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Authors

Nagata, Jason M
Palar, Kartika
Gooding, Holly C
[et al.](#)

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Food Insecurity, Sexual Risk, and Substance Use in Young Adults

Jason M. Nagata, MD, MSc¹, Kartika Palar, PhD², Holly C. Gooding, MD, MSc³, Andrea K. Garber, PhD, RD¹, Jennifer L. Tabler, PhD⁴, Henry J. Whittle, M.B.B.S., M.S.⁵, Kirsten Bibbins-Domingo, PhD, MD, MAS^{2,6}, Sheri D. Weiser, MD, MPH²

¹Department of Pediatrics, University of California, San Francisco, San Francisco, CA

²Department of Medicine, University of California, San Francisco, San Francisco, CA

³Departments of Pediatrics, Emory University School of Medicine, Atlanta, GA

⁴Department of Sociology and Criminology, University of Wyoming, Laramie, WY

⁵Centre for Psychiatry, Wolfson Institute of Preventive Medicine, Barts and the London School of Medicine and Dentistry, Queen Mary University of London, London, UK

⁶Department of Epidemiology and Biostatistics, University of California, San Francisco, San Francisco, CA

Abstract

Purpose: To determine the association between food insecurity, sexual risk behaviors, sexually transmitted infections (STIs), and substance use in a nationally representative sample of US young adults.

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. Multiple logistic and linear regression analyses were conducted with food insecurity as the independent variable and self-reported STIs, sexual risk behaviors and substance use as the dependent variables, adjusting for covariates and stratifying by sex.

Results: Of the 14,786 young adults in the sample, 14% of young women and 9% of young men were food insecure. Food-insecure young women had greater odds of any STI, HIV, chlamydia, exchanging sex for money, and multiple concurrent sex partners in the past 12 months compared to young women reporting food security, adjusting for covariates. Food insecurity was associated with higher odds of any STI, chlamydia, and exchanging sex for money among young men who identified as gay or bisexual, but not in the general population of young men. Food insecurity was

Corresponding Author: Jason M. Nagata, 3333 California Street, Suite 245, San Francisco, California 94143, Telephone: +1 (626) 551-1932, jasonmnagata@gmail.com.

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also associated with greater odds of marijuana, methamphetamine, and nonmedical use of prescription opioids, sedatives, and stimulants in both young men and women.

Conclusions: Food insecurity is associated with risk behaviors and self-reported STIs including HIV in young adulthood. Health care providers should screen for food insecurity in young adults and provide referrals when appropriate.

Keywords

food insecurity; young adult; risk behavior; sexually transmitted infection; sexually transmitted disease; substance use; drug use; opioid

Introduction

Food insecurity affects 15 million households in the United States (US) and is defined as “the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways” (1). Young adults, defined as ages 18–34 years by the US Census Bureau, may be at risk for food insecurity given their educational transitions and economic instability (2). For instance, over forty percent of young adults have student debt (2). Young adults are more likely to contract sexually transmitted infections (STIs) and engage in substance use than adolescents, but are less likely to attend regular medical checkups (3). Furthermore, brain development and neuroplasticity continues through young adulthood and may be influenced by nutritional status and food insecurity (4). In our previous studies using the National Longitudinal Study of Adolescent Health, we estimated that food insecurity affects 14% of young women and 9% of young men (5), similar to the 11.1–14.6% prevalence reported using the US Household Food Security Survey Module (6). Even higher rates, ranging from 35–59%, have been reported among university students (7,8). Among US young adults, food insecurity is associated with poor mental health (9), chronic disease (10), obesity (5), and migraine (11). Food insecurity remains an understudied potential contributor to risk behaviors in young adults such as sexual health risks and substance use.

Because brain development continues through young adulthood (4), nutritional status and food insecurity may impact young adult decision making. Young adulthood is also a period of sexual risk taking; young adults have the highest rates of sexually transmitted infections (STIs), such as chlamydia and gonorrhea, compared to other age groups in the US (12). Although food insecurity has been associated with sexual health risks in the general adult population (13–17), few studies have focused specifically on young adults. One recent study among sexually active persons 15–44 years old found an association between food insecurity and sexually transmitted infections in both males and females (18). International studies have found that food insecurity is associated with sexual health risk among women (16,17), and more recently, studies from the US have found strong associations between food insecurity and sexual risk among men, particularly gay and bisexual men (13,14). Studies among adult populations have found that food insecurity is associated with transactional sex (13,16) because participants needed to procure food or money to buy food (13). In addition, food insecurity is associated with multiple sexual partners (15,17) as well as STIs and

related symptoms (14,19,20) in adults. However, there remains a paucity of studies examining food insecurity and sexual risk in young adulthood.

Substance use, including tobacco and marijuana use, increases and peaks during young adulthood (21). Prior studies have found an association between food insecurity and substance use in the general adult population (13,14,22), including smoking tobacco (23). One study among socioeconomically disadvantaged young adults in California found an association between food insecurity and smoking tobacco (24); however, this was not a nationally representative sample of young adults.

