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SNAP for U: Food insecurity and SNAP use among college students, including institution type differences

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Abstract

The objective of this study was to examine food insecurity and knowledge of the Supplemental Nutrition Assistance Program (SNAP), including barriers to and facilitators for enrolling in SNAP among college students in the Midwest. An observational, cross-sectional online survey was administered during Fall 2021 to Spring 2022. Participants included 844 college students from nine higher education institutions across Missouri. Of students

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Declaration of Interest Statement

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who participated, 44.9% reported being food insecure, 67.9% reported knowing what SNAP was, and only 34.3% knew if they were eligible for SNAP. Students at private colleges [unadjusted odds ratio (OR) and 95% confidence interval (CI) = 4.79 (2.45-9.36), p<0.001)], community colleges [OR 3.21 95% CI (2.26-4.56), p<0.001)], technical schools [OR 2.21 95% CI (1.08-4.53), p=0.031], and Historically Black Colleges and Universities (HBCUs) [OR 2.05 95% CI (1.37-3.07)., p<0.001] reported higher odds of food security compared to public institutions. College students reported lack of knowledge of SNAP in general as the main barrier for enrollment and campus assistance as the main facilitator. Food insecurity is highly prevalent in Missouri college students, where SNAP knowledge and enrollment barriers persist. Findings support a need for increased attention and resources to target college food insecurity.

Keywords
food security, food insecurity, SNAP, college students

Introduction

Food insecurity in college students is a widespread problem with implications for academic and public health outcomes (Berger et al., 2022; Nazmi et al., 2019). In 2022, the United States Department of Agriculture (USDA) reported an estimated 12.8% of U.S. households experienced food insecurity (USDA, 2023a). Food insecurity can be defined as "unable to acquire adequate food for one or more household members because they had insufficient money and other resources for food" (Coleman-Jensen et al., 2018, p. 6). Research shows a significantly higher risk of food insecurity in college students than the general public due to college-specific factors, which include financial instability, housing issues, childhood history of food insecurity, racial/ethnic backgrounds, first-generation students, as well as women, LGBTQIA+, and minority status (Budowle et al., 2023; Esaryk et al., 2021; Henry et al., 2023; Leung et al., 2019; Nazmi et al., 2019; Sackey et al., 2021; Weaver et al., 2020). Additionally, some research suggests that the societal position of being a college student may promote inequities that support food insecurity (Darby et al., 2023). Long-term effects of college food insecurity, which can include learning deficits, lower graduation rates, diminished diet quality leading to poor dietary behaviors, and mental health and social issues (Hagedorn-Hatfield et al., 2022), highlight the need to address this problem.

Federal food assistance programs like the Supplemental Nutrition Assistance Program (SNAP; also known as "food stamps") can help alleviate food insecurity concerns among college students. However, until recently, college students faced more strict eligibility criteria for SNAP based on income and enrollment guidelines (Center on Budget and Policy Priorities, 2016). Due to the effect of COVID-19 on food systems, employment, and higher education, SNAP guidelines were loosened and millions of additional college students became eligible. However, it is unclear if expansion of benefits has led to an increase in utilization of these government assistance programs. Prior to the COVID-19 pandemic, it was reported that 28.5% of students at an urban university were food insecure, with only 4.7% of those having used SNAP (Sackey et al., 2021).

There is a lack of research looking at college student enrollment in SNAP, as well as main barriers and facilitators for students enrolling in the program (Esaryk et al., 2022). A 2017 study involving 70 community colleges across 24 states found a food insecurity rate of 56%, yet literature is lacking on comparison by institution type (e.g. public vs. private vs. community college) (Blagg et al., 2017). Data on SNAP usage by higher education institution type could help create specialized food security services for college students (Bianchi, 2019). However, state-administered community colleges disproportionally serve low-income households (Burnside et al., 2021), and it has been noted that in single and multicampus studies of college food insecurity, rates vary greatly by institution type (Dickinson, 2022). Further, few studies have examined this issue among students at HBCUs (Kornbluh et al., 2022). Thus, there is a need to examine differences by institution type when making policy recommendations regarding federal food assistance among college students.

Better understanding these factors will help in the development of policy and systems changes to

improve utilization of federal food assistance programs like SNAP, thereby reducing food insecurity, and potentially improving academic and health outcomes in college students. Food insecurity and SNAP across multiple higher education institutions has not been specifically studied statewide in Missouri. One primary focus of this study is to examine food insecurity, which is defined as the inability to acquire adequate food for one or more household members because of insufficient money and other resources for food (Coleman-Jensen et al., 2018), as differentiated from food security, defined as "access by all [people] at all times to enough food for an active, healthy life" (USDA ERS, 2023b, "What is food security?" para. 1). Both terms are used in this manuscript given that the USDA Food Security Survey Module, which was used in this study, measures both.

Therefore, the purposes of this study were to: 1) Examine food insecurity in a wide sample of Missouri college students; 2) explore use and knowledge of SNAP by the students; 3) describe perceived barriers to and facilitators for enrolling in and using SNAP, and 4) explore group differences in food insecurity and SNAP use and knowledge by higher education institution type.

