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Sexual-Orientation Disparities in Substance Use in Emerging Adults: A Function of Stress and Attachment Paradigms

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Abstract

More lesbian, gay, and bisexual (LGB) youths than heterosexuals report substance use. We examined a theoretical model to understand these disparities in lifetime and past-year substance use by means of stress and attachment paradigms, using the longitudinal Growing Up Today Study (GUTS) and Nurses' Health Study II (NHSII). GUTS participants are the children of participants in NHSII; thus, child and maternal data are available. In addition, GUTS contains siblings, allowing for comparisons of LGB and heterosexual siblings. Of 5,647 GUTS youths ($M = 20.6$ years old in 2005), 1.6% were lesbian/gay (LG), 1.6% bisexual (BI), 9.9% mostly heterosexual (MH), and 86.9% completely heterosexual (CH). After adjusting for sibling clustering in GUTS and covariates, significantly more sexual minorities (LGs, BIs, and MHs) than CHs reported lifetime and past-year smoking, non-marijuana illicit drug use, and prescription drug misuse. More sexual minorities also reported marijuana use in the past year. The relations between sexual orientation and substance use were moderated by the stress markers: As mother's discomfort with homosexuality increased, more BIs and MHs than CHs used substances. As childhood gender nonconforming behaviors increased, more LGs than CHs used substances. The relations between sexual orientation and substance use were mediated by attachment and maternal affection (percent

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of effect mediated ranged from 5.6%–16.8% for lifetime substance use and 4.9%–24.5% for past-year use). In addition, sibling comparisons found that sexual minorities reported more substance use, more childhood gender nonconforming behaviors, and less secure attachment than CH siblings; mothers reported less affection for their sexual-minority than CH offspring. The findings indicate the importance of stress and attachment paradigms for understanding sexual-orientation disparities in substance use.

Keywords

Sexual orientation; substance use; attachment; stress; youth

Lesbian, gay, and bisexual (LGB) youths report elevated rates of substance use relative to heterosexual peers in representative samples of the population, including cigarette smoking, alcohol use, marijuana use, and other illicit drug use (Eisenberg & Wechsler, 2003; Fergusson, Horwood, & Beautrais, 1999; Hatzenbuehler, Wieringa, & Keyes, 2011; Kann et al., 2011; Marshal, Friedman, Stall, & Thompson, 2009; Russell, Driscoll, & Truong, 2002; Russell, 2006; for a meta-analysis, see Marshal et al., 2008). We propose and examine a theoretical model of disparities in substance use by sexual orientation that is based on stress and attachment paradigms. We compare different sexual-minority youths (lesbians/gays [LGs], bisexuals [BIs], and mostly heterosexuals [MHs]) to completely heterosexuals (CHs) because sexual-minority groups may not differ from heterosexuals to the same extent on substance use: LG youths have not been found to differ significantly from heterosexual peers on substance use, but BI youths have been more likely to use substances than heterosexuals (Ford & Jasinski, 2006; Russell et al., 2002). We examine the model with respect to lifetime and past-year substance use with a large national cohort that has been followed longitudinally, using data reported by young people and their mothers. Finally, we compare the sexual minorities and their CH siblings on the model's theoretical variables, enabling examination of sexual-orientation disparities in families while controlling for potential confounders that are stable within but not across families.

Theoretical Model of Health Disparities by Sexual Orientation and Study Hypotheses

The theoretical model explaining health disparities by sexual orientation is depicted in Figure 1. Although two of the constructs, attachment and maternal affection, theoretically inform one another, they are situated in the model by year of assessment.

Stress and attachment paradigms anchor the theoretical model of disparities in substance use by sexual orientation. The model focuses on interpersonal processes involving the primary parent directly or indirectly. The young person experiences stressors that involve parents and which affect the young person's attachment process with the primary parent. The stress and attachment paradigms, in turn, affect the young person's substance use. The paradigms concern vulnerabilities for which substances are enlisted as coping strategies and represent poor health.

Stress Paradigm: The Direct or Moderating Process

Attention has focused on the unique or disproportionate stress experienced by sexual minorities. “Minority stress” (Meyer, 2003) or equivalently “gay-related stress” (Rosario, Schrimshaw, Hunter, & Gwadz, 2002) refers to society's stigmatization of homosexuality, which is experienced by those who are or are perceived to be LGB. The stigmatization encompasses a wide range of experiences for the victim, including, for example, prejudice and discrimination. The impact of minority stress on the victim may be direct, such that more stress results in poorer health. As will be explained below, minority stress also may condition health disparities by sexual orientation because minority stress generally has more relevance for sexual minorities than for heterosexuals and it varies among sexual-minority adults and youths (e.g., Corliss, Cochran, & Mays, 2002; Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010; Herek, 2009; Huebner, Rebchook, & Kegeles, 2004; Kann et al., 2011; Kosciw, Greytak, Diaz, & Bartkiewicz, 2010; Russell, Franz, & Driscoll, 2001).

Sexual-orientation disparities in health are made possible by variability in minority stress. More sexual minorities than heterosexuals experience minority stress because gay-related stress is experienced by those who are or are perceived to be LGB, as stated earlier. Heterosexuals may experience minority stress to the extent that some (albeit much fewer in number than sexual minorities) are perceived to be LGB. Consequently, sexual-orientation disparities in health depend on stress, such that differences between sexual minorities and heterosexuals on health become more pronounced as minority stress increases. In addition, sexual minorities vary in their experience of gay-related stress. For example, BIs have been found to experience more stress than LGs (Jorm Korten, Rodgers, Jacomb, & Christensen, 2002). Therefore, the strength of the health disparities between sexual minorities and heterosexuals may vary with the sexual-minority group in question. In other words, minority stress is expected to moderate sexual-orientation disparities in health in subtle or nuanced ways that may depend on a particular sexual-minority group.

Most research on minority stress among LGB young people has focused on victimization experiences, such as verbal and physical abuse from peers and parents (e.g., D'Augelli, Grossman, & Starks, 2005; Kann et al., 2011; Kosciw et al., 2010; Russell et al., 2001). Less attention has focused on more subtle or indirect forms of stress. We target two such experiences that implicate parents.

Maternal discomfort with homosexuality—The relation between maternal negative attitudes toward a child's sexual-minority orientation (e.g., maternal discomfort with homosexuality) and the child's substance use remains understudied, particularly among sexual-minority young people. This is surprising because such negative attitudes logically seem to be the foundation and driving force behind a parent's gay-related abuse or rejection of a child, as well as less severe but perhaps more prevalent behavioral expressions of such attitudes (e.g., gay-related microaggressions: Sue, 2010). Parental rejection due to sexual orientation has been associated with poorer health outcomes among sexual-minority youths, including substance use (Rosario, Schrimshaw, & Hunter, 2009; Rothman, Sullivan, Keyes, & Boehmer, 2012; Ryan, Huebner, Diaz, & Sanchez, 2009). Furthermore, the negative attitudes may be activated without the parent knowing the child's sexual-minority

orientation. The parent's suspicion, whether based on conscious (e.g., the child's gender nonconforming behaviors) or unconscious information, may be the only trigger necessary to provoke the negative attitudes. The attitudes, however, should often be less relevant for heterosexual children because they are less likely to be considered LGB.

Maternal negative attitudes toward homosexuality comprise a minority stressor that may occur early in the child's life, has implications for the parent-child attachment system, and may elucidate health disparities by sexual orientation. An aspect of maternal negative attitudes that has received scant attention is the importance for the parent that the child be heterosexual. In addition, assessments of maternal attitudes, as far as we know, have been based on the child's report of those attitudes and not, as will be the case here, on the parent's self-report.

Childhood gender nonconforming behaviors—The expression of behaviors or characteristics that are socially and culturally associated with the other gender defines gender nonconforming behaviors (Bell, Weinberg, & Hammersmith, 1981). Higher levels of gender nonconforming behaviors are associated with having a sexual-minority orientation (for a review, see Zucker, 2008).

We posit that gender nonconforming behaviors serve as a marker of minority stress because they trigger negative responses from those who consider such behaviors an unacceptable breach of gender or heterosexual norms. Consequently, substance use is expected to be elevated among those with more gender nonconforming behaviors as a way of coping with the stress generated by others' negative reactions to the individual's gender nonconforming behaviors. Indeed, gender nonconforming behaviors have been related to higher rates of experiencing stressors, such as discrimination, violence, and negative family-related events (D'Augelli, Grossman, & Starks, 2006; Roberts, Rosario, Corliss, Koenen, & Austin, 2012; Smith & Leaper, 2006). Gender nonconforming behaviors also have been related to substance use among young sexual-minority women (Rosario, Schrimshaw, & Hunter, 2008). The stress associated with gender nonconforming behaviors probably begins early in life because gender nonconforming behaviors occur in childhood and are consistently expressed from childhood through adulthood (Rieger, Linsenmeier, Gygax, & Bailey, 2008).

Attachment Paradigm: The Mediating Process¹

Our theoretical model goes beyond the stress paradigm because stress, by itself, does not explain how poor outcomes develop. A psychological mediational model is needed for such a purpose and one has been proposed (Hatzenbuehler, 2009). Here, we focus on the attachment paradigm as the mediational process. Attachment begins early in life and affects the individual's interpersonal relationships throughout life. Children's early experiences with the primary caregivers (usually the mother) represents an important foundation for developing attachment or a sense of emotional safety and security (Bowlby, 1969). Those early and ongoing experiences with the primary attachment figure shape the child's internal working models (templates of thought, emotion, and behavior) that concern expectations and

¹The term, "attachment paradigm," is used to represent the constructs of attachment and maternal affection in the theoretical model and to avoid the inevitable confusion that would occur if we referred to both constructs by the same name as one of the constructs.

beliefs about the availability and responsiveness of the attachment figure. These expectations generalize to others and affect the internal working model of the self, meaning one's sense of self-worth (Bowlby, 1969). The importance of attachment to the primary caregiver across the lifespan has been demonstrated in heterosexual samples in several long-term longitudinal studies (Grossmann, Grossmann, & Waters, 2005), as has attachment's relation to psychopathology, including substance use (for a review, see Dozier, Sovall-McClough, & Albus, 2008). We posit that substances mediate the frustration and hopelessness of establishing or maintaining a relationship with, for example, an unsupportive, unavailable, abusive, or rejecting parent, as well as assist in protecting the self against the implications of having such a parent.

