Lifestyle indicators for health care vs. non-health care students

By Jaclyn Collins, Susan Burda, Brittany Crawford, Randi Gregoire, Alicia Heinrich, Amera Nelson, Caitlin Prunty, Katie Pullar, Kayla Wahlin, and Desiree L. Tande, PhD
University of North Dakota

Abstract

Healthy lifestyle behaviors have the potential to reduce rates of chronic disease and improve the quality of life among college students. Eating a healthy diet, limiting alcohol consumption, and maintaining a healthy weight are important behaviors for health among young adults. Identifying disparities in health behaviors among student and developing education programs, course requirements, or policies to reduce disparities could improve current and future health among college students. This paper explores whether health indicators such as dietary intake, alcohol intake, Body Mass Index (BMI), smoking, sleep, and physical activity vary between undergraduate students who are enrolled in health-related majors compared with non-health-related majors. Further, we studied sex differences in these health indicators among college undergraduate students.

Introduction

Many Americans desire quick, easy food choices due to their busy schedules.[1] Fast food is convenient but is more likely to be high in fat, sodium, and calories. College students, like non-college-going Americans, frequent fast food establishments for constraints of time and also because fast food is relatively inexpensive.[2] The alternative to the typical American diet—a prudent or healthy diet— has been related to decreased cardiovascular disease[3] and mortality risk.[4,5] According to Yang, Cogswell, Flanders, Hong, Zhang, Loustalot, Gillespie, Merritt, and Hu cardiovascular disease continues to be the leading cause of death among U.S. adults.[5]

Undergraduate students are expected to be healthy because most of them are young adults. However, this is not necessarily the case. Obesity rates among adolescents and adults have increased dramatically from the early 1990s.[6,7] Further, Fernandes and Lofgren (2011) reports that metabolic syndrome, is present among a high number of college students.[8] Metabolic syndrome is a condition with at least three of the following characteristics present: abdominal obesity, insulin resistance, elevated blood pressure, low HDL-C, and high triglyceride levels.[9] More than a quarter of the study sample met at least one criteria for the diagnosis of metabolic syndrome.[8] This syndrome that leads to increased risk of heart disease is associated with poor dietary quality. This study exemplifies the importance of evaluating lifestyle factors among college students for the purpose of identifying risky behaviors and planning targeted interventions to help them inculcate health habits and reduce their chances of developing ailments in the future.

Eating a healthy diet, limiting alcohol consumption, and maintaining a healthy weight are all important behaviors for heart health among young adults.[10] During the first three years of college there are often changes in these behaviors,[11] so identifying disparities in health behaviors among students and developing education programs or policies to reduce disparities among college students could impact their future health. Sex differences in health-related behaviors[2,12] and disease incidence[13,14] have been reported among college students. Previous researchers have found that college students are more likely to eat poorly when not enrolled in a nutrition-related curriculum[2] and alcohol intake varies across major area of study among males in India.[15] These differences in health indicators by area of study may translate to the work world and have long-term implications. Among working adults, poor health status is related to unskilled or low skilled occupations[16] and obesity is related to working more hours each week.[17]

Obesity has been identified as a major public health concern requiring attention on college campuses.[18] Among U.S. adolescents and young adults, obesity predicts cardiovascular mortality.[19] Additional research is needed to examine whether health indicators vary across major areas of study. Students' knowledge and experience gained through a major area of study may influence their lifestyle choices. Shah, Amirabdollahian, and Costa reported better dietary intake for junior and senior students compared with freshman students and for dietetic majors compared with non-dietetics majors.[20] Several academic programs are training students to work in the field of health care and wellness but most studies are limited to medical, nursing, or dietetics students.[12,15,19,20] We don't currently know if these students benefit from more favorable lifestyle behaviors compared to other college students.

