Functional and structural social support, substance use and sexual orientation from a nationally representative sample of US adults

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ABSTRACT

Background and Aims Sexual minority (SM) populations experience higher rates of substance use disorder (SUD) associated with increased sexual orientation-related stress. Social support may moderate the impact of stress on SUD among SM adults. This study assessed associations between social support and DSM-5 SUD by sex and sexual minority identity. **Design** Cross-sectional study using data from the 2012–13 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III). **Setting and participants** A nationally representative cross-sectional sample of adults ($n = 36\,309$) in the United States. **Measurements** SUD were defined based on the DSM-5 criteria for alcohol use (AUD), tobacco use (TUD) and drug use (DUD) disorders. Structural social support was measured as the type and frequency of kin and non-kin contact, and functional social support was measured by the Social Provision Scale. **Findings** SM adults had higher odds of all SUD compared to heterosexual adults [AUD = 1.535, 95% confidence interval (CI) = 1.782–1.844; TUD = 1.512, 95% CI = 1.234–1.854; DUD = 1.520, 95% CI = 1.139–2.028]; SM women experienced the highest proportion of all SUD (AUD = 27.1%, TUD = 29.1%, DUD = 10.9%). Type of social support was differentially associated with SUD by sex and sexual identity status. Higher social provision was associated with lower rates of AUD [adjusted odds ratio (aOR) = 0.771, 95% CI = 0.705–0.844], TUD (aOR = 0.747, 95% CI = 0.694–0.804] and DUD (aOR = 0.558, 95% CI = 0.490–0.636). Marriage was associated with lower SUD among heterosexual men (AUD, aOR = 0.500, 95% CI = 0.432–0.579; TUD, aOR = 0.603, 95% CI = 0.521–0.699; DUD, aOR = 0.504, 95% CI = 0.369–0.689) and women (AUD, aOR = 0.637, 95% CI = 0.529–0.767; TUD = 0.0584, 95% CI = 0.507–0.671; DUD, aOR = 0.515, 95% CI = 0.372–0.712). Compared to heterosexual adults, SM women with at least one child under the age of 18 years had higher odds of TUD (aOR = 1.990, 95% CI = 1.325–2.988). SM-related discrimination was not associated with SUD among some SM subgroups, but discrimination among male heterosexually identifying individuals reporting same-sex attraction or behavior was associated AUD (aOR = 4.608, 95% CI = 1.615–13.14). **Conclusions** In the United States there are significant associations between functional support (quality or provision of support) and structural support (type and frequency of social networks) and substance use disorder (SUD) which differ by sex and sexual identity status.

Keywords Substance use disorder, sexual orientation, social support, discrimination, alcohol use disorder, tobacco use disorder, drug use disorder.

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INTRODUCTION

Sexual minorities (SM), individuals who have sexual identity, orientation or behavior different than the majority population (e.g. gay, lesbian, bisexual) experience a higher prevalence of substance use disorders (SUD). Studies across the globe have found greater alcohol (AUD), tobacco (TUD) and drug (DUD) use disorders among SM compared to heterosexual adults [1–4]. However, SUD are not homogeneous among SM populations, and differences exist

between male and female SM [3]. Although TUD is higher among all SM adults compared to heterosexual adults [5,6], SM women are more likely than SM men to use tobacco products [7,8]. Studies also have found AUD to be significantly higher among SM individuals [1,8–10]. Higher burdens of stressors experienced by SM, including discrimination and stigma, are associated with substance use [11–15]. This relationship between stressors and substance use is consistent with Meyer's Minority Stress Model, which posits that unique SM-related stressors are associated with poor mental health outcomes, including SUD [16]. Substance use associated with SM-related stress varies by sex and sexual identity [11,17], potentially the result of stressor severity or differential coping and resilience mechanisms [13,17,18].

Social support is a moderator of stress in the Minority Stress Model and a protective factor against poor mental health outcomes, including SUD [16,19–21]. Social support, defined as perceived and actual support received through social ties, includes four primary domains: emotional, instrumental, informational and appraisal [22]. Emotional support is the expression of empathy, trust and love; instrumental support includes tangible support and services; informational support includes guidance and advice; and appraisal support is information that guides self-evaluation [22]. Social support can be measured as structural support, the composition of the social network and frequency of contact; and as functional support, the quality or provision of support. Social support acts as a buffer to stress and is associated with lower victimization and higher resilience against SM-related discrimination [23–26]. However, while the relationship between social support and substance use has been extensively assessed among young SM [27–29], there has been less research on the impact of social support, and specifically structural and functional support, on SUD among SM adults [30]. Understanding external influences, including social relationships, on substance use among adults is critical to developing effective strategies for reducing SUD. Thus, we assessed associations between social support, including structural social support (type and frequency of social networks) and functional social support (perceived and enacted social provision), and three major groups of SUD (AUD, TUD and DUD) by sex and sexual minority status.

METHODS

This study used National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III) data collected via in-person interviews from April 2012 to June 2013 among the general US civilian non-institutionalized population of individuals aged 18 years or older. The NESARC-III sample design, response rates and weighting procedures have been described elsewhere [1,31]. NESARC-III procedures were approved by an institutional review board (IRB), and this secondary data analysis was deemed exempt by the IRB at the first author's institution.

The NESARC-III included reliable and validated measures that align with the Diagnostic and Statistical Manual of Mental Disorders, fifth edition DSM-5 (American Psychiatric Association, 2013) criteria for AUD, TUD and DUD among self-identified heterosexual and SM (lesbian, gay, bisexual and 'not sure') respondents [32], using the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5), a fully structured diagnostic interview that maps onto the 11 DSM-5 symptom criteria for alcohol, tobacco and drug use [33].

