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ORIGINAL RESEARCH



Survey Recruitment Bias and Estimates of College Student Food Insecurity

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ABSTRACT

Having valid measures of college student FI is essential for justifying basic-needs services for students. But college student food insecurity (FI) rates vary significantly across institutions, perhaps partially due to differences in non-response bias resulting from participant recruitment strategies. We tested for effects of recruitment method on measured levels of college student FI at three time points (2020, 2021, 2022). Survey response rates varied dramatically across recruitment modalities. Higher FI rates were estimated in low-response-rate survey deliveries. Emailed surveys appear to inflate estimates of student FI. Efforts to increase response rates likely produce more valid estimates of college student FI.

KEYWORDS

College food insecurity; sample bias; response bias; survey recruitment

Introduction

Public health and public policy researchers increasingly identify college student food insecurity (FI) as a significant and unresolved problem. Across campuses, FI estimates average around 40%, nearly four times the rate of FI annually found in U.S. households.^{1,2} FI rates among college students also vary dramatically between campuses, from 10% to 75%.¹⁻³ This variation could be due in part to differences in the characteristics of student populations across campuses,⁴ but we and others suspect that methodologies used to generate these estimates may play an important role as well^{1, 5}. Moreover, while the relatively high levels of FI measured among college students could indeed be partially inflated by the use of FI measures inattentive to college students' unique experiences,⁴ these high rates could also derive from the types of data collection methodologies used. The most complete systematic reviews of existing literature suspect this possibility, but do not test it² GAO.^{3,6} Public opinion survey researchers have long been concerned over non-response bias⁷ and those who specifically study college student survey response locate clear evidence of non-response bias.⁸

Our study examines the degree to which methodological approaches that lead to survey response bias due to selective participation may inflate estimates of college student FI. If indeed study design demonstrably inflates estimates, then perhaps differences in such design choices may also explain some of the variability in estimates. By employing a two-phase sampling scheme at a single university within the same month, we explore the degree to which survey recruitment modality and resulting response rate impact FI estimates. The difference in estimates obtained from emailed surveys and those obtained in a classroom setting reveal the potential role of survey response bias in inflating estimates of FI among college students. The policy implications of determining the best methods for estimating FI rates reach beyond college students, relevant to other local, regional, and statewide estimates of FI. The United States Department of Agriculture (USDA) has recently called for examination of how sample response bias and differing response rates may impact differences in national household estimates of FI and food insufficiency.⁹ The implications for better estimates are tangible, especially in terms of estimating need for or impacts of pro-food security policies.

Background

While we do not undertake assessment of the validity of the existing measures of FI commonly used in the college student population, we note that the USDA developed what has been considered the “gold standard” for measuring FI. The USDA Food Security Survey Module (FSSM) uses a variety of indicators to classify households as food secure or insecure, with attentiveness to sub-classifications within those categories (e.g., very low food security, low food security, marginal food security, and high food security.) The FSSM, available since the late 1990s, has been validated using qualitative, quantitative, and narrative analyses and has been examined and approved by the National Academy of Sciences.^{9,10} The FSSM is used every December as part of the U.S. Bureau of Labor Statistics’ Current Population Survey (CPS), producing annual estimates of FI for the nation, each state, and various demographic groups.

Critics of the USDA FSSM appropriately identify its weaknesses related to the lack of validation for use in the college student population.^{4,11} Concerns about using the measure with college students include the wording of the items and the variety of “household” types in which college students may reside.^{4,11} Furthermore, college students’ life circumstances are often very different from the general population, who, with the exception of student parents, are likely to have greater independence and less responsibility for others.¹² The heterogeneity in college students’ potential life circumstances suggests that a different survey instrument may be necessary to adequately assess FI in this vulnerable population. Yet, imperfect as the USDA FSSM may be for describing unique facets of college student FI, the repeated use of it in many studies has allowed for comparisons over

