



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



INFAS

Inter-institutional Network for
Food, Agriculture, and Sustainability

College student food security during the COVID-19 pandemic

Frankie Rafferty,^a Tania Schusler,^b and

Mariana Cecilia Valencia Mestre^{c*}

Loyola University Chicago

Submitted March 20, 2022 / Revised July 21, October 2, and October 28, 2022 /
Accepted October 28, 2022 / Published online March 16, 2023

Citation: Rafferty, F., Schusler, T., & Valencia Mestre, M. C. (2023). College student food security during the COVID-19 pandemic. *Journal of Agriculture, Food Systems, and Community Development*, 12(2), 79–96. <https://doi.org/10.5304/jafscd.2023.122.019>

Copyright © 2023 by the Authors. Published by the Lyson Center for Civic Agriculture and Food Systems. Open access under CC BY license.

Abstract

Food insecurity among college and university students has increased in the past decade. The COVID-19 pandemic has presented unique public health challenges, including increased food insecurity. In a cross-sectional survey of students at a private university in the midwestern U.S. ($N=253$) we

examined how student food security status changed during the pandemic and what relationships exist between changes in food security and various aspects of student identities. Twenty-nine percent of responding students indicated that they became less food secure during the pandemic, and the overall reported food insecurity rate increased by 130.77%. Change in respondent food security status during the pandemic was associated with household income ($p=0.000$), loss or family loss of employment because of the pandemic ($p=0.000$), receiving financial aid ($p=0.006$), individual or family infection with COVID-19 ($p=0.020$), perceived health during the pandemic ($p=0.000$), eating 4.5

^a Frankie Rafferty, Undergraduate student, School of Environmental Sustainability, Loyola University Chicago; 1032 West Sheridan Road; Chicago, IL 60660 USA; fcrafferty@gmail.com

^b Tania M. Schusler, Assistant Professor, School of Environmental Sustainability, Loyola University Chicago; 1032 West Sheridan Road; Chicago, IL 60660 USA; tschusler@luc.edu

^{c*} *Corresponding author:* Mariana C. Valencia Mestre, Lecturer, School of Environmental Sustainability, Loyola University Chicago.

Mariana C. Valencia Mestre is now Assistant Teaching Professor, Department of Marine and Environmental Sciences, Northeastern University; 360 Huntington Avenue; Boston, MA 02115 USA; m.valenciamestre@northeastern.edu

Conflicts of Interest

The authors have no conflicts of interest to disclose.

Author Note

This study was conducted as a research capstone for the School of Environmental Sustainability at Loyola University Chicago by Mx. Frankie Rafferty and their research mentor, Dr. Mariana Valencia Mestre.

cups of fruits and/or vegetables each day ($p=0.040$), race and ethnicity ($p=0.042$), first-generation in higher education ($p=0.017$), sexual orientation ($p=0.027$), and spring 2020 GPA ($p=0.003$). The results contribute to a growing body of evidence that higher education institutions, as well as state and federal governments, should increase their efforts to support students to achieve food security. In doing so, it is critical to consider the disparities in food security associated with diverse and intersecting social identities, including socio-economic class, race and ethnicity, being first in one's family to attend college, and sexual orientation. Our results further suggest the need for interventions that not only address immediate symptoms of food insecurity but also structural discrimination that makes it more difficult for members of marginalized groups to become food secure.

Keywords

Food Insecurity, Higher Education, COVID-19, Pandemic, Sexual Orientation, Retrospective Pretest-Posttest

Introduction

Food insecurity refers to the lack of consistent access, in socially acceptable ways, to an adequate and safe food supply for an active and healthy life (McArthur et al., 2018). Marginalized groups have been more likely to experience food insecurity, including single-female households with children, Black and Hispanic American households, and households with an income under 185% of the federal poverty guidelines (Maroto et al., 2015). Although reducing food insecurity has been a major priority for multiple national agencies, such as the U.S. Department of Health and Human Services and the U.S. Department of Agriculture, food insecurity in the U.S. has risen nationwide and on college campuses (Maroto et al., 2015). In the past decade, the number of college students experiencing food insecurity has increased and students from marginalized households have been more likely to experience food insecurity (Mialki et al., 2021).

The reported food insecurity rate among U.S. college students has exceeded the national average of 14% for children and adults (Coleman-Jensen et

al., 2014). One systematic review found that the student food insecurity rate prior to the pandemic averaged 32.9 % (Bruening et al., 2017), while another systematic review found an average of 43.5% (Nazmi et al., 2019). Both studies agreed that food insecurity among college students could be as high as 50%. Research conducted at two large state universities during the pandemic showed contradicting results. One study conducted in April 2020, found that 17% of students reported experiencing food insecurity at the start of the pandemic, exceeding the general population average but not the rate previously recorded at that institution (Davitt et al., 2021). In a study conducted from May to June 2020, 34.5% of the students surveyed indicated that they were food insecure (Owens et al., 2020), also exceeding the national average. (Data on food insecurity before the pandemic were not available for this university.) These studies varied in the points during the pandemic when they were conducted, the amount of time the surveys were open, and the survey items used, among other factors. Thus food insecurity rates have varied across colleges and universities; further psychometric testing of the surveys used in food security studies is needed to explain the variation (Nikolaus et al., 2020). Nonetheless, studies have been consistent in that nearly all have documented food insecurity rates among students that exceed the national average.

High food insecurity rates among college students raise concerns not only for student nutrition and physical health. Food insecurity has been associated with lower GPA (McArthur et al., 2018) and higher rates of mental health issues, unhealthy eating, and alcohol use (Bruening et al., 2016). Students report that effects of food insecurity include stress, fear of disappointing family, resentment of food-secure students, difficulty in developing meaningful social relationships, sadness, feeling hopeless or undeserving of help, academic consequences, and physical impacts like hunger and illness. A student stated that food insecurity manifests in a way that causes a feeling "that one is not worth food" (Meza et al., 2019, p. 1717).

The COVID-19 pandemic has exacerbated the effects of food insecurity, especially for marginalized groups (Morales et al., 2021) who already

experience higher food insecurity rates due to structural racism and/or other determinants such as poverty, unemployment, incarceration, and disability (Coleman-Jensen & Nord, 2013; Odoms-Young & Bruce, 2018). Recent research in two large land-grant universities has demonstrated that food security worsened during the pandemic for 17.7% (Soldavini et al., 2021) and 59.6% (Mialki et al., 2021) of students in the studies. To further understand the impact of the pandemic on student-reported food security, we investigated how changes in food security status at a private university in the midwestern U.S. during the pandemic, as compared to prior to its onset, may be associated with four categories of factors: finances, health, food access, and diverse facets of student social identities. We focused on these four categories based on the results of prior studies.

Financial factors, including household income, financial aid, and employment, can affect a college student's food security status. A study at a large, public university found that food security depended on the income of student families and that receiving financial support from parents reduced the odds of food insecurity (Payne-Sturges et al., 2018). A study at two community colleges, urban and suburban, found no association between food security and income, perhaps due to students not knowing their family household income (Maroto et al., 2015). Studies also have shown that food-insecure students receive more financial aid through their institutions (Davitt et al., 2021). The substantial rise in food insecurity has been attributed, in part, to the growing cost of higher education and the limitations of financial aid to meet basic needs (Payne-Sturges et al., 2018; Watson et al., 2017). Others have documented associations of change in food security with loss of student or family employment during the pandemic (Mialki et al., 2021; Soldavini et al., 2021).

