The Association of Food Insecurity, Mental Health, and Healthcare Access and Use Among Lesbian, Gay, and Bisexual Adults in the United States: Results From the 2021 National Health Interview Survey

Rainier Masa, PhD[1] ⓘ **, Sylvia Shangani, PhD[2], Dicky Baruah, MA[1], and Don Operario, PhD[3]**

Abstract

Purpose: We sought to describe the prevalence of food insecurity and its relationship with mental health, health care access, and use among lesbian, gay, and bisexual (LGB) adults in the U.S.

Design and Setting: We analyzed data from the National Health Interview Survey (NHIS), a cross-sectional study of noninstitutionalized adults from all 50 states and the District of Columbia.

Sample: The study sample was restricted to LGB adults ≥18 years (N = 1178) from the 2021 NHIS survey.

Measures: Food security was assessed using the 10-item U.S Adult Food Security Survey Module. Study outcomes were mental health (depression, anxiety, life satisfaction, and serious psychological distress), health care utilization, and medication adherence.

Analysis: Descriptive statistics and linear and generalized linear regressions.

Results: The study sample consisted of 69% White, 14% Hispanic/Latinx, 9% Black, and 8% people of other races. Approximately half (53%) identified as bisexual and 47% identified as gay or lesbian. Eleven percent were food insecure. Sexual orientation, income-to-poverty ratio, and health insurance were significant correlates of food insecurity. In multivariable analyses, food insecurity was significantly associated with mental illness (including depression, anxiety, and serious psychological distress), limited health care access and use (including inability to pay medical bills, delay in getting medical and mental health care, and going without needed medical and mental health care), and medication nonadherence (including skipping medication, taking less medication, delay filling prescription, and going without needed prescription).

Conclusion: Food insecurity is a constant predictor of adverse mental health and low medical and mental health care use rates among LGB adults in the United States. Achieving food security in LGB people requires improving their financial and nonfinancial resources to obtain food.

Keywords

food insecurity, mental health, health care utilization, medication adherence, gays, lesbians, bisexuals

Purpose

Lesbian, gay, and bisexual (LGB) individuals in the United States disproportionately experience poorer health outcomes than non-LGB individuals.[1,2] LGB populations are more likely to have mental health problems, chronic health conditions, substance use disorders, and low access to care than non-LGB individuals.[3,4] These disparities are related to the historical and current inequitable distribution of social and economic resources related to sexual minority status, which

[1]School of Social Work, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
[2]School of Public Health, Boston University, Boston, MA, USA
[3]Rollins School of Public Health, Emory University, Atlanta, GA, USA

Corresponding Author:
Rainier Masa, School of Social Work, ,The University of North Carolina at Chapel Hill, 325 Pittsboro Street, CB 3550 Chapel Hill, NC 27599-3550, USA.
Email: rmasa@email.unc.edu

leads to unequal treatment and discrimination of LGB populations.[5,6] LGB persons are thus significantly more likely than non-LGB persons to experience consequences of inequitable distribution of resources, including poverty, unemployment, and other social determinants of health, such as food insecurity.[7,8]

Food insecurity, defined as a lack of access to food necessary to support a healthy life,[9] has been shown to affect LGB populations.[8] Rates of food insecurity are much higher for households comprising LGB members compared to households without LGB members.[10,11] Approximately 13.1% of lesbian, gay, bisexual, and transgender (LGBT) adults in the U.S. lived in a household that experienced food insecurity compared to 7.2% of non-LGBT adults.[11] This heightened risk of food insecurity may be explained by disparities in income and wealth between LGBT and non-LGBT adults.[12] A report by the Federal Reserve Bank of St. Louis identified that 45% of LGBT adults had trouble paying for essential household expenses, including food, housing, and medical care during the first half of 2022, compared to 34% of non-LGBT adults.[13] The same report noted that LGBT adults have limited liquidity, or cash on hand, to handle usual and emergency expenses.[12] Lack of liquid assets or cash increases the daily challenges for LGBT adults to afford essential expenses, such as food.[13] Socioeconomic disparities also exist within this population, with bisexual adults more likely to experience food insecurity, earn a lower income, and live in poverty than gay and lesbian adults.[8,14,15]

The association of food insecurity with poor health outcomes, including mental illness and chronic diseases, has been well-documented among non-LGB populations.[16–18] However, there have been recent calls for more research to examine food insecurity and its influence on health outcomes and disparities.[19] To fill this gap and meet Healthy People 2030 goal of reducing household food insecurity and hunger, there is a need for a greater understanding of the association between food insecurity and health outcomes in LGB individuals. This study investigated the relationship between food insecurity, mental health, and health care access and use in LGB individuals in the United States. We hypothesized that food insecurity would be associated with adverse mental health and suboptimal health care access and use among LGB individuals in the United States.

