

PREVALENCE AND ASSOCIATED FACTORS
OF FOOD ACCESS AMONG
COLLEGE STUDENTS

by

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OF FOOD ACCESS AMONG
COLLEGE STUDENTS

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ABSTRACT

Background. The USDA defines food insecurity as when individuals lack the resources and money to obtain food in socially acceptable ways. As of December 2020, 10.5% of the U.S. population is food insecure, with an average of 39.7% food insecurity on college campuses, specifically. There are limited studies regarding food insecurity at private universities.

Objective. To identify the rate and distribution of food insecurity at a private university in North Texas and to analyze the demographic, socio-economic, and other factors associated with food insecurity among college students.

Methods. For this cross-sectional study, participants completed a one-time online survey. Participants had to be current students at the university and at least 18 years of age. The survey included sociodemographic questions and the validated USDA Adult Food Security Survey Module to measure food insecurity status. Independent-samples t-tests were used to compare the mean scores of continuous variables and chi-square tests of independence were used to analyze associations between sociodemographic variables and food insecurity.

Results. Of the 353 participants in the study, 22.4% were categorized as food insecure. Participants who are older ($p=0.006$), non-binary ($p=0.001$), people of color ($p=0.259$), veterans ($p=0.032$), graduate students ($p=0.005$), upperclassman ($p=0.001$), those that live alone or with their children only ($p=0.003$), international students ($p=0.367$), and those with more financial aid ($p=0.005$) were more likely to be food insecure. Only 30.4% of food insecure participants were aware of resources on or near campus where they could obtain help to get food, and only 16 out of the 79 food insecure participants had ever utilized those resources.

Conclusions. More studies are needed regarding food insecurity at private universities. However, there is sufficient data based on the current study to take action to address food insecurity at this university by means of advocacy, dissemination of resource information, and the addition of new resources, such as an on-campus food pantry.

Keywords: food insecurity, food security, hunger, food access, college campuses, college students, university students, North Texas, COVID-19, survey

CHAPTER I

INTRODUCTION

ii. Defining Food Insecurity

The United States Department of Agriculture (USDA) defines food *security* as “access by all people at all times to enough food for an active, healthy life”.¹ Alternatively, food *insecurity* (FI) occurs when individuals lack the resources and money to obtain adequate food in socially acceptable ways.¹ There are three types of FI: 1) marginal food security is indicated by a shortage of food or anxiety over food sufficiency, 2) low food security is when a person reports reduced variety, quality, or desirability of their diet, and 3) very low food security is characterized by reduced food intake and multiple reports of disrupted eating patterns.¹ Note: there is little change in food intake with the marginal and low types.

iii. Food Insecurity Prevalence

According to the USDA Report on Household Food Security, the rate of FI in the United States was 10.5% in December of 2020, which is the most recent data available.¹ According to a study of 10,368 U.S. adults collected in March 2020, FI in the United States increased to 38.3% during the peak of the COVID-19 pandemic.³ This study conducted during the COVID-19 pandemic used the 10-item USDA Adult Food Security Survey Module (AFSSM)² to assess FI statuses, but the questions pertained only to the last 3 months, reflecting changes due to the COVID-19 pandemic.³ A systematic review of FI on postsecondary education campuses conducted in 2016 reported the average rate of FI on college campuses in the United States to be 32.9%.⁴ A cross-sectional study at a state-funded university in Texas conducted in May 2020

collected data on FI among 502 college students during the COVID-19 pandemic.⁵ Within the 30 days before data collection, 34.5% of respondents were classified as food insecure, a ~15% increase from a similar study conducted in 2019.⁵ Collectively, these studies indicate that FI on college campuses was prevalent before the COVID-19 pandemic and has increased during the pandemic.^{4,5} FI among college students can negatively impact physical and mental health status, productivity, and academic outcomes, among other things.⁴ Analyzing the prevalence and determinants of FI on college campuses is the first step towards addressing these negative effects and improving student health and academic performance.

iv. Objectives

Prior research on FI among college students has focused mainly on public rather than private universities with an emphasis on undergraduate students.^{3,4,6-13} The present study aims to help fill that gap by including both undergraduate and graduate students at a private, not-for-profit university.

The purposes of this study are to identify the rate and distribution of food insecurity at a private university in North Texas and to analyze the demographic, socio-economic, and other factors associated with food insecurity among college students.

CHAPTER II

REVIEW OF LITERATURE

ii. Prevalence of FI Among College Students Prior to COVID-19 Pandemic

There are several studies examining the prevalence of FI among college students prior to COVID-19.^{4,6-13} Bruening et al. (2016) conducted a systematic review of FI in United States postsecondary education campuses based on nine cross-sectional studies.⁴ The average rate of low and very low food security, as defined by the USDA, was 18.1% and 22.4%, respectively.⁴ Zein et al. conducted a prospective study of 855 first-generation, racial minority, first-year students at 8 U.S. universities in 2019.⁶ FI was assessed using the 10-item validated USDA AFSSM² at the beginning and end of the student's first year of college.⁶ Out of 855 students, 25.3% had marginal food security, 12.0% had low food security, and 7.0% had very low food security.⁶ A total of 19% of students included in the study were classified as food insecure.⁶

Previous literature has primarily used cross-sectional surveys to determine FI prevalence among college students.⁷⁻¹³ Wooten et al. conducted a cross-sectional study of 4,842 undergraduate and graduate students enrolled at three large university campuses in the Southeast United States in 2018, excluding first-year students.⁷ FI over a four-week period was assessed using the USDA AFSSM² and included questions pertaining to FI status prior to and during college.⁷ A total of 35.6% of participants were categorized as food insecure, with 19.5% and 16.1% categorized as having very low food security and low food security, respectively.⁷ Twenty-two percent of participants were categorized as having marginal food security.⁷ Abu et al. conducted a cross-sectional survey of 173 students (0.5% of student population) at one of the largest universities in West Texas in 2018.⁸ The validated Household Food Insecurity Access

