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The Effects of Gender- and Sexuality-based Harassment on Lesbian, Gay, Bisexual, and Transgender Substance Use

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Abstract

Purpose—We tested three competing models about whether gender- and sexuality-based harassment at school have non-independent, additive, or interactive effects on adolescents' electronic cigarette use (i.e., vaping), cigarette smoking, alcohol use, and heavy episodic drinking (HED). We also tested whether harassment mediated substance use disparities between lesbian, gay, bisexual, transgender (LGBT) adolescents and their cisgender heterosexual peers.

Methods—We analyzed cross-sectional data from the 2013–2014 California Healthy Kids Survey, including 316,766 students in grades 7, 9, and 11 from over 1,500 middle and high schools. We used logistic regression models and interaction terms to estimate associations of past-year gender- and sexuality-based harassment at school on past-month substance use, and the Karlson-Holm-Breen method to test whether harassment mediated LGBT disparities in substance use.

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Results—Vaping, smoking, drinking, HED, and gender- and sexuality-based harassment were higher for transgender adolescents versus cisgender males and females, and for adolescents who were lesbian, gay, or bisexual only versus heterosexual only. Gender- and sexuality-based harassment were independently associated with greater odds of using each substance in every grade. These two types of harassment had positive interactions with each other for vaping in grade 11, smoking in grade 11, and HED in grades 9 and 11. Gender- and sexuality-based harassment significantly mediated many of the LGBT disparities in substance use.

Conclusions—Gender- and sexuality-based harassment at school independently or interactively produced LGBT disparities in substance use. Reducing these types of discrimination in schools will likely mitigate these disparities.

Keywords

Lesbian; gay; bisexual; and transgender; harassment; electronic cigarette use; cigarette use; alcohol use

INTRODUCTION

Lesbian, gay, and bisexual (LGB) adolescents are more likely than heterosexuals to smoke cigarettes,^{1–3} drink alcohol,^{3–6} and engage in heavy episodic drinking (HED).^{3–6} LGB adolescents have 123–323% higher odds of lifetime cigarette and alcohol use than heterosexuals.³ These disparities are larger for females than males, and for younger versus older adolescents.^{1–5} Scant research has examined differences in substance use behaviors between transgender and cisgender adolescents,⁷ but existing research suggests transgender youth have 18–72% higher odds of lifetime alcohol and cigarette use than cisgender adolescents.^{8,9} Less research has examined how these transgender–cisgender disparities differ by age/grade and sexual identity; however, this kind of intersectionality research¹⁰ was deemed a priority by the Institute of Medicine.⁷ Additionally, few studies have examined gender and sexual identity disparities in electronic cigarette use (i.e., vaping),^{11,12} despite vaping being more prevalent among adolescents than conventional cigarette smoking.¹³ Though the negative effects of adolescent smoking and alcohol use are well established,^{14,15} the effects of vaping are nascent. Nonetheless, vaping has been associated with nicotine dependence,¹⁶ poisonings,¹⁷ and inhalation of metals and toxins,¹⁸ thereby warranting vaping prevention during adolescence.

Minority stress theory¹⁹ posits LGB and transgender (LGBT) adolescents experience an excess burden of discrimination and victimization related to their sexual- and gender-minority statuses, which can lead them to cope by using substances. Victimization is more prevalent among LGBT versus cisgender heterosexual adolescents.^{8,20–23} Sexual identity disparities in peer victimization are larger for females than males, and for younger versus older ages,^{24,25} but little is known about whether transgender disparities in victimization vary by sexual identity or age/grade. Nevertheless, experiencing any form of victimization places adolescents at greater risk for several health risk behaviors, including smoking and drinking,²⁶ and victimization has been shown to mediate LGBT disparities in smoking and drinking.⁸ Notably, discriminatory types of victimization—such as gender- and sexuality-based harassment—are more strongly associated with substance use than non-biased

victimization,²⁷ but rarely²⁸ have they been tested as mediators of LGBT disparities in adolescent substance use. Furthermore, few studies have examined the predictors of vaping,²⁹ including harassment.³⁰

Moreover, few studies have examined how multiple types of discrimination—especially gender- and sexuality-based harassment—work in concert to influence adolescents' use of substances. Multiple forms of harassment may influence health in three distinct ways.^{31,32} In *non-independent models* (e.g., prominence or inurement models^{31,32}), the combined effect of multiple types of discrimination on health is not worse than the effects of just one form. In *additive models*, each type of discrimination produces independent effects on health, and, when both are present, their combined effect is equal to the sum of their independent effects. In *interactive models* (e.g., synergistic or exacerbation models^{31,32}), the combined effect of multiple types of discrimination produce greater effects on health than simply adding together the independent effects of each type of discrimination. Research on discrimination among adolescents has found evidence of *non-independent models* for suicidal ideation,³¹ marijuana use,³¹ and HED³¹; *additive models* for depressive symptoms,^{23,31} psychological distress,³³ self-rated health²³; and *interactive models* have yet to be found. Research has primarily examined sexuality- and race-based discrimination, limiting knowledge about the effects of gender- and sexuality-based harassment on substance use among adolescents. Multicollinearity and lack of statistical power are common statistical problems in conducting research on multiple types of discrimination,³¹ but these problems are mitigated when analyzing data from large samples.

We analyzed data from Californian adolescents in grades 7, 9, and 11 to investigate gender and sexual identity disparities in gender- and sexuality-based harassment at school, as well as past-month vaping, smoking, drinking, and HED. We examined how these disparities varied across grades, and how sexual identity disparities differed by gender within grades. We explored whether gender- and sexuality-based harassment have non-independent, additive, or interactive effects on substance use, and tested the mediational effects of these types of harassment in producing gender and sexual identity disparities in substance use. We hypothesized substance use and harassment at school would be higher among LGB versus heterosexual adolescents, and transgender versus cisgender adolescents. We hypothesized sexual identity disparities would be larger for younger versus older adolescents, and for cisgender females versus cisgender males. Since scant research has tested the combined effects of gender- and sexuality-based harassment on substance use, we did not have a priori hypotheses about these associations. We hypothesized gender- and sexuality-based harassment would mediate gender and sexual identity disparities in substance use.

METHODS

Study Design

We analyzed cross-sectional data from the 2013–2014 California Healthy Kids Survey (CHKS), administered to students in grades 7, 9, and 11. The sample included 439,743 students attending 1,584 middle and high schools in California. Average school response rates were 77.0%, 67.0%, and 56.2% for grades 7, 9, and 11, respectively. Schools notified parents about the survey and offered them the opportunity to grant or withhold consent for

their child(ren)—using either passive or active parental consent. Eligible students voluntarily completed anonymous confidential surveys, either online or using paper surveys depending on their school's administration method. Sampling frames were diverse across schools and developed in collaboration with WestEd.³⁴ Generally, census-sampling was employed in schools with <900 students per grade, and randomly selected classrooms were sampled in schools with >900 students per grade. The University of Pittsburgh Institutional Review Board deemed the current study exempt.

Measures

Our primary independent variables were gender and sexual identity. The following question measured LGBT status: "Which of the following best describes you?" Response options included: heterosexual (straight); gay or lesbian or bisexual; transgender; not sure; and decline to respond. Because surveys instructed participants to "mark all that apply," we created 4 sexual identity groups based only on the first 2 response options. The 4 sexual identity groups were: lesbian, gay, or bisexual (LGB) only; heterosexual only; both heterosexual and LGB; and neither heterosexual nor LGB (participants who did not select either option). We removed participants who selected "decline to state" (n=31,637) or "not sure" (n=23,121) because we could not discern whether this corresponded with their gender or sexual identity. We created a three-category measure of gender by coding participants who selected "transgender" as transgender adolescents, and those who did not select this option were coded as cisgender males or cisgender females based on their responses to the following question: "What is your sex? Male or Female."

