eating and exercise among its students?*" Interestingly, administrators and students had very divergent views of promotional efforts under way at the university. Notably, administrators described a multitude of efforts, whereas students stated that very few promotional activities were occurring.

Administrators' perspective. Administrators described active and passive promotional efforts targeting nutrition and exercise. Passive promotion included bulletin boards, informational fliers, and informational signs. Active promotion included targeted programs, events, and direct services (i.e., student health center). One administrator discussed his view of the influence of passive promotional activities on students, stating that:

> *Every once-in-a-while some flyers will come out so it's sort of passive, and like, just nutritional habits and things like that, letting the facts be known. The university is really good at throwing out statistics, and so when a flyer goes out about nutritional statistics or things like that, people see it, and some people will even relay it to the their friends, "Oh, did you know this?" and so not only programs but passively as well. I know that's what we do over here, but on campus I know that they do that every once-in-a-while too.*

Similarly, another administrator described improvements in the university's offering of information related to food served on campus. The individual stated, "*I've seen them [dining services] consistently get better and better with being able to offer the nutritional information for students.*" In other words, administrators perceived thriving extant promotional efforts through the use of signs, fliers, and bulletin boards.

In addition to passive promotional efforts, administrators discussed a variety of activities presented at the university to affect healthier behaviors. Administrators discussed events such as seminars about healthy cooking, outdoor recreation events, and occasional events promoting a specific form of exercise (e.g., dance week). Administrators' perceptions of the role of active promotion among students, particularly residential students, were captured in the following statement:

> *That's a lot of what we do here on the residential side is the events and the programming. Over in the residential offices they have the outdoor adventure stuff and we do a lot of participating events where students can participate in their learning. And that's kind of, I think, our theme with the living, learning communities is you live where you learn and all that kind of comes together.*

Students' perspective. Although administrators described multiple and varied promotional efforts, participating students had a different perspective. Namely, students did not acknowledge many promotional efforts, but more often stated that, "*I don't see any promotion for health.*" Despite students' overall view of limited promotion, a few students did remember some promotional efforts. Specifically, one student noted that the dining hall provides nutrition information for entrées. Another student noted an informational kiosk discussing various health aspects, noting however, that the information was not maintained year-round. The student's comment asserted that:

> *The Health office has some sort of kiosk that's set up on the ground floor that tries to promote healthy eating and sometimes they'll have these bottles of sugar that say, "If you consume this many sodas per week, you're eating this much calories. If you go to a sports drink or a healthier drink, a V8-type drink, if you take this many of these, you'll get this many nutrients, this many things, and this many healthy items that will promote your . . . could help you live a longer life." But the issue with that is that they only do that in the first week of the semester and they don't continue trying to promote that throughout the entire semester, especially closer to finals when people are more concerned with consuming sugar and staying awake and cramming for their exams.*

Though students mentioned a few promotional items, the majority of student participants noted a lack of promotion. Many of their examples included not being informed of events, schedules, access to services, or access to nearby amenities. They described that any health promotion efforts they were aware of, were focused in the reverse, stressing not engaging in an unhealthy behavior (i.e., drug use, binge drinking), rather than promoting healthful behavior (i.e., proper nutrition & exercise). A series of examples are presented below that highlight students' view of the limited positive promotion of physical activity and healthy eating.

Two short dialogues from the student focus groups highlight the lack of awareness of physical amenities and schedules. The group discussed the following:

Student A: *I actually work at the pool on campus. They have these cards that have the schedule written out; for each semester they change, but they're only in the sports center. There's a big stack of them that you can take, but if you don't go in there and . . .*

Student B: *Yeah, this is my fourth year here and I've never seen the schedule posted that I'd like really stopped and noticed.*

Interviewer: *While it sounds like they actually exist, they're clearly not promoted through or distributed throughout the campus.*

Student A: *They're at the front desk by the pool which is practically in the basement. Until I started working there I never really went down there either.*

In the second focus group, students discussed a similar issue as follows:

Student A: *I haven't seen really any pushers for exercise around campus. I know we do have a gym, but . . .*

Student B: *It's not pushed.*

Student A: *Yeah, I only know one person who ever uses it and it's because it's convenient for her specifically.*

Student C: *And it's so hidden. I found it one day on accident and I'm like, "Oh, that's where it is."*

Additionally, students provided multiple examples of the presentation of material targeting reduction of unhealthy behaviors, versus the promotion of increasing healthy behaviors. A dialogue between two students captured this discrepancy:

Student A: *Like there's a lot of – this might be touchy but, there's like a lot of anti-drug, anti-alcohol bulletin boards – or not bulletin boards but . . . yeah, like posters and even things sitting right by the walkway so it's really easy to notice them and that's great but if we could promote healthier lifestyles...I mean, if there was something else that was right there like . . .*

Student B: *I believe that what you're saying is "You can say, 'no, don't do this, don't do this...'", but we need an alternative to not smoking and not drinking. Give us something to do.*

Summary of current health promotion. Administrators and students have had congruent views regarding most topics discussed in the interviews and focus groups; however, they diverged when discussing current health promotion. Overall, administrators described a vibrant network of health promotion, whereas students saw limited positively-aimed activity. This divergence represents a significant disconnect between the groups' views. Although students described limited health promotion efforts, it is noteworthy that administrators discussed a trend in students requesting healthier options (see Supports). It seems that students are receiving some type of health promotion message; however, the source of the message is unknown. It may well be that the health promotion efforts by administrators are having an implicit effect, even though students are not able to explicitly recognize the source of the messages. Alternatively, students may be receiving the message from other sources, although they also did not identify the source of their knowledge. Given the discrepancy in health promotion views and the description of other challenges facing college students, both groups were asked to provide their view of potential improvements.

Suggestions for Improvements

As noted previously, many students did not change from having a BMI in the overweight or obese range, despite an overall trend of less caloric consumption and increased physical activity. Therefore, in conjunction with the question regarding barriers to improving students' health, both groups were asked to comment on how the university could make improvements. Specifically, participants were asked, "*What are some things the university could do differently to promote healthy eating and exercise among its students?*"

Participants noted much opportunity for potential change. Primary areas for improvement were greater access to and options for healthier foods and increased access to adequate recreational facilities. Consistent with previous results, participants, particularly students, noted a need for increased health promotion and education. Additionally, both participant groups described necessary changes in university policies to promote health. Administrators also discussed strategies to integrate university

resources to promote health. Areas for improvements and specific recommendations are described below.

Improving access to healthier foods and recreational facilities. The key areas for improvement described by both participant groups were developing greater access to and options for healthier food, as well as improved access to recreational facilities. In regard to food, participants requested having healthier food options spread throughout the campus, rather than concentrated in a few limited areas. One student highlighted this theme, commenting that:

> *There might be free food offered in one area of campus, like "okay, those are my healthy options." But, it you're in the library and you want something it's like, "oh, well it's much easier to get a muffin from Starbucks® than it is to walk all the way down to the student union to get a sandwich." So, options that are little bit more spread out I think would be helpful.*

Another suggestion by students was the development of a grocery cooperative (food co-op). Although students did not specifically use the term food co-op, they described a system that resembles a food co-op. Students discussed being willing to pay a food fee to have the university purchase bulk, unprocessed foods and provide a small store front where they would be able to buy foods at a cost similar to, or less than, a local grocer. Students identified this strategy as a way to provide access to healthy food options, as well as create a healthy grocery store on campus. Students noted that the nearest grocer is multiple miles away from campus, a distance that can create a barrier for students without transportation. Therefore, an on-campus grocer would provide those students easy access to healthful food options.

A final suggestion from both students and administrators for improving access to food was creating communal kitchens for students living in the dormitories. Participants noted that having a communal kitchen would provide students the opportunity to cook their own food, promoting a greater skill set for adulthood and a greater variety for foods. As one student explained:

One thing that the dorms might consider doing if they ever have a renovation in future years, is at other universities, even in the dorms, where they don't have kitchens in their rooms, there is a kitchen on every floor. It may be crowded with forty people every night, but there would at least be an option to make stove top soup and not just have to live off of peanut butter and jelly.

Regarding recreational facilities, participants discussed the desire to have a larger facility in the near future. Participants noted that the university has plans to build a new athletic complex and expressed the hope that this will expand the current athletic complex into a larger student recreation center. Congruent with the added space would be a more open schedule and added opportunities for activities. This theme was captured by the following administrator comment:

I really think that, and we've talked about this when we started talking about the recreation facility that is now evolved into the sports arena, I really believe that a fabulous recreation place is needed on this campus. Something with a rock climbing wall, something that's more of this era; students really like that kind of thing. I've seen some campuses that have that and it really is well utilized by both on-campus and off-campus students.

In addition to hope of a new recreation center, participants suggested having regularly scheduled activity times for non-organized sports. For example, a student described having a weekly day and time set aside for a specific activity suggesting, "*what they could do is, like at my old school, they'd do like, 'Wednesday Night Volleyball', that's like at a certain time every single week. I think if they did that you'd meet new people and get exercise.*"

Another suggestion that arose in both participant groups was a university partnership with a local gym to provide a reduced-fee membership, creating more access to recreational activities. Students particularly pushed this option, as they recognized that the vast majority of students at the university do not live on campus. One student highlighted the idea, stating that:

I think it would be great for the university to get on with some sort of gym, you know, to offer students some sort of discount for joining for a membership to a gym. That might, because, you know, a lot of students live all around town so it's like they could access a gym in their own area without having to come to the school.

Education and promotion. Students and administrators discussed areas for improvement in regard to health education and promotion. Both groups discussed the need to provide students with information regarding local resources for activity (i.e., city trail system), particularly commuter students. The idea was exemplified by the following administrator comment:

There is a huge bike trail system and cross-country skiing system right outside our back door. Now, if you get a student who's never cross-country skied, never done anything like that, they may not see an opportunity to recreate that would actually get them off campus, into the wilderness even though it would be in the city. I think that's an opportunity that hasn't been really explored and promoted

Students perceived a lack of health promotion on campus but could not offer suggestions for improving accessibility of extant promotions. Participants discussed receiving information by email or through social media (i.e., Facebook®, Twitter®). They noted that other attempts appeared unsuccessful, largely due to lack of maintaining informational announcements. A dialogue between students in a focus group highlighted their preference to have information emailed to them.

Student A: *I did not know that there was open skate or open swim. I don't really know anything about the gym at all, and if that was promoted a little more heavily I think I would probably, at least, look into it.*

Interviewer: *So just promoting what's even available currently?*

Student A: *Yeah, I mean, if you don't know about it you're not going to use it.*

Student B: *Having like, skate night, "Everyone come to the skating rink."*

Student A: *I get an email every week that somebody died, I mean . . .*

Student C: *Oh yes, I hate that. You're just like, "Can I ever have any good news?"*

Student B: *Can I get good news? Something like skate night...how about that?*

Student B: *Also just for the gym, I know a lot of people don't know how to properly use equipment so maybe if they had... not all the time, but maybe like, "Come down to the gym today and learn how to properly use this or use that," or get a custom work out thing. It doesn't have to be all the time, but just a little once-a-month type thing.*

Student C: *Also, when they try the little Twitter® pages, like actually keep up with it because I know a couple of . . . like, they have a University Free Food one and they don't really update even though you know there's free food on campus.*

In addition to promoting currently available resources, participants discussed creating a wellness rewards program to help incentivize healthy behavior. Multiple administrators described this idea and likened it to a similar employee wellness program at the university. Although multiple administrators remarked about the program, they doubted that there would be adequate resources to make it successful. One administrator's comments highlighted the idea of a wellness program:

I think that if they offered a wellness program for students, just like on an entry level, low level, I think that there would be students who would take them up on that. I think with the program you can mark things that you do that are healthy and then after a hundred points you get a prize, having that for students, that incentive. Not just exercise but, "did you eat breakfast all this week?" "Yeah, I did". "Did I wear my seatbelt?" "Yes, I did". Stuff like that. I think that would be good for the students.

Policy changes to promote wellness. Administrators and students discussed multiple policies they would like to see changed to promote wellness. In regard to physical activity, both groups suggested moving Student Recreation from being under the Athletics department to becoming a part of Student Affairs. Both groups discussed that students are often frustrated with requests for athletic fee adjustments, as they view such

fee changes as helping only a select group of students (i.e., athletes), rather than the greater student body. Therefore, both groups suggested policy changes – either separating the student recreation fee from the Athletics department or moving Student Recreation under Student Affairs. The themes outlined by participants were exemplified by one student's comment, followed by an administrator's comment:

> Student's Comment: *The price of the recreation fee that we pay has always frustrated me greatly, especially when I know how little actual students participate and use the sports complex. That we pay for our teams' travels and that has always been a thing that I have not been pleased with.*
>
> Administrator's Comment: *I think the students would approve a fee increase if they actually felt like it would get them more access to recreate. They didn't want a fee increase last year because they weren't going to get anything more for that fee increase. Part of the problem, the student's fee goes into athletics, which also gets them like free tickets to hockey games. Other places it's a separate fee. For example, one fee for student recreation, which gets them access to the gym and then there is a different fee get you free hockey tickets, but here it's all tied to the same thing. In other campuses, recreation -- student recreation -- is more tied with Student Affairs than with Athletics. I think that sometimes serves students better. Then their focus is on students and recreating, instead of athletes and you know...traveling, and NCAA titles, and things like that. I think they're very different missions.*

In regard to nutrition, students and administrators described a variety of desired policy changes, particularly as related to contractual issues and meal plans. The main change suggested was to allow multiple vendors for food on campus, instead of a single vendor system. Participants described that requests to allow healthier vendors into the university food system were denied due to current contractual guidelines. Participants noted that current vendor contracts do not offer the flexibility to provide a variety of food options for university and student events. One administrator explained this well:

I guess one thing we always see is that free food brings students to things and unfortunately free food is usually not the healthiest options. So with contracting rules we can only spend $250 or else we have to go through catering to get them food. My students serve a lot of food to students. So, healthy options are more expensive, and yet they are tied to this $250 limit. It'd be cool in the next contract if you could get it waived for healthy choices. Like if my students could buy $400 worth of fruit instead of $250 worth of donuts, or pizza, because it's fine for them to go over the $250 because it's a healthy choice.

Students suggested policy changes related to funds for meals plans not rolling over to the next semester. Students described how the current policy can encourage overconsumption of unhealthy food, particularly at the end of the semester. Therefore, students offered the idea that the monies transfer to the next semester, therefore, not creating a binge on unhealthy foods. The idea was highlighted by the following student comment:

Towards the end of the semester, when you try and get rid of all of our meal blocks since they don't roll over, you're going to spend a lot of them on large amounts of unhealthy food, like cases of soda and energy drinks. So, the policy by itself is pretty unhealthy.

