

# Do Substance Use Norms and Perceived Drug Availability Mediate Sexual Orientation Differences in Patterns of Substance Use? Results from the California Quality of Life Survey II

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**ABSTRACT. Objective:** Illicit drug and heavy alcohol use is more common among sexual minorities compared with heterosexuals. This difference has sometimes been attributed to more tolerant substance use norms within the gay community, although evidence is sparse. The current study investigated the role of perceived drug availability and tolerant injunctive norms in mediating the linkage between minority sexual orientation status and higher rates of prior-year substance use. **Method:** We used data from the second California Quality of Life Survey (Cal-QOL II), a followback telephone survey in 2008–2009 of individuals first interviewed in the population-based 2007 California Health Interview Survey. The sample comprised 2,671 individuals, oversampled for minority sexual orientation. Respondents were administered a structured interview assessing past-year alcohol and illicit drug use, perceptions of perceived illicit drug availability, and injunctive norms concerning illicit drug and

heavier alcohol use. We used structural equation modeling methods to test a mediational model linking sexual orientation and substance use behaviors via perceptions of drug availability and social norms pertaining to substance use. **Results:** Compared with heterosexual individuals, sexual minorities reported higher levels of substance use, perceived drug availability, and tolerant social norms. A successfully fitting model suggests that much of the association between minority sexual orientation and substance use is mediated by these sexual orientation–related differences in drug availability perceptions and tolerant norms for substance use. **Conclusions:** Social environmental context, including subcultural norms and perceived drug availability, is an important factor influencing substance use among sexual minorities and should be addressed in community interventions. (*J. Stud. Alcohol Drugs*, 73, 675–685, 2012)

ACCUMULATING EVIDENCE SHOWS THAT individuals with minority sexual orientation, regardless of their gender, tend to have higher rates of illicit drug and heavy alcohol use than do their same-gender heterosexual counterparts (Burgard et al., 2005; Cochran et al., 2000, 2004; Drabble et al., 2005; Gruskin et al., 2001; Hughes et al., 2010; McCabe et al., 2009; McLaughlin et al., 2010; Talley et al., 2011). Several population-based studies have reported higher rates of illicit drug and alcohol use and problem drinking among homosexually active women compared with exclusively heterosexual women, even after controlling for differences in sociodemographic characteristics (Burgard et al., 2005; Cochran et al., 2000, 2004; Drabble et al., 2005; Gruskin et al., 2001; Hughes et al., 2010; McCabe et al., 2009; McLaughlin et al., 2010; Talley et al., 2011). Further, a population-based survey of women

ages 18–29 in low-income neighborhoods in northern California found that women who reported having both male and female sexual partners had significantly higher rates of injection drug use compared with others (Scheer et al., 2002). Similarly, studies conducted with men who have sex with men have observed elevated rates of substance use disorders (Cochran et al., 2004; McCabe et al., 2009; Talley et al., 2011). For example, Stall and colleagues (2001) found that men who have sex with men, including gay and bisexual identified men, recruited from four urban areas nationally, had elevated levels of alcohol-related problems and recreational drug use when compared with national rates found among men in general.

Several explanations have been posited for these sexual orientation–related differences (Cochran, 2001). Most often these disparities are attributed to a greater probability for exposure to antigay stigma and discrimination, both in childhood and as adults (Hamilton and Mahalik, 2009; Hughes et al., 2010; Mays and Cochran, 2001; Stall et al., 2003; Wilsnack and Wilsnack, 1995). Known as the “minority stress hypothesis” (Meyer, 2003; Stall et al., 2003), this perspective asserts that the higher rates of dysfunctional alcohol and illicit drug use found among lesbian, gay, and bisexual individuals are a direct or indirect consequence of social disadvantage.

Received: January 2, 2012. Revision: February 28, 2012.

This study was supported by National Institute on Drug Abuse Grant R01-DA 20826 and National Center for Minority Health and Health Disparities Grant P60-MD 000508.

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However, there may be additional reasons for these differences. Elsewhere, studies have demonstrated consistent evidence of neighborhood and community influence on substance use behaviors and attitudes. For example, there is a positive relationship between neighborhood alcohol outlet density and social norms regarding alcohol use, as well as rates of alcohol consumption (Scribner et al., 2000). In this regard, the social organization of a visible gay and lesbian community, traditionally centered on "gay bars" and social outlets, may encourage the use of alcohol and illicit drugs (Green and Feinstein, 2011; Simon Rosser et al., 2008). The effect may be to create a climate of tolerant injunctive social norms surrounding substance use in which illicit drugs are, in turn, more readily available. *Injunctive norms* refer to people's perceptions that the behaviors in question are either socially approved or disapproved (Schultz et al., 2007). Indeed, Stall and colleagues (2003) have underscored that illicit substance use is woven into a pattern of socializing and sexual practices among young gay and bisexual men living in an urban gay male culture, implying a milieu in which substance use is seen as normative.

