



Bystander Program Effectiveness to Reduce Violence and Violence Acceptance Within Sexual Minority Male and Female High School Students Using a Cluster RCT

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Abstract

Bystander interventions have been highlighted as promising strategies to reduce sexual violence and sexual harassment, yet their effectiveness for sexual minority youth remains largely unexamined in high schools' populations. This rigorous cluster randomized control trial addresses this gap by evaluating intervention effectiveness among sexual majority and minority students known to be at increased risk of sexual violence. Kentucky high schools were randomized to intervention or control conditions. In intervention schools, educators provided school-wide *Green Dot* presentations (phase 1) and intensive bystander training to student popular opinion leaders (phase 2). Each spring from 2010 to 2014, students attending 26 high schools completed anonymous surveys about violence acceptance and violent events. An analytic sample of 74,836 surveys with no missing data over the 5 years was available. Sexual violence acceptance scores declined significantly over time in intervention versus control schools among all but sexual minority males. This intervention was also associated with reductions in both perpetration and victimization of sexual violence, sexual harassment, and physical dating violence among sexual majority yet not sexual minority youth. Both sexual minority and majority youth experienced reductions in stalking victimization and perpetration associated with the intervention. In this large cluster randomized controlled trial, the bystander intervention appears to work best to reduce violence for sexual majority youth. Bystander programs may benefit from explicitly engaging sexual minority youth in intervention efforts or adapting intervention programs to include attitudes that shape the experience of sexual minority high school youth (e.g., homophobic teasing, homonegativity).

Keywords Violence acceptance · Bystander intervention · Sexual minority

Introduction

Sexual violence and sexual harassment are serious public health concerns among high school aged youth in the USA. At least a third of high school youth have experienced sexual

harassment (Chiodo et al. 2009; Martin 2008). Emerging evidence suggests that sexual minority youth—those who identify as lesbian, gay, bisexual, or queer; experience same-gender attraction; and/or have same-gender sexual partners—are at elevated risk for sexual and dating

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violence compared with heterosexual (e.g., sexual majority) youth (Edwards 2018; Johns et al. 2018). Sexual orientation health disparities may be understood using a minority stress framework, which suggests that sexual minority youth experience bias, discrimination, and rejection in their families, schools, and communities, as well as internalized homonegativity and the engagement of risk behaviors (e.g., substance use) that shape vulnerability to violence victimization (Meyer 2003).

Nationwide, campuses are implementing bystander intervention programs to reduce violence among college students (Gidycz et al. 2011; Coker et al. 2016), high school students (Coker et al. 2017), and adolescent male athletes (Miller et al. 2013). Bystander programs share a philosophy that all members of the community have a role in preventing violence and, thus, train participants with awareness, knowledge, and skills to intervene should they witness disrespectful, threatening, or otherwise risky situations. Community responsibility for violence prevention contrasts with traditional violence prevention programs that consider participants either victims or perpetrators of abusive behavior and teach skills and promote behavior change to shape individual risk. By engaging participants not as potential victims or perpetrators but as potential witnesses and allies, both defensiveness and victim-blaming attitudes are reduced (Banyard et al. 2004; Berkowitz 2002).

Effective bystander intervention programs prompt youth to engage in five actions: (1) notice a situation as potentially harmful, (2) recognize the need to take action, (3) take responsibility for helping someone vulnerable to harm, (4) know how to help, and (5) take action to interrupt (e.g., distract, step in to prevent) abusive behavior (Darley and Latane 1968). Prevention scientists encourage youth to take responsibility to act by increasing awareness about sexual violence, building empathy for victims, and challenging social norms and attitudes that sexual violence is acceptable (Brown and Messman-Moore 2010). Critical to these steps is an individual's willingness to intervene, which is shaped by cultural assumptions of what attributes or behaviors "deserve" to be punished and *whom* deserves to be protected (Katz and Moore 2013). Sexual minority youth, in particular, are affected by social norms of homophobia and potentially co-occurring attitudes regarding the acceptance of violence directed towards those identifying or suspected of belonging to a sexual minority group. Research among college students has found that perceived inclusivity of sexual minorities on campus is associated with significantly lower odds of sexual assault, highlighting the importance of affirming or inclusive social norms in shaping violence among sexual minority youth (Coulter and Rankin 2017).

Bystander intervention programs can also differ with respect to how they incorporate risk factors and mechanisms underlying sexual violence into their prevention

programming. Specifically, programs have adopted gender-transformative or gender-neutral lenses in their design and implementation. Gender-transformative approaches focus on promoting gender-equitable attitudes as a key strategy for reducing male-perpetrated violence against women (Casey et al. 2018; McCauley et al. 2013). Gender-neutral approaches emphasize that perpetrators and victims can be of any gender, allowing youth (including sexual minority youth) to see themselves in intervention content (Katz et al. 2011). Relevant to understanding why sexual minority youth experience elevated risk for sexual violence, critics of gender-transformative programs caution against using approaches that privilege gender over an intersectional perspective that highlights the ways that power and oppression exist at the intersection of gender, race, sexual orientation, and other domains of difference (Dworkin et al. 2015). Meanwhile, critics of gender-neutral programs express concern that these programs are "identity neutral" without explicit attention to how power manifests (e.g., homophobia) to shape violence (Hong 2017).

No previous studies have assessed the effectiveness of an evidence-based bystander intervention program—either gender-transformative or gender-neutral—among sexual minority high school youth. Thus, the purpose of this study was to evaluate the effectiveness of the *Green Dot* bystander intervention to reduce (a) sexual violence acceptance and (b) number of sexual violence and dating violence events, measured separately for both perpetration and victimization, over time with intervention implementation, among male and female sexual minority and majority high school students. This gender-neutral program did not explicitly address sexual minority or majority status. This bystander intervention was hypothesized to reduce violence and violence acceptance among all students over time and with complete intervention implementation (in years 3 and 4).

