

Oregon State University Food Security Study

OSU DIVISION OF STUDENT AFFAIRS
FOOD INSECURITY TASKFORCE

AUTHORS:

Mark Edwards, PhD

Professor of Sociology, OSU Policy Analysis Lab
College of Liberal Arts

Jenny Jackson, PhD, MS, RDN

Clinical Assistant Professor
College of Public Health and Human Sciences

Justine Meyer, RDN

Master of Public Health candidate
College of Public Health and Human Sciences

Victoria Venable

Master of Public Policy candidate
College of Liberal Arts

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Executive Summary

Food insecurity (FI) is a growing concern on college campuses. Upon request from the Oregon State University (OSU) Food Insecurity Taskforce, this report outlines findings from the first formal study of the prevalence and patterns of FI among OSU students on the Corvallis campus during Fall term, 2020. FI was measured using the United States Department of Agriculture (USDA) 10-item Food Security Survey Module (FSSM) with a 2-item food sufficiency screener. Two sampling strategies were employed in an effort to improve upon existing sampling methods commonly used for estimating FI among college students. These findings can be used to inform OSU's plan to ensure equitable food access among all students.

The full report of this study provides background on the issue of college student FI, broadly and within the context of the COVID-19 pandemic. This is followed by a detailed description of the methodology used to estimate FI among OSU students, followed by Corvallis campus results, including indicators and patterns of FI among specific student sub-populations. The report ends with a discussion of the findings, including limitations and areas for potential future research.

Our findings differed based on two different sampling methods applied in our study, indicating that methodology is an important consideration in measuring FI in this population. In one sample, 24.3% of participants reported being food insecure compared with 31.6% in the other sample. For reasons explained in the full report, we believe the more conservative estimate of 24.3% is most accurate.

Among OSU Corvallis campus students, race/ethnicity, first-generation college student status, class standing, and receipt of Supplemental Nutrition Assistance Program (SNAP) benefits are significant correlates of FI. Among most racial/ethnic groups, being a first-generation college student appeared to account for the higher rates of FI. However, this was not the case for students who identified as Pacific Islander or Native Hawaiian, who, even when controlling for other variables, reported higher rates of FI than students who are not Native Hawaiian or Pacific Islander.

A lower prevalence of FI was found among students who reported living with their families, indicating that living situation and familial support may provide a protective effect against FI. Likewise, undergraduate students in their first or second year of school reported lower rates of FI compared to third- and fourth-year students, suggesting financial and food access differences between younger and older students. These findings warrant further investigation.

This study corroborates other research indicating that college students are vulnerable to FI and highlights the importance of sampling methodology in estimating FI prevalence. These findings also highlight that prevalence of FI is unequally distributed among OSU student sub-populations, with students of color, first-generation students, third- and fourth-year students, and students receiving SNAP benefits at higher risk of FI. These findings can be used to promote equitable and targeted campus-based initiatives to increase access to food resources for all students and particularly for those most vulnerable to FI.

Background

In Fall 2019, the Oregon State University (OSU) Food Insecurity Taskforce convened to address food insecurity at OSU. A recommendation of the Taskforce was to first assess the prevalence of food insecurity among OSU students. With funding from the OSU Division of Student Affairs and the School of Public Policy's OSU Policy Analysis Lab, Clinical Assistant Professor Jenny Jackson and Professor Mark Edwards assembled a research team including eight undergraduate and graduate students to conduct an innovative survey in the Fall term of 2020.

Food Insecurity

Food insecurity (FI) is defined as the inability to access an adequate supply of food due to lack of money or additional resources. Food insecure households may be further categorized as having low food security (problems acquiring food leading to reduced diet quality) or very low food security (inability to afford food to the degree of multiple instances of reduced food intake) (Coleman-Jensen et al., 2020). In Oregon, 9.8% of households were food insecure in 2017-19, with 4.3% being very low food secure (Coleman-Jensen et al., 2020). In the area surrounding OSU, overall household FI ranged from 10.8% in Benton County to 13.1% in Linn County and 13.8% in Lane County, in 2018. (Feeding America, 2020a). By October of 2020, during the COVID-19 pandemic, household FI for the state of Oregon had surged to around 25% (OSU Policy Analysis Laboratory, 2020).

Variability in Food Insecurity Across Institutions

Pre-pandemic estimates of the prevalence of FI among college students ranged from 9% to well over 50% (Larin, 2018). In 2014, a study at Western Oregon University reported 59% of the student body was food insecure (Patton-Lopez et al., 2014). In 2017, a review of FI in postsecondary education settings in the U.S. found an average FI rate of 32.9% (Bruening et al., 2017). The high level of variation among estimates of FI in higher education can be largely attributed to study methodology, particularly survey modality and sampling design (Nikolaus, Ellison & Nickols-Richardson, 2020; Nikolaus, Ruopeng, Ellison, & Nickols-Richardson, 2019). Surveys present inherent obstacles for validity and accuracy related to human responses, sampling representativeness, and generalizability. Nonetheless, surveys are the only method available to assess FI in populations of students, suggesting that careful attention must be given to improving external validity.

Concerns regarding FI survey validity may be exacerbated by the context of a college campus (Nikolaus, Ellison, & Nickols-Richardson, 2019a; Nikolaus, Ellison, & Nickols-Richardson, 2019b). Some limitations related to using standard FI surveys in the college setting include students' differing interpretations of FI questions (Nikolaus, Ellison, & Nickols-Richardson, 2019a); varying campus dining plans and practices (Van Woerden et al., 2019); and difficulty quantifying students' financial resources (Carnevale et al., 2015) and parental support (Nikolaus, Ellison, & Nickols-Richardson, 2019a). Additionally, college student FI rates reported by campus surveys have shown differences based on the timing of the survey within both the school term (Van Woerden et al., 2019) and the school year (Riddle et al., 2020), as well as the type of campus when comparing online, metropolitan, and suburban campuses (Moore et al., 2020; Owens et al., 2020).

Research shows the prevalence of FI is greater among some groups, with race, ethnicity, parenting status, living arrangement, and income level demonstrating a relationship with FI in the college student population (Baker-Smith et al., 2020; Owens et al., 2020; Soria et al., 2020) as well as US households (Coleman-Jensen et al., 2020). In college students, gender identity and sexual orientation also have shown a correlation with FI (Baker-Smith et al., 2020; Owens et al., 2020; Riddle et al., 2020; Soria et al., 2020). Additionally, college students' year of study and first-generation status have been associated with FI (Owens et al., 2020; Riddle et al., 2020; Soria et al., 2020).

COVID-19 and College Student Food Insecurity

An examination of FI at several universities during COVID-19 found average FI rates of 22% among undergraduates and 19% among graduate students, with rates reaching greater than 30% in many historically marginalized and underrepresented groups (Soria et al., 2020). Goldrick-Rab et al. (2020) report in their study of multiple colleges an overall increase in FI rates from 33% to 38% between Fall of 2019 and Spring of 2020. Soldavini et al. (2020) report that at one university, the 10.8% rate of FI in Winter 2020 grew to 14.5% in the months soon after the pandemic hit.

