


Mental Health and Substance Use Disparities Among Urban Adolescent Lesbian and Bisexual Girls

Journal of the American Psychiatric Nurses Association
19(5) 271–279
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DOI: 10.1177/1078390313503552
jap.sagepub.com


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Abstract

BACKGROUND: Sexual minority girls (SMGs) report large substance use disparities and victimization experiences, yet there is a dearth of research that focuses exclusively on SMGs. **OBJECTIVE:** To examine substance use and mental health disparities among SMGs and to determine whether disparities were larger for African American compared with European American girls. **METHOD:** Data were used from Wave 11 of the Pittsburgh Girls Study, a multiple-cohort, prospective study of urban girls. Girls for the current analysis were aged 16 to 19 years. Fifty-five percent were African American. One hundred and seventy-three (8.3%) identified as SMGs, and 1,891 identified as heterosexual. Multiple regression analyses controlling for age, race, and parent education were conducted. **RESULTS:** SMGs reported a robust pattern of large disparities in externalizing, internalizing, and borderline personality disorder symptoms. There was little evidence to suggest disparities were moderated by race. **CONCLUSION:** SMGs and their families would benefit from intervention and prevention programs to reduce disparities among this highly vulnerable population.

Keywords

adolescent girls, sexual orientation, mental health, substance use, intersectionality

Substance use and mental health problems such as depression and suicidality are leading causes of adolescent morbidity and mortality (Lawrence, Gootman, & Sim, 2009); thus, it is critical that we identify individuals at high risk for such problems and develop interventions that can help reduce them. The minority stress hypothesis (Meyer, 2003; Rosario, Schrimshaw, Hunter, & Gwadz, 2002) suggests that compared with heterosexual individuals, lesbian, gay, and bisexual individuals experience higher levels of substance use and mental health problems due to minority stress experiences including discrimination and violent victimization. Evidence from the adolescent literature consistently shows that sexual minority youth (SMY; youth who report same-sex romantic or sexual attraction and/or same-sex behavior, orientation, or identity), compared with heterosexual youth, report higher levels of substance use, depression, and suicidality (Kann et al., 2011; Marshal et al., 2008; Marshal et al., 2011).

Compared with disparities among sexual minority boys, substance use disparities (Marshal et al., 2008) and disparities in some forms of violent victimization (Friedman et al., 2011) are higher among sexual minority girls (SMGs). Despite the potential higher risk for

some negative outcomes among SMGs, historically research has either combined boys and girls or only focused on behavioral health problems (such as HIV risk behavior) among sexual minority boys. In contrast, relatively few studies have focused on the health and wellness of SMGs exclusively (however see Hipwell et al., 2013; Marshal, King, et al., 2012; Marshal, Sucato, et al., 2012), leaving a large gap in the literature

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and a dearth of understanding of SMG disparities and potential for long-term health problems. The primary goals of this article were to examine differences in the prevalence of internalizing symptoms (e.g., anxiety, depression symptoms, and suicidal thoughts), externalizing symptoms (e.g., substance use, oppositional defiant disorder, and conduct disorder symptoms), and internalizing–externalizing symptoms (borderline personality disorder symptoms, including self-injury) between heterosexual girls and SMGs.

Internalizing Symptoms Among Sexual Minority Girls

High rates of suicidality and depression symptoms in SMY are especially concerning for girls because evidence has long shown that adolescent girls suffer higher rates of depression than adolescent boys (Costello, Erkanli, & Angold, 2006). Although suicide mortality rates are higher for males than females regardless of sexual orientation (Nock et al., 2008), adolescent females are more likely to report having considered attempting suicide, made a suicide plan, and attempted suicide (Eaton et al., 2012). Lesbian and bisexual women are more likely to be depressed and to express suicidal ideation than are heterosexual women (King et al., 2008), which underscores the need to detect and prevent depression symptoms in adolescence. Rates of anxiety symptoms and disorders are also higher among adolescent girls compared with boys (Albano & Krain, 2005). There are relatively few studies in the SMY literature that examine anxiety disparities, although there is ample evidence that such disparities exist among sexual minority adults (King et al., 2008). In this article, we sought to build on the existing SMY disparities research by examining and reporting anxiety symptom disparities among SMGs.