While previous studies on food insecurity, sexual health, and substance use in adults have included young adults within their samples (13,14,18,25), few have focused specifically on the young adult time period. Given the high risk for food insecurity, STIs including HIV, and substance use in young adulthood (3), the study of these interrelationships during this important developmental period is warranted. The National Longitudinal Study of Adolescent to Adult Health was designed specifically to study the transition from adolescence to adulthood at the national level (26), and represents a unique data set to explore these relationships. Therefore, the objective of this study was to determine the association between food insecurity, sexual risk, STIs, and substance use in a nationally representative sample of young adults from the US. We hypothesized that food insecurity would be associated with greater sexual risk and substance use in both men and women. Given that food insecurity disproportionately affects women, that effects of food insecurity on risky sex may differ according to gender, and the differing prevalence of STIs by sex (12), we also stratified the sexual risk outcomes by sex.

Methods

Study population

This study uses nationally representative data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a longitudinal cohort study of US adolescents followed into young adulthood (26). 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 to collect information on food insecurity. All Add Health study procedures were approved by the University of North Carolina Institutional Review Board. Written informed consent was obtained from all study participants. Sensitive questions, including those related to sexual behavior, were self-administered using Computer-Assisted Self-Interview (CASI). Further details about the study design can be found elsewhere (26).

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 included 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 (5,27–29). 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 (5,9–11).

Outcome variables

Sexual Risk

Number of total sexual partners: Participants were asked, “Considering all types of sexual activity, with how many female [or male] partners have you ever had sex?” Number of sexual partners was the sum of total number of male and female partners. Number of sexual partners has been used as a proxy for sexual risk in other studies using Add Health data (30).

Number of one-time sexual partners: Participants were asked, “Considering all types of sexual activity, with how many partners, male or female, have you had sex on one and only one occasion?”

Sexually transmitted infections in past 12 months: Participants were asked, “In the past 12 months, have you been told by a doctor, nurse, or other health professional that you had the following sexually transmitted disease?” Affirmative responses to the options of chlamydia, gonorrhea, trichomonas, syphilis, herpes, human papilloma virus, human immunodeficiency virus, or other sexually transmitted diseases were coded as having a STI in the past 12 months. Given their clinical relevance with current STI screening guidelines (31) and relatively high prevalence in young adulthood (12), we also analyzed HIV and self-reported chlamydia and gonorrhea individually.

Exchanging sex for money in past 12 months: Participants were asked, “In the past 12 months, how many times have you paid someone to have sex with you or has someone paid you to have sex with them?” Responses were dichotomized into none (0) or 1 times (32).

Multiple sex partners at around the same time in past 12 months: Participants were asked, “In the past 12 months, did you have sex with more than one partner at around the same time?” Responses were “yes” (1) or “no” (0).

Condom use in past 12 months: Participants who were sexually active were asked, “In the past 12 months, did you or your partner(s) use any of these methods for birth control or

disease prevention: condoms (rubbers)?” Affirmative responses were coded as condom use present (33).

Substance Use

Marijuana: Participants were asked, “During the past 30 days, on how many days did you use marijuana?” Responses were dichotomized into none (0) or 1 times (34).

Smoking: Smokers were identified as those self-reporting smoking tobacco more than 10 days in the prior 30 days (5).

Nonmedical use of prescription medication: Participants were asked, “Which of the following types of prescription drugs have you taken that were not prescribed for you, taken in larger amounts than prescribed, more often than prescribed, for longer periods than prescribed, or that you took only for the feeling or experience they caused (check all that apply)?” Response options included 1) pain killers or opioids such as Vicodin, OxyContin, Percocet, Demerol, Percodan or Tylenol with codeine; 2) sedatives such as barbiturates, sleeping pills, Quaalude, or Seconal; 3) tranquilizers such as Librium, Valium, or Xanax; or 4) stimulants or uppers such as amphetamines, diet pills, Ritalin, Preludin, or speed. Responses were “yes” (1) or “no” (0) (35,36).

Cocaine and methamphetamine: Participants were asked, “Have you ever used any of the following drugs?” Response options included cocaine and crystal meth. Responses were “yes” (1) or “no” (0) (37).

There was less than 0.4% of missing data for substance use and sexual health and STI questions except for number of sexual partners (1.37% missing) and number of one-time sexual partners (1.96% missing).

Covariates

Age, sex, race/ethnicity, sexual orientation, and household size were recorded based on self-report (26). Education was based on self-report and dichotomized into high school or less versus more than high school. Household income was based on participant self-report. Participants were asked, “Thinking about your income and the income of everyone who lives in your household and contributes to the household budget, what was the total household income before taxes and deductions? Include all sources of income, including non-legal sources.” Gaussian normal regression imputation method was used to impute household income for the 835 participants who refused to answer the income question or stated they did not know as has been done previously (5,9–11). Sexual minority young adults self-identified as bisexual, mostly homosexual, or homosexual (gay). Alcohol users were identified as those currently consuming alcohol on one or more days a week in the prior 30 days (5).

