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## ASSOCIATIONS OF A MULTILEVEL SCHOOL HEALTH PROGRAM AND HEALTH OUTCOMES AMONG LESBIAN, GAY, AND BISEXUAL YOUTH

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### Abstract

Lesbian, gay, and bisexual (LGB) adolescents are often at higher risk than their heterosexual peers for adverse sexual health, violence, mental health, and substance use outcomes. Schools are a vital resource for enhancing protective behaviors and reducing risk behaviors. Sixteen school districts selected schools to implement a sexual health program (exposed) or usual programming (unexposed). We analyzed LGB student health outcomes using 2015 and 2017 Youth Risk Behavior Surveys. Analyses compared LGB student health outcomes by exposure status across time points using a multilevel approach. Program exposure was associated with decreased odds of ever having sex, ever testing for HIV, and using effective hormonal birth control, and an increased odds of condom use. There were no significant findings among secondary violence, mental health, and substance use outcomes. This evaluation highlights the potential for schools to reduce sexual risk behaviors among LGB youth, and opportunities to improve access to health services.

### Keywords

sexual minority youth; condom use; sexual health; school health; adolescent health

### INTRODUCTION

Health risk behaviors in adolescence, including sexual risk behaviors and substance use, are associated with risk for violence victimization and poor mental health and can in turn increase risk for HIV, other sexually transmitted infections, and unintended pregnancy (Division of Adolescent and School Health, 2018). The social-ecological model describes how factors across the social ecology (e.g., individual, interpersonal, community) shape individual behaviors and experiences throughout life (McLeroy et al., 1988). Schools and school districts are important aspects of adolescents' social ecology, often implementing anti-bullying and harassment policies and providing social and emotional education

alongside standard academic education. As such, schools present a unique opportunity to promote positive health behaviors among a large number of adolescents and prevent adverse health outcomes (National Center for Education Statistics, 2019).

Lesbian, gay, bisexual, transgender, and queer/questioning (LGBTQ) adolescents face elevated health risks compared to their cisgender, heterosexual peers (Johns et al., 2019). Studies among LGBTQ youth consistently describe increased risk for sexual risk behaviors, feeling unsafe at school, substance use, and poor mental health and suicide compared to heterosexual youth (Amos et al., 2020; Johns et al., 2018, 2019, 2020; Kann et al., 2016). These increases in risk are largely attributed to minority stress, wherein individuals from a socially marginalized group, such as LGBTQ youth, may experience, internalize, and expect discrimination in their daily lives, leading to increased risks for health risk behaviors and experiences (Hatzenbuehler, 2009; Hatzenbuehler et al., 2013; Johns et al., 2019; Meyer & Frost, 2012). These stressors may occur at various levels of the social ecology (e.g., interpersonal bullying, discriminatory policies) underscoring the need for multilevel interventions to support LGBTQ adolescents. Beneficial strategies for LGBTQ adolescents include implementing anti-bullying school policies, offering student-led clubs such as gay-straight or genders and sexualities alliances (GSAs), identifying safe spaces, and providing professional development to school staff on practices to support LGBTQ youth (Day et al., 2019; Johns et al., 2019; Marx & Kettrey, 2016).

Between August 2013 and July 2018, the Centers for Disease Control and Prevention's (CDC) Division of Adolescent and School Health (DASH) funded 17 school districts across the U.S. to implement a school-based, multilevel, multi-strategy prevention program to address student health. The program (Division of Adolescent and School Health, 2014) included three main strategies: (1) sexual health education—strengthening policies and educational practices to support health education through professional development, technical assistance, and follow-up teacher support; (2) sexual health services—increasing availability and student awareness of sexual health services, and providing guidance and support to empower staff to identify student needs and refer to appropriate services; and (3) safe and supportive school environments—including promoting anti-bullying and sexual harassment policies and practices, increasing school connectedness, enhancing parental engagement with schools, and fostering school environments to support programming for disproportionately affected populations, including LGBTQ youth. Districts decided how and when required activities were implemented according to local needs and resources and were required to focus their efforts on a set of schools (exposed schools), selected for high adolescent sexually transmitted infection (STI), pregnancy, or sexual risk behavior rates. CDC provided districts with technical assistance and monitoring. Districts further provided exposed schools with tailored technical assistance and follow-up. Unexposed schools are those schools in the same districts that were not the focus of the CDC program and may have implemented similar activities but did not receive the same supports as exposed schools. A detailed description of program activities is provided in Table 1.

Fostering school safety and support is beneficial and important for LGBTQ youth, and positive school climates may protect against adverse health outcomes (Bradshaw et al., 2014; Colvin et al., 2019; DiClemente et al., 2005; Reaves et al., 2018). CDC's guidance

for funded districts identified a range of LGBTQ- supportive policies and practices across the three main program strategies for districts and schools to adopt. These policies and practices included: anti-LGBTQ bullying and harassment policies; teacher professional development on supporting LGBTQ youth; implementing curricula relevant to LGBTQ youth; and providing supplementary materials for LGBTQ students and their parents (Division of Adolescent and School Health, 2014). Districts were encouraged to provide LGBTQ students with support through activities such as implementing and promoting GSAs or other similar youth-led clubs. Districts were given discretion in the implementation and timing of these recommended LGBTQ-supportive activities based on local needs and resources.

In the program main effects evaluation, we found that program exposure was associated with decreases in several key sexual risk, violence victimization, and substance use outcomes, though there was also a decrease in use of hormonal birth control relative to unexposed schools (Robin et al., 2022). As part of a broader evaluation of this multilevel, multistrategy school-based adolescent health program, the present study examines the association between program exposure and sexual health and related health outcomes among lesbian, gay, and bisexual (LGB) youth, given that supporting and improving health among LGB youth was a key focus of the program.

