Published in final edited form as:

Cancer Causes Control. 2010 November ; 21(11): 1817–1828. doi:10.1007/s10552-010-9609-3.

The mediating effect of childhood abuse in sexual orientation disparities in tobacco and alcohol use during adolescence: results from the Nurses' Health Study II

Hee-Jin Jun,

Channing Laboratory, Brigham & Women's Hospital and Harvard Medical School, Boston, MA, USA

S. Bryn Austin,

Channing Laboratory, Brigham & Women's Hospital and Harvard Medical School, Boston, MA, USA

Division of Adolescent and Young Adult Medicine, Children's Hospital, 300 Longwood Ave., Boston, MA 02115, USA

Department of Society, Human Development, and Health, Harvard School of Public Health, Boston, MA, USA

Sarah A. Wylie,

Division of Adolescent and Young Adult Medicine, Children's Hospital, 300 Longwood Ave., Boston, MA 02115, USA

Heather L. Corliss,

Division of Adolescent and Young Adult Medicine, Children's Hospital, 300 Longwood Ave., Boston, MA 02115, USA

Benita Jackson,

Department of Psychology, Smith College, Northampton, MA, USA

Donna Spiegelman,

Channing Laboratory, Brigham & Women's Hospital and Harvard Medical School, Boston, MA, USA

Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

Department of Biostatistics, Harvard School of Public Health, Boston, MA, USA

Mathew J. Pazaris, and

Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

Rosalind J. Wright

Channing Laboratory, Brigham & Women's Hospital and Harvard Medical School, Boston, MA, USA

Department of Environmental Health, Harvard School of Public Health, Boston, MA, USA

S. Bryn Austin: bryn.austin@childrens.harvard.edu

Abstract

Objective—To examine the mediating effect of childhood abuse on sexual orientation disparities in tobacco and alcohol use during adolescence.

Methods—We carried out analyses with data from over 62,000 women in the ongoing Nurses' Health Study II cohort who provided information on sexual orientation, childhood abuse occurring by age 11, and tobacco and alcohol use in adolescence. We used multivariate regression analyses, controlling for confounders, to estimate the mediating effect of childhood abuse on the association between sexual orientation and tobacco and alcohol use in adolescence.

Results—Lesbian and bisexual orientation and childhood abuse were positively associated with greater risk of tobacco and alcohol use during adolescence. For lesbians, the estimated proportion of excess tobacco and alcohol use in adolescence relative to use among heterosexual women that was mediated by abuse in childhood ranged from 7 to 18%; for bisexual women, the estimated proportion of excess use mediated by abuse ranged from 6 to 13%.

Conclusions—Elevated childhood abuse in lesbian and bisexual women partially mediated excess tobacco and alcohol use in adolescence relative to heterosexual women. Interventions to prevent child abuse may reduce sexual orientation disparities in some of the leading causes of cancer in women.

Keywords

Alcohol; Bisexual; Child abuse; Lesbian; Sexual orientation; Tobacco

Introduction

Tobacco and alcohol use in women have been linked with myriad cancers, including ovarian, breast, endometrial, head and neck, liver, and colorectal cancers [1–8]. Attention to use of these substances in adolescence is critical to cancer prevention efforts because (1) the vast majority of adult smokers and drinkers began their tobacco and alcohol use in adolescence [9]; and (2) early onset of tobacco use has been found to exacerbate risk of breast and aerodigestive tract cancer in smokers [2,10], and alcohol consumption during adolescence has been associated with heightened risk of breast cancer [11,12]. Considerable evidence indicates that lesbian and bisexual women have higher rates of both tobacco and alcohol use than heterosexual women [13–20], but the reasons underlying these cancer risk factor disparities are not well understood [21]. Identifying the determinants of these disparities will inform effective prevention and treatment initiatives to reduce tobacco and alcohol use in lesbian and bisexual women.

Findings from representative samples consistently have documented higher risk of tobacco [16,17,19] and alcohol [15,17,18] use in lesbian and bisexual compared to heterosexual women. In our team's prior work with the Nurses' Health Study (NHS) II, an ongoing prospective cohort of almost 120,000 female registered nurses living throughout the United States, we found similarly elevated rates of both tobacco and alcohol use in lesbian and bisexual women relative to heterosexual women [20]. Sexual orientation-related disparities in cancer risk behaviors observed in adulthood have been shown to emerge in adolescence [22–24]. Analyses of data gathered through the Massachusetts and Vermont Youth Risk Behavior Survey (YRBS) conducted in high schools statewide found pronounced sexual orientation group differences in both tobacco and alcohol use: 26% of lesbian and bisexual girls in grades 9 through 12 reported smoking more than half a pack of cigarettes per day and 19% reported drinking alcohol one or more times per day, compared to 6 and 5%, respectively, for each behavior, among heterosexual girls [22].

Despite well-documented disparities in these critical cancer risk behaviors, it is not yet known why these disparities exist. Violence victimization in childhood may be an important contributor, as childhood victimization has been strongly linked with subsequent tobacco and alcohol use [25,26]. Substance use may be an unhealthy coping strategy adopted in response to distress resulting from violence victimization [27,28], and emotional distress has been

prospectively associated with increased risk of tobacco and alcohol use [29,30]. Accumulating evidence indicates that lesbian and bisexual females are significantly more likely than heterosexual females to report histories of childhood physical and sexual abuse [31–36]. In NHSII, the proportion of women experiencing physical abuse victimization in childhood before age 11 years was higher for lesbian (47%; risk ratio [RR] 1.3; 95% CI 1.1, 1.4) and bisexual (42%; RR 1.1; 95% CI 0.9, 1.3) women than for heterosexual women (38%) [35]. Rates of childhood sexual abuse were also elevated: 34% (RR 1.6; 95% CI 1.5, 1.9) of lesbian and 35% (RR 1.7; 95% CI 1.4, 2.0) of bisexual women in NHSII reported childhood sexual abuse occurring by age 11 years when compared to 21% of heterosexual women.

The Massachusetts and Vermont YRBS study mentioned earlier found that lesbian and bisexual high school girls who reported high levels of victimization at school were at higher risk of cigarette and alcohol use than were similarly victimized heterosexual girls, yet among girls who reported low levels of victimization at school, lesbian, bisexual, and heterosexual girls showed similar risk of tobacco and alcohol use [22]. Two studies in samples of lesbian and bisexual women (without a heterosexual comparison group) have shown associations between sexual abuse in childhood and psychological distress in adulthood, early onset drinking behavior, and alcohol dependence [37,38]. However, as these two studies excluded heterosexual women, it was not possible to examine if sexual orientation minority vs. majority differences in childhood abuse history explained sexual orientation disparities in alcohol use. A study by Matthews et al. found lesbians reported higher rates than heterosexual women of depressive distress in adulthood in addition to higher rates of sexual abuse victimization before age 15 years, but researchers did not find abuse history to mediate the sexual orientation-depressive distress association; links between abuse history and tobacco and alcohol use were not assessed in this study [33].

