

# Cigarette Smoking Disparities Between Sexual Minority and Heterosexual Youth

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abstract

**BACKGROUND:** Using a population-based sample of youth, we examined rates of cigarette use and trends in cigarette use disparities between heterosexual youth and 3 subgroups of sexual minority youth (SMY) (ie, lesbian or gay, bisexual, and unsure) from 2005 to 2015.

**METHODS:** Data are from 6 cohorts of the Youth Risk Behavior Survey, a national, biennial, school-based survey of ninth- to 12th-grade students in the United States ( $n = 404\,583$ ). Sex-stratified analyses conducted in 2017 examined trends in 2 cigarette-related behaviors: lifetime cigarette use and heavy cigarette use (20+ days in the past 30).

**RESULTS:** Disparities in lifetime cigarette use between lesbian and heterosexual girls were statistically smaller in 2015 relative to 2005 (adjusted odds ratio [aOR] 0.29; 95% confidence interval [CI] 0.12–0.75;  $P = .011$ ). Sexual orientation disparities in heavy use were narrower for bisexual boys in 2015 compared with 2005 (aOR 0.39; 95% CI 0.17–0.90;  $P = .028$ ). Girls and boys unsure of their sexual identity had wider disparities in heavy use in 2015 (aOR 3.85; 95% CI 1.39–11.10;  $P = .009$ ) relative to 2005 (aOR 2.44; 95% CI 1.22–5.00;  $P = .012$ ).

**CONCLUSIONS:** SMY remain at greater risk for cigarette-related behaviors despite greater acceptance of lesbian, gay, and bisexual people in the United States. Focused policies and programs aimed at reducing rates of SMY cigarette use are warranted, particularly for youth questioning their sexual identity.



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**WHAT'S KNOWN ON THIS SUBJECT:** Elevated rates of cigarette use among sexual minorities are largely attributed to experiences of stigma. Data limitations have prevented research on whether sexual orientation disparities in cigarette use have changed amid growing social acceptance of lesbian, gay, and bisexual people.

**WHAT THIS STUDY ADDS:** Adolescent cigarette use declined for heterosexual, lesbian, gay, and bisexual youth from 2005 to 2015. Sexual orientation identity disparities between heterosexual and sexual minority youth have largely remained unchanged and for questioning youth have widened since 2005.

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Tobacco use is a leading preventable cause of death in the United States.<sup>1,2</sup> Although adolescent cigarette use has declined in recent decades,<sup>3,4</sup> a substantial body of research documents sexual orientation disparities in cigarette use among youth and adults.<sup>5,6</sup> Sexual minority (eg, lesbian, gay, and bisexual [LGB]) youth are >3 times as likely as heterosexual youth to indicate lifetime cigarette use and >1.5 times more likely to report smoking cigarettes in the past 30 days.<sup>7</sup> Prospective studies also indicate that sexual minority youth (SMY), particularly sexual minority relative to heterosexual girls, demonstrate an acceleration in the frequency of cigarette use during the transition to adulthood.<sup>8</sup> These early experiences with cigarette use, along with increased use over time, leave sexual minority adults vulnerable to smoking-related morbidity and mortality across the life course.<sup>9,10</sup> Early intervention therefore has long-term consequences, particularly for LGB population health.

A growing body of literature links structural (ie, laws and policies)<sup>11</sup> and interpersonal (ie, discrimination and victimization)<sup>12</sup> stigma to sexual orientation-related disparities in tobacco use. For example, SMY who live in states with lower levels of structural stigma (operationalized by density of same-sex-headed households, presence of gay-straight alliances, and protective policies) are less likely to report cigarette smoking than SMY who live in high-stigma states.<sup>11</sup> Although structural and interpersonal factors that perpetuate anti-LGB stigma remain, there have been extraordinarily swift changes to the political and social climate as it relates to the rights and protections of LGB people. The visibility surrounding these changes was also accompanied by notable increases in favorable attitudes toward LGB people in the United States. In 1999,

for example, 62% of United States adults opposed same-sex marriage compared to 34% in 2017.<sup>13</sup> Similarly, 57% of adults in 2015 report that they would not be upset if their child told them that they were gay or lesbian compared to 23% of adults in 2000.<sup>14</sup> Recent data also indicate that younger cohorts are more accepting of LGB people than previous generations.<sup>13</sup> As of 2017, 56% of baby boomers (born 1946–1964) favor same-sex marriage compared to 65% of generation X (born 1965–1980) and 74% of millennials (born 1981–2004), which suggests that contemporary SMY are coming of age in peer cohorts that are increasingly more accepting of LGB people. Considering the link between anti-LGB attitudes and elevated rates of substance use among SMY and sexual minority adults,<sup>15–18</sup> there has been emerging interest in whether health disparities between heterosexual and LGB youth have diminished as social attitudes toward LGB people have improved.<sup>19–21</sup>

