



Published in final edited form as:

Psychol Addict Behav. 2009 December ; 23(4): 620–631. doi:10.1037/a0017334.

Tobacco, Marijuana Use and Sensation-seeking: Comparisons Across Gay, Lesbian, Bisexual and Heterosexual Groups

Karen F. Trocki, Ph.D.,

Alcohol Research Group, Public Health Institute

Laurie A. Drabble, Ph.D., and

San Jose State University, College of Social Work

Lorraine T. Midanik, Ph.D

University of California at Berkeley, School of Social Welfare

Abstract

This study examined patterns of smoked substances (cigarettes and marijuana) among heterosexuals, gays, lesbians, and bisexuals based on data from the 2000 National Alcohol Survey (NAS), a population-based telephone survey of adults in the United States. We also examined the effect of bar patronage and sensation-seeking/impulsivity (SSImp) on tobacco and marijuana use. Sexual orientation was defined as: lesbian or gay self-identified, bisexual self-identified, heterosexual self-identified with same-sex partners in the last five years, and exclusively heterosexual (heterosexual self-identified, reporting no same sex partners). Findings indicate that bisexual women and heterosexual women reporting same-sex partners had higher rates of cigarette smoking than exclusively heterosexual women. Bisexual women, lesbians and heterosexual women with same-sex partners also used marijuana at significantly higher rates than exclusively heterosexual women. Marijuana use was significantly greater and tobacco use was elevated among gay men compared to heterosexual men. SSImp was associated with greater use of both of these substances across nearly all groups. Bar patronage and SSImp did not buffer the relationship between sexual identity and smoking either cigarettes or marijuana. These findings suggest that marijuana and tobacco use differ by sexual identity, particularly among women, and underscore the importance of developing prevention and treatment services that are appropriate for sexual minorities.

Keywords

sexual orientation; tobacco use; marijuana use; sensation-seeking; bar patronage

Introduction

Although research about sexual orientation and use of both tobacco and marijuana is limited, an emerging literature using population-based and other probability sampling methodology suggests a pattern of higher substance use risk among lesbian, gay and bisexual populations

Author note: Contact information for the corresponding author, Karen Trocki, is Alcohol Research Group, 6475 Christie Ave. Suite 400, Emeryville, CA 94608. ktrocki@arg.org.

Laurie Drabble and Lorraine Midanik are also affiliated with the Alcohol Research Group

Publisher's Disclaimer: The following manuscript is the final accepted manuscript. It has not been subjected to the final copyediting, fact-checking, and proofreading required for formal publication. It is not the definitive, publisher-authenticated version. The American Psychological Association and its Council of Editors disclaim any responsibility or liabilities for errors or omissions of this manuscript version, any version derived from this manuscript by NIH, or other third parties. The published version is available at www.apa.org/journals/adb

compared to heterosexuals (Cochran, Ackerman, Mays, & Ross, 2004; Hughes & Eliason, 2002; Ryan, Wortley, Easton, Pederson, & Greenwood, 2001). Estimates of sexual minorities in the U.S. range from just under two percent to nine percent of the general population, with lower estimates based on measures of sexual identity (lesbian, gay or bisexual) and higher estimates based on behavior (reports of same sex partners in a given time frame) (Laumann, Gagnon, Michael, & Michaels, 1994). Understanding disparities in risk for substance use among diverse populations, including sexual minorities, is important to informing effective prevention and intervention efforts (GLMA, 2001).

Sexual Orientation and Use of Tobacco and Marijuana

Population-based studies of smoking and sexual orientation generally suggest higher smoking risk among sexual minority groups. Although these studies have used different definitions of smoking risk and different measures of sexual orientation (e.g., some have direct measures of self-identity and others rely on measures of sexual behavior), findings are fairly consistent. While a few studies with probability samples found no differences or mixed results by sexual orientation (Bowen et al., 2004; King & Nazareth, 2006; Mercer et al., 2008; Sandfort, Bakker, Schellevis, & Vanwesenbeeck, 2006), several statewide population-based studies in the United States found higher rates of smoking among sexual minority women and men compared to heterosexuals (Burgard, Cochran, & Mays, 2005; Dilley et al., 2005; Gruskin, Greenwood, Matevia, Pollack, & Bye, 2007; Tang et al., 2004). These findings are consistent with studies using probability sampling in selected large United States cities (Diamant & Wold, 2003; Diamant, Wold, Spritzer, & Gelberg, 2000; Greenwood et al., 2005; Stall, Greenwood, Acree, Paul, & Coates 1999), adult members of a large Northern California Health Plan (Gruskin & Gordon, 2006; Gruskin, Hart, Gordon, & Ackerson, 2001), multi-state samples of clinics/health providers with internal comparison groups (Koh & Diamant, 2000; Valanis et al., 2000), a multi-site women's health study (Hughes, Johnson, & Matthews, 2008), and a large prospective cohort study of women nurses (Case et al., 2004).

Population-based studies examining differences in marijuana use by sexual orientation have generally found higher rates among lesbian, gay, and bisexual adults compared to heterosexuals (Cochran, Ackerman, Mays & Ross; Scheer et al., 2003; Stall et al., 2001; Woody et al., 2001). Studies using probability samples have also found higher rates of marijuana use among sexual minority male and female youth compared to heterosexual youth (Hegna & Rossow, 2007; Russell, Driscoll, & Truong, 2002). Some studies of college students in the U.S. found higher rates of smoking (Eisenberg & Wechsler, 2003; McCabe, Boyd, Hughes, & d'Arcy, 2003; Ridner, Frost, & LaJoie, 2006) and greater past month marijuana use (McCabe et al., 2003; McCabe, Hughes, & Boyd, 2004) among lesbian and bisexual women compared to heterosexual women, but no differences based on sexual orientation among men.

Correlates of Tobacco and Marijuana Use among Lesbian, Gay and Bisexual Populations

Although few studies have been conducted that examine explicitly the factors that may underlie high rates of both smoking and marijuana use among lesbian, gay, and bisexual populations, there is an emerging literature that explores underlying mechanisms. Consistent with general population studies related to smoking, demographic variables, such as lower educational attainment, appear to be predictive of smoking among both lesbians and gay men (Hughes, Johnson, & Matthews, 2008; Stall et al, 1999; Tang et al., 2004). However, other factors that contribute to tobacco and marijuana use may differ by gender among sexual minorities. Hughes and Jacobson (2003) found that in addition to risks associated with greater rates of depression and target marketing, sexual minority women were more likely than heterosexuals to have a partner who smoked and that multiple marginalized statuses increased odds of lifetime and current smoking. Elevated tobacco and marijuana among lesbian and bisexual women may be associated with gender atypicality (e.g., butch compared to femme identity) and greater use of

social contexts such as bars (Rosario, 2008; Rosario, Schrimshaw, & Hunter, 2008). A study of correlates of smoking among gay and bisexual men found that tobacco use was associated with heavier drinking, frequent bar patronage, greater AIDS-related losses, and health status (HIV seropositivity or lower health rating than members of the same age cohort) (Stall, Greenwood, Acree, Paul, & Coates, 1999). Early sexual debut, which may increase risk of exposure to homophobia and social environments conducive to smoking, also appears to be associated with tobacco use among gay men (Lombardi, Silvestre, Janosky, Fisher, & Rinaldo, 2008).

Some studies focus explicitly on psychological vulnerability, such as lifetime discrimination and harassment reported by lesbian, gay and bisexual women and men, found greater vulnerability to psychiatric morbidity, including substance abuse (Espelage, Aragon, Birkett, & Koenig, 2008; Mays & Cochran, 2001). One study based on convenience sample of lesbian, gay, and bisexual participants in a gay pride festival found significant relationships between internalized homophobia use of alcohol, marijuana and cigarettes among women but no relationship among men (Amadio & Chung, 2004). Another study of smoking among men who have sex with men (MSM) compared to a general population sample found that depression, alcohol use, and lack of access to health care was correlated with tobacco use among both MSM and a general population sample, but that these variables were more common among MSM (McKirnan, Tolou-Shams, Turner, Dyslin, & Hope, 2006).

Environmental factors may also contribute to high rates of smoking, including target marketing of tobacco to lesbian, gay, bisexual communities (Drabble, 2000; LeCook, Ferris Wayne, Keithly, & Connolly, 2003; Smith, Offen, & Malone, 2005; Smith, Thomsan, Offen & Malone, 2008; Stevens, Carlson, & Hinman, 2004) and positive noncommercial tobacco in LGB publications that contributes to normalization of tobacco use (Smith, Offen, & Malone, 2006).

