

# School, Friends, and Substance Use: Gender Differences on the Influence of Attitudes Toward School and Close Friend Networks on Cannabis Involvement

Nikola Zaharakis<sup>1</sup> · Michael J. Mason<sup>1</sup> · Jeremy Mennis<sup>2</sup> · John Light<sup>3</sup> · Julie C. Rusby<sup>3</sup> · Erika Westling<sup>3</sup> · Stephanie Crewe<sup>4</sup> · Brian R. Flay<sup>5</sup> · Thomas Way<sup>6</sup>

Published online: 5 July 2017  
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**Abstract** The school environment is extremely salient in young adolescents' lives. Adolescents who have unfavorable attitudes toward school and teachers are at elevated risk for dropping out of school and engaging in behavioral health risks. Peer network health—a summation of the positive and negative behaviors in which one's close friend group engages—may be one way by which attitudes toward school exert influence on youth substance use. Utilizing a sample of 248 primarily African-American young urban adolescents, we tested a moderated mediation model to determine if the indirect effect of attitude to school on cannabis involvement through peer network health was conditioned on gender. Attitude toward school measured at baseline was the predictor (X), peer network health measured at 6 months was the mediator (M), cannabis involvement (including use, offers to use, and refusals to use) measured at 24 months was the

outcome (Y), and gender was the moderator (W). Results indicated that negative attitudes toward school were indirectly associated with increased cannabis involvement through peer network health. This relationship was not moderated by gender. Adolescents in our sample with negative attitudes toward school were more likely to receive more offers to use cannabis and to use cannabis more frequently through the perceived health behaviors of their close friends. Implications from these results point to opportunities to leverage the dynamic associations among school experiences, friends, and cannabis involvement, such as offers and use.

**Keywords** Cannabis use · Peer networks · Attitudes toward school · Gender differences · Urban adolescents

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✉ Nikola Zaharakis  
nzaharak@utk.edu

<sup>1</sup> Center for Behavioral Health Research, College of Social Work, University of Tennessee, Henson Hall, 1618 Cumberland Avenue, Knoxville, TN 37996-3332, USA

<sup>2</sup> Department of Geography & Urban Studies, Temple University, Philadelphia, PA, USA

<sup>3</sup> Oregon Research Institute, Eugene, OR, USA

<sup>4</sup> Department of Pediatrics, Virginia Commonwealth University, Richmond, VA, USA

<sup>5</sup> School of Social and Behavioral Health Sciences, Oregon State University, Corvallis, OR, USA

<sup>6</sup> Department of Computing Sciences, Villanova University, Villanova, PA, USA

School environments significantly affect adolescents in a number of ways. Adolescents who hold negative attitudes about school are at increased risk for a host of undesirable outcomes, including engagement in risky health behaviors, such as cannabis use (van den Bree and Pickworth 2005). Adolescents' close friends also exert an important influence on their substance use (or non-use) (e.g., Simons-Morton and Farhat 2010). Further, the influence of school and peers/friends on substance use may differ by gender (e.g., Maddox and Prinz 2003), as well as for some racial groups, such as African-American youth (Bonny et al. 2000; Cornelius et al. 2010; McNeely et al. 2002). Taken together, this research suggests that understanding the school and friend environments of urban African-American adolescents, and how these influences differ by gender, is critical to developing interventions aimed at preventing youth cannabis use.

## Cannabis Use Among Adolescents

Cannabis remains the most widely used illicit substance by adolescents, and there is growing evidence of negative effects associated with use during adolescence, including effects on the developing brain (Lorenzetti et al. 2016). A recent review implicates adolescent cannabis use with vulnerability to the development of anxiety, depression, suicidal ideation, personality disorders, and interpersonal violence (Copeland et al. 2013). Cannabis use has been associated with several negative educational events, including failing a school class, being held back a grade level, and having been sent to the principal (Trenz et al. 2015). Poor school performance among youth is associated with young adult cannabis use and with developing a cannabis use disorder (Hayatbakhsh et al. 2009). Differences in prevalence rates of cannabis use among racial/ethnic groups have essentially disappeared, with Hispanic and African-American high school students using cannabis at the same rate as Whites. However, compared to White and Hispanic 12th grade adolescents, African-Americans have slightly increased their average rate of daily use of cannabis in the last 3 years from 6.0% in 2012 to 6.3% in 2015 (Johnston et al. 2016).