Methods

Details of this school-based randomized controlled trial have been described in detail elsewhere (Coker et al. 2017). Data collection began in 2010; no data analyses were conducted before final data collection and cleaning in late 2014 (Coker et al. 2017).

The Prevention Intervention Committee of the Kentucky Association of Sexual Assault Programs identified the *Green Dot* violence prevention program (www.alteristic.org) as the intervention to test for this cluster randomized control trial (RCT) (Coker et al. 2011). Briefly, in this program, all students are taught to recognize situations and behaviors that could lead to violence (termed "red dots") and use active bystander behaviors (called "green dots") to reduce the risk or effect of violence. *Green Dot* differs from other violence prevention bystander

interventions such as bringing in the bystander, mentors in violence prevention, and coaching boys into men in its inclusion of students of all genders in the same training groups and its use of a popular opinion leader identification and invitation into the intervention training model (Banyard et al. 2007; Katz et al. 2011; Kelly 2004; Miller et al. 2013).

Rape Crisis Center educators (hereafter “educators”; $n = 28$ educators; all female) were trained to deliver the *Green Dot* high school curriculum over a 4-day session by the developer, Dr. Dorothy Edwards. This high school curriculum, which was adapted from the college curriculum, was the same used and described in detail elsewhere (Coker et al. 2017; Cook-Craig et al. 2014). Educators began *Green Dot* training in the Fall of 2010 (intervention year 1 [Y1]) with students receiving a 50-min introductory persuasive speech (phase 1). In Y2–Y4, *Green Dot* speeches were provided to incoming students so that all students would have access to intervention training during their time in high school. Implementation of *Green Dot* phase 2 began Spring 2011 (Y2) and continued through Y4 using the popular opinion leader (POL) strategy. For phase 2, educators worked with high school staff to identify student leaders. These students were invited to participate in intensive (5-h) bystander training. As space was available, this training was opened to other interested students. Both training phases focused on sexual violence risk, sexual harassment, stalking, and partner violence. At baseline (i.e., pre-intervention), less than 2% of students in intervention schools had heard a speech. Training rates Y1 through Y4 were 50.6%, 42.2%, 36.4%, and 34.9%, respectively. Similarly, for phase 2 POL training, at the baseline, less than 3% of students reported receiving this training which was not delivered until intervention years 1–4. In these years, 9.2%, 9.5%, 13.6%, and 14.5% of students reported receiving bystander POL training, respectively.

Schools randomized to the control condition received no bystander-based intervention training over the 5 years of this cluster RCT. Administrators at control schools signed memoranda of understanding agreeing not to implement bystander programming in their schools until the end of the trial. Control schools could adopt other non-bystander-based prevention programming.

Study Sample

Two schools within each of the 13 Kentucky Rape Crisis Centers’ regions ($n = 26$) were selected by the Rape Crisis Centers for simple randomization (Coker et al. 2017). Two schools dropped out over the course of the study; one in the intervention condition left the study in Y3 and one control school left the study in Y1. For these two schools, missing school-level data were imputed using single imputation (last observation carried forward) because sample size ($n = 26$) was

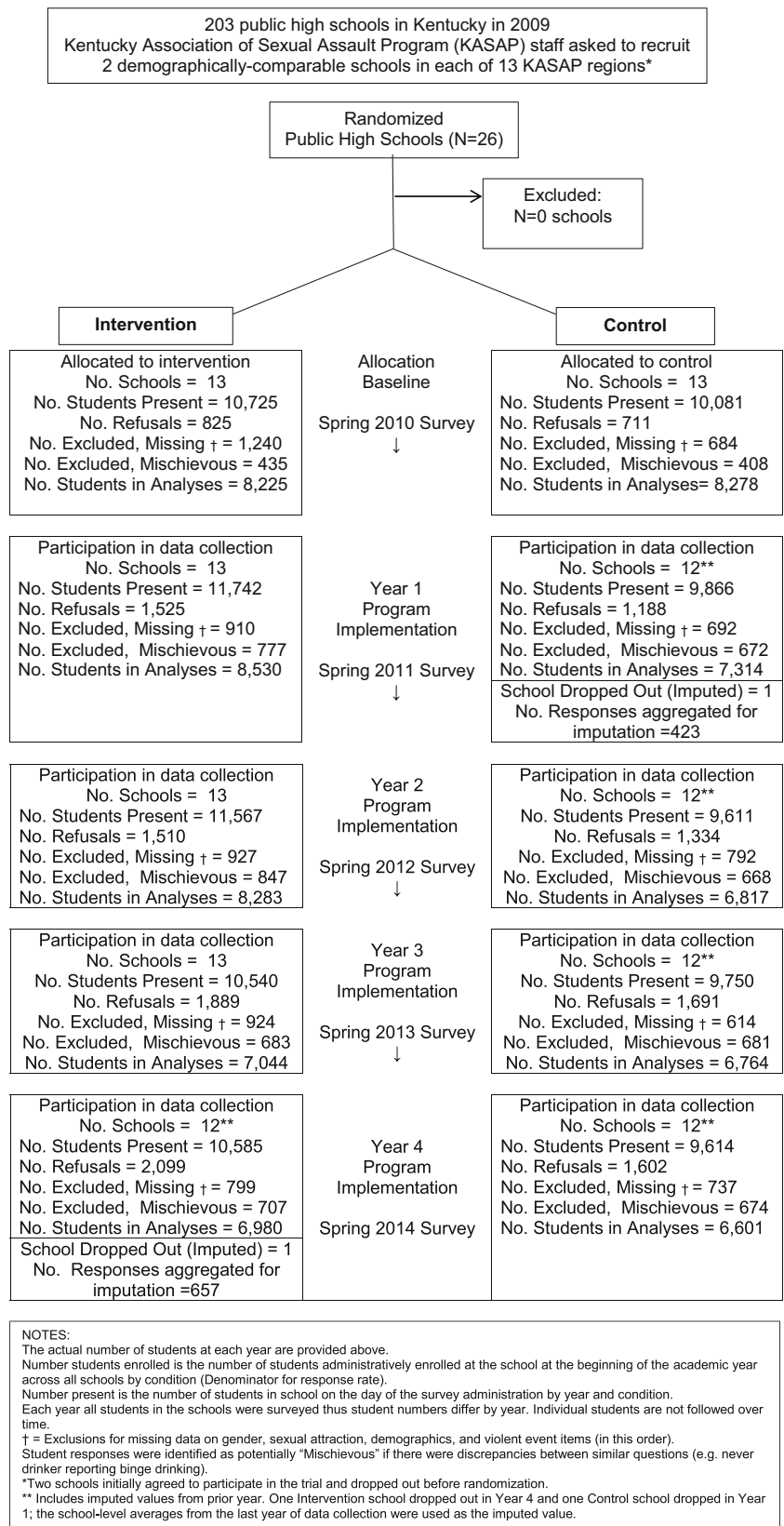
too small for multiple imputation and because missingness was due only to school dropout without the option of returning. All students (grades 9–12) who could provide consent were invited to complete an annual, anonymous survey before intervention implementation (Spring 2010, baseline) and annually thereafter from 2011 (Y1) through 2014 (Y4). The research team traveled to each school over the 5-year data collection and surveyed between February and April when most students would be present.