Health factors also relate to food security status. The Center for Disease Control (CDC) recommends eating 4.5 cups of fruits and/or vegetables per day (Lee-Kwan et al., 2017); meeting this dietary requirement can serve as a modest indicator of the nutritional quality of the food consumed by students. In one study, researchers reported that few college students met CDC recommendations

for fruit, vegetable, and fiber consumption, with no difference found in nutritional intake between food-secure and food-insecure students (Davitt et al., 2021). However, other researchers have found that food-insecure students are less likely to consume the recommended quantity of fruits and vegetables (Mei et al., 2009).

Some students and/or their families may have experienced increased risk of COVID-19 because they had to continue working in-person at jobs providing essential services. Carlsten et al. (2021) reported that essential workers (e.g., health workers, protective services, office and administrative support, social services, and maintenance workers) faced the highest susceptibility to COVID-19. During the time of our study, vaccines were not available to most of the U.S. population, and a lack of safety precautions in many workplaces put economically vulnerable families at higher risk of disease (Michaels & Wagner, 2020). Students or their families who were essential workers when the vaccine was not available could have become ill more easily and thus experienced reduced food security due to loss of income and the need to isolate (Wolfson & Leung, 2020).

Prior to the pandemic, factors including living situation and transportation options were found to influence student ability to access food. Studies found that students who lived alone, with spouses/partners, or with roommates were more likely to be food insecure than students living with their parents or relatives (Maroto et al., 2015; Payne-Sturges et al., 2018). Furthermore, lack of reliable transportation was reported by students as a barrier to food access (Henry, 2017). During the pandemic, mandated shelter-in-place policies, lack of transportation, and/or fear of harassment (e.g., anti-Asian xenophobia) made accessing food more difficult for groups predisposed to be food insecure (Morales et al., 2021).

Several facets of social identity have been associated with food insecurity. In studies completed prior to the pandemic, researchers found that African American, Hispanic, and Asian students were more likely to be food insecure than White students (Cady, 2014; Maroto et al., 2015; Payne-Sturges et al., 2018). Studies conducted since the onset of COVID-19 at two large, public universi-

ties found that Black, Asian, Latine,¹ and multiracial students comprised the highest percentages of those experiencing decreased food security due to the pandemic (Mialki et al., 2021; Soldavini et al., 2021). Soldavini et al. (2021) also reported that 30.7% of students who experienced food security loss were first-generation students.

Sexual minorities have experienced disparate access to resources and greater food insecurity relative to heterosexuals (Gibbs et al., 2021), but this aspect of identity has not been commonly studied in studies of food security among students. Gibbs et al. (2021) found that twice as many people experienced in sexual interactions with the same sex were moderately to severely food insecure compared to heterosexual individuals. They hypothesized that the increased vulnerability of sexual minorities to food insecurity is a manifestation of structural discrimination and sexual stigma, which limit their access to employment opportunities, social support, and housing security—as well as increase their risk of poverty. Furthermore, non-affirming social circumstances create harmful interpersonal experiences, resulting in sexual minorities often working at lower wages in more vulnerable situations than heterosexual people. With diminished financial resources, and with housing discrimination, sexual minorities are often relegated to living in areas of food apartheid (Gibbs et al., 2021). Sexual minority students are more likely to face these socio-structural inequities and thus experience greater food insecurity.

The four groups of factors involving finances, health, food access, and social identities do not occur independently. An example of the intersection of food insecurity, race, and public health is the disproportionate impact, including high rates of job loss and COVID-19 deaths, on the U.S. Black population due to persistent underlying economic and health inequities (Gould & Wilson, 2020). Food security relates to financial, health, and food access factors, which interact with social identities and highlight the need for researchers to consider intersectionality among race, ethnicity, and other social determinants of health when studying stu-

dent food insecurity. Toward that end, we conducted a cross-sectional survey at a private university in the midwestern U.S., using a retrospective pretest–posttest design (Little et al., 2020), to assess changes in student-reported food security during the pandemic compared to prior to its onset. We examined how the changes related to financial, health, food access, and social identity factors.

Research Methods

Using Qualtrics (qualtrics.com), we distributed a cross-sectional, closed-ended, web-based survey to students attending Loyola University Chicago, a private university in the midwestern U.S. In 2018, the student population was 11,919 undergraduates (70.08%) and 5,088 graduate students; 66% of enrolled students were women and 40.2% were students of color (Office of Institutional Effectiveness, 2019). We sought to reach as many students as possible by distributing the survey through multiple channels, including the Office of the Dean of Students, academic departments, and various university programs, groups, and student clubs (Appendix). To participate, students had to be an enrolled undergraduate or graduate student and at least 18. We endeavored to include students from marginalized identity groups because studies have suggested that members of these groups are least likely to answer questionnaires but most likely to be food insecure (Leung & Tester, 2019). Therefore, we sent the questionnaire to university organizations led by and composed of students from marginalized identity groups. The survey, approved by the university Institutional Review Board, was open for three months from February 12 to May 7, 2021. Two hundred and fifty-three students completed the survey at sufficient depth to provide usable data for analysis. Following other studies (Maroto et al., 2015), we used the U.S. Department of Agriculture 10-Item Food Security Module (Economic Research Service, 2012) to measure food security, and closed-ended questions to obtain socio-demographic information, as described below.

¹ “Latine” refers to people of diverse races, ethnicities, cultures, and languages who share Latin American ancestry. It is used to be inclusive of all gender identities.

Food Security and Food Security Change Variables

To assess the change in food security among students due to the pandemic, we adopted 10 questions (Table 1) from the 10-Item Food Security Module (Economic Research Service, 2012; Mialki et al., 2021). The questions were asked twice: for the timeframe March 2020 to May 2021 (during the pandemic) and then for the timeframe October 2019 to March 2020 (before the pandemic). This retrospective pretest-posttest design was used to help participants reflect with greater awareness on

the degree of change that they experienced (Little et al., 2020). *Yes, often, sometimes, almost every month, and some months not every month* were coded as 1. *Never true, no, and only 1 or 2 months* were coded as 0 following the recommendation of the Economic Research Service (2012). After coding responses, we inspected the *decline to answer/ don't know* responses and verified if there was enough information to enter imputed values. A conservative 0 score was given to each missing item to minimize the chance of granting a food insecurity score when the participant is food secure. In total, we

Table 1. Students were asked to respond to items from the 10-Item Food Security Module (Economic Research Service, 2012) for March 2020 to the present and then October 2019 to March 2020

Survey Items	Response options with score in parenthesis
(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.	Often true (1) Sometimes true (1) Never true (0) Decline to answer/Don't know
The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.	Often true (1) Sometimes true (1) Never true (0) Decline to answer/Don't know
(I/We) couldn't afford to eat balanced meals.	Often true (1) Sometimes true (1) Never true (0) Decline to answer/Don't know
Did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes (1) No (0) Decline to answer/Don't know
How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	Almost every month (1) Some months but not every month (1) Only 1 or 2 months (0) Decline to answer/Don't know
Did you ever eat less than you felt you should because there wasn't enough money for food?	Yes (1) No (0) Decline to answer/Don't know
Were you ever hungry but didn't eat because there wasn't enough money for food?	Yes (1) No (0) Decline to answer/Don't know
Did you lose weight because there wasn't enough money for food?	Yes (1) No (0) Decline to answer/Don't know
Did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?	Yes (1) No (0) Decline to answer/Don't know
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, or in only 1 or 2 months?	Almost every month (1) Some months but not every month (1) Only 1 or 2 months (0) Decline to answer/Don't know

imputed a 0 score for 14 participants with three or fewer missing items during the pandemic, and eight participants with two or fewer missing items for before the pandemic.