## METHODS

### DATA COLLECTION

All 17 funded districts were required to participate in CDC's 2015 and 2017 Youth Risk Behavior Survey (YRBS). The YRBS was administered biennially using a two-stage cluster sample design among public high school students in grades 9–12. Students completed a self-administered questionnaire covering a range of health behaviors and experiences during a regular class period using computer-scannable answer sheets. In participating schools, one or two classrooms in each grade from either a required subject (e.g., English, social studies) or a required period (e.g., homeroom, second period) were randomly sampled. All students in sampled classrooms were eligible to participate. Participation was anonymous and voluntary, and all local procedures for parental consent were followed. Use of YRBS data in this current study was approved by CDC as research not involving identifiable human subjects.

Among funded districts, all exposed schools were included in YRBS administration in 2015 and 2017. In 11 districts, all high schools were surveyed during both years and in the remaining 6, unexposed schools were sampled. The 17 districts are located in District of Columbia, California, Florida, Illinois, Massachusetts, New York, Ohio, Pennsylvania, Tennessee, and Texas. The analytic sample included districts with an overall response rate of at least 60% (an average of school and student response rates), based on a standard YRBS response rate threshold (Underwood et al., 2020). One district was excluded from the analytic sample due to a low response rate of 20% in 2015. The remaining 16 district response rates ranged from 72% to 86% with an average of 75% in 2015 and from 63% to 89% with an average of 76% in 2017.

## PARTICIPANTS

The initial sample consisted of 104,640 students in 17 districts. After excluding one district for low response rate, the sample consisted of 101,728 students with 46,966 in exposed schools ( $n = 237$ ) and 54,762 in unexposed schools ( $n = 412$ ). The sample was restricted to students who reported a lesbian, gay, or bisexual sexual identity, resulting in a sample of 10,819 LGB students (exposed  $n = 5,308$ ; unexposed  $n = 5,511$ ). The YRBS does not include a standard gender identity item across all included sites and thus transgender students could not be identified for this analysis. Given that the 2014–2015 school year was the initial implementation of the program, we constructed a cross-sectional cohort by limiting our sample to 9th and 10th graders in the 2015 YRBS (since they were also included in the 2017 YRBS administration) and 10th–12th grade students in the 2017 YRBS since these students had at least one year of program exposure. The final analytic sample consisted of 7,038 LGB students, with 3,574 students in exposed schools ( $n = 233$ ) and 3,464 in unexposed schools ( $n = 371$ ).

## MEASURES

Demographic variables included: sexual identity, used to restrict analyses to LGB students; sex, dichotomized as male (reference) or female; race/ethnicity, categorized as non-Hispanic White (reference), non-Hispanic Black, Hispanic/Latino of any race, and other race; and grade level, categorized as 9th (reference), 10th, 11th, or 12th grade. Dichotomous indicators were included for year of YRBS administration (2015 as reference) and whether students attended an exposed or unexposed school (reference).

The following YRBS items assessed the primary sexual behavior outcomes for this study.

*Ever had sex.* “Have you ever had sexual intercourse?” with response options of “No” (reference) and “Yes.”

*Four or more sexual partners.* “During your life, with how many people have you had sexual intercourse?” with response options of “1 person,” “2 people,” “3 people,” “4 people,” “5 people,” and “6 or more people.” This item was dichotomized to 0 = 3 or fewer partners (reference) and 1 = 4 or more partners.

*Currently sexually active.* “During the past 3 months, with how many people did you have sexual intercourse?” with response options of “I have never had sexual intercourse,” “I have had sexual intercourse, but not during the past 3 months,” “1 person,” “2 people,” “3 people,” “4 people,” “5 people,” and “6 or more people.” This item was dichotomized to 0 = no sexual partners in the past 3 months (reference) and 1 = 1 or more sexual partner in the past 3 months.

*Ever tested for HIV.* “Have you ever been tested for HIV, the virus that causes AIDS? (Do not count tests done if you donated blood)?” with response options of “No” (reference) and “Yes.”

*Effective hormonal birth control use.* “The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy? (Select only one response.)”

Response options included “I have never had sexual intercourse,” “No method was used to prevent pregnancy,” “Birth control pills,” “Condoms,” “An IUD (such as Mirena or ParaGard) or implant (such as Implanon or Nexplanon),” “A shot (such as Depo-Provera), patch (such as Ortho Evra), or birth control ring (such as NuvaRing),” “Withdrawal or some other method,” and “Not sure.” This item was dichotomized to 0 = no hormonal birth control use (reference) and 1 = “Birth control pills,” “IUD or implant,” or “A shot, patch, or birth control ring.” This outcome was analyzed among youth who reported being currently sexually active.

*Condom use.* “The last time you had sexual intercourse, did you or your partner use a condom?” with response options of “I have never had sexual intercourse,” “No,” and “Yes.” This outcome was analyzed among youth who reported being currently sexually active with 0 = No (reference) and 1 = Yes.

*Dual use of condoms and effective hormonal birth control.* This outcome is a composite measure of the effective hormonal birth control and condom use items, dichotomized as 0 = used only one of or neither condoms or effective hormonal birth control (reference) and 1 = used both condoms and an effective hormonal birth control method. This outcome was analyzed among youth who reported being currently sexually active.

The following YRBS items assessed violence victimization, mental health, and substance use (secondary psychosocial outcomes).

*Did not go to school because of safety concerns.* “During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?” with response options of “0 days,” “1 day,” “2 or 3 days,” “4 or 5 days,” and “6 or more days.” This item was dichotomized to 0 = 0 days and 1 = 1 or more days.

*Threatened or injured with a weapon at school.* “During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?” with response options of “0 times,” “1 time,” “2 or 3 times,” “4 or 5 times,” “6 or 7 times,” “8 or 9 times,” “10 or 11 times,” and “12 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times.

