Who is eating the Fruits and Vegetables: Couch Potato or Internet Junkie?

Authors
Christiane Schroeter, Assistant Professor (contact author)
Agribusiness Department
California Polytechnic State University
San Luis Obispo, CA 93407, USA
E-mail: cschroet@calpoly.edu
Tel: 805.756.5045

and

Marianne Wolf, Professor
Agribusiness Department
California Polytechnic State University
San Luis Obispo, CA 93407, USA
E-mail: mwolf@calpoly.edu
Tel: 805.756.5027

Selected paper for presentation at the Agricultural and Applied Economics Association's 2012 AAEA & AERE Joint Annual Meeting, Seattle, Washington, August 12-14, 2012

Abstract

About 21% of U.S. college students are overweight. However, aside from the 1995 National College Health Risk Behavior Survey (NCHRBS), the prevalence of health-risk behavior among college students has not been well characterized. The objective of this study is to investigate how college student's body fruit and vegetable intake is affected by (1) demographics, (2) dietary habits, and (3) lifestyle. We collected data of college students enrolled at California Polytechnic State University. Sedentary habits such as watching TV, playing computer games, and surfing the web negatively impact both fruit and vegetable intake, which emphasizes the need to improve on-campus health education.

JEL codes: I1, D12, I19, I23

Keywords: Obesity, Health-risk behavior, Lifestyle, Sedentary activity.

Introduction

Recently, increased policy attention has been placed on improving health education and preventing obesity, given that 67% of the U.S. population is overweight or obese. In particular, the college years present a transition point from family home life to autonomy and are critical for understanding young adult health status and behavior. Previous studies estimated that about 21% of all college students are overweight or obese (Lowry et al., 2000). Childhood and adolescent obesity tends to persist into adulthood, which increases the risk of a multitude of chronic health risks that are related with high costs to the individual and the society (Mokdad et al., 2000; U.S. Department of Health and Human Services (USDHHS), 2000; Lowry et al., 2000).[1]

Colleges and universities are important settings for reducing important health-risk behaviors among many young adults, given that of all persons aged 18-24 years in the U.S., one fourth are currently either full- or part-time college students. In addition, of all persons aged 20-24 years, more than half are attending college (National Center for Education Statistics, 1996).
With the gene pool remaining relatively stable, factors such as change in eating habits and sedentary lifestyles are considered to be responsible for much of the increase in the obesity epidemic. About 74% of U.S. college students eat less than five servings of fruits and vegetables daily and only about 20% of the students engage in vigorous or moderate physical activity at recommended levels (Lowry et al., 2000).

While there is some regional variation of obesity rates within the U.S., California, as one of the major producing states of fruits and vegetables, is also one of 31 states where obesity rates significantly rose in the past year (Segal, 2006). Declining produce consumption patterns are

[1] Whether an individual is overweight or obese is determined by the Body Mass Index (BMI), which is determined by the formula: weight (in kilograms)/height^2 (in meters). Among adults, overweight is classified by a BMI between 25.0 and 29.9, while a BMI greater than or equal to 30.0 defines obesity (Centers for Disease Control and Prevention (CDC), 2006).

commonly attributed to changing socio-demographics, rising demands for convenience foods, growing away-from-home food expenditures and declining food preparation skills.

Unfortunately, aside from the National College Health Risk Behavior Survey (NCHRBS) that took place in 1995, the prevalence of health-risk behavior among college students has not been well characterized and no recent data exists (CDC, 1997). Studies that have targeted college students focused on assessing physical activity and food intake levels, and did not determine any relationships between lifestyle habits and body weight (e.g. Anding, Suminski, and Boss, 2001; Suminski et al., 2002; Haberman and Luffey, 1998; Brevard and Ricketts, 1996). Thus, there is a need for research that empirically determines the influence of college life on food intake (Racette et al. 2005).

The objective of this study is to investigate how college student's fruit and vegetable intake is affected by (1) demographics, (2) dietary habits, and (3) lifestyle. This study will constitute a unique contribution to the existing research, because it will address the missing link between health behavior and food consumption. An understanding of these factors will allow for a more targeted approach to health promotion among college students.