Integration of services. Administrators discussed their perceptions that greater integration of university services would help promote student wellness. Multiple administrators discussed the idea of having a wellness center at the university where multiple training programs targeting health behaviors could be co-housed. One administrator described the idea at length to have a holistic center with services co-located for easy access, explaining that:

Here's my big dream. It would be to have the Health Center embedded in the Athletic Complex and have it be a Health and Wellness Center. So that not only would we be providing health care for episodic illness but health prevention. Wouldn't it be nice to be right next door to psychological services doing groups with a focus on eating disorders, and then the Health Education Department

could do biometric analysis. You could then have personal trainers that could help people. I think there's a lot of comingling that could happen if you had a health center that was a training site for different programs. It would benefit not only the various departments but the students, and allow greater services through the integration.

A similar idea was to use university training programs to enhance the health of students. Administrators described having various health-focused training programs provide direct services for students and the university as a whole. Specific programs mentioned were the nutrition and dietetics programs, culinary arts, physical education, counseling programs, and nursing. One administrator highlighted this idea with the following comment:

I don't know exactly how this would work out, but we have an outstanding culinary program here and a growing nutrition dietetics program and I would like to see those students somehow, in a leadership position, teach other students and prepare healthy meals. It seems to be just such a shame that we have excellent students preparing healthy culinary food yet our students go on the other side of the wall to eat food prepared by catering, which is not as healthy. So, I think the University could somehow connect those two things and students could be teaching other students about healthy eating practices and how food is prepared.

Challenges for improvements. In addition to discussing potential improvements for student wellness, administrators were asked to discuss potential challenges in implementing such supports. Administrators were asked to comment on these challenges, as they often have more information regarding policy and contractual issues. Administrators also have institutional knowledge and the ability to shape policies and allocate resources that influence students. In response, participants noted multiple challenges to implementing supports, largely related to finances and resources. Additional challenges emerged in the context of legal liability, promotional challenges, and student motivation to participate.

In regard to financial and resource challenges, administrators noted that any change shifts finances and resources. Participants described limited funds and resources to provide the options that currently exist. As one administrator stated;

> *Money is always a challenge. A lot of times, to promote change it costs some sort of fiscal amount to change over to that operation especially with dining and things like that. Maybe the people that have healthier options, and they can do healthier options have a more expensive contract.*

Similarly, in regard to the recreation center, an administrator discussed how the limited resource would be overwhelmed if more promotion was to occur. This notion was highlighted in the exchange below:

> Administrator: *The size of the facility [recreation center] that is accessible is a challenge. If our student body was actually being promoted to go work out and use the facilities, there's not enough room. I think the only reason it works right now is because not that many people use it and so it works . . .*
>
> Interviewer: *If people actually did start going, it would fill up in a matter of minutes.*
>
> Administrator: *There's (sic) five treadmills. I mean, when you have a student body of this size it'd be overwhelmed.*

In addition to challenges related to finances and resources, administrators discussed issues of legal liability, promotional challenges, and concern about lack of participation from students. Multiple administrators noted the desire to have a more active outdoor adventure program; however, they were also quick to point out that legal liabilities may be too stringent to have a broad program. The administrators highlighted a previous severe accident that has caused trepidation among the administration to develop a larger program. One administrator discussed the point, stating, "*I talked about like the lack of outdoor recreation programs. It's growing, but because of accidents that happened years ago, the university doesn't want to support the programs.*"

Although many administrators previously discussed their view that physical activity and proper nutrition were well promoted, some did make statements congruent

with students' perspective that wellness promotion is non-existent. Two key points were raised regarding promotional challenges. One point emerged in relation to the hope of a new recreation center. An administrator described that a history of a lack of promotion of the current facility may preclude future involvement:

> *I envision that when we have the time [for additional recreation], people will love us and come running out of the woodwork. I think the challenge will be is once we have the opportunities is to make sure we promote them in such a way that we start getting students back involved.*

Another promotional challenge highlighted was similar to the students' view that many promotional efforts are targeting the prevention of unhealthy behaviors rather than the promotion of healthful behaviors. One administrator captured this idea clearly in the following statement: *"I see a lot of focus right now on alcohol and drug prevention. However, instead of just focusing on these negative, harmful behaviors, also focus on promoting the healthful behaviors."* Therefore the challenge noted by the administrator, was actually being realized by the students.

The final challenge noted by administrators was concern about limited motivation among students to actually engage in healthier behaviors, even if opportunities exist. The key informants expressed the view that participants may be more likely to choose less healthful foods due to taste or familiarity, not due to issue of access. Participants expressed similar concern about students not actively participating in recreational activities. The following administrator comment exemplified this concern:

> *I guess it's if people are willing to take us up on it. Just the idea of people not thinking they're going to enjoy the food, but they want the pizza and not enjoying or partaking in the healthy options. So we offer them up, but maybe they wouldn't take us up on it. I think that's maybe the hurdle because we can do so much, but they still have to meet us in the middle.*

Summary of suggested improvements and identified barriers. Administrators and students provided a multitude of suggestions for improvements to support physical activity and healthful eating. Suggestions revolved around greater access and options for

healthier foods and recreational facilities. Participants discussed changes to current health education and promotion efforts, with students noting the use of email and social media as potential media for successful promotion. Both groups highlighted policy changes that could be implemented that would create systemic influences to promote better options for recreation. Specifically, they suggested a separate fee schedule for student recreation and having the department be housed under Student Affairs, instead of Athletics, due to divergent missions. Administrators expressed hope for a greater integration of training programs aligned with service delivery. In addition to ideas for improvement, administrators described various barriers, including financial and resource limitations, legal liabilities, promotional challenges, and concern about student motivation to participate in healthier behaviors.

Response to Research Findings

Findings from the first phase of the study suggested that students' specific dietary habits had implications related to weight gain. Specifically, students who reported eating more sweets and desserts had increased odds of gaining weight versus those who did not. Additionally, students who gained weight reported consuming fewer calories from fat across time. Therefore, it appeared that students who gained weight were reporting greater consumption of sweets and desserts, but fewer calories from fat. Participants were asked about their reactions to these findings to develop a greater context in which to understand and use them. Students and administrators were asked the question, *From our research we found that students who gained weight in college ate more sweets and desserts and ate fewer calories from fat. The research is consistent with other reports that limiting certain types of fat and increasing sugars in your diet can lead to weight gain. Does that information change the way you think about anything we've talked about today?*

Interestingly, participants did not express surprise by the results, but rather provided quick anecdotal explanations or speculated as to the cause of the increased consumption of sugar and reduction of fats. Many participants noted various means for students to consume more sugar than fats, namely, from sodas and energy drinks (e.g., *"I*

think this is a generational thing, but the students I work with now, drink a lot of energy drinks which are very high in sugar."). Some participants noted past messages about the need to consume less fat in one's diet, while not being notified of the potential health effects from sugars. Similarly, participants also noted discrepant views of students who expressed a desire to be healthier and chose to decrease fat intake, yet consumed excess sugars. These views were highlighted by the following exchange between a student and the interviewer:

> Participant: *You hear a lot of people talking about losing weight, and saying, "I'm cutting down on fats," and here they are eating Skittles®.*
>
> Interviewer: *Okay. It is fat free.*
>
> Participant: *It is fat free but they're eating two bags of them and you're like, "Good luck with that."*

Overall, participants' responses to the research findings noted changes in students' diets that include an increase in sugar, while others expressed the view that students may not be knowledgeable about the health consequences related to sugars. Participants' responses were consistent with results from the first phase, specifically, students reported a high level of self-efficacy and motivation to live healthfully, yet were simultaneously reporting behaviors incongruent with their ratings. Therefore, based on the context of the participants' responses, students may need additional education or need to have different food options available.

Summary of Qualitative Results

Overall, administrators and students provided similar responses to the interview protocols. Both groups defined healthy nutrition and physical activity consistent with current health guidelines. Participants identified multiple supports and challenges for healthy living among college students. The supports identified included having access to healthier foods and recreational facilities, university resources to support healthy behaviors, administrative responsiveness to student needs, and a noted trend toward healthier living among students. Both groups discussed how the physical environment of the university and its surroundings (e.g., enclosed walkways, nearby city bike trails)

promoted physical activity. Despite overlap between student and administrator perspectives, the groups diverged regarding the view of staff modeling and explicit health promotion programs. Notably, administrators discussed at length the efforts made in health promotion and staff modeling, whereas students did not seem aware of those efforts.

Oftentimes, supports and barriers mirrored one another. Participants described having access to some healthy food options and recreational facilities as a support, but later described their access as limited, thus creating a barrier for increased physical activity and eating healthfully. Additional barriers included the weather in a northern climate, limited motivation among students, transitioning to college and adulthood, and students having limited knowledge regarding healthy nutrition. A final challenge discussed by administrators was concern that staff were promoting or modeling poor nutritional choices. Although administrators expressed this concern, students did not acknowledge staff behavior as influencing their decision to choose unhealthy food.

Participants identified a number of key differences between students who live on campus and those who commute. Students living on campus were described as younger and as transitioning to independence. Other differences included better availability of healthful foods and preparation facilities for off-campus students. Conversely, participants described residential students as more likely to exercise due to convenient access to recreational facilities. Participants noted that students who live off campus are harder to engage with promotional efforts due to their limited time on campus; in contrast, participants discussed residential students are readily engaged by the promotion activities.

In addition to comparisons between the two student groups, administrators were asked to provide their perceptions of the university's role in supporting healthful living. Administrators consistently expressed the view that the university has an obligation to provide a healthy environment to promote active learning. Although key informants were clear about the university's role in the health of its students, they did acknowledge that other administrators or the general public may have conflicting beliefs and opinions.

In addition to discussing supports and challenges, participants were asked to provide suggestions for improvements. Administrators and students had a multitude of ideas, including providing greater access and options for healthier foods and recreational facilities. Students noted the use of email and social media may be a potential medium for successful health promotion. Both groups highlighted policy changes that could be implemented that would create systemic influences to promote greater options for recreation. In addition to ideas for improvement, administrators described various challenges, including financial and resource barriers, legal liabilities, promotional difficulties, and a concern that students would not be motivated to participate in healthier behaviors.

In ending the interview protocols, participants were asked to give their reaction to some of the salient findings from the first phase of the study. The specific finding discussed was related to the dietary habits of students. Overall, participants' responses noted changes in students' diets that include an increase in sugar, while others expressed the view that some students may not be knowledgeable about health consequences related to sugar consumption. Based on the context of participants' responses, students may need additional education or have different food options available, as previously discussed by the participant groups.

Consistent with a mixed-method approach, the findings from the qualitative phase helped contextualize the results from the quantitative phase. Together, the findings from the quantitative phase and the subsequent qualitative phase have several important implications. The integration of findings and related implications are the topic of discussion in Chapter Six.

Chapter 6: Discussion of Quantitative and Qualitative Findings

Through the integration of quantitative and qualitative research methodologies, this study explored weight gain among first-year university students over the course of two years to provide a strong foundation for recommendations for improvements to the documented phenomenon (Vella-Zarb & Elgar, 2009). An explanatory mixed-method approach was employed for this study to develop a greater understanding, as the methodology provides an opportunity to explore a topic with greater breadth and depth (Johnson & Onwuegbuzie, 2004). As described previously, the study was carried out in two phases, a quantitative examination of archival longitudinal data (Phase I) and a qualitative phase (Phase II) contextualizing findings from the quantitative analysis. The integration of these two phases culminated in a third phase that created a comprehensive overview of health-related behaviors of first-year university students, along with contextual barriers and supports to healthy living among college students. Based on these findings, a series of evidence-informed recommendations are offered for university service and care providers, as well as academic policymakers to address health needs of new and continuing university students.

Anthropomorphic, Behavioral, and Psychological Characteristics

The students who participated in both phases of the longitudinal study had an average BMI of 24.1 and body fat percentage of 25.2% at baseline, both of which are within the normal range (Flegal et al., 2010). The majority of students' BMI was within a normal range (68.7%), with remaining participants in the overweight (18.2%) and obese range (13.1%). Nearly all participants' BMI status category (BMI < 25 versus BMI ≥ 25) remained static over the course of two years (90% of sample), despite changes in their diet and physical activity. Although nearly one-third of participants gained five or more pounds, few participants had a change in their BMI status category.

Participants' average reported caloric consumption was 2124 calories (reflecting a 20% adjustment for possible under-reporting) at baseline, with the majority of calories coming from carbohydrates, followed by fats and then proteins. Reported calories and macronutrient distribution are similar to those reported in past studies and in line with US

dietary guidelines from the same data collection period (Butler et al., 2004; Megel et al., 1994; Wengreen & Moncur, 2009; USDA-DHSS, 2005). Additionally, at baseline, participants reported consuming 11.1% of their calories from sweets and desserts.

In regard to physical activity, participants in the longitudinal study reported 923 METs minutes/week worth of activity (reflecting an adjusted reduction of 65% for possible over-reporting). The average reported activity is nearly equivalent to *either* walking 60 minutes daily, 50 minutes of moderate activity a day, or 25 minutes of vigorous activity (e.g., running, basketball) a day, five days a week. Therefore, on average, participants reported meeting or exceeding the recommended amount of physical activity (USDA-DHSS, 2005); however, nearly 45% of students did not meet the recommended amount. Thus, there appear to be two divergent groups of students: those who exercise regularly and those who do not. The discrepancy noted between an overall active student body versus a large proportion of students not meeting physical activity guidelines is consistent with prior research (Driskell et al., 2005; Morrow et al., 2006).

Consistent with previous research about self-efficacy among college freshmen (Butler et al., 2004), participants reported a high level of self-efficacy related to healthy nutrition and maintaining an active lifestyle. Additionally, participants reported high motivation for eating healthfully and exercising. The majority of participants indicated they were either in an action stage or maintenance stage for both physical activity (68%) and healthy nutrition (61%). These results are consistent with previous studies examining motivation among college freshmen (Racette et al., 2005).

Participants' anthropomorphic, behavioral, and psychological characteristics are consistent with previous studies and national norms. Although the characteristics are consistent and within norms, it must be noted that discrepancies existed between some students' reported self-efficacy and motivation and their reported behaviors and anthropomorphic measurements. This discrepancy is highlighted by nearly 45% of students not meeting recommended physical activity guidelines, yet the majority of participants indicating that they have a very high level of self-efficacy for engaging in regular exercise and being in the action or maintenance stage for exercising. Similarly,

nearly 10% of participants' total caloric intake was from sweets and desserts, despite high scores on self-efficacy and stage-of-change measures for nutrition. One may conclude that participants not engaging in the healthier behaviors are the same people not reporting the higher scores; however, this hypothesis was unfounded when examining the sample dynamics at baseline and longitudinally. Namely, students who reported differing levels of self-efficacy reported similar levels of physical activity and consumption of sweets or desserts. Therefore, the discrepancy noted between reported behaviors and health-related motivation and efficacy was found throughout the sample. The discrepancy noted above highlights the importance of examining the contextual factors that may affect students' ability engage in healthful behaviors.