Statistical analysis

Data analysis was performed using Stata 15.0. Add Health's pre-constructed sample weights specific to Wave IV to yield nationally representative estimates specific to 2008. All analyses were stratified by sex, given different rates of food insecurity (1), STIs, sexual risk (12), and substance use (14,25) by sex. Multiple logistic regression analyses were used to identify associations with binary sexual risk outcomes (any STI, HIV, chlamydia, gonorrhea, exchanging sex for money, multiple sex partners around the same time, and condom use) as the dependent variables, and food insecurity as the independent variable, adjusting for age, race/ethnicity, sexual orientation, education, household income, smoking, and alcohol. Linear regression analysis was used to identify associations with number of lifetime or one-time sexual partners (continuous) as the dependent variable, and food insecurity as the independent variable, adjusting for age, race/ethnicity, sexual orientation, education, household income, smoking, and alcohol. Given prior literature on food insecurity and sexual risk in men who identify as gay or bisexual, we performed the above analyses in a subpopulation of young men who identified as gay or bisexual (13,14). Multiple logistic regression analyses were used to identify associations with binary substance use outcomes (marijuana, cocaine, methamphetamine, and nonmedical use of prescription opioids, prescription sedatives, prescription tranquilizers, and prescription stimulants) as the dependent variables, and food insecurity as the independent variable, adjusting for age, race/ethnicity, education, household income, smoking, and alcohol.

Results

Of the 14,786 young adults (ages 24–32) included in Wave IV of Add Health, 14% of young women and 9% of young men were food insecure. The demographic and health characteristics of participants who were food secure versus food insecure are reported in Table 1 by sex. A greater proportion of food-insecure young women reported any STI, chlamydia, gonorrhea, and exchanging sex for money in the past 12 months compared to young women who reported being food secure. For instance, 18.4% of food-insecure versus 11.8% of food-secure young women reported an STI in the past 12 months (Figure 1). Similarly, 2.4% of food-insecure versus 0.5% of food-secure young women reported exchanging sex for money in the past 12 months (Figure 2). Although a greater proportion of food-insecure young men reported any STI, chlamydia, gonorrhea, and exchanging sex for money in the past 12 months compared to food-secure young men, the differences were not statistically significant.

Logistic regression analyses with food insecurity as the independent variable and self-reported sexual health risk outcomes as the dependent variables are presented in Table 2. Food-insecure young women had greater odds of any STI (1.48, 95% Confidence interval [CI] 1.13–1.92), chlamydia (2.06, 95% CI 1.36–3.12), HIV (23.34, 95% CI 1.98–275.07), exchanging sex for money (2.59, 95% CI 1.19–5.66), and multiple sex partners around the same time (1.32, 95% CI 1.01–1.73) in the past 12 months, compared to young women reporting food security, adjusting for covariates. There were not significant associations between food insecurity and sexual risk among young sexual minority women. Food-insecure young men who identified as gay or bisexual had greater odds of any STI (3.17,

95% CI 1.05–9.60), chlamydia (77.00, 95% CI 2.23–2,655.87), and exchanging sex for money (30.21, 95% CI 3.78–241.69) compared to those reporting food security; however, there were not significant associations between food insecurity and sexual risk in the general population of young men. Food insecurity was not significantly associated with condom use among sexually active young men or women.

Food-insecure young women had 3.52 (95% CI 0.58–6.47, $p=0.019$) more lifetime sexual partners and 2.10 (95% CI 0.09–4.11, $p=0.041$) more one-time sexual partners than food-secure young women in linear regression models, adjusting for covariates. Among a subsample of sexual minority women, food insecurity was associated with 15.67 (95% CI 6.83–24.51, $p=0.001$) more lifetime sexual partners and 12.91 (95% CI 0.54–25.29, $p=0.041$) more one-time sexual partners in adjusted models. Food insecurity was not associated with lifetime sexual partners nor one-time sexual partners among young men in linear regression models, adjusting for covariates.

Logistic regression analyses with food insecurity and self-reported substance use outcomes are presented in Table 3. Food insecurity was associated with smoking in the past 30 days (2.09, 95% CI 1.67–2.63), marijuana use in the past 30 days (2.04, 95% CI 1.64–2.54) and ever use of methamphetamine (1.72, 95% CI 1.25–2.35), cocaine (1.74, 95% CI 1.40–2.16), and nonmedical use of prescription opioids (2.02, 95% CI 1.57–2.61), prescription sedatives (1.56, 95% CI 1.13–2.15), prescription tranquilizers (1.62, 95% CI 1.18–2.22), and prescription stimulants (1.57, 95% CI 1.09–2.28) among young women, adjusting for covariates. Food insecurity was associated with smoking in the past 30 days (1.69, 95% CI 1.31–2.19), marijuana use in the past 30 days (1.57, 95% CI 1.19–2.06), ever use of methamphetamine (2.03, 95% CI 1.48–2.79), and ever nonmedical use of prescription opioids (1.54, 95% CI 1.12–2.12), prescription sedatives (1.55, 95% CI 1.13–2.14), and prescription stimulants (1.57, 95% CI 1.06–2.34) among young men, adjusting for covariates.