Research Methodology

Data Collection

Despite the significant increase in obesity, economic research on decreasing its prevalence has only recently begun. Thus, the main difficulty in health economics is obtaining objective data. Health data is frequently self-reported and thus, associated with a subjective measurement error. Even though many U.S.-based surveys that collect health data exist, these surveys typically do not take place at the state- or even program-level to assess any regional outcomes. Current data is

frequently only available at the national level. In addition, large-scale survey data that contain demographic backgrounds with information on exercise intensity, food consumption, lifestyle habits, and body weights are extremely rare.

This study is based on the FLASH College Health Study, which has been collected by Cal Poly's Science through Translational Research in Diet and Exercise (STRIDE). FLASH data is based on a convenience sample. Students enrolled at California Polytechnic State University, San Luis Obispo can voluntarily sign up for the study. Thus, respondents represent a variety of majors within the university. Survey questions assess students' height, weight, dietary intake, demographics and lifestyle, as well perceptions about their health, stress levels, drug and alcohol consumption. With this information, STRIDE examines the modifiable risk factors associated with weight gain, obesity, cardiovascular disease and diabetes among undergraduate students. The longitudinal study involves the Cal Poly class of 2013 and 2014. Since initiating the pilot study in Spring 2008, FLASH undergraduate research students have collected 6,733 surveys and conducted physical assessments, making it the largest research project of its kind (STRIDE Research, 2011). Given the on-going data analysis, this study is based on 600 respondents who participated in the survey which took place during the 2010 Fall quarter (September-December).

Variable Selection

This study employs four types of variables: 1) fruit and vegetable consumption; 2) demographics; 3) dietary habits, and 4) lifestyle. Table 1 shows the definitions, means and standard deviations of each variable used in the regression analyses. While fruit and vegetable consumption served as our dependent variables, the remaining three variable categories were used as independent variables in our analyses.

Fruit and Vegetable Consumption

The Dietary Guidelines for Americans 2010 suggest the consumption of fruit and vegetables for three main reasons: (1) they are major contributors of several under-consumed nutrients, (2) their consumption is associated with reduced risk of many chronic diseases, and (3) fruits and vegetables are naturally low in calories, which assists individuals in maintaining a healthy weight. Regarding the first reason, fruit and vegetables are major contributors of the shortfall nutrients folate, magnesium, potassium, dietary fiber, and vitamins A, C and K; of which potassium and dietary fiber are of particular concern to public health (USDA/USHHS, 2010; Schroeter, Anders, and Carlson, 2011).

This study utilizes two dependent variables 1) the frequency of fruit consumtion, i.e. fresh, frozen or canned fruit that is consumed alone or with other food such as cereal or yogurt, and 2) the frequency of vegetable consumption, such as tomatoes, carrots, onions, peppers, broccoli, zucchini, peas, fresh, frozen, cooked, and canned beans. Both consumption variables are assessed over 30 days.

In order to collect this food frequency information, the respondents had to fill out a food diary. According to the CDC (2012), a 21-year-old college student should consume 2 cups of fruit and 2.5 cups of vegetables every day. Thus, the frequency of produce consumption was separated into three main categories, accordingly. Even though the serving amounts of foods consumed are not known, it would be possible for students in the highest consumption category to cover the required amount of fruit and vegetable intake. Thus, the highest category, classified as '3', consisted of consuming each type of food at least once per day. A student in this consumption category would have to eat 2 cups of fruit, or 2.5 cups of vegetables per serving in order to meet the recommendation by the CDC. The medium category falls below the

recommended produce intake, with consumption frequencies ranging between 3-6 times of consuming fruit or vegetables per week. The lowest category was labeled as '1', where the consumption frequencies were 'never', '1-3 times last month', or '1-2 times per week'. This category could be classified as the 'at-risk' group of students, given their low produce intake.

As shown in Table 1, the average of the fruit response categories was 2.17, while the average vegetable consumption was 1.98. Thus, both averages range between the frequencies of 5-6 times per week and once per day.