University of Kentucky IRB approved the study protocol. Each year letters describing the study were mailed to the parents of all students. A passive parental consent method was employed in which parents who did not wish their student to participate were instructed to inform researchers by phone or e-mail. Research staff read elements of assent to all students; students had the option to refuse participation prior to being presented with the 99-item paper and pencil survey. This 20–45-min survey was conducted during school hours.

Because some students may complete surveys for reasons other than complete veracity, we applied a strategy described by Robinson-Cimpian (2014) to identify mischievous responders. Potential mischievous responders were defined as those with inconsistent or impossible responses. In these data, our operational definition of mischievous respondents was (1) responses of never drinking alcohol yet reporting symptoms of alcohol abuse, (2) never sexually active responders who also reported being pregnant or having children, or (3) responses of being in multiple relationships yet not being in a dating relationship when answering the dating violence items. Potential mischievous responders were more likely than those not so identified to be male, non-White, and to have experienced or used physical or sexual violence.

As reported elsewhere for this cluster RCT (Coker et al. 2017), 104,081 students were present in schools on survey days and 89,707 completed surveys (see Fig. 1, consort diagram). We had data on sexual attraction only for those participating; thus, we could not determine refusal rates by sexual attraction; males were more likely than females to refuse participation. Response rates declined over the 5-year period from 92.6% at baseline and to 76.6% at year 4; no differences in response rates were observed by condition (intervention (84.4%) and control (83.4%)) overall or within year. Excluded were surveys without demographics, including sex and sexual attraction, and those missing violence or violence acceptance item responses ($n = 8319$). To limit potential bias introduced by including inaccurate responses, we excluded 6552 respondents as potentially mischievous. The final analytic sample included 74,836 surveys over 5 years, representing 26 schools. The overall survey completion rate with non-missing data was 83.4% ($n = 74,836/89,707$). As reported elsewhere, similarities in sociodemographic and violence risk

Fig. 1 Consort diagram for study enrollment, allocation, and data collection and analysis



characteristics, violence acceptance, and violence rates (school-level averages) suggested that randomization resulted

in comparable schools across conditions (Coker et al. 2019; Coker et al. 2017).

Measures

Sex, Sexual Minority/Majority Status, and Demographics

Participants reported their sex as either female or male. Participants also indicated whether they were attracted only to females, attracted mostly to females, attracted equally to females and males, attracted mostly to males, attracted only to males, or not sure. Sexual minority status was operationalized as participants indicating any sexual attraction except exclusively attracted to the opposite sex (sexual majority). We created four groups for these analyses: male sexual majority, male sexual minority, female sexual majority, and female sexual minority. For each of these four subgroups, school-level outcomes were re-calculated for each subgroup, i.e., four school-level, sex-sexual minority/majority outcomes resulted for each dependent variable.

Violence Acceptance Sexual violence acceptance was asked at the individual level and, for the analyses, averaged at the school level. The stem for the measure was “Thinking about your own feelings and beliefs, please indicate how much you personally agree or disagree with each statement. There are no right or wrong responses.” Response options were the following: strongly disagree = 0, disagree = 1, agree = 2, and strongly agree = 3. Statements were phrased such that higher scores indicated greater violence acceptance.

Sexual violence acceptance was measured with a modified version of the *Illinois Rape Myth Acceptance Scale (IRMA)*. The original 20-item IRMA Scale (Payne et al. 1999) was reduced to seven items (range 0–21; see Coker et al. (2019) for specific items) with good internal consistency (Cronbach’s $\alpha = 0.75$; mean \pm SD = 6.0 ± 3.4).

Violent Events by Form for Perpetration and Victimization

The second set of outcomes were self-reported numbers of violent events either used (perpetration) or experienced (victimization) in the past 12 months. Violence forms included sexual violence, sexual harassment, stalking, physical dating violence, and reproductive or contraceptive interference. The response options included frequencies ranging from zero to ten or more times. For analyses, response categories were scored as the minimum value in each response range (zero, one, three, six, and ten) to err towards undercounting versus overcounting incidents. (See Appendix Figure 1 in Coker et al. (2017) for a detailed description of measures.)