Overall sample changes. The importance of examining the contextual factors that may affect students' ability engage in healthful behavior was also highlighted by discrepant trends noted in changes in the overall sample across time. Students who participated in both the baseline and follow-up studies reported consuming fewer overall calories, increasing their protein intake, decreasing their consumption of sweets and desserts, and being more physically active at the two-year follow-up compared to their baseline measures. In essence, students reported an increase in healthier behaviors and continued to report a high level of self-efficacy and motivation across time. Although students reported healthier trends in their behavior at follow-up, average weight, BMI, and body fat percentage did not change significantly. In fact, the average change in weight was an increase of 1.5 pounds and nearly 90% of the sample did not change in their BMI status. The non-significant change in weight is congruent with two prior studies (Graham & Jones, 2002; Hodge et al., 1993); however, the non-significant change in weight contradicts the majority of prior studies (Vella-Zarb & Elgar, 2009). Although a non-significant change in weight occurred among the sample overall, nearly a third of the group (31.7%) gained more than five pounds, which is consistent with prior studies (Vella-Zarb & Elgar, 2009).

Sample changes by baseline BMI status, gender, weight change status.

Beyond the trends present in the overall sample, there were no significant differences in health behaviors based on students' baseline BMI status category. In essence, BMI status did not predict whether students were going to change their physical activity, alter their diet, gain weight, or have different psychological perspectives related to health behaviors. This finding has implications regarding targeted intervention and prevention efforts; specifically, *all* students should be a target audience for prevention and intervention efforts, regardless of BMI. Although significant differences were not present based on students' BMI status, a few differences emerged between men and women and between those who gained weight versus those who did not. Specifically, men and women did not differ on the majority of variables examined with two exceptions. First, men reported greater physical activity than women. Second, although men reported more exercise, women were more likely to lose weight and men were more likely to gain. Despite reported increase in physical activity, weight gain among men did not correspond to a significant change in body fat percentage, indicating that the increase in weight among men did not correspond to an increase in muscle mass. The likelihood for men at this stage of life to gain weight is an important finding, as most studies to date (less than 30%) have not included a large proportion of men.

Beyond differences noted between men and women, there were significant differences between students who gained weight versus those who did not in regard to consumption of calories from sweets or desserts. Those who gained weight reported consuming more calories from sweets and desserts at both baseline (5.8% more) and follow-up (2.9% more) than those who maintained or lost weight. Overall, both groups decreased their consumption of calories from sweets and desserts, but those who gained weight still consumed a significantly greater amount.

A significant interaction effect emerged between weight change status and time, related to percentage of fat calories consumed. At baseline, there was no significant difference in consumption of fat calories between participants who gained weight and those who maintained or lost weight. However, across time those who gained weight

reported a reduction in calories from fat versus the reported average increase in fat consumption among those who maintained or lost weight. That is, those who lost weight ate more calories from fat across time than those who gained weight. Therefore, at baseline, the two groups were undistinguishable by their consumption of fat calories, but those students who chose to restrict calories from fat across time gained weight. This finding is noteworthy when considering the between-group effect of an increase in consumption of sweets or desserts, which was also the *only* significant predictor variable of weight gain and change in body composition. These findings are noteworthy when considering that increase in sweets or desserts *and* the limiting of fats were related to weight gain. Given this combination, the driver of weight gain appears to be food that is laden with carbohydrates (sugars), rather than fats.

These findings are consistent with prior research on college student dietary behaviors and relevant nutrition literature. For example, in examining nutritional factors related to weight gain during the first year of college, Wengren and Moncur (2009) found that students who gained more than 5% of their baseline weight ate more "junk food" snacks. Similarly, Levistky and colleagues (2004) identified eating "junk food" as a primary variable that accounted for most weight gain during the first-year of college. Additionally, weight gain associated with the increase in calories from sweets or desserts and the reduction of certain types of fat is also supported by current nutrition literature (Astrup, 2005). Specifically, multiple studies have linked the reduction or absence of monounsaturated-fatty-acids (MUFAs) with increased weight gain and associated diseases (i.e., type II diabetes, cardiovascular disease; Misra, Singhal, Khurana, 2010; Moussavi, Gavino, & Receveur, 2008; Warodomwichit et al., 2008). Therefore, combining the findings from the current study and prior research, it appears that students who gain weight tend to eat more calorically dense snacks that are higher in sugar and lower in fat (i.e., sodas, candy).

Summary of anthropomorphic, behavioral, and psychological characteristics. Overall, the majority of students were in the healthy BMI range, consistent with national norms. Additionally, the student sample as a whole reported eating and exercising within

recommended guidelines and perceived themselves as being able and motivated to live a healthy lifestyle. Although the majority of students reported being able and motivated to live healthfully, some students' behaviors were incongruent with their beliefs. Namely, some students did not exercise regularly or consumed an excessive amount of calories despite reporting high motivation and self-efficacy. Additionally, students as a whole reported a trend of engaging in healthier behaviors, yet that trend did not translate into the expected change in anthropomorphic measurements over the two-year study. Finally, in examining the characteristics of students who gained weight, the driver of weight gain was related to dietary habits, particularly an increased consumption of sweets or desserts and decreased consumption of fats. Therefore, students' self-efficacy and high motivation to engage in healthful behaviors are not sufficient to overcome environmental and contextual factors that get in the way. Given these findings, it is essential to contextualize and integrate these results with findings from the qualitative phase to determine where supports for healthy living can be bolstered and barriers removed within the university setting.

Contextual Factors Affecting Weight Gain

Students and administrators demonstrated that they were knowledgeable about recommended nutritional and physical activity guidelines; however, inconsistencies existed between reported knowledge, motivation, and self-efficacy and students' health behaviors. Specifically, students appear to have adequate knowledge related to healthful living and report high levels of motivation and self-efficacy; yet, students reported consuming nearly 10% of their daily caloric intake from sweets or desserts and roughly 45% did not meet physical activity guidelines. Therefore, it appears that students' knowledge and intention is not translated into consistent action. This discrepancy in results suggests that students are unable to overcome contextual and environmental challenges to living a healthy lifestyle.

The primary challenge identified through the qualitative data collection was limited access to healthful food and recreational facilities, coupled with high availability of unhealthy foods despite a commitment from university administrators to support a

healthy environment. Limited access to healthful foods and greater availability of sugar-laden foods are consistent with the reported consumption of sweets and desserts and weight gain from their consumption in this and prior research. Wengren and Moncur (2009) found that students who gained more than 5% of their baseline weight ate fewer fruits and vegetables, consumed less milk, drank more sweetened beverages, ate more "junk food" snacks, and ate more meals at a dining hall and "fast-food" restaurants. Similarly, Levistky and colleagues (2004) identified variables that accounted for most weight gain during the first-year of college as eating "junk food" and eating at an "all-you can eat" facility. Congruent with results of the current study, it appears that students who gain weight tend to eat more snacks and dine at "all-you-can-eat" dining halls.

In regard to physical activity, students and administrators discussed the presence of a recreational facility, but noted that the facility is small, crowded, and has limited hours of operation. The limited access to a recreational facility was a common discussion point among the qualitative study participants, who noted their desire but lack of opportunity to engage in more physical activity. Although lack of physical activity was not a driver of weight gain in this study, prior research has indicated that a lack or decrease in physical activity among college students leads to increased weight (Butler et al., 2004; Jung et al., 2008; Kasparek et al., 2008). Although it is unclear if access was the reason for a large portion of the sample not meeting physical activity guidelines, the desire to have adequate access was apparent among students, particularly given their enrollment at a university in a northern climate.

The presence of these challenges does not imply that administrators are not putting effort into supporting students' health. In fact, administrators provided examples of numerous efforts in promotion, modeling, policy commitments, and responsiveness to students' needs. Students recognized many efforts of the administration, with the exception of those related to health promotion and modeling. Although students did not acknowledge active promotional and modeling efforts, their knowledge base reflected acquisition of health-related knowledge. Administrators also recognized that current university policies are not as conducive to supporting healthy nutrition and exercise.

Specifically, they noted that the Student Recreation department may have conflicting obligations under the parent organizational structure of the Athletics department. Additionally, they noted contractual limitations related to multiple food vendors, and consequences of certain meal-plan policies.

In sum, participants noted that some healthy food options and recreational opportunities exist, but their limited availability and variety create a challenge to maintaining a healthy lifestyle. These sentiments are consistent with the longitudinal study and participants' desire and motivation to live a healthier lifestyle. Additionally, the expressed desire is consistent with the trend toward healthier behaviors noted in the quantitative and qualitative phases of the study (i.e., increased physical activity, reduced calories from sweets or desserts, reported trend of activity on campus).

Implications

Results from this study highlight the interplay between individuals' perceived abilities, motivation, behaviors, and environmental factors related healthful living. The tension arc between individuals and their environment is consistent with past research that examines how changes at an individual level is necessary, but not sufficient to overcome environmental barriers (Centers for Disease Control, 2009). Therefore, weight management is not just an individual issue, but an environmental or systemic one, as shown in Figure 2. Several factors were identified by students and administrators that contributed to weight gain. As presented in Table 22, these factors fall into three broad categories: access, health promotion, and policy.

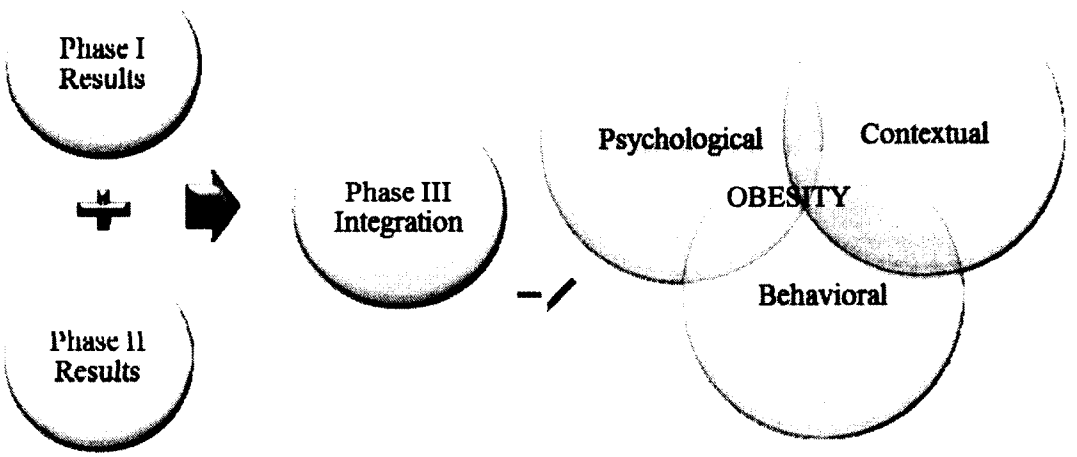

Figure 2. Interplay between study results and factors related to weight gain.

Table 22

Current Factors for Weight Gain

Current Factor	Problem
Access	
High availability of sugar rich, nutrient deficient foods	Increases consumption of sugar-laden foods
Limited access to healthier foods	Limits opportunities for healthier decision making
All-you-can-eat dining for residential students	Creates opportunity for excessive calorie consumption
No available food preparation in residence halls (i.e., kitchens, sinks)	Impairs ability to prepare healthier foods
Limited access to recreational facilities & inclement weather	Limits opportunities for exercise
Policy	
Inability to roll-over left over meal plan food monies	Creates opportunity for to students to binge on unhealthy foods purchased at the end of the year
Rigid policy regarding outside food vendors	Limits access to foods that may be healthier than current food vendor
Student Recreation housed under Athletics department	Leads to conflicting mission with the focus on Athletics (i.e., athlete funding, priority of facilities)
Student Recreation fee coupled with Athletics fee	Results in students not seeing the value in Athletic fees and voting down changes for fee increase
Promotion	
No unified health promotion campaign	Leads to students not recognizing university efforts in health promotion Leads to duplication of staff efforts in health promotion Results in staff feeling and being underappreciated by students
No positive health promotion activities	Leads to students only receiving negative message about what not to do rather than positive message about healthful behaviors
No health promotion activities using modern technology	Leads to strategies that are less than effective in capturing students' attention to health promotion efforts

Given the factors outlined in Table 22, action appears needed by all stakeholders in the university system to counter weight gain during collegiate study and to provide another element of support for students' foundation of health. Action must be initiated particularly by administrators with influence on policy development and environmental change, as well as by students developing individual strategies to improve their health and advocate for change. Presented below are action items students and administrators can implement to engender support and change in the lives of students to help prevent the sequelae of the status quo.

Recommendations for students.

Knowledge development. Students demonstrated adequate knowledge regarding general nutritional guidelines; however, in the longitudinal data, students reported

consuming excess calories from sweets or desserts and those who gained weight consumed less healthful fat. Therefore, it is recommended that students as a whole would benefit from learning more information regarding nutrition, particularly the role and effects of macronutrients, nutrition labeling, and food production. Being an informed consumer of foods provides a stronger foundation for health and wellness, as well as being able to advocate for improved foods. Additionally, past research supports that an increase in knowledge about nutrition and physical activity can support weight maintenance (Hekler, Gardner, & Robinson, 2010; Hivert, Langlois, Berard, Cuerrier, & Carpentier, 2007; Matvienko, Lewis, & Schafer, 2001).

As demonstrated by these data and previous research, beyond learning broader nutritional knowledge, students would benefit from reducing their caloric intake of sugar laden foods and incorporating an appropriate amount of healthful fats [e.g., monounsaturated fatty acids (MUFAs) and polyunsaturated fats (PUFAs)]. Students would also benefit from incorporating regular meals, rather than eating inconsistently throughout the day or week. Prior studies have demonstrated that regular meals help maintain body weight and increase appropriate insulin and lipid levels (fat) among children and adults (Edelstein, Barrett-Connor, Wingard, & Cohn, 1992; Kant, Schatzkin, Graubard, & Ballard-Barbash, 1995; Koletzko & Toschke, 2010). Although various levels of fruit and vegetable consumption were not a predictor of weight gain in this study, student are encouraged to consume appropriate levels of fruits and vegetables, as previous studies have noted that a lack of consumption of fruits and vegetables is a predictor of weight gain (Wengren & Moncur, 2009). In essence, students are recommended not only to enhance their knowledge of foods, but incorporate healthier alternatives whenever possible.