Demographics

The sample consisted of 600 college students, of which 57% were females (Table 1). Previous studies showed that 20.2% of female students were overweight, in comparison to 21% of all male students. It has been documented that especially college-aged women exhibit a high level of concern about their body weight (e.g. Stuart, 1996; Henderson-King and Henderson-King, 1997; Schwitzer et al., 1998; Delene and Bragowicz, 1990; Graham and Jones, 2002). Several studies have aimed at determining the relationship between college-aged women, and weight gain during the freshman year. The myth "Freshman 15" is a belief that college freshman gain 15 pounds during their first year on campus, while typically enrolling into 15 credit hours per semester. Mounting evidence suggests that the concept may be myth rather than fact (e.g. Hodge, Jackson, and Sullivan, 1993; Megel et al., 1994). In our sample, the average BMI is 22.38, which is within the normal range of body weight.

With regard to race/ethnicity, 12.8% students were from Hispanic or Latino descent. Previous research suggests that food cultural habits formed during childhood have been shown to have a lasting impact on adult food habits (Becker, 1992; Dietary Guidelines Advisory

Committee, 2010). Schroeter, House, and Lorence (2007) emphasized the impact of food culture on fruit and vegetable consumption of college students in Arkansas and Florida. In contrast, Aldrich and Variyam (2000) argue that as the U.S. population becomes more diverse and many individuals live in or grow up in multi-racial settings, race and ethnicity may play a less important role with regard to food intake. A well-documented case in point emphasizing the interplay of diet quality and ethnicity is the "Hispanic Health Paradox". The paradox suggests that U.S. immigrant's heritage food culture may act as a protective barrier against a rapid assimilation of dietary habits. Thus, immigrants may show health outcomes that are equal to or better than those of non-immigrants (Morales et al., 2002; Batis et al., 2011).

Economic variables, such as parents' income may influence the quality of food consumption of a college student. The analysis included the father's income, and classified it as 'high' if it exceeded $50,000/year. Students whose father or primary male guardian falls into this income groups typically may have a higher ability to purchase fruits and vegetables, which are often perceived as higher priced. A higher income level in the family home may have formed the child's eating habits towards foods of higher dietary quality, such as fruit and vegetables. Table 1 shows that 29% of the students have a father with an income of more than $50,000/year.

Dietary Habits

Respondents were also asked about the weekly frequency of eating at on-campus dining establishments, such as dining halls or on-campus restaurants, vs. consuming foods at off-campus restaurants. The majority of the students, 77% of all respondents eats more than 5 times per week in on-campus dining places. We also included a variable for eating at off-campus restaurants more than 5 times per week. We expect that respondents, who eat out frequently

consume fewer servings of fruits and vegetables, given that the typical restaurant meal is less healthy than home-cooked food, since it is more calorie-dense and contains more total fat, more saturated fat, less calcium, fiber, and iron (Chou, Grossman, and Saffer, 2002; Lin and Frazão, 1999, Lin and Frazão, 1997).

In light of declining produce consumption and rising levels of nutritional supplement intake in the U.S., it remains unclear what role supplements may play in consumers' diet and health behavior. Many physicians advise the intake of multivitamin supplements because their patients might have difficulties consuming a balanced diet including a variety of fruits and vegetables (Wang, 2011; Dooren, 2011). Consumers may choose to take nutritional supplements to complement and improve their diet with specific micronutrients. As such, vitamins might serve as a disease-preventative input. The U.S. Council for Responsible Nutrition suggests that up to $8.4 billion annually could be saved if people consumed at least 100 International Units (IU) of vitamin E on a regular long-term basis to reduce the risk of heart disease (Bendich et al., 1997; Dickinson, 2002). Other consumers may choose to consume vitamin supplements to substitute for the lack of consuming vitamins from fruits and vegetables. However, there might be insufficient evidence that the same protective effect of fruit and vitamins could be derived from dietary supplements (USDA/USHHS, 2010; Schroeter, Anders, and Carlson, 2011).

Table 1 shows that about 51% of Cal Poly students who participated in the study take dietary supplements. The Council for Responsible Nutrition (2005) reports occasional use of nutritional supplements for 62% of U.S. adults, whereas 46% are reported to take supplements regularly (Dickinson and Shao 2006).