The purpose of this study was to investigate whether health indicators, including dietary intake, alcohol intake, smoking, sleep, physical activity, and BMI vary between undergraduate students at an upper Midwest university who are enrolled in a health-related area of study compared with those enrolled in other areas of study. Students enrolled in health-related majors may be perceived as following a healthier lifestyle than their peers; however, this has not been reported in the literature. Thus, the current study was employed to learn whether differences in health indicators exist between students in health-related majors compared with non-health-related majors. A secondary purpose was to examine differences between males and females in health-related and non-health-related majors because sex differences have been reported for health indicators and

disease prevalence. The ability to identify differences between groups is important for screening students and identifying those at risk for early intervention.

Healthy lifestyle behaviors have the potential to reduce rates of chronic disease and improve the quality of life among college students. Perhaps all students would benefit from taking health-related courses as part of their Bachelor's degrees but first we must establish whether differences exist between groups of students in health care related majors compared with those enrolled in other major areas of study. We hypothesize that on average students majoring in health-related disciplines report more favorable dietary intake, alcohol intake, and BMI compared with their counterparts majoring other disciplines. We also hypothesize that on average females will have more favorable dietary intake, alcohol intake, and BMI status when compared with males.

Methods

The present study was reviewed and approved by the University of North Dakota's Institutional Review Board. The cross-section study design was carried out at a mid-sized public university. Participation was open to undergraduate students across all disciplines. Study participants reviewed and signed informed consent forms prior to study entry. A self-administered survey was provided to a convenience sample. Data collection was carried out in February, 2012.

On the basis or their area of study, student participants were divided into two groups: health care and non-health care. Health care areas of study were selected based on the likelihood of graduates working in the field of health care or wellness as well as the undergraduate requirements for wellness and health courses at the university. Non-health care areas of study were identified as all other undergraduate majors offered at the university. Health care students were identified by self-reported majors or minors in the following areas of study: (1) anatomy and cell biology, (2) athletic training, (3) biochemistry and molecular biology, (4) biology– pre health science, (5) communication and speech disorders, (6) community nutrition, (7) dietetics, (8) gerontology, (9) health education, (10) kinesiology, (11) medical laboratory science, (12) nursing, (13) physical education, exercise science, and wellness, (14) physical therapy, (15) social work, and (16) pre-health science. Students with majors and minors in disciplines different from the ones mentioned or those who had not yet declared their area of study were classified under non-health care. Undergraduate class status was defined based on the university definitions: freshman (0 through 23 credits), sophomore (24 through 59 credits), junior (60 through 89 credits), senior (90 through 125 credits). Graduate and distance students were excluded from the study.

Measures

The survey measured the following lifestyle indicators: smoking status, physical activity, alcohol consumption, sleep duration, height, weight, and dietary intake. Physical activity items measured weekly participation in moderate and vigorous activities. The MEDFICTS (meats, eggs, dairy, fried food, fat in baked goods, convenience foods, fats added at the table and snacks) dietary assessment questionnaire measured dietary fat and cholesterol consumption. This questionnaire was designed to measure adherence to the National Cholesterol Education Program for heart health and provides a dietary quality score based on dietary fat and cholesterol consumption. The MEDFICTS scores range from zero to 216 and were categorized into three groups: "Need for Dietary Changes" (score of greater than 70), "Heart-Healthy" (score of 40 through 70), and "Therapeutic Lifestyle Changes" (score of less than 40). The MEDFICTS tool used in this study is described in detail elsewhere.[23,24] BMI was calculated from self-reported heights and weights. BMI categories were defined as underweight (less than 18.5), normal (18.5 to 24.9), overweight (25.0 to 29.9), and obese (greater than or equal to 30.0).[25] The underweight and normal categories were grouped due to the small number of students in the underweight category. The following BMI groups were utilized for statistical analysis: (1) less than 25.0, (2) 25.0 to 29.9, and (3) greater than 29.9.