The sum of affirmative responses to the 10 questions is the raw food security score. A raw score of zero represents *high food security among adults*, a raw score of 1–2 indicates *marginal food security*, a raw score of 3–5 indicates *low food security*, and a raw score of 6–10 specifies *very low food security* (Economic Research Service, 2012). We collapsed *low food security* and *very low food security among adults* into one category called *low food security* (Soldavini et al., 2019). Thus, each participant was designated as reporting high, marginal, or low food security both before and during the pandemic. We compared these food security categories during and before the pandemic to determine a change in food security. For each participant, food security either decreased, increased, or did not change. Participants experienced a decrease in food security if their category during the pandemic reflected lower food security than prior to it. Participants experienced an increase in food security if their category during the pandemic reflected higher food security than prior to it. If the participant's category was the same during and before the pandemic, then that individual experienced no change in food security.

Socio-demographic Variables

To assess an association between changes in food security and socio-demographic attributes, participants responded to closed-ended questions asking about their gender identity, race and ethnicity, sexual orientation, if they were a graduate or undergraduate student, years of college attendance, if they were the first generation of their family to attend a higher education institution, and their GPA during and before the pandemic. Participants also reported financial characteristics, including financial aid, household income, employment before and during the pandemic, and losing employment due to COVID-19. Reported health factors included perceived health during and before the pandemic, if they were infected with COVID-19, and if they consumed 4.5 cups of fruits and

vegetables per day. To ascertain factors related to food access, the survey asked about participant living situation during and before the pandemic, as well as their access to transportation. Finally, to understand perceptions of the university resources to help food-insecure students, participants were asked if they were familiar with and had used these resources, if the university could improve how it provides resources, and what solutions they suggest for increasing food security at the university.

Data Analysis

Two hundred fifty-three participants completed the food security survey, but data were missing for some demographic variables, as noted in Tables 2–6. Data were descriptively analyzed to assess change in food security status. We employed a two-sided Fisher Exact Test of Independence (Marshall et al., 2021) to test our hypotheses that changes in student food security status during the pandemic are associated with intersecting identities. The analysis was completed with RStudio (posit.co).

Limitations

This study has several limitations. Others have noted that cross-sectional studies like ours only capture transient relationships (Payen-Sturges et al., 2018). The data were collected during a specific period of the COVID-19 pandemic when most students were taking classes online at Loyola University Chicago, but approximately one year had passed since the pandemic started. Therefore, the study was vulnerable to recall bias. That the data are self-reported poses another limitation (Payne-Sturges et al., 2018); ultimately, the data speak to student perceptions about their own experiences. Our sample was passively recruited, and the results cannot be generalized beyond the students surveyed. We also ran a bivariate statistical analysis that did not control for confounding variables, thereby restricting the assertion of causality. For the household income variable, providing few response options was practical but limits interpretation of the results. The broad category of \$45,000–\$139,999² does not allow for fine distinctions among students whose household income fell

² All currencies in this paper are in US\$.

in this bracket. Despite limitations related to recall bias, generalizability, and causality, our results provide useful insights into student experience of food insecurity and how changes in food security during the pandemic related to financial, health, food access, and social identity factors.

Results

Of the survey participants, 82.61% were undergraduate students, 75.29% identified as women, 38.68% as non-heterosexual/non-straight, 32.81% as students of color, and 18.97% as first-generation college students. Students reported that before the pandemic 10.27% experienced low food security and 10.67% marginal food security. During the pandemic, 23.71% reported experiencing low food security and 11.06% marginal food security. Thirty

percent of participants experienced a decrease in food security during the pandemic and 3.16% experienced an increase in food security during that time (Table 2).

Financial Factors

Change in food security status is associated with household income ($p=0.000$), losing employment due to the pandemic ($p=0.000$), and receiving financial aid ($p=0.006$). The percentage of students reporting decrease in food security during the pandemic was highest for those who themselves or their families lost employment (62.96%) and those receiving financial aid from the university (15.08%). Students in the <\$20,000 income bracket (43.75%) reported the highest decrease in food security, but the sample size was small ($n=7$) (Table 2). Change

Table 2. Results of Fisher Exact Test for Food Security Status Change and Financial Factors

Characteristic	Food Security Status Change				p value
	N 253	Decrease 75 (29.64%)	Increase 8 (3.16%)	No Change 170 (67.19%)	
Household Income (US\$)¹					0.000*
<\$20,000	16	7 (43.75%)	0 (0%)	9 (56.25%)	
\$20,000-\$44,999	23	2 (8.69%)	0 (0%)	21 (91.30%)	
\$45,000-\$139,999	92	36 (39.13%)	3 (3.23%)	53 (57.60%)	
>\$139,999	108	9 (8.33%)	2 (1.85%)	97 (89.81%)	
Student's Current Employment					0.206
Employed	124	43 (34.68%)	4 (3.22%)	77 (62.09%)	
Unemployed	129	32 (24.81%)	4 (3.10%)	93 (72.09%)	
Student's Employment Before Pandemic					0.114
Employed	139	48 (34.53%)	3 (2.16%)	88 (63.31%)	
Unemployed	114	27 (23.68%)	5 (4.39%)	82 (71.93%)	
Student and/or Family Put out of Work because of Pandemic					0.000*
Only Family	47	21 (44.68%)	2 (4.25%)	24 (51.06%)	
Only Myself	54	21 (38.89%)	2 (3.70%)	31 (57.41%)	
Myself and Family	27	17 (62.96%)	2 (7.41%)	8 (29.63%)	
No	125	16 (12.80%)	2 (1.60%)	107 (85.60%)	
Financial Aid					0.006*
Yes	200	67 (33.50%)	8 (4.00%)	125 (62.50%)	
No	53	8 (15.08%)	0 (0%)	45 (84.90%)	

¹ Totals not adding up to total sample size are due to missing data/declined responses.

in food security was not associated with student current employment status and employment before the pandemic.

Health Factors

Change in food security was associated with being infected with COVID-19 ($p=0.020$), perceived health during the pandemic ($p=0.000$), and eating 4.5 cups of fruits and/or vegetables per day ($p=0.040$). The percentage of students reporting a decrease in food security during the pandemic was highest for those perceiving their health to be poor during the pandemic (53.85%), those infected by COVID-19 with their families infected as well (48.15%), and those that did not eat 4.5 cups of fruits and/or vegetables per day (18.75%). Change in food security was not associated with perceived health before the pandemic (Table 3).

Food Access Factors

Change in food security was not associated with access to transportation, change in living situation, living situation before the pandemic, or with whom students currently live (Table 4).