Sexual violence: Three items based on the 2010 CDC National Intimate Partner and Sexual Violence Survey (NISVS) (Black et al. 2011) measured sexual violence as coerced sex, physically forced sex, and drug- or alcohol-facilitated sex (Cronbach’s $\alpha = 0.86$ for perpetration and 0.76 for victimization). **Sexual harassment:** As recommended by CDC, sexual harassment was included as a component of sexual violence using three items: telling sexual stories or

jokes that made one uncomfortable; made gestures, rude remarks, or used sexual body language to embarrass or upset another; or kept asking another out or for a hookup even after repeated refusals (Cronbach’s $\alpha = 0.76$ for perpetration and $\alpha = 0.69$ for victimization). **Stalking:** Three items from stalking measures included in the 1998 National Violence Against Women Survey (Tjaden and Thoennes 1998) were used to indicate being followed, spied on, or observed by another using electronic devices; another showing up at home, school, work, or waiting for them when they were asked not to do so; and sending unwanted gifts, messages, phone calls, notes, or posting pictures on social media (Cronbach $\alpha = 0.81$ for perpetration; $\alpha = 0.68$ for victimization). **Physical dating violence:** One physical dating violence victimization item, based on the NISVS (Black et al. 2011), was used to separately measure victimization and perpetration. **Reproductive or contraceptive interference** was measured using the following five items measured only as victimization by a current or previous boyfriend or girlfriend. Items included: Said to you “You want us to use birth control or condoms so you can sleep around with other people.” Said to you, “If we have a baby, you will never have to worry about me leaving you. I will always be around.” Said to you, “you would have a baby with me if you really loved me.” Not allowed you to use birth control or condoms when you wanted to? Forced you to have sex when you were not using birth control or condoms? (Cronbach’s $\alpha = 0.74$).

Statistical Analysis

The following analytic approaches were used to measure hypothesized declines in school-level outcomes in the intervention [I] relative to control [C] conditions over time by the four sex and sexual majority/minority subgroups. For the two types of violence acceptance outcomes, mean school-level, subgroup scores were compared by condition over time for each of the four subgroups. For the range of violence perpetration and victimization measures, two approaches were used to estimate intervention effectiveness by subgroups. First, school-level, subgroup sums for the number of violent events reported by students in each subgroup were used as outcomes because schools, not students, were randomized and data from schools, not students, could be linked longitudinally. The absolute difference in number of events occurring in the intervention and control conditions for each subgroup, within year, was used as a measure of the intervention effect for the subgroup. Second, a dichotomous violence indicator variable was created to estimate violence prevalence rates (%) within each subgroup for both victimization and perpetration in each condition by year.

To estimate the longitudinal effect of the intervention within each subgroup over time, linear mixed models included the effects of randomized condition, time (Y1 2010–Y4 2014), baseline outcome values, and the condition x time (CxT)

interaction on violence acceptance or number of event outcomes (PROC GLIMMIX with an AR (1) R matrix and bias-corrected empirical SE estimates) (SAS, version 9.3, 9.4; Kauermann and Carroll 2001). The estimated mean school-level, subgroup violence acceptance scores were presented by condition (and 95% CI) with absolute differences (intervention–control [I–C]; 95% CI) within year, providing an estimate of reduction in violence acceptance attributable to the intervention for each subgroup. Similarly, for violence outcomes by perpetration and victimization, the mean school-level, subgroup sum (yearly subgroup totals) of violent events are presented by condition (and 95% CI) with absolute differences (intervention-control [I-C]; 95% CI) within year provided as an estimate of events potentially prevented for that subgroup. Parallel analyses were conducted for each violence form for perpetration and victimization by the four subgroups. All analyses were adjusted for baseline violence acceptance and number of violent events.

Using the dichotomous reports of violence (%) prevalence within 12 months provided by students belonging to each subgroup as the outcome at the school level, violence prevalence rate ratios (PRR) were created to compare intervention to control conditions within year using generalized estimating equations (PROC GENMOD, link = log, dist = bin, using REPEATED with EXCH matrix in SAS, version 9.3, 9.4) for the sexual minority/majority subgroups, adjusting for sex. Generalized estimating equations allowed comparison of PRR at the student-level while accounting for school-level clustering in a log-binomial regression framework. Results are provided by year with adjusted PRR and 95% confidence intervals.

Results

Sexual minority youth were more likely to identify as non-white, to report receiving a reduced-price meal, to have witnessed parental IPV, and to have engaged in binge drinking in the past 30 days compared to sexual majority youth ($p < .0001$). Because the focus of this analysis was to examine school-level outcomes, we did not adjust for student-level demographic differences existing between subgroups except for student-level analyses by sexual minority status which adjusted for sex. At baseline, the following significant differences ($p < .0001$) were observed across sex and sexual minority subgroups (Table 1) where sexual majority males were the referent group. Sexual minority males and females were more likely to disclose perpetration of sexual violence, stalking, and dating violence victimization; sexual minority males and females regardless of sexual minority status were more likely to disclose dating violence perpetration and victimization of sexual violence, harassment stalking, and reproductive coercion;

and sexual majority females were significantly less likely disclose perpetration of sexual violence or sexual harassment.

Significant declines in sexual violence acceptance over time (Table 2, mean school-level IRMA scores) were observed in the sexual majority male subgroup (CxT; $p = .02$), sexual majority females (CxT; $p = .004$), and sexual minority female subgroup (CxT; $p = .03$). The differences in IRMA scores by condition within year were also presented. Only in the sexual minority female subgroup was there an intervention-associated reduction in scores for the 2 years in which intervention was fully implemented (years 3 and 4), as illustrated by negative values (excluding zero) in year 3 (Y3: I-C 95% CI: $-1.20, -0.16$) and year 4 (Y4: I-C 95% CI: $-1.16, -0.03$). Among the sexual majority female subgroup, there was only a significant, intervention-associated reduction in scores for year 3 (Y3: I-C 95% CI = $-0.43, -0.01^*$).

