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# Receipt of Health Information, Body Mass Index, And Physical Activity And Dietary Behaviors Among University Students

Julianne M. Meadows

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RECEIPT OF HEALTH INFORMATION, BODY MASS INDEX,  
AND PHYSICAL ACTIVITY AND DIETARY BEHAVIORS  
AMONG UNIVERSITY STUDENTS

by

JULIANNE M. MEADOWS

(Under the Direction of Anthony V. Parrillo)

ABSTRACT

This study examined relationships between receipt of health information, body mass index (BMI), and dietary and physical activity behaviors in a sample of university students ( $n = 1,799$ ). A cross-sectional design assessed health-risk behaviors. Students were placed into dichotomous categories related to receipt of information, then grouped by “risk” and “non-risk” for each dependent behavioral variable; descriptive statistics were then generated. Odds ratios assessed relationships between receipt of health information and activity, diet, and nutrition for normal-weight and overweight students; odds ratios also assessed associations between BMI and diet and activity behaviors. *Post-hoc* analyses were also conducted. Students who received health information were more likely to: attempt weight-loss; diet; exercise at recommended levels; and eat well. Normal-weight students behaved more optimally than overweight students after receiving health information. Health messages may provide limited benefits regarding health-promoting behaviors; information should be but one component of a comprehensive strategy to target high-risk students.

INDEX WORDS: Receipt of health information, Physical activity risk behaviors, Dietary risk behaviors, College students, Body mass index

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JULIANNE M. MEADOWS

B.S., Shorter College, 2002

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COMMUNITY HEALTH

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2005

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JULIANNE M. MEADOWS

Major Professor: Anthony V. Parrillo

Committee: Stuart H. Tedders  
Steve Elliott  
Padmini Shankar

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## DEDICATION

In recognition of their constant support and encouragement, I hereby dedicate this thesis to my family: My parents, Olney and Jerriane Meadows, and my sister, Joy Susannah Meadows.

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## CHAPTER 1

### INTRODUCTION

#### Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students

Health promotion efforts at Georgia Southern University's Health Services involve presentation of health information to students in many forms, including: health fairs; group presentation and peer education sessions; use of brochures; and other methods to promote health and prevent disease in the college student population. Such health promotion efforts are vital in that college students, especially freshmen, are in a period of transition as they move from relatively healthy, stable lifestyles in high school and the home, to a more independent, less structured college environment (Sparling, 2003). They may also continue behavioral trends from high school into college (Soliah, Walter, & Erickson, 2000; Vohs, Heatherton, & Herrin, 2001). If they begin to practice or continue practicing established patterns of risk behaviors, especially dietary and physical activity risk behaviors, students may develop life-long habits that place them at increased risk for overweight, obesity, and related chronic diseases, including coronary heart disease, type-2 diabetes (diabetes mellitus), and endometrial, colon, and post menopausal breast cancers (Grace, 1997; U.S. Department of Health and Human Services [USDHHS], 2001). However, if health information can be effectively presented to those at-risk, students can adopt healthy patterns of eating and physical activity that will sustain health benefits throughout life (Flegal, Carroll, Kuczmarski, & Johnson, 1998; McCullough, Feskanich, Stampfer, Giovannucci, Rimm, Hu, Spiegelman, Hunter, Colditz, & Willett, 2002; USDHHS, 1996; USDHHS, 2001). Today's students will be the leaders, policy makers,

and role models of tomorrow for an increasingly healthy population, or one beset by obesity and related diseases caused by a sedentary lifestyle (Engstrom, 2004; USDHHS, 1996).

On this campus, as on others across the country, sufficient facilities and resources, as well as faculty and staff, are available for students' use in beginning or continuing to practice the health behaviors of physical activity and nutrition. Health promotion efforts are in existence, as are peer education teams, and these resources are being used at many locations and times throughout the year. Yet data from the 2002-2003 *College Student Health Risk Behavior Profile* (Teddens, Parrillo, & Carter, 2004) showed that only 62.1% of Georgia Southern students reported receiving information from the University on physical activity, and 53.6% reported receipt of nutrition information. These results are higher than national levels, as reported in the 1995 National College Health Risk Behavior Survey (NCHRBS) (Centers for Disease Control and Prevention [CDC], 1997), in which fewer than one-in-three students (30.4%) reported receiving health information on dietary behaviors and nutrition; a similarly low percentage (35.9%) received information on physical activity and fitness.

Although Georgia Southern University students report higher levels of receipt of information, it is not yet clear what impact the receipt of information at its current levels is having on the health behaviors of students. The efficacy of receipt of health information on students' dietary behaviors and physical activity was studied by Hertzler and Frary (1989). In this study of 212 college students enrolled in a nutrition education course, one-in four students reported increasing their consumption of fruits and vegetables as a perceived result of information received in the class. Most encouraging,

those who were overweight, the majority of whom were women, tended to report an improvement in dietary intake due to information received in-class (Hertzler & Frary, 1989). Other studies have surveyed health information and college students, finding no relationship between students' desire for health information (Svenson & Campbell, 1992) or their perceived need of information on specific behaviors (Ford & Goode, 1994) and their actual behaviors.

Ford and Goode (1994) compared perceptions of health issues among a group of 224 college students attending historically Black colleges with their corresponding health behaviors. As these authors reported, students indicated a need for health information on many topics, regardless of whether or not they had engaged in health or risk behaviors in that health category. Interest was shown in health topics such as nutrition and physical activity by both those engaged in related risk behaviors as well as students who were not, according to Ford and Goode. This study was encouraging in that students indicated both a receptiveness to preventive information as well as to intervention efforts once they were engaging in risk behaviors (Ford & Goode, 1994). Svenson and Campbell's (1992) work surveying students found that males aged twenty-two years and older were less likely to report a desire to receive nutrition information as compared to younger males, while four-in-nine females (43%) reported a desire to receive nutrition information.

Although students' preferences for health information on nutrition and physical activity behaviors, as well as the prevalence of their receipt of health information on these topics, has been reported in the literature, no studies linking receipt of information and health behaviors has yet been conducted. This study will examine the association between receipt of health information and BMI, dietary and nutrition behaviors, and

physical activity behaviors; the researcher hopes to provide insight into this area within the limitations of the study.

#### Purpose of the Study

The purpose of this study is to examine the relationship among receipt of health information, body mass index, and dietary and physical activity behaviors in a purposive sample of university students. Results will be used to address health promotion efforts on-campus aimed at preventing obesity and chronic disease by decreasing nutrition- and physical activity-related risk among students.



## CHAPTER 2

### METHODS

The *College Student Health Risk Behavior Profile* (Teddens, Parrillo, & Carter, 2004) was conducted using the National College Health Risk Behavior Survey (NCHRBS) (CDC, 1997), developed by the CDC's Division of Adolescent and School Health (DASH) to monitor the health-risk behaviors of college students.

Data gathered in the NCHRBS include polychotomous and categorical information about seven risk factor groupings, two of which were used in this study: dietary behaviors and physical activity. Twenty-two items from that survey assessed: receipt of health information (two items); body mass index (BMI) (two items); dietary-risk (seven items); and risk from physical inactivity in college students (five items). Demographic information on gender, race/ethnicity, class standing, and fraternity/sorority membership were also used.

The data were analyzed in four phases. In phase one, students were placed into dichotomous categories related to receipt of health information (yes/no). Students who placed a checkmark next to "dietary behaviors/nutrition" were categorized as having received information in that area; those who did not check the box were categorized as not having received that information. Similarly, those students who placed a checkmark next to the "physical activity/fitness" box were categorized as receiving information; those who did not check the box were categorized as not having received such information. Descriptive statistics were then generated by race, gender, and age.

In the second phase, dichotomous categories were created for each dependent variable, consistent with the national data (CDC, 1997), to group students into "risk" or

“non-risk” categories for purposes of analysis. Body mass index was calculated using self-reported height and weight to group students as to whether they were “at-risk” (overweight or obese:  $\geq 25.0 \text{ kg/m}^2$ ) or “not at-risk” (normal weight:  $< 25.0 \text{ kg/m}^2$ ). The following behaviors were assessed: perception of self as overweight (yes/no); consumed five-or-more servings of green vegetables, fruit juice, fruit, or green salad during the previous day (yes/no); ate two-or-more servings of fatty foods, such as french fries, cookies, dough-nuts, cakes, pies, pizza, hamburgers, hot dogs, or sausages during the previous day (yes/no); dieted to lose weight or keep from gaining weight (yes/no); exercised to lose weight or keep from gaining weight (yes/no); vomited or used laxatives to lose weight or keep from gaining weight (yes/no); took diet pills to lose weight or keep from gaining weight (yes/no); participated in vigorous physical activity on three-or-more of the last seven days (yes/no); participated in moderate physical activity on five-or-more of the last seven days (yes/no); participated in stretching exercises on three-or-more of the last seven days (yes/no); and participated in strengthening exercises on three-or-more of the last seven days (yes/no).

In the third phase, odds ratios were computed to assess the relationship between students’ receipt of health information on diet and nutrition and its association with weight loss behaviors, receipt of health information on diet and nutrition and its association with dietary behaviors, and receipt of health information on physical activity and its association with physical activity risk; results included students of normal weight and those who were overweight. Finally, odds ratios were computed to assess the relationship between BMI and dietary behaviors, and between BMI and physical activity behaviors. Chi-square analyses were conducted to identify differences between

independent and dependent measures, using  $\alpha \leq .05$  as the level of statistical significance. When significant odds ratios were observed, Breslow-Day and Mantel-Haenszel tests were used *post-hoc* to estimate the average conditional association between each independent and behavioral variable. *Statistical Package for the Social Sciences – Version 12.0* (SPSS, Inc., 2004) was used to analyze the data and to examine associations between the independent and dependent variables.

To collect information on height and weight, the survey asked participants to select from a set of categories (for example, 111-to-130 pounds). To calculate BMI, the researcher took the median value of each range to establish weight so that a range of 111-to-130 pounds became 120 pounds. These weight values were then converted to kilograms, then used in the calculation along with height in feet-and-inches, converted to meters.

## CHAPTER 3

### RESULTS

The purpose of this study was to examine the relationship among receipt of health information, body mass index, and dietary and physical activity behaviors in a purposive sample of university students.

As obesity in the population becomes more of a public health concern, colleges have an increasing opportunity to promote prevention through healthy nutrition and physical activity behaviors in their health education and promotion efforts on-campus. On college campuses, the environment is conducive to physical activity and good nutrition; there is needed only a health education and promotion emphasis on increasing the levels of health promoting behaviors to bring about long-lasting results in improving college students' health, as well as impacting the health of the population long-term.

The results section will present data in the following areas: 1) a demographic profile of study participants; 2) students' receipt of health information on diet and nutrition and its association with weight loss behaviors; 3) receipt of health information on diet and nutrition and its association with dietary behaviors; 4) and receipt of health information on physical activity and its association with physical activity risk. Two sections will also present results which include students of normal weight and those who are overweight.

#### Demographic Profile of Participants

A demographic profile of study participants is presented in Table 3.1. The sample of university students included 1,799 participants. Slightly more students in the sample were male (51.8%) than female (48.2%). More than three-in-four students were white (77.7%);

nearly one-quarter (22.3%) were black. Additionally, the vast majority of students were freshmen (71.9%), while only two-in-ten students were sophomores (21.7%); very few were either juniors or seniors. Almost one-in-six students were members of fraternities or sororities (14.0%).

Table 3.1  
Demographic Characteristics of Participants

Demographic Characteristic	Frequency	Percent
Gender		
Male	932	51.8
Female	867	48.2
Race		
White	1,398	77.7
Black	401	22.3
Class Standing		
Freshman	1,293	71.9
Sophomore	390	21.7
Junior	101	5.6
Senior	15	0.8
Fraternity/Sorority Membership		
Yes	2,511	14.0
No	548	86.0

*Note.*  $n = 1,799$ .

## Association Between Receipt of Health Information and Behavior

### *Receipt of Health Information on Diet and Nutrition and Dietary Behaviors*

The association between students' receipt of health information on diet and nutrition and specific dietary behaviors is presented in Table 3.2. Regarding weight perceptions, students who received health information were no more likely than those who did not receive such information to perceive themselves as overweight. When examined by race and gender, no statistically significant associations were found.

Among all students, those who received health information on diet and nutrition were 1.4 times as likely as those who did not receive such information to attempt to lose weight or control weight gain ( $p < .001$ ); no statistically significant associations were detected by race and gender. In addition, students who received health information on diet and nutrition were more likely than those who did not receive such information to use diet and exercise to lose weight or control their weight. Specifically, students who received health information were 1.4 times as likely as those who did not receive health information to have dieted ( $p < .001$ ). By race and gender, no statistically significant associations were detected. Similarly, students who received health information were 40% more likely than those who did not receive health information to exercise ( $p < .001$ ). No statistically significant associations were detected when analyzed by race and gender.

Regarding vomiting or taking laxatives, students who received information on diet and nutrition were no more likely than those who did not receive such information to engage in this behavior; no significant associations were observed among the racial or ethnic subgroups. Similarly, students who received information on diet and nutrition were no more likely than those who did not receive such information to take diet pills to

lose weight or control their weight. Black females who received information on diet/nutrition were 4.5 times as likely as those who did not receive such information to have taken diet pills ( $p = .013$ ); no significant associations were observed in any of the other subgroups.

Table 3.2

Association Between Receipt of Health Information on Diet and Nutrition and Dietary Behaviors Among Students by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Dietary Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Perceived self as overweight (yes/no)	1.0	1.0	0.9	1.6	1.1
▶ Received information (yes/no)	(0.7-1.4)	(0.7-1.4)	(0.5-1.9)	(0.9-2.9)	(0.9-1.4)
	ns	ns	ns	ns	ns
Were attempting weight loss (yes/no) <sup>a</sup>	1.0	1.2	1.3	1.4	1.4
▶ Received information (yes/no)	(0.7-1.4)	(0.9-1.7)	(0.6-2.5)	(0.8-2.6)	(1.2-1.7)
	ns	ns	ns	ns	< .001
Dieted to lose weight or control weight (yes/no) <sup>a</sup>	1.1	1.2	1.0	1.6	1.4
▶ Received information (yes/no)	(0.8-1.6)	(0.8-1.6)	(0.4-2.5)	(0.8-2.9)	(1.2-1.8)
	ns	ns	ns	ns	< .001
Exercised to lose weight or control weight (yes/no) <sup>a</sup>	1.2	1.4	0.8	1.3	1.4
▶ Received information (yes/no)	(0.9-1.6)	(0.9-2.0)	(0.4-1.4)	(0.7-2.2)	(1.2-1.7)
	ns	ns	ns	ns	.001
Vomited or took laxatives to lose weight or control weight (yes/no) <sup>a</sup>	0.9	1.2	1.0	1.3	1.3
▶ Received information (yes/no)	(0.3-2.8)	(0.7-2.1)	(0.9-1.1)	(0.3-5.9)	(0.8-2.0)
	ns	ns	ns	ns	ns
Took diet pills to lose weight or control weight (yes/no) <sup>a</sup>	0.6	0.75	0.4	4.5	1.0
▶ Received information (yes/no)	(0.3-1.2)	(0.5-1.1)	(0.08-2.0)	(1.3-16.4)	(0.8-1.4)
	ns	ns	ns	.013	ns

Note. *n* = 1,799.

<sup>a</sup>During the 30 days preceding the survey.



*Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors*

Receipt of health information on diet and nutrition was not associated with students' having eaten five-or-more servings of fruits and vegetables the previous day (Table 3.3); similarly, no statistically significant associations were observed by race and gender. For all students, those who received health information on diet and nutrition were 1.3 times as likely as those who had not received this information to report eating two-or- fewer servings of high-fat foods the previous day ( $p = .007$ ). No significant associations were observed among any of the subgroups in the study.

Table 3.3

Association Between Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors Among Students by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Nutrition Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits and vegetables (yes/no) <sup>a</sup>	1.0 (0.7-1.6)	0.8 (0.5-1.2)	0.96 (0.5-2.0)	1.3 (0.6-2.7)	0.9 (0.7-1.2)
▶ Received information (yes/no)	ns	ns	ns	ns	ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>a</sup>	1.3 (0.9-1.7)	1.2 (0.8-1.8)	1.0 (0.6-1.8)	0.9 (0.5-1.7)	1.3 (1.1-1.6)
▶ Received information (yes/no)	ns	ns	ns	ns	.007

Note.  $n = 1,799$ .

<sup>a</sup>On the previous day.

*Receipt of Health Information on Physical Activity and Physical Activity Behaviors*

The association between students' receipt of health information on physical activity and physical activity is shown in Table 3.4. Those who received information on physical activity were 1.3 times as likely than those that did not receive the information to engage in sufficient levels of vigorous physical activity – activities that made them sweat and breathe hard for at least 20 minutes on at least three of the seven days prior to having been surveyed ( $p = .021$ ). White males in the sample who received health information were 1.4 times as likely as those who did not receive information to do so ( $p = .015$ ).

Likewise, students who received information on physical activity were 1.4 times as likely as those who did not receive such information to participate in sufficient moderate activity, or activities that did not make them breathe hard, such as walking or bicycling, for 30 minutes or more on at least five of the seven days preceding the survey ( $p = .011$ ). By race and gender, white females who received health information were 1.5 times as likely as white females who did not receive this information to do so ( $p = .047$ ).

Students who received information on physical activity were 1.4 times as likely as those who did not receive such information to participate in stretching on at least three of the seven days prior to the survey ( $p < .001$ ). White males ( $p = .044$ ) and black females ( $p = .029$ ) who received health information were more likely than those who did not receive information to report stretching. Finally, students who received health information were 1.3 times as likely as those who did not receive such information to participate in strengthening activity on at least three of the seven days before taking the survey ( $p = .041$ ). White males who received health information were 1.4 times as likely as those who did not receive such information to report doing so ( $p = .046$ ).

Table 3.4

Association Between Receipt of Health Information on Physical Activity and Physical Activity Behaviors Among Students by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Physical Activity Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on	1.4	1.0	1.5	1.4	1.3
≥3 of previous 7 days (yes/no)	(1.1-1.9)	(0.8-1.4)	(0.8-2.6)	(0.8-2.6)	(1.0-1.5)
▶ Received information (yes/no)	.015	ns	ns	ns	.021
Participated in moderate activity on	1.4	1.5	1.5	0.8	1.4
≥5 of previous 7 days (yes/no)	(0.9-2.1)	(1.0-2.3)	(0.8-2.8)	(0.4-1.5)	(1.1-1.7)
▶ Received information (yes/no)	ns	.047	ns	ns	.011
Participated in stretching activity on	1.4	1.3	1.6	2.0	1.4
≥3 of previous 7 days (yes/no)	(1.0-1.9)	(0.9-1.8)	(0.9-2.9)	(1.1-3.9)	(1.1-1.7)
▶ Received information (yes/no)	.044	ns	ns	.029	< .001
Engaged in strengthening activity on	1.4	1.1	1.6	1.3	1.3
≥3 of previous 7 days (yes/no)	(1.0-1.8)	(0.8-1.6)	(0.8-2.9)	(0.7-2.5)	(1.0-1.5)
▶ Received information (yes/no)	.046	ns	ns	ns	.041

Note. *n* = 1,799.

*Receipt of Health Information on Diet and Nutrition and Dietary Behaviors: Normal Weight Students*

Additional analysis was conducted to examine the association among receipt of health information and dietary and physical activity behaviors by placing students into one of two weight classifications: normal weight (a BMI < 25.0 kg/m<sup>2</sup>) and overweight (a BMI that was ≥ 25.0 kg/m<sup>2</sup>) (*NB*: For purposes of this study, overweight students included those classified as both overweight [BMI between 25.0-to-29.9] and obese [BMI ≥30.0], including the morbidly obese) (CDC, 2005). The association between receipt of health information on diet and nutrition and specific dietary behaviors for students of normal weight is presented in Table 3.5. Normal weight students who received health information were more likely than those who did not receive such information to attempt to lose weight or keep from gaining weight (*OR* = 1.5; *p* = .001) and to use both diet (*OR* = 1.6; *p* < .001) and exercise (*OR* = 1.6; *p* < .001) to do so; no significant associations were observed by race and gender.

Students of normal weight who received health information were no more likely than those who did not receive such information to perceive themselves as overweight, to have vomited, taken laxatives, or taken diet pills to lose weight or to control weight gain in the 30 days preceding the survey. By race and gender, there was one statistically significant result: Black women of normal weight who had received health information on diet and nutrition were less likely than those who had not received such information to have used diet pills to lose weight or keep from gaining weight (*p* = .024).

Table 3.5

Association Between Receipt of Health Information on Diet and Nutrition and Dietary Behaviors by Race and Gender: Normal Weight Students

	White ♂	White ♀	Black ♂	Black ♀	Total
Dietary Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Perceived self as overweight (yes/no)	1.9	0.9	1.3	0.9	1.2
▶ Received information (yes/no)	(0.7-5.3)	(0.6-1.3)	(0.1-21.3)	(0.2-4.1)	(0.8-1.8)
	ns	ns	.033	ns	ns
Were attempting weight loss (yes/no) <sup>a</sup>	0.9	1.3	0.4	1.3	1.5
▶ Received information (yes/no)	(0.5-1.6)	(0.8-1.8)	(0.04-4.1)	(0.6-2.8)	(1.2-1.9)
	ns	ns	ns	ns	.001
Dieted to lose weight or control weight (yes/no) <sup>a</sup>	1.5	1.2	1.3	2.2	1.6
▶ Received information (yes/no)	(0.8-2.9)	(0.8-1.7)	(0.2-9.2)	(0.9-5.3)	(1.2-2.1)
	ns	ns	ns	ns	< .001
Exercised to lose weight or control weight (yes/no) <sup>a</sup>	1.3	1.4	0.9	1.2	1.6
▶ Received information (yes/no)	(0.9-2.0)	(0.9-2.1)	(0.3-2.4)	(0.6-2.5)	(1.2-1.9)
	ns	ns	ns	ns	< .001
Vomited or took laxatives to lose weight or control weight (yes/no) <sup>a</sup>	1.0	1.3	1.0	0.98	1.4
▶ Received information (yes/no)	(0.1-16.4)	(0.7-2.4)	(0.98-1.1)	(0.1-7.2)	(0.8-2.6)
	ns	ns	ns	ns	ns
Took diet pills to lose weight or control weight (yes/no) <sup>a</sup>	0.4	0.74	1.0	0.9	1.0
▶ Received information (yes/no)	(0.1-2.1)	(0.5-1.2)	(0.98-1.1)	(0.8-0.9)	(0.7-1.5)
	ns	ns	ns	.024	ns

Note. *n* = 1,202.

<sup>a</sup> During the 30 days preceding the survey.

*Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors:*

*Normal Weight Students*

Among normal weight students, the receipt of health information on diet and nutrition was not associated with having eaten five or more servings of fruits and vegetables on the previous day, nor with having eaten two or fewer servings of fatty foods on the previous day (Table 3.6). No statistically significant associations were observed in any of the racial/ ethnic subgroups.

Table 3.6

Association Between Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors by Race and Gender: Normal Weight Students

	White ♂	White ♀	Black ♂	Black ♀	Total
Nutrition Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits and vegetables (yes/no) <sup>a</sup>	1.8 (0.9-3.1)	0.7 (0.4-1.2)	0.9 (0.3-2.3)	1.3 (0.5-3.2)	1.0 (0.8-1.5)
▶ Received information (yes/no)	ns	ns	ns	ns	ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>a</sup>	1.0 (0.7-1.5)	1.3 (0.9-2.1)	1.4 (0.6-3.0)	0.9 (0.4-1.8)	1.3 (0.9-1.6)
▶ Received information (yes/no)	ns	ns	ns	ns	ns

Note. *n* = 1,202.

<sup>a</sup>On the previous day.

*Receipt of Health Information on Physical Activity and Physical Activity Behaviors:**Normal Weight Students*

Students of normal weight who received health information on physical activity were consistently more likely than those that did not receive this information to participate in physical activity (Table 3.7). Students in this group who received health information were 1.3 times as likely as those who did not receive such information to participate in sufficient vigorous activity ( $p = .037$ ) and 1.5 times as likely to participate in sufficient moderate physical activity ( $p = .007$ ).

Table 3.7

Association Between Receipt of Health Information on Physical Activity and Physical Activity Behaviors by Race and Gender: Normal Weight Students

	White ♂	White ♀	Black ♂	Black ♀	Total
Physical Activity Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on ≥3 of previous 7 days (yes/no)	1.3 (0.9-1.9)	1.1 (0.8-1.6)	2.3 (0.9-5.3)	1.7 (0.8-3.6)	1.3 (1.0-1.6)
▶ Received information (yes/no)	ns	ns	ns	ns	.037
Participated in moderate activity on ≥5 of previous 7 days (yes/no)	1.5 (0.9-2.5)	1.6 (1.0-2.7)	2.4 (0.9-6.3)	0.7 (0.3-1.6)	1.5 (1.1-2.0)
▶ Received information (yes/no)	ns	.041	ns	ns	.007
Participated in stretching activity on ≥3 of previous 7 days (yes/no)	1.2 (0.8-1.8)	1.3 (0.9-1.9)	1.5 (0.7-3.5)	2.7 (1.2-6.3)	1.4 (1.1-1.7)
▶ Received information (yes/no)	ns	ns	ns	.020	.014
Engaged in strengthening activity on ≥3 of previous 7 days (yes/no)	1.3 (0.9-1.9)	1.3 (0.9-2.0)	2.1 (0.8-5.3)	1.8 (0.7-4.4)	1.4 (1.1-1.8)
▶ Received information (yes/no)	ns	ns	ns	ns	.016

Note. *n* = 1,202.

Normal weight white females who received health information on physical activity were 1.6 times as likely as those who did not receive this information to report participating in sufficient moderate activity ( $p = .041$ ) (Table 3.7). Students who received



information on physical activity were 1.4 times as likely as those who did not receive such information to participate in stretching activity on at least three of the previous seven days ( $p = .014$ ). Specifically, black females who received such information were 2.7 times as likely as those black females who did not receive this information to participate in stretching activity ( $p = .020$ ). Finally, students who received health information were 1.4 times as likely as those who did not receive such information to engage in strengthening activity on at least three of the previous seven days ( $p = .016$ ).

