Title

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Journal

Journal of Agriculture Food Systems and Community Development, 12(2)

ISSN

2152-0798

Authors

Tanner, Zoee
Loofbourrow, Brittany
Chodur, Gwen
et al.

Publication Date

2023

DOI

10.5304/jafscd.2023.122.018

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://foodsystemsjournal.org

Special Section:
Justice and Equity Approaches to College and University Student Food (In)Security

SPECIAL SECTION SPONSORED BY

Food insecurity and utilization of campus food resources differ by demographic and academic group

Zoee R. Tanner,[a] Brittany M. Loofbourrow,[b] Gwen M. Chodur,[c] Leslie Kemp,[d] and Rachel E. Scherr [e] *
University of California, Davis

Submitted March 14, 2022 / Revised June 28 and July 25, 2022 / Accepted July 29, 2022 / Published online March 16, 2023

Citation: Tanner, Z. R., Loofbourrow, B. M., Chodur, G. M., Kemp, L, & Scherr, R. E. (2023). Food insecurity and utilization of campus food resources differ by demographic and academic group. *Journal of Agriculture, Food Systems, and Community Development*, *12*(2), 63–78. https://doi.org/10.5304/jafscd.2023.122.018

Abstract

Food insecurity is a major challenge for many college students, negatively affecting their well-being and academic success. To address the challenge, universities are implementing food resources to provide free access to food; however, little is known about how students' identities affect their utilization of these resources. This study analyzed the relationships among food insecurity, campus food resource participation, and student demographic and academic identity. Survey data were collected from a representative sample (n=1,190) of undergraduate students at the University of California (UC), Davis. Analyses were conducted using

[a] Zoee R. Tanner, Department of Nutrition, and Aggie Compass Basic Needs Center, University of California, Davis; 1 Shields Avenue; Davis, CA 95616 USA; zrtanner@ucdavis.edu

[b] Brittany M. Loofbourrow, Ph.D., Department of Nutrition, and Aggie Compass Basic Needs Center, University of California, Davis; 1 Shields Avenue; Davis, CA 95616 USA; bloof@ucdavis.edu

[c] Gwen M. Chodur, MSPH, RDN, Department of Nutrition, and Aggie Compass Basic Needs Center, University of California, Davis; 1 Shields Avenue; Davis, CA 95616 USA; gmchodur@ucdavis.edu

[d] Leslie Kemp, MA, Aggie Compass Basic Needs Center, University of California, Davis; 1 Shields Avenue; Davis, CA 95616 USA; lckemp@ucdavis.edu

[e] * *Corresponding author*: Rachel E. Scherr, Ph.D., Department of Nutrition, University of California, Davis; Davis, CA, USA.

Dr. Scherr is a founder of Scherr Nutrition Science Consulting and is now a lecturer at San Francisco State University; 1600 Holloway Avenue; San Francisco, CA 94132 USA; rescherr@sfsu.edu

Conflicts of Interest

The authors have no conflicts of interest to disclose.

Funding Disclosure

Funding provided in part by University of California, Davis Aggie Compass Basic Needs Center; University of California Office of Educational Opportunity and Enrichment Services; and University of California, Davis Jastro Research Award.

chi-square tests of independence and logistic regression to assess factors related to food insecurity and campus food resource participation. The results indicate that transfer students are 84% more likely to experience food insecurity, but 39% less likely to use campus food resources. Both first-generation and fourth- year students disproportionately experience food insecurity and utilize campus food resources more. Latino(a)/Chicano(a)/Hispanic students are twice as likely to experience food insecurity and 49% more likely to use food resources than white/European American students. These results demonstrate that student identity intersects with food insecurity and access in the college environment. These findings can guide recommendations for improving and expanding campus food resources by utilizing equitable outreach strategies that build a support network of food access while reflecting the diverse needs of student populations.

Keywords
Food Insecurity, University Students, Campus Food Pantry, Higher Education

Introduction and Literature Review

While the university is a place for individuals to achieve higher educational goals and for some is an integral steppingstone on the path to their chosen career fields, it can also be rife with problems such as housing insecurity, financial stress, and mental health difficulties (Britt et al., 2017; Broton & Goldrick-Rab, 2018; Goldrick-Rab, Richardson, et al., 2018; Oswalt et al., 2020; Robb, 2017). An increasingly visible issue experienced by students across university campuses in the U.S. is food insecurity (Bruening et al., 2017; Nazmi et al., 2019).

Food insecurity is defined by the U.S. Department of Agriculture as "limited or uncertain access to adequate food" with varying levels of food security that range from very low to high (USDA Economic Research Service, 2022). University students experience low and very low food security, collectively defined as food insecurity, far more frequently than the U.S. general population, with one systematic review reporting that 43.5% of college students were experiencing some form of food insecurity, nearly four times the prevalence of food insecure households in the U.S. (Nazmi et al., 2019; U.S. Government Accountability Office [GAO], 2018; USDA Economic Research Service, 2022).