## Cannabis Use and Attitudes Toward School

A growing literature has demonstrated the influence that the school context can have on cannabis use, and adolescents' attitudes toward school (i.e., school satisfaction, opinions about the utility of school, and comfort with school) may be particularly salient. Poor satisfaction with school was associated with higher cannabis use among Dutch high school students in one cross-sectional study (Hoff et al. 2010). In the extant literature, the construct of attitudes toward school overlaps with the definition of school bonding or connectedness to school (Maddox and Prinz 2003). Adolescents who report poor school bonding are less likely to perceive that substance use will have negative effects on their goals (Henry et al. 2005). Both cross-sectional and longitudinal studies offer evidence of this influence. In one study of data from the Monitoring the Future project, adolescents with higher levels of interest in school reported less concurrent cigarette and alcohol use (Bryant et al. 2003). In a recent latent profile analysis of high school students' substance use behavior, positive attitudes toward school were associated with being in the non-substance use group at baseline, but were not predictive of transitions to other substance use profiles over time (Mistry et al. 2015). Several studies have demonstrated that school attitudes are predictive of later substance use. Cynicism toward school predicted more frequent cannabis consumption and abuse among a sample of high school students in France (Walburg et al. 2015). A recent analysis of 12 to 17 year olds

in the National Survey on Drug Use and Health study from years 2002–2013 found that increases in positive attitudes toward school had a protective influence on the subsequent development of cannabis use disorders (Grucza et al. 2016).

## Attitudes Toward School and Gender Differences

Gender appears to play a role in how the school environment influences adolescent substance use, but findings thus far have been somewhat mixed. Some research has shown that boys in middle school have lower initial levels and greater decreases in school bonding compared to girls (Oelsner et al. 2011), while others have found similar rates of decline across boys and girls in the same age group (Wang and Dishion 2012). Other studies have suggested that girls experience faster declines in school bonding compared to boys from middle school into high school (Johnson et al. 2006). These different findings may partly reflect the differences in measurement across these studies. Some have measured how much adolescents' enjoy school and perceptions of their relationships with teachers (e.g., Oelsner et al. 2011), while others have also included feelings of being a part of their school and perceptions of relationships with teachers and others at school (e.g., Johnson et al. 2006). These mixed findings suggest examining gender differences is important when seeking to understand the influence of the school context on adolescent substance use.

## Friend Influences on Cannabis Use

Numerous studies have established the association between the negative influence of peers and friends on adolescent substance use, including cannabis (e.g., Ennett et al. 2006; Simons-Morton and Farhat 2010). In contrast, prosocially oriented peer networks can serve as protective mechanisms against substance use (Bauman and Ennett 1996). While the peer networks with which an adolescent associates have an important influence on an adolescent's substance use, research has demonstrated that close friends exert a stronger influence on an adolescent's substance use behavior, including cannabis use (Simons-Morton and Farhat 2010).

The robust literature regarding friend influence on adolescent substance use demonstrates the complexity of the relationship between these phenomena. Evidence exists to support both the friend selection and socialization mechanisms with regard to marijuana use behavior (de la Haye et al. 2013). Further, characteristics of an adolescent's friendships also play a role in how youth are influenced by their friends toward substance use. The frequency with which adolescents engage in antisocial behaviors in order to please their friends predicts

later adolescent use of cannabis and other substances, while connectedness appears unrelated to use (McDonough et al. 2015). While many studies have examined the proximal influence of friends, a few studies provide evidence of their distal influence on later substance use. For example, Korhonen et al. (2008) found that the number of smoking friends and the number who had experimented with cannabis or other drugs at age 14 predicted lifetime cannabis and drug use at age 17. Thus, the early influence of friends appears to impact substance use several years later, suggesting an important potential target for intervention.