Similar to the analyses presented in Table 2, subgroup, school-level analyses for the number of violent events by condition over time were presented in an Appendix by sex and sexual minority status. In the sexual minority female subgroup, reductions in violent events in the intervention versus control condition over time (CxT; $p \leq .05$) were noted sexual harassment and physical dating violence perpetration and stalking victimization. In the sexual minority males subgroup, there were no significant reductions in violent events by condition over time. In contrast, for the sexual majority male and female subgroups, significant reductions in violent events were noted by condition over time for all forms of violence perpetration and victimization except stalking victimization for male subgroup and sexual violence perpetration for female subgroup. Only in the sexual majority male subgroup did this bystander intervention appear to have a strong effect in reducing sexual violence *perpetration* over time and in both full implementation years (Y3 and Y4; see Appendix).

Table 3 presents student-level analyses within year and by sexual minority status subgroup to test reduction in violence rates (%) associated with the intervention. Because schools, not individual students, were followed over time we cannot test differences in student-level violence rates by condition over time. We have provided prevalence rate ratios for condition and violence rates (perpetration and victimization) for all students and by sexual minority status subgroups. Reductions in perpetration in the sexual majority student subgroup were observed for sexual violence, sexual harassment, stalking, and physical dating violence. No statistically significant reductions in perpetration were observed for the sexual minority subgroup. Similarly, reductions in victimization were observed in the sexual majority subgroup over time and in both full implementation years (Y3 and Y4) for sexual violence, sexual harassment, and stalking. The sexual minority subgroup demonstrated intervention-associated reductions only in stalking victimization.

Table 1 Violence rates at baseline by sex and sexual minority status ($n = 16,503$)

	Sexual minority females $n = 1558$	Sexual majority females $n = 7415$	Sexual minority males $n = 653$	Sexual majority males $n = 6877$ REF
Perpetration (past 12 months: % yes)				
Sexual violence	178 (11.4%)*	295 (4.0%)*	94 (14.4%)*	608 (8.8%)
Sexual harassment	461 (29.6%)	1093 (14.7%)*	230 (35.2%)	1936 (28.2%)
Stalking	312 (20.0%)*	857 (11.6%)	148 (22.7%)*	822 (12.0%)
Physical dating violence	231 (14.8%)*	706 (9.5%)*	67 (10.3%)*	234 (3.4%)
Victimization (past 12 months: % yes)				
Sexual violence	480 (30.8%)*	1526 (20.6%)*	175 (26.8%)*	759 (11.0%)
Sexual harassment	1075 (69.0%)*	4889 (65.9%)*	385 (59.0%)*	2788 (40.5%)
Stalking	779 (50.0%)*	2892 (39.0%)*	289 (44.3%)*	1749 (25.4%)
Physical dating violence	271 (17.4%)*	721 (9.7%)	114 (17.5%)*	677 (9.8%)
Reproductive coercion	731 (47.7%)*	2744 (37.6%)*	242 38.1%*	1583 (25.5%)

REF referent group for comparisons

*Rates significantly different than reference, sexual majority males, $p < .0001$

Discussion

As previously reported, this 5-year cluster RCT indicated that the *Green Dot* program, as adapted for high school students and delivered by trained Rape Crisis Center educators, was effective over time reducing multiple forms of perpetration and victimization, including sexual violence, sexual harassment, and stalking (Coker et al. 2017). Based on the current analyses, these noted reductions in violence perpetration and victimization were primarily observed among sexual majority youth. Sexual minority youth in intervention schools experienced statistically significant reductions in stalking

victimization only. These findings—that *Green Dot* works primarily among sexual majority students—are critical given that evidence-based bystander intervention programs have not previously been evaluated for their effectiveness with sexual minority youth, a population which often experiences bias and discrimination resulting in minority stress, maladaptive coping mechanisms, and violence victimization (Meyer 2003).

Previously reported analyses indicated that *Green Dot* changed both sexual violence and dating violence acceptance, highlighting the effectiveness of *Green Dot* in shifting school-level social norms overall (Coker et al. 2019). However, the current findings illustrate the nuance of these social norms

Table 2 Changes in violence acceptance (adjusted mean score and 95% CI) over time by condition within sex and sexual minority status