The high prevalence of campus food insecurity can be observed through its detrimental effects on overall student well-being and achievement. It is associated with diminished academic performance, lower grade point average (GPA), and poor mental and physical health (Becerra & Becerra, 2020; Martinez et al., 2019, 2020; Payne-Sturges et al., 2018; Weaver et al., 2020). In addition, other factors associated with student food insecurity including lack of sleep, lower fruit and vegetable consumption, and fewer days of moderate to vigorous exercise further indirectly contribute to higher body mass index (BMI) and poor physical health (Martinez et al., 2019). Thus, food insecurity compounds in many ways to negatively affect university students.

Food insecurity often intersects with student demographics. Demographic characteristics such as race and ethnicity are associated with increased likelihood of student food insecurity, with Black, Latino(a), and other marginalized groups more likely to report experiencing food insecurity (Camelo & Elliott, 2019; Martinez et al., 2018; Reeder et al., 2020; UC Global Food Initiative, 2017). A study found that Latino(a) students—students identified as Latino(a)/Chicano(a)/Hispanic—are twice as likely to be food insecure as white students (DeBate et al., 2021). Receiving need-based financial aid, living outside the parents' home, and experiencing childhood food insecurity also increase a student's risk for food insecurity (Martinez et al., 2018). Increased accrual of debt has been associated with increased risk of experiencing food insecurity in students (Knol et al., 2018). In addition, food insecurity has been found to be correlated with housing and financial insecurity, indicating how experiencing disadvantages in one area can overlap with food insecurity to create further challenges (Leung et al., 2021).

Despite knowledge of these predictors, research is still limited available on how the demographic identities of students, especially admission type, such as nontraditional (25 or older), transfer, first-generation, juniors and seniors, undocumented, Deferred Action for Childhood Arrivals

(DACA)-eligible, and international or graduate, intersect with the challenge of campus food insecurity (Beam, 2020; Camelo & Elliott, 2019; Coffino et al., 2021; Klobodu et al., 2021; Soldavini et al., 2019; Soldavini & Berner, 2020; UC Admissions, n.d.; UC Global Food Initiative, 2017). Such types, particularly transfer and first-generation students, are known to experience distinct challenges transitioning to and navigating the college environment (Daddona et al., 2021; Gibbons et al., 2019; Nuñez & Yoshimi, 2017; Zilvinskis & Dumford, 2018). Qualitative studies of nontraditional and DACA-eligible students have discussed the unique ways in which they experience and navigate food insecurity; prioritizing food over other basic needs and expenses, rationing food, relying on the support of friends and family, and choosing foods out of cost convenience over healthfulness are strategies that have been reported (Beam, 2020; Klobodu et al., 2021). Such studies demonstrate that marginalized academic groups are facing food insecurity, but fail to identify how their experience, especially regarding food resources, compares with nonmarginalized students.

Given the high prevalence of food insecurity in the college environment and its relevance to student success and well-being, universities are seeking solutions to food insecurity by implementing campus food resources like food pantries (Becerra & Becerra, 2020; College & University Food Bank Alliance, n.d.; Martinez et al., 2019, 2020; Nazmi et al., 2019; Payne-Sturges et al., 2018; Weaver et al., 2020). Campus food pantries provide students with immediate access to food, making them a potential source for supporting students and alleviating food insecurity (Esaryk et al., 2021; Goldrick-Rab, Cady, et al., 2018). This strategy is increasingly employed by universities to address the need for food access and is being used by students more frequently (Esaryk et al., 2021; Gammon et al., 2021; Weaver et al., 2021). For example, all ten campuses in the UC system have campus food pantries, basic needs centers to support student food security, and annual basic needs budgets that each campus utilizes with its own tailored approach (UC Basic Needs Initiative, n.d.). However, a study conducted at University of Florida showed that while over a third of students reported being food insecure, only 38% utilized the campus food pantry, raising concerns as to how effective the campus current practice is (El Zein et al., 2018). Recent literature has called for further evaluation of campus food resource participation and the effectiveness of food pantries in addressing food insecurity (Davis et al., 2020; Esaryk et al., 2021; Goldrick-Rab, Cady, et al., 2018). Given the current gaps in understanding food insecurity, as well as the limited literature on campus food resources generally, it would be beneficial to utilize student demographic and food resource usage data to inform current and future campus food resource implementation efforts, especially as they pertain to various marginalized demographic and academic groups.

This study aims to analyze the relationships between food insecurity, food resource participation, and demographic and academic groups in the student population at a large, 4-year research university, University of California, Davis (UC Davis). UC Davis has multiple campus food resources available for students, including, but not limited to: Aggie Compass, the campus basic needs center offering food, housing, and financial support to students; the ASUCD [Associated Students, University of California, Davis] Pantry, a student-run food pantry providing free perishable and nonperishable food as well as free hygienic and menstrual products to students as well as staff and faculty; and Fruit and Veggie Up, an Aggie Compass program distributing fresh produce free to students (Aggie Compass Basic Needs Center, 2022; ASUCD Pantry, 2022). Given that marginalized students experiencing food insecurity may have a greater need, and that there are campus food resources present at UC Davis to support such students experiencing food insecurity, it was hypothesized that marginalized academic and demographic groups would both experience greater food insecurity and participate in campus food resources more compared to their less marginalized/more traditional student counterparts (Camelo & Elliott, 2019; DeBate et al., 2021; Martinez et al., 2018; Reeder et al., 2020; UC Global Food Initiative, 2017).