Methods

This was a cross-sectional, observational study titled *SNAP for U*, which used an online survey to examine food insecurity, knowledge and use of SNAP, and barriers to and facilitators for enrolling in and using SNAP among college students in Missouri. Consent to participate was indicated by students completing the survey. Study procedures were reviewed and approved by the Missouri Southern State University (MSSU) Institutional Review Board (IRB). The IRB approval provided coverage to research team members at MSSU and other participating institutions.

Instrument

The online survey was developed by the study team and used a mix of existing instruments and study specific questions. See Appendix A for the full survey instrument. It was administered using Qualtrics software. The survey instrument contained 51 questions across the following sections:

(1) Demographics (9 total questions on age, gender, grade, race and ethnicity, self-reported height and weight, annual income separate from parents, and household receipt of food stamps in the past 12 months);
(2) Food insecurity status, assessed via the USDA Food Security Survey Module (11 questions including a screener question) (USDA Economic Research Service, 2012) plus one question on whether the amount of food in the household was affected by COVID-19 (response options included amount of food has been reduced a lot, a little, has not changed, has increased a little, or increased a lot);
(3) Knowledge and use of SNAP including 16 questions developed by others (Fordham & Baldridge, n.d.) plus an additional question developed by the team to assess agreement with government spending on SNAP; and
(4) Barriers (1 question with 16 select all that apply choices) and facilitators (1 question with 11 select all that apply choices) for enrolling and using SNAP, which were developed by the study team using the literature and pretesting (see below).

Self-reported height and weight were converted into BMI and examined for the mean and standard deviation (SD) as well as the BMI categories set forth by the Centers for Disease Control and Prevention (CDC, 2024). All items were scored in accordance with their published guidelines. The USDA questionnaire has demonstrated accuracy in predicting food insecurity in college students (Nikolaus et al., 2019).

One author (AC) pilot-tested the survey instrument with a sample of 15 college students to examine any wording or technical issues and the average completion time. No major revisions were needed, and the average completion time was 15 minutes.

Recruitment

A total of 13 universities or colleges across the state were invited to participate. The goal was to obtain two schools and 250 combined students per

institution type (eight schools, 1,000 students total) across public, private, community college, and technical college settings. Four institutions were invited and chose not to participate, they were three community colleges and one private university. Institutions that did not respond to the invitation to participate included three private institutions, eight community colleges, and one technical school. This method allowed for food insecurity examination within and across each institution type. Students were recruited to complete the survey via each individual campus liaison, which included administrators, faculty members, and members of campus food services. Campus liaisons shared the electronic survey via email link and QR code made available on a recruitment flyer specific to each institution. Any student was eligible, regardless of whether they were food insecure.

All participants who completed the survey and provided a valid, institution-associated email address were provided with a $10 electronic gift card as an incentive for participating.

Analyses

Descriptive data are presented as frequencies and percentages for categorical variables and means with standard deviations (SD) for continuous variables. Chi-square analyses and multiple logistic regression were used to analyze the relationship between food security and institution type. Statistical analyses were conducted using SPSS version 27.0 on all available non-missing cases. Missing data were handled by pairwise deletion to use the majority of the data collected. The significance level was set at p-value < 0.05 in all relevant group comparisons.

Results

A total of 1166 students opened the survey. Responses were removed if they included 2% or less of any responses (n = 86), duplicates (those who tried to complete the survey from the same IP address twice or more, n = 204), and those with unlikely IP addresses (e.g. same longitude and latitude, n = 32). The final sample included 844 responses. The majority were female (n = 508, 60.5%), white/Caucasian (n = 622, 73.7%), and underclass (freshmen or sophomores; n = 464, 55%). Of the 13 institutions invited, nine participated, which resulted in a 69% participation rate by institution. Of the nine participating institutions, three were public, two were private, one was a community college, two were technical schools, and one was an HBCU. See Table 1 for complete demographics. Of the four nonparticipating institutions that were invited, three were community colleges and one was a private university. Institutions that did not respond included three private institutions, eight community colleges, and one technical school.

Food Insecurity

A total of 379 (44.9%) students reported being food insecure per the USDA Food Security Survey Module, and 465 (55.1%) were food secure. A total of 304 students (36%) reported their household received food stamp benefits in the previous 12 months. When asked whether COVID-19 affected the amount of food in their household, 390 (48%) reported it reduced their food by a little or a lot (Table 2).

Results indicate a clear and significant association between the type of school and food insecurity, with all institution types except for public demonstrating more food security than food insecurity. Multiple logistic regression revealed significantly higher odds of students being food secure in private institutions, HBCU, community colleges, and technical schools, compared to students in public institutions (Table 3).