Clear disparities in cancer risk behaviors and violence victimization have been documented in comparing lesbian and bisexual women to heterosexual women, but few studies have brought the two domains together to assess the possible contribution of violence victimization in childhood to disparities in onset of cancer risk behaviors in adolescence. In the current study, we examined the role of physical and sexual childhood abuse in subsequent tobacco and alcohol use in adolescence among lesbian, bisexual, and heterosexual women in NHSII. Specifically, we hypothesized that childhood abuse victimization would partly mediate associations between minority sexual orientation and elevated tobacco and alcohol use in early and middle adolescence.

Methods

Study population

NHSII began in 1989, when baseline questionnaires were sent to approximately 520,000 registered nurses from 14 populous US states, and 116,608 women aged 25–42 years were enrolled in the study. Returning a completed questionnaire was considered an indication of consent to participate in the study. The cohort has been followed with biennial questionnaires assessing risk factors and disease incidence [39]. In 2001, a supplemental violence victimization questionnaire was mailed to 91,286 women in the cohort, excluding those who had previously requested short-form questionnaires only or those who required more than four mailings before responding to the previous biennial follow-up questionnaire in 1999; 68,505 women returned the questionnaires, with a 75% response rate [40]. This study was approved by the institutional review board at Brigham and Women's Hospital and the Human Subjects Committee at the Harvard School of Public Health.

Measures

Outcome variables—For tobacco use outcomes, smoking by age 14 years and smoking between ages 15 and 19 years were measured. In the baseline questionnaire, women were asked whether they had smoked 20 packs of cigarettes in their lifetime. If they answered “yes,” they were asked about the average number of cigarettes smoked per day: (a) by 14 years of age; (b) at ages 15 and 19 years; and (c) in older age periods. We used this information to create the following two binary tobacco outcome variables: smoking by 14 years old (early onset smoking) and smoking between ages 15–19 years (regardless of their smoking status by age 14 years). Two additional continuous tobacco outcome variables were average number of cigarettes smoked per day in early onset smokers and in smokers at ages 15–19 years.

For alcohol use outcomes, drinking by ages 15–17 years and amount of drinking at the same ages were measured. On the baseline questionnaire, women were asked their usual number of drinks of alcohol per month or week at ages 15–17 years. The response categories were none or less than 1 per month, 1–3 per month, 1 per week, 2–4 per week, 5–6 per week, 7–13 per week, 14–24 per week, 25–39 per week, or 40 or more per week. We used this information to create two alcohol use outcome variables: (1) drinking by ages 15–17 years (binary) and (2) amount of drinking (grams of alcohol per day; continuous) at ages 15–17 years.

Predictor variables—To assess sexual orientation identity, we used an item added to the questionnaire in 1995. The item read: “Whether or not you are currently sexually active, what is your sexual orientation or identity? (Please choose one answer),” with response options: “(1) Heterosexual, (2) Lesbian, gay or homosexual, (3) Bisexual, (4) None of these, (5) Prefer not to answer.” In this study, we included the participants who reported their identity as heterosexual; bisexual; or lesbian, gay, or homosexual.

The 2001 NHSII supplemental questionnaire included validated self-report measures assessing physical and sexual abuse experienced in childhood occurring up to age 11 years. Important for establishing temporal precedence, exposure to childhood abuse occurred before adolescent substance use outcomes. Physical abuse was assessed with five items adapted from the nine-item Physical Assault Subscale of the Revised Conflict Tactics Scale (CTS2) [41]. On the NHSII questionnaire, the items were preceded by the clause: “When you were a child (up to age 11 years), did your parent, step-parent or adult guardian ever,” which was followed by five items: “Push, grab, or shove you,” “Kick, bite, or punch you,” “Hit you with something that hurt your body,” “Choke or burn you,” and “Physically attack you in some other way.” Response options were: “Never,” “Once,” “A few times,” and “More than a few times.” A categorical childhood physical abuse severity scale was created with a minimum score of 0 = no physical abuse, 1 = mild physical abuse (defined as being pushed, grabbed, or shoved at any frequency or being kicked, bitten, or punched once or hit with something once), 2 = moderate physical abuse (defined as being hit with something more than once or physically attacked once), and 3 = severe physical abuse (defined as being kicked, bitten, or punched or physically attacked more than once or ever choked or burned). Those who experienced more than one category of abuse were classified in the more severe category.

Sexual abuse was assessed with four items adapted from a national survey conducted by the Gallup Organization assessing prevalence of abuse [42,43]. An item on unwanted touching asked, “When you were a child (up to age 11 years), were you ever touched in a sexual way by an adult or an older child or were you forced to touch an adult or an older child in a sexual way when you did not want to?” An item on forced sexual activity asked respondents, “When you were a child (up to age 11 years), did an adult or older child ever force you or attempt to force you into any sexual activity by threatening you, holding you down or hurting you in some way when you did not want to?” Exposure to sexual abuse during childhood was categorized

into three groups: 0 = no experience of abuse, 1 = being touched in a sexual way, or 2 = being forced or attempted to be forced into sexual activity.

Other covariates—Potential confounders were identified based on the theoretical and empirical literature. Based on prior research in NHSII [20,40] indicating that sexual orientation and tobacco and alcohol use differ by age, race/ethnicity, region of residence at age 15, and parental smoking during childhood, we considered these variables as potential confounders. Indicators of the childhood psychosocial environment, such as socioeconomic status (SES), have been linked to earlier smoking onset [44] and to exposure to violence [45], and thus we also considered mother's education level as a potential confounder.

Statistical analyses

For our primary analyses, we evaluated sexual orientation group differences for each binary outcome (smoking by age 14, smoking during ages 15–19, drinking during ages 15–17 years), comparing lesbian and bisexual women to heterosexual women as the reference group using the SAS statistical package (version 9.1, SAS Institute, Cary, NC). We calculated multivariate-adjusted relative risks (RRs) and 95% confidence intervals (CIs), controlling for confounders as described earlier using log-binomial regression [46]. We first estimated the association between sexual orientation and each binary outcome (base models). Next, we added to the models predictor terms indicating physical and sexual abuse during childhood occurring by age 11 years to evaluate the potential mediating effect of childhood abuse on the association between sexual orientation and tobacco use and sexual orientation and alcohol use (abuse-adjusted models). To do so, we calculated the mediation proportion and its 95% CI [47] using the publicly available % Mediate macro designed by our group (<http://www.hsph.harvard.edu/faculty/spiegelman/mediate.html>). The mediation proportion is the proportion of excess tobacco or alcohol use in adolescence by lesbian and bisexual women relative to heterosexual women that can be attributed to elevated rates of child abuse victimization in lesbian and bisexual women.

