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Understanding How the Confluence of Food (In)Security and the Food Access Environment
Impact Academic Performance in College Students

By

BRITTANY MAHOGANY LOOFBOURROW
DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

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in

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Abstract

Food insecurity on college campuses is a pervasive problem affecting nearly half of students in the US. Several factors were explored relating to the food security landscape on college campuses, comprising examinations of food security and knowledge, attitudes, and participation in available resources, student food choice motivation, and the impacts of resources on student academic performance. The approach taken was to use a combination of validated questionnaires which asked college students about their experiences using Likert-scales and binary items.

The first study aimed to assess the knowledge, attitudes, and practices (KAPs) surrounding CalFresh in college students. Using a combination of a content-validated questionnaire and the USDA's 10-item Adult Food Security Survey Module, participants were asked about their food security status, knowledge, and attitudes towards CalFresh, and whether they participated in CalFresh and on-campus food resources.

Students experiencing food insecurity used food access resources and CalFresh more than their food secure peers ($\chi^2=37.3$, $p<0.001$; $\chi^2=34.0$, $p<0.001$, respectively). Regardless of this difference, a large proportion of students experiencing food insecurity did not use on campus resources; 36% reported not using any of the on-campus resources. Based on a series of Likert-scale statements about CalFresh knowledge and attitudes, five themes were identified through exploratory factor analysis: CalFresh Knowledge, Negative Attitudes Around Participating in CalFresh, Positive Attitudes Around Participating in CalFresh, Negative Attitudes Around Others Participating in CalFresh, and Fortunate Attitudes for not Participating in CalFresh. The trends in these data indicated overall positive correlations between CalFresh Knowledge and attitudes towards the program; CalFresh Knowledge was positively correlated with Positive Attitudes Around Participating in CalFresh in students who participated in CalFresh ($r=0.152$, $p=0.025$) and negatively correlated with Negative Attitudes Around Others Participating in

CalFresh ($\tau b = -0.278$, $p < 0.001$), and positively correlated with Fortunate Attitudes for not Participating in CalFresh ($\tau b = 0.123$, $p = 0.004$).

In the second study of this dissertation, university students were asked to select food choice motivators that they identified when choosing foods for themselves. Of eight identified food choice motivators (food appearance, taste, nutrition, cost, convenience, dietary restrictions, food familiarity, and meal prepping), three motivators were identified through exploratory factor analysis: *Hedonics* (which included appearance and taste), *Constraints* (cost and convenience), and *Nutrition Knowledge* (dietary restrictions, familiarity, and meal prepping). Food insecurity was positively correlated with the *Constraints* motivator ($\tau b = 0.101$, $p < 0.001$), while it was negatively correlated with *Nutrition Knowledge* ($\tau b = -0.079$, $p < 0.001$) and *Hedonics* ($\tau b = -0.182$, $p < 0.001$).

The final study in this dissertation series was conducted to examine how food insecurity changes over time, and how participation in CalFresh may moderate the negative affect that food insecurity has on academic performance. Food security status did not change within an academic quarter, but was observed to change over the span of an academic year ($\chi^2(2) = 17.008$; $p < 0.001$). During the first quarter of university lockdown, participation in CalFresh positively moderated the effect of food insecurity on GPA ($B = 0.0971$, $p = 0.0088$).

Together, the research presented in this dissertation clarifies student food insecurity experiences and suggests actionable steps forward to improve campus food security. Future research should be conducted in this area during non-pandemic times to achieve more generalizable results about the differences in food access resource KAPs, food choice motivation, and how resource participation may be of benefit to students' academic performance.

Chapter 1

Review of the Literature

Introduction

Food insecurity, the lack of access to nutritionally adequate food to support a healthy and active lifestyle,¹ is a concern for a significant proportion of the United States (U.S.) population. In 2020, 89.5% of U.S. households were considered food secure; of remaining households, 6.6% experienced low food security (uncertain access to quality foods) and 3.9% of households experienced very low food security (possibly disrupted eating patterns).² While these proportions maintained the previous year's general outlook on food security in the US, this represents over 40 million individuals experiencing some level of food insecurity throughout the year.^{2,3} It is also a growing concern in the college student population that has garnered much attention within the fifteen years.⁴⁻²⁹ In 2020, college students numbered 19.4 million students,³⁰ representing 41% of 18- to 24-year-olds,³¹ making this group a nontrivial subpopulation in the US. Food insecurity is typically described in terms of broad demographic groups: age groups including children, adults, and seniors; racial/ethnic groups including white non-Hispanic, Black non-Hispanic, Hispanic, and Other non-Hispanic; household composition, such as married couples and single-parent households; and residential characteristics, including metropolitan area and geographic region.³ While these broad categorizations are extremely valuable, they fail to take into account subgroups of individuals whose experience may not be widely shared and thus become invisible problems in the eyes of the general public. College students have a unique set of circumstances that may alter their food security, while also sharing characteristics which may contribute to their food security status, including factors like income level, race, and location.^{32,33}

The College Food Security Landscape in the US and California

College students have often been considered to be of a “privileged” or “elite” group, however many across the country, including those enrolled in private universities, struggle with food insecurity.³⁴⁻³⁸ Students are a group which is highly impacted by food insecurity; prevalence estimates on campuses

range between 19%³⁹ to 56%⁴⁰, with many campuses reporting food insecurity prevalence around four times the national average.^{41,42,43} Regardless of perceptions of college students, food insecurity is a pervasive issue which touches large proportions of students from all backgrounds.⁴⁴

Food insecurity in California persists regardless of the state's large agricultural output,⁴⁵ and this experience trickles down to affect students in the 116 campuses of the California Community Colleges (CCC), 23 campuses of the California State University (CSU), and 10 campuses of the University of California (UC). California students have been observed to experience food insecurity at the same disproportionately high prevalence as other colleges nationwide, with a study of the UC indicating that about 44% of its student population experience food insecurity.⁴⁶ Similar to the national distribution of food insecurity, prevalence changes depending on campus location.⁴⁷ The average food insecurity of all types of institutions reflect these differences, with average food insecurity prevalence at CCCs being of 52%⁴⁸ and CSUs being estimated at 21%.⁴⁷ The prevalence of food insecurity at these institutions tracks generally with students who are from low-income backgrounds, with just over half of CCC students,⁴⁹ and 40% of CSU and UC students being from low-income backgrounds.⁴⁷ Other students who frequently experience food insecurity are first-generation students (whose parents did not attend a 4-year college).⁵⁰ Consistent observations of food insecurity among these demographic characteristics lend to the idea of poor college readiness.⁴⁸⁻⁵⁰ Low-income and first-generation students do not have the same level of college readiness as peers who do not come from low-income backgrounds and whose caregivers attended college, and the lack of preparedness can affect not only their academic life,⁵¹ but it may also their ability to support themselves outside of school.

Student Finances as a Factor in Food Insecurity

Financial status and food insecurity are very closely linked; students who are from low-income backgrounds are more likely to experience food insecurity.⁵² Further, research in college students

indicates that financial literacy (the knowledge and skills of personal financial management)^{53,54} is variable but limited.^{55,56} Whether financial literacy is high in an individual to some degree is irrelevant, as the costs associated with college attendance – which includes housing, health, transportation and food costs – are exceedingly high.⁵⁷⁻⁵⁹ A student may have adequate knowledge and skills to manage their finances, but in the face of the federal Pell Grant failing to cover most of the cost of college, public school budget cuts leading to more students paying higher tuition and fees, and debt being taken on to cover costs while attending school full-time, the ability to balance a personal budget is not enough to maintain financial stability.⁵⁷ In addition, a greater proportion of students are attending college from low-income backgrounds, widening the gap between financial stability and college attainment.⁴⁹

Although financial literacy is especially poignant in the context of food security and food literacy, it will not change the means that a student has available to them.⁶⁰ Food literacy (the knowledge, skills, and behaviors needed to manage one's dietary intake) and food security are both partly dependent on financial literacy.⁶¹ The ability to procure and prepare foods is predicated on the ability to prioritize money for foods,⁶¹ and limited financial literacy combined with low means may inhibit food security and stymie food literacy before it is able to develop in this group.

Food Insecurity and Poorer Academic Performance

College food insecurity is frequently observed to have a negative association with academic performance. In the college student population, academic performance is a critical outcome area, an idea which is supported by the plethora of research articles describing how food insecurity affects GPA.^{12,26,24,43,62-64} Camelo and Elliot showed that food insecurity is negatively associated with GPA, both alone and when considering demographic covariates.⁶⁵ Further, their study demonstrated that food insecurity was a partial mediator of race/ethnicity's association with GPA, which the authors describe as one way that achievement gaps observed among groups may persist.⁶⁵ Woerden et al found that GPA

was different between food secure and food insecure students by a startling 0.25 grade points.³² While the most common metric is GPA, others have cited retention and neglect of academic responsibilities as other correlates with food insecurity.⁶⁶ Phillips et al report that students experiencing food insecurity are about 3.5 times more likely than their food secure peers to consider dropping out of school, and about 3 times more likely to neglect academics in favor of earning a wage to support themselves.⁶⁶ Reasons behind this association are likely complex and varied; studies have pointed to the ways that food insecurity is associated with poorer physical health,⁶⁷ poorer sleep,⁶⁷ and poorer mental health.^{62,67} Mental health in particular has been implicated for its role in academic performance. Studies have shown that food insecurity is directly correlated with poorer mental health, which is linked to subsequent decreases in GPA.^{62,63} Students have described this aspect of food insecurity and poor performance as taking “a lot of mental power”, causing academic strain due to inability to concentrate and the ways that the sensation of physical hunger can impact academics by increasing fatigue and lowering stamina.⁶⁴ Stebledon et al conducted similar qualitative evaluations of food insecurity on campuses and found sentiments from students which echoed these, with one student indicating feelings of poorer mental and physical health during times of worse food insecurity.⁶⁸

The consistent observation of the association between food insecurity and academic performance indicates a clear and actionable area for colleges and universities to prioritize providing support for their populations.⁶⁸ Many institutions have recognized the utility of promoting food security on campus and have allocated resources accordingly.⁶⁹ As pointed out by Stebledon et al, food insecurity is a factor in academic performance which can be modified; by supporting students food security, institutions of higher education may improve their own rankings.⁶⁸

The Physical and Mental Health Toll of Food Insecurity

Food insecurity has been associated with health concerns like overweight and obesity, and long-term chronic diseases like type II diabetes and cardiovascular disease.⁷⁰ In the college student population, studies have indicated that students experiencing food insecurity confront similar issues. A recent study by Knol et al found that students experiencing food insecurity were more than twice as likely as food secure students to report fair/poor general health compared to excellent/good health.⁷¹ Additionally, Martinez et al indicate that food insecurity is associated with poor health, increased BMI, fewer days of enough sleep, less exercise, and fewer daily servings of fruits and vegetables.⁶⁷ Another area of health that has associations with food insecurity is poorer mental health.^{43,72,73} Raskind et al showed that food insecurity was associated with higher anxiety and depression and lower hope.⁶³ Diamond et al described that both short- and long-term food insecurity are associated with symptoms of depression, stress, isolation, and poorer resilience.⁷⁴ Both food insecurity and low fruit and vegetable intake were associated with depressive symptoms in a study by Wattick et al.⁷⁵ Although the literature in this area continues to grow, relatively few studies exist to show the impact of food insecurity on health in this population; more research is merited to illustrate the relationships between food insecurity and health outcomes in college students. One area of research which may be build out this picture of food insecurity and health outcomes is the study of the drivers of student food choice.

Motivators of Student Food Choice

Food choice is a complicated issue, comprising many motivators that vary in importance depending on individual circumstances.⁷⁶⁻⁷⁸ In adults, factors considered in food choice can include hunger, family food pattern history, social connectedness,⁷⁹ nutrition,^{80,81} and knowledge. A study by Tallant indicated that first-year students' food choices change after taking a nutrition seminar, with a majority of students reporting healthier food choices and more nutrition label reading following a 16-week nutrition course.⁸² Food choice constraints including convenience and cost have also been identified

as motivating factors in student athletes.⁸³ In the more general college population, food choice motivators are less well-understood. The dearth of literature in this area has led researchers like Vilaro et al to work toward building a scale to assess college food decision-making.⁸⁴ This study found that food choice was influenced by social media and advertisements, health, quality, and effect on body appearance, and taste, convenience, familiarity, and how filling the food was.⁸⁴ Although this study contributes meaningful results to build out the picture of student eating patterns, it does not address how food insecurity may relate to food choice. Other work has identified differences in fruit and vegetable intake between students who are experiencing food insecurity and those who are not.⁸⁵ To add to the picture of differences in food behaviors, a study by Knol et al showed that food preparation skills and feelings of cooking self-efficacy were different between these groups of students.⁸⁶ Together, these studies create an unclear but compelling picture of the ways food insecurity and food choice interact. More studies are merited to establish drivers of food choice in college students, in order to both learn more about the ways that diet quality differs and to leverage those results in building programs which support student diet quality.

Ways of Promoting Student Food Security

Means-tested Financial Aid for Students in Need

One solution to promoting food security is by providing students from low-income backgrounds with financial aid to offset the costs of foods. These means-tested financial aid sources may be distributed from the federal government or state government, and include grants like the Pell Grant and CalGrant, respectively.^{87,88} In order to receive these grant funds, students must be eligible by demonstrating financial need (a student's cost of attendance compared to their expected family contribution), be a citizen or eligible noncitizen, be enrolled at least half-time, and other criteria.⁸⁷

Despite monies being distributed to students exhibiting financial need, receiving grant funds does not appear to be protective against experiencing food insecurity.^{89,90} Research indicates that students who are Pell Grant eligible or Pell Grant recipients are significantly more likely to be food insecure.³⁸ This correlation likely points to a larger problem in student finances and the cost of college; grant funds are not enough to lift students out of financial instability and ensure their basic needs are met.⁵⁸ Students who receive need-based grants are likely still financially unstable, and those who receive these grants remain food insecure.³⁸ Recent research at the UC indicates that students have identified high college costs as one reason for decreased food security. Tuition and fees levied by college institutions consume student financial aid, such that students are unable to use financial aid for basic needs like food in lieu of paying for schooling costs.⁹¹ Although means-tested financial aid is a great resource for supporting low-income and first-generation college students, these funds are not enough to support the full costs associated with college attendance, leaving students with limited resources likely to sacrifice their housing and food security as their financial aid monies are claimed by their college institution.⁹¹

Campus Food Pantries as an Emergency Response to Food Insecurity

Food pantries are expanding across the US.^{92,93} The College and University Food Bank Alliance (CUFBA) is a professional organization of on-campus food pantries and support, which has consistently reported growth in its membership as student food security concerns are highlighted.⁹⁴ According to CUFBA, membership in the organization grew from 262 pantries in 2018 to over 700 as of early 2021.^{94,95} Chief among these efforts are food pantries which are supplied through university efforts, partnerships with local food banks, purchasing foods from grocery stores, and others.⁹⁵ These exist with the aim of supporting food security in student populations,⁹⁶ however their distribution across institutions is uneven. Implementing a food pantry on a college campus can be exceptionally challenging, with cited barriers including securing staffing and volunteers, and a lack of clarity in establishing a new pantry.⁹⁶ To support

campuses interested in implementing a pantry, CUFBA has toolkits available which describe starting and running a pantry, however these resources do not solve the problem of a lack of funds, staffing, or perceived legitimacy of pantry efforts.^{94,96} However, the growth of CUFBA membership indicates that college food insecurity is becoming more visible on campuses, and that there is a growing interest in supporting students' basic needs.^{94,97}

Many campuses in California have developed programs to help promote student food security. At the UC, pantries have been established at all ten campuses, and funds have been dedicated from the California state budget to support these establishments.^{69,98,99} The UC estimated that 52,000 students were served across its campuses in fiscal year 2017-2018, however this estimate may be only 30% of students experiencing food insecurity.⁹⁸ At the CSU, all 23 campuses offer a food pantry.¹⁰⁰ Although termed "vital" by students, a 2019 report of CSU basic needs programs estimated that just 16.7% of food insecure students participate in these resources.¹⁰¹ At the CCC, nearly all of the 116 campuses serving nearly 2 million students across the state have an on-campus pantry.⁹⁹

Unfortunately, a campus having a food pantry does not guarantee that all students experiencing food insecurity will use the resource. Research by El Zein et al indicates that participation in pantries by students varies, and that barriers include factors like perceived stigma and conflicting self-identity, as well as logistical barriers including lack of knowledge about the resource and time conflicts.¹⁰² To help address these areas, Goldrick-Rab of the Hope Center recommends that lecturers add a statement about food security and available resources to their course syllabus.¹⁰³ In addition to spreading knowledge about resources, stigma surrounding food insecurity and utilizing food pantries may be reduced by normalizing the open discussion of these topics.¹⁰³ A study by Esaryk et al supports this idea by showing that open discussion of resources by on-campus food pantry staff resulted in more visits to the pantry.¹⁰⁴

Although campus food pantries may help to support student's food security, it is important to note that the goal of these organizations is not to guarantee food security or be relied upon for the long term.⁹⁶ To that end, other resources may be more appropriate for providing improved food security, including federal programs like SNAP.

National Programs Can Promote Student Food Security

While localized efforts are helpful, there can be benefit from federal entitlement programs as well. The Supplemental Nutrition Assistance Program (SNAP) is the largest social welfare program in the U.S., which provided an average of \$218 monthly per each of its near 40 million participants in 2021.^{105,106} Research regarding SNAP typically focuses on adults of various subgroups throughout the US, with delineations in data occurring at the demographic, geographic, and health outcome levels. College students remain a highly underrepresented group in these studies.

In California, research has indicated that many students do not participate in CalFresh (the name of SNAP in California), although eligibility requirements for college students may allow for a significant proportion of students to participate.¹⁰⁷ According to the California Department of Social Services, over 416,000 college students across the state are likely to be eligible to participate in the program.¹⁰⁸ In spite of this wide eligibility, only 127,360 students receive CalFresh benefits annually.¹⁰⁸ Due to an overall lack of representation of college students participating, it is unclear what the main driver of nonparticipation is. In some populations, stigma associated with welfare programs like SNAP have been cited as barriers to participation.¹⁰⁹ This stigma about social safety nets may include assumptions that participants are lazy¹⁰⁹, that they do not or cannot hold a job, associations of poverty with decreased quality of life, not wanting a "hand-out,"¹⁰⁹ concerns about outside perceptions and embarrassment,¹¹⁰ and shame.¹⁰⁹

In the college student population, a key barrier cited by researchers are unclear eligibility requirements.⁵⁸ In order to qualify for CalFresh benefits, college students must meet one of several

criteria, including meeting income requirements, working an average of 20 hours per week, participating in programs like the Educational Opportunity program (EOP), or receiving federal Work Study.¹⁰⁷ These criteria are cited as being confusing for students, if they are known at all.⁵⁸ To address this barrier, colleges in California have partnered with the state in recent years to streamline student eligibility and make eligibility clearer.⁹⁸ If students at the UC participate in the EOP or receive the federal Pell Grant, they receive an automated message indicating their possible eligibility and a link to a verification letter to present to CalFresh eligibility workers at the county level.¹¹¹ California colleges continue to partner with the state to find solutions to make CalFresh more accessible.¹¹² By improving access to this program, participation rates may increase and boost food security in this population.

Food Security Concerns in Response to External Shocks: COVID-19

The circumstances surrounding COVID-19 were unprecedented for college students.¹¹³ Early in the pandemic, campuses nationwide closed to students, forcing many to return home or maintain housing local to the university.^{114,115} Alongside this change in housing, some students also reported a change in work, as part-time work evaporated when businesses shut down in response to local lockdowns.^{115,116} Literature regarding details of how this impacted students is still emerging, but early results indicate that the pandemic precipitated significant increases in food insecurity.^{116,117} Barber et al conducted a study at UCLA examining the relationships between remote learning, food insecurity, first-generation status, and under-represented minority status, and found that the transition to remote learning due to the pandemic had significant negative impacts on food security in these groups.⁵⁰ Owens et al conducted a study at a Texas university which indicated that changes in living arrangements and job status due to the pandemic were strong predictors of food insecurity, highlighting the tenuous position many students are in with limited resources.¹¹⁵ Ahmed et al described worsening food security in New

York colleges, however there were increases in students' knowledge about food resources and willingness to use the resources during the pandemic compared to pre-pandemic measurements.¹¹⁸

An analysis of psychosocial health and food insecurity during the COVID-19 pandemic by DeBate et al found that students experiencing food insecurity also experienced poorer mental health and lower levels of resilience and flourishing.¹¹⁹ The authors pose that universities have a responsibility to their students to address food insecurity such that in the event of public health emergencies like the recent pandemic, these students do not struggle disproportionately more than their peers.¹¹⁹ Similar calls to build emergency preparedness at the campus level were echoed in a study by Silva et al, who found that student diet quality decreased during the pandemic lockdown, and particularly so for students experiencing food insecurity.¹²⁰ Unfortunately, resource availability was not stable for all college students nationwide; Zottarelli et al reported a decrease in food pantry availability among community colleges in Texas during the pandemic.¹²¹

Conclusion

Research in the area of food insecurity in college has expanded in vast and meaningful ways since its early explorations.⁴ Dozens of studies have evaluated the prevalence of food insecurity across US college campuses⁴⁴ and found that college students are not exempt from the negative health associations seen in other populations. Students experiencing food insecurity have been observed to report poorer physical and mental health, and consume fewer foods associated with healthful eating patterns.⁶⁷ Limited research has explored associations of food insecurity with poorer quality dietary patterns by exploring food choice motivation, and of particular concern how the frequently accompanying financial insecurity may influence food choice.⁸³

It is imperative to find ways to fill the gaps in food security and provide students with healthful foods which support their physical health, mental health, and academic performance. Resources are

available to different degrees at the campus level with expanding access to food pantries nationwide. Unfortunately, participation in these resources has not been observed to be high, even among students experiencing food insecurity. Stigma associated with food pantries may be a reason for low participation,¹⁰² but increasingly limited knowledge and open dialogue about food insecurity and resources appear to be a driver for low participation.¹⁰³¹⁰⁴ Important resources which may be of great benefit to this population are CalFresh/SNAP benefits, as the program allows participants to use funds to select foods that help meet their own needs and wants.

In the context of COVID-19, food resources were of particular importance. Due to campus closures, many students' living situations changed, and many were unable to utilize on-campus resources as they may have otherwise.¹²¹ In this unprecedented public health emergency, the utility of CalFresh is highlighted; during the COVID-19 pandemic, program benefits were expanded to support food security in vulnerable individuals in the face of widespread lockdown and job loss.¹²²

Under normal circumstances, research indicates that SNAP is effective in supporting food security in the general population,¹²³ and although this research has not been conducted in college students, it logically follows that this population would experience similar benefits. When considering the ebb and flow of college academic calendars, the consistent benefits available through a federal food support program are critical not only in emergencies,¹¹⁷ but also during normal times when on-campus resources are not available, such as holiday and summer breaks. Considering campuses which may not have robust food support programs like pantries available to their students,¹⁰⁴ promotion of federal benefits may offer another avenue through which campuses can work to promote food security for their student body.⁵⁸

The effects of food insecurity are far-reaching, and although much has been and continues to be done to characterize this experience in college students, relatively little has been done to examine solutions to food insecurity and how these solutions may influence student health and performance.⁵⁸

Given the concerns of food insecurity, greater emphasis should be put on researchers to examine ways to support student food access. Moreover, promoting campus-wide food security should be a priority for college administrators, in order to meet the needs of their student bodies, maintain reputations, and meet missions of excellence.⁶⁸

Statement of Purpose

Food insecurity on college campuses is an issue which affects over 40% of college students, both at the national level and in California. The experience of food insecurity in this population has been observed to be negatively associated with physical health, mental health, and academic performance. Research has indicated that differences in dietary patterns exist between students experiencing food insecurity compared to those who are not, which may contribute to these poorer outcomes. The Supplemental Nutrition Assistance Program (SNAP, known as CalFresh in California) is the United States' most important food support program, however a dearth of knowledge exists regarding its effects on college students.

The approach of this dissertation was to probe students' food security status; knowledge of, attitudes towards, and participation in CalFresh; and what motivates their food choice through a validated questionnaire. Chapter 2 of this dissertation explores how food security status and knowledge and attitudes are associated with CalFresh participation. Chapter 3 describes how food choice motivation differs in students experiencing food insecurity. Chapter 4 investigates the role that CalFresh participation plays in moderating the effect of worsening food insecurity on academic performance.

References

1. Coleman-Jensen A, Rabbitt MP, Gregory CA. Definitions of Food Security. United States Department of Agriculture; 2020. Accessed May 25, 2021. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>
2. Coleman-Jensen A. Household Food Security in the United States in 2020. Published online 2020:55.
3. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. Household Food Security in the United States in 2019. Accessed October 9, 2020. <http://www.ers.usda.gov/publications/pub-details/?pubid=99281>
4. Chaparro MP, Zaghoul SS, Holck P, Dobbs J. Food insecurity prevalence among college students at the University of Hawai'i at Mānoa. *Public Health Nutr.* 2009;12(11):2097-2103. doi:10.1017/S1368980009990735
5. Patton-Lopez MM, Lopez-Cavallos DF, Cancel-Tirado DI, Vazquez L. Prevalence and Correlates of Food Insecurity Among Students Attending a Midsize Rural University in Oregon | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2013.10.007
6. Broton KM, Weaver KE, Mai M. Hunger in Higher Education: Experiences and Correlates of Food Insecurity among Wisconsin Undergraduates from Low-Income Families. *Soc Sci.* 2018;7(10):179. doi:10.3390/socsci7100179
7. Tu K. Hungry to Learn: An Analysis of the Food Insecurity Problem in the California Community College System and Implications for Public Policy Solutions. Published online August 2020.
8. Coffino JA, Spoor SP, Drach RD, Hormes JM. Food insecurity among graduate students: prevalence and association with depression, anxiety and stress. *Public Health Nutr.* 2021;24(7):1889-1894. doi:10.1017/S1368980020002001

9. Davidson A, Morrell J. Food insecurity prevalence among university students in New Hampshire. *J Hunger Environ Nutr.* 2020;15(1):118-127. doi:10.1080/19320248.2018.1512928
10. DeMunter J, Rdesinski R, Vintro A, Carney PA. Food Insecurity Among Students in Six Health Professions' Training Programs. *J Stud Aff Res Pract.* 2020;0(0):1-16.
doi:10.1080/19496591.2020.1796690
11. Fortin K, Harvey S, Swearingen White S. Hidden Hunger: Understanding the Complexity of Food Insecurity Among College Students. *J Am Coll Nutr.* 2021;40(3):242-252.
doi:10.1080/07315724.2020.1754304
12. Hagedorn RL, Olfert MD. Food Insecurity and Behavioral Characteristics for Academic Success in Young Adults Attending an Appalachian University. *Nutrients.* 2018;10(3):E361. doi:10.3390/nu10030361
13. Hagedorn RL, McArthur LH, Hood LB, et al. Expenditure, Coping, and Academic Behaviors among Food-Insecure College Students at 10 Higher Education Institutes in the Appalachian and Southeastern Regions. *Curr Dev Nutr.* 2019;3(6):nzz058. doi:10.1093/cdn/nzz058
14. Hege A, Stephenson T, Pennell M, et al. College Food Insecurity: Implications on Student Success and Applications for Future Practice. *J Stud Aff Res Pract.* 2021;58(1):44-61.
doi:10.1080/19496591.2020.1726359
15. Ilieva RT, Ahmed T, Yan A. Hungry minds: Investigating the food insecurity of minority community college students. *J Public Aff.* 2019;19(3):e1891. doi:10.1002/pa.1891
16. Keogh B, Kushalnagar P, Engelman A. Peer support and food security in deaf college students. *J Am Coll Health J ACH.* 2020;68(1):1-5. doi:10.1080/07448481.2018.1515750

17. Leung CW, Wolfson JA, Lahne J, Barry MR, Kasper N, Cohen AJ. Associations between Food Security Status and Diet-Related Outcomes among Students at a Large, Public Midwestern University. *J Acad Nutr Diet*. 2019;119(10):1623-1631. doi:10.1016/j.jand.2019.06.251
18. Leung CW, Farooqui S, Wolfson JA, Cohen AJ. Understanding the Cumulative Burden of Basic Needs Insecurities: Associations With Health and Academic Achievement Among College Students. *Am J Health Promot*. 2021;35(2):275-278. doi:10.1177/0890117120946210
19. McArthur LH, Ball L, Danek AC, Holbert D. A High Prevalence of Food Insecurity Among University Students in Appalachia Reflects a Need for Educational Interventions and Policy Advocacy. *J Nutr Educ Behav*. 2018;50(6):564-572. doi:10.1016/j.jneb.2017.10.011
20. Morris M, Smith S, Davis J, Null B. The Prevalence of Food Security and Insecurity Among Illinois University Students | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2016.03.013
21. Soldavini J, Berner M, Da Silva J. Rates of and characteristics associated with food insecurity differ among undergraduate and graduate students at a large public university in the Southeast United States. *Prev Med Rep*. 2019;14:100836. doi:10.1016/j.pmedr.2019.100836
22. Taylor LC, Delavega E, Jin SW, Neely-Barnes SL, Elswick SE. The Prevalence and Correlates of Food Insecurity among Students at a Multi-Campus University. *J Poverty*. 2019;23(7):621-633. doi:10.1080/10875549.2019.1656141
23. Trawver KR, Hedwig T. Food and housing insecurity and homelessness among students in an open-enrollment university*. *J Soc Distress Homelessness*. 2020;29(1):57-64. doi:10.1080/10530789.2020.1676987
24. Woerden I van, Hruschka D, Bruening M. Food insecurity negatively impacts academic performance. *J Public Aff*. 2019;19(3):e1864. doi:10.1002/pa.1864