Our hypothesized mediators were sexuality- and gender-based harassment. We used the term harassment because the victimization was directly tied to being a (real or perceived) member of a social group. First, the survey provided the definition: "You were bullied if you were shoved, hit, threatened, called mean names, teased, or had other unpleasant physical or verbal things done to you repeatedly or in a severe way. It is not bullying when two students of about the same strength quarrel or fight." Participants were then asked: "During the past 12 months, how many times on school property were you harassed or bullied for any of the following reasons...": (1) "because you are gay or lesbian or someone thought you were"; and (2) "your gender (being male or female)." Response options for each item included: 0 times; 1 time; 2 to 3 times; 4 or more times. We dichotomously coded each item as any versus none based on low prevalence and prior research.²⁷

Our dependent variables were vaping, smoking, drinking, and HED, measured with the following items, "During the past 30 days, on how many days did you use...": (1) "an electronic cigarette or any other nicotine delivery device"; (2) "cigarettes"; (3) "one drink of alcohol"; and (4) "five or more drinking of alcohol in a row, that is, within a couple of hours." Response options included 0, 1, 2, 3–9, 10–19, and 20–30 days. We dichotomously coded each substance use item as any versus none because each variable was zero-inflated and failed to have Gaussian or Poisson distributions. (We conducted sensitivity analyses with alternative cutoffs [e.g., <2 versus ≥2 times], which yielded similar results.)

Demographic covariates included grade, race/ethnicity (Hispanic/Latino; White; Black, Asian or Pacific Islander; and other), and parents' education. The following item assessed

parents' highest education level: "What is the highest level of education your parents completed? (Mark the educational level of the parent who went the furthest in school.)" Response options included: did not finish high school; graduated from high school; attended college but did not complete four-year degree; graduated from college; and don't know.

Analyses

We conducted analyses in Stata version 14 (College Station, TX). After removing 12.5% of participants who checked "decline to state" or "unsure" for the gender and sexual identity item, 384,985 students in grades 7, 9, and 11 completed surveys. Per recommendations,³⁵ we removed 2.7% of participants who selected "only some of them" or "hardly any" when responding to the question: "How many questions in this survey did you answer honestly?" Among the remaining participants, the proportion of missingness was highest for gender and sexual identity (11.0%) followed by gender- and sexuality-based harassment (5.7% for each). Of the participants who responded to at least one substance use question, 84.5% had complete data for all independent variables, mediators, and covariates, creating an analytic sample of 316,766 participants. We allowed sample sizes to vary for each substance use variable, and the samples had similar characteristics. Data were not missing completely at random: compared with participants missing gender and sexual identity data, participants included in our analytic sample were less likely to report vaping, smoking, HED, and gender- and sexuality-biased harassment, but more likely to report alcohol use. We chose not to impute missing data because missingness was largest for our primary independent variables.

We tested the bivariate associations between independent variables, mediators, and dependent variables using Rao-Scott chi-square tests to account for the clustering of students within schools. In all multivariable models, we controlled for demographic covariates using logistic regression with cluster-robust standard errors to adjust for the nesting of students within schools and provide precise estimations (comparable to multilevel modeling) when the number of clusters is plentiful.³⁶

We used the same model building processes to examine the gender and sexual identity disparities in harassment and substance use. We initially examined the main effects of gender and sexual identity on harassment and substance use, followed by a model with grade-by-gender and grade-by-sexual-identity interaction terms. Subsequently, we stratified analyses by grade to illuminate the main effects of sexual and gender identity within each grade. We then added gender-by-sexual-identity interaction terms. To illuminate these intersectional disparities, we created a categorical variable for each sexual-identity-by-gender subgroup (with heterosexual only cisgender males as the referent).

To test the non-independent and additive models of harassment on substance use, we entered the two types of harassment as separate dichotomous variables into the model. To test the interactive harassment model, we added the interaction term for the 2 dichotomous harassment variables. To test whether harassment mediated LGBT disparities in substance use, we used the Karlson-Holm-Breen method, which provides the proportion of reduction in the effect of the primary independent variable caused by the mediators, as well as a p-value for the indirect effects.³⁷

RESULTS

In total, 51.1% of participants were cisgender females, 48.2% were cisgender males, and 0.7% were transgender (Table 1). Overall, 94.4% of participants were heterosexual only, %4.6 were LGB only, 0.5% reported being both heterosexual and LGB, and 0.4% reported being neither (which is only comprised of transgender adolescents per the nature of the variable).

Harassment Disparities

From grades 7 to 11, gender-based harassment decreased from 7.3% to 6.5%, and sexuality-based harassment decreased from 9.5% to 6.3% (Table 2). Across all grades, gender- and sexuality-based harassment were higher among transgender adolescents than cisgender males and cisgender females, and among LGB only adolescents versus heterosexual only adolescents.

Grade Interactions—Controlling for demographics, gender- and sexuality-based harassment disparities were larger in higher grades for transgender adolescents compared with cisgender males ($p<0.001$). Gender-based harassment disparities were smaller in higher grades for LGB only compared with heterosexual only adolescents ($p<0.001$), but sexuality-based harassment disparities by sexual identity did not differ across grades ($p=0.20$).

Main Effects—In each grade, transgender adolescents had significantly higher odds of gender- and sexuality-based harassment compared with cisgender males and cisgender females (Table 2). LGB only adolescents had higher odds of gender- and sexuality-based harassment compared with heterosexual only adolescents.

Gender-by-Sexual-Identity Interactions—Disparities for LGB only versus heterosexual only adolescents in gender- and sexuality-based harassment were smaller for cisgender females compared with cisgender males in grades 9 and 11 (Table 2). In grade 7, these findings were similar for gender-based harassment, but odds of sexuality-based harassment for LGB only versus heterosexual only adolescents were larger for cisgender females than cisgender males.

Substance Use Disparities

Vaping, smoking, drinking, and HED increased from grades 7–11 (Table 3). In each grade, all substance use prevalence rates were higher among transgender adolescents than cisgender males and cisgender females, and among LGB only versus heterosexual only adolescents.

Grade Interactions—In multivariable models, all substance use disparities were larger in lower grades for transgender adolescents versus cisgender males ($p\text{-values}<0.001$), and for LGB only versus heterosexual only adolescents ($p\text{-values}<0.001$).

Main Effects—In every grade, the odds of each substance use behavior were higher for transgender adolescents versus cisgender males, and for LGB only adolescents versus heterosexual only adolescents (Table 3).

Gender-by-Sexual-Identity Interactions—Disparities for LGB only versus heterosexual only adolescents were larger among cisgender females than cisgender males for: vaping in all grades; smoking in grades 9 and 11; and alcohol use and HED in grade 11 (Table 3). Disparities for both heterosexual and LGB adolescents versus heterosexual only adolescents were larger among cisgender females than cisgender males for: vaping in grades 9 and 11; smoking and HED in grade 11; and alcohol use in grades 7 and 11. Disparities for both heterosexual and LGB adolescents versus heterosexual only adolescents were smaller among transgender adolescents than cisgender males for: vaping and smoking in all grades and HED in grade 11; but they were larger for drinking in all grades and HED in grade 9. Table 4, Step 1 shows the specific disparities for each sexual-identity-by-gender subgroup on substance use.

Harassment–Substance Use Associations

Adolescents who reported gender- or sexuality-based harassment were more likely than those who did not experience these types of harassment to engage in each substance use behavior (Table 4; $p\text{-values} < 0.001$). In multivariable models, each type of harassment was independently associated with higher odds of each substance use behavior in every grade—confirming additive models (Step 2). When testing the interaction effects of harassment on substance use, we found positive significant interactions between gender- and sexuality-based harassment for vaping in grade 11, smoking in grade 11, and HED in grades 9 and 11 (Step 3). Gender- and sexuality-based harassment significantly mediated most of the gender and sexual identity disparities in substance use (Step 4). When significant, gender- and sexuality-based harassment explained 12.9–89.2% of the disparities in substance use.

DISCUSSION

We examined LGBT disparities in substance use—including vaping—and the interactive and mediational effects of gender- and sexuality-based harassment at school on substance use. Therefore, our paper addressed research recommendations put forth by the Institute of Medicine report⁷—examining disparities for transgender populations, using intersectionality to examine LGBT health disparities, and identifying social influences contributing to these disparities.