Data analysis

Statistical Package for Social Sciences (SPSS) software was utilized for data analysis version 18.0.[26] Means, standard deviations, and frequencies were utilized to describe the data. Pearson correlations, independent t-tests, analysis of variance (ANOVA) with Tukey post hoc tests, and chi square were utilized for statistical analysis. Two data points were identified as extreme outliers – one for BMI and another for a MEDFICTS score. The outliers were not data entry errors so completely removing them is not advisable. These outliers were identified by reviewing histogram charts and confirmed by a score beyond 3.0 times the H-spread (BMI > 41.7; MEDFICTS score > 180). The extreme outliers distort statistical estimates for sample means and variance, and therefore, the values were changed to be the largest value in each variable but no longer an extreme outlier by changing the data points to values that were equal to the mean value plus two standard deviations.[27,28]

Results

Study participants were undergraduate college students (N = 158) from an upper Midwest university. The participation rate for the study was 89.2%. A total of 177 students participated in the study with 158 completing the study. Nineteen surveys were incomplete or non-qualifying surveys (e.g., graduate students). The majority of study participants were non-health care students (57%) with the mean age of 20.9 years (SD, 2.8). Most study participants were white (93%), female (61.4%), and non-smokers (94.3%). The distribution across undergraduate class status was the following: 25.3% freshman, 19.6% sophomores, 22.2% juniors, and 32.9% seniors. Detailed information about sample characteristics and comparisons between health care and non-health care students is provided in Table 1.

Sex differences were found in some lifestyle characteristics. Seventy five percent of males (46 of 61 male participants) and 56% (54 of 97 female participants) of females reported weekly alcohol consumption. Male participants were shown to consume more servings of alcohol per week than women (mean ± SD, 8.3 ± 8.0 and 2.2 ± 3.0, respectively, $t = 5.74$, $p < 0.001$). Dietary intake of fat and cholesterol was higher for males than females (mean ± SD, 60.3 ± 30.2 and 39.4 ± 26.1, $t = 4.62$ respectively; $p < 0.001$), and more females than males fell into the optimal intake level for fat and cholesterol based on MEDFICTS scores (score of less than 40; $\chi^2 = 16.9$, $p < 0.001$, effect size = 0.327).

The majority (63% or 100 of 158 participants) of students reported weekly alcohol intake, with a higher average weekly intake for non-health care students compared to health care students ($t = 3.97$, $p < 0.001$). The number of students consuming alcohol on a weekly basis was also higher for non-health care (71% or 64 of 90 participants) compared with health care students (53% or 36 of 68 participants) ($\chi^2 = 5.50$, $p = 0.019$, effect size = 0.187) and male (75% or 46 of 61 participants) compared with female (56% or 54 of 97 participants) ($\chi^2 = 6.281$, $p = 0.012$, effect size = 0.119). Positive relationships were found between alcohol use and smoking status ($r = 0.27$, $p < 0.01$) and MEDFICTS score (lower scores indicate a heart healthy diet) ($r = 0.26$, $p < 0.01$; refer to Table II). MEDFICTS scores were higher among students that reported weekly alcohol intake (mean ± SD, 52.7 ± 32.1) compared to those who did not consume alcohol weekly (38.5 ± 21.7) ($t = -3.32$, $p = 0.001$).

Smoking was inversely related to physical activity ($r = -0.18$, $p = 0.02$) and daily sleep duration ($r = -0.17$, $p = 0.03$) and directly related to alcohol ($r = 0.27$, $p < 0.01$) and MEDFICTS score ($r = 0.26$, $p < 0.01$). Smokers participating in this study were less likely to report weekly moderate or vigorous physical activity. Smokers also reported drinking more alcohol per week and fewer hours of daily sleeping, on average. Pearson correlations for participant characteristics are presented in Table 2.

BMI was higher for non-health care students (mean ± SD, 25.2 ± 4.1) than health care students (23.4 ± 3.7) ($t = 2.75$, $p = 0.007$). Fewer health care students fell into the overweight and obese groups (Figure I). BMI also varied between sexes with a higher BMI for men (mean ± SD, 25.5 ± 3.7) than women (23.8 ± 4.1) ($t = 2.60$, $p = 0.01$). Further, BMI was positively related to undergraduate class status (freshman, sophomore, junior, and senior) ($r = 0.17$, $p \leq 0.05$), sex ($r = -0.20$, $p \leq 0.05$) and age ($r = 0.34$, $p \leq 0.01$) (refer to Table 2). MEDFICTS scores varied across BMI groups among males ($F(2,58) = 4.59$, $p = 0.014$). Males in the overweight group (BMI ≥ 25.0 – 29.9) had a significantly lower MEDFICTS score ($M = 47.7$, 95% CI [38.7, 56.6]) than men in the < 25.0 group ($M = 71.6$, 95% CI [58.9, 84.2]), $p = 0.011$), but MEDFICTS scores did not vary across BMI groups for women.