Past-year AUD and TUD diagnosis was made for 'any disorder', defined as two or more symptoms based on the recommended approach in the DSM-5 [34,35]. A diagnosis for DUD was similar to AUD and TUD, except that multiple drug classes were included and required at least two symptoms from the same drug class (i.e. sedative/tranquilizer, cannabis, amphetamine, cocaine, non-heroin opioid, heroin, hallucinogen, club drugs and solvents/inhalants). Test–retest reliability for DSM-5 AUD, TUD and DUD diagnoses was fair and dimensional criteria scales were fair to excellent [34–36].

Socio-demographic characteristics included age, self-reported sex (male and female), race/ethnicity, education level, income, employment status, US region and urbanicity. Sexual minority status was assessed by asking respondents to identify which of the following categories best described them: heterosexual, gay, lesbian, bisexual or 'not sure'. The NESARC-III also includes questions about sexual attraction and behavior, but for the purposes of the current study sexual minority status is defined by sexual identity only (heretofore referred to as SM), and heterosexual-identifying respondents who reported same-sex behavior/attraction were defined as heterosexual. To retain a large enough sample size to stratify the analysis by sex, we dichotomized heterosexual and SM (combining gay or lesbian, bisexual and 'not sure').

Structural support was measured as the frequency and type of past 2-week social contact with kin and non-kin [37]. We used dichotomous measures (yes/no) to assess kin using marital status [i.e. married, cohabiting but not married, not married (widowed/divorced/separated/never married)], having at least one child under the age of 18 years, past 2-week contact with parents, past 2-week contact with grown children (18 or older), past 2-week contact with spouses' parents and past 2-week contact with other relatives. Non-kin contact was measured (continuously variables) as the number of past 2-week contacts with 'close friends' and acquaintances (i.e. 'fellow students', 'co-workers', 'neighbors', 'people from volunteer groups' and people from 'other groups').

Functional support was measured as the mean score from the Social Provision Scale, a 12-item scale that measured the four domains of social support (see the footnotes in Table 2 for the wording on each item) [38]. The scale ranged from 1 to 4, with 4 indicating the highest level of social provision. The social provision scale has excellent reliability based on data from the NESARC-III (Cronbach's α = 0.83).

SM-related discrimination was based on the Experiences with Discrimination scale [39,40]. Questions in the NESARC-III regarding SM-related discrimination were restricted to adults who self-identified as SM and heterosexual-identified adults who reported same-sex attraction or behavior. The scale measured six types of discrimination that respondents have experienced based on sexual minority status (obtaining health care, receiving health care, obtaining a job/applying to school/interacting with police, public locations, verbal or physical aggression), with responses ranging from 'never' (0) to 'very often' [4]. The analyses coded heterosexually identified individuals with concordant behavior and attraction responses as 'never' (0), given that these questions were not asked of these respondents due to the low possibility of being discriminated against based on their sexuality (i.e. concordant heterosexual identity, heterosexual behavior and heterosexual attraction). Cronbach's α for these six items within the analytical sample used in this study was equal to 0.893.

The data analysis was divided into three sections. First, differences (based on sex and sexual minority status) in social contacts, social provision, sexual orientation discrimination and past-year SUD (i.e. AUD, TUD and DUD) were assessed using either binary logistic or linear regression. Secondly, we used binary logistic regression to assess the association between SUD and social contacts/social provision/sexual orientation discrimination within the full sample, controlling for sex, sexual minority status and socio-demographic characteristics. Thirdly, we stratified the binary logistic regression models assessing the association between SUD and social contacts/social provision/sexual orientation discrimination in order to examine differences in the associations between heterosexual men, SM men, heterosexual women and SM women. To compare logit coefficients across models, we used the Z-test for the equality of coefficients [41] to test differences between the strength of the coefficients assessing different types of SUD between groups. This approach is similar to creating interaction terms, with the added benefit of seeing specific associations that are unique within each of the stratified groups (i.e. heterosexual men, SM men, heterosexual women, SM women).

We used Stata version 15.0 for all analyses (StataCorp LP, College Station, TX, USA). The NESARC-III design included stratification and clustering of the target population. Analytical techniques were design-based, using sampling weights to calculate estimates of population parameters and specialized variance estimation techniques to accommodate the complex design features when estimating standard errors. All estimates provided here used these sampling weights. However, unweighted sample sizes are provided to show the actual number of respondents within each subpopulation. Given the number of comparisons and analyses performed, we only considered values that reached an alpha level of 0.01 or lower to be indicative of statistical significance within the analyses [42]. List-wise deletion was used to handle any missing data within the analyses; only 4.1% of the sample had missing data on at least one of the items used in the current analyses (95.9% of the sample had complete information).

RESULTS

Among the 36 309 respondents, 15 724 (43.3%) were men and 20 271 (55.8%) were women (Table 1). Respondents identifying as heterosexual made up most of the sample (n = 34 644, 95.4%), and 1351 (3.7%) identified as SM. Significant differences between heterosexual and SM males included age, education, income, employment, geographic region and urbanicity. Among women, significant differences between heterosexual and SM were found for age, race, education, income and urbanicity.

Bivariate differences between sex and sexual identity

Substantial variation was found by sex and sexual minority status with respect to the main independent (social contacts, social provision and sexual orientation discrimination) and dependent (AUD, TUD, DUD) variables (Table 2). The average social provision score was significantly higher for heterosexual men and women (3.50 and 3.51, respectively) when compared to their SM peers (3.33 and 3.42, respectively). The prevalence of past-year AUD and TUD was significantly higher for SM men (AUD = 27.2%; TUD = 28.5%) and women (AUD = 27.1%; TUD = 29.1%) when compared to their heterosexual peers (men: AUD = 16.8%, TUD = 19.6%; women: AUD = 9.3%, TUD = 14.6%).

