

Factors Influencing College Food Choices: Findings from a Survey of Honors College Students

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Data analysis was conducted using Fisher's Exact test or Chi-Squared analysis for categorical variables and Poisson Regression on count variables.

Participants: All students enrolled in the Honors College at a single higher educational institution in Eastern North Carolina in 2013 were invited to participate. 92 Honors Students responded, 22.8% male and 77.2% female.**Results:** FFF consumed greater amounts of sweetened beverages ($P = 0.01$), had higher stress levels ($P = 0.04$), and higher perceived caloric needs ($P = 0.03$). Perceived caloric need was also associated with more frequent snacking ($P = 0.01$). No other significant associations were identified.**Conclusion:** Despite their privileged educational status Honors students demonstrated a high frequency of unhealthy food behaviors similar to that reported in non-honors undergraduates. Overestimation of recommended caloric intake was associated with increased snacking behavior and students with higher fast food consumption also consumed sweetened beverages at a higher frequency. Despite their privileged educational status Honors students demonstrated a high frequency of unhealthy food behaviors similar to that reported in non-honors undergraduates. Overestimation of recommended caloric intake was associated with increased snacking behavior and students with higher fast food consumption also consumed sweetened beverages at a higher frequency.**Keywords:** Food Choices; Eating Behavior; Obesity**Introduction**

Eating behavior can be influenced by a number of factors in adolescents and young adults including food appeal, cravings, convenience and availability. Maladaptive eating habits especially frequent consumption of fast food and sweetened beverages have been linked to obesity and higher prevalence of cardiovascular and other disorders. This study examined factors influencing food choices amongst Honors College students in a region with high rates of obesity and metabolic disease.

Adolescents have been found to experience weight and body composition changes after they complete high school as they move through their college years [1-3]. The "Freshman Fifteen" is a popular theory that a college freshman can expect to gain 15

pounds during their first year of college. While most college freshman will not gain 15 pounds, they do tend to gain weight over the course of their college experience [4,5] with males seeing larger gains in BMI than females [2]. Declining levels of activity amongst college students have also led to increases in body fat proportion [5]. Stress has been shown to negatively affect eating patterns in college students [6,7]. Unhealthy food choices in young adults have been linked to obesity and a higher preponderance of cardiovascular risk. Obese body habitus in turn has been strongly linked to increases in risk for a number of diseases including: coronary artery disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, cancer, sleep apnea and chronic kidney disease [8,9]. A previous study of undergraduates from Eastern North Carolina demonstrated high prevalence of metabolic risk factors. In that study 44% of undergraduates screened had 2 or more metabolic

risk factors and 12.5% had 3 or more risk factors. The top three risk factors of low high-density lipoprotein, overweight BMI status and inactivity were equally prevalent at a rate of approximately 27% [10].

Studies in adolescents and young adults (AYA) found body image or “self-appearance” to be a strong motivator for food behavior. Other factors such as food appeal; convenience and availability; parental, cultural and environmental influences; and for some individuals health consciousness also affect food choices and behaviors [11,12]. Kim., et al. utilized the Health Belief Model to determine that nutritional knowledge affects nutritional confidence which influences intention to eat healthy food and to increase physical activity [13]. Nutritional knowledge and female gender have been associated with healthier snacking practices [14,15]. Studies find that females tend to have higher nutritional awareness at an earlier age than males. In addition more females than males agree unhealthy things should be limited in their diet [16]. Females in general tend to drink fewer sweetened beverages (SB), although findings vary by study [17-20].

In the United States, data on effectiveness of interventions aimed at changing college students’ eating habits demonstrate promising outcomes, but few durable long-term results Deliens., et al. [21] in a systematic review found one study on college students focusing on eating competence and body acceptance which exerted long term effect on eating behavior. College students who take the time to prepare their meals eat less fast food and are more likely to meet dietary objectives for fat, calcium, fruit, vegetable, and whole grain consumption [22].

Unfortunately food preparation is done infrequently by young adults in the modern era with lack of time being the most frequently reported barrier. Plotnikoff., et al. 2015 [23], in a systemic review of interventions in university and college students found that shorter interventions spanning a semester (12 weeks) or less, targeting a single rather than multiple factors demonstrated higher success in influencing behavior. Similar to our study there was a strong bias towards female participants in nutritional interventions.