Discussion

Using nationally representative data, we found that food insecurity was associated with sexual risk including STIs and exchanging sex for money in young women and young men who identify as gay or bisexual in the US. Food insecurity was associated with self-reported HIV diagnosis among young women. We also found that food insecurity was associated with marijuana and methamphetamine use, and the misuse of several classes of prescription drugs, including prescription opioids, tranquilizers, and stimulants, in both young men and women. These findings were robust even after adjusting for income, education, and other covariates, indicating that food insecurity is not simply a proxy for poverty. However, food insecurity could be a proxy for other forms of structural vulnerability, such as access to health care (primary care, addiction treatment, and harm reduction modalities) and access to public transportation. This research builds upon prior studies examining food insecurity and adverse physical and mental health outcomes in the US (5,9–11), indicating that food insecurity is associated with health across several domains in young adults.

Our finding that food insecurity was associated with exchanging sex for money among young women and young men who identify as gay or bisexual in the US is in line with prior research in resource-poor settings such as in sub-Saharan Africa (16). One qualitative study in San Francisco found that transactional sex may be a procurement strategy for either money or for food among women and men who have sex with men (13). Transactional sex often occurred during times of destitution and an absolute lack of food (13). Notably, however, men in this qualitative study were often less explicit about conceptualizing their episodes of transactional sex in terms of a purposeful exchange. Instead, they often framed their narratives in terms of being more open to opportunistic sexual encounters that may then bring added benefits of food or shelter (13). This kind of dynamic may not be captured by the question in our study, which asked specifically about exchanging sex for money.

Food insecurity has also previously been shown to be associated with multiple sexual partners among adults in diverse settings (15,17,38). Our research confirms these findings among young adult women, who may be at increased risk for both food insecurity and sexual risk. Although one previous study found an association between food insecurity and number of sexual partners among homeless and marginally housed men who had sex with men in San Francisco (15), we did not find a significant association in a nationally representative sample of young men.

We found that food insecurity was associated with STIs, particularly chlamydia and HIV, in the past 12 months. Prior studies among adults in diverse settings have found that food insecurity was associated with STIs including HIV (14,19,20,39). The association may be explained by greater number of sexual partners, or exchanging sex for money. Furthermore, micronutrient deficiencies and malnutrition may lead to weakened host defense mechanisms, damage to genital and gut epithelial lining, and differentiation of target cells (14,40), potentiating transmission of STIs including HIV. Although one study in US men found that food insecurity was associated with STIs including HIV (14), we did not find this association to be significant among young men, except among those who identify as gay or bisexual. Given that the STI variables were based on self-report, it is possible that young men with STIs were undiagnosed because of lack of symptoms or less frequent health care visits and, thus, the measured STI outcome was less common in this population (12). Furthermore, there may be reduced frequency or delayed testing for STIs due to fewer testing resources in areas where food insecure young people are living, competing priorities on time or resources to get tested, and worse access to health care for food-insecure young people.

Our findings on the associations between food insecurity and substance use highlights another pathway linking food insecurity and young adult risk. This is a particularly important finding in light of the contemporary US epidemic of prescription drug misuse, which affects young adults more than any other age group (41). We confirm the finding that food insecurity is associated with smoking specifically among young adults nationwide, similar to prior studies in the general adult population (23) and socioeconomically disadvantaged young adults in California (24). Prior studies in adult samples have found that food insecurity may contribute to illicit drug use (14,25) and sharing injection equipment among people who inject drugs (22). Prior studies report that street youth use psychoactive

substances to curb hunger and anxiety and use stimulants and opioids for their appetite-suppressing qualities (25,42). The links between food insecurity and substance use suggest another potential mechanism towards sexual health risk in that substance use can contribute to increased sexual health risk (14). There are likely bidirectional relationships between food insecurity and substance use; for instance, spending limited resources on drugs instead of food may compromise an individual's ability to pay for food (14,43). Individuals may experience loss of productivity, wages, or employment due to addiction. Notably, this study is among the first to demonstrate an association between food insecurity and the misuse of prescription drugs in the US, including prescription opioids, tranquilizers, and stimulants among both young women and men as well as prescription sedatives among young women.

Our study was a secondary analysis of previously collected data and should be considered in light of several limitations. The measures were based on self-report, and thus may be subject to response bias. However, sensitive questions were asked using CASI and the STI measures were based on self-report of a physician's diagnosis. 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 (28). Although this is only one item, it is notable that even worrying about not having enough money for food is associated with sexual risk. Future research in young adults could assess food insecurity using the full US Household Food Security Scale (28). The substance use questions reflected "ever" use (except for smoking and marijuana, which reflected use in the past 30 days), thus it is possible that the substance use temporally preceded food insecurity. Nonetheless, prior studies have shown an association between food insecurity and subsequent substance use six months later (25). Although we controlled for a number of potential confounders including age, race/ethnicity, sexual orientation, education, household income, household size, smoking, and alcohol, there is the possibility for unmeasured confounders. Household income data was imputed on 6% of the sample; however, results were not significantly changed when analyses were conducted without the imputed data. Add Health did not ask gender identity questions and thus we were unable to assess if participants were transgender or gender minorities. This cross-sectional associational study does not establish directionality or causality in the relationship between food insecurity and sexual risk. The data were collected in 2008 during a recession, and the national prevalence of food insecurity has decreased since this time (6). However, this study period may capture an important window of vulnerability to food insecurity nationwide. Despite these limitations, strengths of the study included a large, nationally-representative sample size of an understudied population of young adults. It is important to note that the association between food insecurity and sexual risk persisted independent of other socio-economic measures such as income and education, indicating food insecurity is not simply a proxy for poverty.