Externalizing Symptoms Among Sexual Minority Girls

Substance use disparities are twice as large for sexual minority girls (odds ratio [OR] = 5.02) than for sexual minority boys (OR = 1.90; Marshal et al., 2008). Although the prevalence of substance use in adolescence is higher among boys than girls, any substance use by girls can be problematic because the threshold for resulting mental health outcomes may be lower among girl substance users, and because females show a more rapid progression from initiation of use to problem use (Johnson, Richter, Kleber, McLellan, & Carise, 2005; Randall et al., 1999). Some substance use behaviors, such as binge drinking, can pose unique health risks among girls such as sexual victimization (Champion et al., 2004)

and unintended pregnancy due to risky sexual behavior when intoxicated (Nolen-Hoeksema, 2004).

Adolescents with behavioral disorders such as oppositional defiant disorder (ODD) and conduct disorder (CD) are at a greater risk for depression than those without ODD and CD (Wolff & Ollendick, 2006), and girls with disruptive behavior disorders may be more likely than boys to suffer from comorbid disorders, including depression, substance use, and antisocial personality disorder (Keenan, Loeber, & Green, 1999). The consequences of behavioral disorders such as CD are serious, including an increased risk compared with peers for arrest, high school dropout, unintended pregnancy, early and violent death, and substance dependence (Zoccolillo, Tremblay, & Vitaro, 1996). CD is the second-most common psychiatric diagnosis in adolescent girls, yet research studying CD in girls is limited because the disorder is more commonly diagnosed in boys (e.g., Hipwell & Loeber, 2006). There are even fewer studies focusing on CD in SMGs, yet risks for this population may be even more serious due to comorbidities. For example, in a study of 428 runaway adolescents in eight Midwestern cities, Whitbeck, Chen, Hoyt, Tyler, and Johnson (2004) found lesbian adolescent runaways to be more likely than heterosexual females to meet criteria for CD, as well as posttraumatic stress disorder and substance abuse. Another goal of this study therefore is to examine and describe SMG disparities in externalizing disorder symptoms such as ODD and CD in order to determine their potential contribution to long-term substance use and mental health problems.

Borderline Personality Disorder Symptoms in Sexual Minority Girls

Borderline personality disorder (BPD) is characterized by a heterogeneous set of symptoms that include impulsivity, affect dysregulation, and dysfunctional interpersonal relationships (American Psychiatric Association, 2000). When compared with other psychiatric disorders, BPD is distinct in the nosological landscape by its position on both the internalizing and externalizing dimensions of psychopathology (Eaton et al., 2011; James & Taylor, 2008). Several developmental theories of BPD place disruptions in the emotional system as key in the subsequent manifestation of other BPD features (Linehan, 1993; Putnam & Silk, 2005). Linehan's (1993) *biosocial theory of BPD* is one of the most thoroughly delineated etiological models of BPD. According to the biosocial theory, BPD is primarily a disorder of the emotion regulation system and emerges from transactions between individuals with biological vulnerabilities to emotion sensitivity and environmental influences, specifically an invalidating family environment. Emotion dysregulation subsequently leads to maladaptive behavior patterns as

either a direct consequence or to cope with the emotional response. Additionally, individuals with BPD engage in impulsive behaviors, such as substance use, and self-injury to regulate intense and sustained negative affective states (Brown, Comtois, & Linehan, 2002; Yen et al., 2004).

These hypotheses regarding the role of the invalidating environment in escalating emotion dysregulation are highly congruent with the minority stress hypothesis (Meyer, 2003; Rosario et al., 2002), which asserts that substance use and mental health disparities can be attributed to experiences with discrimination and violent victimization generated from many different social environments, including from within the family. Homophobia and its negative social consequences, including discrimination and violence toward SMY, most likely cause disruptions in family relationships and difficulties integrating sexual orientation and identity into one's sense of self. There is ample evidence that SMY suffer from highly invalidating environments. For example, a recent meta-analysis showed that SMY report much higher rates of several forms of violent victimization including childhood sexual abuse, parent physical abuse, and being threatened by peers at school with a weapon (Friedman et al., 2011). And a long rich history of within-group studies show that SMY report distressingly high levels of gay-related bullying and victimization (D'Augelli, Pilkington, & Hershberger, 2002; Rosario et al., 2002). Recent research shows that there are higher rates of suicide behaviors among SMY living in socially conservative and presumably homophobic neighborhoods (Hatzenbuehler, 2011). Thus, based on minority stress theory, and an abundance of evidence suggests SMY suffer from highly invalidating environments, we hypothesize that these experiences may lead to higher rates of BPD symptoms among SMGs compared with heterosexual girls.

