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Sexual orientation and sex-related substance use: The unexplored role of bisexuality

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ABSTRACT

Using alcohol and drugs in sexual contexts is associated with negative health consequences, including increased risk for HIV/STIs, sexual victimization, unplanned pregnancies, and overdose. Evidence suggests millions of adults *regularly* use alcohol in sexual contexts, thus increasing their risk for these consequences. However, no nationally representative estimates exist for rates of regular alcohol *and/or* drug use in sexual contexts. Additionally, previous studies suggest sexual minority individuals are more likely to use substances in sexual contexts than heterosexuals; however, none of these studies examined for multiple dimensions or subgroups of sexual orientation. Thus, using two distinct datasets—one large, nationally representative sample (N = 17,491) and an Internet-collected convenience sample (N = 1001)—we explored the associations between sexual orientation (dimensions *and* subgroups) and rates of regular sex-related alcohol *and/or* drug use in American adults. Results showed that sexual minority individuals were significantly more likely to report regularly using substances in sexual contexts compared to heterosexuals; however, results varied based on dimension of sexual orientation and by sex. Across both samples, bisexual individuals exhibited the highest rates of regular sex-related substance use. Findings suggest that sexual minorities, and bisexual individuals in particular, may be at increased risk for regular sex-related substance use and its associated negative health consequences. Future research should include nuanced and multidimensional assessments of sexual orientation to investigate sex-related alcohol and/or drug use and its associated risks, as well as examine the potential direct and indirect pathways by which these disparities may be conferred.

1. Introduction

Using alcohol and drugs in sexual contexts is associated with many risky sexual behaviors, such as having more unplanned sex (Cooper, 2002), more sex partners (Caldeira et al., 2009; Hirshfield, Remien, Humberstone, Walavalkar, & Chiasson, 2004), and reduced likelihood of engaging in safer sexual behaviors like condom use (Caldeira et al., 2009; Colfax et al., 2005; Leigh, Ames, & Stacy, 2008; Purcell, Parsons, Halkitis, Mizuno, & Woods, 2001). It is also associated with increased risk for HIV/STI infection (Mansergh et al., 2008; Shuper et al., 2010; Shuper, Joharchi, Monti, Loutfy, & Rehm, 2017), sexual victimization (Bryan et al., 2016; Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004), unintended pregnancy (Naimi, Lipscomb, Brewer, & Gilbert, 2003; Reardon, Coleman, & Cougle, 2004), and drug-related mortality (Hockenhull, Murphy, & Paterson, 2017). Several studies suggest that adults regularly use drugs in sexual contexts (Calsyn et al., 2010; Colfax et al., 2004, 2005) at rates similar to those of alcohol (4.3 million American adults; Eaton, Thompson, et al., 2015). However, no nationally representative estimates exist regarding the prevalence of regular sex-related drug use or regular sex-related alcohol *and* drug (i.e., substance) use. Given associations with multiple detrimental social and health outcomes, regular alcohol and/or drug use in sexual contexts signifies an important public health concern that warrants further investigation.

1.1. Sex-related substance use and sexual orientation

Growing evidence indicates significant sexual orientation-related mental and physical health disparities exist among sexual minority

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individuals (e.g., those who identify as lesbian, gay, or bisexual; report same-sex attractions; and/or engage in same-sex sexual behavior) compared to heterosexuals. For instance, compared to heterosexuals, sexual minorities have two to three times the risk for mood and anxiety disorders (e.g., major depressive disorder, generalized anxiety disorder; Cochran & Mays, 2000; Cochran, Sullivan, & Mays, 2003; Meyer, 2003; Ross et al., 2018), and two to nearly five times the risk for physical health conditions (e.g., liver disease, high blood pressure, cardiovascular disease; Dyar et al., 2018; Institute of Medicine, 2011). Additionally, sexual minority men and women have, at most, 17 and 12.4 times the risk for problematic substance use compared to heterosexual individuals (Drabble, Midanik, & Trocki, 2005; McCabe, Hughes, Bostwick, West, & Boyd, 2009; Pachankis, Hatzenbuehler, & Starks, 2014). Although rates of substance use (e.g., amyl nitrates [poppers], methamphetamine, gamma-hydroxybutyrate [GHB], mephedrome [bath salts]) in sexual contexts among sexual minorities are high, most studies have failed to compare rates for sexual minority and heterosexual individuals (Colfax et al., 2004; Diaz, Ayala, & Bein, 2004; Harawa et al., 2008; Hirshfield et al., 2004; Koblin et al., 2006; Mansergh et al., 2008; Purcell et al., 2001). The few extant comparisons suggest that sexual minority individuals are more likely to use substances in sexual contexts relative to heterosexuals (Gordon et al., 2017; Zellner et al., 2009). However, such evidence remains preliminary and has not utilized nationally representative data.

