

Gender–sexuality alliance membership and activities: associations with students' comfort, confidence and awareness regarding substance use resources

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Abstract

Belonging to a school Gender and Sexuality Alliance (GSA) is associated with lower substance use among LGBTQ+ youth. However, it is unknown whether GSA participation facilitates access to resources for substance use concerns. Using longitudinal data from 38 Massachusetts high schools, we compared sources of support for substance use concerns listed by GSA members ($n = 361$) and nonmembers ($n = 1539$). Subsequently, we tested whether GSA membership was associated with comfort, confidence and awareness regarding substance use resources in school and the community. Finally, we assessed whether specific GSA activities and discussions (e.g. social support) were associated with these outcomes. Among students with recent substance use, GSA membership was associated with greater comfort, confidence and awareness regarding school-based substance use resources in the spring semester, adjusted for fall semester levels and non-GSA club involvement. Furthermore, students in GSAs where members reported more advocacy and social support activities reported higher levels of comfort, confidence and awareness regarding community-based substance use resources. These results indicate that among students using

alcohol or nicotine products, GSA members may be more receptive to school-based substance use prevention efforts. Furthermore, GSA-based social support and activism experiences may promote access to community-based substance use resources.

Introduction

Alcohol, cigarettes and nicotine vaping are common among US adolescents: in 2019, 29.3% of US 12th-graders reported using alcohol, 5.7% reported smoking cigarettes and 25.5% reported vaping nicotine in the past month [1]. Adolescents who are LGBTQ+—i.e. with sexual orientation identities other than heterosexual (e.g. lesbian, gay, bisexual, queer) and/or gender identities not matching cultural expectations for their sex assigned at birth (e.g. transgender, non-binary)—report higher levels of drinking, smoking and vaping compared to their heterosexual, cisgender counterparts [2–4]; for instance, the 2015 prevalence of current cigarette use was 9.8% among heterosexual US high-school students but 19.2% among lesbian, gay and bisexual students [3]. These disparities highlight the need for substance use prevention strategies that address the needs of LGBTQ+ adolescents.

The role of supports for substance use concerns

Little is known about the people, places, programs or materials to which adolescents turn with questions or concerns about substance use. Most studies on this topic have required adolescents to choose from pre-specified categories of people (e.g. parents, clergy) [5, 6]; it is unclear what resources adolescents would identify on their own. Furthermore, beyond limited demographic information [5, 6] and substance use history [7], it is not known whether some adolescents are more likely to identify particular resources or feel confident and comfortable seeking assistance. This gap limits efforts to tailor substance use prevention efforts (e.g. for LGBTQ+ adolescents) or deliver them in adolescents' preferred settings.

Gender and sexuality alliance membership and adolescent health and Well-Being

One setting that may be salient for LGBTQ+ adolescents is a Gender and Sexuality Alliance (also known as a Gay-Straight Alliance or GSA). GSAs are school-based clubs that facilitate discussion, social support and advocacy on issues relevant to LGBTQ+ adolescents. The proportion of public US secondary schools with a GSA or similar group ranges from 14.5% (Mississippi) to 71.9% (Rhode Island), with a median of 36.8% [8]. GSAs often serve multiple roles, from providing resources and support for individual students to engaging in advocacy against anti-LGBTQ+ bullying and discrimination [9, 10]. Typically, GSAs are led by students and supported by one or more adult advisors [11].

For LGBTQ+ adolescents, GSA membership is associated with favorable outcomes, including less frequent substance use [12]. These associations have been conceptualized in various ways. One perspective focuses on GSAs' 'health education' role. It is not unusual for GSA participants to discuss health topics (e.g. mental health, substance use) or share information about health resources [10, 13], and advisors may correct misconceptions and direct students toward high-quality resources [13]. Another perspective views GSAs as 'positive youth

development' settings, meaning that participation fosters positive psychosocial characteristics (e.g. self-efficacy, social competence) that may reduce health risk behaviors and other negative outcomes [14, 15]. Most studies comparing GSA members to nonmembers have been limited to LGBTQ+ adolescents, but the health education and positive youth development perspectives imply that GSA membership may also benefit non-LGBTQ+ members.

These perspectives suggest that GSA membership may be associated with greater comfort accessing supports for substance use concerns, awareness of potential resources for these concerns, and confidence about finding such resources. As a health education setting, GSAs may function as a resource for substance use concerns or increase awareness of external resources. As a positive youth development setting, GSAs may indirectly increase comfort, confidence and awareness relative to substance use resources via a variety of pathways, such as general self-efficacy. However, to date, these associations have not been studied.

Interaction between GSA membership and alcohol or nicotine product use

Among adolescents, using alcohol or nicotine products is associated with less intention to access substance use resources [16]; barriers to help-seeking include shame and fear of judgment [17, 18]. These dynamics may be particularly relevant at school, where substance use may be treated as a disciplinary issue: in Massachusetts (the setting of the present study), school districts are required to have policies prohibiting substance use [19]. Consequently, students with recent substance use may feel less comfortable accessing substance use resources, perceive fewer resources as available to them, and be less confident that they could access those resources.