Among urban youth, these relationships may be even more complicated. African-American youth attending inner-city secondary schools may use cannabis to manage their insecurity and “fit in” with their peer group. In one study of urban, primarily Black youth, smoking cannabis was an important source of peer bonding and social identity (Fletcher et al. 2009). In order to fit in, these adolescents appear to engage in a vicious cycle, in which they disengage from parents and school and escalate cannabis use, so as to secure their place within a peer group. As relationships with parents and teachers become more stressful because of their disengagement, youth appear to escalate their cannabis use in order to reduce stress and self-medicate (Fletcher et al. 2009).

### Gender Differences in Friend Influences on Cannabis Use

Friend networks operate differently for adolescent girls as compared with boys. Girls report more stress related to disturbances in their close friend networks compared to boys (Rose and Rudolph 2006). Further, girls engage in more social conversation and self-disclosure, as well as more prosocial behavior than boys do (Rose and Rudolph 2006). Evidence also suggests that the influence of friends on substance use differs by gender. Adolescent females’ (<17 years) substance use is strongly associated with their close friends, as opposed to older females and to younger and older males (Mason et al. 2010). Friend influences on cannabis use in particular have been shown to be stronger for girls than for boys (Epstein et al. 2016). This may reflect the differences in friend interactions as noted above, with girls developing more intimate relationships with their friends, thus building potentially stronger bridges of influence via these relationships. Girls who engage with anti-social peers may be more likely to be outliers (Epstein et al. 2016) and may be more influenced by these relationships due to the stronger bonds that develop between females. Thus, examining gender differences in friends’ influences on substance use is important to target accurately the potentially different risk factors for girls and boys.

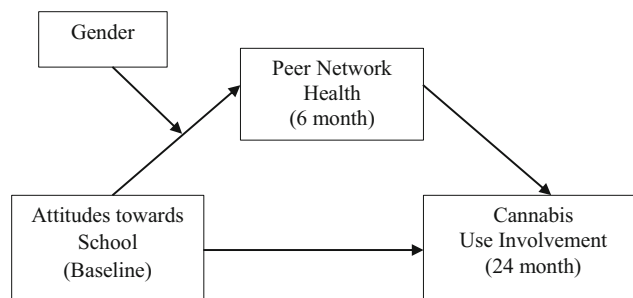
### The Current Study

The current study examines the links between attitudes toward school, close friend influence, and cannabis use involvement over time, as well as the influence of gender on these associations. We examined attitudes to school at baseline, close friend influence at 6 months, and cannabis use involvement at 24 months in order to examine the effects that school and friends have in early adolescence and how this influences substance use in later adolescence. We tested school attitudes early in adolescence (at 13–14 years old), how these attitudes affected close friend influence a shortly thereafter (6 months later), and finally whether these attitudes and close friends influences would have an impact 2 years out from baseline (24 months). We hypothesized that negative attitudes toward school would indirectly increase adolescent cannabis use involvement, prospectively, through poorer network health of an adolescent’s close friend group. In addition, we examined gender differences, hypothesizing that the indirect relationship between negative attitudes toward school and cannabis use involvement through network health would be stronger for girls than for boys. Please see Fig. 1 for our conceptual diagram.

### Method

#### Participants

This study examined data from the Social-Spatial Adolescent Study, a 2-year longitudinal investigation of the interacting effects of peer networks, urban environment, and substance use. We recruited participants between November 2012 and February 2014. The majority of participants (72%) were recruited from an urban adolescent medicine primary care clinic at Virginia Commonwealth University Medical Center, in Richmond, Virginia; the remainder were recruited from a city health district satellite clinic located within a subsidized housing development. Over 400 adolescents and parents were either approached at the outpatient hospital clinic or referred



**Fig. 1** Conceptual model of the indirect effect of attitudes toward school on cannabis involvement through peer network health being moderated by gender

from the satellite clinic; of these, 57% enrolled in the study ( $N = 248$ ). All procedures were the same across sites. Chi-square and independent  $t$  tests revealed no significant differences in demographics (age, sex, and race) or key study variables (school attitudes, peer network health, and cannabis involvement) between sites.