Lifestyle

Indicators of lifestyles include health and risky behaviors such as exercise frequency and sedentary activities such as time spent in front of the TV and/or computer. These lifestyle factors may significantly influence an individual's health status and food choice behavior (Cawley and Ruhm, 2011). Health experts continue to emphasize the importance of regular health-enhancing activities including the consumption of a well-balanced diet and physical activity (Dwyer 2001; USDA/USDHHS 2010). Thus, it is plausibly to assume that an increased frequency of exercising may be positively correlated with eating a healthy diet of fruit and vegetables. In our sample, the exercise frequency of vigorous activities such as heavy lifting and aerobics was assessed. On average, respondents perform a vigorous workout 2.5 times per week (Table 1).

In order to measure sedentary activities, we summed three different variables, which measured the number of hours spent on non-work or study-related screen time. Any of these non-physical activities could be combined with each other, i.e. texting while watching a movie or playing a video game. Increasing screen time leaves less time for physical activity, which may indicate that the respondent values sedentary entertainment over the health benefits of physical activity. A high number of hours spent watching TV/movies, playing video games or texting may be a proxy for an increased consumption of unhealthier foods as substitutes for fruit and vegetables as snack choices (Schroeter, Anders, and Carlson, 2011).

Methodology

Data Analysis

Two models were estimated with ordered probit regressions. The first dependent variable was the frequency consumption of fruits during the past 30 days (1 = consumption 1-3 times last

month or 1-2 times per week, 2 = 3-4 times per week and 5-6 times per week, 3 = consumption of 1 or more servings per day). The second model used the same categories of consumption frequency and focused on vegetable intake during the past 30 days. The second models also employed the same set of independent variables.

We chose an ordered probit model, given that the order of the discrete choice mattered. The frequency of fruit consumption varied by respondent as the standard deviations show (Table 1). The ordered probit model is: $Y_i^* = x_i\beta + \varepsilon_i$. Although Y_i^* is not directly observable, the observed dichotomous choice variable Y_i consists of ordinal responses, i.e Y_i =1, Y_i =2, Y_i =3, etc. Thus, Y_i is related to the Y_i^* in the following manner: $Y_i = 1$ if $Y_i^* \le 2$, $Y_i = 2$ if $3 \le Y_i^* \le \alpha_2$, $Y_i = 3$ if $0 < Y_i^* \le \alpha_3$, and $Y_i = J$ if $\alpha(j-1) \le Y_i^*$, where α_i are unknown threshold parameters.

The advantage of using a probit analysis is that even though a variable coefficient might be, for example, positive in the regression analyses and thus implies an increase in fruit and vegetable consumption, this variable might not increase the *probability* of consuming fruits and vegetables. However, this increase in probability would be shown by the probit analysis. A probit analysis increases the explanatory power of the independent variables and delivers practical relevance for the interpretation of factors determining fruit and vegetable consumption of college students.

Thus, a positive (negative) coefficient in the probit analysis means that higher values of this explanatory variable are linked to an increase (decrease) in the likelihood of consuming fruit or vegetables. Assuming that the individual decisions are independent, the log-likelihood function based on the observations for n individuals can be written as:

$\ln L(\beta; y, x) = \sum_{i=1}^{n} y_i \ln(p_i(x_i\beta)) + \sum_{i=1}^{n} (1 - y_i) \ln(1 - p_i(x_i\beta))$ (Mittelhammer, Judge, and Miller, 2000). Results of both ordered probit models are shown in Table 2.

Results

Results of this study provide information the impact of a) demographics, b) dietary habits, and c) lifestyle on fruit and vegetable consumption of college students. Interestingly, the same set of independent variables impacted the consumption of fruits vs. vegetables consumption differently

Demographics

As expected, the demographic variables were highly significant in determining the consumption of fruits and vegetables. Gender was highly predictive of the individual's consumption of fruits and vegetable. Women are 14.3% more likely to consume fruit and 10.5% more likely to consume vegetables, compared to men. This confirms the finding by Schroeter, House, and Lorence (2007) where males were less likely to consume two or three servings of fruits.