*Receipt of Health Information on Diet and Nutrition and Dietary Behaviors: Overweight Students*

The association between receipt of health information on diet and nutrition and specific dietary behaviors for overweight students is presented in Table 3.8. Those in this group who received information on diet and nutrition were 1.5 times as likely as those who did not receive such information to perceive themselves as overweight ( $p = .020$ ). Overweight black females who received health information on diet and nutrition were 7.1 times as likely to perceive themselves as overweight as those who did not receive such information ( $p = .002$ ). Among all overweight students, those who received health information on diet and nutrition were 1.8 times as likely as those who did not receive such information to attempt weight loss during the 30-days preceding the survey ( $p = .001$ ). Black females ( $OR = 3.8$ ;  $p = .048$ ) and white females ( $OR = 2.5$ ;  $p = .047$ ) who received health information on diet and nutrition were more likely than their counterparts who did not receive such information to report attempting weight loss.

Table 3.8

Association Between Receipt of Health Information on Diet and Nutrition and Dietary Behaviors by Race and Gender: Overweight Students

	White ♂	White ♀	Black ♂	Black ♀	Total
Dietary Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Perceived self as overweight (yes/no)	0.99	0.9	1.2	7.1	1.5
▶ Received information (yes/no)	(0.6-1.6)	(0.3-2.9)	(0.5-2.9)	(1.9-27.2)	(1.1-2.1)
	ns	ns	ns	.002	.020
Were attempting weight loss (yes/no) <sup>a</sup>	1.2	0.4	2.5	3.8	1.8
▶ Received information (yes/no)	(0.8-2.0)	(0.5-4.1)	(1.0-6.3)	(0.9-15.3)	(1.3-2.6)
	ns	ns	.047	.048	.001
Dieted to lose weight or control weight (yes/no) <sup>a</sup>	1.1	0.8	1.1	0.2	1.3
▶ Received information (yes/no)	(0.7-1.8)	(0.3-1.9)	(0.4-3.3)	(0.5-3.1)	(0.96-1.9)
	ns	ns	ns	ns	ns
Exercised to lose weight or control weight (yes/no) <sup>a</sup>	1.0	0.5	0.96	1.2	1.2
▶ Received information (yes/no)	(0.7-1.7)	(0.1-2.5)	(0.4-2.4)	(0.5-3.3)	(0.8-1.7)
	ns	ns	ns	ns	ns
Vomited or took laxatives to lose weight or control weight (yes/no) <sup>a</sup>	0.9	0.9	1.0	1.9	1.1
▶ Received information (yes/no)	(0.3-3.1)	(0.3-2.8)	(0.99-1.1)	(0.2-22.4)	(0.5-2.3)
	ns	ns	ns	ns	ns
Took diet pills to lose weight or control weight (yes/no) <sup>a</sup>	0.7	0.7	0.6	2.8	1.0
▶ Received information (yes/no)	(0.3-1.4)	(0.3-1.5)	(0.1-3.0)	(0.7-11.6)	(0.6-1.6)
	ns	ns	ns	ns	ns

Note. *n* = 584.

<sup>a</sup>During the 30 days preceding the survey.

With regard to other weight control behaviors, overweight students who received information on diet and nutrition were no more likely to have dieted, to have exercised, to have vomited or taken laxatives, or to have used diet pills during the 30 days preceding the survey; this was also true for each racial or ethnic subgroup.

*Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors:*

*Overweight Students*

Overweight students who received diet and nutrition information were 1.5 times as likely as those who did not receive this information to eat two-or-fewer servings of high-fat foods the previous day ( $p = .045$ ) (Table 3.9). White males who received this information were twice as likely as white males who did not receive such information to consume two-or-fewer servings of foods high in fat content ( $p = .010$ ). Among overweight students, receipt of health information on diet and nutrition was not associated with eating five-or-more servings of fruits and vegetables the previous day. For this behavior, no significant associations were observed by race and gender.

Table 3.9

Association Between Receipt of Health Information on Diet and Nutrition and Nutrition Behaviors by Race and Gender: Overweight Students

Nutrition Risk Behaviors	White ♂	White ♀	Black ♂	Black ♀	Total
	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits and vegetables (yes/no) <sup>a</sup>	0.6 (0.3-1.1)	1.1 (0.4-3.2)	1.2 (0.3-3.9)	1.4 (0.4-1.8)	0.8 (0.5-1.3)
▶ Received information (yes/no)	ns	ns	ns	ns	ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>a</sup>	2.0 (1.2-3.3)	0.7 (0.3-1.9)	0.8 (0.3-1.9)	0.9 (0.3-3.0)	1.5 (1.0-2.1)
▶ Received information (yes/no)	.010	ns	ns	ns	.045

Note. *n* = 584.

<sup>a</sup>During the 30 days preceding the survey.

*Receipt of Health Information on Physical Activity and Physical Activity Behaviors: Overweight Students*

Among overweight students, those who received information on physical activity were 1.5 times as likely as those who did not receive this information to have participated in sufficient stretching ( $p = .033$ ), that is, the student engaged in stretching on at least three of the seven days prior to the survey (Table 3.10). Overweight white males receiving health information on physical activity were 1.7 times as likely as those who had not received such information to participate in sufficient stretching ( $p = .039$ ).

Among overweight students, receipt of health information on physical activity was not associated with participation in sufficient levels of vigorous or moderate activity, that is, students who received information on physical activity were no more likely than those who did not receive such information to have engaged in activities that made them sweat or breathe hard on three-or-more of the seven days preceding the survey. In addition, students who received this type of health information were no more likely than those who did not receive such information to have engaged in activities such as bicycling or walking on at least five of the previous seven days. For these behaviors, no statistically significant associations were observed by race and gender.

For all overweight students, those who received physical activity information were no more likely than those who did not receive such information to engage in strengthening on three-or-more of the seven days preceding the survey. However, among overweight white females, those who reported receiving information on physical activity were only forty percent as likely as those who did not receive such information to do so ( $p = .049$ ).

Table 3.10

Association Between Receipt of Health Information on Physical Activity and Physical Activity Behaviors by Race and Gender: Overweight Students

	White ♂	White ♀	Black ♂	Black ♀	Total
Physical Activity Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on	1.6	0.7	0.6	1.1	1.2
≥3 of previous 7 days (yes/no)	(0.99-2.5)	(0.3-1.6)	(0.2-1.5)	(0.4-2.9)	(0.8-1.7)
▶ Received information (yes/no)	ns	ns	ns	ns	ns
Participated in moderate activity on	1.4	1.0	1.0	0.8	1.1
≥5 of previous 7 days (yes/no)	(0.8-2.6)	(0.4-2.3)	(0.4-2.8)	(0.3-2.5)	(0.7-1.7)
▶ Received information (yes/no)	ns	ns	ns	ns	ns
Participated in stretching activity on	1.7	0.98	0.7	1.3	1.5
≥3 of previous 7 days (yes/no)	(1.0-2.7)	(0.4-2.1)	(0.3-1.7)	(0.5-3.5)	(1.0-2.1)
▶ Received information (yes/no)	.039	ns	ns	ns	.033
Engaged in strengthening activity on	1.4	0.4	0.8	0.9	1.0
≥3 of previous 7 days (yes/no)	(0.9-2.2)	(0.2-1.0)	(0.3-1.9)	(0.3-2.5)	(0.7-1.4)
▶ Received information (yes/no)	ns	.049	ns	ns	ns

Note. *n* =584.

## Association Between Body Mass Index and Behavior

### *Body Mass Index (BMI) and Dietary Behaviors*

The association between students' body mass index (BMI) and dietary behaviors is presented in Table 3.11. Students who were overweight were 14.8 times as likely as those of normal weight to perceive themselves as overweight ( $p < .001$ ). Similar results were observed for black females ( $OR = 56.1; p < .001$ ), black males ( $OR = 39.8; p < .001$ ), white males ( $OR = 31.4; p < .001$ ), and white females ( $OR = 29.5; p < .001$ ).

Among all students, those who were overweight were 3.8 times as likely as those of normal weight to attempt weight loss ( $p < .001$ ). Specifically, overweight black males were most likely to attempt to lose weight ( $OR = 12.6; p < .001$ ); overweight white males were 10.4 times as likely as those of normal weight to attempt weight loss ( $p < .001$ ). Overweight black ( $OR = 12.6; p < .001$ ) and white ( $OR = 10.4; p < .001$ ) females were also more likely than their normal weight counterparts to attempt weight loss.

In examining specific dietary behaviors, students who were overweight were nearly twice as likely as those of normal weight to diet to lose weight or keep from gaining weight ( $p < .001$ ) (Table 3.11). Overweight black males ( $OR = 7.3; p < .001$ ) were among the most likely to use diet to lose weight or keep from gaining weight, followed by white males ( $OR = 5.9; p < .001$ ). Overweight white ( $OR = 2.7; p < .001$ ) and black ( $OR = 2.7; p < .001$ ) females were also more likely than their normal weight counterparts to diet to lose weight or keep from gaining weight.

Overweight students were 2.3 times as likely as those of normal weight to exercise to lose weight or keep from gaining weight ( $p < .001$ ). By race and gender, black males who were overweight were most likely to exercise to lose weight ( $OR = 7.0; p < .001$ ).

Overweight white males ( $OR = 3.8; p < .001$ ) and females ( $OR = 3.8; p < .001$ ) were more likely than those of normal weight to use exercise to control their weight.

Overweight black females ( $OR = 2.7; p < .001$ ) were more likely than those of normal weight to exercise to lose weight or keep from gaining weight.

Those who were overweight were 1.7 times as likely as those of normal weight to take diet pills to lose weight or control their weight ( $p < .001$ ). Statistically significant results were observed for overweight black males ( $OR = 94.5; p < .001$ ), white males ( $OR = 8.1; p < .001$ ), black females ( $OR = 4.0; p = .008$ ), and white females ( $OR = 1.9; p = .006$ ). Overweight students were no more likely than those of normal weight to vomit or take laxatives to lose weight or keep from gaining weight. However, white males who were overweight were 8.2 times as likely as those of normal weight to do so ( $p < .001$ ).



Table 3.11

Association Between Body Mass Index (BMI)<sup>a</sup> and Dietary Behaviors by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Dietary Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Perceived self as over- weight (yes/no)	31.4 (18.4-53.6)	29.5 (16.4-52.8)	39.8 (9.2-171.9)	56.1 (22.9-137.0)	14.8 (11.5-19.0)
▶ Overweight (yes/no)	< .001	< .001	< .001	< .001	< .001
Were attempting weight loss (yes/no) <sup>b</sup>	10.4 (7.2-14.96)	11.5 (4.6-28.7)	23.6 (7.9-70.0)	12.6 (6.2-25.9)	3.8 (3.1-4.7)
▶ Overweight (yes/no)	< .001	< .001	< .001	< .001	< .001
Dieted to lose/control weight (yes/no) <sup>b</sup>	5.9 (3.9-8.7)	2.7 (1.7-4.3)	7.3 (2.4-22.6)	2.7 (1.5-5.0)	1.9 (1.5-2.3)
▶ Overweight (yes/no)	< .001	< .001	< .001	.002	< .001
Exercised to lose/control weight (yes/no) <sup>b</sup>	3.8 (2.8-5.3)	3.8 (1.9-7.7)	7.0 (3.6-13.6)	2.7 (1.5-4.9)	2.3 (1.8-2.8)
▶ Overweight (yes/no)	< .001	< .001	< .001	< .001	< .001
Vomited/took laxatives to lose/control wt (yes/no) <sup>b</sup>	8.2 (1.8-37.3)	1.4 (0.7-2.6)	2.5 (0.2-28.5)	1.2 (0.3-5.6)	1.2 (0.7-1.9)
▶ Overweight (yes/no)	< .001	ns	ns	ns	ns
Took diet pills to lose/ control weight (yes/no) <sup>b</sup>	8.1 (3.5-18.4)	1.9 (1.2-2.9)	94.5 (12.7-703.0)	4.0 (1.3-12.0)	1.7 (1.3-2.3)
▶ Overweight (yes/no)	< .001	.006	< .001	.008	< .001

Note. *n* = 1,799.

<sup>a</sup>BMI ≥ 25.0 kg/m<sup>2</sup> = overweight; BMI < 25.0 kg/m<sup>2</sup> = normal weight. <sup>b</sup>During 30 days preceding survey.

*Body Mass Index (BMI) and Nutrition Behaviors*

Overweight students were no more likely than those of normal weight to have eaten two-or-fewer servings of fatty foods on the previous day (Table 3.12). However, among subgroups, overweight black females were 2.7 times as likely as those of normal weight to have eaten two-or-fewer servings of high-fat foods the previous day ( $p = .005$ ); overweight black ( $OR = 1.9$ ;  $p = .029$ ) and white ( $OR = 1.6$ ;  $p = .006$ ) males were more likely than normal weight males to engage in this behavior on the previous day.

Table 3.12

Association Between Body Mass Index (BMI)<sup>a</sup> and Nutrition Behaviors by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Nutrition Risk Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits and vegetables (yes/no) <sup>b</sup>	1.5 (1.0-2.3)	1.3 (0.7-2.3)	0.7 (0.3-1.6)	0.96 (0.4-2.1)	1.3 (0.9-1.7)
▶ Overweight (yes/no)	.042	ns	ns	ns	ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>b</sup>	1.6 (1.1-2.1)	1.1 (0.6-1.8)	1.9 (1.1-3.4)	2.7 (1.3-5.3)	1.3 (1.0-1.6)
▶ Overweight (yes/no)	.006	ns	.029	.005	ns

Note.  $n = 1,799$ .

<sup>a</sup>BMI  $\geq 25.0$  kg/m<sup>2</sup> = overweight; BMI  $< 25.0$  kg/m<sup>2</sup> = normal weight. <sup>b</sup>On the previous day.

Body mass index (BMI) was not associated with students' having eaten five-or-more servings of fruits and vegetables except among overweight white males, who were 1.5 times as likely as normal weight white males to have eaten this food amount ( $p = .042$ ).

Table 3.13

Association Between Body Mass Index (BMI)<sup>a</sup> and Physical Activity Behaviors by Race and Gender

	White ♂	White ♀	Black ♂	Black ♀	Total
Physical Activity Behaviors	OR	OR	OR	OR	OR
	(95% CI)	(95% CI)	(95% CI)	(95% CI)	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on $\geq 3$ of previous 7 days (yes/no)	1.2 (0.9-1.6)	1.1 (0.8-1.7)	1.0 (0.6-1.8)	0.9 (0.5-1.5)	1.1 (0.9-1.4)
▶ Overweight (yes/no)	ns	ns	ns	ns	ns
Participated in moderate activity on $\geq 5$ of previous 7 days (yes/no)	0.9 (0.6-1.2)	1.8 (1.1-2.8)	0.7 (0.4-1.4)	0.6 (0.3-1.1)	0.98 (0.8-1.3)
▶ Overweight (yes/no)	ns	.013	ns	ns	ns
Participated in stretching activity on $\geq 3$ of previous 7 days (yes/no)	1.1 (0.8-1.5)	1.3 (0.9-2.0)	0.7 (0.4-1.3)	0.9 (0.5-1.7)	1.1 (0.9-1.3)
▶ Overweight (yes/no)	ns	ns	ns	ns	ns
Engaged in strengthening activity on $\geq 3$ of previous 7 days (yes/no)	1.2 (0.9-1.6)	0.8 (0.5-1.3)	1.4 (0.8-2.5)	1.1 (0.6-2.1)	2.1 (0.9-1.4)
▶ Overweight (yes/no)	ns	ns	ns	ns	ns

Note.  $n = 1,799$ .

<sup>a</sup>BMI  $\geq 25.0$  kg/m<sup>2</sup> = overweight; BMI  $< 25.0$  kg/m<sup>2</sup> = normal weight.

### *Body Mass Index (BMI) and Physical Activity Behaviors*

As a group, overweight students in the sample were no more likely than those of normal weight to participate in sufficient levels of physical activity in the seven days prior to being surveyed (Table 3.13). This included vigorous and moderate activities, and stretching and strengthening activities. When analyzed by race and gender, however, overweight white females were 1.8 times as likely as those of normal weight to engage in sufficient moderate activity in the most recent seven-day period ( $p = .013$ ).

### *Additional Analyses*

In an effort to further explain significant results, additional analyses were conducted; to accomplish this, the Mantel-Haenszel and Breslow-Day tests were selected. Since the data were stratified by race and gender, the Breslow-Day Test of Homogeneity was used to test the hypothesis of no association when significant odds ratios were observed; when Breslow-Day failed to reject the null hypothesis (when a calculated  $p$ -value for the Breslow-Day was  $\geq .05$ ), Mantel-Haenszel was used to estimate the average conditional association (or common odds ratio) between the independent variable (BMI) and each risk behavior variable.

### *Body Mass Index (BMI) and Dietary Risk Behaviors: Males*

All values calculated for the Breslow-Day test of homogeneity for BMI and dietary risk behaviors among males by race were non-significant (Table 3.14). The common odds ratios calculated between BMI and dietary risk behaviors suggest that overweight males are at a significant increased risk of participating in these behaviors, regardless of race.

Table 3.14

Association Between Body Mass Index (BMI)<sup>a</sup> and Dietary Risk Behaviors Among University Males by Race Using Breslow-Day and Mantel-Haenszel Tests

Dietary Risk Behaviors	White $\sigma$ OR (95% CI) <i>p</i> -value	Black $\sigma$ OR (95% CI) <i>p</i> -value	Breslow-Day Test of Homogeneity <i>p</i> -value	Mantel-Haenszel Common OR (95% CI) <i>p</i> -value
Perceived self as overweight (yes/no)	31.4 (18.4-53.6)	39.8 (9.2-171.9)	0.764	32.6 (19.6-54.0)
▶ Overweight (yes/no)	< .001	< .001		< .001
Were attempting weight loss (yes/no) <sup>b</sup>	10.4 (7.2-15.96)	23.6 (8.0-70.0)	0.153	11.6 (8.3-16.4)
▶ Overweight (yes/no)	< .001	< .001		< .001
Dieted to lose/control weight (yes/no) <sup>b</sup>	5.6 (3.9-8.7)	7.3 (2.4-22.6)	0.719	6.0 (4.1-8.8)
▶ Overweight (yes/no)	< .001	< .001		< .001
Exercised to lose/control weight (yes/no) <sup>b</sup>	3.8 (2.8-5.3)	7.0 (3.6-13.6)	0.108	4.3 (3.2-5.7)
▶ Overweight (yes/no)	.001	< .001		< .001
Vomited/took laxatives to lose/control wt (yes/no) <sup>b</sup>	8.2 (1.8-37.2)	2.5 (0.2-28.5)	0.406	6.2 (1.8-21.8)
▶ Overweight (yes/no)	.001	ns		.005
Took diet pills to lose/ control weight (yes/no) <sup>b</sup>	8.1 (3.5-18.4)	10.9 (1.3-89.4)	0.789	8.5 (3.9-18.2)
▶ Overweight (yes/no)	< .001	.006		< .001

Note. *n* = 919.

<sup>a</sup>BMI  $\geq 25.0$  kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight. <sup>b</sup>During 30 days preceding survey.

First, overweight males were 32.6 times as likely as normal weight males to perceive themselves as overweight and 11.6 times as likely to have attempted to control their weight ( $p < .001$ ). In terms of specific weight control behaviors, overweight males were 6.0 times as likely as those of normal weight to have dieted to lose weight or keep from gaining weight ( $p < .001$ ), 4.3 times as likely to have exercised to lose weight or keep from gaining weight ( $p < .001$ ), 6.2 times as likely to have vomited or used laxatives to lose weight or keep from gaining weight ( $p = .005$ ), and 8.5 times as likely to have taken diet pills to lose weight or keep from gaining weight ( $p < .001$ ), regardless of race.

*Body Mass Index (BMI) and Nutrition Behaviors: Males*

The values calculated for the Breslow-Day test of homogeneity for body mass index and nutrition risk behaviors among males by race were non-significant (Table 3.15). The common odds ratios calculated for each behavior suggest a slight increase among overweight males for engaging in risky nutrition behaviors.

Overweight males were 1.3 times as likely as normal weight males to have eaten five-or-more servings of fruits and vegetables on the day before they were surveyed, but this result was statistically non-significant. On the other hand, overweight males were 1.6 times as likely as males of normal weight to have eaten two or fewer servings of high-fat foods on the previous day, regardless of race ( $p = .001$ ).

Table 3.15

Association Between BMI<sup>a</sup> and Nutrition Risk Behaviors Among University Males by Race Using Breslow-Day and Mantel-Haenszel Tests

Nutrition Risk Behaviors	White ♂	Black ♂	Breslow-Day	Mantel-Haenszel
	OR	OR	Test of	Common OR
	(95% CI)	(95% CI)	Homogeneity	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits & vegetables (yes/no) <sup>b</sup>	1.5 (1.0-2.3)	0.7 (0.3-1.6)	0.091	1.3 (0.9-1.8)
▶ Overweight (yes/no)	.042	ns		ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>b</sup>	1.6 (1.1-2.1)	1.9 (1.1-3.4)	0.547	1.6 (1.2-2.2)
▶ Overweight (yes/no)	.006	.029		.001

Note. *n* = 919.

<sup>a</sup>BMI  $\geq$  25.0 kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight. <sup>b</sup>On the previous day.

### *Body Mass Index (BMI) and Physical Activity Behaviors: Males*

Each of the results of the Breslow-Day test of homogeneity among associations of body mass index (BMI) and physical activity risk behaviors in males by race was non-significant (Table 3.16). Common odds ratios for each behavior showed that overweight males were no more likely than males of normal weight to participate in either vigorous activity or moderate activity, or in stretching and strengthening activity over the previous seven days, regardless of race.

Table 3.16

Association Between BMI<sup>a</sup> and Physical Activity Behaviors Among University Males by Race Using Breslow-Day and Mantel-Haenszel Tests

Physical Activity Behaviors	White ♂	Black ♂	Breslow-Day	Mantel-Haenszel
	OR	OR	Test of	Common OR
	(95% CI)	(95% CI)	Homogeneity	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on ≥3 of previous 7 days (yes/no)	1.2 (0.9-1.6)	1.0 (0.6-1.8)	0.628	1.2 (0.9-1.5)
▶ Overweight (yes/no)	ns	ns		ns
Participated in moderate activity on ≥5 of previous 7 days (yes/no)	0.9 (0.6-1.2)	0.7 (0.4-1.4)	0.718	0.8 (0.6-1.1)
▶ Overweight (yes/no)	ns	ns		ns
Participated in stretching activity on ≥3 of previous 7 days (yes/no)	1.1 (0.8-1.5)	0.7 (0.4-1.3)	0.198	0.9 (0.8- 1.3)
▶ Overweight (yes/no)	ns	ns		ns
Engaged in strengthening activity on ≥3 of previous 7 days (yes/no)	1.2 (0.9-1.6)	1.4 (0.8-2.5)	0.591	1.2 (0.9-1.6)
▶ Overweight (yes/no)	ns	ns		ns

Note. *n* = 919.

<sup>a</sup>BMI ≥ 25.0 kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight.



*Body Mass Index (BMI) and Dietary Risk Behaviors: Females*

The values calculated for the Breslow-Day test of homogeneity for body mass index and nutrition risk behaviors among females by race were non-significant (see Table 3.17). Values for a common odds ratio calculated for each behavior indicated a significant increase in risk of participation in dietary behaviors for overweight females compared to normal-weight females, regardless of race.

Females who were overweight were 35.3 times as likely as normal weight females to perceive themselves as overweight and 12.0 times as likely to have attempted to lose weight or keep from gaining weight, regardless of race ( $p < .001$ ). In terms of specific weight control behaviors, female students who were overweight were 2.7 times as likely to have dieted to lose weight or keep from gaining weight ( $p < .001$ ), 3.2 times as likely to have exercised to lose weight or keep from gaining weight ( $p < .001$ ), and 8.5 times as likely to have taken diet pills to lose weight or keep from gaining weight ( $p < .001$ ) as were those of normal weight, regardless of race. Females who were overweight, whether black or white, were statistically no more likely than those who were of normal weight to have vomited or taken laxatives to lose weight or keep from gaining weight.

Table 3.17

Association Between BMI<sup>a</sup> and Dietary Risk Behaviors Among University Females by Race Using Breslow-Day and Mantel-Haenszel Tests

	White ♀	Black ♀	Breslow-Day	Mantel-Haenszel
Dietary Risk Behaviors	OR	OR	Test of	Common OR
	(95% CI)	(95% CI)	Homogeneity	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Perceived self as overweight	29.4	56.1		35.3
(yes/no)	(16.4-52.8)	(22.9-137.0)	0.235	(21.6-57.5)
▶ Overweight (yes/no)	< .001	< .001		< .001
Were attempting weight loss	11.6	12.6		12.0
(yes/no) <sup>b</sup>	(4.6-28.7)	(6.2-28.9)	0.875	(6.6-21.7)
▶ Overweight (yes/no)	< .001	< .001		< .001
Dieted to lose/control weight	2.7	2.7		2.7
(yes/no) <sup>b</sup>	(1.7-4.3)	(1.4-5.0)	1	(1.9-3.9)
▶ Overweight (yes/no)	< .001	.002		< .001
Exercised to lose/control weight	3.8	2.7		3.2
(yes/no) <sup>b</sup>	(1.9-7.7)	(1.5-4.9)	0.466	(2.0- 5.0)
▶ Overweight (yes/no)	< .001	.001		< .001
Vomited/took laxatives to	1.4	1.2		1.3
lose/control wt (yes/no) <sup>b</sup>	(0.7-2.6)	(0.3-5.6)	0.892	(0.3-0.7)
▶ Overweight (yes/no)	ns	ns		ns
Took diet pills to lose/ control	8.1	10.9		8.5
weight (yes/no) <sup>b</sup>	(3.5-18.4)	(1.3-89.4)	0.789	(3.9-18.2)
▶ Overweight (yes/no)	< .001	.006		.001

Note. *n* = 861.

<sup>a</sup>BMI  $\geq$  25.0 kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight. <sup>b</sup>During 30 days preceding survey.