It is been suggested that elevated levels of substance use in sexual minority populations may be due, at least in part, to the use of bars as important social gathering places (Flowers, Knussen, & Church, 2003; Haslop, Hill, & Schmidt, 1998; Nardone et al., 2001; Trocki, Drabble, & Midanik, 2005). National survey research suggests that bar patronage may be higher among sexual minority populations (Trocki, Drabble, & Midanik, 2005). However, few population-based studies examine the relationship between bar patronage and smoking tobacco or marijuana among sexual minorities.

Sensation Seeking and Substance Use

Temperament factors such as impulse control (Eysenk & Eysenk, 1985; Zuckerman, 2007a) and sensation seeking (Zuckerman, 1979; Zuckerman, 2007a) have been found to be associated with many different forms of substance use including smoking and marijuana use among adolescents as well as in the general population of adults (Carrol & Zuckerman, 1977; Jackson, Sher, & Schulenberg, 2008; Trocki & Caetano, 2003; Zuckerman, 1994, 2007a, 2007b; Zuckerman, Neary, & Brustman, 1970). Sensation seeking as a motivation for bar patronage appears to be correlated with heavier drinking among both heterosexual and sexual minority women and men (Trocki & Drabble, 2008).

Research on temperament factors and risk behaviors has shown that there are complex interactions among temperament, environmental factors and traumatic or stressful life events (Aidman & Kollaras-Mitsinikos, 2006; Caspi et al., 2002; Henry, Sloane, & Black-Pond, 2007; Kendler & Prescott, 2006; Ladd, Owens & Nemeroff, 1996; Massie & Szajnberg, 2002; Pickering, Farmer, & McGuffin, 2004; Saltzman, 2001; Trocki & Caetano, 2003; Vanderlinden, Vandereycken, & Claes, 2007; Weaver, Meaney & Szyf, 2006). For example, Kendall and Prescott's (2006) extensive analysis of twin data, found that temperament patterns

interact with the severity of negative life events in predicting outcomes such as mood disorders or substance use. It is possible that the relationship between temperament and environmental stressors can be bidirectional; stressors tend to exacerbate certain temperament characteristics and modify their expression and temperament can drive exposure to stressors (Kendler & Prescott, 2006). These possible relationships are of particular interest in the context of research documenting the impact among sexual minorities of exposure to stressors such as social disapproval, discrimination, and other negative life events (Meyer, 2001).

Few studies of sensation seeking/impulsivity and substance use include analysis by lesbian, gay or bisexual identity. Most of the personality and temperament research among sexual minorities has been limited to sensation seeking and sexual risk behavior among gay men or men who have sex with men (Chng & Geliga-Vargas, 2000; Kalichman, Adair, Rompa, Johnson, & Kelly, 1994; Kalichman, Heckman, & Kelly, 1996; Kalichman & Rompa, 1995; McCoul, 2000; McCoul & Haslam, 2001; Ostrow, DiFranceisco, & Kalichman, 1997; Preston, D'Augelli, Kassab, & Starks, 2007; Schroth, 1996; Semple, Zians, Grant, & Patterson, 2006; Zuckerman & Myers, 1983). Exploring possible relationships between temperament factors, such as sensation-seeking and impulsivity, and substance use among diverse populations including sexual minorities, may help to refine our understanding of differences in risk.

Although many studies combine bisexual and lesbian or gay men in analyses, risks for alcohol, tobacco or other drug use may differ among these populations (Hughes & Eliason, 2002). The few studies of adults that disaggregate findings for bisexual respondents generally suggest a positive relationship between bisexual classification and smoking or marijuana use, particularly among adult women (King & Nazareth, 2006; McCabe et al., 2003; McCabe et al., 2004; Tang et al., 2004) and adolescent females (Austin, Conron, & Patel, 2004; Russell et al., 2002). Among U.S. college and university students, greater differences in marijuana use (and other illicit drug use) was found among both bisexual males and females, but not homosexual males and females, compared to heterosexuals in the same sample (Ford & Jasinski, 2006).

Many of the population-based studies examining sexual orientation and tobacco or marijuana use are based on regional or college populations and, consequently, may be limited in generalizability to larger populations. In addition, few national population based studies disaggregate lesbians and gay men from bisexual respondents. Sexual behavior and sexual identity are not always congruent, because many individuals with same-gender partners do not necessarily identify as homosexual or bisexual (Laumann, Gagnon, Michael, & Michaels, 1994); however, population-based studies do not generally examine separately possible risks for tobacco and marijuana use among individuals who identify as heterosexual but have same-sex partners. Although tobacco use is legal and marijuana use is considered an illicit substance, both substances may impact health and the higher rates of use among sexual minority women and men suggested by prior studies warrant further investigation.

A study using a national population sample is important to overcome potential biases in previous studies of sexual orientation and prevalence correlates of smoking and marijuana use using regional samples or samples drawn from health or educational institutions. Furthermore, there is a need for national population based research that controls for key characteristics that may be associated with heavier use such as sensation-seeking and frequent bar patronage. This study draws on a national, population based sample to examine the following research questions: 1) Do gay, lesbian and/or bisexual individuals smoke or use marijuana more than heterosexuals? 2) Do measures of sensation seeking and bar patronage differ by sexual identity? and, 3) Do variables such as sensation seeking and bar patronage impact relationships between sexual identity and tobacco and/or marijuana use?

Methods

The National Alcohol Survey

The data used for this study are from the 2000 National Alcohol Survey conducted from November 1999 through June 2001, a national household computer assisted telephone interview (CATI) survey of the adult (18 or older) population in all 50 states of the US and Washington D.C. (N = 7612). Random Digit Dialing (RDD) was used to develop the sample with list-assisted number generation, automatic detection of non-working numbers, and computer matching against yellow pages to increase the hit rate. Sampling was done using the last birthday technique, that is, the target respondent is chosen on the basis of the person who most recently had a birthday. A Spanish version was administered to Spanish speakers. Interviews lasted 25-50 minutes depending on the drinking status of the individual. In addition to the main RDD sample, two ethnic group oversamples were selected from exchanges with at least a 10% African-American or Hispanic residents in the area. Another oversample involved augmenting 13 low-population states to achieve at least 50 cases in each state (Midanik & Clark, 1994).

Considerable pre-testing and extensive interviewer training was conducted, and efforts were made to minimize non-response through intensive callback and non-response conversion efforts. The response rate was 58 percent. This level of response is common in US telephone surveys given telemarketing and call screening and non-response in telephone surveys does not seem to alter findings (Keeter, Kennedy, Dimock, Best, & Craighill, 2006). Since earlier National Alcohol Surveys (1995 and earlier) had been face-to-face surveys, several methodological sub-studies were done to ensure comparability of data when we shifted modes in 2000. No major mode effects were found (Midanik & Greenfield, 2003; Midanik, Hines, Greenfield, & Rogers, 1999).

Measures

Demographic variables—Demographic variables include: gender, age (18-29, 30-49, 50 or older), ethnicity (White, Black, Hispanic, Other), relationship status (partnered or not partnered), and educational level (high school or less, greater than high school).

Tobacco and Marijuana use—Respondents were asked how often they used marijuana in the past twelve months (once a week or more often, once every two or three weeks, once every month, less often than that or never). For analysis, the question was dichotomized into never versus any use in the past year. Past year marijuana use has been used in other studies based on National Alcohol Survey data (Graves, & Leigh, 1995; Kerr, Greenfield, Bond, Ye, and Rehm, 2007; Midanik, Tam, & Weisner, 2007).

Tobacco use was also defined by any use in the past year. Respondents were asked about lifetime use of cigarettes or other tobacco. This was followed by questions about frequency of use and whether the tobacco use consisted of cigarettes only, other tobacco or both. Finally, respondents who smoked were asked how many cigarettes they smoked each day. For the purposes of this study, only tobacco smoked in cigarettes over the past year is analyzed to be comparable with other national alcohol studies (Falk, Hyi, & Hiller-Sturmhofel, 2006).

