

# Food Purchasing Behaviors and Food Insecurity among College Students at The University of Texas at San Antonio

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**Abstract** A decline in diet quality observed in college students can be attributed to consuming less than the recommended amounts of primary food groups (dairy, fruit, vegetables, and grains) and higher intakes of sweetened beverages. The investigation of food purchasing behaviors may help explain the potential influences, like food security and access to healthy food that may be causing the shift in dietary patterns. This study used receipt analysis and assessed food security in a cross-sectional sample of 258 undergraduate and graduate students. Food security questionnaires and seven-day food and beverage receipt logs were analyzed. Over half of the sampled population were between 21-25 years of age, of which a majority were undergraduates and lived off campus. Results showed that almost a third of the students were classified as having either very low (11.6%) or low (19.4%) food security. The largest amount of money was spent on grocery store purchases. The highest frequency of purchases occurred at fast-food venues and included a sugar-sweetened beverage and fried food. Gender differences were found in fast-food purchases, with males spending an average of \$19.27 and females spending an average of \$18.29 per week. However, no significant gender differences in the frequency of purchases made at grocery stores, convenience stores, fast-food restaurants, sit-down restaurants or campus dining venues. Moreover, students living in off-campus apartments purchased significantly more fruits and vegetables than students living with parents. The study findings indicate that purchasing patterns persist across levels of food security and for all levels are compounded by less than optimal purchasing of fruit and vegetables.

**Keywords:** food security, college student health, food purchasing

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## 1. Introduction

Food purchasing behavior influences and may provide insight into dietary intake of a selected population. Food purchasing behavior among undergraduate and graduate-level college students is intriguing as changes to dietary patterns often result in a decrease in overall diet quality [1]. Dietary pattern changes that occur during the transition into young adulthood often result in a decrease in overall diet quality. Numerous studies have identified the trends of limited fruit and vegetable consumption and high fatty food consumption by college students [2,3,4]. In fact, college students often report consuming less than the recommended amounts of primary food groups, including grains, fruits, vegetables, dairy and meat(s) [2,5,6]. The 2010 National College Health Assessment found that only 6% of college students consumed the recommended daily serving of fruits and vegetables [2]. Furthermore, previous research has indicated caloric imbalance and high intake of sweetened beverages is common among college students [7,8] and has been associated with weight gain [9]. Overall, serious health issues may arise with limited

fruit and vegetable intake and high intake of sugar-sweetened beverages. This shift in dietary patterns away from nutrient dense foods may stem from a variety of factors that influence food purchasing behavior, including food security, access to healthy food and low income level. In 2012, 41% of US 18 to 24 year olds attended a two or four year degree-granting institution with many depending on financial aid [10]. The 2014 Hunger in America report stated that out of 33.7 million of their clients receiving food assistance 2.1 million of them were full time college students [11]. By examining the food purchasing behaviors of college students, appropriate environmental, educational, and dietary intervention methods can be developed [12]. Food insecurity is common among college students and indicates inadequate access to food, as related to income, location, or food cost [13,14].

In 2013, 14.3% of US households and 18.0% of Texas households were reported as food insecure, with household income at or below the poverty line as a primary risk factor [13,15]. In contrast, almost a third (31%) of the participants in this study were classified as having very low or low food security. Research suggests that food insecurity, including college student food insecurity, is

associated with causal factors such as low income, poor financial management and poor time management, and results in a variety of health and academic issues [16]. Food insecurity is also associated with overeating and obesity [16]. Understanding the degree of food insecurity among college students, and its association with food purchasing, supports effective intervention planning for this population.

Purchasing behavior can be defined through trends and patterns, which are determined by evaluating food and beverage purchases [17]. These patterns can be observed through various methods, including 24-hour recalls, food frequency questionnaires and receipt analysis, which evaluates type, expense, and location of food purchases. Most research on health among college students focuses on assessing dietary patterns through self-report. Research that assesses actual food purchases does not also assess related factors like food security [3,5,18,19].

Documenting food purchasing behaviors such as where and what type of food is purchased, and how much money is spent per food outlet, can enhance the understanding of college students' dietary habits [20]. This study (1) used receipt analysis to determine food purchasing behavior among college students attending the University of Texas at San Antonio, (2) explored food security levels among the study population, and (3) determined if food purchasing behavior is associated with food security levels among the study population.