*Body Mass Index (BMI) and Nutrition Behaviors: Females*

The Breslow-Day test of homogeneity for body mass index and consumption of five-or-more servings of fruits and vegetables daily among university females by race was non-significant (Table 3.18). The common odds ratios calculated for that behavior suggests that overweight females are no more likely than their counterparts of normal weight to have consumed the recommended amounts of fruits and vegetables.

Table 3.18

Association Between BMI<sup>a</sup> and Nutrition Risk Behaviors Among University Females by Race Using Breslow-Day and Mantel-Haenszel Tests

Nutrition Risk Behaviors	White ♀	Black ♀	Breslow-Day	Mantel-Haenszel
	OR	OR	Test of	Common OR
	(95% CI)	(95% CI)	Homogeneity	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Ate five-or-more servings of fruits & vegetables (yes/no) <sup>b</sup>	1.3 (0.7-2.3)	0.96 (0.4-2.1)	0.553	1.2 (0.7-1.8)
▶ Overweight (yes/no)	ns	ns		ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>b</sup>	1.1 (0.7-1.8)	2.8 (1.4-5.5)	0.032 <sup>c</sup>	
▶ Overweight (yes/no)	ns	.004		

Note. *n* = 861.

<sup>a</sup>BMI  $\geq$  25.0 kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight. <sup>b</sup>On the previous day. <sup>c</sup>A significant *p*-value suggests odd ratios were non-homogeneous; the resulting common OR was not meaningful.

A significant Breslow-Day statistic was calculated for the association between BMI and having eaten two-or-fewer servings of fatty foods on the previous day ( $p = .032$ ), which suggests the groups are not homogenous by race. Overweight black females were more likely than white overweight females to eat two-or-fewer servings of fatty foods on the day previous to being surveyed.

*Body Mass Index (BMI) and Physical Activity Behaviors: Females*

Each of the results of the Breslow-Day test of homogeneity among associations of body mass index (BMI) and physical activity risk behaviors in females by race was non-significant (Table 3.19). Common odds ratios for each behavior showed that overweight females were no more likely than males of normal weight to participate in either vigorous activity or moderate activity, or in stretching and strengthening activity over the previous seven days, regardless of race.

Table 3.19

Association Between BMI<sup>a</sup> and Physical Activity Behaviors Among University Females  
by Race Using Breslow-Day and Mantel-Haenszel Tests

Physical Activity Behaviors	White ♀	Black ♀	Breslow-Day	Mantel-Haenszel
	OR	OR	Test of	Common OR
	(95% CI)	(95% CI)	Homogeneity	(95% CI)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
Participated in vigorous activity on	1.2	1.0		1.2
≥3 of previous 7 days (yes/no)	(0.9-1.6)	(0.6-1.8)	0.628	(0.9-1.5)
▶ Overweight (yes/no)	ns	ns		ns
Participated in moderate activity on	0.9	0.7		0.8
≥5 of previous 7 days (yes/no)	(0.6-1.2)	(0.4-1.4)	0.718	(0.6-1.1)
▶ Overweight (yes/no)	ns	ns		ns
Participated in stretching activity on	1.1	0.7		0.9
≥3 of previous 7 days (yes/no)	(0.8-1.5)	(0.4-1.3)	0.198	(0.8- 1.3)
▶ Overweight (yes/no)	ns	ns		ns
Engaged in strengthening activity	1.2	1.4		1.2
on ≥3 of previous 7 days (yes/no)	(0.9-1.6)	(0.8-2.5)	0.591	(0.9-1.6)
▶ Overweight (yes/no)	ns	ns		ns

Note. *n* = 861.

<sup>a</sup>BMI ≥ 25.0 kg/m<sup>2</sup> = overweight; BMI <25.0 kg/m<sup>2</sup> = normal weight.

### Reliability of the Instrument

Data gathered in the NCHRBS include polychotomous and categorical information about seven risk factor groupings, two of which were used in this study: dietary behaviors and physical activity. Specifically, seven questions from the NCHRBS were used in the area of dietary-risk, and five items from the instrument were included to assess risk from physical inactivity.

Internal consistency reliability was calculated, using Cronbach's alpha, since results of this study relied on the accuracy of the multiple-items included in the instrument. Separate alpha coefficients were calculated for: dietary behaviors, nutrition behaviors; and physical activity behaviors. Internal consistency was calculated as follows; dietary behaviors:  $r = .50$ ; nutrition behaviors:  $r = .31$ ; and physical activity behaviors:  $r = .78$ .

The coefficient obtained for physical activity approaches the standard for acceptability ( $r = .80$ ) for basic research, but does not meet the standard for many applied research studies (Nunnally, 1967). The coefficient obtained for dietary behaviors represents modest reliability for instruments used in the early stages of research (Nunnally, 1967), however, the reliability coefficient obtained for nutrition behaviors was unacceptable. The instrument might have performed more optimally with a more representative sample.

## CHAPTER 4

### DISCUSSION

This study explored receipt of health information and its relationship to dietary behaviors and physical activity behaviors in a purposive sample of university students; body mass index and its relationship to these behaviors was also examined. In considering the receipt of health information and dietary behaviors, students who received health information on diet and nutrition were more likely than students who did not receive this information to attempt to lose weight, specifically, to diet and exercise to lose weight or keep from gaining weight. As well, those students who received this information were more likely than those who did not to eat two or fewer servings of fatty foods. These results are consistent with those reported by Hertzler and Frary (1989), who investigated students who had received nutrition education in-class. One-in-four students in their research reported eating more fruits and vegetables than they did prior to having taken the class, and attributed this increase to the nutrition information they received. The study by Grace (1997) produced results contrary to those reported herein, finding that most college students continued to engage in risky dietary behaviors even though they had received health information which pointed out the dangers associated with these behaviors. The present study did not find an association between increased consumption of fruits and vegetables and receipt of dietary information, but eating fewer servings of fatty foods was associated with receiving this information.

Similar results were seen with receipt of information on physical activity: students who received this information were more likely than those who did not receive this information to report sufficient levels of vigorous and moderate activity, and sufficient

stretching and strengthening physical activity. Receipt of physical activity and fitness information and its relationship with sufficient levels of vigorous physical activity, flexibility, muscular strength and endurance activity among college students has been previously reported (Dinger, 1999). The consistency of the findings in these two studies is encouraging, in that results indicate that receipt of health information on physical activity and fitness may factor into college students' participation in sufficient levels of activity, regardless of intensity or type.

The study investigated the association between receipt of health information and dietary behaviors and receipt of health information and physical activity behaviors by body mass index (BMI), comparing students of normal weight ( $BMI < 25.0 \text{ kg/m}^2$ ) with those who were overweight ( $BMI \geq 25.0 \text{ kg/m}^2$ ). The data suggest that several differences existed between these groups (Tables 4.1 and 4.2). Normal weight students who received health information were more likely than those who did not receive this information to diet and exercise to control their weight and to participate in vigorous, stretching, and strengthening activities as compared to those who did not receive information. Conversely, among overweight students, few significant associations were found between students' receipt of health information and dietary and physical activity behaviors.

Receipt of health information may make overweight students aware of their need for improved diet (Hertzler & Frary, 1989) and physical activity, but such information may alone not be enough. Volicer, Quattrocchi, Candelieri, and Nicolosi (2003) reported that, among overweight students surveyed, the majority (75%) correctly perceived themselves as being overweight. However, of overweight students reporting current attempts to lose



weight, fewer than half reported using diet and exercise together; three-quarters of these students reported exercising to lose weight, and half reported dieting to lose weight.

These results are similar to those in the current study, and raise two important questions. First, among students who received health information and simultaneously reported attempts to lose weight or control weight, why did those students not combine diet and exercise to create a more effective effort? Second, for those students who *did* combine diet and exercise to control their weight, when was this effort begun? For example, efforts that may have been recently-adopted might explain why they remained overweight. Neither question is within the scope of the current study, but both could be included in further research.

Although overweight students in this study were aware of their extra weight, and were attempting to combat it, these attempts were as yet unsuccessful. Overweight students who have recently begun any level of diet or physical activity, based on information received, may need special health promotion attention to enable them to succeed. These students may be in the pre-contemplation, contemplation, or preparation stages of behavior change as discussed in the Transtheoretical Model (Prochaska, Redding, & Evers, 2002). They may have received information on diet, nutrition, and physical activity and only recently begun to act, or received the information but made no steps to act on it. One of the study limitations was its lack of questions measuring any theoretical approach to health behavior, such as Stages of Change. However, other studies have used the Transtheoretical Model to examine behavioral change among college students.

Table 4.1

Association Between Receipt of Health Information and Dietary and Nutrition Behaviors:  
Normal Weight and Overweight University Students

	Normal weight	Overweight
Dietary, nutrition, and physical activity behaviors	OR (95% CI)	OR (95% CI)
	<i>p</i> -value	<i>p</i> -value
Perceived self as overweight (yes/no)	1.2 (0.8-1.8)	1.5 (1.1-1.2)
▶ Received information (yes/no)	ns	.020
Were attempting weight loss (yes/no) <sup>a</sup>	1.5 (1.2-1.9)	1.8 (1.3-2.6)
▶ Received information (yes/no)	.001	.001
Dieted to lose weight or control weight (yes/no) <sup>a</sup>	1.6 (1.2-2.1)	1.3 (0.9-1.9)
▶ Received information (yes/no)	< .001	ns
Exercised to lose weight or control weight (yes/no) <sup>a</sup>	1.6 (1.2-1.9)	1.2 (0.8-1.7)
▶ Received information (yes/no)	<.001	ns
Vomited or took laxatives to control weight (yes/no) <sup>a</sup>	1.4 (0.8-2.6)	1.1 (0.5-2.3)
▶ Received information (yes/no)	ns	ns
Took diet pills to control weight (yes/no) <sup>a</sup>	1.0 (0.7-1.5)	1.0 (0.6-1.6)
▶ Received information (yes/no)	ns	ns
Ate five-or-more servings of fruits and vegetables (yes/no) <sup>b</sup>	1.0 (0.8-1.5)	0.8 (0.5-1.3)
▶ Received information (yes/no)	ns	ns
Ate two-or-fewer servings of fatty foods (yes/no) <sup>b</sup>	1.3 (0.9-1.6)	1.5 (1.0-2.1)
▶ Received information (yes/no)	ns	.045

<sup>a</sup>During the thirty days preceding the survey. <sup>b</sup>On the previous day.

Table 4.2

## Association Between Receipt of Health Information and Physical Activity Behaviors:

## Normal Weight and Overweight University Students

Participated in vigorous activity $\geq 3$ of past 7 days (yes/no)	1.3 (1.0-1.6)	1.2 (0.8-1.7)
▶ Received information (yes/no)	.037	ns
Participated in moderate activity $\geq 5$ of past 7 days (yes/no)	1.5 (1.1-2.0)	1.1 (0.7-1.7)
▶ Received information (yes/no)	.007	ns
Participated in stretching activity $\geq 3$ of past 7 days (yes/no)	1.4 (1.1- 1.7)	1.5 (1.0- 2.1)
▶ Received information (yes/no)	.014	.033
Participated in strengthening activity $\geq 3$ of past 7 days (yes/no)	1.4 (1.1-1.8)	1.0 (0.7-1.4)
▶ Received information (yes/no)	.016	ns

Research suggests that many students may be found to be in the pre-contemplation, contemplation, or preparation stages, in which they have yet to meet vigorous or moderate activity guidelines (Clement, Schmidt, Bernaix, Covington, & Carr, 2004; Kelley & Lowing, 1998; Pinto, 1995). To motivate students to move into activity and maintenance stages, the following areas may need to be addressed in health promotion efforts: self-efficacy; enjoyment of physical activity; support from others; perceived benefits of activity; and perceived barriers to activity (Kelley & Lowing). Future study on-campus might address these areas, particularly in light of the work of Sullum and Clark (2000), which confirmed that students who began exercise but relapsed after eight weeks reported lower self-efficacy scores and higher negative attitudes towards activity than did students who continued to exercise.

Receipt of health information, in and of itself, may not play a major role in positive health behavior, since several research studies comparing diet, nutrition, and physical activity behaviors among normal and overweight students have reported similar results to those currently discussed in this study. For example, overweight students in this sample were more likely than those of normal weight to perceive themselves as being overweight, to attempt weight loss, and to diet, exercise, or take diet pills to control their weight. These results are consistent with those of Boutelle, Neumark-Sztainer, Story, and Resnick (2002), who found higher rates of dieting among overweight high-school students. These students were more likely than students of normal weight to engage in unhealthy dieting behaviors such as the use of laxatives, diet pills and vomiting, in both males and females. Prevalence of all dieting behaviors in this study, as well as unhealthy dietary behaviors, was highest among the obese, followed by those merely overweight.

The availability of diet pills, powders, and other weight control substances may influence students who see a need to lose weight but who have not been able to successfully combine diet and exercise for health and weight loss. One study among obese women found that high levels of frustration existed in study participants due to repeated dieting attempts. Earlier initiation of dieting (i.e., prior to age 14) and more frequent dieting attempts were associated with a higher body mass index (Ikeda, Lyons, Schwartzman, & Mitchell, 2004). In this study, repeated ineffective dieting led to more extreme methods of weight loss, including use of diet pills. Overweight students in the present study were likely to use diet pills as *the* means of controlling weight, as opposed to diet, nutrition, and exercise. As advocated by Ikeda et al. (2004), health promotion efforts might emphasize a more comprehensive approach to improving students' health.

Overweight students in the current study were less likely than those of normal weight to have eaten two-or-fewer servings of high fat foods, but no more likely to have eaten five-or- more servings of fruits and vegetables on the previous day. This mixed result may reflect the effects of an unbalanced approach to in which certain foods are restricted but a healthy diet is not achieved. It may be the result of an emphasis on short-term weight loss instead of improved sustainable health for a lifetime.

Regarding physical activity behaviors, no differences were observed between overweight and normal weight students' participation in sufficient levels of vigorous and moderate exercise, or in stretching and strengthening activities. This was a more positive result than found by Boutelle et al. (2002), in which overweight and obese students were less likely than normal weight students to engage in sufficient vigorous activity.

In the *post-hoc* phase of analysis, there were very few instances in which a common odds ratio could not be calculated: overweight males and females were at significantly increased risk over normal weight students for most or all weight loss or control behaviors, regardless of race. These results are consistent with much of the research on health risk, not exclusive to college students. For example, among adolescents, a study by Felts, Parrillo, Chenier, and Dunn (1996) found that almost one-fourth of students surveyed (24.8%) reported perceiving themselves as "too fat" and, of those, 76.4% reported attempting to lose weight. Skipping meals and exercise were most frequently reported as the means for attempted weight loss (Felts et al., 1996). Also among adolescents, Volicer et al. (2003) confirmed that, among overweight and obese students reporting current attempts to lose weight, most reported exercising to do so, one-half reported dieting, and fewer than half reported using diet and exercise together. A similar

pattern was observed in the current data, which suggests that, to produce optimum results, diet and exercise as a tandem should continue to be addressed in health and physical education classes in high schools.

In considering the use of laxatives, vomiting, and diet pills in attempts at weight control, increased BMI is thought to lead to a high level of concern about weight (Arriaza & Mann, 2001). This increased concern, as well as frustration over repeated unsuccessful weight loss attempts (Ikeda et al., 2004), especially among women, may lead to both an ineffective use of diet and exercise as well as more harmful “quick” methods such as use of diet pills. Although the present study did not ask participants how many times they have attempted weight loss, or how frustrated they might have been after repeated attempts, those who work in health promotion on-campus should remain mindful of this issue, since diet pills were the method of choice for weight loss among the overweight in this study.

Results of the current study contrast with those of Gray, Ford, and Kelley (1987) who found black males significantly more likely to diet or fast than white males. This may be less due to racial differences than to the variability in study populations, since the Gray et al. study utilized subjects with established eating disorders. In addition, results may not be directly comparable, due to differences in the instruments used in the Gray et al. study and that used in the College Student Health Risk Profile.

Few studies have shown an association between BMI and the consumption of fruits and vegetables and high-fat foods, especially by race and gender. However, Clement et al. (2004) surveyed female college students and found trends that associated a high BMI with increased fatty food intake and decreased physical activity levels. The post-hoc

analyses conducted in this study found overweight males, regardless of race, more likely to have eaten two or fewer servings of high fat foods.

Results from the current study also corroborate the Clement et al. (2004) study in the area of physical activity. This study found no association between overweight students and their participation in physical activity behaviors, regardless of race, for both genders. The Clement et al. (2004) study included only college women, and found an inverse relationship – that decreased physical activity levels were associated with higher BMI, while increased physical activity levels were related to lower BMI and other health factors. Felts et al. (1996) reported different results in the perceptions students in their statewide high school sample: those perceiving themselves as “too fat” reported significantly fewer days of strenuous activity and fewer hours of strenuous activity in physical education classes. A nationally representative study of adolescents found whites more likely than blacks to report participating in vigorous and moderate exercise, and in strengthening activities. In the current study, no differences were observed between black and white males or black and white females regarding BMI and physical activity.

In the current study, race was not a factor related to behaviors among the overweight, or among their normal weight counterparts. Therefore, regardless of race, overweight students can be addressed with gender-appropriate health promotion efforts. Males and females have differing health needs in diet and nutrition and in physical activity (CDC, 1997; DeBate, Topping, & Sargent, 2001; Fennell, 1997; Ford & Goode, 1994; Hall, Kuga, & Jones, 2002; Huang et al., 2003; Leenders et al., 2003; Pierce et al., 1992; USDHHS, 1996; Wallace & Buckworth, 2002). In terms of these specific behaviors, health promotion efforts can be simplified to target men or women, regardless of race.

In designing, conducting and analyzing this study, there were several limitations worth noting that may have had an impact on the results. First, due to use of a purposively selected convenience sample, (i.e., students who were enrolled in Healthful Living [HLTH 1520] classes), the study population was highly skewed toward freshmen students, which comprised 71.9% of study participants. As a result, the sample was non-representative, which limited the generalizability of study results to all Georgia Southern students.

Second, the data gathered in the College Student Health Risk Profile was self-report data; thus, the extent to which participants were inclined to provide socially desirable responses is not fully known. However, the reliability data reported herein suggest that the data are highly reliable. A third limitation was the one-shot, non-experimental design of the study, which provided only a snapshot of current behavior engaged in by participants. Such a design allows only a limited range of analysis, and any conclusions about causal relationships that might exist in the data are not warranted. Another limitation in this study was the nature of the data used to calculate body mass index. The survey included only categorical ranges for students' height and weight (for example, 111-to-130 pounds), which created the potential for inaccuracies in calculating BMI. Future questionnaires should be designed to provide subjects with the opportunity to provide exact information on their height and weight, such as a check box, to address this limitation.



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## APPENDIX A

### HYPOTHESES, SIGNIFICANCE OF THE STUDY, DELIMITATIONS, LIMITATIONS, ASSUMPTIONS, AND DEFINITIONS OF TERMS

#### Hypotheses

It was hypothesized that the following relationships would exist in the data:

First, a positive relationship will be found between receipt of health information on diet and nutrition and healthy dietary behaviors. Specifically, students who report receiving health information on diet and nutrition will be more likely than those who have not to have eaten five-or-more servings of fruits and vegetables the previous day, and to have eaten two-or-fewer servings of foods typically high in fat in the previous day.

Second, a positive relationship will be found between receipt of health information on physical activity and participation in physical activity. Specifically, students who report that they received health information on physical activity will be more likely than those who did not to participate in moderate and vigorous physical activity, stretching and strengthening activities, and team sports.

Third, an inverse relationship will be detected between BMI and a healthy diet. Students who are overweight or obese will be less likely than those of normal weight to have eaten five-or-more servings of fruits and vegetables the previous day, and to have eaten two-or-fewer servings of foods typically high in fat in the previous day.

Finally, an inverse relationship will be found between BMI and student participation in physical activity. For example, overweight students will be less likely than those of normal weight to participate in moderate and vigorous physical activity, and in stretching and strengthening activities.

### Significance of the Study

As obesity in the population becomes more of a public health concern, colleges have an increasing opportunity to promote prevention through healthy nutrition and physical activity behaviors in their health education and promotion efforts on-campus (Flegal et al., 1998; McCullough et al., 2002; Sparling, 2003; USDHHS, 2000). College may be the most opportune time in students' lives to impact their behaviors; the facilities and faculty exist while resources and environments are conducive to physical activity and nutrition (Sparling, 2003; Keeling, 2002). There is needed only a health education and promotion emphasis on increasing the levels of these health behaviors to bring about long lasting results in improving college students' health, as well as impacting the health of the population long-term (Haberman & Luffey, 1998).

Data from the 1995 National College Health Risk Behavior Survey indicated that only 35.9% of students received information from their campuses on physical activity and fitness, while 30.4% reported having received nutrition information (Brenner & Gowda, 2001). Students at Georgia Southern University reported higher levels, with 62.1% receiving information from the university on physical activity, and 53.6% indicating receipt of information related to nutrition. Nonetheless, these data suggest that an opportunity exists for greater health education and health promotion efforts campus-wide in the areas of nutrition and physical activity.

### Delimitations of the Study

This study will be delimited to the following items. First, data were collected in the 2002-2003 *College Student Health Risk Behavior Profile* at Georgia Southern University, a mid-sized university in the southeastern United States.

Second, for this study, questions on height, weight, physical activity, and diet were included, as well as selected demographic items.

Third, a secondary analysis of the data was done as presented above, including the 2,268 participants in the original study.

#### Limitations of the Study

This study was limited in that it contained only behavioral items that were listed in the *Student Health Risk Behavior Profile*. Other psychological or sociological factors or constructs that are found in the literature and may be related to behaviors under study (e.g., knowledge, attitudes, intentions) were not included.

The data collected was self-report, thus the extent to which participants were inclined to provide socially desirable responses is not fully known. The study also employed a one-shot, non-experimental design, which provided only a point-prevalence snapshot of the current behaviors engaged in by participants. Such a design allows only a limited range of analysis, and any conclusions about causal relationships that might exist in the data were not warranted.

The sample was purposively selected, limited to students who were enrolled in the Healthful Living course (HLTH 1520). As such, the sample was skewed toward the Freshman class, which limited the generalizability of results. Since the majority of respondents were in the freshmen class. Responses may have reflected prior behavioral patterns, rather than those newly-established or formed at Georgia Southern.

The original data were collected between May 2002 and April 2003. Potential confounding due to history and maturation may affect the investigator's ability to accurately interpret results. For example, if a participant indicated "Freshman" as his/her



class standing in May of 2002, that person potentially will have been on campus for an entire school year; another participant, listing the same class standing in August 2002 may not have just arrived to campus, and may not have had the same experiences as his/her counterpart. In addition, the survey included only categorical ranges for students' height and weight, which created the potential for inaccuracies in the calculation of body mass index.

The instrument used was a paper-pencil questionnaire. As such, all questions may not have been answered by study participants; the study included only those students who opted to participate.

#### Assumptions of the Study

The conduct of this study will be based upon the following assumptions. Firstly, students may have inaccurately reported their heights and weights for myriad reasons. It is assumed that participants answered each question sincerely. Secondly, students understood the meaning of the questions as presented. Lastly, all data were entered and coded accurately.

#### Definitions of Terms

Terms pertinent to the study were defined as follows:

##### *Anorexia Nervosa*

(Code 307.1) Refusal to maintain body weight at or above a minimally normal weight for age and height; intense fear of gaining weight or becoming fat, even though underweight; disturbance in the way one's body weight or shape is experienced; in post-menarchal females, amenorrhea (i.e. the absence of at least three consecutive menstrual cycles) (American Psychiatric Association, 2002).

### *Binge-Eating Disorder*

Recurrent episodes of binge eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of Bulimia Nervosa (APA, 2002).

### *Bulimia Nervosa*

(Code 307.51) Recurrent episodes of binge eating, characterized by both of the following: 1) Eating, in a discrete period of time (e. g., within any two-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances; 2) A sense of lack of control over eating during the period (e.g., a feeling that one cannot stop eating or control how much one is eating); recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise. The binge eating and inappropriate compensatory behaviors both occur on average at least twice a week for three months; self-evaluation is unduly influenced by body shape and weight; the disturbance does not occur exclusively during episodes of anorexia nervosa (APA, 2002).

### *Eating Disorder*

The eating disorders are characterized by severe disturbances in eating behavior (APA, 2002).

### *Eating Disorder Not Otherwise Specified*

(Code 307.50) For females, all of the criteria for Anorexia Nervosa are met except that the individual has regular menses; all of the criteria for Anorexia Nervosa are met except that, despite significant weight loss, the individual's current weight is in the normal range; all of the criteria for bulimia nervosa are met except that the binge eating

and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than three months; the regular use of inappropriate compensatory behavior by an individual of normal body weight after eating small amounts of food; repeatedly chewing and spitting out, but not swallowing, large amounts of food (APA, 2002).

### *Energy Balance*

The combination of dietary and physical activity patterns sustained over time, determines body mass and obesity and is related to obesity-related diseases (Prentice et al., 2004).

### *Health Promotion*

An organized set of activities designed to assist individuals in making voluntary behavioral changes that reduce their health risks, modify their consumer health behavior, and enhance their personal well-being and productivity (Grace, 1997).

### *Physical Activity*

Defined as bodily movement produced by the contraction of skeletal muscles that increases energy expenditure above the basal (resting) rate, divided into categories such as occupational, household, transportation, or leisure time (USDHHS, 1996).

### *Leisure Time Physical Activity*

Leisure time activities include physical activity such as competitive sports, recreational activities such as hiking or bicycling, and exercise training for increased performance ability (USDHHS, 1996).

*Moderate Physical Activity*

Defined for college students as physical activity consisting of “...walking or bicycling for 30 minutes or more on five of the last seven days” (CDC, 1997).

*Obesity*

Defined as a body mass index (BMI) greater-than-or-equal-to 30.0 kg/m<sup>2</sup> for both men and women (USDHHS, 1998).

*Overweight*

Defined as having a BMI between 25.0 kg/m<sup>2</sup> and 29.9 kg/m<sup>2</sup> for adults (CDC, 2005).

*Risk Behaviors*

Behaviors that contribute to the leading causes of morbidity and mortality among youth and adults, often are established during youth, extend into adulthood, are interrelated, and are preventable (Grunbaum et al., 2002).

*Vigorous Physical Activity*

Defined for college students as physical activity that makes you “...sweat or breathe hard for 20 minutes or more on three of the last seven days” (CDC, 1997).