Research Goals

Previous FI surveys of college students have produced questionably high and wide-ranging levels of FI, which may be the result of non-response bias among food-secure students. Thus, our research team undertook an effort to compare sampling methods while estimating FI among OSU students in Fall 2020. These data are intended to inform OSU's strategies to ensure equitable food access among students, both in terms of the current COVID-19 pandemic response and long-term interventions on campus. This report provides information about students primarily affiliated with the OSU Corvallis campus. Subsequent studies of students attending the OSU Cascades campus and Ecampus are pending such that FI can be addressed for the entire OSU student body.

Methodology

The United States Department of Agriculture (USDA) defines a range of FI including “food security” and “food insecurity,” which can be further categorized into “low food security” and “very low food security.” The USDA Food Security Survey Module (FSSM) is a validated, widely used instrument for measuring food security and is available in multiple forms (<https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/>). The survey used to assess the prevalence of FI among OSU students consisted of the USDA 10-item FSSM with a 2-item food sufficiency screener, determined to be the most accurate survey currently available for determining FI among college students (Nikolaus, Ellison, & Nickols-Richardson, 2019a). This component of the survey is displayed in Table 1. Individuals were categorized as FI if they responded affirmatively to 3 or more items; otherwise, they were categorized as food secure. We further examined differences among those who reported very low food security as indicated by 6 or more affirmative responses. For our purposes of better understanding which groups of students were more likely to be food insecure, the survey also included questions about student demographics, financial aid, and living situations (see Appendix A for the complete survey).

This study used two sampling strategies – one based on survey distribution within a sample of courses, and the other based on survey distribution via email to the entire student body. The first sample included courses from the OSU Fall 2020 course catalog; specifically, a purposefully selected cross-section of courses that offered the survey to students across all colleges, including undergraduate students from first to final year as well as graduate students at all levels. The course selection also sought to oversample for demographic groups for whom the literature suggests an especially high prevalence of FI and/or who make up a small proportion of the OSU student body. For example, our sample selected multiple courses in the College of Liberal Arts (CLA) because enrollment data provided by the Office of Institutional Research indicate that the CLA includes more students of color than other colleges.

Researchers contacted 45 instructors to request permission to attend the first 5 minutes of a remotely delivered (i.e., Zoom) course session and administer the survey to willing students. Seven instructors reported conflicts or scheduling complications that prevented their participation. Twenty instructors did not respond to our initial or second request. Eighteen professors granted permission for our research team to attend their class. Prior to the class visits, our team provided detailed information about the study and the consent form for the instructor to share with students prior to our visit. In total, our team visited 21 classes between November 9th and November 17th.

Survey data were collected online via Qualtrics. During the in-class visits, student researchers introduced the survey to the students, who were invited to indicate eligibility, informed consent, and complete the survey using a link posted in the chat box. At the end of the 10-day course-sampling effort, the same survey was emailed by the OSU Registrar to the entire Corvallis campus student body. Thus, results from the course-sampling method could be compared to the results from the campus email-sampling method. For each sample (course-based and email-based), entry into a raffle for one of three \$100 gift cards was offered for survey participation. Data were de-identified and stored separately from the student information collected for the \$100 gift card raffle.

Our methods yielded 734 participants from the course visits and 2510 participants from the email survey for a total of 3244 participants between November 9th and November 25th. The response rate in the course visits was approximately 72% whereas the email method yielded a response rate of 12%. Students who participated in the course-sample wave of the survey were precluded from participating in the emailed survey. Thus, we believe the course-based sample suffers from less response bias than the email-based sample and therefore provides a more conservative and likely more valid estimate of the prevalence of FI on the Corvallis campus.

Appendix B presents the representativeness of the samples compared to known demographic characteristics of the OSU population enrolled at the Corvallis campus in November 2020.

Table 1: The USDA 10 item FSSM with a 2-item screener¹

Question/Item	Affirmative Response (indicating insecure)	Negative Response (indicating secure)
2 – item Food Sufficiency Screener		
In the last 30 days, did you ever run short of money and try to make your food or your food money go further?	Yes	No
Which of these statements best describes the food eaten in your household?	Enough but not always the kinds of food we want to eat, Sometimes not enough to eat, Often not enough to eat	Enough of the kinds of food we want to eat
10 – item USDA Food Security Survey Module		
I worried whether my food would run out before I got money to buy more.	Often true, Sometimes true	Never true, Don't know
The food that I bought just didn't last, and I didn't have enough money to get more.	Often true, Sometimes true	Never true, Don't know
I couldn't afford to eat balanced meals.	Often true, Sometimes true	Never true, Don't know
In the last 30 days, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes	No, Don't know
In the last 30 days, how many days did this happen?	≥ 3 Days	1 – 2 Days
In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money for food?	Yes	No, Don't know
In the last 30 days, were you ever hungry but didn't eat because there wasn't enough money for food?	Yes	No, Don't know
In the last 30 days, did you lose weight because there wasn't enough money for food?	Yes	No, Don't know

In the last 30 days, did you ever not eat for a whole day because there wasn't enough money for food?	Yes	No, Don't know
In the last 30 days, how many days did this happen?	≥ 3 Days	1 – 2 Days

Respondents with 3 or more affirmative responses were categorized as “food insecure.” Respondents with 6 or more affirmative responses were further categorized as having “very low food security.”

Results

Our estimates of FI on the OSU Corvallis campus vary between the two sampling methods, indicating that methodology is an important consideration for measuring FI among college students.

Data collected from the course visits yielded 742 responses. After missing data (i.e., incomplete or duplicative responses) were removed, the final sample size was 734. Data collected from the email survey yielded 3309 responses. After missing data were removed, the final sample size was 2510. Responses were considered “missing” if the respondent did not complete the 2-item screener or, if applicable, the 10-item module. If a respondent completed the 10-item FSSM but did not provide any demographic or personal information, the FI response was included, and the remaining data were coded as missing.

Campus-Wide Findings (Corvallis)

Table 2 presents the prevalence of FI among OSU Corvallis campus students from both samples (i.e., course-based and email-based surveys, respectively). Results indicate that 24.3% of the course-based survey participants were food insecure in November 2020 (Table 2). The campus-wide, email-based survey yielded a FI rate of 31.6%. The course-based estimates may be more accurate due to less response bias. However, the email survey method is more commonly used for assessing the prevalence of FI among college students in the U.S. and may be useful for comparing OSU findings with those from other college campuses where the email survey method used. Thus, throughout this report, we present findings from both sampling methods used in this study.