BMI did not have any effect on the frequency of fruit or vegetable consumption, which makes sense given that the average BMI of Cal Poly students who participated in the study was measured at only 22.28. Students who are of Hispanic or Latino descend are 8.6% less likely to consume fruits. However, there was no significant with regard to the vegetable consumption. This may be indicating that the student's household culture may not have emphasized the consumption of fruit.

Having a father or male guardian with a high income increases the likelihood of higher vegetable consumption by 4.6%, while there is no effect of this variable on the frequency fruit consumption.

Dietary Habits

For vegetable consumption, the only significant lifestyle variable was based on whether a student had indicated to eat at on-campus eating establishments more than 5 times per week. Interestingly, with a high frequency of eating on campus, vegetable consumption increases.

Eating at off-campus restaurants 5 times or more per week decreases the frequency of vegetable consumption by 15.8%. This finding is consistent with previous studies which show that eating away from home has been associated with poor diet quality. This may be due to fewer food choices, or less information about the nutrient content of the foods consumed. Another reason may be that consumers regard eating away from home as a 'splurge', independent from its frequency and use it as an opportunity to enjoy foods other than their usual diet, such as desserts. In this case, behavioral strategies need to change consumer attitudes regarding eating out or modify the environmental setting of fast food and full service restaurants (Schroeter, House, and Lorence, 2007).

Consuming supplements increases the likelihood of increased fruit consumption by 7.99%. This is an interesting result, because it suggests that students who consume a well-balanced diet care enough about their health to also take vitamin supplements. In this case, vitamin consumption seems to serve as another marker for healthy eating, which confirms the finding by Schroeter, Anders, and Carlson (2011).

Lifestyle

Many of the lifestyle variables did impact consumption of fruits and vegetables, in particular fruit consumption. For each additional hour of television watched above the average of 7.8 hours during the week, respondents increased their likelihood to consume no fruits by 1.13%. Watching an additional hour above the average of 13.5 hours during the weekend, decreased their likelihood of vegetable consumption. These findings are consistent with previous research that found with each additional hour of television viewed per day, fruit and vegetable consumption decreased by 0.16 servings per day (Boynton-Jarrett et al., 2003).

Texting is a relatively new activity and it is not known yet whether there are any potential relationships between a high frequency of sending text messages and the quality of food consumption. Interestingly, our study suggests that with an increased frequency of sending text messages, students are 1.4% less likely to consume fruit.

Conclusions

Our results suggest that especially lifestyle variables negatively impact the frequency of fruit and vegetable consumption. Physical activity is closely associated with fruit and vegetable intake, where “couch potato” students who do not frequently engage in vigorous physical activity consume less fruit and vegetables. Along the same lines, “internet junkies” who spend more hours watching TV/movies, surfing the web or playing video games are less likely to consume fruit and vegetables. Interestingly, higher sedentary tech activities during the week are associated with lower fruit consumption, while weekend tech habits may lead to lower vegetable consumption.

With regard to the students' tech habits, it is not known whether respondents consumed meals while watching TV/movies or playing video games. However, given that our results suggest a negative impact of watching TV/playing video games on both fruit and vegetable consumption, it could be assumed that these sedentary activities are associated with the consumption of unhealthier food items. Previous research determined that watching television during meals has been found to be related to higher fat consumption in adolescents and adults (Boutelle et al., 2003). In addition, unhealthy eating is promoting through TV advertising, given that television shows which are targeted at adolescents and young adults feature mostly commercials for high-calorie and high-sugar foods (Strauss and Knight, 1999). Other research showed a strong relationship between television watching and overweight, given that television viewing is such a sedentary activity (Strauss and Knight, 1999; Agras and Mascola, 2005; Salmon et al., 2005).

Increased knowledge about health-risk behavior may be one successful strategy when targeting college students, because the benefits of health and good nutrition may become more apparent with increasing age (Frazão and Allshouse, 2003). In this context, it might be important to promote an active lifestyle that includes vigorous activity. On-campus health education might also stress the consumption of healthy snack options such as fruits and vegetables, which could be consumed during sedentary activities such as watching TV.