## APPENDIX B

## EXTENDED REVIEW OF THE LITERATURE

## Receipt of Health Information on College Campuses

*Healthy People 2010* recommended in Objective 7.3 that twenty-five percent of college students receive information from their college or university on each of the six health risk behavior priority areas, including dietary patterns that cause disease, and inadequate physical activity (U.S. Department of Health and Human Services [USDHHS], 2000). Data from the 1995 National College Health Risk Behavior Survey (NCHRBS), developed by the Division of Adolescent and School Health (DASH) of the Centers for Disease Control and Prevention (CDC) to monitor health risk behaviors of college students, were used as a baseline for this recommendation (USDHHS, 2000).

*Healthy People 2010* recommendations continued to highlight the need for colleges and universities to provide health risk behavior information to their students as pointed out in *Healthy People 2000* objectives 8.5 and 18.11. *Healthy People 2000* recommended in Objective 8.5 that fifty percent of all colleges, technical schools, and universities have active health promotion programs for students, faculty, and staff (USDHHS, 1992). Optimum conditions exist in these institutions for encouraging chronic disease prevention in the population through nutrition and physical activity behaviors (Keeling, 2002; Sparling, 2003). As Grace (1997) reported in his review of campus health centers, college students are a population group in which changes to their risk behavior patterns can effectively result in long-term prevention of illness and injury. Through the efforts of health centers on campus, students are given a chance to change the behaviors that if continued into adulthood put them at greater risk of disease, such as those associated with

diet, weight and body image, as well as physical fitness (Grace). Unfortunately, college students are not applying their knowledge of preventive behaviors but are continuing to engage in risky health behaviors, in spite of current health education/promotion efforts. The author reported that the relatedness of these risk behaviors indicates the need for comprehensive health promotion on campus. Public health's response to behaviors that contribute to chronic disease should emphasize communication of information and tools to empower change for the prevention and decrease of obesity in individuals, families, communities, organizations, and government levels (USDHHS, 2001). Public health educators should also focus on action, research, and evaluation (USDHHS, 2001).

Along with other sources, data obtained in the 1995 NCHRBS indicated the need for national emphasis on the responsibility of college and university health professionals to fill unmet needs by providing students with information on dietary and physical activity health risk behaviors. Among 4,609 students at 136 colleges and universities which participated in the 1995 National College Health Risk Behavior Survey, fewer than one-in-three students (30.4%) reported receiving health information on dietary behaviors and nutrition (CDC, 1997). A similarly low percentage of students (35.9%) reported receiving health information on physical activity and fitness. Men and women reported receiving varying amounts of information on specific topics. Fewer men than women (26.0% and 34.2% respectively) reported receipt of information on dietary behaviors and nutrition (CDC, 1997). However, similar percentages of men and women (37.0% and 35.4% respectively) reported receiving health information on physical activity and fitness (CDC, 1997).

The 2002-2003 College Health Risk Profile presented the percentage of students on this campus that reported receiving information on risk behaviors from university sources. Data for this report were gathered using the NCHRBS questionnaire as a framework, and were collected during the 2002-2003 academic year from 2,268 students. According to the data, fewer than two-thirds of Georgia Southern students (62.1%) report receiving information from the University on physical activity, while 53.6% indicating receipt of information related to nutrition (Teddars, Parrillo, & Carter, 2004). Although the campus health promotion efforts were clearly above the national standards, a university such as Georgia Southern should not be satisfied with less than excellent figures in this area. The health promotion efforts, faculty, staff, facilities and resources that are needed already exist for the most part, making it possible for this university to supply each student with information needed to make lasting, sound behavioral choices in the areas of dietary behaviors and physical fitness.

According to Sparling (2003), an emphasis must be placed on physical education and activity in college years due to an increasingly sedentary lifestyle. The author stated that current and future college students may assume leadership roles in health trends and policies. Adoption of physical activity habits in college may lead to life-long maintenance; college is a time of transition to independence, of creating new habits, and of experiencing challenges and behavior changes for better or for worse (Sparling). The physical environment of is already structured to allow ample exercise opportunities and easy access to them (Sparling).

The efficacy of receipt of health information on students' dietary behaviors and physical activity was studied by Hertzler and Frary (1989). The authors found that, of

212 college students enrolled in a nutrition education course, greater than one-in-four students reported increasing their consumption of fruits and vegetables as a perceived result of information received in the class. Most encouragingly, the overweight students, the majority of whom were women, tended to report an improvement in dietary intake which they perceived was due to information received in the class (Hertzler & Frary).

Brener and Gowda (2001) reported on college students' receipt of health information on specific health risk topics from data collected in the 1995 National College Health Risk Behavior Survey. As far as sources of health information, specifically AIDS and HIV education, fewer than one-half of the 4,609 students (41.4%) reported receiving health information in class; more than half of students (51.5%) had received information outside class. As the authors stated, students most commonly reported receiving health information from health pamphlets, brochures or newsletters (33.0%). The study found that other sources were informal discussion with friends, information from campus health services, and college newspapers. In addition, greater than one-in-three (35.9%) students reported receiving health information on activity and fitness, while fewer students (30.4%) reported receiving health information on dietary behaviors and nutrition. Students who were black, Hispanic, or of other race/ethnicity categories were more likely than whites to report having received health information (Brener & Gowda, 2001).

Several factors significantly increased the probability of students' receiving health information on any topic, including whether students were: between 18-and-24 years old (as opposed to 25-and-older); full-time enrollees (as opposed to part-time); living on-campus (as opposed to off-campus); living with a roommate (as opposed to any other arrangement); never married (as opposed to any other marital status); employed part-time



(versus full-time); and a member of a fraternity/sorority (vs. lacking such membership) (Brener & Gowda, 2001).

Another study by Ford and Goode (1994) surveyed 224 students attending historically Black colleges regarding their health behaviors, then compared students' perceptions of health issues with corresponding health behaviors in several areas. Overall, students indicated a need for health information on many topics, regardless of whether they had engaged in health-promoting or at-risk behaviors. Students' perception of need for health information was not related to specific behaviors or experiences in any health category. Further, students indicated an interest in health topics such as nutrition and physical activity whether they engaged in related at-risk behaviors or not. The latter category indicates an opportunity for preventive education and health promotion, while the former suggests an opportunity and willingness to participate in interventions to reduce risk.

Men and women of various ages may perceive different health needs that cause them to desire health information on varying topics, as reported by Svenson and Campbell (1992). The authors surveyed 457 students on their perceptions of needed improvements in areas of health, barriers to making those improvements, and areas of interest in receiving health information. Women were more likely than men to report a need to improve nutrition and lose weight; younger women were more likely than other students to report a need for increased exercise. The authors found that men aged twenty-two years and older were less likely to report a desire to receive nutrition information compared to younger men. Encouragingly, almost one-half of women (43%) reported a desire to receive nutrition information.

Students enrolled in elective health classes may have different health needs than students in the general student population. Wilson and Quinn (1990) compared behavioral and interest differences in students enrolled in an elective health promotion course to those in the general college student population. Students taking the health promotion course reported having better dietary behaviors than did students in the general population (Wilson & Quinn, 1990). Although students in the course were more likely to be overweight, they were also more likely to correctly perceive themselves as overweight compared to those in the general population, according to the authors. The study found that students in the health promotion course expressed more interest in nutrition counseling, weight control or loss, healthy diet, and in health than did those in the general student population. Those enrolled in the health promotion course were also more likely to be involved in fitness programs and to be more informed on exercise than the average student. Whether this difference was due to self-selection of the course based on students' perception of need, or was based on other factors, was not determined.

#### Overweight, Obesity, and Body Mass Index (BMI) among College Students

The need for emphasis on education in dietary behaviors and physical activity has become obvious in light of the increasing prevalence of overweight and obesity nationwide. Unfortunately dependence on technology and other labor-saving devices has led to a decreased need for and an avoidance of daily physical activity, resulting in a sedentary lifestyle even among children and adolescents (Engstrom, 2004; USDHHS, 1996). Levels of activity among students continue to decrease from high school to college (Bray & Born, 2004; Grunbaum, Kann, Kinchen, Williams, Ross, Lowry & Kolbe, 2002; CDC, 1997).

Campus health education efforts, focusing on both prevention of overweight for normal weight students and treatment of overweight for at-risk students, are vital. These programs can emphasize physical activity and nutrition behaviors. In addition to providing better health, these health behaviors have been linked with preventing obesity and related chronic diseases such as cardiovascular disease, stroke, cancer, and diabetes, as the literature indicates (Flegal, Carroll, Kuczmarski, & Johnson, 1998; McCullough, Feskanich, Stampfer, Giovannucci, Rimm, Hu, Spiegelman, Hunter, Colditz, & Willett, 2002; Sparling; USDHHS, 1996; USDHHS, 2001).

The amount that a person is overweight or obese in extra weight corresponds to the amount of extra risk of mortality and chronic disease related to that extra weight (USDHHS, 1998; USDHHS, 2001). The burden of overweight (defined as a body mass index of  $\geq 25.0 \text{ kg/m}^2$  to  $29.9 \text{ kg/m}^2$ ) and obesity (defined as a BMI of  $\geq 30.0 \text{ kg/m}^2$ ) on the health of the public is evident in morbidity and mortality statistics, in health care costs, in lost productivity, and in societal response to obese individuals (CDC, 2005; USDHHS, 2001). According to Kuczmarski and Flegal (2000), the measurement of overweight and obesity in adults has historically been based on height and weight tables or relative weight; today body mass index or BMI is the accepted standard. In most studies reviewed by the authors, BMIs equal to or greater than  $25.0 \text{ kg/m}^2$  are considered to be overweight; those from  $25.0$  to  $29.9 \text{ kg/m}^2$  indicate overweight while BMIs of  $30.0 \text{ kg/m}^2$  or greater indicate obesity (Kuczmarski & Flegal). However, at the time the NCHRBS was published, a body mass index (BMI)  $\geq 27.8 \text{ kg/m}^2$  was the standard considered as overweight for males, and a BMI  $\geq 27.3 \text{ kg/m}^2$  was the standard for females, consistent with *Healthy People 2000* (USDHHS, 1992; CDC, 1997).

Increased risk of type-2 diabetes, high blood cholesterol, hypertension and developmental concerns applies to overweight and obesity in children and adolescents as well as in adults (USDHHS, 2001). Currently the threat of obesity-related mortality as well as of obesity-related chronic diseases impacts the health of the nation with consequences similar to those of infectious diseases in the past (USDHHS, 2001). McGinnis and Foege (1993) reported the estimated mortality associated with diet and physical activity patterns of a sedentary lifestyle in the U. S. to be at least 300,000 deaths per year, accounting in 1990 for 14% of total deaths. More recently, Mokdad, Marks, Stroup, and Gerberding (2005) confirmed the threat of poor diet and physical inactivity, stating that these factors contributed to 365,000 deaths in 2000, or 15.2% of total deaths. Physical inactivity and diet was second only to tobacco as a cause of total mortality among Americans (McGinnis & Foege; Mokdad et al.).

*Healthy People 2010* recommended in objective 19.1 that 60% of American adults ages 20-and-older be at a healthy weight, that is, a BMI  $>18.5 \text{ kg/m}^2$  and  $<25 \text{ kg/m}^2$  while reducing the proportion of adults who are obese to 15% (USDHHS, 2001). For adolescents ages 12-to-19, the recommendation is to reduce the level of overweight to 5% of all adolescents (USDHHS, 2001). The challenge is to ensure an adequate intake of necessary nutrients while avoiding over-consumption of foods and while engaging in sufficient physical activity to maintain an energy balance leading to a healthy body mass index appropriate for age, sex, and stage of life (USDHHS, 2001). Energy balance of dietary intake and physical activity output over time is the major factor in BMI and obesity and related diseases (Prentice, Willett, Greenwald, Alberts, Bernstein, Boyd,

Byers, Clinton, Fraser, Freedman, Hunter, Kipnis, Kolonel, Kristal, Lampe, McTiernan, Milner, Patterson, Potter, Riboli, Schatzkin, Yates, & Yetley, 2004).

Among young adults in the U.S. ages twenty to thirty-four, in the period of 1999-2002, the prevalence of overweight and obesity was 57.4% for men and 52.8% for women (National Center for Health Statistics [NCHS], 2004). Especially for women, there was an obvious in-crease in prevalence of overweight and obesity in this age group from 1994 to the present. In 1994 the prevalence of overweight for men was 47.5% and for women, 37.0%. As well, the prevalence of overweight in adolescents increased over this period. Students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered to be overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered to be obese.

Flegal and colleagues (1998) differentiated between the prevalence of overweight and that of obesity in 1994 for U. S. adults ages 20-to-29. The prevalence of overweight at this time was 24.8%, or 30.6% for men and 18.5% for women. However the prevalence of obesity for adults ages 20-to-29 was 22.5%. In comparison, this percentage was lower than the national average of 54.9% overweight or obese, or 59.4% for men and 50.7% for women, for all adults ages 20-to-74. Students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese.

Sparling (2003) remarked that the impact of a decrease in physical activity of college students and of the population as a whole contributed to increased rates of obesity among all age groups. Overweight and obesity risk behaviors may begin in adolescence and continue on into in the college years. Authors Grunbaum et al.(2002) reported the results of the 2001 Youth Risk Behavior Survey. Adolescent levels of overweight were found to be less than optimum. Students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered to be over-

weight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered to be obese. Of 13,601 high school students in grades 9-thru-12, more than one-in-ten (10.5%) were overweight. According to these authors, males were more likely than females and black students were more likely than white students to report being overweight. A much greater percentage of students (29.2%) reported perceiving themselves as overweight than were actually overweight. Grunbaum et al. reported that those students most likely to perceive themselves as overweight were white females. While a fairly significant proportion of students in high school were found to be overweight, the numbers who perceived themselves to be overweight is much higher (29.9%), especially among white females, and therefore of concern (Grunbaum et al., 2002). Vohs, Heatherton, and Herrin (2001) measured dietary behaviors in a group of 342 female students once in their senior year of high school and again in their freshman year of college. The researchers' purpose was to determine if patterns of eating reported in high school persisted into the students' freshman year in college. The researchers found that change from high school to college was related to a slight weight gain ( $M = 1.73$  kg;  $SD = 2.72$  kg) and an increase in BMI from 21.5-to-22.0 kg/m<sup>2</sup> on average. More women reported themselves as overweight in college (32.2 %) than in high school (21.9%).

These levels of overweight correspond to the findings of the 1999-2004 Fourth National Health and Nutrition Examination Survey (NHANES-IV). Among adolescents ages twelve to nineteen, the prevalence of overweight was 16.7% for boys and 15.4% for girls (USDHHS, 2004). At the college level, the trend of overweight and obesity continued. Among U.S. young adults ages twenty to thirty-four, the prevalence of overweight and obesity in the period of 1999-2002 was 57.4% for men and 52.8% for

women (USDHHS, 2004). Especially for women, there was an obvious increase in this age group from 1988-1994 to the present level. In 1994 the prevalence of overweight for men was 47.5% and for women, 37.0% (USDHHS, 2004). As well, the prevalence of overweight in adolescents increased over this period. Students with a BMI of  $\geq 27.8$  kg/m<sup>2</sup> for men and of  $\geq 27.3$  kg/m<sup>2</sup> for women were considered overweight while those with a BMI of  $\geq 31.1$  kg/m<sup>2</sup> for men and of  $\geq 32.3$  kg/m<sup>2</sup> for women were considered obese (USDHHS, 2004).

As reported in the 1995 NCHRBS, of 4,609 college students nationwide, more than two-in-ten students (20.5%) reported heights and weights corresponding to a BMI of 27.8 kg/m<sup>2</sup> or greater for men and 27.3 kg/m<sup>2</sup> or greater for women (CDC, 1997). These levels of BMI indicate overweight. Similar percentages of men (20.9%) and women (20.2%) were overweight (CDC, 1997). A total of 41.6% of all students reported thinking they were overweight (CDC, 1997). More women than men (48.8% vs. 32.4%, respectively) reported thinking they were overweight (CDC, 1997).

Flegal, et al. (1998) reported the prevalence of overweight and of obesity for adults ages 20 to 29 in 1994. The prevalence of overweight at this time was 24.8%, or 30.6% for men and 18.5% for women (Flegal et al.). However the prevalence of obesity for adults 20- to-29 years of age was 22.5% (Flegal et al.). In comparison, the authors found that this percentage was lower than the national average of 54.9% overweight or obese, or 59.4% for men and 50.7% for women, for all adults ages 20-to-74. Flegal et al. stipulated that those with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese.

Several surveys have been done in college populations that have measured BMIs among other variables. The rates of overweight and obesity among college students form a broad range (Clement, Schmidt, Bernaix, Covington, & Carr, 2004; George & Johnson, 2001; Haberman & Luffey, 1998; Huang, Harris, Lee, Nazir, Born, & Kaur, 2003; Klesges, Mizes, & Klesges, 1987; Leenders, Sherman, & Ward, 2003). Researchers have reported prevalence rates as low as 9.1% of men and less than one percent (0.5 %) of women in the general student population (Adame & Frank, 1990) and as high as 25% among female students enrolled in physical activity classes (Anding, Suminski & Boss, 2001).

One reason for the variability of these results is a lack of a standard BMI to indicate overweight and obesity. Klesges, Mizes, and Klesges (1987) used percentiles so that students at or above the 75th percentile for weight (correcting for age, gender, and height) were considered overweight. Ainsworth et al. (1992) combined overweight and obesity as a BMI  $\geq 25$  kg/m<sup>2</sup>, as did Leenders et al. (2003). In other studies, students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese (Adame & Frank, 1990; Clement et al., 2004; George & Johnson, 2001; Heatherton, Nichols, Mahamedi, & Keel, 1995; Huang et al., 2003; Ainsworth et al., 1992). However, the 1995 NCHRBS measured overweight and obesity at a different BMI, i.e., 27.8 kg/m<sup>2</sup> or greater for men and 27.3 kg/m<sup>2</sup> or greater for women. Vohs et al. (2001) and Haberman and Luffey (1998) also used this measure.

These studies also differed from each other in the populations surveyed. Adame and Frank (1990) investigated BMI, weight perceptions, and related health behaviors of 658 college students in the general population. The prevalence of overweight was reported at



9.1% of men and less than one percent (0.5 %) of women. Similarly, Haberman and Luffey (1998) investigated nutritional habits and behaviors using the Survey of Selected Nutritional Health Practices of College Students among of 302 college students; finding prevalence rates of overweight to be 8% of students (10.5% of men and 6.6% of women). Clement et al. (2004) studied physical activity levels, behaviors, health behaviors and health indicators of only female students, finding that among these 116 women, almost two-in-ten (18.4%) were overweight and half that number (9.2%) were obese.

In 1987, Klesges, Mizes, and Klesges measured the incidence of dieting and weight loss behaviors among 204 college students. Of these students, 37 or 18.1% were at or above the 75th percentile for weight (corrected for age, gender, and height) and were considered overweight. Leenders et al. (2003) did a study among 2,155 students taking a physical activity class, investigating students' reasons for taking the class, as well as the health behaviors of those students; the prevalence of overweight and obesity was 25% among those students. George and Johnson (2001) reported that, of 1,852 college students surveyed on lifestyle behaviors and weight control attitudes, about one-in-ten females (13%) were overweight and 5% were obese; of males, almost one-in-three (30%) were overweight and 8% were obese. Students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese.

Authors Huang et al. (2003) surveyed 738 college students to assess the prevalence of overweight and obesity, as well as students' dietary habits and physical activity. For student younger than 20 years of age, overweight was indicated by a BMI of greater-than-or-equal-to the 85th percentile (or  $\geq 25$  kg/m<sup>2</sup>), while obesity was indicated by a BMI of greater-than-or-equal-to the 95th percentile (or  $\geq 30$  kg/m<sup>2</sup>) according to these authors.

Huang and colleagues found that for students 20 years and older, those with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered to be overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese. The percentage of overweight female students ranged from 11.3% to 16.1% while the prevalence of obesity ranged from 3.1% to 4.2%; for men, prevalence of overweight by BMI ranged from 20.7% to 26.7% while the prevalence of obesity ranged from 5.2% to 5.5%. Anding, Suminski, and Boss (2001) assessed levels of compliance with Dietary Guidelines for Americans among 103 female college students enrolled in aerobics classes. Of these students, 25% were overweight with a BMI of  $\geq 25$  kg/m<sup>2</sup>.

Vohs et al. (2001) surveyed 342 female students in their senior year of high school and again in their freshman year of college to measure eating behavior changes during this period of transition. The authors considered women with a BMI of  $\geq 27.3$  kg/m<sup>2</sup> to be overweight while those with a BMI of  $\geq 32.3$  kg/m<sup>2</sup> were considered obese. More women reported themselves to be overweight in college (32.2 %) than in high school (21.9 %).

Heatherton et al. (1995) compared eating behaviors among college students in 1982 and 1992. The percentage of overweight was low among women at both years, at two percent in 1982 and five percent in 1992, and the slight increase over the ten-year period was insignificant in terms of health risks. Students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese.

However, in measuring leisure time physical activity levels and aerobic fitness levels among 189 black freshmen at a historically black university, Ainsworth et al. (1992) found that percentages of overweight or obese were higher, comprising 39% of men and 37% of women. Similarly, among black and white females, black females had significantly higher BMIs than did white female students (Ainsworth et al.). The authors

found that of all students, 27.9% were overweight or obese with a BMI of greater than 25; 40.8% of all males and 22.0% of all females were overweight or obese. However, of black males, 51.2% were overweight or obese compared to 38.0 % of white males; while of black females, 44.0% were overweight or obese compared to 14.9% of white females.

Trends emerging in the literature indicated that men had higher BMIs than women and that black students had higher BMIs on average than did white students, especially among female students (Ainsworth et al.; DeBate, Topping, & Sargent, 2001). Additionally, Huang, et al.(2003) found that students 20 years or older were significantly more likely to be overweight or obese than students younger than 20 years old. Increased BMI is thought to be a factor in increased weight concern and not a predictor of disordered eating as previously thought (Arriaza & Mann, 2001). The differing BMIs among ethnic groups may result from the various body weight and beauty norms held by these groups and may also reflect the differing effects of various risk factors on each population's weight.

Heatherton, et al. (1995) studied college students in 1982 and 1992; significant changes were reported in these populations over a ten-year interval. The authors found that from 1982 to 1992 the average weight for women significantly increased by five pounds; while men reported an increase as well, it was not significant. This increase in weight corresponded to an increase in BMI for both groups. Heatherton et al. reported that students with a BMI of  $\geq 25$  kg/m<sup>2</sup> were considered overweight while those with a BMI of  $\geq 30$  kg/m<sup>2</sup> were considered obese. There was a significant increase in prevalence of overweight among women as well as a smaller insignificant increase for men (Heatherton et al.). However the percentage of overweight was low among women at

both years, at 2% in 1982 and 5% in 1992, and represented a non-significant gain in terms of health risks, as recorded by Heatherton et al. One third of women in 1982 and one quarter of women in 1992 reported BMIs below  $20 \text{ kg/m}^2$ . Fewer women with weights at or below average in 1992 perceived themselves as overweight compared to 1982 (approximately half of women in 1982 and one-third in 1992) (Heatherton et al.).

Though women weighed significantly more in 1992 than in 1982 they were significantly less likely to perceive themselves as overweight as Heatherton et al. reported. There was no significant change for men in these categories from 1982 to 1992 but men in both years reported themselves as overweight although few were actually overweight (Heatherton et al.). According to the authors, significantly more men and women reported eating a diet low in fat in 1992 than in 1982.

Data from the 1995 NCHRBS results indicated that of college students nationwide, more than two-in-ten students (20.5%) reported heights and weights corresponding to a BMI of  $27.8 \text{ kg/m}^2$  or greater for men and  $27.3 \text{ kg/m}^2$  or greater for women (CDC, 1997). These levels of BMI indicate overweight. Similar percentages of men (20.9%) and women (20.2%) were overweight. According to this study a total of 41.6% of all students reported thinking they were overweight. More women than men (48.8% and 32.4% respectively) reported thinking they were overweight (CDC, 1997).

While the prevalence of overweight and obesity in college students appears to be less than the national average for the age group of 20-to-34 years, the variability of the rates indicate that among some populations, there is a need for increased emphasis on physical activity and good nutrition in order to maintain a healthy energy balance and a healthy

weight. As overweight and obesity rates increase in the general population, there is every reason to expect an increase in the college population as well.

The factors involved in the increase of overweight and obesity in adolescents and young adults include behavioral, environmental, genetic, metabolic, socioeconomic, and cultural considerations (USDHHS, 2000). Overweight and obesity in adolescents is likely to continue into adulthood, and while overweight is associated with its own health risks in adolescence and college ages, the majority of overweight risk is associated with chronic disease, building over time with increase in weight (USDHHS, 2000). The classroom is the ideal place to promote healthy dietary behaviors and physical activity at each level, beginning in childhood and continuing through adulthood (USDHHS, 2000). Efforts should continue to address health risks associated with overweight and obesity as well as how to control weight at a healthy level (USDHHS, 2000). The focus of health promotion efforts should be to encourage maintenance of a healthy weight through a nutritious dietary intake of fruits and vegetables, among other vital nutrients, according to levels established in the 2005 Dietary Guidelines for Americans, and to encourage regular moderate physical activity throughout the lifespan (USDHHS, 2000). Incorporating these factors to maintain a healthy weight may require environmental, behavioral, and cultural modifications in order to change nutrition and physical activity patterns (Prentice et al., 2004).

Volicer, Quattrocchi, Candelieri and Nicolosi (2003) studied dietary and physical activity behaviors among a population of 297 college students, of whom four-in-ten (40%) were overweight or obese with a BMI of 25 kg/m<sup>2</sup> or greater. The authors found that students 21 years old or older were significantly more likely to be overweight or

obese than those under 21; men were significantly more likely than women to be overweight or obese. According to Volicer et al., of those 97 students that were overweight or obese, 75% correctly perceived themselves as overweight, 71% reported current attempts to lose weight, while 27% reported no dieting efforts within the past 30 days. Younger students were more likely than older students to report trying to lose weight. Volicer et al. found that of overweight and obese students reporting current attempts to lose weight, 75% reported exercising to lose weight, 50% reported dieting to lose weight, while fewer than half reported using diet and exercise together. In considering the attempts and directions made by overweight and obese students to lose weight, the need for education and intervention efforts was obvious. Students such as these should be provided with a more effective weight loss plan to reduce the prevalence of overweight and obesity among college students.