Despite public discourse emphasizing the benefits of growing up LGB in the most recent decade, there has been limited empirical research explicitly examining whether sexual identity disparities in health, including substance use, have changed during this time. Until recently, national surveys of youth have excluded measures of sexual identity, attractions, or behaviors (exclusions that have stymied efforts to understand the health and well-being of SMY at the population level). Given recent advancements in the inclusion of sexual identity measures in population-based studies of youth (such as the Youth Risk Behavior Survey [YRBS]) and data management efforts to pool these data, we are able to test whether tobacco use disparities between heterosexual youth and subgroups of SMY have changed amid the backdrop of increasing public acceptance of LGB

people. Specifically, we use data from 6 administrations of the YRBS from 2005 to 2015 to examine trends in the prevalence of 2 cigarette-related behaviors among heterosexual and SMY: lifetime use (ie, any) and heavy use (ie, 20 or more days in the past month). We then assessed within-year sexual identity differences in cigarette-related behaviors between heterosexual youth and 3 subgroups of SMY: (1) lesbian or gay, (2) bisexual, and (3) youth unsure of their sexual identity. Finally, we tested whether the degree to which heterosexual youth and SMY differ in cigarette-related behaviors has changed from 2005 to 2015.

## METHODS

### Data Source

The YRBS is a biennial national survey that has been conducted by the Centers for Disease Control and Prevention (CDC) since 1991 to collect health data on students in grades 9 to 12.<sup>22</sup> The YRBS monitors priority health-related behaviors among youth, such as alcohol use, experiences with violence, and sexual behaviors, among others.<sup>23</sup> For this study, we used data from local versions of the YRBS, which are administered at the state, large urban school district, or county level; in this implementation, jurisdictions use a 2-stage cluster sample design to identify a sample of students.<sup>22</sup> In the first stage, schools are selected with a probability proportional to their enrollment; in the second stage, classes are randomly selected, and all students within these classes are eligible to participate. A new sample or cohort is selected each year that the survey is administered; the same students are not tracked over time.

### Analytic Sample

Local YRBS data were pooled across multiple jurisdictions (city and state) and years (biennially from 2005 to

2015). The entire data set consists of 47 jurisdictions across 6 time points and 541 410 students (see Supplemental Table 5). There were a total of 114 jurisdiction-years (distinct surveys administered by a particular jurisdiction in a specific year) that assessed sexual identity (419 694 students). This data set includes the largest sample of SMY of its kind. For the present analysis, students were excluded if they were missing data on sexual identity (see Supplemental Table 6 for missing by survey year) and any of the primary demographic variables of interest (race and/or ethnicity: 3.11%; sex: 0.67%; and age: 0.32%; not mutually exclusive), resulting in a final sample of 404 583 students.

## Measures

### Sexual Identity

Sexual identity was assessed with the following question: "Which of the following best describes you?" Response options were "heterosexual (straight)," "gay or lesbian," "bisexual," and "unsure."

### Lifetime Cigarette Use

Participants were asked, "Have you ever tried cigarette smoking, even 1 or 2 puffs?" The response options were "yes" or "no."

### Heavy Cigarette Use

Participants were asked, "During the past 30 days, on how many days did you smoke cigarettes?" Potential response options were "0 days," "1 or 2 days," "3 to 5 days," "6 to 9 days," "10 to 19 days," and "20 to 29 days." Responses were recoded to reflect as "<20 days" and "20 or more days" per the CDC's 2015 YRBS data users guide.<sup>24</sup>

## Demographics

### Race and/or Ethnicity

Participants were asked if they identified as Hispanic or Latino. Additionally, participants could select all races that applied from the list of

"American Indian or Alaska Native," "Asian," "Black or African American," "Native Hawaiian or Other Pacific Islander," and "White." By using the CDC's classification, these variables were combined into the following racial and/or ethnic groups: (1) "American Indian or Alaskan Native," (2) "Asian," (3) "Black or African American," (4) "Native Hawaiian and/or other Pacific Islander," (5) "White," (6) "Hispanic and/or Latino," and (7) "multiracial, non-Hispanic."

### Sex

Participants were asked to identify their sex with the item "What is your sex?" Response options were "female" and "male."

### Age

Participants were asked, "How old are you?" The response options ranged from  $\leq 12$  years old to  $\geq 18$  years old. Items were recoded to reflect youth "14 years old or younger," "15 years old," "16 years old," "17 years old," and "18 years old and older."