Dichotomizing sexual orientation (non-heterosexuals vs heterosexuals) in extant literature has obscured the extent to which rates of regular substance use in sexual contexts may differ by sexual orientation subgroup (e.g., lesbian/gay, bisexual, heterosexual). Such analytic treatment obscures potentially nuanced differences in health outcomes between sexual minority subgroups. For example, research that dichotomizes sexual orientation has shown that sexual minorities experience increased risk for psychiatric and alcohol/substance use disorders relative to heterosexuals (Cochran et al., 2003; Meyer, 2003). However, when stratified by sexual minority subgroup (e.g., gay/lesbian vs. bisexual), bisexual individuals are most at-risk for disorders relative to gay/lesbian and heterosexual individuals (Bostwick, Boyd, Hughes, & McCabe, 2010; McCabe et al., 2009).

Additionally, sexual orientation represents a multidimensional construct made up of at least three components (i.e., identity, attraction, and behavior; Sexual Minority Assessment Research Team, 2009). Previous research has shown that each dimension differentially predicts meaningful substance use outcomes (Brewster & Tillman, 2012; McCabe et al., 2009; McCabe, Hughes, Bostwick, & Boyd, 2005). For instance, evidence suggests that attraction and behavior might be more important than identity when predicting risk for problematic substance use by sexual orientation (e.g., Brewster & Tillman, 2012). Despite these findings, no studies have examined dimensions of sexual orientation, other than identity (Gilbert, Trocki, & Drabble, 2015), in relation to the regular use of substances in sexual contexts. This represents a notable gap in the literature.

Given differential risk for important health outcomes for subgroups of sexual minorities (Bostwick et al., 2010; McCabe et al., 2009)—as well as the public health (Institute of Medicine, 2011) and research (Eaton, Thompson Jr, & Hasin, 2015) importance of understanding the associations between multidimensional assessments of sexual orientation and health risk behaviors—such nuanced investigations are warranted.

1.2. The current study

Using two datasets, the current study examined the associations between multi-dimensional facets of sexual orientation (i.e., identity, attractions, behaviors) and the regular use of alcohol and drugs in sexual contexts. First, we expanded upon previous investigations of sexual orientation identity and regular sex-related alcohol use (Gilbert et al., 2015) and, using the same nationally representative sample of U.S. adults ($N = 17,491$), compared the odds of regular *alcohol* use in sexual contexts by sexual orientation identity. Regular sex-related drug use was not assessed in the NESARC and thus was not analyzed in the current study. Next, using an Internet-collected convenience sample ($N = 1001$), we examined the odds of reporting regular *substance* (alcohol and/or drug) use in sexual contexts by dimensions of sexual orientation (i.e., identity, attractions, behaviors) and sexual orientation subgroups (i.e., lesbian/gay, bisexual, heterosexual). We addressed the following research questions: (1) What are the rates of regular sex-related alcohol use by sexual orientation subgroups in a large, nationally representative sample of American adults?; (2) How do rates of regular sex-related substance use differ across dimensions of sexual orientation?; and (3) How do rates of regular sex-related alcohol use in the large, nationally representative sample compare to rates of regular sex-related substance use in the Internet-collected sample?

2. Method

2.1. Participants

Nationally representative sample. Data were from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; see Grant et al., 2009), which comprised two waves: Wave 1 ($N = 43,093$; fielded 2001–2002 with 81% response rate of eligible participants), and a Wave 2 reassessment of Wave 1 participants ($N = 34,653$; fielded 2004–2005 with 86.7% response rate of eligible participants and a cumulative response rate of 70.2%). Regular sex-related alcohol use was only assessed in Wave 2; thus, only Wave 2 data were used in the present study. Further, we restricted our data to a subsample of sexually active drinkers ($n = 17,491$), defined as those participants who had sex and consumed alcohol in the past year (Eaton, Thompson, et al., 2015; Rodriguez-Seijas, Arfer, Thompson, Hasin, & Eaton, 2017). Participant ages ranged from 20 to > 90 years and were 58% female. Participants self-identified race/ethnicity, including: non-Hispanic White (70.9%), Hispanic/Latino (11.6%), non-Hispanic Black (11.1%), Asian/Pacific Islander (4.3%), and Native American (2.2%). NESARC data were weighted to represent the age, racial/ethnic, and gender distributions of the adult United States population based on the 2000 Census. NESARC research protocol, including informed consent, received full ethical review and approval from the Census Bureau and Office of Management and Budget.