Demographic Factors of Social Identity

Change in food security status was associated with student race and ethnicity ($p=0.042$), sexual orientation ($p=0.027$), and first-generation status ($p=0.017$). The percentage of students reporting a decrease in food security during the pandemic was highest for Latine students (48%), followed by a combined category of students who identified as mixed race or ethnicity, White but not European, or Indigenous American (46%). Thirty-three percent of Black students, 31% of Asian students, and 24% of White-identifying students responding to the survey reported decreased food security during the pandemic. A larger percentage of students that were first-generation (46%) also indicated a decrease in food security than those that were not (26%). A larger percentage of LGBTQIA+ students (38%) also indicated a decrease in food security than those who identified as heterosexual/straight (24%). Change in food security was not associated with gender identity, undergraduate or graduate status, or years of college attendance (Table 5).

Table 3. Results of Fisher Exact Test for Food Security Status Change and Health Factors

Characteristic	N 253	Food Security Status Change			p value
		Decrease 75 (29.64%)	Increase 8 (3.16%)	No Change 170 (67.19%)	
Infected by COVID					0.020*
Only Family	63	24 (38.09%)	2 (3.17%)	37 (58.73%)	
Only Myself	13	6 (46.15%)	0 (0%)	7 (53.85%)	
Myself and Family	27	13 (48.15%)	1 (3.79%)	13 (48.15%)	
No	150	32 (21.33%)	5 (3.33%)	113 (75.33%)	
Perceived Health During Pandemic					0.000*
Excellent	28	1 (3.57%)	0 (0%)	27 (96.43%)	
Fair	85	35 (41.17%)	0 (0%)	50 (58.82%)	
Good	127	32 (25.19%)	7 (5.51%)	88 (69.29%)	
Poor	13	7 (53.85%)	1 (7.69%)	5 (38.46%)	
Perceived Health Before Pandemic					0.712
Excellent	51	15 (29.41%)	0 (0%)	36 (70.59%)	
Fair	26	9 (34.61%)	0 (0%)	17 (65.38%)	
Good	173	50 (28.90%)	8 (4.62%)	115 (66.47%)	
Poor	3	1 (33.33%)	0 (0%)	2 (66.67%)	
4.5 Cups of Fruit and/or Vegetables per Day					0.040*
Yes	64	12 (18.75%)	1 (1.56%)	51 (79.69%)	
No	189	63 (33.33%)	7 (3.70%)	119 (62.96%)	

Table 4. Results of Fisher Exact Test for Food Security Status Change and Food Access Factors

Characteristic	Food Security Status Change				p value
	N 253	Decrease 75 (29.64%)	Increase 8 (3.16%)	No Change 170 (67.19%)	
Transportation					0.235
Students with access to a car	124	32 (25.81%)	4 (3.22%)	88 (70.97%)	
Students with no access to a car but access to train	120	39 (32.50%)	3 (2.50%)	78 (65%)	
Students with no access to car or train	9	4 (44.44%)	1 (11.11%)	4 (44.44%)	
Living Situation Change					0.188
Yes	133	46 (34.59%)	4 (3.01%)	83 (62.41%)	
No	120	29 (24.17%)	4 (3.33%)	87 (72.50%)	
Living Situation Before Pandemic					0.117
Family	30	12 (40.00%)	2 (6.67%)	16 (53.33%)	
Off-Campus Housing	103	35 (33.98%)	4 (3.88%)	64 (62.13%)	
Residence Hall	97	25 (25.77%)	2 (2.06%)	70 (72.16%)	
Other	23	3 (13.04%)	0 (0%)	20 (86.85%)	
Who Currently Live With					0.607
By Myself	41	13 (31.70%)	0 (0%)	28 (68.29%)	
Other People	212	62 (29.24%)	8 (0.94%)	142 (66.98%)	

Grade Point Average

Spring 2020 grade point average (GPA) was associated with change in food security ($p=0.003$). Ninety percent of students that reported their GPA for spring 2020 had a GPA of 3.6-4.0. Only 9% reported a GPA below 3.0, but this category had the highest percentage of students experiencing a decrease in food security. Of students who indicated that their food security decreased during the pandemic, the majority (53.33%) reported a <3.0 GPA (Table 6).

Student Perceptions of Campus Efforts to Increase Food Security

When asked about solutions for increasing food security at the university, 79.28% of participants ($N=251$) indicated that they would like the university to make existing resources more widely known through campus marketing campaigns, and 63.35% wanted the university to provide more resources to promote food security. Given a list of three resources offered by the university to address food insecurity, 91.63% answered that they did not know about these resources; only 8.37% answered

yes. Among the latter, 19.05% reported that they had previously used these resources and 80.95% had not. Asked if the university could improve its efforts to provide resources for food security, 84.46% ($N=200$) responded yes. Asked what additional resources would be helpful to them at the time of the survey, 73% ($N=251$) responded that they would like information about university resources for food insecurity; 43% would like information about the Supplemental Nutrition Assistance Program and/or the Special Supplemental Nutrition Program for Women, Infants, and Children; 38% would like information about local food pantries; and 13.5% would like other information not listed.

Discussion

College students in this study reported an increased food insecurity incidence of 130.77% during the pandemic, consistent with other studies documenting higher food insecurity among college students during the pandemic (McCarthy et al., 2022; Mialki et al., 2021; Soldavini et al., 2021; Wolfson & Leung, 2020). We found that 23.71% of respond-

Table 5. Results of Fisher Exact Test for Food Security Status Change and Social Identity Factors

Characteristic	N	Food Security Status Change			p value
		Decrease 75 (29.64%)	Increase 8 (3.16%)	No Change 170 (67.19%)	
First Generation of Higher Education	253				0.017*
Yes	48	22 (45.83%)	2 (4.16%)	24 (50.00%)	
No	205	53 (25.85%)	6 (2.92%)	146 (71.22%)	
Race and Ethnicity					0.042*
Asian	26	8 (30.77%)	2 (7.69%)	16 (6.15%)	
Black	12	4 (33.33%)	0 (0%)	8 (66.67%)	
Latine	21	10 (47.61%)	2 (9.50%)	9 (42.86%)	
Other Multiracial	24	11 (45.83%)	0 (0%)	13 (54.17%)	
White	170	42 (24.40%)	4 (2.35%)	124 (72.94%)	
Years of College Attendance					0.256
1	32	4 (12.5%)	2 (6.25%)	26 (81.25%)	
2	58	15 (25.86%)	1 (1.72%)	42 (72.41%)	
3	47	16 (34.04%)	2 (4.25%)	29 (61.70%)	
4	82	28 (34.15%)	3 (3.66%)	51 (62.19%)	
> 5	34	12 (35.29%)	0 (0%)	22 (64.71%)	
Undergraduate or Graduate					0.470
Undergraduate	209	63 (30.14%)	8 (3.83%)	138 (66.03%)	
Graduate	44	12 (27.27%)	0 (0%)	32 (72.73%)	
Gender Identity¹					0.564
Woman	189	58 (30.69%)	6 (3.17%)	125 (66.14%)	
Man	42	9 (21.43%)	1 (2.38%)	32 (76.19%)	
Students that selected nonbinary, genderqueer/gender non- conforming, identity not listed, or declined to answer	20	7 (35.00%)	1 (5.00%)	12 (60.00%)	
Sexual Orientation¹					0.027*
Heterosexual/Straight	149	35 (23.49%)	4 (11.43%)	110 (73.82%)	
Non-Heterosexual/Non-Straight	94	36 (38.29%)	4 (4.25%)	54 (57.45%)	

¹Totals not adding up to total sample size are due to missing data/declined responses.

