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MAJOR ARTICLE



Prevalence of food insecurity among students attending four Historically Black Colleges and Universities

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ABSTRACT

Objective: This study examined the prevalence of food insecurity (FI) among students attending Historically Black Colleges and Universities (HBCUs) in the Southeastern United States. **Participants:** Students attending four HBCUs ($N = 351$) completed an anonymous Web-based survey. **Methods:** Food insecurity was assessed using the 2-item Hunger Vital Sign Tool. Summary statistics were used to quantify FI experiences. Logistic regression was conducted to determine if student demographic characteristics were significantly associated with FI outcomes. **Results:** Nearly 3 in 4 students (72.9%) reported some level of FI in the past year. Students representing all levels of postsecondary education reported FI. Meal plan participation did not prevent FI. **Conclusions:** Students attending HBCUs experience FI at levels that exceed estimates reported among students attending predominantly White institutions. More work is needed to understand the lived experience of food-insecure HBCU students as a means to ensure institution-level food policies support student academic success and wellbeing.

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Introduction

Stable access to healthy food is required to achieve and maintain physical and emotional health and wellbeing. Among college students, consistent consumption of healthy foods is also necessary to support academic achievement. Food insecurity, defined as a lack of access to sufficient, safe, and nutritious foods at all times¹ is of increasing concern among college students.^{2–13} In 2018, 11% of US households were food insecure;¹⁴ however, across US college campuses, prevalence estimates for experiences of food insecurity range from 19% to 59%.^{2,4–10,12,13} To date, most of what is known about food insecurity on college campuses has come from students attending predominantly White institutions. Little is known about food insecurity experiences among young adults attending Historically Black Colleges and Universities (HBCUs).¹⁵

Historically Black Colleges and Universities comprise a diverse student body, including enrolling 9% of Black students attending postsecondary institutions in the U.S.¹⁶ More than 70% of HBCU students are eligible for Federal

Pell Grants awarded to undergraduates who have a high degree of unmet financial need, highlighting the HBCU commitment to serving low-income students.¹⁷ However, there is still usually a gap between Pell Grant funds and the financial aid provided by an institution.¹⁸ With limited funding, students may be vulnerable to income instability which may mean having to choose between stable housing, school tuition, class attendance, and eating consistently. As such, the likelihood of experiencing food insecurity may be particularly high among the HBCU student population.

Studies link student food insecurity to poor education-related outcomes. Compared to food secure students, food insecure students achieve lower grade point averages, take fewer classes, and are more likely to withdraw from courses or institutions.^{3,7,10,12,19} Indeed in their qualitative study of the impact of food insecurity on academic performance, Mezza et al²⁰ describe students' pervasive feelings of hopelessness culminating in perceptions of being undeserving of help, and a persistent requirement to choose between a focus on food versus academic studies. Among students

attending HBCUs, the loss of an opportunity for academic success related to food insecurity may have devastating consequences for socioeconomic stability in adulthood.

Food insecurity among college students is also linked to several health-related outcomes, including poor self-rated health, consumption of low-quality foods, eating fewer meals, disturbed sleep, and poor mental health.^{2-4,6-9,12,13,15,21} In particular, limited access to healthy foods may contribute to disparities in health outcomes via poor diet quality and diet-related morbidities. For example, in their study of students attending a large Midwestern university, Lueng et al⁹ found that low food security is associated with lower fruit intake; and very low food security is associated with higher intake of total added sugar and added sugar from sugar-sweetened beverages. Furthermore, in their cross-sectional study of students attending ten universities in the California system, Martinez et al²² link food insecurity to student elevated body mass index (BMI); identified mediators of this relationship included inadequate sleep and participation in fewer days of moderate-to-vigorous physical activity. Similarly, the authors identified a significant relationship between food insecurity and poor self-rated health; in addition to inadequate sleep and physical inactivity, low daily consumption of fruits and vegetables mediated this relationship.²² Poor dietary quality, insufficient sleep, low physical activity, and elevated BMI are all factors contributing to cardiometabolic diseases such as hypertension and diabetes,^{23,24} which occur in disproportionately higher prevalence in African American communities.^{25,26}

