

# Alcohol and tobacco use patterns among heterosexually and homosexually experienced California women

Sarah A. Burgard<sup>a,b</sup>, Susan D. Cochran<sup>a,\*</sup>, Vickie M. Mays<sup>c</sup>

<sup>a</sup> Department of Epidemiology, UCLA School of Public Health, 71-245 Center for Health Sciences, Los Angeles, CA 90095-1772, USA

<sup>b</sup> Department of Sociology, University of California, Los Angeles, CA 90095-1551, USA

<sup>c</sup> Department of Psychology, University of California, Los Angeles, CA 90095-1563, USA

Received 9 June 2003; received in revised form 12 July 2004; accepted 12 July 2004

## Abstract

**Background:** Mounting evidence suggests that lesbians and bisexual women may be at especially elevated risk for the harmful health effects of alcohol and tobacco use.

**Methods:** We report findings from the California Women's Health Survey (1998–2000), a large, annual statewide health surveillance survey of California women that in 1998 began to include questions assessing same-gender sexual behavior.

**Results:** Overall, homosexually experienced women are more likely than exclusively heterosexually experienced women to currently smoke and to evidence higher levels of alcohol consumption, both in frequency and quantity. Focusing on age cohorts, the greatest sexual orientation disparity in alcohol use patterns appears clustered among women in the 26–35-year-old group. We also find that recently bisexually active women report higher and riskier alcohol use than women who are exclusively heterosexually active. By contrast, among homosexually experienced women, those who are recently exclusively homosexually active do not show consistent evidence of at-risk patterns of alcohol consumption.

**Discussion:** Findings underscore the importance of considering within-group differences among homosexually experienced women in risk for tobacco and dysfunctional alcohol use.

© 2004 Elsevier Ireland Ltd. All rights reserved.

**Keywords:** Alcohol; Tobacco; Sexual minority; Gay; Lesbian; Epidemiology

## 1. Introduction

Dysfunctional alcohol consumption and tobacco use are major contributors to morbidity and mortality in the United States (McGinnis and Foege, 1999; Miller and Gold, 1998; Murray et al., 1998). Accumulating evidence suggests that lesbians and bisexual women may represent a subpopulation at especially elevated risk for the harmful health effects from alcohol and tobacco use (Bradford et al., 1994; Cochran, 2001; Cochran et al., 2000; Diamant et al., 2000; Fifield et al., 1975; Gruskin et al., 2001; Hughes and Eliason, 2002; Israelstam and Lambert, 1983; McKirnan and Peterson, 1989a, 1989b; Nardi, 1982; Roberts and Sorensen,

1999; Skinner, 1994; Skinner and Otis, 1996). Although findings observed across surveys of lesbians and bisexual women have not been entirely consistent (Bloomfield, 1993; Cochran et al., 2003; Roberts and Sorensen, 1999), typically women classified as lesbian or bisexual, as compared to heterosexual women, more commonly report being a current or former tobacco smoker (Bradford and Ryan, 1988; Cochran et al., 2001; Diamant and Wold, 2003; Diamant et al., 2000; Gruskin et al., 2001), appear less likely to abstain from alcohol consumption (Cochran et al., 2000; Diamant et al., 2000; Roberts and Sorensen, 1999), evidence a pattern of alcohol use that includes more frequent consumption as well as greater amounts drunk, though typically still within a moderate range (Diamant et al., 2000; Hughes and Eliason, 2002; Roberts and Sorensen, 1999), and perhaps fail to show normative age-related declines in alcohol use (Abbott, 1998;

\* Corresponding author. Tel.: +1 310 206 9310; fax: +1 310 206 6039.

E-mail address: [cochran@ucla.edu](mailto:cochran@ucla.edu) (S.D. Cochran).

Bradford et al., 1994; Gruskin et al., 2001; Hughes and Wilsnack, 1997; McKirnan and Peterson, 1989a, 1989b). Although only a minority of lesbians and bisexual women in these surveys evidence problematic drinking behavior, the prevalences observed are generally higher than those reported by heterosexual women. This includes measures of binge and heavier drinking behavior (Cochran et al., 2000; Diamant et al., 2000; Gruskin et al., 2001), perhaps alcohol dependency syndrome (Cochran et al., 2000, 2003) and self-labeling as having problems with alcohol consumption (Bradford and Ryan, 1988; Cochran et al., 2001; McKirnan and Peterson, 1989a, 1989b).

Despite the evidence for greater risk among lesbians and bisexual women, the reasons for the observed differences are not well understood. One perspective hypothesizes that psychosocial factors, such as tolerant gay community norms, foster higher rates of substance use and abuse among lesbians and bisexual women than those seen among heterosexual women (Bloomfield, 1993; Bux Jr., 1996; Fifield et al., 1975; Hughes and Eliason, 2002; McKirnan and Peterson, 1989a, 1989b). Another emphasizes that social stigmatization of homosexuality generates stress that may then contribute to higher rates of substance use (Bux Jr., 1996; Cochran, 2001; Hughes and Eliason, 2002; Mays and Cochran, 2001; McKirnan and Peterson, 1989a, 1989b; Meyer, 2003). A third highlights the structural differences in women's lives associated with minority sexual orientation including the importance of the gay bar as a focus of socialization, the absence of heterosexual marriage, and alternative family structures that are less likely to include parenting responsibilities but more likely to involve full-time employment, which is a known risk factor for higher alcohol consumption among women (Alm et al., 2000; Cochran, 2001; Cochran et al., 2000; Fifield et al., 1975; Hughes and Wilsnack, 1997; McKirnan and Peterson, 1989a, 1989b; Rothblum and Factor, 2001). In addition, some recent work suggests that the highest risk for substance use may be somewhat concentrated among women who can be labeled by either identity or sexual behavior patterns as being bisexual (Diamant et al., 2000; Russell et al., 2002; Scheer et al., 2002).