## Statistical Analysis

All data management was conducted in SAS version 9.4 (SAS Institute, Inc, Cary, NC). Analyses were conducted by using SAS-Callable SUDAAN version 11.0.1 (RTI International, Research Triangle Park, NC) to appropriately weight estimates and to account for the complex sampling design of the YRBS. The YRBS data weights adjust for student nonresponse and the distribution of students by grade, sex, and race and/or ethnicity in each jurisdiction.<sup>22</sup>

Descriptive analyses were conducted to determine the prevalence of cigarette use behaviors by sex and sexual identity at each time point. Then, trends in cigarette use behaviors by sex and sexual identity from 2005 to 2015 were assessed by using the CDC's recommended approach to trend analysis; time was modeled as a continuous variable by using orthogonal coefficients to

reflect the biennial spacing of the surveys.<sup>25,26</sup> The linear time component was significant at  $P < .05$ . These analyses were stratified by sex, controlled for age and race and/or ethnicity, and assessed linear, quadratic, and cubic trends. Linear trends test for significant linear increases or decreases over time, whereas quadratic and cubic trends test for significant nonlinear changes over time. Next, we tested whether SMY differed from heterosexual youth in the prevalence of each cigarette-use behavior within each data collection year stratified by sex and adjusted for age and race and/or ethnicity.

Finally, we used logistic regression with year-by-sexual-identity interactions terms to test whether disparities between heterosexual youth and SMY changed (ie, widened, narrowed, or maintained) from 2005 to 2015. Given that odds ratios (ORs) cannot be compared directly across different samples,<sup>27</sup> the use of an interaction term between survey year and sexual identity in a logistic regression framework allows us to test whether disparities change over time. The year-by-sexual-identity interaction term calculates a ratio of the OR that compares adjusted odds ratios (aORs) for a cigarette use behavior (eg, ever smoked) for a particular subgroup (eg, lesbian girls) relative to the referent group (heterosexual girls) in a given year (eg, 2005) to the odds of those with the same identity in 2015. For ease of interpretation, we inverted estimated interaction ORs to reflect changes from past to present. Therefore, an OR for the interaction term  $> 1$  indicates a widening disparity from the comparison year to 2015, and an OR  $< 1$  indicates a narrowing disparity. A more detailed explanation of this approach is available elsewhere.<sup>19,20</sup> Data analyses were conducted in 2017.

**TABLE 1** Frequency and Prevalence of Sexual Identity and Cigarette Smoking Behaviors, YRBS 2005–2015

	2005		2007		2009		2011		2013		2015	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Girls</b>												
Sexual identity												
Heterosexual	11 451	92.17	14 018	90.65	21 666	89.64	27 855	87.03	57 814	86.58	45 336	83.17
Gay or lesbian	113	0.82	200	1.19	377	1.35	501	1.61	1474	2.17	1416	2.02
Bisexual	592	4.61	878	5.69	1798	6.46	2610	7.77	5690	7.90	5823	9.64
Unsure	343	2.41	457	2.47	743	2.55	1174	3.59	2517	3.35	2775	5.17
Lifetime use												
Yes	3743	51.04	4666	46.16	5761	42.72	7780	39.69	9809	34.39	12 794	29.43
No	3787	48.96	5721	53.84	9088	57.28	13 758	60.31	20 306	65.61	30 972	70.57
Heavy use												
20+	646	5.63	691	5.13	1113	4.22	1058	3.95	1891	2.82	1054	2.06
<20	11 465	94.37	14 339	94.87	22 488	95.78	29 915	96.05	62 812	97.18	52 473	97.94
<b>Boys</b>												
Sexual identity												
Heterosexual	11 417	94.90	13 895	93.99	21 166	93.81	28 352	93.31	57 914	92.58	47 651	91.89
Gay or lesbian	161	1.31	230	1.77	424	1.95	647	2.13	1533	2.18	1354	2.39
Bisexual	223	1.64	292	1.75	499	2.09	705	2.21	1688	2.24	1537	2.85
Unsure	325	2.15	334	2.48	532	2.15	859	2.34	2010	3.01	1746	2.87
Lifetime use												
Yes	3401	50.48	4272	46.45	5399	47.3	7785	43.49	9979	38.91	12 725	32.11
No	3685	49.52	5281	53.55	7481	52.7	11 850	56.51	17 465	61.09	27 755	67.89
Heavy use												
20+	736	6.51	797	5.63	1445	7.21	1519	5.97	2796	4.67	1450	2.89
<20	10 854	93.49	13 276	94.37	19 855	92.79	27 247	94.03	56 427	95.33	47 978	97.11

**RESULTS**

Sex-stratified prevalence of sexual identity subgroups and tobacco-related outcomes by survey year are presented in Table 1.