Attachment—Only a small number of empirical investigations have studied attachment among sexual minorities, nearly all have focused on romantic attachment in adulthood (e.g., Elizur & Mintzer, 2001; Mohr & Fassinger, 2003; Sherry, 2007; Zakalik & Wei, 2006), and none, as far as we know, with respect to substance use. The scant research with sexual minorities is surprising, given the importance of maternal attachment for health and relationships, and the possibility that the primary and romantic attachment of sexual minorities may be problematic, especially for those who experience parental rejection and victimization (D'Augelli, 2002; D'Augelli, et al., 2005; Landolt, Bartholomew, Saffrey, Oram, & Perlman, 2004; Ryan et al., 2009). Thus, attachment to the mother is hypothesized to mediate health disparities by sexual orientation, such that the elevated substance use expected among sexual minorities relative to heterosexuals is explained by less secure attachment among the sexual minorities.

Maternal affection—As far as we know, maternal affection for the child has not been studied alongside the young person's attachment to the mother with respect to understanding health disparities by sexual orientation. This is surprising because a mother's affection for the child affects and is affected by the child's attachment (Bowlby, 1969). We expect that mothers will report less affection for sexual-minority than heterosexual offspring, given society's stigmatization of homosexuality. Consequently, we expect that maternal affection mediates health disparities by sexual orientation. Similarly, we expect that the relation between mother's discomfort with homosexuality and her child's substance use is mediated by little maternal affection for the offspring.

Summary and Hypotheses

We propose a theoretical model (Figure 1) to understand substance use and offer the following major hypotheses: Disparities by sexual orientation exist in substance use and all other theoretical variables. More maternal discomfort with homosexuality, more childhood gender nonconforming behaviors, less secure attachment, and less maternal affection are related to more substance use. Sexual-orientation disparities in substance use are moderated by stress, such that sexual minorities who experience more maternal discomfort with homosexuality or more gender nonconforming behaviors than heterosexuals report more substance use. Disparities by sexual orientation in substance use are directly mediated by attachment and maternal affection. The mediation, however, is partial, not full, given the moderating hypotheses mentioned above. Moreover, gender differences in the relations

between the theoretical predictors and substance use are examined because gender moderated relations might suggest different processes for male and female youths (see Kuyser & Fokkema, 2011, for a discussion of such possibilities). We control for potential covariates related to substance use, including early depressive distress (in 2003), given the relations between such distress and substance use (e.g., Hussong, Jones, Stein, Baucom, & Boeding, 2011) and the self-medication hypothesis (Khantzain, 1997). Finally, we expect to support the theoretical model utilizing a within-family, sibling-comparison study design (Lahey & D'Onofrio, 2010), in which we control for shared genetic and environmental factors that vary across but not within families. We hypothesize that sexual-minority young people, as compared with CH siblings, will report more substance use, more childhood gender nonconforming behaviors, and less secure attachment to their mothers; their mothers, in turn, will report less affection for their sexual-minority than their CH offspring.

METHOD

Participants

Participants in the Growing Up Today Study (GUTS) were included in the current analysis if they provided data specific to the theoretical model, covariates, and demographic characteristics. Their mothers, participants in Nurses' Health Study II (NHSII), also had to provide data pertaining to the theoretical model in order to be included in the analyses. Overall, 5,193 GUTS participants had complete data on all variables across the 2003, 2005, and 2007 waves and their mothers had complete data in 2004 and 2006. An additional 454 participants were missing one or more individual scale items for gender nonconforming behaviors, which were imputed using the mean of the items completed on those particular scales by the participants. A sensitivity analysis examined the mean and standard deviation of each variable when all of its available data were used with comparable statistics when using the reduced sample and imputing missing data. Lack of bias (i.e., random missing data) was suggested by similar findings across the two conditions (comparing with and without imputation of gender nonconforming behaviors). The final analytic sample included 5,647 participants. A comparison of participants in the analytic sample with those in the original 1996 cohort found a higher proportion of the former was female (65.4% vs. 53.5%; $p < 0.0001$).

The young people ($N=5,647$) were 17-25 years old in 2005 ($M = 20.6$, $SD = 1.7$), predominantly female (65.4%), and White (94.1%). Their sexual orientation was lesbian/gay (LG, 1.6%), bisexual (BI, 1.6%), mostly heterosexual (MH, 9.9%), and completely heterosexual (CH, 86.9%). Given the merging of multiple waves of data from GUTS participants (2003, 2005, 2007) and their mothers (2004, 2006), missing data may be of concern. Although sexual minorities were significantly ($p < 0.05$) less likely to be missing data on substance use than CHs, none of the theoretical predictors were significantly missing by sexual orientation. More importantly given the focus of our study, missing data did not affect the relations between any of the theoretical predictors and substance use, including the relations comparing sexual minorities to CHs on substance use.

Procedure

GUTS is a longitudinal cohort of the children of women in NHSII, a prospective cohort of over 116,000 female registered nurses across the United States. Mothers were invited to enroll their 9- to 14-year-old children in GUTS. The mothers provided the names of over 26,000 boys and girls. In 1996, the eligible children, who were interested in participating, were asked to return a health-focused questionnaire. At the beginning of cohort enrollment, the GUTS sample consisted of 7,843 boys and 9,039 girls; 93.3% White and 6.7% of ethnic/racial minority backgrounds. A detailed description of GUTS is available elsewhere (Field et al., 1999). The institutional review board at Brigham and Women's Hospital approved the study.

Measures

Substance use—Drug use in 2007 was dichotomously assessed (yes/no) by youth self-report. Questions assessed lifetime use of cigarettes, any illicit non-marijuana drug (cocaine, heroin, ecstasy, GHB, LSD, crystal methamphetamine, amphetamine), and misuse of prescription drugs (tranquilizers, painkillers, sleeping pills, Ritalin). Past-year substance use included any and greater than weekly cigarette smoking, as well as any and at least monthly marijuana use, any illicit drug use other than marijuana, and any misuse of prescription drugs. It also included binge drinking alcohol (i.e., consuming four [women]/five [men] or more drinks in a few hours) 3 times or 12 times within the past year. The former, 3 times, suggested more than experimentation or happenstance. The latter, binge drinking 12 times (our ceiling response), indicated potential abuse.

Sexual orientation—An item adapted from the Minnesota Adolescent Health Survey (Remafedi, Resnick, Blum, & Harris, 1992) assessed sexual orientation in 2005: Youth were asked, “Which of the following best describes your feelings?,” ranging from 1=completely heterosexual to 5=completely homosexual and 6=not sure. Responses were categorized into four groups to enhance power: completely heterosexual (CH), mostly heterosexual (MH), bisexual (BI), and completely/mostly lesbian/gay (LG). The analytic sample ($N = 5,647$) excludes the 17 unsure participants and 32 participants who did not answer the question.

Maternal discomfort with homosexuality—In 2004, mothers used a 5-point Likert response scale (1=strongly agree to 5=strongly disagree) to indicate the extent to which they agreed with the statements: “I feel uneasy around people who are very open in public about being gay, lesbian, or bisexual” and “It is important to me that my child(ren) be heterosexual (attracted only to persons of the opposite sex).” The items were correlated ($r = 0.60$; $p < 0.0001$) and an exploratory factor analysis (EFA, using PROC FACTOR in SAS for this and all factor analyses) found that the items loaded on a single factor [eigenvalue = 1.19; proportion of variance explained (PVE) = 79.8%]. The items were reverse scored and summed. Higher scores indicated greater maternal discomfort or more negative attitudes toward homosexuality (Cronbach's $\alpha = 0.75$).

Childhood gender nonconforming behaviors—In 2005, each youth responded to four items taken from a validated questionnaire (Zucker et al., 2006) to assess gendered behavior as a child (up to age 11) with respect to sex of TV/movie characters imitated, sex

of character assumed in pretend play, favorite toy/game, and gendered experience of self as child (e.g., “When I was a child, I felt...”). All response scales used a 5-point scale ranging from (1) only the same sex or always masculine (feminine) to (5) only the other sex or always feminine (masculine), with 6 indicating not feeling masculine or feminine or not being involved in the activity. The latter response, representing systematic missing, was not imputed. Items correlated from 0.48 - 0.64 ($p < 0.0001$). EFA found the items loaded on a single factor (eigenvalue = 2.65; PVE = 66.3%). The response scores were added. Higher scores indicated greater childhood gender nonconforming behaviors (Cronbach's $\alpha = 0.83$).

Attachment—In 2005, attachment was measured with a validated scale (Jaccard & Dittus, 1991, 2000; Jaccard, Dittus, & Gordon, 1996), assessing youth's reported satisfaction with the mother across 9 relationship areas (e.g., general communication, affection, emotional support, respect, shared time and interests). Items (e.g., “I am satisfied with the respect my mother shows me”) use a 5-point response scale (1=strongly disagree to 5=strongly agree). Some items were reverse coded to ensure that higher scores on all items indicated more secure attachment. Item correlations ranged from 0.42 - 0.86 ($p < 0.0001$). EFA found that the items loaded on a single factor (eigenvalue = 6.21; PVE = 69.0%). Responses were added (Cronbach's $\alpha = 0.94$).

Our measure of attachment, assessing quality of relationship with the parent, is similar to other attachment measures commonly used in youth research, in particular the Inventory of Parent and Peer Attachment (IPPA, Armsden & Greenberg, 1987). The IPPA has been related to various theoretically meaningful outcomes (e.g., Armsden & Greenberg, 1987; Emmanuelle, 2009; Ruijten, Roelofs, & Rood, 2011; Sternberg, Lamb, Guterman, Abbott, & Dawud-Noursi, 2005), as well as to other attachment measures (Maier, Bernier, Pekrun, Zimmermann, & Grossmann, 2004; Van Ryzin & Leve, 2012).