GSA membership may buffer these associations. GSAs often serve as a source of support for LGBTQ+-specific and general concerns [9]. To the extent that members perceive the group and advisors as discreet and nonjudgmental, they may view the GSA itself as a potential resource or develop greater overall trust in school-based and adult-facilitated

supports regardless of their personal substance use. Consequently, negative associations between current substance use and the substance use resource outcomes may be weaker for GSA members than nonmembers.

Associations between GSA activities or discussions and substance use resource outcomes

Recognizing that GSAs vary from one another, research has increasingly addressed differences in student outcomes by their GSA's characteristics, including the frequency of specific types of activities or discussions [11]. Understanding the roles of specific activities can highlight potential mechanisms linking GSA involvement to well-being. Examining these activities at the GSA level (as opposed to students' individual activity participation) has particular public health significance because it more directly informs GSA advisors' efforts to optimize programming.

In the case of substance use resource outcomes, the health education perspective suggests that these outcomes will be greatest in GSAs with more frequent discussions of substance use and/or discussions of resources. The positive youth development perspective suggests that these outcomes will be associated with activities that promote positive psychosocial characteristics; previous research suggests that GSAs' advocacy-related and social support activities are particularly relevant to these processes [10, 11].

Present study

The first aim of the present study was to describe the frequency with which GSA members and nonmembers identify various school- and community-based sources of support for alcohol, tobacco and/or e-cigarette use concerns. The second aim was to test the hypothesis that GSA membership is positively associated with substance use resource awareness, comfort and confidence, with a significant positive interaction between GSA membership and current substance use. The third aim was to test the hypothesis that students in GSAs that engage in more social

support, advocacy, discussions of resources and discussions of substance use have higher levels of substance use resource awareness, comfort and confidence. Given the importance of context in adolescent health, we assessed school-based and community-based resources separately in each aim.

Methods

Participants

The initial sample included 594 GSA members (recruited during GSA meetings) and 1984 non-GSA students (recruited from one classroom per grade level, typically English classes) attending 38 Massachusetts high schools. Students were surveyed between September and October (Wave 1) and then 6–7 months later between April and May (Wave 2) of either the 2016–17 or the 2017–18 school year. GSA advisors ($n = 58$) provided information about their GSAs in a separate survey.

The present analysis was limited to students who participated at both waves. Attrition was greater in the GSA sample (39.2%) than the classroom sample (20.5%), $P < 0.001$. For non-GSA students only, attrition was greater among female-identified than male-identified students ($P < 0.001$). Among non-GSA students, attrition was greater for LGBTQ+ than non-LGBTQ+ students ($P < 0.001$), but among GSA students, attrition was lower for LGBTQ+ than non-LGBTQ+ students ($P < 0.001$). Age was positively associated with attrition only among non-GSA students ($P < 0.001$). Attrition was greater among Black or African American students (non-GSA $P = 0.012$; GSA $P < 0.001$) compared to White students. For non-GSA students only, attrition was also greater among bi-/multiracial students ($P = 0.033$) compared to White students. Wave 1 substance use was positively associated with attrition (Non-GSA, $P = 0.002$; GSA, $P = 0.005$).

Students in the classroom sample who reported being GSA members ($n = 39$) were excluded, resulting in an analytic sample of 361 GSA members and 1539 nonmembers. [Table I](#) presents demographic information for these subsamples. Notably,

Table I. Characteristics of members of Massachusetts high school GSAs and comparison students sampled from classrooms in the same schools, $N = 1900$.

Variables	Nonmember students ($n = 1539$), n (%)	GSA members ($n = 361$), n (%)
Gender identity		
Female	756 (49.6)	200 (55.6)
Male	755 (49.5)	57 (15.8)
Genderqueer	4 (0.3)	8 (2.2)
Transgender	1 (0.1)	31 (8.6)
Non-binary	—	21 (5.8)
Gender fluid	—	7 (1.9)
Respondent-provided identities	9 (0.6)	36 (10.0)
Sexual orientation identity		
Heterosexual/straight	1370 (90.9)	52 (14.5)
Bisexual	50 (3.3)	80 (22.3)
Gay or lesbian	20 (1.3)	61 (17.0)
Asexual	—	14 (3.9)
Pansexual	—	75 (20.9)
Queer	—	18 (5.0)
Questioning	39 (2.6)	26 (7.3)
Respondent-provided identities	11 (0.7)	3 (0.8)
Age		
13 and under	51 (3.4)	15 (4.2)
14	288 (19.0)	73 (20.4)
15	394 (26.0)	83 (23.2)
16	338 (22.3)	87 (24.3)
17	328 (21.6)	88 (24.6)
18 and over	119 (7.8)	12 (3.4)
Grade		
6th	23 (1.5)	3 (0.8)
7th	15 (1.0)	2 (0.6)
8th	13 (0.8)	6 (1.7)
9th	369 (24.1)	94 (26.3)
10th	414 (27.0)	81 (22.7)
11th	334 (21.8)	94 (26.3)
12th	366 (23.9)	77 (21.6)
Race/ethnicity		
White, non-Hispanic	1130 (73.9)	261 (72.7)
Black or African American	56 (3.7)	8 (2.2)
Asian or Asian American	87 (5.7)	10 (2.8)
Hispanic or Latino/a/x	140 (9.2)	38 (10.6)
Biracial or Multiracial	80 (5.2)	37 (10.3)
Native American	5 (0.3)	0 (0.0)
Middle Eastern/Arab or Arab American	16 (1.0)	1 (0.3)
Born in United States		
Yes	140 (9.1)	29 (8.0)
No	1398 (90.9)	332 (92.0)
Free/reduced price lunch		
No	1000 (65.4)	210 (60.5)
Yes	404 (26.4)	111 (32.0)
Not sure	125 (8.2)	26 (7.5)