Scale (HFAS) was used to assess food access in the four weeks prior to taking the survey.⁸ Of the participants who completed the survey, 59.5% were classified as FI, with 19.9%, 14.4%, and 13.4% classified as mildly, moderately, and severely food insecure, respectively.⁸ Finally, McArthur et al. conducted a cross-sectional survey of 456 first-year students at a university in Appalachia, Virginia in 2018.⁹ FI before and during college was assessed using the 10-item USDA AFSSM.² Among first-year students who participated, 7.1% had experienced FI prior to college while 21.5% had experienced FI during college ($p < 0.01$).⁹ The average prevalence of FI reported in the studies included above is 35.2%.^{4,6-9}

Recent literature has examined FI prevalence specifically at private universities.^{10,12-14} Cuy Castellanos et al. conducted a cross-sectional survey of 560 students at a mid-sized private university in fall 2017.¹⁰ Using the 6-item USDA AFSSM¹¹ for a 30-day reference period, 35.8% of students were categorized as food insecure.¹⁰ Of the students categorized as food insecure, 25.4% and 11.3% were categorized as having low and very low food security, respectively.¹⁰ Bodzio et al. conducted a cross-sectional survey of 142 students at a private university in Northern Pennsylvania in early 2020.¹² Using the 6-item USDA AFSSM¹¹, 31.7% of students were classified as food insecure.¹² Cuy Castellanos et al. conducted a cross-sectional survey of 560 students at the University of Dayton in 2018.¹³ Using the 6-item USDA AFSSM¹¹, 36.7% of students were classified as food insecure.¹³ Funderburk et al. conducted a cross-sectional survey of 125 full-time students at Baylor University in 2018.¹⁴ Among the students who completed the survey, 12.8% and 32.2% were classified as having low food security and very low food security, respectively.¹⁴ These studies show that FI prevalence prior to COVID-19 at private universities, with an average of 37.3% of students classified as food insecure, may be as

prevalent as FI at public universities, with an average of 35.2% of students classified as food insecure, based on the studies included.^{4,6-10,12-14}

iii. Associated Factors of FI Among College Students Prior to COVID-19 Pandemic

Researchers have explored numerous factors for their association with FI among college students including race/ethnicity, place of residence, age, financial independence, employment status, academic classification, children/dependents, gender, and international vs. domestic student classification. Previous literature has conflicting results on every factor except gender, in which both studies found no significant difference in food insecurity based on gender.^{4,6,8-10,12,14}

Several studies reported minority groups were more likely to be food insecure.^{4,6,8,14} Bruening et al. found students of color were more likely to be classified as food insecure.⁴ El Zein et al. also reported FI was significantly associated with race and ethnicity, especially among Black and Hispanic/Latino students ($p < 0.001$).⁶ Abu et al. concluded minority groups were 1.6 times more likely to be food insecure compared to non-Hispanic whites.⁸ Funderburk et al. reported FI was higher among Hispanic students and lower among Asian students compared to non-Hispanic white students.¹⁴

Place of residence was included as a potential factor of FI by three studies.^{6,8,14} El Zein et al. found that FI was higher among students who lived off campus ($p = 0.001$)⁶ while Funderburk et al. found FI was higher among students who lived on campus.¹⁴ Abu et al. found there was no statistically significant difference in FI status between students who lived on-campus versus off-campus.⁸

Age was examined as a potential factor of FI by four studies.^{4,6,8,9} Bruening et al. reported that younger students were more likely to be food insecure.⁴ However, no other study found a statistically significant difference in FI based on age.^{6,8,9}

Student financial independence was examined by four studies as a potential factor of FI.^{4,7,8,10} Wooten et al. found that financial independence from family was significantly associated with FI ($p < 0.001$).⁷ Bruening et al. reported that students who are independent from their parents/guardians, whether that be financial, living, or food independence, were more likely to be classified as FI.⁴ However, alternatively, Abu et al. found there was no statistically significant difference between students who were financially independent and students who received financial support from parents.⁸ Similarly, Cuy Castellanos et al. found FI was not significantly associated with source of tuition payment.¹⁰

Several studies examined employment status as a potential factor of FI.^{6-9,14} Wooten et al. found that having a part-time job was significantly associated with FI ($p < 0.001$). The percentage of full-time employed versus not full-time employed students classified as FI was also statistically significant ($p < 0.001$), with more unemployed students classified as FI.⁷ El Zein et al., Abu et al., and McArthur et al. found no statistically significant difference in FI based on employment status^{6,8,9} and Funderburk et al. reported FI was higher among employed students.¹⁴

Academic classification was explored as a potential factor of FI by two studies.^{7,10} Wooten et al. found FI was significantly associated with undergraduate classifications ($p < 0.001$), however there was no statistically significant differences among the different undergraduate classification levels (freshman, sophomore, etc).⁷ Cuy Castellanos et al. found no statistically significant difference in FI based on academic classification.¹⁰

Caring for children/dependents was examined as a potential factor of FI by two studies.^{4,8} Bruening et al. found students with children/dependents were more likely to be classified as food insecure.⁴ However, Abu et al. found no statistically significant difference in FI between students who had children/dependents versus those who did not.⁸ Gender was also examined as a potential factor of FI by two studies. Both El Zein et al. and Abu et al. found no significant difference in FI between different genders.^{6,8}

Finally, Shi et al. conducted a scoping review of seven studies measuring FI among international tertiary education students in early 2020.¹⁵ Six of the seven studies reported a higher prevalence of FI among international students compared to domestic students, with international students being 2-3 times more likely to be classified as FI.¹⁵

iv. Prevalence of FI Among College Students Since Onset of COVID-19 Pandemic

Previous literature indicates that FI has increased during the COVID-19 pandemic.^{3,16} Wolfson et al. conducted a cross-sectional survey of 1,478 adults <250% of the U.S. federal poverty line in late March 2020.¹⁶ Using the USDA Household Food Security Module², 44% of participants were categorized as food insecure and 20% were categorized as having marginal food security.¹⁶ The COVID-19 pandemic has posed unique challenges to university students, with many students losing employment or having parents/guardians lose employment. Many students, especially those who are financially independent, rely on on-campus employment and meal plans to obtain adequate food.³ Asian and Pacific Islander students may face increased discrimination due to the geographic origin of COVID-19.¹⁷