References

Agras, W.S. and A.J. Mascola. 2005. "Risk factors for childhood overweight." Current Opinion in Pediatrics **17**(5):648-652.

Aldrich, L., and J. Variyam. 2000. Acculturation Erodes the Diet Quality of U.S. Hispanics. *Food Review* 23(1): 51-55.

Anding, J.D., Suminski, R.R., and L. Boss. "Dietary Intake, Body Mass Index, Exercise, and Alcohol: Are College Women Following the Dietary Guidelines for Americans?" *Journal of American College Health* 49(2001): 167-171.

Batis, C., Hernandez-Barrera, L., Barquera, S., Rivera, J.A., and B.M. Popkin. 2011. Food Acculturation Drives Differences among Mexicans, Mexican Americans, and Non-Hispanic Whites. *The Journal of Nutrition* 141(10): 1898-1906.

Becker, G.S. 1992. Habits, Addictions, and Traditions. *Kyklos* 45(3): 327-346.

Bendich, A., Mallick, R., and S. Leaders. 1997. Potential Health Economic Benefits of Vitamin Supplementation. Western J Medicine 166: 306-312.

Boynton-Jarrett, R., Thomas, T.N., Peterson, K.E., Wiecha, J., Sobol, A.M., and S.L. Gortmaker. "Impact of Television Viewing Patterns on Fruit and Vegetable Consumption Among Adolescents." *Pediatrics* 112(2003):1321-1326.

Brevard, P.B. and C.D. Ricketts. "Residence of College Students Affect Dietary Intake, Physical Activity, and Serum Lipid Levels." *Journal of the American Dietetic Association* 96(1996): 35-38.

Cawley, J., and C.J. Ruhm. 2011. The Economics of Risky Health Behaviors. Institute for the Study of Labor (IZA) Discussion Paper No. 5728, May 2011, Bonn, Germany.

Centers for Disease Control and Prevention (CDC). 2006. "About BMI for Adults.". Retrieved from the WWW on May 29, 2006: http://www.cdc.gov/nccdphp/dnpa/bmi/adult_BMI/about_adult_BMI.htm

Centers for Disease Control and Prevention (CDC). "Youth Risk Behavior Surveillance: National College Health Risk Behavior Survey -United States, 1995." *Morbidity and Mortality Weekly Report* 46(1997):1-54. Retrieved from the WWW on May 29, 2006: http://www.cdc.gov/mmwr/preview/mmwrhtml/00049859.htm#00002793.htm

Centers for Disease Control and Prevention (CDC). "Fruits and Veggies Matter." Retrieved from the WWW on June 15, 2012: http://www.fruitsandveggiesmatter.gov/benefits/index.html#

Chou, S.Y., Grossman, M., and H. Saffer. "An Economic Analysis of Adult Obesity: Results from the Behavioral Risk Factor Surveillance System." National Bureau of Economic Research Working Paper No. 9247, 2002.

Delene, L.M. and A.A. Bragowicz. "Student Healthcare Needs, Attitudes, and Behavior: Marketing Implications for College Health Centers." *Journal of American College Health* 38(1990):157-164.

Dickinson, A. 2002. Optimal nutrition for good health: the benefits of nutritional supplements. Council for Responsible Nutrition. www.crnusa.org00benefits_toc.html (accessed 07/28/10).

Dickinson, A., and A. Shao. 2006. Multivitamins and Other Dietary Supplements for Better Health. Position paper prepared for the Council for Responsible Nutrition, May 2006. Available at: www.crnusa.org/pdfs/CRN_PostitionPaper_multivitamin.pdf (accessed 08/10/10).

Dwyer, J.T. 2001. Nutrition Guidelines and Education of the Public. *Journal of Nutrition* 131: 3074-3077.

Dooren, J.C. 2011. Supplements offer Risks, Little Benefits, Study Says. The Wall Street Journal, October 11.

Frazão, E., and J. Allshouse. "Strategies for Intervention: Commentary and Debate." *The Journal of Nutrition* 133(2003):844S-847S.