**Prevalence and Trends by Sexual Identity**

Results from adjusted linear trend comparisons by sexual identity revealed that rates of cigarette-related behaviors have significantly declined from 2005 to 2015 for all youth, regardless of sex or sexual identity, with the exception of heavy use among boys unsure of their sexual identity (see Table 2, Figs 1 and 2). Unadjusted prevalence rates reflected in figures are available in Supplemental Table 7.

**Cigarette Use Disparities Between SMY and Heterosexual Youth Over Time**

Within-year sexual identity disparities in cigarette use are displayed in Table 3. Rates of lifetime use were elevated for all sexual

minority girls, with the exception of unsure girls in 2007. Sexual identity disparities in heavy cigarette use systematically increased from 2005 to 2015, with all sexual minority girl subgroups reporting higher odds of heavy use than heterosexual girls from 2011 to 2015.

Sexual identity disparities in cigarette use were more idiosyncratic across years for boys. Bisexual boys showed consistently higher odds of lifetime

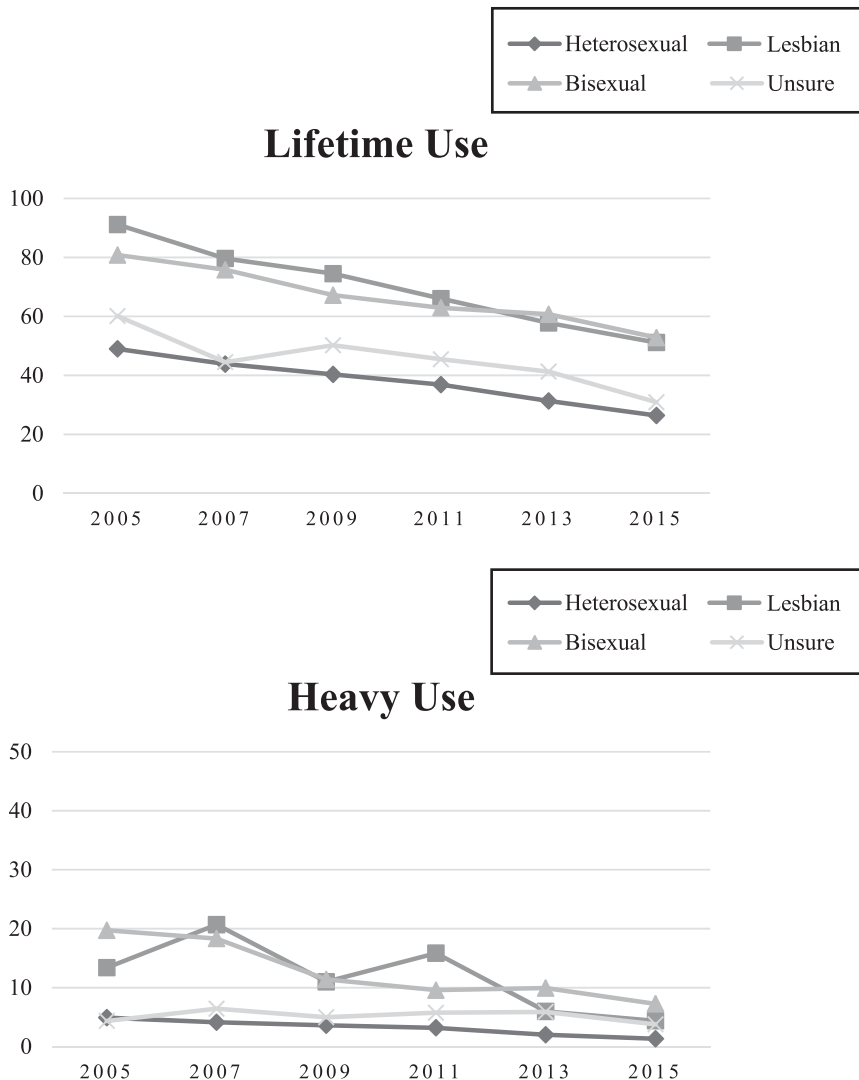
cigarette use compared with heterosexual boys for all survey years; gay boys indicated greater odds of lifetime use in 2007, 2011, 2013, and 2015. Unsure boys did not statistically differ in lifetime use relative to heterosexual boys in any 1 year. Compared with heterosexual boys, rates of heavy use were elevated among gay and bisexual boys across all survey years, with the exception of gay boys in 2015 and

**TABLE 2** Linear Trend Comparison of the Prevalence of Lifetime, Past-30-Day, and Heavy Use by Sexual Identity From 2005 to 2015

	Girls		Boys	
	$\beta$	<i>P</i>	$\beta$	<i>P</i>
Lifetime use				
Heterosexual	-1.05	<.001	-1.25 <sup>a</sup>	<.001
Gay or lesbian	-1.55	<.001	-.97	<.001
Bisexual	-1.25	<.001	-.96	<.001
Unsure	-1.08	<.001	-.70	.002
Heavy use				
Heterosexual	-.97	<.001	-.70	<.001
Gay or lesbian	-1.04	<.001	-.77	.011
Bisexual	-1.13	<.001	-.75	.003
Unsure	-1.08	<.001	-.14	.573

Adjusted for age and race and/or ethnicity.