Examining the Intersection Between Sexual Orientation and Race

Rooted in critical race and feminist theories, a growing interest has developed over the past 10 years in the social sciences in whether and how multiple minority identities (e.g., gender, race, and sexual orientation), and important social stressors associated with minority experiences, might intersect in such a way to increase risk for substance use and mental health outcomes (Cole, 2009). The basic tenets and hypotheses of intersectionality are compelling from the perspective of understanding risk for health disparities among SMY. Given a long history of race-related health disparities due to minority stressors documented in the health sciences literature, and the potentially higher levels of homophobia in the African

American community (see Dyer et al., 2012; Jeffries, Marks, Lauby, Murrill, & Millett, 2012), might African American SMGs be at higher risk for negative health outcomes than are European American SMGs due to the potential compounding and synergistic negative effects of multiple minority stress conditions? The final goal of this study is to examine whether or not there are significant interactions between sexual orientation and race predicting higher rates of substance use and mental health problems than we would observe if the combined effects of more than one minority identity were simply additive.

Method

Study Participants and Design

The Pittsburgh Girls Study (PGS) is a multiple-cohort, prospective study of urban girls designed to investigate the development of conduct problems and depression. Low-income neighborhoods were oversampled to have sufficient power to examine the effects of socioeconomic factors on psychopathology. Of 2,876 girls who were eligible by virtue of their age and who could also be located, 2,451 (85.2%) agreed to participate in the longitudinal study (see Hipwell et al., 2002; Keenan et al., 2010, for further details about the study design). Girls have been assessed annually since 2000 (Wave 1) when they were 5, 6, 7, and 8 years old. The University of Pittsburgh Institutional Review Board approved all study procedures. Prior to data collection, caregivers provided written informed consent and the girls provided verbal and written assent when developmentally appropriate.

Questions assessing sexual orientation were added to the PGS for the oldest cohort in 2008, which were used to conduct a pilot study (Marshal, King, et al., 2012; Marshal, Sucato, et al., 2012). The current study examined the most recent data available (Wave 11, ages 16-19; 86% retention) in which girls reported sexual orientation. Participants who responded to the sexual identity item in Wave 11 were included in the analyses ($N = 2,064$). The mean age of the sample was 17.20 years ($SD = 1.28$), and 39% of the girls were European American, 55% were African American, and about 6% were multiracial or representing another race.

Measures

Sexual Orientation. SMGs ($n = 173$, 8.3%) were self-identified. Participants were asked to endorse if they had a lesbian ($n = 32$), bisexual ($n = 141$), or heterosexual identity ($n = 1,891$) at Wave 11 using the following question: "Do you consider yourself to be (a) Heterosexual or straight; (b) Gay or lesbian; or (c) Bisexual?" Given the

small number of bisexual and lesbian/gay girls, the two groups of girls were combined into a single SMGs group for the analyses.

Demographics. Demographic characteristics collected from the participants' caretakers included each girl's age, race (coded as European American = 0 and African American/other racial minority = 1), and caretaker's highest level of education at Wave 11, with the exception that only Wave 10 caretaker education was available for girls in the oldest cohort. Level of education was dichotomized to represent low education (less than or equal to 12 years) or high education (greater than 12 years).

Externalizing Disorder Symptoms. Girls' report of the frequency of substance use was assessed by the Nicotine, Alcohol, and Drug Use scale (adapted from Pandina, Labouvie, & White, 1984). In the current study, drug use outcomes were treated as binary variables indicating any past year use of cigarettes, marijuana or alcohol, or binge drinking (i.e., five or more drinks in one sitting). ODD and CD symptoms in the past year were assessed using a *DSM-IV*-based questionnaire: the Adolescent Self-Report Inventory-4 (Gadow & Sprafkin, 1998) though age 17 and the Adult Self-Report Inventory-4 (Gadow, Sprafkin, & Weiss, 2004) from age 18 years. Eight ODD symptoms were scored on 4-point scales (0 = *never* to 3 = *very often*). Through age 17, 15 CD symptoms, and from age 18, 13 CD were assessed. For each participant the average of the items was calculated yielding ODD and CD continuous scale scores with a possible range of 0 to 3.

Internalizing Disorder Symptoms. Depression symptom severity and suicidal ideation in the past year were assessed using the Adolescent Symptom Self-Report Inventory-4 (Gadow & Sprafkin, 1998) until age 18 when the Adult Self-Report Inventory-4 (Gadow et al., 2004) was used. Suicidal ideation was examined as a dichotomous outcome indicating if participants reported any suicidal ideation during the past year. Past year anxiety symptoms were operationalized as the total summary score on the Self-Report for Childhood Anxiety Related Disorders (Birmaher et al., 1997).