Graham, M.A. and A.L. Jones. "Freshman 15: Valid Theory or Harmful Myth?" *Journal of American College Health* 50(2002):171-173.

Haberman, S. and L. Deborah. "Weighing in College Students' Diet and Exercise Behaviors." *Journal of American College Health* 46(1998):189-192.

Henderson-King, E. and D. Henderson-King. "Media Effects on Women's Body Esteem: Social and Individual Difference Factors." *Journal of Applied Social Psychology* 27(1997): 399-417.

Hodge, C.N., Jackson, L.A., and L.A. Sullivan. "The "Freshman 15": Facts and Fantasies About Weight Gain in College Women." *Psychology of Women Quarterly* 17(1993):119-126.

Kominski R. and A. Adams. "Educational Attainment in the United States: March 1993 and 1992." Washington, DC: Bureau of the Census, 1994. Current Population Reports no. P20-476.

Lin, B.-H. and E. Frazão. "Nutritional Quality of Foods At and Away from Home." FoodReview 20(1997):33-40.

Lin, B.-H. and E. Frazão. "Away-From-Home Foods Increasingly Important to Quality of American Diet." USDA Agricultural Information Bulletin No. 749, 1999.

Lowry, R., Galuska, D.A., Fullerton, J.E., Wechsler, H., Kann, L., and J.L. Collins. "Physical Activity, Food Choice, and Weight Management Goals and Practices Among US College Students." *American Journal of Preventative Medicine* 18(2000):18-27.

Megel, M.E., Hawkins, P., Sandstrom, S., Hoefler, M.A., and K. Willrett. "Health Promotion, Self-Esteem, and Weight Among Female College Freshmen." *Health Values* 18(1994):10-19.

Mittelhammer, R.C., Judge, G.G., and D.J. Miller. *Econometric Foundations.* Cambridge, UK: Cambridge University Press, 2000.

Mokdad A.H., Sedula, M.K., Dietz, W.H., Bowman, B.A., Marks, J.S., and J.P. Koplan "The Continuing Epidemic of Obesity in the United States." *JAMA* 284(2000):1650-1651.

Morales, L.S., Lara, M., Kington, R.S., and R.O Valdez. 2002. Socioeconomic, Cultural, and Behavioral Factors Affecting Hispanic Health Outcomes. *Journal of Health Care for the Poor and Underserved*, 13(4): 477-503.

National Center for Education Statistics. "Digest of Education Statistics." Washington, DC: US Department of Education, Office of Educational Research and Improvement, 1996; NCES publication no. 96-133.

Salmon, J., Timperio, A., Telford, A., Carver, A., and D. Crawford. 2005. "Association of family environment with children's television viewing and with low level of physical activity." Obesity Research **ad**(11):1939-1951.

Schroeter, C. House, L., and A. Lorence. Fruit and Vegetable Consumption Among College Students in Arkansas and Florida: Food Culture vs. Health Knowledge. *International Food and Agribusiness Management Review* 10(3)(2007): 63-89.

Schroeter, C., Anders, S., and A. Carlson. 2011. "Food Culture and Healthy Eating." Selected paper, presented at the Annual Meeting of the Agricultural & Applied Economics Association, Pittsburgh, PA, July 24-27, 2011.

Schwitzer, A.M., Bergholz, K., Dore, T., and L. Salimi. "Eating Disorders Among College Women: Prevention, Education, and Treatment Responses." *Journal of American College Health* 46(1998):199-207.

Segal, L. "California s ranks 30th heaviest in the country, according to a new report that finds America's obesity epidemic is getting worse." *Trust for America's Health.* HeathyAmericans.org, August 29, 2006.

Science Through Translational Research In Diet and Exercise (STRIDE), STRIDE Research. Retrieved from the WWW on October 4, 2011: http://stride.calpoly.edu/research.html

Racette, S.B., Deusinger, S.S., Strube, M.J., Highstein, G.R., and R.H. Deusinger. "Weight Changes, Exercise, and Dietary Patterns During Freshman and Sophomore Years of College." *Journal of American College Health* 53(2005):245251.