<sup>a</sup> Quadratic models indicated a significant decrease from 2005 to 2011 and from 2011 to 2015.



**FIGURE 1** Unadjusted prevalence and trend comparisons of cigarette-related outcomes among girls by sexual identity from 2005 to 2015.

bisexual boys in 2009. Unsure boys had greater odds of heavy use than heterosexual boys in 2007, 2011, 2013, and 2015.

### Trends in Cigarette Use Disparities Over Time

Sexual-identity-by-year interactions testing differences in the size of sexual orientation disparities in cigarette smoking behavior largely indicated statistically stable differences between heterosexual youth and subgroups of SMY (see Table 4). In other words, smoking behaviors among specific populations

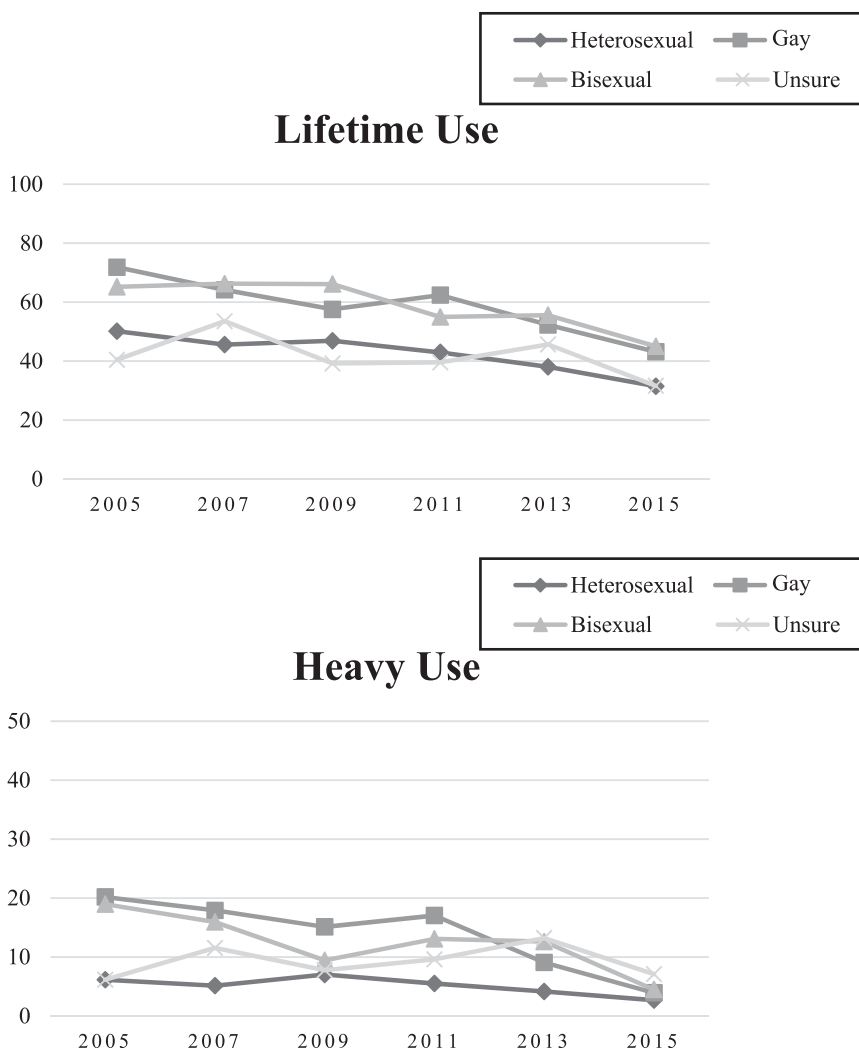
of LGB youth, with few exceptions, were largely the same in 2015 as they were in 2005. Recall that ORs >1.00 indicate a wider disparity in 2015 relative to 2005, whereas ORs <1.00 indicate a narrower disparity. Lifetime use disparities between heterosexual and lesbian girls were narrower in 2015 relative to 2005 (aOR 0.29; 95% confidence interval [CI] 0.12–0.75;  $P = .011$ ). The difference in heavy use between heterosexual and bisexual boys also narrowed in 2015 relative to 2005 (aOR 0.39; 95% CI 0.17–0.90;  $P = .028$ ). Both girls and boys unsure

of their sexual identity demonstrated wider sexual orientation disparities in heavy use in 2015 relative to unsure youth in 2005 (aOR 3.85 [95% CI 1.39–11.10;  $P = .009$ ] and aOR 2.44 [95% CI 1.22–5.00;  $P = .012$ ] for girls and boys, respectively).