Clement et al. (2004) surveyed 116 college women's physical activity levels, behaviors, health behaviors and health indicators. The authors found trends associating high BMI with decreased physical activity levels and increased fatty food intake; for associating high physical activity levels with lowered BMI and increased fruit and vegetable intake; and for associating improved overall health status with increased physical activity level, decreased fatty food intake, and decreased BMI.

Healthy diet and physical exercise leading to balanced energy intake and output are elements of prevention and treatment for overweight, obesity, and the chronic diseases of which these conditions may be precursors (Prentice, 2004). Although every element leading to the development of diabetes, cancers and cardiovascular disease is not fully known, the efficacy of diet and exercise as well as pharmaceuticals to reduce risk in

healthy people and improve outcome of these diseases has been suggested by more than thirty years of trials (Prentice, 2004).

### College Students and Dietary Behaviors

#### *Dietary Intake of Fruits and Vegetables*

Five or more servings of fruit and vegetables per day for all Americans over two years of age is recommended by the National Cancer Institute for promoting good health and preventing many cancers and other chronic diseases (USDHHS, 2005). Five servings per day, three vegetables and two fruits, is the minimum; women should preferably eat seven servings of fruits and vegetables per day and men preferably should eat nine or more servings (USDHHS, 2005). Five to nine servings of fruits and vegetables provide benefits for weight management, prevention of cancers, high blood pressure, stroke, heart disease, diabetes, and other diseases (USDHHS, 2005). For example, Ludwig, Pereira, Kroenke, Hilner, Van Horn, Slatterly, and Jacobs (1999), found that among 2,909 young adults ages 18 to 30 years old, dietary fiber intake, whether from grains, fruits, or vegetables, was found to be linearly associated with lower insulin levels and cardiovascular disease risk factors as shown by data collected in the Coronary Artery Risk Development in Young Adults (CARDIA) Study.

Additionally, Hung, Joshipura, Jiang, Hu, Hunter, Smith-Warner, Colditz, Rosner, Spiegel-man, and Willett (2004) assessed the results from 71,910 female participants in the Nurses' Health Study and 37,725 male participants in the Health Professionals' Follow-up Study, which were periodically updated from 1984 to 1994. The authors found that an increased dietary intake of fruits and vegetables (more than 1.5 servings of fruits and vegetables per day) was inversely related to relative risk of chronic disease,

primarily cardiovascular disease. For men and women, those eating five or more servings of fruits and vegetables per day had a relative risk of 0.96 for major chronic disease. For cardiovascular disease, those eating five or more servings of fruits and vegetables daily had a relative risk of 0.88 that of those eating fewer than 1.5 servings per day (Hung et al., 2004).

Few college students meet the minimum requirements of five servings of fruits and vegetables per day. Among all students participating in the 1995 NCHRBS, little more than one-fourth of students (26.3%) reported eating five or more servings of fruits and vegetables per day (CDC, 1997). Slightly more men than women (28.1% and 25.0% respectively) reported meeting this minimum (CDC, 1997). The 1995 level of college student' fruit and vegetable intake, though below desired levels, was still better than the levels of intake among high school students in 2001, suggesting that fruit and vegetable intake may improve from high school to college.

In reporting the results of the 2001 Youth Risk Behavior Survey among adolescents nationwide, levels of dietary intake of fruits and vegetables were found to be less than optimum (Grunbaum et al., 2002). Of high school students in grades 9-12, fewer than one-in-four students (21.4%) reported eating five or more servings of fruits and vegetables per day. According to these authors, males were more likely than females (23.3% and 19.7% respectively) and black students were more likely than white students (24.5% and 20.2% respectively) to report eating five or more servings of fruits and vegetables per day.

However, Neumark-Sztainer, Story, Hannan, and Croll (2002) found that, in a population of 4,746 adolescents ages 11-to-18, significantly higher percentages of dietary



risk behaviors and BMI were reported than were optimal according to *Healthy People 2010* targets. Fewer than one-in-three high school students (29.2% for females and 26.6% for males) reported consuming five or more servings of fruits and vegetables on the previous day. For both sexes, fruit and vegetable intake decreased as age increased (Neumark-Sztainer et al., 2002).

College students' intake of fruits and vegetables is consistently low in recent studies. In the study by Huang et al.(2003), two-thirds of college students (69.4%) reported eating fewer than five servings of fruits and vegetables; the average fruit and vegetable intake among all students was 4.2 servings per day. Huang et al. also found that male students ate slightly more servings of fruits and vegetables than did female students (4.3 servings for males and 4.0 for females). Haberman and Luffey (1998) described similar results, with 80% of students surveyed reporting inadequate fruit and vegetable consumption.

DeBate, Topping, and Sargent (2001) found that in a population of 630 students, fewer than one-in-five (17.8%) reported eating five-or-more servings of fruits and vegetables per day; fewer males than females reported this behavior. Also, fewer black students than white students reported consuming adequate daily intake. White females were most likely to report consumption of five or more servings of fruits and vegetables per day but only 20.6% did so. This study highlighted a need for emphasis on healthy dietary behaviors for black college students, especially in light of *Healthy People 2010* recommendations in these areas.

Georgiou, Betts, Hoerr, Keim, Peters, Stewart, and Voichick (1997) compared nutrition intakes among a population of 1,338 participants. Three groups were surveyed, including college students, college graduates, and non-students. These authors reported

that college students and college graduates ate more fruits and vegetables than did non-students. In each group, women reported insufficient dietary intakes of vegetables. Findings suggest that although the college experience may contribute to increased fruit and vegetable intake, among women, intakes yet fail to meet the dietary guidelines.

According to results of the study by Clement et al. (2004), increased fruit and vegetable intake was associated with high physical activity levels and lowered BMI among college students. However, Anding, et al. (2001) found that fewer than two-in-ten (15%) female college students in aerobics classes did the same. Leenders et al. (2003) found that, among students enrolled in a physical activity class, slightly more than one-fourth of students (26%) reported eating five-or-more servings of fruits and vegetables per day. Male students were less likely to report this behavior. However, Dinger and Vesely (2001) found a significant association between insufficient fruit and vegetable and low levels of physical activity in analyzing data collected from 4,609 undergraduate students participating in the 1995 NCHRBS. Students reporting insufficient fruit and vegetable intake were found to be 4.24 times as likely to report a low level of physical activity (zero days of vigorous activity and less than two days of moderate activity) as were students reporting adequate fruit and vegetable intake (fewer than five servings of fruits and vegetables on the previous day) according to Dinger and Vesely (2001).

In a study among first-year undergraduate students in Great Britain, Williams (2000) found that fewer than one-in-five (20%) reported consuming five servings of fruits and vegetables per day. This is a similar finding to studies of U.S. college students' intakes. Of all students studied, 90% were aware of the health benefits of fruit and vegetable consumption but not aware of servings needed to produce these health benefits. Intakes

among students had dropped from that at home to that at college for 46% of students; one-in-three students (33%) maintained the same level of consumption of fruits and vegetables as at home (Williams). This study suggests an emphasis in health promotion efforts on the number of servings of fruits and vegetables needed per day for health benefits might have a beneficial effect on increasing the intakes of college students.

#### *College Students and Consumption of Foods Typically High in Fat*

For all Americans older than age eighteen, the *Dietary Guidelines for Americans* recommends consuming a total intake of 20-to-35 percent of total calories per day (USDHHS, 2005). Foods high in saturated fats and/or Trans fatty acids and oils should be limited so that a total of less than ten percent of total daily caloric intake comes from these fat sources. Levels of fat intake over 35 percent of total caloric intake may contribute to increased blood lipid and cholesterol levels which contribute to cardiovascular disease (USDHHS). Foods high in these fats include ground beef, cakes, cookies, quick breads, doughnuts, potato chips, French fries, and other foods (U.S. Department of Agriculture, 2003).

*Healthy People 2010* recommended in Objective 19.8 that the proportion of those two years and older who consume less than 10 percent of total calories from saturated fat be increased to 75 percent from the current status of 36 percent (USDHHS, 2000). In Objective 19.9, *Healthy People 2010* recommended that the percentage of the population who consume less than 30 percent of total calories from all sources of fat also be increased to 75 percent (USDHHS).

To measure the amount of fat in the diet, the NCHRBS asked students how many servings of the following foods typically high in fat they had consumed on the previous

day: French fries, cookies, doughnuts, cakes, pies, pizza, hamburgers, hot dogs, or sausages. These foods typically contain from 3-to-25 grams of fat and from 1.5-to-6.9 grams of saturated fat per serving (Gebhardt & Thomas, 2002). In the typical diet of 2000 calories on which Percent Daily Values of most foods are based, the total amount of fat that provides 30 percent of total calories from fat is no more than 65 grams, and no more than 20 grams of saturated fat to provide ten percent of calories from saturated fats (USDHHS, 2000.) Two servings of these foods would provide from 6 to 50 grams of total fat and from 3-to-13.7 grams of saturated fats, coming close to completing the total amount of recommended fat per day. However, consuming more than two servings could exceed the recommended amount of fat, especially saturated fat, in the diet.

Heatherton et al. (1995) studied trends in college students' nutrition behaviors from over a ten year period, from 1982 to 1992 ; the researchers found that significantly more men and women reported eating a diet low in fat in 1992 than in 1982. Encouragingly, among all students participating in the 1995 NCHRBS, greater than three-quarters of students (78.2%) reported eating two or fewer servings of foods typically high in fat content per day (CDC, 1997). More women than men (84.9% and 69.6% respectively) reported eating low amounts of fatty foods (CDC, 1997). As reported, the numbers of students eating lowered amounts of foods high in fat is a positive sign. A much lower percentage of high school students (55.2% of girls and 44.8% of boys) consumed 30% fewer total calories from fat, according to Neumark-Sztainer et al. (2002). Again, more female students reported meeting this dietary recommendation than did male students.

This trend may or may not be significant among college populations. Fennell (1997) found that among 996 students attending historically/predominately Black universities,

male students were significantly more likely than were female students to have had one or more servings of foods high in fat on the previous day. However, Anding et al. (2001) found that among female college students enrolled in aerobics classes, two-thirds of these students (66%) reported exceeding the recommended level of saturated fat in their diet.

Haberman and Luffey (1998) surveyed a smaller group of college students and found that 52% of students reported limiting their fat intake while 53.6% reported avoiding fried foods. Encouragingly, Georgiou et al. (1997) compared nutrition behaviors in three groups: college students, college graduates, and non-students. These researchers found that college students and college graduates reported less dietary fat than did non-students.

Physical activity behaviors and dietary fat intakes may be related. Clement et al. (2004) surveyed female college students; in this study trends were found that associated high BMIs with decreased physical activity levels and increased fatty food intakes. Conversely, improved overall health status among these students tended to be associated with increased physical activity levels, decreased fatty food intakes, and decreased BMIs (Clement et al., 2004).

Johnson, Nichols, Sallis, Calfas, and Hovell (1998) studied 576 college seniors to determine interrelationships among reported risk behaviors including dietary and physical activity risk behaviors. The authors found that among men, more moderate leisure activity, as opposed to vigorous activity, was related to higher intakes of fatty foods. Higher levels of participation in strengthening activities among women were linked with eating fewer fatty foods (Johnson et al.).

*College Students and Dieting to Control Weight*

The U.S. Food and Drug Administration (FDA) released the final report of its Obesity Working Group, with conclusions that “Calories Count.” In this report the FDA concluded that obesity results from a long-term collaboration of factors and as one way to address the problem as part of a multi-faceted effort, recommendations centered around the energy balance of calories eaten versus calories spent in physical activity and metabolism (USDHHS, 2004). For weight control, keeping track of calories eaten and expended was seen as crucial (USDHHS, 2004).

In order to lose weight, the 2005 Dietary Guidelines for Americans recommended slow decreases in weight by decreasing caloric intake, usually by 500 calories per day, while maintaining an adequate nutrient intake and increasing physical activity. Weight maintenance within a healthy range would require a balance of caloric expenditure with caloric intake: “To reverse the trend toward obesity, most Americans need to eat fewer calories, be more active, and make wiser food choices.” (USDHHS, 2005) Suggested ways to decrease caloric intake included decreasing fats, sweets, and alcohol in the diet, as well as monitoring portion sizes. All diets should meet the Acceptable Macronutrient Distribution Ranges – or the AMDR; fats should account for 20-to-35 percent of total calories; carbohydrates should account for 45-to-65 percent of total calories, and protein should account for 10-to-35 percent of total calories (USDHHS, 2005). Diets that decrease caloric intake while maintaining the intake of vital nutrients, fats, carbohydrates, and proteins, as well as physical activity, will allow weight loss and maintenance at a healthy weight with a BMI in the range of 19-to-24 kg/m<sup>2</sup> (USDHHS, 2005).

Many college students attempt to lose weight; female college students may be more likely than male students to attempt weight loss. Among all students participating in the NCHRBBS, almost half (46.4%) reported attempting to lose weight; more women than men (59.8% and 29.6% respectively) reported current weight loss attempts (CDC, 1997). In addition, Fennell (1997) reported that among students attending historically Black universities, four out of ten students (42.9%) reported trying to lose weight while 15.9% reported doing nothing about their weight. Also in that study, the majority of males did not report current attempts to lose weight, while more than one-third of women (34.3%) did report them. Volicer et al. (2003) reported similar results, finding that among students that were overweight or obese, males were more likely than women to consider their health very good or excellent, less likely to consider themselves overweight, less likely to report trying to lose weight, and less likely to report dieting. These studies also found that, among overweight or obese students who reported trying to lose weight, 75% reported exercising to lose weight, 50% reported dieting to lose weight, and fewer than half reported using diet and exercise together. Those who reported currently efforts to lose weight had significantly higher BMIs than those not currently attempting weight loss (Volicer et al., 2003).

Similar results are found in the literature on high school students. Results of the 2001 YRBS showed that, among adolescents nationwide, levels of weight control behaviors were found to be less than optimal. Of high school students grades 9-thru-12, almost one-half (46%) reported trying to lose weight the previous month (Grunbaum et al., 2002). Females were more likely than males, respectively (62.3% vs. 28.8%,

respectively) and white students (47.1%) more likely than black students (36.9%) to report trying to lose weight in the same period (Grunbaum et al., 2002).

Although weight loss recommendations of the USDA's Dietary Guidelines for Americans and the Calories Count Obesity Working Group Report include decreasing total caloric intake while increasing physical activity, few college students do so in attempts to lose or keep from gaining weight. The methods that students report using are often ineffective at best, or harmful at worst. Many college students report unsafe behaviors of dieting, including restraint or reduction in caloric intake alone to lose weight. The National Institute for Mental Health (NIMH) lists symptoms of the eating disorder known as bulimia nervosa as recurrent episodes of binge eating followed by compensatory behaviors to prevent weight gain from food eaten such as fasting or excessive exercise (2001). Fasting and controlled eating behaviors are also associated with the condition of anorexia nervosa in which restraint is used to maintain a weight that is below normal levels (USDHHS, 2001). Over time, restrained eating at a level less than normal may develop into the eating disorder of anorexia.

The Harvard Eating Disorder Center (HEDC) distinguishes between disordered eating and having an eating disorder. The former is a habit of thoughts and behaviors about food and eating that do not interfere with health or other aspects of living, may cause temporary changes in weight but not medical complications, and that may go away without treatment (HEDC, 2005b). However, an eating disorder, whether anorexia, bulimia, or an eating disorder not-otherwise-specified, is an illness in which frequent and persistent thoughts and behaviors about food and eating interfere with health, school, social life, and work, cause medical complications, and may not improve without



treatment (HEDC, 2005c). Behaviors of dieting, restrained eating, and fasting may be present in disordered eating or in an eating disorder such as bulimia nervosa or eating disorder not-otherwise-specified.

Among all students participating in the 1995 NCHRBS, nearly one-third (30.8%) reported dieting to control weight; more women (42.1%) than men (16.7%) reported current attempts to diet for weight control (CDC, 1997). However, Fennell (1997) found that among students attending historically black universities, fewer than one-in-ten (7.4%) dieted to control their weight in the previous seven days; women were more likely than men to have dieted to control weight during the past seven days.

Gray, Ford, and Kelly (1987) compared two studies on the prevalence of bulimia. In one study, the authors examined bulimia in 507 black college students (66% female, 33% male) and compared those results with a previous study of 339 Caucasian students (64% female, 36% male). Among black males, a relatively high percentage (23%) reported restrictive dieting for weight control. In comparing black and Caucasian males, blacks were found to be significantly more likely to diet or fast than were Caucasians.

Arriaza and Mann (2001) studied disordered eating behaviors among college students of varying ethnicities. Although at first the different ethnic groups seemed to have differing scores on the EDE-Q, after controlling for BMI the only difference remaining was that white women scored significantly on restraint than did Asian and Hispanic women. The study found that increased BMI was not a predictor of disordered eating as previously thought but was instead thought to be a factor in increased weight concern. All ethnicities at similar weights expressed similar levels of concern about weight.

Whites, however, were more likely to restrict eating with these concerns about weight (Arriaza & Mann, 2001).

Differing BMIs among ethnic groups may result from the various body weight and beauty norms held by these groups and may also reflect the differing effects of various risk factors on each population's weight. Although eating disorders are thought to be primarily prevalent among white women, results of this study showed that similar rates and patterns of concern exist across all racial or ethnic groups regarding weight concern, eating, shape, and restraint.

In 1987, Klesges, Mizes, and Klesges measured the incidence of dieting and weight loss strategies, finding that a majority of both men and women (54% of males and 89% of females) reported calorie restriction in order to lose or keep from gaining weight. Females were also more likely than males to report appearance as a perceived benefit of weight loss. However, in a study by Heatherton et al. (1995), dieting frequency significantly decreased between 1982 and 1992 for men and women. Significant changes were reported in this population over the ten year period. Approximately 10% fewer women in 1992 (than in 1982) reported a desire to lose 10-or-more pounds, although a significant majority (70%) reported the desire to lose weight in both years. Many more women and men reported never dieting in 1992 than in 1982.

Conversely, Grunbaum et al. (2002) found that in reporting the results of the 2001 YRBS among adolescents nationwide, levels of dieting to lose or keep from gaining weight were less than optimal. Among high school students grades 9-thru-12, almost one-half (43.8%) reported eating less food, fewer calories, or foods low in fat to lose or avoid gaining weight in the previous month. Females (58.6%) were more likely than

males (28.2%), and whites (45.9%) were more likely than blacks (32.5%) to report dieting to control their weight during the previous month.

Vohs et al. (2001) reported that in measuring female students' dietary behaviors in their senior year of high school and again in their freshman year of college, more students reported a desire to lose weight in college (81.2%) than in high school (78.3%). However, a decrease in the percentages of students reporting that they usually dieted (from 11.2% in high school to 9.6% in college) and an increase in the percentage reporting that they rarely dieted (from 25.1% in high school to 28.7% in college) indicated an overall lessening of dieting behavior from high school to college. The study found that increased dissatisfaction with their bodies, as well as an increase in reported perception of being overweight did not translate into dietary behavior changes for these students.

Soliah, Walter, and Erickson (2000) studied 101 high school students ages 14-to-19, and 293 college students ages 18-to-38, comparing eating restraint and other variables in the two groups. The study found that college females had higher scores of eating restraint than did any other group. Among high school females and males, as eating restraint scores increased, so did weight; eating restraint increased with perception of being overweight. Dissatisfaction with weight and eating restraint were higher for females in high school and college than for males. Rather than beginning in college, Soliah et al. reported that these trends may start among females in the high school years and continue into college. Many college females viewed food as a temptation, attempted to avoid food or snacks, and sought cheer from food, and had feelings of guilt, discontentment and temptation from food. Both high school and college students reported eating fewer than three meals or snacks a day in an attempt to practice restraint. Important areas for health

professionals include prevention of the development of restrictive eating behaviors as well as the treatment of body dissatisfaction and food-related psychological factors.

Thompson and Schwartz (1982) compared women exhibiting three types of eating behaviors: anorexia, anorexia-like behavior (not at clinical level), and normal eating patterns. The groups were compared in terms of their social adjustment and psychological distress. Women in the anorexic group were 14-to-28 years old. Those in the normal and anorexia-like groups were college students ages 18-to-23, and were assigned to their groups by scores on the Eating Attitudes Test (EAT). Almost all of the anorexic-like and normal women reported constant dieting with a mean age of beginning to diet being 14.8 years among anorexic-like women and 15.1 years among normal women. The anorexic-like women were from varying backgrounds, but the majority exhibited similar levels of stress or development and had social support for their dieting behaviors.

Alexander and Tepper (1995) studied the relationship of nutrition knowledge to weight control behavior among 226 college students. The authors found that one-in-four women (40%) and almost one-in-five men (18.7%) reported changing their eating habits to maintain their weight. Students who reported the highest levels of restraint were significantly more likely to report higher nutrition knowledge scores and were more likely to have changed their eating habits in order to lose weight.

Chandler and Abood (1997) compared black and white female college students' eating and weight control behaviors. Among whites, body dissatisfaction scores were higher than among blacks, even though black women weighed more than white women in the group. For both races, weight and weight change were significantly related to the body dissatisfaction scores. Those with higher than ideal weights had correspondingly higher

body dissatisfaction scores; those wanting to lose weight had higher body dissatisfaction scores than did those wanting to maintain or gain weight. The study found significant relationships between weight, desire to lose weight, and body dissatisfaction among these women of both races. There was less body dissatisfaction among the black women although they weighed an average of 10 pounds more than the white women. Rather than race, the variables of weight category and desire to lose weight had more of an impact on body dissatisfaction. For both races, women with higher than ideal weights showed dissatisfaction with their bodies and desired to lose weight. Though these factors may contribute to eating disorders, the extent to which disordered eating and pathogenic eating behaviors and attitudes had developed in the black women was less than in the white women. Even though behaviors may not have developed to a high extent among black women, the same concerns and issues were present in this population for both ethnicities. Professionals in health promotion should apply the same interventions for weight management and eating disorder prevention to all students regardless of race/ethnicity.

Rucker and Cash (1992) also studied dieting behaviors among 104 female black and white college students, comparing body image attitudes and perceptions, eating behaviors and weight concerns among the ethnicities. Results showed a significant difference between black and white women in several areas. In comparison to white students, black students reported scores significantly less conducive to the development of eating disorders in fear of fatness; in drive to be thin; in preoccupation with overweight among other factors. In this study, black students surveyed reported more positive attitudes toward overall appearance and less focus on dieting, fatness, and weight fluctuations than did white students. In contrast, white students reported a stronger drive for thinness,

more frequent dieting, and eating restraint than did black students. These data suggest white students may be more vulnerable to the development of an eating disorder based on an overall higher score on those measures that indicate negative assessment of body image and perceptions, eating behaviors and weight concerns, as the authors reported.

#### *College Students and Exercising to Control Weight*

The Dietary Guidelines for Americans (2005) recommended weight loss through a combination of reduced dietary intake, especially in calories from fats, sugars, and alcohol, along with increased amounts of physical activity (USDHHS). However, unhealthy dietary practices among college students include the use of exercise alone to lose weight especially at high levels or if symptomatic of an eating disorder. The National Institute for Mental Health (NIMH) lists symptoms of the eating disorder known as bulimia nervosa as recurrent episodes of binge eating followed by compensatory behaviors to prevent weight gain from food eaten such as fasting or excessive exercise (USDHHS, 2001). Intense and compulsive exercise is also associated with the condition of anorexia nervosa in which excessive exercise is used to maintain a weight that is below normal levels (USDHHS, 2001). Excessive exercise can lead to abnormalities in the menstrual cycle for females and to stress fractures (HEDC, 2005a). As well, Schwitzer, Bergholz, Dore, and Salimi (1998) reported on the presence of eating disorders that come under the category "Not Otherwise Specified." These disorders are those that do not meet the American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (1994) clinical definitions of anorexia or bulimia are prevalent among college women (Schwitzer et al.). As Schwitzer et al., pointed out, behaviors of these eating disorder trends include constant worry about food and weight,

body dissatisfaction, obsession with caloric and fat intakes, and regular compensation for foods eaten by purging or extreme exercising in order to lose or control weight (Schwitzer et al.). These behaviors caused interruptions to activities of daily life as well as mental distress according to the authors. Prevention of these disorders in susceptible college students as well as interventions and treatment of these eating disorders and behaviors are needed as well as those services specifically for clinical anorexia and bulimia (Schwitzer et al.).

Among all students participating in the 1995 NCHRBS, more than half of all students (53.6%) reported exercising to lose weight or keep from gaining; more women than men (62.6% and 42.3% respectively) reported current attempts to exercise for weight control (CDC, 1997). Among students attending historically black universities, Fennell (1997) found that more than two-in-ten students (23.2%) reported exercising to lose or keep from gaining weight.

Similarly, in reporting the results of the 2001 YRBS among adolescents nationwide, levels of exercising to lose or keep from gaining weight were found to be less than optimum. Of high school students in grades 9-thru-12, more than one-half (59.9%) reported exercising to control their weight in the previous month (Grunbaum et al., 2002). Females were more likely than males (68.4% and 51% respectively) and white students were more likely than black students (61.9% and 50.1% respectively) to report exercising to control weight.

Klesges, Mizes, and Klesges (1987) studied the incidence of dieting and weight loss strategies among college students. According to the study, most female students (80%) and fewer than half of male students (46%) reported using physical activity as a weight

loss strategy. The prevalence of dieting behaviors, including the use of exercise to lose weight, was significantly higher among females than among males. More recently, George and Johnson (2001) surveyed college students about their dieting and weight control behaviors, finding that more females (49%) than males (34%) reported exercising for weight control. The trend suggests that more female students than males engage in dieting behaviors of all types (CDC, 1997; Fennell, 1997; Grunbaum et al., 2002).

Volicer et al. (2003) reported age differences among students exercising to lose weight. The authors reported that among a group of 297 college students, those students younger than 21 were more likely than students 21 or older to report exercising to lose weight. Among these students, exercising was the most common dieting effort reported; 64.5% of students reported exercising to lose weight (Volicer et al.).