(continued)

Table I. (continued)

Variables	Nonmember students ($n = 1539$), n (%)	GSA members ($n = 361$), n (%)
Non-GSA club participation (number of clubs)		
0 clubs	406 (26.4)	71 (19.7)
1 club	393 (25.5)	86 (23.8)
2 clubs	331 (21.5)	96 (26.6)
3 clubs	215 (14.0)	53 (14.7)
4 or more clubs	194 (12.6)	55 (15.2)
Alcohol use (past 6 months)		
No	1096 (72.0)	274 (76.3)
Yes	427 (28.0)	85 (23.7)
Cigarette use (past 6 months)		
No	1464 (96.7)	340 (95.2)
Yes	50 (3.3)	17 (4.8)
E-cigarette use (past 6 months)		
No	1331 (90.4)	312 (90.4)
Yes	141 (9.6)	33 (9.6)
Any alcohol, cigarette or e-cigarette use (past 6 months)		
No	1013 (68.5)	251 (72.1)
Yes	466 (31.5)	97 (27.9)

90.9% of the nonmember subsample and 14.5% of the GSA subsample was heterosexual, with substantial proportions of GSA members identifying as bisexual (22.3%), pansexual (20.9%) and gay/lesbian (17.0%). Among GSA members, 8.6% identified as transgender, 5.8% as non-binary and 14.1% reported other gender identities beyond male and female; less than 1% of the non-GSA sample reported these identities.

Procedures

We consulted the Massachusetts Safe Schools Program for LGBTQ Students to identify public schools across Massachusetts with GSAs. Among these, we purposively sampled schools for variation in size, rural/suburban/urban location and racial/ethnic and socioeconomic composition. Participating schools included traditional, charter and vocational/technical public schools.

With permission from schools (principals, GSA advisors and classroom teachers), students were invited to participate in a confidential survey about their experiences at school. Active consent was obtained from parents (classroom sample) or GSA

advisors (GSA sample), avoiding inadvertent disclosure of students' actual or perceived LGBTQ+ identity to parents. Participating students provided assent; GSA advisors consented prior to completing their own surveys. Proctors were present to answer questions before and during survey completion. Surveys took approximately 30 min and were completed during the classroom period or GSA meeting. Participants received a \$10 (Wave 1) or \$20 (Wave 2) gift card. Study procedures were approved by participating schools and the Boston College institutional review board.

Measures

GSA Experiences: As in previous studies addressing activities undertaken by GSAs as a group, we considered each GSA's level of support/socializing, activism, and resource provision by calculating the mean responses of members in those GSAs on these three dimensions using the GSA Involvement scale [20]. At Wave 2, students responded to the prompt, 'From November until now, how much do you personally feel 'you experienced' in your GSA...' (0 = Not at all; 4 = A lot) [10]. Scores were

calculated for each of three subscales: support (7 items; $\alpha = .86$), information/resources (3 items; $\alpha = .76$) and advocacy (7 items; $\alpha = .88$). Intraclass correlation coefficients (ICC) were .04 for support, .08 for information/resources and .10 for advocacy.

At Wave 2, advisors responded to three items assessing the frequency with which their GSA discussed substance use (e.g. ‘From November until now, how often did your GSA discuss these topics?.. Alcohol or drinking’; 1 = Never, 5 = More than 5 times). We used the mean of these items to indicate the frequency of substance use discussions. For GSAs with multiple advisors, we used the response with the highest mean because some advisors may have missed meetings where substance use was discussed.

Outcomes: To assess confidence in accessing school-based substance use resources, students were asked, ‘Over the past month, how confident have you been that you could find information, resources, or support ‘at school’ related to alcohol, tobacco, or other drug use?’ (1 = Not at all confident; 5 = Very confident).

To assess awareness of substance use resources, students were asked to ‘name the places or people ‘at school’ where you know you could get information, resources, or support about alcohol, tobacco, or other drug use’. Three research assistants classified responses into 18 resource categories (e.g. ‘clubs’, ‘individual peers’) and 6 categories reflecting non-resource responses (e.g. ‘I don’t know’), which were developed by reviewing a subset of responses (see [Table II](#)). Conflicts were resolved by consensus coding. The number of resources listed was defined as the number of resource categories addressed in a student’s open-ended response.

Finally, to assess comfort accessing the school-based substance use resources of which they were aware, students were asked, ‘Over the past month, how comfortable have you felt about going to these places or people?’ (1 = Not at all; 5 = Very).

Students’ confidence, comfort and awareness of resources in the community were assessed using parallel items specifying resources ‘in your neighborhood/town’.

Covariates: Students selected one or more gender identities from the terms ‘male’, ‘female’, ‘transgender’ and ‘genderqueer’ (and, in the GSA sample only, ‘non-binary’ and ‘gender fluid’) or could write in additional terms. Students were grouped into three categories: presumed cisgender boys (‘male’ only), presumed cisgender girls (‘female’ only) and gender minority students (any other combination).