This study examined a sample of Honors Students at East Carolina University relating college associated factors such as course load, type of housing, usage of meal plans, and stress levels; to food choices amongst frequent and infrequent fast food consumers. We identified the Honors cohort as a potential intervention group who could model effective healthy behaviors. We theorized that the Honors College cohort should demonstrate healthier eating habits and a higher degree of nutritional literacy. The goal of this study was to better understand factors, whether related to the college environmental substrate and to educational and behavioral motivations that influence food choices in this particular subgroup of young adults. This understanding can be utilized to modify environmental factors and to tailor embedded curricular interven-

tions such as the Health 1000 course requirement to better support adaptive behavioral changes in food habits. Effective interventions could subsequently be disseminated through this cohort to other undergraduates.

Materials and Methods

An observational cohort study using an 18 question survey was administered via a Qualtrics Survey tool from April to June 2013 utilizing the Honors College’s listserv to include Honors College students in an exploratory sample. The survey was self-administered, internet distributed, and the results were collated over a two month period to allow students adequate time to respond. The survey was developed using a selection of previously published and validated questions from the PROJECT EAT-II Survey for Young Adults [24]. The survey collected self-reported data on the following: frequency of fast food intake, sweetened beverage intake, snacking frequency, exercise frequency, smoking, stress level, course load, use of pre-paid dining plan and type of housing. Demographic information on height, weight, gender, race, family history of diabetes, and cardiovascular disease was also collected. BMI was calculated from self-reported height and weight measures.

For this survey fast food intake was further defined as “eating food from a fast food restaurant either on or off campus”, snacking as “eating in between meals” and sweetened beverage as “soda, juice, smoothie, caffeinated drink, etc.”. Survey participants were asked to identify the correct My Plate proportions [25] and to identify the recommended daily caloric intake for men and women of their age group.

Respondents were stratified by frequency of fast food intake into 2 groups: Frequent fast food consumers (FFF)- 3 times or more per week versus infrequent fast food consumers (IFF) - less than 3 times per week; and by BMI status. Outcomes of interest were differences in food and exercise habits (snacking, SB consumption, activity level) and food knowledge between these groups.

Question responses were summarized using counts and percentages for categorical variables; and mean and standard deviation for continuous variables. Comparisons of categorical variables were performed by Chi-Squared Test or Fisher’s Exact Test. Associations where outcome variables gave count data were tested by Poisson Regression, adjusted for race and sex. Relative risk measure is given where appropriate. Statistical analysis was conducted using SAS® 9.4 [26] with an alpha level of 0.05 considered significant ($P \leq 0.05$). This study was approved by the University and Medical Center Institutional Review Board of East Carolina University.

Results

Ninety-two Honors Students responded to the Qualtrics survey out of which 22.8% were male, 77.2% female, 80.4% White, 3.3% Black, 13.0% Asian, and 3.3% Other (See Table 1). The average Body Mass Index (BMI) was 24.0 (SD: 2.8) for males and 22.9 (SD: 3.3) for females ($P = 0.42$). By BMI category 5% of the sample were

underweight, 68.4% normal weight, 23.9% overweight and 2.2% obese. There were no smokers in this group.

Of the sampled cohort 58% lived on-campus and 61% had a campus meal plan. High activity levels with participation in 150 minutes or more (≥ 2.5 hours) per week of moderate to strenuous physical activity was endorsed by 47.8% of participants. Low activity levels with 120 minutes or less (≤ 2 hours) per week of mild intensity physical activity was reported by 43.5% of participants. Half of participants (50%) reported above average stress levels. Fifty-six percent (56.5%) reported having fast food 3 or more times a week, 50% drank 5 or more sweetened beverages (SB) the prior week, and 57.6% snacked 2 or more times the prior day. Females drank SB with higher frequency compared to males ($P = 0.02$, See Table 1).

	East Carolina University Honors Students	East Carolina University Undergraduates	Eastern North Carolina Adolescent Young Adult [25]
Male	22.80%	42.60%	49.40%
Female	77.20%	57.40%	50.60%
White	80.40%	75.60%	58.90%
Black	3.30%	17.7%	31.20%
Asian	13.00%	NA	NA
Other	3.30%	6.7%	9.90%
Obese	2.20%	3.60%	21.80%
Overweight	23.90%	20.50%	32.20%
Normal weight	68.40%	68.80%	34.70%
Underweight	5.00%	2.90%	11.30%

Table 1: Demographics of Honors Cohort compared to young adults in Eastern North Carolina and ECU Undergraduates.