There have been some studies examining the prevalence and associated factors of FI among college students since the onset of the COVID-19 pandemic.^{5,18,20} Mialki et al. conducted

a cross-sectional survey April through May 2020 of 3,206 students at a large, public university to assess FI status before and during the COVID-19 pandemic.¹⁸ FI was assessed using the 10-item USDA AFSSM² and changes in the raw score indicated an increase or decrease in food security during COVID-19.¹⁸ Prior to the COVID-19 pandemic, 19.1%, 12.2%, and 12.6% of participants were categorized as having marginal food security, low food security, and very low food security, respectively.¹⁸ Of the 1,218 participants who indicated a change in FI status during the COVID-19 pandemic, 40.4% had increased food security while 59.6% had decreased food security.¹⁸ Owens et al. conducted a cross-sectional survey of 502 students at three different campuses of a large public university in Texas in May 2020.⁵ To ensure the results were representative of the campus population, the survey sample was weighted.⁵ Using a 2-item Food Sufficiency Screener¹⁹ and the 6-item USDA AFSSM¹¹, among the 34.5% of participants classified as food insecure, 20.2% and 14.3% were classified as having low and very low food security, respectively.⁵ From week one to week four of data collection, the prevalence of FI decreased from 37.0% to 33.2% ($p < 0.001$), coinciding with the progressive reopening of Texas from early May to early June 2020.⁵ Finally, Ryan et al. conducted a cross-sectional web-based survey of 257 students analyzing FI among undergraduates at a private university in 2021.²⁰ Using the 6-item USDA AFSSM, 41% of participants were categorized as food insecure.²⁰

v. Associated Factors of FI Among College Students Since Onset of COVID-19 Pandemic

Researchers have explored numerous factors for their association with FI among college students since the onset of the COVID-19 pandemic including race/ethnicity, employment status, gender, international vs. domestic student classification, financial independence, academic classification, age, place of residence, and children/dependents.

Race and ethnicity were examined by Owens et al. and Mialki et al. as possible factors of FI.^{5,18} Mialki et al. reported race was significantly associated with FI ($p < 0.001$) with white and Asian students being the least likely to experience FI prior to the COVID-19 pandemic.¹⁸ However, Asian students were more likely than other races to have increased FI during COVID-19.¹⁸ Changes in FI during the COVID-19 pandemic were also significantly associated with ethnicity ($p < 0.001$).¹⁸ Hispanic/Latino students were less likely to retain their pre-COVID-19 FI status (52.1%) than non-Hispanic/Latino students (64.6%).¹⁸ Owens et al. reported that students who identified as Black, Hispanic, or Asian/Pacific Islander were more likely to be food insecure ($p < 0.001$).⁵

Employment status was also included as a possible factor of FI by Owens et al. and Mialki et al.^{5,18} Mialki et al. found that students who were employed fewer hours or unemployed due to COVID-19 became less food secure compared to before the COVID-19 pandemic onset.¹⁸ Owens et al. supported these findings and concluded that students who had reduced employment hours due to COVID-19 were more likely to be food insecure ($p < 0.001$).⁵

Mialki et al. also examined gender, international vs. domestic student classification, and financial independence as potential factors of FI status.¹⁸ FI was significantly associated with gender ($p = 0.007$), with female students more likely to be food insecure.¹⁸ International students had a greater increase in FI during COVID-19, with 35.6% of international students becoming less food secure compared to 19.1% of out-of-state and 22.2% of in-state students.¹⁸ Finally, financially independent students were more likely to have decreased food security during COVID-19 ($p = 0.010$).¹⁸

Owens et al. also examined academic classification, age, place of residence, and children/dependents as potential factors of FI status.⁵ Students who were classified as undergraduate or had children/dependents were more likely to be food insecure ($p < 0.001$).⁵ Students living alone were more likely to be food insecure than students living with family ($p < 0.001$).⁵ Finally, FI prevalence decreased with increasing age ($p = 0.02$).⁵

CHAPTER III

METHODS

ii. Study Design

This was a cross-sectional study conducted completely online. Participants voluntarily clicked a link via email or scanned a QR code at a physical location on or near campus which led them to a one-time survey. Before entering the survey, all participants were required to fill out an anonymous informed consent form. FI was assessed for the 12 months prior to taking the survey. Participant characteristics were also assessed through multiple-choice questions including demographic questions, academic classification, place of residence, parents'/guardians' annual household income, student income, percentage of expenses covered by parents/guardians (financial independence), international vs. domestic student classification, employment status, height and weight, financial aid, transportation access, children/dependents, and food resource awareness (see **Appendix A**). This study protocol was approved by the university's Institutional Review Board and all participants provided written informed consent.

iii. Participants

Participants were recruited using email and QR codes placed at various on-campus locations and facilities near campus (see **Appendices B-D**). Some on-campus locations with fliers included academic buildings, student unions, restaurants, and other common areas where students frequently gather. Emails were sent out by professors, department chairs, administrative assistants, graduate student senate, and student services. Information about the study was also posted on the university announcement website. The email and QR code sent the participant to a survey administered through SurveyMonkey. The survey was voluntary and anonymous.

Participants included in the study were current students. Inclusion criteria include 1) Participant is ≥ 18 y/o; 2) Is currently a student at this university. Exclusion criteria include 1) Participant is < 18 y/o (minors); 2) Participant is not a student at this university. Based on a power analysis, the ideal sample size would have been 313 graduate and 370 undergraduate students (with a 95% confidence level and 5% margin of error). The actual sample size (after incomplete responses were removed) was 93 graduate and 260 undergraduate students.

iv. Protocol

After conducting a literature review, the survey was designed using SurveyMonkey (Momentive AI) that included questions related to demographics, academics, health, and FI status. All participants answered these questions, regardless of FI status. Some questions had “Logic” applied, which skipped certain questions that did not apply to the participant based on previous answers. For example, if participants indicated they were undergraduate students, they would skip the questions related to graduate degrees. Questions with “Logic” applied can be identified in the survey as having page breaks following the question (see **Appendix A**).