Discussion

The study found differences in lifestyle characteristics between sexes as well as between students who study health-related disciplines and those who don't. Dietary fat and cholesterol intake varied by sexes with more women than men falling into the optimal "Therapeutic Lifestyle Changes" category based on the MEDFICTS scores. These findings are consistent with previous research reporting that female students eat a lower percentage of energy from fat than male students.[29]

According to this study, male college students engaged in less healthy eating habits than women independent of their major area of study. Males consume a higher percentage of energy from fat, using food labels less often, and consuming fast food more frequently.[2,29] These habits may contribute to more cholesterol and saturated fat in men's diets as reflected in the MEDFICTS score in the present study. The higher MEDFICTS scores for men may be partially attributed to a higher total caloric intake among men or underreporting by women. Underreporting energy intake is more common among women than men.[30] The lack of ability for MEDFICTS to discriminate between sexes is a limitation of the tool noted in previous research[24] and our findings confirm the difference between men and women in this area. Sex differences found in this study provide further evidence that the MEDFICTS tool may benefit by adding a sex question to the tool, so respondents can report this characteristic.

Non-health care students are more likely to fall into the overweight or obese groups. BMI is correlated with excessive adipose tissue which places individuals at risk for multiple diseases, such as heart disease, hypertension, type 2 diabetes mellitus, sleep apnea, and some forms of cancer.[31] The prevalence of obesity among participants in this study was lower at 12.7% than the national rate of 35.7% recently reported among adults.[32] However, this is expected because obesity rates increase from younger to older age groups and the average age in our study was 20.9 years.[32] Nonetheless, the higher rate of obesity among young men in the present study may indicate an increased risk for chronic diseases later in life.

Dietary scores varied by BMI group for males. The results unexpectedly indicated that the MEDFICTS scores were lower for men in the overweight group than men with a BMI of 24.9 or less, suggesting poorer dietary choices by those with more favorable BMI values. This finding may be due to increased awareness of nutrition

	Health care (n = 68)	Non-health care (n = 90)	p - value	Combined (N = 158)
Age (mean ± SD) years	20.4(2.7)	21.3(2.8)	0.032	20.9(2.8)
Gender (%)			<0.001	
Male	16.2	55.6		38.6
Female	83.8	44.4		61.4
*Ethnicity (%)			–	
White	92.6	93.3		93.0
Black or African American	1.5	0		0.6
Asian	1.5	3.3		2.5
Native Hawaiian or other Pacific Islander	1.5	0		0.6
American Indian, Alaska Native	2.9	3.3		3.2
Smoking (%)			–	
Yes	2.9	7.8		5.7
No	97.1	92.2		94.3
Sleep (mean ± SD) hours/day	7.1(1.2)	7.2(1.0)	NS	7.2(1.1)
Alcohol (mean ± SD) drinks/week	2.6(3.8)	6.1(7.3)	<0.001	4.6(6.2)
Leisure-time physical activity (%) (weekly participation)			NS	
Moderate	7.4	7.8		7.6
Vigorous	25.0	28.9		27.2
Moderate and Vigorous	67.6	63.3		65.2
BMI (mean ± SD)	23.4(3.7)	25.2(4.1)	0.007	24.4(4.0)
*BMI categories (%)			<0.001	
Underweight	1.5	3.3		2.5
Normal	76.5	46.7		59.5
Overweight	11.8	35.6		25.3
Obese	10.3	14.6		12.7
MEDFICTS score (mean ± SD)	42.5(28.6)	51.3(29.7)	NS	47.5(29.5)
MEDFICTS categories (%)			NS	
Category 1 (Score < 40)	51.5	42.2		46.2
Category 2 (Score 40-70)	35.3	34.4		34.8
Category 3 (Score > 70)	13.2	23.3		19.0

Table 1. Descriptives and differences for undergraduate study participants

MEDFICTS: dietary questionnaire assessing fat and cholesterol intake; NS: non-significant.
*Chi-square tests: (1) ethnicity: white was compared with all other ethnic groups combined; (2) BMI categories:, underweight and normal BMI groups were combined and compared to overweight and obese groups.
Smoking and ethnicity lacked sufficient numbers in some groups for chi-square tests.