*Forced sex.* “Have you ever been physically forced to have sexual intercourse when you did not want to?” with response options of “No” (reference) and “Yes.”

*Sexual dating violence.* “During the past 12 months, how many times did someone you were dating or going out with force you to do sexual things that you did not want to do? (Count such things as kissing, touching, or being physically forced to have sexual intercourse.)” with response options of “I did not date or go out with anyone during the past 12 months,” “0 times,” “1 time,” “2 or 3 times,” “4 or 5 times,” and “6 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times. Analysis of this outcome excluded youth who reported not dating anyone in the past 12 months.

*Physical dating violence.* “During the past 12 months, how many times did someone you were dating or going out with physically hurt you on purpose? (Count such things as being hit, slammed into something, or injured with an object or weapon.)” with response options of “I did not date or go out with anyone during the past 12 months,” “0 times,” “1 time,” “2 or 3 times,” “4 or 5 times,” and “6 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times. Analysis of this outcome excluded youth who reported not dating anyone in the past 12 months.

*Bullied at school.* “During the past 12 months, have you ever been bullied on school property?” with response options of “No” (reference) and “Yes.”

*Electronically bullied.* “During the past 12 months, have you ever been electronically bullied? (Count being bullied through texting, Instagram, Facebook, or other social media.)” with response options of “No” (reference) and “Yes.”

*Persistent feelings of sadness or hopelessness.* “During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?” with response options of “No” (reference) and “Yes.”

*Seriously considered attempting suicide.* “During the past 12 months, did you ever seriously consider attempting suicide?” with response options of “No” (reference) and “Yes.”

*Made a suicide plan.* “During the past 12 months, did you make a plan about how you would attempt suicide?” with response options of “No” (reference) and “Yes.”

*Attempted suicide.* “During the past 12 months, how many times did you actually attempt suicide?” with response options of “0 times,” “1 time,” “2 or 3 times,” “4 or 5 times,” and “6 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times.

*Injured in a suicide attempt.* “If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?” with response options of “No” (reference) and “Yes.”

*Injection drug use.* “During your life, how many times have you used a needle to inject any illegal drug into your body?” with response options of “0 times,” “1 time,” and “2 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times.

*Ever use marijuana.* “During your life, how many times have you used marijuana?” with response options of “0 times,” “1 or 2 times,” “3 to 9 times,” “10 to 19 times,” “20 to 39 times,” “40 to 99 times,” and “100 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times.

*Currently use marijuana.* “During the past 30 days, how many times did you use marijuana?” with response options of “0 times,” “1 or 2 times,” “3 to 9 times,” “10 to 19 times,” “20 to 39 times,” and “40 or more times.” This item was dichotomized to 0 = 0 times and 1 = 1 or more times.

Students also responded to the question “During your life, with whom have you had sexual contact?” with response options of “I have never had sexual contact,” males, females, and both males and females. This item was used to restrict analyses of condom use, birth control use, and dual use of condoms and birth control to youth most likely to need these protective methods. Analyses of hormonal birth control use and dual use of hormonal birth control and condoms included youth who reported any different-sex sexual contacts. Analysis of condom use at last sex included female youth who reported any different-sex sexual contacts and male youth.

## DATA ANALYSIS

Bivariate analyses tested for differences between exposed and unexposed schools in demographic and outcome variables within years using Pearson’s chi square. To assess the association between school exposure status and outcomes, we fit three-level multilevel logistic regression models for each sexual behavior and secondary psychosocial outcome accounting for the nesting of students (level 1) in schools (level 2) within school districts (level 3). Models included a multiplicative interaction term of exposure status and year to assess associations between program exposure and outcomes over time. Models controlled for sex, race/ethnicity, grade, year, and school exposure status as fixed effects. Results are presented as adjusted odds ratios (AOR) with corresponding 95% confidence intervals (CIs) based on robust standard errors. The analysis was prespecified, mirroring the approach and theoretical framework of the program main effect evaluation (Robin et al., 2022), and as such the authors did not correct for multiple comparisons. Statistical significance is defined using an  $\alpha = .05$  threshold. Analyses were conducted using Stata 16.0.

## RESULTS

### BIVARIATE ANALYSIS

Sample demographics are detailed in Table 2. Most youth in this analysis identified as bisexual (71%) and as female (73%), with no significant differences by exposure status in either year. Among youth who reported sex of their sexual contacts, approximately 40% reported sexual contact with both males and females, and roughly equal proportions reported sexual contact with only their same sex and only the different sex. There were no significant differences in the distribution of sex of sexual contacts by exposure status and year. The exposed school cohort had significantly higher proportion of Black students and lower proportions of White and Hispanic/Latino students in both years. In 2017, the exposed school cohort also had a significantly lower proportion of 10th-grade students and higher proportions of 11th-grade and 12th-grade students.

Exposed and unexposed school cohorts differed significantly in sexual health outcomes (Table 3). In both years, LGB students in exposed schools reported higher rates of ever having sex, 4+ lifetime sexual partners, being currently sexually active, and ever being tested for HIV, compared to LGB students in unexposed schools. In 2015, sexually active LGB students in exposed schools also had significantly lower rates of condom use during last sexual intercourse. We found no significant differences for hormonal birth control use or dual use of birth control and condoms. Among secondary outcomes, students in exposed

schools in 2015 and 2017 reported higher proportions of missing school due to safety concerns, being threatened or injured at school with a weapon, attempting suicide, and lifetime and current marijuana use. In 2015, higher proportions of youth in exposed schools reported forced sex, injurious suicide attempt, and ever using injection drugs. In 2017, youth in exposed schools had a higher proportion of reporting physical dating violence (Table 3).