For sexual orientation identity, students were provided with the options ‘gay or lesbian’, ‘bisexual’, ‘heterosexual/straight’ and ‘questioning’ (and, in the GSA sample only, ‘pansexual’, ‘asexual’ and ‘queer’). Students could also write in additional terms. Students were classified as sexual minorities if they reported a sexual orientation identity other than ‘heterosexual/straight’.

Students reported their age in years, race/ethnicity (White, non-Hispanic; Black or African American; Asian/Asian American; Latino/a; Bi/multi-racial; Native American; Middle Eastern/Arab or Arab American; write-in), grade in school and free/reduced-price lunch status.

Students were also asked to list up to four clubs of which they were current members; the number listed was used as a measure of non-GSA club involvement.

At Wave 2, GSA members reported their overall level of engagement in the GSA during the school year using the 5-item GSA Engagement scale (e.g. ‘I participated in conversations at GSA meetings’; 0 = Never; 4 = Very often; $\alpha = .88$) [21]. Overall student engagement within a GSA was defined as the mean engagement score among members of that GSA (ICC = .03).

The frequency of student alcohol, cigarette and e-cigarette use was assessed at Wave 1. Students were asked, referring to the past 6 months, ‘How often did you drink beer, wine, or liquor?’; ‘How often did you smoke cigarettes?’; and ‘How often did you use e-cigarettes?’ Due to low prevalence, responses were dichotomized (any versus no substance use).

Analysis

Missing values were multiply imputed [22]. Missingness was less than 2% for most variables

Table II. Proportion of students listing specific categories of potential substance use resources among members of Massachusetts high school GSAs and comparison students sampled from classrooms in the same schools, $N = 1900$

Sources of support	Nonmember students ($n = 1513$), %	GSA members ($n = 357$), %	Adjusted risk ratio (reference = nonmember students), (95% CI), P
In-school sources			
Administration	73.4	69.0	0.95 (0.83, 1.09), $P = 0.463$
Health office staff	31.6	34.0	1.19 (0.89, 1.61), $P = 0.246$
Clubs	2.9	8.4	3.83 (1.67, 8.79), $P = 0.002$
Educational materials	3.8	4.1	1.07 (0.47, 2.42), $P = 0.874$
Events (e.g. assembly)	0.5	0.0	^a
Formal places (e.g. health office)	71.8	71.8	1.05 (0.93, 1.18), $P = 0.424$
Individual adults	11.5	18.8	1.55 (0.99, 2.41), $P = 0.056$
Individual peers	2.7	5.3	1.08 (0.36, 3.23), $P = 0.897$
Informal places (e.g. bulletin board)	2.4	0.0	^a
Peers	9.7	14.9	2.02 (1.18, 3.46), $P = 0.011$
Teacher or coach	58.5	60.0	1.07 (0.91, 1.25), $P = 0.447$
Out-of-school sources			
Educational materials	1.5	2.1	1.19 (0.07, 20.24), $P = 0.905$
Family	58.9	48.1	0.86 (0.71, 1.05), $P = 0.148$
Friends or romantic partners	39.8	24.9	0.69 (0.49, 0.96), $P = 0.031$
Places (e.g. YMCA)	51.8	58.4	1.22 (1.02, 1.47), $P = 0.029$
Community resources	3.9	7.8	1.45 (0.57, 3.67), $P = 0.438$
Self-help (e.g. online resources)	10.2	11.2	1.36 (0.79, 2.32), $P = 0.265$
Service providers (e.g. therapist)	29.3	25.1	0.84 (0.60, 1.18), $P = 0.327$
Other responses			
‘Everywhere’	1.5	0.0	^a
‘Everyone’	1.3	0.0	^a
‘Don’t know’	14.5	23.0	1.27 (0.86, 1.87), $P = 0.230$
None	9.6	10.1	1.22 (0.58, 2.58), $P = 0.601$

Note. P -values and adjusted risk ratios are based on generalized estimating equation models and account for clustering within schools. Risk ratios are adjusted for: non-GSA club participation (count), gender group (i.e. cisgender male, cisgender female [reference], gender minority); sexual orientation identity (i.e. heterosexual [reference], sexual minority); race (i.e. White students, students of color [reference]); free/reduced price lunch status (i.e. yes, no [reference], not sure); nativity (i.e. born in United States [reference], born outside United States) and age (years).

^aRisk ratios were not calculated for sources of support not reported by any GSA members.

but greater for the number of substance use resources named (school-based resources: 5.5% in the GSA sample and 6.3% in the non-GSA sample; community-based resources: 15.0% in the GSA sample and 13.2% in the non-GSA sample). Because it was not clear whether leaving these items blank reflected item missingness or knowledge of 0 resources, we conducted a sensitivity analysis in which a value of 0 was assigned to blank responses. Differences in the results were minimal ([Supplementary data](#) are available at *HEAL* online).