## 2. Methods

This cross-sectional study included undergraduate and graduate students from a large university (30,258 students) in the south central region of the US. Emails were sent to 15 instructors of undergraduate and graduate courses from a variety of study areas to recruit classes. Eight classes total participated in this convenience sample of the target population. Recruitment emails with study instructions and informed consent language were sent to all students in the selected classes. Students were asked to complete an online questionnaire and a receipt log. Participation was incentivized through the offer of extra credit; students were also provided an alternative extra credit opportunity. Students were given a two-week period of time to complete the study documents and each participant was identified by a randomly assigned code upon submission of study materials. Data were excluded if online questionnaire and receipt log were incomplete, or the personal identification codes did not match. The study was approved by the Institutional Review Board of the University of Texas at San Antonio.

### 2.1. Measurement

Participants completed an online questionnaire with questions about demographic variables, purchasing patterns, sources of income and methods of payment for purchases. Participants also completed the US Adult Food Security Survey Module (AFSSM), which was validated in 2006 by Gulliford, Nunes and Rocke [21]. The AFSSM was modified by the National Center for Health Statistics (NCHS) into a 6-question assessment. The survey classified participants into three groups based on food security score: 0-1 (very low food security), 2-4 (low food security), and 5-6 (high or marginal food security).

A receipt log was used to collect all food and beverage purchasing data for a 7-day period of time. The receipt

analysis methodology was selected and adapted based on previous research assessing food purchasing behaviors. [17,22,23] Study participants attached receipts from food purchases to the pages of a logbook that posed three questions concerning each purchase: 1) what was purchased? 2) for whom was the purchase made? and 3) how was the food purchased? The cost per week of food and beverage purchases was calculated by totaling the amount spent per receipt throughout the 7-day period of time. Additionally, all purchases made at each of the seven following locations were summed: grocery store, fast-food restaurant, sit-down restaurant, on-campus food outlet, convenience store, vending machine, and bar. To categorize purchases, a coding structure of themes and subthemes was developed based on a food index adapted by the research team [17]. Two coders were given background information on the study, a list of the potential index categories and a rating sheet. The rating sheet was used to assess the feasibility of coding food items for this study. After food and beverage items from submitted receipts were coded, the principle investigator and lead coder met and reconciled differences.

Statistical analyses were conducted using SPSS version 20 [24]. Descriptive statistics were utilized to assess demographic characteristics of the sample. Independent t-tests and one-way analysis of variance were used to examine the differences and associations between food purchasing behaviors and food security levels.

### 2.2. Strength and Limitations

This study has a variety of strengths. This study incorporated two methods to evaluate purchasing behavior: (1) online questionnaire and (2) receipt analysis, and the latter incorporated all possible food outlets. Only one known study has included such a breadth of food outlets in receipt analysis [17]. Additionally, the present study assessed level of food security and included an analysis of weekly spending patterns to capture typical food purchasing behavior. The only other known assessment of food security on a college campus collected general monthly spending patterns [25]. Finally, evaluating food and beverage purchasing behavior provides an objective measure of dietary patterns [17].

Limitations of this study include the collection of cross-sectional survey data, the use of a convenience purposeful sampling technique, small sample size, short duration, and unknown reliability of receipt collection. Additionally, while the week-long duration of receipt analysis provides specific information about purchasing behavior, the data collected might be impacted by the timing of the participant's income cycle, financial aid distribution, current job status, inconsistent shopping patterns, and monthly schedule. Finally, the index categories were based on the categories identified in the literature and populated by emergent data, however, the index is not able to pick up on all food categories.

## 3. Results

### 3.1. Participants

A total of 258 college students (155 female/103 male) completed both the questionnaire and receipt log. The

sample was majority Hispanic 129 (50%), which is reflective of the south Texas region. Participants represented a wide age range, with over half of the sampled population between 21-25 years of age. Additionally, both undergraduate 215 (83%) and graduate 39 (15%) students were included in the study.