Knowledge and Use of SNAP

A total of 505 students (67.9%) responded "yes" when asked if they knew what SNAP was, but only 257 (34.3%) knew if they were eligible for SNAP and 339 (45.4%) knew where to enroll in the program. When asked to rate their agreement with the statement that "the national government should spend more money to support people on the SNAP program," 465 students (62.1%) reported agreeing or strongly agreeing and 65 (8.7%) reported disagreeing or strongly disagreeing. Table B1 shows these results (Appendix B). Those who were food insecure were more likely than food secure students to know what SNAP was (Chi-square = 16.2, p < 0.001), participate in SNAP

Table 1. Demographic Characteristics of 2021–2022 Missouri College Student Participants in the SNAP for U Study

Variable		*n*,% or, mean, SD
Age (*n* = 775)	Mean age (range: 16–57)	23.5 (6.2)
Gender (*N* = 839)	Male	322 (38.4%)
	Female	508 (60.5%)
	Other	9 (1.1%)
Grade (*n* = 843)	Freshman	226 (26.8%)
	Sophomore	238 (28.2%)
	Junior	77 (9.1%)
	Senior	105 (12.5%)
	Graduate student	144 (17.1%)
	Other	53 (6.3%)
Race/Ethnicity (*n* = 839)	White/Caucasian	622 (73.7%)
	Black/African American	139 (16.5%)
	Hispanic	45 (5.3%)
	Asian	20 (2.4%)
	American Indian	14 (1.7%)
	Alaskan Native	13 (1.5%)
	Other	10 (1.2%)
	Multiple	28 (3.3%)
Annual income (*n* = 841)	US$0–10,000	420 (49.8%)
	US$11,000–20,000	180 (21.3%)
	US$21,000–30,000	140 (16.6%)
	US$31,000 +	101 (12.0%)
Higher education type (*n* = 844)	Public	412 (48.8%)
	HBCU	130 (15.4%)
	Private	54 (6.4%)
	Community college	214 (25.4%)
	Tech school	34 (4.0%)
Body Mass Index (BMI) (*n* = 788)	Range: 14.5–59.5 (kg/m^2)	26.67 (6.9)
BMI category (*n* = 775)	Normal and/or underweight	400 (51.6%)
	Overweight	171 (22.1%)
	Obese	204 (26.3%)

(Chi-square = 60.3, $p < 0.001$), know if they were eligible for SNAP (Chi-square = 39.5, $p < 0.001$), and know where to enroll in SNAP (Chi-square = 22.0, $p < 0.001$).

Barriers and Facilitators to Enrolling in and Using SNAP

The most frequently reported barriers were lack of knowledge about SNAP (*n* = 520, 61.6%), perceived ineligibility for SNAP (*n* = 328, 38.9%), negative stigma associated with SNAP (*n* = 315, 37.3%), and lack of assistance for enrolling in SNAP (*n* = 254, 30.1%). The most frequently reported facilitators were university assistance to enroll in SNAP (*n* = 429, 50.8%), available resources on campus (*n* = 416, 49.3%), easy to determine eligibility (*n* = 369, 43.7%), and clear information for how to enroll (*n* = 349, 41.4%). The full list of perceived barriers and facilitators reported by the students for enrolling in and using SNAP are shown in Table 4.

Discussion

This timely observational study examined food insecurity, knowledge and use of SNAP, and barriers to and facilitators for using SNAP benefits among a large, diverse sample of students attending college in the Midwest. Important findings include the high proportion of food insecurity, greater odds of being food insecure in public institutions, and low awareness of SNAP eligibility. Results also revealed important perceived barriers and facilita-

tors for enrolling in and using SNAP. Although we did not achieve our goal of two schools per institution type, a variety of higher education institutions were successfully recruited to participate.

Food Insecurity

Almost 45% of college students in this study reported being food insecure, falling on the high end of reported findings, which range from 14% to 56% (Freudenberg et al., 2011; Gaines et al., 2014; Goldrick-Rab et al., 2017; Miller et al., 2019; Morris et al., 2016; Nazmi et al., 2019; Ryan et al., 2022). In comparison, the most recent prevalence estimates from the USDA showed that 10.2% of U.S. households were food insecure in 2021 (USDA ERS, 2023a), thus indicating how food insecurity is a wide-reaching problem for students in higher education.

Institutional comparisons are scarce in the literature. Students at public institutions in this study reported higher rates of food insecurity when compared to other institution types, although one private, urban university reported a comparable rate amongst students (41%) (Ryan et al., 2022). Another study of students at a public university found that food insecurity was associated with receiving financial aid, some form of food assistance, or being financially independent, and that food security was associated with financial support from one's family and having credit cards (Gaines et al., 2014). These risk factors for food insecurity at public institutions may be less common at pri-

Table 2. Food Insecurity of Missouri College Students in the 2021–2022 SNAP for U Study, Including Use of Food Assistance, the USDA Food Security Survey Module, and Whether COVID-19 Changed the Amount of Food in their Household

Variable		*n*,%
Receive food stamp benefits in previous 12 months (*n* = 842)	Yes	304 (36.0%)
	No	503 (59.6%)
	Not sure/Don't know	35 (4.1%)
Food security status (*n* = 844)	High food security	297 (35.2%)
	Marginal food security	168 (19.9%)
	Low food security	163 (19.3%)
	Very low food security	216 (25.6%)
Food insecurity status (based on the 4 categories above) (*n* = 844)	Food secure	465 (55.1%)
	Food insecure	379 (44.9%)
Did amount of food in your household change since start of COVID-19 (*n* = 813)	Reduced a lot	86 (10.2%)
	Reduced a little	304 (36.0%)
	No change	343 (40.6%)
	Increased a little	67 (7.9%)
	Increased a lot	13 (1.5%)