We also carried out three sets of multivariate linear regression analyses for the ordinal outcomes, controlling for confounders as described earlier, focused on the amount of tobacco and alcohol use. These analyses were restricted to the subset of participants who reported engaging in tobacco and alcohol use in adolescence. Base models adjusted for confounders as described earlier, and, then in abuse-adjusted models, we examined to what degree childhood abuse victimization contributed to any observed sexual orientation group differences in the amount of tobacco and alcohol used. As with our primary analyses, for these subanalyses, we calculated the proportion of the excess amount of tobacco and alcohol use in adolescence in lesbian and bisexual women relative to heterosexual women that may be mediated by elevated rates of childhood abuse. All *p*-values are two-sided.

Sample sizes included in analyses in this study differed by outcome. Of the 68,505 women who responded to the violence questionnaire, 63,376 also responded to the item on sexual orientation included on the 1995 NHSII questionnaire. Of these women, 358 were excluded because they responded "Prefer not to answer" or "None of these" to the sexual orientation item, and 350 were excluded for missing information on abuse during childhood, leaving us with a sample of 62,668 women for analyses of smoking by age 14 and smoking during ages 15–19. For analyses of alcohol use during ages 15–17 years, we further excluded 464 participants who were missing alcohol use data, leaving us with a sample of 62,204 women. For analyses of number of cigarettes smoked per day, we included only those who smoked by age 14 years (*n* = 2,972) or who smoked during ages 15–19 years (*n* = 14,320). For analyses of number of grams of alcohol consumed per day, we included only those who drank alcohol during ages 15–17 years (*n* = 14,100).

Results

In our study, 98.8% of the participants self-identified as heterosexual ($n = 61,955$), 0.3% as bisexual ($n = 221$), and 0.8% as lesbian ($n = 492$). Participants were mostly of non-Hispanic white race/ethnicity (94.6%) (Table 1). Table 1 shows the prevalence of potential confounders and physical and sexual abuse victimization in childhood, by sexual orientation group. As shown previously [35], lesbian and bisexual women were more likely than heterosexual women to report physical and sexual abuse occurring by age 11 years. Tobacco and alcohol use in adolescence also differed significantly across sexual orientation groups (Table 2). Both lesbian and bisexual women were more likely to begin smoking by age 14 and more likely to smoke at ages 15–19 years than were heterosexuals. We observed similar differences by sexual orientation group for alcohol use at ages 15–17 years. Among the subset who reported smoking in adolescence, bisexual women smoked more cigarettes per day at ages 15–19, but not by age 14, compared to heterosexual women; whereas, lesbians smoked fewer cigarettes per day by age 14 but smoked more cigarettes per day at ages 15–19, compared to heterosexual women. Among the subset who reported drinking alcohol in adolescence, lesbian but not bisexual women consumed more grams per day of alcohol at ages 15–17 than did heterosexual women.

Physical and sexual abuse occurring by age 11 were positively associated with subsequent risk of tobacco and alcohol use as well as higher amounts of use in adolescence for women in all sexual orientation groups, controlling for confounders (base models in Tables 3, 4, and 5). In Tables 3 and 4, comparing abuse-adjusted multivariate regression models to base models for the four tobacco outcomes, it was apparent that the addition of abuse history to models moderately attenuated effect estimates for lesbian and bisexual orientation in all models except in the one estimating number of cigarettes smoked per day by lesbians by age 14. For the two alcohol outcomes, addition of the abuse terms to the base model also resulted in attenuation of sexual orientation effect estimates (Table 5).

There was evidence of statistically significant mediation of the sexual orientation disparities in substance use by exposure to child abuse. For lesbians, the estimated proportion of excess tobacco and alcohol use in adolescence relative to use among heterosexual women that was mediated by abuse in childhood ranged from 7 to 18% across the different outcomes; for bisexual women, the estimated proportion of excess use mediated by abuse ranged from 6 to 13% across the different outcomes (p -values < 0.05 ; Tables 3, 4, and 5).

Discussion

Tobacco and alcohol use have been consistently identified as major causes of cancer. Early onset of these behaviors is of particular concern because use in adolescence may further increase cancer risk [2,8,10–12] and is a predictor of continued use into adulthood [9]. Studies with representative samples as well as other large cohort studies of youth have shown higher rates and earlier onset of smoking and alcohol use in sexual orientation minority vs. majority adolescent girls [22–24,48–50]. Our study findings corroborate existing evidence that lesbian and bisexual females have higher use rates of tobacco and alcohol in adolescence than do heterosexual females. In addition, we documented that elevated rates of childhood victimization occurring before adolescence in part explain sexual orientation-related disparities in tobacco and alcohol use that subsequently emerge in adolescence. A history of victimization in childhood by age 11 may account for up to 18% of excess use in lesbians in adolescence and up to 13% of excess use in bisexual women in adolescence.

Prior research has documented a clear link between childhood violence victimization and subsequent tobacco and alcohol use in women [25,26] and suggests that coping with emotional distress may be an important factor underlying elevated substance use in women with a history

of victimization [27,28]. Previous work suggested a link between childhood abuse, emotional distress, and substance use in lesbian and bisexual women [33,36–38], although abuse had not been directly tested as a mediator of sexual orientation group disparities in substance use. Our findings provide estimates of the degree to which elevated rates of childhood victimization may contribute to subsequent excess tobacco and alcohol use in early and middle adolescence in lesbian and bisexual women.

Our study focused specifically on the mediating effect of childhood abuse on adolescent tobacco and alcohol use and did not examine the additional effects of continued or new onset victimization in adolescence on substance use. In the NHSII cohort, we have previously documented greater chronicity of abuse in childhood and adolescence and higher risk of revictimization in adolescence in lesbian and bisexual women compared to heterosexual women [35]. Future studies will need to investigate whether and to what degree cumulative and chronic victimization may further contribute to excess tobacco and alcohol use in later adolescence and adulthood in these populations.

