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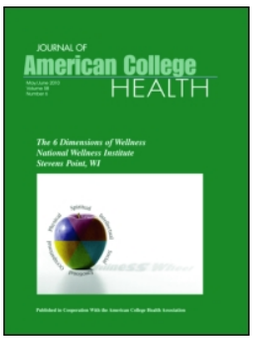

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MAJOR ARTICLE

Struggling with the basics: food and housing insecurity among college students across twenty-two colleges and universities

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ABSTRACT

Objectives: To quantify the number and type of students failing to secure basic needs.
Participants: Students attending 22 postsecondary schools in the United States in Fall 2019.
Methods: The Adult Food Security Module and part of the #RealCollege Survey were used to measure food and housing insecurity, respectively. Logistic and linear regression models were used to assess the relationship between selected factors and basic needs insecurities.
Results: Participants ($n = 22,153$) were classified as 44.1% and 52.3% food insecure and housing insecure, respectively. Homeless students or those who experienced childhood food insecurity were at the greatest odds of college food insecurity. Year in school was the largest contributor to being housing insecure, with PhD or EdD students being 1,157% more likely to experience housing insecurity compared to freshmen.
Conclusions: High prevalence of basic needs insecurities remain. Current campus initiatives may be insufficient, calling for a more holistic approach at the campus, state, and national levels.

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Introduction

More than 17 million individuals, in the United States (US), were enrolled in higher education in Fall 2019.[1] Many factors have been suggested to contribute to a student's success in college including attitudes, behaviors, and dispositions.[2] However, with an average 37% increase in tuition costs at a four-year institution since 2008[3] and an overall decrease in aid for students,[3] the price of attending higher education may be considered a barrier for students' success.[4] This financial burden can spread into all facets of a college student's life and, in recent years, more has been brought to light regarding college students' inabilities

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to meet even their basic needs,[5] which is linked to academic disruption.[6–12] According to Maslow's Hierarchy of Needs, food and shelter are basic needs required for the success of all humans.[13] Postsecondary students who face basic need insecurities fail to meet this fundamental component for success and wellbeing. Not only can this inhibit a student's academic progress, but it could also result in their departure from higher education altogether.[14,15] In light of the COVID-19 pandemic's impact on enrollment and budgetary issues at higher education institutions, investigation of factors that may influence college student success and well-being is timely.

Food insecurity on college campuses has become a recognized public health issue at post-secondary institutions across the United States (US). Defined by the US Department of Agriculture, food insecurity is "a household-level economic and social condition of limited or uncertain access to adequate food.[16]" College food insecurity rates far surpass the US household food insecurity rate of 11%,[17] with weight estimates from peer-reviewed studies of college student food insecurity at 41%.[18] Housing insecurity, including the inability to pay rent or utilities or the need to move frequently,[19] on college campuses is also emerging as a problematic reality faced by many college students. A 2020 systematic review on college housing issues reported approximately 1 out of every 10 college students is homeless and 45% are housing insecure.[20] Food and housing insecurities are complementary, with concerns about one impacting the other (eg, choosing between food and rent). These high rates of basic need insecurities are leading campus stakeholders to take notice and implement student-focused programming or advocate for policy efforts.[20]

When asked by Congress to assess the issue of college food insecurity, the Government Accountability Office (GAO) assessed contributing factors identified in peer-reviewed, published research literature and aligned with National Postsecondary Student Aid Study (NPSAS) data, with the ultimate goals of identifying the students most at risk.[21] Unfortunately, most studies on basic need securities are limited as they look at the prevalence and associated correlates of housing and food insecurity on a single campus. To our knowledge, the #RealCollege Survey is the only multi-campus survey assessing the prevalence of and correlates to basic need securities.[5] However, this #RealCollege report fails to control for factors that may play the largest role in food and housing insecurity by looking at each factor's relationship with food or housing insecurity alone.

Hege and colleagues recommend looking at factors that may contribute to food and housing inequities to show associations so the college and university administrators can use data to drive solutions to improve student outcomes.[15] In response, this study aspired to add to the literature on the prevalence and correlates of basic need insecurities and identify factors that may contribute the most to food and housing insecurity. Further, we aimed to use a large, multi-campus sample to understand the impact these basic need insecurities have on the health, academic, and behavioral outcomes of students.

Methods

Study design and participants

This study uses data collected from an online survey distributed in Fall 2019 across 22 postsecondary institutions. Participating universities are deidentified but were spread across the US in the following states and territories: Alabama, Arizona, Hawaii, Illinois, Kansas, Louisiana, Mississippi, North Carolina, Northern Mariana Islands, Tennessee, Utah, Virginia, and West Virginia. Participating institutions included 17 public four-year institutions (7 land-grant), three private institutions, one academic medical center, and one community college. All institutions were covered under the Institutional Review Board (IRB) approval of the lead university (approval #1904527720A003). Participants were at least 18 years of age and enrolled in one of the participating institutions. All participants completed online consent before accessing the survey.

The survey was built in Qualtrics at the lead university and distributed to the other universities for recruitment. Variation occurred in recruitment and incentive as methods were utilized by each institution's principal investigator to best fit the funding available. Each university used a campus-specific incentive, which included drawing or random selection for a limited number of gift cards or classroom extra credit. Two universities provided no incentive. Method of survey distribution to participants included either distribution via campus listserv or direct email from the campus principal investigator. All collected data were cleaned at the lead institution for consistency.