### DISCUSSION

Although studies have consistently documented cigarette-related disparities between heterosexual youth and SMY,<sup>6,7,28,29</sup> data limitations have stymied understanding of whether sexual identity-related health disparities in the United States have narrowed, concurrent with pro-LGB social and structural changes. Similar to those in previous studies, our results reveal that the prevalence of lifetime and heavy cigarette use is decreasing among youth, including SMY.<sup>4,19</sup> Boys unsure of their sexual identity, however, indicated slower rates of decline in lifetime use and no statistical decline in heavy use. Ultimately, results testing differences in disparities over time suggest that the size of sexual identity-related disparities in cigarette use have remained relatively stable from 2005 to 2015, with few exceptions; sexual identity disparities in heavy use and lifetime use were narrower for bisexual boys and lesbian girls, respectively, in 2015 relative to 2005. Unsure girls and boys in 2015 showed wider disparities in heavy use than unsure girls and boys in 2005, suggesting unique risk for cigarette use among youth who are unsure of their sexual identity.

Sexual minority health disparities are theoretically driven by experiences with anti-LGB stigma and discrimination,<sup>30,31</sup> and a growing body of empirical work supports that these experiences affect the health and well-being of SMY and sexual minority adults.<sup>16,32</sup> Thus, given improved social attitudes and policies for LGB people, we anticipated that



**FIGURE 2** Unadjusted prevalence and trend comparisons of cigarette-related outcomes among boys by sexual identity from 2005 to 2015.

these social changes would attenuate health disparities between heterosexual youth and SMY in more recent samples of youth. Our results, however, do not support this hypothesis. Why might this be? Recent work suggests that there may be a developmental explanation; amid the backdrop of improved pro-LGB attitudes in the United States, research demonstrates a steady decline in the age at which SMY first disclose their sexual identities.<sup>33,34</sup> Young adolescents, however, are more likely to assert prejudicial attitudes, engage in homophobic behavior, and regulate the sexuality and gender expression of peers.<sup>35,36</sup>

This leaves youth who adopt and assert sexual minority identities earlier in the life course vulnerable to social exclusion and victimization from peers.<sup>37</sup> Therefore, despite macrosystemic changes in the acceptance of LGB people, youth may remain vulnerable to interpersonal experiences of prejudice and victimization and associated health outcomes.<sup>16,30,33</sup>

Our findings regarding the persistence of sexual identity disparities in cigarette use may be explained by recent research that documents school-based victimization among SMY. A recent

meta-analytic review,<sup>38</sup> for example, noted that SMY experience moderately higher levels of school-based harassment and victimization than their heterosexual peers and that the association between sexual minority status and school-based victimization was stronger in more recent years; in other words, there are larger sexual orientation disparities in school-based harassment today than in the past. These findings, coupled with additional studies that indicate that general and anti-LGB victimization are among the strongest predictors for substance use among SMY,<sup>16</sup> suggest that focused policies and programs that eliminate school-based victimization for SMY could help to mitigate sexual identity disparities in cigarette use and other negative outcomes.

Still, there may be other competing or compounding explanations for why sexual orientation-related disparities in tobacco use have remained largely unchanged since 2005. For example, there are several intrapersonal and interpersonal factors that have been shown to shape substance use among sexual minorities, including positive expectations of alcohol use and drinking to conform.<sup>39,40</sup> Furthermore, studies continue to reveal that tobacco companies persist in targeting LGB people and communities.<sup>41</sup> Still, continued risk for depression and other mental health symptomology may leave SMY vulnerable to cigarette use. Such factors may complicate the association between changing sociocultural contexts and substance use among sexual minority populations. Ultimately, more research is needed to understand the compounding nature of stress and substance use in the context of these other known mechanisms.