#### *College Students and Vomiting or Using Laxatives to Control Weight*

The National Institute for Mental Health lists symptoms of the eating disorder known as bulimia nervosa as recurrent episodes of binge eating followed by compensatory behaviors to prevent weight gain from food eaten such as self-induced vomiting, misuse of laxatives, or other forms of purging behavior. Fasting or excessive exercise are other compensatory behaviors used to prevent weight gain after an episode of binge eating. Vomiting or use of laxatives as purging behaviors are also associated with anorexia nervosa; while those suffering from bulimia use these and other methods to prevent weight gain from a large amount of food eaten during a binge, those suffering from anorexia use these purging behaviors to supplement a lowered food intake to keep weight at a lower level than is normal and healthy. Over time, vomiting can cause bleeding in the throat and, though rare, may lead to ruptures in the esophagus, as well as erosion of



enamel on teeth due to the acidity of stomach contents; if ipecac syrup is used to induce vomiting it can damage both the nervous system and the heart. Frequent abuse of laxatives in purging can cause serious intestinal problems (HEDC, 2005a). The combination of laxatives, vomiting, and use of diuretics in purging can lead to hypokalemia, a lack of potassium in the body, which can cause interruptions in heart rhythms or cause the heart to stop contracting (HEDC, 2005a).

Schwitzer et al.(1998) studied eating disorders categorized as “Not Otherwise Specified” among college women. These behaviors included regular compensation for foods eaten by purging or extreme exercising in order to lose or control weight. Other behaviors included constant worry about food and weight, body dissatisfaction, and obsession with caloric and fat intakes. These behaviors caused interruptions to activities of daily life as well as mental distress. Schwitzer et al. recommend that prevention of these disorders in susceptible college students as well as interventions and treatment of these eating disorders and behaviors are needed as well as those services specifically for clinical anorexia and bulimia.

Thompson and Schwartz (1982) compared three groups of women exhibiting three types of eating behaviors including anorexia, anorexia-like behavior not at clinical levels, and normal eating patterns. This study found that current vomiting episodes (fewer than twice per week) was common among 32% of anorexic like-women but not among normal women. For anorexic-like women, bingeing, vomiting, and laxative use were related although laxative use was relatively rare; 20% of anorexic-like women as compared to three percent of normal women used laxatives to control their weight. The study also found that anorexic-like women reported feelings of struggling with their college work

and feelings of inadequacy, although their behavior did not prevent them from studying; these women also reported having greater feelings of anxiety and depression than normal women. The anorexic-like women were from varying backgrounds, but a majority experienced similar levels of stress or development and had social support for their dieting behaviors. Differences in psychological state and social contact, as well as other factors between anorexic and anorexic-like women, suggested that adoption of these behaviors may have been temporary to the particular life stage which those anorexic-like college women were experiencing. The continuum of behaviors among women who did not have anorexia was concerning, as was the prevalence of these behaviors and the psychological distress felt by participants, in terms of eating behaviors and life stress.

Another study in this period (Pyle, Mitchell, Eckert, Halvorson, Neuman, & Goff, 1983) examined the prevalence of DSM-III bulimia in 1,355 college freshmen; a small percentage (2.1%) were found to meet the criteria for clinical bulimia (4.5% of females and 0.4% of males). A small percentage – one percent of the total sample and two percent of females in the study – had previously been treated for anorexia nervosa or bulimia. Among non-bulimic students, 34.6% reported weight control attempts by vomiting, laxative use, diuretics, enemas, or fasting (26.1% of non-bulimic men, 47.0% of non-bulimic women). Among females, bulimics were significantly more likely than non-bulimics to report attempts at weight control by vomiting, laxative use, diuretics, enemas, or fasting.

Subsequently, Pyle, Neuman, Halvorson, and Mitchell (1991) studied the prevalence of bulimia nervosa in 911 female and 925 male college freshmen. Fewer than one-in-twenty (4.7%) freshmen females and less than one percent (0.4%) of freshman males

reported an eating disorder. Among females, 2.2% reported bulimia nervosa; while 1.1% reported bulimia with weekly bingeing and purging; among males, none reported bulimia with weekly bingeing and purging; less than one percent (0.3%) reported bulimia nervosa.

The ten-year retrospective study of Heatherton et al. (1995) also included the researching of disordered eating behaviors. Among women, the percentage reporting any indication of disordered eating, as well as the prevalence of bulimia, significantly decreased in the ten-year period 1982-to-1992; laxative use remained at a low level of prevalence. For current and past vomiting behaviors, a slight decline was shown for women and men, although the prevalence of current vomiting increased very slightly; vomiting behavior was reported at very low levels. Although symptoms of disordered eating decreased from 1982-to-1992 the prevalence of eating disorders was still high, with one-in-ten women reporting symptoms of a clinical or near-clinical level of disordered eating in 1992. In men, the prevalence of eating disorders decreased, and was much less common in men than in women.

Among all students participating in the 1995 NCHRBS, 2.6% reported vomiting or taking laxatives to control their weight; more women than men (4.2% vs. 0.6%, respectively) reported current vomiting or taking laxatives for weight control (CDC, 1997). In his study on risk behaviors among students attending historically black universities, Fennell (1997) reported relatively lower incidence rates; slightly more than one percent of students (1.2%) self-reported vomiting as a means of weight control.

The prevalence of purging behaviors seen among high school students was almost twice that of college students. Grunbaum et al. reported these results in the Youth Risk Behavior Survey results published in 2002. Of high school students in grades 9-thru-12,

one-in-twenty students (5.4%) reported vomiting or taking laxatives to lose or keep from gaining weight in the previous month. In this study, females were more likely than males (7.8% vs. 2.9%, respectively) and white female students were more likely than black female students (8.2% vs. 4.2%, respectively) to report vomiting or taking laxatives to lose or avoid gaining weight in the previous month.

Cooley and Toray (1996) studied 225 female college freshmen, finding that beginning levels of bulimia and restraint behaviors as freshman year began were the most significantly related factors to disordered eating at the end of the academic year. It was suggested that behavior patterns established prior to the beginning of college will continue into the college years. The demands of transition from high school to college may increase the likelihood of disordered eating for vulnerable students.

Vohs et al. (2001) also found that the level of classification of eating disorders reported did not change significantly from high school to college, implying that disordered eating behaviors begun in high school continue in severity into college. The authors studied dieting behaviors in female high school seniors and female college freshmen. Findings suggest that increases in body dissatisfaction, as well as an increase in reported perceptions of self as being of overweight in college students compared with high school students did not translate into dietary behavior changes for these students.

In their research of college students, Klesges, Mizes, and Klesges (1987) reported that almost two-thirds of females (61%) reported use of laxatives, appetite suppressants, or skipping meals; males (26%) were significantly less likely to report these behaviors. In the same year, Gray, Ford, and Kelly (1987) compared the prevalence of bulimia in black and white college students. Using DSM-III criteria, a small percentage of black females

(3 %) reported bulimia. Fewer (2%) reported vomiting, 5% reported use of laxatives, and 6% reported the use of diuretics.

Seymour, Hoerr, and Huang (1997) studied 101 young adults aged 18-to-24 who were either college students, college graduates, or non-students. The college students were more likely than the non-students and the college graduates to report inappropriate dieting behaviors, including vomiting and use of laxatives more than twice in the previous month. A very high percentage of female college students (43.3%) reported these behaviors, compared to 9.7% of male college students. Among all students, women were 10.5 times as likely to engage in these behaviors as men. Though the population of this study was small and subgroups were also small, the trend was concerning.

Arriaza and Mann (2001) studied disordered eating behaviors among college students of varying ethnicities. Although eating disorders were thought to be primarily prevalent among white women, results of this study suggest that similar rates and patterns of weight concern exist across all racial or ethnic groups. Chandler and Abood (1997) also compared white and black female college students. For both races, women with higher-than-ideal weights showed dissatisfaction with their bodies and desired to lose weight. Although these factors may contribute to eating disorders, the extent to which disordered eating and pathogenic eating behaviors and attitudes had developed in the black women was lower than it is among white women (Chandler & Abood, 1997). Although behaviors had not developed to a high extent in black women, the same concerns and issues were present for both groups (Chandler & Abood, 1997). This study recommended that professionals in health promotion apply the same strategies for weight management intervention and eating disorder prevention for all students, regardless of ethnicity.

Rucker and Cash (1992) also compared body image attitudes and perceptions, eating behaviors and weight concerns among black and white female college students. Whites reported significantly more frequent bingeing than did blacks. Black women in the study exhibited more positive attitudes toward overall appearance and less focus on dieting, fatness, and weight fluctuations. In contrast, white women reported a stronger drive for thinness, more frequent dieting and eating restraint, than did black women. This study suggests that white women may be more vulnerable to the development of an eating disorder based on an overall higher score on those measures that indicate negative assessment of body image and perceptions, eating behaviors, and weight concerns.

Allison and Park (2004) compared 48 female college students in a sorority and 54 female students not in a sorority. Over a period of three years, sorority women's drive for thinness remained constant, while non-sorority women's drive for thinness decreased significantly. No differences between the groups were reported on other variables of disordered eating, including disordered eating, depression, self-esteem, and ideal weight. The authors concluded that the influence of sorority membership may be to perpetuate emphasis on thinness to an extent not found in those not belonging to a sorority, who were less concerned with thinness over the three-year period.

#### *College Students and Taking Diet Pills to Control Weight*

Those with the eating disorders of anorexia nervosa or bulimia nervosa may use diuretics as a purging, compensatory behavior to either supplement a lowered food intake to keep weight at a lower level than is normal and healthy in anorexia or to prevent weight gain from an episode of binge eating in bulimia. HEDC (2005a) warns that use of diet pills can cause disturbances in heart rhythms, as well as changes in pulse and blood

pressure. If students are taking antidepressant medication such as mono-amine oxidase inhibitors – MAOIs – the interaction of this medication with diet pills causes severe side effects.

Among all students participating in the 1995 NCHRBS, 4.3% reported the use of diet pills to control their weight; more women than men (7.0% vs. 1.1%, respectively) reported current use of diet pills for weight control (CDC, 1997). Grunbaum et al. (2002) reported a higher level of diet pill abuse (diet pills, powders, or liquids) among high school students, as compared to those in college: about one-in-ten students (9.2%) in the high school study reported using these substances for weight control. Females were more likely than males (12.6% vs. 5.5%, respectively) and whites were more likely than blacks (9.5% vs. 6.0%, respectively) to report using diet pills, powders, or liquids to control their weight. As Seymour et al. (1997) reported, one-in-three (33%) women and nearly one-in-ten (8%) men engaging in inappropriate dieting behaviors, including using diet pills, powders, or diets more than twice in the previous month; women were 10.5 times as likely to report these behaviors as were men. In comparing college students, non-students, and college graduates, both male and female college students reported the highest prevalence of these behaviors (43.3% of college women and 9.7% of college men) (Seymour et al., 1997). Neither BMI among women nor current dieting status among men were significantly correlated with inappropriate dietary behaviors, including use of diet pills to control weight. George and Johnson (2001) reported a similar percentage of students who abused diet pills. Four-in-ten females (41%) reported dieting or taking pills to lose weight as compared to about one-in four males (23%). One-in-ten female students (10%) and 5% of males reported taking pills for weight control.

In a study by Klesges, Mizes, and Klesges (1987), the use of diet pills to suppress appetite was reported in conjunction with laxative use and skipping meals by almost two-thirds of female students (61%); male students were significantly less likely to report these dieting behaviors (26%). Encouragingly, Heatherton et al. (1995) reported that from 1982 to 1992 the use of diet pills among female students significantly decreased. However, in a study by Sanchez and Holcomb (2003), almost half of female college students who perceived themselves as overweight(45%) had either considered using or had used diet pills. Among those female students who perceived themselves to be of normal weight, 29.6% reported considering use of or usage of diet pills (Sanchez & Holcomb, 2003). Volicer et al. (2003) found that in a study of 297 college students, diet pill use was prevalent among all students (12.9%), but especially among overweight women, 19.6% of whom reported using these pills in an attempt to lose weight.

#### College Students and Physical Activity

The consensus on intensity of physical activity for health benefits is that moderate intensity activity such as 30 minutes of brisk walking per day is sufficient to improve health (USDHHS, 1996). Increases in activity for those who are capable of more vigorous levels is associated with greater health benefits. By emphasizing a moderate amount and intensity of exercise, which can be accumulated throughout the day, it hoped that people may be more encouraged to begin becoming more active.

Physical activity improves physiological function of the musculoskeletal, cardiovascular, respiratory, and endocrine systems in young and old. These improvements result in reduced risk of premature mortality, coronary heart disease, hypertension, colon cancer, and diabetes mellitus. Regular physical activity is also



associated with reduced anxiety and depression, improved mood, and greater ability to function in daily life. Nationwide, only half of young people ages 12 to 21 participated in regular vigorous activity (USDHHS, 1996). One-fourth reported no vigorous physical activity. Only one-fourth reported walking or bicycling, that is, moderate physical activity, most days of the week. More than one-in-ten young people (14%) reported no vigorous or light-to-moderate activity; this level of inactivity is more prevalent among women than men and among black females than white females (USDHHS, 1996). Men were more likely than women to report participation in vigorous physical activity, strengthening activity, and moderate activity of walking or bicycling. Participation in all types of physical activity decreased as age or grade increased according to these authors. Positive factors associated with physical activity include self-efficacy, enjoyment of the activity, social support, perceived benefits of the activity, and lack of perceived barriers to the activity (USDHHS, 1996). Prentice (2004) reviewed chronic disease treatment and prevention trials. As reported, physical exercise and a healthy diet leading to balanced energy intake and output were found to be elements of prevention and treatment for overweight, obesity, as well as the chronic diseases of which these conditions may be precursors. Although every factor leading to the development of diabetes, cancers, and cardiovascular disease is not fully known, diet and exercise, as well as pharmaceuticals, to reduce risk in healthy people and improve outcome of these diseases has been suggested by more than thirty years of trials (Prentice, 2004).

Pate and his colleagues (1995) authored a consensus statement with the American College of Sports Medicine (ACSM) and the CDC, which defined moderate intensity physical activity as activity performed at an intensity of 3-to-6 METs (work metabolic

rate/ resting metabolic rate), or a brisk walk at 3-to-4 mph in order to expend energy. Physical activity differed from exercise or physical fitness, which related to improvement or maintenance of the ability to be physically active. The following activities were identified as being of moderate intensity: brisk walking at 3-4 mph; cycling at up to 10 mph; swimming at moderate effort; calisthenics; racket sports; and others. Those activities of high-or-vigorous intensity with a metabolic equivalent of greater than 6 were as follows: brisk uphill walking; fast cycling over 10 mph; swimming at a fast tread or crawl; racket sports; and others.

The Joint Statement recommended that all healthy adults accumulate 30-or-more minutes of moderate intensity physical activity on most or all days of the week, in which approximately 200 calories of effort are expended (Pate et al., 1995). This was the minimum level of activity needed to derive the physical and mental health benefits of being physically active. Health professionals, communities, educators, and others were encouraged to promote this recommended level of activity for its health benefits to the population as a whole.

Adame, Johnson, Nowicki, Cole and Matthiasson (2001) found exercise levels among female college students to have significantly improved over a ten-year period. The study queried freshmen college students in 1987 and 1997, finding that significantly greater amounts of exercise in hours per week and greater overall levels of fitness were reported for women in 1997 than in 1987. Interestingly, amounts of exercise and overall fitness levels did not change during this period for men (Adame et al., 2001). Nearly three-in-four women in 1997 (73.60%) and nearly two-in-three men (66.34%) reported exercising five-or-more hours per week in either anaerobic or aerobic types of exercise. In 1987,

reported levels among women were significantly lower (65.31%), while those among men (63.51%) were only slightly lower (Adame et al., 2001).

### *College Students and Vigorous Physical Activity*

*Healthy People 2010* recommended in Objective 23.3 that the percentage of adults engaging in vigorous activity for 20 or more minutes per day on three or more days of the week be increased from 18% in 1997 to 30% by 2010 (USDHHS, 2000). A dose-response curve exists relative to the amount of physical activity and the health benefits gained, so that an increase in activity is associated with greater health benefits (Pate et al., 1995). Physical activity at moderate-or-greater levels is associated with reduced risk of premature mortality, coronary heart disease, hypertension, colon cancer, and diabetes mellitus (USDHHS, 1996). Regular physical activity is also associated with reduced anxiety and depression, improved mood, and greater ability to function in daily life (USDHHS, 1996). Calfas, Sallis, Lovato, and Campbell (1994) surveyed levels of physical activity and its determinants, as well as preferred interventions, in a study of 194 college students and 204 alumni. Vigorous levels of activity in college were more likely than moderate activity levels to be sustained up to five years after college graduation.

Although the benefits of vigorous activity are evident, among all students participating in the 1995 NCHRBS, only one-third (33.0%) reported participating in vigorous physical activity; that is, in activity that caused sweating and hard breathing for 20-or-more minutes on three-or-more of the previous seven days (CDC, 1997). More males than females (43.7% vs. 33.0%, respectively) reported vigorous physical activity (CDC, 1997). Fennell (1997) reported a similar prevalence rate of vigorous activity among students attending historically black universities. One-third (33.0%) reported

participating in vigorous activity on three of the previous seven days; males were more likely than females to do so (Fennell, 1997).

Rates of vigorous activity among high school students were much higher than for those in college students. Of high school students in grades 9-thru-12, nearly two-in-three (64.6%) engaged in vigorous physical activity (a level that caused them to sweat and breathe hard for 20-or-more minutes) on three of last seven days (Grunbaum et al., 2002). Males were more likely than females (72.6 % vs. 57.0%, respectively), and whites were more likely than blacks (66.5% vs. 59.7%, respectively) to do so (Grunbaum et al., 2002).

Ainsworth, Berry, Schnyder, and Vickers (1992) reported similar results in their study of freshmen at an historically black college. Almost one-half of males (48%) exercised at a strenuous level three-or-more days per week, compared to only 18% of females – 28% of all students had done so (Ainsworth et al., 1992). Most students (55%) reported exercising at less than strenuous levels. Greater than four-in-ten students (43%) reported exercising one or fewer days per week; more female than male students reported exercising one or fewer days per week. Similarly, Ford and Goode (1994) found that among black college students, fewer than one-half (44.6%) – and more males (60.0%) than females (40.0%) – engaged in daily physical activity; a large number of students (55.4%) reported no daily physical activity (Ford & Goode, 1994).

Kelley and Kelley (1994) surveyed habitual physical activity among 253 freshmen college students attending a historically black university. Males were significantly more active than females. Significantly more females (65%) than males (42%) reported almost no work or leisure time physical activity; preferred activities also differed by gender among this group. For highly active males, vigorous activity most frequently consisted of

home and leisure activities such as moving heavy objects, shoveling snow, and weightlifting, as well as strenuous sports such as basketball, football, skating, or skiing. For highly active females, vigorous activity most frequently consisted of running, jogging, and exercise dancing.

Differing preferences for activity among male and female students, as well as differing reasons for activity, were also found by Hall, Kuga, and Jones (2002). This study compared determinants of vigorous physical activity among 347 students of differing ethnicities to determine if relationships existed between ethnicity and levels of vigorous physical activity. Males were more likely than females (73.1% vs. 24.9%, respectively) to prefer sports as a physical activity. Exercise for weight control was reported as important among females but not among males. Additionally, males were significantly more likely than females to report high-to-moderate activity levels (76.4% vs. 39.5%, respectively) and to engage in regular physical activity (70.1% vs. 44.4%, respectively).

In a study examining a sample of older college students, with a mean age of 27.5 years (73% were between 21-and-30 years of age), Wallace and Buckworth (2002) studied the characteristics of participants meeting the current CDC and ACSM guidelines for moderate and vigorous intensity exercise. In the study, males reported significantly more days per week of vigorous activity than did females, although fewer than one-third (31.3%) reported vigorous activity. Pierce, Butterworth, Lynn, O'Shea, and Hammer (1992) surveyed aspects of physical fitness including aerobic capacity, body composition, muscle strength and endurance, joint flexibility, and activity patterns with participation measured on a level of twice per week. The study was conducted among 115 male and

143 female college freshmen. Pierce et al. found that among college freshmen, women were more likely to participate in aerobic activity than were men.

Although all studies may not use the terms vigorous or moderate activity, similar terms and intensities have been used to measure activity levels among college students. For example, Huang et al. (2003) found that, among college students, the mean number of days spent per week in aerobic activity was 2.8 (3.1 for males; 2.5 for females); approximately two-in-ten students (16.1%) reported no aerobic exercise per week (Huang et al., 2003). Additionally, Leenders, Sherman, and Ward (2003) examined activity levels of students taking a physical activity class and found that 69% participated in other physical activities (jogging, brisk walking, biking, etc.) long enough to work up a sweat on an average of 2.6 days per week for an average of 36 minutes. This level of activity is very close to the definition of vigorous activity, or activity that causes sweating and hard breathing for 20-or-more minutes on three- or-more of the previous seven days (Douglas & Collins, 1997). Women were slightly less likely than men to participate in physical activity at this level, although high percentages of both sexes reported levels equivalent to vigorous activity (66% of females and 71% of males) (Leenders, Sherman, & Ward, 2003).

Dinger and Vesely (2001) found a significant association between insufficient fruit and vegetable intake and low levels of physical activity. In this study, students reporting insufficient fruit and vegetable intake were found to be 4.24 times as likely to also report a low level of physical activity (zero days of vigorous activity and less than two days of moderate activity) as were students reporting adequate fruit and vegetable intake (fewer than five servings of fruits and vegetables on the previous day). The study concluded that

an association of dietary and physical activity risk behaviors may show a need for combined health promotion efforts addressing both behaviors at once.

Pinto, Cherico, Szymanski, and Marcus (1998) studied changes in vigorous and moderate activity participation rates among 708 students in their first and second years of college. No significant differences in minutes spent in and duration of vigorous and/or moderate activity were observed in the group between year one and two. However, the percentage of sedentary students reporting less than vigorous or moderate activity levels decreased from 42% to 36% over that time, while the percentage of active students reporting either vigorous or moderate activity levels increased from 58% to 64% (Pinto et al., 1998). Hall, Kuga, and Jones (2002) confirmed that perceived barriers had a significant negative effect on physical activity level of college students in their sample, while perceived benefits had a significant positive effect on activity levels.

Buckworth and Nigg (2004) studied physical activity, exercise, and sedentary behaviors in 493 college students enrolled in physical activity conditioning classes. In this sample, the rate of participation in vigorous activity (53.2%) was higher than that found in other studies of the general college population, (e.g., CDC, 1997; Fennell, 1997). Males reported higher levels of activity than females, however, the average student participated in only 2.79 days of activity, which is less than the required level of three-or-more days per week for vigorous activity recommended. Age was negatively correlated with participation in vigorous activity among students, and television viewing was a greater risk factor for lack of participation in vigorous activity in females, while for males, computer use was the greatest risk factor (Buckworth & Nigg, 2004). Johnson et al. (1998) reported that among male college seniors, higher levels of more vigorous

activity was significantly associated with eating healthy foods, while eating fatty foods was associated with lower levels of activity.

Wallace and Buckworth (2002) reported that social support from family and peers was higher for male and female students reporting vigorous activity. Being male, perceiving consequences of inactivity as severe, and reporting greater social support from family and friends were associated with higher rates of vigorous activity levels. The study concluded that perceived severity of the consequences of inactivity had significant impact on vigorous activity, and recommended that greater emphasis be placed on awareness of the benefits of physical activity to raise the levels of activity for college students, along with behavioral and other interventions.

Bray and Born (2004) examined the effect of transitioning from high school to college on vigorous activity levels in a sample of freshman. Students' vigorous exercise habits in the last two months of high school and the first two months of college were examined. Among all students, frequency of vigorous activity declined, from 3.32 sessions per week in high school to 2.68 sessions per week in college. The average student was met recommendations for vigorous activity in high school; once in college, decreased activity levels resulted in their no longer meeting recommended levels. One-third of students (33.1%) were vigorously active in high school, but were not sufficiently active in college (reporting fewer days of vigorous activity and/or on fewer than three days of the week). Among females, however, there was a significant increase in frequency of activity, who were relatively inactive in high school, but became active once in college. Those who became insufficiently active in college reported lower levels of vigor and higher levels of tension than those who remained sufficiently active in the transition. This decline may



have a significant impact on the mental and physical health status of students at a stressful time of transition in their lives.

*College Students and Moderate Physical Activity*

The CDC and American College of Sports Medicine, as well as the U.S. Surgeon General recommend moderate levels of physical activity for 30-or-more minutes on five-or-more days per week for all U.S. adults (Pate et al, 1995; CDC, 1997). Greater health benefits are seen with increased activity levels (Pate et al.). *Healthy People 2010* recommends that the percentage of adults engaging in moderate activity for 30-or-more minutes per day on five-or-more days per week be doubled – from 15% (in 1997) to 30% by 2010 (Objective 23.2) (USDHHS, 2000).

Fewer than one-in-five students (19.5%) participating in the 1995 NCHRBS met those minimum requirements by participating in moderate physical activity; that is, walking or bicycling for 30-or-more minutes on five-or-more of the previous seven days (CDC, 1997). Similar percentages of men and women (19.7% and 19.3%, respectively) reported moderate physical activity (CDC, 1997). In Fennell's study (1997) of historically black universities, nearly one-third of participants (32.1%) engaged in moderate activity on five-or-more of the previous seven days. Ford and Goode (1994) had reported a similar finding; 44.6% of study participants reported daily physical activity, while 55.4% reported no daily activity. More males than females (60.0% for males; 40.0% for females) reported engaging in daily physical activity (Ford & Goode, 1994).

Although Grunbaum et al. (2002) found higher levels of vigorous activity among high school than among college students, little differences were shown between college and

high school levels of moderate physical activity. Among high school students in grades 9-thru-12, one-fourth (25.5%) reported moderate activity (at a level that caused them to sweat or breathe hard for 30-or-more minutes on five of the last seven days). Males were more likely than females (28.4 % vs. 22.8%, respectively) and whites were more likely than blacks (27.3% vs. 20.1%, respectively) to report participating in activity at this level. Almost one-third of students (31.2%) reported insufficient activity, thereby not meeting the levels of vigorous or moderate activity, while one-in-ten (9.5%) reported no vigorous or moderate physical activity (Grunbaum et al., 2002).