	Status	Age	Gender	Ethnicity	Smoking	BMI	Physical Activity	Sleep	Alcohol	MEDFICTS Score	Area of Study
Status	1										
Age	**0.51****	1									
Gender	-0.10	**-0.18***	1								
Ethnicity	-0.07	-0.05	-0.10	1							
Smoking	-0.08	-0.02	**-0.20***	-0.01	1						
BMI	**0.17***	**0.34****	**-0.20***	0.07	-0.06	1					
Physical Activity	0.03	-0.05	-0.08	0.02	**-0.18***	0.01	1				
Sleep	0.02	-0.11	0.06	**-0.17***	**-0.17***	-0.08	-0.01	1			
Alcohol	**0.21****	0.09	**-0.48****	-0.03	**0.27****	0.05	0.07	-0.09	1		
MEDFICTS Score	-0.06	-0.01	**-0.35****	-0.01	**0.26****	-0.01	-0.03	-0.11	**0.32****	1	
Area of Study	**-0.19***	**-0.17***	**0.40***	0.01	-0.10	**-0.22****	0.04	-0.04	**-0.28****	-0.15	1

Table 2. Pearson correlation for participant characteristics

Status: freshman (0), sophomore (1), junior (2), senior (3); Gender: men (0), women (1); BMI, Body Mass Index; Physical activity (leisure) : weekly moderate (0), vigorous (1), or both activities (2); Area of study: non-healthcare (0), healthcare (1).
**Correlation is significant ≤ 0.01 level (2-tailed).
*Correlation is significant ≤ 0.05 level (2-tailed).

and food choice or underreporting energy intake and therefore a lower MEDFICTS score for overweight men. Excess weight has been associated with underreporting energy intake.[31] Men with a BMI of less than 25.0 may also be less concerned with dietary intake because they are not in a weight category associated with high health risk. Notably, MEDFICTS scores did not vary across women's BMI groups. However, overweight women have been reported to have a higher rate of underreporting their energy intake as well as fat and cholesterol intake, [30,33] which may contribute to the lack of dietary difference between BMI groups of women. Because a diet low in saturated fat and cholesterol can decrease the risk for cardiovascular disease and mortality, male students may benefit from education on how to improve the quality of their diets. [3,4,5]

Alcohol intake is an important health concern for the collegiate population. Gore and colleagues[34] reported alcohol consumption as a key risk factor for incidental disability-adjusted life years or years lost due to premature morbidity or mortality based on data from children and young adults, aged 10 – 24 years (WHO's 2004 Global Burden of Disease study). Approximately 62% of U.S. men report drinking alcohol compared to only 47% of U.S. women.[35] The rates in the present study were higher for both men and women, which is a concern that demands additional attention and resources. Non-health care students and male students were more likely to indulge in higher weekly consumption of alcohol. Students who consumed more fat and cholesterol, of which excessive amounts are indicative of poor dietary quality, also consumed more alcohol in the present study. These findings support previous research reporting that dietary quality is inversely related to alcohol intake.[36] Research indicates that alcohol intake may compromise dietary quality. Strategically marketing wellness interventions that aim to improved dietary intake and reduce alcohol intake to male and non-health majors may be an efficient use of limited resources on college campuses.