Applied Research Methods

The current study is a secondary analysis of data previously collected and described elsewhere

(Loofbourrow et al., 2021). The methodology of the study is described briefly below.

Questionnaire Development

Questions relating to student participation in campus food access resources, demographic characteristics, and other student lifestyle factors were developed with the help of a panel of content and survey design experts from UC Davis (Loofbourrow et al., 2020). After edits were made to the questionnaire for content and clarity, the USDA 10-item Adult Food Security Survey Module (AFSSM) was added to assess student food security status (USDA Economic Research Service, 2012). The final questionnaire contained 68 items; however, because of the use of skip logic, not all items were seen by all participants.

Sample and Data Collection

A representative sample of 10,000 students was selected from a complete list of 39,629 students at UC Davis; 5,000 were representative of the overall university student body and 5,000 were selected based on Pell Grant (a federal grant for students from low-income backgrounds) recipient status. The contact list of students was provided to the research team by the UC Davis Office of Budget and Institutional Analysis.

Distribution

The final questionnaire was administered via Qualtrics software at the beginning of the 2020 Winter Quarter (January 2020) using a modified Tailored Design Method (Dillman et al., 2008). During the second week of the quarter, selected students were sent an email notification containing an informed consent letter, the study information, and notification that they would receive a personalized link to the questionnaire the following week. A follow-up email containing the questionnaire link and informed consent letter was sent one week later, followed by two weekly reminder emails for students who did not complete the questionnaire. Within the questionnaire, students consented to participate by providing their university-issued identification number. Students who did not provide their ID number were not included in the final analysis. Students who completed the questionnaire within three weeks of receiving their personalized link were given a US$5 gift card incentive. All responses were collected by February 12, 2020.

Independent Variables of Current Study

Demographic and academic characteristics of interest included student race/ethnicity, first-generation student status (students whose parent/guardian(s) did not complete a 4-year degree), transfer student status (students coming to the university from another 2- or 4-year institution), low-income status (students from a household with earnings <185% of federal poverty guidelines), U.S. citizenship and in-state residency, academic class level, and financial aid receipt.

Dependent Variables of Current Study

Primary outcomes of interest were food security status as measured by the USDA AFSSM and self-reported food access resource participation. AFSSM scores respondents from 0–10 as a continuous measure of food insecurity. Scores of 0 are considered "high food security"; scores of 1–2 are considered "marginal food security"; scores of 3–5 are classified as "low food security"; and scores of 6≥ are classified as "very low food security." To use a binary logistic regression model for analysis, high food security and marginal food security were collapsed into one category ("food secure") and low food security and very low food security were collapsed into a second category ("food insecure"). Food access resource participation included any use of the campus basic needs center (Aggie Compass), campus food pantry (ASUCD Pantry), and the fresh fruit and vegetable distribution program (Fruit and Veggie Up).

Data Analysis of Current Study

Demographic and student characteristics, financial aid receipt, employment status, and food security status were analyzed using a chi-square test for independent variables. Logistic regression was performed to determine whether demographic characteristics including transfer student status, first-generation student status, low-income status, race/ethnicity, academic class level, and financial aid were associated with food security status. Logistic regression was performed to determine whether

these demographic and academic characteristics were associated with food access resource participation.

Results

Of the representative sample, 1,526 students responded to the survey with a response rate of 15%. Of the 1,526 respondents, 100 students were removed from the analytical sample as they did not provide consent for participation and 18 were excluded due to incomplete food security data, resulting in a sample of 1,408 students. From this sample, graduate students were omitted from analysis, resulting in a final analytic sample of 1,190 undergraduate students.

Of the total analytic sample, 45% of students were currently experiencing some level of food insecurity (Table 1). Chi-square analysis of independence showed that transfer students disproportionately experienced more food insecurity than students admitted as freshmen ($\chi^2 = 16.08$ ($p<0.001$); Table 1). First-generation students and low-income students disproportionately experienced food insecurity more (First-Generation: $\chi^2 = 60.41$ ($p<0.001$); Low-Income: $\chi^2 = 18.81$ ($p<0.001$); Table 1). There were no statistically significant differ-

Table 1. Descriptive Characteristics of Sample and Chi-Square Test of Food Security Status