## MULTIVARIABLE MODELING

We conducted multilevel logistic regressions to observe the association between program exposure and sexual behavior outcomes (Table 4). We adjusted models for sex, race/ethnicity, grade, exposure status, and year. We limited analyses of condom use, birth control use, and dual use of condoms and birth control by sex of sexual contacts to exclude youth least likely to need these risk reduction methods. Based on the exposure by year interaction term, we found that LGB students in exposed schools had reduced odds of ever having sex (AOR: 0.77, 95% CI [0.61, 0.97]), ever being tested for HIV (AOR: 0.80, 95% CI [0.68, 0.94]), and effective hormonal birth control use (AOR: 0.59, 95% CI [0.37, 0.94]), and increased odds of using a condom during last sexual intercourse (AOR: 1.75, 95% CI [1.06, 2.89]), compared to their peers in unexposed schools. We repeated these analyses for the secondary outcomes but found no significant association between program exposure and outcomes across years for any of the examined outcomes (see Supplementary Tables S1–S2).

## DISCUSSION

In this study, we examined the association between implementation of a multilevel, multicomponent adolescent school health program and sexual health behaviors and secondary psychosocial outcomes among a subsample of LGB students. The results provide evidence that this federally funded school health program was associated with a reduction in odds of ever having sex and increase in odds of condom use over time among LGB students. Program exposure, however, was associated with relative decreases in odds of HIV testing and hormonal birth control use over time and was not associated with secondary psychosocial outcomes, highlighting opportunities to strengthen district- and school-level strategies to connect students to sexual health services and tailor program components that address violence victimization, mental health, and substance use among LGB youth.

The results of this study show two promising findings: exposure was associated with decreased odds of students reporting ever having sexual intercourse and increased odds of condom use at last sex among female youth with different-sex partners and male youth. School-based sexual health interventions and education have been associated with delayed initiation of sexual activity among youth in previous studies (Mueller et al., 2008; Robin et al., 2022). Although there is evidence that comprehensive sexual health education can improve contraceptive use among male youth during first sexual intercourse (Mueller et al., 2008), the effectiveness of school-based interventions in addressing condom use among LGB youth is still relatively unexplored. One study examined condom use and HIV/AIDS education in school and found that such education was associated with condom use in non-sexual-minority male students but not for sexual minority male students. Sexual



minority male students in that study were also less likely than their non-sexual-minority male peers from the same schools to report receiving school-based HIV/AIDS education after controlling for absenteeism, which the authors theorized may suggest that the education in those schools may not have resonated with sexual minority male students (Rasberry et al., 2018). With the observed decline in condom use among youth nationwide (Division of Adolescent and School Health, 2018; Martin et al., 2019), the findings in the current study highlight the potential for multilevel, multicomponent, school-based interventions to increase condom use among LGB students.

In the current study, program exposure was associated with reduced odds of HIV testing and reduced odds of hormonal birth control use among youth with lifetime different-sex sexual contacts, which may suggest unintended program effects. It is possible that the relative decrease in birth control use may reflect youth better understanding how and when to use birth control based on their sexual contacts as a result of exposure to the program. Youth who report lifetime sexual contact with both sexes may decide not to use birth control because their current or most recent sexual contacts are of the same sex only. The relative decrease in birth control use, however, is consistent with findings of the previous program main effect evaluation and underscores potential opportunities to better understand this finding and strengthen activities addressing birth control use for all youth, including LGB youth (Robin et al., 2022). Birth control use and HIV testing are unique among the sexual behavior outcomes because they require connection to health services. School, district, and community contexts may influence the effectiveness of health services strategies. Adolescent access to confidential contraceptive services varies in the U.S. due to differences in state laws and local community availability of services that may impact uptake of hormonal birth control and other contraceptive use (Committee on Adolescent Health Care, 2017). Differences in implementation of program activities, including provision of school-based sexual health services or referral to community providers, could also impact adolescents' access to services. Implementing targeted strategies, including addressing barriers to health services (e.g., provider insensitivity, student confidentiality concerns), could increase access to these services and promote improved sexual health outcomes for LGB youth (McCarty-Caplan, 2013), such as increasing HIV testing and birth control use.

While the program main effect evaluation found improvements in psychosocial outcomes for all students, we found no significant program effect among this LGB student subsample on violence victimization, mental health, and substance use (Robin et al., 2022). These outcomes were not the primary focus of the program, which may have diminished potential intervention effects. Prior research among the districts in this study found that implementation of LGBTQ-supportive policies and practices is associated with school-wide reductions in psychosocial risk outcomes for both LGB and heterosexual youth (Kaczkowski et al., 2022). It is possible that the present study did not detect significant findings because we did not investigate policies and practices, but rather the effect of the program as a whole among this subgroup of LGB youth. Since districts were given discretion in the implementation of recommended LGBTQ-supportive activities, a lack of significant effects may be a result of the variation in LGBTQ-supportive activities across districts and schools and/or implementation of activities district-wide, rather than only in exposed schools. Prior research from the broader evaluation of this program also demonstrates a significant

moderating effect of number of program practices implemented by schools and program effects on health outcomes among youth. Specifically, increases in the number of practices to foster safe and supportive environments, the program strategy that included many of the recommended LGBTQ-supportive practices, were associated with enhanced program effects on feelings of safety, experiences of forced sex, and several sexual risk behaviors among the general student population (Li et al., 2022). Due to sample size constraints, we were unable to conduct similar analyses of implementation in this LGB student subsample.