Many of these findings are tentative, as studies of substance use among lesbian and bisexual women have been hampered by several methodological difficulties (Cochran, 2001). This is a relatively hidden and geographically dispersed population. Convenience-based samples drawing women from visible gay community sites are vulnerable to a variety of biases that may seriously affect both estimates of substance use and their correlates. As an example, early studies of alcohol and drug use recruited participants from gay bars using snowball sampling because gay bars were the primary place where researchers could find these women. Quite recently, population-based and other systematically sampled studies (Bloomfield, 1993; Cochran et al., 2000, 2003; Diamant and Wold, 2003; Diamant et al., 2000; Gruskin et al., 2001; Nawyn et al., 2000; Scheer et al., 2002) have appeared where respondent selection is not dependent on sexual

orientation. This sidesteps some of the obvious biases associated with convenience sampling. Typically in these latter studies, researchers classify women for sexual orientation either on the basis of the genders of their sexual partners or, in rare instances, self-identification as lesbian, bisexual, or heterosexual. Across these studies, estimates of alcohol use are lower, though they often still find higher levels of at-risk drinking among lesbians and bisexual women than those seen among heterosexual women. The small number of sexual minority women identified in these samples, however, has hampered exploration of factors within this population, such as variations in age or sexual orientation, that might be predictive of substance use. Understanding the influence of these factors could be extremely useful in the development of appropriately targeted interventions.

For the current study, we draw upon data from several years of the California Women's Health Survey (CWHHS) (California Department of Health Services, 2003), a large, annual statewide health surveillance survey of California women that in 1998 began to include questions assessing same-gender sexual behavior. Using self-reported genders of sexual partners as a behavioral proxy for lesbian, bisexual, or heterosexual identity, we examine alcohol and tobacco use patterns reported by sexually experienced adult women who vary in their sexual orientation, including 350 women who report histories of sex with women. In doing so, we seek to identify factors associated with substance use among behaviourally defined sexual minority women. While our reliance on same-gender sexual behavior as proxy for sexual orientation identity shares the common difficulty of some of the recently published work (Cochran et al., 2000; Scheer et al., 2002), the large sample size of the CWHHS and the measurement of both lifetime and recent sexual behavior in 2 of the 3 years of the survey permit exploration of both demographic and sexual behavior-related modifiers of substance use histories in a hidden population at elevated risk for substance abuse and its consequences.

## 2. Methods

### 2.1. Source of the data

We use information available from 3 years (1998–2000) of the California Women's Health Survey. The CWHHS is a monthly survey that employs random digit dial (RDD) techniques to interview approximately 4000 adult women in California annually about their health-related behaviors and attitudes. Beginning in 1998, questions were included that assessed the genders of women's sexual partners. Upper-bound estimates of CWHHS response rates for successfully screened households (the proportion of eligible households contacted from which a completed interview is obtained) varied across surveys from a low of 70% in 1998 to a high of 81% in 1999. A more conservative estimate of response rates (the proportion of completed interviews from among both eligible households and an estimate of eligible households among

those not fully ascertained) also varied from 49% in 1998 to 38% in 2000. These rates are consistent with RDD health surveys conducted in California ([California Health Interview Survey, 2003](#)). The public dataset, including sample weights, is available by request from the California State Department of Mental Health who oversees the survey ([California Department of Health Services, 2003](#)).

## 2.2. Subjects and sexual orientation classification

Between 1998 and 2000, slightly more than 12,000 women were interviewed in the CWHS. In 1998, women ( $n = 4006$ ) were asked the genders of their sexual partners in the past 5 years. Seventy-four women reported at least one female sexual partner and 3222 reported only male sexual partners. In both the 1999 and 2000 surveys, ascertainment of sexual partner genders was altered to assess both adult lifetime experiences (since age 18 years) and partners in the 12 months prior to interview. In 1999, of the 4163 women interviewed, 136 reported at least one lifetime female sexual partner (of these, 60 reported a female partner in the past year) and 3870 reported only male sexual partners. In 2000, of the 4012 women interviewed, 140 reported at least one female lifetime sexual partner (of these, 60 reported a female sexual partner in the past year) while 3762 reported only male sexual partners. Women who were not sexually active or who failed to provide answers to sexual partner questions were dropped from further consideration (for 1998,  $n = 710$ ; for 1999,  $n = 157$ ; and for 2000,  $n = 110$ ) due to our inability to classify for their sexual histories.

## 2.3. Study measures

### 2.3.1. Alcohol use

In the 1998–2000 surveys, women were initially asked if they had consumed alcohol in the month prior to interview. All those who had were then asked the number of days in the past month that they drank any alcoholic beverage, the number of drinks, on average, they consumed on those drinking days, and the number of times they had consumed five or more drinks on any one occasion in the past month. From these responses, we coded six measures of alcohol use: any alcohol consumption in the past month, consumption averaging at least once a week, consumption averaging five or more days per week, the number of reported drinking days, the mean number of drinks consumed per drinking day, and the number of binge drinking days, defined as consuming five or more drinks in one drinking occasion. We also classified women as binge drinkers if they reported binge drinking at least once but no more than four times in the past month, and classify them as heavy drinkers if they reported binge drinking on five or more occasions in the past month.

Respondents in 1999 and 2000 waves of the CWHS were also asked two additional alcohol-related questions. From these, we created two variables. One indexed the number of times in the past year a woman reported being drunk. From

this we created a dichotomous variable indicating being drunk six or more times in the past year versus less than that frequency. The second assessed the number of drinks that the respondent needed to consume to feel drunk. Responses exceeding 12 drinks were top-coded at 12 due to their rarity.

### 2.3.2. Tobacco use

The surveys also asked women how frequently they currently smoked cigarettes (“not at all”, “some of the time”, or “every day”). From this, women were coded as current smokers if they reported any current cigarette use.

### 2.3.3. Demographics

Other items in the survey assessed women’s age, educational achievement, race/ethnic background, married/unmarried or cohabiting couple relationship status, employment status, and the presence of children under age 18 years in the home.

## 2.4. Statistical analyses

Data were analyzed using Stata version 7.0 ([StataCorp, 2001](#)), with weighting to adjust for selection probability and post-stratification to the match the age and race distribution of women in the 1990 California population. Missing demographic and substance use data were imputed using multiple imputation techniques ([Rubin, 1987](#)). Analyses of demographic correlates predicting sexual partner histories were conducted using both logistic (any female sexual partners reported versus only male sexual partners indicated) and multinomial (male partners only versus no sexual partners, both male and female sexual partners, and only female sexual partners) methods depending on the comparison of interest. Reported results adjust for all demographic factors considered simultaneously.