Methods

Design

We used data from the 2021 National Health Interview Survey (NHIS) to explore the relationship between food insecurity and health outcomes in a sample of LGB individuals in the United States. NHIS is a series of annual cross-sectional, nationally representative household survey of the U.S. civilian noninstitutionalized population. The survey includes questions on demographics, health conditions, health care access, health-related behaviors, and psychological distress. Detailed information about the 2021 NHIS survey methods, including its sample design, interviewing procedures during the COVID-19 pandemic, data collection, and questionnaires, is described elsewhere.[20]

Sample

Study sample was restricted to adult (≥18 years old) participants who self-reported their sexual orientation as lesbian, gay, or bisexual ($N = 1178$). We excluded adult participants who identified their sexual orientation as straight (ie, not lesbian or gay, n = 26 734), something else (n = 170), did not know the answer (n = 294), refused to answer (n = 198), and not ascertained (n = 908).

Measures

Food security. Food security was measured using the 10-item U.S. Adult Food Security Survey Module (AFSSM).[21] NHIS uses the 30-day reference period to examine different levels of food security as self-reported by the adult respondent. The AFSSM includes items on whether respondents worried about their food running out, ran out of food, and went without eating for a whole day because there was not enough money for food. Food security raw scores were calculated by summing the affirmative responses to the ten questions, such that higher scores reflected greater levels of food insecurity. Documentation for the original AFSSM recommends that participants with a score of 0 should be categorized as high food security, 1-2 as marginal food security, 3-5 as low food security, and 6-10 as very low food security.[21] Due to the distribution of the food security variable in the current sample of LGB adults, we created a binary food security variable, with raw scores of 0-2 coded as food secure and raw scores of 3-10 coded as food insecure or low and very low food security. The dichotomization of food security status was consistent with previous studies that used NHIS data and reporting guidelines outlined by the scale developers.[21,22]

Mental health. Mental health outcomes included life satisfaction, depression, anxiety, and serious psychological distress. *Life satisfaction* refers to people's subjective assessment of their lives and was assessed with one question that asked participants to rate how they felt about their life using a scale of 0 (very dissatisfied) to 10 (very satisfied).[23] *Depression* was measured with two questions.[24] The first question asked whether a doctor or other health professional had ever told participants that they had any type of depression, including major depressive disorder, bipolar depression, and postpartum depression. The second question asked how often participants felt depressed (never, a few times a year, monthly, weekly, or daily). *Anxiety* was also measured with two questions.[24] The first question asked whether a doctor or other health professional had ever told participants that they had any type of anxiety disorder, including generalized anxiety disorder, social anxiety disorder, panic disorder, post-traumatic stress disorder, obsessive-compulsive disorder, and phobias.

The second question assessed the frequency of feeling worried, nervous, or anxious (never, a few times a year, monthly, weekly, or daily). *Serious psychological distress* was assessed using the Kessler 6 (K6) nonspecific distress scale.[25] K6 items asked respondents to assess the frequency of feeling sad, nervous, restless, hopeless, and worthless in the past 30 days. Each item used a five-point Likert scale, with response values ranging from 0 (none of the time) to 4 (all of the time). After summing the points for each question to produce a score between 0 and 24, we created a dichotomous variable using the scale developer's pre-determined cut-off value to assess the presence of serious psychological distress (SPD).[25] Participants who scored 13 or higher were coded as yes, experiencing SPD, whereas participants who scored between 0 and 12 were coded as not experiencing SPD.

Health care utilization. Utilization refers to using health care services primarily determined by the need for the services, the availability of services, and the resources available for paying for the service.[26] Health care utilization outcomes were assessed using five variables, which asked participants whether, in the past 12 months, they (a) were unable to pay medical bills, (b) delayed medical care due to cost, (c) did not get needed medical care due to cost, (d) delayed mental health care due to cost, and (e) did not get needed mental health care due to cost.[27] All five health care utilization outcomes were binary, with participants responding yes (1) if they endorsed the statement and no (0) if they did not endorse the statement.

Medication adherence. Adherence refers to the extent to which an individual's behavior corresponds with a health care provider's recommendations.[28] Medication adherence was measured using four variables, which asked participants whether, in the past 12 months, they (a) skipped medication doses to save money, (b) took less medication to save money, (c) delayed filling of prescription medication to save money, and (d) did not get needed prescription medication due to cost.[29] All adherence outcomes were binary variables, with participants responding yes (1) if they endorsed the statement and no (0) if they did not endorse the statement.