Survey measures

The 122-question survey was modified from a previously used survey[7] and guided by college food insecurity literature, including the GAO report.[21] Food insecurity was measured using the validated United States Department of Agriculture (USDA) Adult Food Security Module (AFSM).[22] This 10-item screener was modified to ask students about food security issues "since being in college" to ensure questions were focused on campus issues as opposed to the original screener that uses "in the last 12 months" which may include when students still permanently lived at home with a parent or guardian as a minor.[23] Responses to the 10 items were coded as affirmative or non-affirmative and categorized into 4 food security categories: high food security (0 affirmative), marginal food security (1–2 affirmative), low food security (3–5 affirmative), and very low food security (6–10 affirmative). High food security is described as having no reported indications of food-access limitations. Marginal food insecurity is characterized by some anxiety over food sufficiency but limited or no changes in food intake. Low food security is described as dietary intake being reduced in terms of quality and variety but little or no indication of hunger. Very low food security is inclusive of multiple symptoms of disrupted eating patterns and reduced food intake including hunger. Responses were further coded into a binary variable with high and marginal food security combined as food secure and low and very low food security combined as food

insecure per USDA scoring guidelines.[22] Food security status during childhood was also assessed using a modified version of the validated two questions by Hager and collegues,[24] in which an affirmative response to either question categorized a student as experiencing childhood food insecurity.[15]

Housing insecurity was measured using six items from the #RealCollege survey in the 2018 report "Still Hungry and Homeless in College".[19] Students were asked about difficulties paying rent and utilities, moving multiple times, and moving in with others due to financial limitations. The six housing insecurity items were summed and students were considered housing insecure if they answered affirmatively to any of the six questions.[19] An additional question asked students if they were ever homeless while in college to assess student homelessness.

Health, academic, and behavioral factors were collected also. Health-related variables included a self-reported rating of health status (excellent/good or fair/poor)[25] and body mass index (BMI) was calculated from students' self-reported heights and weights. Academic performance was collected using the academic progress scale.[7,8,26] Self-reported grade point average (GPA) was collected but not reported as first-year students would not have a GPA and would have been excluded from the analysis. The spending and coping behaviors of college students were assessed using the eight-item money expenditure scale[26] and the coping strategies scale[26] as collected in previous college food insecurity literature, with higher money expenditure scores showing a student spends more money on items prior to purchasing food and higher coping strategies scores indicating more reliance on coping strategies such as begging for food or selling personal property to receive food.[7,8,26]

Collected variables from the GAO report included disability status, being a first-generation student, former foster youth, income, having dependents, and receiving Supplemental Nutrition Assistance Program (SNAP) benefits.[21] Other variables considered, but not ultimately included, in the GAO analysis were collected in this study, including year in school, familial financial support, childhood enrollment in free and reduced lunch, off-campus living arrangement, food preparation skills, financial aid use, race/ethnicity, sex, and international student status.[21] Lastly, additional variables were added due to previous research showing a relationship with basic need insecurity and included veteran status,[5,27,28] marital status,[7,29] employment,[7,30–32] and understanding of finances.[33]

Analysis

Data were analyzed using JMP Pro version 12.2 (SAS Institute Inc.) and SAS version 9.4 software (SAS Institute Inc.). Significance was established *a priori* at $p < 0.05$. Descriptive statistics were computed for all variables. To assess the relationship between being food or housing insecure versus each selected characteristic, Pearson chi-square and Wilcoxon tests were used. To examine the correlates most affecting basic need insecurities, separate logistic regression models were employed for food and housing insecurity. All variables that were significant in the bivariate analyses were included in the regression models. Multicollinearity was assessed using variance inflation factor using a cutoff value of 10. No variables violated this assumption. Area under the curve (AUC) was used to assess model predictive power. Hosmer and Lemeshow (HL) goodness-of-fit was assessed for each logistic regression analysis. Sensitivity analysis was conducted *post hoc* with freshmen excluded from the model due to some previous food insecurity research removing freshmen from the analysis, and odds ratios (OR) and 95% confidence interval (CI) are presented.[34,35] The relationship between food and housing insecurities and health, academic, and behavioral outcomes was also assessed using multiple linear regression models for BMI, academic progress, coping, and money expenditure scores and logistic regression for health rating. The university or college each respondent was attending was controlled for in all models

Results

Characteristics of respondents in association with food and housing insecurity

A total of 22,153 students completed consent and the full food security screener for study inclusion. Full sample characteristics, as well as by food and housing security status, are shown in Table 1. Results indicate that 44.1% and 52.3% of students were food and housing insecure, respectively. From the full sample, 1.8% of students faced homelessness. In univariate analyses, basic need insecurities were associated with the following variables: younger student age, higher BMI, female or nonbinary gender identity, nonwhite race, single marital status, upperclassman, undergraduate school years, having one or more part-time job, lower income, receipt of financial aid, enrollment in the SNAP program, history of being in foster care, receiving free/reduced lunch, or being food insecure as a child. Students who were food and housing insecure had lower academic progress scores and higher money expenditure and coping strategy scores. Further, being a first-generation college student, homeless, living off-campus, lacking familial financial support, and self-reporting a disability, lower financial knowledge, or poorer health status were associated with both basic need insecurities. Food insecurity was also associated with Hispanic ethnicity, while housing insecurity was associated with being female, being enrolled in an online program, having dependents, and being a veteran. Being aware of food resources on campus was associated with both basic needs insecurities while using food resources on campus was only associated with housing insecurity.

Odds of basic need insecurities

Relationships between factors and food and housing insecurity are reported in Tables 2 and 3, controlling for university and the other basic needs insecurity. The food insecurity logistic regression model was considered

Table 1. Characteristics of participants and correlations with food and housing security status.