BPD Symptoms and Indicators. BPD symptoms were defined as the count of the 9 BPD items on the International Personality Disorders Examination (Smith, Muir, & Blackwood, 2005) used in other recent investigations with the current data set (Stepp, Burke, Hipwell, & Loeber, 2012). Self-injury was measured with a single item from the SCID-I (First, Spitzer, Gibbon, & Williams, 1996).

Statistical Analysis

Multiple regression analysis in SPSS was used to predict mental health problems, suicidal ideation, and substance use from SMY status after controlling for all study covariates: age, race, and parent education. Heterosexual girls were the reference group. Logistic or linear regression methods were used for dichotomous or continuous outcomes, respectively. Power analyses indicated that the sample size of the study ($N = 2,064$) provided ample statistical power ($>.80$) to detect a small main effect sizes ($f^2 = .02$) using both multiple and logistic regression (Cohen, 1988; Faul, Erdfelder, Lang, & Buchner, 2007).

Next, we examined the potential moderating effects of race on the relation between sexual orientation and the outcome variables. For the moderation analyses, we excluded ethnic/racial minority participants who were not African American (Asian American, $n = 12$, and girls who endorsed a multiracial heritage, $n = 103$) to simplify our test of intersectionality reducing our total sample size for the interaction tests to 1,949. According to Aiken and West (1991), we had ample statistical power ($>.80$) to detect small interaction effects (assuming modest measurement reliability of $.80$) with this sample size. Interaction terms between sexual orientation and race were entered into the models with the main effects and controlling for the other covariates to determine if the effects of sexual orientation on mental health outcomes differed across racial groups. Significant interaction effects ($p < .05$) were further examined using simple slope analyses (Aiken & West, 1991).

Results

Table 1 provides the descriptive statistics for the outcome variables and demographic covariates for each group. Compared with heterosexual girls, SMGs reported significantly higher levels of all the mental health and substance use outcomes examined in the current study (Table 2). Specifically, SMGs demonstrated at least a twofold risk of engaging in any alcohol use ($OR = 2.71, p < .001$) or binge drinking ($OR = 2.96, p < .001$) compared with heterosexual girls in the past year. SMGs were also over five times more likely to report any cigarette use ($OR = 5.18, p < .001$) or any self-harm ($OR = 6.87, p < .001$) than heterosexual girls in the past year. They were nearly four times more likely to report marijuana use ($OR = 3.61, p < .001$) and suicidal ideation ($OR = 4.43, p < .001$) than heterosexual girls in the past year. Furthermore, SMG status corresponded with significantly higher symptom severity of CD ($\beta = .18, p < .001$), ODD ($\beta = .11, p < .001$), BPD ($\beta = .16, p < .001$), anxiety ($\beta = .05, p < .05$), and depression ($\beta = .16, p < .001$). These effects

Table 1. Substance Use and Mental Health Outcomes, and Demographic Characteristics of Sexual Minority Girls and Heterosexual Girls in the Pittsburgh Girls Study.

	Sexual minority girls (n = 173)	Heterosexual girls (n = 1,891)
Externalizing disorder symptoms		
Alcohol use	59.5%	37.3%
Binge drinking	32.9%	15.8%
Cigarette use	49.1%	17.3%
Marijuana use	50.3%	21.0%
CD	0.15 (0.19)	0.08 (0.11)
ODD	0.83 (0.52)	0.83 (0.53)
Internalizing disorder symptoms		
Anxiety	15.10 (10.40)	13.43 (9.44)
Depression	0.85 (0.52)	0.59 (0.43)
Suicidal ideation	26.0%	7.2%
BPD symptoms		
BPD symptoms	3.28 (2.10)	2.19 (1.79)
Self-injury	9.5%	1.6%
Covariates		
Minority race	64.2%	60.5%
Low parent education	41.6%	43.2%
Age	17.35 (1.25)	17.18 (1.28)

Note. ODD = oppositional defiant disorder; CD = conduct disorder; BPD = borderline personality disorder. The table summarizes the percentage of girls in each sexual orientation group that endorsed each dichotomous outcome or the mean level (standard deviation) for each continuous outcome within each sexual orientation group.

Table 2. Relations Between Sexual Orientation and Demographic Variables With Substance Use and Mental Health Outcomes in the Pittsburgh Girls Study.