Sexual Orientation—Sexual Orientation was based primarily on a self-identity question and, secondarily, a sexual behavior question (Drabble, Trocki, & Midanik, 2005; Midanik, Drabble, Trocki, & Sell, 2006). The following identity question was asked of all respondents: “Which of the following statements best describes your sexual orientation? Would you say: Heterosexual, that is ‘straight,’ or prefer to have sex with people of the opposite sex; Bisexual, that is, prefer to have sex with people of either sex; or Homosexual, that is, gay or lesbian, or

prefer to have sex with people of your own sex?" In addition, respondents were asked the following sexual behavior question: "Thinking of the last 5 years, has the partner or partners in your sexual relationships been: (1) Only men (2) mostly men (3) almost the same number of men and women (4) mostly women (5) only women (6) never had sexual relationship in last 5 years." Using these measures, a four category sexual orientation variable was created: homosexual identity, bisexual identity, heterosexual identity with reports of same-sex partners, and exclusively heterosexual (heterosexual identity with no reports of same-sex partners). Earlier studies using National Alcohol Survey data to compare identity and behavior measures of sexual orientation (Midanik, Drabble, Trocki, & Sell, 2006), examine alcohol consumption and alcohol related problems (Drabble & Trocki, 2005; Drabble, Trocki, & Midanik, 2005), and explore use of heavier drinking contexts (Trocki, Drabble, & Midanik, 2005) affirm the salience of identity, particularly among women, in examining alcohol related problems as well as the value of examining possible differences in risk among respondents who identify as heterosexual but also report same-sex partners. This study employs the same four-category sexual orientation variable to examine tobacco and marijuana use.

Respondents in the full sample (N=7612) who did not categorize themselves in response to the identity question (refused, did not know, or did not provide a response) were eliminated from this analysis (4.8%; n=364). More women than men refused to answer the behavior question (3.8% vs. 1.7%) and the identity question (5.4% vs. 2.7%) (Midanik, Drabble, Trocki, & Sell, 2006).

Sensation-seeking/impulse control—Sensation-seeking/impulse control is measured in the National Alcohol Survey using a short scale of nine items that is suitable for use in time-constrained surveys. The scale has a high reliability of .86 (Schafer, 1994), has been used in the National alcohol surveys since the 1970's (Cahalan & Room, 1974), and has consistently correlated with substance use and other risk behaviors (e.g. Cherpitel, 1999; Cherpitel, Meyers, & Perrine, 1998; Cunradi, 1999; Ericksen & Trocki, 1992; Trocki, 1993; Trocki & Caetano, 2003). Sensation seeking and impulsivity constructs are sometimes considered separately but the short scale in the National Alcohol Survey combines to a single factor. Zuckerman and Kuhlman (2000) also have a single scale factor which combines impulsivity and sensation-seeking (ImpSS) which they have used in studies of risky behavior and substance use. Since the scale used in this study also combines impulsivity and sensation seeking, SSImp is used to distinguish it from the Zuckerman and other scales.

Examples of impulse control items include: *I often act on the spur-of-the-moment without stopping to think* or *I get a real kick out of doing things that are a little dangerous*. Items tapping sensation-seeking includes: *I'm always up for a new experience*; *I go for the thrills in life when I get a chance*. Responses are on a four category Likert-type scale ranging from 3 to 0 (would you say that this statement describes you quite a lot, some, a little or not at all). The items were summed (with the high end representing higher SSImp) and divided into very low, low, high and very high groups on the basis of population quartiles. Respondents in the highest quartile are compared to all other groups combined.

Bar Patronage—As part of a scale that assesses the social contexts of alcohol use, respondents were asked how often they went to bars, taverns or cocktail lounges during the past year (?). There were five pre-determined response categories ranging from 'never' to 'once a week or more.' For the purpose of these analyses, the frequency range was collapsed into two categories: 1) less than once a month and 2) once a month or more. This was based on previous experience which showed that there was a steep increase in risky behavior and heavier substance use in the 1+ per month category (Clark, 1988).

Analysis

All analyses were conducted separately by gender. Bivariate analyses were conducted to examine the distribution for each of the criterion (cigarette use and marijuana use) and the predictor variables (all others) by sexual identity group using chi-square tests and follow up tests for between group comparisons. Bivariate analysis of mean age by sexual identity group was conducted using ANOVA. All analyses were conducted separately for women and men. Logistic regression modeling was used to test whether sexual orientation was significantly related to dichotomous outcome measures of tobacco and marijuana use while simultaneously controlling for demographic variables, bar-patronage, and sensation-seeking/impulsivity. Logistic regressions were conducted separately for women and men. We used multivariate logistic regression because it is extremely robust and suitable for many public health questions where the independent variables include subgroups that vary widely in size (Hosmer & Lemeshow, 1989). We also ran the logistic regressions with only the criterion variable and the sexual identity variables entered to see the relative change when adjusted by demographics, SSImp and bar patronage. We first entered the sexual orientation variable, then the demographic block and finally SSImp and bar patronage.

The analyses reported here were weighted, which corrects for unequal probability of selection in larger versus smaller households and adjusts for any differences in age, sex, and region of the country. Analyses also controlled for sampling design effects (Stata Corp., 2007) such as number of adults and number of independent phone numbers in a household. Analyses were done both in Stata (2007) and SPSS version 15.0 (2007). Since the analyses were virtually identical, the SPSS data are presented.

Description of Study Sample

Table 1 presents a demographic description of the study sample. Sexual orientation groups were created using an item asking about self-identity and one on behavior. For simplicity, we use 'sexual identity' to refer to these groupings rather than sexual identity/behavior. Among women in the sample, 96% (n=3723) identified as heterosexual and reported exclusively opposite sex partners in the past 5 years (hereinafter referred to as exclusively heterosexual), 1.8% (n=71) identified as heterosexual but reported having had same-sex partners, 1.3% (n=50) were bisexual, and 0.9% (n=36) were lesbian. Among men in the full sample, 95% (n=3201) identified as heterosexual and reported exclusively opposite sex partners in the past 5 years, 2.5% (n=83) identified as heterosexual while reporting same-sex partners in the past 5 years, 0.8% (n=27) were bisexual, and 1.7% (n=57) were gay.

Among women, bisexual women were significantly younger and less likely to be in a partnered relationship than the other three groups. The four groups of men did not differ from one another on age but they did differ on other demographic variables. Exclusively heterosexual men were more likely to report being in a partnered relationship compared to the three other groups. Exclusively heterosexual men and gay men were more likely to be white, bisexual men were more likely to be 'other' and heterosexual men who reported same sex partners were more likely to be black or Hispanic. Gay men were more likely to report having more than a high school education compared to both exclusively heterosexual men and heterosexual identified men reporting same-sex partners.

Results

Do Gay, Lesbian and/or Bisexual Individuals Smoke Tobacco or Use Marijuana More Than Heterosexuals?

Overall, 21.0 percent of respondents to our survey smoked cigarettes in the prior year (19.7% of women and 22.7% percent of men). Table 1 shows the bivariate results for tobacco use. Chi-

square analyses found significant differences by sexual orientation in the proportion of women who smoked cigarettes. Heterosexual women were the least likely to be smokers (19.1%). By contrast, 34.1 percent of heterosexual women with same-sex partners were smokers, 44.4 percent of bisexual women and 23.1 percent of lesbian women. The unadjusted odds ratios (calculated by a series of simple logistic regressions with only the dependent variables and sexual identity as the predictor) for each group relative to exclusively heterosexual women were as follows: heterosexual women with same-sex partners, unadjusted OR=2.23 (CI=1.40-3.54, $p < .001$), bisexual women, unadjusted OR= 3.39 (CI= 1.86-6.16, $p < .001$) and lesbian women, unadjusted OR=1.23 (CI= .58-2.6, *ns*). For the men, differences in proportions of cigarette smokers across groups were not significant in the bivariate analysis; however the unadjusted odds ratio for gay men compared to exclusively heterosexual men approached significance (unadjusted OR=1.86 CI=.98-3.50, $p = .06$)

Table 1 also shows the results for marijuana use. In this instance, chi-squared analyses found significant differences in marijuana use across the four groups of women. Bisexual women had the highest odds of marijuana use (unadjusted OR=11.29, 95% CI=6.03-21.13, $p < .001$) compared to exclusively heterosexual women. Heterosexual women with same-sex partners were approximately four times as likely as exclusively heterosexual women to use marijuana (unadjusted OR=4.62, 95% CI=2.63-8.14, $p < .001$). Finally, lesbians were nearly six times more likely than heterosexual women to use marijuana (unadjusted OR=5.33, 95% CI=2.45-11.6, $p < .001$). Although the bivariate test of marijuana use was significant across the four groups of men $\chi^2 (3, n = 3526) = 23.99, p < .001$, it is only the gay men who differ. Gay men had odds for marijuana in the year prior to the survey approximately four times greater (unadjusted OR= 4.35, CI=2.21-8.56, $p < .001$) than exclusively heterosexual men.