Clement et al.(2004) surveyed physical activity levels among college females, finding that almost three-fourths of students in their sample (72.4%) reported regular moderate exercise three-or-more times per week. For these students, decreased physical activity levels were related to higher BMIs and increased fatty food intake, while increased physical activity levels were associated with lowered BMIs, increased fruit and vegetable intake, and an improved overall health status (Clement et al., 2004).

Wallace and Buckworth (2002) studied moderate physical activity levels among college students and found that fewer than two-in-ten students (13.6%) reported moderate activity levels. Similar percentages of males (16.9%) and females (12.2%) reported participating at this level of activity. Being male, perceiving consequences of inactivity as severe, and reporting greater social support from family and friends were the factors associated with higher levels of moderate activity. Improving awareness of the consequences of inactivity as an attempt to emphasize its perceived severity to college students, along with behavioral and other interventions, may result in increased activity.

Buckworth and Nigg (2004) found that, among college students enrolled in physical activity conditioning classes, nearly one-in-three students (30.6%) reported participation in moderate physical activity. Among females, age was inversely associated with days per week of moderate activity. Television watching was negatively associated with moderate exercise frequency. The average student did not meet recommendations for moderate activity, reporting only 2.97 days of moderate activity per week.

The Kelley and Kelley (1994) study of freshmen college students attending a historically black university also included moderate activity, and found differences in preferences for types of moderate activity among males and females. Among moderately active males, non-strenuous sports such as softball, shooting baskets, volleyball, ping-pong, leisurely jogging, swimming, as well as walking and hiking were most often reported. Among female students who were moderately active, walking, hiking, and home exercises were most often reported (Kelley & Kelley, 1994).

Dinger and Vesely (2001) found a significant association between insufficient fruit and vegetable intake and low levels of physical activity among college students. Students who reported insufficient fruit and vegetable intake were found to be 4.24 times as likely to report a low level of physical activity (zero days of vigorous activity and fewer than two days of moderate activity) as students reporting adequate fruit and vegetable intake (fewer than five servings of fruits and vegetables on the previous day). Similarly, among male college students, higher levels of vigorous activity were associated with eating more servings of healthy foods, while more moderate leisure activity was related to higher intake of fatty foods (Johnson et al., 1998).

### *College Students and Stretching Exercises*

*Healthy People 2010* recommends that the percentage of adults ages 18-and-older who perform physical activities that enhance and maintain flexibility be increased to 34 % from the 1998 baseline of 30 % of U.S. adults (Objective 22.5) (USDHHS, 2000). As reported by the American College of Sports Medicine (2001), flexibility is the ability to move joints and muscles in the full range of motion. Flexibility improves quality of life and ability to perform daily activities, as well as reducing risk of injury or pain in the lower back (USDHHS, 1996). Stretching to improve or maintain flexibility in large muscle groups should be done in a slow and sustained manner without bouncing; at least four repetitions should be done per muscle group for 10-to-30 seconds on at least two to three days per week. Although there is controversy on the role of stretching prior to exercise in preventing muscle or tendon injury during exercise; stretching exercises can and should be done in order to increase flexibility and other health factors. Participation in stretching among those 12-to-21 years old decreased as age increased in both the 1992 National Health Interview Survey and 1995 YRBS (USDHHS, 1996). Among students in the YRBS, 50.3% reported participating in stretching exercises on three or more of the previous seven days (USDHHS, 1996).

As compared to high school students, fewer college students reported meeting the recommendations for stretching exercises. Among all students participating in the 1995 NCHRBS, greater than one-third (34.1%) reported participating in stretching exercises such as toe touching, knee bending, or leg stretching on three-or-more of the previous seven days (CDC, 1997). Similar percentages of males and females (33.9% vs. 34.4%, respectively) reported participating in stretching exercises. Fennell (1997) found that

among students at historically black colleges, almost one-half (44.9%) did not participate in stretching exercises in the previous seven days (Fennell, 1997). Males were significantly more likely than females to report stretching exercises (Fennell, 1997).

Buckworth and Nigg (2004) found that among college students enrolled in physical activity conditioning classes, age was negatively correlated with days per week of stretching exercises. Television viewing was negatively correlated with frequency of stretching exercises among females, but not among males in this study. Students enrolled in conditioning class reported participating in stretching on 2.21 days per week, a level which did not meet *Healthy People* or ACSM recommendations (Buckworth & Nigg, 2004). Johnson et al. (1998) reported that, among male college seniors, higher levels of participation in strengthening occurred. Among females, higher levels of participation in strengthening was associated with increased intake of healthy foods. As college students enter adulthood, a lifestyle without habitual flexibility exercises may result in rigid joints, causing impairments in all daily activities and loss of function later in life (CDC, 1997).

#### *College Students and Strengthening Exercises*

Strengthening exercises are particularly important for older adults to prevent loss of muscle tone, a decrease in one's physical ability, and susceptibility to falls as age increases (CDC, 1997). Strength training can also increase bone density, providing a protective factor for post-menopausal women (USDHHS, 2001). However, adolescents and young adults can also benefit from increased muscle tone and strength.

*Healthy People 2010* recommends that the proportion of adults ages 18-and-older who perform physical activities that enhance and maintain muscular strength and endurance be increased from the baseline level of 18% to 30% of U.S. adults (Objective

22.4) (USDHHS, 2000). Activities that strengthen muscles include weight training and resistance activities. For adolescents ages 12-to-21, the 1992 NHIS reported that 45.6% had participated in strengthening exercises on three of the previous seven days; the prevalence of strengthening exercises decreased with age in this group (USDHHS, 1996). Similarly, among high school students in the 1995 YRBS, 50.3% reported participating in strengthening exercises on three-of-the previous seven days; strengthening exercises were more common among males than among females and among white students than among black students in both groups (USDHHS, 1996). Slightly higher prevalence rates were reported among high school students; more than half (53.4%) reported participating in strengthening exercises on three-or-more of the previous seven days. Males were more likely than females (62.8% vs. 44.5%, respectively) and whites more likely than blacks (54.8% vs. 47.9%, respectively) to engage in strengthening (Grunbaum et al., 2002).

Comparatively fewer college students engage in strengthening exercises. Fewer than three-in-ten students in the NCHRBS (29.9%) reported engaging in strengthening exercises such as push-ups, sit-ups, or weightlifting on three-or-more of the previous seven days; more males (33.9%) than females(26.8%) participated in strengthening (CDC, 1997). Pierce et al. (1992) also found this trend among college freshmen. Among students attending historically black universities, more than one-half (54.1%) reported that they did not participate in strengthening exercises (Fennell, 1997). The author reported that among those who did report strengthening exercises on three-or-more of the previous seven days, males were significantly more likely than females to do so (Fennell, 1997).

Buckworth and Nigg (2004) also studied strengthening exercises among college students enrolled in physical activity conditioning classes. For males, time spent using the computer was negatively associated with days per week spent in strength training; for females, time spent viewing television was negatively associated with frequency of strengthening exercise. The average student participated in 2.16 days of strengthening exercises (Buckworth & Nigg, 2004). Similarly, Huang et al. (2003) found that students participated in 2.2 days per week of strengthening exercises on average; one-in-three (33.2%) reported no participation; a higher percentage of older students reported no strength training per week (40.5% for older students and 30.7% for younger students) (Huang et al., 2003). Time spent studying was positively associated with days per week of strength training for women (Huang et al., 2003). Johnson et al. (1998) found that, among college seniors, higher levels of participation in strengthening activities among females were associated with eating fewer fatty foods.

Physical activity and nutrition-risk and preventive behaviors may be related. In Johnson et al. (1998), males who did vigorous, moderate, and flexibility activities were more likely to eat healthy foods; moderate leisure activity was related to a higher intake of fatty foods. Among females, eating healthy foods was related to more vigorous physical activity, and higher levels of physical activity occurred in white women (Johnson et al., 1998). Among college freshmen, levels of muscle strength in both men and women were found to be excellent (Pierce et al., 1992). If college students are able to keep muscle strength by meeting *Healthy People* recommendations, they will continue to enjoy related health benefits throughout college and adult life, with fewer complications as they age (USDHHS, 1996).

### Reliability of National College Health Risk Behavior Survey Items

The dietary and nutrition and physical activity risk behaviors used in the *College Student Health Risk Behavior Profile* (Teddgers, Parrillo, & Carter, 2004) were those that appeared in the National College Health Risk Behavior Survey (NCHRBS) (CDC, 1997), developed by the Division of Adolescent and School Health (DASH) to monitor health-risk behaviors among college students. The NCHRBS is a 96-item behavioral questionnaire that measures and reports on six categories of priority health-risk behaviors among youth and young adults, including the following: behaviors that contribute to unintentional and intentional injuries; tobacco use; alcohol and other drug use; sexual behaviors; unhealthy dietary behaviors; and physical inactivity. Student responses given on the Youth Risk Behavior Survey (YRBS) can be assumed to be accurate and truthful. This is due to various aspects of the survey, including: a design that protects both the confidentiality of schools and the anonymity of students; a variety of edit checks that remove inconsistent responses; checks for logical patterns within question sets; the comparison of YRBS data with similar surveys; the instrument's consistency over time; item-by-item consistency with measured health outcomes over time; consistency of the variations that occur within subgroups; and the outcomes of psychometric tests (North Dakota Department of Public Instruction, 2005).

Several studies including psychometric data have been published on both the NCHRBS and the Youth Risk Behavior Surveillance (YRBS) questionnaire, the instrument from which the college questionnaire was derived. In 1992, the CDC conducted a test-retest reliability of the original YRBS questionnaire (Brener, Collins, Kann, Warren, & Williams, 1995), the first to demonstrate the test-retest reliability of all



categories of health risk behavior in a diverse sample of adolescents. The study found that nearly three-quarters of the questionnaire items had a substantial ( $\geq 61\%$ ) or higher reliability, according to the qualitative labeling categories suggested by Landis and Koch (1977). In addition, the study found that responses of younger students (specifically seventh-graders) were less consistent than those of students in higher grades. Most physical activity items demonstrated acceptable reliability (kappas  $\geq 41\%$ ); one item, “exercise in physical education class” demonstrated substantial reliability ( $k = 74.9\%$ ). Nearly all kappa values for dietary behaviors were acceptable; two had “substantial” kappas: *perceived self as overweight* ( $k = 67.2\%$ ); and *trying to lose weight* ( $k = 78.7\%$ ) (Brener et al., 1995).

After several modifications to the survey, including new items and changes in wording on several questions, another study was conducted which assessed the test-retest reliability of the 1999 YRBS (Brener, Kann, McManus, Kinchen, Sundberg, & Ross, 2002). This study found that 47.2% of items had at least “substantial” reliability; 93.1% had at least “moderate” reliability (kappas  $\geq 41\%$ ). Five-of-seven dietary behavior items had kappas at moderate levels, ranging from 42.1% (taking diet pills) to 58.6% (perception of self as overweight) (mean kappa = 50.0%); each of the physical activity questions had kappa values at moderate or higher levels, ranging from 41.1% (exercising  $\geq 20$  minutes in physical education class) to 84.1% (attending physical education class  $\geq 1$  day a week) (mean kappa = 55.2%) (Brener et al., 2002).

Few studies have been published in the peer-review literature which assess the reliability of the college survey, particularly in the two areas included in this study. Johnson (2004) studied 1,917 undergraduate students in China on each of the six risk-

behavior categories, using 45 items from the NCHRBS. A Chronbach alpha of .81 was reported for the overall survey; internal consistency reliability for the seven dietary items ( $r = .47$ ) and four physical activity items ( $r = .57$ ) were lower than desirable. However, Johnson noted the potential for difficulty in translating the questionnaire into Chinese, which might have affected results. Dinger (2003) was the first to examine the psychometric properties of physical activity items included on the NCHRBS. After a one-week test-retest format, intra-class correlation coefficients were computed for the following: vigorous activity ( $r = .98$ ); moderate activity ( $r = .96$ ); stretching activities ( $r = .99$ ); and strengthening ( $r = .99$ ). The data suggest that the physical activity items are reliable (Dinger, 2003).

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13. How much education does your mother have?

< High School    High School/GED    Some College    College Degree    Graduate Degree    Not Sure

14. How much education does your father have?

< High School    High School/GED    Some College    College Degree    Graduate Degree    Not Sure

**The next 15 questions ask about safety and violence.**

15. How often do you wear a seat belt when **riding in** a car driven by someone else?

Never    Rarely    Sometimes    Most of the time    Always

16. How often do you wear a seat belt when **driving** a car?

I do not drive a car    Never    Rarely    Sometimes    Most of the time    Always

17. During the past 12 months, how many times did you ride a motorcycle?

0 times    1- 10 times    11-20 times    21-39 times    40 or more times

18. **When you rode a motorcycle** during the past 12 months, how often did you wear a helmet?

I did not ride a motorcycle during the past 12 months    Never    Rarely    Sometimes    Most of the time  
 Always

19. During the past 12 months, how many times did you ride a bicycle?

0 times    1- 10 times    11-20 times    21-39 times    40 or more times

20. **When you rode a bicycle** during the past 12 months, how often did you wear a helmet?

I did not ride a bicycle during the past 12 months    Never    Rarely    Sometimes    Most of the time  
 Always

21. During the past 12 months, how many times did you go boating or swimming?

0 times    1- 10 times    11-20 times    21-39 times    40 or more times

22. When you went boating or swimming during the past 12 months, how often did you drink alcohol?

I did not go boating during the past 12 months    Never    Rarely    Sometimes    Most of the time  
 Always

23. During the past 30 days, how many times did you ride in a car or other vehicle **driven by someone who had been drinking alcohol?**

0 times    1 time    2-3 times    4-5 times    6 or more times

24. During the past 30 days, how many times did you drive a car or other vehicle **when you had been drinking alcohol?**

0 times    1 time    2-3 times    4-5 times    6 or more times

25. During the past 30 days, on how many days did you carry **a weapon** such as a gun, knife, or club? Do not count carrying a weapon as part of your job.

0 days    1 day    2-3 days    4-5 days    6 or more days



26. During the past 30 days, on how many days did you carry a gun? Do not count carrying a gun as part of your job.

0 days     1 day     2-3 days     4-5 days     6 or more days

27. During the past 12 months, how many times were you in a physical fight? (*If you answer "0 times" - skip to question 30*)

0 times     1 time     2-3 times     4-5 times     6- 7 times     8-9 times     10-11 times     12 or more times

28. During the past 12 months, with whom did you fight? (*Select all that apply*)

A total stranger     A friend/ someone I know     A boy/girlfriend/ date     My spouse/ domestic partner     A parent/sibling/ other family member     Other

29. During the past 12 months, how many times were you in a physical fight in which you were injured and had to be treated by a doctor or nurse?

0 times     1 time     2 or 3 times     4 or 5 times     6 or more times

**Sometimes people feel so depressed and hopeless about the future that they may consider attempting suicide, that is, taking some action to end their own life. The next four questions ask about suicide.**

30. During the past 12 months, did you ever seriously consider attempting suicide?

Yes     No

31. During the past 12 months, did you make a plan about how you would attempt suicide?

Yes     No

32. During the past 12 months, how many times did you actually attempt suicide?

0 times     1 time     2 or 3 times     4 or 5 times     6 or more times

33. **If you attempted suicide** during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?

I did not attempt suicide during the past 12 months     Yes     No

**The next 8 questions ask about tobacco use.**

34. Have you ever tried cigarette smoking, even one or two puffs?

Yes     No (*Skip to question 41*)

35. How old were you (in years) when you smoked a whole cigarette for the first time?

I have never smoked a whole cigarette     12 or younger     13-14     15-16     17-18     19- 20     21-24     25 or older

36. During the past 30 days, on how many days did you smoke cigarettes?

0 days     1-2 days     3-5 days     6-9 days     10-19 days     20-29 days     All 30 days

37. During the past 30 days, on the days you smoked, how many cigarettes did you smoke **per day**?

I did not smoke     Less than 1     1     1-5     6-10     11-20     More than 20

38. Have you ever smoked cigarettes regularly, that is, **at least one cigarette every day for 30 days**?

Yes     No

39. How old were you (in years) when you first started smoking cigarettes regularly (at least one cigarette every day for 30 days)?

- I have never smoked cigarettes regularly     12 or younger     13-14     15-16     17-18     19-20     21-24     25 or older

40. Have you ever tried **to quit** smoking cigarettes?

- Yes     No

41. During the past 30 days, on how many days did you use chewing tobacco or snuff, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen?

- 0 days     1-2 days     3-5 days     6-9 days     10-19 days     20-29 days     All 30 days

**The next three questions ask about drinking alcohol. This includes drinking beer, wine, wine coolers, and liquor such as rum, gin, vodka, or whiskey. For these questions, drinking alcohol does not include drinking a few sips of wine for religious purposes.**

42. How old were you when you had your first drink of alcohol other than a few sips?

- I have never had a drink of alcohol other than a few sips (*Skip to question 45*)     12 or younger     13-14     15-16     17-18     19-20     21-24     25 or older

43. During the past 30 days, on how many days did you have at least one drink of alcohol?

- 0 days     1-2 days     3-5 days     6-9 days     10-19 days     20-29 days     All 30 days

44. During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?

- 0 days     1-2 days     3-5 days     6-9 days     10-19 days     20-29 days     All 30 days

**The next three questions ask about marijuana use.**

45. During your life, how many times have you used marijuana?

- 0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times  
(*Skip to question 48*)

46. How old were you (in years) when you tried marijuana for the first time?

- 12 or younger     13-14     15-16     17-18     19-20     21-24     25 or older

47. During the past 30 days, how many times did you use marijuana?

- 0 times     1-2 times     3-9 times     10-19 times     20-39 times     40 or more times

**The next 10 questions ask about cocaine and other drug use.**

48. During your life, how many times have you **used any** form of cocaine, including powder, crack, or freebase?

- 0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times  
(*Skip to question 52*)

49. How old were you when you tried **any** form of cocaine, including powder, crack, or freebase, for the first time?

12 or younger     13-14     15-16     17-18     19- 20     21-24     25 or older

50. During the past 30 days, how many times did you use **any** form of cocaine, including powder, crack, or freebase?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40 or more times

51. During your life, how many times have you used the **crack** or **freebase** forms of cocaine?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times

52. During your life, how many times have you sniffed glue, or breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times

53. During your life, how many times have you taken **steroid pills or shots** without a doctor's prescription?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times

54. During your life, how many times have you used any other type of **illegal** drug, such as LSD, PCP, ecstasy, mushrooms, speed, ice, or heroin?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40-99 times     100 or more times

55. During the past 30 days, how many times have you used any other type of **illegal** drug, such as LSD, PCP, ecstasy, mushrooms, speed, ice, or heroin?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40 or more times

56. During the past 30 days, how many times have you used any **illegal** drug in combination with drinking alcohol?

0 times     1-2 times     3-9 times     10-19 times     20-39 times     40 or more times

57. During your life, how many times have you used a needle to inject any illegal drug into your body?

0 times     1 time     2 or more times

**The next 15 questions ask about sexual behavior. For the purpose of this survey, sexual intercourse is defined as vaginal intercourse, anal intercourse, or oral/genital sex.**

58. How old were you when you had sexual intercourse for the first time?

I have never had sexual intercourse     12 or younger     13-14     15-16     17-18     19- 20     21-24     25 or older

59. During your life, with how many **females** have you had sexual intercourse?

I have never had sexual intercourse with a female     1 female     2 females     3 females     4 females     5 females     6 or more females

60. During the past 3 months, with how many **females** have you had sexual intercourse?

I have never had sexual intercourse with a female not during the past 3 months     I have had sexual intercourse with a female, but     1 female     2 females     3 females     4 females     5 females     6 or more females

61. During your life, with how many **males** have you had sexual intercourse?

- I have never had sexual intercourse with a male       1 male  2 males  3 males  4 males  5 males  6 or more males

62. During the past 3 months, with how many **males** have you had sexual intercourse?

- I have never had sexual intercourse with a female       I have had sexual intercourse with a female, but not during the past 3 months       1 female  2 females  3 females  4 females  5 females  6 or more females

63. During the past 30 days, how many times did you have sexual intercourse?

- 0 times  1 time  2-3 times  4-9 times  10-19 times  20 or more times

64. During the past 30 days, how often did you or your partner use a condom?

- I have not had sexual intercourse during the past 30 days       Never  Rarely  Sometimes  Most of the time  Always

65. The **last time** you had sexual intercourse, did you or your partner use a condom?

- Yes  No

66. Did you drink alcohol or use drugs before you had sexual intercourse **the last time**?

- Yes  No

67. The **last time** you had sexual intercourse, what method did you or your partner use to **prevent pregnancy**?

- No method was used to prevent pregnancy       Birth control pills  Condoms  Withdrawal  Some other method  Not sure

68. How many times have you been pregnant or gotten someone pregnant?

- 0 times  1 time  2 or more times  Not sure

69. During your life, have you ever been forced to have sexual intercourse against your will?

- Yes  No (*Skip to question 72*)

70. How old were you (in years) **the first time** you were forced to have sexual intercourse against your will?

- 4 or younger  5-12  13-14  15-16  17-18  19-20  21-24  25 or older

71. How old were you (in years) **the last time** you were forced to have sexual intercourse against your will?

- 4 or younger  5-12  13-14  15-16  17-18  19-20  21-24  25 or older

72. Have you ever had your blood tested for the AIDS virus/HIV infection?

- Yes  No  Not sure

73. How do **you** describe your weight?

- Very underweight  Slightly underweight  About the right weight  Slightly overweight  Very overweight

74. Which of the following are you trying to do about your weight?

Lose weight     Gain weight     Stay the same weight     I am **not trying to do anything** about my weight

75. During the past 30 days, did you **diet** to lose weight or to keep from gaining weight?

Yes     No

76. During the past 30 days, did you **exercise** to lose weight or to keep from gaining weight?

Yes     No

77. During the past 30 days, did you **vomit or take laxatives** to lose weight or to keep from gaining weight?

Yes     No

78. During the past 30 days, did you take diet pills to lose weight or to keep from gaining weight?

Yes     No

79. What is your **height** (in feet and inches)?

≤ 5'0     5'1     5'2     5'3     5'4     5'5     5'6     5'7     5'8  
 5'9     5' 10     5'11     6'0     6'1     6'2     ≥ 6'3

80. What is your weight (in pounds)?

≤ 90     91-110     111-130     131-150     151-170     191-210  
 211-230     231-250     251-270     271- 290     291- 300     ≥ 300

**The next seven questions ask about food you ate yesterday. Think about all the meals and snacks you ate yesterday from the time you got up until you went to bed. Be sure to include food you ate at home, on campus at restaurants, or anywhere else.**

81. Yesterday, how many times did you eat fruit?

0 times     1 time     2 times     3 or more times

82. Yesterday, how many times did you drink fruit juice?

0 times     1 time     2 times     3 or more times

83. Yesterday, how many times did you eat green salad?

0 times     1 time     2 times     3 or more times

84. Yesterday, how many times did you eat **cooked** vegetables?

0 times     1 time     2 times     3 or more times

85. Yesterday, how many times did you eat hamburger, hot dogs, or sausage?

0 times     1 time     2 times     3 or more times

86. Yesterday, how many times did you eat french fries or potato chips?

0 times     1 time     2 times     3 or more times

87. Yesterday, how many times did you eat cookies, doughnuts, pie, or cake?

0 times     1 time     2 times     3 or more times

**The next six questions ask about physical activity.**

88. On how many of the past 7 days did you exercise or participate in sports activities for at least 20 minutes **that made you sweat and breathe hard**, such as basketball, jogging, swimming laps, tennis, fast bicycling, or similar aerobic activities?

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

89. On how many of the past 7 days did you do **stretching exercises**, such as toe touching, knee bending, or leg stretching?

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

90. On how many of the past 7 days did you do exercises to **strengthen or tone your muscles**, such as push-ups, sit-ups, or weight lifting?

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

91. On how many of the past 7 days did you **walk or bicycle for at least 30 minutes at a time?** (Include walking or bicycling to or from class or work.)

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

92. During this school year, have you been enrolled in a physical education class?

Yes    No

93. During this school year, on how many college sports teams (intramural or extramural) did you participate?

0 teams    1 team    2 teams    3 or more teams

**The next three questions ask about AIDS education and health information.**

94. Have you ever been taught about AIDS or HIV infection **in your college classes?**

Yes    No    Not sure

95. During this school year, where **on your college campus** did you receive information about avoiding **AIDS or HIV infection?**

<input type="checkbox"/> College classes	<input type="checkbox"/> Residence hall/ other campus housing	<input type="checkbox"/> Student clubs/ organizations	<input type="checkbox"/> Student health center
<input type="checkbox"/> Health fair	<input type="checkbox"/> Pamphlets/brochures/ newspapers	<input type="checkbox"/> College newspapers	<input type="checkbox"/> Informal discussions with friends
<input type="checkbox"/> Other sources of information	<input type="checkbox"/> I was not provided with any information		

96. On which of the following **health topics** have you ever received information from your college or university?

<input type="checkbox"/> Tobacco use prevention	<input type="checkbox"/> Alcohol/other drug use prevention	<input type="checkbox"/> Violence prevention	<input type="checkbox"/> Injury prevention/ safety
<input type="checkbox"/> Suicide prevention	<input type="checkbox"/> Pregnancy prevention	<input type="checkbox"/> Sexually transmitted disease (STD) prevention	<input type="checkbox"/> AIDS or HIV infection prevention
<input type="checkbox"/> Dietary behaviors/ nutrition	<input type="checkbox"/> Physical activity/ fitness		

97. How many hours of television do you watch every day?

- Less than 1 hour  1-2 hours  3-4 hours  5-6 hours  7-8 hours  
 9 or more hours

98. Have you ever been enrolled in Healthful Living (HLTH 1520) at Georgia Southern?

- Yes  No

99. Why are you enrolled in Healthful Living (HLTH 1520) at Georgia Southern again?

- This is the first semester I have been enrolled in Healthful Living  I dropped Healthful Living in a previous semester  I am repeating Healthful Living because of academic reasons

APPENDIX D

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD

APPLICATION COVER SHEET



## Cover Page

### Georgia Southern University Institutional Review Board

**For electronic submission:** Your proposal narrative should already be completed and saved. Next complete cover page and "Save As" a word document to your computer or disk named "Coverage\_Year\_Month\_Date\_lastname, First initial.doc". Then open and complete Informed Consent Checklist.