This research has several public health and clinical implications. Clinicians may consider screening jointly for food insecurity, sexual risk, and substance use, particularly among young adult populations. Validated two-item screeners for food insecurity have been developed for clinical use (27). Primary care clinicians could address these interrelated issues by providing community linkages, resource lists, counseling, and nutrition consultations to address overlapping and reciprocal vulnerabilities. Although young adults with food insecurity could be referred to the Supplemental Nutrition Assistance Program

(SNAP), these resources may be difficult to obtain for young adults and federal funding for food-insecure young adults remains an important programmatic gap for advocacy efforts (44). Recent campus garden and food pantry interventions have been developed to address food insecurity among young adult university students (45). Future research understanding longitudinal relationships, such as between food insecurity and incident HIV, other STIs, or substance use disorders are needed. Despite current national recommendations to screen for food insecurity, food insecurity is not regularly assessed in national datasets such as Add Health (food insecurity was not subsequently assessed in the 2016–2018 Wave V survey). Interventions to address food insecurity should be evaluated for their impact on sexual risk taking and illicit substance use.

Our findings emphasize that food insecurity is associated with STIs, sexual risk behaviors, and substance use among young adults using a nationally representative sample from the US, particularly among women and sexual minority men. Future research should examine these associations prospectively and using objective laboratory measures for STIs to further characterize these associations. Young adulthood may be an important time to screen for and intervene on food insecurity, sexual health risk, and substance use.

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Implications and Contribution

Food insecurity is associated with risk behaviors, including substance use, in young adults aged 24–32 years and sexual risk behaviors among young women and young men who identified as gay or bisexual in a nationally representative sample. Clinicians should consider screening for food insecurity in young adult populations.

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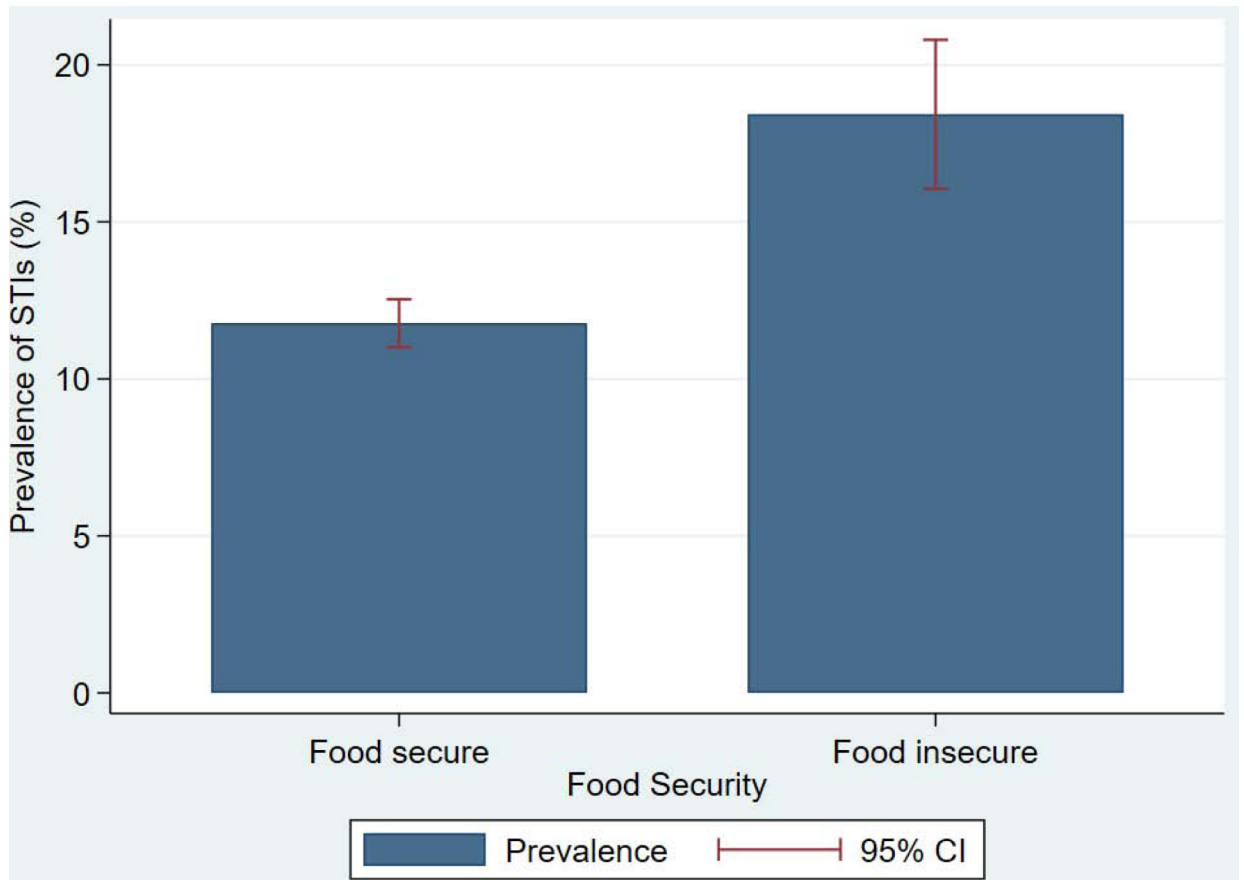


Figure 1. Prevalence of sexually transmitted infections in US young women by food security status.