We found evidence of *interactive* and *additive models*—but not *non-independent models*—for gender- and sexuality-based harassment on substance use. *Interactive models* were detected for vaping, smoking, and HED in certain grades. For these behaviors, gender- and sexuality-based harassment were independently associated with use, and they also interacted to produce effects significantly greater than simply adding their independent effects together. Evidence of interaction models is new to the literature on discrimination among adolescents, and the explanations for our findings likely relate to psychological, developmental, and social processes. Psychologically, coping with a single stressor (e.g., gender-based harassment) may deplete adolescents' energy reserves, making it more challenging for adolescents to deal with additional stressors (e.g., sexuality-based harassment)³⁸ and magnifying adolescents' use of substances to cope. Developmentally, adolescence is a period of identity formation, and having multiple identity-related stressors may interrupt healthy

identity formation for LGBT youth, causing them to use substances in an exacerbated fashion. Socially, LGBT people may face discrimination from low-substance-using peers, causing them to have a greater number of high-substance-using peers³⁹ and more permissive substance-use norms,²⁸ thereby exacerbating their substance use. Contrastingly, for any alcohol use in every grade and each substance use behavior in grade 7, we found gender- and sexuality-based harassment were only additive. This might be because: having less than 5 drinks in one occasion is normative for adolescents; and in younger grades, harassment is more common and substances may be less accessible. Future research can investigate mechanisms that additively or synergistically link multiple types of harassment with substance use.

Second, LGBT adolescents have greater odds of substance use than cisgender heterosexuals, and there were significant interactions between grade, gender, and sexual identity. While we confirmed previous literature on sexual identity disparities in smoking and drinking,^{1–6,8} our study provides novel insights about disparities for transgender populations and about vaping as a health disparity for LGBT adolescents.^{11,12} Because electronic cigarettes are relatively new, our findings suggest LGBT adolescents are more vulnerable than cisgender heterosexuals to using emerging substances in the future, calling for ongoing surveillance of gender and sexual identity differences in use of emerging substances. Though the transgender-by-LGB-only interaction was not significant for any substances, the main effects were large for transgender and LGB only; the nonsignificant interaction suggests the combined effect was not greater than additive.

Third, we found that gender- and sexuality-based harassment mediate substance use disparities for most LGBT subgroups. Mediation only failed to reach significance among the smallest subgroups (e.g., heterosexual only transgender adolescents), likely due to limited statistical power. Our study highlights how discriminatory victimization may be a culprit contributing to LGBT disparities in substance use. This finding held true for electronic cigarette use, confirming harassment as a correlate of vaping.

Our findings can inform future epidemiologic and intervention research. Mediation can be more robustly tested in longitudinal studies, and harassment may be a moderator of LGBT disparities in substance use. Though our research examined the intersections of multiple identities and multiple forms of harassment on substance use, research can also examine how other social identities (e.g., race/ethnicity, disability status) and forms of harassment (e.g., race/ethnicity- and disability-based harassment) intersect to produce substance use disparities. Future research can examine how additional social ecological factors (e.g., LGBT school climate⁶) impact harassment and substance use. Given that gender- and sexuality-based harassment were either additive or interactive on substance use, interventions reducing biased-based harassment at school might be a key tool to reduce LGBT disparities in substance use. Preventing harassment for youth will likely yield great public health impact, as harassment during childhood and adolescence has deleterious health effects later in life.⁴⁰ For students already exposed to harassment or substance use, effective treatment programs are critical. However, there are few interventions for reducing harassment and substance use among LGBT youth,⁷ but are necessary to achieve LGBT health equity.

Limitations and Strengths

Cross-sectional data may bias mediation estimates and cannot confirm causality or temporality between harassment and substance use, despite our strong theoretical foundation.¹⁹ Items were self-reported, and their psychometric properties are unknown. Given the sexual/gender identity item, we cannot compare lesbian/gay versus bisexual, know why participants selected both heterosexual and LGB, discern the current gender identity versus natal sex among transgender participants, differentiate whether transgender youth are on the transmasculine or transfeminine spectrums. This item also blends sexual and gender identity and omits some gender and sexual identities (e.g., non-binary, queer). No measures were included for sexual behavior, sexual attraction, or gender expression, which might yield different results, since gender and sexual identity are developmental processes that younger adolescents might not have completed. Biased-based harassment was evaluated based on participants' perceptions, and attributions of harassment may be imprecise. Because the harassment items provided examples not inclusive of all LGBT youth (e.g., bisexuals, transgender people), harassment may be underreported among excluded groups. Bias-based harassment only measured school-related experiences, excluding harassment in other contexts (e.g., home). Additionally, participants who perceive discriminatory harassment may be more likely to report substance use, but we cannot be certain. Substance use was dichotomized as any versus none, which obscures differences in frequency. CHKS data are not weighted, therefore the prevalence may not be representative of Californian adolescents. Our findings may be biased if nonresponse was differentially related to gender, sexual identity, harassment, and substance use variables; however, the extent of this bias is unknown. Finally, we did not examine intersections with race/ethnicity.

Nevertheless, our study had several strengths. CHKS measured explicit types of discriminatory harassment and novel forms of substance use. We analyzed data from a large sample, allowing for investigation of interactions between multiple identities and types of harassment as well as disparities for transgender youth. The sample also included participants in 7th grade, while most studies of LGBT adolescents include only high-school-aged participants.

Conclusions

LGBT adolescents are more likely to use substances—including electronic cigarettes—than cisgender heterosexuals. Depending on the grade and substance, gender- and sexuality-based harassment have additive or synergistic associations with vaping, smoking, drinking, and HED. Many of the gender and sexual identity disparities in substance use are mediated by gender- and sexuality-based harassment at school. Only by designing interventions that effectively reduce anti-LGBT harassment or mitigate their deleterious effects will we eliminate LGBT disparities in substance use.

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ABBREVIATIONS

CHKS	California Healthy Kids Survey
HED	heavy episodic drinking
LGB	lesbian, gay, or bisexual
LGBT	lesbian, gay, bisexual, and transgender

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IMPLICATIONS AND CONTRIBUTIONS

Gender- and sexuality-based harassment have additive or interactive effects on adolescents' electronic cigarette use, cigarette smoking, alcohol use, and heavy episodic drinking depending on the substance and the adolescents' grade. Gender- and sexuality-based harassment at school mediate many of the substance use disparities for lesbian, gay, bisexual, and transgender adolescents.

Table 1

Sample Characteristics of the Total Sample and by Gender and Sexual Identity: California Healthy Kids Survey, California, 2013–2014

	Gender				Sexual Identity			
	Total sample (N=316,766)	Cisgender males (n=152,564)	Cisgender females (n=161,833)	Transgender (n=2,369)	Heterosexual only (n=298,921)	LGB only (n=14,726)	Both heterosexual and LGB (n=1,699)	Neither heterosexual nor LGB (n=1,420)
Sexual Identity		%	%	%	%	%	%	%
Heterosexual only	94.4	96.9	93.2	10.9	100.0	0.0	0.0	0.0
LGB only	4.6	2.8	6.2	20.1	0.0	100.0	0.0	0.0
Both heterosexual and LGB	0.5	0.3	0.6	9.1	0.0	0.0	100.0	0.0
Neither heterosexual nor LGB	0.4	0.0	0.0	59.9	0.0	0.0	0.0	100.0
Gender								
Cisgender males	48.2	100.0	0.0	0.0	49.5	28.7	29.2	0.0
Cisgender females	51.1	0.0	100.0	0.0	50.5	68.1	58.1	0.0
Transgender	0.7	0.0	0.0	100.0	0.1	3.2	12.7	100.0
Grade								
7th	26.9	27.2	26.8	23.3	27.5	16.8	26.1	21.5
9th	37.8	37.6	37.9	41.3	37.6	41.4	37.5	42.4
11th	35.3	35.3	35.3	35.5	35.0	41.9	36.4	36.1
Race/Ethnicity								
Hispanic/Latino	48.6	47.4	49.7	48.9	48.4	52.3	51.4	51.5
White, non-Hispanic/Latino	23.3	23.6	23.0	21.7	23.5	20.4	18.4	18.4
Asian or Pacific Islander, non-Hispanic/Latino	13.6	14.0	13.5	10.1	14.0	8.8	11.4	10.8
Black, non-Hispanic/Latino	3.5	3.7	3.3	7.0	3.4	4.8	4.5	8.2
Other, non-Hispanic/Latino	10.9	11.3	10.5	12.2	10.7	13.7	14.4	11.1
Parent's Highest Education Level								
Less than high school degree	13.2	11.5	14.8	18.6	13.0	17.4	15.9	20.1
High school degree	15.7	15.6	15.9	14.9	15.6	17.9	17.1	16.7
Attended some college	13.1	12.2	14.0	12.7	13.0	15.5	14.9	11.8

	Gender				Sexual Identity			
	Total sample (N=316,766)	Cisgender males (n=152,564)	Cisgender females (n=161,833)	Transgender (n=2,369)	Heterosexual only (n=298,921)	LGB only (n=14,726)	Both heterosexual and LGB (n=1,699)	Neither heterosexual nor LGB (n=1,420)
College degree	40.8	42.0	39.7	34.9	41.3	32.2	34.7	31.3
Don't know	17.1	18.7	15.7	18.9	17.1	17.0	17.4	20.1

Note. LGB = lesbian, gay, or bisexual. Gender and sexual orientation were significantly associated with all covariates (all p-values<0.001).