Develop and implement individual strategies to improve health. As mentioned previously, there was a discrepancy between students' reported dietary and exercise behaviors and their high level of reported self-efficacy and motivation to eat healthfully and exercise regularly. Therefore, it is recommended that students develop strategies to increase healthful eating and regular exercise. One strategy for students would include

developing social supports to help achieve their goals. Past research has demonstrated that social supports help increase healthier behaviors in both nutrition and exercise (McKinley, 2009; Nelson, Kocos, Lytle, & Perry, 2009). Social supports may also help students develop plans to overcome environmental factors that can diminish students' resolve in achieving their goals. Other suggestions offered to counter negative environmental factors include packing snacks and bringing healthier lunches to campus and, when feasible, to seek out healthier dining options. When healthier dining options are not available, students would benefit from examining restaurants' menus from a nutritional standpoint to determine healthier options versus less healthy options (e.g., a side salad versus french fries).

Students are also recommended to implement strategies to increase their physical activity on a daily basis to maintain a regular pattern of activity. Although students were quick to note their perceived lack of time to exercise, they also acknowledged simple actions they could implement to maintain activity levels. In addition to developing social supports as discussed above, students discussed actions that include incorporating exercise into their daily routines that is not dependent upon a recreational center, such as walking to classes across campus, biking to school, and utilizing the local walking trails. An increase in daily physical activity not only helps expend excess calories and improve overall physical functioning, but it can lead to healthier eating (Dutton, Napolitano, Whiteley, & Marcus, 2008).

Awareness of promotional efforts. To help students implement their own strategies toward healthier nutrition and greater physical activity, students are recommended to try to be actively aware of the promotional opportunities displayed around campus. As administrators mentioned throughout their interviews, much effort is invested in trying to educate and promote healthier alternatives than what are present in students' day-to-day lives; although, at the same time, students report not being aware of the efforts. Therefore, students are encouraged regularly to read email announcements and fliers that are posted by administrators. Students are also recommended to talk to knowledgeable staff about lifestyle decisions regarding nutrition and physical activity

(e.g., Student Health staff). As mentioned previously, being informed increased students' abilities to manage their weight (Hekler et al., 2010; Hivert et al., 2007; Matvienko et al., 2001).

Considering that administrators expressed concern and a desire to support healthful lifestyles, students are encouraged to be proactive in making requests for healthier alternatives to administrators. Students would benefit from having a consistent, unified voice to demonstrate their desire and commitment to healthier options. Students are encouraged to approach the administration through existing channels, including student clubs and the Union of Students. In the case where an organized club does not exist, students are encouraged to develop health-specific student groups with a mission to promote student health. With an organized element, students can request funds to engender their own strategies to improve the wellness of students. Additionally, administrators were quick to note that students often receive more support and acknowledgment when they have a unified voice and clear organizational plan.

Recommendations for university administrators.

Access to healthier food alternatives. Although students are encouraged to take charge of personal action either to increase or extend their commitment to eating healthfully and exercise regularly, students also require adequate environmental access and support from their university administration (Centers for Disease Control, 2009). Based on the current study's findings, the two primary recommendations to improve the health of students are to increase access to healthier foods and limit the availability of calorie-dense, nutrient-deficient foods and to improve access to recreational facilities. A meta-analysis by Papas and colleagues (2007) found that access to healthier foods in an individual's environment had a direct correlation to lower BMIs in the short-term and long-term (over three years). This recommendation is congruent with the latest *Dietary Guidelines for Americans* (2010), which states that:

> *In order for individuals and families to be able to make healthy lifestyle choices, they first need to be aware of and have access to those healthy choices. Access*

includes not only availability of these choices, but also affordability and safety (p.57).

Not only does the literature support the importance of greater access to healthier food and physical activity options, but it was requested by students and staff alike. Although administrators expressed concern about lack of motivation among students to utilize healthier foods and facilities, students' reported self-efficacy, motivation, and current trends in health should allay fears of underutilization. Therefore, to create greater access, a number of recommendations are offered.

To increase access to healthier foods, administrators are recommended to continue working with vendors to develop healthier food alternatives both in dining areas and vending machines. Administrators may want to consider increasing the number of vendors for on-campus catering, as some students and administrators noted that current vendor contracting is reducing the availability of healthy alternatives. Additionally, administrators should explore the potential for expanding the current on-campus convenience store into a full-service grocer, including access to a produce department.

To aid in developing healthy alternatives for dining services, administrators are encouraged to work with the local university expertise and resources to create nutritious *and* appetizing varieties. Administrators are encouraged to partner the Dietetics and Culinary Arts programs with local vendors to develop menus that are enticing for patrons, as well as providing healthful choices [e.g., spinach salad with dried nuts and fruits and flavorful vinaigrette dressings; herb-roasted chicken (4 oz) with a half-cup brown-rice, or quinoa]. Options for vending machines may include products that are more nutritionally balanced and less processed, such as no-sugar-added dried fruit, roasted and unsalted nut varieties, fruit and nut based granola/protein bars (without refined sugars), no-sugar-added fruit juices, and providing water fountains with spigots for easily filling reusable water bottles. In contrast, administrators are recommended to avoid implementing blind directives that require healthier alternatives that students are not likely to embrace. For example, administrators might require additional salad bars, yet the salad options may not

be appealing, may lack flavor, and do not actually promote wellness (e.g., iceberg lettuce with un-ripened tomatoes, and ranch dressing).

Shifting food options and availability will benefit both residential and commuter students, as each indicated difficulty finding healthier food alternatives while on campus. Additionally, past research has demonstrated that on average, students in dorms have over 20,000 calories worth of food in their rooms, with the bulk of foods being salty snacks, desserts or candy, and sugar-sweetened beverages (Nelson & Story, 2009). Therefore, providing healthier alternatives can either reduce the number of total calories in student rooms or at least provide more nutritionally-sound options.

In addition to providing healthier alternatives, packaging cues have been shown to help increase consumption of healthier foods versus less healthful foods. Freedman and Connors (2010) tracked sales of foods in a university convenience store over a five-week period. Healthier food items labeled with point-of-purchase nutrition information label ("Eat Smart") increased in sales over other similarly-priced items, less-healthy items. Thus, it appears that students really are choosing healthier items when the items are accessible, affordable, and with salient information about their greater healthfulness.

In conjunction with clear packaging cues, students would benefit from having nutritional information readily available for all food items presented to them. For example, all food menus at the food service areas could have signs with visual representations of appropriate serving size and corresponding calories and other nutritional information (e.g., percent protein, type of fat, grams of simple sugars). Similarly, at vending areas, posters could be in place indicating the caloric and nutritional values of each of the food items. In providing such signage, it is important not to limit the information to calories and servings sizes as healthful nutrition moves far beyond calories consumed. Attention needs to be placed on educating students about actual nutritional value of foods. Two items may have similar caloric value and yet be highly discrepant in nutritional value. Creating informational venues in common food areas for helping students become attuned to such nutritional, not just caloric, differences is crucial to supporting more healthful food choices. As mentioned previously, having information

available increased students' abilities to manage their weight (Hekler et al., 2010; Hivert et al., 2007; Matvienko et al., 2001).

Environmental changes could be implemented to increase healthy behaviors. Previous research has shown that environmental changes can influence the type and amount of foods consumed. Environmental influences, such as bowl size and plate size, have been shown to have an effect on the number of calories consumed. For example, study participants who were given a larger bowl or plate consumed an average of 31% more compared to the control group (Wansink & Sobal, 2007). Therefore, a simple recommendation for university dining services would be to reduce the size of their bowls, plates, and drink cups to provide a reduction in caloric intake.

Of course, simply reducing calories is not enough to develop a healthful diet. Reducing serving sizes is but one step in developing healthful nutrition. The incorporation of more nutritionally balanced and quality foods is equally, if not more, important. One possibility to help increase access to such nutritionally superior foods would be the creation of a summer vegetable-growing program in conjunction with the current flower-growing program. Although the university resides in a northern climate, a growing season is present from late Spring into the Fall. Students could be recruited to participate in the growing efforts and summer-session courses could incorporate a service-learning component to develop the produce. Concurrent with service-learning projects, students could work with other local organizations to help teach youth (children and adolescents) the basics of gardening, thus reinforcing college students' learning and promoting health-related knowledge to the next generation. Currently, research does not exist to demonstrate the health effects of gardening among college students; however, past research has demonstrated community gardening has helped adolescents maintain their weight and improve physical functioning (Davis, Ventura, Cook, Gyllenhammer, & Gatto, 2011). First-year college students may have similar benefits considering their developmental transition.

In addition to healthier food alternatives, administrators are recommended to re-visit their policy about leftover monies on student meal plan accounts. As noted

previously, students cannot carry over funds from one semester to the next, thus creating an opportunity for end-of-semester binges on unhealthy foods. In conjunction with healthier alternatives, administrators are encouraged to change the expiration timeframe for meal plan monies. Although a specific timeframe was not recommended by students or other administrators, one timeframe may be to allow the monies to remain available as long as the student is enrolled full-time.

Access to recreational facilities. Students and administrators recommended providing greater access to extant recreational facilities. One recommendation included expanding the available hours for the general student body population at the recreation center. Inclusive of the expanded hours would be the addition of free drop-in classes, such as yoga, aerobics, and dance. Additionally, students and administrators offered the recommendation to consider a substantial policy shift of moving the Student Recreation department under Student Affairs rather than leaving it under the Athletics department. Students and administrators alike expressed the belief that Student Affairs' mission may be more congruent with Student Recreation than Athletics. Students noted that such a substantial change within the organization may make students more amenable to increases in fees for student recreation.

Health promotion. In conjunction with providing access to healthier options and considering students' comments regarding the lack of health promotion at the university, it is recommended to have a unified and positive health promotion program. The program should target promotion of local resources to encourage physical activity, increased healthy food choices, and utilization of local amenities. Although an evidenced-based health promotion program for college students was not identifiable in the literature, worksite promotion, prevention, and intervention programs have demonstrated gains in healthier behaviors among employees (Anderson et al., 2009). Additionally, a call for new contemporary programs with the inclusion of social media is recommended for this generation's college students (Morrel, 2011).

In developing a unified, integrated and positively-focused health promotion program, administrators are encouraged to connect with existing university resources.

Considering that administrators invariably supported a holistic approach to wellness, they may choose to involve faculty and advanced students of appropriate programs. Programs could include, but not be limited to Nutrition and Dietetics, Athletics Department, Psychology Department and Psychological Services Center, Public Health, Business and Marketing, Graphic Design, and the Student Health Center. Given the breadth and depth of expertise within each program, the university could rely on the local knowledge to develop a university-specific health promotion message that embraces all aspects of wellness in a positive manner.

In connecting the various programs, the university could engage a committee that develops a recognizable and coherent student health promotion program. In developing the committee and program, it is recommended student representatives be included on the committee. Past research supports student involvement, as it has been shown that student representatives on wellness promotion development leads to increased student acceptance (Jomaa et al., 2010). The inclusion of students can help provide insights into student-favored media, such as social network sites, local student newspaper and radio, and email or SMS messaging. In addition to social media, health promotion messages could be distributed into existing venues with large concentration of students (e.g., freshmen orientation, library, eateries, Student Union).

Given that students called for internet-based promotion, prevention, and intervention strategies, it is recommended to provide requested strategies to aid in the development and maintenance of healthy behaviors. A simple, cost-effective strategy was developed by Levitsky and colleagues (2004), which required students to monitor their weight daily and send researchers their weight via email. Research staff then sent students a recommended calorie amount to maintain their weight. Students who participated in the study maintained their weight for one semester, whereas the control group gained seven pounds. Gow, Trace and Mazzeo (2010) designed and implemented a similar program to Levitsky's (2004), but with the inclusion of six weekly, 45-minute internet-based information sessions designed for college students. After the six-week sessions, participants in the treatment group lost weight, whereas the control group

gained a minimal amount of weight. Although these initial research projects required a staff member to respond to emails and upload course content, an automated internet-based program could be developed. Additionally, mobile phone applications could be put in place to perform the same function.

Funding recommendations. Commensurate with the recommendations described above and administrators' perception of cost as a primary barrier to stimulate systems change, administrators are recommended to evaluate their funding priorities. Considering that multiple recommendations fall at the behest of the completely self-funded Dining Services, the department could benefit from general funds to create more healthful choices at on-campus eateries. Another healthy funding allocation would include funds to increase recreational facilities on campus commensurate with the size of the student body. Funds could be allocated to develop a freshman course on wellness, with the inclusion of nutrition and exercise information, and promotion of local supports. The course could be required for all freshmen and count toward a general education requirement for any major. A final suggestion for funding allocations could be a collaboration with the local Union of Students to support and motivate a student club dedicated to student wellness. Funds could help them develop and promote educational events and resources that they deem relevant to students (e.g., health seminars and outdoor recreation activities).

Summary of recommendations. Students and university administrators are encouraged to collaborate and develop individual and system changes. For individual changes, students are challenged to gain more knowledge about nutrition and exercise, develop and implement strategies to living healthfully, and become more aware of active promotional efforts. To foster and support individual changes, the university system as a whole needs to provide adequate access to healthful food alternatives and recreational facilities commensurate with the size of the student body. Without adequate access, individual student efforts will likely be met with limited success. In conjunction with improvements in access, the university may want to develop a unified, positive promotional message that incorporates existing resources and supports. To expand

access and develop a promotional campaign, funding resources need to be allocated to meet the proposed changes. Funds can be allocated to support collaborations among existing supports to improve access, promotion, and ultimately student wellness. Through these changes, the university can actualize the aspirations of students' and administrators' commitment to wellness. Table 23 provides a summary of the recommendations for improvements.