Internet sample. Data were from a sample of 1001 individuals who completed an Internet survey about sexuality on Amazon Mechanical Turk (MTurk) in 2014. Mturk is a data collection website where Internet users volunteer to participate in online tasks and in exchange are compensated with a small monetary award ($2 for the current study). Mturk participants tend to pay better attention to quality assurance manipulations than college subject pool participants (Hauser & Schwarz, 2016), which were utilized in the current study, indicating that Mturk participants provide high quality data, including in the current sample. Previous research has found Mturk samples to provide data comparable in quality to those using more traditional data collection methods (e.g., paper and pencil; laboratory sessions), and Mturk samples also tend to be more demographically diverse (Buhrmester, Kwang, & Gosling, 2011; Gosling, Vazire, Srivastava, & John, 2004). This study was approved by the Stony Brook University Institutional Review Board.

Given small cell sizes when stratifying by sex and sex-related substance use, only cisgender (i.e., non-transgender) individuals were included in analyses. That is, individuals who did not identify as either cisgender male or cisgender female ($n = 12$) were excluded from the current analyses. After quality control exclusion rules were applied,[1] an analytic sample of $N = 936$

[1] We used three methods to ensure quality of the data and derive an analytic sample. First, we removed subjects who completed the task in fewer than seven minutes ($n = 46$), which was suggestive of careless responding (median completion time = 13 min). Second, we repeated two items (about appealingness of two sexual behaviors; not included in the current study) scored on a seven-point Likert-type scale throughout the survey, and we removed participants whose responses to both item pairs differed by three or more scale points ($n = 5$),

(49% female) was analyzed. Participants' ages ranged from 18 to 82 years (median = 31). Participants could choose more than one race/ethnicity category, which we reflected here, and self-identified as 80% White, 10% Black, 8% Asian, 6% Hispanic, and 2% Native American.

2.2. Measures

Regular sex-related alcohol use. In the NESARC, drinking before sex was assessed with the question: "During the past year, how often did you drink alcohol before having sex?". Response options were on a 5-point Likert-type scale, including "never" (1), "rarely" (2), "sometimes" (3), "most of the time" (4), and "always" (5). In the Internet sample, drinking before sex was assessed with the question: "How often do you use alcohol shortly before having sex?" Response options were on a 5-point Likert-type scale, including "never" (1), "rarely" (2), "sometimes" (3), "usually" (4), and "always" (5). In accordance with previous research which established an empirical cut-point for regular sex-related alcohol use (Eaton, Thompson, et al., 2015; Thompson, Eaton, Hu, Grant, & Hasin, 2014), responses were dichotomized to reflect regular (i.e., responses more frequent than sometimes) versus normative (i.e., responses sometimes, rarely, and never) alcohol use before sexual activity, yielding 615 (1.8%) regular sex-related alcohol users in the NESARC sample and 43 (4.6%) in the Internet sample.

Regular sex-related drug use. Regular sex-related drug use was not assessed in the NESARC. In the Internet sample, sex-related drug use was assessed with the item: "How often do you use drugs (not including caffeine, alcohol, or a medication prescribed to you, but including cannabis, cocaine, methamphetamine, poppers, etc.) shortly before or during sex?" Response options were on a 5-point Likert-type scale, including "never" (1), "rarely" (2), "sometimes" (3), "usually" (4), and "always" (5). Responses were similarly dichotomized to reflect regular versus normative substance use before sex, yielding 47 (5.1%) regular sex-related drug users.

Regular sex-related substance use. Internet sample participants who endorsed regular sex-related alcohol and/or drug use were collapsed into a superordinate sex-related *substance* use category for further analysis. This yielded a total of 83 regular sex-related substance users (8.9%). Endorsement rates of sex-related substance use for both samples are presented by sexual orientation and sex in Table 1.

Sexual orientation. The NESARC sexual orientation measures reported herein are based exclusively on Wave 2 data.

Identity. In the analytic sample of the NESARC, participants self-identified as heterosexual (n = 17,054; 97.5%), gay/lesbian (n = 227; 1.3%), and bisexual (n = 141; 0.8%). The remainder identified as unsure (n = 62; 0.4%) or was unknown (n = 9; 0.0%) and were excluded from analyses due to empty bivariate cells. Sexual orientation frequencies **in the** analytic sample were similar to those in the total sample of the NESARC at Wave 2 (heterosexual: n = 33,598, 97.0%; gay/lesbian: n = 335, 1.0%; bisexual: n = 242, 0.7%). In the Internet sample, participants self-identified as heterosexual (n = 737; 78.7%), bisexual (n = 126; 13.5%), and lesbian/gay (n = 43; 4.6%). The remainder (n = 30; 3.2%) self-identified as asexual, unsure, or provided a free response (e.g., pansexual) and were excluded from analyses due to empty bivariate cells.