Differences by and Interactions of Gender and Sexual Identity on Gender- and Sexuality-based Harassment, Stratified by Grade: California Healthy Kids Survey, California, 2013–2014

Table 2

	Gender-based Harassment at School in Past Year			Sexuality-based Harassment at School in Past Year		
	Prevalence	Main Effects	Interactions	Prevalence	Main Effects	Interactions
	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)
GRADE 7						
Total	7.3			9.5		
Gender						
Cisgender male	5.4	1.00 (referent)	1.00 (referent)	9.7	1.00 (referent)	1.00 (referent)
Cisgender female	8.7	1.59 (1.50, 1.69)	1.66 (1.56, 1.76)	8.9	0.78 (0.74, 0.83)	0.74 (0.70, 0.78)
Transgender	33.6	3.90 (2.84, 5.35)	4.98 (2.80, 8.83)	40.1	1.52 (1.09, 2.11)	2.48 (1.40, 4.40)
Sexual Identity						
Heterosexual only	6.5	1.00 (referent)	1.00 (referent)	7.7	1.00 (referent)	1.00 (referent)
LGB only	26.6	4.57 (4.12, 5.07)	6.60 (5.52, 7.89)	58.8	17.53 (16.01, 19.20)	11.97 (10.26, 13.97)
Both heterosexual and LGB	21.9	3.22 (2.52, 4.11)	3.82 (2.50, 5.84)	40.1	7.50 (6.10, 9.21)	5.06 (3.65, 7.01)
Neither heterosexual nor LGB	30.5	2.09 (1.38, 3.16)	1.68 (0.89, 3.17)	33.4	3.51 (2.32, 5.29)	2.09 (1.12, 3.90)
Gender × Sexual Identity Interactions						
Cisgender female × LGB only			0.60 (0.48, 0.74)			1.78 (1.47, 2.15)
Cisgender female × Both heterosexual and LGB			0.80 (0.47, 1.37)			2.14 (1.42, 3.21)
Transgender × LGB only			0.54 (0.26, 1.13)			0.82 (0.40, 1.69)
Transgender × Both heterosexual and LGB			0.59 (0.24, 1.46)			0.68 (0.30, 1.57)
GRADE 9						
Total	6.8			8.3		
Gender						
Cisgender male	3.9	1.00 (referent)	1.00 (referent)	7.7	1.00 (referent)	1.00 (referent)
Cisgender female	9.1	2.23 (2.09, 2.38)	2.47 (2.32, 2.64)	8.3	0.79 (0.75, 0.82)	0.80 (0.76, 0.84)
Transgender	37.9	6.48 (5.14, 8.18)	4.84 (2.84, 8.27)	44.8	1.77 (1.38, 2.26)	1.98 (1.11, 3.52)
Sexual Identity						
Heterosexual only	5.7	1.00 (referent)	1.00 (referent)	5.6	1.00 (referent)	1.00 (referent)

	Gender-based Harassment at School in Past Year			Sexuality-based Harassment at School in Past Year		
	Prevalence	Main Effects	Interactions	Prevalence	Main Effects	Interactions
	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)
LGB only	22.8	4.07 (3.77, 4.40)	7.67 (6.70, 8.77)	52.2	18.90 (17.71, 20.16)	20.70 (18.55, 23.11)
Both heterosexual and LGB	19.9	2.97 (2.41, 3.66)	4.31 (2.80, 6.64)	33.3	7.98 (6.72, 9.47)	6.21 (4.59, 8.40)
Neither heterosexual nor LGB	36.5	2.42 (1.82, 3.23)	3.48 (1.97, 6.13)	42.2	6.24 (4.63, 8.41)	5.61 (3.06, 10.29)
Gender × Sexual Identity Interactions						
Cisgender female × LGB only			0.43 (0.37, 0.50)			0.88 (0.77, 0.99)
Cisgender female × Both heterosexual and LGB			0.59 (0.36, 0.99)			1.42 (0.98, 2.06)
Transgender × LGB only			0.82 (0.44, 1.52)			0.81 (0.41, 1.60)
Transgender × Both heterosexual and LGB			1.09 (0.46, 2.60)			1.13 (0.51, 2.52)
GRADE 11						
Total	6.5			6.3		
Gender						
Cisgender male	3.5	1.00 (referent)	1.00 (referent)	6.1	1.00 (referent)	1.00 (referent)
Cisgender female	8.7	2.50 (2.33, 2.68)	2.79 (2.60, 2.99)	5.9	0.70 (0.66, 0.74)	0.75 (0.70, 0.80)
Transgender	44.3	9.51 (7.48, 12.10)	7.63 (4.36, 13.37)	48.1	2.62 (2.01, 3.42)	7.36 (4.28, 12.67)
Sexual Identity						
Heterosexual only	5.5	1.00 (referent)	1.00 (referent)	3.9	1.00 (referent)	1.00 (referent)
LGB only	18.7	3.26 (3.03, 3.51)	6.08 (5.31, 6.97)	42.4	18.93 (17.71, 20.23)	22.50 (20.28, 24.96)
Both heterosexual and LGB	18.3	2.58 (2.07, 3.23)	4.25 (2.68, 6.73)	26.5	8.01 (6.60, 9.72)	8.97 (6.44, 12.49)
Neither heterosexual nor LGB	44.8	2.63 (1.95, 3.55)	3.53 (1.95, 6.38)	45.8	6.78 (4.93, 9.31)	2.49 (1.42, 4.36)
Gender × Sexual Identity Interactions						
Cisgender female × LGB only			0.43 (0.37, 0.51)			0.77 (0.67, 0.87)
Cisgender female × Both heterosexual and LGB			0.53 (0.31, 0.90)			0.85 (0.56, 1.29)
Transgender × LGB only			0.81 (0.43, 1.51)			0.24 (0.13, 0.45)
Transgender × Both heterosexual and LGB			0.78 (0.34, 1.77)			0.29 (0.13, 0.63)

Note. Boldface indicates statistical significance ($p < 0.05$). LGB = lesbian, gay, or bisexual; AOR = adjusted odds ratio; CI = confidence interval; All models were estimated using logistic regression, adjusting for race/ethnicity, parent education, and school clustering (using cluster-robust standard errors).