It is important to note that we found the majority of excess tobacco and alcohol use in early and middle adolescence in lesbian and bisexual women was not mediated by disparities in childhood abuse nor explained by other known confounders considered in our models. Further research is needed to identify additional factors such as parental, sibling, and peer alcohol use, parental mental health, peer tobacco use, and cumulative and chronic victimization that may contribute to observed sexual orientation disparities in these critical cancer risk behaviors. In addition, it is possible that the types of factors contributing to tobacco and alcohol use disparities or the relative contribution of these factors may differ for lesbian vs. bisexual women. For instance, while for lesbians, all estimated mediated proportions were statistically significant, for bisexual women, only three estimated proportions reached significance and the magnitude of the estimated proportions appeared to differ for lesbians compared bisexual women in some cases. These apparent subgroup differences may simply be due to instability in estimates resulting from the small sample size of the bisexual group, or they may be due to true differences in the experiences of lesbian and bisexual women. Further research will need to investigate similarities and differences in the exposures and health outcomes in these groups.

There are several limitations to our study. NHSII is a not a representative sample and has limited socioeconomic diversity, as all participants were registered nurses at the time of enrollment. In addition, sexual orientation was assessed when the participants were adults, thus we do not know how they would have reported their orientation in adolescence, and due to small subsample sizes, we were not able to examine whether sexual orientation-related disparities vary by race/ethnicity. Though we do have information on the timing of abuse as occurring in childhood by age 11 years, we do not have data on the exact age of onset of tobacco or alcohol use. It is possible that for some women, their tobacco or alcohol use preceded the onset of childhood abuse, though we believe this may be a rare situation in our cohort because of the low rates of substance use by girls during the historical period of our participants' youth. NHSII participants, whose ages ranged from 25 to 42 years at baseline in 1989, were age 11 years between 1958 and 1975. During this historical period in the United States, less than 0.01% of girls initiated smoking [51] and 7.6% had ever tried alcohol [52] by age 11 years. Therefore, in the majority of cases, it is likely that substance use onset was subsequent to reported victimization, a temporal association that is important for causal inference.

Items used to measure frequency of tobacco use could also have affected our results. Models of victimization and tobacco use were restricted to individuals who reported having smoked 20 or more packs of cigarettes in their lifetime [53]. As a consequence, adolescent smokers who went onto smoke 20 or more packs in their lifetimes were identified as smokers, but those who simply experimented with tobacco in adolescence and then remitted without having

reached 20 packs were coded as non-smokers for our analyses. Therefore, we were not able to examine the association between childhood abuse victimization and risk of experimenting with cigarettes. That said, sustained and heavy tobacco use is of far greater cancer risk than short-term light exposure to tobacco, so our analyses are focused on use associated with substantial cancer burden. Retrospective reporting of tobacco and alcohol use and of child abuse history could also have contributed to underestimates of rates of each.

A strength of our cohort is that selection of participants was independent of sexual orientation, which eliminates bias related to recruitment based on self-identification as lesbian or bisexual and enhances internal validity. In addition, our sample includes a relatively large number of women compared to most other studies of sexual orientation and cancer risk factors, which allowed us to examine patterns in bisexual and lesbian women separately. Another strength of our analysis was our ability to establish that physical and sexual victimization occurred in childhood by age 11, before the likely age of onset of tobacco and alcohol use in most cases, thus allowing us to conduct mediation analyses and to quantify the proportion of excess tobacco and alcohol use in adolescence attributable to sexual orientation-related disparities in child abuse victimization.

A range of documented cancer risk disparities adversely affect lesbian and bisexual women, but to date, little is known about the causes of these differences in cancer risk behaviors. Our study indicates that child abuse victimization is one important contributor to elevated cancer risk behaviors in lesbian and bisexual women. Interventions designed to prevent child abuse may also help to reduce the behavioral sequelae of abuse, such as tobacco and alcohol use, which are among the leading causes of cancer in women. As childhood abuse was found to only partly mediate excess tobacco and alcohol use in adolescence in these vulnerable populations, it will be vital for future research on the health of lesbian and bisexual women to continue the critical work of identifying the determinants of disparities observed across multiple cancer risk domains to inform effective cancer prevention interventions.

Acknowledgments

The authors would like to thank Janet Rich-Edwards, ScD, for her contributions to this paper and the tens of thousands of women across the country participating in NHSII. The work reported in this manuscript was supported by the Harvard Medical School Center of Excellence in Women's Health, American Cancer Society grant RSGT-07-172-01-CPPB, NIH grants HL64108 and CA50385. NHSII is supported for other specific projects by the following NIH grants: CA67262, AG/CA14742, CA67883, CA65725, DK52866, HL64108, HL03804, DK59583, and HD40882. In addition, the Channing Laboratory has received modest additional resources at various times and for varying periods since January, 1, 1993, from the Alcoholic Beverage Medical Research Foundation, American Cancer Society, Amgen, California Prune Board, Centers for Disease Control and Prevention, Ellison Medical Foundation, Florida Citrus Growers, Glaucoma Medical Research Foundation, Hoffmann-LaRoche, Kellogg's, Lederle, Massachusetts Department of Public Health, Mission Pharmacal, National Dairy Council, Rhone Poulenc Rorer, Robert Wood Johnson Foundation, Roche, Sandoz, US Department of Defense, US Department of Agriculture, Wallace Genetics Fund, Wyeth-Ayerst, and private contributions. S.B.A. and H.L.C. are supported by the Leadership Education in Adolescent Health project, Maternal and Child Health Bureau, HRSA grant T71-MC00009-17. H.L.C. is supported by K01DA023610.

References

1. Permuth-Wey J, Sellers TA. Epidemiology of ovarian cancer. *Methods Mol Biol* 2009;472:413–437. [PubMed: 19107446]
2. Pelucchi C, Gallus S, Garavello W, Bosetti C, La Vecchia C. Alcohol and tobacco use, and cancer risk for upper aerodigestive tract and liver. *Eur J Cancer Prev* 2008;17(4):340–344. [PubMed: 18562959]
3. Coyle YM. Lifestyle, genes, and cancer. *Methods Mol Biol* 2009;472:25–56. [PubMed: 19107428]
4. Jordan SJ, Whiteman DC, Purdie DM, Green AC, Webb PM. Does smoking increase risk of ovarian cancer? A systematic review. *Gynecol Oncol* 2006;103(3):1122–1129. [PubMed: 17005245]