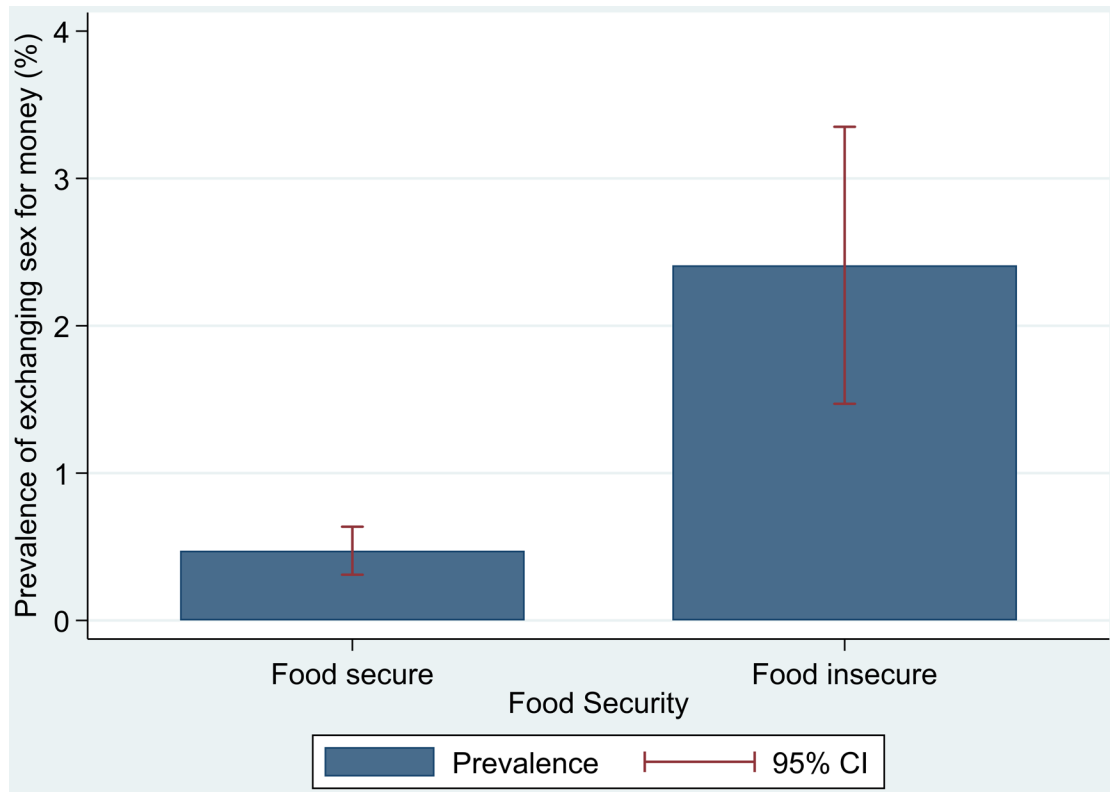


Figure 2. Prevalence of engaging in exchanging sex for money in US young women by food security status.

Demographic and health characteristics of 14,786 young adult participants in the National Longitudinal Study of Adolescent Health, stratified by food security status

Table 1.