Given identified relationships between food insecurity and poor health and academic outcomes among students in higher education, and the paucity of data available to assess food security status among students attending HBCUs, the purpose of this study was to characterize food insecurity across four HBCU campuses in the Southeastern United States. Our goal was to document the prevalence of food insecurity reported by students. In the event a need was identified, we posited study results would contribute to the development of a larger body of data to be used to inform policy development that addresses meal consistency among students attending HBCUs. In 2018, 101 HBCUs educated undergraduate and graduate students across the United States.¹⁶

Methods

Study design and participants

This study is a secondary analysis of baseline data from an intervention to develop a nutrition program focused on fruits and vegetables in four HBCUs in metropolitan, urban regions of North Carolina. A convenience sample of students completed a Web-based survey recruited via the university intranet system, class announcements, and school activity events. Students completed the anonymous survey via Qualtrics. The survey asked students about nutrition-related behaviors and consistency in access to healthy foods. Students also provided demographic information including self-identified race-ethnicity, age, gender identity, and student classification. A total of 351 students completed the survey. The survey took approximately 20 min to complete. The study protocol was approved

by the governing University Campus IRB and the IRBs of the four participating colleges and universities.

Food insecurity instrument

The baseline survey included the validated, two-item Hunger Vital Sign (HVS), a food insecurity screening tool based on the U.S. Household Food Security Survey Module.²⁷ Participants responded how often the following statements were true for them: (1) Within the past 12 months I was worried whether my food would run out before I got money to buy more; and (2) Within the past 12 months, the food I bought just did not last and I did not have money to get more. Response options for both statements were ‘never true,’ ‘sometimes true,’ and ‘often true’. An answer in the affirmative, either ‘sometimes true’ or ‘often true’ for question 1 and/or question 2 indicates a positive screen (97% sensitivity, 83% specificity).²⁷ In bivariate and multivariable analyses for the current study, response options for each question were collapsed to reflect any (‘sometimes true’ or ‘often true’) versus no experience of food insecurity (‘never true’).

Covariates

Students reported age as a continuous variable and gender identity as ‘female’, ‘male’, or ‘other’. Race-ethnic categories included: Non-Hispanic (NH) Black, African American; Hispanic; NH White; NH Asian; and NH Other. Student classification included: freshman, sophomore, junior, senior, and graduate student. Students responded ‘yes’ or ‘no’ to participation in a meal plan package provided through their institution. Participating institutions included four HBCUs in North Carolina.

Data analysis

Summary statistics were used to quantify student demographic characteristics and food insecurity experiences. Correlations between participant age, school classification, and meal plan participation were conducted to determine measurement of unique constructs. Correlations between meal plan participation and student classification (correlation = 0.25), and age and meal plan participation (correlation = 0.33) were modest. The correlation between age and student classification was strong (correlation = 0.78). Given small samples for student gender identification as ‘other’, race-ethnic identification other than ‘NH Black, African American’, and ‘graduate student’ classification categories, bivariate and multivariable analyses included categories for students identifying as: ‘male’ or ‘female’; NH Black, African American versus all other race-ethnic identities (collapsed category for Hispanic, NH White, NH Asian, and NH Other); and undergraduate students (freshman, sophomore, junior, senior categories). Chi-square analyses were performed to determine if food insecurity experiences differed for males and females, by race-ethnic identification (NH Black, African American versus any other identification), and across student classification. Multivariable logistic

Table 1. Student characteristics ($N = 351$).