5. Dumitrescu RG, Shields PG. The etiology of alcohol-induced breast cancer. *Alcohol* 2005;35(3):213–225. [PubMed: 16054983]
6. Setiawan VW, Monroe KR, Goodman MT, Kolonel LN, Pike MC, Henderson BE. Alcohol consumption and endometrial cancer risk: the multiethnic cohort. *Int J Cancer* 2008;122(3):634–638. [PubMed: 17764072]
7. Freedman ND, Schatzkin A, Leitzmann MF, Hollenbeck AR, Abnet CC. Alcohol and head and neck cancer risk in a prospective study. *Br J Cancer* 2007;96(9):1469–1474. [PubMed: 17387340]
8. Giovannucci E. An updated review of the epidemiological evidence that cigarette smoking increases risk of colorectal cancer. *Cancer Epidemiol Biomarkers Prev* 2001;10(7):725–731. [PubMed: 11440957]
9. MacKay, AP.; Duran, C. National Center for Health Statistics. Hyattsville: US Department of Health and Human Services; 2007. Adolescent health in the United States, 2007.
10. Speizer FE, Colditz GA, Hunter DJ, Rosner B, Hennekens C. Prospective study of smoking, antioxidant intake, and lung cancer in middle-aged women (USA). *Cancer Causes Control* 1999;10(5):475–482. [PubMed: 10530619]
11. Okasha M, McCarron P, David Gunnell D, Smith GD. Exposures in childhood, adolescence and early adulthood and breast cancer risk: a systematic review of the literature. *Breast Cancer Res Treat* 2003;78:223–276. [PubMed: 12725422]
12. Colditz GA, Frazier AL. Models of breast cancer show that risk is set by events of early life: prevention efforts must shift focus. *Cancer Epidemiol Biomarkers Prev* 1996;4:567–571. [PubMed: 7549816]
13. 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* 2004;15:797–803. [PubMed: 15456993]
14. Dilley JA, Maher JE, Boysun MJ, Pizacani BA, Mosbaek CH, Rohde K, et al. Cigarette smoking among lesbians, gays, and bisexuals: How serious a problem? *Cancer Causes Control* 2005;16:1133–1134. Response letter to: Tang H, Greenwood GL, Cowling DW, Lloyd JC, Roeseler AG, Bal DG. [PubMed: 16184480]
15. Cochran SD, Keenan C, Schober C, Mays VM. Estimates of alcohol use and clinical treatment needs among homosexually active men and women in the US population. *J Consult Clin Psychol* 2000;68(6):1062–1071. [PubMed: 11142540]
16. 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. *Arch Fam Med* 2000;9(10):1043–1051. [PubMed: 11115206]
17. Drabble L, Trocki K. Alcohol consumption, alcohol-related problems, and other substance use among lesbian and bisexual women. *J Lesbian Stud* 2005;9(3):19–30. [PubMed: 17548282]
18. Gilman SE, Cochran SD, Mays VM, Hughes M, Ostrow D, Kessler RC. Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey. *Am J Public Health* 2001;91(6):933–939. [PubMed: 11392937]
19. Pizacani BA, Rohde K, Bushore C, Stark MJ, Maher JE, Dilley JA, et al. Smoking-related knowledge, attitudes and behaviors in the lesbian, gay and bisexual community: A population-based study from the US Pacific Northwest. *Prev Med* 2009;48(6):555–561. [PubMed: 19306893]
20. 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 II. *J Women's Health* 2004;13(9):1033–1047.
21. Brown JP, Tracy JK. Lesbians and cancer: an overlooked health disparity. *Cancer Causes Control* 2008;19(10):1009–1020. [PubMed: 18551371]
22. Bontempo DE, D'Augelli AR. Effects of at-school victimization and sexual orientation on lesbian, gay, or bisexual youths' health risk behavior. *J Adolesc Health* 2002;30(5):364–374. [PubMed: 11996785]
23. Easton A, Jackson K, Mowery P, Comeau D, Sell R. Adolescent same-sex and both-sex romantic attractions and relationships: implications for smoking. *Am J Public Health* 2008;98(3):462–467. [PubMed: 18235075]

24. Russell ST, Driscoll AK, Truong N. Adolescent same-sex romantic attractions and relationships: implications for substance use and abuse. *Am J Public Health* 2002;92(2):198–202. [PubMed: 11818291]
25. Downs WR, Harrison L. Childhood maltreatment and the risk of substance problems in later life. *Health Soc Care Community* 1998;6(1):35–46. [PubMed: 11560575]
26. Simpson TL, Miller WR. Concomitance between childhood sexual and physical abuse and substance use problems: a review. *Clin Psychol Rev* 2002;22:27–77. [PubMed: 11793578]
27. Harrison PA, Fulkerson JA, Beebe TJ. Multiple substance use among adolescent physical and sexual abuse victims. *Child Abuse Negl* 1997;21(6):529–539. [PubMed: 9192142]
28. Schuck AM, Widom CS. Childhood victimization and alcohol symptoms in females: causal inferences and hypothesized mediators. *Child Abuse Negl* 2001;25:1069–1092. [PubMed: 11601598]
29. Orlando M, Ellickson PL, Jinnett K. The temporal relationship between emotional distress and cigarette smoking during adolescence and young adulthood. *J Consult Clin Psychol* 2001;69(6):959–970. [PubMed: 11777123]
30. Swendsen JD, Tennen H, Carney MA, Affleck G, Willard A, Hromi A. Mood and alcohol consumption: an experience sampling test of the self-medication hypothesis. *J Abnorm Psychol* 2000;109(2):198–204. [PubMed: 10895557]
31. Balsam KF, Rothblum ED, Beauchaine TP. Victimization over the life span: a comparison of lesbian, gay, bisexual, and heterosexual siblings. *J Consult Clin Psychol* 2005;73(3):477–487. [PubMed: 15982145]
32. Corliss HL, Cochran SD, Mays VM. Reports of parental maltreatment during childhood in a United States population-based survey of homosexual, bisexual, and heterosexual adults. *Child Abuse Negl* 2002;26(11):1165–1178. [PubMed: 12398854]
33. Matthews AK, Hughes TL, Johnson T, Razzano LA, Cassidy R. Prediction of depressive distress in a community sample of women: the role of sexual orientation. *Am J Public Health* 2002;92(7):1131–1139. [PubMed: 12084697]
34. Tjaden P, Thoennes N, Allison CJ. Comparing violence over the life span in samples of same-sex and opposite-sex cohabitants. *Violence Vict* 1999;14(4):413–425. [PubMed: 10751048]
35. Austin SB, Jun H-J, Jackson B, Spiegelman D, Rich-Edwards J, Corliss HL, et al. Disparities in child abuse victimization in lesbian, bisexual, and heterosexual women in the Nurses' Health Study II. *J Women's Health* 2008;17(4):597–606.
36. Wilsnack SC, Hughes TL, Johnson TP, Bostwick WB, Szalacha LA, Benson P, et al. Drinking and drinking-related problems among heterosexual and sexual minority women. *J Stud Alcohol Drugs* 2008;69(1):129–139. [PubMed: 18080073]
37. Hughes TL, Johnson TP, Wilsnack SC, Szalacha LA. Childhood risk factors for alcohol abuse and psychological distress among adult lesbians. *Child Abuse Negl* 2007;31(7):769–789. [PubMed: 17628667]
38. Morris JF, Balsam KF. Lesbian and bisexual women's experiences of victimization: mental health, revictimization, and sexual identity development. *J Lesbian Stud* 2003;7(4):67–85.
39. Brigham and Women's Hospital/Harvard Medical School. Boston: Nurses' Health Study, Brigham and Women's Hospital/Harvard Medical School; [[cited 2010 Jan. 26, 2010]]. Available from: <http://www.channing.harvard.edu/nhs/>
40. Jun H-J, Rich-Edwards J, Boynton-Jarret R, Wright RW. Intimate partner violence and cigarette smoking: association between smoking risk and psychological abuse with and without co-occurrence of physical and sexual abuse. *Am J Public Health* 2008;98(3):527–535. [PubMed: 17600272]
41. Straus M, Hamby S, Boney-McCoy S, Sugarman D. The revised conflict tactics scales (CTS2). *J Family Issues* 1996;17(3):283–316.
42. Finkelhor D, Moore D, Hamby S, Straus M. Sexually abused children in a national survey of parents: methodological issues. *Child Abuse Negl* 1997;21(1):1–9. [PubMed: 9023018]
43. Moore, D.; Gallup, G.; Schussel, R. Disciplining children in America: a Gallup poll report. Princeton: The Gallup Organization; 1995.
44. US Department of Health and Human Services. Preventing tobacco use among young people: a report from the Surgeon General. Atlanta: 1994.