Results from the online questionnaire indicated that the majority of the students lived in an off-campus apartment or house, with about a quarter living with a parent or

relative. Study participants reported a variety of income sources, with many indicating multiple sources of income. Almost a third of the participants were classified as having either very low (29 or 12%) or low (49 or 19%) food security; however, only nine participants (4%) reported receiving aid from government assistance programs. In total, 178 (69%) participants were classified as high or marginal food security.

**Table 1. Study population and food security levels.**

Food Security Classifications	Study population n (%)	Texas %	United States %
Very low/low food security	80 (31)	17.4	14.7
High/marginal food security	178 (69)		
Total	258 (100)		
Age	n		%
18-20	37		14.3
21-25	159		61.6
26-55	49		24
Gender	n		%
Male	103		39.9
Female	155		60.1
Marital Status	n		%
Single	230		89.2
Married	28		10.9
Student Classification	n		%
Graduate	39		15.1
Freshman	2		0.8
Sophomore	26		10.1
Junior	89		34.5
Senior	98		38
Special student	4		1.6
Ethnicity	Study population (%)	University population (%)	US College student population (%)
Asian	9 (3.5)	5	6
African American	32 (12.4)	8.1	14
White	76 (29.5)	33.1	61
Hispanic	129 (50)	44.1	13
Other	12 (4.7)	9.5	6

### 3.2. Receipt Log Analysis

Analysis of receipt log data revealed weekly patterns in location, category and frequency of food and beverage purchases. Of the 258 study participants, 209 (81%) submitted at least one receipt for fast-food venues, 216 (83.7%) purchased at least one sugar-sweetened beverage, and 184 (71.3%) purchased at least one fried item (Table 2). Fruit and vegetable purchases were made by 143 (55.4%) of participants. On average, \$18.68 (SD = \$20.39) was spent at fast-food venues per week, \$43.98 (SD = \$54.70) at grocery stores and \$15.97 (SD = \$26.15) at restaurants (Table 2). Overall, the receipt logs identified no significant differences between the total amount spent on fast food, restaurant, and grocery purchases. Minimal differences were found based on gender for fast-food purchases, with males spending an average of \$19.27 and females spending an average of \$18.29 per week.

### 3.3. Food Purchasing Questionnaire

Participants reported monthly spending patterns for grocery and fast-food purchases using the online questionnaire. As reported on the questionnaire, most (81%) participants reported visiting fast-food restaurants

1-2 times per week, 37.6% of participants reported purchasing meals on campus 1-2 times per week, and 78.7% reported shopping at a full grocery store 1-2 times per week. Participants reported that they most typically purchased food from fast-food venues (81%), grocery stores (71.7%) and restaurants (48.8%), but some also purchased food from on-campus fast-food venues (33.3%), on-campus dining venues (29.1%) and convenience stores (22.5%).

### 3.4. Food Purchasing Behaviors

Each category of food and beverage purchasing behavior was compared with student characteristics to assess differences. No significant differences were found between the frequency of purchases made at grocery stores, convenience stores, fast-food restaurants, sit-down restaurants or campus dining venues based on gender, living arrangement, student classification or level of food security. In contrast, significant differences were found among the frequency of restaurant purchases based on student classification, with graduate students purchasing from restaurants significantly more than undergraduate students (Table 3,  $t = 2.80$ ,  $p < 0.01$ ) and undergraduate students purchasing from on-campus dining significantly more than graduate students (Table 3, follow-up Tukey

test,  $t = 3.04$ ,  $p < 0.01$ ). Significant differences were also found based on living arrangement, with students living in off-campus apartments purchasing on-campus dining

significantly more than students living with parents (Table 4, post-hoc Tukey test,  $F [2,255] = 4.08$ ,  $p < 0.05$ ,  $\eta = 0.018$ ).

