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## Student hunger on campus: Food insecurity among college students and implications for academic institutions

Devon C Payne-Sturges<sup>1,\*</sup>, Allison Tjaden<sup>2</sup>, Kimberly M Caldeira<sup>3</sup>, Kathryn B Vincent<sup>3</sup>, and Amelia M Arria<sup>3</sup>

<sup>1</sup>Maryland Institute of Applied Environmental Health, University of Maryland School of Public Health, 2234 School of Public Health Building, College Park, MD, 20742, USA

<sup>2</sup>Dining Services, University of Maryland, 1105C South Campus Dining Hall, College Park, MD, 20742, USA

<sup>3</sup>Center on Young Adult Health and Development, Department of Behavioral and Community Health, University of Maryland School of Public Health, 2387 School of Public Health Building, College Park, MD, 20742, USA

### Abstract

**Purpose**—To estimate the prevalence of food insecurity among students at a large mid-Atlantic publicly-funded university; examine the association between food insecurity, demographic characteristics, potential financial risk factors, and self-reported physical and mental health and academic performance; and identify possible risk factors for food insecurity.

**Design**—Cross-sectional survey.

**Setting**—Large, public mid-Atlantic university.

**Subjects**—237 undergraduate students.

**Measures**—USDA 18-item Household Food Security Survey Module (HFSSM) and questions on demographics, student status, economic factors, housing stability, living arrangements, academic performance, and self-rated physical health and depression symptoms.

**Analysis**—Multivariate logistic regression analysis.

**Results**—Among students surveyed 15% were food insecure; an additional 16% were at risk for food insecurity. Students who were African-American, other race/ethnicity, receiving multiple forms financial aid, or experiencing housing problems were more likely to be food insecure or at risk for food insecurity ( $AOR=4.00$ , 95%CI=1.83–8.71,  $P$ -value<0.0001;  $AOR=5.26$ , 95%CI=1.85–14.98,  $P$ -value=0.002;  $AOR=3.43$ , 95%CI=1.85–6.37,  $P$ -value<0.001;  $AOR = 8.00$ , 95%CI=3.57–17.93,  $P$ -value<0.0001, respectively). Food secure students were less likely to report depression symptoms than at-risk or food insecure students.

\*Corresponding author: Devon C. Payne-Sturges, DrPH, Assistant Professor, Maryland Institute of Applied Environmental Health, University of Maryland School of Public Health, 2234 School of Public Health Building, College Park, MD, 20742, USA, Phone: 301-405-2025; Fax: 301-314-1012; dps1@umd.edu.

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**Conclusion**—Food insecurity among college students is an important public health concern that might have implications for academic performance, retention, and graduation rates. Universities that measure food insecurity among their students will be better positioned to advocate for policy changes at state and federal levels regarding college affordability and student financial assistance.

### Keywords

Food insecurity; college students; racial disparities; housing insecurity; mental health; academic performance; achievement gap; college affordability; student financial aid; campus wellness

### Indexing Key Words

Manuscript format: quantitative research; Research purpose: modeling/relationship testing; Study design: cross-sectional; Outcome measure: behavioral; Setting: public university; Health focus: food insecurity, overall physical and mental health; Target population age: young adults; Target population circumstances: undergraduate students

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### Purpose

Food insecurity is a growing public health problem for college students, with significant potential for adverse effects on both physical and mental health, and functioning.<sup>1-6</sup> Food insecurity is defined as, “limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” due to a lack of money or other resources,<sup>7,8</sup> and is reported to have increased among the general US population as a result of the Great Recession.<sup>4,9</sup> More is known about the prevalence of food insecurity among the general population than among college students. The US Department of Agriculture (USDA) estimates that 12.7% of US households are food insecure.<sup>10</sup> Previous research has documented a myriad of negative physical and mental health consequences of food insecurity among adults including decreased nutrient intake, increased mental health problems and depression, diabetes, obesity, hypertension, poor sleep, and lower self-rated health.<sup>4,11</sup> In addition, food insecurity, hunger, or food insufficiency has been associated with lower academic achievement, behavioral and attention problems, and adverse psychosocial development among school-aged and teenage students.<sup>6,12-16</sup> This study builds on a small body of cross-sectional studies of students at specific US universities, some of which have linked food insecurity to lower GPAs, poorer health, and housing instability.<sup>5,17-20</sup> This study aims to: 1) estimate the prevalence of food insecurity among students at a large mid-Atlantic publicly-funded university; 2) examine the association between food insecurity and self-reported physical health, depression symptoms, and academic performance; and 3) develop multivariate models to identify possible risk factors for food insecurity. The study was undertaken as formative research to provide baseline data to inform a new campus-based initiative addressing student hunger via establishment of a campus food pantry.