Table 3
Differences by and Interactions of Gender and Sexual Identity on Substance Use, Stratified by Grade: California Healthy Kids Survey, California, 2013–2014

	Electronic Cigarette Use			Cigarette Smoking			Alcohol Use			Heavy Episodic Drinking		
	Prev- alence	Main Effects	Interactions	Prev- alence	Main Effects	Interactions	Prevalence	Main Effects	Interactions	Prev- alence	Main Effects	Interactions
	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)
GRADE 7												
Total	6.9			2.3			7.6			2.9		
Gender												
Cisgender male	6.6	1.00 (referent)	1.00 (referent)	2.2	1.00 (referent)	1.00 (referent)	6.6	1.00 (referent)	1.00 (referent)	2.6	1.00 (referent)	1.00 (referent)
Cisgender female	6.8	0.91 (0.86, 0.97)	0.89 (0.83, 0.94)	2.2	0.84 (0.76, 0.92)	0.86 (0.77, 0.95)	8.2	1.13 (1.07, 1.20)	1.12 (1.06, 1.19)	2.8	0.92 (0.85, 1.01)	0.94 (0.85, 1.03)
Transgender	30.4	2.90 (2.10, 3.99)	3.38 (1.97, 5.80)	25.8	5.82 (4.13, 8.19)	4.77 (2.22, 10.23)	34.3	3.53 (2.57, 4.85)	3.36 (1.91, 5.91)	26.7	4.62 (3.31, 6.46)	1.54 (0.49, 4.84)
Sexual Identity												
Heterosexual only	6.2	1.00 (referent)	1.00 (referent)	1.8	1.00 (referent)	1.00 (referent)	6.8	1.00 (referent)	1.00 (referent)	2.3	1.00 (referent)	1.00 (referent)
LGB only	24.8	4.55 (4.08, 5.08)	3.56 (2.87, 4.42)	14.9	7.99 (6.90, 9.24)	9.01 (7.15, 11.35)	28.3	4.72 (4.27, 5.22)	4.68 (3.86, 5.66)	17.1	7.51 (6.60, 8.55)	8.19 (6.48, 10.36)
Both heterosexual and LGB	20.6	3.22 (2.51, 4.14)	3.13 (2.03, 4.82)	10.5	4.09 (2.91, 5.75)	4.03 (2.25, 7.23)	22.3	3.17 (2.48, 4.06)	1.94 (1.17, 3.23)	13.1	4.60 (3.46, 6.13)	3.56 (2.04, 6.22)
Neither heterosexual nor LGB	29.0	1.94 (1.29, 2.91)	1.64 (0.90, 3.00)	22.3	2.24 (1.47, 3.42)	2.77 (1.24, 6.18)	31.6	1.83 (1.21, 2.77)	1.92 (1.03, 3.56)	24.8	2.73 (1.78, 4.19)	8.26 (2.53, 26.96)
Gender × Sexual Identity Interactions												
Cisgender female × LGB only			1.42 (1.11, 1.81)			0.81 (0.62, 1.07)			1.01 (0.81, 1.26)			0.86 (0.66, 1.14)
Cisgender female × Both heterosexual and LGB			1.11 (0.63, 1.93)			1.16 (0.55, 2.44)			2.11 (1.16, 3.81)			1.37 (0.69, 2.71)
Transgender × LGB only			1.07 (0.51, 2.25)			1.26 (0.51, 3.12)			1.07 (0.52, 2.21)			3.16 (0.94, 10.61)
Transgender × Both heterosexual and LGB			0.89 (0.83, 0.94)			0.86 (0.77, 0.95)			1.12 (1.06, 1.19)			0.94 (0.85, 1.03)
GRADE 9												
Total	12.1			4.1			17.5			8.6		
Gender												
Cisgender male	12.3	1.00 (referent)	1.00 (referent)	4.0	1.00 (referent)	1.00 (referent)	14.3	1.00 (referent)	1.00 (referent)	7.5	1.00 (referent)	1.00 (referent)
Cisgender female	11.5	0.84 (0.81, 0.88)	0.82 (0.79, 0.86)	3.8	0.79 (0.74, 0.84)	0.76 (0.71, 0.82)	20.1	1.39 (1.34, 1.44)	1.38 (1.33, 1.43)	9.2	1.12 (1.07, 1.17)	1.11 (1.06, 1.17)
Transgender	37.1	1.67 (1.34, 2.08)	1.61 (1.01, 2.58)	28.6	2.54 (1.98, 3.26)	1.59 (0.69, 3.68)	42.2	2.00 (1.59, 2.51)	1.80 (1.15, 2.84)	35.4	2.15 (1.69, 2.73)	2.31 (1.34, 3.98)
Sexual Identity												
Heterosexual only	11.1	1.00 (referent)	1.00 (referent)	3.3	1.00 (referent)	1.00 (referent)	16.2	1.00 (referent)	1.00 (referent)	7.7	1.00 (referent)	1.00 (referent)
LGB only	25.8	2.65 (2.48, 2.83)	2.18 (1.93, 2.46)	15.5	5.06 (4.65, 5.50)	4.23 (3.63, 4.93)	35.9	2.49 (2.35, 2.65)	2.28 (2.02, 2.57)	21.8	2.98 (2.78, 3.19)	2.97 (2.59, 3.40)

	Electronic Cigarette Use			Cigarette Smoking			Alcohol Use			Heavy Episodic Drinking		
	Prevalence	Main Effects	Interactions	Prevalence	Main Effects	Interactions	Prevalence	Main Effects	Interactions	Prevalence	Main Effects	Interactions
	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)	%	AOR (95% CI)	AOR (95% CI)
Both heterosexual and LGB	28.5	2.92 (2.43, 3.52)	2.08 (1.46, 2.98)	14.2	4.13 (3.28, 5.20)	4.44 (2.79, 7.07)	35.4	2.44 (2.06, 2.88)	2.03 (1.39, 2.96)	23.9	3.26 (2.67, 3.96)	2.78 (1.82, 4.25)
Neither heterosexual nor LGB	29.9	2.86 (2.14, 3.84)	2.93 (1.77, 4.86)	30.5	4.36 (3.20, 5.93)	6.84 (2.89, 16.21)	44.2	2.42 (1.81, 3.25)	2.67 (1.64, 4.35)	39.7	3.89 (2.89, 5.23)	3.61 (2.06, 6.35)
Gender × Sexual Identity Interactions												
Cisgender female × LGB only			1.32 (1.15, 1.52)			1.31 (1.09, 1.57)			1.13 (0.98, 1.29)			1.01 (0.86, 1.19)
Cisgender female × Both heterosexual and LGB			1.55 (1.02, 2.34)			0.74 (0.41, 1.34)			1.29 (0.85, 1.96)			1.19 (0.74, 1.91)
Transgender × LGB only			1.16 (0.64, 2.12)			1.70 (0.68, 4.25)			1.27 (0.72, 2.23)			0.85 (0.44, 1.65)
Transgender × Both heterosexual and LGB			0.82 (0.79, 0.86)			0.76 (0.71, 0.82)			1.38 (1.33, 1.43)			1.11 (1.06, 1.17)
GRADE 11												
Total	14.7			7.4			28.1			17.1		
Gender												
Cisgender male	16.4	1.00 (referent)	1.00 (referent)	8.5	1.00 (referent)	1.00 (referent)	26.6	1.00 (referent)	1.00 (referent)	17.7	1.00 (referent)	1.00 (referent)
Cisgender female	12.6	0.70 (0.67, 0.73)	0.67 (0.64, 0.70)	6.0	0.63 (0.60, 0.66)	0.58 (0.55, 0.62)	29.2	1.09 (1.06, 1.13)	1.08 (1.04, 1.11)	16.2	0.86 (0.83, 0.89)	0.84 (0.81, 0.87)
Transgender	42.5	1.47 (1.15, 1.88)	2.14 (1.29, 3.55)	37.4	1.92 (1.48, 2.49)	2.65 (1.48, 4.76)	50.6	1.31 (1.02, 1.67)	2.19 (1.41, 3.41)	43.4	1.72 (1.35, 2.20)	2.23 (1.39, 3.58)
Sexual Identity												
Heterosexual only	13.9	1.00 (referent)	1.00 (referent)	6.5	1.00 (referent)	1.00 (referent)	27.2	1.00 (referent)	1.00 (referent)	16.3	1.00 (referent)	1.00 (referent)
LGB only	24.4	2.05 (1.93, 2.19)	1.58 (1.41, 1.77)	19.0	3.45 (3.19, 3.72)	2.43 (2.16, 2.74)	40.0	1.70 (1.60, 1.81)	1.53 (1.39, 1.68)	26.3	1.80 (1.68, 1.93)	1.48 (1.32, 1.66)
Both heterosexual and LGB	28.0	2.36 (1.98, 2.82)	1.26 (0.86, 1.85)	18.4	3.01 (2.45, 3.69)	1.47 (0.94, 2.30)	42.5	1.90 (1.61, 2.23)	1.15 (0.83, 1.59)	30.1	2.08 (1.74, 2.48)	1.03 (0.69, 1.54)
Neither heterosexual nor LGB	47.4	3.24 (2.39, 4.38)	2.19 (1.30, 3.70)	41.1	4.20 (3.13, 5.63)	2.96 (1.65, 5.30)	55.2	2.66 (1.96, 3.62)	1.58 (0.99, 2.52)	46.5	2.48 (1.82, 3.37)	1.89 (1.15, 3.11)
Gender × Sexual Identity Interactions												
Cisgender female × LGB only			1.53 (1.33, 1.75)			1.77 (1.53, 2.05)			1.19 (1.06, 1.34)			1.35 (1.18, 1.55)
Cisgender female × Both heterosexual and LGB			2.26 (1.43, 3.57)			2.63 (1.53, 4.54)			1.86 (1.26, 2.75)			2.41 (1.51, 3.84)
Transgender × LGB only			0.62 (0.33, 1.15)			0.80 (0.41, 1.55)			0.43 (0.25, 0.75)			0.68 (0.38, 1.21)
Transgender × Both heterosexual and LGB			0.67 (0.64, 0.70)			0.58 (0.55, 0.62)			1.08 (1.04, 1.11)			0.84 (0.81, 0.87)

Note. Boldface indicates statistical significance (p<0.05). LGB = lesbian, gay, or bisexual; AOR = adjusted odds ratio; CI = confidence interval. All models were estimated using logistic regression, adjusting for race/ethnicity, parent education, and school clustering (using cluster-robust standard errors).