Demographic and socioeconomic covariates. The following demographic and socioeconomic variables were included in our multivariable models: age (in years), race/ethnicity (White, Hispanic/Latinx, Black or African American, or other racialized groups, including American Indian, Alaskan Native, Asian, and biracial/multiracial persons), assigned sex at birth (female or male), sexual orientation (gay/lesbian or bisexual), income-to-poverty ratio, housing (owned/being bought or rented/other arrangements), income from employment/wages (yes or no), and health insurance (yes or no). The income-to-poverty ratio refers to the family income ratio to the poverty threshold for the sample adult's family. Based on its frequency distribution, we recoded the income-to-poverty ratio using five categories: below poverty, 100%-174% of the poverty threshold (PT), 175%-

299% of PT, 300%-499% of PT, and ≥500% of PT. These covariates were selected based on our review of the literature on food security and health outcomes in LGB populations.[30–32]

Analysis

Univariate frequency distributions with weighted percentages described the study sample's demographic, socioeconomic, and health characteristics. The 2021 NHIS survey weights were used for descriptive statistics. Bivariable tests examined group differences between food-secure and food-insecure LGB adults using weighted simple regression for continuous variables and weighted Pearson χ^2 test for categorical variables. Multivariable linear and generalized linear regression analyses were conducted to examine point estimates and 95% confidence interval of food insecurity in LGB adults, with statistical significance set at $P < .05$. Adjusted P values for multiple comparisons were presented to evaluate significance while taking multiplicity of tests into account.

We estimated 16 multivariable models, with the first model examining the social and economic correlates of food insecurity among LGB adults. The remaining 15 models examined food insecurity's association with mental health, health care use, and medication adherence after incorporating age, race and ethnicity, sex, sexual orientation, poverty ratio, housing status, wage income, and health insurance as covariates. The overall sample of 1178 was included in all models except for three of four medication adherence outcomes (skipped medication, took less medication, and delayed filling a prescription). The sample size for the three medication adherence outcomes was restricted to LGB participants who reported taking prescription medication in the past 12 months (n = 858). Linear regression was used to estimate the relationship between food insecurity and a continuous-level outcome (ie, model 2: life satisfaction). Logistic regression was conducted to estimate models with binary outcome variables (models 1, 3, 5, 7-16). Ordinal logistic regression was used to estimate ordinal-level outcomes (model 4: frequency of depression and model 6: frequency of anxiety).

We also evaluated the significance of the impact of sampling weights on estimation results to determine whether to use sampling weights in our multivariable regression analyses.[33,34] We used sampling weights if test results were significant, ie, adding the weight and the interaction of the weight with each independent variable in our model added a significant amount of explained variance.[34] We did not use sampling weights in multivariable models with a nonsignificant test, which means that the weighted and unweighted estimates were not significantly different. Seven multivariable models used the adult sampling weights provided in the 2021 NHIS data, whereas nine multivariable models did not use sampling weights. We also conducted sensitivity analyses to compare the coefficients of food insecurity with and without weights. Results showed no significant differences between models with and without sampling weights. All analyses were conducted using Stata 17.

This study, which involved secondary analyses of publicly available, de-identified data, did not require human subjects review. We condcuted our analyses following relevant guidelines and regulations. The data supporting this study's findings are available through National Center for Health Statistics, Centers for Disease Control and Prevention at https://www.cdc.gov/nchs/nhis/2021nhis.htm.

Results

Descriptive statistics and bivariable results

Eleven percent of the study sample reported food insecurity (ie, low or very low food security). Fifty-nine percent were assigned female at birth, 47% identified as lesbian or gay, and 53% identified as bisexual. The mean age was 36.6 years. Most of the sample was White (69%), followed by Hispanic/Latinx (14%) and Black or African American (9%). Other racialized groups, including Asian, Native American, and Alaskan Native, accounted for 8% of the sample. Although 88% of LGB adults reported earning income/wages from employment, 12% lived below the US poverty threshold, 12% lived between 100% and 174% of the poverty threshold, and 22% lived between 175% and 299% of the poverty threshold. Fifty-four percent reported living at 300% or higher of the poverty threshold. Fifty-three percent of the sample were homeowners, and 91% reported having health insurance. Table 1 lists the study sample's health characteristics and their social and economic attributes. Table 1 also presents the weighted proportion and bivariable comparisons of the study sample by food security status. Food-insecure LGB adults were more likely to be younger, bisexual, living below the poverty level, and renters than food-secure LGB adults. They **were** less likely to receive income from employment and have health insurance than food-secure LGB persons. Bivariable results also suggest that food-insecure LGB adults were more likely to report diagnoses of mental illness, less likely to utilize medical and mental health care, and less likely to take their medications as prescribed than food-secure LGB adults.

Correlates of food insecurity in LGB adults

Multivariable results identified various social and economic factors as significant correlates of food insecurity in LGB adults (see Table 1, columns 6 and 7). Those who identify as bisexual were more likely to experience food insecurity than those who identify as gay or lesbian. LGB adults living between 175% and 299% of the poverty threshold had lower odds of reporting food insecurity than their peers living below the poverty threshold. The likelihood of experiencing food insecurity was much lower for LGB adults living between 300% and 400% and ≥500% of the poverty threshold, respectively, compared to LGB adults living below the poverty threshold. LGB adults with health insurance had lower odds of food insecurity compared to LGB adults without health insurance. LGB renters had higher odds of food insecurity than LGB adults who owned or bought their homes. LGB adults of color were also more likely to experience food insecurity than White LGB adults; however, these associations between racialized groups and food insecurity did not achieve statistical significance. Results also indicated no significant difference in the likelihood of food insecurity among gay males, gay females, bisexual males, and bisexual females.