Despite documented differences in sexual orientation-related health disparities by sex and sexual identity,<sup>7,8,20,23,33</sup> it is notable that we observed declines in lifetime and

**TABLE 3** Sexual Identity Disparities in Cigarette-Related Outcomes Within the Year

	2005 <sup>a</sup>	2007 <sup>a</sup>	2009 <sup>a</sup>	2011 <sup>a</sup>	2013 <sup>a</sup>	2015 <sup>a</sup>
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
<b>Girls<sup>b</sup></b>						
Lifetime use						
Lesbian	8.78 (3.67–20.97) <sup>c</sup>	4.90 (2.72–8.85) <sup>c</sup>	4.29 (2.68–6.86) <sup>c</sup>	3.58 (2.49–5.15) <sup>c</sup>	3.02 (2.28–4.01) <sup>c</sup>	2.95 (2.20–3.95) <sup>c</sup>
Bisexual	4.33 (2.87–6.54) <sup>c</sup>	3.89 (2.84–5.33) <sup>c</sup>	3.11 (2.42–4.00) <sup>c</sup>	3.08 (2.54–3.72) <sup>c</sup>	3.55 (3.06–4.12) <sup>c</sup>	3.29(2.67–4.04) <sup>c</sup>
Unsure	1.66 (1.04–2.64) <sup>c</sup>	1.00 (0.69–1.46) <sup>c</sup>	1.63 (1.15–2.29) <sup>c</sup>	1.51 (1.16–1.98) <sup>c</sup>	1.73 (1.38–2.17) <sup>c</sup>	1.47 (1.18–1.83) <sup>c</sup>
Heavy use						
Lesbian	3.26 (0.91–11.77)	7.63 (3.60–7.74) <sup>c</sup>	4.65 (1.96–11.06) <sup>c</sup>	7.02 (4.23–11.65) <sup>c</sup>	3.52 (2.22–5.60) <sup>c</sup>	3.74 (2.15–6.51) <sup>c</sup>
Bisexual	4.88 (3.01–7.91) <sup>c</sup>	5.46 (3.85–7.74) <sup>c</sup>	4.00 (2.59–6.17) <sup>c</sup>	4.26 (2.89–6.27) <sup>c</sup>	6.36 (4.84–8.35) <sup>c</sup>	6.22 (4.33–8.96) <sup>c</sup>
Unsure	0.91 (0.41–2.02)	1.80 (0.90–3.60)	1.65 (0.77–3.54)	2.35 (1.28–4.32) <sup>c</sup>	3.91 (2.58–5.93) <sup>c</sup>	3.30 (1.87–5.81) <sup>c</sup>
<b>Boys<sup>b</sup></b>						
Lifetime use						
Gay	2.21 (0.98–4.99)	2.01 (1.11–3.64) <sup>c</sup>	1.50 (0.93–2.43)	2.08 (1.41–3.06) <sup>c</sup>	1.70 (1.19–2.43) <sup>c</sup>	1.70 (1.17–2.48) <sup>c</sup>
Bisexual	2.12 (1.18–3.82) <sup>c</sup>	2.31 (1.22–4.37) <sup>c</sup>	2.37 (1.45–3.88) <sup>c</sup>	1.77 (1.32–2.39) <sup>c</sup>	2.01 (1.50–2.69) <sup>c</sup>	1.70 (1.21–2.38) <sup>c</sup>
Unsure	0.70 (0.39–1.26)	1.41 (0.91–2.17)	0.74 (0.42–1.31)	0.89 (0.61–1.29)	1.33 (0.99–1.77)	1.03 (0.76–1.41)
Heavy use						
Gay	3.40 (1.38–8.40) <sup>c</sup>	2.98 (1.55–5.70) <sup>c</sup>	2.71 (1.48–4.97) <sup>c</sup>	3.25 (1.99–5.31) <sup>c</sup>	2.28 (1.41–3.69) <sup>c</sup>	1.52 (0.86–2.69)
Bisexual	4.17 (2.02–8.59) <sup>c</sup>	3.70 (1.78–7.70) <sup>c</sup>	1.55 (0.79–3.03)	2.78 (1.69–4.59) <sup>c</sup>	3.56 (2.49–5.08) <sup>c</sup>	1.61 (1.06–2.44) <sup>c</sup>
Unsure	1.17 (0.66–2.07)	2.98 (1.55–5.70) <sup>c</sup>	1.43 (0.70–2.89)	1.89 (1.20–2.99) <sup>c</sup>	3.66 (2.62–5.12) <sup>c</sup>	2.93 (1.99–4.30) <sup>c</sup>

<sup>a</sup> Models adjusted for age and race and/or ethnicity.

<sup>b</sup> Heterosexual youth are the referent group for comparisons.

