



Food insecurity and mental health among young adult college students in the United States

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ABSTRACT

Background: Food insecurity is prevalent among college students in the United States and has been associated with mental health problems. However, the literature is not entirely consistent and is missing key aspects of mental health.

Methods: Using cross-sectional data from the Health Minds Study ($N = 96,379$; September 2020–June 2021), we used multivariable logistic regression to examine associations between food insecurity and several aspects of mental health (i.e., depression, anxiety, languishing, perceived need, loneliness, self-injurious behaviors), adjusting for age, gender, race/ethnicity, financial distress, and parental education.

Results: Food insecurity was associated with greater odds of having depression, anxiety, languishing, perceived need for help, loneliness, and self-injurious behaviors, adjusting for sociodemographic characteristics and markers of socioeconomic status.

Conclusion: This study found evidence to suggest that food insecurity is related to poor mental health in a large sample of young adult college students in the United States, calling for targeted interventions.

1. Introduction

Research over the past two decades has shown that mental health symptoms among college students in the United States have increased over the past decade (Eisenberg, 2019), underscoring the need for preventive interventions to address rising mental health problems among this population while improving overall health trajectory into the future. One possible preventive intervention may be addressing food insecurity, which is defined as not being able to obtain adequate amounts of nutritious food or being concerned about how to procure food in socially acceptable ways (see Gundersen and Ziliak, 2015). This topic has been a concern in public health and preventive medicine given the prevalence of food insecurity among young adults (Walker et al., 2021) and college students in the United States (Bruening et al., 2017). One systematic review estimated 41.4% of college students were food insecure, which is

higher than the 13% prevalence among US national households (Nazmi et al., 2019).

Studies have shown that food insecurity has been connected to several mental health outcomes, such as depression and suicidal ideation (Arenas et al., 2019; Pourmotabbed et al., 2020). Studies have also linked food insecurity to anxiety (Arenas et al., 2019), though this association does not appear to be consistent outside of North America (Pourmotabbed et al., 2020). There are, however, several mental health outcomes have yet to be examined thoroughly. For instance, no studies have looked at how food insecurity is related to languishing or perceived need for help. While some studies suggest an association between food insecurity and loneliness, this has often been conducted in older adult populations (e.g., Burris et al., 2021) and requires replication in young adults in the United States. Some studies have examined food insecurity with respect to suicidal ideation (Davison et al., 2015)

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and suicide attempt (Shayo and Lawala, 2019) in select countries; however, few studies in the United States have examined the relation between food insecurity and self-injurious behaviors more broadly among young adults.

To address these gaps, we analyzed a large sample of young adult students attending colleges in the United States and examined the associations between food insecurity and several mental health outcomes during the COVID-19 pandemic, when food insecurity and mental health symptoms may have increased across college populations. We hypothesized that food insecurity would be significantly associated with greater odds of having mental health problems, net the effects of other markers of socioeconomic status.

2. Methods

2.1. Sample

We analyzed data from the Fall and Spring cohort of the 2020–2021 Healthy Minds Study (HMS), a repeated cross-sectional, non-probability, web-based survey examining health and wellness among undergraduate and graduate student populations in the US. The survey was first administered at 37 universities ($N = 34,168$) between September through December of 2020, and then administered at 103 universities ($N = 103,748$) between January through June 2021. These data were pooled into a single cross-sectional dataset. At each university, a random sample of 8000 students was invited by e-mail to participate, except at smaller universities (< 8000 students) where all students were invited to participate. The response rate was 14%, which is comparable to other response rates from online surveys using convenience samples and panels (Baker et al., 2013; Craig et al., 2013). We restricted the sample by age (18–34) to isolate young adults (18,013 individuals excluded) and excluded individuals who were missing data on any of the variables of interest; we used complete-case analysis (23,557 individuals excluded listwise), resulting in a final analytic sample of 96,379. The HMS was approved by the Institutional Review Board Advarra, and the Institutional Review Boards at all participating campuses. All campuses offered incentives to participate. The HMS data are available upon request at: <https://healthymindsnetwork.org/hms/>.

2.2. Measures

Food insecurity (independent variable). Food insecurity was measured using two items: (1) Within the past 12 months I was worried whether our food would run out before we got money to buy more; and (2) Within the past 12 months the food I bought just didn't last and I didn't have money to get more. Respondents could answer: *never true, sometimes true, often true*. Individuals were identified as food insecure if responding *sometimes true* or *often true* to either question, following the two-item screen for families at risk of food insecurity (Hager et al., 2010).