	Total *n* (%)	Food Secure *n* (%)	Food Insecure *n* (%)	χ^2 (p-value)
Total Sample	1190 (100)	655 (55.0)	535 (45.0)	
Transfer **	241 (20.3)	105 (43.7)	136 (25.4)	16.08 (<0.001)
First-Generation **	554 (53.3)	245 (37.4)	309 (66.7)	60.41 (<0.001)
Low-Income **	488 (41.0)	232 (35.4)	256 (47.9)	18.81 (<0.001)
U.S. Citizen	1044 (87.7)	565 (86.3)	479 (89.5)	2.93 (0.09)
California Resident	1082 (90.9)	587 (89.6)	495 (92.5)	3.01 (0.08)
Class Level				
Freshman (1st Year)	239 (20.1)	139 (21.2)	100 (18.7)	1.17 (0.28)
Sophomore (2nd Year)	240 (20.2)	145 (22.1)	95 (17.8)	3.51 (0.06)
Junior (3rd Year)**	337 (28.3)	201 (30.7)	136 (25.4)	4.02 (0.04)
Senior (4th Year)**	374 (31.4)	170 (26.0)	204 (38.1)	20.26 (<0.001)
Race/Ethnicity				
American Indian/Alaska Native	7 (0.6)	3 (0.5)	4 (0.7)	0.42 (0.52)
Black/African American	36 (3.0)	16 (2.4)	20 (3.7)	1.68 (0.19)
East Asian**	276 (23.2)	193 (29.5)	83 (15.5)	32.18 (<0.001)
Latino(a)**	354 (29.7)	138 (39.0)	216 (40.4)	52.51 (<0.001)
Middle Eastern/South Asian	70 (5.9)	42 (6.4)	28 (5.2)	0.74 (0.39)
Native Hawaiian/Pacific Islander	8 (0.7)	3 (0.5)	5 (0.9)	1.00 (0.32)
Other Asian	36 (3.0)	16 (2.4)	20 (3.7)	1.68 (0.19)
Southeast Asian	122 (10.3)	69 (56.6)	53 (9.9)	0.13 (0.72)
White**	260 (21.8)	168 (25.6)	92 (17.2)	12.32 (<0.001)

** Significant differences

ences in the experience of food insecurity by California residency and U.S. citizenship status. Both juniors and seniors had a significant difference in food security status, with senior students making up a greater proportion of students experiencing food insecurity (Junior: $\chi^2 = 4.02$ (p=0.04); Senior: $\chi^2 = 20.26$ (p<0.001); Table 1). Significant differences were not observed in freshmen and sophomore students. In terms of race/ethnicity, East Asian students (students identified as Chinese, Korean, or Japanese) and white students (students identified as white/European American) disproportionately experienced less food insecurity (East Asian: $\chi^2 = 32.18$ (p<0.001); white: $\chi^2 = 12.32$ (p<0.001); Table 1). Latino(a) students disproportionately experienced more food insecurity (Latino(a): $\chi^2 = 52.51$ (p<0.001); Table 1). Significant differences were not observed in all other racial/ethnic demographics.

In observing differences in food resource use, a chi-square analysis of independence indicated that students experiencing food insecurity disproportionately utilized campus food resources more (Food Insecure: $\chi^2 = 27.46$ (p<0.001); Table 2). More than 1/3 (35.5%) of students experiencing food insecurity did not participate in campus food

Table 2. Chi-Square Test of Campus Food Resource Participation

	Total *n* (%)	Use Food Resources *n* (%)	Do Not Use Any Food Resources *n* (%)	χ^2 (*p*-value)
Overall Sample	1,097 (100)	621 (56.6)	476 (43.4)	
Food Insecure**	488 (44.5)	319 (51.4)	169 (35.5)	27.46 (<0.001)
Transfer	225 (20.5)	124 (20.0)	101 (21.2)	0.26 (0.61)
First-Generation**	554 (53.3)	339 (57.0)	215 (48.4)	7.47 (0.01)
Low-Income	451 (41.1)	271 (43.6)	180 (37.8)	3.78 (0.05)
US Citizen**	967 (88.1)	558 (89.9)	409 (85.9)	3.98 (0.05)
CA Resident**	1,000 (91.2)	576 (92.8)	424 (89.1)	4.52 (0.03)
Class Level				
Freshman (1st Year)**	218 (19.9)	90 (14.5)	128 (26.9)	26.01 (<0.001)
Sophomore (2nd Year)	214 (19.5)	116 (18.7)	98 (20.6)	0.62 (0.429)
Junior (3rd Year)	316 (28.8)	180 (29.0)	136 (28.6)	0.02 (0.881)
Senior (4th Year)**	349 (31.8)	235 (37.8)	114 (23.9)	23.97 (<0.001)
Race/Ethnicity				
American Indian/Alaska Native**	6 (0.5)	1 (0.2)	5 (1.1)	3.92 (0.05)
Black/African American	32 (2.9)	23 (3.7)	9 (1.9)	3.13 (0.08)
East Asian	256 (23.3)	153 (24.6)	103 (21.6)	1.36 (0.24)
Latino (a)	320 (29.2)	191 (30.8)	129 (27.1)	1.74 (0.19)
Middle Eastern/South Asian**	66 (6.0)	27 (4.3)	39 (8.2)	7.05 (0.01)
Native Hawaiian/Pacific Islander	7 (0.6)	4 (0.6)	3 (0.6)	0.00 (0.98)
Other Asian	36 (3.3)	24 (3.9)	12 (2.5)	1.53 (0.22)
Southeast Asian	112 (10.2)	70 (11.3)	42 (8.8)	1.76 (0.18)
White**	243 (22.2)	116 (18.7)	127 (26.7)	10.00 (0.002)