Attractions. Although NESARC participants provided information on sexual attractions and behaviors, significant differences in timeframes and response options prevented making meaningful comparisons across samples and thus were not included in the present analyses. In the Internet sample, participants reported the extent to which they experienced feelings of sexual attraction to (1) men and (2) women, separately, on a 5-point Likert scale (1 = "not at all sexually attracted", 2 = "a little sexually attracted", 3 = "somewhat sexually attracted", 4 = "a good deal sexually attracted", 5 = "very sexually attracted"). For the purpose of the current study, we maintained the continuous coding, but responses were recoded such that the two attractions items reflected the extent to which each participant was sexually attracted to individuals of the (1) same or (2) opposite sex of the participant.

Behaviors. In the Internet sample, participants were asked to report the number of times that they engaged in sexual activity with (1) men and (2) women, separately, in the last twelve months. For the purpose of the current study, we maintained the continuous coding, but responses were recoded to reflect the number of times the participant engaged in sexual activity with individuals who were of the (1) same or (2) opposite sex of the respondent.

2.3. Statistical analyses

Analyses were conducted using Mplus version 8 (Muthén & Muthén, 1998–2017). All analyses of NESARC data incorporated the NESARC's complex design features (i.e., sample weights, primary sampling units, and stratification variables). First, in the NESARC sample, we examined the odds of reporting regular sex-related *alcohol* use for: (1) lesbian/gay and (2) bisexual versus heterosexual (reference group) participants using logistic regression. Using only the Internet sample, we examined the odds of reporting regular sex-related *substance* use—defined as reporting regularly engaging in sex-related alcohol and/or drug use—by sexual orientation identity (i.e., lesbian/gay and bisexual vs. heterosexual) using logistic regression. We further examined the associations between (1) attractions to, and (2) sexual behaviors with, members of the same- and opposite-sex and sex-related substance use. All analyses utilized logistic regression for the dichotomous sex-related substance use outcome (i.e., regular vs. normative use), a maximum likelihood estimator with robust standard errors, and were stratified by sex. Sexual attraction and behavior variables were mean centered. Of note, pairwise comparisons of sexual minority individuals by sex (e.g., gay men vs. bisexual men; gay men vs. lesbian women) were not possible due to small sample sizes of sexual minority men and women.

3. Results

Odds ratios (ORs) of regular sex-related alcohol use by sexual orientation utilizing the NESARC sample are presented in Table 2. ORs of regular sex-related substance use by sexual orientation, sexual attractions, and past year sexual behaviors utilizing the Internet sample are presented in Table 3. Visual depictions of the differences in endorsement rates for regular sex-related alcohol and drug use in the Internet sample are presented in Figs. 1 and 2, respectively.

3.1. Identity: nationally representative sample

Women. Lesbian women were more likely to report regular sex-related alcohol use (OR = 3.79, $p < .01$) compared to heterosexual women. Conversely, bisexual women did not differ from heterosexual women in rates of reporting regular sex-related alcohol use, although their unadjusted rates were markedly higher than those for lesbian and heterosexual women.

Men. Bisexual men were significantly more likely to report regular sex-related alcohol use than heterosexual men (OR = 2.51, $p < .05$), whereas gay men did not significantly differ from heterosexuals.

(*footnote continued*)
consistent with Tellegen's variable response inconsistency (VRIN) used in other measures (e.g., the Minnesota Multiphasic Personality Inventory-2 [MMPI-2]; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989; the Multidimensional Personality Questionnaire [MPQ]; Tellegen & Waller, 2008) to minimize inconsistent and random responding (see Tellegen, 1988). Third, participants were queried at the end of the study about the degree of honesty with which they responded to items, noting that this would not impact payment, and we removed any participants who reported being "somewhat honest" or less (n = 20). Due to small cell sizes, individuals who were asexual, unsure, or provided a free response were excluded from the analytic sample. Some participants met more than one exclusion criterion.

Table 1
Regular sex-related alcohol and drug use endorsement rates (n [%]) by sexual orientation and sex in the NESARC and internet samples.

Sexual Orientation	Regular Sex-related Alcohol Use				Regular Sex-related Drug Use	
	NESARC		Internet		Internet	
	Men	Women	Men	Women	Men	Women
	(n = 8699)	(n = 8792)	(n = 465)	(n = 459)	(n = 465)	(n = 459)
Heterosexual	394 (4.64)	195 (2.28)	22 (5.56)	11 (3.34)	16 (4.01)	13 (3.99)
Gay/Lesbian	10 (7.94)	1 (1.00)	5 (15.15)	3 (3.49)	4 (12.50)	10 (11.24)
Bisexual	3 (6.98)	8 (8.16)	1 (5.26)	1 (4.76)	1 (5.00)	2 (8.00)

Note. The NESARC only assessed sex-related alcohol use. The Internet sample assessed both sex-related alcohol and drug use.

Table 2
Odds ratios (ORs) of regular sex-related alcohol use by sexual orientation and sex in the NESARC sample.