Using generalized estimating equation (GEE) models to address clustering by school, we first calculated risk ratios comparing the probability of listing each resource type among GSA members versus nonmembers, adjusted for student characteristics (described below). Subsequently, we fit GEEs comparing levels of each of the six outcomes (comfort accessing resources, confidence in finding resources, and number of resource categories listed, measured at Wave 2, assessed separately for school- and community-based resources) between GSA members and nonmembers. Models adjusted for the

baseline value of the outcome and for membership in other clubs (count), sexual orientation identity (sexual minority or heterosexual), free/reduced-price lunch status, gender group (cisgender boys, cisgender girls or gender minority students), nativity (born within or outside the United States), race/ethnicity (student of color or White) and age in years. To test for effect modification by recent substance use, we included a main effect term for alcohol, cigarette and/or e-cigarette use in the prior 6 months (0 = none, 1 = at least once) and an interaction term between this variable and GSA membership. Because of the large number of outcomes (6), we employed the Holm method for multiple testing [23]; tests of each predictor across all outcomes were considered a family of tests.

Finally, among GSA members, we fit GEE models in which the GSA-level frequency of each activity/discussion type predicted the individual-level Wave 2 substance use resource outcomes, with separate models for each predictor/outcome combination. These models were adjusted for student characteristics and the mean level of engagement among students in the GSA.

For each analysis, we conducted a secondary analysis restricted to LGBTQ+ students (Supplementary data are available at *HEAL* online). Point estimates were generally similar to those from the primary analyses, but most hypothesis tests comparing GSA members to nonmembers were non-significant, likely due to the limited number of LGBTQ+ students in the nonmember sample ($n = 139$).

Results

The frequencies with which GSA members and nonmembers listed each category of substance use resource are presented in Table II. In covariate-adjusted analyses, GSA members were less likely than nonmembers to list friends or romantic partners but more likely than nonmembers to list peers, school-based clubs and non-school places. Other comparisons were non-significant.

Table III presents estimates of differences in substance use resource outcomes by GSA membership, adjusted for baseline levels, demographic factors and membership in other clubs. Figure 1 depicts interactions between GSA membership and substance use. After adjustment for multiple comparisons, GSA membership was not significantly associated with any outcomes among students without recent substance use at Wave 1. However, there was a significant positive interaction between GSA membership and recent substance use for comfort accessing school-based resources ($b = 0.45$, 95% CI: 0.15, 0.74, $P = 0.003$), confidence about finding school-based resources ($b = 0.33$, 95% CI: 0.08, 0.59, $P = 0.010$) and confidence about finding community-based resources ($b = 0.37$, 95% CI: 0.12, 0.61, $P = 0.003$). Furthermore, summing the interaction and main effect terms indicated that, among students with recent substance use at Wave 1, GSA membership was associated with greater comfort accessing school-based substance use resources ($b = 0.70$, 95% CI: 0.42, 0.98, $P < 0.001$); confidence about finding school-based substance use resources ($b = 0.34$, 95% CI: 0.08, 0.59, $P = 0.010$); and number of school-based substance use resources listed ($b = 0.34$, 95% CI: 0.08, 0.61, $P = 0.011$). GSA membership was not significantly associated with the community-based substance use resource outcomes regardless of recent substance use.

Estimates of the association between GSA-level activities/discussions and members' substance use resource outcomes are presented in Table IV. After adjustment for multiple comparisons, GSA-level social support was associated with more comfort accessing school-based substance use resources. However, GSA-level social support was not significantly associated with the number of school-based resources listed or with confidence about finding school-based resources. GSA-level advocacy, resource discussions and substance use discussions were not significantly associated with members' school-based substance use resource outcomes.

Turning to community-based outcomes, GSA-level social support was positively associated with comfort accessing community-based substance use

Table III. Coefficients from adjusted generalized estimating equation models for spring term self-reported substance use resource outcomes among members of Massachusetts high-school GSAs and comparison students sampled from classrooms in the same schools, N = 1900