Eligible adolescents were aged 13 or 14 at enrollment and a registered patient of either clinic site (that is, the adolescent was an active patient and the clinic was the site where the adolescent received primary care as needed). Written informed consent was obtained from all parents and adolescent participants prior to conducting any research activities. The first author's university and the Richmond City Health Department's institutional review boards approved the research protocol, and the study received a federal Certificate of Confidentiality from the National Institutes of Health. At enrollment, participants completed an initial survey in a private room separate from parents and any clinic staff. Participants received monetary incentives for their time and effort in completing follow-up surveys (\$10 at the 6th month and \$60 at the 24th month). The majority of participants in the original sample completed the follow-up surveys at 6 months (82%) and 24 months (84%). Independent  $t$  tests revealed no significant differences between completers and non-completers on peer network health and cannabis involvement ( $p > 0.05$ ).

## Measures

**Demographics** Participants ( $N = 248$ ) reported on their age, sex, and race during the initial survey at enrollment. Age was dichotomized as participants were either 13 or 14 years old at enrollment. Gender was coded as 0 = girls, 1 = boys. Race was dichotomized (0 = not black, 1 = black) because the sample was 88% African-American, 3% White, 2% Latino, 1% Asian, 1% Alaskan Indian/Native American, and 5% Other.

**Socioeconomic Status** Following previous research (Keita et al. 2011), we used the US Census Bureau data to construct an index of neighborhood SES incorporating commonly used indicators of community-level income, educational attainment, employment, and family composition. Using 2013 estimates (EASI 2016) for the 103 block groups in the Richmond, Virginia metropolitan area that contained participant residences, the index was calculated as the mean of the z-scores of the following four variables (Cronbach's  $\alpha = 0.88$ ): median household income, percent of households which are not single-parent households with children, percent employed (of those 16 and over in the civilian workforce), and percent with a college degree. Higher scores indicated a higher neighborhood socioeconomic status (SES). Each participant was assigned an SES value based on the block group within which they resided at enrollment.

**Peer Network Health** Peer network health data were gathered using the Adolescent Social Network Assessment (ASNA) (Mason et al. 2004). The ASNA captures information on each participant's close personal contacts, which constitute their personal or egocentric friend network. In order to be consistent with past research with this measure, we retain the term "peer network health" even though the data collected represent an adolescent's close friends. Because our study focused on the influence of close friend networks, we limited the number of nominated close friends to three as this is within the range commonly reported for close friend network size. For example, in a recent national study, Ali et al. (2011) reported that the average number of close friends nominated among adolescents was 2.54. Also, given the aims of the present study, limiting the number of close friends was desired because close friends have more influence on health behaviors such as substance use than general peer networks (Cruz et al. 2012; Duan et al. 2009). Adolescents were asked to think of up to three friends and to provide information about each of their friends' substance use, influence on behavior, and types of activities. Specifically, participants were asked about negative/risky activities such as whether they know if each nominated friend uses substances, if the friend is a daily user, and whether the participant has been directly or indirectly influenced to use or not to use substances by each friend, as well as participating in illegal, violent, or dangerous behaviors. In addition, participants were asked about positive/protective activities with their friends such as receiving help with school or transportation, providing support by talking through problems, and encouragement to participate in sports, volunteering, or religious activities. Participants reported on these behaviors by answering questions such as "Has Friend XX ever offered, suggested, or asked you to use alcohol, marijuana, or other drugs?" and "During the past 30 days, did Friend XX provide you with support such as: help with school, help with money, help with transportation, or talking through problems?"