Associations between SUD and social contact, social provision and sexual orientation discrimination

Women had lower odds of indicating an AUD [adjusted odds ratio (aOR) = 0.554, $P < 0.001$], TUD (aOR = 0.657, $P < 0.001$) and DUD (aOR = 0.536, $P < 0.001$) compared to men, while SM had higher odds of indicating an AUD (aOR = 1.535, $P < 0.001$), TUD (aOR = 1.512, $P < 0.001$) and DUD (aOR = 1.520, $P < 0.001$) compared to heterosexuals (Table 3). Several other measures

Table 1 Demographics of United States adults by sex and sexual minority status (NESARC-III)

	Total (n = 36 309) % (n)	Men Heterosexual (n = 15 190) % (n)	Sexual minority (n = 534) % (n)	Women Heterosexual (n = 19 454) % (n)	Sexual minority (n = 817) % (n)
Age (years)					
18–34	30.2 (11 755)	30.9 (4962)	38.1 (197)	28.4 (6037)	59.7 (481)
35–54	35.7 (13 150)	36.2 (5572)	35.5 (199)	35.6 (7030)	25.9 (231)
55+	34.0 (11 404)	32.8 (4656)	26.3 (138)	35.9 (6387)	14.4 (105)
Race					
White	66.1 (19 194)	66.7 (8175)	69.6 (318)	66.0 (10173)	62.0 (401)
Black	11.8 (7766)	11.0 (3035)	10.2 (84)	12.3 (4333)	17.0 (230)
Hispanic	14.7 (7037)	15.2 (2959)	14.5 (103)	14.2 (3750)	15.4 (152)
Other race	7.3 (2312)	7.1 (1021)	5.8 (29)	7.5 (1198)	5.6 (34)
Education					
High school degree or less	38.8 (15 289)	40.5 (6699)	31.7 (159)	37.3 (7958)	40.1 (334)
Some college	33.1 (12 105)	33.2 (4737)	32.9 (201)	34.7 (6755)	37.6 (305)
College degree or higher	28.1 (8915)	28.3 (3754)	35.5 (174)	28.0 (4741)	22.3 (178)
Personal income ($US)					
$0–24 999	52.3 (20 094)	42.0 (6964)	52.2 (276)	61.1 (12 085)	70.9 (577)
$25 000–$59 999	31.0 (11 339)	34.0 (5261)	29.9 (174)	28.7 (5646)	20.0 (169)
$60 000+	16.7 (4876)	24.0 (2965)	17.9 (84)	10.2 (1723)	9.1 (71)
Employment					
Not employed full-time	55.4 (20 376)	47.1 (7354)	56.8 (298)	62.8 (12 020)	64.0 (509)
Employed full-time (35 + hours)	44.6 (15 933)	52.9 (7836)	43.2 (236)	37.2 (7434)	36.0 (308)
US region					
Northwest	18.2 (5180)	17.9 (2138)	24.6 (97)	18.3 (2764)	21.0 (140)
Midwest	21.5 (7566)	21.7 (3229)	19.3 (98)	21.4 (4004)	19.1 (164)
South	37.1 (14 532)	36.8 (5915)	29.6 (177)	37.5 (8003)	33.8 (297)
West	23.2 (9031)	23.6 (3908)	26.5 (162)	22.8 (4683)	26.1 (216)
Urbanicity					
Suburban/urban	78.7 (30 193)	78.7 (12 588)	86.1 (480)	78.1 (16 116)	87.7 (739)
Rural	21.3 (6116)	21.3 (2602)	13.9 (54)	21.9 (3338)	12.3 (78)

Sexual minority was defined as self-reported gay, lesbian, bisexual or 'not sure' identity [men: gay (*n* = 321, 1.7%), bisexual (*n* = 144, .8%%) or 'not sure' (*n* = 69, .4%); women: lesbian (*n* = 265, 1.2%), bisexual (*n* = 422, 1.8%) or 'not sure' (*n* = 130, 0.6%)]. Heterosexual-identifying individuals with same-sex behavior or attraction were defined as heterosexual. Sample sizes vary due to missing data. Unweighted sample sizes are provided. Percentages incorporate survey weights provided by the National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III). Results from design-adjusted Rao-Scott χ^2 tests are provided.

assessing social contact and social provision were found to have a robust association across each of the substance use disorders. Respondents who were married had lower odds of AUD (aOR = 0.579, $P < 0.001$), TUD (aOR = 0.605, $P < 0.001$) and DUD (aOR = 0.507, $P < 0.001$) compared to unmarried respondents; cohabitation was associated with a higher odds of AUD and TUD compared to unmarried/non-cohabiting respondents. Higher average social provision scores were associated with lower odds of indicating an AUD (aOR = 0.771, $P < 0.001$), TUD (aOR = 0.747, $P < 0.001$) and DUD (aOR = 0.558, $P < 0.001$). Higher sexual orientation discrimination scores were only positively associated with past-year AUD (1.396, $P < 0.01$).

Associations between SUD and social contact, social provision and sexual orientation discrimination

Tables 4–6 show stratified results (by sex and sexual minority status) in associations between SUD and the main independent variables. Examining Table 4, two statistically significant differences were found in the associations between AUD and the main independent variables across the stratified groups. First, there was a significantly stronger negative association (i.e. lower odds of indicating an AUD) between AUD and contact with spouses' parent among heterosexual women compared to heterosexual men [heterosexual women: aOR = 0.738, $P < 0.01$; heterosexual men: aOR = 1.090, non-significant (NS), Z-

Table 2 Social support/sexual orientation discrimination and past-year SUD by sex and sexual minority status (NESARC–III).