Maternal affection—In 2006, mothers reported their satisfaction with their relationship with their children (a proxy for affection), using the similarly worded 9 items and response scale to those completed by their children (see Attachment above). Items were coded to ensure higher scores indicated greater affection. Items were related ($r = 0.44 - 0.83$; $p < 0.0001$). EFA found that items loaded on a single factor (eigenvalue = 6.28; PVE = 69.8%). Responses were summed (Cronbach's $\alpha = 0.94$). Mothers with multiple children in GUTS completed this measure for each child.²

Covariates—We adjusted for youth-reported demographic characteristics of sex, age, and white vs. minority ethnic/racial background. We controlled for depressive distress in 2003, using the Depressive Symptoms subscale of the McKnight Risk Factor Survey (Shisslak et al., 1999). The subscale consists of 6 items and a 5-point response scale from “never” (0) to “always” (4) experienced each symptom in the past year. EFA indicated the items loaded on

²Despite the fact that attachment and maternal affection use the same items, these constructs are not identical. A child is attached to a parent because attachment represents safety and security (Main, 1999). A child is not an attachment figure for a parent, except perhaps during a parent's elderly years. Excluding the attachment relationship between an elderly parent and adult child, a parent who seeks safety and security from a child raises serious concerns: parental psychopathology and negative consequences for the child's attachment.

a single factor (eigenvalue = 2.51; PVE = 50.2%). Responses were summed (Cronbach's α = 0.74).

Furthermore, we controlled for substance use in 2005 when examining past-year substance use in 2007, allowing for investigation of change in substance use from 2005 to 2007. Substance use in 2005, a binary variable, assessed any cigarette smoking, binge drinking, or marijuana use in the past year. Use of illicit drugs other than marijuana and misuse of prescription drugs were not assessed in 2005.

Data Analysis

Distributions of scales were assessed for normality and regression assumptions were examined, including confirming that the logit of each substance use outcome was a linear combination of the independent variables included in the model (Hastie & Tibshirani, 1990; Stone, 1985). SAS 9.2 was used.

Bivariate analyses, interactions, and path analyses—Generalized estimating equations (GEE), using PROC GENMOD, were used to adjust for nonindependent observations due to the sibling clusters (Liang & Zeger, 1986; Zeger, Liang, & Albert, 1988). Continuous variables were transformed to z scores ($M = 0$, $SD = 1$).

A series of simultaneous regression models tested the theoretical model, in which each outcome was predicted by factors that were adjusted by the other theoretical factors in the analysis, covariates, and sibling clusters. To examine whether stress moderated the relation between sexual orientation and substance use, logit models included the product of each stressor by sexual orientation after adjusting for all theoretical predictors, covariates, and sibling clusters. We also examined whether sex moderated the relations between the theoretical predictors and substance use in a similar way. To examine whether the attachment paradigm mediated sexual-orientation disparities in substance use, the MacArthur rules (Kraemer, Kiernan, Essex, & Kupfer, 2008) for mediation were followed, in which the potential mediator (attachment or maternal affection) had to be related to sexual orientation, follow or be co-incident with sexual orientation in 2005, and predate substance use in 2007. In addition, a SAS macro (Hertzmark, Pazaris, Spiegelman, 2009) was used to quantify the mediational effects (Percent of Exposure Effect, PEE) and compare the betas between models with and without mediators.

Sibling-comparison analyses—Sexual minorities were compared with their CH siblings. Continuous variables (gender nonconforming behaviors, attachment, and maternal affection) were dichotomized at their median because the data were arranged in a series of stratified 2x2 contingency tables, one for each family. To compare siblings on the theoretical variables, the Cochran-Mantel-Haenszel test was used (Robins, Breslow, & Greenland, 1986; Mantel & Haenszel, 1959). Its odds ratio (OR) compares the number of pairs in which a case is exposed (e.g., the sexual-minority sibling smokes) and its comparison is not exposed (the CH sibling is a non-smoker) to the number of pairs in which the case is not exposed but the comparison is exposed. The OR is the ratio of the former by the latter pairs. Sibling data are presented for 1,686 youths (194 sexual minorities and 1,492 CHs). The actual number of families and siblings contributing to the estimation differed across

variables because the *OR* is a function of discordance; sexual minorities and their CH siblings are not included if, for example, they all smoke or all do not smoke. Maternal discomfort with homosexuality was not included because mothers completed items as a global assessment of their attitudes, rather than specific to each child.

RESULTS

Table 1 provides descriptive data for the theoretical variables stratified by sexual orientation, including substances that are not examined in subsequent analyses in order to have a manageable number of outcomes. As expected, a higher proportion of lesbian/gay (LG), bisexual (BI), and mostly heterosexual (MH) young people reported substance use than did completely heterosexual (CH) youths, except for binge drinking. Expected differences also were found for other theoretical variables. For example, the sexual-minority young people reported more childhood gender nonconforming behaviors than CH peers. However, mothers of sexual minorities reported being more comfortable with homosexuality than mothers of CHs. Age, sex, and ethnicity/race were related to sexual orientation; thus, we controlled for them in all subsequent regression models. LGs were older than CHs. Relative to CHs, MHs and BIs were less likely to be male, and LGs were more likely to be male; the latter meant that a significantly greater proportion of males were homosexual than CH. MHs and BIs were less likely to be White than CHs.

Direct and Moderating Processes of Stress Paradigm

Table 2A presents the bivariate relations between substance use in 2007 and all other variables, adjusting for sibling clustering. Nearly all relations among the explanatory theoretical variables and substance use were significant. However, the odds of substance use were higher with decreasing levels of maternal discomfort with homosexuality. In addition, childhood gender nonconforming behaviors were generally unrelated to substance use. These unexpected bivariate findings may have little, if any, consequential meaning, if more complex relations existed, as hypothesized and discussed below.

We examined the potential moderating effect of the stress markers in sexual-orientation disparities in substance use after controlling for all other theoretical variables, covariates, and sibling clusters. In 3 of 8 relations, as mother's discomfort with homosexuality increased, significantly more BIs than CHs engaged in past-year binge drinking ($OR = 1.60$; 95% $CI = 1.08, 2.38$), marijuana use ($OR = 1.55$; 95% $CI = 1.01, 2.37$), and other illicit drug use ($OR = 1.94$; 95% $CI = 1.26, 2.99$). A similar pattern of significant findings occurred for MHs relative to CHs on lifetime ($OR = 1.25$, 95% $CI = 1.03, 1.52$) and past-year ($OR = 1.26$, 95% $CI = 1.00, 1.60$) illicit drug use other than marijuana and lifetime misuse of prescription drugs ($OR = 1.20$, 95% $CI = 1.00, 1.45$). In 3 of 8 relations, as childhood gender nonconforming behaviors increased, significantly more LGs than CHs reported lifetime cigarette smoking ($OR = 1.59$; 95% $CI = 1.00, 2.51$) and lifetime ($OR = 1.75$; 95% $CI = 1.14, 2.70$) and past-year ($OR = 1.82$; 95% $CI = 1.16, 2.85$) illicit drug use other than marijuana.

Mediational Process of Attachment Paradigm

Table 2B contains the bivariate relations among the theoretical predictors, adjusting for sibling clusters. It shows that all sexual-minority groups reported less secure attachment and less maternal affection than CHs. Indeed, attachment and maternal affection may be potential mediators of sexual-orientation disparities in substance use, per the MacArthur rules (Kraemer et al., 2008).

Table 3 presents the findings confirming mediation. Column A shows the relations to be mediated: the significant relations between sexual orientation and substance use controlling for covariates and sibling clusters. Column B shows the attenuation (mediation) in these relations provided by attachment and maternal affection. Column C indicates the percent of mediation, which ranged from 5.6% to 16.8% for lifetime substance use and 4.9% to 24.5% for past-year substance use (the latter actually represents change in substance use from 2005 to 2007). Although in some instances the p-values associated with the percent mediation did not achieve statistical significance for LGs and BIs due to low power, it is the case that 52% of sexual-orientation disparities in substance use were significantly mediated (11/21 relations).

Gender Moderating Effects

Product terms were added to the multivariable models to examine whether sex modified the relations between the theoretical predictors and each substance use outcome. Of 24 relations between sexual orientation and substance use (3 sexual-orientation variables by 8 substances), sex significantly ($p < 0.05$) modified only one relation, less than what would be expected by chance. Therefore, sexual-orientation disparities in substance use were comparable between the sexes. Of 32 relations between the remaining 4 predictor variables by 8 substances, sex significantly modified four relations (12.5%). Of the four, three concerned gender nonconforming behaviors. In the past year and regardless of sexual orientation, female youths were more likely than male youths to smoke cigarettes, engage in binge drinking, and use illicit drugs other than marijuana as childhood gender nonconforming behaviors increased.

Sibling Comparisons

The young sexual-minority individuals were compared to their CH siblings on the theoretical variables (Table 4). Our hypotheses were confirmed: More sexual minorities than CH siblings reported substance use, childhood gender nonconforming behaviors, and less secure attachment. Mothers reported less affection for their sexual-minority than their CH offspring.

DISCUSSION

More sexual minorities than completely heterosexuals (CHs) reported substance use, adjusting for depressive distress, age, sex, ethnicity/race, and sibling clustering in a large cohort of emerging adults. Anticipating these disparities, we empirically tested a theoretical model of stress and attachment paradigms to understand disparities in substance use by sexual orientation.

Stress Paradigm

We hypothesized that exposure to stress would predict more substance use and, more importantly, that stress would moderate the relations between sexual orientation and substance use. For the latter, we expected that the likelihood of substance use would increase for sexual minorities relative to CHs as stress increased.

Maternal discomfort with homosexuality—Contrary to expectations, negative attitudes toward homosexuality by mothers were related to lower levels of substance use in their children, suggesting that more accepting maternal attitudes were related to more substance use. This finding was attributed to CHs because they composed over 85% of the sample and their mothers reported the highest levels of discomfort with homosexuality (Table 1). Although the mothers of sexual minorities were more comfortable with homosexuality than were mothers of CH, it may be that by the time the mothers were queried about their attitudes toward homosexuality, the mothers of the sexual minorities may have modified their attitudes in order to be more accepting of their sexual-minority children. This would be in keeping with findings indicating that parents of sexual minorities become more accepting of their offspring over time, despite initial negative reactions to the child's sexual orientation (Beals & Peplau, 2006; Ben-Ari, 1995; Savin-Williams & Ream, 2003; Vincke & Van Heeringen, 2002).