Table 2: Food Insecurity Prevalence (%) among OSU Corvallis students¹

Demographic characteristic	Course Sample		Email Sample	
	FI (%)	N ²	FI (%)	N ²
All Participants	24.3	734	31.6	2510
<i>Class Standing</i>				
Frosh/Soph	19.9	264	28.9	730
Jr/Senior+	31.8	265	41.1	1189
Graduate - Masters	17.7	91	31.4	222
Graduate - PhD	22.7	107	23.8	292
<i>College</i>				
Agricultural Sciences	7.3	45	35.7	304
Business	26.2	239	40.5	208
Education ³	-	-	10.2	26
Science	39.6	53	31	447
Liberal Arts	48.2	43	38.9	363
Public Health and Human Sciences	36	48	34.4	266

Earth, Ocean, and Atmospheric Sciences	37.3	32	36.4	106
Veterinary Medicine or Pharmacy	20.5	85	43.1	78
Engineering	15.1	175	31	629
<i>Credit Hours</i>				
Part-time	21.1	49	32.7	383
Fulltime	26.5	678	33.9	2050
<i>Race/Ethnicity</i> ⁴				
White or Caucasian	22.3	437	31.4	1472
American Indian or Alaska Native	29.2	15	43	67
Asian	29.5	110	33.2	363
Black, African American, African diaspora	59.4	17	45.1	39
Latinx or Hispanic	36.5	44	48.8	137
Native Hawaiian or Pacific Islander (NHPI)	100	2	79.3	10
Multiracial / Two or more	33.2	74	38.7	213
BIPOC ⁵	34.5	268	38.7	855
<i>First-generation College Status</i>				
First-generation	36.3	244	46.8	927
Not first-generation	20.1	470	25.9	1481
<i>Gender</i>				
Female	28.1	371	33.9	1542
Male	21.5	363	28.7	968
Nonbinary	22.7	10	46	76
Transgender ⁶	0	2	46.8	39
<i>Funding</i>				
Pell Grant	41.8	140	48.5	639
Work-study	36.5	90	48.1	314
Other funding	20.7	56	37.6	141
Graduate funding	19.8	102	21	357
No funding	18.4	309	23.6	1148
<i>Participation in SNAP Food Assistance Program</i>				
Received SNAP within past year	59.5	54	60.3	334
Currently on SNAP	62.8	43	61.4	264

Has not received SNAP within past year	21.8	646	29	2072
<i>Current Employment Status</i>				
Not employed	23.9	408	31.3	1075
Employed	28.6	319	35.8	1358
<i>Living Arrangement</i>				
Lives with children	19.0	119	24.1	383
Lives with family	14.3	256	23.8	676
Lives with spouse	28.1	108	35.1	585
Lives on campus	26.9	132	25.8	270
Lives in local county	29.8	535	35.8	1774
Lives in Oregon	26.7	670	33.5	2176
<i>School Dining Plan</i>				
Yes	22.6	114	25.7	239
No	31	419	37.5	1532

FI rates presented in Table 3 are weighted for known OSU population, considering racial demographics and class standing.

² Sub-sample sizes do not always sum to the total number of participants due to missing data.

³ The College of Education was unintentionally omitted from the course sample phase of the study.

⁴ The race and ethnicity question allowed respondents to “check all that apply.” Respondents were coded with a category if they *only* selected that race/ethnicity. If a respondent selected more than one category, they were coded as “Multiracial.”

⁵ The BIPOC (Black, Indigenous, and People of Color) category includes respondents who identified as a student of color including those who identified as multiracial and those who identified with a single race.

⁶ We include all respondents who indicated identifying as transgender, including those who also indicated female or male, meaning this category is *not* exclusive.

The results in Table 2 confirm anticipated patterns of FI among usually vulnerable groups of students. Focusing on results from the course-based sample, approximately 1 in 3 first-generation college students reported being food insecure -- a rate 16 percentage points higher than for students who are not first-generation college students. Students of color (BIPOC) reported FI at a rate 12 percentage points higher than white students. Findings also indicate that juniors and seniors reported higher FI rates than first- and second-year students. Throughout this report, we provide more detailed analyses exploring the patterns of FI among specific groups.

Table 3 shows how each demographic characteristic was associated with FI, accounting for the other variables measured. Because apparent differences in percentages (e.g., between race and ethnic groups) may be the result of differences in first-generation status among these groups, it is important to examine how the likelihood of FI differs once those factors are accounted for. This table reports adjusted odds ratios, or the likelihood of being food insecure given that a respondent is in a specific demographic group while controlling for other factors.

Table 3: Adjusted odds of food insecurity among Corvallis OSU students, 2020¹

Variable	Weighted ²	Unweighted
<i>Class Standing</i>		
Frosh/Soph (referent)		
Jr/Senior+	1.35***	1.38***
Graduate - Masters	1.32	1.25
Graduate - PhD	1.21	1.03
<i>College</i>		
	0.99	0.99
<i>Credit Hours</i>		
Part-time (referent)		
Full-time	0.96	0.95
<i>Race/Ethnicity</i>		
White or Caucasian (referent)		
American Indian or Alaska Native	1.20	1.14
Asian	1.32**	1.27*
Black African American, African diaspora	1.70	1.63
Latinx or Hispanic	1.36	1.309
Native Hawaiian or Pacific Islander (NHPI)	8.23***	7.84**
Multiracial / Two or more	1.22	1.16
<i>First-generation College Status</i>		
Not first-generation (referent)		
First-generation	2.00***	1.99***
<i>Gender³</i>		
Male (referent)		
Female	1.05	1.06
Nonbinary	1.62*	1.64*
Transgender	1.80	1.79
<i>Funding</i>		
No funding (referent)		
Pell Grant	1.96***	1.96***
Work-study	1.36**	1.36**

Other funding	1.69**	1.68**
Graduate funding	0.73*	0.73*
<i>Participation in SNAP Food Assistance Program</i>		
Has not received SNAP with past year (referent)		
Currently on SNAP	1.61*	1.63**
Has received SNAP within past year	1.42	1.41
<i>Current Employment Status</i>		
Not employed (referent)		
Employed	1.17*	1.18*
<i>Living Arrangement⁴</i>		
Lives with children	1.02	1.00
Lives with family	0.46***	0.45***
Lives with spouse	0.90	0.90
Lives in local county	1.39**	1.40**
Weighted covariate	1.34	
Constant	.15***	0.20***
N ⁵	2697	2697

legend: * p<.1; ** p<.05; *** p<.01

¹Adjusted odds ratios are adjusted for all variables that were significant in univariate analyses of food insecurity on a 90% confidence interval (class standing, credit hours, college, first-generation status, gender, race/ethnicity, living situation, SNAP receipt, employment, and institutional funding).

² Using data from the Office of Institutional Research, we evaluated the representativeness of our sample and applied statistical weights to better reflect the known demographic composition of the OSU Corvallis Campus. For a more detailed description of this process, see Appendix B.

³ The “female” and “male” categories include all respondents who identified as “female” or “male,” including those who also identified as transgender. The transgender variable is a binary variable indicating if a respondent selected “transgender” as a gender identity whether in conjunction with other identities such as male or female or independently.

⁴The referent category for each of the variables within “Living arrangements” is the opposite, such as “Does not live with children.”

⁵The sample number includes respondents totaled from both survey phases (course-based and email-based survey respondents) and does not include those respondents with incomplete surveys. Respondents were only able to complete the survey once.