Food insecurity and mental health in LGB adults

Food insecurity was consistently associated with adverse mental health outcomes in LGB adults (see Table 2). LGB adults with low or very low food security reported lower life satisfaction scores compared to LGB adults who were food secure. Food insecurity was also associated with an increased likelihood of reporting a diagnosis of (any type of) depression and (any type of) anxiety. LGB adults with low or very low food security also reported experiencing depression and anxiety more frequently than their food-secure peers. The odds of experiencing serious psychological distress were also significantly higher among LGB adults with low or very low food security compared to their food-secure peers.

Food insecurity and health care utilization in LGB adults

Table 3 presents the multivariable logistic regression results for the association between food insecurity and health care utilization in LGB adults. LGB adults with low or very low food security reported experiencing more difficulties accessing and utilizing various health care services than those who were food secure. Food insecurity was associated with higher odds of being unable to pay medical bills in the past 12 months. Food insecurity was also associated with delayed medical care, not getting needed medical care, delayed mental health therapy or counseling, and not getting needed mental health therapy or counseling.

Food insecurity and medication adherence

Table 4 presents the multivariable logistic regression results for the association between food insecurity and medication adherence in LGB adults. Food insecurity was associated with a reduced likelihood of medication adherence among LGB adults. LGB adults with low or very low food security were more likely to skip medication doses to save money, take less medication to save money, delay filling prescriptions to save money, and forego needed prescription medication due to cost, compared to LGB adults who were food secure.

Discussion

Study results indicate a persistent association of food insecurity with LGB adults' adverse mental health outcomes, inability to

Table 1. Participants Characteristics and Bivariable and Multivariable Associations of Food Security Status in LGB Adults.

| | Unweighted n (weighted % or M) | | | | Food insecurity (model 1) | |
Variables	Overall sample	Food secure	Food insecure	χ^2 or β	O.R.	95% CI
Demographics, social, and economic characteristics						
Age (in years)	1177 (36.63)	1043 (37.11)	126 (32.89)	-4.22**	.99	.97, 1.01
Race/Ethnicity				1.93		
White	821 (69%)	745 (70%)	74 (61%)		Ref	
Hispanic/Latinx	156 (14%)	130 (14%)	22 (14%)		1.13	.64, 2.02
Black or African American	102 (9%)	83 (8%)	18 (16%)		1.22	.65, 2.30
Other racialized groups	99 (8%)	86 (8%)	12 (9%)		1.01	.49, 2.05
Sex				3.41		
Female	673 (59%)	583 (58%)	84 (69%)		Ref	
Male	504 (41%)	460 (42%)	42 (31%)		1.17	.75, 1.83
Sexual orientation				12.99***		
Lesbian or gay	602 (47%)	563 (49%)	33 (26%)		Ref	
Bisexual	576 (53%)	481 (51%)	93 (74%)		2.04**	1.26, 3.31
Poverty ratio				29.30***		
Below poverty	131 (12%)	91 (9%)	40 (35%)		Ref	
100%-174% of poverty threshold	150 (12%)	107 (10%)	41 (32%)		.94	.54, 1.63
175%-299% of poverty threshold	235 (22%)	207 (23%)	26 (18%)		.33***	.18, .60
300%-499% of poverty threshold	265 (23%)	253 (24%)	10 (9%)		.12***	.05, .27
≥500% of poverty threshold	397 (31%)	386 (34%)	9 (6%)		.10***	.04, .22
Housing				20.61***		
Owned	585 (53%)	556 (56%)	29 (28%)		Ref	
Rented/Other arrangement	581 (47%)	485 (44%)	96 (72%)		1.60†	.97, 2.62
Income from employment				8.87**		
No	193 (12%)	160 (11%)	33 (20%)		Ref	
Yes	974 (88%)	876 (89%)	93 (80%)		.80	.46, 1.40
Had health insurance				15.89***		
No	86 (9%)	62 (8%)	23 (22%)		Ref	
Yes	1092 (91%)	982 (92%)	103 (78%)		.50*	.28, .89
Mental health characteristics						
Life satisfaction	1176 (7.58)	(7.69)	(6.61)	-1.09***		
Diagnosed with depression, any type				7.92**		
No	697 (58%)	640 (60%)	52 (43%)			
Yes	480 (42%)	403 (40%)	74 (57%)			
Diagnosed with anxiety, any type				9.89**		
No	739 (60%)	681 (62%)	51 (43%)			
Yes	438 (40%)	362 (38%)	75 (57%)			
Experienced depression, frequency				8.24***		
Never	325 (24%)	308 (26%)	14 (13%)			
A few times a year	367 (31%)	339 (32%)	24 (18%)			
Monthly	189 (17%)	169 (17%)	19 (14%)			
Weekly	187 (19%)	148 (17%)	39 (38%)			
Daily	108 (9%)	78 (8%)	30 (17%)			
Experienced anxiety, frequency				3.58**		
Never	139 (11%)	133 (12%)	5 (5%)			
A few times a year	268 (20%)	247 (20%)	16 (17%)			
Monthly	145 (12%)	133 (12%)	12 (9%)			
Weekly	287 (25%)	258 (26%)	29 (20%)			
Daily	338 (32%)	272 (30%)	64 (49%)			