Sexual Orientation	Regular Sex-related Alcohol Use			
	Men		Women	
	β	OR	β	OR
Gay/Lesbian	0.04	3.22	0.08*	3.79
Bisexual	0.06*	2.51	−0.06	0.35

Note. Heterosexuals served as the reference group for all comparisons.
*$p < .05$.

3.2. Identity: internet sample

Women. Compared to heterosexual women, lesbian and bisexual women were not more likely to report regular sex-related alcohol use. Bisexual women were more likely to report regular sex-related drug use compared to heterosexual women (OR = 3.05, $p < .01$), whereas lesbian women did not differ from heterosexual women. Bisexual women were more likely to report regular sex-related substance use relative to heterosexual women (OR = 2.45, $p < .05$); lesbian women did not differ from heterosexual women.

Men. Compared to heterosexual men, bisexual men were more likely to report regular sex-related alcohol (OR = 3.04, $p < .05$) *and* drug (OR = 3.42, $p < .05$) use. Gay and heterosexual men did not differ in rates of regular sex-related alcohol or drug use. Bisexual men were more likely to report regular sex-related substance use (OR = 2.88, $p < .05$) relative to heterosexual men, whereas gay men did not differ from heterosexual men.

3.3. Attractions: internet sample

Women. Women who reported higher levels of same-sex attractions were more likely to report regular sex-related drug (OR = 1.51, $p < .01$) and substance (OR = 1.49, $p < .001$) use, but not regular sex-related alcohol use. Women who reported higher levels of opposite-sex attractions were not associated with regular sex-related alcohol, drug, or substance use.

Men. Men who reported higher levels of same-sex attractions were more likely to report regular sex-related alcohol (OR = 1.44, $p < .05$), drug (OR = 1.73, $p < .01$), and substance use (OR = 1.58, $p < .01$). Conversely, men who reported higher levels of opposite-sex attractions were not associated with regular sex-related alcohol, drug, or substance use.

3.4. Behaviors: internet sample

Women. Women who reported higher levels of past year opposite-sex sexual behaviors were more likely to report regular sex-related alcohol use (OR = 1.76, $p < .01$). Women who reported higher levels of past year opposite-sex sexual behaviors (OR = 1.46, $p < .05$) and same-sex sexual behaviors (OR = 2.32, $p < .001$) were more likely to report regular sex-related drug use. Women who reported higher levels of past year opposite-sex sexual behaviors (OR = 1.53, $p < .01$) and same-sex sexual behaviors (OR = 2.27, $p < .001$) were more likely to report regular sex-related substance use.

Men. Men who reported higher levels of past year opposite-sex sexual behaviors (OR = 1.45, $p < .01$) and same-sex sexual behaviors (OR = 1.42, $p < .05$) were more likely to report regular sex-related alcohol use. Men who reported higher levels of past year opposite-sex

Table 3
Odds Ratios (OR) for Regular Sex-Related Substance, Alcohol, and Drug Use, by Sexual Orientation Dimension and Sex in the Internet Sample.

Sexual Orientation Dimension	Substance Use				Alcohol Use				Drug Use			
	Men		Women		Men		Women		Men		Women	
	β	OR	β	OR	β	OR	β	OR	β	OR	β	OR
Identity												
Gay/Lesbian	0.02	1.21	0.10	2.29	−0.06	0.94	0.37	1.45	0.23	1.26	0.93	2.53
Bisexual	0.15*	2.88	0.19*	2.45	1.11*	3.04	0.04	1.05	1.23*	3.42	1.11*	3.05
Attractions												
Opposite-Sex Attractions	0.05	1.14	0.13	1.25	0.01	1.01	0.38	1.47	0.33	1.39	0.15	1.16
Same-Sex Attractions	0.28***	1.58	0.30***	1.49	0.36*	1.44	0.20	1.22	0.55**	1.73	0.41**	1.51
Behaviors												
PY Opposite-Sex Behavior	0.24***	1.42	0.22*	1.53	0.37**	1.45	0.56**	1.76	0.31*	1.36	0.38*	1.46
PY Same-Sex Behavior	0.13*	1.38	0.24***	2.27	0.35*	1.42	0.34	1.40	0.29	1.34	0.84***	2.32

Note. PY = past year. Heterosexuals served as the reference groups for all comparisons of sexual orientation identity. ORs for attractions and behaviors should be interpreted as the odds of reporting regular sex-related substance use for a 1-unit increase in attractions/behaviors.
***$p < .001$.
**$p < .01$.
*$p < .05$.