Do Measures of Sensation-Seeking and Bar Patronage Differ by Sexual Identity?

The figures for association between sexual identity groups and the sensation seeking/impulsivity variable are shown at the bottom of Table 1. The statistics represent the proportion of individuals who were in the highest quartile on the SSImp variable. Among exclusively heterosexual women, only 10 percent were in the highest quartile on SSImp compared to a 23 percent of heterosexual women with same-sex partners, 30 percent of bisexual women and 34 percent of lesbians were in the top quartile, $\chi^2 (9, n = 3751) = 67.98, p < .001$. In contrast, proportionately more men were in the highest quartile (21.3% of men versus 11.0% of women overall) but the men did not differ on SSImp on the basis of sexual identity.

Table 1 also shows the proportion of our sample who go to bars once a month or more across the four different sexual identity groups. Only about 14 percent of exclusively heterosexual women went to bars once a month or more compared to 30 percent or more in the three other groups of women, $\chi^2 (3, n = 3748) = 37.45, p < .001$. Heterosexual men and heterosexual men with same-sex partners patronized bars (23% and 20% respectively) considerably less than gay men (nearly 50 percent go to bars monthly) and somewhat less than bisexual men (28%), $\chi^2 (3, n = 3526) = 15.01, p = .002$.

Do Variables such as Sensation Seeking/Impulsivity and Bar Patronage Impact Relationships between Sexual Identity and Tobacco and/or Marijuana Use?

Multivariate logistic regression analyses were performed to address this question and determine whether differences in use of these substances were still associated with sexual orientation identity/behavior after adjusting for key demographic variables such as age, education, ethnicity and relationship status. Table 2 shows the final odds ratios after all variables have been entered. The first column shows the multivariate logistic regression results for cigarette smoking for women. Bisexual women and heterosexual women with same-sex partners smoked more than exclusively heterosexual women after all the other variables have been entered. This

is consistent with the unadjusted odds ratios reported earlier where, again, lesbians did not have higher odds of smoking than heterosexual women. With respect to other demographic variables, those women who were older (over 50), those who were better educated and those of Black or Latino ethnicity smoke less; those who were single, higher on sensation seeking and frequent bar patrons smoke more.

For men, sexual identity was associated with tobacco use only among gay men compared to heterosexual men, and that was at the margin of significance. It is notable that this is the same odds ratio as reported earlier for the unadjusted association indicating that none of the other demographic variables affected this association. The relationship between the other demographics and tobacco use were similar to the findings for women with one exception. Latina women were less likely to use tobacco than white women but this tendency did not achieve significance among Latino men compared to white men.

For marijuana use, exclusively heterosexual women were significantly less likely to use marijuana compared to the other three groups of women. Those women who were not partnered, who were high on sensation seeking, and those who reported more frequent bar patronage were also more likely to use marijuana. The odds for marijuana use were lower among older age groups. Education and ethnicity were not significant predictors among women.

Gay men were significantly more likely to use marijuana than exclusively heterosexual men; no other differences by sexual identity were significant (as was the case in the unadjusted analyses reported earlier). Men who were single, better educated, higher on sensation seeking and frequent bar patrons were more likely to use marijuana. As with women, older age was a protective factor. Among men, classification as Black or "other" was associated with higher odds for marijuana use compared to white men.

Bar patronage and SSImp have independent and significant effects on both cigarette smoking and marijuana use. Even controlling for other demographic variables, the odds of both tobacco and marijuana use were higher among respondents in the highest quartile of the SSImp score compared to respondents with lower scores. The odds of both tobacco and marijuana use were also significantly higher among respondents who patronized bars once a month or more compared to respondents who patronized bars less frequently. We also conducted a series of analyses to examine whether bar patronage and SSImp might mediate the relationship between sexual identity and the two criterion variables of tobacco smoking and marijuana use. Tables showing iterations of the logistic regression model are not shown because the mediating effect of both bar patronage and SSImp on the association between the predictor variables and the criterion variables is very small, only occurs for women, and does not change significance of relationships in the full model depicted in Table 2.

Discussion

The overall rates of smoking tobacco among respondents in our study were similar to findings for the National Health Interview Survey (National Center for Health Statistics, 2004). Although most population based studies suggest that smoking is also higher among both lesbians and gay men (Burgard et al., 2005; Dilley et al., 2005; Greenwood et al., 2005; Gruskin et al., 2007; Stall et al., 1999; Tang et al., 2004), we found elevated but not significantly greater smoking among gay men and lesbians compared to exclusively heterosexual men and women. Our findings are consistent with other population-based studies that find higher rates of marijuana use among sexual minority women and men compared to heterosexual men and women (Cochran et al., 2004; Diamant and Wold, 2003; Diamant et al., 2000; Scheer et al., 2003; Stall et al., 2001; Woody et al., 2001). In addition, our findings appear to support studies that suggest that risks for tobacco and marijuana use may be particularly pronounced among

bisexual women (Easton, Jackson, Mowery, Comeau, & Sell, 2008; Hegna & Rossow, 2007; McCabe et al., 2004; Russell et al., 2002). Specifically, we found higher rates of marijuana use among gay men and among lesbian, bisexual, and heterosexual identified women who had sex with women compared to exclusively heterosexual respondents. In our study, women who identified as bisexual, as well as heterosexual women who reported same-sex partners, also had odds for tobacco use that were substantially higher than that of exclusively heterosexual women.

Measures of sensation seeking and bar patronage were, as expected, significantly associated with tobacco smoking and marijuana use among both women and men. Analyses of differences in sensation seeking and bar patronage by sexual orientation found consistent and strong differences among women. Specifically, rates of frequent bar-patronage and classification as high on the sensation seeking scale were significantly lower for exclusively heterosexual women compared to lesbians, bisexuals, and heterosexual-identified women reporting same-sex partners. Bar patronage was significantly different among men, with gay men reporting particularly frequent bar patronage.

This research does not yet fully explain why there appear to be differences in sensation seeking across sexual identity groups for women. Authors of one study of addictive behavior (gambling) and sexual orientation speculated that biological differences in sensation-seeking by gender may explain variations in risky behaviors (Hershberger and Bogaert, 2005). However, although sensation seeking is often conceptualized as a biological factor that may create vulnerability to substance use and abuse (Zuckerman, 2007b), the direction of the relationship between sensation-seeking and substance abuse may be more complex. As noted earlier, many behavioral outcomes in Kendall & Prescott's (2006) twin sample were associated with interactions between environment and temperament characteristics. Kendler and Prescott note that women seem to be more susceptible than men to negative behavioral outcomes if they are more extreme on temperament characteristics such as novelty seeking. Other studies affirm that sensation seeking may increase in relation to exposure to excessive stress or traumatic events in childhood or even later (Aidman & Kollaras-Mitsinikos, 2006; Henry, Sloane, & Black-Pond, 2007; Kendler & Prescott, 2006; Massie & Szajnberg, 2002; Pickering, Farmer, & McGuffin, 2004; Saltzman, 2001; Trocki & Caetano, 2003; Vanderlinden, Vandereycken, & Claes, 2007).

Furthermore, a recent animal study found that that exposure to alcohol or cocaine during adolescence was associated with increased novelty-related behaviors and less inhibited behaviors in adulthood (Stansfield & Kirstein, 2007). The interactions between biology, stress, and environmental factors on both temperament and substance use may be particularly salient to sexual minorities given disproportionate stressors, experience of violence, and heavier alcohol and drug use among adolescents (see Hegna et al., 2007; Marshal, Friedman, King, Miles, Gold, Bukstein, et. al, 2008; Russell et al., 2002; Thompson & Johnson, 2003).