Nevertheless, we found more complex relations involving maternal discomfort with homosexuality. Greater maternal discomfort was associated with increased risk of past-year binge drinking, marijuana use, and other illicit drug use for bisexuals (BIs) relative to CHs. These findings indicate that the higher prevalence of substance use among BIs relative to CHs may be attributed to maternal negative attitudes to homosexuality. These patterns of findings also applied to mostly heterosexuals (MHs) relative to CHs because similar moderating relations were found for them. Furthermore, these patterns of findings may apply to lesbians/gays (LGs) for whom similar but nonsignificant findings were found probably due to power. The totality of the findings may suggest that more accepting maternal attitudes are protective of substance use among sexual minorities relative to CHs. Such positive attitudes might enhance maternal affection for a sexual-minority offspring and increase the child's attachment to mother. The attachment factors should reduce sexual-orientation disparities in substance use, according to our model.

Childhood gender nonconforming behaviors—We found, as expected, that childhood gender nonconforming behaviors were related to sexual orientation (Bailey & Zucker, 1995; Zucker, 2008), such that CHs had the lowest levels of gender nonconforming behaviors, followed by mostly heterosexual (MHs), then BIs, and finally LGs with the highest levels of gender nonconforming behaviors. However gender nonconforming behaviors were not directly related to substance use. This was surprising because gender nonconforming behaviors have been related to more substance use among sexual-minority youth (Rosario et al., 2008) and to emotional distress among young sexual minorities and heterosexuals (D'Augelli et al., 2006; Fitzpatrick, Euton, Jones, Schmidt, 2004; Plöderl & Fartacek, 2009; Roberts et al., 2012; Yunger, Carver, & Perry, 2004).

Instead, we found that gender nonconforming behaviors moderated the relation between sexual orientation and substance use: More LGs than CHs reported lifetime cigarette smoking and lifetime and past-year non-marijuana illicit drug use as childhood gender nonconforming behaviors increased. We attribute this finding to a chain of events that begins early in life with the higher prevalence of childhood gender nonconformity among sexual minorities than heterosexuals (Zucker, 2008) and the relative constancy of gender nonconforming behaviors found from childhood through adolescence and into adulthood (Rieger et al., 2008; Rieger & Savin-Williams, 2012). Individuals who engage in more gender nonconforming behaviors are more likely to experience stress from those who find such behaviors unacceptable or distressing. The literature indicates that young people with childhood gender nonconforming behaviors experience a wide range of stressors (D'Augelli, Grossman, & Starks, 2008; Roberts et al., 2012) and those reporting more gender nonconforming behaviors (such as our LGs) experience more stress (Roberts et al., 2012). In turn, substances may be used to cope with the stress related to gender nonconforming behaviors. Thus, a possible link between sexual orientation and substance use may depend in part on childhood gender nonconforming behaviors.

Attachment Paradigm

Three overarching findings emerged concerning the attachment paradigm. First, compared to CHs, sexual minorities reported less secure attachment and their mother's reported less maternal affection for them. These relations also were found when sexual minorities were compared to their CH siblings. Second, less secure attachment and less maternal affection were related to an increased probability of lifetime and past-year substance use, even after adjusting for other variables in the theoretical model and covariates; the latter included substance use in 2005, allowing for examination of change in substance use from 2005 to 2007. Third, attachment and maternal affection partially mediated the relations between sexual orientation and subsequent substance use.

Our findings concerning the attachment paradigm in substance use are consistent with previous research (Grossmann et al., 2005) and suggest that interpersonal mechanisms involving significant others partly explain disparities in substance use by sexual orientation. Given that attachment begins early in life (Bowlby, 1969), that parents may consciously or unconsciously suspect a child may be a sexual minority (D'Augelli et al., 2005), and that some parents respond in a negative or rejecting way to a sexual-minority child (e.g., Ryan et al., 2009; Savin-Williams & Ream, 2003), it follows that substance use among sexual minorities may be evident at younger ages and with higher prevalence than in heterosexuals. Indeed, research finds that sexual-minority youths relative to heterosexual peers initiate substance use at younger ages and are more likely to use substances (Corliss et al., 2008, 2010, 2013; Kann et al., 2011). Substance use may be a particularly attractive coping strategy for youths, given their developmentally limited coping capabilities (Rosario & Schrimshaw, 2013). Unfortunately, such a coping strategy may lead to substance abuse or dependence (Fergusson et al., 1999; Fergusson, Horwood, Ridder, & Beautrais, 2005).

Sibling Comparisons

As hypothesized, sexual minorities as compared with CH siblings reported more lifetime and past-year substance use, more childhood gender nonconforming behaviors, and less secure attachment. In addition, mothers reported less affection for their sexual-minority than CH offspring. These findings are compelling because the sibling-comparison design controls to some extent for shared genetic and environmental influences (e.g., biological predisposition, maternal substance use, permissive parenting, socioeconomic status, neighborhood).

The findings illustrate the continued stigmatization of homosexuality by society, even within families that include a health professional (children's mothers are nurses). Interventions or therapeutic efforts targeting families may reduce the discrimination and psychological deprivation potentially experienced by a sexual-minority young person, as well as the subsequent substance use, abuse, and dependence that may result. The literature consistently finds in representative samples of the population that sexual-minority adults relative to heterosexuals report elevated rates of substance abuse or dependence (e.g., Cochran, Ackerman, Mays, & Ross, 2004; Drabble, Midanik, & Trocki, 2005; Gilman, Cochran, Mays, Hughes, Ostrow, & Kessler, 2001; Hughes, McCabe, Wilsnack, West, & Boyd, 2010; McCabe, Bostwick, Hughes, West, & Boyd, 2010; Sandfort, de Graaf, Bijl, & Schnabel, 2001). The sibling-comparison findings suggest a possible explanation for these adult disparities. In families, sexual-orientation disparities in substance use are apparent in the children. Less secure attachment linked to less maternal affection may be more likely to be experienced by the sexual minorities than by their heterosexual siblings. Faced with this unequal treatment, substances may be used by young sexual minorities to self-medicate against and escape from such deprivation. To the extent that substances continue to be used to palliate the attachment-related wounds, the likelihood of abuse or dependence increases over time.

Final Notes on the Theoretical Model

The theoretical model (Figure 1) is anchored in stress and attachment paradigms, as indicated at the beginning of this article. The model also conforms to other paradigms. For example, a correlation rather than a directional path is posited between sexual orientation and gender nonconforming behaviors because these factors are related by means of genetics or prenatal hormonal effects (e.g., Alanko et al., 2010; Meyer-Bahlburg et al., 2004; for a review of these literatures, see Rosario & Schrimshaw, 2013).

Several implications of the model must be investigated in future research. First, changes over time in the theoretical factors and relations among the factors require attention. For example, maternal discomfort with homosexuality, as assessed here, refers to the mother's own report of her discomfort. Such discomfort clearly predates a child's birth. However, it may lessen over time for some mothers who have a sexual-minority offspring, perhaps enhancing maternal affection for the child and the child's attachment to the mother. Second, paternal attachment and affection should be considered as both mothers and fathers contribute to the sense of safety and security of their offspring (Grossmann, Grossmann, Kindler, & Zimmermann, 2008). Third, the generalization of the model to health outcomes

other than substance use must be considered, given the multiple poor health outcomes to which sexual minorities are vulnerable (for a review, see Institute of Medicine, 2011). Fourth, the applicability of the model to health disparities among sexual minorities requires thought. BI youths have been found to be at greater risk for substance use than LG youths (Ford & Janinski, 2006; Russell et al., 2002). Might the disparity be a function of stress and attachment, if the model generalizes to within, sexual-minority comparisons? Jorm et al. (2002) found that BIs experienced more stress than LGs. Why and what kind of stress is elevated among BIs and how severe and chronic is it? Furthermore, might their attachment be more problematic than that of LGs and why? We recommend that future investigations be prepared to test explanatory hypotheses for any anticipated disparities.

The model (Figure 1) also has empirical constraints that future research can overcome. A bidirectional relation theoretically exists between attachment and maternal affection, as indicated earlier. However, the model has a directional path from attachment to maternal affection, given constraints associated with the year in which these factors were assessed.

Limitations and Conclusions

The study has limitations. First, some of the measures could have been stronger or more robust. For example, maternal negative attitudes toward homosexuality were assessed with two items. Sexual orientation is a multidimensional construct consisting of sexual attractions, behavior, and identification, but only attractions were assessed. Although the response scale may be conflated with identification, sexual minorities may still be under-identified in GUTS, given the three indicators of sexual orientation are not concordant (for a literature review and discussion, see Rosario & Schrimshaw, 2013). Second, the GUTS sample is not representative of the population, given children had mothers who were nurses. Therefore, the generalizability of findings to more diverse samples of young people (e.g., heterogeneous communities in education/income) remains to be determined. Third, the sample is predominantly White, requiring caution in generalizing findings to more ethnically or racially diverse individuals.

Despite the limitations, we proposed and examined a theoretical model of substance use based on attachment and stress paradigms. We found that the attachment paradigm proved important in understanding disparities by sexual orientation in substance use and that stress moderated disparities in substance use by sexual orientation. If the findings are confirmed by others, interventions targeting attachment may be developed. Such interventions, if successful, would reduce the substance abuse and dependence to which sexual minorities seem vulnerable and offer the ability to confirm the causal pathway implied in the theoretical model.