Food Security by Class Standing and College

Class standing was associated with FI; specifically, students who identified as juniors or seniors were 1.35 times more likely to be food insecure compared to first- and second-year students, after accounting for other student characteristics. Odds of FI for graduate students also appear higher but this finding was statistically insignificant, perhaps due to the smaller sample of graduate students.

Although the college in which a student is enrolled was not a significant correlate of food insecurity (Table 3), there were nonetheless differences in FI across colleges (Table 2). The course-sampling method showed more obvious differences across colleges than the emailed sample. These differences further illustrate the potential for response bias and the need for attention to sampling methodology. However, in either case, the apparent college-level differences were not found to be robust after adjustment for demographic characteristics (Table 3).

While our survey collected information about credit enrollment, allowing us to evaluate the impact of being a full-time or part-time student, credit-hour enrollment was not associated with FI in either sample; FI rates were similar for part- and full-time students.

Food Security by Race, Ethnicity, and First-Generation College Status

Students of color reported a higher prevalence of FI compared to white students (Table 2). The course-sampling method shows that Asian and American Indian or Alaska Native students had FI rates about 7 percentage points higher than White students whereas Latinx or Hispanic and multiracial students had slightly higher rates of FI. Notably, Black, African American, and African diaspora (hereafter indicated as Black) students had a FI rate more than twice that of white students. The two Native Hawaiian and Pacific Island (NHPI) students in this sample both reported being food insecure. The email sample, with more representation from NHPI students, also indicates a high rate of FI for this group as well as among Latinx or Hispanic and Black students.

Table 3 shows that when adjusted for other variables, the association between racial and ethnic status is most evident among Asian and NHPI students. The odds of FI for these students are 30% higher for Asian compared to White students, and 800% higher for NHPI students. The odds of FI for other racial and ethnic groups tend to be higher than for White students, with some appearing to be 20% to 70% higher. Although these differences were not statistically significant ($p < .05$) in our sample, they reflect important trends as reported in the literature. Moreover, the odds of FI for Black and Latinx or Hispanic students appear to be reduced when adjusting for first-generation college status (see Appendix C for further discussion). Our findings suggest that this association with FI found in our study may be partially due to racial/ethnic differences in family resources available to students. We cannot conclude that this association is fully accounted for by first-generation college status since the coefficients for Black and Latinx or Hispanic students remain high. The exception where first-generation college status did not account for race is among Asian and NHPI students.

The importance of first-generation college status appears in Tables 2 and 3, as well as in our further analysis presented in Appendix C. Table 2 indicates that first-generation college students show a FI rate at least 16 percentage points higher than for other students, with the estimated difference being higher in the email-based sample (~20 percentage points). Table 3 shows the relationship between first-generation college status and FI, adjusted for other variables, with first-generation students being about 2 times more likely to be food insecure than non-first-generation students. Appendix C further examines how first-generation college status appears to impact FI, showing that this association was not explained by controlling for race or other variables.

Table 2 shows higher rates of FI among cis-gender women (in the course-based sample but not the email-based sample), and higher rates of FI among non-binary and transgender students (in the email-based sample). Table 3 shows that after adjusting for other variables, non-binary students have 60% greater odds of FI. A similar result was found for transgender students, although it was not statistically significant.

The survey offered several response options for gender, in a “check all that apply” format including (1) Woman, (2) Man, (3) Transgender, (4) Agender, (5) Non-binary, (6) Prefer not to disclose, and (7) Prefer to self-describe. Thus, many different combinations of gender identities were reported. Table 4 shows gender identity frequency and rates of FI within the combined sample. Some groups are very small and thus FI rates are not reliable estimates; however, we present these findings to indicate the need to explore FI among these gender identities. These data limitations notwithstanding, we observed higher rates of FI among the larger of the small subsamples for non-binary and transgender students. We further explore these data in Appendix C, noting persistent evidence of greater vulnerability to FI among transgender and non-binary students.

Table 4: Frequencies and FI rates by gender identity using the combined sample¹

Gender Identity	Frequency	FI rate (%)
Agender	4	25.0
Agender, Non-binary	2	0.0
Man, Non-binary	3	0.0
Non-binary	42	47.6
Man	1077	29.5
Woman	1911	33.1
Woman, Agender	2	50.0
Woman, Man	1	0.0
Woman, Non-binary	19	63.2
Transgender	12	50.0
Woman, Transgender	2	0.0
Man, Transgender	15	53.3
Man, Transgender, Agender	1	100
Man, Transgender, Agender, Non-binary	2	50.0
Man, Transgender, Non-binary	1	0.0
Transgender, Non-binary	8	37.5
Prefer to self-describe	4	50.0
Prefer to self-describe: Cis genderqueer	1	0.0
Prefer to self-describe: Gender fluid	2	0.0
Prefer to self-describe: Khwaja Sira	1	100
Prefer to self-describe: Two-spirit	1	0.0
Prefer not to disclose	133	18.8
Total	3244	31.8

The combined sample includes the course-based and email-based survey responses

Food Security by Funding, Support, and Employment

Important factors influencing the lived experiences of college students include funding, support in the form of resources, and employment. For graduate students, funding is commonly in the form of institutional support that provides for tuition and a living stipend. Undergraduate students may receive Pell Grants, work-study opportunities, or other funding resources. Table 2 presents FI rates based on funding status, receipt of SNAP benefits, and employment. Table 3 shows that for undergraduates, after other variables are adjusted for, enrollment in Pell Grants and work-study increases the odds of being food insecure. This non-intuitive finding is consistent with the other non-intuitive finding of higher FI rates among SNAP recipients (Table 3). These programs provide resources intended to reduce FI, and enrollment in these programs signals a level of need. Qualifying for such programs is an indicator of financial hardship, which would be worse in the absence of these resources. Thus, we interpret these findings with caution. Participation in assistance programs promises to improve the situation and serves as an indication that a real need exists.

An additional non-intuitive finding evident in Table 3 is the observation that working students have higher FI rates than those who do not work. Again, while employment produces income that could potentially reduce FI, the need to work is also an indicator of financial need.

For graduate students, graduate funding appears to reduce FI (Table 3). Because much of graduate funding is not need-based, resources provided to graduate students operate as income usually does, potentially reducing food insecurity.

See Appendix D for further exploration of these data.

Food Security by Living Arrangements

Living arrangements, such as living within a family household or living in an on-campus dormitory, have changed dramatically due to the COVID-19 pandemic. Table 2 shows fairly modest differences among different living arrangements, in both the course-sample and the email-sample. The group that appears most insulated from FI are students living within family households, which remains an important correlate of FI in the multivariate model (Table 3). After adjusting for other characteristics, those students living in family households were half as likely to report FI.

Of particular interest is the observation that students living on campus had FI rates about the same as all students. Similarly, those with campus meal plans also had FI rates around 25%, similar to the larger student population (Table 2). These findings indicate persistent FI among students with campus-based housing and meal plans, which requires further examination.