Table 6. Results of Fisher Exact Test for Food Security Status Change and GPA

Characteristic	N	Food Security Status Change			p value
		Decrease 75 (29.64%)	Increase 8 (3.16%)	No Change 170 (67.19%)	
GPA Spring 2020¹	253				0.003*
3.6-4.0	151	32 (21.19%)	1 (0.66%)	118 (78.14%)	
3.1-3.5	45	7 (15.55%)	2 (4.44%)	36 (80.00%)	
<3.0	15	8 (53.33%)	1 (6.66%)	6 (40.00%)	

¹Totals not adding up to total sample size are due to missing data/declined responses.

ents indicated that they were food insecure at least once during the year following the lockdown in March 2020. Another study conducted in Summer 2020 at a different private university in the same city found that 28.6% of responding students experienced food insecurity (Glantsman et al., 2021). Similar studies in large, public universities in Summer 2020 found that 17% (Davitt et al., 2021) and 34.5 % (Owen et al., 2020) of respondents were food insecure. Food insecurity worsened for 29.64% of students in our study, as compared to 17.7% (Soldavini et al., 2021) and 59.6% (Mialki et al., 2021) in studies that took place two to three months after the March 2020 lockdown at large, public universities. This emerging body of evidence documents that food insecurity among college students, already a concern prior to COVID-19, has been exacerbated by the pandemic.

Consistent with previous research, increased food insecurity in this study was associated with financial and health factors. Food access factors related to living situation and transportation, however, were not significant. Increased food insecurity also was associated with social identity factors, including race and ethnicity, being the first generation in the family to attend college, and sexual orientation. Our results agree with some recent studies examining changes in food security due to COVID-19 and contradict others; however, as others have noted, studies cannot be easily compared because they use different measures for food security (Cady, 2014) and do not consistently report details about the community, administration, and student body (Nazmi et al., 2019).

We found that change in student food security status during the COVID-19 pandemic was associated with household income. A non-linear trend across income brackets in the percentage of students that experienced greater food insecurity adds uncertainty to our results. The largest percentage of students reporting increased food insecurity (43.75%) was from households with annual income below \$20,000. Only 8% of students in the \$20,000–\$44,999 income bracket reported decrease in food security, compared to 39% of students from households that would be considered middle class (\$45,000–\$139,999 annual income). Although the non-linear trend prevents robust conclusions

about the association between household income and change in food security, our results resemble national trends in that food insecurity has affected individuals across a range of income brackets during the COVID-19 pandemic (Lauren et al., 2020). Furthermore, half of our respondents indicated that they, their family, or both lost employment due to the pandemic. The highest percentage of students reporting a decrease in food security fell in this latter group. Our results align with three studies in large, public universities that found change in food security associated with loss of student employment and loss of household employment during the pandemic (Hagerdon et al. 2020; Mialki et al., 2021; Soldavini et al., 2021). As in one study in a large, public university (Soldavini et al., 2021), we found that change in food security status during the pandemic was associated with student reception of financial aid.

We also found that change in student food security status during the COVID-19 pandemic was associated with health factors, including having 4.5 cups of fruit and/or vegetables per day. The percentage of students that experienced a decrease in food security was highest for those that did not eat 4.5 cups of fruits and/or vegetables per day, consistent with Mei et al. (2009) who found this association with food security at a large, public university before the pandemic. A fall 2022 survey of more than 100,000 students at 202 colleges in 42 states found that students self-reporting COVID-19 infection were more likely to experience food insecurity, anxiety, and depression (Goldrick-Rab et al., 2022). In our study, change in food security also was associated with infection by COVID-19, perceived health, and perceived change in health. The percentage of students that experienced a decrease in food security was highest for those who got infected by COVID-19 along with their families and who perceived their general health as poor during the pandemic. Inadequate workplace safety measures may have put some of these families at risk, as Michaels and Wagner (2020) have reported.

We also found that just over half of the students experienced a change in their living situation during the pandemic, but this was not related to a change in food security. Our results differ from a

study at a large, public university that reported an association between change in living situation due to the pandemic and change in food security, with differences occurring between students living off and on campus (Davitt et al., 2021). In our study, change in food security also was not associated with student living situations before the pandemic or their access to transportation. Our results regarding transportation may differ from another study (Henry, 2017) due to a lack of statistical power in our study (only nine respondents had no access to a car or train) or because the university is located near public transit, and enrolled students can take unlimited train and bus rides using a student pass.

Our results showed that students with social identities that were already vulnerable to food insecurity before the pandemic experienced greater impact on their food security during COVID-19. The percentage of students that experienced a decrease in food security was highest among students that identified as Latine, followed by multiracial and American Indigenous, Black, and Asian students. It was lowest among those that identified as White. These results align with other recent studies documenting racial disparities in the pandemic impact on student food security at large, public universities (Mialki et al., 2021; Soldavini et al., 2021). Similarly, in a private university located in the same city as this study, students of color were at significantly greater risk of food insecurity than White students during the pandemic (Glantsman et al., 2021). Race and ethnicity are primary factors associated with food insecurity and health outcome disparities due to social and economic disadvantages, a long history of disparate treatment, and several dimensions of social stratification (e.g., education, income, comorbidities, occupation) (Kimani et al., 2021). We also found that food insecurity was higher among students that are first generation in higher education, consistent with findings by Soldavini et al. (2021).

The percentage of students that experienced a decrease in food security was higher among students that identify as LGBTQIA+ than their heterosexual peers. At a private university in the same city, sexual minorities also were at higher risk of food insecurity than straight/heterosexual students

during the pandemic (Glantsman et al., 2021). Structural discrimination and sexual stigma may create vulnerabilities to food insecurity for the LGBTQIA+ population. Research is needed to explicate further the specific mechanisms that cause the disparate experience of food insecurity between LGBTQIA+ and heterosexual individuals.

Food insecurity may affect student academic success. We found that GPA in the spring semester of 2020 was associated with being food insecure. Before the pandemic, Maroto et al. (2015) found at two community colleges that food-insecure students were more likely to report a lower GPA. However, Payne-Sturges et al. (2018) found no statistically significant difference in self-reported GPA by food security status in a large, public university. It is unclear whether GPA is a good indicator of academic success; other measures such as delayed graduation, discontinuous enrollment, and attenuation of academic goals should also be considered. Food insecurity may indirectly worsen student's academic experience by negatively impacting student's physical and mental health, social relationships, and emotional well-being (Bruening et al., 2016). Additional research could examine how food insecurity affects learning experience and academic success.

Implications and Recommendations

Food insecurity poses a serious threat to college student well-being but has been inadequately addressed by higher education institutions (Watson et al., 2017). Integrating our results with calls for action in the literature by others, we recommend that colleges and universities address food insecurity in at least three realms: shifting campus culture, providing direct food assistance, and advocating for policy change at state and federal levels.

Lack of action from universities may be due partly to the normalization of food insecurity in college students. If students are struggling to meet their basic needs, food is one of the easiest things to sacrifice to make ends meet (Watson et al., 2017). To be a "starving college student" can sometimes be seen as a rite of passage (Crutchfield et al., 2020; Meza et al., 2019). Rather than enabling normalization, colleges and universities can adopt interdisciplinary approaches that include campus

administration, academic faculty, student affairs practitioners, governing bodies, and non-profit organizations (Cady, 2014) to create a culture that encourages food literacy, including food knowledge, cooking skills, and the value of food for social cohesion (Watson et al., 2017). Shifting campus culture can help normalize the fact that all students should have access to adequate, safe, and socially acceptable food.