time and across groups. Most studies exploring FI among college students have used the USDA FSSM in some form.¹³ Nazmi et al.² and Bruening et al.⁶ observe that extant surveys use either the 10 or 6 item version of the survey, with some asking about students' food security experiences over the past 12 months and others over the past 30 days. Recent critiques suggest that sampling and surveying processes may help account for the widely disparate estimates of college FI even when they use the same measure.^{5,13} Many studies' sampling strategies rely on convenience samples¹ wherein response rates cannot be computed. But Nazmi et al.² show great variation across campuses even among studies relying on more careful sampling efforts or even census methods, suggesting that other concerns such as recall bias, survey fatigue, and the resulting representativeness of samples likely plague even those surveys. More recently, the scoping review by Nikolaus et al.¹ noted that most studies had low response rates, and none had examined potential nonresponse biases. A scan of the studies included in the Bruening et al.⁶ and Nazmi et al.² reviews highlight the various sample selection methods, modalities of survey delivery, and (when reported) dramatically differing response rates. These observations are consistent with the claims of other researchers proposing that methodology undoubtedly influences these widely disparate estimates.^{1,5,14}

Bruening et al.⁶ speculate that there may be a negative association between response rate and FI rate. While non-response to surveys could be random, leading to negligible bias in the estimates, our pre-survey hypothesis was that food-insecure students are more likely to participate in a survey about FI, and food secure students are less likely to participate, thus increasing the proportion of respondents who indicate they are food insecure. The resulting sample is likely to be unrepresentative of the population with regard to the outcome variable of FI. Food insecure students may be more likely to participate not only because the survey topic is more salient to them but also because any financial incentives offered to survey participants may be of greater value to them. When response rates are very low, this response bias would likely be exacerbated.

Admittedly, some survey data gathered about college student food insecurity may be obtained from more generic student well-being surveys that could reduce this potential bias but this has not been the norm in the dozens of studies reviewed in the above-mentioned systematic reviews. The increasingly frequent inclusion of FI indicators in more recent general surveys of student well-being is not only a welcome development indicating growing awareness of the problem but is also an opportunity to improve the validity of measurements. Meanwhile, additional approaches to survey recruitment that enhance response rate can help correct for this bias. Our approach, even if not always feasible to use elsewhere, permits us to assess the magnitude of the potential bias, laying the groundwork for computing a numerical correction for future emailed FI surveys for college students, and alerting researchers of FI in other populations to the magnitude of the likely bias created by recruitment techniques.

Self-selection bias could be present, regardless of whether the survey is presented to potential respondents by email, postal delivery, or introduced in a social setting like a classroom. The bias could be present whether the survey is delivered to a random sample of students or an entire student population of interest. That is, whatever the sampling method or survey delivery method, response bias via self-selection could be evident wherein food secure students may be less likely than food insecure students to agree to participate. This observation does not negate the reality that other aspects of the modality of delivery may impact measured FI among college students. For example, Nikolaus et al.¹ provide some evidence that emailed-questionnaire answers and paper-and-pencil-questionnaire answers may yield different results. This, however, is a different concern than that of response bias where food insecure students may be over-represented due to their perception of the saliency of the study whereas food secure students opt out, assuming the survey is not relevant to them.

Accuracy of measurement and the importance of sound sampling schemes may also be important when considering the patterns of disparities in FI based on sociodemographic characteristics. Several studies that have utilized the FSSM on college campuses have demonstrated multiple inequalities in FI based on race, ethnicity, sexual orientation, and gender identity.^{13,15} There are well-documented relationships between FI and first-generation student status, parental status, and socioeconomic status.¹³ However, if indeed lower income students show higher FI rates, and others find the topic less salient, this could exacerbate apparent demographic group differences in FI among college students. Thus, we would not only predict FI rates to be lower when survey participation rates are higher but differences in FI between first-generation college students and others may be less evident.

Methodology

In November of 2020, we conducted a two-phase survey of students on one campus of a state-funded university (hereafter called “Main Campus”), and in February 2021, repeated the process at a distant “Branch Campus” of the same institution. In May of 2022, we replicated the study at “Main Campus.”

“Main Campus” has a resident student body of nearly 24,000, with 85% undergraduate and around 28% students of color. Approximately one in four undergraduates are first-generation college students and approximately the same percentage are eligible for federal PELL grants (i.e., students with exceptional financial need). “Branch Campus,” while less than one-tenth the size of “Main Campus” (under 1,500), has similar demographics in terms of race, ethnicity, and first-generation status.