Demographic characteristic	Frequency n (%)
Age	
18	81 (23.3)
19	89 (25.6)
20	71 (20.4)
21	52 (14.9)
22	29 (8.3)
23	15 (4.3)
24	5 (1.4)
≥ 25	6 (1.7)
School classification	
Freshman	86 (24.5)
Sophomore	105 (29.9)
Junior	80 (22.8)
Senior	74 (21.1)
Graduate student	6 (1.7)
Gender identity	
Female	283 (80.6)
Male	67 (19.1)
Other	1 (0.3)
Race/Ethnicity	
NH Black, African American	320 (91.2)
Hispanic	14 (4)
NH White	5 (1.4)
NH Asian	3 (0.9)
NH Other	9 (2.6)
Student on a meal plan	
Yes	319 (90.9)
No	32 (9.1)
Food insecurity items	
Past 12 months, student worried food would run out before they got money to buy more	
Never True	106 (31)
Sometimes True	120 (35.1)
Often True	116 (33.9)
Past 12 months, food bought just did not last and student did not have money to get more	
Never True	121 (35.7)
Sometimes True	129 (38.1)
Often True	89 (26.3)

Note: NH: Non-Hispanic.

regression was conducted to determine if student demographic indicators were significantly associated with each food insecurity outcome after adjustment for other demographics in the models. Student age and school classification were entered into separate regression models with all other demographic variables. All statistical analyses were performed using Stata 12 SE (Stata Corp, College Station, TX). Less than 1% of respondents ($n = 3$) did not report their age. No other demographic data were missing. A total of 12 respondents did not provide answers to both HVS questions (3.4%). These students (mean age 20.5 years) reported being: NH Black, African American (100%); female (58.3%); male (41.7%); freshman (25%), sophomore (8.3%), junior (25%), senior (41.7%); and on a meal plan (91.7%). In the present analyses, age and food insecurity data were not imputed, and participants with missing data were excluded.

Results

Student demographic characteristics

Student demographic characteristics are presented in Table 1. The mean age of students was 20.1 years (range 18–48 years). Most students self-identified as Non-Hispanic

Table 2. Past 12 months, student worried food would run out by student demographics.

Categories	Never True	Sometimes True	Often True
School classification			
Freshman	37 (44.6)	24 (28.9)	22 (26.5)
Sophomore	31 (29.8)	37 (35.6)	36 (34.6)
Junior	22 (27.9)	29 (36.7)	28 (35.4)
Senior	13 (18.6)	28 (40)	29 (41.4)
Graduate Student	3 (50)	2 (33.3)	1 (16.7)
Gender identity			
Female	84 (30.2)	93 (33.5)	101 (36.3)
Male	21 (33.3)	27 (42.9)	15 (23.8)
Other	1 (100)	0	0
Race/Ethnicity			
NH Black, African American	92 (29.6)	114 (36.7)	105 (33.8)
Hispanic	5 (35.7)	4 (28.6)	5 (35.7)
NH White	1 (20)	0	4 (80)
NH Asian	2 (66.7)	1 (33.3)	0
NH Other	6 (66.7)	1 (11.1)	2 (22.2)
Student on a meal plan			
Yes	102 (32.9)	106 (34.2)	102 (32.9)
No	4 (12.5)	14 (43.8)	14 (43.8)

Note: NH: Non-Hispanic.

(NH) Black, African American (91.2%). The majority of survey participants were female (80.6%) and participated in an institution-sponsored meal plan (90.9%). Students represented the spectrum of undergraduate classification.

Student food insecurity experiences

Student food insecurity experiences are summarized in Tables 1–3. More than two-thirds of students (69%) reported that, in the past year, they experienced some degree of worry that food would run out before they had a chance to buy more. Almost two-thirds of students (64.3%) reported that, in the past year, the food they bought did not last and they did not have enough money to get more. In total, 72.9% of respondents experienced some degree of food insecurity in the past 12 months.

Students representing all levels of postsecondary education reported food insecurity. Experiences of food insecurity occurred across student classification: freshman (55.4% worried about food running out; 56.6% reported food did not last); sophomore (70.2% worried about food running out; 66.3% reported food did not last); junior (72.2% worried about food running out; 62.3% reported food did not last); senior (81.4% worried about food running out; 73.9% reported food did not last); graduate student (50% worried about food running out; 50% reported food did not last).