Meyer's (2003) minority stress model explains how stigma, prejudice, and discrimination contribute to increased risk of substance abuse and other mental health problems among sexual minorities. Stress responses appear to differ by gender and personality characteristics such as sensation seeking may help to buffer stress (Roberti, 2003). For example, one study of multiple factors that mediate the relationship between stress and drinking found that both female gender and high sensation seeking were predictive of event stress-drinking (Park, Armeli, & Tennen, 2004). We know little about how these factors may further differ by sexual orientation or about how broader environmental contexts may impact both stress and drinking. For example, a recent study found significant differences in drinking patterns and reports of negative alcohol-related consequences between different age cohorts of lesbians (Parks & Hughes, 2007). The authors note that social and cultural factors, such as the level of public acceptance and visibility

of sexual minorities, may influence the level of stress and subsequent drinking behaviors associated with individual processes of developing identity, disclosing sexuality, and creating community.

The current data, while having the advantage of national representativeness and a probability sample, still have limitations. The data were gathered in 2000; although overall trends in smoking may have changed, our finding of differences by sexual identity generally appear to be consistent with other recent studies. Gay men, lesbians and bisexuals are subject to discrimination and social disapproval, thus making it possible that some respondents might not have disclosed sexual orientation information over the phone. This possibility is supported by a recent study comparing interactive voice response (in which respondents interact directly with a computerized system) compared to computer-assisted telephone interviewing (CATI) methods using National Alcohol Survey data, which found a higher proportion of reports of homosexual and bisexual identity in the IVR compared to CATI samples for respondents 40 years or older but no differences in reports about sexual behavior (Midanik & Greenfield, 2008). This suggests that disclosing non-heterosexual identity may remain sensitive, particularly for older survey respondents, even in anonymous telephone surveys.

Although the data used allowed for examination of important variables such as sensation seeking/impulsivity and bar patronage, other variables that may have been ideal to include, such as direct measures of experiences of discrimination or minority stress, were not available. Furthermore, the numbers of respondents in sexual minority groups in this population based survey are small. It is possible that our finding of elevated but not significantly greater smoking among gay men and lesbians compared to exclusively heterosexual men and women may be related to the small numbers of respondents in these categories in our sample. It may be that larger studies with greater sample sizes, or oversamples of sexual minority populations, are needed to verify these findings. A clear understanding of disparities in smoking risks among lesbians and gay men will be made possible only as sexual identity demographic variables are routinely included in health surveillance surveys.

Despite these limitations, the study does support a growing body of literature suggesting differential risks for tobacco and marijuana use among sexual minority populations, particularly among women. The finding that temperament, specifically sensation-seeking/impulsivity, has a mild attenuating effect on smoking and marijuana use among sexual minority women suggests that such individual factors may be particularly salient to substance abuse prevention and smoking cessation efforts for sexual minority women. The importance of environmental prevention strategies would also appear to be supported by the finding that bar patronage was associated with smoking and marijuana use among all women as well as marijuana use among gay men. Findings from this study also underscore the importance of advancing population-based research that is inclusive of sexual orientation, particularly research that may foster a greater understanding of factors that may contribute to health disparities among sexual minority populations.

Acknowledgments

Grant support: This research was supported by grants P50 AA05595 (National Alcohol Research Center) and R01 AA-08564 from the National Institute on Alcohol Abuse and Alcoholism to the Alcohol Research Group, Public Health Institute.

References

Aidman EV, Kollaras-Mitsinikos L. Personality dispositions in the prediction of posttraumatic stress reactions. *Psychological Reports* 2006;99(2):569–580. [PubMed: 17153828]

- Amadio DM. Internalized homophobia and substance use among lesbian, gay and bisexual persons. *Journal of Gay & Lesbian Social Services* 2006;17(1):83–101.
- Austin SB, Conron KJ, Patel A. Measures of sexual orientation in epidemiologic surveys: Findings from a cognitive processing study with adolescents. *Journal of Adolescent Health* 2004;34(2):113–114.
- Bowen D, Bradford JB, Powers D, McMorrow P, Linde R, Murphy BC, et al. Comparing women of differing sexual orientations using population-based sampling. *Women & Health* 2004;40(3):19–34.
- Burgard SA, Cochran SD, Mays VM. Alcohol and tobacco use patterns among heterosexually and homosexually experienced California women. *Drug and Alcohol Dependence* 2005;77:61–70. [PubMed: 15607842]
- Cahalan, D.; Room, R. Problem drinking among American men (Monograph No 7). New Brunswick, NJ: Rutgers Center of Alcohol Studies; 1974.
- Carrol EN, Zuckerman M. Psychopathology and sensation seeking in “downers,” “speeders,” and “trippers”: A study of the relationship between personality and drug choice. *International Journal of the Addictions* 1977;12(4):591–601.
- Case P, Austin SB, Hunter DJ, Manson JE, Malspeis S, Willett WC, et al. Sexual orientation, health risk factors, and physical functioning in the Nurses' Health Study. *Journal of Women's Health* 2004;13(9):1033–1047.
- Caspi A, McClay J, Moffitt TE, Mill J, Martin J, Craig IW, et al. Role of genotype in the cycle of violence in maltreated children. *Science* 2002;297(5582):851–854. [PubMed: 12161658]
- Cherpitel CJ. Substance use, injury, and risk-taking dispositions in the general population. *Alcoholism: Clinical and Experimental Research* 1999;23(1):121–126.
- Cherpitel CJ, Meyers AR, Perrine MW. Alcohol consumption, sensation seeking and ski injury: a case-control study. *Journal of Studies on Alcohol* 1998;59:216–221. [PubMed: 9500309]
- Chng CL, Geliga-Vargas J. Ethnic identity, gay identity, sexual sensation seeking and HIV risk taking among multiethnic men who have sex with men. *AIDS Education and Prevention* 2000;12(4):326–339. [PubMed: 10982122]
- Clark WB. Places of drinking: a comparative analysis. *Contemporary Drug Problems* 1988;1:399–446.
- Cochran SD, Ackerman D, Mays VM, Ross MW. Prevalence of non-medical drug use and dependence among homosexually active men and women in the US population. *Addiction* 2004;99:989–998. [PubMed: 15265096]
- Cunradi, CB. Unpublished doctoral dissertation. University of California, Berkeley; Berkeley, CA: 1999. A contextual analysis of domestic violence: The role of drinking and neighborhood socioeconomic factors.
- Diamant AL, Wold C. Sexual orientation and variation in physical and mental health status among women. *Journal of Women's Health* 2003;12(1):41–49.
- Diamant AL, Wold C, Spritzer K, Gelberg L. Health behaviors, health status and access to and use of health care: A population-based study of lesbian, bisexual, and heterosexual women. *Archives of Family Medicine* 2000;9:1043–1051. [PubMed: 11115206]
- Dilley JA, Maher JE, Boysun MJ, Pizacani BA, Mosbaek CH, Rohde K, et al. Response letter to: Tang H, Greenwood GL, Cowling DW, Lloyd JC, Roeseler AG, Bal DG. Cigarette smoking among lesbians, gays, and bisexuals: How serious a problem? *Cancer Causes Control* 2005;16:1133–1134. [PubMed: 16184480]
- Drabble L. Alcohol tobacco and pharmaceutical industry funding: Considerations for organizations serving lesbian, gay, bisexual and transgender communities. *Journal of Lesbian and Gay Social Services* 2000;11(1):1–26.
- Drabble L, Trocki K. Alcohol consumption, alcohol-related problems, and other substance use among lesbian and bisexual women. *Journal of Lesbian Studies* 2005;9(3):19–30. [PubMed: 17548282]
- Drabble L, Trocki KF, Midanik LT. Reports of alcohol consumption and alcohol-related problems among homosexual, bisexual and heterosexual respondents: Results from the 2000 National Alcohol Survey. *Journal of Studies on Alcohol* 2005;66:111–120. [PubMed: 15830911]
- Easton A, Jackson K, Mowery P, Comeau D, Sell R. Adolescent same-sex and both-sex romantic attractions and relationships: Implications for smoking. *American Journal of Public Health* 2008;98(3):462–467. [PubMed: 18235075]