Gender and Sexual Identity Differences in Substance Use and the Mediating Effects of Gender- and Sexuality-based Harassment: California Healthy Kids Survey, California, 2013–2014

Table 4

	Electronic Cigarette Use					Cigarette Use				
	Prev- alence	Step 1. Base Model	Step 2. Harassme nt Main Effects Model	Step 3. Harassme nt Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prev- alence	Step 1. Base Model	Step 2. Harassme nt Main Effects Model	Step 3. Harassme nt Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)
GRADE 7										
Sexual Identity and Gender Subgroups										
Heterosexual only cisgender male	6.3	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2	1.9	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2
Heterosexual only cisgender female	6.0	0.89 (0.83, 0.94)	0.88 (0.83, 0.94)	0.88 (0.83, 0.94)	−1.2 (0.989)	1.7	0.86 (0.77, 0.95)	0.85 (0.77, 0.94)	0.85 (0.77, 0.94)	−5.0 (0.960)
Heterosexual only transgender	19.5	3.38 (1.97, 5.80)	2.85 (1.63, 4.98)	2.85 (1.63, 4.97)	12.3 (0.178)	9.1	4.77 (2.22, 10.23)	3.57 (1.55, 8.21)	3.58 (1.55, 8.22)	14.3 (0.166)
LGB only cisgender male	19.5	3.56 (2.87, 4.42)	2.36 (1.90, 2.94)	2.36 (1.90, 2.94)	31.1 (<0.001)	15.2	9.01 (7.15, 11.35)	5.10 (3.97, 6.53)	5.10 (3.97, 6.54)	24.2 (0.001)
LGB only cisgender female	26.1	4.49 (3.95, 5.10)	2.89 (2.51, 3.32)	2.88 (2.50, 3.32)	28.9 (<0.001)	12.7	6.30 (5.26, 7.55)	3.37 (2.75, 4.12)	3.37 (2.75, 4.12)	32.1 (<0.001)
LGB only transgender	40.7	12.85 (8.15, 20.28)	6.94 (4.30, 11.19)	6.98 (4.33, 11.25)	24.1 (<0.001)	47.6	54.16 (34.25, 85.62)	24.74 (14.78, 41.42)	24.74 (14.77, 41.42)	20.7 (<0.001)
Both heterosexual and LGB cisgender male	17.9	3.13 (2.03, 4.82)	2.49 (1.62, 3.83)	2.49 (1.62, 3.83)	18.4 (0.059)	7.5	4.03 (2.25, 7.23)	2.75 (1.53, 4.94)	2.75 (1.53, 4.94)	22.2 (0.060)
Both heterosexual and LGB cisgender female	19.2	3.07 (2.17, 4.35)	2.25 (1.57, 3.23)	2.25 (1.56, 3.23)	27.6 (0.005)	8.2	4.01 (2.48, 6.47)	2.54 (1.55, 4.17)	2.54 (1.55, 4.17)	30.7 (0.007)
Both heterosexual and LGB transgender	33.3	8.18 (4.51, 14.84)	5.45 (3.04, 9.77)	5.46 (3.05, 9.80)	18.7 (<0.001)	27.1	20.28 (11.29, 36.43)	11.12 (6.35, 19.47)	11.12 (6.35, 19.47)	18.7 (<0.001)
Neither heterosexual nor LGB transgender	29.0	5.56 (4.23, 7.32)	4.13 (3.17, 5.39)	4.14 (3.17, 5.40)	16.5 (0.011)	22.3	13.19 (9.91, 17.56)	8.44 (6.26, 11.37)	8.44 (6.26, 11.37)	15.6 (0.010)
Gender-based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.65 (1.50, 1.81)	1.71 (1.49, 1.95)				2.26 (2.00, 2.56)	2.23 (1.84, 2.69)	
Sexuality- based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.90 (1.74, 2.07)	1.93 (1.74, 2.15)				2.20 (1.92, 2.52)	2.18 (1.85, 2.57)	
Interaction between Gender-based and Sexuality-based Harassment at School										
				0.93 (0.76, 1.13)					1.03 (0.79, 1.35)	
GRADE 9										
Sexual Identity and Gender Subgroups										
Heterosexual only cisgender male	11.9	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2	3.6	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2

	Electronic Cigarette Use					Cigarette Use				
	Prev- alence	Step 1. Base Model	Step 2. Harassme nt Main Effects Model	Step 3. Harassme nt Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prev- alence	Step 1. Base Model	Step 2. Harassme nt Main Effects Model	Step 3. Harassme nt Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%ad (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%ad (pb)
Heterosexual only cisgender female	10.3	0.82 (0.79, 0.86)	0.80 (0.77, 0.84)	0.80 (0.77, 0.84)	−10.1 (0.786)	2.9	0.76 (0.71, 0.82)	0.73 (0.68, 0.78)	0.73 (0.68, 0.79)	−11.0 (0.796)
Heterosexual only transgender	18.6	1.61 (1.01, 2.58)	1.46 (0.91, 2.34)	1.45 (0.91, 2.33)	18.0 (0.270)	5.9	1.59 (0.69, 3.68)	1.27 (0.56, 2.90)	1.27 (0.56, 2.89)	36.0 (0.270)
LGB only cisgender male	23.4	2.18 (1.93, 2.46)	1.58 (1.40, 1.80)	1.59 (1.40, 1.80)	39.3 (<0.001)	14.3	4.23 (3.63, 4.93)	2.42 (2.04, 2.86)	2.44 (2.06, 2.89)	35.8 (<0.001)
LGB only cisgender female	26.3	2.37 (2.20, 2.56)	1.78 (1.64, 1.93)	1.78 (1.64, 1.94)	32.0 (<0.001)	15.2	4.21 (3.80, 4.66)	2.53 (2.25, 2.85)	2.54 (2.26, 2.86)	32.5 (<0.001)
LGB only transgender	35.8	4.09 (3.02, 5.53)	2.41 (1.74, 3.34)	2.40 (1.73, 3.33)	36.8 (<0.001)	31.4	11.45 (8.52, 15.39)	4.80 (3.39, 6.80)	4.76 (3.35, 6.77)	34.7 (<0.001)
Both heterosexual and LGB cisgender male	22.5	2.08 (1.46, 2.98)	1.79 (1.25, 2.56)	1.79 (1.25, 2.56)	19.2 (0.065)	15.0	4.44 (2.79, 7.07)	3.35 (2.07, 5.43)	3.36 (2.07, 5.45)	16.4 (0.052)
Both heterosexual and LGB cisgender female	28.0	2.65 (2.11, 3.33)	2.18 (1.72, 2.78)	2.18 (1.72, 2.78)	18.8 (0.016)	9.4	2.51 (1.76, 3.59)	1.70 (1.17, 2.48)	1.71 (1.17, 2.49)	35.9 (0.015)
Both heterosexual and LGB transgender	43.0	5.76 (3.68, 8.99)	3.96 (2.54, 6.18)	3.94 (2.53, 6.15)	21.4 (<0.001)	36.7	15.86 (10.00, 25.17)	8.32 (5.11, 13.55)	8.23 (5.05, 13.42)	22.9 (<0.001)
Neither heterosexual nor LGB transgender	39.9	4.72 (3.91, 5.70)	3.42 (2.84, 4.11)	3.41 (2.83, 4.11)	20.6 (<0.001)	30.5	10.89 (8.98, 13.21)	6.19 (5.02, 7.63)	6.18 (5.00, 7.62)	22.3 (<0.001)
Gender-based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.72 (1.61, 1.83)	1.68 (1.55, 1.83)				2.36 (2.14, 2.60)	2.18 (1.90, 2.50)	
Sexuality- based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.48 (1.39, 1.59)	1.46 (1.36, 1.58)				1.95 (1.75, 2.16)	1.86 (1.65, 2.10)	
Interaction between Gender-based and Sexuality-based Harassment at School										
GRADE 11										
Sexual Identity and Gender Subgroups										
Heterosexual only cisgender male	16.1	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 3	8.1	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 3
Heterosexual only cisgender female	11.6	0.67 (0.64, 0.70)	0.65 (0.63, 0.68)	0.66 (0.63, 0.69)	−4.2 (0.840)	4.9	0.58 (0.55, 0.62)	0.57 (0.53, 0.60)	0.57 (0.54, 0.60)	−3.2 (0.867)
Heterosexual only transgender	29.1	2.14 (1.29, 3.55)	1.79 (1.09, 2.95)	1.79 (1.08, 2.95)	22.5 (0.044)	19.0	2.65 (1.48, 4.76)	2.07 (1.18, 3.61)	2.07 (1.18, 3.62)	22.9 (0.041)
LGB only cisgender male	23.6	1.58 (1.41, 1.77)	1.20 (1.07, 1.34)	1.22 (1.09, 1.37)	54.2 (0.006)	17.8	2.43 (2.16, 2.74)	1.64 (1.45, 1.87)	1.69 (1.48, 1.92)	38.0 (0.003)
LGB only cisgender female	24.6	1.62 (1.50, 1.75)	1.27 (1.17, 1.39)	1.28 (1.18, 1.40)	45.3 (0.014)	18.9	2.51 (2.29, 2.77)	1.80 (1.62, 2.00)	1.83 (1.64, 2.03)	31.3 (0.010)
LGB only transgender	30.2	2.08 (1.49, 2.90)	1.20 (0.85, 1.70)	1.15 (0.81, 1.63)	79.9 (<0.001)	33.1	5.14 (3.71, 7.12)	2.52 (1.79, 3.54)	2.43 (1.72, 3.42)	44.2 (<0.001)
Both heterosexual and LGB cisgender male	19.2	1.26 (0.86, 1.85)	1.06 (0.72, 1.57)	1.07 (0.72, 1.59)	66.0 (0.106)	11.2	1.47 (0.94, 2.30)	1.15 (0.73, 1.82)	1.17 (0.74, 1.85)	53.1 (0.093)