		Men		Women	
	Total (n = 36 309) %/mean (SE)	*Heterosexual (a)* (n = 15 190) %/mean (SE)	*Sexual minority (b)* (n = 534) %/mean (SE)	*Heterosexual(c)* (n = 19 454) %/mean (SE)	*Sexual Minority (d)* (n = 817) %/mean (SE)
Marital status/children					
Married	51.2% (0.005)	54.6% (0.006)[b,c,d]	11.5% (0.022)[a,c]	50.6% (0.005)[a,b,d]	17.6% (0.005)[a,c]
Living with someone as if married	6.6% (0.001)	6.8% (0.003)[b,c,d]	16.2% (0.021)[a,c]	5.8% (0.002)[a,b,d]	16.0% (0.015)[a,c]
At least 1 child under the age of 18	27.3% (0.004)	25.4% (0.006)[b,c]	7.1% (0.018)[a,c,d]	30.0% (0.0056)[a,b]	23.9% (0.022)[c]
Contact with kin (2 weeks)					
Contact with grown children (18 years of age or older) (yes)	43.6% (0.004)	39.6% (0.006)[b,c,d]	12.4% (0.020)[a,c]	49.3% (0.006)[a,b,d]	14.3% (0.014)[a,c]
Contact with parents (yes)	61.5% (0.004)	61.7% (0.005)[d]	63.8% (0.026)[d]	60.9% (0.004)[d]	74.3% (0.020)[a,b,c]
Contact with spouses' parents (yes)	26.8% (0.004)	29.4% (0.005)[b,c,d]	9.9% (0.017)[a,c,d]	25.3% (0.004)[a,b,d]	18.1% (0.019)[a,b,c]
Contact with other relatives (yes)	73.6% (0.004)	69.3% (0.006)[c]	64.5% (0.029)[c]	78.1% (0.005)[a,b,d]	71.8% (0.019)[c]
Number of contacts with non-kin (2 weeks)					
Close friends	4.31 (0.044)	4.49 (0.063)[c,d]	4.47 (0.309)	4.15 (0.053)[a]	3.76 (0.156)[a]
Acquaintances (e.g. fellow students, co-workers...)	6.07 (0.099)	6.67 (0.154)[c,d]	6.30 (0.770)	5.55 (0.114)[a]	4.87 (0.411)[a]
Social provision (past-year)					
Social provision	3.50 (0.004)	3.50 (0.005)[b,d]	3.33 (0.032)[a,c]	3.51 (0.005)[b,d]	3.42 (0.023)[a,c]
Sexual orientation discrimination (past-year)					
Sexual minority discrimination	0.010 (0.001)	0.001 (0.001)[b,d]	0.297 (0.028)[a,c]	0.002 (0.001)[b,d]	0.229 (0.018)[a,c]
Past-year SUD					
Alcohol use disorder (2+ symptoms)	13.3% (0.002)	16.8% (0.003)[b,c,d]	27.2% (0.026)[a,c]	9.3% (0.003)[a,b,d]	27.1% (0.019)[a,c]
Tobacco use disorder (2+ symptoms)	17.4% (0.004)	19.6% (0.005)[b,c,d]	28.5% (0.026)[a,c]	14.6% (0.004)[a,b,d]	29.1% (0.021)[a,c]
Drug use disorder (2+ symptoms)	4.0% (0.001)	4.9% (0.002)[c,d]	8.1% (0.015)[c]	2.7% (0.002)[a,b,d]	10.9% (0.016)[a,c]

SE = standard error; SUD = substance use disorder. Sexual minority was defined as self-reported gay, lesbian, bisexual or 'not sure' identity. Heterosexual-identifying individuals with same-sex behavior or attraction were defined as heterosexual. The 12 items for social support included the following: 'would have a hard time finding someone to take a day trip with me', 'feel that there is no one to share worries and fears with', 'would be able to find someone to help with chores if sick', 'someone to turn to for advice on family problems', 'could easily find someone to go to movie on spur of the moment', 'someone I could turn to for personal problems', 'don't often get invited to do things with others', 'would be difficult to find someone to watch house if out of town', 'could easily find lunch companion', 'someone would get me if stranded 10 miles from home', 'would be difficult to get advice from someone for a family crisis', 'would have a hard time finding someone to help me move'. Sample sizes vary due to missing data. Unweighted sample sizes are provided. Percentages incorporate survey weights provided by the National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III). Results from binary logistic and bivariate regression models were used to determine if differences between heterosexual (men and women) and sexual minorities (men and women) were statistically significant at the 0.01 alpha level for: [a]heterosexual (a) men, [b]sexual minority (b)men, [c]heterosexual (c) women and [d]sexual minority (d) women.

score = 3.06, P < 0.01 (Z-scores not shown in tables)]. Secondly, there was a significantly stronger positive association (i.e. higher odds on indicating an AUD) between AUD and sexual orientation discrimination among heterosexual men compared to SM women (heterosexual men: aOR = 4.608, P < 0.01; SM women: aOR = 1.121, NS; Z-score = 2.49, P < 0.01).