25. Watson TD, Malan H, Glik D, Martinez SM. College students identify university support for basic needs and life skills as key ingredient in addressing food insecurity on campus. *Calif Agric.* 2017;71(3):130-138. doi:10.3733/ca.2017a0023
26. Weaver R, Vaughn N, Hendricks S, et al. University student food insecurity and academic performance. *J Am Coll Health.* 2019;68:1-7. doi:10.1080/07448481.2019.1600522
27. Willis DE. Feeding the Student Body: Unequal Food Insecurity Among College Students. *Am J Health Educ.* 2019;50(3):167-175. doi:10.1080/19325037.2019.1590261
28. Wooten R, Spence M, Colby S, Anderson Steeves E. Assessing food insecurity prevalence and associated factors among college students enrolled in a university in the Southeast USA. *Public Health Nutr.* Published online December 21, 2018:1-8. doi:10.1017/S1368980018003531
29. Zigmont VA, Linsmeier AM, Gallup P. Understanding the Why of College Student Food Insecurity. *J Hunger Environ Nutr.* 2019;0(0):1-16. doi:10.1080/19320248.2019.1701600
30. The Integrated Postsecondary Education Data System. Accessed February 18, 2022. <https://nces.ed.gov/ipeds/search/ViewTable?tableId=29448>
31. COE - College Enrollment Rates. Accessed August 20, 2021. <https://nces.ed.gov/programs/coe/indicator/cpb>
32. Bruening M, Brennhofner S, van Woerden I, Todd M, Laska M. Factors Related to the High Rates of Food Insecurity among Diverse, Urban College Freshmen. *J Acad Nutr Diet.* 2016;116(9):1450-1457. doi:10.1016/j.jand.2016.04.004
33. Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *Am Psychol.* 2000;55(5):469-480. doi:10.1037/0003-066X.55.5.469

34. Allen CC, Alleman NF. A Private Struggle at a Private Institution: Effects of Student Hunger on Social and Academic Experiences. *J Coll Stud Dev*. 2019;60(1):52-69. doi:10.1353/csd.2019.0003
35. Cuy Castellanos D, Holcomb J. Food insecurity, financial priority, and nutrition literacy of university students at a mid-size private university. *J Am Coll Health J ACH*. 2020;68(1):16-20. doi:10.1080/07448481.2018.1515762
36. College and the Road to Elitism. *National Review*. Published March 13, 2019. Accessed August 20, 2021. <https://www.nationalreview.com/corner/college-and-elitism/>
37. Neklason A. Elite-College Admissions Were Built to Protect Privilege. *The Atlantic*. Published March 18, 2019. Accessed August 20, 2021. <https://www.theatlantic.com/education/archive/2019/03/history-privilege-elite-college-admissions/585088/>
38. Keefe S, Garagiola-Bernier A, Kiley E, England J, Schmitt SR, Shore M. Campus Food Insecurity: Bringing Private Institutions into Conversations on Basic Needs. *J Hunger Environ Nutr*. 2020;0(0):1-15. doi:10.1080/19320248.2020.1838984
39. El Zein A, Shelnutt KP, Colby S, et al. Prevalence and correlates of food insecurity among U.S. college students: a multi-institutional study. *BMC Public Health*. 2019;19(1):660. doi:10.1186/s12889-019-6943-6
40. Maroto ME, Snelling A, Linck H. Food Insecurity Among Community College Students: Prevalence and Association With Grade Point Average. *Community Coll J Res Pract*. 2015;39(6):515-526. doi:10.1080/10668926.2013.850758

41. Adamovic E, Newton P, House V. Food insecurity on a college campus: Prevalence, determinants, and solutions. *J Am Coll Health*. Published online March 9, 2020:1-7.
doi:10.1080/07448481.2020.1725019
42. Becerra MB, Becerra BJ. Psychological Distress among College Students: Role of Food Insecurity and Other Social Determinants of Mental Health. *Int J Environ Res Public Health*. 2020;17(11):4118.
doi:10.3390/ijerph17114118
43. Bruening M, Argo K, Payne-Sturges DC, Laska M. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses- ClinicalKey for Nursing. Accessed October 8, 2020. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267217305518?returnurl=https%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267217305518%3Fshowall%3Dtrue&referrer=https%2F%2Fpubmed.ncbi.nlm.nih.gov%2F28754200%2F>
44. Nikolaus CJ, An R, Ellison B, Nickols-Richardson SM. Food Insecurity among College Students in the United States: A Scoping Review. *Adv Nutr*. doi:10.1093/advances/nmz111
45. CDFA - Statistics. Accessed January 22, 2022. <https://www.cdfa.ca.gov/Statistics/>
46. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: What are the risk factors? *J Hunger Environ Nutr*. 2018;13(1):1-18.
doi:10.1080/19320248.2017.1374901
47. CALIFORNIA HOMELESS, YOUTH PROJECT AND SCHOOLHOUSE CONNECTION. Basic Needs Unmet: Understanding California's College Students. Published online October 2018.
<https://www.calstate.edu/impact-of-the-csu/student-success/basic-needs-initiative/Documents/5GuidesToHelpHomelessCollegeStudents.pdf>

48. California Community Colleges #RealCollege Survey Report (March 2019). Accessed January 22, 2022. <https://www.cccstudentmentalhealth.org/california-community-colleges-realcollege-survey-report-march-2019/>
49. California Public Higher Education: Funding Supplemental Services for Low-Income and First-Generation Students. Accessed January 22, 2022. <https://lao.ca.gov/publications/report/3724>
50. Barber PH, Shapiro C, Jacobs MS, et al. Disparities in Remote Learning Faced by First-Generation and Underrepresented Minority Students during COVID-19: Insights and Opportunities from a Remote Research Experience. *J Microbiol Biol Educ*. Published online March 31, 2021. doi:10.1128/jmbe.v22i1.2457
51. Deng L. The Pathway to Success: Facilitating First-Generation Student Learning in Academic Libraries Through Cross-Campus Collaborations. *J Libr Adm*. 2022;62(1):1-18. doi:10.1080/01930826.2021.2006975
52. Martinez SM, Maynard K, Ritchie LD. Student Food Access and Security Study. *Univ Calif Off Pres Glob Food Initiat*. Published online July 11, 2016:29.
53. Hung AA, Parker AM, Yoong JK. Defining and Measuring Financial Literacy. :28.
54. President's Advisory Council on Financial Literacy (PACFL). 2008 Annual Report to the President Executive Summary.; 2009. https://www.treasury.gov/about/organizational-structure/offices/Domestic-Finance/Documents/exec_sum.pdf
55. Lusardi A, Mitchell OS, Curto V. Financial Literacy among the Young. *J Consum Aff*. 2010;44(2):358-380. doi:10.1111/j.1745-6606.2010.01173.x
56. Study on Collegiate Financial Wellness. Center for the Study of Student Life. Accessed August 18, 2021. <https://cssl.osu.edu/research-projects/study-on-collegiate-financial-wellness>

57. Goldrick-Rab S. *Paying the Price: College Costs, Financial Aid, and the Betrayal of the American Dream*. University of Chicago Press; 2016.
58. Freudenberg N, Goldrick-Rab S, Poppendieck J. College Students and SNAP: The New Face of Food Insecurity in the United States. *Am J Public Health*. 2019;109(12):1652-1658.
doi:10.2105/AJPH.2019.305332
59. The NCES Fast Facts Tool provides quick answers to many education questions (National Center for Education Statistics). Accessed August 20, 2021. <https://nces.ed.gov/fastfacts/display.asp?id=372>
60. Moore CE, Davis KE, Wang W. Low Food Security Present on College Campuses despite High Nutrition Literacy. *J Hunger Environ Nutr*. 2020;0(0):1-17. doi:10.1080/19320248.2020.1790460
61. Vidgen HA, Gallegos D. Defining food literacy and its components. *Appetite*. 2014;76:50-59.
doi:10.1016/j.appet.2014.01.010
62. Martinez SM, Frongillo EA, Leung C, Ritchie L. No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *J Health Psychol*. Published online June 25, 2018:1359105318783028.
doi:10.1177/1359105318783028
63. Raskind IG, Haardorfer R, Berg CJ. Food insecurity, psychosocial health, and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476.
doi:10.1017/S1368980018003439
64. Meza A, Altman E, Martinez SM, Leung CW. "It's a Feeling That One Is Not Worth Food": A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students- *ClinicalKey for Nursing*. Accessed August 6, 2019.
<https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0->

S2212267218306932?returnurl=https%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267218306932%3Fshowall%3Dtrue&referrer=https%2F%2Fwww.ncbi.nlm.nih.gov%2F

65. Camelo K, Elliott M. Food Insecurity and Academic Achievement Among College Students at a Public University in the United States. *J Coll Stud Dev*. 2019;60(3):307-318. doi:10.1353/csd.2019.0028
66. Phillips E, McDaniel A, Croft A. Food Insecurity and Academic Disruption Among College Students. *J Stud Aff Res Pract*. 2018;55(4):353-372. doi:10.1080/19496591.2018.1470003
67. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from Food Insecurity to Health Outcomes among California University Students. *Nutrients*. 2019;11(6):1419. doi:10.3390/nu11061419
68. Stebleton MJ, Lee CK, Diamond KK. Understanding the Food Insecurity Experiences of College Students: A Qualitative Inquiry. *Rev High Educ*. 2020;43(3):727-752. doi:10.1353/rhe.2020.0005
69. Bill Text - SB-106 Budget Act of 2019. Accessed January 18, 2022. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB106
70. Conrad Z, Rehm CD, Wilde P, Mozaffarian D. Cardiometabolic Mortality by Supplemental Nutrition Assistance Program Participation and Eligibility in the United States. *Am J Public Health*. 2017;107(3):466-474. doi:10.2105/AJPH.2016.303608
71. Knol LL, Robb CA, McKinley EM, Wood M. Food Insecurity, Self-rated Health, and Obesity among College Students. *Am J Health Educ*. 2017;48(4):248-255. doi:10.1080/19325037.2017.1316689
72. Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student Hunger on Campus: Food Insecurity Among College Students and Implications for Academic Institutions. *Am J Health Promot*. 2018;32(2):349-354. doi:10.1177/0890117117719620

73. Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *Int J Behav Nutr Phys Act.* 2018;15(1):9. doi:10.1186/s12966-018-0647-7
74. Diamond KK, Stebleton MJ, delMas RC. Exploring the Relationship Between Food Insecurity and Mental Health in an Undergraduate Student Population. *J Stud Aff Res Pract.* 2020;57(5):546-560. doi:10.1080/19496591.2019.1679158
75. Wattick RA, Hagedorn RL, Olfert MD. Relationship between Diet and Mental Health in a Young Adult Appalachian College Population. *Nutrients.* 2018;10(8):957. doi:10.3390/nu10080957
76. Jones SA, Walter J, Soliah L, Phifer JT. Perceived Motivators to Home Food Preparation: Focus Group Findings. *J Acad Nutr Diet.* 2014;114(10):1552-1556. doi:10.1016/j.jand.2014.05.003
77. Larson NI, Neumark-Sztainer D, Hannan PJ, Story M. Family Meals during Adolescence Are Associated with Higher Diet Quality and Healthful Meal Patterns during Young Adulthood. *J Am Diet Assoc.* 2007;107(9):1502-1510. doi:10.1016/j.jada.2007.06.012
78. Brug J, Debie S, van Assema P, Weijts W. Psychosocial determinants of fruit and vegetable consumption among adults: Results of focus group interviews. *Food Qual Prefer.* 1995;6(2):99-107. doi:10.1016/0950-3293(95)98554-V
79. Hua J, Howell JL, Olson D. Eating together more but feeling worse: Discrepancies between observed and reported well-being of Latino(a/x) students at a Hispanic-Serving Institution. *J Am Coll Health.* 2021;0(0):1-5. doi:10.1080/07448481.2021.1953033
80. Lopez Tabbetha D, Hernandez Daphne, Bode Sharon, Ledoux Tracey. A complex relationship between intuitive eating and diet quality among university students. *J Am Coll Health.* 2021;0(0):1-7. doi:10.1080/07448481.2021.1996368

81. Tabatabai M, Holland J, Curtis L, Morris MN. The Relationship Between Intuitive Eating and Diet Quality in a College Population. *Californian J Health Promot.* 2021;19(1):34-43.
doi:10.32398/cjhp.v19i1.2647
82. Tallant A. Full article: First-Year College Students Increase Food Label–Reading Behaviors and Improve Food Choices in a Personal Nutrition Seminar Course. Accessed January 20, 2022.
<https://www.tandfonline.com/doi/full/10.1080/19325037.2017.1343160>
83. Brauman K, Achen R, Barnes JL. The five most significant barriers to healthy eating in collegiate student-athletes. *J Am Coll Health.* 2021;0(0):1-7. doi:10.1080/07448481.2021.1899186
84. Vilaro MJ, Zhou W, Colby SE, et al. Development and Preliminary Testing of the Food Choice Priorities Survey (FCPS): Assessing the Importance of Multiple Factors on College Students’ Food Choices. *Eval Health Prof.* 2017;40(4):425-449. doi:10.1177/0163278717735872
85. Mirabitor E, Peterson KE, Rathz C, Matlen S, Kasper N. Predictors of college-student food security and fruit and vegetable intake differ by housing type. *J Am Coll Health.* 2016;64(7):555-564.
doi:10.1080/07448481.2016.1192543
86. Knol LL, Robb CA, McKinley EM, Wood M. Very Low Food Security Status is Related to Lower Cooking Self-Efficacy and Less Frequent Food Preparation Behaviors Among College Students. *J Nutr Educ Behav.* 2019;51(3):357-363. doi:10.1016/j.jneb.2018.10.009
87. Grants | Federal Student Aid. Accessed January 3, 2022. <https://studentaid.gov/understand-aid/types/grants>
88. State Aid | Federal Student Aid. Accessed January 3, 2022. <https://studentaid.gov/help-center/answers/article/state-aid>

89. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. *Int J Consum Stud*. 2014;38(4):374-384. doi:10.1111/ijcs.12110
90. Loofbourrow B, Jones A, Scherr R. Evaluating knowledge, attitudes, and practices (KAPs) regarding university student food access resource use. APHA 2021 Annu Meet Expo. Published online October 25, 2021.
91. Martinez SM, Esaryk EE, Moffat L, Ritchie L. Redefining Basic Needs for Higher Education: It's More Than Minimal Food and Housing According to California University Students. *Am J Health Promot AJHP*. 2021;35(6):818-834. doi:10.1177/0890117121992295
92. College & University Food Bank Alliance | Character Clearinghouse. Accessed January 1, 2022. <https://characterclearinghouse.fsu.edu/article/college-university-food-bank-alliance>
93. Cady C, White CC. Food Pantries on Campus to Address Student Hunger. *New Dir Community Coll*. 2018;2018(184):73-82. doi:10.1002/cc.20329
94. CUFBA | About Us. Accessed January 18, 2022. <https://cufba.org/about-us/>
95. Goldrick-Rab S, Cady C, Coca V. CAMPUS FOOD PANTRIES: INSIGHTS FROM A NATIONAL SURVEY. :12.
96. Gupton JT, Trost JL, Collins K. Food Pantries as a Gateway for Academic Enhancement and Basic Needs Support. *New Dir Community Coll*. 2018;2018(184):61-71. doi:10.1002/cc.20328
97. Davis H, Sisson SB, Clifton S. A call for evidence to support food security interventions on college campuses. *J Am Coll Health*. 2021;69(6):693-695. doi:10.1080/07448481.2019.1705829

98. Regents of the University of California, Special Committee on Basic Needs. The University of California's Next Phase of Improving Student Basic Needs.; 2020:1-59.
<https://regents.universityofcalifornia.edu/regmeet/nov20/s1attach.pdf>
99. The 2020-21 Budget: Higher Education Analysis. :80.
100. Providing Virtual and Remote Basic Needs Support to CSU Students | CSU. Accessed January 18, 2022. <https://www.calstate.edu:443/impact-of-the-csu/student-success/basic-needs-initiative/Pages/virtual-and-remote-support.aspx>
101. Study of Student Service Access and Basic Needs. :127.
102. El Zein A, Mathews AE, House L, Shelnett KP. Why Are Hungry College Students Not Seeking Help? Predictors of and Barriers to Using an On-Campus Food Pantry. *Nutrients*. 2018;10(9):1163.
doi:10.3390/nu10091163
103. Goldrick-Rab S. Beyond the Food Pantry: Spreading the Word- Supporting Students' Basic Needs with a Syllabus Statement and Welcome Survey. :5.
104. Esaryk EE, Jiménez Arriaga EE, Kalaydjian S, Martinez SM. Campus Food Pantry Use Addresses a Gap Among California Public University Students. *J Nutr Educ Behav*. 2021;53(11):921-930.
doi:10.1016/j.jneb.2021.06.005
105. The CalFresh Food Assistance Program. Public Policy Institute of California. Accessed January 21, 2022. <https://www.ppic.org/publication/the-calfresh-food-assistance-program/>
106. SNAP Data Tables | USDA-FNS. Accessed December 4, 2019.
<https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap>

107. Special rules for students. LSNC Guide to CalFresh Benefits. Published July 30, 2015. Accessed January 22, 2022. <https://calfresh.guide/special-rules-for-students/>
108. Senate Bill 77 Calfresh Student Data Report. :14.
109. Signing Up For Food Stamps: The Choice And The Stigma. NPR.org. Accessed January 10, 2021. <https://www.npr.org/2013/04/25/179038260/signing-up-for-food-stamps>
110. Haynes-Maslow L, Auvergne L, Mark B, Ammerman A, Weiner BJ. Low-Income Individuals' Perceptions About Fruit and Vegetable Access Programs: A Qualitative Study. *J Nutr Educ Behav*. 2015;47(4):317-324.e1. doi:10.1016/j.jneb.2015.03.005
111. admin SF. Economic Crisis. Financial Aid and Scholarships. Published September 2, 2016. Accessed January 22, 2022. <https://financialaid.ucdavis.edu/wellness/ECRT>
112. University of California Office of the President. Review of University of California Basic Needs Efforts.; 2019. <https://regents.universityofcalifornia.edu/regmeet/jan19/s1.pdf>
113. Bountress KE, Cusack SE, Conley AH, et al. Unpacking the impact of the COVID-19 pandemic: identifying structural domains. *Eur J Psychotraumatology*. 2021;12(1):1932296. doi:10.1080/20008198.2021.1932296
114. Davitt ED, Heer MM, Winham DM, Knoblauch ST, Shelley MC. Effects of COVID-19 on University Student Food Security. *Nutrients*. 2021;13(6):1932. doi:10.3390/nu13061932
115. Owens MR, Brito-Silva F, Kirkland T, et al. Prevalence and Social Determinants of Food Insecurity among College Students during the COVID-19 Pandemic. *Nutrients*. 2020;12(9):2515. doi:10.3390/nu12092515

116. Mialki K, House LA, Mathews AE, Shelnut KP. Covid-19 and College Students: Food Security Status before and after the Onset of a Pandemic. *Nutrients*. 2021;13(2):628. doi:10.3390/nu13020628
117. Soldavini J, Andrew H, Berner M. Characteristics associated with changes in food security status among college students during the COVID-19 pandemic. *Transl Behav Med*. 2021;11(2):295-304. doi:10.1093/tbm/ibaa110
118. Ahmed T, Ilieva RT, Shane J, et al. A Developing Crisis in Hunger: Food Insecurity within 3 Public Colleges before and during the COVID-19 Pandemic. *J Hunger Environ Nutr*. 2022;0(0):1-20. doi:10.1080/19320248.2022.2026853
119. DeBate R, Himmelgreen D, Gupton J, Heuer JN. Food Insecurity, Well-being, and Academic Success among College Students: Implications for Post COVID-19 Pandemic Programming. *Ecol Food Nutr*. 2021;60(5):564-579. doi:10.1080/03670244.2021.1954511
120. Silva FB, Osborn DE, Owens MR, et al. Influence of COVID-19 Pandemic Restrictions on College Students' Dietary Quality and Experience of the Food Environment. *Nutrients*. 2021;13(8):2790. doi:10.3390/nu13082790
121. Zottarelli LK, Moreno A, Miranda A, Xu X, Sunil TS. Basic Needs Initiatives at Texas Community College Hispanic-Serving Institutions: Changes in Service Offerings during the Covid-19 Pandemic. *Community Coll J Res Pract*. 2022;46(1-2):138-144. doi:10.1080/10668926.2021.1973611
122. Benefit increases because of COVID-19. LSNC Guide to CalFresh Benefits. Published April 9, 2020. Accessed January 21, 2022. <https://calfresh.guide/benefit-increase-because-of-covid-19/>
123. Chart Book: SNAP Helps Struggling Families Put Food on the Table. Center on Budget and Policy Priorities. Accessed June 30, 2021. <https://www.cbpp.org/research/food-assistance/chart-book-snap-helps-struggling-families-put-food-on-the-table>

Chapter 2

Evaluating Knowledge, Attitudes, and Practices Regarding CalFresh Participation in University Students

Introduction

In the United States (U.S.), food security is defined as access by all people to nutritionally adequate food to support a healthy and active lifestyle.¹ Four levels of food security have been described by the United States Department of Agriculture (U.S.D.A.): (1) high food security, reporting no problems in obtaining food; (2) marginal food security, reporting anxiety regarding food sufficiency or household food shortages; (3) low food security, reporting reduced diet quality, variety, or desirability; and (4) very low food security, reporting disrupted eating patterns and reduced intake.² Low and very low food security are collectively described as “food insecure.” In 2020, it was estimated that 11% of U.S. households experienced food insecurity.¹ Of these, households with children (13.6%), headed by a single woman (28.7%) or single man (15.4%), single woman or single man living alone (13.0% and 12.8%, respectively), non-Hispanic Black (19.1%), and Hispanic (15.6%) members, and households living below 185% of the federal poverty threshold (27.6%)³ were disproportionately affected by food insecurity.¹

College students are another at-risk group for food insecurity who are not highlighted in these national statistics. College students comprise a substantial proportion of the U.S. population, with a projected 19.7 million students attending college during the 2020-2021 academic year.⁴ Although college students have historically been considered to be in a “privileged” and “elite” setting, a significant proportion are from low-income backgrounds⁵ - research investigating college students has indicated that food insecurity may impact them at rates up to four times the national prevalence.⁶⁻¹³ Similar to nationwide findings, college students in certain demographic groups are at higher risk, including students who are Black, Hispanic, or from low-income households.^{6,14} The effects of food insecurity may be broad and far-reaching in this group, with negative associations on health¹³, psychosocial functioning,^{15,16} and poor academic outcomes.^{6,10,15,17-21} In an effort to reduce food insecurity, the U.S.D.A. established the Supplemental Nutrition Assistance Program (SNAP, previously known as Food Stamps and referred to as CalFresh in California), which provides an average of \$155 monthly to its 40 million participants

nationwide.²² Historically, college students have been hindered from participating in this program, due to stringent eligibility requirements which frequently preclude them.²³ In spite of these restrictions many college students are in fact eligible for this program, yet research in this area indicates that their participation is extremely low.^{10,12,16}

In the general population, reasons for choosing to not participate in programs like SNAP include negative attitudes (such as embarrassment or shame),²⁴ a lack of awareness of the program or its eligibility requirements, among others.¹⁰ In the college student population, reasons regarding program participation are unknown, however the authors hypothesize that knowledge about food assistance programs is low. Students are often newly independent and may have limited awareness of many of the resources that are available to them including those provided through the university as well as resources to improve housing and food access.

Although a growing body of literature continues to illustrate how food insecurity affects college students, there is a dearth of research of how student knowledge and perceptions of food assistance resources like CalFresh may differ between among students by food security status.⁵⁻¹⁹ The purpose of current study was to identify students' knowledge and attitudes about food access resources, particularly CalFresh, and assess whether knowledge and attitudes were associated with CalFresh participation. In addition, relationships among demographic and academic characteristics, food insecurity, and academic outcomes were assessed.

Methods

Sample

This was a cross-sectional study conducted between the months of January and February 2020. The university's office of Budget and Institutional Analysis provided the research team with the sample of n=10,000 students (undergraduate and graduate). Students were selected from the complete list of 39,629 students enrolled at a large public university in California, and representative of the university

population based on selected factors of race/ethnicity, academic class standing, college, international student status, and California residency. Out of this population, n=5,000 were representative of the university student body. The remaining n=5,000 were selected based on the same criteria, and additionally were oversampled for recipients of the federal Pell Grant (provided to students from low-income families earning less than \$50,000 annually) to ensure that students exhibiting financial need and food insecurity were surveyed. Of the n=10,000 students contacted, n=1,526 students completed the questionnaire (15% response rate). Of these, 100 students were removed for not providing adequate consent to participate. Of the remaining n=1,426, n=18 students were excluded for providing incomplete food security data, resulting in an analytical sample of n=1,408 participants. Test of differences indicated no demographic differences between students with complete versus incomplete data.

CalFresh Knowledge, Attitudes, and Practices (KAPs) Question Development

Questions relating to knowledge about CalFresh, attitudes regarding CalFresh, campus food access resource and CalFresh participation, and other student lifestyle questions were developed and edited with the help of a panel of content and survey design experts.²⁵ Cognitive interviews²⁶ with university students (n=15) were conducted to determine whether questions were being answered as intended and to improve clarity. Following edits to refine the questionnaire, a second round of cognitive interviews was conducted (n=10). The final draft of questions was reviewed again by the same panel of experts. The questionnaire contained 68 items in total, with 27 CalFresh KAPs items. Skip logic was implemented in the questionnaire such that not all students viewed all questions. For example, students who indicated current participation in CalFresh also received questions asking about their own participation in the program (see Appendix 1).

Study questionnaire and data collection

The study questionnaire was administered at the beginning of the January 2020 academic term using a modified Tailored Design Method.²⁷ At the beginning of the second week of the academic term, potential participants received an initial email invitation to participate, which provided detailed study information, informed consent letter, and a notification that they would receive a questionnaire via email. A follow-up email was sent one week with a personalized link which included informed consent documentation and the questionnaire. The questionnaire was distributed via Qualtrics (Provo, Utah, United States) software. In the questionnaire, students electronically consented by providing university-issued student ID number. Two reminder emails were sent to participants who did not complete the survey, one week apart. Participants who did not complete the questionnaire within the following week received one final reminder. Participants who completed the questionnaire within 3 weeks of receiving the initial questionnaire link were given a \$5 gift card incentive.

After data collection via Qualtrics was complete, data were returned to the campus Office of Budget and Institutional Analysis to be deidentified and combined with student-specific demographic and academic data, including age, race/ethnicity, transfer student status (students transferred from a 2-year or another 4-year institution), low income status (students whose university application indicates a household income below 185% of US federal poverty guidelines), international student status, first-generation status (students whose parents did not complete a 4-year degree), cumulative and term grade point average (GPA), college and major, number of units enrolled, and academic class standing.

Independent variables

CalFresh KAPs. Participants reported on knowledge items including such statements as “My tax dollars help to fund the CalFresh program,” and “CalFresh helps people who are considered low-income,” which were scored using a 3-point Likert scale, ranging from disagree to agree. Attitudes items included

statements such as “I have felt glad,” and “I have felt guilty,” in reference to using CalFresh benefits; “I feel pity for them,” and “I feel glad for them because they are receiving the benefits,” in reference to other individuals using CalFresh benefits. All attitudes’ questions utilized a 5-point Likert scale, ranging from strongly disagree to strongly agree. Practices items included questions about the timing of CalFresh participation, whether students currently receive CalFresh benefits or have used them in the past, which were recorded on a yes/no binary scale.

Dependent variables

Food insecurity. Food security status as measured by 10-item USDA Adult Food Security Survey Module (USDA AFSSM²⁸) was self-reported by participants over the last 30 days.

GPA. Cumulative GPA based on institutional records.

Covariates

We controlled for the following: race/ethnicity, first-generation student status, transfer student status, low-income status, international citizenship, out-of-state residency, and academic class standing, including freshman (0-44.99 units accumulated), sophomore (45-89.99 units), junior (90-134.99 units) senior (135+ units) students and graduate/professional students. Considering academic class standing, sophomore students were the reference group – in this class at the university, students are not required to live on campus or to be on a campus meal plan, thus their eating patterns and use of CalFresh may be more representative of other students. Graduate/professional students were also used as the reference group, due to their generally higher food security.

Data Analysis

Descriptive statistics were used to examine demographic and student characteristics. Chi-square analysis of independence was used to compare racial/ethnic profile of study sample to university demographics to assess whether study sample was representative of university population. A Mann-Whitney U test was used to determine if there were differences in GPA by food security status.

Exploratory factor analysis was performed with Quartimax rotation to reduce dimensions regarding CalFresh knowledge, general attitudes towards respondents' own CalFresh participation, attitudes about others' participation in CalFresh, and attitudes about not needing CalFresh. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were assessed to determine factorizability of KAPs responses. Resulting factor scores were used in Kendall's tau-b correlation analysis due to nonparametric nature of variables to determine whether associations existed between knowledge of and attitudes towards CalFresh. Significance for all tests was designated at a p-value <0.05. All data analyses were performed using IBM SPSS version 27 (Armonk, New York, United States).

Two multiple variable logistic regressions were performed. Model 1 examined transfer student status, first-generation student status, low-income status, race/ethnicity, citizenship, in-state residence, class standing as independent variables and food security status as the dependent variable; Model 2 examined food insecurity, CalFresh knowledge, and the previously listed demographic characteristics as independent variables with CalFresh participation as the dependent variable.

A third set of multiple linear regression models were used to determine whether food security status was associated with changes in academic performance (GPA). Model 3a included food insecurity as the independent variable; Model 3b included food insecurity, race/ethnicity, transfer status, first-generation status, low-income status, citizenship, California residency, and class standing as independent variables; Model 3c included the same covariates, while omitting graduate/professional students.

Results

Sample Characteristics

In the sample of respondents, 1% were identified as American Indian/Alaska Native, 3% were Black/African American, 23% were East Asian (students who identified as Chinese, Korean, or Japanese), 28% were Latino/a (students who identified as Chicano, Latino, Mexican, Mexican-American, or Other Spanish), 6% were Middle Eastern/South Asian (students who identified as East Indian/Pakistani), 1% were Native Hawaiian/Pacific Islander, 3% were Other Asian, 10% were South Asian (students who identified as Filipino or Vietnamese), and 26% were white (students who identified as white or Caucasian)(Table 1). Chi-square analysis of independence indicated that the race/ethnicity characteristics of the sample were not significantly different from the university population (Figure 1). Other demographic characteristics provided by office of Budget and Institutional Analysis included low-income status (35%), transfer student status (18%), international student status (15%), in-state residency (87%), and academic class standing (84% undergraduate student and 16% graduate/professional student). Participants provided information on first-generation student status (49.4%; Table 1).