Table 3. Association Between Institution Type and Odds of Being Food Secure among 2021–2022 Missouri College Students in the SNAP for U Study

Institution type	Food secure (*n*, %)	Food insecure (*n*, %)	Unadjusted OR (95% CI)*	*p*-value
Public	174 (42.2%)	238 (57.8%)	Reference	—
HBCU	78 (60%)	52 (40%)	2.05 (1.37-3.07)	<0.001
Private	42 (77.8%)	12 (22.2%)	4.79 (2.45-9.36)	<0.001
Community college	150 (70.1%)	64 (29.9%)	3.21 (2.26-4.56)	<0.001
Tech school	21 (61.8%)	13 (38.2%	2.21 (1.08-4.53)	0.031

OR = odds ratio; CI = confidence interval; HBCU = Historically Black College or University
*compared to the reference category

vate schools, potentially resulting in a lower rate of food insecurity. Additionally, financial aid programs may differ by institution type (Parthemer, 2020). Possible explanations for this are unknown, and future research should explore the role that higher education institution types and characteristics (e.g. financial aid availability), along with student characteristics, have in food security. It should be noted that the highest prevalence of food insecurity (56%) in higher education has been reported among students attending two-year community colleges (Goldrick-Rab et al., 2017).

With 74.1% of college students attending public schools, and public institutions having the highest food insecurity rates, a significant portion of college students could be at risk for food insecurity (Hanson, 2022). In 2018, the Government Accountability Office (GAO) estimated that Pell Grants cover less than 20% of the mean cost of attending a 4-year institution of higher education (U.S. Government Accountability Office, 2019). Students with food insecurity are more likely to have a lower GPA (Morris et al., 2016; Patton-López et al., 2014; van Woerden et al., 2019), experience at least one adverse academic experience, have difficulty concentrating in class (Farahbakhsh et al., 2017), experience lower retention rates, and report poor self-rated health, excess weight or obesity, and depressive symptoms (Willis, 2021).

Further, research on college campuses has reported that students who were enrolled in more than 13 credit hours were significantly more likely to be food insecure (Hanna, 2014). In addition, Black and Latino students were more likely to be food insecure compared to White and Asian students (Freudenberg et al., 2011), and members of the LGBTQIA+ community may experience additional need (Henry et al., 2023). Moreover, students who are parents were more likely to be food insecure than their non-parenting

Table 4. Perceived Barriers or Challenges, and Perceived Facilitators or Helpful Factors, for Enrolling in and Using SNAP Benefits Reported by 2021–2022 Missouri College Students*

Barrier or challenge	*n*, % selecting that barrier
Lack of knowledge about SNAP	520 (61.6%)
Not eligible for SNAP benefits	328 (38.9%)
Negative stigma associated with enrolling or using SNAP benefits	315 (37.3%)
Lack of assistance for enrolling in SNAP	254 (30.1%)
Lack of access to SNAP	250 (29.6%)
Unsure of where to purchase food using SNAP funds	192 (22.7%)
Takes too long to determine eligibility	184 (21.8%)
Unsure of what foods are allowed under SNAP	178 (21.1%)
Lack transportation to retailers that accept SNAP funds	174 (20.6%)
Unsure how to answer SNAP application questions	170 (20.1%)
None of my friends or family are enrolled in SNAP	159 (18.8%)
Lack of time to enroll in SNAP	154 (18.2%)
Lack of accessibility due to COVID-19	144 (17.1%)
Not safe due to COVID-19 concerns	105 (12.4%)
Lack transportation to enroll in SNAP	97 (11.5%)
Lack government-issued ID	73 (8.6%)
Facilitator or helpful factor	***n*, % selecting that facilitator**
University assistance to enroll in SNAP	429 (50.8%)
Available resources on campus	416 (49.3%)
Easy to determine eligibility	369 (43.7%)
Clear information for how to enroll in SNAP	349 (41.4%)
Clear information for where to use SNAP benefits	280 (33.2%)
State website for enrolling in SNAP	276 (32.7%)
Available community resources to enroll in SNAP	265 (31.4%)
I have friends and/or family enrolled in SNAP	211 (25.0%)
University website for SNAP assistance	199 (23.6%)
Having multiple sites to submit SNAP applications	193 (22.9%)
Having transportation to get to SNAP location	168 (19.9%)

* Students were able to select all that apply on survey

counterparts (Goldrick-Rab et al., 2017). These findings highlight the importance of addressing known barriers and facilitators, in order to help higher education institutions aid their students in gaining access to healthful foods.

Combating food insecurity on college campuses is not new; some college campuses have aimed to reduce food insecurity through food pantries to provide additional aid outside of government food assistance programs. Food pantries are a growing option on campuses, with 45% of existing pantries opening in the past five years (Swipe Out Hunger, 2022). Full-time students with outside employment were more likely to visit college food pantries (Esaryk et al., 2021). Further, students that are first-generation, housing insecure, and receiving needs-based financial aid are reported as higher users at university food pantries (Esaryk et al., 2021; Shi et al., 2021). This research indicates important subgroups of college students that may be eligible for SNAP but not utilizing it.