Participating in a meal plan did not prevent experiences of food insecurity. Among students on an institution-sponsored meal plan, similar percentages of students reported some degree of food insecurity: 67.1% worried about food running out; 62.7% reported food did not last. Among students not participating in a university-sponsored meal plan, a large majority reported some experience with food insecurity in the past year: 87.5% worried about food running out; 80.7% reported food did not last.

Table 3. Past 12 months, food just did not last by student demographics.

Categories	Never True	Sometimes True	Often True
School classification			
Freshman	36 (43.4)	30 (36.1)	17 (20.5)
Sophomore	35 (33.7)	42 (40.4)	27 (26)
Junior	29 (37.7)	29 (37.7)	19 (24.7)
Senior	18 (26.1)	26 (37.7)	25 (36.2)
Graduate Student	3 (50)	2 (33.3)	1 (16.7)
Gender identity			
Female	96 (34.8)	104 (37.7)	76 (27.5)
Male	24 (38.7)	25 (40.3)	13 (21)
Other	1 (100)	0	0
Race/Ethnicity			
NH Black, African American	108 (35.1)	120 (39)	80 (26)
Hispanic	6 (42.9)	4 (28.6)	4 (28.6)
NH White	1 (20)	1 (20)	3 (60)
NH Asian	2 (66.7)	1 (33.3)	0
NH Other	4 (44.4)	3 (33.3)	2 (22.2)
Student on a meal plan			
Yes	115 (37.3)	114 (37)	79 (25.7)
No	6 (19.4)	15 (48.4)	10 (32.3)

Note: NH: Non-Hispanic.

Table 4. Relationships between food insecurity and student demographic characteristics, models with student classification.

	AOR (95% CI)
Past 12 months, student worried food would run out	
Biological sex, male	0.89 (0.48–1.65)
NH Black, African American, yes	2.14 (0.94–4.83)
Student on a meal plan, yes	0.29 (0.08–1.00)
Student classification	
Freshman	Referent
Sophomore	1.86 (1.01–3.44)*
Junior	1.82 (0.93–3.55)
Senior	3.27 (1.52–7.02)**
Past 12 months, food just did not last	
Biological sex, male	0.87 (0.48–1.56)
NH Black, African American, yes	1.35 (0.61–2.99)
Student on a meal plan, yes	0.40 (0.15–1.12)
Student classification	
Freshman	Referent
Sophomore	1.51 (0.83–2.76)
Junior	1.15 (0.60–2.18)
Senior	1.97 (0.97–3.98)

Note: AOR: adjusted odds ratio; CI: confidence interval; NH: Non-Hispanic.

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

Food insecurity relationships with gender identity, race/ethnicity, school classification

Student experience of worry that food would run out before getting enough money to buy more did not differ by gender identity $\chi^2(1) = 0.12$, $p = 0.73$ or student race-ethnic identification $\chi^2(1) = 2.58$, $p = 0.11$. Student worry that food would run out before getting enough money to buy more differed significantly by student classification $\chi^2(3) = 12.83$, $p < 0.01$. Student experience of food not lasting and not having money to buy more did not differ by gender identity $\chi^2(1) = 0.20$, $p = 0.66$, student race-ethnic identification $\chi^2(1) = 0.33$, $p = 0.57$, or by student classification $\chi^2(3) = 5.36$, $p = 0.15$.

Food insecurity relationships with student demographic characteristics, final models

In multivariable models adjusting for student race-ethnicity, (NH Black, African American versus all other race-ethnic identifications), gender identity (male versus female), school

Table 5. Relationships between food insecurity and student demographic characteristics, models with student age.