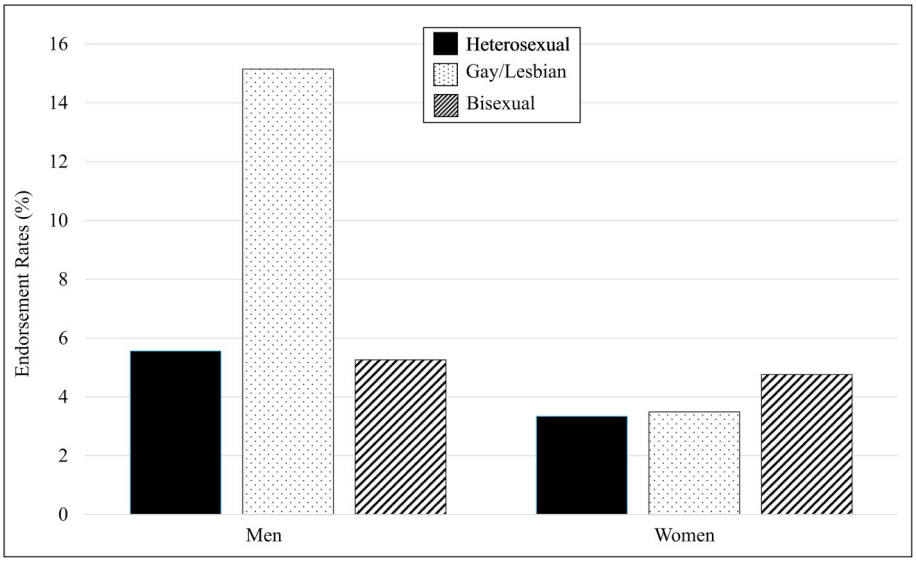

Fig. 1. Regular sex-related alcohol use endorsement rates by sexual orientation and sex in the Internet sample.

sexual behaviors were more likely to report regular sex-related drug use (OR = 1.36, $p < .05$). Men who reported higher levels of past year opposite-sex sexual behaviors (OR = 1.42, $p < .001$) and same-sex sexual behaviors (OR = 1.38, $p < .05$) were more likely to report engaging in regular sex-related substance use.

4. Discussion

We explored associations between sexual orientation and sex-related substance use, implementing a nuanced examination of how the odds of reporting regular sex-related alcohol and drug use differ—when compared to heterosexuals—as a function of sexual minority subgroup. These results correspond with previously reported findings of increased risk for regular sex-related alcohol use among sexual minority individuals compared to heterosexuals (Gilbert et al., 2015), and further expanded upon these findings by showing that, across both a nationally representative and Internet sample, results differ by sexual minority subgroup and dimension of sexual orientation. These findings underscore the importance of utilizing nuanced conceptualization of sexual minority status in public health research to better understand the negative psychosocial health outcomes and the potential pathways by which they may be conferred among sexual minority populations.

4.1. The importance of attending to nuances within sexual minority populations

Our results illustrate the importance of the conceptualization of sexual orientation used in sexual orientation-related psychosocial health outcomes. Analyzing sexual orientation dichotomously (sexual minority vs. heterosexual) may obscure important differences between gay/lesbian and bisexual persons compared to heterosexuals. In the present study, bisexual men and women drove the effects in sexual minorities' increased odds of reporting regular sex-related alcohol and drug use compared to heterosexuals. Failure to account for these differences can lead to erroneous assumptions about the health of sexual minority individuals. Indeed, emerging research examining within-group differences in sexual minority populations has revealed that bisexual individuals are at elevated risk for myriad mental and physical health conditions. For instance, bisexuals were 1.44 and 2. 4 times more likely to report depression compared to lesbian/gay and heterosexual

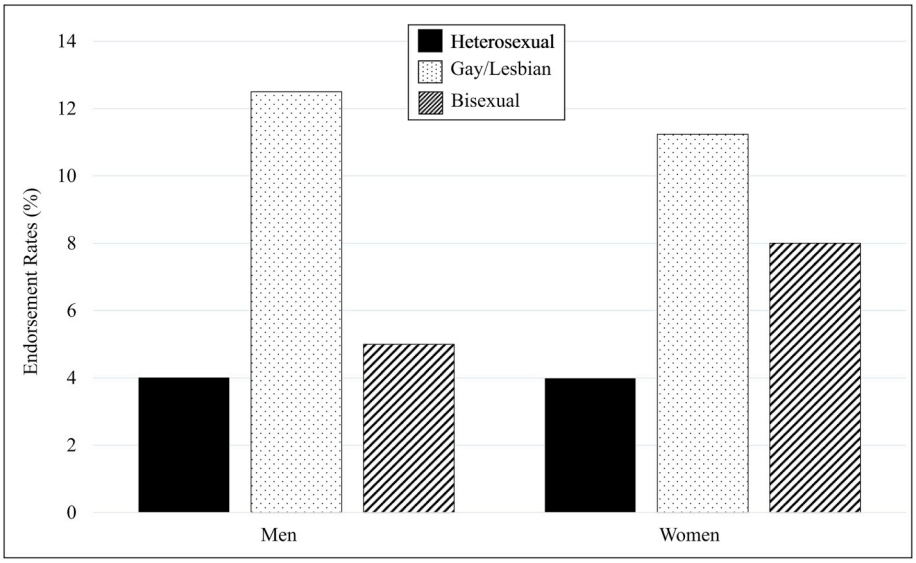

Fig. 2. Regular sex-related drug use endorsement rates by sexual orientation and sex in the Internet sample.