	SMG status	Age	Minority race	Low parent education
Externalizing symptoms				
Alcohol use ^a	2.71 (1.92-3.82)***	1.57 (1.45-1.70)***	0.42 (0.35-0.51)***	0.78 (0.64-0.94)*
Binge drinking ^a	2.96 (2.03-4.31)***	1.83 (1.64-2.04)***	0.40 (0.31-0.52)**	0.78 (0.60-1.01)
Cigarette use ^a	5.18 (3.66-7.31)***	1.47 (1.34-1.62)***	0.47 (0.37-0.60)***	1.42 (1.12-1.80)**
Marijuana use ^a	3.61 (2.60-5.03)***	1.33 (1.22-1.45)***	1.15 (0.92-1.43)	1.01 (0.88-1.36)
ODD ^b	0.11***	-0.05*	0.07**	0.04
CD ^b	0.18***	-0.04*	0.08***	0.04
Internalizing symptoms				
Anxiety ^b	0.05*	-0.05*	0.03	0.07**
Depression ^b	0.16***	-0.02	0.01	0.05*
Suicidal ideation ^a	4.43 (2.99-6.57)***	1.01 (0.89-1.146)	0.66 (0.48-0.90)*	1.03 (0.75-1.42)
BPD symptoms				
BPD symptoms ^b	0.16***	-0.07**	0.11***	0.09***
Self-injury ^a	6.87 (3.57-13.24)***	0.82 (0.64-1.05)	0.37 (0.20-0.70)**	0.92 (0.49-1.72)

Note. ODD = oppositional defiant disorder; CD = conduct disorder; BPD = borderline personality disorder.
 a. Reported effects are odds ratios (95% confidence interval) that were estimated using logistic regression.
 b. Reported effects are standardized regression coefficients estimated using multiple linear regression models.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

were observed even after controlling for age, race, and parent education.

There was a significant interaction between sexual orientation status and race predicting CD ($\beta = .09, p < .02$). Consistent with intersectionality theory, the largest disparities between sexual minority girls and heterosexual

girls were detected among African American girls ($\beta = .20, p < .001$) compared with CD disparities for European American girls, which was significant but much smaller ($\beta = .12, p < .01$; see Figure 1); however, the remaining 10 interaction terms were not significant by conventional standards (all $ps > .05$).

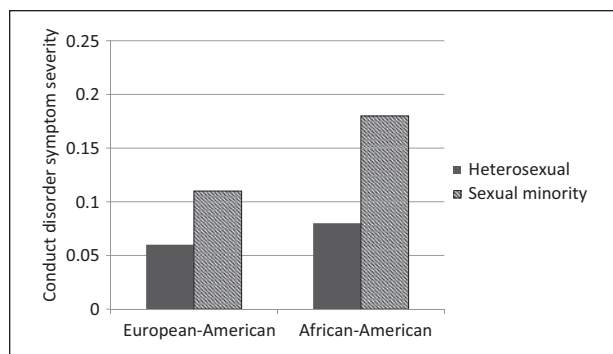


Figure 1. Racial and sexual orientation differences of conduct disorder symptoms levels.

Discussion

The results of this study demonstrate a pronounced pattern of SMG substance use and mental health disparities across several broad domains of internalizing and externalizing disorder symptoms and borderline personality disorder symptoms and provide several valuable contributions to the literature. First, it is one of the first studies to examine and report SMG group differences in externalizing problems such as ODD and CD. Historically, SMGs have reported higher rates of substance use and abuse compared with heterosexual girls, and this disparity may be larger for SMGs than it is for sexual minority boys (Marshal et al., 2008). According to problem behavior theory (Donovan & Jessor, 1985), externalizing behaviors such as substance use, ODD, and CD symptoms are part of a larger syndrome of problem behaviors that are expected to be highly correlated among high-risk youth. Results from this study are consistent with the tenets of this theory, demonstrating that SMGs are more likely to report higher rates of substance use, ODD, and CD. More research is needed to understand whether these behaviors are more likely to cluster together among SMGs.