Knowledge and Use of SNAP

The SNAP eligibility requirements were expanded for college students in 2020 in response to the COVID-19 pandemic, yet our findings underscore a gap in student knowledge of the SNAP program. Fewer than half of study participants knew eligibility requirements or how to apply for the program, and 43% of students reported ever using SNAP in their lifetime. Up to 18% of SNAP applications are denied due to administrative errors (Miller et al., 2019), which could contribute to lower participation rates among this population. It is encouraging that almost half the college student sample in this study reported knowing where they could enroll in SNAP. Further improving this awareness could provide continued benefit. Students who were food insecure generally had more knowledge about SNAP than those who were food secure, which may indicate that those who are food insecure have already received information on SNAP.

While campus food pantries have increased in number, pantry assistance is meant to provide temporary or emergency assistance (Esaryk et al., 2022) during crisis, while SNAP enrollment has been linked to longer term economic and health benefits and increases in food security status (Food Research and Action Center, 2022). Others have noted that university responses focus on emergency support (Shisler et al., 2023), and argue that campus food banks should not be the solution to student hunger. Rather, it is argued that university or government programs and policies are needed to improve food security (Farahbakhsh et al., 2017; Nazmi et al., 2019). As a result, the recent National Strategy on Hunger, Nutrition and Health (September 2022) aims to prioritize increases in SNAP outreach and education to eligible college students (The White House, 2022). Of note, the majority of college students in our study (62.1%) were supportive of money being spent on these types of programs. Others have noted that participation in SNAP decreased perceived food insecurity by almost half (Nazmi et al., 2023), providing hopeful results for future work in this area.

Barriers and Facilitators to Enrolling in and Using SNAP

The top barriers to and facilitators for enrolling in SNAP indicated the need for additional SNAP education and enrollment services offered by higher education institutions on-campus. The utilization of resources like the College SNAP Project (https://collegesnapproject.org/), which provides the latest information to college students for enrolling in SNAP, could prove helpful with these needs. The current application process is cumbersome and time-consuming (Asada et al., 2023), creating barriers in assessing eligibility. Implementation of an eligibility screener could streamline the student enrollment process.

Stigma is a known barrier preventing college students from using SNAP (Miller et al., 2019; U.S. Government Accountability Office, 2019). In the *SNAP for U* study, negative stigma was the third most reported barrier to enrolling in and using SNAP. Further research is needed to understand strategies for overcoming this barrier to aid in efforts promoting SNAP usage and enrollment.

Strengths and Limitations

One major strength of the study was the inclusion of a large, diverse sample of college students representing multiple higher education institution types. This diversity allowed for an examination of a vari-

ety of perspectives on food insecurity and use of SNAP among college students across institutions, strengthening the literature in this field. Limitations include the cross-sectional data, which inhibits causal associations, and self-report strategy, which may be limited by recall or response bias (e.g. perhaps students were more likely to participate if they had previous experience with SNAP). Small sample sizes from private colleges and technical schools limit generalizability to those populations, and we did not make comparisons by academic ranking or quality of the institutions. Additionally, this study was done among students from higher education institutions in a single Midwestern state, and factors influencing food insecurity may not be generalizable to other regions. Further, in the absence of more rigorous methods to ensure generalizability, data may not be representative of all college students in Missouri. It has been noted that much of the work in college food insecurity includes low response rates and lack of generalizability (Dickinson, 2022), indicating a need for more rigorous studies in this area. We found that recruiting college students to participate in surveys proved difficult at some institutions, and a large number of students completed the survey twice or more, perhaps trying to obtain an extra gift card. Different communication avenues, such as social media and special interest groups, or marketing strategies at existing campus events, may improve future response rates. Future research on this would be beneficial for increasing college student participation in research.

Conclusions

This study suggests institutions can play a major role in aiding in college student knowledge, enrollment, and utilization of SNAP benefits. Notably, as supported by our findings, higher education institutions could identify community and campus leaders (Laska et al., 2020) who could provide access to food resources, hire a needs-based campus liaison to connect students to food, housing and other resources, or develop other innovative strategies (e.g. campus community gardens, partnerships with WIC) to address the widespread food insecurity issue (Goldrick-Rab et al., 2017). In setting up efficient systems in all higher education institutions, more students could receive access to healthful foods and reduce food insecurity. This in turn could lead to better health and educational outcomes.

In some states, assistance programs such as SNAP and WIC are part of combined application efforts to determine if one qualifies for either. In Missouri, each program is applied for separately, which may partially contribute to the reported difficulty with the application process barriers, including lack of assistance for enrolling in SNAP and unsure of how to answer SNAP application questions. States that have similar systems in place to Missouri could benefit from examining strategies to streamline their SNAP enrollment processes. Future work could examine comparisons by the academic ranking and quality of each institution, which may be proxy measures for the students' socioeconomic status and availability of community resources to address food insecurity.