Illinois rape myth acceptance (IRMA)	Intervention (I) (95% CI)	Control (C) (95% CI)	Difference in I-C (95% CI)	Intervention (I) (95% CI)	Control (C) (95% CI)	Difference in I-C (95% CI)
	Sexual minority females			Sexual majority females		
Time: year 1	5.74 (5.27, 6.21)	5.78 (5.51, 6.06)	-0.04 (-0.60, 0.52)	4.74 (4.58, 4.90)	4.78 (4.67, 4.89)	-0.04 (-0.23, 0.16)
Time: year 2	6.13 (5.38, 6.88)	5.65 (5.32, 5.99)	0.47 (-0.37, 1.32)	4.65 (4.47, 4.83)	4.68 (4.52, 4.85)	-0.04 (-0.28, 0.21)
Time: year 3‡	5.08 (4.72, 5.44)	5.76 (5.38, 6.14)	-0.68 (-1.20, -0.16)*	4.48 (4.32, 4.63)	4.70 (4.56, 4.83)	-0.22 (-0.43, -0.01)*
Time: year 4‡	4.61 (4.14, 5.07)	5.20 (4.88, 5.53)	-0.60 (-1.16, -0.03)*	4.18 (3.96, 4.40)	4.44 (4.23, 4.65)	-0.26 (-0.57, 0.05)
	Condition * time F test $_{DF1,DF2}$ p value = 3.05 _{3,72}			Condition * time F test $_{DF1,DF2}$ p value = 4.86 _{3,72}		
	.03			.004		
	Sexual minority males			Sexual majority males		
Time: year 1	6.62 (5.83, 7.42)	6.67 (5.93, 7.41)	-0.04 (-1.17, 1.08)	6.83 (6.68, 6.98)	6.55 (6.34, 6.76)	0.28 (0.02, 0.53)
Time: year 2	7.31 (6.36, 8.26)	7.38 (6.78, 7.99)	-0.07 (-1.22, 1.08)	6.64 (6.42, 6.86)	6.51 (6.27, 6.75)	0.13 (-0.20, 0.45)
Time: year 3‡	6.61 (5.64, 7.58)	7.59 (6.77, 8.41)	-0.98 (-2.22, 0.27)	6.27 (6.05, 6.49)	6.48 (6.19, 6.78)	-0.21 (-0.59, 0.16)
Time: year 4‡	5.99 (5.20, 6.77)	6.81 (5.92, 7.69)	-0.82 (-2.00, 0.36)	6.10 (5.92, 6.27)	6.27 (6.08, 6.45)	-0.17 (-0.43, 0.09)
	Condition * time F test $_{DF1,DF2}$ p value = .80 _{3,72}			Condition * time F test $_{DF1,DF2}$ p value = 3.47 _{3,72}		
	NS			.02		

Analyses adjusted for baseline Illinois rape myth acceptance (IRMA) within each of the 4 sex and sexual minority/majority subgroups

*Statistical significance ($p < .05$) in the difference in IRMA scores by condition within year (95% CI excludes 0.0)

‡Year 3 and year 4 represent full implementation of the intervention

Table 3 Violence rates, past 12 months, (%) and prevalence rate ratios (PRR) of violence by condition for all students, and within sexual minority and majority status adjusting for sex