**Table 2. Frequencies of Food Purchasing Behavior as Per Receipt Analysis**

Receipts by Venue (number of participants that submitted at least one receipt per venue)					
Food Venue Type	N	%			
Fast-Food Venues	209	81.0			
Grocery Stores	185	71.7			
Restaurants	126	48.8			
On-campus Fast-Food	86	33.3			
On campus Dining	75	29.1			
Convenience Stores	58	22.5			
Food index categories					
Entrees	Side items	Combo meals			
Value/dollar menu items	Fried items	Tex/Mex items			
Water/no calorie beverage	Alcohol	Caffeinated beverages			
Sweetened beverages	Grocery items	Vegetables/fruit			
Grocery entrée/mixed dish	Discretionary salty/sweet	Meat/poultry/legumes			
Dairy	Grains	Eggs			
Significant findings from food index categories					
	N	%			
Fruits/Vegetables	143	55.4			
Caffeinated Beverages	74	28.7			
Sweetened Beverages	216	83.7			
Fried items	184	71.3			
Fast-food Value/Dollar menu items	37	14.3			
Money Spent per Venue by Receipts					
Venue	Minimum	Maximum	Mean	Median	Std. Deviation
Grocery	\$ .00	\$300.63	\$43.98	\$23.88	\$54.70
Fast-Food	\$ .00	\$152.90	\$18.68	\$12.76	\$20.39
Restaurant	\$ .00	\$150.31	\$15.97	\$ .00	\$26.15
Campus Dining	\$ .00	\$36.69	\$4.78	\$ .00	\$7.42
Vending Machine	\$ .00	\$1.50	\$ .01	\$ .00	\$0.13
Convenience Store	\$ .00	\$77.84	\$1.85	\$ .00	\$6.29
Bar	\$ .00	\$37.50	\$ .92	\$ .00	\$4.92

**Table 3. Food Purchasing Behaviors by Student Classification (n=258)**

Food purchasing behaviors	Mean per week (SD)			F	P < .05
	On-campus	Off-campus	Off-campus with Parents		
Campus dining frequency	1.50 (1.73)	1.48 (1.80)	.90 (1.33)	4.08	0.018
Fruit/vegetable purchases	4.17 (6.60)	3.91(4.85)	2.05 (3.59)	3.88	0.022
Money spent on campus dining	\$7.62 (\$9.77)	\$6.61 (\$9.43)	\$3.96 (\$6.27)	4.01	0.019

**Table 4. Food Purchasing Behaviors by Students' Living Arrangement (n=258)**

Food purchasing behaviors	Mean per week (SD)		t	P
	Undergraduate	Graduate		
Restaurant frequency	.72 (1.01)	1.28 (1.78)	2.80	< .01
Campus dining frequency	1.19 (.97)	.41 (1.54)	3.04	< .01
Money spent on restaurants	\$14.33 (\$23.66)	\$25.17 (\$36.19)	2.41	< .05
Money spent on campus dining	\$5.31 (\$7.76)	\$1.76 (\$3.96)	2.79	< .01

No significant differences were found between purchases of foods in the index categories (fruits and vegetables, sugar-sweetened beverages, fried items, caffeinated beverages and value/dollar menu items) based on gender, student classification or level of food security. In contrast, significant differences were found based on living arrangement, (Table 4, post-hoc Tukey test,  $F[2,255] = 3.88$ ,  $p < 0.05$ ,  $\eta = .022$ ), with students living in off-campus apartments purchasing significantly more fruits and vegetables than students living with parents.

No significant differences were found between the amount of money spent at grocery stores, fast-food

restaurants, sit-down restaurants and campus dining venues based on gender, living arrangement, student classification, or level of food security. Significant differences were found between the amount of money spent on food and beverage purchases based on living arrangement, with graduate students spending more at restaurants than undergraduates (Table 3,  $t = 2.41$ ,  $p < .05$ ), students residing in off-campus apartments spending more at campus dining venues than students living with parents (Table 4, follow up Tukey test,  $F[2,255] = 4.01$ ,  $p < 0.05$ ,  $\eta = .019$ ) and undergraduate students spending more at



campus dining venues than graduate students (Table 3,  $t = 2.79, p < .01$ ).

## 4. Discussion

The present study revealed several key findings. The students surveyed most frequently purchased food and beverages from fast-food venues, although they spent more money at grocery stores. During the week in which they logged receipts, most of the students purchased at least one sugar-sweetened beverage and one fried item, and almost half did not purchase any fruits or vegetables. Significant differences were found for food purchasing behaviors based on living arrangement and student classification, which suggests food availability differences among these groups. Student both living on-campus and off-campus spent more money of fruits and vegetables than did students living off-campus with parents. In contrast, no significant differences were found for food purchasing behaviors based on gender or level of food security.