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REFERENCES

- Alanko K, Santtila P, Harlaar N, Witting K, Varjonen M, Jern P, Sandnabba NK. Common genetic effects of gender atypical behavior in childhood and sexual orientation in adulthood: A study of Finnish twins. *Archives of Sexual Behavior*. 2010; 39:81–92. doi: 10.1007/s10508-008-9457-3. [PubMed: 19172387]
- Armsden GC, Greenberg MT. The Inventory of Parent and Peer Attachment: Individual differences and their relationship to well-being in adolescence. *Journal of Youth and Adolescence*. 1987; 16:427–454. doi: 10.1007/BF02202939. [PubMed: 24277469]
- Bailey JM, Zucker KJ. Childhood sex-typed behavior and sexual orientation: A conceptual analysis and quantitative review. *Developmental Psychology*. 1995; 31:43–55.
- Beals KP, Peplau LA. Disclosure patterns within social networks of gay men and lesbians. *Journal of Homosexuality*. 2006; 51(2):101–120. doi: 10.1300/J082v51n02_06. [PubMed: 16901869]
- Bell, AP.; Weinberg, MS.; Hammersmith, SK. Sexual preference: Its development in men and women. Indiana University Press; Bloomington, IN: 1981.
- Ben-Ari A. The discovery that an offspring is gay: Parents', gay men's, and lesbians' perspectives. *Journal of Homosexuality*. 1995; 30:89–112. doi: 10.1300/J082v30n01_05. [PubMed: 8907600]
- Bowlby, J. Attachment and loss: Volume 1. Attachment. Basic Books; New York: 1969.
- Cochran SD, Ackerman D, Mays VM, Ross MW. Prevalence of non-medical drug use and dependence among homosexual active men and women in the US population. *Addiction*. 2004; 99:989–998. doi: 10.1111/j.1360-0443.2004.00759.x. [PubMed: 15265096]
- 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 & Neglect*. 2002; 26:1165–1178. [PubMed: 12398854]
- Corliss HL, Rosario M, Wypij D, Fisher LB, Austin SB. Sexual orientation disparities in longitudinal alcohol use patterns among adolescents. *Archives of Pediatric and Adolescent Medicine*. 2008; 162:1071–1078. doi: 10.1001/archpedi.162.11.1071.
- Corliss HL, Rosario M, Wypij D, Wylie SA, Frazier AL, Austin SB. Sexual orientation and drug use in a longitudinal cohort study of U.S. adolescents. *Addictive Behaviors*. 2010; 35:517–521. doi: 10.1016/j.addbeh.2009.12.019. [PubMed: 20061091]
- Corliss HL, Wadler B, Hee-Jin J, Rosario M, Wypij D, Frazier AL, Austin SB. Sexual-orientation disparities in cigarette smoking in a longitudinal cohort study of adolescents. *Nicotine & Tobacco Research*. 2013; 15:213–222. doi:10.1093/ntr/nts114. [PubMed: 22581940]
- D'Augelli AR. Mental health problems among lesbian, gay, and bisexual youths ages 14–21. *Clinical Child Psychology and Psychiatry*. 2002; 7:433–456. doi: 10.1177/1359104502007003039.
- D'Augelli AR, Grossman AH, Starks MT. Parent's awareness of lesbian, gay, and bisexual youths' sexual orientation. *Journal of Marriage & the Family*. 2005; 67:474–482. doi: 10.1111/j.0022-2445.2005.00129.x.
- D'Augelli AR, Grossman AH, Starks MT. Childhood gender atypicality, victimization, and PTSD among lesbian, gay, and bisexual youth. *Journal of Interpersonal Violence*. 2006; 21:1462–1482. doi: 10.1177/0886260506293482. [PubMed: 17057162]
- D'Augelli AR, Grossman AH, Starks MT. Gender atypicality and sexual orientation development among lesbian, gay, and bisexual youth. *Journal of Gay & Lesbian Mental Health*. 2008; 12:121–143. doi: 10.1300/J529v12n01_08.
- Dozier, M.; Sovall-McClough, KC.; Albus, KE. Attachment and psychopathology in adulthood.. In: Cassidy, J.; Shaver, P., editors. *Handbook of attachment: Theory, research, and clinical applications*. 2nd ed. Guilford Press; New York, NY: 2008. p. 718–743.
- Drabble L, Midanik LT, Trocki K. 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]
- Eisenberg ME, Wechsler H. Social influences on substance-use behaviors of college students with same-sex experience: Findings from a national study. *Social Science and Medicine*. 2003; 57:1913–23. doi:10.1016/S0277-9536(03)00057-1. [PubMed: 14499515]

- Elizur Y, Mintzer A. A framework for the formation of gay male identity: Processes associated with adult attachment style and support from family and friends. *Archives of Sexual Behavior*. 2001; 30:143–167. doi: 10.1023/A:1002725217345. [PubMed: 11329725]
- Emmanuelle V. Inter-relationships among attachment to mother and father, self-esteem, and career indecision. *Journal of Vocational Behavior*. 2009; 75:91–99. doi:10.1016/j.jvb.2009.04.007.
- Fergusson DM, Horwood LJ, Beautrais AL. Is sexual orientation related to mental health problems and suicidality in young people? *Archives of General Psychiatry*. 1999; 56:876–880. doi: 10.1001/archpsyc.56.10.876. [PubMed: 10530626]
- Fergusson DM, Horwood J, Ridder EM, Beautrais AL. Sexual orientation and mental health in a birth cohort of young adults. *Psychological Medicine*. 2005; 35:971–981. doi: 10.1017/S0033291704004222. [PubMed: 16045064]
- Field AE, Camargo CA Jr, Taylor CB, Berkey CS, Frazier AL, Gillman MW, Colditz GA. Overweight, weight concerns, and bulimic behaviors among girls and boys. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38:754–760. doi: 10.1097/00004583-199906000-00024. [PubMed: 10361795]
- Fitzpatrick KK, Euton SJ, Jones JN, Schmidt NB. Gender role, sexual orientation and suicide risk. *Journal of Affective Disorders*. 2004; 87:35–42. doi:10.1016/j.jad.2005.02.020. [PubMed: 15893824]
- Ford JA, Jasinski JL. Sexual orientation and substance use among college students. *Addictive Behaviors*. 2006; 31:404–413. doi:10.1016/j.addbeh.2005.05.019. [PubMed: 15970397]
- Gilman SE, Cochran SD, Mays VM, Hughes M, Ostrow D, Kessler RC. Risks of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey. *American Journal of Public Health*. 2001; 91:933–939. [PubMed: 11392937]
- Grossmann, K.; Grossmann, KE.; Kindler, H.; Zimmermann, P. A wider view of attachment and exploration: The influence of mothers and fathers on the development of psychological security from infancy to young adulthood.. In: Cassidy, J.; Shaver, PR., editors. *Handbook of attachment: Theory, research, and clinical applications*. 2nd ed.. Guilford Press; New York: 2008. p. 857-879.
- Grossmann, KE.; Grossmann, K.; Waters, E. *Attachment from infancy to adulthood: The major longitudinal studies*. Guilford Press; New York: 2005.
- Hastie TJ, Tibshirani RJ. *Generalized Additive Models*. New York: Chapman and Hall. 1990
- Hatzenbuehler ML. How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological Bulletin*. 2009; 135:707–730. doi: 10.1037/a0016441. [PubMed: 19702379]
- Hatzenbuehler ML, McLaughlin KA, Keyes KM, Hasin DS. The impact of institutionalized discrimination on psychiatric disorders in lesbian, gay, and bisexual populations: A prospective study. *American Journal of Public Health*. 2010; 100:452–459. doi:10.2105/AJPH.2009.168815. [PubMed: 20075314]
- Hatzenbuehler ML, Wieringa NF, Keyes KM. Community-level determinants of tobacco use disparities in lesbian, gay, and bisexual youth: Results from a population-based study. *Archives of Pediatrics and Adolescent Medicine*. 2011; 165:527–32. doi:10.1001/archpediatrics.2011.64.
- Herek GM. Hate crimes and stigma-related experiences among sexual minority adults in the United States: Prevalence estimates from a national probability sample. *Journal of Interpersonal Violence*. 2009; 24:54–74. doi: 10.1177/0886260508316477. [PubMed: 18391058]
- Hertzmark, E.; Pazaris, M.; Spiegelman, D. [September 15, 2011] *The SAS Mediate Macro*. 2009. <http://www.hsph.harvard.edu/faculty/donna-spiegelman/files/mediate.pdf>
- Huebner DM, Rebchook GM, Kegeles SM. Experiences of harassment, discrimination, and physical violence among young gay and bisexual men. *American Journal of Public Health*. 2004; 94:1200–1203. doi: 10.2105/AJPH.94.7.1200. [PubMed: 15226143]
- Hughes T, McCabe SE, Wilsnack SC, West BT, Boyd CJ. Victimization and substance use disorders in a national sample of heterosexual and sexual minority women and men. *Addiction*. 2010; 105:2130–2140. doi: 10.1111/j.1360-0443.2010.03088.x. [PubMed: 20840174]
- Hussong AM, Jones DJ, Stein GL, Baucom DH, Boeding S. An internalizing pathway to alcohol use and disorder. *Psychology of Addictive Behaviors*. 2011; 25:390–404. doi: 10.1037/a0024519. [PubMed: 21823762]