*Significant differences

resources (Food Insecure: $\chi^2 = 27.46$ ($p<0.001$); Table 2). First-generation students disproportionately used campus food resources more (First-Generation: $\chi^2 = 7.47$ ($p=0.01$); Table 2). Additionally, students with U.S. citizenship and students with California residency made up significantly greater proportions of the population that does not use campus food resources (U.S. Citizenship: $\chi^2 = 3.98$ ($p=0.05$); CA Residency: $\chi^2 = 4.52$ ($p=0.03$); Table 2). There were no significant differences in food resource use by transfer and low-income students. With respect to class level, a significant difference was noted in freshmen and senior students. Freshmen students disproportionately use campus food resources less while senior students disproportionately use resources more (Freshmen: $\chi^2 = 26.01$ ($p<0.001$); Senior: $\chi^2 = 23.97$ ($p<0.001$); Table 2). There were no statistically significant differences between sophomore students and junior students in food resource use. Regarding race/ethnicity, American Indian/Alaska Native students, Middle Eastern/South Asian students (students identified as East Indian/Pakistani), and white students disproportionately do not use campus food resources (American Indian/Alaska Native: $\chi^2 = 3.92$ ($p=0.05$); Middle Eastern/South Asian: $\chi^2 = 7.05$ ($p=0.01$); white: $\chi^2 = 10.00$ ($p=0.002$); Table 2). All other student racial/ethnic demographics did not exhibit significant differences in food access resource participation.

In a logistic regression analysis of food insecurity, transfer students were significantly more likely to experience food insecurity compared to non–transfer students (OR: 1.84, CI: 1.27-2.68, $p=0.001$;

Table 3. Student Characteristics' Associations with Food Insecurity Using Logistic Regression

	Odds Ratio (OR)	95% Confidence Interval (CI)	*p*-value
Transfer** (Yes; Ref: No)	1.84	1.27–2.68	0.001
First-Generation ** (Yes; Ref: No)	1.79	1.31–2.46	<0.001
Low-Income (Yes; Ref: No)	1.11	0.82–1.52	0.50
US Citizen (No; Ref: Yes)	0.91	0.51–1.62	0.75
CA Resident (No; Ref: Yes)	0.85	0.44–1.64	0.62
Class Level			
Freshman (1st Year)	0.79	0.51–1.22	0.28
Sophomore (2nd Year)	0.71	0.47–1.08	0.11
Junior (3rd Year)**	0.58	0.40–0.81	0.002
Senior (4th Year)	1	Reference	
Race/Ethnicity			
American Indian/Alaska Native	2.42	0.36–16.10	0.36
Black/African American	1.90	0.83–4.34	0.13
East Asian	0.74	0.48–1.13	0.16
Latino(a)**	2.12	1.41–3.18	<0.001
Middle Eastern/South Asian	1.38	0.74–2.58	0.31
Native Hawaiian/Pacific Islander	1.02	0.13–7.83	1.00
Other Asian **	2.09	0.97–4.50	0.06
Southeast Asian	1.19	0.71–2.00	0.51
White	1	Reference	

** Significant differences

Table 3). First-generation students had higher odds of experiencing food insecurity when compared to non–first-generation students (OR: 1.79, CI: 0.20-0.96, $p<0.001$; Table 3). Low-income status, U.S. citizenship status, and California residency status did not significantly increase the odds of experiencing food insecurity. In terms of class level, junior students had significantly lower odds of experiencing food insecurity compared to senior students (OR: 0.58, CI: 0.40-0.81, $p=0.002$; Table 3). Being a freshman or sophomore was not significantly associated with experiencing food insecurity. Latino(a) students and other Asian students had more than twice the odds of experiencing food insecurity compared to white students (Latino(a): OR: 2.12, CI: 1.41-3.18, $p<0.001$; Other Asian: OR: 2.09, CI: 0.97-4.50, $p=0.06$; Table 3). All other student racial/ethnic demographics were not significantly associated with experiencing food insecurity when compared to white students.

In logistic regression analysis, students experiencing food insecurity were more significantly likely to use food resources compared to those who were food secure (OR: 1.81, CI: 1.37-2.40, $p<0.001$; Table 4). Transfer students were less likely to use food resources compared to non–transfer students (OR: 0.61, CI: 0.42-0.88, $p=0.01$; Table 4). Being a first-generation student or low-income student was not significantly associated with using food resources. U.S. citizenship or California residency was not significantly associated with using food resources. Compared to senior students, freshmen and sophomore and junior students were each less likely to use food resources (Freshmen: OR: 0.28, CI: 0.18-0.41, $p<0.001$; Sophomore: OR: 0.51, CI: 0.34-0.76, $p=0.001$; Junior: OR: 0.69, CI: 0.49-0.97, $p=0.03$; Table 4). Black/African American students were more than three times more

Table 4. Prediction of Food Resource Use by Logistic Regression

	Odds Ratio (OR)	95% Confidence Interval (CI)	*p*-value
Food Insecure** (Yes; Ref: No)	1.81	1.37–2.40	<0.001
Transfer** (Yes; Ref: No)	0.61	0.42–0.88	0.01
First-Generation (Yes; Ref: No)	1.15	0.84–1.57	0.38
Low-Income (Yes; Ref: No)	1.00	0.74–1.36	0.98
US Citizen (No; Ref: Yes)	1.35	0.76–2.36	0.30
CA Resident (No; Ref: Yes)	1.28	0.68–2.43	0.45
Class Level			
Freshman (1st Year)**	0.28	0.18–0.41	<0.001
Sophomore (2nd Year)**	0.51	0.34–0.76	0.001
Junior (3rd Year)**	0.69	0.49–0.97	0.03
Senior (4th Year)	1	Reference	
Ethnicity			
American Indian/Alaska Native	0.26	0.03–2.49	0.24
Black/African American**	3.240	1.34–7.82	0.01
East Asian**	2.070	1.39–3.08	<0.001
Latino(a)**	1.490	1.01–2.21	0.05
Middle Eastern/South Asian	0.894	0.49–1.62	0.71
Native Hawaiian/Pacific Islander	5.121	0.53–49.31	0.16
Other Asian	2.007	0.92–4.38	0.08
Southeast Asian**	1.956	1.17–3.26	0.01
White	1	Reference	