Consistent with this view, some types of drug use have become essentially institutionalized within "gay culture," including use of inhalants ("poppers"), "club drugs," and methamphetamines, all of which are also associated with high-risk sexual behavior among men who have sex with men (Ober et al, 2009; Ostrow et al., 2009). Trocki and colleagues (2005) observed that women who reported histories of same-gender sexual partners spent more time in bars and party settings than exclusively heterosexual women and that sexual minority women also consumed more alcohol in these settings. However, the same study also found contradictory evidence with regard to men. Specifically, rates of heavy drinking among men did not vary by sexual orientation across settings, even though gay men spent more time in bars than bisexual and heterosexual men did.

Some researchers (Cochran, 2001; Green and Feinstein, 2011; McKirnan and Peterson, 1989) have speculated that tolerant norms regarding drug use are endemic among sexual orientation minorities, particularly among those living in areas of higher gay density. In one study of more than 700 gay men living in New York City, men with more "gay-centric" networks had higher rates of substance use (Carpiano et al., 2011). Another study of gay men who had moved to a gay resort area in South Florida found that those who had lived in the area for 1 year or longer had higher levels of risky behaviors and more drug-using friends compared with newer arrivals (Egan et al., 2011). Thus, adoption of gay identity and acculturation within a gay-identified community may increase one's exposure to more tolerant social norms regarding drug use. Further, these tolerant norms may be especially influential for individuals who are more vulnerable to the effects of stress, such as from genetic disposition, high rates of cumulative exposure to stressors, or lack of adaptive coping

skills (Cicchetti et al., 2007; Heffernan, 1998; Kendler et al., 2011; McKirnan and Peterson, 1988, 1989).

In the current study, we investigated the nature of the relationships among sexual orientation, perceived availability of illicit drugs, and tolerant injunctive social norms regarding substance use. To do so, we used data available from the second California Quality of Life Survey (Cal-QOL II). We hypothesized that the frequently observed association between minority sexual orientation and higher rates of substance use is, at least in part, mediated by both higher rates of perceived drug availability and more tolerant injunctive social norms regarding substance use among sexual minorities compared with their heterosexual counterparts.

## Method

### Overview

Participants in Cal-QOL II were drawn from 5,000 eligible persons systematically selected from nearly 49,000 adult respondents in the population-based 2007 California Health Interview Survey (CHIS; CHIS, 2009). Both surveys were structured telephone interviews. The parent random-digit-dial CHIS survey received approval from three entities: the University of California, Los Angeles (UCLA), Institutional Review Board; the California Health and Human Services Agency; and the Westat Institutional Review Board. All participants provided anonymous responses. Cal-QOL II eligibility comprised the following: 18–70 years of age at the time of the CHIS interview (the group eligible for CHIS sexual orientation assessment), interviewed in English or Spanish (98% of CHIS interviewees), and agreement to be re-contacted for future health surveys (91% of language-eligible respondents). From this list, we divided the sampling frame into two strata. One stratum, selected with certainty, included all who reported in CHIS a lesbian, gay, or bisexual identity and/or a same-gender sexual partner in the year before the interview ( $n = 1,387$ ). From the second stratum, we selected 3,613 individuals proportional to their representation in the California population, except for oversampling African Americans. Permission to interview these individuals received approval from the CHIS Data Disclosure Review Committee and the UCLA and Westat Institutional Review Boards.

The 2007 CHIS response rate was 21.1%, consistent with other recent random-digit-dial telephone interviews (Burgard et al., 2005; National Center for Chronic Disease Prevention and Health Promotion, 2005; Simon et al., 2001) including the 2007 California Behavior Risk Factor Surveillance System survey (18.7%) (CHIS, 2009). Of the 5,000 potential respondents, 65 were deemed ineligible (e.g., moved out of California, deceased). However, 2,815 were successfully interviewed between August 2008 and January 2009 in either English or Spanish for a Cal-QOL II-specific response rate of 57%.

### Sample

We excluded 144 of the 2,815 Cal-QOL II respondents who were administered a shortened interview as part of an embedded refusal conversion experiment; this shortened instrument omitted norm-related questions. Thus, our final sample size was 2,671. The mean age of the unweighted sample was 46.5 years ( $SD = 13.6$  years). Approximately 51% of participants were female. Respondents reported diverse ethnic/racial backgrounds including 545 Hispanics and, among non-Hispanics, 1,539 Whites, 398 African Americans, 157 Asian Americans, and 32 American Indian/Alaskan Natives.

### Interview

Respondents were administered a fully structured, computer-assisted telephone interview by extensively trained lay interviewers. Assessments included the following:

*Sexual orientation.* Individuals were asked the genders of their sexual partners since age 18 and in the year before the interview. Next, they were asked whether they considered themselves heterosexual or straight, lesbian (for women) or gay, or bisexual. We used this information to categorize respondents into one of two groups: exclusively heterosexual (heterosexual identity and only different-gender sexual partners, if any, since age 18 reported;  $n = 1,877$ ) and sexual orientation minority (lesbian, gay, or bisexual identity [ $n = 719$ ] or a history of same-gender sexual partners since age 18 [ $n = 75$ ]). Finally, to assess sexual orientation-related discrimination, respondents were asked, "Sometimes people are treated badly or unfairly because of their sexual orientation. How often has that happened to you?" Answer options included 1 = *never*, 2 = *rarely*, 3 = *sometimes*, and 4 = *often*.