## Methods

### Sample

We based our sample size calculation on significance level  $\alpha=0.05$ , power of 0.90 and assumed prevalence of food insecurity between 10% and 20% (based on the lower end of the range found in earlier published campus-based studies)<sup>21</sup> and we estimated that at least 122 participants would be needed. Our sampling strategy conservatively aimed to recruit approximately 250 students from a total sampling frame of 27,000 undergraduate students within a public mid-Atlantic university. A convenience sample of 237 undergraduate students (62% response rate) was recruited to take the 10-minute web-based survey during eight regularly scheduled class sessions at two colleges within the university during the fall of 2015 via announcements that included the survey link. The classes were required courses for students majoring in family science, community health, or agriculture. Eligibility was restricted to individuals who were 18 years or older and currently enrolled as an undergraduate student. No incentives were offered. IRB approval and online consent were obtained.

### Measures

The survey included questions on demographics, student status, economic factors (e.g., personal and family income, financial aid), housing stability, living arrangements, academic performance, and self-rated physical health. Food security status was assessed via the USDA 18-item Household Food Security Survey Module (HFSSM).<sup>22</sup> The HFSSM measures a variety of conditions and behaviors as indicators of the presence and severity of food insecurity.<sup>22</sup> The HFSSM has been found to be valid and reliable in numerous previous studies.<sup>23</sup> HFSSM responses were scored following USDA protocol<sup>22</sup> and collapsed into three categories: food secure (zero affirmative responses), at risk for food insecurity/marginal food security (1–2 affirmative responses), and food insecure (3+ affirmative responses) adapted from Chaparro et al.<sup>24</sup> Symptoms of depression were assessed via the validated Patient Health Questionnaire-9.<sup>25</sup> Sleep was assessed by asking, “On average, how many hours do you sleep per day?”. Also included were questions on self-rated health, height, and weight.

### Analysis

Bivariate comparisons were made between students in the three groups using  $\chi^2$  tests and Analysis of Variance (ANOVA). A series of multivariate logistic regression models was developed to evaluate the association between food insecurity and several suspected risk factors after adjustment for age, gender, and family income ( $\alpha=0.05$ ). Because of the modest sample size, for the multivariate analyses, the at-risk and food insecure groups were collapsed, yielding a dichotomous dependent variable of food security status (i.e., at risk for food insecurity or food insecure vs. food secure). We collapsed students reporting Hispanic ethnicity, American Indian/Alaskan Native, and other race due to small cell sizes. Variables that were statistically significant in the bivariate analyses were included in the logistic multivariate models. All analyses were conducted using Stata 14.1.

## Results

The prevalence of food insecurity among students surveyed was 15% with an additional 16% being at risk for food insecurity. Among the food insecure, a subset of 15 students (43%) had indications of very low food security or food insecurity with hunger. Food insecure students were more likely to report inability to eat balanced meals (80%), eating less (69%), and being hungry (69%) because there wasn't enough money for food during the past year.

As shown in Table 1, at the bivariate level, off-campus living situation, financial independence, financial aid, use of university meal plans, employment, age, race, household income, and housing stability problems were all statistically significantly different between the three food security statuses (all  $P$ -values<.05). Food security status was not associated with residency status or use of food assistance programs.

There were many indications that food insecure and at-risk students were in poorer health than food secure students (Table 1). For example, food insecure and at-risk students were more likely to report their overall health as fair, poor, or very poor and reported lower energy levels compared with food secure students. Food insecure students however reported more frequent depression symptoms (little interest, feeling down, feeling tired, poor appetite, and feeling bad about oneself) and that they experienced disruptions in academic work as a result of depression symptoms. These differences remain statistically significant after applying Bonferroni correction for multiple comparisons using  $\chi^2$  and Fisher's exact tests. However, there was no statistically significant difference in self-reported GPA by food security status.

Even after adjusting for age, gender, and family income, students categorized as African-American or other race/ethnicity were significantly more likely to be food insecure or at-risk than white students ( $AOR=4.00$ ; 95%CI=1.83–8.71;  $P$ -value<0.0001; and  $AOR=5.26$ ; 95%CI=1.85–14.98;  $P$ -value=0.002, respectively). Additionally, receiving multiple forms of financial aid ( $AOR=3.43$ ; 95%CI=1.85- 6.37;  $P$ -value<0.001) and housing instability significantly ( $AOR = 8.00$ , 95%CI=3.57–17.93,  $P$ -value<0.0001) increased the odds of being food insecure. Receiving financial support from family was associated with a decrease in the odds of food insecurity ( $AOR=0.28$ ; 95%CI=0.12–0.67;  $P$ -value=0.004). Food insecurity status was not significantly associated with financial independence, student status, credit hours, years in school, living situation, employment, or having a university meal plan after adjusting for age, gender, and family income.