FI status was measured using a validated Food Sufficiency Screener¹⁹ and the validated six-item USDA AFSSM.¹¹ Participants completed the screener question first, and then, if they were identified as having experienced FI within the past 12 months by answering “sometimes true” or “often true”, they were directed to complete the six-item USDA AFSSM questionnaire to determine their level of FI. “Logic” was applied to this question within SurveyMonkey to skip other questions based on their answer. Participants who answered “never true” or “do not know/prefer not to answer” were screened out as having not experienced FI within the past 12 months and exited the survey. This survey was self-administered online and participants were

prevented from completing the survey twice by SurveyMonkey. Data was collected over a period of four months from November 2021 through February 2022. Materials related to participant recruitment and the survey are included in the appendices.

v. Statistical Analysis

The results were recorded through SurveyMonkey, then the data was coded and analyzed utilizing IBM SPSS for Windows version 26 statistical package (SPSS Inc., Armonk, NY). Descriptive statistics including mean, range, and standard deviation were calculated for continuous variables and *n* (percentage) for categorical variables. Frequency and percentages were computed to describe the characteristics of the sample. Independent-samples t-tests were used to compare the mean scores of continuous variables. The data was also cross-tabulated with sociodemographic data collected in the study to determine if relationships exist between sociodemographic variables and FI. Chi-Square Tests of Independence were conducted to determine if there were categorical associations between food security status and sociodemographic characteristics (bivariate analysis). All tests were two-tailed and statistical significance was set at $p < 0.05$.

CHAPTER IV

RESULTS

ii. Prevalence of Food Insecurity

The first purpose of this study was to identify the rate and distribution of FI at the current university. There was a total of 455 responses collected, with 353 responses analyzed after incomplete responses were removed. Of the 353 participant responses analyzed, 22.4% (n=79) of participants were categorized as food insecure and 77.6% (n=274) were categorized as food secure based on the validated Food Sufficiency Screener¹⁹ and the 6-item USDA AFSSM.¹¹ Among those categorized as food insecure, 3.1% (n=11) were categorized as having marginal food security, 9.6% (n=34) were categorized as having low food security, and 9.6% (n=34) were categorized as having very low food security.

iii. Participant Demographics

The mean age of the participants was 22.5 years with a standard deviation of 6.6 years. The majority of participants self-identified as women, white/Caucasian, and not of Hispanic/Latinx/Spanish origin. **Table 1** outlines the participant demographics for the total population and the sub-population of food insecure participants identified in this study. Older participants (p=0.006) and non-binary participants (p=0.001) were significantly more likely to be categorized as food insecure.

Table 1. Participant Demographics

Variable	Total Population <i>n</i> = 353; 100%	Food Insecure <i>n</i> = 79; 22.4%
Age Mean \pm SD	22.5 \pm 6.6	24.0 \pm 7.7*
Gender		
Women	76.8% (<i>n</i> =271)	64.6% (<i>n</i> =51)
Men	18.1% (<i>n</i> =64)	19.0% (<i>n</i> =15)
Non-Binary	4.0% (<i>n</i> =14)	12.7% (<i>n</i> =10)*
Transgender Man	0.3% (<i>n</i> =1)	1.3% (<i>n</i> =1)
Transgender Woman	0.3% (<i>n</i> =1)	0% (<i>n</i> =0)
Other	0.6% (<i>n</i> =2)	2.5% (<i>n</i> =2)
Race		
American Indian/Alaska Native	1.1% (<i>n</i> =4)	3.8% (<i>n</i> =3)
Asian/Asian American	5.7% (<i>n</i> =20)	6.3% (<i>n</i> =5)
Black/African American	4.5% (<i>n</i> =16)	8.9% (<i>n</i> =7)
White/Caucasian	81.6% (<i>n</i> =288)	77.2% (<i>n</i> =61)
Biracial/Mixed Race	6.5% (<i>n</i> =23)	3.8% (<i>n</i> =3)
Other	0.6% (<i>n</i> =2)	0% (<i>n</i> =0)
Ethnicity		
Hispanic/Latinx/Spanish Origin	17.0% (<i>n</i> =60)	24.1% (<i>n</i> =19)
Not Hispanic/Latinx/Spanish Origin	83.0% (<i>n</i> =293)	75.9% (<i>n</i> =60)

*Statistically significant ($p < 0.05$)

iv. Participant Characteristics and Likelihood of Food Insecurity

The second purpose of this study was to analyze the demographic, socioeconomic, and other factors associated with FI. Participants who are military veterans were significantly more likely to be food insecure vs non-veterans ($p=0.032$). Veteran participants comprise 5.1% ($n=4$) of participants categorized as food insecure, but only comprised 2.3% ($n=8$) of the total study population. Among the 50.0% ($n=4$) of veteran participants who were categorized as food insecure, 37.5% ($n=3$) were categorized as having very low food security.

Among the participants categorized as food insecure, 68.4% (n=54) were undergraduate students and 31.6% (n=25) were graduate students. Graduate students were significantly more likely to be food insecure vs undergraduate students ($p=0.005$), with 25 out of the total 93 graduate participants being categorized as food insecure. Juniors and seniors (upperclassmen) are also significantly more likely to be food insecure compared to freshman and sophomores ($p=0.001$). Juniors comprised 22.8% (n=18) of participants categorized as food insecure, but only comprised 15.6% (n=55) of the total study population. Seniors comprised 17.7% (n=14) of participants categorized as food insecure, but only comprised 13.6% (n=48) of the total study population. Participants pursuing a Master's degree were significantly more likely to be food insecure than those pursuing a Doctoral degree ($p<0.001$). Twenty-one out of the total 63 participants (33.3%) seeking a Master's degree were categorized as food insecure.

