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Food Insecurity is Associated with Poorer Mental Health and Sleep Outcomes in Young Adults

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Abstract

Purpose: To determine the association between food insecurity, mental health, and sleep outcomes among young adults. Young adulthood represents an important developmental period when educational and economic transitions may increase risk for food insecurity; however, little is known about associations between food insecurity and health outcomes in this time period.

Methods: Cross-sectional nationally representative data of US young adults ages 24–32 years old from Wave IV (2008) of the National Longitudinal Study of Adolescent to Adult Health were analyzed in 2018. Multiple logistic regression analysis was conducted with food insecurity as the independent variable and self-reported mental health (depression, anxiety, and suicidality) and sleep (trouble falling and staying asleep) outcomes as the dependent variables.

Results: Of the 14,786 young adults in the sample, 11% were food insecure. Food-insecure young adults had greater odds of mental health problems including a depression diagnosis (1.67, 95% Confidence interval [CI] 1.39–2.01), anxiety or panic disorder diagnosis (1.47, 95% CI 1.16–1.87), and suicidal ideation in the past 12 months (2.76, 95% CI 2.14–3.55). Food insecurity was also associated with poorer sleep outcomes including trouble falling (AOR 1.78, 95% CI 1.52–2.08) and staying (AOR 1.67, 95% CI 1.42–1.97) asleep.

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Conclusions: Food insecurity is associated with poorer mental and sleep health in young adulthood. Health care providers should screen for food insecurity in young adults and provide referrals when appropriate. Future research should test interventions to simultaneously combat food insecurity and mental health problems in young adulthood.

Keywords

Food security; young adult; mental health; depression; anxiety; sleep; suicide

Introduction

Food insecurity is defined as disruption of food intake or eating patterns because of lack of money and other resources [1]. Food insecurity affects approximately 12% of American households [2]. The limited research on food insecurity among young adults estimates that food insecurity affects 9–14% of young adults aged 24–32 in the US [3], but higher rates (35–59%) have been reported among university students, depending on the measure of food insecurity [4, 5]. Although definitions of young adulthood vary [6, 7], the US Census Bureau defines young adults as ages 18–34, finding that 41% of this age group has student debt and one third live in their parents' home [8]. Among young adults who live at home, one quarter are idle meaning they are neither working nor attending school [8]. Thus, young adulthood represents an important developmental period that is distinct from adolescence and older adulthood when educational and economic transitions may increase risk for food insecurity [9].

Although food insecurity is associated with adverse mental health outcomes in the general adult population [10, 11] and adolescents [12], there is a paucity of research examining relationships between food insecurity and mental health outcomes in US young adults. Food insecurity may be an overlooked factor that could affect mental health in young adults. Food-insecure individuals may experience stress [13], stigmatization [14], and have greater risk for obesity [3], which can all contribute to poor mental health. Nine percent of young adults reported a major depressive episode in the past year [9]. Mental health disorders have profound impacts on health and functioning, and lead to substantial economic costs [15]. Depressed individuals may experience difficulties with employment, earning income, or managing finances which could lead to food insecurity [16]. Young adults have a higher rates of suicide deaths, tobacco use, alcohol use, and marijuana use and are less likely to get regular medical checkups than adolescents [9].

Mental health is closely related to poor sleep, which is both a symptom of many common mental disorders [17] and a risk factor for developing depression, anxiety, alcohol abuse, and psychosis.[18] There is a growing literature in adults that food insecurity is associated with poor sleep outcomes.[19], which may be due to psychological distress [20], poorer mental health [10], and greater obesity risk [3] which is associated with obstructive sleep apnea. In the general adult population, food insecurity is associated with inadequate sleep duration and increased sleep complaints [19]. Young adults are a population at particular risk for poor sleep [21]; however, the relationship between food insecurity and sleep outcomes have not been examined specifically in young adults.

The objective of this study is to determine the association between food insecurity and mental health (depression, anxiety, and suicidality) and sleep (trouble falling and staying asleep) outcomes, using a nationally representative sample of young adults in the US. We hypothesize that food insecurity will be associated with a greater prevalence of adverse mental health and sleep outcomes.

Methods

Study population

This study uses cross-sectional data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a longitudinal cohort study of a nationally representative sample of adolescents in the United States who were followed into adulthood [22]. The baseline sample was collected in 1994–1995 when subjects were adolescents (11–18 years) and used systematic sampling methods and implicit stratification to ensure that the high schools (n=80) and paired middle schools selected were representative of US schools with respect to region of the country, urbanicity, size, type, and ethnicity. For this particular study, we used the nationally representative restricted-use cross-sectional sample from Wave IV of Add Health, collected in 2008 when participants were young adults (24–32 years). Wave IV was the only wave that collected information on food insecurity. The University of North Carolina Institutional Review Board approved all Add Health study procedures. Further details about the study design can be found elsewhere [22].