<sup>c</sup> Statistically significant ( $P < .05$ ).

heavy tobacco use for both girls and boys as well as LGB youth. We did, however, find sex and sexual identity differences when assessing change in disparities over time. That is, sexual orientation differences in lifetime use for lesbian girls and heavy use for bisexual boys were statistically smaller in 2015 relative to 2005. These findings suggest that lesbian girls in 2015 were less likely to try cigarettes than in the past but demonstrated the same degree of elevated risk for heavy use as their

lesbian peers in 2005. Conversely, bisexual boys were no more or less likely to try cigarettes in 2015 than in 2005 but had lower odds of heavy use in 2015. These findings are in line with research that documents more robust sexual orientation–related substance use and abuse disparities among sexual minority girls and women than sexual minority boys and men.<sup>7,8,20,42</sup> More research is needed to understand the mechanisms that are driving these differences both concurrently and

over sociohistorical time. It could be, for example, that girls are more susceptible to substance use as the result of peer victimization and thus more likely to use at higher rates.<sup>43,44</sup> Studies of adults support this supposition.<sup>45</sup>

The increase in risk among youth who are unsure of their sexual identity also deserves attention. Other preliminary evidence suggests elevated risk among youth questioning their identity,<sup>15</sup> particularly those youth who experience homophobic victimization. Interestingly, although unsure youth were at greater risk for tobacco use than heterosexual youth, their overall levels of risk were lower than those of LGB youth (see within-year comparisons). It may be that unsure youth are less likely to experience homophobic victimization and harassment than their LGB-identified peers. Indeed, studies indicate that youth who are “out” about their sexual identity are more susceptible to victimization.<sup>37</sup> Together, findings suggest that youth who are unsure of or questioning their sexual orientation may be uniquely

**TABLE 4** Adjusted Trends in Cigarette-Related Disparities From 2005 to 2015

	Lifetime Use			Heavy Use		
	aOR <sup>a</sup>	(95% CI)	<i>P</i>	aOR <sup>a</sup>	(95% CI)	<i>P</i>
<b>Girls</b>						
Heterosexual by 2015	1.00	—	—	1.00	—	—
Lesbian by 2005	0.29 <sup>b</sup>	(0.12–0.75) <sup>b</sup>	.011 <sup>b</sup>	0.95	(0.20–4.55)	.980
Bisexual by 2005	0.77	(0.48–1.22)	.260	1.25	(0.69–2.33)	.447
Not sure by 2005	0.88	(0.49–1.64)	.697	3.85 <sup>b</sup>	(1.39–11.10) <sup>b</sup>	.009 <sup>b</sup>
<b>Boys</b>						
Heterosexual by 2015	1.00	—	—	1.00	—	—
Gay by 2005	0.81	(0.32–2.04)	.662	0.47	(0.16–1.35)	.158
Bisexual by 2005	0.85	(0.44–1.69)	.694	0.39 <sup>b</sup>	(0.17–0.90) <sup>b</sup>	.028 <sup>b</sup>
Not sure by 2005	1.43	(0.76–2.78)	.320	2.44 <sup>b</sup>	(1.22–5.00) <sup>b</sup>	.012 <sup>b</sup>

Adjusted models included sexual identity, survey year, race and/or ethnicity, and age along with orientation by year interactions. Heterosexual by 2015 is the referent group. —, not applicable.

<sup>a</sup> aOR inverted to reflect changes from past to present.

<sup>b</sup> Statistically significant ( $P < .05$ ).

vulnerable to cigarette and other substance use and could benefit from focused research attention.

Our findings must be considered in light of limitations. The YRBS is a crucial source of data on the health of adolescents in the United States, but there has been inconsistent inclusion of sexual identity measures. These analyses cover a wide range of the nation but are not strictly population representative. The YRBS data are also school based; therefore, youth not enrolled or absent are not included in the data. This is important considering that SMY are often overrepresented in groups of youth who experience homelessness, school pushout, or absence because of safety concerns.<sup>46–48</sup> Such limitations

would suggest, however, that the results presented in this article are likely underestimated because youth who are likely to be most vulnerable are excluded.

## CONCLUSIONS

Broadly, our findings indicate that cigarette use has declined among youth in the United States. Yet, sexual identity disparities in cigarette use persist. Such results support the conclusion that SMY health disparities remain a significant public health concern. Researchers should continue to explore how SMY health and health disparities have changed or remain unchanged in light of social changes. However, this work can only

be done with the continued inclusion of sexual identity measures in large-scale studies of youth. In the interim, the development and application of policies and programs that seek to reduce SMY cigarette use are needed.

## ABBREVIATIONS

aOR: adjusted odds ratio  
CDC: Centers for Disease Control and Prevention  
CI: confidence interval  
LGB: lesbian, gay, and bisexual  
OR: odds ratio  
SMY: sexual minority youth  
YRBS: Youth Risk Behavior Survey

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