*Substance use.* Respondents answered questions about their alcohol and drug use in the 12 months before the interview. Those who reported consuming five or more alcoholic drinks in a single drinking occasion on a weekly basis were coded as heavier drinkers. Individuals were also queried about past-year use of marijuana or hashish and 10 other classes of drugs. Six of these were illicit drugs: cocaine or crack, methamphetamine, heroin, hallucinogens, synthetic or club drugs, and inhalants. Four included drugs available by prescription (analgesics, tranquilizers, stimulants, and sedatives) but specified in the interview as being used either without prescription or in greater amounts than prescribed. From this, we coded two variables: past-year use of marijuana specifically (yes/no) and past-year illicit use of any other drug (yes/no).

*Perceived drug availability.* The survey included three questions drawn from the 2007 National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration Office of Applied Studies, 2008) as-

sessing perceived drug availability. Specifically, respondents were asked, "How difficult or easy would it be for you to get some (specified drug), if you wanted some?" The three specified drugs were marijuana; cocaine; and lysergic acid diethylamide (LSD), crystal methamphetamine ("crystal meth"), or other hallucinogens. Answers were given on a 5-point scale: 1 = *probably impossible*, 2 = *very difficult*, 3 = *fairly difficult*, 4 = *fairly easy*, and 5 = *very easy*.

*Injunctive norms.* Four questions assessed injunctive norms pertaining to heavy drinking and illicit drug use. These questions were adapted from the 2007 National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration Office of Applied Studies, 2008). Specifically, respondents were asked, (a) "How do you feel about someone your age having four or five drinks of an alcoholic beverage nearly every day?" (b) "How do you feel about adults trying marijuana or hashish once or twice?" (c) "How do you feel about adults trying cocaine?" and (d) "How do you feel about adults trying LSD, crystal meth, or other hallucinogenic drugs?" Responses were recorded on a 3-point scale: 1 = *strongly disapprove*, 2 = *somewhat disapprove*, or 3 = *neither approve nor disapprove*.

*Personal demographics.* The interview also assessed respondents' age, gender, educational attainment, race/ethnicity, relationship status, and urban residency. We coded age into five categories (18–29 years, 30–39 years, 40–49 years, 50–59 years, and 60–72 years), educational attainment into five categories (less than high school, high school degree, some college, college degree, and graduate education), race/ethnicity into two categories (non-Hispanic White, racial/ethnic minority), relationship status into two groups (married or cohabiting, other), and urban residency into two classifications (lives in urban metropolitan statistical area, other).

### Data analysis

Data were analyzed using SAS Version 9.2 (SAS Institute Inc., Cary, NC) and MPlus (Muthén and Muthén, 2007) using weights to adjust for selection probability and survey nonresponse. In the first group of analyses, we used Wald chi-square tests to evaluate anticipated sexual orientation-related differences in demographic characteristics and frequency of sexual orientation-related maltreatment. Both demographic characteristics (gender, age, race/ethnicity, educational attainment, relationship status, and residency location) and perceived maltreatment were then treated as possible study confounders because of previous research suggesting their association both with alcohol and drug use (Brady and Randall, 1999; Johnson and Gerstein, 1998; Mays and Cochran, 2001) and sexual orientation in population-based surveys (Cochran, 2001; Cochran et al., 2000; Gilman et al., 2001) similar to the Cal-QOL II. We also evaluated sexual orientation-related differences in the individual indicators of perceived availability of illicit