Measures

Primary Predictor Variable—*Food insecurity*: was based on self-report. Participants were asked, “In the past 12 months, was there a time when (you/your household were/was) worried whether food would run out before you would get money to buy more?” Response options were yes/no, with a 99.9% response rate. This single item has a 59–93% sensitivity and 85–87% specificity (though in pediatric populations) for detecting food insecurity as measured by the gold standard 18-item US Household Food Security Scale and is considered the most inclusive question of the scale [3, 23–25]. For the purposes of this study, we will refer to those with an affirmative response as “food insecure” as has been done in other studies using Add Health Data [3, 26].

Outcome variables:

Mental Health—*Depression scale*: was based on a modified 9-item version of the Center for Epidemiologic Studies Depression (CESD) scale [27], coded on a four-point scale indicating the frequency of symptoms occurring in the past week with 0=never or rarely, 1=sometimes, 2=a lot of the time, 3=most of the time or all of the time, which has been extensively validated and published in the literature including in Add Health [27–32]. After reverse coding relevant items as some were phrased positively, each respondent’s item score was calculated in each wave (0–27 total points possible). The scale had good internal consistency (Chronbach’s $\alpha=0.84$). Higher point values indicated greater depressive symptom severity, though the scale is not diagnostic [33].

Depression diagnosis: was based on an affirmative response to the interview question, “Has a doctor, nurse or other health care provider ever told you that you have or had: depression?” as has been previously coded and published in prior Add Health studies [28, 34].

Anxiety or Panic Disorder Diagnosis: was based on an affirmative response to the interview question, “Has a doctor, nurse or other health care provider ever told you that you have or had: anxiety or panic disorder?” as has been previously coded and published in prior Add Health studies [28, 35].

Suicidal thoughts: was based on an affirmative response to the interview question, “During the past 12 months, have you ever seriously thought about committing suicide?” as has been coded and published in previous Add Health studies [36, 37]. The wording of this measure is the same as in the National Comorbidity Survey Adolescent and similar to other national adolescent surveys such as the Youth Risk Behavior Survey [38], which have been shown to have good convergent and discriminant validity [39].

Suicide attempt: was based on a response to the interview question, “During the past 12 months, how many times have you actually attempted suicide?” Any numerical response greater than zero was coded as a suicide attempt, and a dichotomous variable was then created to indicate any suicide attempt (yes/no) as has been coded and published in previous Add Health studies [36, 37]. The wording of this measure is nearly identical to the suicide attempt measure in the Youth Risk Behavior Survey and similar to other national adolescent surveys [38], which have been shown to have good convergent and discriminant validity [39].

Sleep—Trouble falling or staying asleep: was based on a response to the interview question, “Over the past four weeks, how often did you have trouble falling asleep?” and “Over the past four weeks, how often did you have trouble staying asleep through the night? For example, you woke up several times at night or woke up earlier than you planned to?” Response options included: “never in the past four weeks,” “less than once a week,” “1 or 2 times a week,” “3 or 4 times a week,” and “5 or more times a week.” Consistent with prior studies evaluating chronic sleep disturbance using this measure in Add Health, we recoded both trouble falling and staying asleep into dichotomous variables: 0) 2 times or less per week or 1) 3 times or more per week [40].

Covariates

Age, sex, race/ethnicity, and household size were recorded based on self-report [22]. Education was based on self-report and dichotomized into high school or less versus more than high school. Participant income was based on self-report of personal earnings in the previous calendar year rounded to the nearest dollar. Participants were asked, “how much income did you receive from personal earnings before taxes, that is, wages or salaries, including tips, bonuses, and overtime pay, and income from self-employment?” Gaussian normal regression imputation method was used to impute income for the 835 participants who either refused to answer the income question or stated they did not know. Public assistance was considered present if the participant reported receiving any public assistance, welfare payments, or food stamps in the intervening years since the prior wave of data

collection. Smokers were identified as those currently smoking tobacco more than 10 days in the prior 30 days [3]. Alcohol users were identified as those currently consuming alcohol on one or more days a week in the prior 30 days [3]. Body mass index (BMI) was based on measured weight and height by the interviewer and calculated using the standard formula weight (kilograms) divided by height (meters) squared ($BMI = \text{weight}/\text{height}^2$). BMI has been adjusted for as a potential confounder in other models examining food insecurity and mental health or sleep [41].