Variables	School resources			Community resources			
	Comfort resources b (95% CI), P	accessing resources b (95% CI), P	Confidence in resources b (95% CI), P	finding resources listed b (95% CI), P	accessing resources b (95% CI), P	Confidence in resources b (95% CI), P	finding resources listed b (95% CI), P
GSA membership (ref = nonmember)							
GSA member	0.26 (0.01, 0.50), P = 0.044	0.01 (-0.19, 0.21), P = 0.924	0.30 (0.06, 0.53), P = 0.014	0.05 (-0.19, 0.28), P = 0.694	-0.12 (-0.36, 0.11), P = 0.301	0.04 (-0.09, 0.17), P = 0.588	
Substance use (ref = no substance use)							
Any substance use at time 1	-0.62 (-0.99, -0.24), P = 0.001 ^a	-0.56 (-0.87, -0.25), P < 0.001 ^a	-0.10 (-0.42, 0.22), P = 0.544	-0.37 (-0.69, -0.06), P = 0.021	-0.59 (-0.91, -0.28), P < 0.001 ^a	-0.04 (-0.24, 0.17), P = 0.714	
Any substance use x GSA sample	0.45 (0.15, 0.74), P = 0.003 ^a	0.33 (0.08, 0.59), P = 0.010 ^a	0.04 (-0.20, 0.28), P = 0.739	0.21 (-0.05, 0.46), P = 0.109	0.37 (0.12, 0.61), P = 0.003 ^a	0.00 (-0.15, 0.16), P = 0.981	
Outcome value at time 1	0.40 (0.36, 0.44), P < 0.001 ^a	0.39 (0.36, 0.43), P < 0.001 ^a	0.24 (0.18, 0.30), P < 0.001 ^a	0.41 (0.37, 0.45), P < 0.001 ^a	0.40 (0.36, 0.43), P < 0.001 ^a	0.24 (0.19, 0.30), P < 0.001 ^a	
Non-GSA club participation	0.04 (-0.00, 0.07), P = 0.081	0.04 (0.01, 0.07), P = 0.007 ^a	0.05 (0.01, 0.09), P = 0.008 ^a	0.06 (0.02, 0.10), P = 0.007 ^a	0.03 (-0.01, 0.08), P = 0.152	0.03 (0.01, 0.05), P = 0.011 ^a	
Sexual orientation identity (ref = heterosexual)							
Sexual minority identity	-0.22 (-0.41, -0.02), P = 0.031	-0.17 (-0.33, -0.01), P = 0.042	-0.01 (-0.13, 0.12), P = 0.934	-0.09 (-0.28, 0.11), P = 0.380	-0.13 (-0.30, 0.04), P = 0.138	0.01 (-0.09, 0.10), P = 0.875	
FRPL status (ref = no FRPL)							
Receives free or reduced-price lunch	-0.01 (-0.17, 0.16), P = 0.947	-0.09 (-0.23, 0.06), P = 0.231	-0.05 (-0.18, 0.07), P = 0.416	-0.19 (-0.34, -0.04), P = 0.013	-0.10 (-0.26, 0.06), P = 0.207	-0.13 (-0.19, -0.07), P < 0.001 ^a	
Not sure	-0.06 (-0.24, 0.11), P = 0.484	-0.27 (-0.48, -0.06), P = 0.011	-0.09 (-0.27, 0.09), P = 0.306	-0.08 (-0.27, 0.10), P = 0.375	-0.15 (-0.33, 0.03), P = 0.098	-0.09 (-0.20, 0.02), P = 0.116	
Gender group (ref = cis female)							
Cis male	0.14 (0.02, 0.25), P = 0.021	0.07 (-0.02, 0.17), P = 0.119	-0.04 (-0.14, 0.06), P = 0.467	0.07 (-0.03, 0.17), P = 0.189	0.05 (-0.07, 0.17), P = 0.390	0.04 (-0.01, 0.09), P = 0.137	
Gender minority	-0.25 (-0.50, 0.01), P = 0.060	-0.02 (-0.27, 0.22), P = 0.863	-0.16 (-0.36, 0.05), P = 0.132	-0.36 (-0.54, -0.17), P < 0.001 ^a	-0.12 (-0.37, 0.13), P = 0.349	-0.12 (-0.26, 0.03), P = 0.119	
Nativity (ref = born in the United States)							
Born outside the United States	0.14 (-0.02, 0.30), P = 0.093	0.12 (-0.07, 0.31), P = 0.211	0.01 (-0.14, 0.15), P = 0.941	0.17 (-0.02, 0.37), P = 0.084	0.00 (-0.18, 0.19), P = 0.964	0.04 (-0.10, 0.18), P = 0.585	
Race/ethnicity (ref = students of color)							
White	0.08 (-0.05, 0.21), P = 0.231	0.15 (0.01, 0.28), P = 0.031	0.07 (-0.06, 0.20), P = 0.270	0.12 (-0.02, 0.26), P = 0.098	0.19 (0.03, 0.36), P = 0.023	0.05 (-0.05, 0.15), P = 0.310	

(continued)

Table III. (continued)

Variables	School resources			Community resources		
	Comfort resources <i>b</i> (95% CI), <i>P</i>	Confidence in accessing resources <i>b</i> (95% CI), <i>P</i>	Number of resources listed in finding <i>b</i> (95% CI), <i>P</i>	Comfort accessing resources <i>b</i> (95% CI), <i>P</i>	Confidence in resources <i>b</i> (95% CI), <i>P</i>	Number of resources listed in finding <i>b</i> (95% CI), <i>P</i>
Age (in years)	-0.02 (-0.06, 0.02), <i>P</i> = 0.236	-0.03 (-0.08, 0.03), <i>P</i> = 0.341	-0.05 (-0.10, -0.00), <i>P</i> = 0.039	-0.04 (-0.09, 0.01), <i>P</i> = 0.167	-0.02 (-0.07, 0.02), <i>P</i> = 0.304	-0.02 (-0.04, 0.01), <i>P</i> = 0.220

Note. FRPL, free or reduced-price lunch. Results are based on generalized estimating equation models.

*Statistical significance after applying the Holm method for multiple comparisons, with tests of each predictor across all six outcomes treated as a family of tests.

resources, confidence about finding community-based resources and the number of resources listed. GSA-level advocacy activities were also positively associated with all three outcomes. GSA-level resource discussions were positively associated with comfort accessing community-based resources but not with confidence or the number of resources listed. GSA-level substance use discussions were not significantly associated with any of the community-based resource outcomes.

Discussion

Building on previous work positioning GSAs as spaces for informal health education and positive youth development, this study is among the first to identify relationships between high-school students' GSA involvement and their comfort, confidence and awareness regarding substance use resources in their schools and communities. We found that GSA membership buffered the negative association between recent substance use and self-rated comfort and confidence accessing substance use resources—and that, among students with recent substance use, membership was associated with more comfort, confidence and awareness regarding school-based substance use resources. Furthermore, in GSAs where members reported perceiving more social support and engaging in more advocacy, members reported higher levels of comfort, confidence and awareness regarding community-based substance use resources; students in GSAs where members perceived more social support also reported greater comfort regarding school-based substance use resources.