We used the USDA 10-item Food Security Survey Module (FSSM) with a 2-item food sufficiency screener, asking students about food security

indicators in the previous 30 days. The survey also measured demographic variables such as race/ethnicity, gender, first-generation college student status, year in school, and several other student characteristics. The survey was administered using the secure online survey platform Qualtrics. The university's Institutional Review Board approved all protocol and procedures prior to initiation of this study. For both campus surveys, we initially (2020 and 2021) surveyed a sample of students by recruiting them during class, via Zoom while their class was being delivered remotely during the COVID pandemic. In 2022, we recruited students by visiting in-person during their campus-based class period. Permission from course instructors was provided in advance. During the in-class visits (either Zoom in 2020/2021 or in the traditional classroom in 2022), researchers introduced the survey to the students and asked them to complete it during the first 5 min of class. Students were assured that instructors would not know who did or did not participate in the survey. To honor the value of students' time and to further assure confidentiality as to their participation, students could forego participating and engage in an alternative online activity reading about FI while others took the survey. Students were also told that those who completed the survey could enter their university email address in a subsequent raffle for one of three \$100 gift cards. They were then invited to click on the survey link as provided in the chat box on Zoom (in 2020/2021) or as provided on the screen or chalkboard in the front of the classroom (in 2022). The survey asked students to indicate eligibility (18 years or older), provide informed consent, and then complete the survey during class. During the allotted 5 min in class, the researcher counted the number of students present (on Zoom or in the classroom) so that actual response rates could be calculated based on those counts and the number of Qualtrics surveys completed. One week after course visits were completed, the same survey was emailed by the university's Registrar to the entire campus student body. No follow-up reminders were sent to students visited in class nor to the whole student body who received the single email invitation. Students who completed the survey via the course sampling approach were electronically blocked from completing the survey a second time when they received the campus-wide email invitation to participate.

This two-phase approach resulted in two distinct samples on each campus – one based on survey distribution within a selection of courses, and the other based on survey distribution via email to the entire student body. Thus, results from the course sampling method could be compared to the results from the campus email sampling method.

The course sample for each campus was selected from courses listed in the catalogs for Main Campus in fall 2020 and spring 2022 and for Branch Campus in winter 2021. For each campus, we purposefully selected a cross-section of courses that offered the survey to students across all colleges within

the university, 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 among whom the literature suggests there is an especially high prevalence of FI and/or who make up a small proportion of the student body (groups that would likely be missed in a purely random sample). Final results were then weighted to adjust for how the resulting sample either over- or under-represented students of color and those of different class-level categories (first year through graduate school). In 2022, the weighting considered race/ethnicity and the student's college-location within the university – Science, Liberal Arts, etc. (See [Appendix 1](#) for the 2022 replication.)

Survey data for each campus and year were analyzed using SPSS statistical software to compute cross-tabulations and two-sample t-tests to identify significant differences between recruitment modalities. The combined data (course-visit and emailed) were analyzed using logistic regression which quantifies the apparent effect of recruitment modality net of other sample characteristics.

Results

[Table 1](#) shows that response rates for course visits at each campus were consistently high (72% and 75% at Main, 75% at Branch) compared to the email response rates (12% and 4%, and 5%, respectively). The course visit participation rates were calculated based on the number of responses obtained in the course visits divided by the number of students in attendance on the days surveyors visited the class.

Meanwhile, qualtrics time-stamped the completed surveys, allowing us to identify which responses were offered during the class visit, and thus permitting us to calculate a participation rate without jeopardizing anonymity. The email-survey rates were calculated by dividing the number of responses by the number of emails to which the survey invitations were sent.

Our estimates of FI on Main Campus and Branch Campus vary between the two sampling methods, indicating that methodology is an important consideration in assessing FI rates. For simplicity of presentation, we first confine our

Table 1. Survey participation by recruiting modality.