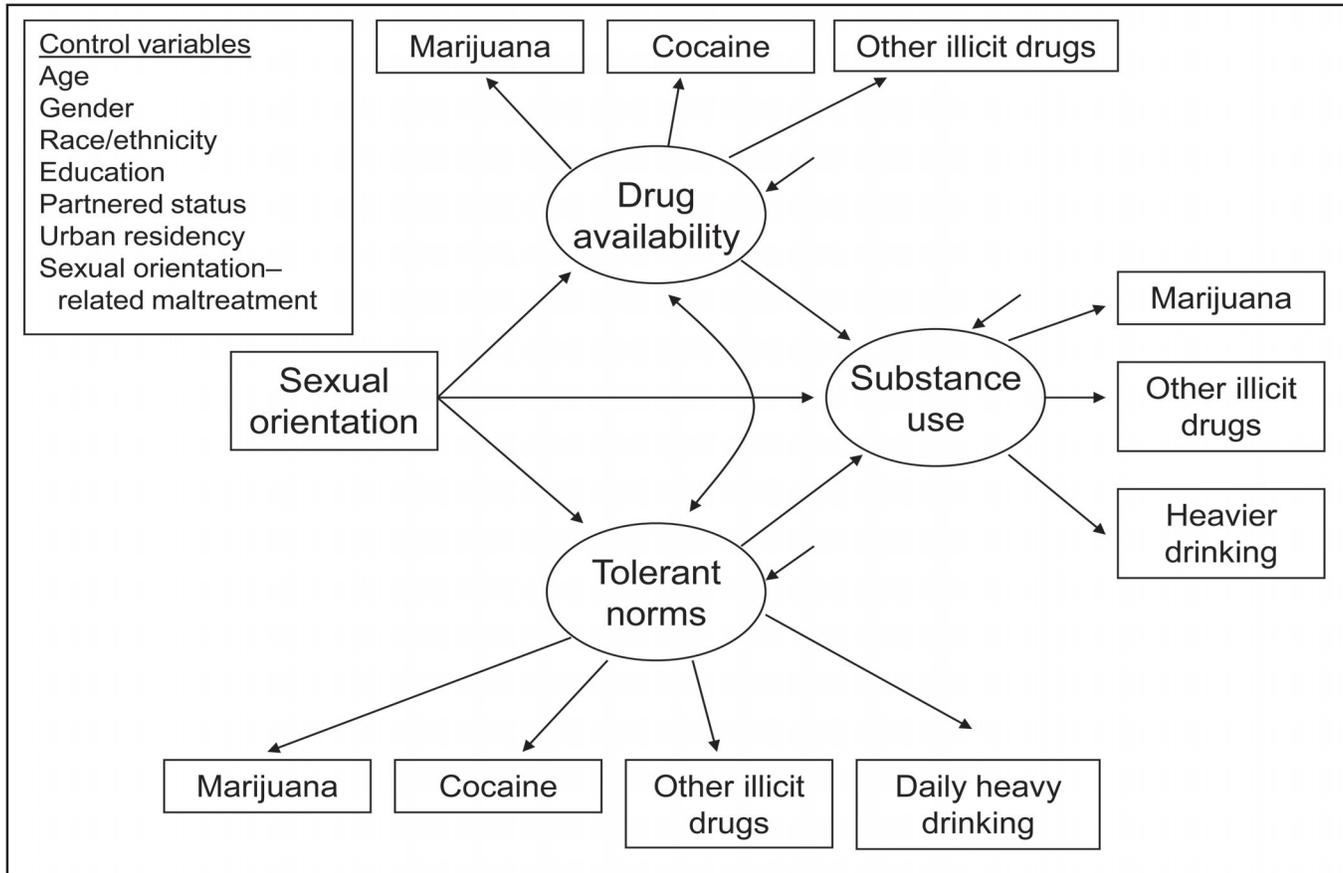


FIGURE 1. Mediation model of sexual orientation, perceived drug availability, tolerant norms, and past-year substance use

drugs, tolerant injunctive norms, and substance use using either Wald  $F$  tests or Wald chi-square tests, as appropriate.

Next, we used structural equation modeling (SEM) methods with weighted least squares (WLS) estimators to build and test both fit and parameters of three possible mediational models linking sexual orientation to substance use patterns (Figure 1). In the general model, the predictive association between sexual orientation and substance use was hypothesized to result from both direct and indirect pathways via perceived drug availability and tolerant injunctive norms. As an initial step, we first investigated, independently, the fit of three measurement models indexing the hypothesized latent constructs of drug availability, tolerant substance use norms, and substance use behaviors. After obtaining assurance that these models had satisfactory properties, we then investigated bivariate associations (polychoric correlations) between the three latent variables and both sexual orientation and possible confounders. Statistical testing was accomplished by use of the critical ratio (CR) test ( $\text{estimate} / SE$ ), which has an approximate Gaussian distribution. Those variables evidencing an association consistent with  $p < .20$  with a particular latent variable were retained for the subsequent modeling steps.

Finally, we estimated the fit of three variants of structural

relationships between sexual orientation status and the latent construct of substance use. In the first model, we evaluated a mediational model where drug availability alone is the link between sexual orientation and substance use. In the second model, we hypothesized that injunctive norms alone mediate the link between sexual orientation and substance use. Moreover, in the third model, we hypothesized that both factors function as conjoint mediators. In all model testing steps, models were evaluated for fit, or their ability to capture the covariance structure of the data, using three fit indices: the comparative fit index (CFI; Bentler, 1990), the Tucker-Lewis index (TLI; Brown, 2006), and the root mean square error of approximation (RMSEA; Steiger, 1990). CFI and TLI values above .95 and RMSEA values below .05 are consistent with a good fitting model (Hu and Bentler, 1999). We also report the model chi-square statistic. Although a nonsignificant chi-square is also consistent with model fit, this statistic is particularly sensitive to small departures from expected values in large sample sizes, such as the one used in the current study (Kline, 2011). Tests of structural parameters, including a comparison of mediation effects between perceived drug availability and tolerant injunctive norms, were conducted using CR tests. We also estimate mediation ratios (Ditlevsen et al., 2005) for structural relationships testing mediational

TABLE 1. Characteristics of respondents in the second California Quality of Life Survey by sexual orientation: Weighted percentages and standard errors shown

Demographic characteristics	Exclusively heterosexual (unweighted $n = 1,877$ )		Sexual orientation minority (unweighted $n = 794$ )	
	%	(SE)	%	(SE)
Female	51.5	(1.3)	57.1	(3.7)
Age, in years***				
18–29	23.8	(1.2)	12.2	(1.8)
30–39	21.1	(1.1)	21.6	(3.1)
40–49	23.1	(1.1)	29.4	(3.8)
50–59	18.5	(1.0)	24.7	(3.4)
60–72	13.6	(0.8)	12.1	(2.4)
Education***				
<High school degree	14.0	(1.0)	6.6	(2.2)
High school degree	23.1	(1.1)	12.8	(2.4)
Some college	25.4	(1.2)	27.5	(3.3)
College degree	22.1	(1.1)	31.4	(3.8)
Graduate school	15.4	(0.9)	21.7	(3.0)
Married/cohabiting***	63.8	(1.3)	48.5	(3.9)
Race/ethnicity***				
Non-Hispanic White	48.1	(1.3)	74.5	(3.2)
Other	51.9	(1.3)	25.5	(3.2)
Urban residency	97.1	(0.4)	93.7	(2.5)
Sexual orientation–related maltreatment***				
Never	92.1	(0.8)	53.4	(3.8)
Rarely	6.6	(0.3)	27.6	(3.3)
Sometimes	1.2	(0.6)	15.2	(1.7)
Often	0.1	(0.7)	3.8	(0.8)