Participants who live alone or with their children only were significantly more likely to be food insecure compared to those who lived with roommates, significant others, or parents/guardians. ($p=0.003$). Participants who live alone comprised 20.3% (n=16) of participants categorized as food insecure, but only comprised 12.5% (n=44) of the total study population. There were only two total participants who live with their children only, and both were categorized as food insecure. Additionally, participants with more than one child/dependent were more likely to be categorized as food insecure. Participants with more than one child/dependent comprise 7.6% (n=6) of participants categorized as food insecure but comprise only 4.0% (n=14) of the total participant population.

Participants with 0-25% of their expenses covered by parents/guardians were significantly more likely to be food insecure vs those with >25% of their expenses covered by parents/guardians ($p=0.013$). Participants with 0-25% of their expenses covered comprised

49.4% (n=39) of participants categorized as food insecure, but only comprised 35.7% (n=126) of the total study population. Similarly, participants with a parental/guardian annual household income of \leq \$50,000 were significantly more likely to be food insecure vs those with a parental/guardian annual household income $>$ \$50,000 ($p=0.001$). Fifty-three percent (n=8) of participants with a parental/guardian annual household income of \$25,000-\$50,000 were categorized as food insecure. Among the group of participants with an annual parental/guardian household income of $<$ \$25,000, 36.4% (n=4) were categorized as having very low food security.

Thirty-six percent (n=12) of international student participants were categorized as food insecure compared to 21.0% (n=67) of domestic student participants ($p=0.367$). Further broken down into level of FI, 6.1% (n=2); 9.1% (n=3); and 21.2% (n=7) of international students were categorized as having marginal, low, and very low food security, respectively. International students from North America (including Central America) were significantly more likely to be food insecure compared to those from South America, Europe, Asia, and Africa ($p=0.033$). Of the international student participants who were categorized as food insecure, 41.7% (n=5) were from North America.

Eighty-nine percent (n=70) of participants categorized as food insecure are receiving financial aid, compared to 8.9% (n=7) of participants not receiving financial aid. Additionally, the average amount of financial aid awarded among food insecure participants was significantly higher than the average amount of financial aid awarded among all participants ($p=0.005$). The average amount of financial aid reported for food insecure participants was \$32,410, while the average amount of financial aid reported for all participants was \$27,287. There were no statistically significant differences in FI status based on housing location (on-campus versus off-

campus), personal (student) income level, employment status, body mass index (BMI), or primary mode of transportation.

The survey also included questions about participants' awareness and utilization of resources on or near campus to obtain food or help to obtain food. Students who were not aware of resources on or near campus to help obtain food were significantly more likely to be food insecure compared to students who were aware of resources ($p=0.004$). Of the participants who were categorized as food insecure, only 30.4% ($n=24$) were aware of resources on or near campus to help obtain food. Of those who were aware of resources, 33.3% ($n=8$) never; 45.8% ($n=11$) sometimes; and 20.8% ($n=5$) often utilized those resources to help obtain food. Only 16 out of the 79 participants (20.3%) categorized as food insecure had ever used resources on or near campus to help obtain food.

CHAPTER V

DISCUSSION & CONCLUSIONS

ii. Discussion

The USDA defines food insecurity (FI) as when individuals lack the resources and money to obtain adequate food in socially acceptable ways. The three types of FI in order of increasing severity are marginal food security, low food security, and very low food security.¹ According to literature published within the past five years, FI rates on college campuses range from 19-60% with an average of 39.7% FI.^{4-13,18,20} Prior studies also indicate that FI has increased on college campuses and in the U.S. as a whole since the onset of the COVID-19 pandemic.^{3,5}

The first purpose of the current study was to identify the rate and distribution of FI at a private university in North Texas. The results of this study indicate that more than one in every five participants is food insecure based on the validated Food Sufficiency Screener¹⁹ and 6-item USDA AFFSM¹¹. Compared to previous studies at other universities, this study has a FI prevalence (22.4%) that is below the average of 39.7% FI.^{4-13,18,20} When compared only to other private universities, this study's prevalence is closer to the average of 38% FI among private universities (although there are limited studies and the sample sizes are relatively small).^{10,12-14,20}

The current study found that older participants were significantly more likely to be categorized as food insecure (see **Table 1**). Previous studies have had mixed results, with some reporting younger participants as more likely to be food insecure, and others reporting no significant differences in FI status based on age.^{4-6,8,9} Overall, there were limited studies that

examined age as a potential factor of FI and those included have conflicting results. It is unclear why there are conflicting results for FI status based on age, but it may be due to university-level differences in housing requirements and dining plans. Older students may be more likely to live off-campus and not have access to a dining plan at some universities compared to others. More research is needed to determine how age is associated with FI status.

The current study also concluded that non-binary participants were significantly more likely to be food insecure (see **Table 1**). El Zein et al. and Abu et al. found no significant difference in FI between different genders.^{6,8} However, Mialki et al. concluded that females were significantly more likely to be food insecure.¹⁸ It is difficult to compare the results of the current study regarding gender to previous studies because most prior studies used binary gender identities (woman/female, man/male) as opposed to the current study which used a spectrum of gender identities including non-binary and transgender identities.

The current study also found that people of color are more likely to be food insecure. People of color comprised 46.8% of participants categorized as food insecure, but only comprised 23.8% of the total study population. All previous studies examined had similar results and concluded that people of color were more likely to be food insecure than non-Hispanic white participants.^{4-6,8,14,18}

The current study analyzed student classification and FI status and found that graduate students and upperclassmen were significantly more likely to be food insecure. Some of the previous literature concluded that undergraduates were more likely to be food insecure, while others found no significant differences in FI status based on student classification.^{7,10,5} It is unclear why there are conflicting results for this factor, but it may be the result of university-

level differences in student dining plans, food environments, and housing requirements. For instance, the university in the current study requires freshman and sophomore students to live on campus and have a dining plan, which may help to increase food access when compared to upperclassman and graduate students who do not have these requirements.