Living within nearby counties (Linn, Lane, Benton) shows a relationship with student FI, with a prevalence rate about 6 percentage points higher than the average rate in the course-visit sample and 4 percentage points higher for the campus-wide email sample (Table 2). In the combined sample, odds of FI for students living locally were around 40 percent higher (Table 3). This finding may be influenced by the prevalence of household FI, which are higher in local counties compared to the state average. As classes moved to remote learning during the pandemic, living

location during this study may be influenced by students temporarily returning home to other counties within the state or out of state. Further research to evaluate how living location influences college student food security is needed.

Discussion

The results of this study corroborate prior research indicating that college students are particularly vulnerable to FI. Our findings show that 24.3% of the course-based sample survey participants at the OSU Corvallis campus were food insecure in November 2020 (Table 2). We consider this estimate to be most reliable (compared to the larger, email-based survey sample) due to the response rate of approximately 72%, suggesting that this estimate is less likely influenced by non-response bias. This caveat being noted, a benefit of having a total of 3,244 student participants recruited through the combined survey methods (i.e., courses and email) is establishing sub-sample sizes large enough to identify predictors of FI, presented as adjusted odds ratios in Table 3.

In addition to providing an estimate of the prevalence of FI among OSU Corvallis students, our findings indicate which sub-groups are more likely to be food insecure. Our analysis identified several key indicators of FI, including class standing, race/ethnicity, first-generation status, non-binary gender identity, and living situation. Our findings also show how some patterns exist but are not drivers of FI. For example, while patterns exist across academic colleges (Table 2), these are explained by demographics and economic circumstances of students enrolled in those colleges.

We found that undergraduate students in their third or fourth year are more likely to be food insecure than first- or second-year college students, even after adjusting for race/ethnicity and first-generation college status. While we found that race/ethnicity was associated with FI in univariate analyses, controlling for first-generation status explained much of this association. The exception was among Asian and NHPI students. Even after adjusting for all other variables, students who identified as NHPI reported higher rates of FI. This suggests that factors other than socio-economic background could be driving this disparity. The apparently high odds of FI among NHPI students is uniquely high; however, the sample size for this group was small ($n=12$), suggesting that further research for this group, in particular, is needed to better understand this finding.

Our research also identified patterns of FI among students based on their living situation. Students living in local counties (Benton, Linn, or Lane County) reported higher rates of FI, even when controlling for other factors. This may not be unique to OSU, as research in 2018 revealed that residents in Benton, Linn, and Lane County reported higher rates of FI than the state average (Feeding America, 2020a). While OSU is in the position to help address FI among students through campus-based strategies, the local counties' responses to household FI may also be impactful to students. The results of this study are therefore relevant to broader local strategies addressing FI. Local community and county public health policies and programs should include college students as a particularly vulnerable group when planning FI interventions.

Unsurprisingly, and consistent with other research, first-generation college status is a predictor of FI. Our findings indicate that even when controlling for other key factors such as race/ethnicity and class standing, first-generation college students are nearly twice as likely to experience FI compared to their non-first-generation peers. Notably, our most conservative estimate indicates that one in three first-generation college students at the OSU Corvallis campus is food insecure.

Our results for non-binary and transgender students suggest the need for further exploration of how and why FI may be more prevalent among these populations. Similarly, the finding of higher rates of FI among working students, and those receiving educational funding support a call for further examination of the adequacy of these financial resources.

Finally, and notably, this research shows how different sampling methods can produce drastically different estimates of FI. To our knowledge, this study is the first to examine and compare two different survey sampling strategies in the college student population. While the course-based methodology estimates the Corvallis campus FI rate to be 24.3%, the email-based methodology produced a much higher estimate of 31.6%. This supports the hypothesis that variation among estimates of FI can be attributed to the methodology of studies, as suggested by Nikolaus et al (2020). Our findings contribute to the literature on college student FI, as well as the general sampling and survey methodology literature. Further research is warranted to validate our findings and investigate other methodologies that could be used to improve upon the reliability of estimates. Subsequent studies of students attending the OSU Cascades campus and Ecampus are pending to assess FI among the entire OSU student body and to further investigate this methodological question.

Limitations and Future Improvements in Methodology

While 2,510 students provided complete responses to the email version of the survey, food-secure students may have been more likely to opt-out of this survey compared to the course-based survey. All students in both samples were informed that their participation in the survey was completely voluntary and would not impact their academic standing; and yet it appears that, as we anticipated, the course visit may have provided a context that encouraged more food secure students to participate. Thus, the course-based sampling approach likely reduced non-response bias. That said, even with 72% of students participating in the course-based sample, we do not know what was the FI rate among those who did not participate in the survey. If lack-of-interest bias also occurred, then our estimate of 24.3%, which is more conservative than that of the email-based sample, may still be slightly overestimated.

The FI screener and questionnaire focuses on a 30-day reference period when assessing level of food security. However, FI is often an intermittent, recurring condition (Coleman-Jensen et al., 2020). The prevalence of FI among OSU students as captured by this study represents a snapshot of those experiences within the past month but may not reflect student food security over a longer timeframe. Because the survey refers to the previous 30 days instead of an annual rate, the overall level of FI experienced by the OSU Corvallis student population during the academic year is undoubtedly under-estimated since more students are likely to become food insecure following the survey time period.

The timing of the survey provides an important context for interpreting our findings. We do not have baseline FI rates for OSU students prior to the COVID-19 pandemic for comparison. The rates of FI and correlates presented herein may be representative of unique situational circumstances during the pandemic, which may have further exacerbated already present inequities between specific groups or obscured existing patterns. The unique context of when these data were gathered may make our overall rates of FI for OSU students less comparable to the broader literature on college student FI completed elsewhere, pre-pandemic, and any research

conducted post-pandemic. Future, regular assessments of FI among the OSU student body may help to determine typical rates of FI in this population. Additionally, this study may not accurately reflect the entire OSU student body. To address this concern, additional surveys are underway at OSU Cascades and OSU Ecampus.

Acknowledgments

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Shahinur Bashar, College of Liberal Arts

Sabrina Beck, College of Liberal Arts

Elianna Coulton, College of Public Health and Human Sciences

Molly Haag, College of Public Health and Human Sciences

Jon Ruff, College of Liberal Arts

Ania Ty, College of Liberal Arts

Bree Weeden, College of Public Health and Human Sciences

Appendices

Appendix A: Food Security Survey – Corvallis Campus

The results of this survey will help OSU improve the health and well-being of all our students. Your participation, whether or not you have had any difficulty accessing enough food, will help us to understand the problem of food insecurity at OSU.

This survey should take approximately 5 minutes to complete.

Before getting started, please review and consider the following consent information.

Consent

Purpose: The purpose of this study is to evaluate which groups of students are more or less food secure, particularly during the current COVID lockdown. We are surveying students to ask them about their level of food security (i.e. access to sufficient quantity of affordable, nutritious food), their current circumstances such as living situation, their economic security, and their receipt of public program help. We are interested in the entire student body at Oregon State University.

Eligibility requirement: To be eligible to participate in this study, you must be currently enrolled in a course offered by Oregon State University. You must also be at least 18 years of age.

Activities: We ask you to complete an online survey about your current circumstances related to food security, living situation, and economic security. This should take less than 5 minutes. At the end of the survey, you will be given the opportunity to submit your ONID email to enter a drawing for one of three \$100 gift cards.