	Intervention % (CI)	Control % (CI)	Prevalence rate ratios (95% confidence interval)		
			All N = 74,836	Sexual minority N = 10,596	Sexual majority N = 64,240
Sexual violence perpetration					
Time: baseline year 0	6.70 (6.08, 7.39)	6.97 (6.47, 7.51)	0.96 (0.85, 1.09)	0.95 (0.73, 1.24)	0.96 (0.84, 1.10)
Time: year 1	6.97 (6.29, 7.73)	6.14 (5.48, 6.88)	1.14 (0.97, 1.32)	0.93 (0.70, 1.23)	1.19 (1.01, 1.40)
Time: year 2	6.81 (6.13, 7.56)	7.34 (6.61, 8.14)	0.93 (0.79, 1.08)	1.10 (0.87, 1.40)	0.86 (0.71, 1.04)
Time: year 3‡	5.08 (4.53, 5.70)	6.07 (5.34, 6.89)	0.84 (0.70, 1.00)	0.91 (0.63, 1.32)	0.82 (0.66, 1.02)
Time: year 4‡	4.69 (4.15, 5.31)	5.83 (5.12, 6.64)	0.80 (0.68, 0.96)*	0.85 (0.58, 1.26)	0.79 (0.66, 0.94)*
Sexual harassment perpetration					
Time: baseline year 0	22.23 (21.00, 23.54)	21.29 (20.49, 22.12)	1.04 (0.98, 1.12)	1.08 (0.92, 1.26)	1.03 (0.95, 1.12)
Time: year 1	18.59 (17.65, 19.57)	18.00 (16.81, 19.26)	1.03 (0.95, 1.13)	0.95 (0.80, 1.12)	1.04 (0.95, 1.14)
Time: year 2	16.89 (15.93, 17.90)	17.62 (16.45, 18.89)	0.96 (0.87, 1.05)	1.00 (0.87, 1.15)	0.94 (0.84, 1.06)
Time: year 3‡	13.97 (12.53, 15.57)	17.19 (15.68, 18.84)	0.81 (0.71, 0.94)*	0.84 (0.71, 1.00)	0.81 (0.69, 0.95)*
Time: year 4‡	14.89 (13.79, 16.07)	16.45 (15.24, 17.76)	0.91 (0.81, 1.01)	0.87 (0.71, 1.06)	0.90 (0.78, 1.04)
Stalking perpetration					
Time: baseline year 0	12.75 (11.86, 13.70)	13.13 (12.26, 14.07)	0.97 (0.88, 1.07)	0.97 (0.82, 1.15)	0.97 (0.87, 1.09)
Time: year 1	10.94 (10.24, 11.70)	10.34 (9.37, 11.40)	1.06 (0.94, 1.19)	1.16 (0.97, 1.40)	1.02 (0.87, 1.19)
Time: year 2	10.44 (9.71, 11.22)	11.00 (10.01, 12.08)	0.95 (0.84, 1.07)	1.00 (0.83, 1.21)	0.92 (0.79, 1.07)
Time: year 3‡	8.18 (7.49, 8.93)	10.55 (9.76, 11.41)	0.78 (0.69, 0.87)*	0.84 (0.69, 1.02)	0.76 (0.64, 0.89)*
Time: year 4‡	8.69 (8.24, 9.17)	9.86 (9.04, 10.74)	0.88 (0.80, 0.98)*	0.80 (0.63, 1.03)	0.89 (0.75, 1.06)
Physical dating violence perpetration					
Time: baseline year 0	6.88 (5.87, 8.07)	6.46 (5.80, 7.19)	1.07 (0.88, 1.29)	1.01 (0.80, 1.26)	1.09 (0.84, 1.41)
Time: year 1	7.64 (6.61, 8.84)	6.14 (5.48, 6.87)	1.25 (1.03, 1.50)*	1.29 (0.97, 1.72)	1.24 (1.02, 1.52)*
Time: year 2	6.78 (6.06, 7.58)	6.61 (5.89, 7.41)	1.03 (0.87, 1.21)	1.42 (1.12, 1.80)	0.89 (0.76, 1.06)
Time: year 3‡	4.57 (4.14, 5.03)	6.07 (5.42, 6.79)	0.75 (0.65, 0.87)*	0.72 (0.52, 1.00)	0.76 (0.65, 0.90)*
Time: year 4‡	5.02 (4.31, 5.84)	5.79 (5.19, 6.45)	0.87 (0.72, 1.05)	0.87 (0.64, 1.18)	0.88 (0.69, 1.12)
Sexual violence victimization					
Time: baseline year 0	16.59 (15.54, 17.71)	17.57 (16.80, 18.38)	0.94 (0.87, 1.02)	1.01 (0.88, 1.17)	0.92 (0.84, 1.01)
Time: year 1	16.64 (15.46, 17.92)	15.95 (15.18, 16.75)	1.04 (0.96, 1.14)	1.03 (0.88, 1.22)	1.04 (0.96, 1.14)
Time: year 2	15.68 (14.82, 16.59)	17.13 (15.80, 18.58)	0.92 (0.83, 1.01)	0.96 (0.82, 1.12)	0.90 (0.79, 1.02)
Time: year 3‡	12.80 (11.95, 13.72)	14.63 (13.77, 15.55)	0.87 (0.80, 0.95)*	0.98 (0.80, 1.19)	0.84 (0.76, 0.94)*
Time: year 4‡	12.70 (11.70, 13.79)	14.56 (13.24, 16.01)	0.87 (0.77, 0.99)*	0.99 (0.83, 1.19)	0.83 (0.71, 0.99)*
Sexual harassment victimization					
Time: baseline year 0	54.23 (52.31, 56.21)	53.37 (52.00, 54.78)	1.02 (0.97, 1.06)	1.02 (0.96, 1.08)	1.01 (0.96, 1.06)
Time: year 1	52.19 (50.60, 53.83)	50.23 (49.09, 51.39)	1.04 (1.00, 1.08)	0.98 (0.91, 1.07)	1.05 (1.01, 1.10)*
Time: year 2	49.12 (47.47, 50.84)	49.22 (47.19, 51.34)	1.00 (0.95, 1.05)	1.03 (0.95, 1.13)	0.99 (0.94, 1.05)
Time: year 3‡	44.79 (42.61, 47.08)	48.05 (45.90, 50.30)	0.93 (0.88, 0.99)*	0.99 (0.93, 1.07)	0.91 (0.86, 0.97)*
Time: year 4‡	44.70 (43.59, 45.83)	47.38 (45.13, 49.75)	0.94 (0.89, 0.99)*	1.04 (0.97, 1.11)	0.93 (0.87, 0.98)*
Stalking victimization					
Time: baseline year 0	34.06 (32.52, 35.67)	33.64 (32.37, 34.96)	1.01 (0.96, 1.07)	1.04 (0.94, 1.15)	1.01 (0.94, 1.07)
Time: year 1	35.66 (34.27, 37.11)	32.89 (31.77, 34.04)	1.08 (1.03, 1.14)*	1.18 (1.07, 1.30)	1.06 (1.00, 1.13)
Time: year 2	32.93 (31.56, 34.37)	32.62 (31.21, 34.09)	1.01 (0.95, 1.07)	0.94 (0.84, 1.05)	1.02 (0.96, 1.09)
Time: year 3‡	29.05 (27.57, 30.62)	32.13 (30.82, 33.50)	0.90 (0.85, 0.97)*	0.89 (0.80, 0.98)*	0.91 (0.84, 0.98)*
Time: year 4‡	29.78 (28.87, 30.72)	31.30 (29.98, 32.68)	0.95 (0.90, 1.00)	1.01 (0.91, 1.11)	0.93 (0.87, 1.00)
Physical dating violence victimization					
Time: baseline year 0	10.88 (9.93, 11.92)	10.88 (10.12, 11.69)	1.00 (0.89, 1.12)	0.98 (0.81, 1.20)	1.00 (0.87, 1.15)
Time: year 1	11.49 (10.39, 12.71)	9.92 (8.89, 11.07)	1.16 (1.00, 1.34)	1.15 (0.90, 1.47)	1.16 (1.00, 1.34)

Table 3 (continued)

	Intervention % (CI)	Control % (CI)	Prevalence rate ratios (95% confidence interval)		
			All N = 74,836	Sexual minority N = 10,596	Sexual majority N = 64,240
Time: year 2	10.55 (9.72, 11.44)	9.78 (8.70, 10.99)	1.08 (0.94, 1.24)	1.23 (1.02, 1.50)*	1.03 (0.86, 1.22)
Time: year 3‡	8.51 (7.83, 9.25)	9.99 (9.18, 10.89)	0.85 (0.76, 0.96)*	0.91 (0.70, 1.16)	0.85 (0.74, 0.97)*
Time: year 4‡	8.14 (7.09, 9.35)	9.10 (8.19, 10.12)	0.89 (0.75, 1.06)	0.96 (0.74, 1.25)	0.87 (0.72, 1.06)
Reproductive or contraceptive interference victimization					
Time: baseline year 0	32.00 (30.42, 33.67)	32.08 (30.16, 34.12)	1.00 (0.92, 1.08)	1.01 (0.90, 1.13)	0.99 (0.91, 1.08)
Time: year 1	31.30 (29.14, 33.61)	30.08 (27.88, 32.45)	1.04 (0.93, 1.16)	1.01 (0.89, 1.14)	1.05 (0.93, 1.17)
Time: year 2	28.34 (26.40, 30.43)	28.75 (26.12, 31.65)	0.99 (0.87, 1.11)	1.02 (0.89, 1.16)	0.97 (0.85, 1.11)
Time: year 3‡	25.77 (24.46, 27.16)	27.71 (24.76, 31.01)	0.93 (0.82, 1.05)	1.00 (0.85, 1.18)	0.90 (0.79, 1.03)
Time: year 4‡	23.97 (21.59, 26.62)	27.61 (24.84, 30.68)	0.87 (0.74, 1.01)	0.92 (0.79, 1.09)	0.86 (0.73, 1.01)