In Missouri college students across institution type reported lack of knowledge of SNAP as the main barrier for enrollment while assistance from campus resources as the main facilitator. Lack of SNAP knowledge and enrollment barriers contribute to high rates of food insecurity in Missouri college students. In Missouri there is a need for increased attention and resources to target college food insecurity.

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Appendix A. Survey Instrument

I. Demographics

a. What is your age: _____ years

b. What is your gender: (circle one)

Male	Female	Other: _____(specify)

c. What grade are you in: (circle one)

Freshman	Sophomore	Junior
Senior	Graduate student	Other: _____ (specify)

d. What is your race/ethnicity: (circle all that apply)

White/Caucasian	Hispanic/Latinx	American Indian or Alaska native	Other: _____ (specify)
Black/African American	Asian descent	Native Hawaiian or other Pacific Islander	

e. In the last 12 months, did you, or any member of your household receive food stamp benefits?[1]
   i. Yes
   ii. No
   iii. Don't know/Not sure

II. Food insecurity:

a. Food insecurity (USDA U.S. Adult Food Security Survey Module, attached below)[2]
b. Has the amount of food in your household changed since the start of the COVID-19 pandemic period?
   i. The amount of food has been reduced a lot
   ii. The amount of food has been reduced a little
   iii. The amount of food as not changed
   iv. The amount of food has increased a little
   v. The amount of food has increased a lot

III. Health behaviors

a. Physical activity/exercise[3]

i. During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise? Yes, No, Don't know/Not Sure, Refused
ii. How many times per week or per month did you take part in this activity during the past month? ___Times/week, ___ Times/month, Don't know/Not Sure, Refused
iii. And when you took part in this activity, for how many minutes or hours did you usually keep at it? ___Hours and minutes, Don't know/Not Sure
iv. During the past month, how many times per week or per month did you do physical activities or exercises to strengthen your muscles? ___ Times per week, ___ Times per month, Never, Don't know/Not Sure, Refused

b. **Diet, including fruit and vegetable and beverage consumption**[3]
   i. Now think about the foods you ate or drank during the past month, that is, the past 30 days, including meals and snacks. Not including juices, how often did you eat fruit? You can tell me times per day, times per week or times per month. __ Day, __Week, __Month, Less than once a month, Never, Don't Know, Refused
   ii. Not including fruit-flavored drinks or fruit juices with added sugar, how often did you drink 100% fruit juice such as apple or orange juice? __Day, __Week, __ Month, Less than once a month, Never, Don't Know, Refused
   iii. How often did you eat a green leafy or lettuce salad, with or without other vegetables? __ Day, __ Week, __Month, Less than once a month, Never, Don't Know, Refused
   iv. How often did you eat any kind of fried potatoes, including French fries, home fries, or hash browns? __ Day, __Week, __Month, Less than once a month, Never, Don't Know, Refused
   v. How often did you eat any other kind of potatoes, or sweet potatoes, such as baked, boiled, mashed potatoes, or potato salad? __ Day, __ Week, __ Month, Less than once a month, Never, Don't Know, Refused
   vi. Not including lettuce salads and potatoes, how often did you eat other vegetables? __ Day, __ Week, __ Month, Less than once a month, Never, Don't Know, Refused

c. **Beverage Intake**[3]
   i. During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor? __Days per week, __ Days in past 30 days, No drinks in past 30 days, Don't know/Not sure, Refused
   ii. One drink is equivalent to a 12-ounce beer, a 5ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average? __ Number of drinks, None, Don't know/Not sure, Refused

d. **Beverage Intake and Breakfast Consumption**[4]
   i. During the past 7 days, how many times did you drink a **can, bottle, or glass of soda or pop**, such as Coke, Pepsi, or Sprite? (Do **not** count diet soda or diet pop.)
      1. I did not drink soda or pop during the past 7 days
      2. 1 to 3 times during the past 7 days
      3. 4 to 6 times during the past 7 days
      4. 1 time per day
      5. 2 times per day
      6. 3 times per day
      7. 4 or more times per day

   ii. During the past 7 days, how many **glasses of milk** did you drink? (Count the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)
      1. I did not drink milk during the past 7 days
      2. 1 to 3 glasses during the past 7 days
      3. 4 to 6 glasses during the past 7 days
      4. 1 glass per day
      5. 2 glasses per day
      6. 3 glasses per day
      7. 4 or more glasses per day

iii. During the past 7 days, on how many days did you eat **breakfast**?
   1. 0 days
   2. 1 day
   3. 2 days
   4. 3 days
   5. 4 days
   6. 5 days
   7. 6 days
   8. 7 days

e. **Weight and Height**[3]
   i. About how much do you weigh without shoes? ___ Weight (pounds/kilograms), Don't know/Not sure, Refused
   ii. About how tall are you without shoes? __ / __ Height (ft/inches/meters/centimeters), Don't know/Not sure, Refused

f. **Sleep patterns**[5]
   i. On average, how many hours of sleep do you get in a 24-hour period?