Notes: Where relevant, percentages sum to 100% except for rounding error. Statistical significance evaluated by Wald chi square tests.

\*\*\* $p < .001$ .

hypotheses. The mediation ratio (MR) is the ratio of estimated indirect effects to the sum of estimated direct and indirect effects, or the total effect. This ratio represents the percentage change in regression coefficients when a hypothesized mediating variable is included in the model. Significance of all tests, other than adequacy of model fit, was evaluated at  $p < .05$ . All reported confidence intervals (CIs) are at 95%.

## Results

### Background differences by sexual orientation

Approximately 4.5% (CI [3.9, 5.3]) of the weighted respondents reported any markers of minority sexual orientation, including identifying as lesbian, gay, or bisexual (2.4%, CI [2.2, 2.8%]) or indicating a positive adult history of same-gender sexual partners (2.1%, CI [1.5, 2.8%]). As shown in Table 1, sexual minorities were generally older,  $\chi^2(4) = 5.52, p < .001$ , and more educated,  $\chi^2(4) = 6.41, p < .001$ ; were less likely to be married or cohabiting,  $\chi^2(1) = 14.06, p < .001$ ; and were more likely to be non-Hispanic White,  $\chi^2(1) = 42.10, p < .001$ . As expected, compared with heterosexuals, sexual minorities also reported more frequent experiences with being treated badly or unfairly because of their sexual orientation,  $\chi^2(3) = 54.56, p < .001$ .

Rates of substance use differed by sexual orientation in the expected directions (Table 2). Overall, sexual minorities

were significantly more likely than exclusively heterosexual persons to report having used marijuana,  $\chi^2(1) = 18.67, p < .001$ , or other illicit drugs,  $\chi^2(1) = 10.47, p = .001$ , and showed a trend to report greater prevalence of weekly heavier drinking,  $\chi^2(1) = 2.83, p = .09$ . Perceived illicit drug availability was also greater among sexual minorities, including reporting significantly greater ease of obtaining marijuana, Wald  $F(1) = 27.30, p < .001$ , or hallucinogenic drugs, Wald  $F(1) = 7.06, p < .01$ , but not cocaine, Wald  $F(1) = 1.02, p = .31$ . Compared with exclusively heterosexual persons, sexual minorities also evidenced significantly more tolerant injunctive norms concerning adults trying marijuana, Wald  $F(1) = 87.09, p < .001$ ; trying cocaine, Wald  $F(1) = 41.32, p < .001$ ; trying hallucinogenic drugs, Wald  $F(1) = 29.05, p < .001$ ; or engaging in daily heavy consumption of alcohol, Wald  $F(1) = 13.40, p < .001$ .

### Development of latent variables

We next investigated the fit of the three measurement models depicted in Figure 1 by evaluating associations among the indicators of hypothesized latent variables. The polychoric correlation matrix is given in Table 2. Overall, there were strong and significant correlations among the perceptions of drug availability and among norms related to heavy alcohol and drug use, with the strongest associations between cocaine and hallucinogens. Past-year marijuana use

TABLE 2. Weighted means and percentages by sexual orientation and polychoric correlations of key indicator variables in the model

Variable	Exclusively heterosexual			Sexual orientation minority			Polychoric correlations								
	<i>M</i>	%	<i>SE</i>	<i>M</i>	%	<i>SE</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.
Drug availability <sup>a</sup>															
1. Marijuana***	3.41		0.04	3.93		0.09	–								
2. Cocaine	2.69		0.04	2.80		0.09	.69***	–							
3. Hallucinogens*	2.46		0.03	2.76		0.10	.61***	.79***	–						
Injunctive norms <sup>b</sup>															
4. Marijuana use***	2.16		0.02	2.69		0.05	.30	.15	.13	–					
5. Cocaine use***	1.44		0.02	1.87		0.06	.20	.20	.16	.76***	–				
6. Hallucinogen use***	1.31		0.02	1.70		0.07	.17	.15	.19	.70***	.91***	–			
7. Frequent heavy drinking***	1.71		0.02	1.95		0.06	.12	.07	.10	.48***	.49***	.44***	–		
Past-year substance use															
8. Marijuana use***		8.6	0.8	22.9	3.1		.42	.17	.14	.58***	.33***	.33***	.23	–	
9. Other illicit drug use*		9.4	0.8	19.6	3.0		.22	.14	.12	.27	.22	.16	.04	.50***	–
10. Weekly heavy episodic drinking		5.8	0.6	9.5	2.1		.24	.10	.13	.14	.09	.15	.39***	.31***	.25***

Notes: Weighted means and percentages are shown. Results of significance testing evaluating differences between exclusive heterosexuals and sexual minorities are indicated next to the variable name. Results of tests of polychoric correlations are indicated next to estimate of the correlation.