## Discussion

### Summary

Food insecurity among a convenience sample of undergraduate students attending a large mid-Atlantic publicly-funded university was 15% with an additional 16% at risk for food insecurity. These rates are higher than household food insecurity in the state (10.7%),<sup>10</sup> but within the lower range found at other universities.<sup>5,17–20,24,26,27</sup>

Adjusting for age, gender, and family income, students who were African-American, other race/ethnicity, receiving multiple forms financial aid, or experiencing housing problems were more likely to be at-risk or food insecure. Race/ethnicity has previously been reported to be related to food insecurity.<sup>24</sup> Although receiving financial support from family was shown to be protective against food insecurity—regardless of family income—the positive association between food insecurity and financial aid suggests that current financial aid might not be adequate to cover basic needs.<sup>27</sup>

We observed statistically significant differences in food security status between students living on-campus versus off-campus as well as those with housing instability (e.g., difficulty covering rent). These findings are consistent with one prior study in which 24% of students reported both food and housing insecurity.<sup>19</sup> This raises concerns about impact on academic performance. Students experiencing housing and food insecurity have been found to be at greater risk for not completing their studies.<sup>5</sup>

The present finding that food insecure students reported lower academic achievement is consistent with prior campus-based studies.<sup>17,18,20</sup> However, examining GPA as the only indicator of academic achievement might not capture all the nuances of food insecurity's impact on academics. Future studies should examine delayed graduation, discontinuous enrollment, and attenuation of academic goals as possible consequences of food insecurity.

The self-reported physical health problems and depression symptoms among the at-risk and food insecure students in our study are consistent with extant literature on health consequences of food insecurity.<sup>3,4</sup> Such health consequences have implications for university administrators because they represent another likely mechanism by which food insecurity might undermine important academic outcomes including GPA, retention, and on-time graduation.

## Limitations

The cross-sectional nature of the study does not permit speculation about the causal direction of the relationships observed between food insecurity and academic performance, health problems, or other correlates. Determining whether food insecurity among the sample studied is a transient or stable phenomenon is not possible. Although the data from this study are self-reported, the survey was anonymous and we have no reason to believe that any under- or over-reporting occurred. There is the possibility of selection bias caused by missing students that dropped out of school due to economic hardship, or other reasons. We did not collect information on whether students were first-generation or transfer students, which could provide insight regarding intervention targets. Our study did not collect information on student spending patterns/debt or knowledge about specific student support services which could provide insight into whether certain behaviors are associated with food insecurity. While we used the validated USDA HFSSM to assess food insecurity among our sample, assessment of the psychometric properties of the HFSSM among college student populations has not been explicitly evaluated. This highlights the need for more research in this area, including the development of validated assessment tools to measure food insecurity among young adult college student populations.

## Significance

Our study affirms individual observations about student hunger on campus and quantifies the burden of food insecurity among this population. Our analysis identified important predictors which can inform the operations of ongoing campus-based interventions aimed at ameliorating the underlying causes of food insecurity. For our student population, the causes are more likely related to financial need which often intersects with racial/ethnic minority status. Institutional interventions aimed at addressing student financial need, especially among underrepresented minority and first generation students, could be expanded to include food and nutrition education/outreach programs on how to shop for and prepare healthy low-cost foods. Our study adds to the diversity of existing campus-based studies and extends prior evidence that food insecure students are at increased risk for health, academic, and housing instability problems, and thereby warrant attention and action by university officials to avert adverse impacts on retention and graduation rates.

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## **SO WHAT? Implications for Health Promotion Practitioners and Researchers**

### **What is already known on this topic?**

Food insecurity among college students has the potential to negatively impact student success on campus as well as their health but very little data exist.

### **What does this article add?**

We evaluated multiple correlates of food insecurity (e.g., housing stability, physical health, depression symptoms, and academic performance), which is unique among the few existing studies.

### **What are the implications for health promotion practice or research?**

The present findings are being used at this university to explore ways to expand the reach and impact of existing emergency food distribution, and to inform decisions about restructuring residential dining programs. Our finding about housing instability highlights the importance of affordable housing for college students, to reduce the pressure on low-income students who must otherwise choose between rent and other necessities.