Table 5 shows the stratified results assessing past-year TUD. There was a significantly stronger positive association between TUD and having a child under the age of 18 years among SM women compared to either heterosexual men or heterosexual women (SM women: aOR = 1.990, P < 0.001; heterosexual men: aOR = 1.064, NS; heterosexual women: aOR = 1.029, NS; Z-score = 2.90, P < 0.01 and Z-score = 3.07, P < 0.01, respectively). There was a significantly stronger positive association between TUD and having contact with grown children among heterosexual women compared to heterosexual men (heterosexual women: aOR = 1.397, P < 0.001; heterosexual men: aOR = 0.953, NS; Z-score = 3.80, P < 0.001). There was also a significantly stronger positive association between TUD and number of close friends

Table 3 Substance use disorder as a function of sex, sexual minority status, social support and sexual orientation discrimination (NESARC-III).

	AUD 2+ (n = 34 913) aOR 95% CI	*TUD 2+ (n = 34 866)* aOR 95% CI	*DUD 2+ (n = 34 919)* aOR 95% CI
Substance use disorder (2+ symptoms)	AUD 2+	TUD 2+	DUD 2+
Sex			
Men	Reference	Reference	Reference
Women	0.554*** (0.510, 0.601)	0.657*** (0.609, 0.709)	0.536*** (0.457, 0.628)
Sexual minority			
Heterosexual	Reference	Reference	Reference
Sexual minority	1.535*** (1.278, 1.844)	1.512*** (1.234, 1.854)	1.520*** (1.139, 2.028)
Marital status/children			
Not married	Reference	Reference	Reference
Married	0.579*** (0.520, 0.645)	0.605*** (0.554, 0.662)	0.507*** (0.409, 0.629)
Living with someone as if married	1.251** (1.057, 1.480)	1.405*** (1.212, 1.627)	1.160 (0.890, 1.512)
Does not have a child under the age of 18	Reference	Reference	Reference
At least 1 child under the age of 18	0.825*** (0.751, 0.906)	1.082 (0.981, 1.192)	0.847 (0.695, 1.031)
Contact with kin (2 weeks)			
No contact with grown children (18 years of age or older)	Reference	Reference	Reference
Contact with grown children (18 years of age or older)	0.900 (0.799, 1.014)	1.169** (1.051, 1.299)	1.193 (0.926, 1.537)
No contact with parent	Reference	Reference	Reference
Contact with parent	1.159* (1.034, 1.298)	1.023 (0.941, 1.112)	1.005 (0.835, 1.210)
No contact with spouses' parent	Reference	Reference	Reference
Contact with spouses' parent	0.924 (0.828, 1.031)	1.023 (0.917, 1.143)	0.857 (0.674, 1.091)
No contact with other relatives	Reference	Reference	Reference
Contact with other relatives	0.853*** (0.778, 0.935)	0.894* (0.820, 0.976)	0.886 (0.763, 1.028)
Number of contacts with non-kin (2 weeks)			
Close friends (continuous measure)	1.014*** (1.006, 1.022)	0.995 (0.986, 1.005)	1.000 (0.986, 1.013)
Acquaintances (continuous measure)	1.004* (1.000, 1.008)	0.991*** (0.985, 0.996)	1.001 (0.993, 1.009)
Social provision (past-year)			
Social provision (continuous measure)	0.771*** (0.705, 0.844)	0.747*** (0.694, 0.804)	0.558*** (0.490, 0.636)
Sexual orientation discrimination (past-year)			
Sexual orientation discrimination (continuous measure)	1.396** (1.106, 1.760)	1.277 (0.980, 1.665)	1.193 (0.832, 1.711)

The zero-order correlations between alcohol use disorder (AUD) and tobacco use disorder (TUD) was 0.226 ($P < 0.001$). The zero-order correlation between AUD and drug use disorder (DUD) was 0.245 ($P < 0.001$). The zero-order correlation between TUD and DUD was 0.215 ($P < 0.001$). Sample sizes vary due to missing data. Unweighted sample sizes are provided. Analysis incorporates survey weights provided by the National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III) and control for age, race, level of education, personal income, employment status, US region and urbanicity. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. CI = confidence interval; aOR = adjusted odds ratio.

among SM men compared to heterosexual women (SM men: aOR = 1.062, $P < 0.05$; heterosexual women: aOR = 0.980, $P < 0.05$; Z-score = 2.56, $P < 0.01$). Finally, we found a significantly stronger negative association between TUD and number of acquaintances among heterosexual women compared to heterosexual men (heterosexual women: aOR = 0.979, $P < 0.001$; heterosexual men: aOR = 0.998, NS; Z-score = 3.33, $P < 0.001$).

In the stratified results assessing DUD (Table 6), we found a significantly stronger negative association between DUD and social provision among heterosexual women compared to heterosexual men and SM men (heterosexual women: aOR = 0.413, $P < 0.001$; heterosexual men: aOR = 0.639, $P < 0.001$; SM men: aOR = 1.651, NS; Z-

score = 3.31, $P < 0.001$ and Z-score = 3.77, $P < 0.001$, respectively).

DISCUSSION

In this nationally representative cohort of US adults, we found that associations between social support and DSM-5 SUD differed by sex and sexual minority status and sex. Consistent with previous studies [1,9,10], SM individuals had higher past-year AUD, TUD and DUD compared to heterosexual individuals. Specifically, SM men and women had significantly more AUD and TUD; SM women also had significantly higher DUD. Although social contacts were associated with SUD, types and frequency of contacts

Table 4 Alcohol use disorder (AUD) as a function of social support and sexual orientation discrimination (NESARC-III).