Table 1. (continued)

Variables	Unweighted n (weighted % or M)			χ² or β	Food insecurity (model 1)	
	Overall sample	Food secure	Food insecure		O.R.	95% CI
Experienced serious psychological distress				29.04***		
No	1039 (87%)	949 (89%)	82 (67%)			
Yes	134 (13%)	90 (11%)	44 (33%)			
Health care utilization						
Had problems paying or being unable to pay medical bills				32.31***		
No	1019 (85%)	935 (88%)	77 (64%)			
Yes	152 (15%)	102 (12%)	49 (36%)			
Delayed medical care because of cost				29.39***		
No	1018 (85%)	926 (87%)	85 (63%)			
Yes	160 (15%)	118 (13%)	41 (37%)			
Did not get needed medical care due to cost				43.26***		
No	1044 (87%)	955 (90%)	82 (62%)			
Yes	134 (13%)	89 (10%)	44 (38%)			
Delayed mental health therapy/counseling due to cost				22.66***		
No	992 (82%)	904 (84%)	81 (62%)			
Yes	185 (18%)	139 (16%)	45 (38%)			
Did not get needed mental health therapy/counseling due to cost				28.70***		
No	997 (82%)	912 (85%)	78 (59%)			
Yes	180 (18%)	131 (15%)	48 (41%)			
Medication adherence				24.42***		
Skipped medication doses to save money						
No	795 (92%)	723 (94%)	68 (78%)			
Yes	63 (8%)	40 (6%)	22 (22%)			
Took less medication to save money				32.75***		
No	791 (91%)	723 (93%)	64 (68%)			
Yes	67 (9%)	40 (7%)	26 (32%)			
Delayed filling prescription to save money				38.28***		
No	765 (88%)	705 (91%)	56 (62%)			
Yes	93 (12%)	58 (9%)	34 (38%)			
Did not get needed prescription due to cost				44.96***		
No	1072 (90%)	978 (93%)	87 (67%)			
Yes	106 (10%)	66 (7%)	39 (33%)			
n					1157	

χ² = weighted Pearson Chi-square.
[a]For variable age, the weighted means and standard errors are presented.
[b]For categorical variables, the P value was obtained using tests of independence using Pearson's χ² statistic with weights. For interval level variables, β and P values were obtained using simple linear regression with weights.
***$P < .001$, **$P < .01$, *$P < .05$, †$P < .10$.

adhere to their medication regimen, and utilize necessary physical and mental health services. Our findings draw attention to the magnitude of food insecurity and its role in inhibiting desirable mental health outcomes and consistent health care access and use among LGB adults. LGB adults may choose food when the need to eat competes with health care and medication needs. As food affects physical and mental health, LGB adults may experience elevated stress and anxiety levels when they anticipate not having enough food. Theoretical and empirical evidence support the proposition that increased stress

and anxiety levels may result from the anticipation of being unable to meet basic needs or tangible resources, such as food, running low.[35] Maslow[36]'s hierarchy of needs argues that physiological needs, including food, must be satisfied before individuals pay attention to higher-order needs such as health. LGB adults may be unlikely to spend their money paying for health care and medications unless they have access to adequate food through their ability to purchase food in the marketplace, obtain food assistance through public and private organizations, produce their food, or access food using other socially desirable

Table 2. Multivariable Association of Food Insecurity and Mental Health Outcomes Among LGB Adults.