These findings highlight the possibility that GSAs help adolescents access supports for substance use concerns, and they suggest specific ways in which this may occur. First, while students with recent substance use may perceive school-based resources as stigmatizing, GSA experiences—such as nonjudgmental support from an adult advisor—may promote more positive views of these resources. Second, GSA-based experiences, notably social support and advocacy, may help students develop

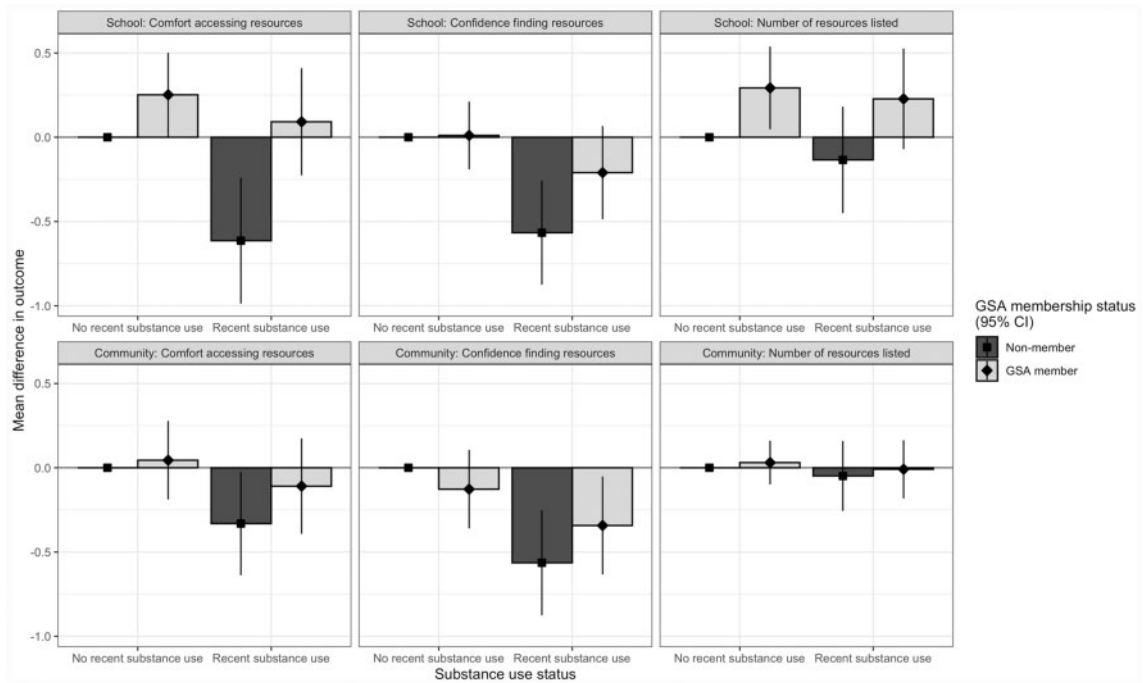


Fig. 1. Interaction plots for the association between GSA membership and each substance use resource outcome among students with and without recent substance use.

general characteristics (e.g. self-efficacy) that engender comfort, confidence and awareness regarding substance use resources. This scenario is consistent with a positive youth development perspective on GSA involvement and with prior studies linking GSA-based social support and advocacy to beneficial psychosocial characteristics [10, 11]. Future studies should explore the extent to which specific psychosocial characteristics mediate associations between GSA involvement and substance use resource outcomes.

These results also have important implications for GSA advisors and for school- and community-based health service providers. By indicating that GSA members are particularly open to school-based substance use supports, the findings bolster proposals to supplement GSAs' informal health discussions with structured health programming [13]. The fact that associations were present only for youth with recent substance use makes clear

that this programming should address the needs of adolescents currently using substances. Partnerships between GSAs and other health promotion efforts (e.g. school health centers) could be particularly beneficial. For instance, school health staff could facilitate substance use discussions during GSA meetings, and GSA members could consult with health staff on making their services welcoming to LGBTQ+ students. GSA members could also be trained as peer educators to address elevated substance use risks among LGBTQ+ students [2–4]. With respect to community-based resources, GSA advisors and service providers should develop referral relationships for students with substance use concerns.

These results should be interpreted in light of school health and substance use prevention practices in Massachusetts, the setting for this study. Compared to other states, Massachusetts public secondary schools are more likely to have a full-time

Table IV. Adjusted associations between GSA-level activity/discussion frequencies and spring term self-reported substance use resource outcomes among students in Massachusetts high school GSAs ($n = 357$) based on generalized estimating equation models