	Men		Women	
	Model 1 *Heterosexual (a) (n = 14 662)* aOR 95% CI	*Model 2* *Sexual minority (b) (n = 518)* aOR 95% CI	*Model 3* *Heterosexual (c) (n = 18 937)* aOR 95% CI	*Model 4* *Sexual minority (d) (n = 796)* aOR 95% CI
Alcohol use disorder (2+ symptoms)	AUD 2+	AUD 2+	AUD 2+	AUD 2+
Marital status/children				
Not married	Reference	Reference	Reference	Reference
Married	0.500*** (0.432, 0.579)	0.883 (0.237, 3.287)	0.637*** (0.529, 0.767)	0.590 (0.210, 1.660)
Living with someone as if married	1.060 (0.858, 1.308)	0.984 (0.415, 2.332)	1.581*** (1.219, 2.051)	1.358 (0.709, 2.601)
Does not have a child under the age of 18	Reference	Reference	Reference	Reference
At least 1 child under the age of 18	0.853 (0.721, 1.010)	1.021 (0.311, 3.350)	0.747*** (0.656, 0.851)	1.258 (0.808, 1.957)
Contact with kin (2 weeks)				
No contact with grown children (18 years of age or older)	Reference	Reference	Reference	Reference
Contact with grown children (18 years of age or older)	0.906 (0.776, 1.058)	1.174 (0.434, 3.176)	0.855 (0.699, 1.046)	1.032 (0.521, 2.043)
No contact with parent	Reference	Reference	Reference	Reference
Contact with parent	1.133 (0.967, 1.327)	1.199 (0.593, 2.427)	1.200 (0.971, 1.482)	0.818 (0.457, 1.466)
No contact with spouses' parent	Reference	Reference	Reference	Reference
Contact with spouses' parent	1.090 (0.933, 1.274)[c]	0.739 (0.220, 2.485)	0.738** (0.605, 0.900)[a]	0.819 (0.406, 1.650)
No contact with other relatives	Reference	Reference	Reference	Reference
Contact with other relatives	0.861* (0.759, 0.977)	0.871 (0.474, 1.601)	0.809** (0.703, 0.932)	1.029 (0.657, 1.613)
Number of contacts with non-kin (2 weeks)				
Close friends (continuous measure)	1.016** (1.000, 1.026)	1.060 (0.995, 1.130)	1.009 (0.995, 1.024)	0.974 (0.918, 1.034)
Acquaintances (continuous measure)	1.006* (1.001, 1.011)	1.007 (0.986, 1.028)	1.002 (0.994, 1.009)	0.984 (0.959, 1.009)
Social provision (past-year)				
Social provision (continuous measure)	0.798*** (0.702, 0.906)	0.532* (0.318, 0.890)	0.775*** (0.680, 0.883)	0.741 (0.507, 1.083)
Sexual orientation discrimination (past-year)				
Sexual orientation discrimination (continuous measure)	4.608** (1.615, 13.14)[d]	1.574 (0.992, 2.498)	1.147 (0.547, 2.404)	1.121 (0.744, 1.688)[a]

Table 5 Tobacco use disorder (TUD) as a function of social support and sexual orientation discrimination (NESARC-III).

	Men		Women	
	Model 1 Heterosexual (a) (n = 14 640) aOR 95% CI	*Model 2* Sexual minority (b) (n = 518) aOR 95% CI	*Model 3* Heterosexual (c) (n = 18 913) aOR 95% CI	*Model 4* Sexual minority (d) (n = 795) aOR 95% CI
Tobacco use disorder (2+ symptoms)	TUD 2+	TUD 2+	TUD 2+	TUD 2+
Marital status/children				
Not married	Reference	Reference	Reference	Reference
Married	0.603*** (0.521, 0.699)	1.635 (0.493, 5.422)	0.584*** (0.507, 0.671)	0.425* (0.182, 0.996)
Living with someone as if married	1.353** (1.100, 1.665)	1.114 (0.527, 2.356)	1.570*** (1.241, 1.985)	0.847 (0.391, 1.835)
Does not have a child under the age of 18	Reference	Reference	Reference	Reference
At least 1 child under the age of 18	1.064 (0.932, 1.213)[d]	0.839 (0.324, 2.175)	1.029 (0.909, 1.165)[d]	1.990*** (1.325, 2.988)[a, c]
Contact with kin (2 weeks)				
No contact with grown children (18 years of age or older)	Reference	Reference	Reference	Reference
Contact with grown children (18 years of age or older)	0.953 (0.830, 1.094)[c]	0.982 (0.343, 2.815)	1.397*** (1.210, 1.612)[a]	1.806 (0.843, 3.870)
No contact with parent	Reference	Reference	Reference	Reference
Contact with parent	1.059 (0.917, 1.223)	0.680 (0.347, 1.333)	1.020 (0.906, 1.148)	0.873 (0.501, 1.522)
No contact with spouses' parent	Reference	Reference	Reference	Reference
Contact with spouses' parent	1.065 (0.909, 1.248)	0.929 (0.255, 3.377)	0.940 (0.789, 1.121)	1.485 (0.629, 3.504)
No contact with other relatives	Reference	Reference	Reference	Reference
Contact with other relatives	0.911 (0.817, 1.016)	0.897 (0.498, 1.615)	0.869* (0.756, 0.999)	0.821 (0.506, 1.333)
Number of contacts with non-kin (2 weeks)				
Close friends (continuous measure)	1.000 (0.989, 1.012)	1.062* (1.001, 1.128)[c]	0.980* (0.964, 0.997)[b]	0.996 (0.930, 1.066)
Acquaintances (continuous measure)	0.998 (0.992, 1.004)[c]	0.983 (0.959, 1.008)	0.979* (0.969, 0.988)[a]	0.961* (0.929, 0.995)
Social provision (past-year)				
Social provision (continuous measure)	0.831*** (0.748, 0.925)[c]	0.651 (0.385, 1.101)	0.688*** (0.618, 0.767)[a]	0.915 (0.630, 1.328)
Sexual orientation discrimination (past-year)				
Sexual orientation discrimination (continuous measure)	1.738 (0.660, 4.571)	1.561* (1.028, 2.370)	1.974 (0.879, 4.429)	1.003 (0.664, 1.514)