Table 23

Recommendations for Improvement

Suggested Recommendation(s)	Anticipated Outcome
Students	
• Increase Knowledge of Nutrition and Physical Activity	• Improve health-related decisions
• Develop and implement Strategies for Healthful Living o Develop social supports o Pack healthy snacks and lunches o Avoid less healthful eateries, and/or; review menus and make informed nutritional decisions o Develop social supports o Incorporate activity into daily routine o Use local amenities (trail system)	• Increase and maintain high level of motivation and self-efficacy • Increase weight management strategies
• Active Awareness of Health Promotion o Read emails, fliers, and promotions of administrators o Contact Student Health to discuss health-related decision	• Increase knowledge of supports for health
• Student Advocacy for Health o Making organized requests to campus administrators o Work through existing channels to request more access to exercise facilities and healthier food options o Organize student clubs with a focus on wellness	• Increase student voice for change in health programs and policies • Increase student-driven health promotion
Administrators	
• Improve Access to Healthier Foods o Reduce availability of sugar-laden foods with increased availability of healthier options o Increase access to fruits, vegetables, healthier snacks o Partner vendors with Dietetics and Culinary Arts to develop nutritious and flavorful meals o Expand university grocer to include healthier foods o Create health-promoting food labels to increase consumption of healthier alternatives o Discontinue all-you-can-eat with single meal servings, and/or; reduce size of serving trays, plates, bowls, cups o Allow monies to remain on students accounts while enrolled, or longer timeframe than 1-semester o Develop a summer vegetable-growing program with incorporated service learning	• Increase access and consumption of healthier foods • Reduce total calories consumed and decrease food expenses/ increase food profits • Reduce overconsumption of healthy foods at end of semesters • Increase student knowledge of gardening and provide greater access to vegetables
• Improve Access to Recreational Facilities o Increase hours of operation for recreational facility o Expand facilities commensurate to student body o Shift Student Recreation under Student Affairs due to better alignment of mission	• Increase opportunities for exercise • Increase focus on greater student body versus athletes
• Create Unified Promotion Campaign (e.g., 'Healthy UAA') o Develop committee with student representatives & representatives from health program across campus o Incorporate student-favored media o Promote at existing venues where students gathering (e.g., freshman orientation, library, Student Union) o Incorporate internet-based and mobile phone applications for promotion, prevention, & intervention strategies	• Increase awareness of health behaviors • Increase university commitment to health • Increase student involvement in healthful behaviors
• Funding Allocations Strategies o Provide general funds to Dining Services o Allocate funds to increase recreational facilities commensurate with the size of the student body o Allocate funds to teach a requited freshman course on wellness (fulfills general elective requirement for any major) o Allocate funds to support and motivate a student wellness club	• Create more healthful choices in residence halls' dining halls and other campus eateries • Increase opportunities for exercise • Increase student-driven health promotion

Limitations

Although this study provides new insights into the phenomenon of weight gain among first-year and continuing university students, it is not without limitations. One limitation present in this study is the concern of self-selection bias. Namely, those who participated in both phases of the study may be more likely to be interested in nutrition and exercise versus those who did not participate. Unfortunately, there is no way to control for self-selection bias; however, it must be noted that the follow-up longitudinal sample did not differ from those who did not complete the second portion of the study, at least at their baseline measurements. Therefore, it is unknown what type of bias may have occurred at the baseline measure; however, the follow-up sample was not statistically different from those who did not complete the follow-up study. Although the two groups were not statistically different at their baseline measures, the possibility does exist that the students who did not follow-up with the study may have not engaged in similar behaviors as those who did complete the follow-up study (e.g., decrease in caloric intake, decreased consumption of sweets or desserts, increase in physical activity). In other words, students who did not follow-up may be maintaining less healthful behaviors, may have gained weight, or engaging in less healthful behaviors, thus being less likely to attend a study on nutrition, exercise, and weight management.

Another limitation noted in the research of exercise and nutrition is individuals' tendency to underestimate caloric intake and overestimate physical activity. An attempt to mitigate those errors in estimation was employed through the use of augmenting reported nutrition and physical activity levels by metrics noted in other studies of direct physiological measurement. Although attempts were made to adjust for potential report bias, it must be noted that participants may have had additional demand characteristics during the follow-up evaluation. Given that the evaluation was a repeat examination of the same variables, participants may have opted to underreport their caloric intake and over-report physical activity to present themselves as healthier individuals. Other limitations to the first phase of the study included not knowing the residence of the students (i.e., on campus, off campus), not knowing specific sources of macronutrient

estimates, and single item motivation measures. A more comprehensive measure of motivation may have helped elucidate differing degrees of motivation and differing dynamics among the sample. A final limitation to the analysis of the archival data was the limitation in sample size. If data from a larger sample size were collected, additional inferential statistical analyses could have been utilized to explore other parameters and relationships of the sample.

Self-selection bias may also have been present among administrators and student participants in the qualitative study. However, it must be noted that the full range of administrators with involvements in student nutrition and exercise were asked to participate and staff participants were from diverse administrative departments. Therefore, participants were able to give a breadth of information and provided multiple perspectives among the administration, which may have reduced bias in the totality of responses. Although staff were from diverse departments, the individuals who did participate may be more likely to be interested in developing strategies to improve the health of students than those who chose not to participate. Although participants came from diverse administrative departments, it must be noted that the administrative sample was composed mostly of women, thus reducing the diversity in gender distribution.

In regard to student focus group participation, motivation for participation was unknown. Interestingly, across all the groups, regardless of class standing and residence, all noted similar experiences, thus lending support to the notion that they were providing a voice for the broader student population in expressing their desire to see changes related to nutrition and exercise. Although the students were similar to one another, the students who chose to participate may be more inclined to voice concerns or motivated to create policy changes. Therefore, the students who participated may be similar to one another across the various participant groups, but they may have differing viewpoints than the greater student body. At this time it is unknown if the students who participated are representative of the greater student body, but it must be noted that both students and administrators alike noted a trend toward healthier behaviors; therefore, these students may have been representative of the broader student body.

Another limitation to this study is that the longitudinal data and qualitative research methodology occurred at the same university, thus limiting generalizability. Although the research was limited to one university, trends in the data are supported by past research at other large public universities. Additionally, utilizing both research methodologies at one university provides an opportunity to explore the phenomenon of student health with greater breadth and depth. Although the research provides greater examination of nutrition and exercise within one university and the data are supported by past research, it must be noted that this university is located in a far northern climate with limited access to local agriculture. Therefore, other large public universities may not have the same challenges related to elevated cost of produce and weather difficulties. That being said, other universities may have other situational factors that need to be addressed in a similarly recommended fashion (i.e., student involvement and relying on local resources).

Conclusion

University students are at crossroads for many things in their lives, one of which is making new health-related decisions. Students in this study demonstrated that they have broad knowledge of recommended nutrition and physical activity guidelines, report high levels of motivation and perceived ability to live healthier, and are capable of engaging in behaviors to better their health over time. Although students reported a desire and ability to live healthier, they were quick to note that they needed healthy options available to reach their full health potential. Such options included access to healthful and affordable foods and recreational facilities. Unfortunately, the very things students need to succeed in maintain their health can be limited in university settings, despite the best intentions from university administrators. Although limited in resources, universities can employ additional low-cost, resource-limited strategies to help promote healthful behaviors. Strategies include the use of internet-based prevention programs and simple environmental changes to food services on campuses. In essence, university students are asking for help to be healthier, more productive people. Their requests

should be met, as investments in healthful behaviors at an early age are likely to pay dividends for decades to come.

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Appendix A

Literature Review Summary

Author & Year	Population	Sample	Study Variables	Method	Findings
(Hovell et al., 1985)	First year college women and young women not enrolled in college	Experimental Group: Baseline: 158 (100% female) Follow-up: 123 at 1 year 43 at 2 year Control Group: Baseline: 48 (100% female) Follow-up: (8-12 months) 48 Mostly upper middle class Caucasian women	Examine if those women who live on campus and attend college gain more weight than those who do not attend college and if self-reported diet and physical activity were related to weight change	Quasi-experimental prospective longitudinal study with anthropomorphic measures taken from a random subsample and self-report height and weight and psychosocial questionnaires from all participants.	• University women gained more weight over time than community control • University women gained 8.8lbs over ideal weight over the course of a year • 26% of university women were identified as above ideal weight (e.g., overweight/obese) • Weight gain slowed during sophomore year and weight loss began during junior year
(Hodge et al., 1993)	First year college women	61 (100% female)	Examine weight gain during the first year of college and associated factors (self-esteem, self-monitoring, locus of control)	Prospective longitudinal study with questionnaires given at time one, but only weight taken at time two	• Majority of sample maintained weight across time • Those who gained weight (30% of sample), gained 7lbs • Those who lost weight reported more negative appearance and physical health
(Megel et al., 1994)	First year college women	57 (100% women, over two years of data collection)	Examine health-promoting behaviors, diet, weight, self-esteem	Prospective longitudinal study with weight and questionnaire data gather at three points through the academic year	• 30% of sample gained 5 or more lbs over the year • 40% of sample dissatisfied with weight at end of year • Negative correlations between weight and health-promoting behaviors,

Author & Year	Population	Sample	Study Variables	Method	Findings
					exercise, and satisfaction with weight • Positive correlations between self-esteem and health-promoting behaviors and weight satisfaction, • Positive correlation between health-promoting behaviors and weight satisfaction
(Pinto et al., 1998)	First-year university students	242 (61% female)	Examined weight and physical activity over one year and preferences for supports to increase physical activity	Mailed survey during first year of school and completed a one-year follow-up	• Mean BMI increased from 21.7 to 21.8 • Activity level did not change significantly over time • Monthly newsletters most endorsed way for students to feel supported in activity • Sedentary to active students endorsed semester long seminars to support activity (more structure over time)
(Cooley & Toray, 2001)	First-year female students in residence halls	104 (100% female)	Examined weight and disordered eating	Prospective longitudinal study using questionnaires and self-report height and weight	• Although the study was focused on disorder eating results indicated that participants gained an average of 4.4lbs over 7 months
(Vohs & Heatherton, 2001)	First-year university students	342 (100% female)	Examined weight, body satisfaction, well-being, and disordered eating	Prospective longitudinal study beginning in the senior year of High School with follow-up during first-year of college	• Participants considered themselves more overweight when they entered college and had greater body dissatisfaction • Participants gained an average of 3.8lbs and an increase in BMI by .5 (21.5-22.0)

Author & Year	Population	Sample	Study Variables	Method	Findings
					• An increase in BMI was associated with decrease in body satisfaction
(Graham & Jones, 2002)	First year college students	49 (80% female)	Examine weight gain and perception of "Freshmen 15" on eating behaviors, eating attitudes, and weight gain	Prospective longitudinal study with weight and questionnaire data gather at the beginning and end of the academic year	• No overall significant weight gain • 60% of sample gained an average of 4.6 pounds • 30% of sample gained 5 pounds or more • Participants reported a perceived significant weight change • Those most concerned about "Freshmen 15", reported a greater perception of weight gain
(Anderson et al., 2003)	First year college students under 19	135 (57% female)	Examine weight gain among first year university men and women	Prospective longitudinal study with two main data points measures in Sept. and Dec.	• Significant weight gain for total sample • No gender difference • 26% of sample gained 5lbs or more from Sept. to Dec. • Nearly 14% of the sample increased to a BMI >25 from Sept. to Dec. (33% had BMI>25 in Dec. vs. 20% in Sept.)
(Butler et al., 2004)	First year college women living on campus	52 (100% female)	Examined weight, diet, physical activity, self-efficacy and body composition among first-year female college students	Prospective longitudinal study with questionnaires and anthropomorphic measures given at beginning of academic year and five months later	• Samples' weight, fat mass, & BMI increased over time • Decrease in food intake • Decrease in physical activity • Self-efficacy remained stable over time

Author & Year	Population	Sample	Study Variables	Method	Findings
(Levitsky et al., 2004)	First semester college students	60 (85% female)	Examine change in body weight related to eating habits, alcohol consumption, sleep, and physical activity	Prospective longitudinal study with questionnaires given at beginning and end of first semester of college and anthropomorphic measures	• First year college students gain significantly more weight than other adults • Variance accounted for in weight gain includes eating at all-you-can-eat dining halls, more snacks, consumption of junk food, dieting, and weekend meals
(Racette et al., 2005)	First-year university students	Baseline, $n = 764$ (53% female) Follow-up, $n = 290$ (??% female)	Examined weight, BMI, nutrition, and stages of change for exercise and nutrition; Measured at beginning of freshmen year and again at the end of sophomore year	Prospective longitudinal study beginning at the start of freshmen year and following up at the end of sophomore year using questionnaires and anthropomorphic measures	• BMI significant increased from 22.6 to 23.2 • 18% of participants overweight at baseline • 70% of participants gained weight, with average gain of approximately nine pounds • Decrease in fried food consumption but no change in vegetable or fat intake • Decrease in maintenance stage for aerobic activity over time, increase in maintenance stage for stretching • No change in readiness for healthy diet behaviors • 30% of participants did not engage in any physical activity
(Hajhosseini et al., 2006)	First-year university students	27 (81% female) participants from primarily Asian and Caucasian heritages	Examine BMI, body composition, diet, and resting metabolic rate (RMR) over a semester	Prospective longitudinal design over the course of a semester using anthropomorphic measures for height,	• Mean weight gain was 3.0lbs • 59% gained 3lbs or more • 22% gained 6lbs or more • 7% lost weight, but were intercollegiate athletes

Author & Year	Population	Sample	Study Variables	Method	Findings
				weight, body composition, RMR, and 3-day food log for diet data	• Mean BF% increased by 1% • RMR was negatively correlated with weight gain • 33% of sample had a BMI>25 at end of study versus 26% at beginning
(Hoffman, Policastro, Quick, & Lee, 2006)	First-year university students living in dormitories	67 (52% Female)	Examined weight, BMI, body composition	Prospective longitudinal study examining using anthropomorphic measures from September to April	• Participants gained an average of 7lbs • Fat Mass and Fat Free Mass both increased without any significant gender differences
(Lowe et al., 2006)	First-year university women	69 (100% female)	Examined weight, dieting type, and disordered eating	Prospective longitudinal study using anthropomorphic measures and questionnaires from September to April	• Participants gained an average of 4.5 lbs • Current dieters gained the most, followed by those with a history of dieting, then non-dieters • Restrained and disorder eating did not predict weight gain
(Morrow et al., 2006)	First-year university women	137 (100% female)	Examined weight, body composition, and fat distribution	Prospective longitudinal study examining anthropomorphic measures, dual x-ray absorptiometry (DXA) for body composition, waist-hip ratio for fat distribution, and IPAQ for physical activity from September to April	• Participates reported 1.5 hours of vigorous and 1 hour moderate activity per week • Significant increases in body mass, body fat, fat-free mass, total fat, and waist and hip circumferences • Average weight gain was 2.42 lbs

Author & Year	Population	Sample	Study Variables	Method	Findings
(Hull et al., 2007)	First-year university women	69 (100% female)	Examined weight, body composition over summer months	Prospective longitudinal study examining anthropomorphic measures, dual x-ray absorptiometry (DXA) for body composition, waist-hip ratio for fat distribution, and IPAQ for physical activity	• Weight remained stable over summer months, but fat-mass increased significantly over the summer • 90% lived on campus during academic year, but 88% lived with parents during summer
(Delinsky & Wilson, 2008)	First-year university general psychology students	336 (100% female)	Examined BMI, dietary restraint, eating disorder symptoms, and perceptions of 'Freshmen 15'	Prospective longitudinal study using self-reported weight with sub-sample actually weighed and questionnaires from September to April	• BMI significantly changed from 22.3 to.22.9 across year • 15.4% overweight or obese at baseline 18.2% at follow-up • Mean weight gain of 3.4lbs • Dietary restraint increased overtime, but did not predict weight gain • No other variables predicted weight gain

Author & Year	Population	Sample	Study Variables	Method	Findings
(Economos et al., 2008)	First-year university students mean	396 (65% female)	Examined stress, fruit/vegetable intake, alcohol consumption, physical activity on change of weight during first year of college	Prospective longitudinal study using self-reported weight and questionnaires at baseline (end of High School), and taking anthropomorphic measures at follow-up with questionnaires	• 80% of participants gained weight, with mean gain of 7.8lbs • 20% loss weight, with mean loss of 4.8lbs • Mean weight change of 5.3lbs gained • No significant gender difference • 35% of men and 40% of women gained at least 5% of their body weight • 16.5% of men and 11% of women overweight or obese • Alcohol consumption was correlated with weight gain in men • Increased workload was associated with weight gain in women