Two additional sets of analyses are reported. One uses the 1998–2000 sample of sexually experienced respondents to compare women reporting any female sexual partners to those reporting only male sexual partners. We also further divide the sample into four age categories (18–25, 26–35, 36–45, and 46 years or older) to conduct age-stratified analyses. Given the recency of measuring markers of sexual orientation in population-based surveys ([Cochran, 2001](#)), there is only sparse data available on the relationship between patterns of partner selection on the basis of gender over the two time periods measured in the 1998–2000 CWHS surveys. Unpublished data from the National Health and Social Life Survey ([Laumann et al., 1992](#)) indicate that of the 52 women in that survey who reported sex with other women since age 18 (out of 1921 women interviewed), half reported sex with women within the 5 years prior to interview and 23 reported sex only with men. Thus, analyses of the CWHS that combine respondents from the years 1998–2000 can be expected to sample somewhat differently from the population of women who are homosexually experienced. Results obtained using only the 1999–2000 surveys demonstrated the same pattern

of relative differences, though due to the smaller sample size, some of these differences did not achieve statistical significance. We, therefore, discuss only the results for the samples combining respondents from 1998–2000.

The other set of analyses considers only women surveyed in the 1999–2000 waves in order to examine possible associations of bisexuality with substance use. Here we make two sets of comparisons. The first contrasts women reporting only male sexual partners during their lifetimes (the referent group) with homosexually experienced women who report only female, only male, both male and female, or no sexual partners in the year prior to interview. The second explores differences among homosexually experienced women who vary in their recent patterns of sexual partners. To do these latter comparisons, we contrast estimates for homosexually experienced but currently heterosexually active women (the referent group) to homosexually experienced women who were currently sexually active only with women, with both men and women, or not sexually active.

Across all analyses, we report the weighted prevalence of tobacco and alcohol use. Linear and logistic regression models predicting the alcohol and tobacco use outcomes are adjusted for the effects of age, race/ethnic group, education, relationship status, employment status, and the presence of children under 18 years in the home, all of which may confound associations between substance use and sexual orientation (Cochran, 2001). All reported odds ratios (OR) and regression estimates ( $\beta$ ) are adjusted for this possible confounding. Significance tests are judged at the criterion of  $P < 0.05$ . Reported confidence intervals (CI) are evaluated at the 95% confidence level.

### 3. Results

#### 3.1. Characteristics of sexually experienced women

Approximately 3.8% (CI: 3.4–4.1%) of the women surveyed reported at least one female partner since age 18 years in the past 5 years (using 1998 data) or in their lifetime (using 1999–2000 data). More precisely, using only the 1998 sample where women reported on sexual partners in the prior 5 years, 2.6% (CI: 2.1–3.2%) of women indicated at least one female sexual partner. In contrast, using the 1999 and 2000 data and reflecting the longer time frame, 4.2% (CI: 3.8–4.7%) of women reported at least one female sexual partner in adulthood. Across all three survey years, these homosexually experienced women, as compared to exclusively heterosexually experienced women, were significantly younger, more likely non-Hispanic white, and possessed higher levels of education when the effects of all demographic predictors were considered simultaneously (see Table 1). They were also less likely to be married or in an unmarried partnership or to have children under age 18 years living in their households. In analyses not shown,

these differences held whether the study sample included all 3 years of CWSHS surveys or only the latter 2 years when all women were reporting on lifetime sexual partner patterns.

Among homosexually experienced women in the 1999–2000 surveys, 33.5% (unweighted  $n = 77$ ; CI: 27.9–39.1%) reported only female sexual partners in the past year, 16.6% (unweighted  $n = 43$ ; CI: 12.2–21.1%) both male and female sexual partners, 11.6% (unweighted  $n = 38$ ; CI: 7.8–15.4%) no sexual partners, and 38.3% (unweighted  $n = 118$ ; CI: 32.5–44.0%) only male sexual partners. There were a few demographic differences among these four groups of women, when all demographic factors were considered simultaneously. Compared to homosexually experienced women with recent histories of exclusively male sexual partners, homosexually experienced women who reported recent bisexuality were less likely to be non-Hispanic white ( $P < 0.05$ ). Women with recent histories of exclusive homosexuality were less likely to report children in their households than homosexually experienced women who had only male sexual partners in the past year ( $P < 0.01$ ). Finally, homosexually experienced women with no recent sexual partners, in comparison to similar homosexually experienced women who were currently sexually active with men, were somewhat older ( $P < 0.01$ ), less likely to be married or cohabiting ( $P < 0.01$ ), and less likely to live with children under age 18 years ( $P < 0.05$ ).

#### 3.2. Patterns of substance use

In the total sample, homosexually experienced women were more likely than exclusively heterosexually experienced women to report being current tobacco smokers (adjusted OR = 1.84; CI: 1.47–2.31) (see Table 2). Further, while these women appeared to be no more likely to use alcohol in a given month than women indicating only male partners, they were more likely to consume alcohol at least weekly (adjusted OR = 1.29; CI: 1.04–1.60) and to drink on more days per month (adjusted  $\beta = 0.81$ ; S.E. = 0.29). Homosexually experienced women, in contrast to exclusively heterosexually active women, also reported consuming more drinks per drinking day (adjusted  $\beta = 0.24$ ; S.E. = 0.07), having more binge drinking days per month (adjusted  $\beta = 0.17$ ; S.E. = 0.07), and were more likely to report binge drinking behavior (adjusted OR = 1.41; CI: 1.06–1.89).

#### 3.3. Age-related patterns of substance use

Within each of the four age groups considered, homosexually experienced California women, in comparison to exclusively heterosexually active women, showed higher prevalence of tobacco use (see Table 3). In particular, age-specific comparisons achieved significant differences in three of the four age groups evaluated: 18–25-year olds (adjusted OR = 1.77; CI: 1.05–3.01), 26–35-year olds (adjusted OR = 1.72; CI:

Table 1

Demographic characteristics of sexually experienced California women, aged 18 years and older, in the California Women's Health Survey (1998–2000)<sup>a</sup> by self-reported genders of sexual partners

	Any female sexual partners reported ( <i>n</i> = 350)	Only male sexual partners reported ( <i>n</i> = 10,854)	<i>P</i> -value
Age in years (%)			<0.001
18–25	25.2	15.6	
26–35	31.6	26.1	
36–45	25.3	21.4	
46 or older	17.9	36.9	
Level of education (%)			<0.05
High school or less	30.2	42.8	
Some college	32.4	30.7	
College degree or more	37.4	26.5	
Ethnic/racial background (%)			<0.01
White, non-Hispanic	72.7	62.0	
Other	27.3	38.0	
Married/cohabiting (%)	46.8	62.3	<0.001
Employed fulltime (%)	67.5	56.7	0.41
Children (0–18 years) in home (%)	35.9	50.9	<0.001

Note: Weighted prevalences shown. *P*-values obtained from a multivariate logistic regression analysis regressing sexual orientation on age, education, ethnic/racial background, marital/cohabiting status, employment status, and children in the home, coded as categorical variables.