Sample characteristics and description of health and academic performance correlates among undergraduate students, by food security status<sup>1</sup>

|  | Total sample (n=237) | Food secure (n=163) | At-risk (n=39) | Food insecure (n=35) | P <sup>3</sup> |
|--|----------------------|---------------------|----------------|----------------------|----------------|
| Gender, % male   | 19                   | 20                  | 13             | 23                   | 0.51           |
| Age, years   | 20.69 ± 4.30         | 19.94 ± 1.97        | 21.67 ± 6.72   | 23.05 ± 7.06         | 0.0001         |
| Race/ethnicity, %  |                      |                     |                |                      | 0.002          |
| American Indian/Alaska Native  | 1                    | 1                   | 0              | 3                    |                |
| Black or African American  | 20                   | 15                  | 33             | 29                   |                |
| White  | 49                   | 58                  | 28             | 34                   |                |
| Asian/Native Hawaiian/Pacific Islander   | 22                   | 23                  | 23             | 20                   |                |
| Hispanic (of any race)   | 6                    | 2                   | 13             | 14                   |                |
| Other  | 2                    | 2                   | 3              | 0                    |                |
| Receive any financial aid, %   | 64                   | 57                  | 79             | 74                   | 0.014          |
| Off-campus living, %   | 69                   | 64                  | 69             | 91                   | 0.006          |
| On university meal plan, %   | 39                   | 44                  | 36             | 17                   | 0.011          |
| Participation in food assistance programs during the past year, <sup>2</sup> % | 5                    | 4                   | 3              | 11                   | 0.11           |
| Employed, % yes  | 61                   | 54                  | 74             | 77                   | 0.008          |
| Average work hours per week  | 10.32 ± 12.18        | 9.23 ± 12.35        | 10.93 ± 11.69  | 14.86 ± 11.33        | 0.07           |
| Receive financial support from family, %                                       | 86                   | 93                  | 69             | 74                   | <0.001         |
| Household/family income, %   |                      |                     |                |                      | <0.001         |
| Under \$10k  | 5                    | 3                   | 5              | 15                   |                |
| \$10k–\$14,999   | 1                    | 1                   | 3              | 0                    |                |
| \$15k – \$19,999   | 1                    | 1                   | 3              | 0                    |                |
| \$20k – \$24,999   | 3                    | 3                   | 5              | 3                    |                |
| \$25k – \$29,999   | 2                    | 0                   | 5              | 9                    |                |
| \$30k – \$34,999   | 2                    | 1                   | 5              | 3                    |                |
| \$35k – \$39,999   | 3                    | 0                   | 5              | 15                   |                |
| \$40k – \$44,999   | 0                    | 0                   | 0              | 3                    |                |
| \$45k – \$49,999   | 1                    | 1                   | 3              | 0                    |                |
| \$50k – \$59,999   | 2                    | 3                   | 0              | 3                    |                |
| \$60k – \$69,999   | 3                    | 3                   | 8              | 0                    |                |

|  | Total sample (n=237) | Food secure (n=163) | At-risk (n=39) | Food insecure (n=35) | P <sup>3</sup> |
|--|----------------------|---------------------|----------------|----------------------|----------------|
| \$70k and above  | 58                   | 67                  | 38             | 38                   |                |
| Housing Instability, %   | 17                   | 7                   | 28             | 54                   | <0.001         |
| Sleep, hrs./day  | 6.74 ± 1.14          | 6.9 ± 1.16          | 6.37 ± 0.94    | 6.44 ± 1.08          | 0.0085         |
| Self-rated health suboptimal, %  | 9                    | 7                   | 14             | 17                   | <0.001         |
| Energy level suboptimal, %   | 24                   | 15                  | 37             | 49                   | <0.001         |
| Depression symptoms, %   |                      |                     |                |                      |                |
| Little interest or pleasure in doing things  | 43                   | 34                  | 46             | 77                   | <0.001         |
| Feeling down, depressed, or hopeless   | 43                   | 34                  | 51             | 71                   | 0.001          |
| Trouble falling or staying asleep, or sleeping too much  | 61                   | 55                  | 68             | 74                   | 0.018          |
| Feeling tired or having little energy  | 80                   | 75                  | 92             | 89                   | 0.002          |
| Poor appetite or overeating  | 56                   | 50                  | 65             | 69                   | 0.003          |
| Feeling bad about yourself—or that you are a failure or have let yourself or your family down  | 47                   | 38                  | 65             | 66                   | <0.001         |
| Trouble concentrating on things, such as reading the newspaper or watching television  | 38                   | 34                  | 46             | 49                   | 0.399          |
| Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual | 19                   | 14                  | 32             | 29                   | 0.024          |
| Depression symptoms impacts school, %  | 54                   | 46                  | 62             | 80                   | 0.001          |
| GPA  | 3.05 ± 0.91          | 3.06 ± 0.95         | 3.19 ± .73     | 2.88 ± 0.92          | 0.39           |

<sup>1</sup> Values are percentages or means ± SDs.

<sup>2</sup> This included: emergency food from church, food pantry/bank, or emergency kitchen; WIC; SNAP; or assistance from private organizations.

<sup>3</sup> Overall statistically significant differences between the three food security statuses was determined by either one-way ANOVA or  $\chi^2$  tests.