Statistical analysis

Data analysis was performed in 2018 using STATA 15.0. Add Health's pre-constructed sample weights were used for all analyses to yield nationally representative estimates. Multiple logistic regression analyses were used to identify associations with mental health (depression, anxiety or panic disorder, suicidal ideation, suicide attempt) and sleep (trouble falling and staying asleep) as the dependent variables, and food insecurity as the independent variable, adjusting for race/ethnicity, age, sex, education, income, public assistance, smoking, alcohol, and body mass index. Multiple linear regression analysis was used to identify associations with depression score (continuous) as the dependent variable, and food insecurity as the independent variable, adjusting for race/ethnicity, age, sex, education, income, public assistance, smoking, alcohol, and body mass index. Given differing definitions of young adulthood [6–8], in a sensitivity analysis, we dichotomized age (24–28 years versus 29–32 years) and tested for a food insecurity-age interaction for all outcomes. $P < 0.05$ was considered statistically significant.

Results

The study sample included 14,786 young adults (51% male, 49% female) from the National Longitudinal Study of Adolescent to Adult Health. Mean age was 28.3 years and there was no significant difference in mean age by food security status. Over a third were racial or ethnic minorities (Table 1). Overall, 11% of young adults were food insecure and nearly three quarters had more than a high school education.

The demographic characteristics of participants who were food secure versus food insecure are reported in Table 1. A greater proportion of female compared to male ($p < 0.001$), Black/African American compared to White ($p < 0.001$), those with a high school education or less compared to more than high school education ($p < 0.001$), and smokers compared to non-smokers ($p < 0.001$) reported food insecurity. A greater proportion of young adults reporting food insecurity had higher rates of mental health and sleep problems compared to young adults who reported being food secure ($p < 0.001$ for all unadjusted outcomes).

Logistic regression analyses with food insecurity as the independent variable and mental health and sleep outcomes as dependent variables are presented in Table 2. Adjusted analyses controlled for age, sex, race/ethnicity, education, income, BMI, smoking, alcohol, and receipt of public assistance. Food-insecure young adults had greater odds of mental health problems including a depression diagnosis (adjusted odds ratio [AOR] 1.67, 95% Confidence interval [CI] 1.39–2.01), anxiety or panic disorder diagnosis (AOR 1.47, 95% CI 1.16–1.87), and suicidal ideation in the past 12 months (AOR 2.76, 95% CI 2.14–3.55). The

association between food insecurity and suicide attempt in the past 12 months was in a positive direction but was not statistically significant (AOR 1.52, 95% CI 0.86–2.68). Food insecurity was associated with a 2.69 (95% CI 2.29–3.08) higher depression score beta coefficient compared to food security in linear regression model adjusting for covariates (not shown in Table). Food insecurity was also associated with poorer sleep outcomes including trouble falling asleep in the past four weeks (AOR 1.78, 95% CI 1.52–2.08), and trouble staying asleep in the past four weeks (AOR 1.67, 95% CI 1.42–1.97). In sensitivity analyses, there was no significant food insecurity-age interaction for any mental health or sleep outcome.

Discussion

Young adults are an understudied population who are disproportionately affected by mental health problems [9]. In this study, we find that food insecurity is common, affecting 11% of a nationally representative sample of US young adults, and is associated with both mental and sleep health. Specifically, we find that food insecurity is associated with depression, anxiety, and suicidal ideation. Furthermore, we find that food insecurity in young adulthood is associated with sleep outcomes such as trouble falling and staying asleep.

Prior evidence has shown that food insecurity is associated with poorer mental health in the general adult population, including depression, perceived stress, and anxiety in adults [10, 11]. In adolescents, food insecurity has been shown to be associated with overall mental health problems, emotional problems, and conduct problems [12]. Less is known about this relationship in the young adult population; however, one French study found that food insecurity was associated with increased depression among 18 to 35 year olds [41]. We add to this literature by demonstrating an association between food insecurity and mental health among US young adults even when adjusting for socio-economic status and other potential confounders, suggesting an independent association.