<sup>a</sup> Sample from 1998 includes women who reported their sexual partners in the 5 years prior to interview; samples from 1999–2000 include all women reporting any lifetime sexual partners.

Table 2

Prevalence of self-reported tobacco and alcohol use among sexually experienced California women, aged 18 years and older, by genders of their sexual partners, 1998–2000 California Women's Health Survey<sup>a</sup>

Self-reported substance use	Any female sexual partners ( <i>n</i> = 350)	Male sexual partners only ( <i>n</i> = 10,854)
Current tobacco smoker (%) <sup>*</sup>	29.8	17.0
Alcohol use in past month		
Consumed alcohol at least once (%)	66.0	52.9
Drank once or more per week (%) <sup>*</sup>	40.2	27.3
Drank average of 5–7 days per week (%)	5.1	4.6
No. of drinking days, $\bar{x}$ (S.D.) <sup>*</sup>	4.6 (6.4)	3.2 (5.9)
No. of drinks per drinking day, $\bar{x}$ (S.D.) <sup>*</sup>	1.4 (1.8)	0.9 (1.3)
No. of binge drinking days, <sup>b</sup> $\bar{x}$ (S.D.) <sup>*</sup>	0.6 (1.7)	0.3 (1.4)
Engaged in binge drinking <sup>c</sup> (%) <sup>*</sup>	15.0	7.3
Engaged in heavy drinking <sup>d</sup> (%)	3.7	1.4

Note: Weighted prevalences and means shown. Statistical comparisons between the two groups adjusted for the effects of age, education level, race/ethnic background, employment status, relationship status, and the presence of children under 18 years of age in the home.

<sup>a</sup> Sample from 1998 includes women who reported their sexual partners in the 5 years prior to interview; samples from 1999–2000 include all women reporting any lifetime sexual partners.

<sup>b</sup> Defined as consuming five or more drinks in any drinking occasion.

<sup>c</sup> Defined as one to four binge drinking events in past month, heavy drinkers excluded from comparison.

<sup>d</sup> Defined as five or more binge drinking events in past month.

<sup>\*</sup> *P* < 0.05.

1.11–2.67), and 36–45-year olds (adjusted OR = 1.76; CI: 1.13–2.72).

Indicators of alcohol use suggested a somewhat more mixed picture for age-specific differences between homosexually and exclusively heterosexually experienced women (see Table 3). The greatest disparity in alcohol use patterns was clustered among women in the 26–35-year-old group. Among women in this age group, those who were homosexually experienced, as compared to exclusively heterosexually experienced women, were significantly more likely to report consuming alcohol frequently (five to seven times per week on average, adjusted OR = 2.32; CI: 1.09–4.92), drinking

on more days per month (adjusted  $\beta$  = 1.78; S.E. = 0.43), consuming more drinks per drinking day (adjusted  $\beta$  = 0.43; S.E. = 0.14), having more binge drinking days per month (adjusted  $\beta$  = 0.54; S.E. = 0.14), and engaging in a pattern of heavy drinking (adjusted OR = 4.33; CI: 1.94–9.67). Other age-specific comparisons did not reveal consistently higher levels of alcohol use among homosexually experienced as compared to exclusively heterosexually experienced women with two exceptions: homosexually experienced women age 46 years and older were significantly more likely to report drinking once or more per week (adjusted OR = 1.63; CI: 1.02–2.62) and to report heavy drinking (adjusted OR: 7.11;

Table 3

Patterns of self-reported tobacco and alcohol use among sexually active California women by genders of their sexual partners and age group, 1998–2000 California Women's Health Survey<sup>a</sup>

Self-reported substance use	Any female sexual partners reported				Only male sexual partners reported			
	18–25 Years	26–35 Years	36–45 Years	46 Years or older	18–25 Years	26–35 Years	36–45 Years	46 Years or older
Current tobacco smoker (%)	34.5*	31.2*	30.3*	19.8	19.4	16.3	19.2	15.0
Alcohol use in past month								
Consumed alcohol at least once (%)	75.8	68.0	58.3	59.6	56.8	51.5	55.1	47.8
Drank once or more per week (%)	39.5	40.9	37.8	43.4*	28.5	24.9	27.6	27.5
Drank about 5–7 days a week (%)	1.3	7.2*	4.7	7.3	1.2	2.4	4.0	8.2
No. of drinking days, $\bar{x}$ (S.D.)	4.3 (4.9)	5.2 (7.1)*	4.3 (6.5)	4.6 (6.8)	2.6 (4.2)	2.6 (4.7)	3.2 (5.7)	3.9 (7.4)
No. of drinks per drinking day, $\bar{x}$ (S.D.)	1.9 (1.8)	1.6 (2.2)*	1.1 (1.4)	0.9 (0.9)	1.5 (1.8)	1.0 (1.5)	1.0 (1.3)	0.7 (0.9)
No. of binge drinking days, $\bar{x}$ (S.D.)	0.7 (1.5)	0.9 (2.4)*	0.2 (0.9)	0.3 (1.1)	0.6 (1.7)	0.3 (1.4)	0.2 (1.2)	0.1 (1.3)
Engaged in binge drinking <sup>c</sup> (%)	26.5	16.6	9.8	3.2	17.1	9.2	7.0	2.8
Engaged in heavy drinking <sup>d</sup> (%)	2.6	7.1*	0.5	3.5*	4.8	1.3	0.8	0.6
<i>N</i> (unweighted)	66	104	101	79	1188	2604	2701	4361

Note: Weighted prevalences and means shown. Statistical significance refers to comparisons between the two groups within the indicated age strata, adjusted for the effects of education level, race/ethnic background, employment status, relationship status, and the presence of children under 18 years of age in the home.