Sexual minority was defined as self-reported gay, lesbian, bisexual or 'not sure' identity. Heterosexual-identifying individuals with same-sex behavior or attraction were defined as heterosexual. Sample sizes vary due to missing data. Unweighted sample sizes are provided. Analysis incorporates survey weights provided by the National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III) and control for age, race, level of education, personal income, employment status, US region and urbanicity. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. Significant differences between logit coefficients using the Z-test of equality at the 0.01 alpha level or lower when compared to: [a]heterosexual (a) men, [b]sexual minority (b) men, [c]heterosexual(c) women and [d]sexual minority(d) women. CI = confidence interval; aOR = adjusted odds ratio.

Table 6 Drug use disorder (DUD) as a function of social support and sexual orientation discrimination (NESARC-III).

	Men		Women	
	Model 1 Heterosexual (a) (n = 14 668) aOR 95% CI	Model 2 Sexual minority (b) (n = 519) aOR 95% CI	Model 3 Heterosexual (c) (n = 18 936) aOR 95% CI	Model 4 Sexual minority (d) (n = 795) aOR 95% CI
	DUD 2+	DUD 2+	DUD 2+	DUD 2+
Other drug use disorder (2+ symptoms)				
Marital status/children				
Not married	Reference	Reference	Reference	Reference
Married	0.504*** (0.369, 0.689)	0.605 (0.174, 2.103)	0.515*** (0.372, 0.712)	0.404 (0.114, 1.428)
Living with someone as if married	1.174 (0.795, 1.733)	0.527 (0.158, 1.756)	1.204 (0.821, 1.765)	0.729 (0.248, 2.142)
Does not have a child under the age of 18	Reference	Reference	Reference	Reference
At least 1 child under the age of 18	0.960 (0.713, 1.292)	0.879 (0.187, 4.127)	0.750* (0.582, 0.966)	0.643 (0.307, 1.348)
Contact with kin (2 weeks)				
No contact with grown children (18 years of age or older)	Reference	Reference	Reference	Reference
Contact with grown children (18 years of age or older)	1.230 (0.913, 1.657)	0.411 (0.031, 5.376)	1.013 (0.698, 1.470)	2.173 (0.741, 6.374)
No contact with parent	Reference	Reference	Reference	Reference
Contact with parent	1.080 (0.832, 1.401)	0.624 (0.253, 1.540)	0.951 (0.695, 1.301)	0.912 (0.443, 1.877)
No contact with spouses' parent	Reference	Reference	Reference	Reference
Contact with spouses' parent	0.871 (0.594, 1.277)	2.638 (0.716, 9.717)	0.776 (0.559, 1.077)	0.874 (0.266, 2.868)
No contact with other relatives	Reference	Reference	Reference	Reference
Contact with other relatives	0.799* (0.658, 0.971)	0.439* (0.226, 0.853)[c]	1.060 (0.833, 1.349)[b]	1.178 (0.638, 2.175)
Number of contacts with non-kin (2 weeks)				
Close friends (continuous measure)	1.005 (0.991, 1.020)	0.995 (0.918, 1.078)	0.989 (0.958, 1.020)	0.951 (0.868, 1.041)
Acquaintances (continuous measure)	1.004 (0.994, 1.014)	1.016 (0.989, 1.043)	0.994 (0.978, 1.010)	0.950 (0.892, 1.011)
Social provision (past-year)				
Social provision (continuous measure)	0.639*** (0.537, 0.760)[b, c]	1.651 (0.819, 3.326)[a, c]	0.413*** (0.340, 0.502)[a, b]	0.732 (0.411, 1.304)
Sexual orientation discrimination (past-year)				
Sexual orientation discrimination (continuous measure)	1.684 (0.602, 4.707)	1.535 (0.982, 2.399)	1.880 (0.767, 4.608)	0.827 (0.446, 1.531)

Sexual minority was defined as self-reported gay, lesbian, bisexual or 'not sure' identity. Heterosexual-identifying individuals with same-sex behavior or attraction were defined as heterosexual. Sample sizes vary due to missing data. Unweighted sample sizes are provided. Analysis incorporates survey weights provided by the National Epidemiologic Survey on Alcohol and Related Conditions–III (NESARC-III) and control for age, race, level of education, personal income, employment status, US region and urbanicity. *P < 0.05; **P < 0.01; ***P < 0.001. Significant differences between logit coefficients using the Z-test of equality at the 0.01 alpha level or lower when compared to: [a]heterosexual (a) men, [b]sexual minority (b) men and [c]heterosexual (c) women and [d]sexual minority (d) women. CI = confidence interval; aOR = adjusted odds ratio.

varied by drug class and sexual minority status. Social provision was associated with all types of SUD and was significantly lower among SM compared to heterosexuals. SM women reported lower social provision and fewest non-kin social contact, as well having the highest prevalence of SUD.

Measures of structural support, including frequency of kin and non-kin contacts, were inconsistently associated with SUD, sexual minority status, or sex. In general, populations with higher frequency of kin and non-kin contact had comparably lower SUD. However, differences in the number of social contacts did not necessarily impact odds of SUD. For example, SM women had the highest proportion of recent contact with parents, but this was not associated with increased risk for any substance use disorder. This suggests that frequency of contact alone may not be a sufficient predictor of SUD.