- Institute of Medicine. The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding. National Academies Press; Washington, DC: 2011.
- Jaccard, J.; Dittus, P. Parent-teenager communication: Towards the prevention of unintended pregnancies. Springer-Verlag; New York: 1991.
- Jaccard J, Dittus PJ. Adolescent perceptions of maternal approval of birth control and sexual risk behavior. *American Journal of Public Health*. 2000; 90:1426–1430. doi: 10.2105/AJPH.90.9.1426. [PubMed: 10983201]
- Jaccard J, Dittus PJ, Gordon VV. Maternal correlates of adolescent sexual and contraceptive behavior. *Family Planning Perspectives*. 1996; 28:159–165. 185. [PubMed: 8853281]
- Jorm AF, Korten AE, Rodgers B, Jacomb PA, Christensen H. Sexual orientation and mental health: Results from a community survey of young and middle-aged adults. *British Journal of Psychiatry*. 2002; 180:423–427. [PubMed: 11983639]
- Kann L, Olsen EO, McManus T, Kinchen S, Chyen D, Harris WA, Wechsler H, Centers for Disease Control and Prevention (CDC). Sexual identity, sex of sexual contacts, and health-risk behaviors among students in grades 9–12—Youth Risk Behavior Surveillance, selected sites, United States, 2001–2009. *MMWR Surveillance Summaries*. 2011; 60(7):1–133. <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6007a1.htm>.
- Khantzian EJ. The self-medication hypothesis of substance use disorders: A recommendation and recent applications. *Harvard Review of Psychiatry*. 1997; 4:231–244. [PubMed: 9385000]
- Kosciw, JG.; Greytak, EA.; Diaz, EM.; Bartkiewicz, MJ. The 2009 national school climate survey: The experiences of lesbian, gay, bisexual and transgender youth in our nation's schools. GLSEN (Gay, Lesbian and Straight Education Network); New York: 2010.
- Kraemer HC, Kiernan M, Essex M, Kupfer DJ. How and why criteria defining moderators and mediators differ between the Baron & Kenny and MacArthur approaches. *Health Psychology*. 2008; 27:S101–108. doi: 10.1037/0278-6133.27.2(Suppl.).S101. [PubMed: 18377151]
- Kuyper L, Fokkema T. Minority stress and mental health among Dutch LGBs: Examination of differences between sex and sexual orientation. *Journal of Counseling Psychology*. 2011; 58:222–233. doi: 10.1037/a0022688. [PubMed: 21401219]
- Lahey BB, D'Onofrio BM. All in the family: Comparing siblings to test causal hypotheses regarding environmental influences on behavior. *Current Directions in Psychological Science*. 2010; 19:319–323. doi: 10.1177/0963721410383977. [PubMed: 23645975]
- Landolt MA, Bartholomew K, Saffrey C, Oram D, Perlman D. Gender nonconformity, childhood rejection, and adult attachment: A study of gay men. *Archives of Sexual Behavior*. 2004; 33:117–128. doi: 10.1023/B:ASEB.0000014326.64934.50. [PubMed: 15146144]
- Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22. doi: 10.1093/biomet/73.1.13.
- Maier MA, Bernier A, Pekrun R, Zimmermann P, Grossmann KE. Attachment working models as unconscious structures: An experimental test. *International Journal of Behavioral Development*. 2004; 28:180–189. doi: 10.1080/01650250344000398.
- Main, M. Attachment theory: Eighteen points with suggestions for future research.. In: Cassidy, J.; Shaver, PR., editors. *Handbook of attachment: Theory, research, and clinical applications*. Guilford; New York: 1999. p. 845–887.
- Mantel N, Haenszel E. Statistical aspects of the analysis of data from retrospective studies of disease. *Journal of the National Cancer Institute*. 1959; 22:719–748. [PubMed: 13655060]
- Marshal MP, Friedman MS, Stall R, 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. doi: 10.1111/j.1360-0443.2008.02149.x. [PubMed: 18339100]
- Marshal MP, Friedman MS, Stall R, Thompson AL. Individual trajectories of substance use in lesbian, gay, and bisexual youth and heterosexual youth. *Addiction*. 2009; 104:974–981. doi: 10.1111/j.1360-0443.2010.02953.x. [PubMed: 19344440]
- McCabe SE, Bostwick WB, Hughes TL, West BT, Boyd CJ. The relationship between discrimination and substance use disorders in lesbian, gay, and bisexual adults in the United States. *American Journal of Public Health*. 2010; 100:1946–1952. doi: 10.2105/AJPH.2009.163147. [PubMed: 20075317]

- 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. doi: 10.1037/0033-2909.129.5.674. [PubMed: 12956539]
- Meyer-Bahlburg HFL, Dolezal C, Baker SW, Carlson AD, Obeid JS, New MI. Prenatal androgenization affects gender-related behavior but not gender identity in 5-12-year-old girls with congenital adrenal hyperplasia. *Archives of Sexual Behavior*. 2004; 33:97–104. doi: 10.1023/B:ASEB.0000014324.25718.51. [PubMed: 15146142]
- Mohr JJ, Fassinger RE. Self-acceptance and self-disclosure of sexual orientation in lesbian, gay, and bisexual adults: An attachment perspective. *Journal of Counseling Psychology*. 2003; 50:482–495. doi: 10.1037/0022-0167.50.4.482.
- Plöderl M, Fartacek R. Childhood gender nonconformity and harassment as predictors of suicidality among gay, lesbian, bisexual, and heterosexual Austrians. *Archives of Sexual Behavior*. 2009; 38:400–410. doi: 10.1007/s10508-007-9244-6. [PubMed: 18040769]
- Remafedi G, Resnick M, Blum R, Harris L. Demography of sexual orientation in adolescents. *Pediatrics*. 1992; 89(4 suppl.):714–721. [PubMed: 1557267]
- Rieger G, Linsenmeier JA, Gygax L, Bailey JM. Sexual orientation and childhood gender nonconformity: Evidence from home videos. *Developmental Psychology*. 2008; 44:46–58. doi: 10.1037/0012-1649.44.1.46. [PubMed: 18194004]
- Rieger G, Savin-Williams RC. Gender nonconformity, sexual orientation, and psychological well-being. *Archives of Sexual Behavior*. 2012; 41:611–621. doi: 10.1007/s10508-011-9738-0. [PubMed: 21350914]
- Roberts AL, Rosario M, Corliss HL, Koenen KC, Austin SB. Childhood gender nonconformity: A risk indicator for childhood abuse and posttraumatic stress in youth. *Pediatrics*. 2012; 129:410–417. doi: 10.1542/peds.2011-1804. [PubMed: 22351893]
- Robins J, Breslow N, Greenland S. Estimators of the Mantel-Haenszel variance consistent with both sparse and large-strata limiting modes. *Biometrics*. 1986; 42:311–323. [PubMed: 3741973]
- Rosario, M.; Schrimshaw, EW. Theories and etiologies of sexual orientation.. In: Tolman, DL.; Diamond, LM., editors. *APA handbook of sexuality and psychology*. Vol. 1: Person-based approaches. American Psychological Association; Washington, DC: 2013. pp. ??-??
- Rosario, M.; Schrimshaw, EW. The sexual identity development and health of lesbian, gay, and bisexual adolescents: An ecological perspective.. In: Patterson, CJ.; D'Augelli, AR., editors. *Handbook of psychology and sexual orientation*. Oxford; New York: 2013. p. 87-101.
- 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; 43:1002–1015. doi: 10.1080/10826080801914402. [PubMed: 18649226]
- Rosario M, Schrimshaw EW, Hunter J. Disclosure of sexual orientation and subsequent substance use and abuse among lesbian, gay, and bisexual youths: Critical role of disclosure reactions. *Psychology of Addictive Behaviors*. 2009; 23:175–184. doi: 10.1037/a0014284. [PubMed: 19290704]
- Rosario M, Schrimshaw EW, Hunter J, Gwadz M. Gay-related stress and emotional distress among gay, lesbian, and bisexual youths: A longitudinal examination. *Journal of Consulting and Clinical Psychology*. 2002; 70:967–975. doi: 10.1037/0022-006X.70.4.967. [PubMed: 12182280]
- Rothman EF, Sullivan M, Keyes S, Boehmer U. Parents' supportive reactions to sexual orientation disclosure associated with better health: Results from a population-based survey of LGB adults in Massachusetts. *Journal of Homosexuality*. 2012; 59:186–200. doi: 10.1080/00918369.2012.648878. [PubMed: 22335417]
- Ruijten T, Roelofs J, Rood L. The mediating role of rumination in the relation between quality of attachment relations and depressive symptoms in non-clinical adolescents. *Journal of Child Family Studies*. 2011; 20:452–459. doi: 10.1007/s10826-010-9412-5. [PubMed: 21841901]
- Russell, ST. Substance use and abuse and mental health among sexual minority youths: Evidence from Add Health.. In: Omoto, A.; Kurtzman, H., editors. *Sexual orientation and mental health: Examining identity and development in lesbian, gay, and bisexual people*. American Psychological Association; Washington, DC: 2006. p. 13-35.

- 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; 92:198–202. doi: 10.2105/AJPH.92.2.198. [PubMed: 11818291]
- Russell ST, Franz BT, Driscoll AK. Same-sex romantic attraction and experiences of violence in adolescence. *American Journal of Public Health*. 2001; 91:903–906. [PubMed: 11392932]
- Ryan C, Huebner D, Diaz RM, Sanchez J. Family rejection as a predictor of negative health outcomes in white and Latino lesbian, gay, and bisexual young adults. *Pediatrics*. 2009; 123:346–352. doi: 10.1542/peds.2007-3524. [PubMed: 19117902]
- Sandfort TGM, de Graaf R, Bijl RV, Schnabel R. Same-sex behavior and psychiatric disorders: Findings from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Archives of General Psychiatry*. 2001; 58:85–91. [PubMed: 11146762]
- Savin-Williams RC, Ream GL. Sex variations in the disclosure to parents of same-sex attractions. *Journal of Family Psychology*. 2003; 17:429–438. doi: 10.1037/0893-3200.17.3.429. [PubMed: 14562466]
- Sherry A. Internalized homophobia and adult attachment: Implications for clinical practice. *Psychotherapy*. 2007; 44:219–225. doi: 10.1037/0033-3204.44.2.219. [PubMed: 22122212]
- Shisslak CM, Renger R, Sharpe T, Crago M, McKnight KM, Gray N, Bryson S, Estes LS, Parnaby OG, Killen J, Taylor CB. Development and evaluation of the McKnight Risk Factor Survey for assessing potential risk and protective factors for disordered eating in preadolescent and adolescent girls. *International Journal of Eating Disorders*. 1999; 25:195–214. [PubMed: 10065397]
- Smith TD, Leaper C. Self-perceived gender typicality and the peer context during adolescence. *Journal of Research on Adolescence*. 2006; 16:91–103. doi: 10.1111/j.1532-7795.2006.00123.x.
- Sternberg KJ, Lamb ME, Guterman E, Abbott CB, Dawud-Noursi S. Adolescents' perceptions of attachments to their mothers and fathers in families with histories of domestic violence: A longitudinal perspective. *Child Abuse & Neglect*. 2005; 29:853–869. doi:10.1016/j.chiabu.2004.07.009. [PubMed: 16126269]
- Stone CJ. Additive regression and other nonparametric models. *Annals of Statistics*. 1985; 13:689–705.
- Sue, DW. *Microaggressions in everyday life: Race, gender, and sexual orientation*. Wiley; Hoboken, NJ: 2010.
- Van Ryzin MJ, Leve LD. Validity evidence for the security scale as a measure of perceived attachment security in adolescence. *Journal of Adolescence*. 2012; 35:425–431. doi:10.1016/j.adolescence.2011.07.014. [PubMed: 21803412]
- Vincke J, Van Heeringen K. Confidant support and the mental wellbeing of lesbian and gay young adults: A longitudinal analysis. *Journal of Community and Applied Social Psychology*. 2002; 12:181–193. doi: 10.1002/casp.671.
- Yunger JL, Carver PR, Perry DG. Does gender identity influence children's psychological well-being? *Developmental Psychology*. 2004; 40:572–582. doi: 10.1037/0012-1649.40.4.572. [PubMed: 15238044]
- Zakalik RA, Wei M. Adult attachment, perceived discrimination based on sexual orientation, and depression in gay males: Examining the mediating and moderation effects. *Journal of Counseling Psychology*. 2006; 53:302–313. doi: 10.1037/0022-0167.53.3.302.
- Zeger SL, Liang KY, Albert PS. Models for longitudinal data: A generalized estimating equation approach. *Biometrics*. 1988; 44:1049–1060. [PubMed: 3233245]
- Zucker KJ. Reflections on the relation between sex-typed behavior in childhood and sexual orientation in adulthood. *Journal of Gay & Lesbian Mental Health*. 2008; 12:29–59. doi: 10.1300/J529v12n01_04.
- Zucker KJ, Michell JM, Bradley S, Tkachuk J, Cantor JM, Allin S. The recalled childhood gender identity/gender role questionnaire: Psychometric properties. *Sex Roles*. 2006; 54:469–483. doi: 10.1007/s11199-006-9019-x.