Second, this study is one of the first to report higher rates of BPD symptoms among SMGs compared with heterosexual girls. Recent evidence from the current sample of girls shows that childhood attention deficit hyperactivity disorder and ODD symptom trajectories are associated with BPD symptoms at age 14 (Stepp et al., 2012). The origins of BPD are thought to be in part due to predisposing biological vulnerabilities in the context of a highly invalidating social or contextual environment (Crowell, Beauchaine, & Linehan, 2009). Indeed, for many SMGs, social and contextual invalidation of one's gay/lesbian or bisexual identity is an incessant and pervasive social stressor (Meyer, 2003; Rosario et al., 2002) that occurs in multiple contexts including the home, school, church, government, and more. Although we did

not assess and test differential rates of BPD diagnosis, our results showing (a) a higher level of BPD symptoms among SMGs and (b) higher levels of some precursors of BPD including ODD symptoms in this same sample (Stepp et al., 2012) suggest that SMGs may be at increased risk for developing BPD.

Third, this study provides very little evidence to suggest that for some girls and young women, a combination of gay-related stressors and race-related stressors may synergistically interact to produce a higher level of outcomes. We found only one significant interaction effect (out of 11 total tests) showing that conduct disorder symptom disparities were larger for African American SMGs than they were for European American SMGs. This lack of strong support for the intersectionality hypothesis has been demonstrated in other large studies examining SMY disparities that also found few significant interactions with race (Talley, Aranda, Birkett, Marshal, & Hughes, in press). One possible explanation for these null findings is that we did not measure and examine stressors associated with sexual orientation and race status, *per se*, but other factors associated with sexual minority and racial minority identities. Future research that attempts to replicate these findings and more closely examine the potential driving mechanisms underlying the interaction effects is warranted.

Finally, this study adds to the small literature that focuses exclusively on SMGs. Previous studies in the SMY literature have identified robust gender differences of substance use (Marshal et al., 2008) and the experience of some social stressors, such as being threatened by peers in school (Friedman et al., 2011). These early gender disparities warrant additional attention as some of these adolescent experiences may be precursors to disparities experienced by lesbian adults (Cochran, Ackerman, Mays, & Ross, 2004; Hughes & Wilsnack, 1997; King et al., 2008). Our recent research examining trajectories of substance use, depression, and suicide disparities among SMGs supports this hypothesis, showing that disparities in adolescence persist or even increase as SMGs transition to young adulthood (Dermody et al., 2013; Marshal, Burton, Chisolm, Sucato, & Friedman, 2013; Marshal, King, et al., 2012; Marshal, Sucato, et al., 2012).

There are several limitations of the current study. We conducted a cross-sectional investigation; thus, we cannot make statements about long-term disparities or outcomes among SMGs. Nor were we able to examine factors associated with the coming out process, and whether change in sexual orientation over time and the timing of coming out, for example, was associated with concomitant changes in mental health symptoms over time. Second, results from this study are not generalizable to all girls in Pittsburgh or other similarly sized cities

because girls from low-income neighborhoods were oversampled. Also, despite having a relatively large sample of SMGs, only a small proportion identified as gay/lesbian because the majority of SMGs in our study identified as bisexual. Previous studies have shown that heterogeneity with respect to how youth identify (gay vs. bisexual) accounts for much of the variability in outcomes among SMY; thus, understanding these potential influences is important. Future longitudinal studies using the PGS sample will be able to describe change over time in SMG self-identification and will further elucidate the role of SMG identity on disparities.

In summary, using a large epidemiological sample of adolescent girls and young women, we found a very robust pattern of large substance use and mental health disparities after controlling for several key demographic covariates including age, race, and socioeconomic status. We also found that the size of the disparities was the same for almost all of our outcomes across African American and European American subsamples. Despite these alarmingly big disparities reported by SMGs, it is important to recognize that many SMGs did not report substance use or mental health problems. For example, most SMGs did not report a history of binge drinking. Furthermore, the vast majority of SMGs did not report a history of suicidality or nonsuicidal self-harm. It will be important for future research to focus on SMGs who are happy and healthy despite the potentially high levels of adversity they face living in a very homophobic and violent culture. Researchers, clinicians, and especially SMGs and their families will benefit from more research to help elucidate the best mechanisms for reducing distress in this highly vulnerable population, and preventing long-term serious substance use and mental health problems.

Author Roles

MPM conceived of the study, participated in its design and coordination and drafted the manuscript; SSD participated in the design of the study, conducted all of the statistical analyses, and drafted the Method and Results sections; MPM, SDS, NM, TC and AEH contributed to data analysis decisions and data interpretation; All authors contributed to writing components of the Introduction and Discussion. All authors read, edited, and approved the final manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this

article: This manuscript was supported by the National Institutes of Health (grant numbers MH056630, DA012237, and DA030385).

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