	Course-visit Recruiting			Email Recruiting (whole campus)		
	Number Invited to Participate	Number of Participants	Participation Rate	Number Invited to Participate	Number of Participants	Participation Rate
Main Campus (2020)	1,019	734	72%	25,100	2510	10%
Branch Campus (2021)	372	279	75%	1,480	74a	5%
Main Campus (2022)	883	662	75%	23,325	933	4%

^aThe very small number of cases for Branch Campus reflects the much smaller student body at this campus. In this case, the course-visits approach yielded a larger sample than the email approach.

analysis to the earliest studies before commenting on the 2022 replication. Table 2 displays the prevalence of FI among social demographic groups using both samples on both campuses (2020 and 2021). For both campuses, the estimate derived from the email-based sample was higher than that of the course-based sample. In the Main Campus survey, this difference is 7% points, while in the Branch Campus survey it is 22% points. In almost every sub-category comparison at the Main Campus, the emailed surveys indicated higher FI rates than did the class visit surveys. For those differences that were statistically significant, the order of magnitude of the difference was from 5% to 15% points. A higher FI rate among emailed versus course-visited undergraduates was reported by all genders, first-generation college students, and others. The difference in recruitment strategy did not yield different FI rates for students of color nor PhD students. The Branch Campus survey yielded results consistent with the Main Campus findings. Again, statistically significant higher FI rates appeared in the emailed surveys (Table 2). In all but one category (males) the FI rate was higher for the emailed survey invitation compared to the course-visit invitation. A few of those higher rates were not statistically significant, but in almost every case the statistically insignificant differences appear to be of similar magnitude in comparison to the differences that were significant. In those cases, sample sizes were smaller precluding us from adequately testing their significance. A notable exception again is that students of color do not show higher FI rates in the emailed sample, although the differences are in the 5% point range, a difference found to be significant in other demographic categories (e.g., females and non-first-

Table 2. Prevalence of food insecurity on two campuses using two modalities, 2020–2021^b.

Demographic Characteristics	Main Campus (2020)				Branch Campus (2021)			
	Course-visit Sample		Email Sample		Course-visit Sample		Email Sample	
	FI (%)	N	FI (%)	N	FI (%)	N	FI (%)	N
All Participants	24.3**	734	31.6	2510	24.9**	279	46.8	74
<i>Class standing</i>								
Frosh/Soph	19.9**	264	28.9	730	21.1	81	36.4	25
Jr/Senior+	31.8**	265	41.1	1189	30.4**	144	59.7	35
Graduate – Masters	17.7**	91	31.4	222	18.7	50	33.3	10
Graduate – PhD	22.7	107	23.8	292	-	-	-	-
<i>Race/Ethnicity</i>								
White	22.3**	437	31.4	1472	24.8**	207	46.7	56
Students of Color	34.5	268	38.7	855	29.3	58	34.6	16
<i>First-generation College Status</i>								
First-generation	36.3**	244	46.8	927	28.8**	111	61.8	34
Not First-generation	20.1**	470	25.9	1481	23.8**	168	42.5	40
<i>Gender</i>								
Female	28.1*	371	33.9	1542	28.1**	151	55.8	55
Male	21.5**	363	28.7	968	20.9	119	25.7	15
Nonbinary	22.7	10	46.0	76	0.0	2	57.2	3

** $p < .01$ * $p < .05$ Comparing percentages (within demographic groups) across two modalities on the same campus.

^bRates of food insecurity are weighted for known university student population, considering racial demographics and class standing.

generation students at Main Campus). In the Main Campus case, the difference between first-generation and non-first-generation student status was 16% points in the course visit sample and 21% points in the emailed sample. For Branch Campus, the course-visit students reported a 5% point difference between first-generation and non-first-generation status, whereas the emailed sample showed an approximately 20% points gap. The 2022 Main Campus replication study yielded results similar to the 2020 study. [Appendix 1](#) reports these findings that show substantial differences in the rates of FI between the two recruitment modalities, both overall and for different demographic categories of students.

[Table 3](#) shows how survey-delivery mode and each demographic characteristic are associated with FI, accounting for the other variables measured. This table reports adjusted odds ratios, or the relative likelihood of being food insecure given that a respondent is in a specific demographic group while controlling for other factors. In both the 2020 Main Campus and 2021 Branch Campus surveys, the delivery mode is a significant predictor of FI whether adjusted for student characteristics or not. On both campuses, the initial estimate of 1.73 or 2.99 indicates the odds of being food insecure if a student was invited by email as opposed to being invited in a course visit. When student characteristics are included these coefficients do not appreciably reduce. The more complex models show that in the Main Campus study, a student is 58% more likely to be identified as food insecure if they took the survey through

Table 3. Delivery mode and adjusted odds of food insecurity, 2020 and 2021.