All items (risky and prosocial) were combined to create a total score for each friend and are based upon a weighted scoring procedure, with scores ranging from  $-14$  to  $14$ . Weights were based upon our previous research that has successfully used this scoring system (Mason et al. 2004, 2011, 2015). Risky and protective friend behaviors were collapsed into an index score, as research has shown that close friends often may provide both opportunity to engage in risk behavior as well as positive support in an adolescent's life (Haynie 2002). Given these data, we developed the following weighted scoring procedures for risk quality: substance user =  $-1$ , daily user =  $-3$ , negative activity =  $-4$ , offered to use =  $-6$ ; and for protective quality: non-substance user =  $4$ , absence of negative activities =  $4$ , did not offer to use =  $6$ . Assuming three friends per participant, total network quality scores can range from  $-42$  to  $42$ . Higher scores indicate greater peer network

health, and lower scores indicate poorer network health or greater behavioral risk. The ASNA has favorable internal reliability (Cronbach's alpha = 0.84) and correlates significantly in the expected direction with self-reported measures of substance use (any alcohol, cannabis, or other substance) ( $r = -.64$ ), alcohol use ( $r = -.66$ ), and cannabis use ( $r = -.54$ ) (Mason et al. 2011).

**Cannabis Involvement** Three items covering cannabis involvement from the Center for Disease Control and Prevention's Youth Risk Behavior Survey (CDC 2011) were used to tap the lifetime use of cannabis, number of offers received, and refusals made to use cannabis in the past 30 days. Each item was explored as a separate outcome, in order to examine differences in school attitudes and peer network health on each aspect of involvement with cannabis. We use the term involvement to be inclusive of the items asked. This is in line with other research that has examined these outcomes separately (e.g., focusing on offers; Andreas and Pape 2015). Each of the three items was dichotomized as 0 = *no lifetime use* or *no past 30-day offers* or *no past 30-day refusals*, 1 = *any lifetime use* or *any past 30-day offers* or *any past 30-day refusals* respectively to account for the zero-inflated nature of the data and the non-normal distribution.

**Attitude Toward School** We used the Attitude to School scale from the Behavior Assessment System for Children, second edition (Reynolds and Kamphaus 2006), a seven-item measure that assesses general utility of school and comfort with school-related matters. Elevated scores indicate decreasing satisfaction and pervasive discomfort with school, placing individuals at risk for dropping out. The scale has an acceptable Cronbach's alpha reliability coefficient of 0.85. Items were summed to create a total scale score, with scores ranging between 0 and 17.

### Statistical Analyses

We began our analyses by conducting descriptive and correlational analyses on the variables included in our models. We chose the 6-month peer network assessment time point in order to model the early influence of friends on cannabis involvement across 24 months. We also conducted an intraclass correlation coefficient (ICC) analysis to determine whether it would be more appropriate to nest our models, given our inclusion of neighborhood socioeconomic status as a control variable. Results of our ICC analysis indicated that neighborhood SES was not significantly clustered by block group ( $ICC = 0.059$ ,  $p = 0.177$ ), suggesting that multilevel modeling was not justified. As we used the smaller block groups instead of the larger census tracts to create the neighborhood SES variable, there were few participants per group ( $M = 2.5$ ), and in many cases, only one participant per block group.

We then tested our study's hypotheses in two steps. First, we tested three individual simple mediation models. Using the PROCESS SPSS, Model 4 computational tool (Hayes 2013), we estimated the indirect effect using bootstrap procedures (10,000 samples). This examined whether the association between attitude to school and each of the cannabis involvement items was mediated by peer network health. PROCESS SPSS automatically recognized the dichotomous nature of the outcome variables and estimated the models using logistic regression. Second, we tested the moderated mediation hypothesis with gender entered as the moderator on the relationship between attitudes toward school and peer network health. We used PROCESS Model 7 to estimate the significance of conditional indirect effects at different values of the moderator variable (male, female). This examined whether (1) the association between attitude to school and peer network health was moderated by gender and (2) the strength of the hypothesized indirect (mediation) effect was conditional on the value of the moderator, which is also known as conditional indirect effects (Preacher et al. 2007). Based on the recommendation of Aiken et al. (1991), all predictors were standardized. Missing data were handled using multiple imputation procedures (i.e., expectation maximization algorithm) in SPSS V. 21. Little's Missing Completely At Random (MCAR) test was subsequently conducted ( $\chi^2 = 6.435$ ,  $DF = 9$ ,  $p > 0.05$ ), indicating no systematic missingness.