There are several mechanisms that may link food insecurity to poor mental health, acting via multiple, interlinked biological and psychosocial paths. Food insecurity may be associated with obesity, for example, which is associated with depressive symptoms and mood disturbances [3]. Food insecurity is also a significant source of chronic stress, which can raise cortisol levels and cause hypothalamic-pituitary-adrenal dysfunction [13]. Such chronic physiological dysregulation may play a role in the development of affective disorders [42]. Furthermore, the experience of food insecurity is characterized by perceived powerlessness, desperation, shame, and guilt, which may directly contribute to anxiety and depressive symptoms [43]. There is also some evidence that food insecurity in the United States is accompanied by stigmatization [14], which may reinforce the experience of chronic stress and poor mental health [44]. Finally, one coping strategy that individuals experiencing food insecurity and associated stress often employ is binge eating of unhealthy foods [45], which is associated with both obesity and depression [46].

On the other hand, depression and mental health problems may lead to food insecurity. Depressed young adults may not be able to work, generate income, or manage financial resources which could lead to food insecurity [16]. In addition, depressed individuals may

lack motivation, energy, or organization to shop or prepare foods and meals or make decisions about food [47]. Longitudinal studies of food insecurity and emotional wellbeing among children and adults have shown that the relationship is bidirectional, creating the possibility for mutually reinforcing cycles between food insecurity and poor mental health [48]. The same is likely also true of young adults specifically.

Fewer studies have examined the association between food insecurity and suicide. One study found an association between food insecurity and suicidal ideation in young adults in France [41]. We confirm the association between food insecurity and suicidal ideation in US young adults,[41] and also find an association between food insecurity and suicide attempts, though the association was not statistically significant. The mechanism linking food insecurity to suicide could be through depression and poor mental health, including self-loathing, feeling hopeless, and thoughts of death as a means of relief [49]. Depression may also lead to both poor diet quality and suicide [50]. Food insecurity is also a socially isolating experience [43], as is the stigma which may accompany it [44].

We report that food insecurity is associated with problems of both falling asleep and staying asleep in young adults. These findings support the limited prior research in the general adult population finding associations between food insecurity and inadequate sleep duration and increased sleep complaints [19, 20]. Three mechanisms may explain the relationship between food insecurity and sleep. First, food insecurity may lead to poor mental health as described above which is associated with poor sleep [10]. One study found that psychological distress mediated the relationship between food insecurity and suboptimal sleep quality [20]. Psychological distress is directly associated with poor sleep [20]. Second, food insecurity may lead to malnutrition or nutritional deficiencies which can affect sleep [51]. Calorie restriction and fasting have been shown to affect Rapid Eye Movement (REM) sleep [51]. Third, food insecurity is associated with obesity in young adults [3], which in turn is associated with obstructive sleep apnea and subsequent poor sleep.

Our study has several limitations. First, the cross-sectional nature of the study precludes causal inferences and some of the associations may have bidirectional relationships. The predictor and outcome measures were based on self-report, which may be subject to response bias. Food insecurity was assessed by a single item food security measure, the first item of both the full 18-item US Household Food Security Scale and the validated 6-item short form [24]. The effectiveness of a one-item question at measuring food insecurity remains a debate in the literature and thus may be a limitation [3, 23–25]. However, it is notable that even just worrying about not having enough money for food, regardless of whether or not there is reduced food quality or quantity of intake, undermines mental health and sleep. Negative impacts on health have been shown along the gradient of food insecurity including at “marginal” levels [52], which would be consistent with answering affirmatively to the worry question even if not to the questions on restricted intakes. Future research in young adults could assess food insecurity using the full US Household Food Security Scale. Our sample of 24–32 year old participants is within the US Census Bureau’s definition of young adulthood (18–34 years) [8]; however, other definitions of young adulthood may not extend beyond age 30 [7]. In sensitivity analyses, we did not find evidence for a food insecurity-age interaction for any outcome. Although we controlled for a number of

potential confounders including age, sex, race/ethnicity, education, income, BMI, smoking, alcohol, and receipt of public assistance, there is the possibility for unmeasured confounders. Nonetheless, the limitations were offset by strengths, including a large, nationally-representative community sample of an understudied population of young adults.

Food insecurity, mental health, and sleep health are among the top public health areas of concern identified by the Healthy People 2020 national objectives [53]. Screening for food insecurity across all age groups, including in young adults who may be overlooked, using validated one to two question screeners should be implemented by clinicians [23, 54]. Screening for mental health and sleep may also be important at young adult health care visits [9, 21]. Interventions for food insecurity and mental health could be integrated. For instance, programs with high rates of people who are food insecure, such as the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), could incorporate screening for mental health in their assessments and provide resources or counseling, and conversely mental health programs could screen for and address food insecurity. Social support may buffer the influence of food insecurity on depression risk [55, 56]; thus novel food insecurity and social support interventions that incorporate social relationship building, member participation, and capacity building may improve mental health consequences of food insecurity and be of particular interest to young adults [57]. Other food insecurity interventions aimed at young adults could include subsidized cafeterias in higher education institutions [41], as food security has been reported in college students [4, 5]. Future longitudinal studies could assess the relationships between food insecurity, mental health, and sleep health longitudinally from adolescence through the transition to adulthood and evaluate the impact of early food insecurity interventions on mental health and sleep in young adulthood.