The current study found that participants who live alone or with their children only were significantly more likely to be food insecure. Some of the previous studies included found that participants with children/dependents were more likely to be food insecure, however, Abu et al. found no significant difference in FI status related to children/dependents.^{4,5,8} Owens et al. concluded that students living alone were significantly more likely to be food insecure ($p < 0.001$).⁵ Overall, the current study's results align with previous literature, but it is difficult to compare some results because living situation (e.g. living alone versus living with roommates) and caring for children/dependents were measured differently depending on the study.

The current study concluded that international student participants are more likely to be food insecure. Previous literature also suggests that international students are more likely to be food insecure compared to domestic students who lived in the United States prior to college.^{15,18} The increased prevalence of FI among international students could be due to physical distance from family support systems, lack of access to federal financial aid or food assistance programs, work restrictions, difficulty integrating into American culture or their specific university's culture, and lack of access to culturally relevant foods.¹⁵

In addition to analyzing the prevalence and associated factors of FI in the current study, it was also important to assess the success of current resources on or near campus intended to help students obtain food. Only 30.4% of food insecure participants indicated awareness of resources

on or near campus and only 16 out of the 79 food insecure participants had ever utilized those resources to help obtain food. This data indicates that information about resources is not effectively reaching food insecure students. The lack of awareness and utilization could be due to a lack of resources, poor dissemination of information about resources, improper targeting of information to at-risk groups, and stigma associated with accepting “handouts”.

iii. Strengths and Limitations

There are numerous strengths to the current study. First, the current study used a validated Food Sufficiency Screener¹⁹ and the validated USDA AFSSM¹¹ to identify participants who are food insecure. Validated measurement tools minimize the likelihood of inaccurate reporting and bias. Second, demographic data related to race and ethnicity is very similar between the study population and the university’s overall student population.²¹ This increases the generalizability of the findings to the student population as a whole.

There are some weaknesses to the current study, as well. The current study used a cross-sectional design, so only associations can be concluded rather than causation. Researchers could not determine whether a certain factor caused FI among the participants. The response rate for the current study was relatively low, with approximately 3% of the student population participating in the study.²¹ Based on the power analysis conducted prior to the data collection period, the current study did not meet the ideal sample size of 313 graduate and 370 undergraduate participants. Because the number of participants was less than the ideal sample size, there is a possibility that a non-significant result may be due to insufficient power. The current study also used self-reported data, which can be subject to recall bias, social-desirability bias, and over or underreporting of food security data. However, the survey was completely

anonymous, which was stated in the informed consent, to minimize social desirability bias. The survey also included two validated food security measurement tools to accurately assess FI status and minimize over or underreporting. Finally, the current study was voluntary and used a convenience sample, which is subject to self-selection bias. However, information about participating in the survey was broadly disseminated across a variety of physical locations and a variety of ages, majors, and types of students to help ensure a heterogeneous sample.

iv. Research Applications

Several recommendations can be made based on the results of the current study. First, the data can be used to raise awareness of the prevalence of FI at this university and college campuses in general. Second, based on the low number of participants aware of resources on or near campus to help obtain food, broader dissemination of information about FI resources for students is recommended. This information can also be targeted toward certain groups that are at a higher risk for FI. Finally, the university where the current study took place does not have an on-campus food pantry for students. This may be a viable option to address the need identified in this study.

v. Conclusions

In this study population of 353 students at a private university in North Texas, 22.4% were categorized as food insecure. This equates to more than one out of every five participants. Participants who are older, non-binary, people of color, veterans, graduate students, upperclassman, those that live alone or with their children only, international students, and those with more financial aid were more likely to be food insecure. Only 30.4% of food insecure participants were aware of resources on or near campus where they could obtain help to get food,

and only 16 out of the 79 food insecure participants had ever utilized these resources. More studies are needed to identify the prevalence and associated factors of FI on college campuses, especially for private universities. At the current university, a similar study with a larger, more representative sample would help to confirm the findings of the current study and further identify factors associated with FI among college students. While further research is beneficial, there is sufficient data based on the current study to take action to address FI at this university by means of advocacy, dissemination of resource information, and the addition of new resources, such as an on-campus food pantry.

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APPENDIX A

FOOD ACCESS SURVEY

Prevalence and Associated Factors of Food Access Among College Students

Informed Consent

Title of Research: Prevalence and Associated Factors of Food Access Among College Students

Principal Investigator: Gina Jarman Hill, PhD, RD, LD

Co-investigator: Maddie Jacobs

Overview: You are invited to participate in a research study. In order to participate, you must be 18 years of age or older and be currently enrolled as a student at Texas Christian University.

Study Details: This study is being conducted online using Survey Monkey. The purpose of the study is to determine the prevalence and associated factors of food access among students at Texas Christian University, a private not-for-profit university. You will take the anonymous survey one time. The survey takes about 15 minutes to complete.

Participants: You are being asked to take part because you are a student at Texas Christian University. We want to explore food access on our college campus. This survey is for all students, not exclusively students who believe they are food insecure. If you decide to be in this study, you will be one of at least 200 participants in this research study.

Voluntary Participation: Your participation is voluntary. You do not have to participate and may stop your participation at any time. You will not lose any benefits if you choose not to take part or if you stop taking the survey after you start. You may skip questions if you do not wish to answer them.

Confidentiality: If we publish the findings from this study, we will keep your information private and confidential. Anyone with the authority to look at your records must keep them confidential.

What is the purpose of the research? The purpose of the study is to determine the prevalence and associated factors of food access among students at Texas Christian University, a private not-for-profit university.

What is my involvement in participating in this study? If you choose to participate in the study, you will take a one-time online survey. We expect your participation to take about 15 minutes. You will be asked questions about your ability to access food and demographic/ background questions.

Are there any alternatives and can I withdraw? You do not have to participate in this research study. You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. Your decision to participate or not to participate will not affect your student status.

What are the risks for participating in this study and how will they be minimized? There are some risks you might experience from being in this study. You may be embarrassed by questions regarding socio-economic and employment status, income, financial aid, height and weight, as well as questions about your ability to access food. You may experience mental discomfort from thinking about your ability to access food.