- Eisenberg M, Wechsler H. Substance use behaviors among college students with same-sex and opposite-sex experience: Results from a national survey. *Addictive Behaviors* 2003;28(5):899–913. [PubMed: 12788264]
- Ericksen KP, Trocki K. Behavioral risk factors for sexually transmitted diseases in American households. *Social Science and Medicine* 1992;34(8):843–853. [PubMed: 1604376]
- Espelage DL, Aragon SR, Birkett M, Koenig BW. Homophobic teasing, psychological outcomes, and sexual orientation among high school students: What influence do parents and schools have? *School Psychology Review* 2008;37(2):202–216.
- Eysenck, HJ.; Eysenck, MW. *Personality and individual differences: A natural science approach*. New York: Plenum Press; 1985.
- Falk DE, Hyi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use disorders. *Alcohol Research & Health* 2006;29(3):162–171. [PubMed: 17373404]
- Flowers P, Knussen C, Church S. Psychosocial factors associated with HIV testing amongst Scottish gay men. *Psychology & Health* 2003;18(6):739–752.
- Ford JA, Jasinski JL. Sexual orientation and substance use among college students. *Addictive Behaviors* 2006;31:404–413. [PubMed: 15970397]
- Gay and Lesbian Medical Association (GLMA) and LGBT health experts. San Francisco, CA: Gay and Lesbian Medical Association; 2001. *Healthy people 2010 companion document for Lesbian, Gay, Bisexual, and Transgender (LGBT) health*. Available at <http://www.healthypeople.gov/Implementation/compdocs.htm>
- Graves KL, Leigh BC. The relationship of substance use to sexual activity among young adults in the United States. *Family Planning Perspectives* 1995;27(1):18–22. 33. [PubMed: 7720848]
- Greenwood GL, Paul JP, Pollack LM, Binson D, Catania JA, Chang J, et al. Tobacco use and cessation among a household-based sample of US urban men who have sex with men. *American Journal of Public Health* 2005;95(1):145–151. [PubMed: 15623875]
- Gruskin EP, Gordon N. Gay/Lesbian sexual orientation increases risk for cigarette smoking and heavy drinking among members of a large Northern California health plan. *BMC Public Health* 2006;6
- Gruskin E, Greenwood GL, Matevia M, Pollack L, Bye LL. Disparities in smoking between the lesbian, gay and bisexual population and the general population in California. *American Journal of Public Health* 2007;97(8):1496–1502. [PubMed: 17600265]
- Gruskin EP, Hart S, Gordon N, Ackerson L. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *American Journal of Public Health* 2001;91(6):976–979. [PubMed: 11392944]
- Haslop C, Hill H, Schmidt RA. The gay lifestyle--Spaces for a subculture of consumption. *Marketing Intelligence & Planning* 1998;16(5):318–326.
- Hegna K, Rossow I. What's love got to do with it? Substance use and social integration for young people categorized by same-sex experience and attractions. *Journal of Drug Issues* 2007;37(2):229–255.
- Henry J, Sloane M, Black-Pond C. Neurobiology and neurodevelopmental impact on childhood traumatic stress and prenatal alcohol exposure. *Language, Speech, and Hearing Services in Schools* 2007;38(2):99–108.
- Hershberger SL, Bogaert AF. Male and female sexual orientation differences in gambling. *Personality and Individual Differences* 2005;38(6):1401–1411.
- Hosmer, DW.; Lemeshow, S. *Applied logistic regression*. New York: John Wiley & Sons; 1989.
- Hughes TL, Eliason M. Substance use and abuse in lesbian, gay, bisexual and transgender populations. *Journal of Primary Prevention* 2002;22(3):263–298.
- Hughes T, Jacobson KM. Sexual orientation and women's smoking. *Current Women's Health Reports* 2003;3:254–261.
- Hughes TL, Johnson TP, Matthews AK. Sexual orientation and smoking: Results from a multisite women's health study. *Substance Use & Misuse* 2008;43(89):1218–1239. [PubMed: 18649240]
- Jackson KM, Sher KJ, Schulenberg JE. Conjoint developmental trajectories of young adult substance use. *Alcoholism: Clinical and Experimental Research* 2008;32(5):723–737.

- Kalichman SC, Adair V, Rompa D, Johnson JR, Kelly J. Sexual sensation seeking: Scale development and predicting AIDS-risk behavior among homosexually active men. *Journal of Personality Assessment* 1994;62(3):385–397. [PubMed: 8027907]
- Kalichman SC, Heckman T, Kelly JA. Sensation seeking as an explanation for the association between substance use and HIV-related risky sexual behavior. *Archives of Sexual Behavior* 1996;25(2):141–154. [PubMed: 8740520]
- Kalichman SC, Rompa D. Sexual sensation seeking and Sexual Compulsivity Scales: reliability, validity, and predicting HIV risk behavior. *Journal of Personality Assessment* 1995;65(3)
- Keeter S, Kennedy C, Dimock M, Best J, Craighill P. Gauging the impact of growing nonresponse on estimates from a national RDD telephone survey. *Public Opinion Quarterly* 2006;70(5):759–779.
- Kendler, KS.; Prescott, CA. Genes, environment, and psychopathology: Understanding the causes of psychiatric and substance use disorders. New York: Guilford Press; 2006.
- Kerr WC, Greenfield TK, Bond J, Ye Y, Rehm J. Age-period-cohort influences on trends in past year marijuana use in the US from the 1984, 1990, 1995 and 2000 National Alcohol Surveys. *Drug and Alcohol Dependence* 2007;86:132–138. [PubMed: 16806739]
- King M, Nazareth I. The health of people classified as lesbian, gay and bisexual attending family practitioners in London: A controlled study. *BMC Public Health* 2006;6:127. [PubMed: 16681849]
- Koh AS, Diamant AL. Use of preventive health behaviors by lesbian, bisexual and heterosexual women: Questionnaire survey. *Western Journal of Medicine* 2000;172:379–384. [PubMed: 10854384]
- Ladd CO, Owens MJ, Nemeroff CB. Persistent changes in corticotropin-releasing factor neuronal systems induced by maternal deprivation. *Endocrinology* 1996;137:1212–1218. [PubMed: 8625891]
- Laumann, EO.; Gagnon, JH.; Michael, RT.; Michaels, S. The social organization of sexuality: Sexual practices in the United States. Chicago: University of Chicago Press; 1994.
- LeCook B, Ferris Wayne G, Keithly L, Connolly G. One size does not fit all: How the tobacco industry has altered cigarette design to target consumer groups with specific psychological and psychosocial needs. *Addiction* 2003;98:1547–1561. [PubMed: 14616181]
- Lombardi E, Silvestre AJ, Janosky JE, Fisher G, Rinaldo C. Impact of early sexual debut on gays men's tobacco use. *Nicotine & Tobacco Research* 2008;10(11):1591–1595. [PubMed: 18988071]
- Marshal MP, Friedman MS, King KM, Miles J, Gold MA, Bukstein OG, Morse JQ. Sexual orientation and adolescent substance use: A meta-analysis and methodological review. *Addiction* 2008;103:546–556. [PubMed: 18339100]
- Massie H, Szajnberg N. The relationship between mothering in infancy, childhood experience and adult mental health: results of the Brody prospective longitudinal study from birth to age 30. *International Journal of Psychoanalysis* 2002;83(Pt 1):35–55. [PubMed: 11915148]
- Mays VM, Cochran S. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *American Journal of Public Health* 2001;91(11):1869–1876. [PubMed: 11684618]
- McCabe SE, Boyd C, Hughes T, d'Arcy H. Sexual identity and substance use among undergraduate students. *Substance Abuse* 2003;24(2):77–91. [PubMed: 12766375]
- McCabe SE, Hughes T, Boyd C. Substance use and misuse: Are bisexual women at greater risk? *Journal of Psychoactive Drugs* 2004;36(2):217–225. [PubMed: 15369203]
- McCoul MD. Personality traits of impulsivity and sensation seeking and their relation to high-risk sexual behavior in males. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2000;60(8B):4237.
- McCoul MD, Haslam N. Predicting high risk sexual behaviour in heterosexual and homosexual men: The roles of impulsivity and sensation seeking. *Personality and Individual Differences* 2001;31(8):1303–1310.
- McKirnan DJ, Tolou-Shams M, Turner L, Dyslin K, Hope B. Elevated risk for tobacco use among men who have sex with men is mediated by demographic and psychosocial variables. *Substance Use & Misuse* 2006;41:1197–1208. [PubMed: 16798685]
- Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin* 2003;129:674–697. [PubMed: 12956539]