Variable	Full sample *n* (%)	Food secure *n* (%)	Food insecure *n* (%)	*p*	Housing secure *n*(%)	Housing insecure *n*(%)	*p*
Food security status							
Food secure	12395 (55.9)	-	-	-	-	-	-
Food insecure	9758 (44.1)						
Housing security status							
Housing secure	10301 (47.7)	-	-	-	-	-	-
Housing insecure	11289 (52.3)						
Sex				0.1187			0.0012
Male	5741 (26.0)	3263 (26.4)	2478 (25.4)		2762 (26.8)	2808 (24.9)	
Female	16386 (74.0)	9117 (73.6)	7269 (74.6)		7528 (73.2)	8466 (75.1)	
Gender identity				<0.0001			<0.0001
Male	5714 (25.8)	3234 (26.1)	2480 (25.4)		2750 (26.7)	2795 (24.8)	
Female	16179 (73.1)	9054 (73.1)	7125 (73.1)		7453 (72.4)	8339 (73.9)	
Other	243 (1.1)	93 (0.8)	150 (1.5)		90 (0.9)	148 (1.3)	
Ethnicity				<0.0001			0.3522
Hispanic	1389 (6.3)	628 (5.1)	761 (7.8)		625 (6.1)	720 (6.4)	
Non-Hispanic	20685 (93.7)	11724 (94.9)	8961 (92.2)		9643 (93.9)	10528 (93.6)	
Race				<0.0001			<0.0001
White	18106 (82.3)	10408 (84.5)	7698 (79.5)		8406 (82.2)	9265 (82.6)	
Black	1235 (5.6)	520 (4.2)	715 (7.4)		601 (5.9)	583 (5.2)	
Asian	1182 (5.4)	738 (6.0)	444 (4.6)		612 (6.0)	541 (4.8)	
Biracial or other	1475 (6.7)	653 (5.3)	822 (8.5)		605 (5.9)	830 (7.4)	
Living				<0.0001			<0.0001
On-Campus	7694 (34.7)	4750 (38.3)	2944 (30.2)		5680 (55.2)	1739 (15.4)	
Off-Campus	14454 (65.3)	7643 (61.7)	6811 (69.8)		4618 (44.8)	9548 (84.6)	
Program type				0.1231			<0.0001
Residential	20691 (94.0)	11546 (93.8)	9145 (94.3)		9792 (95.6)	10369 (92.4)	
Online	1323 (6.0)	767 (6.2)	556 (5.7)		446 (4.4)	853 (7.6)	
School year				<0.0001			<0.0001
Freshman	5075 (22.9)	3282 (26.5)	1793 (18.4)		4106 (39.9)	789 (7.0)	
Sophomore	3864 (17.4)	1986 (16.0)	1878 (19.3)		2281 (22.2)	1461 (13.0)	
Junior	3970 (17.9)	1927 (15.6)	2043 (20.9)		1501 (14.6)	2385 (21.1)	
Senior	4132 (18.7)	2020 (16.3)	2112 (21.7)		1013 (9.8)	3021 (26.8)	
Masters	2483 (11.2)	1485 (12.0)	998 (10.2)		722 (7.0)	1730 (15.3)	
PhD/EdD	1365 (6.2)	873 (7.0)	492 (5.0)		341 (3.3)	1007 (8.9)	
Professional	1253 (5.7)	814 (6.6)	439 (4.5)		332 (3.2)	891 (7.9)	
Marital status				<0.0001			<0.0001
Single	18349 (82.9)	10259 (82.8)	8090 (83.0)		9298 (90.3)	8550 (75.8)	
Living with Partner	1340 (6.1)	628 (5.1)	712 (7.3)		272 (2.6)	1042 (9.3)	
Married	2269 (10.2)	1416 (11.4)	853 (8.7)		674 (6.6)	1561 (13.8)	
Divorced/Widowed	180 (0.8)	84 (0.7)	96 (1.0)		50 (0.5)	128 (1.1)	
Employment				<0.0001			<0.0001
Unemployed	8415 (39.1)	5253 (43.4)	3162 (33.4)		5251 (51.2)	3141 (27.9)	
One or more part-time job	10417 (48.3)	5268 (43.6)	5149 (54.5)		4136 (40.3)	6264 (55.7)	
One or more full-time job	1972 (9.2)	1146 (9.5)	826 (8.7)		614 (6.0)	1354 (12.0)	
Other	739 (3.4)	419 (3.5)	320 (3.4)		251 (2.5)	488 (4.4)	
First generation college student							<0.0001
No	17005 (76.8)	10137 (81.8)	6868 (70.4)	<0.0001	8212 (79.8)	8360 (74.8)	
Yes	5135 (23.2)	2249 (18.2)	2886 (29.6)		2081 (20.2)	2925 (25.9)	
Has dependents				0.1804			<0.0001
No	20483 (92.5)	11486 (92.7)	8997 (92.3)		9679 (94.1)	10277 (91.1)	
Yes	1652 (7.5)	898 (7.3)	754 (7.7)		610 (5.9)	1007 (8.9)	
Has a disability				<0.0001			<0.0001
No	20378 (92.0)	11669 (94.2)	8709 (89.3)		9610 (93.4)	10238 (90.7)	
Yes	1760 (8.0)	718 (5.8)	1042 (10.7)		685 (6.6)	1045 (9.3)	
Was orphan or foster child				<0.0001			<0.0001
No	21819 (98.5)	12262 (99.0)	9557 (98.0)		10190 (98.9)	11076 (98.1)	
Yes	329 (1.5)	130 (1.0)	199 (2.0)		110 (1.1)	210 (1.9)	
Received free or reduced lunch				<0.0001			<0.0001
No	17808 (80.4)	10767 (86.9)	7041 (72.2)		8543 (83.0)	8795 (77.9)	
Yes	4337 (19.6)	1623 (13.1)	2714 (27.8)		1755 (17.0)	2491 (22.1)	
International student				0.2927			0.0817
No	21407 (96.6)	11963 (96.5)	9444 (96.8)		9978 (96.9)	10885 (96.4)	
Yes	743 (3.4)	430 (3.5)	313 (3.2)		322 (3.1)	402 (3.6)	
Veteran				0.3425			0.0110
No	21852 (98.7)	12235 (98.7)	9617 (98.6)		10181 (98.9)	11109 (98.5)	
Yes	292 (1.3)	155 (1.3)	137 (1.4)		117 (1.1)	174 (1.5)	
Childhood food insecurity				<0.0001			<0.0001
No	17477 (79.7)	11080 (90.2)	6397 (66.3)		8759 (85.1)	8458 (74.9)	
Yes	4456 (20.3)	1206 (9.8)	3250 (33.7)		1536 (14.9)	2830 (25.1)	
Homeless				<0.0001			<0.0001
No	21245 (98.2)	12074 (99.6)	9171 (96.6)		10277 (99.8)	10927 (96.8)	
Yes	379 (1.8)	52 (0.4)	327 (3.4)		18 (0.2)	360 (3.2)	