Overall, 43% of respondents had experienced food insecurity (20% low food security, and 23% very low food security (Table 1). Differences were observed between groups, with proportionately more students who were identified as Latino/a, a senior student, a first-generation student, a transfer student, being from a low-income background, experiencing food insecurity, while proportionately fewer students who were identified as East Asian, and white, as a graduate/professional student, or being an international student or out-of-state resident. Student financial factors observed to have significant differences in prevalence of food insecurity include receiving need-based grants, including the federal Pell Grant, statewide CalGrant (California-specific needs-based grant), university needs-based grants, and federal work-study, and receiving both subsidized and unsubsidized federal student loans, and receiving financial support from a family member or friend reported a greater proportion of food insecurity. On-

campus food access resource use was proportionately higher among students experiencing food insecurity (Table 2). In addition, food insecure students reported higher proportions of CalFresh participation and awareness of CalFresh eligibility (Table 2).

Table 1. Demographic and Financial Characteristics of Sample				
	Total	Food Secure	Food Insecure	
	N (%)	n (%)	n (%)	χ^2 (p-value)
Total Sample (n=1408)	1408	808 (57.4)	600 (42.6)	
Median GPA ^{†***}	3.33	3.50	3.11	-9.216 (<0.001)
Race/Ethnicity (n=1369)				
American Indian/Alaska Native	11 (0.8)	5 (0.6)	6 (1.0)	0.645 (0.422)
Black/African American	46 (3.4)	23 (2.9)	23 (4.0)	1.061 (0.303)
East Asian***	314 (22.9)	222 (28.0)	92 (15.9)	29.295 (<0.001)
Latino/a***	386 (28.2)	159 (20.1)	227 (39.3)	57.033 (<0.001)
Middle Eastern / South Asian	81 (5.9)	51 (6.4)	30 (5.2)	1.093 (0.296)
Native Hawaiian / Pacific Islander	9 (6.6)	4 (0.5)	5 (0.9)	0.620 (0.431)
Other Asian	43 (3.1)	21 (2.7)	22 (3.8)	1.326 (0.250)
Southeast Asian	130 (9.5)	75 (9.5)	55 (9.5)	0.005 (0.941)
White/Caucasian***	349 (25.5)	232 (29.3)	117 (20.3)	15.676 (<0.001)

First-Generation Student*** (n=1239)	562 (45.4)	277 (38.6)	335 (64.2)	78.847 (<0.001)
Transfer Student*** (n=1408)	253 (18.0)	113 (14.0)	140 (23.3)	20.413 (<0.001)
Low-Income*** (n=1408)	491 (34.9)	234 (29.0)	257 (42.8)	29.178 (<0.001)
International*	208 (14.8)	133 (16.5)	75 (12.5)	4.289 (0.038)
Out-of-State Resident** (n=1408)	189 (13.4)	125 (15.5)	64 (10.7)	6.837 (0.009)
Class Standing* (n=1408)				
Undergraduate Student***	1190 (84.5)	655 (81.1)	535 (89.2)	17.273 (<0.001)
Freshman	239 (17.0)	139 (17.2)	100 (16.7)	0.070 (0.791)
Sophomore	240 (17.0)	145 (17.9)	95 (15.8)	1.086 (0.297)
Junior	337 (23.9)	201 (24.9)	136 (22.7)	0.923 (0.337)
Senior***	374 (26.6)	170 (21.0)	204 (34.0)	29.649 (<0.001)
Graduate or Professional Student***	218 (15.5)	153 (18.9)	65 (10.8)	17.273 (<0.001)
Pell Grant recipient [†] (n=1163)***	565 (48.6)	254 (37.2)	311 (64.7)	84.858 (<0.001)
CalGrant recipient [†] (n=1172) ***	575 (49.1)	269 (39.4)	306 (62.4)	60.389 (<0.001)

Subsidized Student Loans [‡] (n=1150) ^{***}	376 (32.7)	159 (23.7)	217 (45.3)	59.293 (<0.001)
Unsubsidized Student Loans [‡] (n=1132) ^{***}	242 (21.4)	101 (15.3)	141 (29.9)	34.757 (<0.001)
Private Loans [‡] (n=1136)	45 (4.0)	26 (3.9)	19 (4.1)	0.028 (0.867)
University Grant [‡] (n=1107) [*]	365 (33.0)	161 (24.8)	204 (44.4)	46.698 (<0.001)
Scholarship [‡] (n=1153)	328 (28.4)	204 (30.0)	124 (26.2)	2.069 (0.150)
Work-Study [‡] (n=1127) ^{***}	245 (21.7)	112 (17.0)	133 (28.4)	20.990 (<0.001)
Own 1 or more Credit Accounts [‡] (n=1202)	697 (58.0)	392 (56.2)	305 (60.4)	2.075 (0.150)
Financial Support from Family or Friend [‡] (n=1196) ^{***}	700 (58.5)	451 (65.5)	249 (49.1)	32.147 (<0.001)
Have 1 or more unpaid jobs or internships [‡] (n=1207) [*]	328 (27.2)	171 (24.5)	157 (30.8)	5.990 (0.014)
Have 1 or more paid jobs or internships [‡] (n=1208) ^{**}	537 (44.5)	285 (40.8)	252 (49.4)	8.787 (0.003)
<p>† Independent Samples Mann-Whitney U test performed, Z test statistic provided in place of χ^2</p> <p>‡ Data are self-reported</p> <p>* P<0.05</p> <p>** P<0.01</p> <p>*** P<0.001</p>				

Table 2. Reported Food Access Resource Participation and CalFresh Knowledge and Participation			
	Food Secure	Food Insecure	
	n (%)	n (%)	χ^2 (p-value)
No On-Campus Resource Use (n=1306)***	392 (51.9)	196 (35.6)	33.821 (<0.001)
Participate in CalFresh (n=1303)***	85 (11.3)	128 (76.6)	33.993(<0.001)
Awareness of CalFresh Eligibility (n=1287)			
Yes, and I receive CalFresh***	84 (11.2)	129 (24.0)	37.253 (<0.001)
Yes, but I do not receive CalFresh***	101 (13.5)	131 (24.4)	25.291 (<0.001)
No, I am not eligible***	188 (25.1)	80 (14.9)	19.628 (<0.001)
Not sure***	377 (50.3)	197 (36.7)	23.361 (<0.001)
* P<0.05			
** P<0.01			
*** P<0.001			

Exploratory Factor Analysis Findings

Analysis resulted in five constructs of KAPs: (1) CalFresh Knowledge, (2) Positive Attitudes Around Participating in CalFresh, (3) Negative Attitudes Around Participating in CalFresh, (4) Negative Attitudes Around Others Participating in CalFresh, and (5) Fortunate Attitudes for not Participating in CalFresh. For each, KMO measures and Bartlett's test of sphericity confirmed that they were likely factorizable. The first analysis presented non-CalFresh participating students with eight statements about CalFresh to

assess level of knowledge. One statement was removed due to low communality. With the remaining seven statements, the overall KMO measure was 0.91. Factor analysis identified one component that had an eigenvalue greater than one and explained 49.1% of the total variance. Visual inspection of the scree plot indicated that one component was appropriate to retain – this component was labeled CalFresh Knowledge.

The second analysis presented non-CalFresh participants with nine statements about attitudes towards others using CalFresh benefits. The overall KMO measure was 0.8. Factor analysis identified two components that had an eigenvalue greater than 1 and explained 64% of the total variance. Quartimax rotation with Kaiser normalization was used to aid interpretation. Visual inspection of the scree plot indicated that two components were appropriate to retain – these components were labeled Negative Attitudes Around Others Participating in CalFresh and Fortunate Attitudes for not Participating in CalFresh. The final analysis was run on a different subset of the questionnaire, which presented CalFresh participants with 11 statements about attitudes towards using CalFresh benefits. The overall KMO measure was 0.724. Quartimax rotation with Kaiser normalization was used to aid interpretation. Visual inspection of the scree plot indicated that two components were appropriate to retain – these components were labeled Negative Attitudes Around Participating in CalFresh and Positive Attitudes Around Participating in CalFresh.

Regression factor score coefficients were estimated using SPSS and saved as variables following exploratory factor analysis to be used in the Kendall's tau-b correlation analysis.

Findings from the Kendall's tau-b correlation examining KAPs factor scores showed that in the relationship between CalFresh Knowledge and Positive Attitudes Around Participating in CalFresh, there was a weak positive correlation ($\tau_b = 0.15$, $p = 0.025$; Table 2). In the correlation between CalFresh Knowledge and Negative Attitudes Around Participating in CalFresh, there was a moderate negative correlation ($\tau_b = -0.28$, $p < 0.001$). In the correlation between CalFresh Knowledge and Fortunate Attitudes

for not Participating in CalFresh, there was a weak positive relationship ($\tau_b=0.12$, $p=0.004$). There was not a statistically significant correlation between CalFresh Knowledge and Negative Attitudes Around Participating in CalFresh.

Table 3. Kendall's tau Correlation of CalFresh Knowledge and Attitudes towards CalFresh		
	CalFresh Knowledge Correlation Coefficient (τ_b)	p-value
Negative Attitudes Around Participating in CalFresh (n=111)	-0.030	0.659
Positive Attitudes Around Participating in CalFresh* (n=111)	.152	0.025
Negative Attitudes Around Others Participating in CalFresh*** (n=277)	-.278	<0.001
Fortunate Attitudes for not Participating in CalFresh** (n=277)	.123	0.004
* P<0.05		
** P<0.01		
*** P<0.001		

Food Insecurity

In Model 1, Latino/a students had the highest odds of experiencing food insecurity compared to white students (OR = 1.97; 95% CI, 1.38, 2.83; Table 4); other racial groups did not have a significant difference in the odds of being food insecure. Students who identified as first-generation had double the odds of being food insecure as non-first-generation students (OR = 2.01; 95% CI, 1.52, 2.67), and transfer

students had approximately one and a half times the odds of being food insecure (OR = 1.58; 95% CI, 1.12, 2.24) compared to non-transfer students. When sophomore students were considered the reference category of academic class standing, other class standings were not significantly associated with food insecurity. Compared to graduate/professional students, senior students had more than double the odds of experiencing food insecurity (OR = 2.24; 95% CI, 1.43, 3.49; data not shown). When considered in aggregate, undergraduate students had increased odds of experiencing food insecurity (OR = 1.48; 95% CI, 1.00, 2.19; data not shown). Low-income status, citizenship, and California residency were not significantly related to food insecurity (Table 4).

Table 4. Regression Model 1: Logistic Regression of Demographic and Academic Characteristics' Associations with Food Insecurity			
Factor	Odds Ratio	CI (95%)	p-value
Ethnicity			
American Indian/Alaska Native	1.486	0.399 – 5.527	0.555
Black/African American	1.460	0.722 – 2.952	0.292
East Asian	0.742	0.504 – 1.091	0.129
Latino/a***	1.973	1.376 – 2.828	<0.001
Middle Eastern / South Asian	0.763	0.619 – 1.923	0.763
Native Hawaiian / Pacific Islander	1.626	0.302 – 8.758	0.572
Islander			
Other Asian	1.714	0.857 – 3.427	0.128
Southeast Asian	1.146	0.710 – 1.850	0.576
White/Caucasian	Ref	-	-

First-Generation ^{†***} : Yes (Ref: No)	2.010	1.516 – 2.666	<0.001
Transfer Status*: Yes (Ref: No)	1.581	1.116 – 2.239	0.010
Low-Income: Yes (Ref: No)	1.182	0.882 – 1.585	0.264
Citizen: No (Ref: Yes)	0.927	0.562 – 1.529	0.766
California Resident: No (Ref: Yes)	1.201	0.705 – 2.045	0.501
Class Standing			
Freshman	0.886	0.432 – 1.816	0.740
Sophomore	Ref	-	-
Junior	0.654	0.330 – 1.297	0.224
Senior	1.234	0.639 – 2.386	0.531
Graduate or Professional Student	0.527	0.227 – 1.225	0.137
† Data are self-reported			
* P<0.05			
** P<0.01			
*** P<0.001			

KAPs and CalFresh participation

In Model 2, Among subset of participants who answered CalFresh items based on skip logic questions availability (n=437), Model 2 results showed CalFresh Knowledge was associated with participation in CalFresh while controlling for demographic and academic factors. CalFresh Knowledge factor scores were positively associated with CalFresh participation (OR = 1.40; 95% CI, 1.07, 1.85; Table

5). First-generation students had approximately double the odds of participating in CalFresh of low-income students, compared to non-first generation and non-low-income students, respectively (OR = 2.07; 95% CI, 1.07, 4.01; OR = 1.84; 95% CI, 1.01, 3.33, respectively). In this model, freshman (OR = 0.03; 95% CI, 0.004, 0.28) and graduate/professional students (OR = 0.20; 95% CI, 0.04, 0.99) had lower odds of participating in CalFresh. In another iteration of this model, sophomore, junior, and senior students had much higher odds of participating in CalFresh than the graduate/professional student reference group (OR = 4.98; 95% CI, 1.01, 24.49; OR = 6.05; 95% CI, 1.30, 28.22; OR = 6.400; 95% CI, 1.37, 29.82, respectively; data not shown). Considering undergraduate students collectively compared to graduate students, undergraduate students had nearly five times the odds of participating in CalFresh (OR = 4.57, 95% CI, 1.61, 12.96; data not shown).

Table 5. Regression Model 2: Logistic Regression of factors examining KAPs Association with CalFresh Participation			
Factor	OR	CI (95%)	p-value
CalFresh Knowledge*	1.404	1.066 – 1.850	0.016
Food Insecure*	2.144	1.201 – 3.827	0.010
Race/Ethnicity			
American Indian/Alaska Native	1.267	0.092 – 17.445	0.860
Black/African American	0.836	0.124 – 5.658	0.855
East Asian	1.145	0.505 – 2.599	0.746
Latino/a	1.150	0.526 – 2.514	0.725
Middle Eastern / South Asian	0.407	0.079 – 2.088	0.281
Other Asian	0.873	0.205 – 3.720	0.854
Southeast Asian	0.450	0.139 – 1.456	0.182
White/Caucasian	Ref	-	-

First-Generation ^{†*} : Yes (Ref: No)	2.072	1.070 – 4.012	0.031
Transfer Status: Yes (Ref: No)	0.740	0.376 – 1.455	0.383
Low-Income*: Yes (Ref: No)	1.836	1.012 – 3.328	0.045
Citizen: No (Ref: Yes)	0.445	0.103 – 1.925	0.279
California Resident: No (Ref: Yes)	0.342	0.032 – 3.614	0.372
Class Standing			
Freshman**	0.034	0.004 – 0.277	0.002
Sophomore	Ref	-	-
Junior	1.215	0.538 – 2.744	0.640
Senior	1.286	0.594 – 2.785	0.524
Graduate or Professional Student*	0.201	0.041 – 0.988	0.048
† Data are self-reported			
* P<0.05			
** P<0.01			
*** P<0.001			

GPA

The distribution of GPA was not similar between the groups, as assessed by visual inspection of GPA distribution. Median GPA for food secure students (3.50) and food insecure students (3.11) was significantly different ($U = 166966$, $z = -9.22$, $p < 0.001$; Table 1, Figure 2).

Both Model 3a and Model 3b showed an association of food insecurity with a lower student GPA ($\beta = -0.26$, $p < 0.001$; $\beta = -0.12$, $p < 0.001$, respectively; Table 6); other significant covariates included being Black/African American, Latino/a, Other Asian, a first-generation student, a transfer student, and all undergraduate academic class standings. Model 3c also showed that food insecurity was correlated with

a decrease in student GPA ($\beta=-0.13$, $p<0.001$) after omitting graduate/professional students from the model; other significant covariates included being Black/African American, Latino/a, Other Asian, first-generation student, and a transfer student.

Table 6. Regression Model 3: Multiple Linear Regression of Food Insecurity's Association with of GPA									
Parameter	Model 3a			Model 3b			Model 3c		
	B	Std. Error	p-value	B	Std. Error	p-value	B	Std. Error	p-value
Food Insecurity	-0.261	0.0301	<0.001	-0.124	0.0307	<0.001	-0.133	0.0348	<0.001
Ethnicity									
American Indian/Alaska Native			.197	.1585	.213	.338	.2152	.116	
Black/African American			-.211	.0859	.014	-.239	.1005	.017	
East Asian			-.034	.0434	.430	-.031	.0497	.528	
Latino/a			-.142	.0432	.001	-.150	.0498	.003	
Middle Eastern / South Asian			-.098	.0652	.131	-.092	.0756	.222	
Native Hawaiian / Pacific Islander			-.086	.2024	.673	-.109	.2359	.643	
Other Asian			-.263	.0842	.002	-.299	.0960	.002	
Southeast Asian			-.016	.0571	.778	-.025	.0633	.696	
White/Caucasian			Ref	-	-	-	-	-	
First-Generation [†] : Yes (Ref: No)			-.164	.0339	<0.001	-.186	.0388	<0.001	
Transfer Status: Yes (Ref: No)			-.123	.0417	.003	-.123	.0456	.007	
Low-Income: Yes (Ref: No)			-.075	.0347	.030	-.063	.0374	.091	

Citizen: No (Ref: Yes)	.012	.0577	.831	-.028	.0702	.689
California Resident: No (Ref: Yes)	0.009	.0606	.885	-.001	.0804	.986
Class Standing						
Freshman	-.528	.0550	<0.001	-.053	.0522	.312
Sophomore	-.427	.0543	<0.001	Ref	-	-
Junior	-.491	.0520	<0.001	-.017	.0496	.733
Senior	-.499	.0525	<0.001	-.022	.0493	.652
Graduate or Professional Student	Ref	-	-		-	
† Data are self-reported.						
Model 1: Food Insecurity only						
Model 2: All class standings included (Freshman, Sophomore, Junior, Senior, Graduate/Professional Student)						
Model 3: Graduate/Professional students omitted						
Models include following covariates: Race/Ethnicity, Transfer Status, First-Generation Status, Low-Income Status, Citizenship, California Residency, Class Standing						

Discussion

This study sought to identify student knowledge of and attitudes towards CalFresh and assess whether these factors impact CalFresh participation, as well as explore relationships between demographic and academic characteristics, food insecurity, and academic outcomes. Our findings showed that knowledge about CalFresh was correlated with positive attitudes towards the CalFresh program and a higher likelihood of participation in CalFresh. Knowledge about CalFresh was not correlated with negative attitudes towards using the program in CalFresh participants and was correlated with positive

attitudes towards other individuals using CalFresh benefits. Food insecurity differed by demographic characteristics, including students from low-income backgrounds, Latino/a and Black/African American students, first-generation and transfer students, and students receiving need-based financial aid.^{7,17} Food insecurity was also found to be negatively correlated with GPA, when considered alone and when controlling for demographic characteristics.

The food insecurity prevalence results agree with previous work which has found food insecurity prevalence at the University of California to be approximately 42%.¹² Given the size of the University of California (nearly 286,000 of students across 10 campuses), this estimate may represent over 114,000 University of California students who may be experiencing food insecurity, with nearly half of those experiencing disrupted patterns of food intake as indicated by very low food security.¹² Of particular interest to the University of California is the Latino/a population. Nationally, Hispanic individuals make up 18.5% of the population, while in California that proportion is 39.4%.²⁹ At the UC, Hispanic students make up nearly 25% of the student population;³⁰ such a large proportion of the university represents an important driver in university metrics, as well as a considerable number of vulnerable individuals exhibiting a need for improved food security. The current findings indicate that this population is vulnerable to food insecurity and that these students are nearly twice as likely to be food insecure compared to their white counterparts.

Previous literature has indicated that another important predictor in food insecurity is academic class standing, with one study in a similar population indicating that students who are in the latter half of their university education (particularly juniors and fifth-year seniors) are more likely to experience food insecurity compared to graduate students.⁶ The findings of this study expand on those results, indicating that compared to both graduate and freshman students, sophomore, junior, and senior students are more likely to participate in CalFresh, pointing to an increased need for food access once students are

likely no longer living on-campus. At the study campus, on-campus housing and meal plan is not required, but over 90% of freshman students do opt to live on campus.³¹

Students from low-income backgrounds are also at a higher likelihood of experiencing food insecurity, since the USDA's current measurement tool assessing food security relies heavily on an individual's financial status, this is a logical outcome.^{6,20} These results point to a persistent financial struggle related to food security; students from a low-income background are about 20% more likely to experience food insecurity, and receipt of needs-based financial aid (Pell Grant, University needs-based grant) is also associated with food insecurity. Although being low income and food insecurity often go together,⁶ the consistent association of need-based aid with food insecurity and the greater likelihood of low-income students to experience food insecurity indicate a persistent and pervasive need.

An important program which was created to help alleviate food insecurity is SNAP. Since the 1960s, the US Department of Agriculture has implemented SNAP in order to provide funding for household food and mitigate food insecurity.³² In a 2016 study surveying students across the University of California, food insecurity prevalence was strikingly high (42%), but only 2% of students reported using CalFresh benefits. Though there are many possible explanations, one postulation was that low participation was due to either lack of knowledge about the program and its requirements or negative attitudes towards CalFresh. In spite of the myriad of negative consequences associated with food insecurity, the stigma associated with participating in social safety nets may be enough to discourage its use.^{24,33} Though CalFresh is helpful in promoting food security and alleviating poverty, its benefits may not be enough to dispel negative perceptions about the program.^{34,35} Negative attitudes associated with CalFresh and other welfare programs are frequently coupled with complaints about the process of obtaining and maintaining these benefits; in order to keep their benefits, participants must provide proof of continued eligibility.²³ These eligibility requirements dictate that an individual must be working at least 30 hours weekly and earning below the designated poverty threshold, among others.²³

Although the eligibility requirements of this program may frequently preclude college students from participating in the program, increased efforts have been made in recent years to promote college student participation.³⁶ Despite some improvements to program promotion (including legislative efforts to simplify application to CalFresh by college students, and improved visibility of the program at the university level), many college students do not participate in the program.^{10,12} Previous reports from the UC population have indicated that CalFresh participation is extremely limited.¹² Given the low participation rate, one of the primary objectives of this study was to assess whether stigma associated with CalFresh or uncertainty of eligibility were factors in the lack of participation. This study found that contrary to the UC-wide report, the study population campus had a CalFresh participation rate of 15%,¹² which could indicate a higher level of need at the campus, or that efforts to promote CalFresh (including basic needs center advertisement and hosting a CalFresh representative on campus full-time) have been effective at increasing participation in eligible students. In addition, attitudes towards CalFresh in this population were overwhelmingly positive, while eligibility knowledge appeared to be lacking. These findings present a clear actionable path forward. It is now up to universities and other stakeholders to improve eligibility criteria communications and provide resources to students to help them participate in CalFresh/SNAP.

This study is the first to examine college students' knowledge and perceptions of CalFresh/SNAP. Although the overall perceptions of CalFresh appear to be positive, there is a clear lack of knowledge about program eligibility. Previous research in college students indicate that many students, particularly those who are impacted by low and very low food security, would like to receive more information from their institutions regarding food access resources.⁶ These results highlight the utility of that notion - increases in knowledge about CalFresh is associated with greater CalFresh participation. Although much has been done in recent years to promote basic needs access on campus, low knowledge of CalFresh

eligibility highlights the continued need for promotion of resources that exist outside of the university campus.

At the time of writing, emerging data from the Census Bureau indicate that cash aid is effective at reducing hardship and alleviating food insufficiency.³⁷ Taken together, in order to adequately serve this and other underrepresented populations and promote equity, universities can seek out opportunities to meet the needs of their students and provide them with the resources to help them thrive.

In the college student population, food insecurity has been observed to be detrimental to student physical health, mental health, sleep patterns, and academic outcomes including GPA and retention.⁵⁻²⁰ Educational attainment is an oft-cited way to enhance social mobility and escape the cycle of poverty;³⁸ students whose abilities are hampered by limited food access may have fewer opportunities to excel in an academic environment, putting them at a disadvantage compared to students who do not experience the same hardships.^{16,35} The current study agrees with previous research in this area, describing a detrimental effect of low and very low food security on GPA.^{5,7,9,14,16-20} Controlling for demographic factors, low and very low food security negatively impacted GPA by 0.12 grade points, which for some students may be enough to depress overall GPA by a letter grade. This lower achievement may preclude them from participating in extracurricular activities or internship opportunities, thus having a farther reach in impact than the immediate student concerns of earning high grades. On a larger scale, these metrics impact not only the individual student but the institution which they attend. Retention and student GPA may impact universities' standings and perceptions by incoming students. By prioritizing student basic needs and supporting food access resources like CalFresh, universities can be leaders in promoting equitable access to basic needs while supporting and improving their reputation.

Limitations and Future Directions

Limitations of the current study include the cross-sectional nature of the data and self-reporting of CalFresh participation. As these data were collected at one time point, it is impossible to indicate causality of food insecurity and academic performance. Self-reported data may be incomplete or unreliable. State-level differences in SNAP eligibility may have implications for student participation by geography and as such, these findings may not be representative of the reasons for non-participation nationwide. Future research should perform in-depth interviews with students to further elucidate KAPs regarding CalFresh and other food access resources. In addition, students should be followed over time to assess the impacts of food access resources on food insecurity and academic performance.

Conclusions

The results of this study indicate differences in college students between food secure and food insecure groups in several demographic and academic characteristics, including race/ethnicity, low-income status, transfer and first-generation status, and need-based financial aid receipt. Importantly, these findings indicate that knowledge about CalFresh is associated with positive perceptions of the program and a higher likelihood of participation in CalFresh, pointing to a need for university campuses to expand the reach of advertising for the program. Food insecurity was also found to be negatively correlated with GPA, which offers further support for expanding advertising CalFresh and perhaps other food access resources on campus. Greater visibility of these programs and a clear understanding of eligibility may encourage participation in such programs and reduce food insecurity on campus.

References

1. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. Household Food Security in the United States in 2019. Accessed October 9, 2020. <http://www.ers.usda.gov/publications/pub-details/?pubid=99281>
2. Coleman-Jensen A, Rabbitt MP, Gregory CA. Definitions of Food Security. United States Department of Agriculture; 2020. Accessed May 25, 2021. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>
3. Poverty Guidelines. ASPE. Published November 23, 2015. Accessed October 9, 2020. <https://aspe.hhs.gov/poverty-guidelines>
4. Digest of Education Statistics, 2019. Accessed October 9, 2020. https://nces.ed.gov/programs/digest/d19/tables/dt19_105.30.asp
5. A Rising Share of Undergraduates Are From Poor Families. Pew Research Center's Social & Demographic Trends Project. Published May 22, 2019. Accessed August 23, 2021. <https://www.pewresearch.org/social-trends/2019/05/22/a-rising-share-of-undergraduates-are-from-poor-families-especially-at-less-selective-colleges/>
6. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: What are the risk factors? *J Hunger Environ Nutr.* 2018;13(1):1-18. doi:10.1080/19320248.2017.1374901
7. Nazmi A, Martinez S, Byrd A, et al. A systematic review of food insecurity among US students in higher education. *J Hunger Environ Nutr.* 2018;0(0):1-16. doi:10.1080/19320248.2018.1484316
8. Patton-Lopez MM, Lopez-Cavillos DF, Cancel-Tirado DI, Vazquez L. Prevalence and Correlates of Food Insecurity Among Students Attending a Midsize Rural University in Oregon | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2013.10.007

9. Goldrick-Rab S, Richardson J, Hernandez A. Hungry and Homeless in College: Results from a National Study of Basic Needs Insecurity in Higher Education. Published online March 2017.
<https://vtechworks.lib.vt.edu/bitstream/handle/10919/83028/HungryAndHomelessInCollege.pdf?sequence=1>
10. Bianco S, Bedore A, Jiang M, Stamper N. Identifying Food Insecure Students and Constraints for SNAP/CalFresh Participation at California State University, Chico. :8.
11. Maguire J, O'Neill M, Aberson C. California State University Food and Housing Security Survey: Emerging Patterns from the Humboldt State University Data. :12.
12. Martinez SM, Maynard K, Ritchie LD. Student Food Access and Security Study. Univ Calif Off Pres Glob Food Initiat. Published online July 11, 2016:29.
13. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from Food Insecurity to Health Outcomes among California University Students. *Nutrients*. 2019;11(6):1419.
doi:10.3390/nu11061419
14. Owens MR, Brito-Silva F, Kirkland T, et al. Prevalence and Social Determinants of Food Insecurity among College Students during the COVID-19 Pandemic. *Nutrients*. 2020;12(9):2515.
doi:10.3390/nu12092515
15. Raskind IG, Haardorfer R, Berg CJ. Food insecurity, psychosocial health, and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476.
doi:10.1017/S1368980018003439
16. Meza A, Altman E, Martinez SM, Leung CW. "It's a Feeling That One Is Not Worth Food": A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students- *ClinicalKey for Nursing*. Accessed August 6, 2019.