	Model 2: Life satisfaction		Model 3: Depression, any type		Model 4: Depression, frequency		Model 5: Anxiety, any type		Model 6: Anxiety frequency		Model 7: Experienced SPD	
	β	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI
Food insecure (ref = food secure)	-1.01***	-1.46, -.55	1.82**	1.19, 2.79	2.40***	1.50, 3.84	2.23***	1.45, 3.42	2.12**	1.25, 3.60	3.81***	2.09, 6.95
Age (in years)	.00	-.01, .01	.99	.98, 1.00	.97***	.96, .98	.98***	.97, .99	.97***	.96, .98	.98*	.96, .99
Race/ethnicity (ref = White)												
Hispanic/Latinx	.48**	.17, .79	.45***	.30, .67	.56**	.39, .80	.41***	.27, .63	.56**	.39, .81	.43*	.22, .83
Black/African American	.58*	.05, 1.11	.40***	.25, .65	.43**	.25, .75	.35***	.21, .58	.30***	.17, .55	.51	.24, 1.11
Other racialized groups	.29	-.11, .68	.77	.49, 1.21	.84	.54, 1.29	.53**	.33, .86	.84	.53, 1.32	.46	.18, 1.15
Sex (ref = female)												
Male	-.07	-.30, .15	.56***	.43, .73	.78	.60, 1.00	.63**	.48, .83	.56***	.43, .72	.53*	.31, .88
Sexual orientation (ref = gay or lesbian)												
Bisexual	-.36**	-.62, -.10	1.66***	1.26, 2.19	1.96***	1.44, 2.68	1.59**	1.19, 2.10	1.49**	1.13, 1.99	2.22**	1.26, 3.90
Poverty ratio (ref = below poverty)												
100%–174% of poverty threshold	.46	-.10, 1.02	1.17	.71, 1.95	.83	.47, 1.49	1.64	.98, 2.75	.85	.44, 1.66	1.01	.43, 2.39
175%–299% of poverty threshold	-.14	-.65, .38	1.38	.85, 2.23	1.21	.77, 1.89	1.44	.89, 2.37	1.25	.66, 2.40	1.92	.81, 4.58
300%–499% of poverty threshold	.05	-.47, .57	.94	.57, 1.54	.94	.58, 1.51	1.00	.60, 1.67	1.03	.56, 1.91	1.40	.56, 3.50
≥500% of poverty threshold	.43	-.09, .94	1.05	.64, 1.73	.81	.51, 1.29	1.36	.82, 2.27	1.22	.64, 2.31	1.30	.46, 3.63
Housing status (ref = owned)												
Rented or other arrangement	-.22	-.49, .05	1.31	.99, 1.74	1.13	.84, 1.53	1.22	.92, 1.63	1.16	.85, 1.58	1.19	.72, 1.96
Income from employment (ref = no)												
Yes, received income from employment	.38	-.05, .81	.70	.47, 1.04	.83	.54, 1.26	.65*	.43, .99	1.13	.72, 1.78	.61	.29, 1.29
Health insurance (ref = no)												
Yes, had health insurance	-.40	-.82, .02	1.52	.93, 2.51	1.41	.91, 2.18	1.35	.81, 2.23	1.30	.73, 2.32	.91	.46, 1.79
n	1155		1156		1155		1156		1156		1152	

***$P < .001$, **$P < .01$, *$P < .05$. Note. SPD = serious psychological distress.

Table 3. Multivariable Association of Food Insecurity and Health care Utilization Among LGB Adults.

	Model 8: Unable to pay medical bills		Model 9: Delayed getting medical care		Model 10: Did not get needed medical care		Model 11: Delayed getting mental health care		Model 12: Did not get needed mental health care	
	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI
Food insecure (ref = food secure)	2.59**	1.47, 4.56	2.80***	1.70, 4.61	4.21***	2.53, 6.99	3.04***	1.87, 4.95	3.49***	1.92, 6.34
Age (in years)	.99	.98, 1.00	.99	.97, 1.00	.99	.97, 1.00	.98*	.97, .99	.98**	.96, .99
Race/ethnicity (ref = White)										
Hispanic/Latinx	.79	.38, 1.65	.95	.56, 1.62	.83	.47, 1.48	.75	.45, 1.25	.69	.39, 1.21
Black/African American	.82	.39, 1.74	.87	.45, 1.66	.66	.32, 1.36	.55	.29, 1.07	.41*	.17, .98
Other racialized groups	.41*	.16, 1.05	.83	.43, 1.59	.61	.29, 1.31	.81	.44, 1.47	.69	.31, 1.54
Sex (ref = female)										
Male	.86	.53, 1.38	.71	.47, 1.06	.65	.41, 1.02	.73	.50, 1.06	.64	.40, 1.01
Sexual orientation (ref = gay or lesbian)										
Bisexual	1.04	.64, 1.70	1.65*	1.08, 2.51	1.30	.82, 2.05	1.48	.99, 2.19	1.51	.97, 2.36
Poverty ratio (ref = below poverty)										
100%–174% of poverty threshold	1.23	.55, 2.78	.65	.32, 1.29	.72	.36, 1.45	.56	.28, 1.12	.63	.26, 1.49
175%–299% of poverty threshold	1.55	.70, 3.44	1.21	.65, 2.25	1.05	.54, 2.04	1.72	.94, 3.14	1.79	.77, 4.18
300%–499% of poverty threshold	.68	.28, 1.63	1.11	.57, 2.16	1.05	.52, 2.12	1.33	.70, 2.53	1.27	.54, 2.99
≥500% of poverty threshold	.30*	.11, .80	.69	.34, 1.38	.55	.26, 1.19	.75	.38, 1.48	.76	.30, 1.91
Housing status (ref = owned a house)										
Rented or other arrangement	1.11	.68, 1.81	1.26	.84, 1.89	1.26	.81, 1.97	2.09***	1.41, 3.09	1.65*	1.06, 2.58
Income from wages (ref = no)										
Yes, received income from wages	1.21	.64, 2.30	2.38*	1.21, 4.70	1.97	.99, 3.91	2.72*	1.39, 5.33	2.34*	1.06, 5.17
Health insurance (ref = no)										
Yes, had health insurance	.29***	.15, .55	.24***	.14, .41	.20***	.12, .34	.32***	.19, .55	.22***	.11, .44
n		1151		1157		1157		1156		1156