- Mercer CH, Bailey JV, Johnson AM, Erens B, Wellings K, Fenton KA, Copas AJ. Women who report having sex with women: British national probability data on prevalence, sexual behaviors, and health outcomes. *American Journal of Public Health* 2008;97(6):1126–1133. [PubMed: 17463372]
- Midanik LT, Clark WB. The demographic distribution of U.S. drinking patterns in 1990: Description and trends from 1984. *American Journal of Public Health* 1994;84(8):1218–1222. [PubMed: 8059875]
- Midanik LT, Drabble L, Trocki K, Sell R. Sexual orientation and alcohol use: Identity versus behavior measures. *Journal of Lesbian, Gay, Bisexual, and Transgender Health Research* 2006;3(1):25–35.
- Midanik LT, Greenfield TK. Interactive voice response versus computer-assisted telephone interviewing (CATI) surveys and sensitive questions: The 2005 National Alcohol Survey. *Journal of Studies on Alcohol* 2008;69:580–588.
- Midanik LT, Greenfield TK. Telephone versus in-person interviews for alcohol use: results of the Year 2000 National Alcohol Survey. *Drug & Alcohol Dependence* 2003;72(3):209–214. [PubMed: 14643937]
- Midanik LT, Hines AM, Greenfield TK, Rogers JD. Face-to-face versus telephone interviews: using cognitive methods to assess alcohol survey questions. *Contemporary Drug Problems* 1999;26:673–693.
- Midanik LT, Tam TW, Weisner C. Concurrent and simultaneous drug and alcohol use: Results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence* 2007;90:72–80. [PubMed: 17446013]
- Nardone A, Frankis JS, Dodds JP, Flowers PN, Mercey DE, Hart GJ. A comparison of high-risk sexual behaviour and HIV testing amongst a bar-going sample of homosexual men in London and Edinburgh. *European Journal of Public Health* 2001;11(2):185–189. [PubMed: 11420808]
- National Center for Health Statistics. Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2000 Vital and Health Statistics Series 10, Number 222 (DHHS Publication No PHS 2004-1550). Hyattsville, MD: Centers for Disease Control and Prevention; 2004.
- Ostrow DG, DiFranceisco W, Kalichman S. Sexual adventurousness, substance use, and high-risk sexual behavior: A structural modeling analysis of the Chicago MACS/coping and change cohort. *AIDS and Behavior* 1997;1(3):191–202.
- Park CL, Armeli S, Tennen H. The daily stress and coping process and alcohol use among college students. *Journal of Studies on Alcohol* 2004;65(1):126–135. [PubMed: 15000512]
- Parks CA, Hughes TL. Age differences in lesbian identity development and drinking. *Substance Use & Misuse* 2007;42(23):361–380. [PubMed: 17558935]
- Pickering A, Farmer A, McGuffin P. The role of personality in childhood sexual abuse. *Personality and Individual Differences* 2004;36(6):1295–1303.
- Preston DB, D'Augelli AR, Kassab CD, Starks MT. The relationship of stigma to the sexual risk behavior of rural men who have sex with men. *AIDS Education and Prevention* 2007;19(3):218–230. [PubMed: 17563276]
- Ridner SL, Frost K, LaJoie AS. Health information and risk behaviors among lesbian, gay, and bisexual college students. *Journal of the American Academy of Nurse Practitioners* 2006;18(8):374–378. [PubMed: 16907699]
- Roberti JW. Biological responses to stressors and the role of personality. *Life Sciences* 2003;73(20):2527–2531. [PubMed: 12967677]
- Rosario M. Elevated substance use among lesbian and bisexual women: Possible explanations and intervention implications for an urgent public health concern. *Substance Use & Misuse* 2008;43(89):1268–1270. [PubMed: 18649245]
- Rosario M, Schrimshaw EW, Hunter J. Butch/femme differences in substance use and abuse among young lesbian and bisexual women: Examination and potential explanations. *Substance Use & Misuse* 2008;43(89):1002–1015. [PubMed: 18649226]
- Russell ST, Driscoll AK, Truong N. Adolescent same-sex romantic attractions and relationships: Implications for substance use and abuse. *American Journal of Public Health* 2002;92(2):198–202. [PubMed: 11818291]
- Ryan H, Wortley PM, Easton A, Pederson L, Greenwood G. Smoking among lesbians, gays, and bisexuals: A review of the literature. *American Journal of Preventive Medicine* 2001;21(2):142–149. [PubMed: 11457635]

- Saltzman KM. The psychobiology of children exposed to marital violence. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2001;61(11B):6147.
- Sandfort TGM, Bakker F, Schellevis FG, Vanwesenbeeck I. Sexual orientation and mental and physical health status: Findings from a Dutch population survey. *American Journal of Public Health* 2006;96(6):1119–1125. [PubMed: 16670235]
- Schafer, J. Latent class and factor analyses of the 1990 National Alcohol Survey adult items (Technical Report C77). Berkeley, CA: Alcohol Research Group; 1994.
- Scheer S, Parks CA, McFarland W, Page-Shafer K, Delgado V, Ruiz JD, et al. Self-reported sexual identity, sexual behaviors and health risks: Examples from a population-based survey of young women. *Journal of Lesbian Studies* 2003;7(1):69–83.
- Schroth ML. Scores on sensation seeking as a predictor of sexual activities among homosexuals. *Perceptual and Motor Skills* 1996;82(2):657–658. [PubMed: 8724943]
- Sample SJ, Zians J, Grant I, Patterson TL. Methamphetamine use, impulsivity, and sexual risk behavior among HIV-positive men who have sex with men. *Journal of Addictive Diseases* 2006;25(4):105–114. [PubMed: 17088230]
- Smith EA, Offen N, Malone RE. What makes an ad a cigarette ad? Commercial tobacco imagery in the lesbian, gay, and bisexual press. *Journal of Epidemiology and Community Health* 2005;59:1086–1091. [PubMed: 16286500]
- Smith EA, Offen N, Malone RE. Pictures worth a thousand words: Noncommercial tobacco content in the lesbian, gay and bisexual press. *Journal of Health Communication* 2006;11:635–649. [PubMed: 17074732]
- Smith EA, Thomsan K, Offen N, Malone RE. “If you know you exist, it's just marketing poison”: Meanings of tobacco industry targeting in the lesbian, gay, bisexual, and transgender community. *American Journal of Public Health* 2008;98:99–1003.
- Stall R, Paul JP, Greenwood G, Pollack LM, Bein E, Crosby GM, et al. Alcohol use, drug use and alcohol-related problems among men who have sex with men: The Urban Men's Health Study. *Addiction* 2001;96:1589–1601. [PubMed: 11784456]
- Stall RD, Greenwood GL, Acree M, Paul JP, Coates TJ. Cigarette smoking among gay and bisexual men. *American Journal of Public Health* 1999;89:1875–1878. [PubMed: 10589323]
- Stansfield KH, Kirstein CL. Chronic cocaine or ethanol exposure during adolescence alters novelty-related behaviors in adulthood. *Pharmacology, Biochemistry and Behavior* 2007;86(4):637–642.
- Stata Corporation. Stata Corp Stata Statistical Software (Version Release 10.0). College Station, Texas: 2007.
- Stevens P, Carlson LM, Hinman JM. An analysis of tobacco industry marketing to lesbian, gay, bisexual, and transgender (LGBT) populations: Strategies for mainstream tobacco control and prevention. *Health Promotion Practice* 2004;5(3):129S–134S. [PubMed: 15231106]
- Tang H, Greenwood GL, Cowling DW, Lloyd JC, Roeseler AG, Bal DG. Cigarette smoking among lesbians, gays, and bisexuals: How serious a problem? (United States). *Cancer Causes Control* 2004;15(8):797–803. [PubMed: 15456993]
- Thompson SJ, Johnston L. Risk factors of gay, lesbian, and bisexual adolescents: Review of empirical literature and practice implications. *Journal of Human Behavior in the Social Environment* 2003;8(23):111–128.
- Trocki, K. Predictors of risky sex and other problem behaviors in adolescents. In: Colthurst, T., editor. *HIV and Alcohol Impairment: Reducing risks*. San Diego: University of California at San Diego; 1993. p. 137-151.
- Trocki KF, Caetano R. Exposure to family violence and temperament factors as predictors of adult psychopathology and substance use outcomes. *Journal of Addictions Nursing* 2003;14:183–192.
- Trocki KF, Drabble LA. Bar patronage and motivational predictors of drinking in the San Francisco Bay Area: gender and sexual identity differences. *Journal of Psychoactive Drugs* 2008;42:345–356. [PubMed: 19248392]
- Trocki KF, Drabble L, Midanik L. Use of Heavier Drinking Contexts among Heterosexuals, Homosexuals and Bisexuals: Results from a National Household Probability Survey. *Journal of Studies on Alcohol* 2005;66(1):105–110. [PubMed: 15830910]