## Results

### Descriptive Statistics

Table 1 provides descriptive statistics for all variables from baseline to the 24-month follow-up. Our sample was 57% female, 88% African-American, with an average initial age of 13.4. Correlations between each of the cannabis involvement items were significant. The correlation between lifetime use and the past 30-day offers to use was large and significant ( $r = 0.589$ ,  $p < 0.001$ ). Lifetime use was also significantly correlated with past 30-day refusals to use ( $r = 0.162$ ,  $p < 0.05$ ). The past 30-day offers was moderately correlated with past 30-day refusals ( $r = 0.204$ ,  $p < 0.001$ ).

### Test of Mediation

We hypothesized that peer network health would mediate the association between attitude toward school and cannabis involvement. To examine this hypothesis, we conducted three mediation models with logistic regression, testing the indirect effect of negative attitudes toward school through peer network health on each of the three cannabis involvement variables (dichotomized). The model including refusals to use was not significant. The model including lifetime use and the

**Table 1** Descriptive statistics for study variables at baseline ( $N = 248$ )

Variable	Mean (SD)
Age	13.4 (.49)
Neighborhood socioeconomic status	-0.6 (.94)
Attitudes toward school	5.73 (2.75)
Peer network health	19.4 (11.0)
Lifetime cannabis use <sup>a</sup>	1.3 (1.0)
Past 30-days offers to use cannabis <sup>b</sup>	1.3 (.94)
Past 30-days refuse to use cannabis <sup>b</sup>	1.8 (1.9)

Coding note:

<sup>a</sup> 1 = 0 times, 2 = 1–2 times, 3 = 3–9 times, 4 = 10–19 times, 5 = 20–39, 6 = 40–99 times, 7 = 100 or more times

<sup>b</sup> 1 = 0 days, 2 = 1–2 days, 3 = 3–5 days, 4 = 6–9 days, 5 = 10–19 days, 6 = 20–29 days, 7 = all 30 days

model including offers to use cannabis were significant. Supporting our hypothesis, the pathway between attitude to school and lifetime cannabis use was significantly mediated by peer network health, while controlling for race, gender, age, SES, and baseline lifetime cannabis use. A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was entirely above zero ( $\beta$  indirect = 0.024, Boot SE = 0.0162,  $CI_{95}$  0.0014–0.066,  $p < 0.05$ ). Similarly supporting our hypothesis, the pathway between attitude to school and past 30-day offers for cannabis

use was significantly mediated by peer network health, while controlling for race, gender, age, SES, and baseline past 30-day offers for cannabis use. A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was entirely above zero ( $\beta$  indirect = 0.032, Boot SE = 0.019,  $CI_{95}$  0.004–0.082,  $p < 0.05$ ). Complete model coefficients for both models are provided in Table 2.

**Test of Moderated Mediation**

We hypothesized that the association between attitudes toward school on both lifetime cannabis use and on offers to use cannabis through peer network health would be stronger for girls than for boys (i.e., moderated mediation). For the model predicting lifetime cannabis use, results indicated that the interaction term between attitude toward school and gender was only marginally significantly related to peer network health ( $\beta$  interaction = 1.13, SE = 0.63,  $p = 0.07$ ). For the model predicting offers to use, results indicated that the interaction term between attitude toward school and gender was only marginally significantly related to peer network health ( $\beta$  interaction = 1.17, SE = 0.63,  $p = 0.06$ ). Thus, the indirect pathway from attitude to school to peer network health to lifetime cannabis use was not dependent on gender. Similarly, the indirect pathway from attitude to school to peer network health to offers to use cannabis was not dependent on gender.