** Significant differences

likely to use food resources than white students (OR: 3.24, CI: 1.34-7.82, p=0.001; Table 4). East Asian students, Latino(a) students, and Southeast Asian students (students who identified as Filipino or Vietnamese) were each also more likely to use food resources compared to white students (East Asian: OR: 2.07, CI: 1.39-3.08, p<0.001; Latino(a): OR: 1.49, CI: 1.01-2.21, p=0.05; Southeast Asian: OR: 1.96, CI: 1.17-3.26, p=0.01; Table 4). All other student racial/ethnic demographics were not significantly associated with food resource use.

Discussion

In this secondary analysis of a survey sample of the student population at UC Davis (Loofbourrow et al., 2021), undergraduate student demographic and academic groups experiencing food insecurity and their participation with campus food resources were identified and analyzed. Consistent with previous research, the results demonstrate that college students are experiencing food insecurity to a higher degree than the general population (Bruening et al., 2017; Nazmi et al., 2019; UC Global Food Initiative, 2017; U.S. Government Accountability Office, 2018). The results indicate that 45% of undergraduate UC Davis students experience food insecurity, consistent with a previous finding that 44% of undergraduate students in the University of California system experience food insecurity (UC Global Food Initiative, 2017). Beyond this finding, the results expand knowledge of student demographic factors as they relate to differences in participation in campus food resources. This presents a lens for examining the relationship that students of varied backgrounds have with campus food resources and provides a basis for understanding the impact of student identity in the way they may experience food insecurity in college.

Students who experience food insecurity disproportionately participate in campus food resources, being 81% more likely to utilize such resources (Table 4). However, 35.5% of students who experience food insecurity do not participate in food resources (Table 2). While it is promising that the majority of students experiencing food insecurity are accessing campus food resources, which as supported by previous findings may provide a vital avenue of food support, a significant number of students experiencing food insecurity do not use campus food resources (Esaryk et al., 2021; Goldrick-Rab, Cady, et al., 2018). Previous literature has described multiple barriers to food pantry use by students experiencing food insecurity, including social stigma and unclear information about eligibility for use or how such campus pantries operate that may contribute to lack of food resource participation (El Zein et al., 2018). This suggests that greater outreach may be needed to encourage them to utilize these resources and to overcome such barriers to resource use.

Transfer students at UC Davis disproportionately experience food insecurity compared to non–transfer students, which is supported by previous findings (UC Global Food Initiative, 2017). Although transfer students were 84% more likely to experience some level of food insecurity in the current study, they were 39% less likely to participate in campus food resources (Table 3, Table 4). This suggests that transfer students may be unaware of and/or uncomfortable with current campus food resources. These results are supported by a phenomenon described in the literature as 'transfer shock,' when transfer students not only experience lower GPA after transferring to 4-year institutions, but also struggle with more severe confusion navigating the new institution, both academically and socially (Daddona et al., 2021). Previous research has also indicated a decreased level of campus activity engagement in transfer students compared to non–transfer students, and lack of appropriate transfer resources when entering their receiving institutions further hinders their ability to adjust (Daddona et al., 2021; Nuñez & Yoshimi, 2017; Zilvinskis & Dumford, 2018). Taken together, this suggests that the food insecurity challenges that transfer students experience may be augmented by difficult adjustment to a new university setting.

As transfer students typically enter the university as juniors, they may be more vulnerable to food insecurity associated with higher academic class levels. The results from this study indicate that juniors and seniors at UC Davis experience disproportionately more food insecurity than underclassmen, a finding consistent with previous research in a similar population (UC Global Food Initiative, 2017). Freshman, sophomores, and juniors

are less likely to participate in campus food resources than seniors, suggesting a greater degree of reliance on such resources by students of higher class level or increased familiarity with resources as they acclimate to the university setting. This greater need could be due to the dwindling of aid as students reach the lifetime eligibility limit for federal financial aid, such as the Pell Grant and loans, especially near degree completion (U.S. Department of Education Office of Federal Student Aid, n.d.-a). Financial aid received also may not encompass all needs that a student may encounter during their academic journey (Kelchen et al., 2017). In addition, as students progress through college they also may accrue more debt, increasing the risk of food insecurity (Knol et al., 2018).