Variables	School resources			Community resources		
	Comfort access- ing resources	Confidence finding resources	in Number of resources listed	Comfort access- ing resources	Confidence finding resources	in Number of resources listed
	<i>b</i> (95% CI), <i>P</i>	<i>b</i> (95% CI), <i>P</i>	<i>b</i> (95% CI), <i>P</i>	<i>b</i> (95% CI), <i>P</i>	<i>b</i> (95% CI), <i>P</i>	<i>b</i> (95% CI), <i>P</i>
Social support	0.66 (0.15, 1.17), <i>P</i> = 0.011 ^a	0.51 (−0.06, 1.07), <i>P</i> = 0.077	0.29 (−0.26, 0.85), <i>P</i> = 0.298	0.91 (0.34, 1.48), <i>P</i> = 0.002 ^a	1.17 (0.61, 1.73), <i>P</i> < 0.001 ^a	0.52 (0.17, 0.87), <i>P</i> = 0.004 ^a
Resources	0.24 (−0.02, 0.50), <i>P</i> = 0.069	0.08 (−0.23, 0.39), <i>P</i> = 0.601	0.06 (−0.21, 0.33), <i>P</i> = 0.664	0.51 (0.22, 0.79), <i>P</i> = 0.001 ^a	0.38 (0.06, 0.70), <i>P</i> = 0.019	0.24 (0.04, 0.44), <i>P</i> = 0.019
Advocacy	0.28 (0.03, 0.54), <i>P</i> = 0.030	0.16 (−0.13, 0.45), <i>P</i> = 0.269	0.08 (−0.28, 0.44), <i>P</i> = 0.653	0.75 (0.47, 1.03), <i>P</i> < 0.001 ^a	0.65 (0.31, 1.00), <i>P</i> < 0.001 ^a	0.35 (0.14, 0.57), <i>P</i> = 0.001 ^a
Sub. use discussions	−0.01 (−0.15, 0.14), <i>P</i> = 0.938	0.02 (−0.16, 0.20), <i>P</i> = 0.829	0.11 (−0.01, 0.23), <i>P</i> = 0.062	−0.02 (−0.25, 0.22), <i>P</i> = 0.898	0.03 (−0.19, 0.25), <i>P</i> = 0.789	0.05 (−0.04, 0.15), <i>P</i> = 0.279

Note. GSA-level activity/discussion frequencies are based on mean student reports (support, resources, and advocacy) or advisor reports (substance use discussions). Each result is based on a separate generalized estimating equation model and is adjusted for mean student engagement within the GSA and the following individual characteristics: non-GSA club participation (count), gender group (i.e. cisgender male, cisgender female [reference], gender minority); sexual orientation identity (i.e. heterosexual [reference], sexual minority); race (i.e. White students, students of color [reference]); free/reduced price lunch status (i.e. yes, no [reference], not sure); nativity (i.e. born in United States [reference], born outside United States) and age (years). Results for each GSA activity are not adjusted for levels of the other activities.

^aStatistical significance after applying the Holm method for multiple comparisons, with tests of each predictor across all six outcomes treated as a family of tests.

school nurse and, as mandated by state law, to screen students for substance use disorders [8, 24]. Massachusetts also has a history of influential substance use prevention efforts, including media campaigns and youth leadership programs [25, 26]. Indeed, adolescent tobacco use is less prevalent in Massachusetts than nationally, although vaping and alcohol use are not [27]. Moreover, more than 72% of Massachusetts public secondary schools report helping students access off-campus health services experienced with LGBTQ+ youth, and 61% of schools' lead health educators report training in working with LGBTQ+ students, considerably above US state medians [8]. These differences may reflect relatively high awareness of LGBTQ+ students' needs and availability of LGBTQ+-affirming services. These factors may have influenced our participants' anticipated sources of support and, potentially, the relationship between GSA involvement and substance use resource outcomes. Future

studies should assess whether the present findings extend to other geographic areas.

This study is among the first to describe potential sources of substance use support that students generated without a preset list of responses. Questionnaires in previous studies have typically focused on interpersonal sources of support, e.g. parents or friends [5, 6]. In our data, 87% of participants listed at least one non-interpersonal resource, such as a place (e.g. YMCA) or online resource. Future studies of substance use help-seeking should consider these resources alongside interpersonal sources of support for a more refined indication of where adolescents seek support.

Additional strengths of the present study include attention to two distinct facets of GSA participation (membership and activities) and indicators of students' relationships to substance use resources across two different settings (school and community). Students were drawn from a diverse set of 38

schools, and the longitudinal design reduced the threat of reverse causation in the membership analysis.

This study also has several limitations. Possible unmeasured confounding precludes inferring that GSA experiences causally affected the substance use outcomes. Our findings may not be generalizable to other areas or to all Massachusetts schools with GSAs. Furthermore, we did not directly address differences between LGBTQ+ and non-LGBTQ+ adolescents or among subgroups of LGBTQ+ adolescents.

The present study found that GSA membership buffered the negative association between recent substance use and several outcomes—and, for students with recent substance use, was associated with higher levels of comfort, confidence and awareness regarding school-based substance use resources. Furthermore, students in GSAs where members, on an average, reported more perceived social support and more advocacy activities had higher levels of comfort, confidence and awareness regarding community-based substance use resources. These results suggest that GSA members may be an ideal population for school-based substance use prevention, a strategy that would also address substance use disparities for LGBTQ+ adolescents. The results also point to social support and advocacy as possible ‘active ingredients’ in the link between GSA involvement and substance use resource outcomes. For adolescent substance use prevention programs, these findings should draw attention to GSAs as potential partners. For GSA members and advisors, the findings confirm the importance of social support and advocacy activities in their efforts to promote health and well-being for all adolescents.

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Conflict of interest statement

None declared.

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