45. Ackard D, Neumark-Sztainer D, Hannan P. Dating violence among a nationally representative sample of adolescent girls and boys: associations with behavioral and mental health. *J Gend Specif Med* 2003;6(3):39–48. [PubMed: 14513575]
46. Spiegelman D, Hertzmark E. Easy SAS calculations for risk or prevalence ratios and differences. *Am J Epidemiol* 2005;162(3):199–200. [PubMed: 15987728]
47. Lin DY, Fleming TR, De Gruttola V. Estimating the proportion of treatment effect explained by a surrogate marker. *Stat Med* 1997;16:1515–1527. [PubMed: 9249922]
48. Austin SB, Ziyadeh N, Fisher LB, Kahn JA, Colditz GA, Frazier AL. Sexual orientation and tobacco use in a cohort study of US adolescent girls and boys. *Arch Pediatr Adolesc Med* 2004;158(4):317–322. [PubMed: 15066869]
49. Ziyadeh NJ, Prokop LA, Fisher LB, Rosario M, Field AE, Camargo CA Jr, et al. Sexual orientation, gender, and alcohol use in a cohort study of US adolescent girls and boys. *Drug Alcohol Depend* 2007;87(2–3):119–130. [PubMed: 16971055]
50. Corliss HL, Rosario M, Wypij D, Fisher LB, Austin SB. Sexual orientation disparities in longitudinal alcohol use patterns among adolescents: findings from the growing up today study. *Arch Pediatr Adolesc Med* 2008;162(11):1071–1078. [PubMed: 18981356]
51. Lee L, Gilpin EA, Pierce JP. Changes in the patterns of initiation of cigarette smoking in the United States: 1950, 1965, and 1980. *Cancer Epidemiol Biomarkers Prev* 1993;2:593–597. [PubMed: 8268779]
52. National Household Survey on Drug Abuse. [database on the Internet]. 1979 [[cited May 22, 2009]]. Available from: <http://www.icpsr.umich.edu/cgi-bin/SDA/SAMHDA/hsda3>
53. Jun H-J, Rich-Edwards J, Boynton-Jarrett R, Austin SB, Frazier AL, Wright RJ. Child abuse and smoking among young women: the importance of severity, accumulation, and timing. *J Adolesc Health* 2008;43(1):55–63. [PubMed: 18565438]

Table 1

Sample characteristics, by sexual orientation, in NHSII (*n* = 62,668)

Characteristic	Heterosexual (<i>n</i> = 61,955)			Bisexual (<i>n</i> = 221)			Lesbian (<i>n</i> = 492)		
	<i>n</i>	% ^a	<i>p</i> ^b	<i>n</i>	% ^a	<i>p</i> ^b	<i>n</i>	% ^a	<i>p</i> ^b
Age in 2001, years			0.21						0.007
36–41	10,083	16.3	25	11.3			56	11.4	
42–46	19,294	31.1	68	30.8			149	30.3	
47–51	20,874	33.7	81	36.7			174	35.4	
52–56	11,704	18.9	47	21.3			113	23.0	
Race/Ethnicity			0.32						0.04
White (non-Hispanic)	57,874	93.4	205	92.9			473	96.0	
Other	4,081	5.3	16	6.7			19	3.4	
Region of residence at age 15			0.05						0.0003
Northeast	22,087	35.7	93	41.1			173	35.3	
Midwest	21,873	35.3	57	26.8			134	27.2	
South	7,396	11.9	23	10.5			67	14.3	
West	6,394	10.3	26	11.2			69	13.3	
Other	1,090	1.8	5	2.3			15	2.8	
Mother's level of education			0.01						0.19
Less than high school	10,018	16.2	29	12.6			78	15.5	
High school graduate	27,105	43.8	86	38.1			206	42.2	
Some college	12,488	20.2	40	18.0			105	21.1	
College graduate	5,238	8.4	31	14.4			55	11.4	
Parental smoking			0.001						0.0002
No Parent smoked	21,857	35.3	62	28.5			136	28.4	
Father smoked	4,937	8.0	23	10.7			51	10.1	
Mother smoked	17,587	28.4	51	23.1			131	26.6	
Both father and mother smoked	17,329	28.0	85	37.8			170	34.2	
Physical abuse victimization in childhood			0.0001						<0.0001
No physical abuse	31,737	51.2	101	46.0			217	44.1	
Mild physical abuse	10,175	16.4	40	18.4			60	12.0	
Moderate physical abuse	15,890	25.6	49	22.1			132	27.0	

Characteristic	Heterosexual (<i>n</i> = 61,955)		Bisexual (<i>n</i> = 221)			Lesbian (<i>n</i> = 492)		
	<i>n</i>	% ^{<i>a</i>}	<i>n</i>	% ^{<i>a</i>}	<i>p</i> ^{<i>b</i>}	<i>n</i>	% ^{<i>a</i>}	<i>p</i> ^{<i>b</i>}
Severe physical abuse	4,153	6.7	31	13.5		83	16.9	
Sexual abuse victimization in childhood					<0.0001			<0.0001
Never	49,135	79.3	144	65.4		322	65.9	
Touched at least once	9,164	14.8	42	18.9		94	18.8	
Forced sex at least once	3,656	5.9	35	15.7		76	15.3	

^{*a*}With the exception of age variable, all percents age-adjusted

^{*b*}Heterosexual women served as the reference group for each comparison. There were no significant differences between lesbians and bisexuals except for race/ethnicity (*p* = 0.03)