Strauss, R.S. and J. Knight. 1999. "Influence of the Home Environment on the Development of Obesity in Children." Pediatrics **103**:85-95.

Stuart, A.E. Effects of Media-Endorsed, Thin-Ideal Body Image on Women's Self-Esteem." *Modern Psychological Studies* (1996):67-76.

Suminski, R.R., Petosa, R., Utter, A.C., and J.J. Zhang. "Physical Activity Among Ethnically Diverse College Students. *Journal of American College Health* 51(2002):75-80.

U.S. Department of Health and Human Services/U.S. Department of Agriculture. Dietary Guidelines for Americans, 2005. 6th ed. Washington, D.C.: U.S. Government Printing Office; 2005. Retrieved from the WWW on April 12, 2007: http://www.health.gov/dietaryguidelines.

U.S. Department of Health and Human Services, National Center for Health Statistics (USDHHS-NCHS). "Prevalence of Overweight and Obesity among Adults: United States, 1999-2000." (2000). Retrieved from the WWW on October 8, 2002: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/obese/obse99.htm

Wang, S.S. 2011. Is this the End of Popping Vitamins? The Wall Street Journal, October 25.

Table 1: Descriptive Statistics of Variables (N=600)

Variable	Definition	Mean and Std. deviation
Dependent variables		
Fruits	Frequency of consuming fruit during the last 30 days	2.17 (0.61)
Vegetables	Frequency of consuming vegetables (tomatoes, carrots, onions, peppers, broccoli, zucchini, peas, fresh/cooked/frozen beans during the last 30 days where 3=1, 2, 3, 4+ times per day 2= 3-4 or 5-6 times per week 1= 1-2 times per month or 1-2 times per week	1.98 (0.61)
Demographics		
Female	=1 if respondent is female	0.57 (0.49)
BMI	Weight (kg)/ (Height (m))^2	22.38 (3.08)
Hispanic	=1 if of Hispanic or Latino descent	0.13 (0.33)
Father high income	=1 if Father's (or other male primary guardian) income is more than $50,000/year	0.29 (0.45)
Dietary Habits		
Frequent campus dining	Frequency of eating in on-campus dining halls or on-campus restaurants for more than 5 times /week	0.77 (0.49)
Frequent eating out	Frequency of eating at off-campus restaurants for more than 5 times/week	0.02 (0.13)
Supplements	=1 if intake of any vitamins, minerals, herbal products, or other dietary supplements during past 30 days	0.51 (0.50)
Lifestyle		
Vigorous activity	Frequency of performing physical activity and exercise per week, as measured by number of times involved in heavy lifting, digging, aerobics, fast bicycling (range 0-7)	2.56 (2.09)
TVPCNet_week	Number of hours spent watching TV, movies, DVDs/videos, playing video games, surfing the web for non-academic purposes during a week day	7.81 (4.71)
TVPCNet_weekend	Number of hours spent watching TV, movies, DVDs/videos, playing video games, surfing the web for non-academic purposes during a weekend day	13.48 (4.71)
Texting	Average number of text messages/day	5.11 (2.09)

Table 2. Results from the Ordered Probit Models

	Fruits		Vegetables	
Demographics	Coefficient	St.Err.	Coefficient	St.Err.
Female	0.443***	0.106	0.496***	0.105
BMI	-0.009	0.016	0.016	0.016
Hispanic	-0.289*	0.149	0.013	0.147
Father high income	-0.003	0.107	0.201*	0.105
Dietary habits				
Frequent campus dining	-0.109	0.078	0.160**	0.076
Frequent eating out	0.605	0.917	-6.092	195.82
Supplements	0.254***	0.097	0.056	0.095
Lifestyle				
Vigorous activity	0.154***	0.025	0.104***	0.024
TVPCnet_week	-0.036***	0.012	-0.015	0.012
TVPCnet_weekend	0.003	0.009	-0.015*	0.009
Texting	-0.045**	0.020	-0.019	0.019
Log-Likelihood	-505.135		-531.941	
Pseudo R2	7.97%		5.99%%	

Significance indicated by *, **, and *** at the 90%, 95%, and 99% confidence levels.