<sup>a</sup> Sample from 1998 includes women who reported their sexual partners in the 5 years prior to interview; samples from 1999–2000 include all women reporting any lifetime sexual partners.

<sup>b</sup> Defined as consuming five or more drinks in any drinking occasion.

<sup>c</sup> Defined as one to four binge drinking events in past month, heavy drinkers excluded from comparison.

<sup>d</sup> Defined as five or more binge drinking events in past month.

\*  $P < 0.05$ .

CI: 1.97–25.68), as compared to exclusively heterosexually experienced, but similarly-aged women.

### 3.4. Associations of substance use with recent sexual partner patterns

More extensive questions about sexual partner histories in the 1999–2000 CWSHS survey waves permitted further examination of possible differences in substance use patterns among homosexually experienced women who varied in their recent patterns of sexual behavior. Restricting analyses to these 2 years, we classified women into one of five groups: (1) those reporting exclusively male sexual partners during their lifetime; and homosexually experienced women who reported that in the past 12 months they had (2) only female sexual partners, (3) both female and male sexual partners, (4) no sexual partners, or (5) only male sexual partners. Comparing patterns of substance use among the four groups of homosexually experienced women individually to exclusively heterosexually experienced women suggests a somewhat more complicated picture than the analyses reported above. While as noted earlier, homosexually experienced women overall evidenced higher prevalence of tobacco use and, on some indicators, of alcohol use, in these later comparisons recent bisexuality emerges as a strong correlate of alcohol use patterns among homosexually experienced women. Specifically, homosexually experienced women who reported a recent history of bisexuality, as compared to exclusively heterosexually experienced women, were significantly more likely to report consuming alcohol in the past month (adjusted OR = 2.36; CI: 1.25–4.43), doing so at least

weekly (adjusted OR = 1.83; CI: 1.02–3.29), drinking on more days per month (adjusted  $\beta = 1.67$ ; S.E. = 0.78), consuming more drinks per drinking day (adjusted  $\beta = 0.64$ ; S.E. = 0.17), having more binge drinking days per month (adjusted  $\beta = 0.44$ ; S.E. = 0.20), and being drunk six or more times in the past year (adjusted OR = 3.87; CI: 2.00–7.50). These women were also more likely to meet criteria for being a binge drinker (adjusted OR = 4.45; CI: 2.42–8.17). Homosexually experienced, but currently heterosexually active women were more likely to report being current tobacco smokers (adjusted OR = 1.54; CI: 1.02–2.34) and being drunk six or more times in the past year (adjusted OR = 2.41; CI: 1.48–3.92) in comparison to exclusively heterosexually experienced women. In contrast, although tobacco and alcohol use patterns among homosexually experienced women with only recent female sexual partners or no sexual partners were somewhat indicative of heavier use than that seen among exclusively heterosexually experienced women, these differences did not achieve statistical significance after adjusting for demographic confounding with one exception: homosexually experienced women who were recently sexually active only with women were significantly more likely to have been drunk six or more times in the past year (adjusted OR = 2.16; CI: 1.23–3.80).

Restricting focus to comparisons among groups of homosexually experienced women, we found no strong evidence to suggest that self-reported current tobacco smoking status was associated with differences in recent sexual partner patterns among women. However, we did observe that patterns of recent alcohol use appeared to vary somewhat in association with sexual partner patterns among homosexually

experienced women. Specifically, homosexually experienced women who were recently bisexually active, as compared to those who were recently exclusively heterosexually active, were more likely to report consuming alcohol in the past month (adjusted OR = 2.75; CI: 1.32–5.71), drank more drinks per drinking day (adjusted  $\beta$ : 0.62; S.E. = 0.20), and evidenced a pattern of drinking indicative of being a binge drinker (adjusted OR = 2.92; CI: 1.37–6.26). Homosexually experienced women who had only recent female sexual partners were significantly less likely than homosexually experienced women who were recently exclusively heterosexual active to be binge drinkers (adjusted OR = 0.35; CI: 0.14–0.89). Finally, homosexually experienced women with no recent sexual partners were significantly less likely to have been drunk six or more times in the past year in comparison to homosexually experienced, but currently heterosexually active women (adjusted OR = 0.13; CI: 0.02–0.83).

#### 4. Discussion

Homosexually experienced women are at increased risk for both tobacco use and higher rates of alcohol use in comparison to heterosexual women. Similar to other studies that used convenience-based sampling from the visible lesbian community (Bradford and Ryan, 1988; Cochran et al., 2001; Fifield et al., 1975; McKirnan and Peterson, 1989a, 1989b; Roberts and Sorensen, 1999; Skinner, 1994; Skinner and Otis, 1996) or systematic health surveys of women in the general (Bloomfield, 1993; Cochran et al., 2000; Diamant and Wold, 2003; Diamant et al., 2000; Gruskin et al., 2001; McCabe et al., 2003; Nawyn et al., 2000; Russell et al., 2002; Scheer et al., 2002), we observed that homosexually experienced women interviewed in the CWHHS were more likely to report smoking tobacco, drinking alcohol, and using alcohol in a somewhat more dysfunctional manner than exclusively heterosexually experienced women. But at the same time, our findings suggest that both age and patterns of sexual partner gender choice are important factors to consider in understanding the differences in substance use behavior among women who may vary in their same-sex sexual behavior patterns. There may also be, as yet unidentified age-cohort effects, similar to those found recently among gay and bisexual men (Crosby et al., 1998).

For some time, it has been thought that lesbians and bisexual women do not show normative age-related declines in their alcohol use, though the actual evidence for this perspective is sparse (Hughes and Wilsnack, 1997). Gruskin et al. (2001), using a much smaller sample than the California Women's Health Survey, was able to show tentatively that lesbian and bisexual women between 20 and 34 years of age were at greater risk for more frequent and heavy alcohol use when compared to heterosexual women, but that this difference between the two groups attenuated among older women. A lack of statistical power prevented closer examination of age-related differences in those two groups of women.

Our findings extend Gruskin et al.'s to suggest that although women under 25 years of age who are likely to be lesbian or bisexual show somewhat heavier patterns of alcohol use than similarly-aged women who are most likely heterosexual, the point of marked divergence in patterns appears to occur with women between 25 and 35 years of age. Here, homosexually experienced women use alcohol at much higher rates than women who are exclusively heterosexually experienced. A second point of divergence for heavy drinking only may occur among women 46 years of age and older.