participants, respectively, and were 1.6 and 3.3 times more likely to report current anxiety compared to lesbian/gay and heterosexual participants. Bisexual women demonstrate similar differential findings for risk of physical health conditions, such as arthritis, cardiovascular disease, gastrointestinal conditions, and liver disease, relative to other sexual minority subgroups (Dyar et al., 2018).

4.2. Unique stressors faced by bisexual individuals

Understanding factors related to elevated negative psychosocial health outcomes among bisexual populations is important. Bisexual individuals experience unique stressors related to their sexual orientation from both heterosexual and sexual minority communities (Bostwick & Hequembourg, 2014; Dodge et al., 2016; Hayfield, Clarke, & Halliwell, 2014). Examples of negative stereotypes that persist about bisexual individuals include the beliefs that bisexuals are sexually adventurous, promiscuous, obsessed with sex, desire multiple sex partners as well as group sex activities, and suffer from STIs (Brewster & Moradi, 2010; Friedman et al., 2014). Although sexual minority acceptance is on the rise (Gallup, 2015), a recent study revealed that a majority of U.S. adults either explicitly agree with, or fail to reject, these negative bisexual stereotypes (Dodge et al., 2016). Bisexual individuals notice this, with most reporting weekly negative experiences of being stereotyped as highly sexual or likely to have an STI (Dyar & London, 2018).

Considering these stereotypes and their prevalence, sexual contexts may elicit concerns about rejection by sexual partners or sexual coercion for some bisexual individuals. Many heterosexual and sexual minority individuals, including other bisexuals, express an unwillingness to engage romantically or sexually with bisexual persons (Feinstein, Dyar, Bhatia, Latack, & Davila, 2014; Li, Dobinson, Scheim, & Ross, 2013). Bisexual individuals' awareness of this increases their concerns about rejection from potential and actual romantic and sexual partners (Bostwick & Hequembourg, 2014; Hayfield et al., 2014; Hequembourg & Brallier, 2009; Li et al., 2013), and sensitivity to rejection based on one's sexual orientation is associated with higher rates of risky sexual behaviors (Pachankis et al., 2015; Rendina et al., 2017; Wang & Pachankis, 2016) and substance use (Pachankis et al., 2014). Additionally, bisexual women frequently report feeling pressured to engage in sex and other sexual activities, such as having sex with multiple partners, with which they are uncomfortable or do not wish to participate (Hequembourg & Brallier, 2009; Kelley et al., 2018; Li et al., 2013), and subsequently report using alcohol to cope with these negative sexual experiences (Hauser & Schwarz, 2016). Furthermore, bisexual individuals have also commonly experienced other types of victimization, including childhood sexual abuse and adult sexual assault (Conron, Mimiaga, & Landers, 2010; Rothman, Exner, & Baughman, 2011; Walters, Chen, & Breiding, 2013)—all of which are associated with higher risk for sex-related substance use (Arreola, Neilands, & Díaz, 2009; Brennan, Hellerstedt, Ross, & Welles, 2007; Lloyd & Operario, 2012; Paul, Catania, Pollack, & Stall, 2001). Therefore, concerns about rejection and the potential for sexual coercion and victimization may increase the likelihood of engaging in sex-related substance use among bisexual individuals as a means of coping with these stressors.

Contending with the negative stereotypes about bisexuality might also lead to internalized binegativity among bisexual individuals, providing another explanation of elevations in sex-related substance use among bisexuals. Internalizing negative societal messages about one's sexual minority status is positively associated with risky sexual behaviors (Smith, Mohr, & Ross, 2018) and substance use problems (Brubaker, Garrett, & Dew, 2009; Green & Feinstein, 2012; Pachankis et al., 2014), as well as sex-related substance use (Bruce, Ramirez-Valles, & Campbell, 2008). Substance use during sex can serve to reduce internalized negativity, ease anxiety about social rejection, and overcome sexual inhibitions arising from internalized negativity (Kashubeck-West & Szymanski, 2008; Pachankis, 2014; Pollard, Nadarzynski, & Llewellyn, 2018). Notably, bisexual individuals tend to have higher levels of internalized negativity than lesbian/gay individuals (Balsam & Mohr, 2007; Dyar, Feinstein, & London, 2015). Taken together, the unique stressors faced by bisexual individuals may drive differences in sex-related substance use, as well as other psychosocial health disparities. Future research should examine potential mechanisms and pathways that may help to explain bisexuals' higher rates of regular sex-related substance use.