Findings from this study demonstrate that low-income students at UC Davis are disproportionately more food insecure, yet this increased likelihood of food insecurity is not significantly associated with campus food resource participation. This is consistent with previous research that has found that students receiving need-based financial aid are more food insecure (Martinez et al., 2018). However, previous research has suggested that low-income students may be relying on other off-campus support resources (Knol et al., 2018). The lack of use of campus food resources, despite clear need, presents a challenge in ensuring that interventions to address food insecurity reach such students (El Zein et al., 2018). Despite need-based financial aid, low-income students may not receive enough to cover the expenses of modern university costs, including both basic needs and tuition (Martinez et al., 2021). Due to protections with respect to student financial information particularly regarding low-income status, it is not possible to accurately associate reported household information with actual student financial status or that of their parent/guardian. However, in considering student food accessibility and low-income status, it is nonetheless important not only to focus on the availability of campus food resources, but other sources of institutional support as well, which may be aiding student food access.

The results of this study indicate that UC Davis first-generation students are disproportionately more food insecure and utilize campus food resources more than their peers, also consistent with previous research (Camelo & Elliott, 2019; UC Global Food Initiative, 2017). Previous research has found that first-generation students face greater social and cultural challenges adjusting to and navigating the college environment (Gibbons et al., 2019). Many first-generation students enter the institution with limited cultural capital—general knowledge of how institutional and academic systems work—producing a steeper learning curve in adjusting to the university (Stephens et al., 2015). Challenges in adjusting include lack of information about the financial aid process, difficulty navigating institutional and academic systems, and limited familial knowledge of the higher education system and/or monetary support (Feeney & Heroff, 2013; Gibbons et al., 2019). For example, during this transitional period first-generation students are vulnerable to missing crucial financial aid deadlines, thus losing assistance (Feeney & Heroff, 2013). Adjusting to and navigating the college environment may lead first-generation students to seek out campus food resources and other basic needs support in their transition to college. However, more research is needed to investigate their coping strategies in order to better discern differences between groups such as first-generation students and more traditional students.

Student race and ethnicity present a tapestry of varied experiences around food security status and campus food resource participation. Consistent with previous literature, white students at UC Davis have higher levels of food security and less frequent use of campus food resources than their peers of other racial and ethnic backgrounds (DeBate et al., 2021). In contrast, Latino(a) students and students classified as Other Asian are twice as likely to experience food insecurity than white students, as observed in the results of this study and supported by previous research (DeBate et al., 2021). Latino(a) households in the U.S. tend to experience food insecurity to a greater degree than other populations, in general (Rodriguez et al., 2021). Specific barriers to food security for Latino(a) students may be due to underlying structural racism that permeates academic environments, which contributes to food insecurity through impediments to opportunity (Bowen et al.,

2021; Merolla & Jackson, 2019). While there is limited research on food insecurity specifically among Latino(a) students, challenges of racial injustice can make it both difficult and stressful to access food in an increasingly costly college environment, which may lead to the observed increase in food insecurity and use of campus food resources.

In addition, the challenges in food access faced by undocumented students may also overlap with Latino(a) students, since most undocumented individuals in the U.S. are from Latin countries (Baker, 2021; Migration Policy Institute, 2022). As immigration status is a protected class, it was not possible to ask students their immigration status in the study survey in order to better understand how Latino(a) and undocumented student experiences may overlap. Undocumented individuals are largely ineligible for federal food benefits (U.S. Department of Agriculture Food and Nutrition Service, 2022.). Similar to international students, undocumented students (including those who are DACA- or AB540-eligible), are excluded from receiving disproportionately lower use while students who are undocumented are not exclusively Latino(a), governmental and institutional structures barring them from access to financial aid and food resources may affect Latino(a) students to a greater degree (Baker, 2021; Migration Policy Institute, 2022). Such policies promote an atmosphere of nativism and xenophobia that can negatively affect the food security of Latino(a) students regardless of their citizenship status (Ramirez, 2021). Awareness of the unique challenges that Latino(a) students may be encountering in food access can ensure students are met with equitable institutional support.

East Asian students at UC Davis make up a greater proportion of food secure students yet are twice as likely to participate in campus food resources as white students. This may highlight a potential success in bettering student food security, as East Asian students utilize resources more frequently yet do not experience food insecurity to a significant degree. Other ethnic groups have distinct differences in how they utilize campus food resources. Middle Eastern/South Asian students at UC Davis make disproportionately lower use of campus food resources, and Southeast Asian students make disproportionately higher use. While there is limited research on use of food access resources among these college populations, potential differences in help-seeking behaviors in the college setting may be relevant to observed differences in resource use (Chang et al., 2020). Such differences between ethnic groups have been seen in previous literature and point to cultural differences; however, they can also be due to negative stereotypes and stigma associated with food resources (Kim & Lee, 2014; Masuda et al., 2009). An example is the "model minority myth" that highlights how racial and ethnic stereotypes of Asian American students can lead to avoiding asking for help (Kim & Lee, 2014). While previous studies have focused more on academic, health, and emotional help-seeking behaviors in college students, it is possible that such associations with reaching out for support may be affecting decisions to use campus food resources, as seen in this study.