Author & Year	Population	Sample	Study Variables	Method	Findings
(Holm-Denoma, Joiner, Vohs, & Heatherton, 2008)	First-year university students	607 (56% female)	Examine change in body weight related to self-esteem, relationships, eating habits, exercise, and disordered eating	Prospective longitudinal study with questionnaires given at end of high school and during one of three points throughout the first year of college	• Men gained 3.5lbs and women gained 4.0lbs during first year in college • Weight gained seemed to occur early in the year and be maintained • Men who reported exercising more and having troubled relationships with their parents reported more weight gain • Women who reported good relationship with parents had more weight gain • First year college students gain significantly more weight than other adults
(Jung et al., 2008)	First-year university students living on campus	101 (100% female)	Examined weight, body composition, physical activity, and nutrition	Prospective longitudinal study with a focus on nutrition and physical activity on weight change using anthropomorphic measures, 3-day food logs, and physical activity questionnaire	• Participants gained significant amount of weight over year, approximately 3 pounds • Those who gained weight, gained an average of 7.4lbs BMI change significantly from 22.6 to 23.2 • Body fat increased for those who gained weight and decreased for those who lost weight • Caloric intake decreased overtime for all participants • Physical activity decreased for those who gained weight, but remained stable for those who lost weight

Author & Year	Population	Sample	Study Variables	Method	Findings
(Kasparek et al., 2008)	First year university students (95% lived on campus)	193 (88% female)	Examined self-reported weight, height, fruit and vegetable intake, physical activity, and alcohol consumption	Online questionnaire given in Fall and then in Spring (6 months apart)	• 23% of participants were overweight at baseline • 57% reported some type of weight gain • Average. weight gain of 2.5lbs • BMI significantly changed from 23 to 23.51 • Those who were overweight at baseline gained a mean of nearly 11lbs compared to 6.21lbs of those not overweight at baseline • Men more twice as likely to gain weight than women • Low frequency of activity was associated with elevated BMIs • Significant decrease in fruit/vegetable consumption, but not associated with weight gain
(Mihalopoulos et al., 2008)	First-year university students living on campus	125 (66% female)	Examined weight, BMI, and gender differences	Self-report online survey sent out at beginning of year and end of year. No repeated measures	• Significant increase of 2.7lbs across sample over the year • Men gained more the women • 51% gained weight (7.4lbs) • 33% no change • 15% lost weight (7.8lbs) • BMI 23.3 at start and 23.7 at end

Author & Year	Population	Sample	Study Variables	Method	Findings
(Pliner & Saunders, 2008)	First-year Canadian university general psychology students	72 (79% female)	Examined BMI, dietary restraint, eating habits, and residence	Prospective longitudinal study using questionnaires and anthropomorphic measures from October to March	• BMI increased significantly from baseline to follow-up • Participants living on campus and restrained eaters had the greatest weight increase (9.1lbs) vs. those living at home (2.6lbs) • Participants who scored higher on unhealthy eating scale had significantly higher weight gain
(Wengreen & Moncur, 2009)	First-year university students	186 (63% female)	Examine diet, physical activity, weight, and BMI changes	Longitudinal study with questionnaires given at beginning and end of first semester of college and anthropomorphic measures	• Mean weight gain for sample was 3.3lbs • 23% of sample gained a clinically significant amount of weight (more than 5% of body weight) with an average gain of 9.9lbs • Those who gained 5% or more body weight reported less physical activity and more sleep
(Vella-Zarb & Elgar, 2009)	Meta-analysis of first-year university student weight gain	24 studies, n = 3041 (85% female)	Examined weight gain across studies and predictors	Meta-analysis	• Mean weight gain of 3.9lbs • Duration of study correlated with weight gain • Recommended using anthropomorphic measures, including more men, and examining additional predictors

Appendix B

International Physical Activity Questionnaire – Short Form

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at school, as part of your house and yard work (chores), to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

- ☐ 0 days
- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

2. On the days when you engaged in vigorous physical activity, how much time did you spend?

Average minutes per day: ___

Think about all the **moderate** activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at regular pace, or doubles tennis? Do not include walking.

- ☐ 0 days
- ☐ 1 day

- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

4. On the days when you engaged in moderate physical activity, how much time did you spend?

Average minutes per day: ___

Think about the time you spent walking in the last 7 days. This includes at school and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

- ☐ 0 days
- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

6. On the days when you engaged in walking, how much time did you spend?

Average minutes per day: ___

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at school, at home, while doing homework and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting per day on an average week day?

Hours per day: ___
Minutes per day: ___

Appendix C

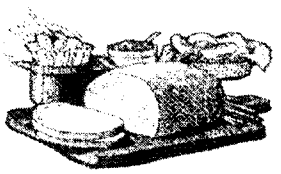
Brief Food Frequency Questionnaire (BFFQ)

RESPONDENT ID NUMBER

TODAY'S DATE

○ Jan	DAY	YEAR
○ Feb		
○ Mar		2000 ○
○ Apr		2001 ○
○ May		2002 ○
○ Jun		2003 ○
○ Jul		2004 ○
○ Aug		2005 ○
○ Sep		2006 ○
○ Oct		2007 ○
○ Nov		2008 ○
○ Dec		2009 ○

BRIEF FOOD QUESTIONNAIRE



This form is about the foods you usually eat.
It will take about 15 - 25 minutes to complete.

- **Please answer each question as best you can. Estimate if you aren't sure.**
- **Use only a No. 2 pencil.**
- **Fill in the circles completely, and erase completely if you make any changes.**

Please print your name in this box.

SEX
○ Male
○ Female

If female, are you pregnant or breast feeding?
○ No
○ Yes
○ Not female

AGE

WEIGHT pounds

HEIGHT ft. in.

This form is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. There are two kinds of questions for each food.

HOW OFTEN, on average, did you eat the food during the past year?
*Please DO NOT SKIP any foods. Mark "Never" if you didn't eat it.

HOW MUCH did you usually eat of the food?
*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
*Sometimes we ask "how much" as A, B, C or D. LOOK AT THE ENCLOSED PICTURES. For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)

EXAMPLE: This person drank apple juice twice a week, and had one glass each time. Once a week he ate a "C"-sized serving of rice (about 1 cup).

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME — SEE PORTION SIZE PICTURES FOR A-B-C-D				
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	● 1	○ 2	○ 3	○ 4
Rice	○	○	○	○	●	○	○	○	○	How much each time	○ A	○ B	● C	○ D

PLEASE DO NOT WRITE IN THIS AREA

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
How often do you eat each of the following foods all year round?														
Eggs, including egg biscuits or Egg McMuffins (Not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs each time	○ 1	○ 2	○ 3	○ 4
Bacon or breakfast sausage, including sausage biscuit	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cooked cereals like oatmeal, cream of wheat or grits	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Cold cereals like Corn Flakes, Cheerios, Special K, fiber cereals	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Which cereal do you eat most often? **MARK ONLY ONE:** ○ Bran Buds, Raisin Bran, Fruit-n-Fiber, other fiber cereals ○ Product 19, Just Right, Total ○ Other cold cereal, like Corn Flakes, Cheerios, Special K														
Cheese, sliced cheese or cheese spread, including on sandwiches.	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 4	○ 4
Yogurt (not frozen yogurt)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
How often do you eat each of the following fruits?														
Bananas	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Apples or pears	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Oranges, tangerines, not including juice	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Applesauce, fruit cocktail, or any canned fruit	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fruit, like grapes, melon, strawberries, peaches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you eat each of the following vegetables, including fresh, frozen, canned or in stir fry, at home or in a restaurant?														
French fries, fried potatoes or hash browns	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
White potatoes not fried, incl. boiled, baked, mashed & potato salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Sweet potatoes, yams, or sweet potato pie	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Baked beans, chili with beans, pintos, any other dried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Refried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Broccoli	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Carrots, or stews or mixed vegetables containing carrots	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Spinach, or greens like collards	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cole slaw, cabbage	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Raw tomatoes, including in salad	○	○	○	○	○	○	○	○	○	How much	○ 1/4	○ 1/2	○ 1	○ 2
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Salad dressing or mayonnaise (Not lowfat)	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Any other vegetable, like corn, squash, okra, cooked green peppers, cooked onions	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Vegetable soup, vegetable beef, chicken vegetable, or tomato soup	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D

PLEASE DO NOT WRITE IN THIS AREA

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
MEATS														
Do you ever eat chicken, meat or fish? ○ Yes ○ No IF NO, SKIP TO NEXT PAGE														
Hamburgers, cheeseburgers, meat loaf, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much meat	○ 1/8 lb.	○ 1/4 lb.	○ 1/2 lb.	○ 3/4 lb.
Tacos, burritos, enchiladas, tamales	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Beef steaks, roasts, pot roast, or in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Pork, including chops, roasts, or dinner ham	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat beef or pork, do you ○ Avoid eating the fat ○ Sometimes eat the fat ○ Often eat the fat ○ Don't eat meat														
Mixed dishes with meat or chicken, like stew, corned beef hash, chicken & dumplings, or in frozen meals	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Fried chicken, at home or in a restaurant	○	○	○	○	○	○	○	○	○	# medium pieces	○ 1	○ 2	○ 3	○ 4
Chicken or turkey not fried, such as baked, grilled, or on sandwiches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat chicken, do you ○ Avoid eating the skin ○ Sometimes eat the skin ○ Often eat the skin ○ N/A														
Fried fish or fish sandwich, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fish or shellfish not fried, including tuna	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Hot dogs, or sausage like Polish, Italian or Chorizo	○	○	○	○	○	○	○	○	○	How many	○ 1	○ 2	○ 3	○ 4
Boloney, sliced ham, turkey lunch meat, other lunch meat	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
When you eat lunch meats, are they ○ Usually low-fat ○ Sometimes ○ Rarely low-fat ○ N/A														

PLEASE DO NOT WRITE IN THIS AREA

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
Pasta, breads, spreads, snacks														
Spaghetti, lasagna, or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cheese dishes without tomato sauce, like macaroni and cheese	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Pizza, including carry-out	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Biscuits, muffins	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Rolls, hamburger buns, English muffins, bagels	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
White bread or toast, including French, Italian, or in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Dark bread like rye or whole wheat, including in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Tortillas	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Margarine on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Butter on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Peanuts or peanut butter	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Snacks like potato chips, corn chips, popcorn (Not pretzels)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Doughnuts, cake, pastry, pie	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cookies (Not lowfat)	○	○	○	○	○	○	○	○	○	How many	○ 1-2	○ 3-5	○ 6-7	○ 8+
Ice cream, frozen yogurt, ice cream bars	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat ice cream or frozen yogurt, is it	○ Usually low-fat		○ Sometimes		○ Rarely low-fat		○ N/A							
Chocolate candy, candy bars	○	○	○	○	○	○	○	○	○	How many bars	① small	① medium	① large	② large

TYPE OF BEVERAGE	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
How often do you drink the following beverages?														
Real orange or grapefruit juice, Welch's grape juice, Minutemaid juices, Juicy Juice	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Hawaiian Punch, Sunny Delight, Hi-C, Tang, or Ocean Spray juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Kool Aid, Capri Sun or Knudsen juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Instant breakfast milkshakes like Carnation, diet shakes like Slimfast, or liquid supplements like Ensure	○	○	○	○	○	○	○	○	○	How many glasses or cans	○ 1	○ 2	○ 3	○ 4
Glasses of milk (any kind)	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3	○ 4
When you drink glasses of milk what kind do you usually drink? **MARK ONLY ONE:**	○ Whole milk ○ Reduced fat 2% milk ○ Low-fat 1% milk				○ Non-fat milk ○ Rice milk ○ Soy milk				○ I don't drink milk or soy milk					
Cream, Half-and-Half or non-dairy creamer in coffee or tea	○	○	○	○	○	○	○	○	○	Total TBSP. on those days	○ 1	○ 2	○ 3-4	○ 5+
Regular soft drinks, or bottled drinks like Snapple (Not diet drinks)	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Beer	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3-4	○ 5+
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many drinks	○ 1	○ 2	○ 3-4	○ 5+

During the past year, have you taken any vitamins or minerals regularly, at least once a month?

○ No, not regularly ○ Yes, fairly regularly →

(IF YES) WHAT DID YOU TAKE FAIRLY REGULARLY?

VITAMIN TYPE	HOW OFTEN					FOR HOW MANY YEARS?					
	DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	LESS THAN 1 YR.	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Multiple Vitamins. Did you take...											
Regular Once-A-Day, Centrum, or Thera type	○	○	○	○	○	○	○	○	○	○	○
Stress-tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Antioxidant combination type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins (not part of multiple vitamins)											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic acid, folate	○	○	○	○	○	○	○	○	○	○	○
Calcium or Tums, alone or combined with vit. D or magnesium	○	○	○	○	○	○	○	○	○	○	○
Zinc	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○
Vitamin D, alone or combined with calcium	○	○	○	○	○	○	○	○	○	○	○

If you took vitamin C or vitamin E:

How many milligrams of **vitamin C** did you usually take, on the days you took it?

○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ don't know

How many IUs of **vitamin E** did you usually take, on the days you took it?

○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ don't know

How often do you use fat or oil in cooking?

○ Less than once per week ○ A few times per week ○ Once a day ○ Twice a day ○ 3+ per day

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

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

Did you ever drink more beer, wine or liquor than you do now? ○ Yes ○ No

Do you smoke cigarettes now? ○ Yes ○ No

IF YES, On the average about how many cigarettes a day do you smoke now?