<sup>a</sup>Measured on 5-point scale, where 2 = *very difficult*, 3 = *fairly difficult*, 4 = *fairly easy*; <sup>b</sup>measured on 3-point scale, where 1 = *strongly disapprove*, 2 = *somewhat disapprove*, 3 = *neither approve nor disapprove*.

\* $p < .05$ ; \*\*\* $p < .001$ .

was positively associated with perceptions of greater availability of marijuana, cocaine, and hallucinogens; past-year other illicit drug use was associated with past-year marijuana use. Past-year weekly heavy episodic drinking was associated with perceived tolerant norms regarding heavy drinking as well as past-year use of marijuana and other illicit drugs.

In the initial modeling step, we evaluated the adequacy of our three measurement models embedded in Figure 1. First, we hypothesized a single latent factor (drug availability) indexing the three measured indicators of perceived ease of obtaining marijuana, cocaine, or hallucinogenic drugs. This model had adequate fit to the data,  $\chi^2(1) = 15.197$ ,  $p < .001$  (CFI = 1.00; TLI = 1.00; RMSEA = .073). All estimated factor loadings were strongly positive (availability of cocaine loading fixed at 1.0; marijuana: 0.79,  $SE = 0.01$ ; hallucino-

gens: 0.86,  $SE = 0.01$ ). Next, we investigated the fit of the model indexing a latent factor of tolerant injunctive norms for substance use. Four measured indicators were used to define the factor; all were strong predictors of the construct (approval or disapproval of cocaine fixed at 1.0; hallucinogens: 0.91,  $SE = 0.01$ ; marijuana: 0.78,  $SE = 0.02$ ; alcohol: 0.53,  $SE = 0.02$ ). This model demonstrated an excellent fit to the covariance structure,  $\chi^2(2) = 18.98$ ,  $p < .001$  (CFI = 1.00; TLI = 1.00; RMSEA = .045). Finally, three indicators of substance use (past-year use of marijuana, past-year illicit use of other drugs, and heavier drinking with at least weekly frequency on average) successfully defined the third latent factor reflecting past-year substance use,  $\chi^2(1) = 1.24$ ,  $p = .266$  (CFI = 1.00; TLI = .99; RMSEA = .009). All indicators again were strongly related to the latent construct (marijuana

TABLE 3. Bivariate associations between latent factors and sexual orientation and potential control variables

Variable	Latent factors					
	Drug availability		Tolerant norms		Substance use	
	Estimate	( <i>SE</i> )	Estimate	( <i>SE</i> )	Estimate	( <i>SE</i> )
Sexual orientation minority	0.12***	(0.04)	0.34***	(0.04)	0.27***	(0.05)
Control variables						
Age	-0.16***	(0.03)	-0.00 <sup>n.s.</sup>	(0.03)	-0.25***	(0.04)
Female gender	-0.22***	(0.03)	-0.17***	(0.04)	-0.35***	(0.05)
Ethnic/racial minority <sup>a</sup>	-0.03 <sup>n.s.</sup>	(0.03)	-0.32***	(0.03)	-0.12*	(0.05)
Higher educational attainment	-0.10***	(0.03)	0.22***	(0.03)	-0.10*	(0.04)
Partnered status	-0.11*	(0.04)	-0.07 <sup>†</sup>	(0.04)	-0.19***	(0.05)
Urban residence	0.07 <sup>n.s.</sup>	(0.06)	0.05 <sup>n.s.</sup>	(0.07)	0.18*	(0.09)
Frequency of sexual orientation maltreatment	-0.02 <sup>n.s.</sup>	(0.02)	-0.05 <sup>†</sup>	(0.02)	-0.02 <sup>†</sup>	(0.01)

Notes: Polychoric correlations estimated independently for each latent variable; reported estimates are rounded to two decimal points; statistical significance was evaluated by critical ratio (CR) tests, where CR = estimate / *SE*. <sup>n.s.</sup> = not statistically significant. <sup>a</sup>Referent is non-Hispanic White.

<sup>†</sup> $p < .20$ ; \* $p < .05$ ; \*\*\* $p < .001$ .

TABLE 4. Direct and indirect effects and fit indices for three mediational models linking sexual orientation and substance use in the California Quality of Life Survey II: Partial results shown

Variable	Model 1	Model 2	Mediation ratio		Model 3 (Figure 1)	Mediation ratio		
			Est.	SE		Est.	SE	
Direct effects ( <i>b</i> )								
Sexual orientation → substance use	0.57***	0.42***			0.39***			
Sexual orientation → drug availability	0.28***				0.28***			
Drug availability → substance use	0.28***				0.20***			
Sexual orientation → tolerant norms		0.59***			0.59***			
Tolerant norms → substance use		0.47***			0.41***			
Indirect effects								
Sexual orientation via availability → substance use	0.08**		0.11	0.01	0.06**	0.12	0.03	
Sexual orientation via norms → substance use		0.27***	0.40	0.02	0.24***	0.38	0.03	
Total indirect effects					0.30***	0.43	0.03	
Fit indices								
$\chi^2$	151.21***	254.37***			396.26***			
Comparative fit index	.993	.980			.987			
Tucker–Lewis index	.990	.972			.983			
Root mean square error of approximation	.031	.037			.035			

Note: Est. = estimate.