g. **Sedentary behavior**[6]
   i. The next questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television.
      1. During the last 7 days, how much time did you usually spend **sitting** on a **weekday?**
         _____ hours per day
         _____ minutes per day
      2. During the last 7 days, how much time did you usually spend **sitting** on a **weekend day?**
         _____ hours per day
         _____ minutes per day

IV. Knowledge and use of SNAP[7]

a. Where do you get your food? (select all that apply)
   i. Large grocery/supermarket
   ii. Local neighborhood market
   iii. Campus dining options
   iv. Convenience store
   v. Dollar store
   vi. Fast food
   vii. Farmer's market
   viii. Food pantry
   ix. Grow own
   x. Other (specify)

b. Approximately how many miles do you live from the nearest chain grocery store (i.e. Walmart, Aldi, Schnuck's)?
c. Approximately how much money do you spend on food from the grocery store per month?
d. Approximately how much money do you spend on eating out (restaurants) per month?
e. Have you ever had a high school or college class that taught about nutrition? y/n/idk
f. Do you know what SNAP is? y/n/idk
g. Have you, and/or your family, ever participated in SNAP in the past? y/n/idk
h. Do you know if you are eligible for SNAP? y/n/idk
i. Do you know where to enroll in SNAP? y/n/idk
j. Do you know how SNAP benefits are delivered to participants? y/n/idk
k. Have you ever tried to enroll in SNAP? y/n/idk
l. Have you ever used SNAP to purchase food or beverages? y/n/idk
m. How long do you think people can be on SNAP?
n. How much money (in dollars) do you think people on this program are given per month (per person)?
o. Which of these items do you believe are purchased/covered by SNAP benefits on a regular basis? (select all that apply)
    i. Perishable foods (produce, dairy, meat, bread)
    ii. Fruit and vegetable plants
    iii. Packaged food (chips, crackers, beans, cereals)
    iv. Canned foods (soup, vegetables)
    v. Alcoholic beverages
    vi. Toiletries (soap, toothpaste, etc.)
    vii. Organic foods
    viii. Food from farmer's markets
    ix. Pet food
    x. Gasoline
    xi. Lottery tickets
    xii. Bread
    xiii. Soft drinks
    xiv. Cigarettes/tobacco
    xv. Dessert/snack items (candy, chocolate, ice cream, cake)
    xvi. Paper goods (toilet tissue, paper towels, napkins)
    xvii. Kitchen utensils (plates, cups, silverware)
    xviii. Clothing
    xix. Prepared foods from grocery stores (fried chicken, French fries, sandwiches)
    xx. Food from restaurants/fast foods

p. Which **of these items do you believe SHOULD be covered by SNAP benefits?** (select all that apply)
   i. Perishable foods (produce, dairy, meat, bread)
   ii. Fruit and vegetable plants
   iii. Packaged food (chips, crackers, beans, cereals)
   iv. Canned foods (soup, vegetables)
   v. Alcoholic beverages
   vi. Toiletries (soap, toothpaste, etc.)
   vii. Organic foods
   viii. Food from farmer's markets
   ix. Pet food
   x. Gasoline
   xi. Lottery tickets
   xii. Bread
   xiii. Soft drinks
   xiv. Cigarettes/tobacco
   xv. Dessert/snack items (candy, chocolate, ice cream, cake)
   xvi. Paper goods (toilet tissue, paper towels, napkins)
   xvii. Kitchen utensils (plates, cups, silverware)
   xviii. Clothing
   xix. Prepared foods from grocery stores (fried chicken, French fries, sandwiches)
   xx. Food from restaurants/fast foods

q. Rate your agreement with the following statement: "the national government should spend more money to support people on the SNAP program?"
   i. Strongly agree
   ii. Agree
   iii. Neutral
   iv. Disagree
   v. Strongly disagree

V. Barriers/Facilitators to using SNAP

a. In general, what are barriers or challenges for college students enrolling in and using SNAP? Select all that apply:
   i. Lack of knowledge about SNAP
   ii. Negative stigma associated with enrolling or using SNAP benefits
   iii. Lack of access to SNAP
   iv. Not eligible for SNAP benefits
   v. Lack of assistance for enrolling in SNAP
   vi. Lack of time to enroll in SNAP
   vii. Unsure of where to purchase food using SNAP funds
   viii. Unsure of what foods are allowed under SNAP
   ix. Lack transportation to enroll in SNAP
   x. Lack transportation to retailers that accept SNAP funds
   xi. Not safe due to COIVD-19 concerns

xii. Lack of accessibility due to COVID-19
xiii. Takes too long to determine eligibility
xiv. None of my friends or family are enrolled in SNAP
xv. Lack government-issued ID
xvi. Unsure how to answer SNAP application questions
xvii. Other (please specify: _____)

b. In general, what are facilitators or helpful factors for college students enrolling in and using SNAP? Select all that apply:
   i. University assistance to enroll in SNAP
   ii. Available resources on campus
   iii. Available community resources to enroll in SNAP
   iv. Clear information for how to enroll in SNAP
   v. Clear information for where to use SNAP benefits
   vi. University website for SNAP assistance
   vii. State website for enrolling in SNAP
   viii. Easy to determine eligibility
   ix. I have friends and/or family enrolled in SNAP
   x. Having multiple sites to submit SNAP applications
   xi. Other (specify: _____)

VI. Are you interested in participating in anonymous, online focus groups to further explore these topics?

a. Yes or No
   i. If yes, please provide:
      1. Name
      2. Email
      3. Age
      4. Gender
      5. Race/Ethnicity

Appendix B.