Figure 1.

Proposed theoretical model of health by sexual orientation and related factors. [Note. Dotted paths indicate hypothesized mediated relations by attachment paradigm (attachment or maternal affection), such as between sexual orientation and the health outcome of substance use. The bolded, solid arrows that end midway between sexual orientation and substance use depict the moderating effects of maternal discomfort with homosexuality and gender nonconforming behaviors in sexual-orientation disparities in health. The year each construct was assessed appears in parentheses.]

Table 1

Substance Use Behaviors, Other Theoretical Variables, and Potential Covariates of Female and Male Young People ($N = 5,647$) Stratified by Sexual Orientation.

Variable (year assessed)	Lesbian/Gay $n = 92$	Bisexual $n = 89$	Mostly Heterosexual $n = 561$	Completely Heterosexual $n = 4905$	Total Sample $N = 5647$
	% (n)	% (n)	% (n)	% (n)	% (n)
Lifetime Substance Use (2007)					
Smoking at least 100 cigarettes	39.1 (36)**	53.9 (48)***	40.8 (229)***	22.9 (1125)	25.5 (1438)
Any illicit non-marijuana drug use	31.5 (29)**	53.9 (48)***	39.2 (220)***	16.4 (805)	19.5 (1102)
Any prescription drug misuse	33.7 (31)**	50.6 (45)***	39.6 (222)***	21.3 (1046)	23.8 (1344)
Past-Year Substance Use (2007)					
Any cigarette smoking	55.4 (51)***	57.3 (51)***	52.6 (295)***	32.4 (1587)	35.1 (1984)
Weekly cigarette use ⁺	19.6 (18)**	23.6 (21)**	20.5 (115)***	10.4 (509)	11.7 (663)
Binge drinking (3)	66.3 (61)	65.2 (58)	70.2 (394)***	60.1 (2950)	61.3 (3463)
Binge drinking (12) ⁺	34.8 (32)	30.3 (27)	30.7 (172)	28.2 (1381)	28.6 (1612)
Any marijuana use	46.7 (43)***	55.1 (49)***	49.0 (275)***	26.2 (1287)	29.3 (1654)
Monthly marijuana use ⁺	17.4 (16)*	24.7 (22)***	23.5 (132)***	10.5 (514)	12.1 (684)
Any illicit non-marijuana drug use	23.9 (22)***	24.7 (22)***	21.6 (121)***	8.5 (415)	10.3 (580)
Any prescription drug misuse	20.7 (19)**	27.0 (24)***	25.0 (140)***	14.2 (695)	15.6 (878)
	<hr/>				
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Other Theoretical Variables					
Maternal discomfort with homosexuality (2004)	4.8 (2.1)***	5.1 (2.3)***	5.3 (2.1)***	6.2 (2.1)	6.1 (2.2)
Childhood gender nonconforming behaviors (2005)	10.8 (3.6)***	10.1 (3.0)***	9.0 (3.1)***	7.5 (2.8)	7.8 (2.9)
Attachment (2005)	35.1 (8.1)**	34.4 (8.9)***	35.1 (8.3)***	38.3 (6.8)	37.8 (7.1)
Maternal affection (2006)	37.2 (7.1)*	37.1 (6.4)**	37.4 (6.9)***	38.9 (6.4)	38.7 (6.5)
Potential Covariates					
Age (2005)	21.1 (1.6)**	20.7 (1.6)	20.8 (1.7)*	20.6 (1.7)	20.6 (1.7)
Depressive distress (2003)	6.9 (3.7)**	7.7 (4.4)***	7.2 (3.7)***	5.9 (3.3)	6.0 (3.4)
	<hr/>				
	% (n)	% (n)	% (n)	% (n)	% (n)
Substance use (2005)	77.2 (71)**	80.9 (72)**	76.7 (430)***	60.7 (2976)	62.9 (3549)
Sex: Male	53.3 (49)**	15.7 (14)**	25.7 (144)***	36.4 (1785)	35.3 (1992)
Female	46.7 (43)	84.3 (75)	74.3 (417)	63.6 (3120)	64.7 (3655)

	% (n)	% (n)	% (n)	% (n)	% (n)
Race/Ethnicity: White	92.4 (85)	86.5 (77) **	90.2 (505) ***	94.4 (4632)	93.8 (5299)
Racial/Ethnic minority	7.6 (7)	13.5 (12)	10.0 (56)	5.6 (263)	6.2 (348)

Note. Sexual orientation reported in 2005. Completely heterosexual is the referent category for all comparisons. Non-marijuana illicit drug use includes cocaine, heroin, ecstasy, GHB, LSD, crystal methamphetamine, amphetamine. Prescription drug misuse includes tranquilizers, pain killers, sleeping pills, Ritalin. Substance use (2005) includes any smoking, binge drinking, or marijuana use in the past year. Linear models were used to estimate mean differences by sexual orientation. Logit models estimated differences in proportions by sexual orientation.

⁺ Not examined in subsequent analyses.

*
p<0.05

**
p<0.01

p<0.0001

Table 2A

Bivariate Relations Among Variables in the Theoretical Model and Covariates ($N = 5,647$).

Variable (year assessed)	Lifetime Substance Use (2007)				Past-Year Substance Use (2007)			
	Smoking at least 100 cigarettes	Any illicit non-marijuana drug use	Any prescription drug misuse	Any cigarette smoking	Binge drinking 3 times	Any marijuana use	Any illicit non-marijuana drug use	Any prescription drug misuse
Odds Ratios (95% Confidence Intervals)								
Lesbian/Gay (2005)	2.16 (1.42, 3.29)**	2.34 (1.48, 3.70)**	1.87 (1.22, 2.89)**	2.60 (1.73, 3.92)***	1.30 (0.85, 2.01)	2.47 (1.62, 3.75)***	3.40 (2.08, 5.56)***	1.58 (0.94, 2.63)
Bisexual (2005)	3.93 (2.59, 5.97)***	5.96 (3.89, 9.14)***	3.77 (2.49, 5.72)***	2.81 (1.84, 4.27)***	1.24 (0.80, 1.93)	3.44 (2.25, 5.27)***	3.55 (2.18, 5.78)***	2.24 (1.39, 3.61)**
Mostly heterosexual (2005)	2.32 (1.93, 2.78)***	3.29 (2.73, 3.95)***	2.42 (2.01, 2.90)***	2.32 (1.94, 2.77)***	1.56 (1.29, 1.89)***	2.70 (2.26, 3.23)***	2.98 (2.38, 3.73)***	2.01 (1.64, 2.48)***
Maternal discomfort with homosexuality (2004)	0.84 (0.79, 0.89)***	0.71 (0.66, 0.76)***	0.76 (0.72, 0.81)***	0.84 (0.79, 0.89)***	0.74 (0.70, 0.78)***	0.66 (0.62, 0.70)***	0.74 (0.67, 0.81)***	0.80 (0.75, 0.86)***
Childhood gender nonconforming behaviors (2005)	0.99 (0.93, 1.05)	1.04 (0.97, 1.11)	1.02 (0.95, 1.09)	0.97 (0.91, 1.02)	0.89 (0.84, 0.94)***	0.99 (0.93, 1.05)	1.01 (0.92, 1.12)	0.98 (0.90, 1.05)
Attachment (2005)	0.82 (0.78, 0.87)***	0.80 (0.75, 0.85)***	0.85 (0.80, 0.90)***	0.82 (0.78, 0.87)***	0.95 (0.90, 1.01)	0.87 (0.82, 0.92)***	0.80 (0.74, 0.86)***	0.84 (0.79, 0.90)***
Maternal affection (2006)	0.70 (0.66, 0.74)***	0.73 (0.68, 0.77)***	0.77 (0.73, 0.82)***	0.72 (0.68, 0.76)***	0.92 (0.87, 0.97)**	0.78 (0.74, 0.83)***	0.70 (0.65, 0.75)***	0.76 (0.72, 0.81)***
Covariates:								
Age (2005)	1.26 (1.18, 1.35)***	1.21 (1.14, 1.29)***	1.07 (1.00, 1.13)*	0.98 (0.93, 1.03)	1.00 (0.95, 1.06)	0.90 (0.85, 0.95)**	0.89 (0.82, 0.97)**	0.91 (0.85, 0.98)*
Depressive distress (2003)	1.21 (1.13, 1.29)***	1.22 (1.14, 1.31)***	1.25 (1.17, 1.33)***	1.16 (1.10, 1.23)***	1.08 (1.03, 1.14)**	1.15 (1.08, 1.21)***	1.21 (1.10, 1.32)***	1.25 (1.16, 1.35)***
Substance use (2005)	--	--	--	10.71 (9.07, 12.64)***	10.86 (9.55, 12.35)***	9.39 (7.86, 11.23)***	16.80 (11.06, 25.51)***	5.97 (4.79, 7.44)***
Male (vs female)	1.07 (0.94, 1.21)	1.23 (1.07, 1.41)**	1.23 (1.08, 1.40)**	1.27 (1.13, 1.43)***	1.25 (1.12, 1.41)**	1.36 (1.21, 1.54)***	1.63 (1.36, 1.94)***	1.18 (1.02, 1.37)*
White (vs minority)	0.96 (0.75, 1.24)	0.71 (0.55, 0.92)*	0.75 (0.58, 0.96)*	0.94 (0.75, 1.18)	1.43 (1.14, 1.79)**	0.84 (0.66, 1.07)	0.72 (0.51, 1.00)*	0.82 (0.62, 1.09)

Note. Completely heterosexual (CH) is the referent category for all comparisons. Odds ratio were adjusted for sibling clustering. Relations involving binary predictors (e.g., sexual orientation) can be interpreted as the difference in odds of the outcome between one group and another (e.g., lesbians/gays to CHs). Relations involving continuous predictors can be interpreted as the difference in odds for a standard deviation difference in the continuous variable (e.g., a standard deviation unit increase in attachment is associated with 0.82 decreased odds of lifetime smoking 100+ cigarettes).