- <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267218306932?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267218306932%3Fshowall%3Dtrue&referrer=https:%2F%2Fwww.ncbi.nlm.nih.gov%2F>
17. Bruening M, Argo K, Payne-Sturges DC, Laska M. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses- ClinicalKey for Nursing. Accessed October 8, 2020. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267217305518?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267217305518%3Fshowall%3Dtrue&referrer=https:%2F%2Fpubmed.ncbi.nlm.nih.gov%2F28754200%2F>
 18. Maroto ME, Snelling A, Linck H. Food Insecurity Among Community College Students: Prevalence and Association With Grade Point Average. *Community Coll J Res Pract.* 2015;39(6):515-526. doi:10.1080/10668926.2013.850758
 19. Morris M, Smith S, Davis J, Null B. The Prevalence of Food Security and Insecurity Among Illinois University Students | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2016.03.013
 20. El Zein A, Shelnutt KP, Colby S, et al. Prevalence and correlates of food insecurity among U.S. college students: a multi-institutional study. *BMC Public Health.* 2019;19(1):660. doi:10.1186/s12889-019-6943-6
 21. Phillips E, McDaniel A, Croft A. Food Insecurity and Academic Disruption Among College Students. *J Stud Aff Res Pract.* 2018;55(4):353-372. doi:10.1080/19496591.2018.1470003
 22. SNAP Data Tables | USDA-FNS. Accessed August 24, 2021. <https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap>
 23. Eligibility and Issuance Requirements. Accessed June 30, 2021. <https://www.cdss.ca.gov/inforesources/cdss-programs/calfresh/eligibility-and-issuance-requirements>

24. Signing Up For Food Stamps: The Choice And The Stigma. NPR.org. Accessed January 10, 2021.
<https://www.npr.org/2013/04/25/179038260/signing-up-for-food-stamps>
25. Loofbourrow B, Jones A, Morgan M, Scherr R. Development of a Comprehensive Questionnaire Evaluating Knowledge, Attitudes, and Practices Regarding University Student Food Access Resource Use. *Curr Dev Nutr.* 2020;4(Supplement_2):229-229. doi:10.1093/cdn/nzaa043_080
26. Beatty PC, Willis GB. Research Synthesis: The Practice of Cognitive Interviewing. *Public Opin Q.* 2007;71(2):287-311. doi:10.1093/poq/nfm006
27. The Tailored Design Method | Social & Economic Sciences Research Center at WSU. Accessed May 19, 2020. <https://sesrc.wsu.edu/about/total-design-method/>
28. USDA ERS - Survey Tools. Accessed May 25, 2020. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/#household>
29. U.S. Census Bureau QuickFacts: California. Accessed July 16, 2021.
<https://www.census.gov/quickfacts/CA>
30. Fall enrollment at a glance. University of California. Published March 24, 2021. Accessed July 26, 2021. <https://www.universityofcalifornia.edu/infocenter/fall-enrollment-glance>
31. Housing Eligibility | UC Davis Student Housing and Dining Services. Accessed July 15, 2021.
<https://housing.ucdavis.edu/eligibility/all-students/>
32. A Short History of SNAP | USDA-FNS. Accessed December 4, 2019.
<https://www.fns.usda.gov/snap/short-history-snap#1964>

33. Reutter LI, Stewart MJ, Veenstra G, Love R, Raphael D, Makwarimba E. "Who Do They Think We Are, Anyway?": Perceptions of and Responses to Poverty Stigma. *Qual Health Res.* 2009;19(3):297-311. doi:10.1177/1049732308330246
34. Chart Book: SNAP Helps Struggling Families Put Food on the Table. Center on Budget and Policy Priorities. Accessed June 30, 2021. <https://www.cbpp.org/research/food-assistance/chart-book-snap-helps-struggling-families-put-food-on-the-table>
35. Watson TD, Malan H, Glik D, Martinez SM. College students identify university support for basic needs and life skills as key ingredient in addressing food insecurity on campus. *Calif Agric.* 2017;71(3):130-138. doi:10.3733/ca.2017a0023
36. Warren E. Text - S.1569 - 117th Congress (2021-2022): Student Food Security Act of 2021. Published May 11, 2021. Accessed July 22, 2021. <https://www.congress.gov/bill/117th-congress/senate-bill/1569/text>
37. Cooney P, Shaefer HL. MATERIAL HARDSHIP AND MENTAL HEALTH FOLLOWING THE COVID-19 RELIEF BILL AND AMERICAN RESCUE PLAN ACT. :12.
38. Project MG Adam Looney, Jeremy Patashnik, and Muxin Yu, and The Hamilton. Thirteen Economic Facts about Social Mobility and the Role of Education. Brookings. Published June 26, 2013. Accessed July 26, 2021. <https://www.brookings.edu/research/thirteen-economic-facts-about-social-mobility-and-the-role-of-education/>

Chapter 3

Relationships Among Food Choice Motivators, Food Insecurity, and Academic Outcomes

Introduction

Food security in the United States (US) is defined as access to nutritionally adequate food to support a healthy and active lifestyle.¹ The prevalence of low and very low food security (combined these are referred to as food insecurity) at some time during 2020 was estimated to be 10.5% of households.¹ Of households experiencing food insecurity in 2020, many demographic groups have been observed to have disproportionately high rates of food insecurity: those with children, headed by a single woman, or single man, non-Hispanic Black, and Hispanic members, and households living below 185% of the federal poverty threshold.^{2,3}

College students are another notable group that experiences food insecurity at disproportionately high rates. Recent research indicates that food insecurity prevalence on college campuses may be up to four times the national average.⁴⁻¹⁰ Similar to nationwide findings, college students in specific groups are more likely to experience food insecurity: Black, Hispanic, and students from low-income households are more likely to experience food insecurity.^{9,11,12} Food insecurity's effects can be seen in many areas, including poorer self-reported health,¹⁰ negative psychosocial impacts,^{13,14} and poor academic outcomes.^{5,13,15-18}

Reasons for increased food insecurity in college students compared to the national population are varied and often compounded, which include the rising cost of higher education and living expenses, decreasing federal and state funding for college, increasing numbers of low-income students attending college, and low participation by eligible students in federally-funded food assistance programs (SNAP, known as CalFresh in California).¹⁹ In addition, college students also experience emergent independence, adjusting to a new living and social environment, living off campus, lack of participation in a school meal plan, limited access to on-campus resources due to work, lack of nutrition knowledge, and limited budgeting experience.¹⁸⁻²²

Although a growing body of literature continues to illustrate how food insecurity affects college students, there is a dearth of knowledge on how student food choices differ between food-secure and food-insecure students, and how these choices may differ among groups of students.²³ Surveyed college students generally prioritize cost, convenience, time, and flavor over nutrition content.^{24,25} In the broader US population, research has found that being from a low-income background is associated with poorer diet quality.²⁶ College students experiencing similar circumstances may similarly opt for convenient, low-cost, energy-dense foods at the expense of nutrient-dense choices.²²

A greater understanding of the motivations behind student food choice behaviors may help to shape effective, consequential policies that better support student health. Many potential drivers of food choice have been hypothesized and identified,^{23,27} including preferences, health, time and budget, however to our knowledge, this is the first study to examine motivators of food choice as it relates to food insecurity in the college student population. The current study aimed to identify the prevalence of food and security at a large research university in California, relationships between student food security level and food choice motivators, and the association between food insecurity and academic performance.

Methods

Sample

This cross-sectional study was conducted between the months of January and February 2020. The university's office of Budget and Institutional Analysis (BIA) provided the research team with the sample of n = 10,000 students (undergraduate and graduate) selected from the total student population enrolled at a large public university in California. This contact list was representative of the university population based on selected factors of: race/ethnicity, academic class level, college, international student status, and California residency. Of this list, n = 5,000 were representative of the university student body. The

remaining n = 5,000 were selected based on the same criteria, and additionally were oversampled for recipients of the federal Pell Grant (provided to students from low-income families earning less than \$50,000 annually) to ensure that students exhibiting financial need and food insecurity were surveyed.

Of the 10,000 students in the contact list, 1,526 students completed the questionnaire for a response rate of 15%. Of these, 100 students were removed for not providing adequate consent to participate. Of the remaining 1,426, 18 students were excluded for providing incomplete food security data, resulting in an analytical sample of 1,408 participants. Test of differences indicated no demographic differences between students with complete versus incomplete data.

Questionnaire and Data Collection

A questionnaire on student food choice motivators, attitudes and knowledge regarding CalFresh, campus food access resource participation, student stressors, and other student lifestyle was developed²⁸ and included eight questions regarding motivators of food choice. Participants stated whether they were motivated by the following: food appearance, taste, nutrition, cost, convenience, dietary restrictions, food familiarity, and meal prepping.

The questions underwent one-on-one cognitive interviewing²⁹ with university students (n=15) to determine whether questions were being interpreted as intended and to improve clarity. Following edits to the questionnaire, a second round of one-on-one cognitive interviews were conducted (n=10). The final draft of questions was reviewed by a panel of experts on nutrition and survey development. The 10-item USDA Adult Food Security Survey Module (AFSSM)³⁰ was added to the questionnaire, which contained 68 items in total and had an estimated completion time of 15 minutes. Although the final questionnaire contained 68 items, participants did not answer all questions due to the implementation of skip logic.

The questionnaire was distributed at the beginning of an academic term (January 2020) using a modified Tailored Design Method.³¹ At the beginning of the second week of the academic term, selected participants received an initial email to provide detailed study information and provide informed consent, and a notification that they would receive a questionnaire via email. A follow-up email was sent one week after notification with a personalized link which included informed consent documentation and the questionnaire, distributed via Qualtrics (Provo, Utah, United States) software. Students provided electronic consent by providing their university student ID number. Participants who did not complete the survey within two weeks received a weekly survey completion reminder. Participants who completed the questionnaire within 3 weeks of receiving the link were given a \$5 gift card incentive.

After completion of the questionnaire, results were returned to BIA to be deidentified and combined with student-specific demographic and academic data, including age, race/ethnicity, transfer student status (students transferred from a 2-year or another 4-year institution), low-income status (students whose university application indicates a household income below 185% of US federal poverty guidelines), international student status, in-state residency status, first generation status (students whose parents did not complete a 4-year degree), cumulative and term grade point average (GPA), college and major, number of units enrolled, and academic class level.

Independent variables

Food Choice Motivators. Participants reported on factors they consider when choosing foods, including such statements as “I choose foods that look the most appealing”, “I choose low-cost foods to save money”, and “I choose foods based on personal dietary restrictions, such as religious beliefs, allergies, or food intolerances”. These factors were scored on a binary yes/no scale.

Dependent variables

Food insecurity. Food security status as measured by 10-item USDA Adult Food Security Survey Module (USDA AFSSM³²) was self-reported by participants over the last 30 days.

GPA. Cumulative GPA based on institutional records.

Covariates

We controlled for the following: race/ethnicity, first-generation and transfer student status, low-income status, international citizenship, out-of-state residency, and academic class level, including freshman (0-44.99 units accumulated), sophomore (45-89.99 units), junior (90-134.99 units) senior (135+ units) students and graduate/professional students.

Data Analysis

Demographic characteristics, academic characteristics, financial factors, and food security status were analyzed using a Chi-square test for independent variables. Exploratory factor analysis was performed to reduce dimensions of food choice motivators. Kendall's tau-b was used to determine whether associations existed between demographic characteristics and food choice motivators. Three binary logistic regressions were performed to determine whether food choice motivators were associated with food insecure status: Model 1a included the food choice motivators as the independent variables; Model 1b included the food choice motivators as independent variables while controlling for demographic characteristics including transfer student status, first-generation student status, race/ethnicity, and academic class level; Model 1c was identical to Model 1b, with graduate/professional students omitted. Three generalized linear models were used to determine how food security status was associated with changes in academic performance (GPA); Model 2a included food insecurity as the independent variable; Model 2b included food insecurity as the independent variable while controlling for demographic characteristics including transfer student status, first-generation student status, race/ethnicity, and academic class level; Model 2c was identical to Model 2b, with graduate/professional

students omitted. Significance for all tests was designated at a p-value <0.05. Exploratory factor analysis was conducted with R (Vienna, Austria). Data analyses were performed using SPSS version 27 (Armonk, New York).

Results

Sample Characteristics

In the sample, 22.9% were East Asian (students who identified as Chinese, Korean, or Japanese), 28.2% were Latino/a (students who identified as Chicano, Latino, Mexican, Mexican-American, or Other Spanish), 25.5% were white (students who identified as white or Caucasian), with other racial ethnic groups having fewer than 10% representation per group (Table 1). Other demographic characteristics included low-income status (34.9%), transfer student status (18.0%), international student status (14.8%), out-of-state student status (13.4%), and academic class level (17.0% freshman, 17.0% sophomore, 23.9% junior, 26.6% senior, 15.5% graduate/professional student). Participants provided information on first-generation student status (49.4%; Table 1). Of the total number of responses, 43% were experiencing food insecurity.

Chi-square test for independence indicated that differences in food security status were observed among groups, with a greater proportion of Latino/a students experiencing food insecurity ($p < 0.001$; Table 1) and students who were identified as East Asian, and white experiencing proportionately less food insecurity ($p < 0.001$). Other demographic factors such as being a first-generation student, being a transfer student, and being from a low-income background were all associated with an increased proportion of experiencing food insecurity ($p < 0.001$). Significant differences in academic class level and food insecurity were also observed; students with senior standing had a higher prevalence of food insecurity ($p < 0.001$). Students who were not US citizens and students who were not California residents had a higher proportion of food insecurity ($p < 0.05$ and $p < 0.01$, respectively).

Table 1. Demographic Characteristics of Sample			
	Total Sample	Food Secure	Food Insecure
	n (%)	n (%)	n (%)
Total Sample (n=1408)	1408 (100)	808 (57)	600 (43)
Ethnicity*** (n=1369)			
American Indian/Alaska Native	11 (0.8)	5 (0.6)	6 (1)
Black/African American	46 (3)	23 (3)	23 (4)
East Asian***	314 (23)	222 (28)	92 (16)
Latino/a ***	386 (28)	159 (20)	227 (39)
Middle Eastern / South Asian	81 (6)	51 (6)	30 (5)
Native Hawaiian / Pacific Islander	9 (1)	4 (1)	5 (1)
Other Asian	43 (3.1)	21 (3)	22 (4)
Southeast Asian	130 (10)	75 (10)	55 (10)
White ***	349 (26)	232 (29)	117 (20)
First-Generation ^a *** (Yes; Ref: No) (n=1189)	562 (47)	277 (39)	335 (64)
Transfer Status*** (Yes; Ref: No) (n=1408)	253 (18)	113 (14)	140 (23)

Low-Income*** (Yes; Ref: No)(n=1408)	491 (35)	234 (29)	257 (43)
Citizen* (No; Ref: Yes)	208 (15)	133 (16)	75 (13)
California Resident** (No; Ref: Yes) (n=1408)	189 (13)	125 (15)	64 (11)
Class Level*** (n=1408)			
Freshman	239 (17)	139 (17)	100 (17)
Sophomore	240 (17)	145 (18)	95 (16)
Junior	337 (24)	201 (25)	136 (23)
Senior***	374 (27)	170 (21)	204 (34)
Graduate or Professional Student	218 (16)	153 (19)	65 (11)
*Significance p<0.05			
** Significance p<0.005			
*** Significance p<0.001			
a. Data is self-reported			

Food Choice Motivators and Demographic Characteristics

Exploratory factor analysis was conducted on the eight food choice motivator questions. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity confirmed that the responses were likely factorizable. The overall KMO measure was 0.61, and Bartlett's test of sphericity was significant ($p<0.001$). Visual inspection of the scree plot indicated that three components were appropriate to retain – these components were labeled *Hedonics* (comprised of food appearance, food taste, and food familiarity),

Nutrition Knowledge (comprised of nutrition value, meal prepping, and dietary restrictions), and *Constraints* (comprised of food cost and convenience).

A Kendall’s tau-b correlation was used to assess associations between demographics and the extracted factors of *Hedonics*, *Constraints*, and *Nutrition Knowledge*. In the correlation between demographics and *Hedonics*, there was a weak positive association with freshman class level, and with students identified as East and Middle Eastern/South Asian (Table 2); there was a weak, negative association with food insecure status, first-generation student status, transfer student status, and junior and senior class levels. In the correlation to determine the relationship between demographics and *Constraints*, there was a weak positive association with food insecure status, low-income status, senior class level, and students identified as Southeast Asian; there was a weak, negative association with international student status, out-of-state student status, graduate/professional student class level, and students identified as white. In the correlation to determine the relationship between demographics and *Nutrition Knowledge*, there was a weak positive association with graduate/professional student class level, and students identified as white; there was a weak, negative association with food insecure status, first-generation student status, low-income status, international student status, freshman class level, and students identified as Southeast Asian.

Table 2. Kendall’s tau-B Correlation and Heatmap of Food Choice Motivators and Demographic Characteristics			
tau-b coefficient			
Food Choice Motivator	Hedonics	Constraints	Nutrition Knowledge
Food Insecure Status (n=487)	-.182***	.101***	-.079***

First-Generation Student (n=588)	-.084***	0.043	-.139***
Transfer Student (n=212)	-.058**	-0.024	-0.024
Low-Income (n=421)	-0.024	.103***	-.113***
International Student (n=153)	-0.013	-.117***	-.089***
Out-of-State Residency (n=144)	-0.021	-.098***	-0.009
Freshman (n=198)	.126***	-0.031	-.067**
Sophomore (n=193)	0.023	0.032	0.011
Junior (n=288)	-.048*	-0.027	-0.03
Senior (n=322)	-.053*	.076***	0.006
Graduate or Professional Student (n=185)	-0.034	-.060**	.086***
American Indian/Alaska Native (n=10)	-.059**	-0.035	-0.016
Black/African American (n=38)	-0.006	0.001	0.007
East Asian (n=272)	.102***	-0.014	-0.011
Latino/a (n=327)	-.070**	0.04	-0.022
Middle Eastern / South Asian (n=71)	.066**	-0.004	-0.014
Native Hawaiian / Pacific Islander (n=6)	0.034	0.025	0.006
Other Asian (n=39)	-0.017	0.014	-0.03

Southeast Asian (n=109)	0.002	.084***	-.062**
White (n=314)	-0.028	-.069**	.093***
<p>*Significance p<0.05</p> <p>** Significance p<0.005</p> <p>*** Significance p<0.001</p> <p>Red color indicates a positive correlation; blue color indicates a negative correlation; color saturation indicates strength of correlation</p>			

Food Insecurity and Food Choice Motivators

Three binomial logistic regression models were examined to assess food choice motivator’s association with food insecure status. Model 1a included the food choice motivators as the independent variables; Model 1b included the following student demographic characteristics: race/ethnicity, transfer status, first-generation status, low-income status, citizenship, California residency, and class level; Model 1c included the same covariates, however it omitted graduate/professional students. In all 3 models, *Hedonics* and *Constraints* were positively and negatively associated with food insecurity, respectively (Table 3). Nutrition Knowledge was not significantly associated with food insecurity.

Parameter	Model 1a			Model 1b			Model 1c		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Hedonics	0.582	0.514-	<0.001	0.593	0.513-	<0.001	0.581	0.498-	<0.001
		0.660			0.685			0.679	

Constraints	1.481	1.313-	<0.001	1.460	1.269-	<0.001	1.570	1.348-	<0.001
		1.670			1.681			1.829	
Nutrition	0.902	0.802-	0.081	0.973	0.850-	0.689	0.967	0.837-	0.701
Knowledge		1.013			1.113			1.118	
Ethnicity									
American Indian/Alaska Native				1.261	.328-	.736	.1451	.246-	.681
					4.851			8.542	
Black/African American				1.448	.690-	.328	2.234	.963-	.061
					3.037			5.182	
East Asian				.798	.534-	.270	.910	.587-	.675
					1.192			1.411	
Latino/a				1.879	1.292-	<.001	2.323	1.535-	<.001
					2.733			3.515	
Middle Eastern / South Asian				1.288	.714-	.401	1.596	.838-	.155
					2.326			3.040	
Native Hawaiian / Pacific Islander				1.900	.343-	.462	2.601	.406-	.313
					10.508			16.672	
Other Asian				1.680	.804-	.168	2.134	.951-	.066
					3.513			4.791	

Southeast Asian	1.071	.650-	.788	1.245	.732-	.418
		1.764			2.118	
White/Caucasian	Ref	-	-	-	-	-
First-Generation: Yes (Ref: No)	2.021	1.502-	<.001	1.841	1.332-	<.001
		2.718			2.544	
Transfer Status: Yes (Ref: No)	1.570	1.091-	.015	1.706	1.164-	.006
		2.259			2.501	
Low-Income: Yes (Ref: No)	1.085	.798-	.603	1.905	.798-	.574
		1.476			1.503	
Citizen: No (Ref: Yes)	.920	.543-	.757	.890	.486-	.706
		1.560			1.629	
California Resident: No (Ref: Yes)	1.179	.676-	.561	1.186	.591-	.631
		2.055			2.381	
Class Level						
Freshman	1.656	1.003-	.049	1.277	.808-	.295
		2.733			2.0019	
Sophomore	1.322	.811-	.263	Ref	-	-
		2.155				
Junior	1.172	.736-	.503	.890	.579-	.595
		1.866			1.368	

Senior	2.094	1.323-	.002	1.579	1.038-	.033
		3.314			2.404	
Graduate or Professional Student	Ref	-	-		-	
Model 1a: Food Choice Motivators only						
Model 1b: All class levels included (Freshman, Sophomore, Junior, Senior, Graduate/Professional Student)						
Model 1c: Graduate/Professional students omitted						

GPA

Three multiple linear regression models were built to assess food insecurity’s impact on GPA, using the same covariate structure used to assess food choice motivators’ effect on food insecurity. Model 2a included the food insecurity as the sole independent variable, and in this model food insecurity was observed to negatively impact GPA (B=-0.261, p<0.001; Table 4). Model 2b (including all student demographic characteristics of interest) food insecure status was observed to negatively impact GPA (B=-0.124, p<0.001). Model 2c (omitting graduate/professional students) indicated a negative impact of food insecure status with GPA (B=-0.133, p<0.001).

Table 4. Multiple Linear Regression of Food Insecurity’s Association with GPA									
	Model 2a			Model 2b			Model 2c		
Parameter	B	Std.	p-value	B	Std.	p-value	B	Std.	p-value
	Error			Error			Error		
Food Insecurity	-0.261	0.0301	<0.001	-0.124	00.307	<0.001	-0.133	0.0348	<0.001

Ethnicity						
American Indian/Alaska Native	.197	.1585	.213	.338	.2152	.116
Black/African American	-.211	.0859	.014	-.239	.1005	.017
East Asian	-.034	.0434	.430	-.031	.0497	.528
Latino/a	-.142	.0432	.001	-.150	.0498	.003
Middle Eastern / South Asian	-.098	.0652	.131	-.092	.0756	.222
Native Hawaiian / Pacific Islander	-.086	.2024	.673	-.109	.2359	.643
Other Asian	-.263	.0842	.002	-.299	.0960	.002
Southeast Asian	-.016	.0571	.778	-.025	.0633	.696
White/Caucasian	Ref	-	-	-	-	-
First-Generation [†] : Yes (Ref: No)	-.164	.0339	<0.001	-.186	.0388	<0.001
Transfer Status: Yes (Ref: No)	-.123	.0417	.003	-.123	.0456	.007
Low-Income: Yes (Ref: No)	-.075	.0347	.030	-.063	.0374	.091
Citizen: No (Ref: Yes)	.012	.0577	.831	-.028	.0702	.689
California Resident: No (Ref: Yes)	0.009	.0606	.885	-.001	.0804	.986
Class Level						
Freshman	-.528	.0550	<0.001	-.053	.0522	.312
Sophomore	-.427	.0543	<0.001	Ref	-	-
Junior	-.491	.0520	<0.001	-.017	.0496	.733
Senior	-.499	.0525	<0.001	-.022	.0493	.652
Graduate or Professional Student	Ref	-	-	-	-	-

† Data are self-reported.

Model 2a: Food Insecurity only

Model 2b: All class levels included (Freshman, Sophomore, Junior, Senior, Graduate/Professional Student)

Model 2c: Graduate/Professional students omitted

Discussion

The results of this study build on and expand previous works done to assess food insecurity in college students.^{4,15} In this study as in others, students who are experiencing food insecurity compared to their food secure peers, certain demographic groups appear to experience food insecurity in greater proportions than other students, including low-income students, first-generation, transfer students, and students from certain racial/ethnic backgrounds. This study is the first of the authors' knowledge to examine correlations between the types of drivers of student food choice and demographic groups and found when considering food insecurity, and interesting patterns emerged in food choice motivation.

Many food choice motivators have been proposed in previous studies in different populations.^{23,27} Although not all of the previously proposed motivators were included here, the selected food choice motivators for this population were significantly correlated with food insecure status. The *Constraints* motivator was positively associated with food insecure status, but by comparison, the *Hedonics* and *Nutrition Knowledge* motivators were negatively associated with food insecurity. These results point to a compelling pattern of food choice: students experiencing food insecurity will report that constraints like cost and convenience will drive their choice, and by equal measure they report that the way foods look and taste, and the nutritional value of foods are not motivating their choices. Ultimately, this may mean that students experiencing food insecurity may not be prioritizing foods that they may find desirable or even healthful, but those that are less burdensome on their time and finances. These

observed links between food choice motivation and food insecurity may be part of the observed trend in overweight and obesity being more prevalent in food insecure populations, college students included.^{10,12,33-35}

A growing body of literature has indicated that food insecurity may affect college students in particular ways, beyond differences in BMI. Food insecurity in this group is associated with decreased diet quality, less sleep, poorer mental health, and decreased academic performance.^{10,11,14,36,7} The observations in correlations between the selected motivators and food insecurity in this study serve to further support previous research in this area. The experiences and stresses of food insecurity and its demographic correlates (namely low-income status) go hand in hand with food insecurity's positive association with the *Constraints* motivators, and the negative association with both *Hedonics* and *Nutrition Knowledge*. Previous literature has indicated that students frequently choose low-cost, convenient foods compared to healthful items, and this study supports that food insecurity may play its own role.²⁵ Students who are experiencing food insecurity are likely to be low-income,¹¹ and given the financial burdens associated with academics and cost of living, it stands to reason that these students may have more pressing day-to-day financial concerns than procuring nutritious foods. With the average cost of University of California attendance being \$34k-\$36k (\$64k-\$66k for nonresidents),³⁸ and a recent report from the UC Berkeley campus indicating that housing insecurity is managed preferentially before food insecurity, it is no wonder that maintaining a healthful eating pattern is not a priority.^{25,39}

Nationwide, many food access support systems exist with the aim of improving food secure status. Primary among these is the Supplemental Nutrition Assistance Program, or SNAP, which serves an estimated 38 million individuals nationwide, with nearly 3.8 million individuals in the state of California alone.⁴⁰ Alongside being an important program for elevating food security, SNAP has also been observed to help lift individuals and families out of poverty – these benefits provide funds for food, and in so doing help individuals to offset costs and reallocate funds towards other expenses.⁴¹ In a college population,

these types of distributed funds may be particularly beneficial, as improved food secure status is associated with improved health outcomes as well as improved academic outcomes.^{10,36}

While it appears college students in particular could greatly benefit from the use of SNAP, or CalFresh as it is known in California, there are a number of barriers associated with CalFresh participation. To participate in CalFresh, individuals must meet certain eligibility requirements, including citizenship and minimum work requirements.⁴² Given the time and energy constraints of college workload, possible international citizenship, and lack of awareness about CalFresh and/or its eligibility requirements, it is no wonder that many students do not participate in CalFresh.⁹ Taken together, the benefits of CalFresh and links between food security and health and academic outcomes in college students point to an increased need for university administration to provide additional support and access to resources for students who may be experiencing food insecurity.

In an effort to promote access to these types of resources, the University of California's president founded an initiative aimed at reducing housing and food insecurity. Founded in 2014, the Global Food Initiative (GFI) is one way in which University of California is working to support students with housing and food security.⁴³ Although the GFI has contributed meaningful research and projects aimed at supporting students, it is clear that these efforts need further support to reduce food insecurity on its campuses from its observed 42%.⁹

Alongside food choice motivators and other characteristics associated with food insecurity, college students may face other barriers to healthy eating.²⁵⁴⁴ Often, these individuals are just leaving home for the first time and may lack the practiced skills of financial management, nutrition knowledge, and cooking skills.⁴⁵⁴⁶ This lack of knowledge may also contribute to food choices, and may in turn contribute to decreased diet quality.²³ To address lack of knowledge in budgeting, shopping for, and preparing food, future work needs to be done in supporting basic life skill knowledge in college students.

Further, future studies should examine how these and other motivators manifest in foods chosen and examine diet quality in college students, how it may change over time, and its correlates to student health, and academic performance.

Until such a time as college student food choice motivators, life skills, and nutrition knowledge are well understood, administrators in the higher education should remain vigilant in supporting there are student body's food security. With the associations between food security and improvements in GPA and retention,³⁶ support of student food security is critical at both the student and institutional level.