Receive financial aid				<0.0001			<0.0001
No	5809 (27.0)	3479 (28.8)	2330 (24.6)		3016 (29.4)	2774 (24.7)	
Yes	15735 (73.0)	8607 (71.2)	7128 (75.4)		7238 (70.6)	8472 (75.3)	
SNAP benefits				<0.0001			<0.0001
No	20542 (97.0)	11694 (98.5)	8848 (95.0)		9922 (98.9)	10580 (95.2)	
Yes	639 (3.0)	177 (1.5)	462 5.0)		106 (1.1)	533 (4.8)	
Familial support				<0.0001			<0.0001
No	6489 (30.6)	3102 (26.2)	3387 (36.4)		2257 (22.5)	4219 (38.0)	
Yes	14682 (69.4)	8761 (73.8)	5921 (63.6)		7769 (77.5)	6887 (62.0)	
Financial knowledge				<0.0001			<0.0001
Low/Very Low	4333 (20.5)	2167 (18.3)	2166 (23.3)		2147 (21.4)	2182 (19.6)	
Moderate	10575 (49.9)	5945 (50.1)	4630 (49.7)		5091 (50.8)	5462 (49.2)	
High/Very High	6267 (29.6)	3752 (31.6)	2515 (27.0)		2788 (27.8)	3466 (31.2)	
Health status				<0.0001			<0.0001
Poor/Fair	4733 (24.1)	1754 (16.0)	2979 (34.4)		1826 (19.8)	2900 (27.8)	
Excellent/Good	14914 (75.9)	9240 (84.0)	5674 (65.6)		7373 (80.2)	7515 (72.2)	
Food resource awareness				<0.0001			<0.0001
No	10388 (58.7)	5676 (57.1)	4712 (60.7)		4620 (56.4)	5750 (60.6)	
Yes	7317 (41.3)	4271 (42.9)	3046 (39.3)		3571 (43.6)	3735 (39.4)	
Use food resources				0.0862			<0.0001
No	15105 (86.1)	8525 (86.5)	6580 (85.6)		6774 (83.6)	8305 (88.3)	
Yes	2437 (13.9)	1330 (13.5)	1107 (14.4)		1331 (16.4)	1103 (11.7)	
	Full sample mean (SD)	**Food secure**	**Food insecure**	***p***	**Housing secure**	**Housing insecure**	***p***
Age	22.3 (5.5)	22.4 (5.8)	22.2 (5.0)	<0.0001	21.2 (5.5)	23.3 (5.3)	<0.0001
Income (monthly)	987.9 (1404.5)	1067.3 (1563.4)	892.0 (1177.4)	0.0009	914.4 (1582.7)	1048.2 (1231.3)	<0.0001
Academic progress	12.8 (2.1)	13.3 (1.9)	12.2 (2.2)	<0.0001	13.1 (2.0)	12.6 (2.2)	<0.0001
Money expenditure	9.3 (1.8)	8.6 (1.4)	10.1 (2.0)	<0.0001	8.8 (1.6)	9.7 (2.0)	<0.0001
Coping strategies	41.1 (9.3)	36.3 (6.7)	47.1 (8.5)	<0.0001	36.9 (7.1)	44.8 (9.4)	<0.0001
BMI	24.7 (5.5)	24.4 (5.0)	25.2 (5.9)	<0.0001	24.3 (5.1)	25.2 (5.7)	<0.0001

Body mass index (BMI).

acceptable (AUC = 0.75; Hosmer and Lemeshow $p = 0.62$). This model showed students were less likely to be food insecure if they were Black, Hispanic, and biracial or other students were respectively 49%, 23%, and 20% more likely to be food insecure compared to white students. Compared to first-year students, sophomores and juniors were 49% and 26% more likely to be food insecure, respectively, while PhD/EdD students were and professional students were 21% and 22% less likely to be food insecure, respectively. Students who were married were 22% less likely to be food insecure compared to single students; however, students who were widowed or divorced were 57% more likely to be food insecure. Students who held one or more part-time jobs were 27% more likely to be food insecure compared to students who held one or more full-time jobs. Students who reported their financial knowledge as low or very low were 53% more likely to be food insecure and students who reported moderate levels of financial knowledge were 22% more likely to be food insecure compared to students who reported high or very high levels of financial knowledge. Odds of food insecurity were higher for students who: lived off campus (11% higher), were first-generation (21% higher), had disabilities (67% higher), received free or reduced lunch (28% higher), had SNAP benefits (67% higher), experienced childhood food insecurity (235% higher), and were homeless at some time in the last year (254% higher). Odds of food insecurity were lower among students who: received financial aid (9% lower), had familial financial support (29% lower), and were aware of food assistance resources on campus (23% lower). As student age increased, a student was 2% less likely to be food insecure each year they are older. Sensitivity analysis, excluding freshmen students, showed similar results but a few differences were noted (data not shown in Table 2). These included students living with a partner who were 19% more likely to be food insecure compared to single students (1.19; 1.02–1.39) and students living off-campus were 29% more likely to be food secure compared to students living on campus (1.29; 1.15–1.44). Financial aid receipt was no longer significant (0.97; 0.89–1.07) with freshmen excluded. The lower likelihood of food insecurity for Master's (0.82; 0.70–0.96), PhD/EdD (0.81; 0.67–0.99), and professional (0.78; 0.64–0.96) students remained when compared to sophomores instead of freshmen, but junior (1.06; CI 0.94–1.19) year students were no longer significantly more likely to be food insecure.