A recent systematic review of LGBTQ youths' experiences in schools highlights several supportive practices that align with guidance given to districts, including implementation of GSAs, provision of professional development to school staff on supporting LGBTQ youth, and implementation of anti-LGBTQ bullying policies (Abreu et al., 2021; Division of Adolescent and School Health, 2014). Additional resources and evidence for suicide prevention can be found in CDC's suicide prevention technical package (Stone et al., 2017). Further research examining the availability of LGBTQ-supportive practices and health outcomes among LGB youth may explain the apparent lack of significant findings in this study. The lack of significant effects of the program on these psychosocial outcomes among LGB youth and the persistence of significantly increased prevalence of adverse psychosocial outcomes (e.g. attempted suicide, missed school due to safety concerns) in exposed schools compared to unexposed schools, however, highlight the need for additional research and programmatic attention to work to address these health inequities.

## LIMITATIONS

Study findings should be interpreted in context with the following limitations. First, bivariate analyses (Tables 2 and 3) demonstrate that exposed and unexposed schools are not equivalent groups and may not have parallel trends in outcomes. However, we stratified the sample by cohorts, used a multilevel approach to account for clustering of variance at the school and district levels, and adjusted for individual-level demographics to control for the non-equivalence of groups.

Use of the YRBS to assess health outcomes and behaviors among LGB students may introduce limitations that could be addressed with follow-up research more focused on this population of students. We were unable to identify transgender youth in analysis as the YRBS did not include a standard gender identity measure across districts, limiting conclusions we can draw for this group. Additionally, the reduced sample size precluded sex-stratified analyses and comparisons between lesbian, gay, and bisexual students, which may mask potential differences by sex and sexual identity. Approximately 70% of the sample identified their sex as female, which may limit generalizability and conclusions that can be drawn for male youth. It is possible that LGB students would have interpreted the sexual behavior items differently if the terminology specified anal or vaginal sex rather than sexual intercourse. While we do not anticipate there to be systematic differences in interpretation by school exposure status due to the lack of significant differences by sexual orientation and sex of sexual contacts (Table 2), more detailed measures appropriate to the study population may better inform levels of risk. The sex of sexual contacts item, used to narrow the analytic sample for condom and birth control use outcomes, reports on

lifetime sexual contacts, while the condom and birth control use items refer to the last sexual encounter. Students who report different-sex sexual contacts during their lifetime may report not using birth control at last sex because the last sexual partner was same-sex, which would not fit the criteria for risky sexual behavior in this analysis. This potentially overestimates the prevalence of risky sexual behavior (e.g., not using birth control). However, this analysis still found an increase in condom use relative to unexposed school students, and the relative decrease in birth control use may also be partially affected by the potential overestimation of risk. Future research can better address this measurement limitation and determine the factor(s) driving the relative decrease in birth control use. Despite limitations of the condom and birth control use outcomes among LGB youth in this study, the hormonal birth control findings are consistent with previous evaluation findings, highlighting a need for additional research investigating the mechanisms of this relationship. Additionally, the bullying measures are related to general experiences of bullying, though measuring homophobic/identity-based bullying may be more relevant for this population of students and may partially explain the lack of significant effects seen in this subsample.

Substance use analysis was limited to measures of lifetime and recent marijuana and lifetime injection drug use, which limits the possible conclusions about the program's associations with other substance use. Other substance use measures were excluded due to high degrees of missingness and small cell sizes. Additionally, while this study refers to exposed and unexposed schools, some program activities may have been implemented district-wide in both sets of schools. Program effects may therefore be attenuated when only examining exposure status. Prior research from the broader program evaluation has shown that there may be an incremental program effect, especially pertaining to the increased implementation of practices to foster safe and supportive school environments (Li et al., 2022). The sample size precluded analyses incorporating actual implementation of activities, and future research examining measures of implementation may better categorize program effects. This study was conducted using a pre-specified theoretical approach following the main effect evaluation (Robin et al., 2022) and, as such, did not correct for multiple comparisons. Findings for ever had sex and hormonal birth control use, however, are consistent with findings from the main effect evaluation, which increases our confidence in these findings. In addition, schools may have implemented other programs concurrently that may influence associations. Lastly, these findings are not generalizable outside of the schools and districts represented in this study.

Further research is warranted to explore the relative decreases in hormonal birth control use and HIV testing and the lack of significant findings across the secondary psychosocial outcomes. Additionally, research regarding implementation of activities can inform program tailoring in the future to better support the health, wellbeing, and education of LGBTQ youth. Future research can incorporate mixed-methods and implementation science frameworks to address the limitations of the present study, providing nuanced insight into the relative decline in hormonal birth control use and HIV testing and the apparent lack of significant findings across psychosocial outcomes.

This study found significant effects of program exposure on reducing LGB youth's odds of ever having sex and increasing odds of using a condom at last sexual intercourse,

while also finding reductions in odds of using effective hormonal birth control and HIV testing. Importantly, the findings suggest changes in odds of risk behaviors over time, but bivariate analyses (Table 3) show that absolute levels of risk remain higher in many cases among students in exposed schools. While this study demonstrates the potential for a federally funded, multilevel, school health program to improve health outcomes among LGB youth, more work is needed to eliminate health inequities. Future research evaluating implementation of program activities is needed to understand factors such as the timing and selection of activities at the school and district level that may most benefit LGBTQ youth.

## CONCLUSIONS

This study is part of a broader evaluation of a multilevel, federal health program implemented in schools and school districts across the U.S. Study findings provide evidence that implementation of a multilevel, multicomponent sexual health program can achieve population-level improvements in important sexual health behaviors among LGB youth, parallel to findings from the analysis of program main effects among the overall youth population; however, more research is still needed to support continued program refinement and improvement (Robin et al., 2022).