About a third of students (34.8%) correctly identified ADA recommended daily caloric intake. Twenty three percent of participants overestimated caloric intake and 42.4% underestimated recommended caloric intake.

Approximately a quarter of males (28.6%) and 36.6% of females correctly identified recommended caloric intake. Although a tendency was noted gender did not significantly affect the students' ability to correctly identify goal caloric intake ($P = 0.61$). When stratified by frequency of fast food intake, a higher number of IFF 40% compared to FFF (30.8%) correctly identified recommended caloric intake.

FFF accounted for 56.5% of the sample. FFF did not significantly differ from IFF in BMI with average FFF BMI of 23.4 compared to average IFF BMI of 22.8 ($P = 0.92$, SD 3.2). Out of 52 FFF 19.2% were male and 80.8% were female, statistically similar to the IFF group (RR=1.24, 95% CI 0.76-2.02, $P = 0.45$). As a group FFF consumed greater amounts of SB ($P = 0.01$), had higher stress levels ($P = 0.04$), and higher perceived caloric needs ($P = 0.03$) than IFF

(See Figures 1,2,3). Conversely these individual variables did not demonstrate a significant effect on the number of times an Honors student ate fast food. There was no significant differences in activity level between the FFF and IFF groups.

Figure: 1-3

Poisson regression showed student's guesstimation of recommended daily caloric intake was positively associated with the reported snacking frequency for the past day ($P = 0.01$). There was also a statistically significant difference in consumption of SB between males and females with females more likely to consume SB at higher frequency ($P = 0.02$, Figure 4). No difference was seen, however between males and females for frequency of fast food. BMI was not statistically associated with differences in any outcome variable.

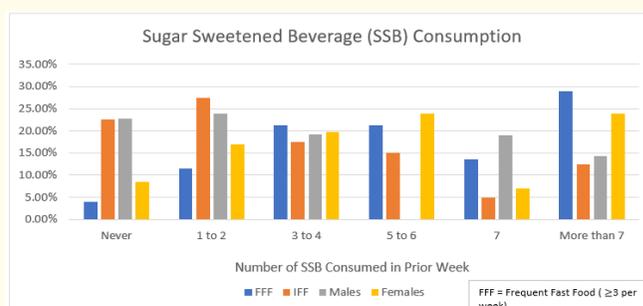


Figure: 4

Discussion

The college student is in a uniquely pivotal time of development due to the immersive environment, separation from previous influences, exposure to new pressures and consolidation of independent decision-making skills.

This is a period for potential significant change in perspective, beliefs and behavioral patterns. Simultaneously there appears to

be an acceleration in rates of obesity that begins during the transition from late adolescent years (~17%) to early adulthood (~33% between ages 20-39 years) which peaks in late middle age (36 - 40% between ages 49 - 60 years) [27-29]. Improving nutritional competence and encouraging personal agency and intentionality in food selection and preparation through components of existing college health curriculum remains a suitable strategy. The higher education system provides an accessible platform in which interventional studies can be conducted targeting motivated student populations such as the Honors student cohort. Basic concepts of health and exercise are already incorporated into the curriculum for undergraduates at East Carolina University through a requirement of 3 semester credit hours of health and exercise [30]. We identified the Honors cohort as a sub-population who potentially have higher resilience due to advantages in education and socioeconomic status. Acceptance into an honors cohort suggests that these individuals will demonstrate higher engagement and may respond faster to strategies enhancing nutritional and food literacy.

The Honors cohort are also well positioned to serve as effective change agents in due to their status as peer leaders.

Contrary to our expectations, this study found a high proportion of FFF, snackers, and SB consumption amongst Honors College students with frequencies comparable to that reported in literature for other young adult populations [31-35]. The percent of obese and overweight individuals in the Honors cohort was comparable to that of the general undergraduate group, but much lower than that observed in the overall Eastern North Carolina AYA population [36]. The reason for this finding is unclear, but could represent differences in socioeconomic status of young adults engaged in higher education with higher availability of healthier food options. Other studies have shown that campus meal plans may improve availability of healthy food options [37]. This study did not however demonstrate association between BMI and between on-site living or FFF and on-site living. Underrepresentation of African Americans in the college cohort with differences in culturally acceptable weight status and in traditional dietary choices may be another factor for their lower overall weight status. Over representation of females who traditionally have greater exposure to food preparation training and food economy with possibly greater food knowledge, higher frequency of food preparation and higher pressure to achieve lower BMI status could also theoretically influence this finding. Unlike findings in other studies, body mass index in this cohort was not significantly associated with fast food consumption, snacking, intake of SB or activity level. Further investigation into these lack of associations with higher sample size is needed.