Mental health outcomes (dependent variables). We examined six mental health outcomes, including depression, anxiety, languishing, perceived need for help, loneliness, and self-injurious behaviors (non-suicidal self-injury, suicidal ideation, suicide plan, suicide attempt).

Depression was measured using the Patient Health Questionnaire – 9 (PHQ-9; Kroenke and Spitzer, 2002), which is validated and widely used in various populations. The PHQ-9 contained nine questions eliciting information about depression symptoms over the past two weeks, ranging symptoms such as anhedonia to suicidal ideation. Respondents could answer the frequency of these symptoms from *not at all* to *nearly every day*. The depression items were summed into a scale ranging from 0–27 and was dichotomized (yes/no) to reflect the presence of moderately severe or severe depression (i.e., a score of 15- to 27).

Anxiety was measured using the General Anxiety Disorder – 7 (GAD-7; Spitzer et al., 2006), which is also validated and widely used in various populations. The GAD-7 elicited information about anxiety

symptoms over the past two weeks, ranging from nervousness to irritability. The anxiety items were summed into a scale ranging from 0–12, and then dichotomized (yes/no) to reflect the presence of moderately severe or severe anxiety (i.e., a score of 11 to 21).

Languishing. While mental health is often understood in terms of negative outcomes (e.g., pathology, deficits, symptoms), it often does not capture positive aspects of wellbeing. As such, flourishing is a term used to describe positive emotions (e.g., happiness, satisfaction), positive psychosocial functioning, and other dimensions of life that involve growth, generativity, goodness, and resilience (Fredrickson and Losada, 2005). The absence of flourishing is referred to as languishing. We assessed flourishing/languishing using a validated scale (Diener et al., 2009, 2010), which elicits the respondent's level of agreement to eight statements, such as *I lead a purposeful and meaningful life* and *I actively contribute to the happiness and wellbeing of others*. Respondents could answer: *strongly disagree, disagree, mixed/neither agree nor disagree, slightly agree, agree, strongly agree*. The items were summed into a scale ranging from 8–56, with higher scores representing greater levels of flourishing. The flourishing scale was dichotomized such that a score of 47 or lower was considered languishing in accordance with prior studies (Hone et al., 2014).

Perceived need for help. How much do you agree with the following statement? - *In the past 12 months, I needed help for emotional or mental health problems such as feeling sad, blue, anxious or nervous*. Responses options were: *strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree*. This item was dichotomized (yes/no) to reflect those who strongly agree, agree, or somewhat agree versus those who somewhat disagree, disagree, or strongly disagree.

Loneliness. Loneliness was measured using the 3-item UCLA loneliness scale (Hughes et al., 2004), where respondents were asked three questions: *How often do you feel that you lack companionship?*; *How often do you feel left out?*; *How often do you feel isolated from others?*. Respondents could answer: *hardly ever, some of the time, or often*. These items were summed into a scale ranging from 3–9, with greater scores, suggesting more loneliness. This scale was dichotomized to reflect people who were significantly lonely (i.e., who had scores of 6 or higher).

Self-injurious behaviors. Self-injurious behaviors included non-suicidal self-injury, suicidal ideation, suicide plans, and suicide attempt. Non-suicidal self-injury was measured using the item: *In the past year, have you ever done any of the following intentionally?* Responses included: *cut myself, burned myself, punched/banged myself, scratched myself, pulled my hair, bit myself, interfered with wound healing, carved words or symbols into skin, rubbed sharp objects into skin, punched or banged an object to hurt myself, other (please specify)*. This item was coded dichotomously (yes/no) to reflect the presence of any of the self-injurious behaviors. Suicidal ideation is measured by the dichotomous item (yes/no): *In the past year, did you ever seriously think about attempting suicide?* Individuals who reported suicidal ideation were asked about suicide plans, using the dichotomous items (yes/no) on suicide plans (*In the past year, did you make a plan for attempting suicide?*) and suicide attempts (*In the past year, did you attempt suicide?*).