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1.**

**Program Strategies, Suggested Activities, and Implementation Level**

Strategy	Suggested Activities	Implementation Level	
		District	School
<b>Designate a district school health coordinator, and establish, strengthen, and maintain school health councils at the district level and school health teams at the school level.<sup>a</sup></b>			
<b>Exemplary sexual health education</b>			
Strengthen policies and guidance <sup>b</sup>	Assess, develop, monitor, and enforce policies and provide guidance on: <ul style="list-style-type: none"> <li>• health education requirements</li> <li>• classroom management strategies</li> <li>• selection of health education curricula</li> <li>• provision of health education materials</li> <li>• health education scope and sequence K-12</li> <li>• qualifications for health educators</li> <li>• instructional competencies for health education</li> </ul>	✓	
Strengthen staff capacity <sup>c</sup>	Provide professional development at least every 2 years for health education on: <ul style="list-style-type: none"> <li>• subject matter topics</li> <li>• delivering curricula</li> <li>• instructional competencies</li> <li>• policies and guidance on health education</li> </ul>	✓	✓
Increase student access to programs and services <sup>c</sup>	Select school health education curricula resulting in student behavioral change that are evidence-based and aligned with national, state, and district standards <ul style="list-style-type: none"> <li>• Deliver effective classroom sexual health education curricula to students</li> </ul>	✓	✓
Engage agency, parent, and community partners <sup>c</sup>	Engage and strengthen collaborations with parents, students, parent organizations, youth-serving community organizations, and local health agencies	✓	✓
<b>Sexual health services</b>			
Strengthen policies and guidance <sup>c</sup>	Assess, develop, monitor, and enforce policies and provide guidance on: <ul style="list-style-type: none"> <li>• what health services may be provided to students</li> <li>• contradictions among federal, state, and district policies</li> <li>• school and district policies on student absences related to seeking medical care</li> <li>• confidentiality policies at the federal, state, and district levels</li> <li>• guidance on student referrals to sexual health services</li> </ul>	✓	
Strengthen staff capacity <sup>c</sup>	Provide professional development at least every 2 years to increase student access to appropriate health services including: <ul style="list-style-type: none"> <li>• policies and guidance on health services provision to students including confidentiality</li> <li>• raising awareness of student need for and availability of services</li> <li>• guidance on providing referrals to students for on-site services or community health care providers</li> </ul>	✓	✓
Increase student access to programs and services <sup>c</sup>	Increase student access to appropriate health services through: <ul style="list-style-type: none"> <li>• social marketing campaigns</li> <li>• coordinating with condom availability programs</li> <li>• coordinating with school-based STI testing programs</li> <li>• providing referrals to on-site or community health care provider services</li> <li>• increasing billing and reimbursement for eligible services</li> </ul>	✓	✓
Engage agency, parent, and community partners <sup>c</sup>	Engage and strengthen collaborations with state and local health departments; third-party contractors for school-based clinics; local health care providers; child health insurance programs; federal and state health care exchanges; and local health care providers.	✓	✓
<b>Safe and Supportive Environments</b>			

Strategy	Suggested Activities	Implementation Level	
		District	School
Strengthen policies and guidance <sup>c</sup>	Assess, develop, monitor, and enforce policies and provide guidance on: <ul style="list-style-type: none"> <li>• anti-bullying and sexual harassment policies</li> <li>• school-wide bullying prevention programs</li> <li>• revise or eliminate zero-tolerance policies</li> <li>• classroom management policies and guidance; anti-discrimination policies</li> <li>• soliciting and receiving parent input on policies and programs.</li> </ul>	✓	
Strengthen staff capacity <sup>c</sup>	Provide professional development at least every 2 years for health education on: <ul style="list-style-type: none"> <li>• school anti-bullying policies and programs</li> <li>• classroom management strategies; school-wide positive behavior programs; strategies to increase student connection to schools and adults</li> <li>• strategies to increase parent communication with adolescents</li> <li>• strategies to involve parents in school policies, practices, and decision-making.</li> </ul>	✓	✓
Increase student access to programs and services <sup>c</sup>	Set positive behavior expectations school-wide <ul style="list-style-type: none"> <li>• Provide targeted and intensive behavioral interventions for students with behavioral problems</li> <li>• Use language, behaviors, and environmental cues to make adults more approachable by students</li> <li>• Link students to mentorship and service-learning opportunities</li> <li>• Support student participation in clubs and extracurricular activities</li> <li>• Promote gender and sexual-supportive programs and practices (e.g., gay-straight alliances)</li> <li>• Promote parent practices to enhance the health of students</li> <li>• Involve parents in school programs and decision-making</li> </ul>	✓	✓
Engage agency, parent, and community partners <sup>c</sup>	Engage and strengthen collaborations with parents, students, parent organizations, community youth-serving organizations, and local health departments	✓	✓

<sup>a</sup>Districts are required to engage in all the listed activities.

<sup>b</sup>Districts are required to assist all district secondary schools in all the listed activities.

<sup>c</sup>Districts are required to assist priority schools in one or more of the listed activities.

Note: This table is reused with permission from the original authors of the evaluation of the overall programmatic main effects.[19]



**Table 2.**

Demographic characteristics by year and program exposure status among cohorts of lesbian, gay, and bisexual youth (n=7038) in 16 school districts in the United States– Youth Risk Behavior Survey (YRBS) 2015 and 2017