Adjusted for sex

* $p < .05$ (PRR 95% CI excludes 1.0)

‡Years 3 and year 4 represent full implementation of the intervention

across sex and sexual minority subgroups. We found reductions in sexual violence acceptance for sexual minority and majority females, while neither sexual minority nor sexual majority males experienced similar changes. Previous research has found that female-identified youth and sexual minorities are less likely to endorse (or more likely to reject) rape myths compared to male-identified youth and sexual majority youth, respectively (McMahon 2010; Wilson and Newins 2019; Worthen 2017). Students who showed the greatest reductions in sexual violence acceptance in our sample were the youth who were least likely to endorse them.

Collectively, these findings highlight the importance of greater engagement with men and sexual minorities in bystander programs moving forward. For example, *Green Dot* is unique compared to other bystander programs in its use of a popular opinion leader model to diffuse prosocial, non-violent norms through students' peer networks. Given research regarding the power men have in shaping other men's perceptions and behaviors (Fabiano et al. 2003) and evidence that negative attitudes towards sexual minorities are associated with rape myth acceptance (Davies et al. 2012; Worthen 2017) explicit attempts to engage men and sexual minorities as popular opinion leaders may be an important strategy to shift attitudes, social norms, and violence among these groups. Greater attention to shifting homophobic attitudes in intervention programming may be needed in homophobic school contexts where sexual minorities may not be considered popular opinion leaders.

Emerging studies have documented the elevated risk for violence victimization among sexual minority youth compared with sexual majority youth (Edwards 2018; Johns et al. 2018), making effective intervention strategies to reduce

violence among high school students particularly important. Moreover, as we demonstrated with *Green Dot*, intervention strategies (bystander programs) aimed at shifting broader, school-level social norms about violence have been demonstrated effective among high school youth (Coker et al. 2019; Miller et al. 2013). However, our findings highlight the need for programs to attend to the unique experiences of sexual minority youth that drive disparities in violence victimization, such as homophobic teasing. Indeed, a study of middle and high school youth in the U.S. Midwest found that late middle school homophobic name-calling perpetration was associated with subsequent perpetration of sexual violence in high school (Espelage et al. 2018). These findings may also be related to attitudes regarding youths' intentions to intervene, including their perceptions of the types of behaviors that should be interrupted and which groups of peers are worth protecting. Studies among college students have found that having sexual minority friends and having affirming attitudes towards sexual minorities are associated with higher intentions to intervene (Dessel et al. 2017). Thus, in addition to bystander programs aiming to shift attitudes about sexual violence, they might incorporate content that explicitly addresses homophobic behavior and promotes intervention when youth witness homophobic behavior among their peers (Dessel et al. 2017).

In the age of #MeToo, social norms surrounding what sexually aggressive or harassing behaviors are acceptable are beginning to change. Recent "backlash" has also arisen. For example, recent (2018) changes in the Department of Education's regulations on campus sexual misconduct would strengthen the rights of students who are accused of sexual assault or harassment and lessen liability for colleges. Given current bystander programs were not designed to explicitly to

shift climates related to sexual orientation, research is needed to understand effectiveness of existing programs by sexual minority status.

Limitations

As noted elsewhere (Coker et al. 2017), *Green Dot* was implemented in Kentucky high schools with thorough intervention training and fidelity throughout the implementation. Results of this trial may not generalize to other settings if implemented with different educator training or fidelity. Although an experimental study design was used in this trial, all outcomes were self-reported; the validity of our findings remains dependent on the accuracy of students' self-reports. Instability of the student-level sample could bias results over time in that each year students both enter and leave high school. Because schools, and not necessarily individuals, were followed over time, we cannot track changes in an individual's sexual attraction nor other demographics or training exposure. Misclassification may have biased study results, but these effects were unlikely to be differential by condition. Because of school-level randomization, the lack of blinding of intervention status may have led to a social desirability bias in outcome measures, such that students in intervention schools may have under-reported violence acceptance, victimization, and perpetration, because they knew their school had a violence prevention program. To address this potential bias, data collection was anonymous thus there was no way to link individual students by training and over time. While this choice precluded our ability to assess the trajectories of individuals over time, the current study measured intervention-associated change in violence acceptance and violence at the school-level, which is consistent with the *Green Dot* model for intervention diffusion where training impacts individuals, their social networks, and ultimately violence changes at the school level. Bystander behaviors were not included as an outcome for these analyses. This exclusion limits our ability to determine whether this intervention has an effect on bystander behaviors by sex or sexual minority status. Finally, we did not assess attitudes related to sexual orientation and therefore cannot comment on the school climates (including homophobia and homonegativity) for sexual minority youth in participating schools.

Conclusions

This is the first study to assess the effectiveness of a bystander program among sexual minority and sexual majority youth in high school settings. Implementation of a bystander intervention to reduce violence acceptance in Kentucky high schools decreased both violence acceptance and violence frequency over time but these changes were largely seen among sexual majority youth. Bystander programs may benefit from explicitly engaging sexual minority youth in intervention efforts or

adapting intervention programs to include attitudes that shape the experience of sexual minority high school youth.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Disclaimer The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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