	Main Campus (2020)		Branch Campus (2021)	
	Association with delivery mode	Controlling for covariates	Association with delivery mode	Controlling for covariates
Delivery Mode	1.73***	1.58***	2.99***	2.56***
Course visit (referent)				
Email recruitment				
<i>Class standing</i>				
Frosh/Soph (referent)				
Jr/Senior+		1.53***		1.53
Graduate – Masters		1.20		– ^c
Graduate – PhD		1.09		– ^c
<i>Race/Ethnicity</i>				
White (referent)				
Students of Color		1.68***		0.64
<i>First-generation College Status</i>				
Not first-generation (referent)				
First-generation		2.33***		1.30
<i>Gender</i>				
Male (referent)				
Female		1.05		1.98**
Nonbinary		1.46		– ^c
Constant	0.34***	0.03***	0.57*	0.19***
N	3244	3120	353	332

*** $p < .001$ ** $p < .01$ * $p < .05$.

^cDenotes categories not included in the analysis due to very small n's in these categories.

email than if they took the survey during a course visit, even when other demographic factors are considered. In the Branch Campus study, the odds of FI are 156% higher for those responding to the email survey invitation.

Discussion

To our knowledge, this is the first study to test for and estimate the size of the influence of survey recruitment and response bias on college student FI. Our results illustrate that the magnitude of response bias can produce substantially different FI estimates from the same population. The emailed survey produced FI estimates inflated by at least 7% points (Main Campus), 10% to 20% points for various sub-groups, and in the Branch Campus at least 20% points. These higher estimates represent substantial over-estimates of the number of FI students. Survey delivery mode can exacerbate or diminish response bias which influences these estimates. Recognizing these effects of methodology can help improve future survey recruitment and delivery, or suggest a correction factor that takes into account higher survey participation by FI students. Additional replication of our findings, in the college setting, may confirm the need for deflating measured estimates in emailed surveys by at least 7% points. Using the plethora of campus-based studies in the emerging college FI literature, a multivariate analysis of measured FI rates, taking into account survey response rates, campus demographics, and 30-day versus 12-month recall could provide a more nuanced estimate of a correction factor unique to a campus, and influenced by the method by which it seeks to measure its FI rate.

Our course-based sampling approach reduces the impact of one type of error commonly found in survey research. By using classroom visits and ensuring accessibility to the survey during class time, we substantially decreased the presence of sampling error¹⁶(p. 285). Most notably, our course-based sample partially corrects for an upward bias that is likely present in the email-based sample estimates due to nonresponse bias in the form of food secure students self-selecting out of the sample. Because the course-based sample capitalizes on a readily available audience in a classroom setting and with no obvious perceived opportunity costs to students (they are swapping class time for participation rather than leisure time for participation), fewer food secure students are likely to opt-out of the survey. This approach is an intentional improvement on the convenience samples that many studies of FI on college campuses utilize.¹³

We earlier predicted that social class differences in estimates of FI would be attenuated in the course-visit approach. This is indeed the case in the 2020 and 2021 analysis, where we loosely operationalize social class in terms of first-generation versus non-first-generation status. In the 2022 replication, we again observe that social class and race/ethnic group differences are less pronounced

in the course-visit data, illustrating how response bias may accentuate apparent inter-group differences.

The observation that FI rates for students of color and PhD students did not vary by recruitment modality indicates that these students may have been just as inclined to participate in this study regardless of FI status. Further research is needed to develop a more nuanced understanding of what types of students are more likely to opt in or out of surveys measuring FI rates.

Our study has a few notable limitations. First, this study focuses on two campuses of the same university. Future research should focus on applying this dual sampling method to colleges of varied size, location, and demographic composition. For example, campuses with higher percentages of students with exceptional financial need might show different degrees of impact on FI rates than we observed in our two campuses. Future application of the course-based sampling strategy will require research teams to delicately balance achieving a strong response rate with ethical concerns about utilizing class time for survey research. Our team attempted to mitigate any ethical concerns about consent and perceived pressure to participate by only visiting courses with consent from the instructor, clearly stating that participation was voluntary and confidential, and providing an alternative online activity for students who chose not to participate. Replicating these steps will need to be catered to specific settings and may require unique strategies. This approach requires greater monetary, time, and human resources than simply emailing a survey.