Variables <sup>a</sup>	Total N (%)	2015 YRBS		<i>p</i> *	2017 YRBS		<i>p</i> *
		Exposed Schools <sup>b</sup>	Unexposed Schools <sup>c</sup>		Exposed Schools	Unexposed Schools	
		n (column %)			n (column %)		
<b>Sexual Identity</b>							
Lesbian/Gay	2032 (28.9%)	393 (27.6%)	319 (24.8%)	0.109	644 (31.6%)	676 (29.5%)	0.138
Bisexual	5006 (71.1%)	1033 (72.4%)	965 (75.2%)		1394 (68.4%)	1614 (70.5%)	
<b>Sex</b>							
Male	1836 (26.8%)	365 (26.3%)	311 (24.6%)	0.329	521 (26.5%)	639 (28.5%)	0.136
Female	5026 (73.2%)	1023 (73.7%)	951 (75.4%)		1449 (73.5%)	1603 (71.5%)	
<b>Race</b>							
White	898 (13.4%)	130 (9.6%)	171 (13.8%)	<0.001	256 (13.3%)	341 (15.5%)	<0.001
Non-Hispanic Black	2226 (33.2%)	549 (40.7%)	399 (32.2%)		717 (37.2%)	561 (25.6%)	
Hispanic/Latino	2648 (39.5%)	490 (36.3%)	493 (39.7%)		669 (34.7%)	996 (45.4%)	
Other	941 (14%)	180 (13.3%)	178 (14.3%)		285 (14.8%)	298 (13.6%)	
<b>Grade <sup>d</sup></b>							
9 <sup>th</sup>	1314 (19.3%)	691 (50.7%)	623 (50.2%)	0.802	-	-	0.001
10 <sup>th</sup>	2847 (41.9%)	671 (49.3%)	617 (49.8%)		675 (34.3%)	884 (39.7%)	
11 <sup>th</sup>	1391 (20.5%)	-	-		676 (34.3%)	715 (32.1%)	
12 <sup>th</sup>	1246 (18.3%)	-	-		618 (31.4%)	628 (28.2%)	

<sup>a</sup>Due to missing values in each variable, the sum of the columns may not add up to the total N.

<sup>b</sup>Exposed schools are a set of high-need schools, defined by high adolescent STI, pregnancy, or sexual risk behavior rates, that are the focus of the district's programmatic efforts.

<sup>c</sup>Unexposed schools are schools in the same districts which were not the focus of the CDC program and may have implemented similar activities but did not receive the same supports as exposed schools.

<sup>d</sup>Based on the data inclusion/exclusion criteria for this analysis, we only included 9th - 10th grade students for 2015 YRBS, and 10th - 12th graders for 2017 YRBS.

\* Pearson's chi-square test.

**Table 3.**

Health behavior and experience outcomes by year and program exposure status among cohorts of lesbian, gay, and bisexual youth (n=7038) in 16 school districts in the United States–Youth Risk Behavior Survey (YRBS) 2015 and 2017

Variables <sup>a</sup>	Total N (%)	2015 YRBS		<i>p</i> *	2017 YRBS		<i>p</i> *
		Exposed Schools <sup>b</sup>	Unexposed Schools <sup>c</sup>		Exposed Schools	Unexposed Schools	
		n (column %)			n (column %)		
Ever had sex	2453 (47.3%)	470 (47.4%)	356 (35%)	<0.001	794 (55.3%)	833 (47.8%)	<0.001
4+ Sexual partners, lifetime	647 (13%)	117 (12.5%)	80 (7.9%)	0.001	231 (17.5%)	219 (12.8%)	<0.001
Currently sexually active	1673 (32.8%)	308 (30.8%)	228 (22.4%)	<0.001	565 (40.5%)	572 (33.8%)	<0.001
Ever tested for HIV	1632 (26.8%)	340 (27.7%)	232 (21.1%)	<0.001	539 (30%)	521 (26.3%)	0.011
Hormonal birth control use <sup>a,d</sup>	255 (21.9%)	48 (21.1%)	28 (17.7%)	0.418	82 (21.1%)	97 (24.8%)	0.223
Condom use at last sex <sup>a,e</sup>	616 (48.6%)	100 (41.8%)	90 (53.9%)	0.017	213 (49.3%)	213 (49.7%)	0.919
Dual birth control and condom use <sup>a,d</sup>	71 (6.6%)	13 (6%)	10 (6.8%)	0.763	18 (5%)	30 (8.3%)	0.071
Did not go to school because of safety concerns	1101 (16.5%)	241 (18%)	159 (12.7%)	<0.001	360 (19.4%)	341 (15.4%)	0.001
Threatened or injured with a weapon at school	970 (14.2%)	222 (16.6%)	152 (12.6%)	0.005	328 (16.3%)	268 (11.8%)	<0.001
Forced sex	1007 (18.8%)	246 (20%)	123 (14.3%)	0.001	358 (20.4%)	280 (18.6%)	0.198
Sexual dating violence <sup>f</sup>	758 (18.9%)	186 (19.2%)	163 (20.2%)	0.604	189 (17.5%)	220 (19%)	0.349
Physical dating violence <sup>f</sup>	914 (20.2%)	210 (21.6%)	154 (19.1%)	0.198	299 (22.4%)	251 (17.7%)	0.002
Bullied at school	1579 (23.7%)	370 (27.5%)	328 (26.4%)	0.505	414 (21.8%)	467 (21.5%)	0.773
Electronically bullied	1449 (21.7%)	315 (23.4%)	260 (21.1%)	0.155	402 (21%)	472 (21.5%)	0.66
Persistent sadness & hopelessness	3585 (54.3%)	742 (55.5%)	667 (54.2%)	0.505	983 (52.6%)	1193 (55%)	0.13
Considered attempting suicide	2380 (35.8%)	505 (38.2%)	478 (38.7%)	0.806	648 (33.9%)	749 (34.4%)	0.739
Made a suicide plan	1564 (31.9%)	412 (36.6%)	273 (33.9%)	0.231	479 (28.9%)	400 (30.4%)	0.375
Attempted suicide	1581 (26.7%)	406 (34.6%)	275 (25.6%)	<0.001	467 (27.3%)	433 (22.4%)	0.001
Injured in a suicide attempt	449 (9.3%)	113 (13.4%)	86 (8.8%)	0.002	114 (9.5%)	136 (7.5%)	0.052
Lifetime injection drug use	362 (8.8%)	83 (11.7%)	44 (5.8%)	<0.001	104 (10.3%)	131 (8%)	0.05
Ever use marijuana	1910 (56.7%)	435 (60.6%)	297 (49.1%)	<0.001	614 (61.5%)	564 (53.8%)	<0.001
Currently use marijuana	2292 (35.5%)	485 (37.8%)	310 (26.1%)	<0.001	784 (42%)	713 (33.5%)	<0.001

\* Pearson's chi-square test

<sup>a</sup> Among youth who are currently sexually active

<sup>b</sup> Exposed schools are a set of high-need schools, defined by high adolescent STI, pregnancy, or sexual risk behavior rates, that are the focus of the district's programmatic efforts.