	AOR (95% CI)
Past 12 months, student worried food would run out	
Biological sex, male	0.77 (0.41–1.42)
NH Black, African American, yes	2.04 (0.92–4.49)
Student on a meal plan, yes	0.37 (0.10–1.32)
Student age	1.26 (1.05–1.50)*
Past 12 months, food just did not last	
Biological sex, male	0.75 (0.41–1.37)
NH Black, African American, yes	1.30 (0.59–2.85)
Student on a meal plan, yes	0.57 (0.20–1.64)
Student age	1.20 (1.02–1.42)*

Note: AOR: adjusted odds ratio; CI: confidence interval; NH: Non-Hispanic.

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

classification (freshmen as referent group) and meal plan status, student classification was significantly associated with past year worry that food would run out before getting enough money to buy more. Compared to being a freshman, being a sophomore and being a senior was associated with significantly increased odds of worrying that food would run out before having a chance to buy more (Table 4). No significant demographic correlates for student report that food did not last and there was no money to buy more in the past year were identified in these models.

In multivariable models adjusting for student race-ethnicity, gender identity, age, and meal plan status, student age was associated with significantly increased odds of worrying that food would run out before having a chance to buy more and student report that food did not last and there was no money to buy more in the past year (Table 5).

Discussion

Study findings in context

Using baseline data from an intervention focused on the development of a nutrition program across four HBCU campuses located in the Southeastern United States, this study reports on the prevalence of food insecurity experiences among HBCU students. Using the 2-question Hunger Vital Sign (HVS) tool, findings reveal that more than two-thirds of students have experienced at least some worry about food running out before having additional money to buy more food at some time during the previous year. Furthermore, almost two-thirds of students reported the food that was purchased did not last and there was no money to buy more food at some time during the past year. Taken together, estimates for food insecurity across the four HBCU campuses (72.9% of respondents experienced some degree of food insecurity) exceed national estimates and estimates of previous postsecondary studies, most of which are located within institutions where students of African descent comprise a small portion of the student population.^{4–10,12,13}

In previous studies examining the prevalence of food insecurity on college campuses, student-reported African American race is associated with increased odds of being food insecure or at risk of food insecurity.^{10,13} Study findings also suggest that experiences of food insecurity among HBCU students are not limited to college level classification,

including at the graduate level. Student participation in a meal plan did not prevent food insecurity experiences. In multivariable analyses, we found limited evidence for demographic correlates of student food insecurity experiences, suggesting a need to assess food insecurity, broadly, across student demographic characteristics.

This study used the 2-question HVS tool to assess food insecurity, a validated screener based on the U.S. Household Food Security Survey Module.²⁷ In a previous study of food insecurity among freshmen attending a large southwestern university, administration of the HVS using one- and three-month time frames, produced food insecurity estimates of 32% and 37%, respectively.⁴

The present study contributes to a first step in understanding food insecurity experiences of students attending HBCU institutions. One other study examining experiences of food insecurity on an HBCU campus found more than 3 in 4 students (77.7%) experienced some level of food insecurity in the last 12 months.¹⁵ We present findings for students representing four HBCU campuses. The two studies combined suggest food insecurity is an urgent issue among students attending HBCUs. As such, more work is required to understand the range of contexts in which students are struggling to secure consistent access to healthy foods and the longitudinal impact of inequities in food access for student health and wellbeing during their college career and beyond.

Compared to freshman student status, senior student status, in particular, was associated with increased odds of reporting past year worry that food would run out before getting enough money to buy more. Although not able to be examined in the current study, one may postulate several reasons for increased risk of food insecurity among upper classmen, including higher food expenses from a greater proportion of meals eaten off of campus (for example, when the student meal plan may be less likely to be the primary source of food access), competing expenses from living in off-campus housing and necessary transportation-related costs for travel to and from school, more limited options for grants and other financial support that does not have to be repaid, more limited financial support from family as expectations for self-sufficiency increase with further transition into adulthood, and increased time that is spent in unpaid internships and assistantships in preparation for jobs and/or further educational pursuits, which further limits how far one's budget will go. Study findings also suggest that older student age is significantly associated with an affirmative response to either of the HVS questions. Indeed, expenses from living off campus, limited financial support from family or others, and responsibilities related to paying off other debt may be relevant for older students. Additional qualitative study of students by classification and age may offer better understanding of factors associated with food insecurity experiences, including contexts for competing expenses, budgetary constraints, financial aid opportunities, and ease of accessing help as students transition through college and additional life experiences.