We found differences in SUD by sex and sexual minority status based on the type of social contact. Heterosexual men with a higher number of contacts with close friends were significantly more likely to have AUD. This finding is similar to previous studies, indicating that larger social networks made up of heavy drinkers have been found to be associated with greater alcohol consumption and AUD among men [43,44]. Being married was associated with all types of past-year SUD, consistent with the literature, indicating that marriage may provide additional social support for both men and women, with decreased substance use after marriage [45–48]. Reciprocally, individuals without SUD may be more able to participate in stable, functioning relationships [47,49]. We did not find a similar relationship between marriage and SUD among SM populations, due possibly to a smaller percentage of married SM individuals in this cohort. The NESARC-III study was completed in 2013, prior to the 2015 Supreme Court decision to legalize same-sex marriage, and many states did not have marriage equality laws at the time of the survey. Although we did not find consistent patterns of associations between structural support and TUD and DUD among SM populations, previous research has found greater frequency of TUD and DUD among SM populations is attributed, in part, to higher prevalence of substance use and substance use acceptability in SM social networks, as well as increased perceived tolerant norms and availability of drugs [29,50,51].

Higher functional support was associated with lower SUD, although it varied with sex and sexual minority status. Higher social provision was associated with lower odds of all SUD for both heterosexual men and women but not for SM adults. The null findings for the relationship between social provision and SUD among SM may be the result of a smaller sample size, or that social provision was already significantly lower among SM. Functional social support indicates the quality of social support received,

which is important for approaches in decreasing SUD. Caring, positive relationships that include informational support and promotion of self-efficacy are linked to reduced substance use initiation [21,52–54], and higher functional social support has been found to increase efficacy of substance use treatment interventions and identified as an indicator of entry and retention in treatment [55–57]. Due to the cross-sectional nature of our data, we are unable to determine whether higher social provision results in lower SUD or if the presence of SUD results in lower social provision due to loss of support resources related to substance use. However, our findings of a strong association between functional social support and SUD suggest that incorporating existing social support resources or enhancing provisions of support may increase effectiveness of prevention and treatment programs in reducing SUD.

The overall association between functional support and SUD, and the inconsistent relationship between structural support and SUD, suggests quality of relationships and social provision to be as important a consideration as composition and frequency of contact relative to substance use [28,58,59]. Additionally, while social support may function to moderate SUD, it is also probable that substance use may contribute to social dynamics that create shifts in relationships and social networks. Individuals with SUD are more likely to have relationships that include substance users, but individuals may also be selecting social relationships that affirm existing substance use [60]. Our findings are not able to tease out the temporal relationship between social support and SUD, but determining the specific role of social networks and support in substance use is important for interventions that integrate social support mechanisms in prevention and treatment. For example, Valente *et al.* found that a peer-influence substance use intervention in a school setting was mainly effective only for students with social networks that did not include substance users [61]. Effective strategies to incorporate social support may require assessing the functional support received and tailoring interventions based on social networks.

SM-related discrimination has been found to be associated with increased tobacco, alcohol and drug use in SM populations [13,17,62,63], although differentially associated with substance use across SM identities [8,13,64]. We found that while SM-related discrimination was significantly higher among SM, discrimination was not significantly associated with SUD among SM-identifying individuals. However, SM-related discrimination was significantly associated with AUD among heterosexual-identifying men who reported same-sex attraction/behavior. In a previous NESARC-III analysis, McCabe *et al.* found significant associations between sexual identity/attraction discordance and TUD, although the relationships between discordant identity/attraction and AUD and DUD have been mixed in other studies [65,66].

Discordance between identity and attraction may be due to identity concealment and fear of disclosure associated with experiences of discrimination that may increase risk for SUD.

The present study is not without limitations. First, the NESARC-III is a cross-sectional study, and experiences of social support and discrimination are dynamic. Longitudinal studies would be more informative in establishing causation with SUD. Secondly, we did not examine differences between social support and SUD within specific sexual identity populations (i.e. bisexual, 'not sure'). Individuals who identify as 'not sure' may lack community connectedness and social support that warrants further exploration [15]. Thirdly, there are other possibe explanatory factors that were not considered in our analysis, including age, polysubstance use and gender identity (NESARC-III did not capture gender identity—e.g. trans-, cis-gender). Finally, we assessed functional and structural social support as separate mechanisms for SUD and did not look at the interaction of social provision with frequency of contacts or social networks. The NESARC-III data are limited for this type of assessment, and future studies should consider the quality of social support in the context of composition of social networks.

To our knowledge, this is the first assessment of social support and SUD by sex and sexual minority status from a nationally representative sample of US adults. We found social support to be differentially associated with SUD among by sex and sexual minority status. Higher social provision was generally associated with lower SUD, suggesting that functional support may be a more important avenue for developing strategies to reduce SUD. Understanding differences by sex and sexual minority status in how social support influences SUD is important in developing targeted strategies for substance use prevention and treatment for diverse populations. Marriage was associated with lower SUD among heterosexuals, and future research should revisit this relationship among SM populations in light of marriage equality. Our findings are consistent with constructs of the Minority Stress Model, but additional research on social composition and relationship quality by specific populations of SMs may further tease out the influence of social support and discrimination on substance use behaviors that can inform future research and development of strategies for substance use prevention. Of particular relevance for intervention development is assessing how social networks are formed in the context of substance use and how social provisions of support are related to SUD in order to incorporate social support into effective prevention and treatment.

Declaration of interests

None.

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