4.3. Multidimensional nature of sexual orientation

While most studies of health outcomes among sexual minority populations rely on respondents' reports of sexual orientation identity, we expanded upon previous findings to show that same-sex attractions and behaviors are also related to increased odds of reporting regular sex-related substance use. Findings highlight that attending to the multiple dimensions of sexual orientation bears important implications. Individuals commonly have same-sex sexual attractions and/or engage in same-sex sexual behaviors without identifying as lesbian, gay, or bisexual (Laumann, 1994). Nonetheless, these individuals may not be immune to the unique psychosocial stressors faced by sexual minority communities. Indeed, according to our findings, increased reported same-sex attraction—for both men and women—is associated with higher likelihood of engaging in one risky sexual behavior (sex-related substance use). When it comes to behavior, greater relative sexual behavior—regardless of the sex one's sexual partner—is associated with higher odds of reporting regular sex-related substance use. Further research into the mechanisms associated with sexual attraction and behavior, and risky sexual practices remains warranted.

4.4. Limitations and future research

This study is not without limitations. First, the Internet sample had comparatively small numbers of sexual minority individuals compared to the NESARC; and second, the Internet sample was one of convenience and was not population-based, thus limiting generalizability. That said, our ability to compare and contrast findings for regular sex-related alcohol use between the NESARC and Internet sample somewhat ameliorates these concerns, highlighting in the comparisons that sexual orientation subgroups evinced similar patterns among the men. Nevertheless, no data exist documenting sex-related drug and/or substance use at the population level, preventing us from testing this construct in the NESARC. Taken together, our results investigated a critical area of sexual orientation-related disparities research. Future research should expand upon our findings to assess sex-related substance use using large, population-based samples that include more individuals identifying as non-heterosexual across dimensions of sexual orientation.

Third, although we examined differences in sex-related alcohol and drug use separately within the Internet sample, these results must be considered preliminary. Due to the small number of sexual minority individuals reporting regular sex-related alcohol and drug use—particularly among gay men and lesbian women—these findings require replication with larger sample sizes before generalizations about population health can be made. Also due to small sample sizes of sexual minority men and women, the current study did not compare differences in rates of sex-related alcohol and drug use *among* sexual minority subgroups (e.g., bisexual men vs. bisexual women; gay men vs. bisexual men). Future research would benefit from exploring the differences potential differences in frequency of regular sex-related substance use within sexual minority populations.

Finally, extant literature has failed to assess important correlates regarding sex-related substance use, including amount and number of specific substances consumed, negative consequences, such as failure to practice safer sex (e.g., condom use), increased HIV/STI risk, and unwanted pregnancies, as well as participants' motivations and

expectancies for engaging in sex-related substance use (e.g., coincidentally drank a glass of wine at dinner before sex vs. drank a bottle of wine to feel comfortable having sex). Previous evidence has shown that enhancement and coping motives of substance use are associated with distinct behavioral patterns and outcomes (Carpenter & Hasin, 1998; Cooper, Frone, Russell, & Mudar, 1995). For instance, coping expectancies of substance use, such as for relief or self-inflation, are positively associated with consumption levels, problems related to substance use, and substance dependence (Buckner, 2013; Carpenter & Hasin, 1998; DeMartini & Carey, 2011; Lac & Brack, 2018). Given sexual minority individuals are already at higher risk for problematic alcohol and substance use (Drabble et al., 2005; McCabe et al., 2009; Pachankis et al., 2014), it is essential that future research assess individuals' sexual orientation, the level and number of substances consumed, and motivations for engaging in substance use when examining sex-related substance use.

5. Conclusion

Sex-related substance use is associated with a host of detrimental outcomes. Nonetheless, millions of American adults *regularly* engage in sex-related alcohol use, thus increasing their risk, yet no nationally representative data exist regarding rates of regular sex-related alcohol and/or drug use. Additionally, previous studies suggest sexual minority individuals use substances in sexual contexts at higher rates than heterosexuals, however, none have included dimensions or subgroups of sexual orientation. Our study indicates that bisexual men and women were more likely to regularly use substances in sexual contexts than heterosexual men and women. These findings highlight a critical area on which to focus public health efforts and also illustrate the importance of including nuanced and multidimensional assessments of sexual orientation when investigating sexual orientation-related psychosocial health disparities. Future research should examine the possibility that unique stressors faced by bisexual individuals may interact synergistically to compromise their health.

Declarations of interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2018.12.012.

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