\*\* $p < .01$ ; \*\*\* $p < .001$ .

fixed at 1.0; illicit drugs: 0.54,  $SE = 0.05$ ; heavier drinking: 0.44,  $SE = 0.07$ ).

Having established the validity of the latent variables, we then evaluated their bivariate associations with sexual orientation and the seven potentially confounding demographic and maltreatment characteristics. As shown in Table 3, sexual orientation was significantly associated with all three latent constructs. Perceived drug availability was significantly associated with most demographic characteristics with the exception of ethnic/racial minority status and urban residence. Specifically, younger individuals, men, persons with less education, and single persons were significantly more likely to report greater availability of illicit drugs. Tolerant norms for substance use were positively and significantly associated with being male, being non-Hispanic White, and possessing higher levels of education. Finally, the latent construct of substance use was significantly associated with being younger, male, and non-Hispanic White; possessing lower levels of education; being single; and living in an urban environment. Frequency of sexual orientation–related maltreatment was not strongly related to any of the three latent constructs.

#### Evaluation of mediational models

We then explicitly evaluated three variants of the model depicted in Figure 1 while adjusting for possible confounding because of retained demographic and sexual orientation–related maltreatment measures (not shown in Figure 1). The first variant hypothesized that sexual orientation is linked to substance use through direct structural linkage and via an indirect pathway mediated by perceived drug availability. This model was a good fit to the covariance structure of sample data (Table 4). Parameter estimates are consistent

with a model in which perceived drug availability partially, but not fully, mediates associations between sexual orientation and substance use. Indeed, results suggest that the ratio of mediated effects via perceptions of drug availability to total sexual orientation–related effects ( $MR = 0.12$ ,  $CI [0.02, 0.22]$ ) is relatively modest.

In the second variant of Figure 1, we hypothesized a structural model where the link between sexual orientation and substance use is mediated solely by differences in tolerant injunctive norms. This model, too, proved to be a good fit to the covariance structure of the data as shown in Table 4. Both sexual orientation and tolerant injunctive norms were significant predictors of substance use. The ratio of estimated indirect effects mediated by injunctive norms to the sexual orientation–related total effects ( $MR = 0.39$ ,  $CI [0.18, 0.61]$ ) was considerably larger than that observed in the previous model.

Finally, we fit a third structural model in which both perceived drug availability and tolerant norms were hypothesized as correlated mediators of sexual orientation–related differences in substance use. This final model also proved to be an excellent fit to the covariance structure of the data as reported in Table 4. Estimates of indirect effects linking sexual orientation and substance use via mediation by perceptions of drug availability ( $b = 0.06$ ,  $SE = 0.02$ ) were significantly weaker than similar indirect effects estimated via the effects of injunctive norms ( $b = 0.24$ ,  $SE = 0.05$ ;  $CR = -3.57$ ,  $p < .001$ ). Reflecting this, the mediation ratio associated with drug availability ( $MR = 0.12$ ,  $CI [0.01, 0.24]$ ) was smaller than that estimated for injunctive norms ( $MR = 0.38$ ,  $CI [0.18, 0.58]$ ). Overall, the combined effect of the two latent factors—drug availability and tolerant norms—was associated with a mediation ratio of 0.43 ( $CI [0.22, 0.64]$ ).

## Discussion

The higher levels of substance use disorders seen among sexual minority individuals in many convenience-based studies of the visible gay community (Cochran, 2001; McKirnan and Peterson, 1988, 1989) and confirmed more recently by comparative population-based surveys (Burgard et al., 2005; Cochran et al., 2000, 2004; Cochran and Mays, 2000; Drabble et al., 2005; Gilman et al., 2001; Gruskin et al., 2001; McCabe et al., 2009; Stall et al., 2001) has generally been explained by reasons rooted in the collateral effects of psychopathology (Cochran, 2001; Hatzenbuehler et al., 2011; McLaughlin et al., 2010; Meyer, 2003; Talley et al., 2011). According to this view, greater exposure to discrimination results in higher rates of stress-related mental distress, and this, in turn, encourages substance use as a coping behavior. In support of this explanation, multiple studies have demonstrated that exposure to stress and trauma is associated with mental disorders, substance use, and treatment seeking among individuals in general as well as among sexual minorities (Frisell et al., 2010; Hatzenbuehler et al., 2011; Hughes et al., 2010; Keyes et al., 2011; Marshal et al., 2012; Mays and Cochran, 2001; McLaughlin et al., 2010; Talley et al., 2011).