Sociodemographic characteristics and socioeconomic status (covariates). Respondents self-reported age (continuous), gender (man, woman, transgender/nonbinary/other), and race/ethnicity (White, Black, Latinx/Hispanic, Asian American/Pacific Islander, multiracial, and Other). Current financial distress was assessed using the single item: *How would you describe your financial situation right now?* Respondents could answer: *always stressful, often stressful, sometimes stressful, rarely stressful, and never stressful*. This variable was treated ordinally in the regression models. Parental education was assessed using the item: *What is the highest level of education completed by your parents or step-parents?* This variable was dichotomized (yes/no) to reflect whether both parents attended college (or beyond).

2.3. Analysis

Multivariable logistic regression analyses were used to test for associations between food security and each mental health outcome (depression, anxiety, languishing, perceived need for help, loneliness, non-suicidal self-injury, suicidal ideation, suicide plan, and suicide attempt). We adjusted all models for age, gender, race/ethnicity, current financial distress, and parental education. To adjust for non-response, sample probability weights were created using administrative data on full student populations at each participating college with respect to gender, race/ethnicity, academic level, and Grade Point Average. Sample weights gave equal aggregate weight to each school in the national estimates rather than assigning weights in proportion to school size, so that overall national estimates were not dominated by schools in the sample with large enrollment. Standard errors were clustered by university. We present results as odds ratios with 95% confidence intervals. We performed all statistical analyses using R (R Core Team, 2021).

3. Results

In this sample of young adult college students aged 18–34 (N = 96,379), an estimated 30.8% of the sample reported food insecurity. Food insecurity was more common among cis-gender women (32.2%, n = 17,915), and transgender/nonbinary/other (42.1%, n = 1320) when compared with cis-gender men (27.8%, n = 10,494). Further, food insecurity was more common among Black (50.3%; n = 5213) and Latinx/Hispanic (42.6%, n = 3263) students compared to White students (25.6%, n = 15,035). Across the board, all mental health outcomes were more common among those who were food insecure than those who were food secure [Table 1].

Multivariable logistic regression models showed that food insecurity was associated with greater odds of having depression, anxiety, perceived need for help, and loneliness. Food insecurity was associated with greater odds of languishing. Food insecurity was also associated with greater odds of self-injurious behaviors, including non-suicidal self-injury, suicidal ideation, suicide plan, and suicide attempt. [Fig. 1]

Table 1

Prevalence of mental health outcomes among young adults (aged 18–34) attending colleges in the United States, stratified by food insecurity, Health Minds Study (2020–2021).

	Food secure(n = 66,650)	Food insecure(n = 29,729)	Total (96,379)	P-value
Depression				<0.001
No	55,452 (83.20%)	19,103 (64.26%)	74,555 (77.36%)	
Yes	11,198 (16.80%)	10,625 (35.74%)	21,823 (22.64%)	
Anxiety				<0.001
No	46,868 (70.32%)	14,961 (50.32%)	61,829 (64.15%)	
Yes	19,783 (29.68%)	14,768 (49.68%)	34,551 (35.85%)	
Languishing				<0.001
No	26,579 (39.88%)	8108 (27.27%)	34,687 (35.99%)	
Yes	40,072 (60.12%)	21,621 (72.73%)	61,693 (64.01%)	
Perceived need for help				<0.001
No	26,944 (40.43%)	8043 (27.05%)	34,987 (36.30%)	
Yes	39,707 (59.57%)	21,686 (72.95%)	61,393 (63.70%)	
Loneliness				<0.001
No	32,140 (48.22%)	10,223 (34.39%)	42,363 (43.95%)	
Yes	34,510 (51.78%)	19,506 (65.61%)	54,016 (56.05%)	
Non-suicidal self-injury				<0.001
No	51,944 (77.93%)	20,185 (67.90%)	72,129 (74.84%)	
Yes	14,707 (22.07%)	9544 (32.10%)	24,251 (25.16%)	
Suicidal ideation				<0.001
No	59,553 (89.35%)	23,347 (78.53%)	82,900 (86.01%)	
Yes	7097 (10.65%)	6382 (21.47%)	13,479 (13.99%)	
Suicide plan				<0.001
No	63,850 (95.80%)	26,939 (90.62%)	90,789 (94.20%)	
Yes	2801 (4.20%)	2790 (9.38%)	5591 (5.80%)	
Suicide attempt				<0.001
No	66,120 (99.20%)	28,902 (97.22%)	95,022 (98.59%)	
Yes	530 (0.80%)	827 (2.78%)	1357 (1.41%)	

N (Weighted%); P-values reflect Chi2 test for binary/categorical variables.