	Females		Males		P
	Food Secure	Food Insecure	Food Secure	Food Insecure	
n	6,838	1,027	6,301	620	
Demographic characteristics	Mean ± SE / % ^b	Mean ± SE / % ^b	Mean ± SE / % ^b	Mean ± SE / % ^b	P
Age, years	28.2 ± 0.1	28.4 ± 0.2	28.4 ± 0.1	28.5 ± 0.2	0.887
Race/ethnicity		<0.001			<0.001
White (non-Hispanic)	67.2%	55.7%	66.2%	61.1%	
Black/African American (non-Hispanic)	14.8%	26.3%	14.8%	25.3%	
Hispanic/Latino	12.0%	11.9%	12.3%	10.6%	
Asian/Pacific Islander (non-Hispanic)	3.6%	1.7%	3.6%	1.3%	
American Indian/Native American	1.5%	3.5%	2.0%	3.5%	
Other	0.9%	0.9%	1.0%	1.2%	
Educational attainment		<0.001			<0.001
Less than high school	6.3%	15.6%	9.3%	22.6%	
High school graduate	13.0%	22.8%	21.1%	24.3%	
Some college	43.6%	50.2%	41.3%	42.6%	
College graduate	37.1%	11.4%	28.4%	10.5%	
Sexual identification		<0.001			0.782
Heterosexual (straight) or mostly heterosexual	95.8%	91.4%	96.8%	96.7%	
Bisexual, mostly homosexual, or homosexual (gay)	3.5%	8.0%	2.9%	3.1%	
Asexual	0.7%	0.6%	0.4%	0.2%	
Income, US dollars	62,421 ± 1,163	33,843 ± 1,331	64,451 ± 1,106	36,237 ± 1,820	<0.001
Alcohol use	21.4%	16.0%	38.2%	30.1%	0.004
Physical activity (# bouts per week)	5.6 ± 0.1	5.2 ± 0.2	7.1 ± 0.1	7.1 ± 0.3	0.888
Sexual health characteristics, self-reported					
Number of lifetime sexual partners	9.3 ± 0.3	15.4 ± 1.7	17.0 ± 0.7	18.1 ± 1.9	0.613
Number of one-time sexual partners	2.8 ± 0.1	5.8 ± 1.2	5.3 ± 0.3	6.1 ± 1.0	0.473
Any sexually transmitted infection, ^a past 12 months	11.8%	18.4%	4.8%	7.4%	0.061

n	Females				Males			
	Food Secure		Food Insecure		Food Secure		Food Insecure	
	6,838	1,027	6,301	620	6,301	620	620	
Chlamydia, past 12 months	2.4%	7.2%	<0.001	0.168	1.6%	2.6%	0.168	
Gonorrhea, past 12 months	0.4%	2.0%	<0.001	0.259	0.8%	1.8%	0.259	
Human immunodeficiency virus (HIV), past 12 months	0.0%	0.2%	0.004	0.274	0.2%	0.0%	0.274	
Trichomonas, past 12 months	1.1%	2.8%	<0.001	0.030	0.2%	1.2%	0.030	
Genital herpes, past 12 months	2.2%	3.6%	0.049	0.132	0.8%	0.2%	0.132	
Human papillomavirus (HPV) genital warts, past 12 months	6.1%	4.8%	0.206	0.141	1.6%	2.5%	0.141	
Syphilis, past 12 months	0.0%	0.2%	0.401	0.360	0.0%	0.1%	0.360	
Other sexually transmitted infection, past 12 months	0.0%	0.0%	0.978	0.184	0.2%	0.5%	0.184	
Exchanging sex for money, past 12 months	0.5%	2.4%	<0.001	0.145	2.8%	4.2%	0.145	
Multiple sex partners around the same time	9.0%	14.6%	<0.001	0.176	16.9%	19.6%	0.176	
Substance use, self-reported								
Smoking, past 30 days	24.1%	44.0%	<0.001	<0.001	31.9%	49.4%	<0.001	
Marijuana, past 30 days	11.0%	23.7%	<0.001	<0.001	20.4%	31.8%	<0.001	
Methamphetamine, ever use	6.7%	13.1%	<0.001	<0.001	10.6%	19.9%	<0.001	
Cocaine, ever use	14.7%	23.5%	<0.001	0.086	25.0%	29.4%	0.086	
Opioid, ever nonmedical use of prescription medication	11.2%	19.4%	<0.001	0.014	17.3%	23.9%	0.014	
Sedative, ever nonmedical use of prescription medication	7.5%	11.6%	0.001	0.011	11.0%	16.0%	0.011	
Tranquilizer, ever nonmedical use of ^ prescription medication	7.7%	11.6%	0.002	0.122	10.9%	13.8%	0.122	
Stimulant, ever nonmedical use of prescription medication	5.5%	8.2%	0.011	0.049	8.2%	11.5%	0.049	

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

^aIncludes chlamydia, gonorrhea, syphilis, HIV, herpes, trichomonas, and human papillomavirus.

Association between food insecurity and sexual risk in young adults aged 24–32 years, adjusted for demographic variables and health behaviors

Table 2.