References

1. Coleman-Jensen A. Household Food Security in the United States in 2020. Published online 2020:55.
2. Poverty Guidelines. ASPE. Published November 23, 2015. Accessed October 9, 2020. <https://aspe.hhs.gov/poverty-guidelines>
3. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. Household Food Security in the United States in 2019. Accessed October 9, 2020. <http://www.ers.usda.gov/publications/pub-details/?pubid=99281>
4. Nazmi A, Martinez S, Byrd A, et al. A systematic review of food insecurity among US students in higher education. *J Hunger Environ Nutr.* 2018;0(0):1-16. doi:10.1080/19320248.2018.1484316
5. Patton-Lopez MM, Lopez-Cavallos DF, Cancel-Tirado DI, Vazquez L. Prevalence and Correlates of Food Insecurity Among Students Attending a Midsize Rural University in Oregon | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2013.10.007

6. Goldrick-Rab S, Richardson J, Hernandez A. Hungry and Homeless in College: Results from a National Study of Basic Needs Insecurity in Higher Education. Published online March 2017.
<https://vtechworks.lib.vt.edu/bitstream/handle/10919/83028/HungryAndHomelessInCollege.pdf?sequence=1>
7. Bianco S, Bedore A, Jiang M, Stamper N. Identifying Food Insecure Students and Constraints for SNAP/CalFresh Participation at California State University, Chico. :8.
8. Maguire J, O'Neill M, Aberson C. California State University Food and Housing Security Survey: Emerging Patterns from the Humboldt State University Data. :12.
9. Martinez SM, Maynard K, Ritchie LD. Student Food Access and Security Study. Univ Calif Off Pres Glob Food Initiat. Published online July 11, 2016:29.
10. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from Food Insecurity to Health Outcomes among California University Students. *Nutrients*. 2019;11(6):1419.
doi:10.3390/nu11061419
11. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: What are the risk factors? *J Hunger Environ Nutr*. 2018;13(1):1-18.
doi:10.1080/19320248.2017.1374901
12. Owens MR, Brito-Silva F, Kirkland T, et al. Prevalence and Social Determinants of Food Insecurity among College Students during the COVID-19 Pandemic. *Nutrients*. 2020;12(9):2515.
doi:10.3390/nu12092515
13. Raskind IG, Haardorfer R, Berg CJ. Food insecurity, psychosocial health, and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476.
doi:10.1017/S1368980018003439

14. Meza A, Altman E, Martinez SM, Leung CW. "It's a Feeling That One Is Not Worth Food": A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students- ClinicalKey for Nursing. Accessed August 6, 2019.
<https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267218306932?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267218306932%3Fshowall%3Dtrue&referrer=https:%2F%2Fwww.ncbi.nlm.nih.gov%2F>
15. Bruening M, Argo K, Payne-Sturges DC, Laska M. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses- ClinicalKey for Nursing. Accessed October 8, 2020. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267217305518?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267217305518%3Fshowall%3Dtrue&referrer=https:%2F%2Fpubmed.ncbi.nlm.nih.gov%2F28754200%2F>
16. Maroto ME, Snelling A, Linck H. Food Insecurity Among Community College Students: Prevalence and Association With Grade Point Average. *Community Coll J Res Pract.* 2015;39(6):515-526.
doi:10.1080/10668926.2013.850758
17. Morris M, Smith S, Davis J, Null B. The Prevalence of Food Security and Insecurity Among Illinois University Students | Elsevier Enhanced Reader. doi:10.1016/j.jneb.2016.03.013
18. El Zein A, Shelnutt KP, Colby S, et al. Prevalence and correlates of food insecurity among U.S. college students: a multi-institutional study. *BMC Public Health.* 2019;19(1):660. doi:10.1186/s12889-019-6943-6
19. Freudenberg N, Goldrick-Rab S, Poppendieck J. College Students and SNAP: The New Face of Food Insecurity in the United States. *Am J Public Health.* 2019;109(12):1652-1658.
doi:10.2105/AJPH.2019.305332

20. van Woerden I, Hruschka D, Vega-López S, Schaefer DR, Adams M, Bruening M. Food Insecure College Students and Objective Measurements of Their Unused Meal Plans. *Nutrients*. 2019;11(4). doi:10.3390/nu11040904
21. Funding Down, Tuition Up. Center on Budget and Policy Priorities. Accessed April 1, 2021. <https://www.cbpp.org/research/state-budget-and-tax/funding-down-tuition-up>
22. El Zein A, Colby SE, Zhou W, et al. Food Insecurity Is Associated with Increased Risk of Obesity in US College Students. *Curr Dev Nutr*. 2020;4(nzaa120). doi:10.1093/cdn/nzaa120
23. Vilaro MJ, Zhou W, Colby SE, et al. Development and Preliminary Testing of the Food Choice Priorities Survey (FCPS): Assessing the Importance of Multiple Factors on College Students' Food Choices. *Eval Health Prof*. 2017;40(4):425-449. doi:10.1177/0163278717735872
24. Jana Regina Kicklighter PhD R, Valarie Jean Koonce MFA M, Christine Ann Rosenbloom PhD R, PhD NEC. College Freshmen Perceptions of Effective and Ineffective Aspects of Nutrition Education. *J Am Coll Health*. 2010;59(2):98-104. doi:10.1080/07448481.2010.483709
25. Sogari G, Velez-Argumedo C, Gómez MI, Mora C. College Students and Eating Habits: A Study Using An Ecological Model for Healthy Behavior. *Nutrients*. 2018;10(12). doi:10.3390/nu10121823
26. French SA, Tangney CC, Crane MM, Wang Y, Appelhans BM. Nutrition quality of food purchases varies by household income: the SHoPPER study. *BMC Public Health*. 2019;19(1):231. doi:10.1186/s12889-019-6546-2
27. Walker RE, Kawachi I. Use of Concept Mapping to Explore the Influence of Food Security on Food Buying Practices. *J Acad Nutr Diet*. 2012;112(5):711-717. doi:10.1016/j.jand.2011.12.020

28. Loofbourrow B, Jones A, Morgan M, Scherr R. Development of a Comprehensive Questionnaire Evaluating Knowledge, Attitudes, and Practices Regarding University Student Food Access Resource Use. *Curr Dev Nutr*. 2020;4(Supplement_2):229-229. doi:10.1093/cdn/nzaa043_080
29. Beatty PC, Willis GB. Research Synthesis: The Practice of Cognitive Interviewing. *Public Opin Q*. 2007;71(2):287-311. doi:10.1093/poq/nfm006
30. USDA ERS - Definitions of Food Security. Accessed May 22, 2020. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>
31. The Tailored Design Method | Social & Economic Sciences Research Center at WSU. Accessed May 19, 2020. <https://sesrc.wsu.edu/about/total-design-method/>
32. USDA ERS - Survey Tools. Accessed May 25, 2020. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/#household>
33. Dietz WH. Does Hunger Cause Obesity? *Pediatrics*. 1995;95(5):766-767.
34. Townsend MS, Peerson J, Love B, Achterberg C, Murphy SP. Food Insecurity Is Positively Related to Overweight in Women. *J Nutr*. 2001;131(6):1738-1745. doi:10.1093/jn/131.6.1738
35. Leung CW, Williams DR, Villamor E. Very low food security predicts obesity predominantly in California Hispanic men and women. *Public Health Nutr*. 2012;15(12):2228-2236. doi:10.1017/S1368980012000857
36. Phillips E, McDaniel A, Croft A. Food Insecurity and Academic Disruption Among College Students. *J Stud Aff Res Pract*. 2018;55(4):353-372. doi:10.1080/19496591.2018.1470003

37. Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student Hunger on Campus: Food Insecurity Among College Students and Implications for Academic Institutions. *Am J Health Promot.* 2018;32(2):349-354. doi:10.1177/0890117117719620
38. Tuition & cost of attendance | UC Admissions. Accessed June 30, 2021. <https://admission.universityofcalifornia.edu/tuition-financial-aid/tuition-cost-of-attendance/>
39. Martinez SM, Esaryk EE, Moffat L, Ritchie L. Redefining Basic Needs for Higher Education: It's More Than Minimal Food and Housing According to California University Students. *Am J Health Promot AJHP.* 2021;35(6):818-834. doi:10.1177/0890117121992295
40. A Closer Look at Who Benefits from SNAP: State-by-State Fact Sheets. Center on Budget and Policy Priorities. Accessed June 28, 2021. <https://www.cbpp.org/research/food-assistance/a-closer-look-at-who-benefits-from-snap-state-by-state-fact-sheets>
41. Chart Book: SNAP Helps Struggling Families Put Food on the Table. Center on Budget and Policy Priorities. Accessed June 30, 2021. <https://www.cbpp.org/research/food-assistance/chart-book-snap-helps-struggling-families-put-food-on-the-table>
42. Eligibility and Issuance Requirements. Accessed June 30, 2021. <https://www.cdss.ca.gov/inforesources/cdss-programs/calfresh/eligibility-and-issuance-requirements>
43. UC Global Food Initiative: Food and Housing Security at the University of California. :66.
44. Pang NF. Assessing Perceptions That Serve as Barriers to Healthy Eating in Underrepresented and Represented Students at the University of California, Davis. Published online December 2019.
45. Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *Am Psychol.* 2000;55(5):469-480. doi:10.1037/0003-066X.55.5.469

46. Cuy Castellanos D, Holcomb J. Food insecurity, financial priority, and nutrition literacy of university students at a mid-size private university. *J Am Coll Health J ACH*. 2020;68(1):16-20.
doi:10.1080/07448481.2018.1515762

Chapter 4

Understanding the Role of CalFresh Participation and Food Insecurity on Academic Outcomes Among College Students During the COVID-19 Pandemic

Introduction

Food insecurity, the lack of access to nutritionally adequate food which supports a healthy and active lifestyle,¹ is a growing concern in the college student population.²⁻⁹ Although no group in the United States is immune to food insecurity, college students have been observed to experience food insecurity at a prevalence that can greatly exceed food insecurity in adults nationally, with estimates of four times or more of the 10.5% national prevalence.^{2,10} Food insecurity has been associated with a suite of other experiences and conditions, including poor physical health and increased stress; feelings of stigma,¹¹ strained personal relationships,¹¹ and a higher prevalence of anxiety and depression.^{7,12,13} Of particular concern in this group is the effect that food insecurity may have on academic outcomes. Compared to their food secure peers, students experiencing food insecurity have been reported to be more likely to neglect their academics to pursue wage-earning work, drop out of school, and have a lower GPA.¹⁴⁻¹⁶ Following the through line of dampened academic performance, it has been observed that students who achieve at lower levels may go on to experience an altered career trajectory, as employers and universities often screen job or graduate school applicants by college GPA.¹⁷⁻¹⁹

Although many factors may contribute to each students' academic success, current observations of college campuses point to an increased focus on improving basic needs access as a way to support student success.^{20,21} At the University of California (UC), the definition of "basic needs" includes "equitable access to nutritious and sufficient food; safe, secure, and adequate housing [...]; healthcare [...]; affordable transportation; resources for personal hygiene care; and emergency needs for students with dependents."²² To improve basic needs access at the UC, all ten campuses have basic needs centers in place which support students experiencing basic needs insecurity.²³ Each UC campus hosts food pantries to provide students with dry goods and fresh produce and nutrition education opportunities.²³ To further supplement these campus efforts, UC Davis works closely with the local county and California State University to provide students with support in determining eligibility and applying for the

Supplemental Nutrition Assistance Program (SNAP, referred to as CalFresh in California).²⁴ Access to this resource in a school setting is particularly beneficial, as these benefits function year-round, while campus pantries may not be available while campuses are closed.

Nationwide, SNAP has been observed to help alleviate food insecurity and financial insecurity.²⁵ On college campuses, the benefits of SNAP are not well-understood due to a lack of research in this area.²⁶ Given the observed advantages of SNAP benefits in the general population, it is of interest to understand if college students benefit in the same way in regards to improved food security. Further, participation in SNAP may confer additional benefits specific to this population; students with greater food security have been observed to have improved GPA compared to students experiencing food insecurity,^{7,14,16} and so participation in SNAP may be associated with improvements in GPA.

Due to the structure of financial aid disbursements (one disbursement at the beginning of a quarter)²⁷ it was hypothesized that over the span of a 10-week academic quarter, student food security would decrease as financial aid monies were used, as observed in a 16-week semester setting.²⁸ With the current sample, food security change patterns were inconsistent – students experienced irregular changes in food security, leading the research team to perform new probes on the data. The subhypothesis of the study was that CalFresh participation would positively moderate the effect of food insecurity on GPA.

Methods

Study Context

The current study started at the beginning of Spring quarter 2020 (start date March 26, 2020), closely following the World Health Organization's declaration of the COVID-19 pandemic on March 11, 2020.²⁹ Given the unprecedented circumstances of the COVID-19 pandemic and that national increases in food insecurity,³⁰ the initial focus of changes in food security status over time was shifted to examine how

CalFresh participation may interact with student food security and affect academic performance, as access to these resources changed with campus closures and on-campus resource operations changing.

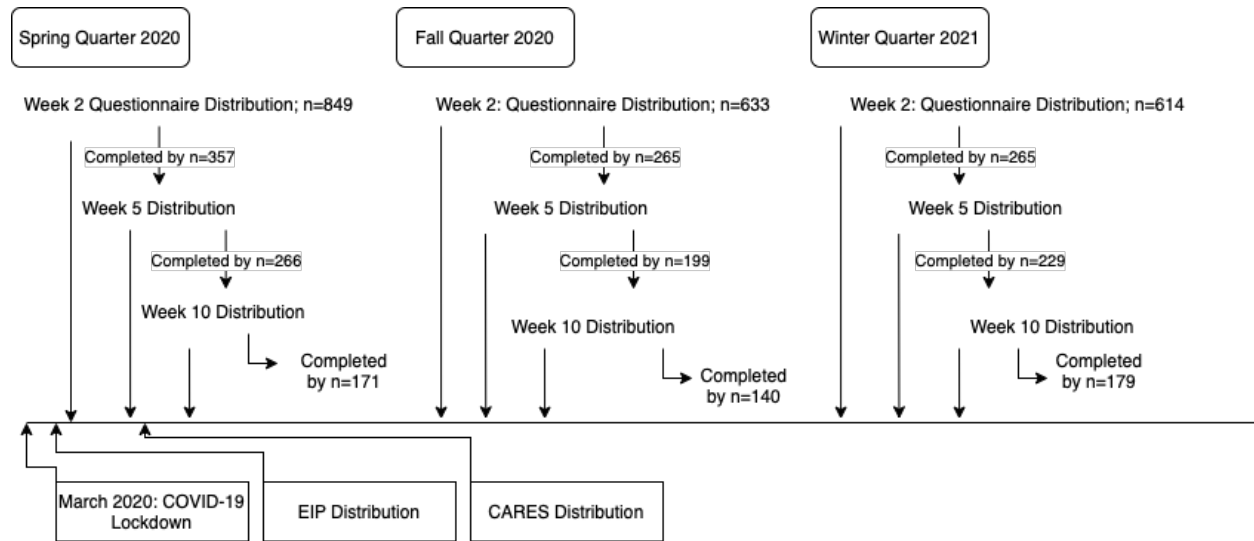


Figure 1. Study Timeline

Sample

The current study was a longitudinal subanalysis conducted between the months of April 2020 and March 2021. The university’s office of Budget and Institutional Analysis provided the research team with the initial n=10,000 student sample during the previous academic quarter (January-March 2020) for the initial cross-sectional study, which was representative of the university population based on race/ethnicity, academic class level (including undergraduate and graduate students), college, international student status, and California residency. Out of this population, n = 5,000 were representative of the university student body and the remaining n = 5,000 were selected based on the same criteria, and additionally were oversampled for recipients of the federal Pell Grant (provided to students from low-income families earning less than \$50,000 annually) to ensure that students exhibiting financial need and likely associated food insecurity were surveyed. Of the initial 10,000 students contacted, 1,408 students completed the questionnaire during the previous quarter (Winter quarter, 2020). Of these, 935 students opted to be contacted for future studies; of these, 849 had not graduated or

otherwise left the university and were included in the contact list for Spring quarter 2020. Students who had graduated or left the university were removed from the contact list for the subsequent study periods, resulting in a contact list of 633 during Fall quarter 2020 and 615 during Winter quarter 2021.

Study questionnaire and data collection

Questions relating to CalFresh participation and other student lifestyle questions were developed and edited with the help of a panel of content and survey design experts.²⁷ Two rounds of cognitive interviews³¹ were conducted with university students (n=15; n=10) to determine whether questions were being answered as intended and to improve clarity. The final draft of questions was reviewed again by the same panel of experts. The questionnaire contained 68 items in total, including the 10-item USDA Adult Food Security Survey Module (USDA AFSSM)³² and questions about CalFresh eligibility and participation.

The study questionnaire was administered at three time points during the Spring 2020, Fall 2020, and Winter 2021 academic quarters (nine time points in total) using a modified Tailored Design Method.³³ At the beginning of the second week of each academic quarter, potential participants received an initial email invitation to participate, which provided detailed study information, informed consent letter, and a personalized questionnaire link. Participants received the same email containing informed consent documentation and the questionnaire at two additional time points, including the fifth week and tenth week of each academic quarter. The questionnaire was distributed via Qualtrics (Provo, Utah, United States) software. In each questionnaire, students electronically consented by providing university-issued student ID number. Participants who completed all three questionnaires by the end of each academic quarter were given a \$10 gift card incentive at the end of the academic term.

After data collection via Qualtrics was complete, data were returned to the office of Budget and Institutional Analysis to be deidentified and combined with student-specific demographic and academic data, including age, sex, race/ethnicity, transfer student status (students transferred from a 2-year or another 4-year

institution), low-income status (students whose university application indicates a household income below 185% of US federal poverty guidelines), international student status, first-generation status (students whose parents did not complete a 4-year degree), cumulative and quarter grade point average (GPA), college and major, and academic class level.

Data Analysis

Descriptive statistics were used to examine demographic and student characteristics. Chi-square analysis of independence was used to determine if there were differences in food security status among demographic groups. A Friedman test was run to determine if there were differences in mean academic term food security score over the span of three quarters. A moderation analysis using the PROCESS macro was used to assess whether participation in campus food assistance programs or CalFresh moderated the effect of food insecurity on Spring quarter and Fall quarter GPA; food assistance program participation was not measured during Winter quarter 2021. Quarter GPA was transformed by inversion to achieve normal distribution, as determined by visual analysis of Q-Q plot. All statistical analyses were performed using IBM SPSS version 27 (Armonk, New York, United States).

Variables

Independent variables included CalFresh participation and Food Security. Participants indicated whether they were currently participating in CalFresh (“yes”/“no”/“not sure”). Participants who indicated “not sure” were coded as “no.” Food security status as measured by 10-item USDA AFSSM was self-reported by participants in the last 30 days; Food security status was defined as follows: high food security (raw score zero), marginal food security (raw score 1-2), low food security (raw score 3-5), very low food security (raw score 6-10). Low food security and very low food security were collectively referred to as “food insecure”. Quarter GPA based on institutional records was the dependent variable of the study. The following covariates were included: race/ethnicity, age, first-generation student status, transfer student status, low-income status, international

citizenship, out-of-state residency, and academic class level (including freshman (0-44.99 units accumulated), sophomore (45-89.99 units), junior (90-134.99 units) senior (135+ units) students and graduate/professional students).

Results

Sample

During the Spring quarter questionnaire distribution, n=171 participants completed all three questionnaires (response rate = 20%). During the Fall quarter distribution, n=140 participants completed all three questionnaires (response rate = 22%). During the Winter quarter distribution, n=179 participants completed all three questionnaires (response rate = 29%)(Figure 1).

The longitudinal sample included 58 participants that completed the questionnaires at each of the nine time points (three questionnaire distributions per academic quarter). In this longitudinal sample, 69% of participants were identified as female, 29% as East Asian, 28% as white/Caucasian, 16% as Latino(a)/Chicano(a)/Hispanic, 10% as Middle Eastern/South Asian, with other ethnicities comprising the remaining 17% of participants (Table 1). Nearly half of participants identified themselves as first-generation students (46%). Institutional records identified 12% of participants as transfer students, 45% as low-income students, 3% as international and out-of-state residents, and 85% as undergraduate students during the Fall 2019 student census. During the Spring 2020 quarter, there were significant differences in the number of out-of-state students, freshmen, and senior students compared to the longitudinal sample; no differences between the Fall 2020 and longitudinal sample were observed; differences in students identified as Native Hawaiian/Pacific Islander and low-income were observed in the Winter 2021 quarter compared to the longitudinal sample.

Table 1. Food Security, CalFresh Participation, and Demographic Characteristics of Quarter Samples and Longitudinal Sample
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	Spring 2020	Fall 2020	Winter 2021	Longitudinal
	n (%)	n (%)	n (%)	Sample
	n (%)	n (%)	n (%)	n (%)
Total Sample	171	140	179	58
Food Insecure ^{§†}	41 (24)	26 (18.6)	33 (18.4)	-
CalFresh Participation ^{§†}	41 (24.0)	28 (20.0)	-	-
Median Quarter GPA	3.88	3.76	3.9	-
Demographic Characteristics				
Median Age	21.0	21.0	21.0	-
Female	125 (73.1)	105 (75.0)	129 (72.1)	40 (69.0)
Race/Ethnicity				
American Indian/Alaska Native	3 (1.8)	2 (1.4)	3 (1.7)	2 (3.4)
Black/African American	3 (1.8)	2 (1.4)	4 (2.2)	1 (1.7)
East Asian	43 (25.1)	42 (30.0)	48 (26.8)	17 (29.3)
Latino(a)/Chicano(a)/Hispanic	37 (21.6)	32 (22.9)	34 (19.0)	9 (15.5)
Middle Eastern / South Asian	10 (5.8)	9 (6.4)	11 (6.1)	6 (10.3)
Native Hawaiian / Pacific Islander	3 (1.8)	2 (1.4)	2 (1.1)*	2 (3.4)
Other Asian	5 (2.9)	3 (2.1)	5 (2.8)	1 (1.7)
Southeast Asian	8 (4.7) ^{ab}	11 (7.9) ^a	19 (10.6) ^{ab}	3 (5.2)
White/Caucasian	57 (33.3) ^b	34 (24.3) ^a	49 (27.4) ^a	16 (27.6)
First-Generation Student [§]	86 (50.3)	67 (47.9)	75 (41.9)	27 (45.8)
Transfer Student	27 (15.8)	17 (12.1)	20 (11.2)	7 (12.1)
Low-Income	65 (38.0)	53 (37.9)	62 (34.6)*	26 (44.8)

International	11 (6.4)	9 (6.4)	9 (5.0)	2 (3.4)
Out-of-State Resident	16 (9.4)*	10 (7.1)	14 (7.8)	2 (3.4)
Class Level (Fall 2019)				
Undergraduate Student	135 (80.1) ^a	120 (87.1) ^b	140 (79.3) ^a	49 (84.5)
Freshman	22 (12.9)*	24 (17.1)	34 (19.0)	13 (22.4)
Sophomore	27 (15.8)	26 (18.6)	35 (19.6)	9 (15.5)
Junior	51 (29.8) ^a	54 (38.6) ^b	54 (30.2) ^a	20 (34.5)
Senior	37 (21.6) ^{*b}	16 (11.4) ^a	17 (9.5) ^a	7 (12.1)
Graduate or Professional Student	33 (19.3) ^a	18 (12.9) ^b	37 (20.7) ^a	9 (15.5)
Values with different alphabetical superscripts denote significance of $P < 0.05$.				
[§] Self-reported				
[†] Measurement from first time point of each quarter				
*Different from Longitudinal Sample				

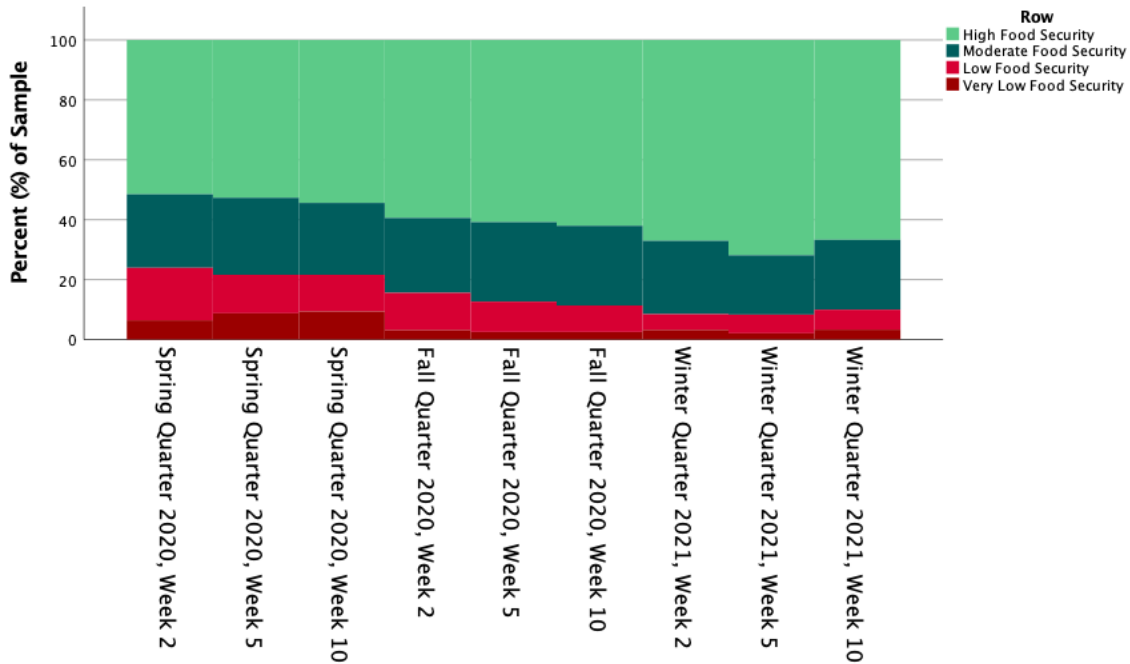


Figure 2. Food Security Status at Each Measurement Timepoint

Changes in Food Security

With respect to the primary hypothesis of investigating changes in food security over the span of an academic quarter, findings were inconsistent (Figure 2). In the longitudinal sample (n=58), after overall Friedman test significance ($\chi^2(2) = 17.008$; $p < 0.001$), pairwise comparisons were performed with a Bonferroni correction for multiple comparisons (Table 2). Differences were observed between average food security scores in Winter 2021 (median = 1.69) and Fall 2020 (median = 2.14; $p = 0.013$; adj. $p = .039$) and Winter 2021 and Spring 2020 (median = 2.17) ($p = 0.009$; adj. $p = .026$). There was no significant difference observed between Spring 2020 and Fall 2020 average food security scores.

Post-hoc Friedman analyses indicated differences in raw quarter food security scores. The overall test significance ($\chi^2(2) = 22.607$; $p = 0.004$), and pairwise comparisons were performed with a Bonferroni correction. Food security score was different between the Winter 2021, week 5 measurement (median =

4.31) and the Spring 2020 week 2, measurement (median = 5.47) ($p = .020$, adj. $p = 0.733$). There was no significant difference observed between all other food security score measurements.

CalFresh Participation Moderation of Food Insecurity

In a regression-based moderation model, average food security score was significantly correlated with a decrease in quarter GPA specifically for the Spring and Fall 2020 quarters (Table 2; Figure 3). During the Spring 2020 quarter, CalFresh participation was not correlated with GPA, however the interaction of average food security score and CalFresh participation was observed to be positively correlated with quarter GPA, indicating a positive moderating effect. These observations remained true after transforming the quarter GPA variable to normalize the outcome variable's distribution, and in addition CalFresh participation was negatively correlated with GPA during Fall 2020.

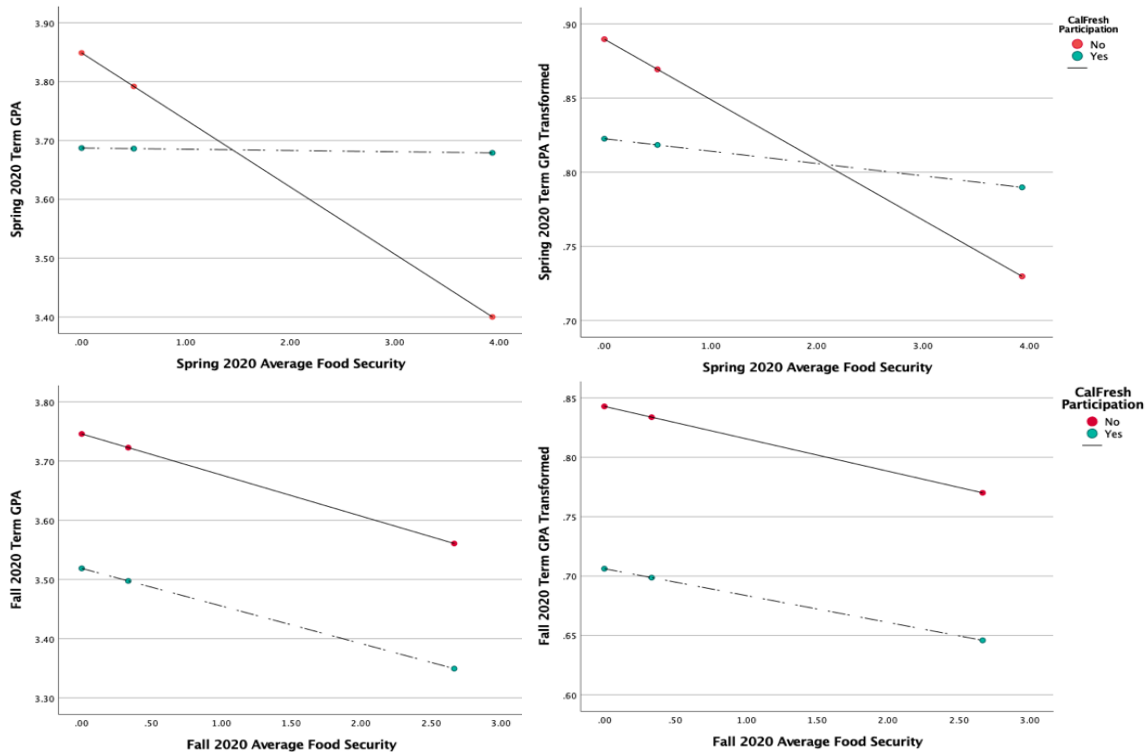


Figure 3. Simple Moderation of CalFresh Participation on Average Food Security Score on Quarter GPA

Table 2. Simple Moderation Model: Food Security Scores' Effect on Quarter GPA with CalFresh

Moderation

	Spring 2020			Spring 2020 – Transformed GPA			
	Coeff	SE	P	Coeff	SE	P	
Average Food				Average Food			
Security	-0.1141	0.0211	<0.001	Security	-0.0407	0.0095	<0.001
CalFresh				CalFresh			
Participation	-0.1617	0.1022	0.116	Participation	-0.0672	0.046	0.1462
Avg Food Security				Avg Food			
x CalFresh				Security x			
Participation	.1120	0.0352	0.0018	CalFresh			
				Participation	.0323	0.0158	0.0429
	Fall 2020			Fall 2020 – Transformed GPA			
	Coeff	SE	P	Coeff	SE	P	
Average Food				Average Food			
Security	-0.0694	0.0221	0.0021	Security	-0.0273	0.0097	0.0057
CalFresh				CalFresh			
Participation	-0.2272	0.119	0.0586	Participation	-0.1367	0.0522	0.01
Avg Food Security				Avg Food			
x CalFresh				Security x			
Participation	.0060	0.044	0.8922	CalFresh			
				Participation	.0047	0.0193	0.809

When including demographic and academic covariates into the moderation models, average food security score remained negatively correlated with quarter GPA during Spring and Fall 2020 (Table 3; Figure 4). As in the simple moderation model, the interaction of average food security score and CalFresh participation was observed to be significant, indicating a positive moderating effect of CalFresh participation on food security's effect on GPA.

After transforming quarter GPA, the moderation effect of CalFresh participation was no longer significant during Spring 2020 and increasing academic class level had a positive correlation with quarter GPA. During the Fall 2020 quarter, female sex was correlated with a decrease in GPA.