***P < .001, **P < .01, *P < .05.

and lawful ways. Thus, tackling food insecurity may be another tool for addressing health disparities by improving mental health and increasing access to and use of health care services among LGB persons.

Building on the findings here, further research can examine the role of food insecurity as a mechanism that reinforces socioeconomic and health disparities. Disparities in income and wealth may explain the heightened risk of food insecurity among LGB adults compared to non-LGB adults.[12,30] Unlike non-LGB adults, LGB adults have lower incomes and liquid assets (ie, cash) to pay for essential expenses, such as food.[13,30] In addition to differences between LGB and non-LGB adults, our findings align with evidence documenting differences within LGB populations.[30,37] In contrast to gay men and women, bisexual men and women were more likely to experience food insecurity, poorer mental health outcomes, and lower health care utilization and medication adherence levels. Research is needed to understand specific reasons linking bisexual adults with food insecurity and related health inequities.

Our results indicate that the income-to-poverty ratio is a robust predictor of food insecurity among LGB persons, even after accounting for housing status and income from employment. This finding reinforces that food security, particularly

food access, is strongly associated with financial resources. Limited or low income constrains a person's ability to access food. Less income also deprives LGB persons of opportunities to save and accumulate assets, which decreases the risk of food insecurity when there is a loss of income.[38] Food insecurity in LGB adults might also be explained by persistent sexual minority earnings gaps. Research has found a consistent pattern of gay and bisexual men earning less than heterosexual men with identical socioeconomic attributes.[39,40] Although lesbian and bisexual women earn more than heterosexual women, lesbian and bisexual women tend to earn less than their male counterparts.[39] The higher food insecurity risk among bisexual adults might also be explained by income and employment gaps within LGB persons, with bisexual adults earning less income and more likely to work part-time than their gay and lesbian peers.[40,41] Our additional bivariable analyses identified bisexual adults as significantly less likely to earn more income, own a house, have income or wage from employment, and have health insurance than gay and lesbian adults. Research is needed to understand mechanisms linking bisexual adults with worse economic outcomes than gay and lesbian adults.

In addition to income, housing and insurance status are correlated with food insecurity in LGB adults. These findings

Table 4. Multivariable Association of Food Insecurity and Medication Adherence Among LGB Adults.

	Model 13: Skipped medication doses		Model 14: Took less medication		Model 15: Delayed filling prescription		Model 16: Did not get needed prescription	
	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI
Food insecure (ref = food secure)	3.80***	1.92, 7.51	5.02***	2.14, 11.81	5.10***	2.80, 9.29	4.93***	2.94, 8.27
Age (in years)	.99	.98, 1.02	1.00	.98, 1.02	1.00	.98, 1.02	.99	.98, 1.01
Race/ethnicity (ref = White)								
Hispanic/Latinx	1.12	.48, 2.60	.52	.19, 1.47	.68	.31, 1.53	.62	.31, 1.23
Black/African American	1.87	.79, 4.44	1.57	.56, 4.44	.80	.32, 1.99	.81	.40, 1.67
Others	1.44	.57, 3.63	1.13	.33, 3.91	1.11	.50, 2.47	.77	.35, 1.68
Sex (ref = female)								
Male	.52*	.27, .99	.52	.26, 1.03	.58	.33, 1.01	.66	.41, 1.07
Sexual orientation (ref = gay or lesbian)								
Bisexual	.75	.39, 1.45	.69	.33, 1.44	1.22	.70, 2.13	.96	.59, 1.57
Poverty ratio (ref = below poverty)								
100%–174% of poverty threshold	1.91	.72, 5.07	2.37	.66, 8.53	1.49	.62, 3.57	1.16	.56, 2.39
175%–299% of poverty threshold	1.24	.45, 3.40	1.96	.52, 7.36	2.06	.87, 4.92	1.32	.64, 2.72
300%–499% of poverty threshold	.86	.29, 2.56	1.25	.31, 5.05	1.18	.46, 3.03	1.01	.46, 2.24
≥500% of poverty threshold	.66	.22, 2.04	.62	.13, 2.91	.83	.31, 2.21	.71	.31, 1.65
Housing status (ref = owned)								
Rented or other arrangement	1.27	.67, 2.43	1.00	.49, 2.06	1.76*	1.01, 3.08	1.77*	1.07, 2.99
Income from employment (ref = no)								
Yes, received income from employment	1.83	.74, 4.50	1.21	.46, 3.17	1.36	.64, 2.88	1.41	.72, 2.75
Health insurance (ref = no)								
Yes, had health insurance	.23**	.10, .52	.13***	.05, .33	.23***	.10, .51	.43**	.23, .79
n		842		842		842		1157