Study findings likely have implications for student future status attainment and health. Students attending HBCUs are

arguably a population for which opportunities for academic achievement and health promotion are critical for community survival within an inequitable society. Historically Black Colleges and Universities are vehicles of upward socioeconomic mobility^{17,28}; however, food insecurity may derail student efforts by negatively impacting class attendance, learning ability, course and degree completion. The ability to maintain food sources to support academic success, graduation and entrance into the workforce to continue to attain one's fullest potential is critical. The current data suggest that the ability of students attending four HBCUs to experience stable access to food sources may be no small task; a fact which may harbor implications for achieving socioeconomic stability and status mobility.

Beyond implications for educational attainment, food insecurity among HBCU students may portend poor future health, separate from its mediation via socioeconomic position. Among young adults, food insecurity is linked to pre-diabetes and diabetes risk.²⁹ In mid-to-late adulthood, food insecurity is significantly correlated with increased risk for hypertension, diabetes, hyperlipidemia, and being in poor or fair health.³⁰ Young African Americans attending HBCUs represent a population in which metabolic risk is prevalent at entrance into college (eg elevated fasting glucose; low high density lipoprotein [HDL] level).³¹ Thus, in the context of a young adult population already exhibiting cardiometabolic risk, experiences of food insecurity during undergraduate and graduate study may have significant relevance for the health of the young adult African American community, a community in which its mature adults are already overburdened with cardiometabolic disease.²⁶

Our findings support two potential areas to target for remedy of food insecurity, namely addressing the adequacy and structure of student meal plans, and making healthy foods more affordable and consistent in pricing across campus outlets. Data for the present study are part of a larger program to address the development of partnerships with local food growers/producers to increase the availability and affordability of fresh fruits and vegetables.

The food insecurity literature would benefit further from research focused on postsecondary institutions. In the example of student meal plans, examination of relationships between diversity of plan structures, with differences in the number of meals and quantity allowed, and student food insecurity experiences is warranted. Understanding the students' lived experiences as they relate to availability and acquisition of foods may further inform food policy development on college campuses. In particular, more quantitative work to understand links between food insecurity, food access, food choice, and food intake among young adult populations of color is critical to help circumvent chronic disease outcomes which disproportionately impact members of marginalized groups, including African American communities.

Limitations

This study has limitations. Analyses are cross-sectional, and prevalence estimates represent one point in time. Data are

from students attending four HBCUs located in North Carolina, and may not be generalizable to other HBCU campuses across the Southeast or to the network of HBCUs across the United States. Small samples for some covariates limited our ability to examine a broad range of relationships between food insecurity experiences and student demographic characteristics, including gender and race-ethnic identification. The present study used the HVS instrument to measure food insecurity experiences. The HVS tool exhibits good sensitivity and specificity in households with and without children.^{27,32} However, given potential variability in response to questions about food insecurity among college students,³³ findings may not be directly comparable to other measures of food insecurity. Although more work is needed to identify the most valid and reliable assessment procedures for studying food insecurity among postsecondary students, recent work suggests inclusion of the 10-item USDA Adult Food Security Survey Module (the HVS items are contained in this module) with a 2-item food sufficiency screener may provide increased accuracy when estimating food insecurity prevalence among college students.³³

Conclusion

Students attending HBCUs experience food insecurity at levels that exceed current estimates reported among students attending predominantly White institutions. As such, more work is needed to understand the lived experience of HBCU students impacted by food insecurity to inform food policy development that supports academic success and future status attainment, health, and wellbeing.

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Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research was performed using established ethical standards. The research protocol received approval from the Duke University Campus Institutional Review Board (IRB) and the four IRBs of the participating Institutions.

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