**Table 2** Model coefficients and significance test for peer network health mediating attitude to school on cannabis involvement variables (lifetime use and offers to use)

Mediation model predicting lifetime cannabis use						
Predictors	Outcomes			Outcomes		
	Peer network health (M)			Lifetime cannabis (Y)		
	Coeff.	Boot SE	<i>p</i>	Coeff.	Boot SE	<i>p</i>
Attitude to school (X)	-0.61	0.30	0.04	0.01	0.05	0.92
Peer network health (M)	-	-	-	-0.04	0.01	0.001
Constant	17.86	20.03	0.37	-6.21	4.12	0.13
	$R^2 = 0.14$			Nagelkerke $R^2 = 0.22$		
	$F(6, 236) = 4.93, p < 0.001$					
Inferential test of significance: Effect = 0.024, Boot SE = 0.016, BootLLCI = 0.001, BootULCI = 0.066						
Mediation model predicting offers to use cannabis						
Predictors	Outcomes			Outcomes		
	Peer network health (M)			Offers for cannabis (Y)		
	Coeff.	Boot SE	<i>p</i>	Coeff.	Boot SE	<i>p</i>
Attitude to school (X)	-0.68	0.30	0.02	0.05	0.06	0.42
Peer network health (M)	-	-	-	-0.05	0.02	0.002
Constant	22.09	19.90	0.27	-2.07	4.67	0.66
	$R^2 = 0.19$			Nagelkerke $R^2 = 0.21$		
	$F(6, 237) = 8.53, p < 0.001$					
Inferential test of significance: Effect = 0.032, Boot SE = 0.019, BootLLCI = 0.004, BootULCI = 0.082						

Bootstrap sample size = 10,000. *LL* lower limit, *CI* 95% confidence interval (bias-corrected), *UL* upper limit Gender, age, race, and SES were controlled for in both models. Baseline lifetime cannabis use was controlled for in the mediation model predicting use; baseline offers for cannabis use were controlled for in the model predicting offers to use cannabis

## Discussion

The present study integrated data on attitudes toward school and the health of adolescents' close friend group during early adolescence to examine indirect pathways by which school attitudes lead to involvement with cannabis during later adolescence differently for girls and boys. Findings align with previous research that has shown that school and friend influences can act to put youth at risk of substance use (e.g., Hoff et al. 2010; Su and Supple 2016). The findings specifically extend the growing literature on offers to use (Andreas and Pape 2015; Pinchevsky et al. 2012) by demonstrating longitudinal pathways by which adolescents become increasingly involved in cannabis use. Youth with high-risk profiles—those with a cannabis-using best friend and involved in more delinquent activities—are more likely to receive offers to use (Andreas and Pape 2015). Our study results show that negative attitudes toward school operate to increase an adolescent's cannabis use and their offers to use cannabis indirectly through the health of their close friend group. Two years later, these adolescents had used cannabis more frequently and were offered cannabis more frequently, possibly by their close friends, increasing their exposure to and potential involvement in cannabis use.

One reasonable interpretation of these results is that youth who have negative attitudes toward school during early adolescence have a weaker attachment to their school environment. This interpretation is in line with social control theory (Agnew 1985; Hirschi 1969), which purports that youth who experience strain in the school environment form weak attachments to school—a prosocial institution—and consequently form attachments to deviant friends in its place. These youth then may become influenced by their friends who are engaged in delinquent activities, such as cannabis use, or reinforced by their friends for the delinquent acts in which they have become involved. These results also suggest that a healthier close friend group protects youth from becoming involved in delinquent activities, such as substance use. Thus, the behaviors of close friends can act as a risk or protective influence on cannabis use involvement.

Further, our results suggest that close friends increase both opportunity to use (e.g., offers) cannabis and lifetime cannabis use. Though experiencing increased offers to engage in cannabis use is less concerning than actual use, it is still an important target of study and intervention. Exposure to opportunities to use substances is considered an initial step toward substance use (e.g., Pinchevsky et al. 2012) and may occur both directly by associating with substance users and indirectly, for example, through the associates of close friends. Furthermore, in this study, offers to use were significantly correlated with lifetime cannabis use.

Interestingly, we did not find evidence that school attitudes indirectly influenced refusals to use cannabis. This finding

may reflect the developmental stage of the adolescents studied. As youth enter later adolescence, it is reasonable to expect that they may receive more offers to use cannabis and may experiment with cannabis use more frequently. However, older adolescents may not increasingly refuse offers to use in order to fit in with their peers. If youth are less likely to refuse offers to use, then teaching refusal skills in drug prevention programs may not be the most effective strategy for preventing use. Potentially supporting this idea, a recent meta-analysis of cannabis prevention programs found no significant impact on improving refusal skills among middle school adolescents (Lize et al. 2017).