Anonymous surveys will be used, so researchers will not collect any information that can link a survey back to the participant. If any of the findings from this study are published, no personally identifying information will be used. Survey Monkey settings were configured for this study to not collect IP addresses of participants.

What are the benefits of participating in this study? Although you will not directly benefit from being in this study, others might benefit because data from the study may be used to help improve food access and reduce food insecurity among university students.

Will I be compensated for participating in this study? You will not be paid to complete the survey.

What are my costs to participate in the study? To participate in the research, you will not need to pay for anything.

How will my confidentiality be protected? The survey is completely anonymous. Every effort will be made to limit the use and disclosure of your personal information, including research study records, to people who have a need to review this information. We cannot promise complete secrecy. Your anonymous records may be reviewed by authorized University personnel or other individuals who will be bound by the same provisions of confidentiality.

What will happen to the information collected about me after the study is over? We will keep your research data to use for future research or other purposes. Since this survey is anonymous, we will not collect your name or other information that can directly identify you.

We may share your research data with other investigators without asking for your consent again, but it will not contain information that could directly identify you.

Who should I contact if I have questions regarding the study or concerns regarding my rights as a study participant?

You can contact Dr. Gina Jarman Hill at g.jarman@tcu.edu or 817-257-7309 with any questions that you have about the study.

Dr. Dru Riddle, Chair, TCU Institutional Review Board, (817) 257-6811, d.riddle@tcu.edu; or Dr. Floyd Wormley, Associate Provost of Research, research@tcu.edu

* 1. By selecting "Agree to participate" below, you are agreeing to be in this study. Make sure you understand what the study is about before you agree. You will be given a copy of this document for your records upon request. If you have any questions about the study after you agree to participate, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I am at least 18 years of age and attend Texas Christian University. I agree to take part in this study.

- Agree to Participate
- Decline to Participate

Prevalence and Associated Factors of Food Access Among College Students

Demographics

* 2. What is your age?

3. To which gender identity do you most identify?

- Woman
- Man
- Non-binary
- Other (please specify)
- Transgender Woman
- Transgender Man
- Intersex

4. Which race or ethnicity best describes you? Select all that apply.

- American Indian or Alaska Native
- Asian or Asian American
- Black or African American
- Native Hawaiian or other Pacific Islander
- White or Caucasian
- Other (please specify)

5. Are you of Hispanic, Latinx, or Spanish origin?

- Yes
- No

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

6. Are you a veteran?

Yes

No

7. What kind of student are you?

Undergraduate

Graduate

Other (please specify)

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

8. What year are you?

- First year (Freshman)
- Second year (Sophomore)
- Third year (Junior)
- Fourth year (Senior)
- Other (please specify)

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

9. What degree are you seeking?

- Masters
- Doctorate
- Other (please specify)

10. Where do you currently live?

- On-Campus
- Off-Campus

11. What is your current living situation?

- Live alone
- Live with roommates
- Live with my spouse/ significant other
- Other (please specify)
- Live with my spouse/ significant other and our children
- Live with my parents or other relatives
- Live with my children only

12. What is the approximate percentage of your expenses covered by your parents/guardians?

- 1-25%
- 25-50%
- 50-75%
- 75-100%
- I do not receive financial support from my parents/guardians

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

13. What is your parents'/guardians' annual household income before taxes?

- | | |
|--|---|
| <input type="radio"/> Less than \$25,000 | <input type="radio"/> \$150,000-200,000 |
| <input type="radio"/> \$25,000-50,000 | <input type="radio"/> >\$200,000 |
| <input type="radio"/> \$50,000-100,000 | <input type="radio"/> I do not know my parents'/guardians' annual household income before taxes |
| <input type="radio"/> \$100,000-150,000 | <input type="radio"/> Prefer not to answer |

14. What is your annual income before taxes?

- | | |
|--|---|
| <input type="radio"/> Less than \$25,000 | <input type="radio"/> \$150,000-200,000 |
| <input type="radio"/> \$25,000-50,000 | <input type="radio"/> >\$200,000 |
| <input type="radio"/> \$50,000-100,000 | <input type="radio"/> I do not know my annual income before taxes |
| <input type="radio"/> \$100,000-150,000 | <input type="radio"/> Prefer not to answer |

15. Did you live outside of the U.S. (international) or within the U.S. (domestic) prior to college enrollment?

- Outside of the U.S. (International Student)
- Within the U.S. (Domestic Student)

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

16. What country did you live in previously?

17. Which of the following BEST describes your current employment status?

- | | |
|--|--|
| <input type="radio"/> Unemployed (lost job before COVID-19 began) | <input type="radio"/> Working full-time |
| <input type="radio"/> Unemployed (lost job during/since COVID-19 began) | <input type="radio"/> Working part-time |
| <input type="radio"/> Employed with diminished hours since COVID-19 began | <input type="radio"/> Stay at home parent/cargiver |
| <input type="radio"/> Essential full-time worker (never stopped working) | <input type="radio"/> Retired |
| <input type="radio"/> Essential part-time worker (never stopped working) | <input type="radio"/> Disabled, not able to work |
| <input type="radio"/> Furloughed (temporarily lost job or on a leave of absence) | |

18. Do you have any dependents or children you financially support?

- Yes, one child/dependent
- Yes, more than one child/dependent
- No

19. Are you currently receiving financial aid? (e.g., grants, scholarships, work-study, loans, aid for military families, aid for international study, other aid from federal/state government or TCU)

- Yes
- No
- Prefer not to answer

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

20. How much financial aid per year are you receiving? (e.g., 25000)

21. What is your height?

Feet and

Inches

22. What is your weight?

Pounds or

Kilograms

23. What is your primary mode of transportation?

- Walking
- Car or other motor vehicle
- Bike
- Other (please specify)
- Public Transportation (Ex. Bus / Train)
- TCU Shuttle

24. Are you aware of resources on or near campus where you can obtain food or help to get food?

- Yes
- No

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

25. How often have you utilized resources on or near campus to help obtain food?

- Never
- Sometimes
- Often

Prevalence and Associated Factors of Food Access Among College Students

Additional Information

26. How often have you utilized resources in communities outside of TCU to help obtain food (ex. A food pantry in your home neighborhood)?