While the reasons for these differences are beyond the scope of the current study, several factors may play important contributory roles. Inhibitory influences on substance use behavior may have greater impact on heterosexual women than lesbians and bisexual women. These influences include role responsibilities that discourage consumption, such as marriage and childbearing (Brady and Randall, 1999; Caetano and Cunradi, 2002; Parks and Scheidt, 2000), especially as women age beyond their college years where binge drinking is more prevalent (Stein and Cyr, 1997). In contrast, other factors that serve to encourage alcohol use may be more likely to be present among sexual minority women. These include persistence of bar-based socializing at older ages, a known correlate of alcohol and tobacco use among gay men (Stall et al., 2001). In addition, lesbians and bisexual women are more likely than heterosexual women to participate in the workforce, another known correlate of alcohol use (Stein and Cyr, 1997). While age-related declines in both tobacco use and dysfunctional patterns of alcohol use do appear to occur among sexual minority women, the offset appears somewhat slower than that seen among heterosexual women. This may result in greater exposure to risk for developing alcohol dependence.

Our findings also underscore that among homosexually experienced women there are variations in patterns of tobacco and alcohol use associated with differences in recent sexual histories. Our results suggest that bisexually active women are most likely to show patterns of alcohol use that are indicative of at-risk drinking patterns. The reasons for this may be twofold. First, bisexuality may be associated with dysfunctional alcohol use as a function of the relatively higher rates of current distress that have been observed in this population when compared to both homosexual and heterosexual individuals (Jorm et al., 2002). Second, sexual behavior, in general, is positively associated with alcohol use (Cochran et al., 2000) and behaviorally bisexual women, as defined for this study (sex with both a man and a woman in a 1-year period), probably had a higher rate of partner change than those women who report sex with a single gender (either a man or a woman in the same 1-year period).

Elsewhere, Bailey (1999) has argued that the higher rates of psychiatric morbidity recently observed among homosexually experienced individuals when compared to exclusively heterosexual experienced persons are not necessarily generated by sexual orientation but may be an inadvertent consequence of misclassification of heterosexually identified,

but homosexually experienced persons. These individuals, he argues, may possess a general pattern of impulsiveness in a variety of domains, including sexual behavior that is linked to psychopathology. The low base rate of minority sexual orientation in general population-based surveys magnifies the effects of even low levels of such misclassification (Cochran, 2001). Our findings are somewhat consistent with this premise. However, irrespective of recent sexual behavior patterns, we also observed a generally higher prevalence of tobacco use and moderate alcohol use among homosexually experienced women as compared to exclusively heterosexually experienced women. Thus, our findings support both the perspective that some of the higher prevalences of dysfunctional alcohol use may be attributable to the problem of misclassification, but that this occurs within a context of high moderate use overall.

As with other general population-based surveys that rely on sexual behavior as a proxy for sexual orientation, our findings should be interpreted within the context of several limitations. The CWHs did not directly ask sexual orientation identity. Evidence suggests that common indicators of sexual orientation, such as sexual attraction, behavior, fantasies, self-identification, and emotional, social, and lifestyle preferences are closely correlated in the general population (Cochran, 2001). For example, unpublished data from Laumann et al.'s survey of sexual behavior in the United States (Laumann et al., 1992) strongly indicates that women's reports of the genders of their sexual partners is quite predictive of sexual orientation identity when heterosexuality is considered. However, among the restricted and small group of women indicating any lifetime same-gender sexual contact, many do not currently label themselves as lesbian or bisexual. Thus, lifetime evidence of same gender partners is an imprecise measure of current lesbian or bisexual identity. In particular, bisexuality as a self-identified identity in Laumann et al.'s sample of 1749 women was very rare ( $n = 9$ ) and 5 of the 7 women bisexually active in the year prior to interview self-identified as heterosexual, not bisexual. From Laumann et al.'s findings (Laumann et al., 1992), we can assume that labeling sexually experienced women as lesbian, bisexual, or even heterosexual on the basis of their sexual behavior alone clearly introduces some misclassification bias, the effects of which are difficult to anticipate (Cochran, 2001).

A second methodological issue is statistical power and our attempts to improve it. Many of the recent population-based and systematically sampled studies examining substance use among women of differing sexual orientations lacked statistical power to examine effect modifiers, such as age, because the numbers of homosexually classified women were very low (Cochran, 2001). This limited studies to simple tests of main effects of sexual orientation. Some of our analyses, too, may have suffered from low power to detect statistically significant differences despite our larger sample of homosexually experienced women. We also were unable to test for interactions among variables, such as age and race differences considered simultaneously. However, in the compari-

son with other such studies, our sample size was fairly large. In our efforts to increase power, we combined two different types of sampling from the homosexually experienced population (sex with women since age 18 years and in the prior 5 years) when analyses included women from all 3 years of the CWHs. This somewhat different sampling from the source population may bias our findings to some extent. However, findings from Laumann et al.'s survey, although a very small sample, are reassuring. Whatever the time frame considered, his homosexually experienced women respondents showed higher rates of daily drinking than women who were not, though their numbers were far too few for statistical analysis. In his study, homosexually experienced women (lifetime) who reported sex only with men in the 5 years prior to interview were just as likely to report drinking alcohol several times a week or more (7 of the 24 women) as homosexually experienced women who reported sex with women in the same time period (8 of the 26 women). This is in contrast to the rate for the 1869 women who reported never having had sex with women (11%). Further, the rate of drinking several times a week or more was nearly the same for lifetime homosexually experienced women (29%) and those reporting sex with women in the past 5 years (27%).

A third consideration is the possible effects of response or non-response bias. Although the CWHs used RDD methods to recruit respondents, it is not known to what extent lesbians and bisexual women are willing to participate in these anonymous surveys or whether only some subsets of these women will disclose information concerning their sexual orientation to telephone interviewers (Cochran, 2001).

Nevertheless, results of this study, in conjunction with others (Diamant et al., 2000; Gruskin et al., 2001; Hughes and Eliason, 2002; Richman et al., 2002), underscore the importance of targeting public health interventions aimed at reducing tobacco use and heavier alcohol use among homosexually experienced women. Our findings also highlight the need for these interventions to consider individual differences within this population. Evidence reported here suggests that it may be essential to target both younger women and a second group of homosexually experienced but probably heterosexually identified women who are not typically reached by an exclusive focus on the visible lesbian community.