In the present study, a majority of the students purchased food from fast food restaurants at least once a week. Previous studies have demonstrated that college students purchase fast-food approximately 1-3 times per week, but purchase frequency can be as high as 6-8 times per week [26,27]. Suggested reasons for the high frequency include convenience [28], time constraints, inclination to eat with others and the belief that fast-food is inexpensive [26]. Moreover, if fast-food is a major part of the college student lifestyle, nutrition education programs should focus on informing students about the nutritional content of fast-food menu items in order to help them make healthier choices when purchasing at these venues. Eating patterns are commonly maintained from college throughout adulthood [6].

The variation in food purchasing behaviors found based on living arrangement could be attributed to the difference in primary shopper of the household. The small difference between grocery and non-grocery (on average \$1.77) suggests that college students contribute a comparable amount of money to both.

Food security was a concern within the group of students surveyed. This finding is consistent with other studies that have demonstrated almost a quarter of college students in the US to be food insecure [25]. Rarely is food purchasing behavior evaluated based on level of food security; therefore, little is known about the relationship between these two variables. In a study using concept mapping to determine the influence of food security on food purchases, Walker and Kawachi demonstrated similarities in purchasing patterns between food secure and insecure populations [29]. Most interestingly, the present study revealed no significant differences between food purchasing behavior based on level of food security, indicating that both food secure and insecure individuals have similar purchasing patterns. One possible explanation for this similarity is the influence of environmental factors on food purchasing behavior. Environmental factors such as food availability, marketing, convenience, and social pressure may lead college students to purchase similar types of foods regardless of financial status [30].

Significant differences were found in food purchasing behavior based on living arrangement and student classification. Graduate students purchased more often from and spent more money at restaurants compared to undergraduate students. This could be explained by potentially higher income among graduate students. Undergraduate students purchased more often from and spent more money at on-campus dining venues compared to graduate students. This could be explained by class schedules that offer undergraduate classes during the day, multiple times per week, placing undergraduate students on campus more often during daytime hours. Furthermore, graduate students living on their own could struggle with the skills needed for meal preparation [31]. This study did not find significant differences in food purchasing behavior based on gender or other demographic characteristics, and this could be due to the similarity of food environments experienced by students across these groups.

Receipt analysis is a promising method for assessing food purchasing behaviors, and provides an alternative to methods that rely on self-reporting of data. Although the collection and analysis of receipts is labor intensive, it is less time consuming than food diaries. Technological improvements like smartphone applications and scanning of receipts could make the process more efficient. Additionally, previous research indicates that even with limited reminders from researchers and minimal incentives, participants complete receipt collection [23].

## 5. Conclusion

Based on results from receipt analysis, this study demonstrates that college students typically spend similar amounts of money on grocery and non-grocery foods, while visiting fast-food restaurants more frequently than other venues. Analysis of purchases by food index category indicates that college students are commonly purchasing at least one sugar-sweetened beverage and one fried item per week, yet only a little over half of the students purchase fruits and vegetables. In addition, a high incidence of food insecurity exists within this population.

Documenting college student food purchasing behaviors may assist nutrition professionals in targeting educational efforts to improve food and beverage choices and food budget management. Due to the high amount of money spent by college students on grocery purchases, educational programs should address the types of foods and beverages purchased from grocery stores, emphasizing a cost-effective shopping strategy that increases fruit and vegetable purchases and decreases sugar-sweetened beverage purchases. By developing strategies to decrease fast-food consumption and increase fruit and vegetable intake, college students may learn to sustain positive behaviors throughout their life.

It is important to understand that there is a large interaction between individuals, their living situation, and their food environments. The influences of environmental factors (e.g. food costs, food policy and food culture) are interrelated and always changing, which may impact individual food purchasing behavior. In the present study, only the individual and community level factors (location of purchases, amount of money spent and specific items

purchased) were examined. Research employing a social-ecological approach is needed to examine the influence of upper-level environmental factors on food purchasing behaviors among college students. Such an approach would yield insight about all levels of the university food environment.

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## Statement of Competing Interests

The authors have no competing interests.

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