Table B1. Knowledge and Use of SNAP Reported by Missouri College Students in the SNAP for U Study, 2021–2022

Variable	Response options	Total sample (n, %)	Public (n, %)	HBCU (n, %)	Private (n, %)	Community college (n, %)	Tech school (n, %)
Know what SNAP is (*n* = 744)	Yes	505 (67.9%)	256 (69.6%)	88 (78.6%)	23 (51.1%)	127 (67.9%)	11 (34.4%)
	No	204 (27.4%)	91 (24.7%)	21 (18.8%)	20 (44.4%)	55 (29.4%)	17 (53.1%)
	Not sure/ Don't know	35 (4.7%)	21 (5.7%)	3 (2.7%)	2 (4.4%)	5 (2.7%)	4 (12.5%)
Ever participated in SNAP (*n* = 750)	Yes	323 (43.1%)	182 (48.9%)	63 (55.8%)	7 (15.6%)	65 (34.6%)	6 (18.8%)
	No	378 (50.4%)	163 (43.8%)	45 (39.8%)	34 (75.6%)	115 (61.2%)	21 (65.6%)
	Not sure/ Don't know	49 (6.5%)	27 (7.3%)	5 (4.4%)	4 (8.9%)	8 (4.3%)	5 (15.6%)
Know if eligible for SNAP (*n* = 749)	Yes	257 (34.3%)	158 (42.6%)	41 (36.3%)	5 (11.1%)	48 (25.5%)	5 (15.6%)
	No	281 (37.5%)	128 (34.5%)	32 (28.3%)	23 (51.1%)	77 (41.0%)	21 (65.6%)
	Not sure/ Don't know	211 (28.2%)	85 (22.9%)	40 (35.4%)	17 (37.8%)	63 (33.5%)	6 (18.8%)
Know where to enroll in SNAP (*n* = 747)	Yes	339 (45.4%)	181 (49.1%)	58 (51.3%)	7 (15.6%)	86 (45.7%)	7 (21.9%)
	No	328 (43.9%)	152 (41.2%)	39 (34.5%)	34 (75.6%)	83 (44.1%)	20 (62.5%)
	Not sure/ Don't know	80 (10.7%)	36 (9.8%)	16 (14.2%)	4 (8.9%)	19 (10.1%)	5 (15.6%)
Know where SNAP benefits are delivered (*n* = 748)	Yes	342 (45.7%)	171 (46.2%)	64 (56.6%)	12 (26.7%)	89 (47.3%)	6 (18.8%)
	No	332 (44.4%)	153 (41.4%)	36 (31.9%)	31 (68.9%)	89 (47.3%)	23 (71.9%)
	Not sure/ Don't know	74 (9.9%)	46 (12.4%)	13 (11.5%)	2 (4.4%)	10 (5.3%)	3 (9.4%)
Ever tried to enroll in SNAP (*n* = 750)	Yes	285 (38.0%)	167 (44.9%)	53 (46.9%)	2 (4.4%)	58 (30.9%)	5 (15.6%)
	No	435 (58.0%)	191 (51.3%)	51 (45.1%)	42 (93.3%)	126 (67.0%)	25 (78.1%)
	Not sure/ Don't know	30 (4.0%)	14 (3.8%)	9 (8.0%)	1 (2.2%)	4 (2.1%)	2 (6.3%)
Ever purchased anything using SNAP benefits (*n* = 749)	Yes	263 (35.1%)	153 (41.2%)	51 (45.1%)	2 (4.4%)	52 (27.7%)	5 (15.6%)
	No	460 (61.4%)	204 (55.0%)	58 (51.3%)	40 (88.9%)	132 (70.2%)	26 (81.3%)
	Not sure/ Don't know	26 (3.5%)	14 (3.8%)	4 (3.5%)	3 (6.7%)	4 (2.1%)	1 (3.1%)

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Variable	Response options	Total sample (n, %)	Public (n, %)	HBCU (n, %)	Private (n, %)	Community college (n, %)	Tech school (n, %)
Government should spend more to support SNAP (n = 749)	Strongly agree	208 (27.8%)	130 (35.0%)	29 (25.7%)	13 (28.3%)	30 (16.0%)	6 (19.4%)
	Agree	257 (34.3%)	154 (41.5%)	47 (41.6%)	13 (28.3%)	37 (19.7%)	6 (19.4%)
	Neutral	219 (29.2%)	72 (19.4%)	30 (26.5%)	14 (30.4%)	92 (48.9%)	11 (35.5%)
	Disagree	47 (6.3%)	13 (3.5%)	7 (6.2%)	4 (8.7%)	17 (9.0%)	6 (19.4%)
	Strongly disagree	18 (2.4%)	2 (0.5%)	--	2 (4.3%)	12 (6.4%)	2 (6.5%)