Table 2
Self-reported history of smoking and alcohol use in adolescence, by sexual orientation, in NHSII

	Heterosexual <i>n</i> (%) ^{<i>b</i>}	Bisexual <i>n</i> (%) ^{<i>b</i>}	<i>p</i> ^{<i>a</i>}	Lesbian <i>n</i> (%) ^{<i>b</i>}	<i>p</i> ^{<i>a</i>}
Smoking					
Onset of smoking by age 14 ^{<i>c</i>}	2,889 (4.7)	33 (14.9)	<0.0001	50 (10.3)	<0.0001
Smoked at ages 15–19 ^{<i>c</i>}	14,069 (22.7)	82 (36.9)	<0.0001	169 (33.6)	<0.0001
	M (SD)	M (SD)		M (SD)	
Average number of cigarettes per day in smokers by age 14 ^{<i>d</i>}	6.0 (5.7)	7.3 (8.0)	0.36	4.7 (4.2)	0.04
Average number of cigarettes per day in smokers at ages 15–19 ^{<i>e</i>}	10.3 (7.6)	12.3 (8.6)	0.02	11.9 (8.1)	0.01
Alcohol use					
Alcohol use at ages 15–17 ^{<i>f</i>}	13,869 (22.5)	74 (35.5)	<0.0001	157 (33.6)	<0.0001
	M (SD)	M (SD)		M (SD)	
Grams of alcohol per day in drinkers, ages 15–17 ^{<i>g</i>}	4.4 (6.1)	5.1 (5.3)	0.34	6.8 (9.6)	0.002

^{*a*} Heterosexuals served as the reference group for each comparison. There were no significant differences between lesbians and bisexuals

^{*b*} All percents age-adjusted

^{*c*} *n* = 62,668

^{*d*} Restricted to respondents who smoked by age 14 (*n* = 2,972)

^{*e*} Restricted to respondents who smoked at ages 15–19 (*n* = 14,320)

^{*f*} *n* = 62,204

^{*g*} Restricted to respondents who consumed alcohol at ages 15–17 (*n* = 14,100)

Multivariate risk ratios (RR) and 95% confidence intervals (CI) estimating sexual orientation group differences in the risk of smoking by age 14 and smoking at ages 15–19, controlling for individual and family-level factors and childhood abuse victimization, in NHSH

Table 3

	Smoked by age 14			Smoked at ages 15–19		
	Base model		Abuse-adjusted model	Base model		Abuse-adjusted model
	RR (95% CI)	RR (95% CI)	Proportion of effect mediated by abuse % (p) ^a	RR (95% CI)	RR 95% CI	Proportion of effect mediated by abuse % (p) ^a
Sexual orientation						
Heterosexual	1.0	1.0		1.0	1.0	
Lesbian	2.05 (1.58, 2.67)	1.82 (1.40, 2.38)	16.4 (0.0001)	1.39 (1.23, 1.58)	1.32 (1.16, 1.50)	16.6 (0.0005)
Bisexual	2.85 (2.09, 3.89)	2.62 (1.92, 3.56)	8.2 (0.004)	1.46 (1.23, 1.74)	1.39 (1.17, 1.66)	12.9 (0.01)
Parental smoking						
No parent smoked	1.0	1.0		1.0	1.0	
Father smoked	1.52 (1.37, 1.69)	1.48 (1.33, 1.64)		1.42 (1.36, 1.47)	1.39 (1.34, 1.45)	
Mother smoked	2.31 (2.04, 2.63)	2.20 (1.94, 2.49)		1.74 (1.65, 1.83)	1.69 (1.60, 1.78)	
Both father/mother smoked	2.34 (2.13, 2.57)	2.20 (2.00, 2.42)		1.72 (1.66, 1.79)	1.66 (1.60, 1.73)	
Missing	2.42 (1.54, 3.80)	2.29 (1.48, 3.55)		1.69 (1.39, 2.06)	1.66 (1.37, 2.02)	
Mother's level of education						
College graduate	1.0	1.0		1.0	1.0	
Some college	0.92 (0.79, 1.06)	0.88 (0.77, 1.02)		1.00 (0.94, 1.06)	0.98 (0.92, 1.03)	
High school graduate	0.87 (0.76, 0.99)	0.82 (0.72, 0.94)		0.96 (0.91, 1.01)	0.93 (0.88, 0.98)	
Less than high school	1.11 (0.96, 1.28)	1.00 (0.86, 1.15)		0.95 (0.90, 1.01)	0.91 (0.85, 0.96)	
Missing	1.08 (0.93, 1.26)	1.00 (0.86, 1.16)		1.05 (0.98, 1.12)	1.00 (0.94, 1.07)	
Physical abuse in childhood						
No physical abuse	1.0	1.0				
Mild physical abuse		1.24 (1.13, 1.37)			1.20 (1.15, 1.25)	
Moderate physical abuse		1.35 (1.24, 1.47)			1.23 (1.89, 1.27)	
Severe physical abuse		1.88 (1.67, 2.11)			1.45 (1.38, 1.52)	
Sexual abuse in childhood						
No sexual abuse	1.0				1.0	
Sexual abuse—touched		1.50 (1.37, 1.64)			1.14 (1.10, 1.19)	

	Smoked by age 14			Smoked at ages 15–19		
	Base model		Abuse-adjusted model	Base model		Abuse-adjusted model
	RR (95% CI)	RR (95% CI)	Proportion of effect mediated by abuse % (<i>p</i>) ^a	RR (95% CI)	RR 95% CI	Proportion of effect mediated by abuse % (<i>p</i>) ^a
Sexual abuse—forced		1.47 (1.30, 1.67)			1.13 (1.07, 1.20)	

Models controlled for variables in table plus age, race/ethnicity, and region of residence at age 15

^aProportion-mediated effect calculated for sexual orientation only and not for other variables in the *s*; bold indicates *p* < 0.05

Table 4

Multivariate linear regression coefficients estimating sexual orientation group differences in average number of cigarettes per day by age 14 and at ages 15–19, controlling for individual and family-level factors and childhood abuse victimization, in NHSD