COVID-19 has highlighted the need for more proactive and creative strategies to reach students directly with food-related resources, regardless of where they are located physically and socially. The university where this study took place has provided food security assistance through two food pantries on its campuses. One pantry has been non-operational since the beginning of the pandemic but the other has been supplied through donations and a separate stream of resources. Although these resources are available to students, they are not necessarily salient to the student body (Office of the Dean of Students, personal communication, October 26, 2020). Our results showed that only 8.37% of respondents knew about these resources, 79.28% would like the university to make these resources more widely known, and 63.35% wanted the university to provide more resources. Brito-Silva et al. (2021) similarly found that in a large, public, highly diverse university, 89.8% of students surveyed reported never using food pantries and 47.8% of students did not know campus pantries existed; one-third of respondents reported barriers to accessing on-campus food pantries, including not knowing locations or whether they were eligible to use them, the social stigma of being perceived as poor, difficulty with transportation to carry food back home, and lack of time.

Efforts to reduce such barriers may be especially critical for students with social identities that we found to be disproportionately impacted by food insecurity, including students of color, first-generation students, and LGBTQIA+ students. While it is important for universities to communicate to all students about the availability of food resources, specific communication channels can also be used to reach the student populations most vulnerable to food insecurity. Our results suggest that outreach should be conducted through the

financial aid office as well as through student development programs and student clubs that engage students of color, first-generation students, and LGBTQIA+ students. Since we conducted our survey, the Loyola University Chicago webpage for food security resources has been updated with external resources, such as links to the student qualifications for the Supplemental Nutrition Assistance Program (SNAP) and citywide and national food bank finders. Nevertheless, our research and other findings suggest that additional efforts will be needed for the university to systematically address student food insecurity.


Universities also can complement their efforts to reach students disproportionately impacted by food insecurity with advocacy to ensure universal food access through state and federal resources. College students are experiencing proportionately higher rates of food insecurity than the national population (Bruening et al., 2016; McArthur et al., 2018). Yet, until recently, SNAP eligibility requirements have excluded the majority of college students (Mialki, et al., 2021). Before January 2021, to qualify for SNAP students needed to work 20 hours per week in addition to being enrolled less than half-time at their college. If a student chose to decrease their course load in order to qualify for SNAP, they would extend the time to earn their degree. A student could be forced to choose between prioritizing education or food, a choice no one should have to make. In January 2021, the Biden administration expanded SNAP eligibility for students who are eligible to participate in state or federally financed work-study during the academic year. In addition, the administration expanded SNAP benefits for students who had no expected family financial contribution in the current academic year (U.S Department of Education, 2021). To reduce food insecurity among college students, it will be important to retain these changes post-pandemic and consider further expanding SNAP eligibility criteria for students.

We found that food insecurity affects students across a large range of household incomes. This suggests that factors besides income are also at play, such as the rising cost of college tuition, which makes balancing college expenses with food expenditures challenging. Legislation in response to

the pandemic, like the CARES Act and expanded SNAP eligibility (Laska et al., 2020; Soldavini, 2021), does not address the rising cost of college tuition. The long-term federal and state policy approaches to support food-insecure college students that are urgently needed may need to incorporate a plan for tuition reduction.

Conclusion

To help understand the impact of the COVID-19 pandemic on reported food security among college students, we surveyed students at a private university in a large metropolitan region of the midwestern United States about their food security status during the pandemic as compared to prior to it. Food insecurity worsened for 29.64% of students who responded. We found statistically significant associations between decrease in food security and financial variables (household income, loss or family loss of employment because of the pandemic, receiving financial aid), health (infection or family infection with COVID-19, perceived health during the pandemic, eating 4.5 cups of fruits and vegetables each day), and social identity (race and ethnicity, first-generation to attend college, and sexual orientation) factors. Our results are consistent with

other studies that indicate that the pandemic has worsened food insecurity for marginalized groups, which already experienced higher food insecurity rates pre-pandemic due to structural racism and/or other social determinants (Morales et al., 2020; Odoms-Young & Bruce, 2018). We also examined the association between sexual orientation and food security among college students. LGBTQIA+ students were more likely to report a decrease in food security during the pandemic than their heterosexual peers. Our results confirm the need for greater action by higher education institutions, as well as state and federal governments, to support students in achieving food security. They also highlight the necessity of interventions—and future research—that attend not only to immediate symptoms of food insecurity, but also the underlying structural discrimination (Odoms-Young & Bruce, 2018) that makes it more difficult for members of marginalized groups to be food secure. 

Acknowledgments

The authors would like to thank the individuals who helped distribute the survey, the students who completed it, and those who participated in its pilot.

References

- Brito-Silva, F. de K., Wang, W., Moore, C. E., Warren, C., Miketinas, D. C., Tucker, W. J., & Davis, K. E. (2022). College campus food pantry program evaluation: What barriers do students face to access on-campus food pantries? *Nutrients*, 14(14), 2807, 1-15. <https://doi.org/10.3390/nu14142807>
- Bruening, M., Brennhof, S., Van Woerden, I., Todd, M., & Laska, M. (2016). Factors related to the high rates of food insecurity among diverse, urban college freshmen. *Journal of the Academy of Nutrition and Dietetics*, 116(9), P1450-P1457. <https://doi.org/10.1016/j.jand.2016.04.004>
- Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: A systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics*, 117(11), 1767-1791. <https://doi.org/10.1016/j.jand.2017.05.022>
- Cady, C. L. (2014). Food insecurity as a student issue. *Journal of College and Character*, 15(4), 265-272. <https://doi.org/10.1515/jcc-2014-0031>
- Carlsten, C., Gulati, M., Hines, S., Rose, C., Scott, K., Tarlo, S. M., & de la Hoz, R. E. (2021). COVID-19 as an occupational disease. *American Journal of Industrial Medicine*, 64(4), 227-237. <https://doi.org/10.1002/ajim.23222>
- Coleman-Jensen, A., Gregory, C., & Singh, A. (2014). *Household food security in the United States in 2013* (ERR No. 173). U.S. Department of Agriculture Economic Research Service. <https://doi.org/10.2139/ssrn.2504067>
- Coleman-Jensen, A. & Nord, M. (2013). *Food insecurity among households with working-age adults with disabilities* (ERR No. 144). U.S. Department of Agriculture Economic Research Service. <https://doi.org/10.2139/ssrn.2202869>
- Crutchfield, R. M., Carpena, A., McCloy, T. N., & Maguire, J. (2020). The starving student narrative: How normalizing deprivation reinforces basic need insecurity in higher education. *Families in Society: The Journal of Contemporary Social Services*, 101(3), 409-421. <https://doi.org/10.1177/1044389419889525>