Voluntary: You do not have to be in the study if you do not want to. Participation in this survey will not influence your grade in any courses in which you are enrolled nor impact your standing with the university. Data collected from this survey will not be used for any future research outside of this context.

Risks: We don't anticipate any risks or discomforts with this study. Know that you may stop the survey at any time or refuse to answer any question. Data collected from this research will not be stored for future research.

Benefit: This study is not designed to benefit you directly, however, the research content and the materials we provide may be supportive and informational to you.

Confidentiality: Other people may learn that you participated in this study but the information you provide will be kept confidential to the extent permitted by law. Should you choose to provide your ONID email at the end of the survey, it will not be linked to your responses.

Study contacts: For more information about this study, please contact the principal investigators, Mark Edwards or Jenny Jackson, by phone at 541-737-5379 or 541-737-4853 or by email at medwards@oregonstate.edu or Jenny.Jackson@oregonstate.edu.

You can also contact the Human Research Protection Program with any concerns that you have about your rights or welfare as a study participant. This office can be reached at (541) 737-8008 or by email at IRB@oregonstate.edu.

For students residing in the European Union, questions regarding General Data Protection Regulations can be address to OSU’s Data Protection Officer, Tom Ordeman at (541) 737-9800 or by email at dpo@oregonstate.edu.

	Yes	No
I am at least 18 years of age or older	<input type="radio"/>	<input type="radio"/>
I currently attend OSU (in-person, remote, or online)	<input type="radio"/>	<input type="radio"/>
I agree to participate in this survey	<input type="radio"/>	<input type="radio"/>

The focus of this study is on the food security situation of students attending OSU. Even if you have had no difficulties obtaining food, we ask you to complete the following section to help us understand the food security of all OSU students.

In the last thirty (30) days, did you ever run short of money and try to make your food or your food money go further?

- Yes
- No

Which of these statements best describes the food eaten in your household?

- Enough of the kinds of food we want to eat
- Enough, but not always the kinds of food we want
- Sometimes not enough to eat
- Often not enough to eat

Thinking about the last thirty (30) days, please select whether the following statements were often true, sometimes true, never true, or if you **don't know**.

In the last 30 days...

	Often true	Sometimes true	Never true	Don't know
I worried whether my food would run out before I got money to buy more.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The food that I bought just didn't last and I didn't have enough money to get more.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I couldn't afford to eat balanced meals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For the following statements, please indicate whether you have experienced the following situations in the last thirty (30) days by selecting **yes**, **no**, or **don't know**.

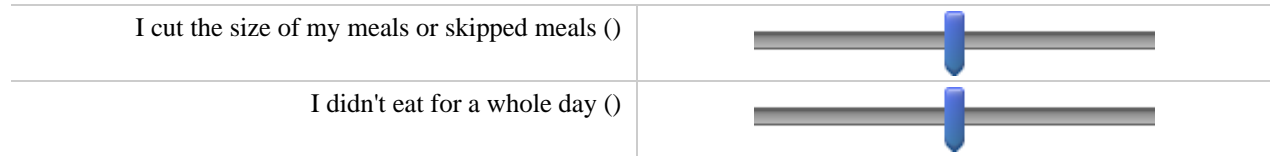
In the last 30 days...

	Yes	No	Don't know
Did you ever cut the size of your meals or skip meals because there wasn't enough money for food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you ever eat less than you felt you should because there wasn't enough money for food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Were you ever hungry but didn't eat because there wasn't enough money for food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you lose weight because there wasn't enough money for food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you ever not eat for a whole day because there wasn't enough money for food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

You indicated that sometimes you would skip meals or didn't eat for a whole day. About how many days did this happen in the last thirty (30) days?

(Click and drag the slider to indicate the approximate number of days each of the following occurred)

0 5 10 15 20 25 30



Have you received SNAP benefits (*i.e.* "food stamps") in the past year?

- Yes
- No
- I'm not sure

Do you currently receive SNAP benefits?

- Yes
- No

To help us better understand who struggles with food security, and to ensure this survey is representative of the OSU student population, the following section will ask you a few questions about your academic progress, personal identity, and current living situations.

How many credit hours are you currently registered for? (Fall Term)

- 1 - 6 credits
- 7 - 11 credits
- 12 - 16 credits
- 17+ credits

Which type of student best represents you?

- Undergraduate student
- Post-baccalaureate student
- Masters student
- Doctoral student

Which College are you in?

- Agricultural Sciences or Forestry
- Business
- Education
- Engineering
- Science
- Liberal Arts
- Public Health and Human Sciences
- Earth, Ocean, and Atmospheric Sciences
- Veterinary Medicine or Pharmacy

Do you receive institutional funding that pays for your tuition? (e.g. GTA/GRA, Fellowship, Fulbright, government scholarship).

- Yes, all of my tuition is covered.
- Yes, but only some of my tuition is covered.
- No

What year are you in your undergraduate studies?

- 1st year
- 2nd year
- 3rd year
- 4th year+

Please select the following institutional support systems that apply to you. *(select all that apply)*

- I receive a Federal PELL grant
- I qualify for "Work Study" programs
- Other *(please specify):*

Are you employed this term?

- Yes
- No

About how many hours per week do you work?

- 1 - 9 hours
 - 10 - 19 hours
 - 20 - 29 hours
 - 30+ hours
-

What is the highest level of education of any of your parents or guardians?

- Less than a high school diploma
 - High school diploma or GED
 - Some college or associate/ trade degree
 - Bachelor's degree
 - Master's degree or higher
 - Don't know
-

What racial/ethnic backgrounds do you identify with? (*Select all that apply*).

- American Indian or Alaska native
 - Asian
 - Black, African American, African diaspora
 - Latinx or Hispanic
 - Native Hawaiian or Pacific Islander
 - White or Caucasian
 - Prefer not to disclose
 - Prefer to self-describe _____
-

What gender(s) do you identify with? (*Select all that apply*).

- Woman
- Man
- Transgender
- Agender
- Non-binary
- Prefer not to disclose
- Prefer to self-describe

Do any children (*under 18*) currently live in your household?

- Yes
 - No
 - Prefer not to disclose
-

Do any adult family members currently live in your household? (*e.g. parents, grandparents, siblings*)

- Yes
 - No
 - Prefer not to disclose
-

Do you currently live with a spouse or partner?

- Yes
- No
- Prefer not to disclose
-

Do you currently live in the Corvallis/Albany/Eugene area? (*Benton, Linn or Lane County*)

- Yes
- No
- Prefer not to disclose
-

Do you live on-campus this term?

- Yes
- No
-

Do you have an OSU dining plan this term?

- Yes
- No
-

Thank you for participating in this survey. Your responses will help us better understand food security at OSU and in our student population. Your answers and identity will remain confidential.

The following question will ask you if you would like to enter the drawing for one (1) of three \$100 gift cards. To protect your privacy, if you select "Yes", you will be redirected to a new survey which will ask you to input your ONID e-mail address. (*Make sure you have pop-ups enabled in your phone or computer browser!*)

By collecting your e-mail in a different survey, we ensure your responses in this survey cannot be connected to your identity.