Further, our results raise a concern that the current efforts for tobacco reduction and cessation may not be optimally effective with homosexually experienced women. In California, an aggressive set of successful tobacco reduction policies has been enacted resulting in successful smoking cessation and reduction of smoking initiation rates in many diverse adult groups (Rohrbach et al., 2002). Our data hint that these efforts may have been less effective with homosexually active women. Only further research can clarify this issue. Understanding the context of lesbian and bisexual women's experiences that support the initiation and use of tobacco will be critical. For example, there is a well-known robust relationship between alcohol consumption and tobacco use (Bergmark, 1999; Bien and Burge, 1990; Gulliver et al., 1995;



Jackson et al., 2003). In a recent study following up participants in the St. Louis Epidemiologic Catchment Area Study 16 years later, Jackson et al. (2003) were able to determine a bi-directional prospective association between alcohol and tobacco use disorders. Unfortunately, the nature of our study did not permit investigation of these issues more fully. But knowledge of co-occurrence of dysfunctional tobacco and alcohol use patterns among homosexually experienced women might prove valuable in the planning of interventions and treatment for this population. Intervening to reduce use of one substance may have an impact on the other, though studies indicate that this is true primarily for alcohol, not smoking, interventions. Results of our study, like that of others (Jackson et al., 2003), indicate that increased risk for substance use is not necessarily drug-specific. This suggests the need for further research about stage theories in substance abuse and how this might be integral in prevention and treatment efforts of substance use/abuse among lesbians and bisexual women.

### Acknowledgments

This work supported by the National Institute of Mental Health (MH 61774) and the National Institute of Drug Abuse (DA 15539). We use public-access data provided by the California Women's Health Survey (CWSH) Group. The CWSH is coordinated by the California Department of Health Services in collaboration with the California Department of Mental Health, the California Department of Alcohol and Drug Programs, and CMRI. Funding for the CWSH is provided by grants from the California Wellness Foundation. Analyses, findings and conclusions described in this paper are solely the responsibility of the authors and have not been endorsed by the CWSH Group.

### References

- Abbott, L.J., 1998. The use of alcohol by lesbians: a review and research agenda. *Subst. Use Misuse* 33, 2647–2663.
- Alm, J., Badgett, M.V.L., Whittington, L.A., 2000. Wedding bell blues: the income tax consequences of legalizing same-sex marriage. *Natl. Tax J.* 53, 201–214.
- Bailey, J.M., 1999. Homosexuality and mental illness. *Arch. Gen. Psychiatry* 56, 883–884.
- Bergmark, K.H., 1999. Drinking in the Swedish gay and lesbian community. *Drug Alcohol Depend.* 56, 133–143.
- Bien, T.H., Burge, R., 1990. Smoking and drinking: a review of the literature. *Int. J. Addict.* 25, 1429–1454.
- Bloomfield, K., 1993. A comparison of alcohol consumption between lesbians and heterosexual women in an urban population. *Drug Alcohol Depend.* 33, 257–269.
- Bradford, J., Ryan, C., Rothblum, E.D., 1994. National Lesbian Health Care Survey: implications for mental health care. *J. Consult. Clin. Psychol.* 62, 228–242.
- Bradford, J., Ryan, C., 1988. The National Lesbian Health Care Survey. National Lesbian and Gay Health Foundation, Washington, DC.
- Brady, K.T., Randall, C.L., 1999. Gender differences in substance use disorders. *Psychiatr. Clin. North Am.* 22, 241–252.
- Bux Jr., D.A., 1996. The epidemiology of problem drinking in gay men and lesbians: a critical review. *Clin. Psychol. Rev.* 16, 277–298.
- Caetano, R., Cunradi, C., 2002. Alcohol dependence: a public health perspective. *Addiction* 97, 633–645.
- California Department of Health Services, 2003. California Women's Health Survey. URL: <http://www.dhs.ca.gov/director/owh/survey.htm>. Accessed: July 2, 2004.
- California Health Interview Survey, 2003. The CHIS 2001 Sample: Response rates. URL: [http://www.chis.ucla.edu/pdf/CHIS2001\\_method4.pdf](http://www.chis.ucla.edu/pdf/CHIS2001_method4.pdf). Accessed: July 2, 2004.
- Cochran, S.D., 2001. Emerging issues in research on lesbians' and gay men's mental health: Does sexual orientation really matter? *Am. Psychol.* 56, 931–947.
- Cochran, S.D., Keenan, C., Schober, C., Mays, V.M., 2000. Estimates of alcohol use and clinical treatment needs among homosexually active men and women in the U.S. population. *J. Consult. Clin. Psychol.* 68, 1062–1071.
- Cochran, S.D., Mays, V.M., Bowen, D., Gage, S., Bybee, D., Roberts, S.J., Goldstein, R.S., Robison, A., Rankow, E.J., White, J., 2001. Cancer-related risk indicators and preventive screening behaviors among lesbians and bisexual women. *Am. J. Public Health* 91, 591–597.
- Cochran, S.D., Mays, V.M., Sullivan, J.G., 2003. Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *J. Consult. Clin. Psychol.* 71, 53–61.
- Crosby, G.M., Stall, R.D., Paul, J.P., Barrett, D.C., 1998. Alcohol and drug use patterns have declined between generations of younger gay-bisexual men in San Francisco. *Drug Alcohol Depend.* 52, 177–182.
- Diamant, A.L., Wold, C., 2003. Sexual orientation and variation in physical and mental health status among women. *J. Women's Health* 12, 41–49.
- Diamant, A.L., Wold, C., Spritzer, K., Gelberg, L., 2000. Health behaviors, health status, and access to and use of health care: a population-based study of lesbian, bisexual, and heterosexual women. *Arch. Fam. Med.* 9, 1043–1051.
- Fifield, L., de Crescenzo, T., Latham, J., 1975. Alcoholism and the gay community. Summary of "On my way to nowhere: alienated, isolated, drunk. An analysis of gay alcohol abuse and evaluation of alcoholism rehabilitation services for Los Angeles County". Los Angeles Gay Community Services Center, Los Angeles, CA.
- Gruskin, E.P., Hart, S., Gordon, N., Ackerson, L., 2001. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *Am. J. Public Health* 91, 976–979.
- Gulliver, S.B., Rohsenow, D.J., Colby, S.M., Dey, A.N., Abrams, D.B., Niaura, R.S., Monti, P.M., 1995. Interrelationship of smoking and alcohol dependence, use and urges to use. *J. Stud. Alcohol.* 56, 202–206.
- Hughes, T.L., Eliason, M., 2002. Substance use and abuse in lesbian, gay, bisexual and transgender populations. *J. Primary Prev.* 22, 263–298.
- Hughes, T.L., Wilsnack, S.C., 1997. Use of alcohol among lesbians: research and clinical implications. *Am. J. Orthopsychiatry* 67, 20–36.
- Israelstam, S., Lambert, S., 1983. Homosexuality as a cause of alcoholism: a historical review. *Int. J. Addict.* 18, 1085–1107.
- Jackson, K.M., Sher, K.J., Wood, P.K., Bucholz, K.K., 2003. Alcohol and tobacco use disorders in a general population: short-term and long-term associations from the St. Louis Epidemiological Catchment Area Study. *Drug Alcohol Depend.* 71, 239–253.
- Jorm, A.F., Korten, A.E., Rodgers, B., Jacomb, P.A., Christensen, H., 2002. Sexual orientation and mental health: results from a community survey of young and middle-aged adults. *Br. J. Psychiatry* 180, 423–427.
- Laumann, E.O., Gagnon, J.H., Michael, R.T., Michaels, S., 1992. National Health and Social Life Survey [United States]. Retrieved March 2, 2000 from the World Wide Web: <http://www.icpsr.umich.edu/archive1.html>. Accessed: March 2, 2000.