As did others (Green and Feinstein, 2011), we observed a greater risk for illicit drug use and heavier drinking among sexual minorities when compared with exclusively heterosexuals. However, our results suggest that additional social factors, as well as minority stress, may warrant closer inspection. In particular, we demonstrated that individuals with minority sexual orientation report both more tolerant norms about substance use and greater availability of illicit drugs. Further, these two factors appear to mediate a substantial portion of the relationship between minority sexual orientation and substance use patterns. Our findings underscore the possible role of the socioenvironmental context in both facilitating and maintaining greater risk for substance use morbidity in this population. Importantly, the mediational effects of tolerant norms and drug availability were largely independent of each other, as seen in the stability of the effects attributable to these factors when entered independently (Models 1 and 2) and simultaneously (Model 3), although drug norms accounted for a larger share of the mediation effect. Further, sexual orientation-related differences were robust even after adjusting for reported frequency of sexual orientation maltreatment.

The source of these differences may lie in the socialization of sexual minority persons. Some have hypothesized that the clustering of individuals with minority sexual orientation (i.e., "gay ghettos") is comparable to ethnic communities, with shared norms, values, and resources (LeVay and Nonas, 1995). This hypothesis has been dubbed the "gay neighborhood drug subculture hypothesis" (Carpiano et al., 2011). Sexual minorities may seek out neighborhoods that

are perceived to be more tolerant of behaviors traditionally deemed as deviant, including homosexuality, drug use, and commercialized sex work. Urban geographers have examined the emergence of lesbian and gay urban areas, which historically have served as a destination for young people seeking to come out. Such areas afford a sense of community, identity, and shared values, in contrast to the marginalization many may have experienced in their home communities (Valentine and Skelton, 2003). Within this context, substance use may be integral to promoting social connectedness as part of a younger "lesbian and gay scene" that is often centered in clubs and bars (Valentine and Skelton, 2003) and "sexualized social contexts" such as sex clubs (Garofalo et al., 2007). In that regard, a recent study found that alcohol use among lesbian/bisexual college students, compared with heterosexual women, was more strongly influenced by desires to get in with a preferred group, although this same effect was not present among men (Talley et al., 2012). It is also possible that tolerant substance use norms are simply part of a cluster of more liberal attitudes about a broad range of social issues that are characteristic of this subpopulation (Herek et al., 2010). Either way, our results hint that the relationships among minority sexual orientation, tolerant drug norms, and greater drug availability may be mutually reinforcing, leading to higher levels of substance misuse across the life span.

Several study limitations warrant consideration. First, the latent construct of "substance use" combined indicators of illicit drug use and alcohol consumption. Therefore, we could not discern relationships of specific types of substance use with the precursor variables. However, we note that correlations among illicit drug, marijuana, and heavier alcohol use were strong. Second, our limited measurement of sexual orientation-related discrimination may have underestimated the effects of discrimination. Thus, our findings should not be interpreted as a test of the comparative strength of the minority stress hypothesis versus a socioenvironmental one. Third, it is likely that there are differences among those classified as sexual minorities. Sample size limitations precluded considering this issue within the SEM approach used. Research elsewhere has documented that bisexual women and homosexually experienced men who do not self-identify as gay/bisexual are especially likely to be at increased risk for substance use morbidity (Cochran and Mays, 2009; McCabe et al., 2009). It may also be true that behaviors in these two groups are under less normative control by the gay community. Thus, determinants of use may vary across sexual minority subpopulations. In a similar vein, sample size precluded investigation of possible race/ethnicity differences in the fit and functioning of the SEM models raising similar concerns. Finally, like other cross-sectional telephone surveys, the Cal-QOL II survey shares common limitations typical of such designs, including the inability to test truly causal hypotheses and the possible introduction of bias through loss to followback.

Despite these concerns, the robust findings reported here suggest strongly that two factors—perceived drug availability and tolerant substance use norms—contribute to sexual orientation–related disparities in substance use. This has direct and translatable implications for community-level interventions targeting reductions in substance use. Previous work has found that although changing social norms at a community level is difficult, once accomplished these changes are particularly sustainable (Latkin et al., 2003). For example, anti-smoking campaigns and legislation in the United States have greatly reduced smoking rates on a broad level (Middlestadt et al., 2011; Tang et al., 2010; Zhu et al., 2007). In addition, interventions to reduce drinking and/or alter patterns of substance use have directly targeted changing social norms with some success (LaBrie et al., 2009; Latkin et al., 2009; Moreira et al., 2009; Neighbors et al., 2010). Further, norm-related interventions are known to be effective within the visible gay community (Kelly, 2000, 2004; NIMH Collaborative HIV/STD Prevention Trial Group, 2010).

Going forward, campaigns to change levels of social approval of illicit drug use and heavy alcohol consumption may serve to reduce the burden of substance use in this population. In crafting these efforts, it is essential to address the ways in which individual characteristics may shape normative influences. Like other populations, characteristics such as age, gender, ethnicity/race, and social disadvantages linked to poverty and geographic location may have relevance here, creating multiple, complex, and sometimes conflicting social and behavioral norms (Latkin et al., 2003). But, in addition, individuals with minority sexual orientation are a particularly diverse group where only some are reachable through campaigns targeting the visible lesbian and gay community. Advocates for sexual minority health have long argued for the need for culturally competent interventions incorporating the unique aspects of gay, lesbian, bisexual, and transgender identity and community into the content of intervention materials (Mayer et al., 2008; Shoptaw and Reback, 2007). Efforts that can successfully reach the diversity of this vulnerable population in its entirety are needed.

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