- Davitt, E. D., Heer, M. M., Winham, D. M., Knoblauch, S. T., & Shelley, M. C. (2021). Effects of COVID-19 on university student food security. *Nutrients*, *13*(6), 1932, 1-15. <https://doi.org/10.3390/nu13061932>
- Economic Research Service. (2012). *U.S Adult Food Security Survey Module: Three-stage design, with screeners*. U.S. Department of Agriculture. <https://www.ers.usda.gov/media/8279/ad2012.pdf>
- Gibbs, J. K., Shokoohi, M., Salway, T., & Ross, L. E. (2021). Sexual orientation–based disparities in food security among adults in the United States: Results from the 2003–2016 NHANES. *The American Journal of Clinical Nutrition*, *114*(6), 2006-2016. <https://doi.org/10.1093/ajcn/nqab290>
- Glantsman, O., McGarity-Palmer, R., Swanson, H. L., Carroll, J. T., Zinter, K. E., Lancaster, K. M., & Berardi, L. (2022). Risk of food and housing insecurity among college students during the COVID-19 pandemic. *Journal of Community Psychology*, *50*(6), 2726-2745. <https://doi.org/10.1002/jcop.22853>
- Goldrick-Rab, S., Coca, V., Gill, J., Peele, M., Clark, K., & Looker, E. (2022). Self-reported COVID-19 infection and implications for mental health and food insecurity among American college students. *Proceedings of the National Academy of Sciences*, *119*(7), e2111787119, 1-3. <https://doi.org/10.1073/pnas.2111787119>
- Gould, E. L., & Wilson, V. (2020). *Black workers face two of the most lethal preexisting conditions for coronavirus? Racism and economic inequality* [Report]. Economic Policy Institute. <https://www.epi.org/publication/black-workers-covid/>
- Henry, L. (2017). Understanding food insecurity among college students: Experience, motivation, and local solutions. *Annals of Anthropological Practice*, *41*(1), 6-19. <https://doi.org/10.1111/napa.12108>
- Kimani, M. E., Sarr, M., Cuffee, Y., Liu, C., & Webster, N. S. (2021). Associations of race/ethnicity and food insecurity with COVID-19 infection rates across US counties. *JAMA Network Open*, *4*(6), e2112852, 1-11. <https://doi.org/10.1001/jamanetworkopen.2021.12852>
- Laska, M. N., Fleischhacker, S., Petsoulis, C., Bruening, M., & Stebleton, M. J. (2020). Addressing college food insecurity: An assessment of federal legislation before and during coronavirus disease-2019. *Journal of Nutrition Education and Behavior*, *52*(10), P982-P987. <https://doi.org/10.1016/j.jneb.2020.07.001>
- Lauren, B. N., Silver, E. R., Faye, A. S., Rogers, A. M., Woo-Baidal, J. A., Ozanne, E. M., & Hur, C. (2021). Predictors of households at risk for food insecurity in the United States during the COVID-19 pandemic. *Public Health Nutrition*, *24*(12), 3929-3936. <https://doi.org/10.1017/S1368980021000355>
- Lee-Kwan, S. H., Moore, L. V., Blanck, H. M., Harris, D. M., & Galuska, D. (2017). Disparities in state-specific adult fruit and vegetable consumption—United States, 2015.. *Morbidity and Mortality Weekly Report (MMWR)*, *66*(45), 1241-1247. <https://doi.org/10.15585/mmwr.mm6645a1>
- Leung, C. W., & Tester, J. M. (2019). The association between food insecurity and diet quality varies by race/ethnicity: an analysis of National Health and Nutrition Examination Survey 2011-2014 results. *Journal of the Academy of Nutrition and Dietetics*, *119*(10), P1676-P1686. <https://doi.org/10.1016/j.jand.2018.10.011>
- Little, T. D., Chang, R., Gorrall, B. K., Waggenspack, L., Fukuda, E., Allen, P. J., & Noam, G. G. (2020). The retrospective pretest–posttest design redux: On its validity as an alternative to traditional pretest–posttest measurement. *International Journal of Behavioral Development*, *44*(2), 175-183. <https://doi.org/10.1177/0165025419877973>
- Maroto, M. E., Snelling, A., & Linck, H. (2015). Food insecurity among community college students: Prevalence and association with grade point average. *Community College Journal of Research and Practice*, *39*(6), 515-526. <https://doi.org/10.1080/10668926.2013.850758>
- Marshall, T. A., Zheng, R., Anderson, C. L., Handoo, N., & Qian, F. (2021). Is food insecurity a barrier to dental student success? *Journal of Dental Education*, *85*(9), 1518-1524. <https://doi.org/10.1002/jdd.12623>
- McArthur, L. H., Ball, L., Danek, A. C., & Holbert, D. (2018). A high prevalence of food insecurity among university students in Appalachia reflects a need for educational interventions and policy advocacy. *Journal of Nutrition Education and Behavior*, *50*(6), P564-P572. <https://doi.org/10.1016/j.jneb.2017.10.011>
- McCarthy, A. C., Belarmino, E. H., Bertmann, F., & Niles, M. T. (2022). Food security impacts of the COVID-19 pandemic: Longitudinal evidence from a cohort of adults in Vermont during the first year. *Nutrients*, *14*(7), 1358, 1-19. <https://doi.org/10.3390/nu14071358>

- Mei, J., Fulay, A., & Leung, C. (2020). Associations between college-student food insecurity and diet at a large, public Midwestern university. *Current Developments in Nutrition*, 4(Suppl. 2), 243. https://doi.org/10.1093/cdn/nzaa043_094
- Meza, A., Altman, E., Martinez, S., & Leung, C. W. (2019). “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. *Journal of the Academy of Nutrition and Dietetics*, 119(10), P1713-P1721. <https://doi.org/10.1016/j.jand.2018.09.006>
- Mialki, K., House, L. A., Mathews, A. E., & Shelnett, K. P. (2021). Covid-19 and college students: Food security status before and after the onset of a pandemic. *Nutrients*, 13(2), 628, 1-13. <https://doi.org/10.3390/nu13020628>
- Michaels, D., & Wagner, G. R. (2020). Occupational Safety and Health Administration (OSHA) and worker safety during the COVID-19 pandemic. *JAMA*, 324(14), 1389-1390. <https://doi.org/10.1001/jama.2020.16343>
- Morales, D. X., Morales, S. A., & Beltran, T. F. (2021). Racial/ethnic disparities in household food insecurity during the COVID-19 pandemic: A nationally representative study. *Journal of Racial and Ethnic Health Disparities* 8(5), 1300-1314. <https://doi.org/10.1007/s40615-020-00892-7>
- Nazmi, A., Martinez, S., Byrd, A., Robinson, D., Bianco, S., Maguire, J., Crutchfield, R. M., Condrón, K., & Ritchie, L. (2019). A systematic review of food insecurity among US students in higher education. *Journal of Hunger & Environmental Nutrition*, 14(5), 725-740. <https://doi.org/10.1080/19320248.2018.1484316>
- Nikolaus, C. J., An, R., Ellison, B., & Nickols-Richardson, S. M. (2020). Food insecurity among college students in the United States: A scoping review. *Advances in Nutrition*, 11(2), 327-348. <https://doi.org/10.1093/advances/nmz111>
- Odoms-Young, A., & Bruce, M. A. (2018). Examining the impact of structural racism on food insecurity: Implications for addressing racial/ethnic disparities. *Family and Community Health*, 41(Suppl. 2), S3-S6. <https://doi.org/10.1097/FCH.0000000000000183>.
- Office of Institutional Effectiveness. (2019). *Annual report on diversity Loyola University Chicago 2018-19*. <https://www.luc.edu/media/lucedu/diversityandinclusion/2018-19-Diversity-Report.pdf>
- Owens, M. R., Brito-Silva, F., Kirkland, T., Moore, C. E., Davis, K. E., Patterson, M. A., Miketinas, D. C., & Tucker, W. J. (2020). Prevalence and social determinants of food insecurity among college students during the COVID-19 pandemic. *Nutrients*, 12(9), 2515, 1-17. <https://doi.org/10.3390/nu12092515>
- Payne-Sturges, D. C., Tjaden, A., Caldeira, K. M., Vincent, K. B., & Arria, A. M. (2018). Student hunger on campus: Food insecurity among college students and implications for academic institutions. *American Journal of Health Promotion*, 32(2), 349-354. <https://doi.org/10.1177/0890117117719620>
- Soldavini, J., Berner, M., & Da Silva, J. (2019). Rates of and characteristics associated with food insecurity differ among undergraduate and graduate students at a large public university in the Southeast United States. *Preventive Medicine Reports*, 14, 100836, 1-8. <https://doi.org/10.1016/j.pmedr.2019.100836>
- Soldavini, J., Andrew, H., & Berner, M. (2021). Characteristics associated with changes in food security status among college students during the COVID-19 pandemic. *Translational Behavioral Medicine*, 11(2), 295-304. <https://doi.org/10.1093/tbm/ibaa110>
- U.S. Department of Education. (2021, February 23). *Education Department amplifies USDA expansion of SNAP benefits to help students pursuing postsecondary education during pandemic* [Press release]. <https://www.ed.gov/news/press-releases/education-department-amplifies-usda-expansion-snap-benefits-help-students-pursuing-postsecondary-education-during-pandemic>
- Watson, T. D., Malan, H., Glik, D., & Martinez, S. M. (2017). College students identify university support for basic needs and life skills as key ingredient in addressing food insecurity on campus. *California Agriculture*, 71(3), 130-138. <https://doi.org/10.3733/ca.2017a0023>
- Wolfson, J. A., & Leung, C. W. (2020). Food insecurity and COVID-19: Disparities in early effects for US Adults. *Nutrients*, 12(6), 1648, 1-13. <https://doi.org/10.3390/nu12061648>