- Mays, V.M., Cochran, S.D., 2001. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *Am. J. Public Health* 91, 1869–1876.
- McCabe, S.E., Boyd, C., Hughes, T.L., d'Arcy, H., 2003. Sexual identity and substance use among undergraduate students. *Subst. Abuse* 24, 77–91.
- McGinnis, J.M., Foegen, W.H., 1999. Mortality and morbidity attributable to use of addictive substances in the United States. *Proc. Assoc. Am. Physicians* 111, 109–118.
- McKirnan, D.J., Peterson, P.L., 1989a. Alcohol and drug use among homosexual men and women: epidemiology and population characteristics. *Addict. Behav.* 14, 545–553.
- McKirnan, D.J., Peterson, P.L., 1989b. Psychosocial and cultural factors in alcohol and drug abuse: an analysis of a homosexual community. *Addict. Behav.* 14, 555–563.
- Meyer, I.H., 2003. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychol. Bull.* 129, 674–697.
- Miller, N.S., Gold, M.S., 1998. Comorbid cigarette and alcohol addiction: epidemiology and treatment. *J. Addict. Dis.* 17, 55–66.
- Murray, R.P., Istvan, J.A., Daniels, K., Beaudoin, C.M., 1998. Alcohol and morbidity in the Lung Health Study. *J. Stud. Alcohol* 59, 250–257.
- Nardi, P.M., 1982. Alcoholism and homosexuality: a theoretical perspective. *J. Homosex.* 7, 9–25.
- Nawyn, S.J., Richman, J.A., Rospenda, K.M., Hughes, T.L., 2000. Sexual identity and alcohol-related outcomes: contributions of workplace harassment. *J. Subst. Abuse* 11, 289–304.
- Parks, K.A., Scheidt, D.M., 2000. Male bar drinkers' perspective on female bar drinkers. *Sex Roles* 43, 927–941.
- Richman, J.A., Shinsako, S.A., Rospenda, K.M., Flaherty, J.A., Freels, S., 2002. Workplace harassment/abuse and alcohol-related outcomes: the mediating role of psychological distress. *J. Stud. Alcohol* 63, 412–419.
- Roberts, S.J., Sorensen, L., 1999. Health related behaviors and cancer screening of lesbians: results from the Boston Lesbian Health Project. *Women's Health* 28, 1–12.
- Rohrbach, L.A., Howard-Pitney, B., Unger, J.B., Dent, C.W., Howard, K.A., Cruz, T.B., Ribisl, K.M., Norman, G.J., Fishbein, H., Johnson, C.A., 2002. Independent evaluation of the California Tobacco Control Program: relationships between program exposure and outcomes, 1996–1998. *Am. J. Public Health* 92, 975–983.
- Rothblum, E.D., Factor, R., 2001. Lesbians and their sisters as a control group: demographic and mental health factors. *Psychol. Sci.* 12, 63–69.
- Rubin, D.B., 1987. *Multiple Imputation for Nonresponse in Surveys*. Wiley, New York, NY.
- Russell, S.T., Driscoll, A.K., Truong, N., 2002. Adolescent same-sex romantic attractions and relationships: implications for substance use and abuse. *Am. J. Public Health* 92, 198–202.
- Scheer, S., Peterson, I., Page-Shafer, K., Delgado, V., Gleghorn, A., Ruiz, J., Molitor, F., McFarland, W., Klausner, J., 2002. Sexual and drug use behavior among women who have sex with both women and men: results of a population-based survey. *Am. J. Public Health* 92, 1110–1112.
- Skinner, W.F., 1994. The prevalence and demographic predictors of illicit and licit drug use among lesbians and gay men. *Am. J. Public Health* 84, 1307–1310.
- Skinner, W.F., Otis, M.D., 1996. Drug and alcohol use among lesbian and gay people in a southern U.S. sample: epidemiological, comparative, and methodological findings from the Trilogy Project. *J. Homosex.* 30, 59–92.
- Stall, R., Paul, J.P., Greenwood, G., Pollack, L.M., Bein, E., Crosby, G.M., Mills, T.C., Binson, D., Coates, T.J., Catania, J.A., 2001. Alcohol use, drug use and alcohol-related problems among men who have sex with men: the Urban Men's Health Study. *Addiction* 96, 1589–1601.
- StataCorp, 2001. *Stata Statistical Software: Release 7.0*. Stata Corporation, College Station, TX.
- Stein, M.D., Cyr, M.G., 1997. Women and substance abuse. *Med. Clin. North Am.* 81, 979–998.