- Never
- Sometimes
- Often

Prevalence and Associated Factors of Food Access Among College Students

Food Access Screening

These next questions are about food eaten in the last 12 months, since November of last year and whether you were able to afford the food you need.

What follows are several statements that people have made about their food situation. For these statements, please indicate whether the statement was often true, sometimes true, or never true for you in the last 12 months.

27. Within the past 12 months, I worried whether my food would run out before I got money to buy more.

- Often True
- Sometimes True
- Never True
- Do not know / Prefer not to answer

Prevalence and Associated Factors of Food Access Among College Students

Food Access Screening

These next questions are about food eaten in the last 12 months, since November of last year and whether you were able to afford the food you need.

What follows are several statements that people have made about their food situation. For these statements, please indicate whether the statement was often true, sometimes true, or never true for you in the last 12 months.

28. Within the past 12 months, the food I bought just didn't last and I didn't have money to get more.

- Often True
- Sometimes True
- Never True
- Do not know / Prefer not to answer

29. Within the past 12 months, I couldn't afford to eat balanced meals.

- Often True
- Sometimes True
- Never True
- Do not know / Prefer not to answer

30. Within the past 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No
- Do not know / Prefer not to answer

Prevalence and Associated Factors of Food Access Among College Students

Food Access Screening

These next questions are about food eaten in the last 12 months, since November of last year and whether you were able to afford the food you need.

31. Within the past 12 months, **how often** did you cut the size of your meals or skip meals because there wasn't enough money for food?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- Do not know / Prefer not to answer

32. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

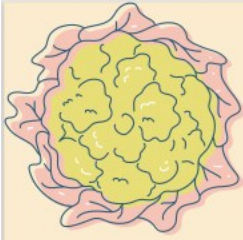
- Yes
- No
- Do not know / Prefer not to answer

33. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- Do not know / Prefer not to answer

APPENDIX B

RECRUITMENT FLYER



Volunteers needed for research study

PREVALENCE AND ASSOCIATED FACTORS OF FOOD ACCESS AMONG COLLEGE STUDENTS

IRB# 2021-221

Principal Investigator: Dr. Gina Hill / Coinvestigator: Maddie Jacobs

The Department of Nutritional Sciences is conducting research to find out the prevalence and associated factors of food access among students at TCU.

You must be ≥ 18 years old and currently a student at TCU.

Participants will be asked to fill out an online questionnaire that will take approximately 15 minutes to complete. Participation will take place online via Survey Monkey.

Please call 817-257-7309 or email g.jarman@tcu.edu with any questions

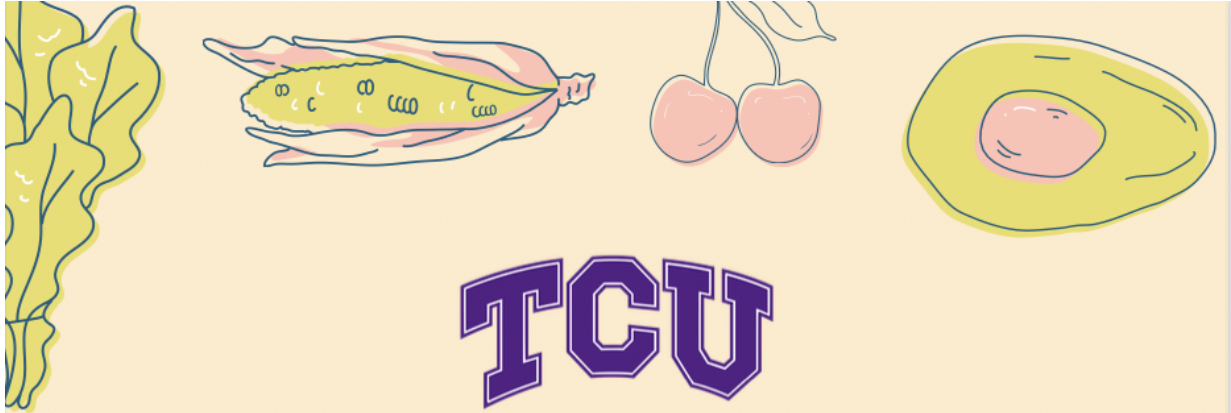
Scan Here!



Texas Christian University
TCU does not discriminate based upon any protected status. Please see <http://www.tcu.edu/notice-of-nondiscrimination.asp>

APPENDIX C

SOCIAL MEDIA FLYER



Volunteers needed for research study

PREVALENCE AND ASSOCIATED FACTORS OF FOOD ACCESS AMONG COLLEGE STUDENTS

IRB# 2021-221

Principal Investigator: Dr. Gina Hill / Coinvestigator: Maddie Jacobs

You must be ≥ 18 years old and currently a student at TCU

Click link in description!

Texas Christian University

TCU does not discriminate based upon any protected status. Please see
<http://www.tcu.edu/notice-of-nondiscrimination.asp>



APPENDIX D

RECRUITMENT EMAIL



**TCU-IRB
RECRUITMENT EMAIL**

Dear Prospective Participant:

My name is Maddie Jacobs and I am a research assistant working with Dr. Gina Hill at Texas Christian University (TCU).

We are conducting a research study on food access among students at TCU. Participation will take 15 minutes. Participation is completely voluntary and your answers are anonymous.

If you are interested, please click the link below for more information and to complete the online survey:

<https://www.surveymonkey.com/r/CYBQ53X>

There will be no compensation for participation in this survey. There are some risks you might experience from being in this study. You may experience mental discomfort from questions regarding socio-economic and employment status, income, financial aid, height and weight, as well as questions about your ability to access food.

If you have any questions, please do not hesitate to contact me (maddie.c.jacobs@tcu.edu) or Dr. Gina Hill (g.jarman@tcu.edu).

Thank you for your time.

Maddie Jacobs

Research Assistant

TCU University