<sup>c</sup> Unexposed schools are schools in the same districts which were not the focus of the CDC program and may have implemented similar activities but did not receive the same supports as exposed schools.

<sup>d</sup> Among youth who report different sex sexual contacts

<sup>e</sup> Among female youth who report different sex sexual contacts and all male youth

<sup>f</sup> Among youth who dated or went out with someone during the 12 months before the survey

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**Table 4.**

Multilevel logistic regression models for sexual risk and protective behaviors, among cohorts of lesbian, gay and bisexual youth in exposed and unexposed schools in 16 school districts in the United States – Youth Risk Behavior Survey (YRBS) 2015 and 2017

	Ever had sex	4+ sex partners	Currently sexually active	HIV testing	Effective hormonal birth control use <sup>a, b</sup>	Condom use at last sex <sup>a, c</sup>	Dual condom & birth control use <sup>a, b</sup>
	AOR (95%CI)						
Sex							
Male (ref)	-	-	-	-	-	-	-
Female	0.99 (0.87, 1.13)	<b>0.62 (0.52, 0.74)</b>	<b>1.28 (1.12, 1.47)</b>	0.91 (0.80, 1.03)	1.16 (0.65, 2.06)	<b>0.66 (0.45, 0.95)</b>	0.72 (0.34, 1.55)
Race							
White (ref)	-	-	-	-	-	-	-
Non-Hispanic Black	<b>1.46 (1.17, 1.82)</b>	<b>1.52 (1.10, 2.08)</b>	<b>1.37 (1.13, 1.66)</b>	<b>1.92 (1.53, 2.40)</b>	0.7 (0.38, 1.26)	1.33 (0.87, 2.04)	0.65(0.32, 1.32)
Hispanic/Latino	<b>1.30 (1.03, 1.65)</b>	1.44 (0.92, 2.26)	1.19 (0.95, 1.49)	<b>1.60 (1.22, 2.09)</b>	0.57 (0.32, 1.02)	1.08(0.72, 1.61)	0.83 (0.41, 1.65)
Other	0.82(0.57, 1.16)	1.29 (0.86, 1.94)	<b>0.80 (0.64, 1.00)</b>	<b>1.58 (1.27, 1.95)</b>	0.93 (0.57, 1.52)	<b>1.40 (1.01, 1.94)</b>	1.33 (0.72, 2.46)
Grade							
9 <sup>th</sup> (ref)	-	-	-	-	-	-	-
10 <sup>th</sup>	<b>1.66 (1.45, 1.91)</b>	1.35 (0.92, 1.98)	<b>1.39 (1.12, 1.73)</b>	<b>1.56 (1.14, 2.14)</b>	<b>2.11 (1.21, 3.70)</b>	0.89 (0.57, 1.40)	1.82(0.78, 4.27)
11 <sup>th</sup>	<b>2.76 (2.13, 3.59)</b>	<b>2.71 (1.62, 4.52)</b>	<b>2.27 (1.78, 2.88)</b>	<b>1.97 (1.20, 3.24)</b>	<b>3.28 (1.44, 7.47)</b>	0.95 (0.46, 1.96)	<b>3.40 (1.69, 6.86)</b>
12 <sup>th</sup>	<b>4.33 (3.64, 5.14)</b>	<b>5.08 (3.37, 7.67)</b>	<b>4.13 (3.21, 5.31)</b>	<b>3.17 (1.96, 5.11)</b>	<b>4.41 (2.03, 9.58)</b>	0.69 (0.39, 1.22)	2.31 (0.82, 6.53)
Exposure status <sup>d</sup>							
Unexposed school (ref)	-	-	-	-	-	-	-
Exposed school	<b>1.65 (1.34, 2.04)</b>	<b>1.57 (1.28, 1.92)</b>	<b>1.54 (1.22, 1.93)</b>	<b>1.63 (1.30, 2.04)</b>	1.45(0.80, 2.63)	<b>0.56 (0.36, 0.88)</b>	1.02 (0.45, 2.33)
Year							
2015 (ref)	-	-	-	-	-	-	-
2017	0.96(0.81, 1.15)	0.81 (0.58, 1.13)	1.01(0.84, 1.20)	0.93(0.67, 1.30)	0.76(0.42, 1.35)	0.91 (0.59, 1.39)	0.83 (0.35, 1.96)
<b>Exposure × Year</b>	<b>0.77 (0.61, 0.97)</b>	0.8 (0.58, 1.11)	0.84(0.69, 1.03)	<b>0.80 (0.68, 0.94)</b>	<b>0.59 (0.37, 0.94)</b>	<b>1.75 (1.06, 2.89)</b>	0.6 (0.26, 1.36)
Observations	4967	4757	4876	5679	1116	1212	1044

Bolded estimates indicate statistical significance (p-value < 0.05)

<sup>a</sup> Among youth who are currently sexually active

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<sup>b</sup> Among youth who report different sex sexual contacts

<sup>c</sup> Among female youth who report different sex sexual contacts and all male youth

<sup>d</sup> Exposed schools are a set of high-need schools, defined by high adolescent STI, pregnancy, or sexual risk behavior rates, that are the focus of the district's programmatic efforts. Unexposed schools are schools in the same districts which were not the focus of the CDC program and may have implemented similar activities but did not receive the same supports as exposed schools.