The housing insecurity logistic regression model was considered acceptable (AUC = 0.80; Hosmer and Lemeshow $p = 0.53$). Results showed black students were 21% less likely to be housing insecure compared to white students, while Asian were 30% less likely to be housing insecure compared to white students. Students who classified their gender as female or nonbinary were 17% and 11% less likely, respectively, to be housing insecure compared to those who classified as males, respectively. All school years were significantly more likely to be housing insecure compared to first-year students. Specifically, for undergraduates, sophomores were 122%, juniors were 413%, and seniors were 927% more likely to be housing insecure compared to freshmen. Additionally, Masters students were 723%, PhD/EdD students were 1,157% and professional students were 1,118%

Table 2. Factors predicting food insecurity from logistic regression model ($n = 15{,}024$).

Variable	OR (95% CI)
Age	0.98 (0.97–0.99)
Income	1.00 (1.00–1.00)
Gender identity	
Male	1 (Ref)
Female	0.96 (0.88–1.05)
Nonbinary or other	1.41 (0.99–2.01)
Ethnicity	
Non-hispanic	1 (Ref)
Hispanic	1.23 (1.04–1.45)
Race	
White	1 (Ref)
Black	1.49 (1.24–1.79)
Asian	0.92 (0.77–1.09)
Biracial or other	1.20 (1.03–1.40)
School Year	
Freshman	1 (Ref)
Sophomore	1.49 (1.24–1.79)
Junior	1.26 (1.09–1.45)
Senior	1.13 (0.98–1.31)
Masters	0.86 (0.72–1.03)
PhD/EdD	0.79 (0.64–0.98)
Professional school	0.78 (0.62–0.98)
Marital status	
Single	1 (Ref)
Living with partner	1.09 (0.93–1.26)
Married	0.78 (0.62–0.98)
Widowed or divorced	1.57 (1.03–2.39)
Living	
On-campus	1 (Ref)
Off-campus	1.11 (1.00–1.23)
First generation college student	
No	1 (Ref)
Yes	1.21 (1.11–1.33)
Disability	
No	1 (Ref)
Yes	1.67 (1.46–1.91)
Was orphan or foster child	
No	1 (Ref)
Yes	1.18 (0.86–1.62)
Received free or reduced lunch	
No	1 (Ref)
Yes	1.28 (1.16–1.43)
Childhood food insecurity	
No	1 (Ref)
Yes	3.35 (3.03–3.71)
Homeless	
No	1 (Ref)
Yes	3.54 (2.54–5.09)
Employment	
Unemployed	1.01 (0.86–1.18)
One or more part time job	1.27 (1.10–1.46)
One or more full time job	1 (Ref)
Other	1.21 (0.98–1.51)
Financial aid	
No	1 (Ref)
Yes	0.91 (0.84–0.99)
SNAP Benefits	
No	1 (Ref)
Yes	1.67 (1.32–2.10)
Familial support	
No	1 (Ref)
Yes	0.71 (0.65–0.78)
Financial knowledge	
Low or Very Low	1.53 (1.37–1.71)
Moderate	1.22 (1.12–1.34)
High or Very High	1 (Ref)
Food resource awareness	
No	1 (Ref)
Yes	0.77 (0.71–0.83)

Model controls for University and housing insecurity. Confidence interval (CI); Odds ratio (OR).

more likely to be housing insecure compared to freshmen. Students who were single were less likely to be housing insecure compared to students who were married (27% more likely), widowed or divorced (70% more likely), or living with a partner (79% more likely). Students who were unemployed were 25% less likely to be housing insecure compared to students holding one or more full-time jobs. Students who reported their financial knowledge as low or very low were 22% more likely to be housing insecure compared to students who reported high or very high levels of financial knowledge. Housing insecurity odds were higher for students who: lived off-campus (156% higher); had disabilities (35% higher); received SNAP benefits (160% higher); experienced childhood food insecurity (49% higher); and received financial aid (16% higher). The odds of housing insecurity were lower by 12% for students who have familial financial support. A student was 4% less likely to be housing insecure for each year increase in age. Again, sensitivity analysis, excluding freshman students, showed similar results with a few differences noted (data not shown in Table 3). These included students who received free or reduced lunch as a child were 14% more likely to be housing insecure compared to students who did not receive free or reduced lunch (1.14; 1.01–1.30) and students who were aware of food assistance resources on campus (0.88; 0.81–0.97) were 22% less likely to be housing secure compared to students who were not aware of resources. Black race was no longer significant (0.85; 0.70–1.05) but multiracial or of other race was significant (1.20; 1.01–1.44) showing a 20% higher odds for students who were multiracial or other race compared to white students. Students who were married (1.17; 0.99–1.38) also no longer had significantly higher odds for housing insecurity compared to single students. Odds of food insecurity remained higher for juniors (2.24; 1.99–2.53), seniors (4.45; 3.91–5.07), Master's (3.50; 2.98–4.12), PhD/EdD (5.34; 4.33–6.60) and professional (4.91; 3.95–6.11) students when compared to sophomores instead of freshman.