* p<0.05
** p<0.01
*** p<0.0001

Table 2B
Bivariate Relations Among Variables in the Theoretical Model and Covariates ($N = 5,647$).

Variable (year assessed)	Maternal discomfort with homosexuality (2004)	Childhood gender nonconformity (2005)	Attachment (2005)	Maternal affection (2006)
<i>Z-scored Beta Coefficients and (95% Confidence Intervals)</i>				
Lesbian/Gay (2005)	*** -0.62 (-0.82, -0.42)	*** 1.11 (0.86, 1.36)	** -0.44 (-0.67, -0.21)	* -0.28 (-0.50, -0.05)
Bisexual (2005)	*** -0.48 (-0.72, -0.25)	*** 0.87 (0.65, 1.09)	*** -0.54 (-0.80, -0.28)	*** -0.29 (-0.50, -0.08)
Mostly heterosexual (2005)	*** -0.39 (-0.48, -0.30)	*** 0.50 (0.40, 0.59)	*** -0.44 (-0.54, -0.34)	*** -0.24 (-0.34, -0.15)
Maternal discomfort with homosexuality (2004)	--	*** -0.06 (-0.09, -0.04)	** -0.04 (-0.07, -0.01)	*** -0.06 (-0.09, -0.03)
Childhood gender nonconforming behaviors (2005)	--	--	*** -0.08 (-0.11, -0.05)	0.02 (-0.004, 0.05)
Attachment (2005)	--	--	--	*** 0.47 (0.44, 0.50)
Maternal affection (2006)	--	--	--	--
Covariates:				
Age (2005)	-0.008 (-0.03, 0.02)	** -0.05 (-0.08, -0.03)	-0.0003 (-0.03, 0.03)	** 0.04 (0.01, 0.06)
Depressive distress (2003)	*** -0.05 (-0.08, -0.03)	*** 0.18 (0.15, 0.21)	*** -0.13 (-0.16, -0.10)	*** -0.07 (-0.09, -0.04)
Substance use (2005)	*** -0.36 (-0.42, -0.30)	* 0.06 (0.009, 0.12)	** -0.10 (-0.16, -0.05)	*** -0.18 (-0.23, -0.13)
Male (vs female)	-0.03 (-0.08, 0.03)	*** -0.85 (-0.90, -0.80)	0.03 (-0.02, 0.08)	*** -0.17 (-0.23, -0.12)
White (vs minority)	0.11 (-0.01, 0.23)	-0.08 (-0.20, 0.04)	** 0.17 (0.06, 0.28)	** 0.21 (0.09, 0.33)

Note. Completely heterosexual is the referent category for all sexual-orientation comparisons. Beta coefficients were adjusted for sibling clustering. Relations involving binary predictors (sexual orientation, substance use in 2005, sex, and race/ethnicity) can be interpreted as Cohen's effect size, d , the standard deviation difference between one group and another (e.g., lesbians/gays to CHs) on each continuous outcome. Relations among continuous variables are interpretable as traditional beta weights, ranging from -1.0 to 1.0.

* $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.0001$

Table 3

Mediational Effects: Percent of Each Sexual Orientation-Drug Relation (Lifetime and Past Year) Jointly Explained by the Hypothesized Mediators (Attachment and Maternal Affection) ($N = 5,647$).

Exposure effect unadjusted for the hypothesized mediators					Exposure effect adjusted for attachment and maternal affection		Percent of effect jointly explained by attachment and maternal affection	
A					B		C	
Adj OR (95% CI)					Adj OR (95% CI)		Percent (95% CI)	
Lifetime Substance Use								
Smoking At Least 100 Cigarettes								
Lesbian/Gay					1.80 (1.12, 2.90) *		12.60 (-4.11, 29.31)	
Bisexual					3.53 (2.28, 5.47) ***		6.43 (0.52, 12.35) *	
Mostly heterosexual					2.04 (1.67, 2.48) ***		9.50 (3.73, 15.27) **	
Any Illicit Non-Marijuana Drug Use								
Lesbian/Gay					1.62 (0.99, 2.66)		16.60 (-3.02, 36.21)	
Bisexual					4.98 (3.11, 7.97) ***		5.58 (0.92, 10.23) *	
Mostly heterosexual					2.74 (2.23, 3.35) ***		7.15 (3.36, 10.93) **	
Any Prescription Drug Misuse								
Lesbian/Gay					1.40 (0.89, 2.21)		16.79 (-7.80, 41.37)	
Bisexual					3.17 (2.04, 4.93) ***		5.69 (0.60, 10.77) *	
Mostly heterosexual					2.05 (1.69, 2.49) ***		7.36 (2.88, 11.84) **	
Past-Year Substance Use								
Any Cigarette Smoking								
Lesbian/Gay					2.33 (1.51, 3.58) **		8.15 (-0.50, 16.80)	
Bisexual					2.29 (1.45, 3.61) **		8.56 (0.52, 16.60) *	
Mostly heterosexual					1.94 (1.58, 2.38) ***		9.21 (3.90, 14.52) **	
Any Marijuana Use								
Lesbian/Gay					1.90 (1.18, 3.06) **		8.04 (-1.72, 17.79)	

	Exposure effect unadjusted for the hypothesized mediators		Exposure effect adjusted for attachment and maternal affection	Percent of effect jointly explained by attachment and maternal affection
	A	B	C	
	Adj OR (95% CI)	Adj OR (95% CI)	Percent (95% CI)	
Bisexual	2.91 (1.76, 4.79) ***	2.76 (1.68, 4.53) ***	5.02 (-0.06, 10.09)	
Mostly heterosexual	2.34 (1.91, 2.85) ***	2.27 (1.85, 2.77) ***	4.92 (1.32, 8.51) **	
Any Illicit Non-Marijuana Drug Use				
Lesbian/Gay	2.67 (1.57, 4.52) **	2.42 (1.41, 4.14) **	10.08 (-0.96, 21.11)	
Bisexual	2.98 (1.73, 5.15) ***	2.83 (1.64, 4.89) **	5.13 (-2.56, 12.51)	
Mostly heterosexual	2.54 (1.98, 3.25) ***	2.39 (1.85, 3.08) ***	6.86 (1.88, 11.84) **	
Any Prescription Drug Misuse				
Lesbian/Gay	1.37 (0.81, 2.34)	1.27 (0.74, 2.18)	24.46 (-22.30, 71.23)	
Bisexual	1.78 (1.08, 2.93) *	1.68 (1.02, 2.79) *	9.69 (-3.34, 22.72)	
Mostly heterosexual	1.66 (1.33, 2.08) ***	1.58 (1.27, 1.98) ***	10.41 (2.49, 18.32) **	

Note. Column A: Adjusted for sibling clustering, age, sex, race/ethnicity, maternal discomfort with homosexuality, childhood gender nonconforming behaviors, and depressive distress. Past-year substance use outcomes also adjusted for substance use (2005). Column B: Attachment and maternal affection were jointly added to the models. Column C: shows the “percent of effect” (PEE) and estimates the percentage of mediation in the relation between sexual orientation in 2005 and substance use in 2007 provided by attachment and maternal affection. The exact p-value is the probability of rejecting a null hypothesis of zero PEE or no mediation by attachment and maternal affection. The referent for each sexual-orientation category is completely heterosexual. Adj. OR = adjusted odds ratio. 95% CI = 95% confidence interval. Binge drinking does not appear because there were no sexual-orientation disparities to mediate once controls were imposed for covariates.

* p<0.05
 ** p<0.01
 *** p<0.0001

Table 4

Comparing Sexual Minorities and Completely Heterosexual Siblings ($n = 1,686$).

Variable (year assessed)	Lesbian/gay, bisexual, mostly heterosexual ($n=194$) % (n)	Completely heterosexual ($n=1,492$) % (n)	OR (95% CI)	Cochran-Mantel-Haenszel χ^2	Number of families contributing to estimation
Lifetime Substance Use (2007)					
Smoking at least 100 cigarettes	34.0 (66)	20.6 (308)	1.98 (1.13, 3.47)*	5.86	56
Any illicit non-marijuana drug use	42.8 (83)	15.8 (236)	2.68 (1.53, 4.70)***	12.74	62
Any prescription drug misuse	39.2 (76)	20.2 (301)	2.47 (1.46, 4.20)***	11.80	67
Past-Year Substance Use (2007)					
Any cigarette smoking	52.1 (101)	29.5 (440)	2.44 (1.47, 4.06)**	12.72	73
Binge drinking (3 times)	71.7 (139)	57.6 (859)	1.58 (0.97, 2.56)	3.42	69
Any marijuana use	46.9 (91)	25.1 (374)	1.66 (1.02, 2.71)*	4.20	69
Any illicit non-marijuana drug use	23.2 (45)	8.9 (132)	2.02 (1.08, 3.78)*	5.05	45
Any prescription drug misuse	25.3 (49)	13.3 (198)	1.92 (1.08, 3.43)*	4.97	52
Other Theoretical Variables⁺					
Childhood gender nonconforming behaviors (2005)	80.9 (157)	58.9 (879)	2.59 (1.52, 4.42)***	13.09	68
Attachment (2005)	35.1 (68)	52.7 (786)	0.50 (0.31, 0.82)***	8.05	72
Maternal affection (2006)	37.1 (72)	52.9 (789)	0.51 (0.28, 0.92)*	5.15	48
Covariate					
Depressive distress (2003)	45.4 (88)	27.9 (417)	2.04 (1.25, 3.34)**	8.50	72
Substance use (2005)	78.4 (152)	58.0 (866)	2.13 (1.27, 3.57)***	8.68	65

⁺ Continuous variables were dichotomized as high/low using the median split.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.005$