4. Discussion

4.1. Main findings

To date, this is the largest study on food insecurity and mental health among young adult college students in the United States. We found that across the board, food insecurity was associated with greater odds of depression, anxiety, languishing, perceived need for help, loneliness, and self-injurious behaviors. Our findings comport with prior studies on depression (Coffino et al., 2021), and anxiety (Arenas et al., 2019; Coffino et al., 2021; Pourmotabbed et al., 2020), while showing novel findings that food insecurity is associated with outcomes that have been rarely studied among US young adult college students, such as languishing, perceived need for help, loneliness, and self-injurious behaviors. To our knowledge, this is the first study to examine food insecurity in relation to these mental health outcomes among college students during the COVID-19 pandemic.

The pathways linking food insecurity and mental health are still being investigated. It is possible that food insecurity may be related to health problems by way of malnutrition. For example, studies have shown that vitamin D deficiency has been linked to depression (Anglin et al., 2013). It is also possible that food insecurity can be highly stressful (Pourmotabbed et al., 2020), activating the hypothalamic pituitary adrenal axis, which can result in ‘wear and tear’ of the mind over time (Frodl and O’Keane, 2013; Maniam et al., 2014). Further, it is possible that people with mental health problems can ‘drift’ into precarious economic circumstances, as having symptoms can make it harder to function in school or work, while managing symptoms can be expensive (e.g., healthcare costs, visits to hospital, medications, therapies; Fox, 1990; Perry, 1996; Yu and Williams, 1999). Finally, food insecurity likely reflects the lifetime presence of distal social determinants of health, such as socioeconomic and socio-environmental factors (e.g., poverty, neighborhood-level deprivation, and other insults) that impact the mental health throughout the life course.

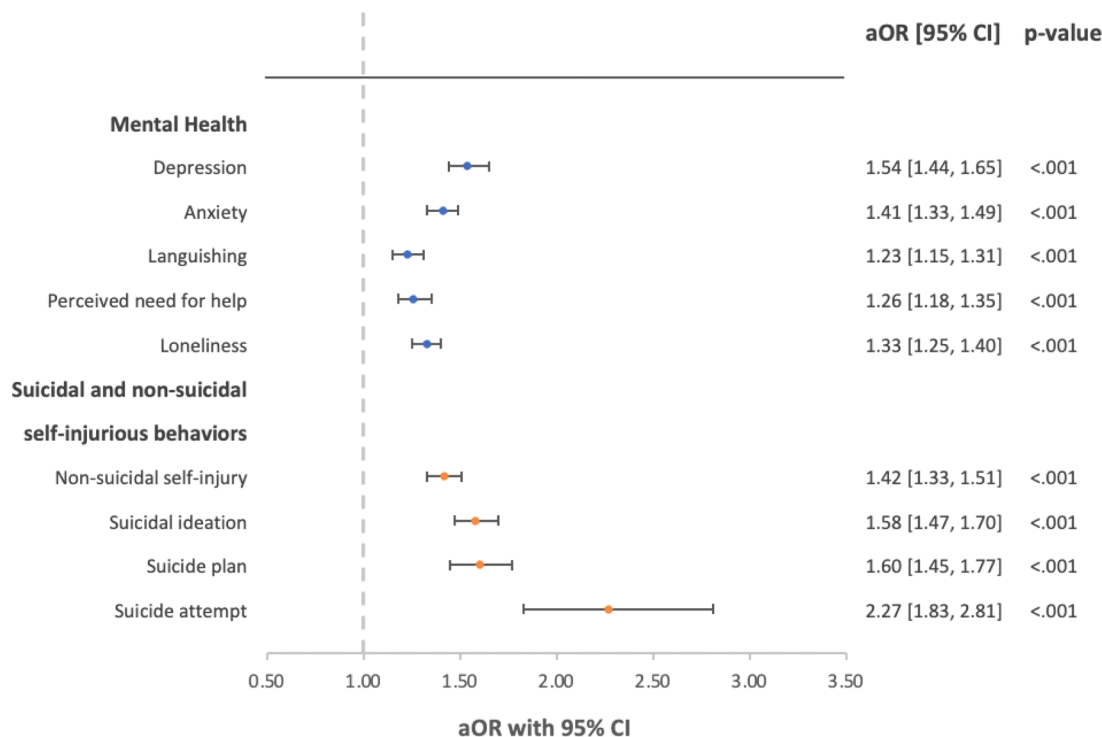


Fig. 1. Multivariable logistic regression models showing associations between food insecurity and mental health outcomes among young adult college students, Health Minds Study 2020–2021. Adjusted for age, gender, race/ethnicity, financial distress, and parental education.