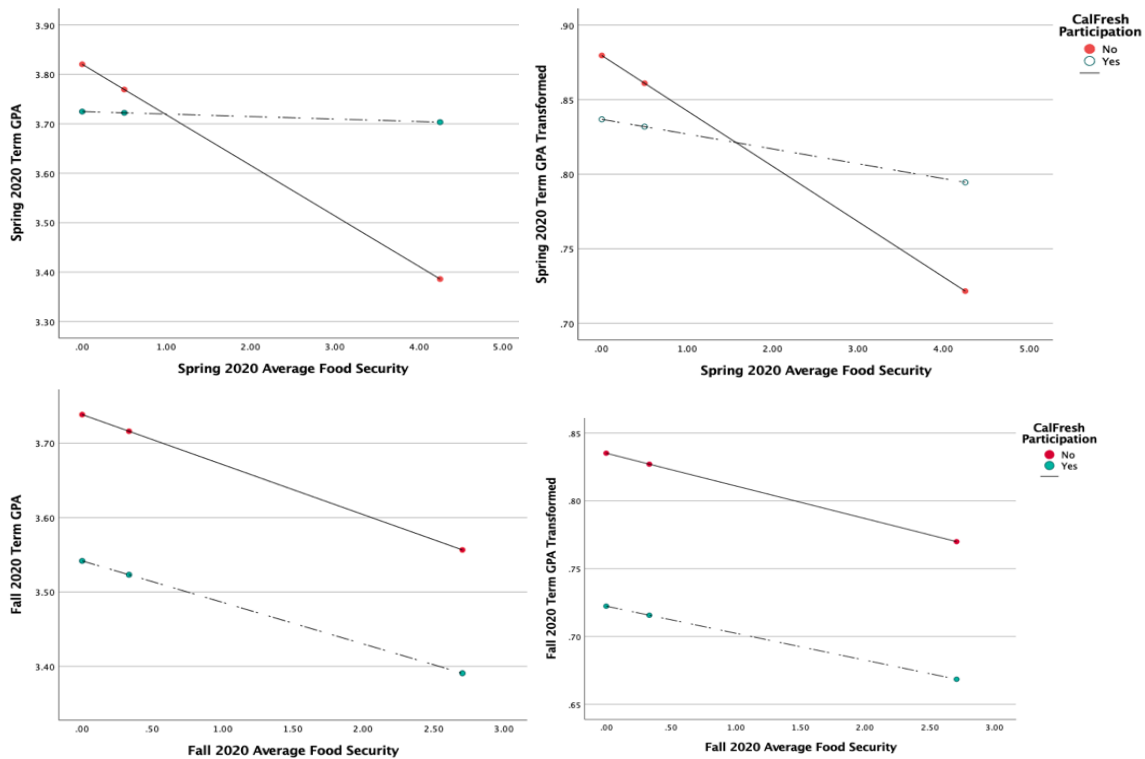


Figure 4. Full Moderation of CalFresh Participation on Average Food Security Score affect on Quarter GPA

Table 3. Full Moderation Model: Food Security Scores' Effect on Quarter GPA with CalFresh Moderation	
Spring 2020	Spring 2020 - Transformed GPA

	Coeff	SE	P
Average Food			
Security Score	-0.1021	0.0223	<0.001
CalFresh			
Participation	-0.0957	0.1135	0.4006
Avg Food			
Security x			
CalFresh			
Participation	.0971	0.0365	0.0088
Ethnicity	0.0136	0.0136	0.3205
Female	-0.0547	0.0809	0.5008
Age	-0.0027	0.0229	0.9049
Transfer			
Student	-0.0334	0.0963	0.7291
First			
Generation			
Student	-0.0398	0.0797	0.6187
Low Income	-0.0215	0.0819	0.7935
US Citizen	.0284	0.1985	0.8863
CA Resident	0.3200	0.1582	0.0453
Academic			
Class Level	.0857	0.044	0.0538

Fall 2020

	Coeff	SE	P
Average Food			
Security Score	-0.0371	0.01	0.0003
CalFresh			
Participation	-0.0428	0.0511	0.4041
Avg Food			
Security x			
CalFresh			
Participation	.0272	0.0164	0.1008
Ethnicity	.0044	0.006	0.4724
Female	-0.0286	0.0364	0.434
Age	.0033	0.0103	0.7528
Transfer			
Transfer Student	-0.0429	0.0434	0.3248
First			
First Generation			
Student	-0.0203	0.0359	0.572
Low Income	.0011	0.0369	0.9762
US Citizen	.0016	0.0894	0.9861
CA Resident	.0992	0.0712	0.1665
Academic Class			
Level	.0399	0.0198	0.0465

Fall 2020 - Transformed GPA

	Coeff	SE	P		Coeff	SE	P
Average Food				Average Food			
Security	-0.0672	0.0239	0.0059	Security	-0.0241	0.0104	0.0229
CalFresh				CalFresh			
Participation	-0.1966	0.1378	0.1564	Participation	-0.1128	0.06	0.0629
Avg Food				Avg Food			
Security x				Security x			
CalFresh				CalFresh			
Participation	.0114	0.0464	0.8062	Participation	0.0042	0.0202	0.8374
Ethnicity	-0.0197	0.0164	0.2312	Ethnicity	-0.0061	0.0071	0.3914
Female	-0.1187	0.0981	0.229	Female	-0.0898	0.0427	0.0381
Age	.0118	0.0206	0.5683	Age	0.0052	0.009	0.5599
Transfer				Transfer			
Student	-0.0413	0.1343	0.759	Transfer Student	-0.0410	0.0585	0.485
First				First			
Generation				First Generation			
Student	-0.1481	0.0963	0.1272	Student	-0.0478	0.0419	0.2566
Low Income	.0401	0.0977	0.6821	Low Income	0.0023	0.0426	0.9576
US Citizen	.0669	0.2667	0.8024	US Citizen	0.0419	0.1162	0.7191
CA Resident	-0.0513	0.2821	0.8561	CA Resident	-0.0103	0.1229	0.9333
Academic				Academic Class			
Class Level	-0.0133	0.0475	0.7795	Level	0.0103	0.0207	0.6207

Discussion

The purpose of the current study was to assess how food security changes over the span of an academic quarter and an academic year in a longitudinal sample. Overall, the results indicated that food security does not change over the span of a 10-week quarter, however food security was observed to improve over the span of a full academic year. To address the secondary hypothesis, the authors investigated whether CalFresh participation moderated the effect of food security on GPA in college students. These results indicated that during the first academic quarter (Spring 2020), the initial COVID-19-related campus closure, CalFresh participation was a positive moderator. The moderation was not seen during the subsequent Fall quarter, suggesting that the early response to the COVID-19 pandemic was unique for this population. In the full moderation model, CalFresh was observed to be a positive moderator when accounting for demographic and academic factors, indicating that participating in food assistance programs is beneficial for students irrespective of demographic characteristics which are typically associated with food insecurity and poor academic outcomes.^{8,34-36}

Combined, the CalFresh moderation of food security's effect on GPA and the lack of change in food security during this quarter creates an apparent inconsistent picture. In the broader context of this time, as part of the early pandemic response in Spring of 2020 low-income students and many students who were financially independent from their parents/guardians received COVID-19 relief payments.³⁷ The federal Economic Impact Payments and funds from the Coronavirus Aid, Relief, and Economic Security (CARES) Act were both distributed to eligible students during Spring Quarter 2020, late in March and early in May, respectively.^{37,38} Adults earning less than \$99,000 annually were eligible to receive \$1,200 from the EIPs, and undergraduate students receiving Pell Grants were eligible to receive \$1,000 and graduate students were eligible to receive \$600 from the CARES Act funds.^{37,38} In total, eligible students may have received up to \$2,200 during Spring quarter in addition to any other financial aid or other benefits. Taken together, these payments and the moderating effect of CalFresh participation point to ways in which Spring quarter 2020 was unique in terms of student finances and food security. Previous research has

described that the cost of higher education has outpaced earnings and grant monies intended to support students, such that the federal Pell Grant is no longer sufficient to cover the cost of higher education.²⁶ In a practical sense, the cost of attending college is more than federal and state grants can support. In order to provide for cost of living (including basic needs like housing and food), students may need to rely on loans in addition to these grants, and these pooled resources may still not be enough to fully support students through their college career.²⁶ The increasingly precarious financial situation surrounding the modern college experience coupled with the infusion of COVID-relief funds during the early months of the pandemic make Spring quarter an interesting case-study for observing how student outcomes may change when they have increased financial stability. It is posited that the observed positive moderation of CalFresh in Spring quarter is visible because CalFresh benefits can be used as supplemental food dollars which promote more healthful eating rather than the sole source of a student's food dollars, where the amount is insufficient to support a healthful eating pattern.

There are several limitations of the current study, including a small sample size, non-normal distributions of GPA and food security scores, and questionnaire distribution timing. Although each quarter saw participants numbering 140-179 participants, only 58 students completed data collection at all time points. Though the moderation models' outcome variables were transformed to achieve a relatively normal distribution, both quarter GPA and the independent variable of food security score had non-normal distributions, owing to a ceiling and a floor in the scores, respectively. Results from the current study may not be generalizable to other college students as the study university is on a quarterly academic schedule, which runs ten weeks, compared to sixteen-week semester schedules. Most importantly, the present study must be considered in the context of the COVID-19 pandemic. Though the authors postulate that CalFresh is a valuable resource for students to improve food security and related outcomes, the results of this study may not represent the student experience under typical academic

conditions. Despite these limitations, however, the results of the study contribute to the increasingly complex picture of student food security and the resources in place intended to mitigate its effects.

With food insecurity being increasingly recognized as an important issue on campuses, there are a growing number of resources to improve student food access, which include growing numbers of on-campus food pantries and distributions³⁹ Although these resources may be useful to students and help bridge the food access gap under normal circumstances, they may fall short when campuses are closed for academic breaks. The COVID-19 pandemic forced many university administrators to quickly adapt to an unprecedented and unpredictable situation, and at the University of California, all campuses were closed to students.⁴⁰ Those who may have been using the resources provided by basic needs centers^{23,24} which provided fresh foods, pantry staples, and toiletries were unable to use the resources in the same capacity.

Although the basic needs centers worked to adapt to the changes and continue providing resources to students, they could only serve those students who remained local and chose to participate in the resources.⁴¹ Prior to the institutional closure, the study population had access to multiple basic needs and food resources, including housing case management services, emergency financial aid, campus-wide and graduate student pantries, twice-weekly fresh produce distribution, and satellite pantries serving specific groups (including student families and nonresidents).²⁴ Students who left campus (an estimated half of the university's undergraduate and nearly a third of its graduate population)⁴² to return home or otherwise chose not to use the adapted resources may have experienced a shift in their food security.^{43,44} This sudden loss of resources during the pandemic closures highlights areas where on-campus resources fall short under normal circumstances; while beneficial during the academic year, during term breaks the lack of resources may negatively impact student food security.⁴⁵ Although the ebb and flow of access to resources is an area which could be improved at the campus level, many campuses may not have adequate resources to operate food distributions year-round,⁴⁶ which could lead to some

populations of students experiencing impediments to improved food security. As a counterexample, UC schools (and particularly those in agricultural hubs like the Davis and Merced campuses) may have more food resources to distribute to students due to campus food production⁴⁷ and partnerships with local food banks.⁴⁸ When resource inequity is combined with the circumstances surrounding the pandemic and strained student finances, certain populations of students may be particularly burdened and experience severe food insecurity.¹⁰

CalFresh – and SNAP, nationally – may be uniquely useful to college students in this area. Although studies of student food security are growing in number and scope, few have examined the intersection of program participation, food security, and academic performance in this population.²⁶ The results of the current study indicate that CalFresh was particularly beneficial during atypical academic times. During the first quarter that the study population was unable to be present on campus, CalFresh participation was observed to moderate the effect of decreasing food security on GPA, such that students who participated in the program saw very little decline in their quarter GPA compared to those who did not participate. Given the observed benefits, encouraging SNAP enrollment should be a priority for university administrators.

The benefits of improving food security are manifold (improved physical and mental health, and in students, improved academic performance)^{8,10} indicating a clear need for food security promotion. CalFresh has the ability to improve food security for millions of individuals, including the growing numbers of college students at risk of experiencing food insecurity, such as low-income, first generation, and transfer students.⁹ Many students may be eligible to receive SNAP benefits, but eligibility criteria tend to be obscure, and the enrollment process is cited as a barrier to enrollment.^{26,49} Advocacy at the local-, state- and federal- level around college student eligibility and clear access to enrollment is one area where universities can act to improve program participation impact their student populations.⁵⁰ By providing resources to build knowledge about these programs on campuses and working alongside SNAP-

implementing agencies, universities can positively impact their student populations; by providing students with the resources to improve their food security, they may help students to improve their academic outcomes.

References

1. Coleman-Jensen A, Rabbitt MP, Gregory CA. Definitions of Food Security. United States Department of Agriculture; 2020. Accessed May 25, 2021. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>
2. Bruening M, Argo K, Payne-Sturges DC, Laska M. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses- ClinicalKey for Nursing. Accessed October 8, 2020. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267217305518?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267217305518%3Fshowall%3Dtrue&referrer=https:%2F%2Fpubmed.ncbi.nlm.nih.gov%2F28754200%2F>
3. Tu K. Hungry to Learn: An Analysis of the Food Insecurity Problem in the California Community College System and Implications for Public Policy Solutions. Published online August 2020.
4. Cuy Castellanos D, Holcomb J. Food insecurity, financial priority, and nutrition literacy of university students at a mid-size private university. *J Am Coll Health J ACH*. 2020;68(1):16-20. doi:10.1080/07448481.2018.1515762
5. El Zein A, Shelnutt KP, Colby S, et al. Prevalence and correlates of food insecurity among U.S. college students: a multi-institutional study. *BMC Public Health*. 2019;19(1):660. doi:10.1186/s12889-019-6943-6

6. Fortin K, Harvey S, Swearingen White S. Hidden Hunger: Understanding the Complexity of Food Insecurity Among College Students. *J Am Coll Nutr.* 2021;40(3):242-252.
doi:10.1080/07315724.2020.1754304
7. Martinez SM, Frongillo EA, Leung C, Ritchie L. No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *J Health Psychol.* Published online June 25, 2018:1359105318783028.
doi:10.1177/1359105318783028
8. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from Food Insecurity to Health Outcomes among California University Students. *Nutrients.* 2019;11(6):1419.
doi:10.3390/nu11061419
9. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: What are the risk factors? *J Hunger Environ Nutr.* 2018;13(1):1-18.
doi:10.1080/19320248.2017.1374901
10. Nazmi A, Martinez S, Byrd A, et al. A systematic review of food insecurity among US students in higher education. *J Hunger Environ Nutr.* 2018;0(0):1-16. doi:10.1080/19320248.2018.1484316
11. Meza A, Altman E, Martinez SM, Leung CW. "It's a Feeling That One Is Not Worth Food": A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students- ClinicalKey for Nursing. Accessed August 6, 2019.
<https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267218306932?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267218306932%3Fshowall%3Dtrue&referrer=https:%2F%2Fwww.ncbi.nlm.nih.gov%2F>

12. Diamond KK, Stebleton MJ, delMas RC. Exploring the Relationship Between Food Insecurity and Mental Health in an Undergraduate Student Population. *J Stud Aff Res Pract.* 2020;57(5):546-560.
doi:10.1080/19496591.2019.1679158
13. Becerra MB, Becerra BJ. Psychological Distress among College Students: Role of Food Insecurity and Other Social Determinants of Mental Health. *Int J Environ Res Public Health.* 2020;17(11):4118.
doi:10.3390/ijerph17114118
14. Weaver R, Vaughn N, Hendricks S, et al. University student food insecurity and academic performance. *J Am Coll Health.* 2019;68:1-7. doi:10.1080/07448481.2019.1600522
15. Phillips E, McDaniel A, Croft A. Food Insecurity and Academic Disruption Among College Students. *J Stud Aff Res Pract.* 2018;55(4):353-372. doi:10.1080/19496591.2018.1470003
16. Woerden I van, Hruschka D, Bruening M. Food insecurity negatively impacts academic performance. *J Public Aff.* 2019;19(3):e1864. doi:10.1002/pa.1864
17. YEC. Council Post: Do College Grades Predict Future Success? *Forbes.* Accessed December 3, 2021. <https://www.forbes.com/sites/theyec/2020/10/19/do-college-grades-predict-future-success/>
18. Key Attributes Employers Want to See on Students' Resumes. Accessed December 3, 2021. <https://www.naceweb.org/talent-acquisition/candidate-selection/key-attributes-employers-want-to-see-on-students-resumes/>
19. Hege A, Stephenson T, Pennell M, et al. College Food Insecurity: Implications on Student Success and Applications for Future Practice. *J Stud Aff Res Pract.* 2021;58(1):44-61.
doi:10.1080/19496591.2020.1726359

20. Leung CW, Farooqui S, Wolfson JA, Cohen AJ. Understanding the Cumulative Burden of Basic Needs Insecurities: Associations With Health and Academic Achievement Among College Students. *Am J Health Promot.* 2021;35(2):275-278. doi:10.1177/0890117120946210
21. Martinez SM, Esaryk EE, Moffat L, Ritchie L. Redefining Basic Needs for Higher Education: It's More Than Minimal Food and Housing According to California University Students. *Am J Health Promot AJHP.* 2021;35(6):818-834. doi:10.1177/0890117121992295
22. Regents of the University of California, Special Committee on Basic Needs. The University of California's Next Phase of Improving Student Basic Needs.; 2020:1-59.
<https://regents.universityofcalifornia.edu/regmeet/nov20/s1attach.pdf>
23. UC Global Food Initiative: Food and Housing Security at the University of California. :66.
24. Kim HSR. CalFresh. Aggie Compass Basic Needs Center. Published September 9, 2018. Accessed January 1, 2022. <https://aggiecompass.ucdavis.edu/get-calfresh>
25. Chart Book: SNAP Helps Struggling Families Put Food on the Table. Center on Budget and Policy Priorities. Accessed June 30, 2021. <https://www.cbpp.org/research/food-assistance/chart-book-snap-helps-struggling-families-put-food-on-the-table>
26. Freudenberg N, Goldrick-Rab S, Poppendieck J. College Students and SNAP: The New Face of Food Insecurity in the United States. *Am J Public Health.* 2019;109(12):1652-1658.
doi:10.2105/AJPH.2019.305332
27. Loofbourrow B, Jones A, Morgan M, Scherr R. Development of a Comprehensive Questionnaire Evaluating Knowledge, Attitudes, and Practices Regarding University Student Food Access Resource Use. *Curr Dev Nutr.* 2020;4(Supplement_2):229-229. doi:10.1093/cdn/nzaa043_080

28. Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *Int J Behav Nutr Phys Act.* 2018;15(1):9. doi:10.1186/s12966-018-0647-7
29. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. *Acta Bio-Medica Atenei Parm.* 2020;91(1):157-160. doi:10.23750/abm.v91i1.9397
30. Niles MT, Beavers AW, Clay LA, et al. A Multi-Site Analysis of the Prevalence of Food Insecurity in the United States, before and during the COVID-19 Pandemic. *Curr Dev Nutr.* 2021;5(12):nzab135. doi:10.1093/cdn/nzab135
31. Beatty P, Willis G. Research Synthesis: The Practice of Cognitive Interviewing | Public Opinion Quarterly | Oxford Academic. Published May 29, 2007. Accessed February 9, 2022. <https://academic.oup.com/poq/article/71/2/287/1928986>
32. USDA ERS - Survey Tools. Accessed May 25, 2020. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/#household>
33. The Tailored Design Method | Social & Economic Sciences Research Center at WSU. Accessed May 19, 2020. <https://sesrc.wsu.edu/about/total-design-method/>
34. Zigmont VA, Linsmeier AM, Gallup P. Understanding the Why of College Student Food Insecurity. *J Hunger Environ Nutr.* 2019;0(0):1-16. doi:10.1080/19320248.2019.1701600
35. Willis DE. Feeding the Student Body: Unequal Food Insecurity Among College Students. *Am J Health Educ.* 2019;50(3):167-175. doi:10.1080/19325037.2019.1590261
36. Maroto ME, Snelling A, Linck H. Food Insecurity Among Community College Students: Prevalence and Association With Grade Point Average. *Community Coll J Res Pract.* 2015;39(6):515-526. doi:10.1080/10668926.2013.850758

37. Werdmuller D. Higher Education Emergency Relief Funds. Financial Aid and Scholarships. Published April 2, 2021. Accessed December 29, 2021. <https://financialaid.ucdavis.edu/heerf>
38. Economic Impact Payment. Accessed January 30, 2022. <https://www.cdss.ca.gov/inforesources/cdss-programs/economic-impact-payment>
39. College & University Food Bank Alliance | Character Clearinghouse. Accessed January 1, 2022. <https://characterclearinghouse.fsu.edu/article/college-university-food-bank-alliance>
40. Coronavirus updates. University of California. Published December 21, 2021. Accessed January 1, 2022. <https://www.universityofcalifornia.edu/coronavirus>
41. Adapting to COVID-19 – The Pantry. Accessed January 1, 2022. <https://thepantry.ucdavis.edu/hours/>
42. Checking In With Chancellor May: Here for You | UC Davis Leadership. Accessed February 5, 2022. <https://leadership.ucdavis.edu/news/checking-in-with-chancellor-may-here-for-you>
43. Mialki K, House LA, Mathews AE, Shelnuttt KP. Covid-19 and College Students: Food Security Status before and after the Onset of a Pandemic. *Nutrients*. 2021;13(2):628. doi:10.3390/nu13020628
44. Davitt ED, Heer MM, Winham DM, Knoblauch ST, Shelley MC. Effects of COVID-19 on University Student Food Security. *Nutrients*. 2021;13(6):1932. doi:10.3390/nu13061932
45. Goldrick-Rab S, Richardson J, Schneider J, Hernandez A, Cady C. STILL HUNGRY AND HOMELESS IN COLLEGE. :52.
46. Gupton JT, Trost JL, Collins K. Food Pantries as a Gateway for Academic Enhancement and Basic Needs Support. *New Dir Community Coll*. 2018;2018(184):61-71. doi:10.1002/cc.20328

47. Doval C. Student Farm. Agricultural Sustainability Institute. Published October 15, 2018. Accessed January 1, 2022. <https://asi.ucdavis.edu/programs/sf>
48. Community Partners. Yolo Food Bank. Accessed January 1, 2022. <https://yolofoodbank.org/community-partners/>
49. Eligibility and Issuance Requirements. Accessed June 30, 2021. <https://www.cdss.ca.gov/inforesources/cdss-programs/calfresh/eligibility-and-issuance-requirements>
50. Bill Text - SB-173 CalFresh: postsecondary student eligibility: workstudy. Accessed October 10, 2020. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB173&search_keywords=snap

Chapter 5

Discussion

Introduction

The research conducted in support of this dissertation was designed to investigate food insecurity and the food access landscape on college campuses by examining food insecurity prevalence and differences among various demographic groups of students, attitudes and behaviors around available resources, motivators of student food choice, and the impacts of resource participation on academic performance. This body of research supports observations of widespread student food insecurity across the US,^{1,2} and previous literature in this area has pointed to food insecurity's associations with poor physical^{3,4} and mental health,⁵ and with poorer academic performance.⁶ The studies here serve to add to burgeoning areas of interest in food security research.

The primary focus of this dissertation was the examination of food insecurity and the food access environment, with a particular focus on California's CalFresh program (federally known as Supplemental Nutrition Assistance Program, or SNAP) as a primary resource in food security support. Although this program is an important food support for households at the national level,⁷ college students have not been observed to participate at the same rates as other adults.⁸ Given that SNAP has been observed to benefit food security in the general population, the approach of this dissertation was to explore food insecurity through the understanding of knowledge and behaviors, with the underlying ethos being that improving student food security will lead to improved academic outcomes. Further, this research was guided by the philosophy of improving student food security at scale; campuses often stand alone and offer a patchwork approach to food access, by offering pantries, information about local resources, pointing to CalFresh/SNAP, or a combination of these.⁹⁻¹¹ By exploring food insecurity and discussing resources that have national reach, promoting widespread food security support for college students becomes feasible and actionable for campuses nationwide.

The first study of this body of work examined knowledge about resources like CalFresh, attitudes towards this program, and how these factors may relate to participation in CalFresh. This study was done simultaneously with an exploration of how food choice motivation differs between students with different levels of food security in order to add clarity to the picture of food choice¹² under adverse circumstances. The final study of this dissertation examined how CalFresh participation moderates the effect of food insecurity on academic performance in the context of the COVID-19-related university shutdown.

Food Insecurity and Responses to Resources

The first investigation in this series aimed to assess the knowledge, attitudes, and practices (KAPs) surrounding CalFresh in college students. Little has been done to examine how college students interact with CalFresh, likely due to the observed low participation in the program seen in this population, which is likely brought about by uncertainty surrounding program eligibility.⁸ This study aimed to probe students' knowledge and attitudes towards the program and assess whether these components were related to participation in CalFresh.

Using a validated questionnaire, students were asked whether they participated in on-campus resources or CalFresh, whether they knew if they were eligible to participate in CalFresh, and to indicate agreement on statements relating to CalFresh participation and the participation of others. A greater proportion of students experiencing food insecurity participated in food access resources compared to those who are classified as food secure; students experiencing food insecurity utilized both on-campus resources and CalFresh more than their food secure peers. The difference in program participation was largely expected, as food insecure students are the primary intended audience for these programs. Although higher participation in resources was largely expected, there was still a large proportion of students experiencing food insecurity who did not use on-campus resources; 36% reported not using any

of the numerous on-campus resources at all. Similar to on-campus resource participation, differences were also observed between food secure and food insecure groups in CalFresh participation, although large proportions of both groups reported a lack of knowledge about their eligibility to participate in the program.

Regardless of their CalFresh eligibility awareness, students were asked about their general knowledge and attitudes towards the program. Five overarching KAPs themes were identified: CalFresh Knowledge, Negative Attitudes Around Participating in CalFresh, Positive Attitudes Around Participating in CalFresh, Negative Attitudes Around Others Participating in CalFresh, and Fortunate Attitudes for not Participating in CalFresh.

Across the board, CalFresh Knowledge was associated with positive attitudes towards CalFresh, in both students who themselves participated in the programs and students remarking on others using the program. Additionally, CalFresh Knowledge was observed to be associated with higher odds of participating in CalFresh. This combination of knowledge being correlated with both positive attitudes and higher program participation highlights the utility of knowledge campaigns on campuses. Additionally, that these results were seen in this population compared to a previous study in adults suggests that these campaigns may be particularly effective for improving participation.¹³ Stakeholders at the campus level can promote resources like on-campus pantries and food distributions as well as CalFresh, and in so doing may improve participation in programs aiming to improve student food security. Indeed, work by Martinez et al indicate that significant proportions of students experiencing food insecurity desire information about programs to improve their food access.¹⁴

Promoting CalFresh enrollment for students may be particularly important when considering the difficulties around starting on-campus food pantries.⁹ These reported barriers of lack of pantry supplies and funding, staffing concerns, and perceived legitimacy of their effectiveness by college administrators

become a nonissue;⁹ campuses without the means to undertake starting a new pantry may rely on effective, well-established federal resources which target their most vulnerable students. In addition, although some campuses may have robust support systems for their students, there is no guarantee that students will use them. Research by El Zein et al discusses students' lack of participation, describing cited student barriers such as perceived stigma and conflicting self-identity.¹⁵ Given these descriptions of campus and student barriers, CalFresh may address needs on both sides: this resource does not require significant financial or staffing investment from colleges, and it may be more palatable to students as a discreet form of support. By promoting CalFresh, colleges may help to improve food security on their campuses with their only investment being open dialogue about food security and distribution of information about the resource.¹⁰ From the institution perspective, the cost-benefit ratio may be decidedly in their favor: promotion of resources which improve student food security may in turn come with better academic outcomes, thereby improving the campus standing and reputation.¹⁶

Food Security and Food Choice

The second investigation in this research aimed to add to the limited body of literature surrounding food choice motivation at the college level.¹² Previous works have indicated that several student characteristics are associated with an increased risk for experiencing food insecurity, including being from a low-income background, being a first-generation student, and belonging to an underrepresented minority group.¹⁷ Much has been done to show how food insecurity may impact students' health and wellness,⁴ but there is little understanding of how food insecurity may be associated with the food choice behaviors that could be exacerbating these observed outcomes.¹⁸

Using the same validated comprehensive questionnaire from the first study, university students were asked to select food choice motivators that they relied on when choosing foods for themselves. Of eight food choice motivators identified through informal interviews (food appearance, taste, nutrition,

cost, convenience, dietary restrictions, food familiarity, and meal prepping), three overarching motivators were identified through exploratory factor analysis: *Hedonics* (appearance and taste), *Constraints* (cost and convenience), and *Nutrition Knowledge* (dietary restrictions, food familiarity, and meal prepping). Each of these food choice motivators were positively or negatively correlated with selected student demographic and academic characteristics, such as low-income, first-generation, and international student status, but the primary finding of this study was determining correlations between these motivators and the experience of food insecurity.

Students experiencing food insecurity did not hold the same priorities in their food choice as their food secure peers. Food choice is intensely personal and is influenced by a large confluence of factors; in a general student population, Vilaro et al described these factors in broad categories including the advertising environment, healthy aesthetics, and busy lifestyles and preferences.¹² Although this study was the first to examine food choice motivation in the current college environment, it failed to take into account one primary motivator in the context of food insecurity—the cost burden of food. As part of the exploration of food insecurity behaviors in this dissertation, it was observed that the experience of food insecurity was positively correlated with the *Constraints* motivator while it was negatively correlated with *Nutrition Knowledge* and especially *Hedonics*. Mirroring this result, being from a low-income background was also positively associated with *Constraints* and negatively correlated with *Nutrition Knowledge*, and first-generation status was negatively correlated with both *Hedonics* and *Nutrition Knowledge*. The pattern of motivators observed here lends credence to the picture of the anecdotal peanut butter and ramen-reliant “starving student,” wherein students who have less means or may not be as prepared for the college environment prioritize foods that are inexpensive, though they may not be preferred.

Understanding how the underlying motivators behind food choice shift among students who are faced with food insecurity may offer insights about the dietary patterns observed in these students, namely fewer servings of healthful fruits and vegetables per week compared to their food secure peers.⁴

Martinez et al found that student food insecurity is associated with fewer servings of foods generally associated with better diet quality, and the differences in motivation seen between food insecure and food secure students serve to reinforce this observation.⁴ Further, as increased food security was correlated with hedonic and nutrition-based food choices, improvements in food security may be meaningful more broad ways than health; improving food security may allow students to choose foods based on what they desire, rather than what they need to survive, thereby improving their sense of confidence and self-worth.¹⁹ Second to this humanistic approach to improving food security, colleges and universities may benefit from this difference in motivation; by working to improve food security on campus, administrators may in time see improvements in nutrition-motivated eating and academic outcomes.²⁰

How Resources Help College Students

The final study in this dissertation series was conducted to examine how food security status changes over time, and how participation in CalFresh may moderate the negative affect that food insecurity has on academic performance. Over the span of an academic year, students were asked about their food security and their CalFresh participation. This was the first longitudinal study assessing food security over time in a quarterly academic schedule, and the first to examine how CalFresh may impact academic outcomes. The primary aim of the study was to assess how food security may change over time. As student financial aid is structured in such a way as to supply students with infusions of funds at the beginning of the academic term with no further support until the following term, it was hypothesized that students would experience increased food insecurity as the term progressed— students generally saw very little change in food security over the span of a quarter, although previous research has indicated that over a 16-week term, food insecurity does increase. Bruening et al observed that students experience an increase in food insecurity over the academic semester, which may be due to longer delays between

financial aid disbursements due to both the longer term and between-term breaks (there are shorter holiday breaks between quarters than between semesters).