***P < .001, **P < .01, *P < .05.

reveal the exacerbated risks of multiple deprivations or intersectional insecurity in our sample of LGB adults. Findings show that LGB adults who were food insecure were also housing-, income-, and health insurance-insecure. The probability of food insecurity diminishes as household income rises and moves further away from the poverty threshold. Prior research has identified racialized groups as having a higher risk of food insecurity than their white peers.[10] We found the same direction of relationship; however, none of the comparisons was statistically significant.

The issue of food insecurity in LGB adults and their families requires a multilevel approach. This multilevel approach should improve economic resources, particularly income, through employment, social assistance, or other socioeconomic mechanisms. LGB adults' access to adequate food may require the removal of barriers that reinforce earnings and employment gaps between non-LGB and LGB adults and within LGB adults. Research is needed to determine and address barriers to accessing and using food and nutrition assistance programs such as the Supplemental Nutrition Assistance Program (SNAP). Research should also explore how to increase the uptake of SNAP among LGB individuals and their families. One critical topic for future studies is the role of stigma and discrimination in

food insecurity among LGB adults, including how different stigma experiences (eg, anticipated, internalized, perceived) and practices (eg, stereotypes, prejudice, and discriminatory attitudes) may affect LGB adults' ability to earn income, obtain full-time employment, rely on their social support system for emergency food assistance, and willingness to access and use social assistance programs, such as SNAP.

This study has limitations. Although data came from a nationally representative sample, the study design was cross-sectional. NHIS is one of few publicly available data on food insecurity among LGB adults. However, the food security measure used in the survey primarily assesses access to food, with limited information on food utilization or diet quality of participants and their households. The 10-item US AFSSM asks about individual and household-level food access; thus, it cannot differentiate whether the adult participant's response refers to food insecurity at the individual, household, or both levels. The binary food security variable (food insecure or food secure) might obscure significant relationships if it was operationalized as an ordinal or continuous level variable, though the variable's skewed distribution required its dichotomization. Although the LGBTQ + population experiences food insecurity at a higher rate than their non-LGBTQ +

peers, we restricted our sample to cisgender sexual minorities due to the availability of a variable to categorize one's sexual orientation. Although there is emerging evidence concerning a high prevalence and associated health risks of food insecurity among gender minority people,[42,43] the publicly available data does not include a variable that can be used to identify participants' gender identity reliably.[44] Reliability and validity of the sexual orientation question might affect the true analytical sample size because some participants might be uncomfortable reporting or identifying as LGB. Strengths of this study include the use of nationally representative data, a multi-item measure of food insecurity, multiple outcomes to determine a pattern of associations with food insecurity, and the availability of relevant covariates (eg, housing status) included in adjusted analyses.

So What?

What is already known on this topic?

Food insecurity is associated with adverse health behaviors and outcomes in the general adult population.

What does this article add?

In a nationally representative sample of LGB adults, food insecurity is consistently and significantly associated with mental ill-health, low health care utilization, and medication nonadherence.

What are the implications for health promotion practice or research?

Although we cannot determine temporal or causal patterns based on the study design, food insecurity in LGB adults is a serious issue with wide-ranging public health implications. Tackling food insecurity in LGB adults offers another tool for addressing health equity by improving their mental health and increasing their access to and use of health care services. Programmatic responses should focus on increasing LGB adults' income and other financial resources. Research is needed to understand the specific reasons linking bisexual adults with food insecurity and related economic and health inequities. Future studies should also examine the role of stigma and discrimination in heightening the risk of food insecurity in LGB adults, including mechanisms that link stigma manifestation to access and use of food and nutrition assistance programs.

Author Contributions

RM conceptualized the study, analyzed data, interpreted results, drafted the article, and reviewed and edited the manuscript; SS conceptualized the study, drafted the article, and reviewed and edited the manuscript; DB analyzed data and drafted the article; and DO conceptualized the study, interpreted results, and reviewed and edited the manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

Our study, which involved secondary analyses of publicly available, de-identified data, did not require human subjects review. We conducted our analysis following relevant guidelines and regulations.

ORCID iD

Rainier Masa ⓘ https://orcid.org/0000-0002-0484-3107

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