	Food Insecurity		Food Insecurity	
	Odds ratio (95% CI)	P	Adjusted odds ratio ^a (95% CI)	P
Self-reported sexual risk outcomes, past 12 months				
Females				
Any sexually transmitted infection ^b	1.69 (1.32–2.17)	<0.001	1.48 (1.13–1.92)	0.004
Chlamydia	3.16 (2.17–4.60)	<0.001	2.06 (1.36–3.12)	0.001
Gonorrhea	5.00 (2.05–12.19)	<0.001	2.39 (0.85–6.70)	0.096
HIV	53.81 (3.66–790.37)	0.004	23.34 (1.98–275.07)	0.013
Exchanging sex for money	5.19 (2.43–11.1)	<0.001	2.59 (1.19–5.66)	0.017
Multiple sex partners at around same time	1.73 (1.37–2.19)	<0.001	1.32 (1.01–1.73)	0.041
Condom use ^c	0.89 (0.82–0.97)	0.007	1.06 (0.85–1.32)	0.623
Males				
Any sexually transmitted infection ^b	1.58 (0.98–2.54)	0.061	1.49 (0.96–2.31)	0.078
Chlamydia	1.68 (0.80–3.53)	0.168	1.08 (0.52–2.25)	0.823
Gonorrhea	2.35 (0.53–10.44)	0.259	1.22 (0.40–3.70)	0.719
HIV	0.35 (0.05–2.32)	0.274	0.27 (0.04–1.78)	0.170
Exchanging sex for money	1.55 (0.86–2.78)	0.145	1.54 (0.89–2.66)	0.124
Multiple sex partners at around same time	1.20 (0.92–1.56)	0.176	1.06 (0.80–1.41)	0.660
Condom use ^c	1.04 (0.81–1.33)	0.766	1.05 (0.82–1.34)	0.726
Sexual minority females ^d				
Any sexually transmitted infection ^b	1.56 (0.81–3.01)	0.180	1.32 (0.64–2.74)	0.445
Chlamydia	2.26 (0.83–6.15)	0.109	2.35 (0.73–7.61)	0.154
Gonorrhea	3.12 (0.19–50.44)	0.423	1.79 (0.08–42.47)	0.716
HIV	--		--	
Exchanging sex for money	2.55 (0.67–9.72)	0.170	4.10 (0.58–28.87)	0.157
Multiple sex partners at around same time	1.41 (0.81–2.44)	0.224	1.32 (0.72–2.44)	0.372
Condom use ^c	1.61 (0.96–2.68)	0.070	1.45 (0.81–2.57)	0.207

Self-reported sexual risk outcomes, past 12 months	Food Insecurity		Food Insecurity	
	Odds ratio (95% CI)	p	Adjusted odds ratio ^a (95% CI)	p
Sexual minority males ^d				
Any sexually transmitted infection ^b	3.00 (1.20–7.52)	0.019	3.17 (1.05–9.60)	0.042
Chlamydia	11.72 (1.87–73.33)	0.009	77.00 (2.23–2655.87)	0.016
Gonorrhea	3.73 (0.65–21.32)	0.139	3.46 (0.28–43.31)	0.335
HIV	0.88 (0.11–7.32)	0.909	0.49 (0.05–4.77)	0.542
Exchanging sex for money	5.89 (1.74–19.94)	0.004	30.21 (3.78–241.69)	0.001
Multiple sex partners at around same time	0.92 (0.41–2.07)	0.840	0.89 (0.35–2.23)	0.797
Condom use ^c	0.86 (0.30–2.45)	0.772	1.54 (0.43–5.51)	0.504

Bold indicates p<0.05.

^aAdjusted for age, sex, race/ethnicity, sexual orientation, education, income, household size, smoking, and alcohol.

^bIncludes chlamydia, gonorrhea, syphilis, HIV, herpes, trichomonas, and human papillomavirus.

^cAmong sexually active participants

^dSelf-identify as homosexual (gay) or bisexual

Association between food insecurity and substance use in young adults aged 24–32 years, adjusted for demographic variables and health behaviors

Table 3.

Self-reported substance use outcomes	Food Insecurity		Food Insecurity	
	Odds ratio (95% CI)	P	Adjusted odds ratio ^a (95% CI)	P
Females				
Smoking, past 30 days	2.47 (2.04–2.99)	<0.001	2.09 (1.67–2.63)	<0.001
Marijuana, past 30 days	2.51 (2.07–3.05)	<0.001	2.04 (1.64–2.54)	<0.001
Methamphetamine, ever use	2.11 (1.59–2.79)	<0.001	1.72 (1.25–2.35)	0.001
Cocaine, ever use	1.78 (1.51–2.11)	<0.001	1.74 (1.40–2.16)	<0.001
Ever nonmedical use of prescription medication				
Opioid	1.91 (1.54–2.38)	<0.001	2.02 (1.57–2.61)	<0.001
Sedative	1.62 (1.21–2.18)	0.001	1.56 (1.13–2.15)	0.007
Tranquilizer	1.56 (1.19–2.07)	0.002	1.62 (1.18–2.22)	0.003
Stimulant	1.55 (1.11–2.17)	0.011	1.57 (1.09–2.28)	0.017
Males				
Smoking, past 30 days	2.08 (1.61–2.70)	<0.001	1.69 (1.31–2.19)	<0.001
Marijuana, past 30 days	1.82 (1.40–2.37)	<0.001	1.57 (1.19–2.06)	0.001
Methamphetamine, ever use	2.09 (1.57–2.78)	<0.001	2.03 (1.48–2.79)	<0.001
Cocaine, ever use	1.25 (0.97–1.62)	0.086	1.23 (0.93–1.61)	0.141
Ever nonmedical use of prescription medication				
Opioid	1.50 (1.09–2.08)	0.014	1.54 (1.12–2.12)	0.009
Sedative	1.54 (1.11–2.15)	0.011	1.55 (1.13–2.14)	0.007
Tranquilizer	1.30 (0.93–1.83)	0.122	1.42 (0.99–12.05)	0.059
Stimulant	1.46 (1.00–2.11)	0.049	1.57 (1.06–2.34)	0.027

Bold indicates p<0.05.

^a Adjusted for age, sex, race/ethnicity, education, income, household size, smoking, and alcohol.