Health, academic, and behavioral outcomes in relation to basic need insecurities are reported in Table 4. Model 1 showed food and housing insecurity accounted for 9% of the variance in academic progress scores. Specifically, compared to a secure student, academic progress score was 0.51 and 0.09 points lower for food and housing insecure students respectively. Model 2 showed food and housing insecurity accounted for 19% of money expenditure score variance. Food and housing insecure students' money expenditure score was 0.64 and 0.27 points higher than students who did not face basic need insecurities. Food and housing insecurity accounted for 41% of the variance in the coping strategies, shown in Model 3. Compared to a food secure student, a food insecure student was expected to have a 4.64 points higher coping strategies score on average. Similarly, a housing insecure student's coping strategies score was 2.62 points higher. Model 4 showed food and housing insecurity account for 3% of the variance in BMI.

Table 3. Factors predicting housing insecurity from logistic regression model ($n = 14{,}808$).

Variable	OR (95% CI)
Age	0.96 (0.95–0.97)
Income	1.00 (1.00–1.00)
Sex	
Male	1 (Ref)
Female	1.35 (0.84–2.17)
Gender identity	
Male	1 (Ref)
Female	0.83 (0.52–1.34)
Nonbinary or other	0.89 (0.54–1.45)
Race	
White	1 (Ref)
Black	0.79 (0.65–0.96)
Asian	0.70 (0.58–0.84)
Biracial or other	1.10 (0.93–1.31)
School year	
Freshman	1 (Ref)
Sophomore	2.22 (1.92–2.57)
Junior	5.13 (4.41–5.97)
Senior	10.27 (8.75–12.07)
Masters	8.23 (6.79–9.97)
PhD/EdD	12.57 (9.92–15.93)
Professional School	12.18 (9.56–15.52)
Marital status	
Single	1 (Ref)
Living with Partner	1.79 (1.49–2.14)
Married	1.27 (1.08–1.49)
Widowed or Divorced	1.70 (1.08–2.68)
Living	
On-campus	1 (Ref)
Off-campus	2.56 (2.31–2.85)
Program type	
Residential	1 (Ref)
Online	1.10 (0.86–1.26)
Veteran	
No	1 (Ref)
Yes	0.96 (0.70–1.32)
First generation	
No	1 (Ref)
Yes	1.08 (0.97–1.19)
Disability	
No	1 (Ref)
Yes	1.35 (1.16–1.56)
Was orphan or foster child	
No	1 (Ref)
Yes	1.38 (0.98–1.94)
Received free or reduced lunch	
No	1 (Ref)
Yes	1.10 (0.98–1.24)
Childhood food insecurity	
No	1 (Ref)
Yes	1.49 (1.33–1.67)
Dependents	
No	1 (Ref)
Yes	0.94 (0.79–1.13)
Employment	
Unemployed	0.75 (0.64–0.89)
One or more part time job	1.07 (0.92–1.25)
One or more full time job	1 (Ref)
Other	0.83 (0.66–1.04)
Financial aid	
No	1 (Ref)
Yes	1.16 (1.05–1.27)
SNAP benefits	
No	1 (Ref)
Yes	2.60 (1.94–3.48)
Familial support	
No	1 (Ref)
Yes	0.88 (0.80–0.97)
Financial knowledge	
Low or very low	1.22 (1.08–1.38)
Moderate	1.07 (0.98–1.18)
High or very high	1 (Ref)
Aware of food resources	
No	1 (Ref)
Yes	0.92 (0.85–1.00)
Use food resources	
No	1 (Ref)
Yes	1.04 (0.92–1.17)

Model controls for University and food insecurity. Confidence interval (CI); Odds ratio (OR).

Respectively, a food or housing insecure student's BMI was 0.21 and 0.39 points higher compared to their secure counterpart. Lastly, compared to food secure students, food insecure students have 155% higher odds of reporting fair or poor health. Housing insecure students have 25% higher odds of reporting fair or poor health.

Discussion

This study highlights the magnitude and the associated impact of basic need insecurities among college students across twenty-two postsecondary institutions in the US and territories. From a sample of over 22,000 students, 44.1% were classified as being food insecure, and 52.3% as being housing insecure, since starting college. These figures add to the growing amount of literature on basic need insecurities among college students[18,20] and are consistent with findings from the #RealCollege surveys.[5] These findings advance the case for federal and institutional aid to assist students in securing the basic needs required to achieve well-being as they seek degree attainment.

This is the largest study to date to investigate factors that are the most influential in student food and housing insecurity. Students who experienced homelessness or came from backgrounds in which they experienced childhood food insecurity were at the greatest odds of being food insecure in college. Homelessness only accounted for 1.8% of this study population, yet that equates to over 350 students living in a car, shelter, or other uncertain situation while trying to maintain their academic studies. This estimate may be low, however, as previous research shows that students are reluctant to identify themselves as "homeless," which may explain why housing insecurity rates are much higher than homelessness.[20] Of these homeless students, the odds of food insecurity were over 250% higher. Thus, as one basic need insecurity magnifies, the other is likely to increase as well. Similarly, students who experienced food insecurity as a child were over 230% more likely to be food insecure in college. Adversity during childhood often echoes into adulthood and food insecurity has been identified to be multigenerational.[36] Similarly, the finding of higher odds among first-generation students and those who received free or reduced lunch as children likely also identify students coming from lower socioeconomic backgrounds as being at higher odds of food insecurity. Education is identified as a means to break such patterns across generations,[36] but it also suggests the education is not enough. For students coming from food insecure backgrounds, adequate assistance is crucial to prevent continued generational food insecurity and barriers to academic success. Assessment of childhood food insecurity during enrollment may be a means to identify students at-risk who may benefit from food resources to prevent food insecurity while in college.