Food insecurity is associated with poor mental health and sleep outcomes including depression, anxiety, suicidal ideation, and trouble falling and staying asleep in a nationally representative sample of US young adults. Young adulthood may be an important period to screen for and address food security given the development of many of these mental health conditions and sleep problems during this time period.

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Implications and Contribution:

Using a nationally representative sample of young adults in the United States, this study finds that food insecurity is associated with poorer mental health and sleep disturbances. Health care providers should screen for food insecurity in young adults and provide referrals when appropriate.

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Table 1.

Demographic and health characteristics of 14,800 young adult participants in the National Longitudinal Study of Adolescent Health, stratified by food security status

n	Food Secure	Food Insecure	p
	13,139	1,647	
Demographic characteristics	Mean ± SE / % ^b	Mean ± SE / % ^b	
Age, years	28.3 ± 0.1	28.4 ± 0.2	0.395
Sex			<0.001
Female	48.2%	57.6%	
Male	51.8%	42.4%	
Race/ethnicity			<0.001
White (non-Hispanic)	66.7%	58.0%	
Black/African American (non-Hispanic)	14.8%	25.3%	
Hispanic/Latino	12.2%	10.6%	
Asian/Pacific Islander (non-Hispanic)	3.6%	1.5%	
American Indian/Native American	1.8%	3.5%	
Other	1.0%	1.0%	
Educational attainment			<0.001
High school or less	25.0%	42.0%	
More than high school	75.0%	58.0%	
Income, US dollars	63,473 ± 999	34,859 ± 1,216	<0.001
Household size	2.1 ± 0.0	2.5 ± 0.1	<0.001
Recent public assistance	20.7%	53.5%	<0.001
Smoker	28.1%	46.3%	<0.001
Alcohol use	30.1%	22.0%	<0.001
Health characteristics, self-reported			
<i>Mental health</i>			
Depression diagnosis	14.7%	28.7%	<0.001
Depression score	5.7 ± 0.1	9.4 ± 0.2	<0.001
Anxiety or panic disorder diagnosis	12.0%	20.5%	<0.001
Suicidal ideation in past 12 months	5.8%	17.0%	<0.001
Suicide attempt in past 12 months	1.3%	3.6%	<0.001
<i>Sleep</i>			
Trouble falling asleep in past four weeks	14.6%	28.5%	<0.001
Trouble staying asleep in past four weeks	19.9%	32.0%	<0.001
Body mass index (BMI), kg/m ²	28.9 ± 0.1	30.2 ± 0.4	<0.001

All means and percentages are calculated with weighted data to reflect the representative proportion in the target U.S. population

Association between food insecurity, mental health, and sleep in young adults 24–32 years of age, adjusted for demographic variables and health behaviors

Table 2.

Self-reported health outcomes	Food Insecurity		Food Insecurity	
	Odds ratio (95% CI)	P	Adjusted odds ratio ^a (95% CI)	P
<i>Mental health</i>				
Depression diagnosis	2.33 (1.96 – 2.78)	<0.001	1.67 (1.39 – 2.01)	<0.001
Anxiety or panic disorder diagnosis	1.89 (1.51 – 2.35)	<0.001	1.47 (1.16 – 1.87)	0.002
Suicidal ideation in past 12 months	3.34 (2.69 – 4.16)	<0.001	2.76 (2.14 – 3.55)	<0.001
Suicide attempt in past 12 months	2.87 (1.71 – 4.81)	<0.001	1.52 (0.86 – 2.68)	0.145
<i>Sleep</i>				
Trouble falling asleep in past four weeks	2.33 (2.03 – 2.67)	<0.001	1.78 (1.52 – 2.08)	<0.001
Trouble staying asleep in past four weeks	1.89 (1.62 – 2.20)	<0.001	1.67 (1.42 – 1.97)	<0.001

Bold indicates p<0.05.

^a Adjusted for age, sex, race/ethnicity, education, income, household size, body mass index, smoking, alcohol, and receipt of public assistance