Appendix

List of university groups and university departments with whom we directly shared the questionnaire. In parentheses we mention if any of these groups declined to share.

- Agape Christian Fellowship
- Agape Latte
- Alpha Chi Omega
- Alpha Delta Phi
- Alpha Kappa Alpha
- Alpha Kappa Psi, Business Fraternity
- Alpha Phi Alpha Fraternity
- Alpha Phi Omega
- Alpha Phi Sigma
- Alpha Psi Lambda National
- Alpha Sigma Alpha
- Alternative Break Immersion
- AMDG Catholic Student Group
- American Medical Association
- American Medical Student Association
- American Medical Women's Association
- Amnesty International
- ASEZ: Save the Earth from A to Z
- Asian Pacific American Medical Student Association
- Association of Latino Professionals for America
- Beta Beta Beta
- Beta Theta Pi
- Black Cultural Center
- Building the Next Generation of Academic Physicians
- Campus Ministry
- Catholic Medical Association
- Challenging Antiquated Norms for Gender Equality
- Chi Alpha Christian Fellowship
- Chi Omega Fraternity-Lambda Mu Chapter
- Chinese Student Association
- Christian Life Communities at Loyola University Chicago
- College of Arts and Sciences (declined to share the survey)
- College Republicans
- Community Service and Action
- Commuter Student Life
- CRU Christian Campus Ministry
- Culture in Medicine
- Delta Phi Lambda Sorority
- Delta Sigma Phi
- Delta Sigma Pi, Business Fraternity
- Delta Sigma Theta Sorority
- Engineers for Social Justice
- Enrich Urban Farming and Gardening
- Evolutionary Medicine
- Feminist Forum
- Femme International LUC Student Ambassadors
- Food Recovery Network
- GlobeMed: Loyola University Chicago Chapter
- Graduate Women in Business
- Graduate School
- Group for Environmental Medicine and Sustainability
- Grower's Guild
- Habitat for Humanity LUC
- Healthcare Administration Student Council
- Hellenic Student Association
- Hillel at Loyola
- Hindu Students' Organization
- Homeless not Hopeless
- Honors Student Association
- Housing Forward
- IGNITE LUC
- Japanese Student Organization
- Kappa Delta
- Kappa Kappa Gamma
- Kapwa Filipinx-American Student Association
- Korean Student Organization
- Labre Homeless Ministry
- Lambda Phi Epsilon
- Lambda Theta Alpha
- Latin American Student Organization
- Leading Women of Tomorrow
- Loyola-Israel Student Alliance
- Loyola Initiative for Global Health Transformation

-
- Loyola PreMedLife
 - Loyola Student COVID Response Team
 - Loyola Students 4 Edgewater Neighborhood Schools
 - Loyola University Chicago Empowering Sisterhood
 - Loyola University Chicago Puerto Rican Student Association
 - Loyola 4 Chicago
 - LUC Indian Student Association
 - LUC Naach Bollywood Fusion Dance Team
 - LUC Public Health Club
 - Medical Student Union
 - Mexican American Student Association
 - Middle Eastern Student Association
 - Minority Association of Premedical Students
 - Mixed Heritage Union
 - Model U.N.
 - Multicultural Greek Council
 - Muslim Medical Student Association
 - Muslim Students' Association
 - National Arab American Medical Association NextGen
 - National Residence Hall Honorary
 - National Society of Collegiate Scholars
 - Neighborhood Health Initiative
 - Net Impact
 - Office of Institutional Effectiveness (declined to share the survey without edits on their part)
 - Office of the Dean of Students
 - Pakistani Student Association
 - Panhellenic Council
 - Parkinson School of Health Sciences and Public Health
 - Phi Delta Epsilon
 - Phi Sigma Sigma
 - Pi Kappa Phi Fraternity
 - Polish Student Alliance
 - Pre-Law Minority Student Association
 - Pre-Law Society
 - Quinlan School of Business
 - PRISM: A Queer People of Color Support Group
 - Rainbow Connection
 - Residence Life
 - Restoration Club
 - Retreats
 - School of Communication
 - School of Continuing and Professional Studies
 - School of Education
 - School of Environmental Sustainability
 - School of Law
 - School of Social Work
 - Sigma Chi
 - Sikh Student Organization
 - Society of Women's Health
 - Sri Lankan Student Association
 - Stritch Pride
 - Student Activities and Greek Affairs
 - Student Diversity and Multi-cultural Affairs
 - Student Environmental Alliance
 - Student Government of Loyola Chicago
 - Student National Medical Association
 - Student Wellness Advisory Group
 - Students for National Health Program
 - Students for Justice in Palestine
 - Students for Recovery Loyola
 - Students for Sustainable Energy through Anaerobic Digestion
 - Students Organize for Syria
 - Tau Kappa Epsilon
 - The Body Project
 - The Loyola Alliance of Socialists
 - Theta Alpha Kappa
 - UNICEF of Loyola
 - Vietnamese Student Association
 - We Are Able LUC
 - weDignify at Loyola: Students for Life
 - White Coats for Black Lives Chapter at Loyola University Chicago Stritch School of Medicine
 - Women in Business
 - Women in Leadership Loyola
 - Women in Science and Math
 - Zeta Phi Beta Sorority