Another limitation concerns the participation rate of 70% or more; though this participation rate is higher than that of the email-based sample and participation rates of many other studies, this still indicates that roughly 30% of the population chose not to participate in the survey. With 30% of the population self-selecting out of the sample, it is possible that our course-based estimates still overestimate FI. If we believe that the email-based sample overestimates FI because food secure students are choosing not to participate in the survey, this logic could still apply to the 30% of students who were offered the opportunity to participate in the survey during a class period but chose not to participate. Moreover, although we consider it unlikely, if students in a public setting (like a classroom) are less willing to honestly answer potentially sensitive questions about food insecurity status, then this population could have a higher FI rate than we have measured and the sampling bias we claim to have demonstrated is potentially over-stated.

Implications

Our research builds on existing FI literature by looking more closely at the biases created by methodological choices made when estimating rates of college student FI. Rather than focus on the shortcomings of existing food insecurity measurements,⁴ a concern we share, we focused on survey recruitment

processes, which may be even more important for explaining elevated estimates regardless of the validity of any anticipated improved measure. Our results indicate that sampling strategy is an important consideration in documenting FI rates. Our course-based sample partially corrects for an upward bias that is present in the email-based sample estimate due to a selection bias that favors participation of food insecure students. These findings provide important insights for FI research for college students and for other populations.

Although this dual sampling strategy could be difficult to replicate in other settings, the magnitude of the effect of sample response bias shown here suggests that researchers would do well to explore alternative strategies to reducing impediments and disincentives to participation in surveys which will be of great versus little interest to possible respondents. The class visit method was one strategy which relied on eliminating opportunity costs to students while protecting their anonymity. Other institutional and organizational venues (e.g., workplaces, other school settings, large volunteer associations) may be able to capitalize on such methods. For example, if opinions of food pantry managers are needed, rather than emailing thousands of them and settling for low response rates, our example suggests that a 5 min “rapid survey” on their phones at a state or national conference would yield results less biased by non-response.

The broader implications of these findings reach beyond college settings. Hunger and FI are now institutionalized concerns not only addressed by federal policy but also by a large and motivated food banking “industry.”¹⁷ Non-profit groups, sometimes in collaboration with academia, conduct surveys at the local or state level, sometimes using the most efficient, least expensive available techniques. Noteworthy among these are emailed surveys, such as the recent State of Washington survey, which offers a cautionary tale.¹⁸ Relying on an email survey, the state estimated their FI rate (during COVID) to be a full 20% points higher than the rate reported by the CPS, which relies on face-to-face and phone interviews with respondents already committed to taking the survey. The CPS invitation to answer questions about FI comes with no obvious opportunity costs and there is no reason to believe the food secure respondents would forego participation. The State of Washington may well have improved the validity of its estimate by focusing resources on improving its response rate among a smaller sample of invited participants, than relying on a lower response rate from a very large sample of invited participants.

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Appendix**Replication of Main Campus Study Spring 2022^d**

Demographic Characteristics	Class Visit Sample		Email Sample	
	FI (%)	N	FI (%)	N
All Participants	26.6**	662	38.7	933
Class standing				
Frosh/Soph	24.3**	328	43.8	243
Jr/Senior+	29.8**	267	41.2	317
Graduate	27.1	51	32.1	373
Race/Ethnicity				
White	26.3	435	31.6	580
Asian	20.4**	117	36.8	182
Black, Latino, Indigenous	39.2**	110	57.4	171
First-generation College Status				
First-generation	37.3**	200	56.3	225
Not first-generation	22.8**	439	32.1	654
Gender				
Female	32.2	325	37.8	559
Male	22.1**	294	40.4	268
Nonbinary	25.0	21	45.9	74

** $p < .01$ * $p < .05$ Comparing percentages (within demographic groups) across two modalities on the same campus.

^dRates of food insecurity are weighted for known university student population, considering racial demographics and College administrative unit.