Student demographic and academic identities and campus food resource participation provide a lens with which the effect of current campus food resources can be evaluated. Students experiencing food insecurity, first-generation students, seniors, and Latino(a) students at UC Davis participate in campus food resources to a greater degree, which may indicate that food access support is reaching those students most affected by food insecurity (Esaryk et al., 2021). However, this participation poses a critical question for campus food resource programs: do current resources provide enough support for students who need them most? Although students experiencing food insecurity may already be utilizing campus food resources to a greater extent than their food secure counterparts, students may still experience food insecurity despite using these resources (Esaryk et al., 2021). It should be noted that most campus food access resources are designed as interventions to support students already experiencing food insecurity and provide a buffer from its negative consequences (Becerra & Becerra, 2020; Martinez et al., 2019, 2020; Payne-Sturges et al., 2018; Weaver et al., 2020). The continued existence of food insecurity among students who use these programs is not necessarily a program failure to alleviate food insecurity but may be a testament to the need for these

programs that provide important short-term support to students. The persistence of food insecurity among first-generation, seniors, and Latino(a) students may highlight the need for institutional support for students who may lack cultural capital and further speaks to pervasive inequities experienced by marginalized populations (Bowen et al., 2021; Gibbons et al., 2019; Stephens et al., 2015).

Limitations

This study is cross-sectional, and the dependent variable of food access resource use was self-reported, thus bias is possibility. While the initial sample was representative of the student population, the responses may not reflect the representative experience of all students. The institutional setting may not be generalizable to students at other institutions. Although the response rate was 15%, the sample size for some ethnic/racial demographic groups is a limitation as their small numbers may represent their overall groups. While Black/African American and American Indian/Alaska Native students had significant results, their small sample size limits generalizability to the Black/African American and America Indian/Alaska Native student experience. Thus, these results were not included in the discussion. The analysis did not consider intersectionality of identities (i.e., students who are first-generation and transfer students). Data for use of other resources to support food access off-campus was not collected, so the results may not provide a complete overview of the resources that students may use for food access.

Recommendations

This study makes a case for considering student unique identities for understanding how a student may access food on campus, both in research and in practice. Demographic and academic identity inform how students become aware of, utilizes, and are excluded from campus food resources as well as how they generally cope with food insecurity. While campus food resources provide one source of relief for students facing food insecurity, knowing that students may be coping differently based on their social identities has implications for how most equitably to reach students experiencing food insecurity. Therefore, best practices for institutional outreach for food insecurity resources should include pursuing the creation of a network to support students that can meet them where they may be in the process of food access, rather than a one size fits all approach.

Some implications for future campus food access that can be drawn from this study are that some groups vulnerable to experiencing food insecurity, such as transfer students, are not accessing campus food resources that could alleviate immediate food needs. For these populations, stronger and consistent outreach strategies could be implemented that directly connect and engage with them. Such outreach has the potential to create more avenues for developing critical points of awareness. These avenues can function as gateways to food access support and empower students to use such resources. In addition, because campus food resources alone are not sufficient to eliminate food insecurity, more funding support, both at the institutional and governmental level, may be needed to build upon existing campus food resource programs. With more adequate funding, such programs can expand their current operations to better address student needs.

While there is some literature about the effectiveness of campus food resource usage, more research is needed to support and expand on current findings (Davis et al., 2020; El Zein et al., 2018; Esaryk et al., 2021; Gammon et al., 2021; Goldrick-Rab, Cady, et al., 2018). Further quantitative research on campus food resource usage with particular emphasis on demographics not measured in this study—such as non–traditional students, undocumented students, and student gender and sexuality—as well as impacts of the intersection of marginalized identities, is essential. More objective measures of usage frequency are needed to accurately assess program impact. Longitudinal research is also necessary to better illuminate the precipitating factors that lead to food resource use. Qualitative studies with students that utilize such campus food resources can also facilitate understanding possible patterns in food access, painting a picture of the campus food landscape from a student's view. Quantitative and qualitative studies combined can help in mapping the food pathways of college

students, knowledge with which institutions can implement better strategies, practices, and policies that are reflective of students, their needs, and their choices in food access.

Conclusion

As students navigate challenges in accessing food in the university setting, challenges influenced in part by their specific academic and demographic backgrounds, they may require greater assistance or support from campus food resources to ensure consistent food access. This research expands upon previous college food insecurity and campus food access literature to showcase the ways through which social identity underlies how students access food in the college environment (Bruening et al., 2017; Esaryk et al., 2021; Martinez et al., 2018; Nazmi et al., 2019; Reeder et al., 2020; UC Global Food Initiative, 2017). A spotlight on these factors provides implications for promoting equitable campus food access that reaches out to and empowers students to utilize resources. While the issue of student basic needs has become a priority, especially in California due to current legislative efforts, these results indicate more can be done (Laska et al., 2021; Martinez et al., 2021; UC Global Food Initiative, 2017). The addition of campus food pantries has been shown to be successful in providing crucial immediate access to food as well as bringing student experience of food insecurity to the forefront (Esaryk et al., 2021; Gammon et al., 2021; Goldrick-Rab, Cady, et al., 2018), but further research is needed to explore how students use food resources and to understand their experiences in traversing the campus food access landscape. It should be paramount for university leadership and administration that students are not struggling to answer the fundamental question "Where and how will I find food to eat today?" and to further ensure equitable food access for all students.

Acknowledgments

The authors would like to acknowledge the student participants. The authors would also like to thank Marcela Radtke and Emily Sklar for their support with this work.

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