The factor playing the largest role in housing insecurity was year in school, with each additional year in school showing higher odds for housing insecurity. There are a few potential explanations for this finding. First, the cost of higher education has increased substantially, with one estimate showing the cost of attending a college or university

Table 4. Change in health, academic, and behavioral outcomes for food and housing insecure students.

	Food insecurity B (SE)	Housing insecurity B (SE)	R^2
Model 1: Academic Progress	−0.51 (0.02)	−0.09 (0.02)	0.09
Model 2: Money Expenditure	0.64 (0.01)	0.27 (0.01)	0.19
Model 3: Coping Strategies	4.63 (0.05)	2.62 (0.05)	0.41
Model 4: BMI	0.21 (0.04)	0.39 (0.04)	0.03
	Food Insecurity OR (95% CI)	**Housing Insecurity OR (95% CI)**	AUC
Model 5: Health Status	(Ref)	(Ref)	0.65
Excellent/Good	2.55 (2.38–2.74)	1.25 (1.16–1.34)	
Fair/Poor			

Each model controls for University.
Models 1–4: *F*-test <0.0001.
Model 5: Hosmer and Lemeshow Goodness of fit $p = 0.23$.
Body mass index (BMI).

rose 34% and 26% in public and private institutions respectively in the past decade.[37] As prices of attending higher education institutions have increased, the price of living expenses has risen as well.[37] As such, college students amass debt to cover the financial costs of both attending college and meeting their basic needs. Across time, this debt builds up, leading to increased financial stress[38] and potential for cutting corners on basic needs, such as eating less or poorly, or living in less than desirable circumstances, to prevent accruing more debt. Secondly, housing insecurity odds were highest amongst graduate students, who often hold teaching assistant or research assistant positions that prohibit holding additional jobs and provide limited income. For example, one graduate student shared "This is really the first time in my life where I have had to watch every single penny and every single nickel…that makes us leave out some things we have traditionally done."[39] This may be especially pertinent for married students or those living with a spouse, as both instances showed higher odds for housing insecurity in this present study. Lastly, students were more likely to move off-campus in later years of school, with 156% higher odds of housing insecurity. Thus, providing housing for reasonable costs on campuses may prevent housing insecurity across the entire student body. However, as the screener asks about moving since being in college, this may likely influence the higher housing insecurity odds seen among graduate students.

Students who had SNAP benefits also were at a higher odds for food and housing insecurity. Although only 3% of the sample received benefits, this higher odds of food insecurity for these students aligns with research showing that SNAP benefits may not be enough to ward off food insecurity completely,[40] with odds of food insecurity being over 60% higher and housing insecurity being 160% higher when students received SNAP benefits. Further, when receiving SNAP benefits, budgeting and financial skills are still needed to manage the benefits throughout the month.[40] Within this study, students who had lower financial knowledge and who displayed increased money expenditure behaviors were at higher odds for basic needs insecurity. It is clear –whether they receive SNAP benefits or not, students on a tight budget would benefit from financial literacy training to help with money expenditures on a tight budget to better navigate the allocation of funds for housing and food costs.[40,41] Further, the sample in this study receiving SNAP benefits may have been lower than the sample of college students eligible for SNAP benefits as many college students are unaware of the SNAP enrollment process and requirements.[37] Freudenberg, Goldrick-Rab, and Poppendieck (2019) provided campus-specific recommendations to help increase college student SNAP enrollment, including the use of university-wide SNAP education and enrollment campaigns and the training of student-service personnel to assist students in the application process for SNAP benefits.[37]

Troublingly, students reporting disabilities showed higher odds of both food and housing insecurity (67% and 35% respectively). From national data, having a disability is shown to be one of the strongest factors contributing to being food insecure.[42] Additionally, households with disabled members are more likely to be food insecure,[43] a similar suggestion of the continuation of food insecurity from childhood to adulthood as previously mentioned. Thus, campus accessibility offices and student support services can play a role in promoting food and housing resources to students in conjunction with meeting their disability needs.

Basic need insecurities documented in this study also impacted the academic performance and health status of students. Students with secure housing and food had higher self-reported academic progress. This finding agrees with previous college food insecurity research and strengthens the case for preventing basic needs insecurities to help students succeed in achieving their academic goals, which is financially beneficial for both the student and postsecondary institutions.[44–46] The perceived health of students was impacted in a similar fashion, affecting their overall well-being, compounding the negative academic effect.[47] Altogether, although not tested directly, these results raise serious questions about the combined impact of food and housing insecurities on degree completion. Student wellness programs should work in tandem with other student services to create a holistic approach to serving students with basic needs insecurities to prevent the detrimental effects on student academic performance related to being food or housing insecure. Because students need to perform well to achieve academic success, it is important to note factors that may impede this success so that college and university administrators can develop programs to meet the needs of students who have basic needs insecurity.