	Average number of cigarettes per day by age 14				Average number of cigarettes per day at ages 15–19			
	Base model		Abuse-adjusted model		Base model		Abuse-adjusted model	
	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>
Sexual orientation								
Heterosexual	REF		REF		REF		REF	
Lesbian	-1.36 (0.60)	0.02	-1.67 (0.59)	0.004	1.49 (0.62)	0.02	1.22 (0.61)	0.45
Bisexual	1.13 (1.36)	0.41	0.84 (1.36)	0.53	1.85 (0.92)	0.04	1.55 (0.91)	0.09
Parental smoking								
No parent smoked	REF		REF		REF		REF	
Father smoked	0.10 (0.30)	0.74	0.09 (0.30)	0.77	0.55 (0.17)	0.001	0.53 (0.17)	0.0017
Mother smoked	0.96 (0.38)	0.01	0.97 (0.38)	0.01	1.26 (0.23)	<0.0001	1.20 (0.23)	<0.0001
Both father/mother smoked	0.94 (0.27)	0.0005	0.85 (0.27)	0.002	1.74 (0.16)	<0.0001	1.65 (0.16)	<0.0001
Missing	-1.34 (0.73)	0.06	-1.76 (0.76)	0.02	1.19 (0.88)	0.18	0.78 (0.88)	0.18
Mother's level of education								
College graduate	REF		REF		REF		REF	
Some college	-0.28 (0.42)	0.50	-0.35 (0.42)	0.41	-0.48 (0.27)	0.08	-0.55 (0.27)	0.04
High school graduate	-0.01 (0.39)	0.98	-0.09 (0.39)	0.82	-0.53 (0.25)	0.03	-0.64 (0.25)	0.009
Less than high school graduate	0.08 (0.45)	0.86	-0.12 (0.45)	0.79	0.20 (0.28)	0.47	-0.04 (0.28)	0.90
Missing	-0.09 (0.46)	0.84	-0.25 (0.45)	0.59	-0.04 (0.29)	0.88	-0.25 (0.29)	0.39
Physical abuse in childhood								
No physical abuse	REF		REF		REF		REF	
Mild physical abuse			-0.14 (0.28)	0.62			0.27 (0.17)	0.13
Moderate physical abuse			0.14 (0.25)	0.58			0.52 (0.15)	0.0005
Severe physical abuse			1.14 (0.41)	0.005			1.63 (0.25)	<0.0001
Sexual abuse in childhood								
No sexual abuse	REF		REF		REF		REF	
Sexual abuse—touched			0.32 (0.28)	0.25			0.76 (0.17)	<0.0001

	Average number of cigarettes per day by age 14				Average number of cigarettes per day at ages 15–19			
	Base model		Abuse-adjusted model		Base model		Abuse-adjusted model	
	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>
				Proportion of effect mediated by abuse % (<i>p</i>) ^a				Proportion of effect mediated by abuse % (<i>p</i>) ^a
Sexual abuse—forced			1.85 (0.45)	<0.0001			1.28 (0.27)	<0.0001

Models controlled for variables in table plus age, race/ethnicity, and region of residence at age 15

^aProportion-mediated effect calculated for sexual orientation only and not for other variables in the table

^bProportion mediated not calculated because abuse variables did not attenuate effect estimate for lesbian orientation; bold indicates *p* < 0.05

Table 5

Multivariate relative risks (RR) and 95% confidence intervals (CI) estimating sexual orientation group differences in the risk of drinking at ages 15–17 and multivariate linear regression coefficients estimating sexual orientation group differences in mean grams of alcohol per day at ages 15–17, controlling for individual and family-level factors and childhood abuse victimization, in NHS II

	Drinking at ages 15–17			Mean grams of alcohol per day at ages 15–17			
	Base model		Abuse-adjusted model	Base model		Abuse-adjusted model	
	RR (95% CI)	RR (95% CI)	Proportion of effect mediated by abuse % (p) ^a	β (SE β)	p	β (SE β)	Proportion of effect mediated by abuse % (p) ^a
Sexual orientation							
Heterosexual	1.0	1.0		REF		REF	
Lesbian	1.51 (1.32, 1.71)	1.46 (1.29, 1.66)	7.2 (0.0001)	2.65 (0.76)	0.0005	2.41 (0.74)	9.1 (0.003)
Bisexual	1.54 (1.30, 1.83)	1.51 (1.27, 1.79)	5.5 (0.004)	0.76 (0.59)	0.20	0.61 (0.58)	20.6 (0.22)
Parental smoking							
No parent smoked	1.0	1.0		REF		REF	
Father smoked	1.14 (1.10, 1.19)	1.13 (1.09, 1.78)		0.20 (0.14)	0.15	0.17 (0.14)	0.20
Mother smoked	1.46 (1.39, 1.53)	1.44 (1.37, 1.51)		0.39 (0.18)	0.03	0.36 (0.18)	0.04
Both father/mother smoked	1.41 (1.36, 1.46)	1.39 (1.34, 1.44)		0.55 (0.13)	<0.0001	0.49 (0.13)	<0.0001
Missing	1.49 (1.24, 1.80)	1.47 (1.22, 1.77)		2.20 (1.32)	0.10	2.04 (1.32)	0.12
Mother's level of education							
College graduate	1.0	1.0		REF		REF	
Some college	0.98 (0.93, 1.03)	0.97 (0.92, 1.02)		−0.07 (0.19)	0.71	−0.07 (0.19)	0.71
High school graduate	0.94 (0.89, 0.99)	0.92 (0.88, 0.97)		0.01 (0.18)	0.94	−0.01 (0.18)	0.94
Less than high school graduate	0.94 (0.89, 1.00)	0.92 (0.86, 0.97)		0.31 (0.22)	0.15	0.23 (0.22)	0.29
Missing	0.98 (0.92, 1.04)	0.96 (0.90, 1.02)		0.16 (0.22)	0.47	0.10 (0.22)	0.63
Physical abuse in childhood							
No physical abuse	1.0	1.0		REF		REF	
Mild physical abuse	1.13 (1.09, 1.17)			0.07 (0.14)		0.07 (0.14)	0.59
Moderate physical abuse	1.09 (1.06, 1.13)			0.34 (0.13)		0.34 (0.13)	0.007
Severe physical abuse	1.26 (1.19, 1.33)			0.73 (0.24)		0.73 (0.24)	0.002
Sexual abuse in childhood							
Sexual abuse—touched	1.08 (1.04, 1.12)			0.27 (0.15)		0.27 (0.15)	0.08

	Drinking at ages 15–17			Mean grams of alcohol per day at ages 15–17				
	Base model		Abuse-adjusted model	Base model		Abuse-adjusted model		
	RR (95% CI)	RR (95% CI)	Proportion of effect mediated by abuse % (<i>p</i>) ^a	β (SE β)	<i>p</i>	β (SE β)	<i>p</i>	Proportion of effect mediated by abuse % (<i>p</i>) ^a
Sexual abuse—forced		1.09 (1.03, 1.16)				1.15 (0.27)	<0.0001	

Models controlled for variables in table plus age, race/ethnicity, and region of residence at age 15

^aProportion-mediated effect calculated for sexual orientation only and not for other variables in the table; bold indicates *p* < 0.05