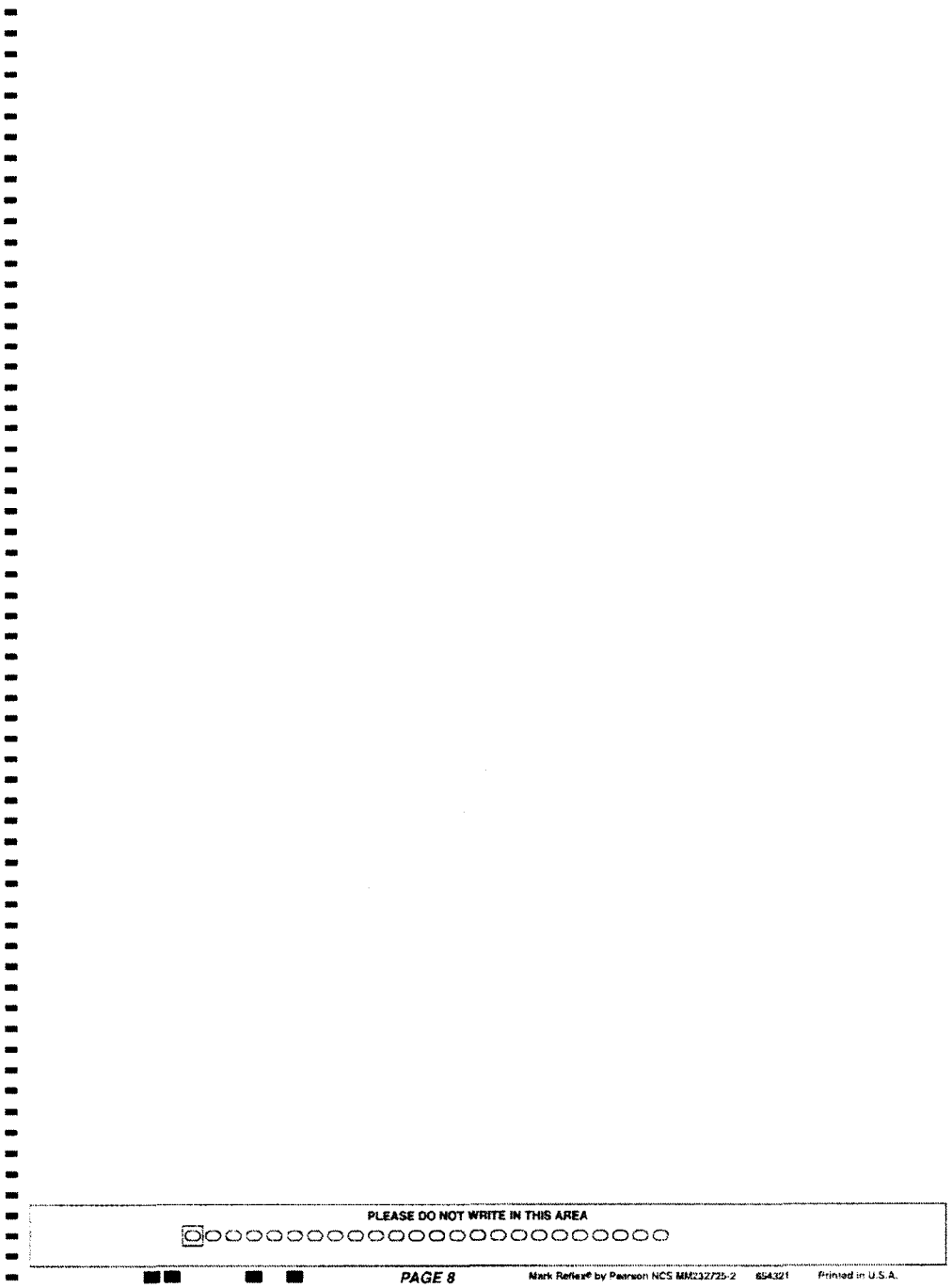
○ 1-5 ○ 6-14 ○ 15-24 ○ 25-34 ○ 35 or more

What is your ethnic group? (MARK ONE OR MORE)

○ Hispanic or Latino ○ Black or African American ○ American Indian or Alaska Native
○ White, not Hispanic ○ Asian ○ Native Hawaiian or Other Pacific Islander

Thank you very much for filling out this questionnaire. Please take a minute to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA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Appendix D

Stage-of-Change and Self-Efficacy Measures

Motivation for Change – Exercise and Nutrition

Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed 3 to 5 times per week for 20-60 minutes per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

1. Do you exercise regularly according to that definition?

- ☐ Yes, I have been for MORE than 6 months.
- ☐ Yes, I have been for LESS than 6 months.
- ☐ No, but I intend to in the next 30 days.
- ☐ No, but I intend to in the next 6 months.
- ☐ No, and I do NOT intend to in the next 6 months.

Healthy nutrition is defined as eating foods that are good for you and your emotional and physical health. It means avoiding junk food and foods with too many calories or unhealthful additives. Eating healthily also means not overeating or starving oneself; instead, it means eating enough to maintain average weight and good health.

2. Do you eat healthily according to that definition?

- ☐ Yes, I have been for MORE than 6 months.
- ☐ Yes, I have been for LESS than 6 months.
- ☐ No, but I intend to in the next 30 days.
- ☐ No, but I intend to in the next 6 months.
- ☐ No, and I do NOT intend to in the next 6 months.

Self-Efficacy for Healthy Nutrition and Exercise

How certain are you that you could overcome the following barriers?

I can manage to stick to healthful foods, even if:

	Yes	No	Not Sure
I need a long time to develop the necessary routines.	☐	☐	☐
I have to try several times until it works.	☐	☐	☐
I have to rethink my entire way of nutrition.	☐	☐	☐
I do not receive a great deal of support from others when making my first attempts.	☐	☐	☐
I have to make a detailed plan.	☐	☐	☐

I can manage to carry out my exercise intentions, even if:

	Yes	No	Not Sure
I have worries and problems.	☐	☐	☐
I feel depressed.	☐	☐	☐
I feel tense.	☐	☐	☐
I am tired.	☐	☐	☐
I am busy.	☐	☐	☐

Appendix E

Letter of Approval from the Center for Behavioral Health Research and Services to Share Archival Data

UAA UNIVERSITY of ALASKA ANCHORAGE
Behavioral Health Research & Services (BHRS)

November 10, 2010

Cody Chipp, M.S.
3231 East 42nd Ave, Unit B
Anchorage, AK 99508

Dear Mr. Chipp:

Thank you for your request to utilize the CBHRS college student health dataset for purposes of your doctoral dissertation in the Ph.D. Program in Clinical-Community Psychology. After having reviewed your request, we have decided that this project is worthwhile and we are granting you permission to use the dataset for your stated purposes.

Permission is granted with the understanding that the data will not be removed from the CBHRS premises (physical or electronic) and that all data analyses will be conducted from the CBHRS research offices at 42nd and Dale Street or via password-protected remote log-in (as arranged with the CBHRS data manager). You may begin work with the data as soon as your proposal has been defended successfully, the project has been approved by the UAA Institutional Review Board, and you have a signed confidentiality form on file with the CBHRS office manager. It is also understood that the CBHRS Directors will have opportunity to review and comment upon all manuscripts that will be developed based upon these data, including your doctoral dissertation.

Please keep me posted on the progress of your work and let me know if you need any assistance. Good luck to you with your dissertation – you have chosen an important topic and CBHRS is honored to be able to contribute valuable data.

Best wishes,

Mark E. Johnson, Ph.D.

Cc: Virginia Mongeau, CBHRS Data Manager
Holland McMullen, CBHRS Office Manager

PO Box 241626 • Anchorage, Alaska 99524 • P 907.561.2420 • F 907.561.2695 • cbhrs@uaa.alaska.edu

CENTER FOR BEHAVIORAL HEALTH RESEARCH & SERVICES
ACCESS TO SERVER AGREEMENT

By being granted access to the CBHRS dedicated server, I agree to the following terms:

- I will maintain the confidentiality of all data housed on the server and do my utmost to maintain the integrity of these data
- I have read and agree to follow at all times the most recent data management guidelines established by CBHRS
- I will maintain a current signed confidential on file
- I will not use the server for any purposes not directly related to my university position without the express written permission of my supervisor(s)
- I will not allow anyone, including other CBHRS employees, to access the CBHRS server through my account
- Upon resignation, server privileges will be terminated.

By signing below, I willingly agree to follow all the terms of this form. I understand that any violation of these terms can result in disciplinary action being taken by the UAA Human Resource Services and UA Legal Counsel.

Name of Employee: Carol Ann App

Signature of Employee: _____ Date: 10/27/09

Supervisor:
I have explained the terms of this agreement and answered all of her/his questions. I believe that she/he understands the information described in this form and freely consents to follow the terms.

Name of Supervisor: Cindy Green

Signature of Supervisor: _____ Date: 10/27/09

Center for Behavioral Health Research & Services (CBHRS)
ACCESS TO CONFIDENTIAL INFORMATION

The Center for Behavioral Health Research and Services routinely handles information of a confidential and sensitive nature. This information includes, but is not limited to, such matters as correspondence, hard copy and electronic data, informed consent and other research participation forms, names and other personal identifiers, phone numbers, and email and physical addresses, CBHRS has been entrusted with this information and is responsible for maintaining their ongoing integrity, security, and confidentiality. As a CBHRS staff member, you will regularly come into contact with this information and must understand that you need to do your utmost to maintain confidentiality.

By being granted access to CBHRS data, I agree to the following terms:

- I will do my utmost to maintain the integrity, security, and confidentiality of all confidential and sensitive information that I encounter through my work at CBHRS.
- I will maintain a current signed confidentiality form on file
- I have read and agree to follow at all times the most recent data management guidelines established by CBHRS
- I will not grant access to the information to any unauthorized individuals
- I will not use the information for any purposes not directly related to my university position
- Upon resignation, all access to this information will be terminated.

By signing below, I willingly agree to follow all the terms of this form. I understand that any violation of these terms can result in disciplinary action being taken by the UAA Human Resource Services and UA Legal Counsel.

Name of Employee: Cori Ann

Signature of Employee: _____ Date: 10/30/09

CENTER FOR BEHAVIORAL HEALTH RESEARCH & SERVICES
STUDENT ACCESS TO DATA AGREEMENT

Name of Student: Cody Child
Name of Project: UAA Health Behaviors
CBHRS Supervisor(s): Chris Brems, PhD, ABPP
Mark Johnson, PhD

By being granted access to CBHRS data, I agree to the following terms:

- I will maintain the confidentiality of all data shared and will do my utmost to maintain the integrity of these data.
- I will not use the data for any purposes not directly related to the project identified above without the express written permission of the UAA CBHRS Co-Directors
- I will not maintain any of the CBHRS data nor share it with anyone other than CBHRS staff and faculty without the express written permission of the UAA CBHRS Co-Directors
- At all times, the data will reside on a thumb drive or other external media.
- I understand that when I am actively using the data, I can download it onto a computer; however, when I am done actively working on the project, I will delete it from the computer and will empty my recycle bin.
- When not in use, I will keep the thumb drive secure and under lock and key.
- When I am done analyzing the data, I will return the thumb drive to CBHRS for storage and I will ensure that the data are deleted everywhere else.

By signing below, I willingly agree to follow all the terms of this form. I understand that any violation of these terms can result in disciplinary/legal action being taken by UA Legal Counsel and will be reported to the Chair or Director of your graduate program.

Name of Student: Cody Child

Signature of Student: [signature] Date: 4/18/11

I have explained the terms of this agreement and answered all of her/his questions. I believe that she/he understands the information described in this form and freely consents to follow the terms.

Name of CBHRS Staff Member: Holland McMullen

Signature of CBHRS Staff Member: Holland McMullen Date: 4/18/11

Appendix F

Institutional Review Board Approval Letters

Research &
Graduate Studies
UNIVERSITY of ALASKA ANCHORAGE

3211 Providence Drive
Anchorage, Alaska 99508-4614
T 907.786.1196 • F 907.786.1791
www.uaa.alaska.edu/research

December 13, 2010

Cody Chipp, M.S.
3231 E. 42nd Avenue, Unit B
Anchorage, Alaska 99508

Dear Mr. Chipp:

Your Institutional Review Board (IRB) proposal *Health Behaviors of First-Year University Students* meets the U.S. Department of Health and Human Services requirements for the protection of human research subjects (45 CFR 46 as amended/revised) as being exempt from full Board review. In keeping with the usual policies and procedures of the IRB, your research project is approved.

Therefore, you have permission to begin data collection for your study. If this study goes beyond one year from the date of this submission, you will need to submit a Progress Report (see http://www.uaa.alaska.edu/research/ric/irb/documents.cfm) for approval to continue the research and please submit a Final Report at the end of the project.

Please report promptly proposed changes in the research protocol for IRB review and approval.

On behalf of the Board, I want to extend my best wishes for success in accomplishing the objectives of your proposed study.

Sincerely,

Kelly McLain, M.A.
Research Compliance Administrator
Institutional Review Board

cc: Christiane Brems, Center for Behavioral Health Research & Services
Dean James Liszka, College of Arts and Sciences

3211 Providence Drive
Anchorage, Alaska 99508-4614
T 907.786.1099, F 907.786.1791
www.uaa.alaska.edu/research/rc

DATE:	September 19, 2011
TO:	Cody Chipp, MS
FROM:	University of Alaska Anchorage IRB
PROJECT TITLE:	[269367-2] Health Behaviors of University Students
SUBMISSION TYPE:	Revision
ACTION	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	September 19, 2011

Your Institutional Review Board (IRB) proposal meets the U.S. Department of Health and Human Services requirements for the protection of human research subjects (45 CFR 46 as amended/revised) as being exempt from full Board review. In keeping with the usual policies and procedures of the IRB, your research project is approved with suggested revisions. Thank you for a copy of these revisions.

Therefore, you have permission to begin data collection for your study. If this study goes beyond one year from the date of this submission, you will need to submit a Progress Report for approval to continue the research and please submit a Final Report at the end of your project.

Please report promptly proposed changes in the research protocol for IRB review and approval.

On behalf of the Board, I wish to extend my best wishes for success in accomplishing the objectives of your study.

Kelly McLain, M.A.

Research Compliance Administrator, Institutional Review Board

Appendix G

Recruitment Messages and Screening Questions

LOOKING FOR RESEARCH PARTICIPANTS

WE WANT TO HEAR FROM YOU!!
EARN $20 FOR TELLING YOUR OPINION

AND

IN JUST 3 MINUTES ENTER TO WIN A
$100 GIFT CERTIFICATE

WHAT THE STUDY INVOLVES:
The study involves one session held on the UAA campus where participants will participate in a focus group with other students. The research session will take about **60 to 90 minutes** of your time. You will be asked questions about your view of diet and exercise habits of university students. We will also ask questions about the supports and barriers to eating healthfully and exercising at the university.

YOU MUST BE 18 YEARS OLD OR OLDER TO PARTICIPATE

HOW LONG WILL IT TAKE AND HOW PARTICIPANTS WILL BE COMPENSATED:
The research session will take about **60 to 90 minutes** of your time. Participants will be given a gift of a **$20 gift card to Fred Meyer.**

IF YOU'RE INTERESTED IN PARTICIPATING:
To participate in the study you first need to answer a few questions online to see if the study is right for you and if there are still spots open for new participants. We're only looking for a certain number of participants and the study will end when we get enough. If you participate in this screening you will be **entered into a drawing** for a **$100 gift certificate to Amazon.com.**

If the study is right for you, we'll ask you to provide your name and contact information so that we can let you know when upcoming sessions are and where sessions will be held on campus.

Go to: http://healthyuaa.org

Web-Based Consent for Screening Focus Group Participants

If you continue on to the next page, you will be asked seven questions about your age, gender, class standing and residence to determine your eligibility to participate in the study. The questions will take about 3 minutes of your time to complete. If you participate in this screening you will be **entered into a drawing for a $100 gift certificate to Amazon.com**.