Would you like to enter the drawing for one of three \$100 gift cards?
(Selecting "Yes" will redirect you to a new page).

- Yes, please!
 - No, thank you.
-

Appendix B: Representativeness of Samples

Using data provided by the Office of Institutional Research, we analyzed the representativeness of our sample. Table B-1 displays the frequency and percentage of each subgroup in the sample population as well as the overall OSU population and percentages.

Table B-1: Representativeness of samples

Demographic characteristic	Course Sample N	Email N	Total Sample N	Sample Percent	OSU Pop	OSU Percent
<i>Class Standing</i>						
Freshman	193	363	556	17.14	4264	13.20
Sophomore	71	367	438	13.50	4670	14.45
Junior	182	487	669	20.62	6042	18.70
Senior	71	631	702	21.64	8384	25.95
Post baccalaureate	12	71	83	2.56	2686	8.31
Undergraduate ¹	529	1919	2448	75.46	26046	80.61
Graduate - Masters	91	222	313	9.65	2339	7.24
Graduate - PhD	107	292	399	12.30	1579	4.89
Prof PhD					620	1.92
<i>College</i>						
Agricultural Sciences	45	304	349	10.76	2901	8.98
Business	239	208	447	13.78	3986	12.34
Education	0	26	26	0.80	449	1.39
Science	53	447	500	15.41	3893	12.05
Liberal Arts	43	363	406	12.52	4423	13.69
Public Health and Human Sciences	48	266	314	9.68	2415	7.47
Earth, Ocean, and Atmospheric Sciences	32	106	138	4.25	1092	3.38
Veterinary Medicine or Pharmacy	85	78	163	5.02	294	0.91
Engineering	175	629	804	24.78	9541	29.53
<i>First-generation College Student</i>	244	927	1171	36.10	6135	18.99
<i>Credit Hours</i>						
Part-time	49	383	432	13.3	10759	33.30
Full-time	678	2050	2728	84.1	21553	66.70
<i>Gender</i>						
Female	371	1542	1913	59	15639	48.40
Male	333	759	1092	33.7	16673	51.60
Nonbinary	10	76	86	2.7	-	-

Transgender ²	2	39	41	1.3	-	-
<i>Race and Ethnicity</i> ³						
White or Caucasian	437	1472	1909	58.8	19541	60.48
American Indian or Alaska Native	15	67	82	2.5	166	0.51
Asian	110	363	473	14.6	2414	7.47
Black, African American, African diaspora	17	39	56	1.7	512	1.58
Latinx or Hispanic	44	137	181	5.6	3566	11.04
Native Hawaiian or Pacific Islander (NHPI)	2	10	12	.4	83	0.26
Multiracial / Two or more	74	213	287	8.8	2174	6.73
BIPOC	297	1038	1335	41.2	8915	27.59
<i>Living Arrangements</i> ⁴						
Lives with children	119	383	502			
Lives with family	256	676	932	28.73		
Lives with spouse	108	585	693	21.36		
Lives on campus	132	270	402	12.39		
Lives in local county	535	1774	2309	71.18		
Lives in Oregon	670	2176	2846	87.73		
<i>School Dining Plan</i>						
Yes	114	239	353	10.88		
No	419	1532	1951	60.14		
<i>Participation in SNAP Food Assistance Program</i>						
Has received SNAP within past year	54	334	388	11.96		
Currently on SNAP	43	264	307	9.46		
Has not received SNAP with past year	647	2071	2718	83.79		

¹Consistent with the Office of Institutional Research, we classified “post baccalaureate” students as “undergraduates.”

² We include all respondents who indicated identifying as transgender, including those who also indicated female or male, meaning this category is *not* exclusive

³ The race and ethnicity question allowed respondents to “check all that apply.” Respondents were coded with a category if they *only* selected that race/ethnicity. If a respondent selected more than one category, they were coded as “Multiracial”

⁴ Data for living arrangements, non-binary or transgender gender identities, and SNAP receipt were not available from the Office of Institutional Research and thus could not be compared to our sample data.

Based on our evaluation of the representativeness of our sample, our team created sample weights to adjust the estimates to better reflect the demographic composition of the OSU Corvallis campus student population. We considered race and academic class standing as our primary concerns for these sample weights. For further discussion of applying sample weights when population demographics are known see Solon, Haider, and Wooldridge (2013). Table 3 in the full report shows both the weighted and unweighted results.

Appendix C: Further Analysis of Race, First-generation College Status, and Gender

We further explored the relationship between demographic variables and FI. Table C-1 begins with a simple model where only variables for each racial/ethnic minority group are included with white identity as the referent category. In the first model, each racial category shows a significantly higher likelihood of FI. (Note: This model is unadjusted for other variables, and hence differs from the model discussed in Table 4.)

When the model is adjusted for first-generation status, the coefficients attenuate, and all lose their statistical significance, with the exception of NHPI identity. While all become statistically insignificant, they nonetheless trend upward. The extraordinarily large coefficient for NHPI identity is impressive, given the small number (n=12) of students in our total sample who are in this ethnic group. Further research is needed to examine this observation and what may be happening for this group of students.

Further addition of variables to the model, only modestly further attenuates the role of first-generation college status, only modestly further impacting the coefficients for race and ethnicity. The reemergence of the importance of being Black in predicting FI, when adjusting for class standing, suggests that our sample may include a larger number of Black frosh/sophomores with relatively low rates of FI.

Table C-1: Racial Identity and FI (Adjusted Odds Ratio)

Variable	Impact of Race on the likelihood of FI	Controlling for first-generation status	Controlling for SNAP status	Controlling for class standing
<i>Race/Ethnicity</i> (White as referent)				
Asian	1.29**	1.10	1.08	1.13
American Indian or Alaska Native	1.65**	1.32	1.13	1.15
Black, African American, African diaspora	1.97**	1.57	1.56	1.60*
Latinx or Hispanic	1.85***	1.27	1.14	1.20
Native Hawaiian or Pacific Islander (NHPI)	12.22***	7.65***	8.03***	8.06***
Multiracial / Two or more	1.25*	1.16	1.14	1.16
First-generation College Status		2.26***	2.05***	1.98***
<i>SNAP Status</i> (Not on SNAP as referent)				
Has received SNAP within past year			2.15***	1.95***
Currently on SNAP			1.49*	1.48*
<i>Class Standing</i> (Frosh/Soph as referent)				
Jr/Senior+				1.66***

Master				1.19
Doctorate				0.99
Constant	0.41***	0.32***	0.29***	0.22***
N	3244	3122	3066	3064

* indicates a p-value < .1; ** indicates a p-value < .05; *** indicates a p-value < .01

We focused our analyses and report on the concept of food insecurity (FI) but our measure permits us to explore who among the food insecure have the most serious situation of very low food security (VLFS). A closer look at the course sample allows us to examine the severity of FI across racial groups (Table C-2).