We theorized that higher stress levels or heavier course loads in the Honors cohort would correspond to more frequent fast food intake. In fact other studies of AYA have found that stress is related to unhealthy food behaviors such as binge eating [6,7,38]. FFF in this study did report higher stress levels (Figure 2), however we did not find a significant difference between FFF and IFF in terms of

potential college associated stresses such as course load, on- or off-site housing, or easier availability of food due to enrollment in pre-paid college dining plans. Fast food consumption itself may serve for some honors students as a maladaptive stress relief mechanism although this was not elucidated in our study. Other dynamics such as resilience when faced with change, cultural expectations, and differences in economic status could potentially be factors leading to higher stress in FFF, but would need further investigation.

FFF in this cohort reported statistically higher consumption of SB and a higher perceived caloric need (See Figures 1,3). Males and females in the Honors group demonstrated similar degree of knowledge regarding recommended caloric intake and "My Plate" knowledge. A statistically significant positive association was also observed between a student's perceived caloric needs and reported snacking frequency ($P = 0.01$). This data is in accordance with the findings by Zaborowicz, *et al.* that nutritional knowledge and perception were important factors in determining healthier food choices [14]. The finding that FFF were more likely to over-estimate goal caloric intake suggests that the perception of a higher goal intake may lend itself to a permissive attitude towards food behaviors favoring convenience and taste appeal over health and nutrition. Fast food purchases may commonly be accompanied by purchase of a SB either as part of a "meal deal" or out of convenience further compounding an unhealthy food choice.

Females in the Honors cohort consumed SB at a higher frequency than males, a finding contrary to that from other studies of adolescents and young adults (AYA) which have demonstrated a higher tendency for males to drink SB than females [18-19] and for females to demonstrate better awareness of the need to reduce sugar in their diet [14,16]. Females were also 24% more likely to have frequent fast food consumption; however, this finding was not significant. Higher consumption of SB by females in the Honors cohort may be related to gender specific responses to college-driven time constraints, body image, or social pressures resulting in meal skipping with replacement of more nutritive meals with caloric beverages. Easy availability of heavily sweetened beverages on campus from chain vendors such as Starbucks, overall higher socioeconomic status and relative financial freedom of Honors College students, combined with female social behaviors such as going out with friends for coffee could be other reasons for this finding. Regional studies showed higher soda intake in the South compared to other regions [20] therefore this result could also be driven by regional differences in food culture or food resources. Bremer *et al.* found that SB consumption in females had a significant impact on insulin resistance, which was not observed in males [17]. In light of the impact of SB consumption on risk of insulin resistance particularly in females this is an important finding that needs to be addressed.

This study is limited because of the self-reported nature of the data which is prone to recall bias and possibly perceptual bias. The demographics of the cohort also do not reflect the demographics

of the surrounding region due to under-representation of Blacks and males. (See Table 1), which limits the generalizability of the study. Our sample skew reflects in part the demographics of the undergraduate class, but could also reflect a bias in that females and whites may be more willing to respond to surveys (see Table 1). Survey questions were limited due to the categorical nature of many of the questions which makes it difficult to interpret effect size.

Snacking behavior did not differentiate between healthy versus unhealthy snack items, which limits interpretation, although the assumption is that snacking denotes unhealthy food behavior. We were unable to determine whether higher nutritional literacy actually motivated healthier eating behavior. Small sample size may have limited ability to detect associations between some individual variables.

Conclusion

Regardless of higher educational status, availability of basic health curriculum, and relatively richer resources Honors College students still reported a high frequency (50% or more) of unhealthy food behaviors such as fast food consumption, snacking and high intake of SB - similar to other undergraduates. Overestimation of caloric requirements in this group may contribute to a more permissive attitudes towards these unhealthy behaviors. A better understanding of the motivations for different food choices in this cohort with attention to environmental and cultural influences is needed. Due to their unique characteristics and potential influence on the larger AYA group, the Honors College cohort remains a promising group for further study of food behavior interventions, however future studies will need to selectively recruit for inclusion of African Americans and males as they remain under-represented in studies of food behavior.

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Conflict of Interest

The authors have no conflicts of interest to disclose.

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