Participation in the screening does not guarantee that you will be selected to participate in the focus group

As part of these questions you will be asked to provide your contact information (e.g., name, email address, phone number) for scheduling and award notification.

Your answers to the following questions are confidential and won't be shared with anyone else.

If you decide that you don't want to answer these questions, you may discontinue answering them at any time. Your participation is completely voluntary.

If you have any questions about this study, please contact Cody Chipp at (907) 227-4620 or Dr. Christiane Brems, Dissertation Chair, at (907) 786-6381. If you have any questions or concerns about your rights as a research participant, please contact Dr. Claudia Lampman, Compliance Officer for the office of Research and the Graduate School at (907) 786-1099.

You may wish to print this consent form for your records

Are you voluntarily willing to participate by completing this brief web-based questionnaire to see if the study is right for you?

___ Yes (if checked directed to web-based screening measure)
___ No (if checked directed to a page thanking them for their time)

Web-Based Screening Questions

1. What is your age? (criterion 1)
2. What is your gender?
3. How many college credits have you completed? (criterion 2)
4. What is your major?
5. Do you currently live on campus? (criterion 3)
6. Are you a member of any of the UAA Seawolf athletic teams?
7. Please provide your name and the best email address and phone number to contact you for scheduling and award notification?

University Staff Key Informant Recruitment Email Message

Dear <University Staff Members Name>,

I am currently conducting a study for my dissertation that explores university staffs' views on how students define healthy nutrition and exercise and what you think are the supports and barriers are to eating healthfully and exercising regularly in college. Also, I would like to hear your views on how the university has been promoting healthy living and what can be improved for students. I hope to learn more about things that would help college students stay healthy, especially during their early college years. You are being asked to participate in this study due to your position at UAA.

What the study involves:
The study involves **one interview session** that will take about **60 minutes** of your time. You will be asked questions about your view of diet and exercise habits of university students. We will also ask questions about the supports and barriers to eating healthfully and exercising at the university.

If you're interested in participating:
If you are willing to participate, please reply to this email to arrange a day and time that works best for you for the interview. I will also be contacting you via your UAA phone number as a follow-up to this email, if I do not receive a response.

If you have any questions or concerns about your rights as a research participant, please contact Dr. Claudia Lampman, Compliance Officer for the office of Research and the Graduate School at (907) 786-1099.

If you have any questions, or concerns, please do not hesitate to ask.

Thank you for considering participating in this study.

Cody Chipp, M.S.
Doctoral Candidate
Ph.D. in Clinical-Community Psychology
University of Alaska Anchorage and University of Alaska Fairbanks
cchipp@uaa.alaska.edu
907-227-4620

Appendix H

Informed Consents

Exploring Health Practices of University Students
Informed Consent
Student Focus Groups

Researcher:
Cody Chipp, MS cchipp@uaa.alaska.edu
Clinical and Community Psychology PhD Program
University of Alaska Anchorage and Fairbanks
Office- (907) 227-4620

Research Supervisor:
Dr. Christiane Brems, afcb@uaa.alaska.edu
University of Alaska Anchorage
Dissertation Chair
Office- (907) 786-6381

PURPOSE AND BACKGROUND

This study explores university students' views on how students define healthy nutrition and exercise. We also want to know what the supports and barriers are to eating healthy and exercising regularly in college. Finally, we would like to hear your views on how the university can promote healthy living. We hope to learn more about things that would help college students stay healthy, especially during their early college years.

PROCEDURES

The research session today will take about 60 minutes of your time. You will be asked questions about your view of diet and exercise habits of university students. We will make notes and the interview will be audio-recorded. The recording will only be used to assure accurate data collection and for data analysis purposes. The recording will be destroyed after all analyses and manuscripts have been completed and distributed.

CONFIDENTIALITY

Your responses in the interview will be confidential. All the materials from this study, including the written notes and audiotape, will be kept in a secure file cabinet in the researchers' offices to which only they have access. The data will be kept so that you cannot be identified. Your name, address, or any other information about you will not be attached to any of your responses. Any reports or publications describing the results of this study will not have any of your personal information in it. Direct quotes from you may be used in the results of this study, your name and other personal information will be kept anonymous.

VOLUNTARY NATURE OF PARTICIPATION

Your participation in this study is voluntary. You may stop at any time and you do not have to answer any questions you do not want to. Nothing will happen to you if you choose not to answer any questions or if you decide not to participate.

COSTS AND COMPENSATION
There are no financial costs to you for participating in this study. As a thank you gift, you will receive a Fred Meyer's gift card for $20 for your time.

POTENTIAL BENEFITS AND RISKS
Your participation in this study only requires a commitment of time on your part. If you decide to participate, your willingness to share your experiences and knowledge may provide valuable information for improving the health of college students. There are no foreseeable risks or benefits to you personally from participation in this study.

QUESTIONS
If you have any questions about this study, please contact Cody Chipp at (907) 227-4620 or Dr. Christiane Brems, Dissertation Chair, at (907) 786-6381. If you have any questions or concerns about your rights as a research participant, please contact Dr. Claudia Lampman, Compliance Officer for the Office of Research and the Graduate School at (907) 786-1099.

SIGNATURE
Your signature below means that you have read the information above and agree to participate in this study. If you have any questions, please feel free to ask them now or at any time during the study. If you sign, you will be indicating that you understand and agree with the following statements:

- I have read or listened to the information on this consent form.
- I am 18 years old, or older.
- I understand what is in the consent form and had opportunity to ask questions.
- I understand that the study is completely voluntary.
- I understand that I can quit at any time and still receive the $20 gift card.
- I would like to participate in this study.

With my signature below, I indicate that I understand and agree with all of the above statements:

Signature_____
Date:_____

Print Name _____

Exploring Health Practices of University Students
Informed Consent
Key Informant

Researcher:
Cody Chipp, MS cchipp@uaa.alaska.edu
Clinical and Community Psychology PhD Program
University of Alaska Anchorage and Fairbanks
Office- (907) 227-4620

Research Supervisor:
Dr. Christiane Brems, afcb@uaa.alaska.edu
University of Alaska Anchorage
Dissertation Chair
Office- (907) 786-6381

PURPOSE AND BACKGROUND

This study explores university staffs' views on how students define healthy nutrition and exercise. We also want to know what you think are the supports and barriers to eating healthfully and exercising regularly in college. Finally, we would like to hear your views on how the university has been promoting healthy living and what can be improved for students. We hope to learn more about things that would help college students stay healthy, especially during their early college years.

PROCEDURES

The research session today will take about 45-60 minutes of your time. You will be asked questions about your view of diet and exercise habits of university students. We will make notes and the interview will be audio-recorded. The recording will only be used to assure accurate data collection and for data analysis purposes. The recording will be destroyed after all analyses and manuscripts have been completed and distributed. Following the interview, we would like to ask some participants how our interview could be improved.

CONFIDENTIALITY

Your responses in the interview will be confidential. All the materials from this study, including the written notes and audiotape, will be kept in a secure file cabinet in the researchers' offices to which only they have access. The data will be kept so that you cannot be identified, except by a coded numbering system. Only the research staff has access to the numbering system. Your name, address, or any other information about you will not be attached to any of your responses. Any reports or publications describing the results of this study will not have any of your personal information in it. Direct quotes from you may be used in the results of this study, your name and other personal information will be kept anonymous, including information about your role at UAA. Any data that is reported about your affiliation with the university will be reported in aggregate form only. For example, we might say, "All interviewees worked at the university for an average of 8 years."

VOLUNTARY NATURE OF PARTICIPATION
Your participation in this study is voluntary. You may stop at any time and you do not have to answer any questions you do not want to. Nothing will happen to you if you choose not to answer any questions or if you decide not to participate.

COSTS AND COMPENSATION
There are no financial costs to you for participating in this study. There is no compensation for your time.

POTENTIAL BENEFITS AND RISKS
Your participation in this study only requires a commitment of time on your part. If you decide to participate, your willingness to share your experiences and knowledge may provide valuable information for improving the health of college students. There are no foreseeable risks or benefits to you personally from participation in this study.

QUESTIONS
If you have any questions about this study, please contact Cody Chipp at (907) 227-4620 or Dr. Christiane Brems, Dissertation Chair, at (907) 786-6381. If you have any questions or concerns about your rights as a research participant, please contact Dr. Claudia Lampman, Compliance Officer for the office of Research and the Graduate School at (907) 786-1099.

SIGNATURE
Your signature below means that you have read the information above and agree to participate in this study. If you have any questions, please feel free to ask them now or at any time during the study. If you sign, you will be indicating that you understand and agree with the following statements:

- I have read or listened to the information on this consent form.
- I understand what is in the consent form and had opportunity to ask questions.
- I understand that the study is completely voluntary.
- I understand that I can quit at any time.
- I would like to participate in this study.

With my signature below, I indicate that I understand and agree with all of the above statements:

Signature_____
Date:_____

Print Name _____

Appendix I

Sample Focus Group Protocol and Demographic Sheet

Health Behaviors of First-Year University Students

Student Focus Group Protocol

Date:	Location:
Time Started:	Time Ended:
Facilitator(s):	Group #:
Remarks:	

Point 1

The primary aim of this focus is to get information about the barriers and supports for students to live a healthy lifestyle while at college. We are also hoping to get information about how the university could support and promote healthy living for students during college.

Point 2

Administer the informed consent

- Do you have any questions for me regarding the informed consent?
- Discus limits of confidentiality with group and ask group to keep all members' answers confidential.
- As stated in the informed consent, I would like to record our conversation.
- Once the interview is done, the recording is used strictly to transcribe what your answers were, but without identifying who you are personally.
- Do you have any questions about the recording?

START RECORDING

Interview Questions

1. How would you define healthy eating and healthy exercise for college students?

    a. Prompt for discussion on macronutrient consumption if not spontaneously discussed (e.g., "What do you think is the right amount and types of fats, proteins, and carbohydrates people should eat?")

    b. Prompt for discussion of different levels of intensity (e.g., low, moderate, vigorous) and types (e.g., cardio and strength training) of exercise. "What types of activities are beneficial for people? How intense and long should exercise sessions be for people?

2. What are the supports for students to eat healthfully and exercise regularly?

    a. Prompt for both exercise and nutrition.

    b. Prompt for differences between students who live on campus versus commuting students.

3. What are the challenges for students to eat healthfully and exercise regularly?

    a. Prompt for both exercise and nutrition.

    b. Prompt for differences between students who live on campus versus commuting students.

4. What are some things the university is currently doing to promote healthy eating and exercise?

    a. Prompt for differences between students who live on campus versus commuting students.

5. What are some things the university could do differently to promote healthy eating and exercise among its students?

    a. Prompt for students' views of the promotion of unhealthy living by the university, if not spontaneously discussed (e.g., what are some things the university is currently doing that supports or promotes *unhealthy* living that you would like to see changed?)

    b. Prompt for differences between students who live on campus versus commuting students.

6. From our research we found that students who gained weight in college ate more sweets and desserts and ate fewer calories from fat. The research is consistent with other reports that limiting certain types of fat and increasing sugars in your diet can lead to weight gain. Does that information change the way you think about anything we've talked about today?

7. We've talked a lot about nutrition and exercise is there anything else you would like to share on this topic?

STOP RECORDING

Closure

Complete Data: Check to see that you have complete data; be sure that every major question was covered.

Consent Form: Make sure each participant has a copy of the consent form and has the name and phone number of relevant project staff should the participant want additional information about the study or thinks of something later.

- I really appreciate that you were willing to talk to me.
- The information you gave me is going to be very helpful.
- Thank you very much for your time.

Student Focus Group Demographic Sheet

1. What is your age?_____

2. What is your gender? _____

3. What is your race/ethnicity? _____

4. How many college credits have you completed? _____

5. What is your major? _____

6. Do you currently live on campus? _____

Appendix J

Sample Key Informant Protocol

Health Behaviors of First-Year University Students

Key Informant Protocol

Date:	Location:
Time Started:	Time Ended:
Facilitator(s):	Key Informant #:
Remarks:	

Point 1

The primary aim of this interview is to get information about the barriers and supports for students to live a healthy lifestyle while at college. We are also hoping to get information about how the university could support and promote healthy living for students during college.

Point 2

Administer the informed consent

- Do you have any questions for me regarding the informed consent?
- As stated in the informed consent, I would like to record our conversation.
- Once the interview is done, the recording is used strictly to transcribe what your answers were, but without identifying who you are personally.
- Do you have any questions about the recording?

START RECORDING

Interview Questions

1. First off, could you please tell me what your role is at UAA? Also, could you tell me how long you've been employed at UAA and how long you've been in your current position?

2. How would you define healthy eating and healthy exercise for college students?

    a. Prompt for discussion on macronutrient consumption if not spontaneously discussed (e.g., "What do you think is the right amount and types of fats, proteins, and carbohydrates should people eat?")

    b. Prompt for discussion of different levels of intensity (e.g., low, moderate, vigorous) and types (e.g., cardio and strength training) of exercise. "What types of activities are beneficial for people? How long and intense should exercise sessions be for people?

3. What are the supports and challenges for students to eat healthfully and exercise regularly at the university?

    a. Prompt for BOTH *supports* AND *challenges* if not spontaneously discussed

    b. Prompt for differences for students in residence versus commuter (e.g., "What differences did you see for students who commute to campus versus those that live on campus?")

4. From your perspective, what role does the university have in supporting healthy eating and exercise among its students?

    a. Prompt for differences for students in residence versus commuter (e.g., "Again, what differences did you see for students who commute to campus versus those that live on campus?")

5. From your perspective, what is the university doing to help promote healthy eating and exercise among its students?

    a. Prompt for differences for students in residence versus commuter (e.g., Again, what differences did you see for students who commute to campus versus those that live on campus?)

6. From your perspective, what else could the university be doing to help promote healthy eating and exercise among its students?

    a. Prompt: What do you see as the challenges to implementing the additional supports to healthy eating and exercise?

b. Prompt for differences for students in residence versus commuter (e.g., Again, what differences did you see for students who commute to campus versus those that live on campus?)

7. From our research we found that students who gained weight in college ate more sweets and desserts and ate fewer calories from fat. The research is consistent with other reports that limiting certain types of fat and increasing sugars in your diet can lead to weight gain. Does that information change the way you think about anything we've talked about today?

8. We've talked a lot about nutrition and exercise for students, is there anything else you would like to share on this topic?

STOP RECORDING

Closure

Complete Data: Check to see that you have complete data; be sure that every major question was covered.

Consent Form: Make sure each participant has a copy of the consent form and has the name and phone number of relevant project staff should the participant want additional information about the study or thinks of something later.

- I really appreciate that you were willing to talk to me.
- The information you gave me is going to be very helpful.
- Thank you very much for your time.