Significant relationships were found between dietary intake and smoking status and are useful to consider for future related research. However, the small number of smokers in our sample greatly limits the generality of these results. Nineteen percent of U.S. adults were smokers in 2010, with 18% of women and 21% of men identifying as current smokers.[37] The present study found that only 5.7% (n = 9) of the sample were self-reported current smokers, while the 2013 estimated cigarette smoking rate is 9.3% among U.S. adults with a Bachelor's degree.[38] The small subsample of smokers limits the generality of the smoking-related findings of this study and requires future research with a larger sample or oversampling of smokers to confirm relationships found in the present study. Therefore, further investigation is needed to determine if smokers are more likely to eat a high fat and cholesterol diet and drink more alcohol as our results indicate. Furthermore, smokers in the current study reported fewer hours of sleep, on average, and were less likely to report moderate or vigorous physical activity than their non-smoking counterparts. A recent, larger study reported an inverse relationship between smoking and fruit and vegetable intake among adults.[39] The results of this study are consistent with our findings that smokers have less healthy diets compared with nonsmokers.

The transition to college is a critical time of change for young adults. Many college students are in a time marked by adjustment and instability in their lifestyles and behaviors.[40] Developing healthy habits at this stage in the life cycle may lower the risk of common chronic diseases later in life. Many preventable chronic diseases are the result of cumulative unhealthy lifestyle behaviors over decades. Thus, early intervention is key for the prevention of these conditions. Most college students experience increased autonomy and decision making with the transition from home to college, so this is a period of opportunity to learn about healthy behaviors and make independent lifestyle choices.[41] Previous research has reported successful interventions that have helped students to improve short-term health-related behaviors.[20,42] Additional research is needed to identity interventions that result in long-term beneficial changes in health-related behaviors and to identify the college students at greatest health risk.

Limitations of the study

The study has several limitations. The data was self-reported and therefore our original data and subsequent results are prone to response bias. The sample included primarily white undergraduate students, which represents the targeted university's student population but limits generality of the results. Although MEDFICTS is a reliable dietary assessment questionnaire that has been evaluated in a variety of adult groups, it does not account for caloric intake or sex differences. The results related to smoking should be interpreted with caution, because only 9 participants (5.7%)

represented this group in our study.

Conclusion

Non-health care students were more likely to drink alcohol and be overweight or obese when compared with health care students. Increased alcohol intake was related to increased dietary intake of fat and cholesterol, thus unhealthy behaviors often coexist among college students. Sex differences place men at a higher risk for chronic disease, including a less favorable fat, cholesterol, and alcohol intake, as well as BMI status. Students who major in a healthcare-related field may benefit from required courses that educate students about wellness and lifestyle choices that are associated with prevention of diseases. According to the results of this study, non-health care students and male students reported less favorable lifestyle characteristics and may benefit from targeted education programs, course requirements, or policies designed to teach students about the benefits of healthy lifestyle choices. Future research should explore whether these types of interventions are equally beneficial for both health care and non-health care students as well as both sexes. Additional research is also warranted to study relationships between smoking, sleep, diet, alcohol, and physical activity in a large college population. The American College Health Association's National College Health Assessment data could be utilized for this purpose.

References

[1]Tillotson, J. (2009) "Americans' food shopping in today's lousy economy (part 2)." Nutrition Today. 44.5. Pg 218-221.

[2]Morse, K., and Driskell, J.A. (2009) "Observed sex differences in fast-food consumption and nutrition self-assessments and beliefs of college students." Nutrition Research. 29. Pg 173-179.

[3]Miller, E.R., Erlinger, T.P., and Appel, L.J. (2006) "The effects of macronutrients on blood pressure and lipids: An overview of the DASH and OmniHeart trials." Current Atherosclerosis Reports. 8.6. Pg 460-465.

[4]Anderson, A.L., et al. (2011) "Dietary patterns and survival of older adults." Journal of the American Dietetic Association. 111.1. Pg 84-91.

[5]Yang, Q., et al. (2012) "Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults." Journal of the American Medical Association. 307.12. Pg 1273-1283.

[6]U.S. Department of Health and Human Services. (2013) "Nutrition, Physical Activity, and Obesity." <http://healthypeople.gov/2020/lhi/nutrition.aspx?tab=data> (Accessed: 11/30/2013)

[7]U.S. Department of Health and Human Services. (2013) "Health Risk Factors" <http://www.cdc.gov/nchs/hus/healthrisk.htm#elevated> (Accessed: 11/30/13)

[8]Fernandes, J., and Lofgren, I.E. (2011) "Prevalence of metabolic syndrome and individual criteria in college students." Journal of American College Health. 59.4. Pg 313-321.