Limitations

Although this is the largest study to date that considers factors identified by the GAO which strongly influence basic need insecurities, limitations must be considered. This study uses a non-probability sample and a cross-sectional study design. Further, although one of the largest studies to date, with approximately 5,300 higher education institutions in the US, this study includes an estimated 0.5% of colleges and universities which limits generalizability. Further, the demographics of participants in this study do not mirror the national demographics as our study included more white females. Thus, these findings might not represent a national sample of college students and future research would benefit from recruiting a more representative sample. All survey measures were self-reported, and some self-response bias may have occurred. The use of an online modality is reportedly different than in-person estimates of food insecurity,[48] which may contribute to the rates of food insecurity shown within this study as well as the uncertainty over college students' interpretation of the food security screener questions.[49] However, the authors used the 10-item questionnaire which is reported to have the best fit among college students.[50] Overall, the AFSM assesses a limited set of attributes that assess adult food insecurity in a larger population including quality and quantity of foods, social disruptions related to consumption, and receiving food from safe sources. Access to food, such as access to grocery stores, is not considered in this assessment. In addition, skills needed to complete food procurement, preparation, and storage were not assessed. Future research should look to investigate these variables among this population. Further, although used in the #RealCollege Survey as a standard for housing insecurity, the six-item screener used in this study is not validated and more work is needed to assess the validity of the tool. As questions assess the number of times a student moves, the increased rate of housing insecurity is likely biased by the length of time a student is in school (ie, a graduate student in school for six years versus a sophomore who has been in school for two years). Ensuring that these variables assess the reason for a student's move, such as financial reasons, is recommended in future work. Lastly, freshmen were included in this study which does not align with all previous food insecurity work. However, to compensate, researchers completed sensitivity analysis with similar results reported when freshmen were excluded from the logistic regression models.

College health implications

These findings offer insight on the issues college students are facing to policymakers, postsecondary administrators, stakeholders, and faculty and staff who work closely with students. The high rates of both housing and food insecurity should raise alarm and actions to secure basic needs among college students are needed. As meeting basic needs is fundamental to student wellbeing, the authors call on higher education institutions to expand surveillance efforts aimed at identifying at-risk students as well as ensuring rapid responses that support food and housing security among vulnerable student populations.

In this study, student awareness of resources was associated with less likelihood of food insecurity, and thus awareness campaigns in collaboration with university and community food pantries may be a key variable for student food security. Postsecondary personnel can use campus listservs and engagement activities to reach out to students, assess need, and offer support to all. Orientation may also provide an opportunity to showcase university resources to students. Especially as students may not self-identify as "in need" or engage in help-seeking behaviors due to normalization of the food issues (ie, a "ramen noodle diet" is considered normal).[51] Engaging with these students and providing assistance is a crucial step in preventing students from short-changing or forgoing their college education. Any campaigns should aim to decrease stigmas associated with accepting assistance amid structural and social barriers.[51]

Campus-based programs are an initial step in the right direction to provide temporary food or shelter for a student, but more upstream solutions are needed to provide financial stability to low-income, at-risk students to prevent basic need insecurities while students obtain an education. As post-secondary institutions are a large economic stimulus in "college towns," local governments also have a motivation for ensuring student well-being. Ensuring college students have access to fair, equitable housing and safe, affordable food is needed for all community members, college students included. With high rates of food insecurity being found at postsecondary institutions across the US, federal policy solutions are also needed. Although there are a variety of federal nutrition assistance programs such as SNAP, the current eligibility criteria exclude most college students.[37,52]

During the COVID-19 pandemic and other natural disasters, these issues are expected to be exacerbated among students. As students were forced off campus, into uncertain situations, many were likely faced with the harsh reality of food or housing insecurity. Families are facing "income shock" as a result of the pandemic,[53] with previous research also showing an impact on college students' basic needs insecurities.[35] Students alone, or those from low-socioeconomic families, are less likely to have extra money for surplus food purchases and are thus faced with the scarcity of food resources left behind by those who can "panic-buy."[54] Since the pandemic, national food insecurity rates have risen to around 38% in a convenience sample, with some states reporting over 50% of their surveyed constituents being without a secure source of food.[55] As shown from this research, and previous literature, food insecurity rates among college students typically fall at rates higher than the national population, thus, it is imperative that college students not be excluded from federal aid packages.

To date, Congress has enacted The Families First Coronavirus Response Act (FFCRA), which included flexibility in adapting and supplementing SNAP and the Coronavirus

Aid, Relief and Economic Security Act (CARES), which saw $300 million allocated to SNAP.[56] However, the Food and Nutrition Service, which administers SNAP, denied the request to roll back restrictions for college students early in the pandemic, thus making this aid unavailable to this at-risk population.[52] College students were also excluded from the stimulus payment received by millions of Americans intended to supplement lost income and poor economic times, further putting this population at risk for failing to meet basic needs. Congress did, however, allocate $6.28 billion to postsecondary institutions to provide emergency grants to college students to help them overcome unforeseen challenges resulting from the COVID-19 pandemic.[57] More recent legislation has relaxed the guidelines until the end of the COVID-19 pandemic, but no permanent solution has been signed into law.[58] Consequently, there is a continued need for policymakers to consider relaxing SNAP guidelines to ensure benefits are more accessible to students. Higher education institutions are charged with ensuring students are aware of the resources available to them, as historically students are often unaware of or confused with the process of getting aid.[59]

As this study identifies, certain student populations are particularly at risk for food and housing insecurity. College administrators should use these findings to inform approaches to ensure any COVID-19 response initiatives especially reach at-risk student populations. Creative solutions are required to connect with students who may be off-campus with limited access technology[57] and international students who do not qualify for federal assistance.[57] This study, and others like it, make clear that addressing food and housing insecurities is directly serving the overall mission of higher education.

Availability of data and material

The datasets generated and/or analyzed in the current study are not publicly available but are available from the corresponding author on reasonable request.

Competing interests

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States of America and received approval from the Institutional Review Board at West Virginia University.

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