Contrary to our hypothesis, we did not find gender differences in the indirect pathway from attitudes toward school on cannabis involvement through the influence of close friends. The extant literature is mixed with regard to gender findings on school attitudes and bonding. Some research has shown gender differences in school bonding (Oelsner et al. 2011), while other research have found similar rates across boys and girls (Wang and Dishion 2012). However, our results suggest that school attitudes operate similarly across adolescent boys and girls, indirectly influencing cannabis use involvement through the behavior of close friends. This research is also in line with recent research, indicating no gender differences in cannabis use outcomes, after controlling for opportunities to use (Van Etten and Anthony 2001).

There are several study limitations to consider when interpreting these results. First, our sample was an urban, primarily African-American sample of youth who were actively engaged with a medical center and therefore our findings may not apply to other populations. While this is an important population to study due to historic underrepresentation within research studies on adolescents, replications with more diverse ethnic and geographic populations are needed. Second, our measure of peer network health was self-report, possibly limiting the accuracy of the data collected regarding friends' antisocial and prosocial activities. However, some research has suggested that an adolescent's perceptions of their friend network are more predictive of engagement in risk behavior than collecting data directly from friends (e.g., Deutsch et al. 2015; Prinstein and Wang 2005). Third, our measure of peer network health included only three items on prosocial behavior. However, while limited, these items captured several traditional aspects of social support that have been validated in the literature, including instrumental and emotional support (e.g., Malecki and Demaray 2002). Fourth, we limited our friend network measure to collect data on each participant's three closest friends. While this is in line with data on the average number of nominated close friends among adolescents (Ali et al. 2011) and relevant to our hypotheses, findings may differ if expanded beyond three closest friends. Fifth, we did not test whether youth engaged in behavior in order to fit in with their peer group. Understanding reasons for youth's

behavior related to their friends could inform which strategies might be most effective in preventing substance use. Finally, we did not control for the influence of offers on use in our analyses. Future work should test this hypothesis to determine whether it may be more plausible to focus intervention efforts on offers rather than use behaviors.

Despite these limitations, the results of this study have important implications for prevention work. Our results suggest that attitudes about school in early adolescence have an important influence on later involvement with cannabis use. These findings are in line with social control theory (Agnew 1985; Hirschi 1969) in emphasizing the importance of youth's bonds to prosocial institutions as a means of instilling conventional norms and deterring attachment to deviant peers as a means of preventing substance use. Thus, preventive interventions that aim to assist youth in developing strong bonds to prosocial institutions, such as school, and fostering positive attitudes toward these institutions would likely be effective in preventing youth from engaging with deviant peers and precluding opportunities for exposure to substance use. Comprehensive school-based interventions, such as The Gatehouse Project (Bond et al. 2004), which includes components focused on building secure, trusted attachments with teachers and students at school, and improving school engagement and climate, have demonstrated reductions in substance use, such as smoking. Future work in the prevention science field should continue to develop this line of prevention programming, focusing on early attitudes about and attachments to school and other prosocial institutions, as these early attitudes and relationships may help youth develop more prosocial friendships and prevent later substance use and delinquent activity. Encouraging parents to instill positive attitudes about school could further reinforce strong attachments to school and the development of prosocial norms. Interventions that aim to improve adolescents' identification with school, the support and respect they feel from teachers, and their ability to freely join extracurricular activities may help them to develop more positive attitudes about their school, which in turn may help to prevent them from becoming involved with deviant friends, thus reducing the opportunity and propensity to engage in substance use. Including parents in these interventions could reinforce these goals and solidify school as a supportive environment toward which youth develop positive attitudes.

#### Compliance with Ethical Standards

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

**Funding** The study was funded by a National Institute of Drug Abuse grant (1R01DA031724) awarded to Michael J. Mason, PhD.

**Human and Animal Rights** 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.

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