	Electronic Cigarette Use					Cigarette Use				
	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)
Both heterosexual and LGB cisgender female	27.4	1.91 (1.51, 2.42)	1.64 (1.28, 2.10)	1.66 (1.29, 2.12)	20.3 (0.126)	17.1	2.26 (1.71, 2.98)	1.82 (1.36, 2.44)	1.85 (1.38, 2.48)	21.1 (0.120)
Both heterosexual and LGB transgender	51.3	5.23 (3.25, 8.42)	3.59 (2.20, 5.85)	3.49 (2.13, 5.71)	25.0 (<0.001)	41.3	7.47 (4.69, 11.89)	4.53 (2.78, 7.36)	4.40 (2.68, 7.21)	25.8 (<0.001)
Neither heterosexual nor LGB transgender	47.4	4.69 (3.92, 5.60)	3.20 (2.67, 3.84)	3.13 (2.60, 3.76)	26.4 (<0.001)	41.1	7.84 (6.51, 9.44)	4.74 (3.91, 5.74)	4.65 (3.83, 5.64)	25.1 (<0.001)
Gender-based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.67 (1.57, 1.79)	1.52 (1.40, 1.65)				1.84 (1.70, 2.00)	1.59 (1.43, 1.78)	
Sexuality- based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.52 (1.41, 1.63)	1.38 (1.26, 1.52)				1.80 (1.64, 1.98)	1.62 (1.43, 1.82)	
Interaction between Gender-based and Sexuality-based Harassment at School										
			1.32 (1.15, 1.52)					1.40 (1.18, 1.66)		
Alcohol Use										
Heavy Episodic Drinking										
	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)
GRADE 7										
Sexual Identity and Gender Subgroups										
Heterosexual only cisgender male	6.3	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2	2.3	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2
Heterosexual only cisgender female	7.3	1.12 (1.06, 1.19)	1.12 (1.05, 1.19)	1.12 (1.05, 1.19)	1.3 (0.989)	2.3	0.94 (0.85, 1.03)	0.92 (0.84, 1.02)	0.92 (0.84, 1.02)	−16.9 (0.934)
Heterosexual only transgender	19.5	3.36 (1.91, 5.91)	2.82 (1.55, 5.12)	2.81 (1.55, 5.10)	13.0 (0.178)	3.9	1.54 (0.49, 4.84)	1.14 (0.35, 3.72)	1.14 (0.35, 3.72)	60.4 (0.155)
LGB only cisgender male	23.8	4.68 (3.86, 5.66)	3.07 (2.52, 3.73)	3.06 (2.52, 3.72)	26.6 (<0.001)	16.3	8.19 (6.48, 10.36)	5.01 (3.93, 6.40)	5.01 (3.93, 6.40)	22.0 (0.001)
LGB only cisgender female	28.8	5.32 (4.75, 5.97)	3.36 (2.95, 3.82)	3.34 (2.94, 3.80)	27.2 (<0.001)	15.7	6.63 (5.70, 7.72)	3.87 (3.27, 4.59)	3.87 (3.27, 4.59)	27.0 (<0.001)
LGB only transgender	49.1	16.89 (10.79, 26.45)	9.11 (5.72, 14.51)	9.21 (5.79, 14.66)	22.7 (<0.001)	43.5	39.79 (25.36, 62.41)	19.15 (11.84, 30.97)	19.14 (11.83, 30.97)	20.5 (<0.001)