- U.S. Department of Health and Human Services (DHHS). Healthy People 2010: Understanding and Improving Health. Vol. 2nd. Washington, DC: U.S. Government Printing Office; 2000.
- Valanis BG, Bowen DJ, Bassford T, Whitlock E, Charney P, Carter RA. Sexual orientation and health. *Archives of Family Medicine* 2000;9:843–853. [PubMed: 11031391]
- Vanderlinden, J.; Vandereycken, W.; Claes, L. Trauma, dissociation, and impulse dyscontrol: Lessons from the eating disorders field. In: Vermetten, E.; Dorahy, M.; Spiegel, D., editors. *Traumatic dissociation: Neurobiology and treatment*. Washington, DC: American Psychiatric Publishing; 2007. p. 317-331.
- Weaver ICG, Meaney MJ, Szyf M. Maternal care effects on the hippocampal transcriptome and anxiety-mediated behaviors in the offspring that are reversible in adulthood. *Proceeding of the National Academy of Sciences* 2006;103(9):3480–3485.
- Woody GE, VanEtten-Lee ML, McKirnan D, Donnell D, Metzger D, Senge G, et al. Substance use among men who have sex with men: Comparison with a national household survey. *Journal of Acquired Immune Deficiency Syndromes* 2001;27:86–90. [PubMed: 11404525]
- Zuckerman, M. *Sensation seeking and risky behavior*. Washington, DC: American Psychological Association; 2007a.
- Zuckerman, M. *Sensation Seeking and Risky Behavior*. Washington, DC: American Psychological Association; 2007b. *Sensation seeking and substance use and abuse: Smoking, drinking, and drugs*; p. 107-144.
- Zuckerman M, Myers PL. Sensation seeking in homosexual and heterosexual males. *Archives of Sexual Behavior* 1983;12(4):347–356. [PubMed: 6639330]
- Zuckerman, M. *Behavioral expressions and biosocial bases of sensation seeking*. New York, NY: Cambridge University Press; 1994. p. xivp. 463(1994)
- Zuckerman, M. *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1979.
- Zuckerman M, Kuhlman DM. Personality and risk-taking: Common biosocial factors. *Journal of Personality* 2000;68(6):999–1029. [PubMed: 11130742]
- Zuckerman M, Neary RS, Brustman BA. Sensation-Seeking Scale correlates in experience (smoking, drugs, alcohol, “hallucinations,” and sex) and preference for complexity (designs). *Proceedings of the Annual Convention of the American Psychological Association* 1970;5(Pt 1):317–318.

Table 1
Demographic and other key variables by sexual identity and gender (weighted percent)

	WOMEN					MEN					TOTAL
	EXCLUSIVELY HETERO-SEXUAL (N=3723)	HETERO-SEXUAL, SAME-SEX (N=87)	BISEXUAL (N=50)	LESBIAN (N=36)	TOTAL (N=3896)	EXCLUSIVELY HETERO-SEXUAL (N=3201)	HETERO SAME-SEX (N=83)	BISEXUAL (N=27)	GAY (N=57)	TOTAL (N=3368)	
ETHNICITY											
White	72.1	75.6	65.9	86.5	72.3	73.0	54.3	54.2	78.0	72.5	
Black	12.3	8.5	11.4	2.7	12.1	10.5	21.4	16.7	4.9	10.7	
Hispanic	9.4	6.1	9.1	2.7	9.3	9.4	18.6	8.3	12.2	9.6	
Other	6.2	9.8	13.6	8.1	6.4	7.2	5.7	20.8	4.9	7.2 ***	
AGE (Mean)	45.3	42.5	30.2	39.9	45.0 ***	43.3	42.8	43.5	39.2	43.2	
AGE (Categories)											
18-29	21.4	28.0	52.3	20.5	21.9	23.2	20.6	16.0	22.0	23.1	
30-49	40.8	45.1	40.9	59.0	41.0	43.2	52.9	52.0	56.1	43.6	
50+	37.9	26.8	6.8	20.5	37.1 ***	33.6	26.5	32.0	22.0	33.3	
EDUCATION											
More than High School	54.0	58.5	60.0	51.3	54.2	55.5	48.6	64.0	87.8	55.8 ***	
RELATIONSHIP											
Not Partnered	39.7	38.6	60.0	41.0 *	39.9 *	29.4	42.9	66.7	61.9	30.2 ***	
SUBSTANCE USE											
Cigarette smoking	19.1	34.1	44.4	23.1	19.7 ***	22.8	25.7	20.0	35.7	23.0	
Marijuana Use	5.0	19.5	37.8	21.1	21.1 ***	8.8	2.9	8.3	29.3 ***	9.0 ***	
OTHER KEY VARIABLES											
Sensation Seeking (% high)	10.3	23.2	29.5	34.2	11.0 ***	21.4	21.4	16.0	21.4	21.3	
Bar patronage 1+ times per month	13.6	30.1	31.1	30.8	14.3 ***	22.9	20.0	28.0	47.6	23.1 **	

* p < .05,

** p < .01,

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

100' > p

Table 2
Multivariate logistic predictors of cigarette and marijuana use in past twelve months by sexual identity

	Current Cigarette Use		Current Marijuana Use	
	Women Adj OR(95% CI)	Men Adj OR (95% CI)	Women Adj OR(95% CI)	Men Adj OR (95% CI)
Sexual Identity				
Exclusively heterosexual ^I				
Heterosexual w/same-sex partners	1.9** (1.2, 3.1)	1.1 (0.7, 2.0)	3.2*** (1.7, 6.0)	0.3 (0.1, 1.1)
Bisexual	2.4** (1.3, 4.6)	0.8 (0.3, 2.3)	5.2*** (2.6, 10.5)	0.9 (0.2, 4.0)
Lesbian/gay	0.9 (0.4, 1.9)	1.9 ⁺ (0.9, 3.7)	3.5** (1.5, 8.1)	4.1*** (1.9, 8.8)
Age				
18-29 ^I				
30-49	1.1 (0.8, 1.3)	1.1 (0.9, 1.4)	0.5*** (0.4, 0.7)	0.7** (0.5, 0.9)
50 ⁺	0.6*** (0.5, 0.8)	0.8 ⁺ (0.6, 1.0)	0.1*** (0.06, 0.2)	0.2*** (0.1, 0.3)
Ethnicity				
White ^I				
Black	0.4*** (0.3, 0.5)	0.7** (0.5, 0.9)	0.7 (0.3, 1.1)	1.6** (1.1, 2.4)
Latino	0.4*** (0.3, 0.5)	0.9 (0.7, 1.2)	0.7 (0.4, 1.2)	1.4 (0.9, 2.1)
Other	0.9 (0.6, 1.2)	1.1 (0.8, 1.5)	1.0 (0.6, 1.8)	1.6* (1.0, 2.4)
Relationship Status				
Partnered ^I				
Not partnered	1.2* (1.0, 1.5)	1.2 ⁺ (1.0, 1.4)	1.4* (1.1, 2.0)	1.7*** (1.3, 2.2)
Education				
High school or less ^I				
Some college or more	0.6*** (0.5, 0.7)	0.6*** (0.5, 0.7)	0.9 (0.6, 1.2)	0.7* (0.6, 0.9)
SSImp (interval variable)				
Higher on sensation-seeking	1.2** (1.1, 1.3)	1.2*** (1.1, 1.3)	1.5*** (1.3, 1.7)	1.6*** (1.4, 1.8)
Bar-going				
Less than 1 per month ^I				
Once per month or more	1.3* (1.1, 1.6)	1.3** (1.1, 1.6)	2.4*** (1.7, 3.3)	1.9*** (1.5, 2.5)

^I Reference group;

⁺ p < .10,

* p < .05,

** p < .01,

*** p < .001,

Note: The odds ratios and confidence intervals for education, sensation seeking and bar-going are identical for both men and women where tobacco smoking is the dependent variable. This was checked to ensure that it was not a mistake. The numbers are different before rounding (e.g. the ORs are .56, 1.15, and 1.31 for women and .55, 1.22 and 1.30 for men).