#### *Application for Research Approval*

Name of Principal Investigator: Julianne Meadows	Email: <a href="mailto:julianne_meadows@hotmail.com">julianne_meadows@hotmail.com</a>	<b>For Office Use Only:</b>  IRB ID _____ Date _____ Received _____  BY _____
Phone:  (912) 764 3830 Department: Jiann-Ping Hsu School of Public Health	Address: 101B Roddie Circle  Statesboro, GA 30461 Project Start Date: May 11, 2004 Project End Date: May 01, 2005	
*Date of IRB education completion: (attach copy of completion certificate) January 23, 2005 <input checked="" type="checkbox"/> Student <input type="checkbox"/> Faculty/Staff <b>Student project please complete advisor's information below:</b>		
Advisor's Name: Anthony V. Parrillo, Ph.D	Advisor's email: <a href="mailto:aparrill@GeorgiaSouthern.edu">aparrill@GeorgiaSouthern.edu</a>	
Advisor's phone: (912) 681 5057	P.O. Box: 8076	
Department: Jiann-Ping Hsu School of Public Health	<b>All applicants please complete all fields below:</b>	
<b>Project Information:</b>		
Title: <b>The Association Among Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students.</b>		
Project Duration (in months): 12 to 18 months		Number of Participants: 2,268
Brief (less than 50 words) Project Summary: This project will be a secondary analysis of selected variables from the 2003 College Student Health Risk Behavior Profile on campus, examining the association among receipt of health information, body mass index, physical activity and dietary risk behaviors. Results will be published in the peer-reviewed literature.		
<i>Please fill in if applicable:</i>		
Name of Georgia Southern or External Funding Source:		
Personnel and/or Institutions Outside of Georgia Southern University:		
<b>Compliance Information:</b>		
Please indicate if the following are included in the study:		<b>IRB Use Only</b>

<input type="checkbox"/> Informed Consent Document <input type="checkbox"/> Greater than minimal risk <input type="checkbox"/> Research Involving Minors <input type="checkbox"/> Deception <input checked="" type="checkbox"/> Generalizable knowledge (results are intended to be published) <input checked="" type="checkbox"/> Survey Research <input type="checkbox"/> At Risk Populations (prisoners, children, pregnant women, etc) <input type="checkbox"/> Video or Audio Tapes <input type="checkbox"/> Medical Procedures, including exercise, administering drugs/dietary supplements, and other procedures		Type of Review <input type="checkbox"/> Full Board <input type="checkbox"/> Expedited <input type="checkbox"/> Exempt  1 <sup>st</sup> Reviewer: X: _____ Date: _____  2 <sup>nd</sup> Reviewer: X: _____ Date: _____
NOTE: All thesis and dissertation work by definition is to create generalizable knowledge.	<b>IRB Use Only</b> <b>Comments:</b>	
Signature of Applicant		Date:
X: <i>Juliana Anderson</i>		Jan 25, 2005
Signature of Advisor (if student) / Dept. Chair (if faculty)		Date:
X: <i>D. Fair</i>		January 25, 2005

Please submit this protocol electronically to the Georgia Southern University Institutional Review Board, c/o The Office of Research Services & Sponsored Programs, P.O. Box 8005.

The application should contain a summary of the project, informed consent form(s), instruments, questionnaires, etc. Questions or Comments can be directed to 486-7758 or [oversight@georgiasouthern.edu](mailto:oversight@georgiasouthern.edu)



Se

[NCI Home](#) | [Cancer Topics](#) | [Clinical Trials](#) | [Cancer Statistics](#) | [Research & Funding](#) | [News](#)


## Human Participant Protections Education for Research Teams

### Completion Certificate

This is to certify that

**Julianne Meadows**

has completed the **Human Participants Protection Education for Research Teams** online course, sponsored by the National Institutes of Health (NIH), on 01/23/2005.

This course included the following:

- key historical events and current issues that impact guidelines and legislation on human participant protection in research.
- ethical principles and guidelines that should assist in resolving the ethical issues inherent in the conduct of research with human participants.
- the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
- a description of guidelines for the protection of special populations in research.
- a definition of informed consent and components necessary for a valid consent.
- a description of the role of the IRB in the research process.
- the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

National Institutes of Health  
<http://www.nih.gov>

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A Service of the National Cancer Institute



FIRST GOV

APPENDIX E

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD

EXEMPT STATUS APPLICATION

**GEORGIA SOUTHERN UNIVERSITY IRB**

**EXEMPT STATUS QUESTIONNAIRE**

P.O. Box 8005 (912)-681-5465      Statesboro, GA 30460  
<http://academics.georgiasouthern.edu/research/>

**For electronic submission:** Complete Exempt Status Questionnaire and "Save As" a word document to your computer or disk named "exemptapp\_yourlastname, First initial.doc". Then, complete the Cover Page and follow its instructions for saving the document. After both the Exempt Status Questionnaire and Cover Page are completed and saved, return to the Forms webpage to submit them to the IRB.

*This questionnaire should be completed if you feel that your research satisfies the federal guidelines that would make it exempt from full or expedited IRB review. Please note that you must also complete the IRB Cover Sheet, and provide a summary of the research protocol. If the IRB decides that the investigation is exempt from full or expedited review, it will not be necessary for you to complete the IRB's Proposal Narrative and Informed Consent Checklist.*

**Please attach an IRB Cover Sheet to the top of this form and submit to the IRB Office. Also be sure to write brief summary of the research protocol in one page or less in the space below.**

I will be \_\_\_collecting, \_\_\_receiving these samples OR, \_\_\_sending these samples or data outside of GSU. (Check all that apply)

**Title of Study: The Association Among Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students.**

**Does the study meet the following criteria?**

<b>YES</b>	<b>NO</b>	Does the research involve the collection or study of <i>existing data</i> , documents, records, pathological specimens, or diagnostic specimens? <i>Existing Data: means that all the data, documents, records, or specimens are in existence prior to IRB Review. Specimens obtained prospectively from future discarded clinical samples do not qualify for exempt review.(1)</i>
<b>YES</b>	<b>NO</b>	Data sources are publicly available; if not, the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects (i.e. social security #'s, account #'s, history #'s, pathology accession #'s, initials, date of birth). (2) <i>If both 1&amp;2 checked: 45CFR46.101(b)(4)</i>
<b>YES</b>	<b>NO</b>	Does the research involve the use of educational tests, survey procedures, interview procedures or observation of public behavior <u>and</u> is the data/information recorded in a manner so that human subjects cannot be identified, directly or through identifiers linked to the subjects such that any disclosure of the human subjects' responses outside the research could not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability or reputation 45CFR46.101(b)(2)
<b>YES</b>	<b>NO</b>	Is the research intended to assess the effectiveness of mandated educational or instructional procedures or otherwise used for program evaluation.

YES	<input type="checkbox"/>	<input type="checkbox"/>	Are the samples or data being collected for the sole purposes of this study?
YES	<input type="checkbox"/>	<input type="checkbox"/>	Are the samples or data collected by a third party and stored in a facility that will not break the code, even upon the request of a family member/ or medical emergency?

Please answer the following two questions to the best of your ability.

YES	<input type="checkbox"/>	<input type="checkbox"/>	Is the <u>probability</u> of the harm or discomfort anticipated in the proposed research greater than that encountered ordinarily in daily life or during the performance of routine physical or psychological examinations or tests?
YES	<input type="checkbox"/>	<input type="checkbox"/>	Is the <u>magnitude</u> of the harm or discomfort greater than that encountered ordinarily in daily life, or during the performance of routine physical or psychological examinations or tests?

Does this study involve any of the following?

YES	<input type="checkbox"/>	<input type="checkbox"/>	Non-hereditary genetic research in which samples are linked/coded or identifiable
YES	<input type="checkbox"/>	<input type="checkbox"/>	Hereditary genetic research
YES	<input type="checkbox"/>	<input type="checkbox"/>	Prisoners, Fetuses, Pregnant Women, Cognitively/Mentally Impaired, Students/Employees/ Under 18 years of age (Circle all that apply)
YES	<input type="checkbox"/>	<input type="checkbox"/>	Human in-vitro fertilization (any fertilization of human ova which occurs outside the body of a female)
YES	<input type="checkbox"/>	<input type="checkbox"/>	Surveys or interviews given to minors
YES	<input type="checkbox"/>	<input type="checkbox"/>	Any procedures that may cause a subject either physical or psychological discomfort or is perceived as harassment above and beyond what the person would experience in daily life
YES	<input type="checkbox"/>	<input type="checkbox"/>	Deception
YES	<input type="checkbox"/>	<input type="checkbox"/>	Observation of minors if the investigator participates in the activities being observed unless there is a federal statute covering the activity
YES	<input type="checkbox"/>	<input type="checkbox"/>	The study of a rare trait/disorder such that there is some risk of exposing the identity of sample donors or the research poses risk of community or cultural harm

### 1. How do you plan to access the targeted subject population?

The data for this project have been previously collected in the College Student Health Risk Behavior Profile done on campus during the 2002-2003 academic year under the supervision of Dr. Stuart H. Tedders. IRB approval for the preceding study was submitted in April 2002. Results of this survey are not identifiable to a specific person, but only by survey number. Statistical Package for the Social Sciences (SPSS) will be used to analyze the data for association among the selected variables: receipt of health information, body mass index, and physical activity and dietary behaviors among university students.

### 2. Please provide a brief summary of the study and a description of the research protocol (chronologically progressed).

Secondary analysis of the data previously collected in the College Student Health Risk Behavior Profile will be performed by the researcher using SPSS statistical

Document: Types of Approvals		
SOP # 3-1 Revision #: 0	Exempt Studies	3 of 3

Secondary analysis of the data previously collected in the College Student Health Risk Behavior Profile will be performed by the researcher using SPSS statistical software to determine associations among the independent and dependent variables. Frequencies of demographic variables of age, race, and sex will be computed and tabulated. Using SPSS, statistical analysis will be done yielding chi-square values in cross tables for each association of the independent variable of receipt of health information with each dependent variable. Measures of association will be reported as chi-square values with corresponding degrees of freedom and p-values. After analysis of the data, the results will be reported in the manuscript style thesis and submitted for approval as part of the requirements for the degree MPH in community health by the researcher. Results will also be submitted for peer-reviewed publication after completion and approval.

**3. What kind of human samples (e.g. tissue, blood) or data will be obtained?**

No human samples will be collected as part of this project.

**4. Informed Consent**

Informed consent will not be necessary due to a secondary analysis of survey data.

*Exempt research is not subject to federal regulations contained in 45 CFR 46, which include requirements for informed consent. Therefore, if the research is eligible for exemption, then "technically" informed consent is not required. It is up to the investigator to decide whether or not consent should be obtained and documented. Often the investigator will provide a letter of explanation or even a consent form. Again, this is not required, but may be the appropriate thing to do to ensure the rights and welfare of the subjects.*

If you plan to provide a Consent Form or letter, please submit it along with this form.

If a questionnaire or interview will be done, please attach a copy of the questions.

Principal Investigator (printed)  
Julianne Meadows

Principal Investigator (Signature)

*Julianne Meadows*

Date

*Jan 25, 2005*

or Use by IRB Office Only

Exempt Status Approved Yes No IRB Chair/Vice  
Chair \_\_\_\_\_ Date \_\_\_\_\_

ment: Types of Approvals		
SOP # 3-1 Revision #: 0	Exempt Studies	4 of 3



APPENDIX F

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD

EXEMPT STATUS APPROVAL

Georgia Southern University  
Office of Research Services & Sponsored Programs

**Institutional Review Board (IRB)**

Phone: 912-681-5465

Administrative Annex

P.O. Box 8005

Statesboro, GA 30460

Fax: 912-681-0719

Ovrsight@GeorgiaSouthern.edu

**To:** Julianne Meadows  
101B Roddie Circle  
Statesboro, GA 30461

**cc:** Dr. Anthony V. Parrillo, Faculty Advisor  
P. O. Box 8076

**From:** Office of Research Services and Sponsored Programs  
Administrative Support Office for Research Oversight Committees  
(IACUC/IBC/IRB)

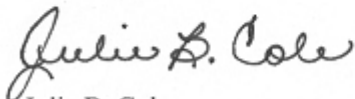
**Date:** January 31, 2005

**Subject:** Status of Application for Approval to Utilize Human Subjects in Research

After a review of your proposed research project numbered: **H05089**, and titled "**The Association Among Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students**", it appears that your research involves activities that do not require approval by the Institutional Review Board according to federal guidelines.

*Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research is exempt from IRB approval. You may proceed with the proposed research.*

Sincerely,



Julie B. Cole

Director of Research Services and Sponsored Programs

APPENDIX G

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD

STUDY TERMINATION APPLICATION



GEORGIA SOUTHERN UNIVERSITY

Office of Research Services & Sponsored Programs
P.O. Box 8005
Statesboro, GA 30458
(912) 681-5465
Fax: (912) 681- 0719

INSTITUTIONAL REVIEW BOARD
Georgia Southern University
RESEARCH STUDY TERMINATION

Current IRB #: H05089

Protocol Title: Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students

Principal Investigator: Julianne Meadows

School: Jiann-Ping Hsu School of Public Health

Office Address: PO Box 8076
Statesboro, GA 30460

Faculty Advisor (if student): Anthony V. Parrillo, PhD, CHES

Approval was given for [ 2,268 ] subjects

Study duration: 12-to-18 months

This research is being terminated because:

- [x] Subject accrual completed and data analyzed
[ ] Serious adverse event.
[ ] Non-effectiveness of the research intervention
[ ] Loss of funding/support
[ ] Other (please list reason below)

\*\*\*\*\*
Provide below a brief (1-2 paragraph) abstract of the research study summary, to address its specific aims, outcomes and conclusions. Also, please respond to each of the following requests for information.

See Attached Announcement Abstract.

\*\*\*\*\*

1. Research Subject Enrollment:
- a. A total of **2,268** subjects were entered into this research protocol since its initial approval.
2. During the Research:
- a. Did any subjects withdraw from the study?  
 No  
 Yes\*  
**(\*If yes, please attach a summary of reasons for withdrawal.)**
- b. Were there any subject complaints?  
 No  
 Yes\*  
**(\*If yes, please attach a summary of these complaints).**
- c. Were there any breaches of subject confidentiality?  
 No  
 Yes\*  
**(\*If yes, please attach a summary of these breaches of confidentiality).**
- d. Were there any **SERIOUS** adverse reactions associated with the conduct of this research protocol at this site or, if applicable, at other sites?  
 No  
 Yes\*  
**(\*If yes, please attach a summary of these reactions).**
- e. Were there any **UNEXPECTED** (i.e., to include reactions of a different nature or greater than expected severity or frequency) adverse reactions associated with the conduct of this research protocol at this site, or, if applicable, at other sites?  
 No  
 Yes\*  
**(\*If yes, please attach a summary of these reactions).**

\*\*\*\*\*

I certify that the above information is correct:

  
 Principal Investigator Signature

7/21/05  
 Date

  
 Faculty Advisor's Signature

7/21/05  
 Date

\*\*\*\*\*

**Announcing the Final Examination of  
Julianne M. Meadows  
for the degree of  
Master in Public Health**

Georgia Southern University  
Jiann-Ping Hsu School of Public Health  
July 21, 2005 at 3:00 p.m. in Hollis Room 2109

**THESIS TITLE:** Receipt of health information, body mass index, and physical activity and dietary behaviors among university students.

**PURPOSE:** The purpose of this study was to examine the association between receipt of health information, body mass index, and dietary and physical activity behaviors in a purposive sample of university students. The study was conducted to assess to what extent students' receipt of health education information would be related to positive correlates of health, including body mass index, dietary behaviors, and levels of physical activity when compared by race and gender.

**PROCEDURES:** A cross sectional design was used to assess priority health risk behaviors among students ( $n = 1,799$ ). Twenty-two items from the *National College Health Risk Behavior Survey* (Centers for Disease Control and Prevention, 1997) were used. Specifically, this study assessed: perception of self as being overweight; consumed five-or-more servings fruits and vegetables the preceding day; consumed two-or-more servings of fatty foods the preceding day; dieted to lose weight or to keep from gaining weight; exercised to lose weight or to keep from gaining weight; vomited or used laxatives to lose weight or to keep from gaining weight; took diet pills to lose weight or to keep from gaining weight; participated in vigorous physical activity on three-or-more of the last seven days; participated in moderate physical activity on five-or-more of the last seven days; participated in stretching exercises on three-or-more of the last seven days; and participated in strengthening exercises on three-or-more of the last seven days. BMI was calculated using measures of height and weight (CDC, 2004).

The data were analyzed in a four-step process. In the first phase, students were placed into dichotomous categories related to receipt of health information (yes/no). Second, dichotomous categories were created for each dependent variable, consistent with the national data, to group students into "risk" or "non-risk" categories; descriptive statistics were then generated by race and gender. In the third phase, odds ratios were computed to assess the relation between students' receipt of health information on diet and nutrition and its association with weight loss behaviors, receipt of health information on diet and nutrition and its association with dietary behaviors, and receipt of health information on physical activity and its association with physical activity risk; results included students of normal weight and those who were overweight. Finally, odds ratios were computed to assess the relation between BMI and dietary behaviors, and between BMI and physical activity behaviors. Chi-square analyses were conducted to identify differences between independent and dependent measures, using  $\alpha \leq .05$  as the level of statistical significance. When significant odds ratios were observed, Breslow-Day and Mantel-Haenszel tests were used *post-hoc* to estimate the average conditional association between each independent and behavioral variable.

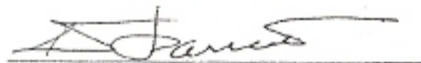
**RESULTS:** Students who received health information on diet and nutrition were more likely to have: attempted weight loss; dieted to lose weight; exercised in sufficient amounts, and eaten fewer servings of fatty foods. Students who received health information on physical activity were more likely to have: participated in sufficient levels of vigorous and moderate activity; and engaged in sufficient levels of strengthening and stretching exercises. Among students of normal weight, those receiving health information were more likely to engage in vigorous and moderate activity, to participate in strengthening and stretching activity, to attempt weight loss, and to use diet and exercise as a means of losing weight. Among overweight students, those who received health information were more likely to eat fewer servings of fatty foods, to stretch, to perceive themselves as overweight, and attempt weight loss.

**CONCLUSION:** Students' receipt of health information may provide limited benefits with regard to health promoting behaviors. Overweight students in the study who received health information were more likely to perceive themselves as being overweight, but used pills rather than diet or exercise as a means of losing weight. Health information should be but one component of a more comprehensive strategy to reach those at greatest risk.

**THESIS COMMITTEE:** Dr. Anthony V. Parrillo (Chair)  
Dr. Stuart H. Tedders

Dr. Steve Elliott  
Dr. Padmini Shankar

APPROVED: \_\_\_\_\_



APPENDIX H

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD

STUDY TERMINATION APPROVAL

Georgia Southern University  
Office of Research Services & Sponsored Programs

**Institutional Review Board (IRB)**

Phone: 912-681-5465

Fax: 912-681-0719

Ovrsight@gasou.edu

4 College Plaza,  
P.O. Box 8005  
Statesboro, GA  
30460-8005

**To:** Julianne Meadows  
101B Roddie Circle  
Statesboro, GA 30461

**cc:** Anthony Parrillo, Faculty Advisor  
P.O. Box 8076

**From:** Office of Research Services and Sponsored Programs  
Administrative Support Office for Research Oversight Committees  
(IACUC/IBC/IRB)

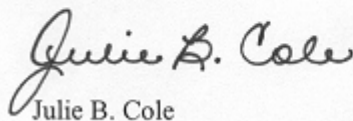
**Date:** July 22, 2005

**Subject:** Status of Research Involving Human Subjects

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Your *Research Study Termination* request was received by our office on **“July 22, 2005”**. Therefore, on behalf of the Institutional Review Board, I am writing to let you know that your proposal **“H05089”** titled **“Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students”** is officially being closed in our records. The university will keep your proposal on file at Archives and Records Management. You may not collect any more data on this project without requesting a renewal, which you may find at the following website: <http://academics.gasou.edu/research/ORSSP/forms/forms.html>. Please contact the Office of Research Services and Sponsored Programs at (912) 486-7758 if you have any questions.

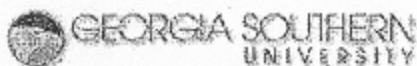
Sincerely,



Julie B. Cole  
Director of Research Services and Sponsored Programs



APPENDIX I  
APPLICATION FOR APPROVAL OF THESIS TOPIC  
AND COMMITTEE MEMBERSHIP



Jack N. Averitt College of Graduate Studies  
 Administrative Annex Building, P.O. Box 8008  
 Statesboro, GA 30460-8008  
 Phone: (912) 681-0578 Fax: (912) 681-0605  
 Website: <http://cogs.georgiasouthern.edu>

---

## Application for Approval of Thesis Topic and Committee Membership (Thesis Prospectus)

Master's candidates in a thesis program should file this form as soon as they can get approval from their committee. To be eligible to graduate, one must have completed all degree requirements including (but not limited to, course requirements, payment of all tuition and fees and the submission of the final approved thesis. If you must graduate in a specific semester, it is important that you submit necessary documents by the submission deadlines. Check the Graduate College Web site for information or contact the College of Graduate Studies if you have questions.

Minor changes in the thesis or project title can be made after this form has been submitted. However, major title changes, a new thesis or project title or committee membership changes will require the submission of a new application form.

Name: Meadows, Julianne Marie SS # 0583

Address: 101B Roddie Circle, Statesboro, Georgia 30461

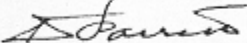
Email Address: julianne\_meadows@hotmail.com

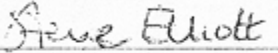
Degree: MPH Major: Community Education

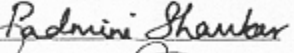
Department: Jiann-Ping Hsu School of Public Health

Proposed Thesis Title (Print or Type): The Association Among Receipt of Health Information, Body Mass Index, and Physical Activity and Dietary Behaviors Among University Students.

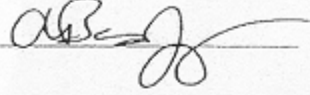
THESIS COMMITTEE (ALL MEMBERS OF THE THESIS COMMITTEE MUST SIGN THIS FORM). *Non-GSU Committee members must provide a current Email address to the College of Graduate Studies.*

Chair:  Print Name: Anthony V. Parrillo, Ph.D, CHES

Member:  Print Name: Steve Elliott, PhD

Member:  Print Name: Padmini Shankar, Ph.D, R.D.

Member:  Print Name: Stuart H. Tedders, Ph.D

Dept Chair/Program Director: 

Print Name: Rick Carter, Ph.D

### STUDENTS MUST COMPLETE BACK OF THIS FORM

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Approval Signature \_\_\_\_\_ College of Graduate Studies Only - Do not write below this line  
 Date \_\_\_\_\_

College of Graduate Studies

if the thesis or project research includes human or vertebrate animal subjects, recombinant DNA and/or biohazardous materials of any kind, you must submit a study proposal to the Office of Research Services and Sponsored Programs for review and approval by the appropriate campus committee (board). Only the appropriate review board has the authority to determine whether a study is exempt from full board review (a streamlined Exempt Request Form is available from each committee website). Do not proceed with the collection of new data or analysis of existing data until you have received a letter of approval, which authorizes you to do so from the appropriate committee through the Office of Research Services and Sponsored Programs. Failure to secure the proper approvals for research involving human or vertebrate animal subjects, recombinant DNA and/or biohazardous materials could result in disallowance of the data collected or analyzed without appropriate authorization. In order to graduate, all students having humans or vertebrate animals subjects, recombinant DNA and/or biohazardous materials must have a letter of approval of that research from the review board.

The following is to be completed and signed by student and verified by the major professor.

- I confirm that my proposed research *does not* involve human or vertebrate animal subjects, recombinant DNA and/or biohazardous materials.
- I confirm that my proposed research *does* involve the use of human subjects and has been or will be submitted for approval by the Institutional Review Board (IRB).  
<http://academics.gasou.edu/research/ORSSP/compliance/irb.html>
- A.  Approved - (Attach a copy of the approval.)
- B.  Pending - (Submitted \_\_\_\_\_ (date) to IRB, approval will be secured prior to any data collection.)
- C.  To Be Submitted - (Will be submitted later to IRB for approval but prior to any data collection.)

I confirm that my proposed research *does* involve the use of vertebrate animal subjects (see the Office of Research and Sponsored Programs web site (<http://academics.gasou.edu/research/>) for a listing of animals for which committee approval must be secured) and has been or will be submitted for approval by the Institutional Animal Care and Use Committee (IACUC). The website for the IACUC is <http://academics.gasou.edu/research/ORSSP/compliance/iacuc.html>. If you have questions about a research animal not listed on the Office of Research and Sponsored Programs web site, please contact the Office of Research and Sponsored Programs at 912-486-7758.

- A.  Approved - (Attach a copy of the approval.)
- B.  Pending - (Submitted \_\_\_\_\_ (date) to IACUC, approval will be secured prior to any data collection.)
- C.  To Be Submitted - (Will be submitted later to IACUC for approval but prior to any data collection.)

I confirm that my proposed research *does* involve the use of recombinant DNA and/or biohazardous materials and has been or will be submitted for approval by the Biohazardous Materials Review Board (<http://academics.gasou.edu/research/ORSSP/compliance/ibe.html>).

- A.  Approved - (Attach a copy of the approval.)
- B.  Pending - (Submitted \_\_\_\_\_ (date) to IBC, approval will be secured prior to any data collection.)
- C.  To Be Submitted - (Will be submitted later to IBC for approval but prior to any data collection.)

Student Signature *Julianne Madore* Date 4/6/05

Major Professor Signature *Dr. Davis* Date 4/6/05

Return to: College of Graduate Studies, Administrative Annex Bldg, Rm 1103, Georgia Southern University, P.O. Box 8008, Statesboro, Georgia, 30460-8008

APPENDIX J

REPORT ON COMPREHENSIVE EXAM/THESIS DEFENSE