Table C-2: Food Insecurity and Very Low Food Security, by Race

Race and Ethnicity	Course Sample		Email Sample	
	VLFS Rate (%)	N	VLFS Rate (%)	N
White or Caucasian	13.1%	437	17.2%	1472
Asian	15.2%	110	16.9%	363
American Indian or Alaska Native	25.3%	15	25.8%	67
Black	55.1%	17	23.3%	39
Latinx or Hispanic	11.3%	44	27.9%	137
Native Hawaiian or Pacific Islander (NHPI)	100%	2	48.8%	10
Multiracial / Two or more	17.5%	74	23.3%	213

We used the USDA definition to categorize a student as having VLFS if they answered six or more questions with an affirmative answer. Details on this process can be found in Table 1. While Table 2 (course-sample data) showed FI rates for Black and American Indian/Alaska Native students of 59.4% and 29.2%, respectively, the VLFS rate for these students (Table C-2) was 55.1% and 25.3%. This similarity in FI and VLFS rates means that in the course-sample, nearly all these Black and American Indian/Alaska Native students who were food insecure were experiencing VLFS. Meanwhile, about 50-60% of food insecure White and Asian students had VLFS, and about one-third of food-insecure Latinx or Hispanic students experienced VLFS. When the same analysis is completed using the larger emailed survey, all of these racial and ethnic groups show that around 50% of those who were food insecure were experiencing VLFS.

Table C-3 more carefully examines the relationship of first-generation college status and FI, showing first that without accounting for any other variables, first-generation status seems to more than double the odds of FI. That relationship reduces slightly when adjusted for race, and reduces still further when adjusted for enrollment in SNAP. This provides some evidence of the reduction of FI among first-generation college students who are enrolled in SNAP. Further

adjusting for class standing and gender identity, both of which are variables associated with FI, does not significantly impact the persistent effect of first-generation college status.

Table C-3: First-generation College Status and FI (Adjusted Odds Ratio)

Variable	Impact of First-generation status on the likelihood of FI	Controlling for race	Controlling for SNAP	Controlling for class standing	Controlling for gender identity
First-generation College Status	2.38***	2.26***	2.05***	1.98***	1.98***
<i>Race (White as referent)</i>					
Asian		1.10	1.08	1.13	
American Indian or Alaska Native		1.32	1.13	1.15	
Black		1.57	1.56	1.60*	
Latinx or Hispanic		1.27	1.14	1.19	
Native Hawaiian or Pacific Islander (NHPI)		7.65***	8.04	8.06***	
Multiracial / Two or more		1.16	1.14	1.16	
<i>SNAP Status (Not on SNAP within past year as referent)</i>					
Has received SNAP within past year			2.15***	1.95***	1.90***
Currently on SNAP			1.49*	1.48*	1.5*
<i>Class standing (Frosh/Soph as referent)</i>					
Jr/Senior+				1.66***	1.66***
Master				1.19	1.19
Doctorate				0.99	0.99
<i>Gender (Male as referent)</i>					
Female					1.10
Nonbinary/agender					1.65**
Transgender ¹					1.61
Constant	0.33***	0.32***	0.29***	0.22***	0.21***
N	3122	3122	3066	3064	3064

* indicates a p-value < .1; ** indicates a p-value < .05; *** indicates a p-value < .01
The referent category for transgender is cis-gender

Table C-4 collapses the detailed gender identities presented in Table 4 into five broader categories including cis-gender, meaning the respondent’s gender identity matches their assigned sex at birth, transgender, nonbinary or agender, unreported, and prefer to self-disclose. This allows us to use categories with larger frequencies and more statistical power. These simple percentages again reinforce the point that transgender and nonbinary/agender students show higher rates of FI than cis-gender students.

Table C-4: Frequencies and FI rates by gender identity using the combined sample.

Gender Identity	Frequency	FI Rate (%)
Cis Gender	2,988	31.8
Transgender	29	48.3
Nonbinary or Agender	90	44.4
Unreported	133	18.8
Prefer to self-disclose	4	50.0
Total	3,244	31.8

Appendix D: Further Exploration of SNAP and Other Support for Students

We further explored the non-intuitive findings about program eligibility, use, and FI (Table D-1). The adjusted odds ratios here indicate that even when accounting for race, first-generation status, and class standing, institutional support and SNAP receipt are correlates of FI among students on the Corvallis campus. Again, it is important to note that the significance of institutional support and SNAP receipt as indicators of FI is not a causal link and may simply highlight the correlation due to a connection between financial status and eligibility for funding and SNAP receipt.

Table D-1: Odds of food insecurity among OSU students by funding, support, and employment (November, 2020)

Variable	Support and Funding	Controlling for Race	Controlling for First-generation	Controlling for Class standing
Institutional Support ¹	1.48***	1.41***	1.25***	1.34***
<i>SNAP Status (Never on SNAP as referent)</i>	1.58**	1.54*	1.53*	1.53*
Currently on SNAP				
History of SNAP	2.21***	2.18***	1.99***	1.79***
Employed (Employed as referent)		1.16*	1.19**	1.13
<i>Race (White as referent)</i>		1.24*	1.10	1.17
Asian				
American Indian or Alaska Native		1.29	1.11	1.12
Black		1.73*	1.49	1.52
Latinx or Hispanic		1.40**	1.08	1.12
Native Hawaiian or Pacific Islander (NHPI)		11.22***	7.88***	7.85***
Multiracial / Two or More		1.22	1.17	1.18
First-generation College Status (First-generation as referent)			1.98***	1.87***
<i>Class standing (Frosh/Soph as referent)</i>				1.61***
Jr/Senior+				1.61***
Master				1.10
Doctorate				0.88
Constant	0.33***	0.29***	0.24***	0.19***
N	3117	3099	3064	3062

The institutional support variable includes graduate funding variables and undergraduate funding variables including Pell grants, Work study, and other funding.

Appendix E: Further Exploration of Food Insecurity and Living Arrangements

The estimates of FI for students in different living arrangements suggest intriguing possibilities but cannot yet answer persistent questions. For example, students living in households with children and in family households reported lower FI rates than others. We do not know whether those living with children are living with their own children, with siblings, or with other children. It would be worthwhile to explore how other living situations, such as living alone, with roommates, and with family may uniquely influence FI. Students living with a spouse reported a higher rate of FI. With regard to other living arrangement variables, the consistency of FI rates in the course-sample is striking with FI rates remaining in the 22% to 26% range. For reasons we have not yet explored, students who responded to the email-based survey reported higher FI rates among those who were living nearby, and those in other parts of Oregon.

Table E-1: Prevalence of food insecurity among OSU students by living situation using both samples, November 2020

Living Situation	Course Sample		Email Sample	
	FI Rate (%)	N	FI Rate (%)	N
Students within households with children	15.1	119	27.9	383
Students within family household	15.2	256	24.7	676
Students living with spouse	25.0	108	36.8	585
Students living in OR	24.0	670	34.8	2176
Students living locally	26.4	535	36.3	1774
Students living on-campus	25.0	132	26.3	270
Students with a dining plan	22.8	114	26.4	239

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