The secondary aim was to assess the effect of CalFresh participation on academic outcomes and determine whether CalFresh was of particular benefit to students. With the understanding that these benefits are helpful in the broad population,⁷ it followed that students would reap similar benefits and that improved food security would help put their academic performance on par with food secure peers, but the results of this study indicated inconsistent results. The study began during the early months of the COVID-19 pandemic,^{21,22} which created an entirely different set of student circumstances under which to examine the effect of CalFresh benefits.

During the first quarter of university lockdown, CalFresh was observed to positively moderate the effect of food insecurity on GPA, such that students who participated in the program saw very little change in GPA as their food security worsened, compared to students who did not participate in the program and saw a decrease in GPA as food security worsened. Interestingly, this moderation was not observed the following quarter; regardless of CalFresh participation, GPA declined with worsening food security. Stark difference in results were unlikely in adjacent quarters, however, considering the timing of implementation, these results may implicate underlying financial insecurity as a factor in student food security and academic performance. The primary difference between the two quarters measured in this study – separated from each other by a 3-month-long summer break – were the financial circumstances brought about by the COVID-19 pandemic. During the first quarter of this study, eligible students were provided with funds from the federal Economic Impact Payments and funds from the Coronavirus Aid, Relief, and Economic Security (CARES) Act,²³ while relief funds were not provided during the fall quarter.

Although the pandemic changed much about normal school operations, these may have helped to shed light on the complicated picture of food insecurity and resource programs in relation to the

broader college environment. During the early months of the pandemic, CalFresh was observed to benefit GPA, and although CalFresh may have an important role to play in mitigating the effects of food insecurity on college student performance, the larger issue at play may be limited financial security.²⁴

Rising costs of college attendance have outpaced the abilities of college grant monies to cover the costs of a higher education.⁸ Wages and funding for public schools have also flagged, favoring increases in tuition and fees.²⁵ Students of limited means and college preparedness (such as students from low-income backgrounds and first-generation students)²⁶ are more likely to experience food insecurity have consistently been observed to perform more poorly than peers who are not experiencing the same difficulties.¹⁴ For the sake of the increasing populations of disadvantaged students²⁷ attending college, it is critical that the gaps in access to basic needs like food are addressed to create a more equitable learning environment in which all students can thrive.

Conclusion

Taken together, these studies illustrate a better picture of the student food insecurity experience and actionable steps forward at the campus, state, and federal level. It has been observed that students experiencing food insecurity make food choices based on motivators in line with time and cost constraints, rather than food preferences or nutrition-related behaviors. Several food access resources exist for students at the local level and beyond, but although students experiencing food insecurity were more likely to use these resources, and attitudes towards resources were positive, many students were unaware of their eligibility for programs which could substantially supplement their diets. Further, the evidence here suggests that in certain circumstances, participation in the CalFresh program may ameliorate the effects of food insecurity and be protective of student GPA. As a whole, the results of these studies illustrate that college students experiencing food insecurity need more access to resources so that they may make food choices based on their wants, and that when they are fully supported, their

academic performance may be improved. To further demonstrate the utility of resource participation, more research in this area should be conducted under non-pandemic circumstances and with a larger sample size.

Based on results from previous studies, stakeholders across California colleges have been working to improve student access to CalFresh in order to boost student food security through on-campus efforts and legislative advocacy.²⁸⁻³¹ The results found in this dissertation serve to bolster this work and provide further justification for the promotion of CalFresh access for college students. This high-level approach to food security promotion serves as an inflection point in addressing the needs of students experiencing food insecurity in California and across the United States.

References

1. Nazmi A, Martinez S, Byrd A, et al. A systematic review of food insecurity among US students in higher education. *J Hunger Environ Nutr.* 2018;0(0):1-16. doi:10.1080/19320248.2018.1484316
2. Bruening M, Argo K, Payne-Sturges DC, Laska M. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses- *ClinicalKey for Nursing.* Accessed October 8, 2020. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0-S2212267217305518?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267217305518%3Fshowall%3Dtrue&referrer=https:%2F%2Fpubmed.ncbi.nlm.nih.gov%2F28754200%2F>
3. Meza A, Altman E, Martinez SM, Leung CW. “It’s a Feeling That One Is Not Worth Food”: A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students- *ClinicalKey for Nursing.* Accessed August 6, 2019. <https://www.clinicalkey.com/nursing/#!/content/playContent/1-s2.0->

S2212267218306932?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2212267218306932%3Fshowall%3Dtrue&referrer=https:%2F%2Fwww.ncbi.nlm.nih.gov%2F

4. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from Food Insecurity to Health Outcomes among California University Students. *Nutrients*. 2019;11(6):1419. doi:10.3390/nu11061419
5. Raskind IG, Haardorfer R, Berg CJ. Food insecurity, psychosocial health, and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476. doi:10.1017/S1368980018003439
6. Phillips E, McDaniel A, Croft A. Food Insecurity and Academic Disruption Among College Students. *J Stud Aff Res Pract*. 2018;55(4):353-372. doi:10.1080/19496591.2018.1470003
7. Chart Book: SNAP Helps Struggling Families Put Food on the Table. Center on Budget and Policy Priorities. Accessed June 30, 2021. <https://www.cbpp.org/research/food-assistance/chart-book-snap-helps-struggling-families-put-food-on-the-table>
8. Freudenberg N, Goldrick-Rab S, Poppendieck J. College Students and SNAP: The New Face of Food Insecurity in the United States. *Am J Public Health*. 2019;109(12):1652-1658. doi:10.2105/AJPH.2019.305332
9. Gupton JT, Trost JL, Collins K. Food Pantries as a Gateway for Academic Enhancement and Basic Needs Support. *New Dir Community Coll*. 2018;2018(184):61-71. doi:10.1002/cc.20328
10. Goldrick-Rab S. Beyond the Food Pantry: Spreading the Word- Supporting Students' Basic Needs with a Syllabus Statement and Welcome Survey. :5.
11. Cady C, White CC. Food Pantries on Campus to Address Student Hunger. *New Dir Community Coll*. 2018;2018(184):73-82. doi:10.1002/cc.20329

12. Vilaro MJ, Zhou W, Colby SE, et al. Development and Preliminary Testing of the Food Choice Priorities Survey (FCPS): Assessing the Importance of Multiple Factors on College Students' Food Choices. *Eval Health Prof.* 2017;40(4):425-449. doi:10.1177/0163278717735872
13. Treiber J, Martinez N, Thao K, Pannu J, Cassady D. Evaluation of a Pilot Nutrition Education Program Delivered by Hmong Community Health Workers (CHWs). undefined. Published online 2016. Accessed February 25, 2022. <https://www.semanticscholar.org/paper/Evaluation-of-a-Pilot-Nutrition-Education-Program-Treiber-Martinez/1d327ee4c7ee7d3e52ff535e2bb4bea3f45829e5>
14. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: What are the risk factors? *J Hunger Environ Nutr.* 2018;13(1):1-18. doi:10.1080/19320248.2017.1374901
15. El Zein A, Mathews AE, House L, Shelnett KP. Why Are Hungry College Students Not Seeking Help? Predictors of and Barriers to Using an On-Campus Food Pantry. *Nutrients.* 2018;10(9):1163. doi:10.3390/nu10091163
16. Stebleton MJ, Lee CK, Diamond KK. Understanding the Food Insecurity Experiences of College Students: A Qualitative Inquiry. *Rev High Educ.* 2020;43(3):727-752. doi:10.1353/rhe.2020.0005
17. Barber PH, Shapiro C, Jacobs MS, et al. Disparities in Remote Learning Faced by First-Generation and Underrepresented Minority Students during COVID-19: Insights and Opportunities from a Remote Research Experience. *J Microbiol Biol Educ.* Published online March 31, 2021. doi:10.1128/jmbe.v22i1.2457
18. Tallant A. Full article: First-Year College Students Increase Food Label-Reading Behaviors and Improve Food Choices in a Personal Nutrition Seminar Course. Accessed January 20, 2022. <https://www.tandfonline.com/doi/full/10.1080/19325037.2017.1343160>

19. Knol LL, Robb CA, McKinley EM, Wood M. Very Low Food Security Status is Related to Lower Cooking Self-Efficacy and Less Frequent Food Preparation Behaviors Among College Students. *J Nutr Educ Behav.* 2019;51(3):357-363. doi:10.1016/j.jneb.2018.10.009
20. Florence MD, Asbridge M, Veugelers PJ. Diet Quality and Academic Performance*. *J Sch Health.* 2008;78(4):209-215. doi:10.1111/j.1746-1561.2008.00288.x
21. Zottarelli LK, Moreno A, Miranda A, Xu X, Sunil TS. Basic Needs Initiatives at Texas Community College Hispanic-Serving Institutions: Changes in Service Offerings during the Covid-19 Pandemic. *Community Coll J Res Pract.* 2022;46(1-2):138-144. doi:10.1080/10668926.2021.1973611
22. BASIC NEEDS UPDATE | Aggie Compass Basic Needs Center. Accessed January 23, 2022. <https://aggiecompass.ucdavis.edu/news/covid-19-update>
23. Werdmuller D. Higher Education Emergency Relief Funds. *Financial Aid and Scholarships.* Published April 2, 2021. Accessed December 29, 2021. <https://financialaid.ucdavis.edu/heerf>
24. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. *Int J Consum Stud.* 2014;38(4):374-384. doi:10.1111/ijcs.12110
25. Goldrick-Rab S. *Paying the Price: College Costs, Financial Aid, and the Betrayal of the American Dream.* University of Chicago Press; 2016.
26. Deng L. The Pathway to Success: Facilitating First-Generation Student Learning in Academic Libraries Through Cross-Campus Collaborations. *J Libr Adm.* 2022;62(1):1-18. doi:10.1080/01930826.2021.2006975
27. A Rising Share of Undergraduates Are From Poor Families. *Pew Research Center's Social & Demographic Trends Project.* Published May 22, 2019. Accessed August 23, 2021.

<https://www.pewresearch.org/social-trends/2019/05/22/a-rising-share-of-undergraduates-are-from-poor-families-especially-at-less-selective-colleges/>

28. Bill Text - SB-106 Budget Act of 2019. Accessed January 18, 2022.

https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB106

29. Bill Text - SB-173 CalFresh: postsecondary student eligibility: workstudy. Accessed October 10, 2020.

https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB173&search_keywords=snap

30. Senate Bill 77 Calfresh Student Data Report. :14.

31. Bill Text - AB-2152 CalFresh: able-bodied adults without dependents. Accessed October 10, 2020.

https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2152

Appendices

Appendix 1. Winter 2020 Questionnaire

Start of Block: Consent to Participate

Thank you for taking the UC Davis Food Security and Food Access Programs Questionnaire.

This survey was created to determine the barriers in using food access programs and levels of food security at UC Davis. Your responses to the questions below will help to inform ways to overcome these barriers and improve food access program use for the many groups in our campus community.

To participate in this research, please provide your student ID number below (SID). Your response is completely voluntary, and all answers will be kept confidential. Your SID will only be used for demographic information and academic data (such as class level and GPA), which will help to improve understanding of the effects of food security and food access program barriers at UC Davis. Researchers will only use your SID for this information and your name will never become available to researchers.

As a participant in this study, you have the right to request a copy of this consent document. If you change your mind about participating in this study, you may withdraw your consent by contacting the research team and requesting to not be a part of the study.

Providing your SID will not affect your ability to use any food access program now or in the future. It will not impact your academic standing in any way at UC Davis. All responses are anonymous and completely voluntary.

If you have any questions or concerns, please feel free to contact Britt Robinson at brobinson@ucdavis.edu. The Principal Investigator for this study, Dr. Rachel Scherr, can also be contacted at rescherr@ucdavis.edu or (530) 752-3817.

By providing my student ID number, I consent to participate in this research. I understand that my responses will be kept anonymous and that all information gained from this research will only be used to assess food security and food resource program use at UC Davis. I understand that my responses will not impact my academic standing or my ability to use food access programs now or in the future. I understand that by participating in this research, I may be contacted to participate in optional future research that is related to this research.

End of Block: Consent to Participate

Start of Block: USDA Food Security Module



FSS In the last year, did you ever run short of money and try to make your food or your food money go further?

- Yes
 - No
-



HH1 Which of these statements best describes the food eaten in your household?

- Enough of the kinds of food I want to eat.
 - Enough but not always the kinds of food I want to eat.
 - Sometimes not enough to eat.
 - Often not enough to eat.
-



HH2 Consider the statement: "I worry whether food will run out before I get money to buy more."

In the last year, was this often true, sometimes true or never true for you?

- Often true
- Sometimes true
- Never true



HH3 Consider the statement: "The food that I bought just didn't last, and I didn't have money to get more."

In the last year, was this often true, sometimes true or never true for you?

- Often true
- Sometimes true
- Never true



HH4 Consider the statement: "I couldn't afford to eat balanced meals."

In the last year, was this often true, sometimes true or never true for you?

- Often true
- Sometimes true
- Never true
- Not sure



AD1 In the last year, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No
- Not sure

Display This Question:

If In the last year, did you ever cut the size of your meals or skip meals because there wasn't enou... = 1



AD1a How often did you cut the size of your meals? Choose one option below.

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- Not sure



AD2 In the last year, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- Not sure



AD3 In the last year, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
 - No
 - Not sure
-



AD4 In the last year, did you lose weight because there wasn't enough money for food?

- Yes
 - No
 - Not sure
-



AD5 In the last year, did you ever not eat for a whole day because there wasn't enough money for food?

- Yes
 - No
 - Not sure
-

Display This Question:

If In the last year, did you ever not eat for a whole day because there wasn't enough money for food? = 1



AD5a How often did you not eat for a whole day because there wasn't enough money for food?

- Almost every month
- Some months but not every month
- Only 1 or 2 months

End of Block: USDA Food Security Module

Start of Block: Food Choices

ChoiceMotiv Which of the following do you consider when choosing the foods you eat? Drag and drop into one of the following categories.

I consider this
_____ I choose foods that look the most appealing.
_____ I choose foods that taste best.
_____ I choose foods based on their nutritional value.
_____ I choose convenient foods that save time.
_____ I choose low-cost foods to save money.
_____ I purchase foods based on meal planning.
_____ I eat the foods that I grew up eating.
_____ I choose foods based on personal dietary restrictions, such as religious beliefs, allergies, or food intolerances.
_____ Other (please specify):

Skip To: ChoiceNut If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 2 [0]

Skip To: ChoiceMyPlate If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 2 [0]

Skip To: OtherPrepMeal If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 3 [0]

Skip To: EatOut If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 3 [0]

Skip To: SelfPrepMeal If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 5 [0]

Display This Question:

If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 2 [0]



ChoiceNut Which, if any, of the following do you consider when choosing food? (Choose all that apply)

- Added Sugar
- Total Sugar
- Total Calories
- Saturated Fat
- Whole Grain Content
- Whether foods are fresh or processed
- Vitamin and Mineral Content
- Protein
- Sodium
- Other (please specify): _____
- None of the Above
- Prefer not to Answer

Display This Question:

If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 2 [0]



ChoiceMyPlate Do you consider the recommendations of the USDA's MyPlate when cooking or eating outside of home?

- Yes
- No
- I'm not familiar with MyPlate
- Prefer not to answer

Display This Question:

If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 3 [0]



OtherPrepMeal How often do you eat meals that you didn't prepare yourself?

- Never
 - Less than once per week
 - 1-2 times per week
 - 3-4 times per week
 - 5-7 times per week
 - At least once a day
 - I eat out for most of my meals
 - Prefer not to answer
-

Display This Question:

If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 3 [0]



EatOut When you eat out, where do you go most often?

- Fast food restaurants
- Friend's house
- A restaurant with counter service (like Chipotle or Panera)
- I sit down in a restaurant with table service
- Prefer not to answer

Display This Question:

If Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 3 [0]

Or Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 4 [0]

Or Which of the following do you consider when choosing the foods you eat? Drag and drop into one o... = 5 [0]



SelfPrepMeal How often do you prepare your own meals?

- Never
 - Less than once per week
 - 1-2 times per week
 - 3-4 times per week
 - 5-7 times per week
 - At least once per day
 - I prepare most of my own food
 - Prefer not to answer
-



EatingChanged Since starting at UC Davis, has your eating pattern changed?

- No, I eat the same foods that I always have.
 - Yes, my eating pattern has changed somewhat.
 - Yes, my eating pattern has changed a lot.
 - Other (please explain) _____
 - I'm not sure
 - Prefer not to answer
-



ChoiceResources Which, if any, of the following resources do you use when making food choices (choose all that apply):

- MyPlate
- Nutrition Facts Label
- Social media platforms like Instagram, Snapchat, Twitter, YouTube, or Facebook (please specify): _____
- Food-tracking apps (please specify):

- Doctor Recommendations
- Personal recommendation from a friend or family member
- Other (please specify): _____
- Prefer not to answer

End of Block: Food Choices

Start of Block: SSB Questions

Q59 Answer in times per day, week, or month for the next 2 questions: for example, twice a day, once a week, etc.



SodaIntake a. During the past 30 days, how often did you drink regular soda or pop that contains sugar?
Do not include diet soda or diet pop.

Answer using only one box:

- _____
- _____
- _____



FruitDrinkIntake b. During the past 30 days, how often did you drink sugar-sweetened fruit drinks (such as Kool-aid™ and lemonade), sweet tea, and sports or energy drinks (such as Gatorade™ and RedBull™)? Do not include 100% juice, diet drinks, or artificially sweetened drinks. Answer using only one box:

- _____
- _____
- _____



WaterIntake Yesterday, how many glasses of water did you drink at school, home, and everywhere else?
Count one cup as one glass and count one bottle of water as two glasses. Count only a few sips, like from a water fountain, as less than one glass. Your best guess is fine.

Include tap water, like from a sink, faucet, fountain, or pitcher, and bottled water like Aquafina®. Do not include flavored sweetened water.

- _____

End of Block: SSB Questions

Start of Block: Knowledge/Awareness



ResourceUse Have you ever used any of the following food access resources on UC Davis campus?

- Aggie Compass
- The Pantry
- Fruit and Veggie Up
- GSA Pantry
- No
- Not sure
- Prefer not to answer



What is CalFresh in California, what is the government program that provides money for groceries every month? Choose all that apply.

- Food Stamps
- EBT (Electronic Benefits Transfer)
- SNAP (Supplemental Nutrition Assistance Program)
- CalFresh
- There is no government program in California that provides money for groceries every month.
- Other (please specify): _____
- Not sure (if not sure, do not select any other option)

In California, the program that provides money for groceries monthly is called CalFresh.

CalFresh, known federally as the Supplemental Nutrition Assistance Program or SNAP, is the largest food program in California, which provides monthly food benefits to individuals and families with low-income.

CalFresh is federally mandated and in California, is state-supervised and county-operated. The amount of benefits a household receives is dependent on household size, countable income, and monthly expenses, such as housing and utilities.

The program issues monthly benefits on an Electronic Benefit Transfer (EBT) card. Food may be purchased at any grocery store or farmers' market that accepts EBT cards.



CFAds Have you seen advertisements for CalFresh placed around campus or on a UC Davis website?

Yes

No

Not Sure

Prefer not to answer

Display This Question:

If Have you seen advertisements for CalFresh placed around campus or on a UC Davis website? = 1



WhereCFAds Where have you seen advertisements for CalFresh placed around campus or on a UC Davis website?

Student Community Center (SCC)

Memorial Union (MU)

Silo

Academic/Classroom buildings

Email notification

Other (please specify): _____



EverReceiveCF Have you EVER received CalFresh benefits?

- Yes
- No
- Not sure
- Prefer not to answer

Skip To: AtUCDUseCF If Have you EVER received CalFresh benefits? = 1

Skip To: OtherEverUseCF If Have you EVER received CalFresh benefits? = 2

Skip To: OtherEverUseCF If Have you EVER received CalFresh benefits? = 3

Display This Question:

If Have you EVER received CalFresh benefits? = 1

Or Have you EVER received CalFresh benefits? = 3



AtUCDUseCF Have you received CalFresh benefits at any time between when you started attending UC Davis to now?

- Yes
- No
- Not Sure
- Prefer not to answer

Skip To: SelfNowUseCF If Have you received CalFresh benefits at any time between when you started attending UC Davis to now? = 1

Display This Question:

If Have you EVER received CalFresh benefits? = 1

Or Have you EVER received CalFresh benefits? = 3



SelfNowUseCF Are you CURRENTLY receiving CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



OtherEverUseCF Do you know someone other than yourself who has EVER received CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer

Skip To: OtherNowUseCF If Do you know someone other than yourself who has EVER received CalFresh benefits? = 1

Skip To: OtherLiveWithCF If Do you know someone other than yourself who has EVER received CalFresh benefits? = 1

Display This Question:

If Do you know someone other than yourself who has EVER received CalFresh benefits? = 1

Or Do you know someone other than yourself who has EVER received CalFresh benefits? = 3



OtherNowUseCF Do you know anyone other than yourself who is CURRENTLY using CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer

Display This Question:

If Do you know someone other than yourself who has EVER received CalFresh benefits? = 1

Or Do you know someone other than yourself who has EVER received CalFresh benefits? = 3



OtherLiveWithCF Is anyone you live with now (roommates, housemates family members, or any other individuals other than yourself) CURRENTLY receiving CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



KnowPurchaseable Do you know what can be purchased with CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



KnowNotPurchase Do you know what can't be purchased with CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer

Display This Question:

- If Do you know what can be purchased with CalFresh benefits? = 1
- Or Do you know what can be purchased with CalFresh benefits? = 3
- Or Do you know what can't be purchased with CalFresh benefits? = 1
- Or Do you know what can't be purchased with CalFresh benefits? = 3

SelectPurchaseable Please sort the food examples below into categories of what can be purchased with CalFresh benefits and what can't be purchased with CalFresh benefits.

Can be purchased with CalFresh benefits

_____ Fresh fruits and vegetables

_____ Frozen foods

- _____ Pantry staples (like bread, pasta and dried beans)
- _____ Soda and other sugar-sweetened beverages.
- _____ Prepared deli foods (like sandwiches, paninis, or burritos)
- _____ Household products (like paper towels and diapers)
- _____ Tobacco products
- _____ Alcohol



SelfEverApplyCF Have you ever applied for CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



SelfEligible Are you currently eligible to receive CalFresh benefits?

- Yes, and I receive CalFresh benefits
- Yes, but I do not receive CalFresh benefits
- No, I am not eligible to receive CalFresh benefits
- Not Sure
- Prefer not to answer

Display This Question:

- If Are you currently eligible to receive CalFresh benefits? = 2
- Or Are you currently eligible to receive CalFresh benefits? = 3
- Or Are you currently eligible to receive CalFresh benefits? = 4



WanttoParticipate If you are eligible to receive CalFresh benefits but do not receive them, would you like to participate in CalFresh?

- Yes
- No
- Not Sure
- Prefer not to answer

WhyWanttoPartCF Why or why not? Please share below.

End of Block: Knowledge/Awareness

Start of Block: Perceptions



RectoOthers Would you recommend CalFresh to others?

- Yes
- No
- Not Sure
- Prefer not to answer

WhyRecCFtoOthers Why or why not? Please share below.

L_ How much do you agree or disagree with the following statements about CalFresh?

	Disagree	Neither Agree nor Disagree	Agree	Not Sure
My tax dollars help fund the CalFresh program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh helps people in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh helps people who are considered low-income.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh helps local businesses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh provides food to children.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh provides food to college students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh provides food to families.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh provides food to immigrants who are undocumented.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalFresh benefits are a form of welfare.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Have you EVER received CalFresh benefits? = 1

Or Are you CURRENTLY receiving CalFresh benefits? = 1



L Thinking about times that you have used CalFresh, how much do you agree or disagree with the following statements about USING CalFresh to purchase foods?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat agree	Strongly agree	Prefer not to answer
I have felt glad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt grateful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt guilty.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt less stressed about purchasing foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt negatively judged by other people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have been able to purchase more food than I could without the benefits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt ashamed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt confident that I can purchase healthier foods than I could without the benefits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt embarrassed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have felt relieved.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Have you EVER received CalFresh benefits? = 1

Or Are you CURRENTLY receiving CalFresh benefits? = 1

CFPartOpinion If you have any other opinions about USING CalFresh benefits, please share below.

Display This Question:

If Have you EVER received CalFresh benefits? = 2

Or Have you EVER received CalFresh benefits? = 3

Or Are you CURRENTLY receiving CalFresh benefits? = 2

Or Are you CURRENTLY receiving CalFresh benefits? = 3



Q29 How much do you agree or disagree with the following statements about OTHERS using CalFresh?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Prefer not to answer
I feel pity for them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel frustrated that I am working to support another person with my taxes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel glad for them because they are receiving the benefits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Have you EVER received CalFresh benefits? = 2

Or Have you EVER received CalFresh benefits? = 3

Or Are you CURRENTLY receiving CalFresh benefits? = 2

Or Are you CURRENTLY receiving CalFresh benefits? = 3

CFOtherOpinion If you have any other opinions about OTHERS using CalFresh benefits, please share below.

Display This Question:

If Have you EVER received CalFresh benefits? = 2



Q31 If you have NOT used CalFresh benefits, how much do you agree or disagree with the following statements about CalFresh?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Prefer not to answer
I feel fortunate that I don't need CalFresh benefits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't like that I'm not eligible to receive CalFresh benefits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am glad that I contribute to CalFresh with my tax dollars.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel people who use CalFresh benefits should purchase food with their own money instead.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel many people use CalFresh benefits when they don't need them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Have you EVER received CalFresh benefits? = 2

CFNonPartOpinion If you have NOT used CalFresh benefits, and you have any other opinions about CalFresh, please share below.

End of Block: Perceptions

Start of Block: Student concerns



FirstGen Are you a first-generation college student? (A first-generation college student is one whose parents or guardians in their household have not completed a 4-year college degree)

- Yes
 - No
 - Not Sure
 - Prefer not to answer
-

Q34 Have any of the following major life events occurred since coming to UC Davis?

	Yes, this happened recently	Yes, this happened a while ago	No, this hasn't happened
Relationship beginning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relationship ending	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Marriage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Divorce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Romantic partner stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Death of someone close to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Roommate/housemate arguments or concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal health concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health concerns of someone close to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gender identity development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Academic struggles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employment stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Family issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



StressExams Have you had any exams, papers, projects, or other deadlines recently that were more stressful than usual?

- Yes
- No
- Not Sure
- Prefer not to answer



NonacademicStress Have you had projects or deadlines outside of school (work, internships, clubs, sports, etc.) that were more stressful than usual?

- Yes
- No
- Not Sure
- Prefer not to answer

End of Block: Student concerns

Start of Block: Finances



Q37 Do you currently receive, or have you received, the following types of Financial Aid?

	Yes, I currently receive this aid.	Yes, I received this aid in the past.	No, I have never received this aid.	Prefer not to answer
Pell Grant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CalGrant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Subsidized Government Student Loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unsubsidized Government Student Loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Private Loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UC Blue and Gold Opportunity Grant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scholarships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work-Study	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

RecOtherFinAid If you received any other Financial Aid not listed above, please share below.

Display This Question:

If Do you currently receive, or have you received, the following types of Financial Aid? = 3 [1]

Or Do you currently receive, or have you received, the following types of Financial Aid? = 3 [2]

Or Do you currently receive, or have you received, the following types of Financial Aid? = 4 [1]

Or Do you currently receive, or have you received, the following types of Financial Aid? = 4 [2]

Or Do you currently receive, or have you received, the following types of Financial Aid? = 5 [1]

Or Do you currently receive, or have you received, the following types of Financial Aid? = 5 [2]



RepaymentStress Is repayment of your student loans a stressor?

Yes

No

Prefer not to answer



CreditAccounts Do you have one or more credit cards/credit accounts (can include car loans) that you pay for?

Yes

No

Prefer not to answer



Display This Question:

If Do you have one or more credit cards/credit accounts (can include car loans) that you pay for? = 1



NumberCreditAccts How many credit cards/credit accounts do you have?

- 0
- 1
- 2
- 3
- 4
- 5+
- Prefer not to answer

Display This Question:

If Do you have one or more credit cards/credit accounts (can include car loans) that you pay for? = 1



CreditPayment Regarding your credit cards/credit accounts, select the option that best describes how you typically pay your credit bill(s) each billing period.

- I am unable to pay the minimum payment amount each billing period.
- I pay the minimum payment amount each billing period.
- I pay more than the minimum payment but less than the full balance each billing period.
- I pay the balance of my account in full by the end of each billing period.
- I do not pay for my accounts, someone else pays for my accounts.
- Prefer not to answer



FinSupportOther Do you receive financial support from someone other than Financial Aid (for example, a family member or friend)?

- Yes
 - No
 - Not Sure
 - Prefer not to answer
-



UnpaidJob Do you currently have one or more UNPAID jobs or internships?

- Yes
 - No
 - Prefer not to answer
-

Display This Question:

If Do you currently have one or more UNPAID jobs or internships? = 1

HrsUnpaid About how many hours do you work each week at all of your UNPAID jobs or internships in total?



PaidJob Do you currently have one or more PAID jobs or internships?

- Yes
- No
- Prefer not to answer

Display This Question:

If Do you currently have one or more PAID jobs or internships? = 1

HrsPaid About how many hours do you work each week at all of your PAID jobs or internships in total?

Display This Question:

If Do you currently have one or more PAID jobs or internships? = 1

Or Do you currently have one or more PAID jobs or internships? = 99



EmplmntRsn What are your reasons for being employed? Select all that apply.