[9]Grunday, S.M., Brewer, H.B., Cleeman, J.I., Smith, S.C., Lenfant, C. (2004) "Definition of metabolic syndrome. Report of the National Heart, Lung, and Blood Institute/American Heart Association conference on scientific issues related to definition." Circulation. 109. Pg 433-438.

[10]Lui, K., et al (2012). "Healthy lifestyle through young adulthood and presence of low cardiovascular disease risk profile in middle age: The Coronary Artery Risk Development in (Young) Adults (CARDIA) Study." Circulation. 125. Pg 996-1004.

[11]Lau, R.R., Jacobs Quadrel, M., and Hartman, K.A. (1990). "Development and Change of Young Adults' Preventive Health Beliefs and Behavior: Influence from Parents and Peers." Journal of Health and Social Behavior. 31.3. Pg 240-259.

[12]Huang, T.T., Harris, K.J., Lee, R.E., Nazir, N., Born, W., and Kaur, H. (2003) "Assessing overweight, obesity, diet, and physical activity in college students." Journal of American College Health. 52. Pg 83-86.

[13]Dasgupta, K. (2008)"Sex differences in the development of higher systolic blood pressure during adolescence." Cardiology Review. 25.5 Pg 54-57.

[14]Thoits, P.A. (2010). "Stress and health: major findings and policy implications." Journal of Health and Social Behavior. 51(S). Pg S41-S53.

[15]Gupta, S., Singh Sarpal, S., Kumar, D., Kaur, T., and Arora, S. (2013). "Prevalence, pattern and familial effects of substance use among the male college students – a north India study." Journal of Clinical Diagnostic Research. 7.8 Pg 1632-1636.

[16]Tjepkema, M., Wilkins, R., and Long, A. (2013). "Cause-specific mortality by occupational skill level in Canada: a 16-year follow-up study" Chronic Diseases and Injuries in Canada. 3.4. Pg 195-203.

[17]Park S., Pan L., and Lankford T. (2013 Nov 7). "Relationship between employment characteristics and obesity among employed U.S. adults." American Journal of Health Promotion. [epub ahead of print].

[18]Sparling, P.B. (2007). "Obesity on campus." Preventing Chronic Disease: Public Health Research, Practice, and Policy. 4.3. (Accessed 11/22/13: www.cdc.gov/pcd/issues/2007/jul/06_0142.htm.)

[19]Saydah, S., McKeever Bullard, K., Imperatore, G., Geiss, L., and Gregg, E.W. (2013). "Cardiometabolic risk factors among US adulescents and young adults and risk of early mortality." Pediatrics. 131.3 Pg e679-e686.

[20]Shah, N, Amirabdollahian, F, and Costa, R. (2011). "The dietary and physical activity habits of university students on health and non-health related courses." Journal of Human Nutrition and Dietetics. 24. Pg 277-278. [abstract]

[21]Sakamki, R., Toyama, K., Amamoto, R., Liu, C-J., and Shinfuki, N. (2005). "Nutritional knowledge, food habits and health attitude of Chinese university students – a cross sectional study-." Nutrition Journal. 4.4 (Accessed 11/22/13: http://www.nutritionj.com/content/4/1/4.)

[22]Wengreen, H.J., and Moncur, C. (2009) "Change in diet, physical activity, and body weight among young-adults during the transition from high school to college." Nutrition Journal 8. Pg 32. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2720988/?tool=pubmed> (Accessed 4/25/12).

[23]Kris-Etherton, P., Eissenstat, B., Jaax S., Srinath, U., Scott, L., Rader, J., and Pearson, T. (2001) "Validation of MEDFICTS, a dietary assessment instrument for evaluating adherence to total and saturated fat recommendations of the National Cholesterol Education Program Step 1 and Step 2 diets." Journal of the American Dietetic Association. 101.1. Pg. 81-86.