4.2. Limitations

Our study should be interpreted bearing in mind several limitations. First, the data were cross-sectional and could not be used to establish a causal direction. It is possible that food insecurity could lead to mental health problems, and vice versa. The association is also likely bi-directional. Future longitudinal studies may help establish the temporal order of events. Second, all measures were self-reported, and it is possible that the data were vulnerable to recall and social desirability biases. People may have been reluctant to disclose mental health conditions or being food insecure due to stigma. Third, the response rate was 14%, which is expected of online surveys of this nature (Baker et al., 2013; Craig et al., 2013). We attempted to address this limitation by using survey weights that account for non-response, but sampling bias remains a concern. However, despite these limitations, our study was the largest to date on the topic among young adult college students in the United States. Further, data were collected during the COVID-19 pandemic, during a time when both food insecurity and mental health symptoms were elevated (Charles et al., 2021). However, the associations we found in our study comport with studies conducted prior to the global pandemic. Finally, while the food insecurity item we used in this study has been validated and widely used, there are more comprehensive batteries to assess food insecurity.

4.3. Implications

While we were unable to establish a causal direction, food insecurity nonetheless may be an important target of public health and preventive interventions, given its associations with a broad range of outcomes, such as depression and anxiety. Further, food insecurity is also related to loneliness, which is a common and strong predictor of future health problems (Burris et al., 2021; Leigh-Hunt et al., 2017), including sleep disturbances (Griffin et al., 2020), high blood pressure (Hawkey et al., 2010), mild cognitive impairments (Lara et al., 2019), and mortality (Holt-Lunstad et al., 2015), potentially by way of inflammation (Gowda

et al., 2012; Smith et al., 2020). Notably, our finding that food insecurity is related to perceived need for help is critical because studies have shown that the majority of college students with mental health problems often do not seek professional treatment (Eisenberg et al., 2012, 2012); thus, more research is needed to identify the barriers that deter help-seeking, which may include being in financially precarious circumstances. Also, self-injurious behaviors are strong predictors of suicide, which is the second leading cause of death among college students. It has been imperative to address the problem of suicide at multiple levels, and it may be fruitful to explore how addressing food insecurity can contribute toward the reduction of self-injurious behaviors. Finally, while most studies have tended to focus on depression and anxiety, we found that food insecurity was related to greater odds of languishing. This is critical because extant literature largely focuses on mental illness (symptoms, disorders) while overlooking other aspects of mental wellness, such as engaging in activities that bring about happiness, meaningful relationships, and a sense of purpose (Hone et al., 2014; Keyes, 2003; Keyes et al., 2010).

5. Conclusion

We found strong evidence to suggest food insecurity was associated with greater odds of mental health outcomes in a large sample of young adult college students in the United States during a global pandemic. Despite the potentially bi-directional nature of the relation, colleges may consider intervening on food insecurity, which may directly or indirectly improve mental health and wellness. Programs to alleviate food insecurity may be particularly effective, and may include expanding affordable meal plans and dining options on campuses (Van Woerden et al., 2019), referrals to food banks and pantries (Bazerghi et al., 2016), and financial counseling (Britt et al., 2015; Choi et al., 2016). Efforts should be coordinated and responsive to the needs of the students (Henry, 2017; Zigmont et al., 2021), with the overarching goal of preventing mental health problems and promoting mental wellness.

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Authorship confirmation

All authors have contributed to the development of this manuscript and have reviewed and approve of this submission.

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Hans Oh: Conceptualization, Methodology, Writing – original draft. **Lee Smith:** Writing – review & editing. **Louis Jacob:** Conceptualization, Writing – review & editing. **Jinyu Du:** Formal analysis. **Jae Il Shin:** Writing – review & editing. **Sasha Zhou:** Data curation, Investigation. **Ai Koyanagi:** Conceptualization, Writing – review & editing.

Declaration of Competing Interest

No competing financial or other interests exist.

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