- To pay for housing expenses, such as rent
- To pay for living expenses, such as groceries
- To pay for utility expenses, such as electricity and/or internet
- To pay for transportation expenses, such as bus or vehicle costs
- To pay for personal expenses, such as clothing
- To pay for social expenses, such as outings to restaurants or out-of-town trips
- To pay for educational expenses, such as tuition, fees, or textbooks
- To save for the future
- Other (please specify): _____
- Prefer not to answer

End of Block: Finances

Appendix 2. Spring 2020 Questionnaire

Start of Block: Consent to Participate

Thank you for taking the UC Davis Food Security and Stress Questionnaire.

This survey was created to evaluate relationships between perceived stress and food security at UC Davis.

You are being invited to participate in this project because you previously provided consent to be contacted to participate in research related to the UC Davis Food Security and Food Access Programs Questionnaire. To participate in this research, please provide your student ID number below (SID). Your response is completely voluntary, and all answers will be kept confidential. By providing your SID, you consent to allow responses from the current questionnaire to be combined with your previously collected data. Researchers will only use your SID for this information and your name will never become available to researchers. As a participant in this study, you have the right to request a copy of this consent document. If you change your mind about participating in this study, you may withdraw your consent by contacting the research team and requesting to not be a part of the study. Providing your SID will not impact your academic standing in any way at UC Davis. All responses are anonymous and completely voluntary. If you have any questions or concerns, please feel free to contact Britt Loofbourrow at bloof@ucdavis.edu. The Principal Investigator for this study, Dr. Rachel Scherr, can also be contacted at rescherr@ucdavis.edu or (530) 752-3817.

By providing my student ID number, I consent to participate in this research. I understand that my responses will be kept anonymous and that all information gained from this research will only be used to assess food security and perceived stress at UC Davis. I understand that my responses will not impact my academic standing.

End of Block: Consent to Participate

Start of Block: USDA Food Security Module



FSPSS_1_HH1 Which of these statements best describes the food eaten in your household?

- Enough of the kinds of food I want to eat.
 - Enough but not always the kinds of food I want to eat.
 - Sometimes not enough to eat.
 - Often not enough to eat.
 - Prefer not to answer
-



FSPSS_1_HH2 Consider the statement: "I worry whether food will run out before I get money to buy more."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Prefer not to answer
-



FSPSS_1_HH3 Consider the statement: "The food that I bought just didn't last, and I didn't have money to get more."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Prefer not to answer
-



FSPSS_1_HH4 Consider the statement: "I couldn't afford to eat balanced meals."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Not sure
 - Prefer not to answer
-



FSPSS_1_AD1 In the last month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No
- Not sure
- Prefer not to answer

Display This Question:

If In the last month, did you ever cut the size of your meals or skip meals because there wasn't eno... = 1



FSPSS_1_AD1a How often did you cut the size of your meals? Choose one option below.

- Days cutting meal size (please specify):

- Not sure
- Prefer not to answer



FSPSS_1_AD2 In the last month, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSS_1_AD3 In the last month, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSS_1_AD4 In the last month, did you lose weight because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSS_1_AD5 In the last month, did you ever not eat for a whole day because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-

Display This Question:

If In the last month, did you ever not eat for a whole day because there wasn't enough money for food? = 1



FSPSS_1_AD5a How often did you not eat for a whole day because there wasn't enough money for food?

- Days without eating (please specify): _____
- Not Sure
- Prefer not to answer

End of Block: USDA Food Security Module

Start of Block: Block 3



FSPSS_1_RecCF Are you CURRENTLY receiving CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



FSPSS_1_OtherRecCF Do you know anyone other than yourself who is CURRENTLY using CalFresh benefits?

- Yes
- No
- Not Sure
- Prefer not to answer



FSPSS_1_Resources In the past 2 weeks, have you used any of the following food access resources?

- Aggie Compass at UC Davis
- The Pantry at UC Davis
- Fruit and Veggie Up at UC Davis
- GSA Pantry at UC Davis
- Other resources (please specify):

-
- No
 - Not sure
 - Prefer not to answer



FSPSS_1_PSS The questions in this scale ask you about your feelings and thoughts during the past month. In each case, please indicate your response by clicking the circle representing how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
How often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that you could not cope with all the things you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often have you been angered because things were outside your control?

How often have you felt difficulties were piling up so high that you could not overcome them?

End of Block: Perceived Stress Scale

Appendix 3. Fall 2020 Questionnaire

Start of Block: Consent to Participate

Thank you for taking the UC Davis Food Security, Stress, and COVID-19 Questionnaire.

This survey was created to evaluate relationships between perceived stress, food security, and lifestyle changes due to COVID-19 at UC Davis.

You are being invited to participate in this project because you previously provided consent to be contacted to participate in research related to the UC Davis Food Security and Food Access Programs Questionnaire. To participate in this research, please provide your student ID number below (SID). Your response is completely voluntary, and all answers will be kept confidential. By providing your SID, you consent to allow responses from the current questionnaire to be combined with your previously collected data. Researchers will only use your SID for this information and your name will never become available to researchers. As a participant in this study, you have the right to request a copy of this consent document. If you change your mind about participating in this study, you may withdraw your consent by contacting the research team and requesting to not be a part of the study. Providing your SID will not impact your academic standing in any way at UC Davis. All responses are anonymous and completely voluntary. If you have any questions or concerns, please feel free to contact Britt Loofbourrow at bloof@ucdavis.edu. The Principal Investigator for this study, Dr. Rachel Scherr, can also be contacted at rescherr@ucdavis.edu or (530) 752-3817.

By providing my student ID number, I consent to participate in this research. I understand that my responses will be kept anonymous and that all information gained from this research will only be used to assess food security and perceived stress at UC Davis. I understand that my responses will not impact my academic standing.

End of Block: Consent to Participate

Start of Block: USDA Food Security Module



FSPSSCOVID_1_HH1 Which of these statements best describes the food eaten in your household?

- a. Enough of the kinds of food I want to eat.
 - b. Enough but not always the kinds of food I want to eat.
 - c. Sometimes not enough to eat.
 - d. Often not enough to eat.
 - e. Prefer not to answer
-



FSPSSCOVID_1_HH2 Consider the statement: "I worry whether food will run out before I get money to buy more."

In the last month, was this often true, sometimes true or never true for you?

- f. Often true
 - g. Sometimes true
 - h. Never true
 - i. Prefer not to answer
-



FSPSSCOVID_1_HH3 Consider the statement: "The food that I bought just didn't last, and I didn't have money to get more."

In the last month, was this often true, sometimes true or never true for you?

- j. Often true
 - k. Sometimes true
 - l. Never true
 - m. Prefer not to answer
-



FSPSSCOVID_1_HH4 Consider the statement: "I couldn't afford to eat balanced meals."

In the last month, was this often true, sometimes true or never true for you?

- n. Often true
- o. Sometimes true
- p. Never true
- q. Not sure
- r. Prefer not to answer



FSPSSCOVID_1_AD1 In the last month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- s. Yes
- t. No
- u. Not sure
- v. Prefer not to answer

Display This Question:

If in the last month, did you ever cut the size of your meals or skip meals because there wasn't eno... = 1



FSPSSCOVID_1_AD1a How often did you cut the size of your meals? Choose one option below.

- w. Days cutting meal size (please specify): _____
- x. Not sure
- y. Prefer not to answer



FSPSSCOVID_1_AD2 In the last month, did you ever eat less than you felt you should because there wasn't enough money for food?

- z. Yes
- aa. No
- bb. Not sure
- cc. Prefer not to answer



FSPSSCOVID_1_AD3 In the last month, were you ever hungry but didn't eat because there wasn't enough money for food?

- dd. Yes
- ee. No
- ff. Not sure
- gg. Prefer not to answer



FSPSSCOVID_1_AD4 In the last month, did you lose weight because there wasn't enough money for food?

- hh. Yes
- ii. No
- jj. Not sure
- kk. Prefer not to answer



FSPSSCOVID_1_AD5 In the last month, did you ever not eat for a whole day because there wasn't enough money for food?

- ll. Yes
- mm. No
- nn. Not sure
- oo. Prefer not to answer

Display This Question:

If In the last month, did you ever not eat for a whole day because there wasn't enough money for food? = 1



FSPSSCOVID_1_AD5a How often did you not eat for a whole day because there wasn't enough money for food?

pp. Days without eating (please specify): _____

qq. Not Sure

rr. Prefer not to answer

End of Block: USDA Food Security Module

Start of Block: Block 3



FSPSSCOVID_1_RecCF Are you CURRENTLY receiving CalFresh benefits?

ss. Yes

tt. No

uu. Not Sure

vv. Prefer not to answer



FSPSSCOVID_1_OtherRe Do you know anyone other than yourself who is CURRENTLY using CalFresh benefits?

ww. Yes

xx. No

yy. Not Sure

zz. Prefer not to answer



FSPSSCOVID_1_Resourc In the past 2 weeks, have you used any of the following food access resources?

- a. Aggie Compass at UC Davis
- b. The Pantry at UC Davis
- c. Fruit and Veggie Up at UC Davis
- d. GSA Pantry at UC Davis
- e. Other resources (please specify): _____
- f. No
- g. Not sure
- h. Prefer not to answer

End of Block: Block 3

Start of Block: COVID-19 Lifestyle Impacts

Display This Question:

If In the past 2 weeks, have you used any of the following food access resources? = 1

Or In the past 2 weeks, have you used any of the following food access resources? = 2

Or In the past 2 weeks, have you used any of the following food access resources? = 3

Or In the past 2 weeks, have you used any of the following food access resources? = 4

Or In the past 2 weeks, have you used any of the following food access resources? = 5

Or Or In the past 2 weeks, have you used any of the following food access resources? Other resources (please specify): Is Not Empty

Or In the past 2 weeks, have you used any of the following food access resources? = 0

Or In the past 2 weeks, have you used any of the following food access resources? = 99



FSPSSCOVID_Pantr How much do you agree with the following statements about using a food pantry/food bank (like the ASUCD Pantry) during the COVID-19 outbreak (March 11th until now)?

	Disagree	Neither Agree nor Disagree	Agree	Not Applicable	Prefer not to Answer
The food offered has been very helpful for me					
They do not have food that I like to eat					
They do not have good quality food					
They give me foods that I don't know how to prepare					
They run out of food often					
Their hours are inconvenient					
There are long lines / long wait time					
Other comments about using food pantries during the COVID-19 outbreak (please specify):					



FSPSSCOVID_GetFood Which of the following places did you use to get food in the quarter before (Winter 2020) and since the COVID-19 outbreak (March 11th until now)? Check all that apply.

I obtained food here before the outbreak	I've obtained food here since the outbreak	Not Applicable	Prefer not to Answer
--	--	----------------	----------------------

Store: Grocery store, supermarket, large bulk stores

Store: Convenience store, corner store

Store: Specialty store (ethnic market, co-op, health food store)

Delivery: Grocery (like Amazon or Instacart)

Delivery: Meal kit (like Blue Apron)

Restaurant or cafeteria: To-go (delivery, take-out, curbside pickup)

Restaurant or cafeteria: Eat-in

Programs that offer food: On campus (ASUCD Pantry, GSA Pantry, Fruit and Veggie Up!)

Programs that offer food: Off campus (Yolo Food Bank, place of worship)

Local: Farmer's market

Local: Direct from farm (community supported agriculture (CSA), farm stand pickup/delivery)

Local: Garden, fishing, foraging, hunting, or using my own canned goods

Other (specify)



FSPSSCOVID_GetFood_2 Which of the following places did you use to get food in the quarter before (Winter 2020) and since the COVID-19 outbreak (March 11th until now)? Check all that apply.

	I obtained food here before the outbreak	I've obtained food here since the outbreak	Not Applicable	Prefer not to Answer
--	--	--	----------------	----------------------

Store: Grocery store, supermarket, large bulk stores

Store: Convenience store, corner store

Store: Specialty store (ethnic market, co-op, health food store)

Delivery: Grocery (like Amazon or Instacart)

Delivery: Meal kit (like Blue Apron)

Restaurant or cafeteria: To-go (delivery, take-out, curbside pickup)

Restaurant or cafeteria: Eat-in

Programs that offer food: On campus (ASUCD Pantry, GSA Pantry, Fruit and Veggie Up!)

Programs that offer food: Off campus (Yolo Food Bank, place of worship)

Local: Farmer's market

Local: Direct from farm (community supported agriculture (CSA), farm stand pickup/delivery)

Local: Garden, fishing, foraging, hunting, or using my own canned goods

Other (specify)



FSPSSCOVID_GetFood3 Which of the following places did you use to get food in the quarter before (Winter 2020) and since the COVID-19 outbreak (March 11th until now)? Check all that apply.

	I obtained food here before the outbreak	I've obtained food here since the outbreak	Not Applicable	Prefer not to Answer
--	--	--	----------------	----------------------

Store: Grocery store, supermarket, large bulk stores

Store: Convenience store, corner store

Store: Specialty store (ethnic market, co-op, health food store)

Delivery: Grocery (like Amazon or Instacart)

Delivery: Meal kit (like Blue Apron)

Restaurant or cafeteria: To-go (delivery, take-out, curbside pickup)

Restaurant or cafeteria: Eat-in

Programs that offer food: On campus (ASUCD Pantry, GSA Pantry, Fruit and Veggie Up!)

Programs that offer food: Off campus (Yolo Food Bank, place of worship)

Local: Farmer's market

Local: Direct from farm (community supported agriculture (CSA), farm stand pickup/delivery)

Local: Garden, fishing, foraging, hunting, or using my own canned goods

Other (specify)

Display This Question:

If Are you CURRENTLY receiving CalFresh benefits? = 1

Or Are you CURRENTLY receiving CalFresh benefits? = 3

Or Are you CURRENTLY receiving CalFresh benefits? = 99



FSPSSCOVID_CFUse How much do you agree with the following statements about using CalFresh (or SNAP/Food Stamps) food benefits since the COVID-19 outbreak (March 11th until now)?

	Disagree	Neither Agree nor Disagree	Agree	Not Applicable	Prefer not to answer
Overall, CalFresh benefits are easy to use to buy foods					
CalFresh benefits are enough to meet my needs					
I can't use CalFresh benefits to pay for groceries ordered online					
I can't use my full months' worth of CalFresh benefits (because, for example, it is hard to go shopping, or stores don't have food I need)					
Any other comments about using CalFresh during the COVID-19 outbreak?					



Display This Question:

If Are you CURRENTLY receiving CalFresh benefits? = 2

Or Are you CURRENTLY receiving CalFresh benefits? = 3

Or Are you CURRENTLY receiving CalFresh benefits? = 99



FSPSSCOVID_CFBARRIER Consider your experience since the COVID-19 outbreak (March 11th until now). How much do you agree with the following statements about concerns and barriers to using food programs like CalFresh (or SNAP/Food Stamps) and food pantries (like the ASUCD Pantry)?

	Disagree	Neither Agree nor Disagree	Agree	Not Applicable	Prefer not to Answer
I am worried about the paperwork I need to share to enroll in food programs					
I don't want to rely on food programs because I value personal independence					
It is difficult for me to travel to the food program offices to apply and/or recertify					
I'm worried that I have too many personal assets (savings, car, house) to qualify for a food program					
I'm worried that using food programs will impact my financial aid package					
I'm worried people will find out that I use these programs					

FSPSSCOVID_Shopping How often did these happen to your household when getting food, EARLY in the COVID-19 outbreak (March 11th and a few weeks following)?

	Never	Sometimes	Usually	Every time	Not Applicable	Prefer not to Answer
Could not find AS MUCH food as I wanted to buy (food not in store)	aaa.	bbb.	ccc.	ddd.	eee.	fff.
Could not purchase AS MUCH food as I wanted to buy (store sold limited amount per customer)	ggg.	hhh.	iii.	jjj.	kkk.	lll.
Could not find THE TYPES of food I prefer to eat	mmm.	nnn.	ooo.	ppp.	qqq.	rrr.
Had challenges knowing where to find help or getting food	sss.	ttt.	uuu.	vvv.	www.	xxx.
Had to go to more places than usual to find the food I wanted	yyy.	zzz.	aaaa.	bbbb.	cccc.	dddd.
Had to stand too close to other people when getting food (less than six feet away)	eeee.	ffff.	gggg.	hhhh.	iiii.	jjjj.
Reduced grocery trips to avoid COVID-19 exposure	kkkk.	llll.	mmmm.	nnnn.	oooo.	pppp.



FSPSSCOVID_Shopping2 How often did these happen to your household when getting food, RECENTLY during the COVID-19 outbreak (within the last few weeks)?

	Never	Sometimes	Usually	Every time	Not Applicable	Prefer not to Answer
Could not find AS MUCH food as I wanted to buy (food not in store)	qqqq.	rrrr.	ssss.	tttt.	uuuu.	vvvv.
Could not purchase AS MUCH food as I wanted to buy (store sold limited amount per customer)	wwww.	xxxx.	yyyy.	zzzz.	aaaaa.	bbbbb.
Could not find THE TYPES of food I prefer to eat	ccccc.	ddddd.	eeeee.	fffff.	ggggg.	hhhhh.
Had challenges knowing where to find help or getting food	iiii.	jjjj.	kkkkk.	llll.	mmmmm.	nnnnn.
Had to go to more places than usual to find the food I wanted	ooooo.	ppppp.	qqqqq.	rrrrr.	sssss.	ttttt.
Had to stand too close to other people when getting food (less than six feet away)	uuuuu.	vvvvv.	wwwww.	xxxxx.	yyyyy.	zzzzz.
Reduced grocery trips to avoid COVID-19 exposure	aaaaaa.	bbbbbb.	cccccc.	dddddd.	eeeeee.	ffffff.



FSPSSCOVID_Strategie Which of the following strategies, if any, are you using now to afford food?

	Using now	Not using now	Prefer not to Answer
Accept food from friends or family	i.	j.	k.
Borrow money from friends or family	l.	m.	n.
Buy different, cheaper foods	o.	p.	q.
Buy food on credit	r.	s.	t.
Buy foods that don't go bad quickly (like pasta, beans, rice, canned foods)	u.	v.	w.
Get food from a food program (like the ASUCD Pantry)	x.	y.	z.
Stretch the food that I have by eating less	aa.	bb.	cc.
Rely more on hunting/fishing/foraging/growing my own food	dd.	ee.	ff.
Other (please specify):	gg.	hh.	ii.



FSPSSCOVID_Strategy2 Which of the following strategies, if any, are you likely to use in the future during the COVID-19 outbreak to afford food?

	Unlikely to Use in the Future	Neither Likely nor Unlikely to Use in the Future	Likely to Use in the Future	Prefer not to Answer
Accept food from friends or family	jj.	kk.	ll.	mm.
Borrow money from friends or family	nn.	oo.	pp.	qq.
Buy different, cheaper foods	rr.	ss.	tt.	uu.
Buy food on credit	vv.	ww.	xx.	yy.
Buy foods that don't go bad quickly (like pasta, beans, rice, canned foods)	zz.	aaa.	bbb.	ccc.
Get food from a food program (like the ASUCD Pantry)	ddd.	eee.	fff.	ggg.
Stretch the food that I have by eating less	hhh.	iii.	jjj.	kkk.
Rely more on hunting/fishing/foraging/growing my own food	lll.	mmm.	nnn.	ooo.
Other (please specify):	ppp.	qqq.	rrr.	sss.



FSPSSCOVID_EmpChange Due to the COVID-19 outbreak, what employment changes have you experienced?

	This happened because of the outbreak	This happened for reasons other than the outbreak	This has not happened	Not applicable	Prefer not to answer
I got a new job					
I lost my job					
I work remotely (from home or another place other than your usual workplace)					
I work fewer hours					
I work more hours					
Other (please specify):					



FSPSSCOVID_HousChang Due to the COVID-19 outbreak, what housing changes have you experienced?

	This happened because of the outbreak	This happened for reasons other than the outbreak	This has not happened	Not Applicable	Prefer not to Answer
I moved into my parent's home					
I moved into a family member's home (not parent(s))					
I moved into a friend's home					
I do not have stable or reliable housing (for example, living on the street, in a vehicle, motel, campground, or couch surfing)					
Other (please specify):					

End of Block: COVID-19 Lifestyle Impacts

Start of Block: Perceived Stress Scale



FSPSSCOVID_1_PSS The questions in this scale ask you about your feelings and thoughts during the past month. In each case, please indicate your response by clicking the circle representing how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
How often have you been upset because of something that happened unexpectedly?					
How often have you felt that you were unable to control the important things in your life?					
How often have you felt nervous and "stressed"?					
How often have you felt confident about your ability to handle your personal problems?					
How often have you felt that things were going your way?					
How often have you felt that you could not cope with all the things you had to do?					
How often have you been able to control irritations in your life?					
How have you felt that you were on top of things?					

How often have
you been
angered
because things
were outside
your control?

How often have
you felt
difficulties were
piling up so high
that you could
not overcome
them?

End of Block: Perceived Stress Scale

Appendix 4. Winter 2021 Questionnaire

Start of Block: Consent

Thank you for taking the UC Davis Food Security and Stress Questionnaire.

This survey was created to assess Food Security and Perceived Stress during Winter Quarter 2021, as well as stressors that students may have experienced during Spring Quarter 2020 and Fall Quarter 2020 at UC Davis. Your responses to the questions below will help to inform researchers of how stress may impact the many groups in our campus community. To participate in this research, please provide your student ID number below (SID). Your response is completely voluntary, and all answers will be kept confidential. Your SID will only be used for demographic information and academic data (such as class level and GPA), which will help to improve understanding of the effects of recent significant stressors. Researchers will only use your SID for this information and your name will never become available to researchers. As a participant in this study, you have the right to request a copy of this consent document. If you change your mind about participating in this study, you may withdraw your consent by contacting the research team and requesting to not be a part of the study. Providing your SID will not impact your academic standing in any way at UC Davis. All responses are anonymous and completely voluntary. If you have any questions or concerns, please feel free to contact Britt Loofbourrow at bloof@ucdavis.edu. The Principal Investigator for this study, Dr. Rachel Scherr, can also be contacted at rescherr@ucdavis.edu or (530) 752-3817.

By providing my student ID number, I consent to participate in this research. I understand that my responses will be kept anonymous and that all information gained from this research will only be used to assess the effect of stressors while at UC Davis. I understand that my responses will not impact my academic standing now or in the future. I understand that by participating in this research, I may be contacted to participate in optional future research that is related to this research.

End of Block: Consent

Start of Block: USDA Food Security Module



FSPSSStr_1_HH1 Which of these statements best describes the food eaten in your household?

- Enough of the kinds of food I want to eat.
 - Enough but not always the kinds of food I want to eat.
 - Sometimes not enough to eat.
 - Often not enough to eat.
 - Prefer not to answer
-



FSPSSStr_1_HH2 Consider the statement: "I worry whether food will run out before I get money to buy more."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Prefer not to answer
-



FSPSSStr_1_HH3 Consider the statement: "The food that I bought just didn't last, and I didn't have money to get more."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Prefer not to answer
-



FSPSSStr_1_HH4 Consider the statement: "I couldn't afford to eat balanced meals."

In the last month, was this often true, sometimes true or never true for you?

- Often true
 - Sometimes true
 - Never true
 - Not sure
 - Prefer not to answer
-



FSPSSStr_1_AD1 In the last month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No
- Not sure
- Prefer not to answer

Display This Question:

If In the last month, did you ever cut the size of your meals or skip meals because there wasn't eno... = 1



FSPSSStr_1_AD1a How often did you cut the size of your meals? Choose one option below.

- Days cutting meal size (please specify):

- Not sure
- Prefer not to answer



FSPSSStr_1_AD2 In the last month, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSSStr_1_AD3 In the last month, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSSStr_1_AD4 In the last month, did you lose weight because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-



FSPSSStr_1_AD5 In the last month, did you ever not eat for a whole day because there wasn't enough money for food?

- Yes
 - No
 - Not sure
 - Prefer not to answer
-

Display This Question:

If In the last month, did you ever not eat for a whole day because there wasn't enough money for food? = 1



FSPSSStr_1_AD5a How often did you not eat for a whole day because there wasn't enough money for food?

- Days without eating (please specify): _____
- Not Sure
- Prefer not to answer

End of Block: USDA Food Security Module

Start of Block: Perceived Stress Scale



FSPSSStr_1_PSS The questions in this scale ask you about your feelings and thoughts during the past month. In each case, please indicate your response by clicking the circle representing how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
How often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt that you could not cope with all the things you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

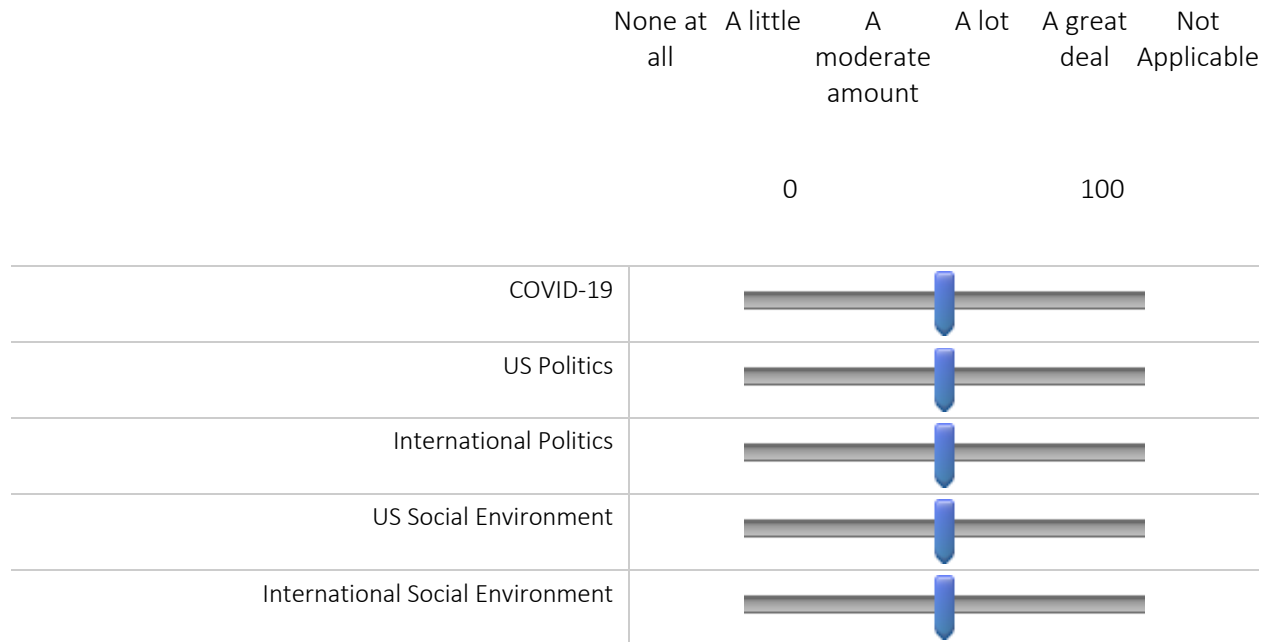
How often have you been angered because things were outside your control?

How often have you felt difficulties were piling up so high that you could not overcome them?

End of Block: Perceived Stress Scale

Start of Block: Stressors

FSPSSStr_1_StressS20 Using the following sliding scales, please indicate how much each of the following items influenced your stress during Spring Quarter 2020 (March 20 - June 11).



FSPSSStr_1_StressF20 Using the following sliding scales, please indicate how much each of the following items influenced your stress during Fall Quarter 2020 (September 30 - current date).

	None at all	A little	A moderate amount	A lot	A great deal	Not Applicable
COVID-19						
US Politics						
International Politics						
US Social Environment						
International Social Environment						

End of Block: Stressors

Start of Block: IES-6

Display This Question:

If Using the following sliding scales, please indicate how much each of the following items influenc... [1] <= 100

Or Using the following sliding scales, please indicate how much each of the following items influenc... [1] <= 100



FSPSSStr_1_IES_Cov You indicated that COVID-19 was a stressful event.

Below is a list of comments made by people after stressful life events. Please mark each item, indicating

how frequently these comments were true for you during the past seven days when considering COVID-19. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often	Prefer not to answer
I thought about it when I didn't mean to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt watchful or on-guard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other things kept making me think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried not to think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Using the following sliding scales, please indicate how much each of the following items influenc... [2] <= 100

Or Using the following sliding scales, please indicate how much each of the following items influenc... [2] <= 100



FSPSSStr_1_IES_USPol You indicated that US Politics was a stressful event.

Below is a list of comments made by people after stressful life events. Please mark each item, indicating

how frequently these comments were true for you during the past seven days when considering US Politics. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often	Prefer not to answer
I thought about it when I didn't mean to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt watchful or on-guard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other things kept making me think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried not to think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Using the following sliding scales, please indicate how much each of the following items influenc... [3] <= 100

Or Using the following sliding scales, please indicate how much each of the following items influenc... [3] <= 100



FSPSSStr_1_IES_IntPo You indicated that International Politics was a stressful event.

Below is a list of comments made by people after stressful life events. Please mark each item, indicating

how frequently these comments were true for you during the past seven days when considering International Politics. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often	Prefer not to answer
I thought about it when I didn't mean to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt watchful or on-guard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other things kept making me think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried not to think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Using the following sliding scales, please indicate how much each of the following items influenc... [4] <= 100

Or Using the following sliding scales, please indicate how much each of the following items influenc... [4] <= 100



FSPSSStr_1_IES_USSoc You indicated that the US Social Environment was a stressful event.

Below is a list of comments made by people after stressful life events. Please mark each item, indicating

how frequently these comments were true for you during the past seven days when considering the US Social Environment. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often	Prefer not to answer
I thought about it when I didn't mean to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt watchful or on-guard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other things kept making me think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried not to think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Using the following sliding scales, please indicate how much each of the following items influenc... [5] <= 100

Or Using the following sliding scales, please indicate how much each of the following items influenc... [5] <= 100



FSPSSStr_1_IES_IntSo You indicated that the International Social Environment was a stressful event.

Below is a list of comments made by people after stressful life events. Please mark each item, indicating how frequently these comments were true for you during the past seven days when considering the

International Social Environment. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often	Prefer not to answer
I thought about it when I didn't mean to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt watchful or on-guard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other things kept making me think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried not to think about it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: IES-6

Start of Block: Additional Info

FSPSSStr_1_FreeResp If you would like to add any information about the stress you experienced during Spring Quarter 2020 or Fall Quarter 2020, please indicate this below.

End of Block: Additional Info