[24]Mochari, H., Gao, Q., and Mosca, L. (2008) "Validation of MEDFICTS dietary assessment questionnaire in a diverse population." Journal of the American Dietetic Association. 108.5. Pg 817-822.

[25]U.S. Department of Health and Human Services. "Healthy Weight- it's not a diet, it's a lifestyle!" <http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html> (Accessed: 2/10/2012.)

[26]SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc.

[27]Pallant, Julie. (2007) SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Window (Version 15): 3rd Edition. McGraw-Hill Companies, Inc.

[28]Van Selst, M., and Jolicoeur, P. (1994). "A solution to the effect of sample size on outlier elimination." The Quarterly Journal of Experimental Psychology. 47A.3. Pg 631-650.

[29]Li, K., Concepcion, R., Lee, H., Cardinal, B., Ebbeck, V., and Woekel, E. (2012) "An examination of sex differences in relation to the eating habits and nutrient intakes of university students." Journal of Nutrition Education and Behavior. 44.3. Pg 246-250.

[30]Brifel, R.R., Sempos, C.T., McDowell, M.A., Chien, S., and Alaimo, K. (1997) "Dietary methods research in the Third National Health and Nutrition Examination Survey: underreporting of energy intake." American Journal of Clinical Nutrition. 65.4. Pg 1203S-1209S.

[31]U.S. Health and Human Services. (1998). "Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults – The evidence report." Obesity Research. 98.6. Pg 51S-209S.

[32]Ogden, C., Carroll, M., Kit, B., and Flegal, K. (2012). "Prevalence of obesity in the United States, 2009-2010." U.S. Department of health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Data Brief Web site. http://www.cdc.gov/nchs/products/databriefs.htm. (Accessed 5/10/2012).

[33]Braam, L.A.J.L.M., Ocké, M.C., Bueno-de-Mesquita, H.B., Seidell, J.C. (1998). "Determinants of obesity-related underreporting of energy intake." American Journal of Epidemiology. 147.11 Pg 1081-1086.

[34]Gore, F.M., Bloem, P.J., Patton, G.C., Ferguson, J, Joseph V., Coffey, C., Sawyer, S.M., and Mathers, C.D. (2011) "Global burden of disease in younger people aged 10 – 24 years: as systematic review." Lancet 377.9783. Pg 2093-2102.

[35]U.S. Health and Human Services. Centers for Disease Control, Division of Population Health Website. "Excessive alcohol use and risks to men's health." <http://www.cdc.gov/alcohol/fact-sheets/mens-health.htm> (Accessed 4/28/12).

[36]Breslow, R., Guenther, P., and Smothers, B. (2006) "Alcohol drinking patterns and diet quality: The 1999-2000 National Health and Nutrition Examination Survey." American Journal of Epidemiology 163.4. Pg 359-366.

[37]U.S. Department of Health and Human Services. Centers for Disease Control and Prevention National Center for Health Statistics Web site. "Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2010." <http://www.cdc.gov/nchs/data/series/sr_10/sr10_252.pdf> (Accessed 4/24/12)

[38]U.S. Department of Health and Human Services. (2013) Adult Cigarette Smoking in the U.S.: Current Estimate. <http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm#national> (Accessed 12/01/13)

[39]Haibach, J.P., Homish, G.G., and Goirino, G.A. (published online ahead of print May 12 2012) "A longitudinal evaluation of fruit and vegetable consumption and cigarette smoking." Nicotine & Tobacco Research. http://www.ncbi.nlm.nih.gov/pubmed/22614546. (Accessed 5/29/12)

[40]Lenz, B. (2001) "The transformation from adolescence to young adulthood: a theoretical perspective." Journal of School Nursing 17.6. Pg 300-306.

[41]National Center for Education Statistics Web

site. "Fast Facts." <http://nces.ed.gov/fastfacts/index. asp?faq=FFOption6#faqFFOption6> (Accessed 5/29/12)

[42]Ha, E.J., and Caine-Bish, N. (2009) "Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students." Journal of Nutrition Education and Behavior 41.2. Pg 103-109.