		Step 4. Proportion of Exposure Effect Explained by Harassment				Step 4. Proportion of Exposure Effect Explained by Harassment					
Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)
Both heterosexual and LGB cisgender male	11.7	1.94 (1.17, 3.23)	1.49 (0.90, 2.46)	1.49 (0.90, 2.47)	35.1 (0.061)	8.0	3.56 (2.04, 6.22)	2.58 (1.47, 4.52)	2.58 (1.47, 4.52)	20.8 (0.075)	
	25.2	4.60 (3.35, 6.32)	3.34 (2.39, 4.65)	3.33 (2.39, 4.64)	21.0 (0.005)	10.9	4.57 (3.02, 6.92)	3.12 (2.03, 4.79)	3.12 (2.03, 4.79)	24.3 (0.010)	
	40.7	11.25 (6.52, 19.41)	7.51 (4.48, 12.57)	7.54 (4.50, 12.62)	17.3 (<0.001)	35.0	25.29 (14.62, 43.77)	15.51 (9.24, 26.04)	15.51 (9.24, 26.04)	15.3 (<0.001)	
	31.6	6.44 (5.00, 8.29)	4.70 (3.67, 6.03)	4.72 (3.68, 6.05)	16.3 (0.009)	24.8	12.68 (9.49, 16.96)	8.49 (6.37, 11.32)	8.49 (6.37, 11.32)	14.6 (0.009)	
Gender-based Harassment at School											
None		1.00 (referent)		1.00 (referent)				1.00 (referent)		1.00 (referent)	
Any		1.70 (1.55, 1.86)		1.84 (1.64, 2.06)				2.29 (2.03, 2.58)		2.28 (1.93, 2.68)	
Sexuality-based Harassment at School											
None		1.00 (referent)		1.00 (referent)				1.00 (referent)		1.00 (referent)	
Any		1.96 (1.80, 2.13)		2.04 (1.86, 2.24)				1.90 (1.68, 2.14)		1.89 (1.65, 2.17)	
Interaction between Gender-based and Sexuality-based Harassment at School											
GRADE 9											
Sexual Identity and Gender Subgroups											
Heterosexual only cisgender male	13.9	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2	7.2	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 3	
Heterosexual only cisgender female	18.5	1.38 (1.33, 1.43)	1.35 (1.30, 1.41)	1.36 (1.30, 1.41)	5.6 (0.790)	8.1	1.11 (1.06, 1.17)	1.08 (1.03, 1.13)	1.09 (1.04, 1.14)	19.8 (0.819)	
Heterosexual only transgender	23.5	1.80 (1.15, 2.84)	1.66 (1.06, 2.59)	1.66 (1.06, 2.59)	12.7 (0.274)	15.8	2.31 (1.34, 3.98)	2.05 (1.20, 3.51)	2.04 (1.19, 3.49)	12.0 (0.278)	
LGB only cisgender male	27.5	2.28 (2.02, 2.57)	1.71 (1.51, 1.94)	1.72 (1.51, 1.95)	33.7 (<0.001)	19.1	2.97 (2.59, 3.40)	2.11 (1.83, 2.44)	2.15 (1.85, 2.49)	27.6 (0.001)	
LGB only cisgender female	38.6	3.54 (3.30, 3.80)	2.76 (2.56, 2.98)	2.77 (2.57, 2.99)	19.5 (<0.001)	22.4	3.34 (3.07, 3.64)	2.45 (2.23, 2.68)	2.47 (2.25, 2.71)	23.3 (0.002)	
LGB only transgender	45.9	5.23 (3.85, 7.10)	3.30 (2.39, 4.56)	3.27 (2.36, 4.53)	27.9 (<0.001)	31.6	5.86 (4.31, 7.96)	3.27 (2.34, 4.59)	3.18 (2.26, 4.49)	33.2 (<0.001)	
Both heterosexual and LGB cisgender male	25.2	2.03 (1.39, 2.96)	1.78 (1.21, 2.61)	1.78 (1.21, 2.61)	17.8 (0.066)	18.1	2.78 (1.82, 4.25)	2.34 (1.52, 3.58)	2.34 (1.53, 3.59)	14.8 (0.100)	
Both heterosexual and LGB cisgender female	38.3	3.62 (2.95, 4.43)	3.06 (2.49, 3.76)	3.06 (2.49, 3.76)	12.9 (0.015)	23.5	3.68 (2.92, 4.64)	2.97 (2.33, 3.77)	2.98 (2.33, 3.79)	14.8 (0.035)	
Both heterosexual and LGB transgender	41.8	4.65 (2.96, 7.30)	3.30 (2.11, 5.14)	3.26 (2.09, 5.10)	22.5 (<0.001)	37.5	8.17 (5.16, 12.92)	5.33 (3.39, 8.38)	5.16 (3.28, 8.14)	21.5 (<0.001)	
Neither heterosexual nor LGB transgender	44.2	4.81 (4.02, 5.76)	3.61 (3.02, 4.32)	3.60 (3.01, 4.30)	18.3 (<0.001)	39.7	8.35 (6.95, 10.02)	5.84 (4.86, 7.01)	5.78 (4.81, 6.95)	17.1 (<0.001)	
Gender-based Harassment at School											
None		1.00 (referent)		1.00 (referent)				1.00 (referent)		1.00 (referent)	
Any		1.62 (1.52, 1.72)		1.57 (1.46, 1.69)				1.91 (1.78, 2.05)		1.66 (1.51, 1.83)	
Sexuality- based Harassment at School											

	Alcohol Use					Heavy Episodic Drinking				
	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment	Prevalence	Step 1. Base Model	Step 2. Harassment Main Effects Model	Step 3. Harassment Interaction Model	Step 4. Proportion of Exposure Effect Explained by Harassment
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	%a (pb)
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.44 (1.36, 1.52)	1.41 (1.32, 1.50)				1.48 (1.37, 1.60)	1.34 (1.22, 1.38)	
Interaction between Gender-based and Sexuality-based Harassment at School										
GRADE II										
Sexual Identity and Gender Subgroups										
Heterosexual only cisgender male	26.3	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 2	17.4	1.00 (referent)	1.00 (referent)	1.00 (referent)	Step 1 versus 3
Heterosexual only cisgender female	28.0	1.08 (1.04, 1.11)	1.06 (1.03, 1.10)	1.06 (1.03, 1.10)	19.1 (0.771)	15.2	0.84 (0.81, 0.87)	0.82 (0.79, 0.85)	0.82 (0.79, 0.85)	–8.5 (0.825)
Heterosexual only transgender	44.2	2.19 (1.41, 3.41)	1.98 (1.27, 3.08)	1.98 (1.27, 3.08)	13.1 (0.036)	32.1	2.23 (1.39, 3.58)	1.96 (1.23, 3.13)	1.96 (1.22, 3.13)	16.3 (0.060)
LGB only cisgender male	35.5	1.53 (1.39, 1.68)	1.31 (1.19, 1.44)	1.31 (1.19, 1.45)	36.2 (0.002)	24.0	1.48 (1.32, 1.66)	1.22 (1.09, 1.36)	1.25 (1.12, 1.40)	41.5 (0.026)
LGB only cisgender female	42.2	1.97 (1.83, 2.11)	1.72 (1.60, 1.85)	1.73 (1.60, 1.86)	19.4 (0.008)	27.0	1.68 (1.55, 1.82)	1.41 (1.30, 1.54)	1.43 (1.31, 1.55)	29.9 (0.030)
LGB only transgender	36.3	1.44 (1.03, 2.02)	1.04 (0.74, 1.46)	1.03 (0.73, 1.44)	89.2 (<0.001)	34.5	2.24 (1.59, 3.16)	1.47 (1.04, 2.09)	1.40 (0.99, 2.00)	56.8 (<0.001)
Both heterosexual and LGB cisgender male	28.6	1.15 (0.83, 1.59)	1.05 (0.75, 1.45)	1.05 (0.76, 1.45)	65.9 (0.076)	17.7	1.03 (0.69, 1.54)	0.91 (0.61, 1.37)	0.92 (0.62, 1.38)	646.1 (0.172)
Both heterosexual and LGB cisgender female	45.6	2.30 (1.86, 2.84)	2.12 (1.71, 2.62)	2.12 (1.72, 2.63)	9.9 (0.089)	30.9	2.08 (1.65, 2.63)	1.86 (1.47, 2.36)	1.88 (1.48, 2.39)	13.1 (0.169)
Both heterosexual and LGB transgender	58.7	3.89 (2.41, 6.27)	3.10 (1.93, 4.99)	3.07 (1.90, 4.95)	17.2 (<0.001)	54.0	5.48 (3.47, 8.68)	4.09 (2.58, 6.48)	3.95 (2.48, 6.29)	19.8 (<0.001)
Neither heterosexual nor LGB transgender	55.2	3.47 (2.88, 4.16)	2.75 (2.29, 3.30)	2.73 (2.27, 3.27)	19.1 (<0.001)	46.5	4.21 (3.50, 5.07)	3.12 (2.59, 3.77)	3.03 (2.51, 3.67)	22.9 (<0.001)
Gender-based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.40 (1.33, 1.49)	1.37 (1.28, 1.47)				1.57 (1.48, 1.68)	1.42 (1.31, 1.54)	
Sexuality- based Harassment at School										
None			1.00 (referent)	1.00 (referent)				1.00 (referent)	1.00 (referent)	
Any			1.27 (1.20, 1.34)	1.24 (1.15, 1.33)				1.32 (1.23, 1.41)	1.18 (1.08, 1.29)	
Interaction between Gender-based and Sexuality-based Harassment at School										
					1.08 (0.95, 1.23)				1.37 (1.19, 1.59)	

Note. Boldface indicates statistical significance (p<0.05). LGB = lesbian, gay, or bisexual; AOR = adjusted odds ratio; CI = confidence interval; Models in Steps 1, 2, and 3 were estimated using logistic regression, adjusting for race/ethnicity, grade in School, parent education, and School clustering (using cluster-robust standard errors). a Proportion of reduction in effects comparing Steps 1 and 2; b p-values for the indirect effects are for Step 1 compared to Step 2 if interaction effect were non-significant or for Step 1 compared to Step 3 if interaction effects were significant (the specified model is noted in the column).

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