

Peer Attitudes Effects on Adolescent Substance Use: The Moderating Role of Race and Gender

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Abstract We examined the relationship between adolescents' perceptions of their close friends' attitudes about substance use, and their own use of cigarettes, alcohol, and marijuana. Using data from the 2010 National Survey on Drug Use and Health, a multistage area probability sample sponsored by the Substance Abuse and Mental Health Services Administration ($n=17,865$), we tested the direct and moderating effects of subgroups of race and gender on perceptions of adolescents' close friends on past month substance use. Significant effects were found on peer attitudes influencing substance use for all race and gender subgroups. Close friends' attitudes of indifference were associated with increased substance use and disapproval associated with reduced use, controlling for age, income, family structure, and adolescents' own attitudes of risk of substance use. Significant moderating effects of peer attitudes on cigarette and marijuana use were found for both gender and race moderators. Conditional effects of the moderation by race were also examined for gender subgroups. The moderating effect of race on close friends' attitudes impacting cigarette and marijuana use was stronger in magnitude and significance for females compared to males. Female marijuana and cigarette use was

more influenced by close friends' attitudes than males, and whites were more influenced by their close friends than Hispanics and blacks. White females are more susceptible to close friends' attitudes on cigarette use as compared to white males and youth of other races. Implications for socially oriented preventive interventions are discussed.

Keywords Adolescent substance use · Peer attitudes · Race and gender

Introduction

Developmental science has long established that children play a role in each other's psychological and social development. Peers contribute uniquely and independently from family factors in the socialization process and are considered one of the primary engines of development for children. As children develop into adolescents, important relationships are created that evolve over time and have bearing on mental and physical health, mortality, and well-being. Children's developmental change is a result of bilateral processes connecting children and their close friends as codeterminants of change and subsequent outcomes (Hartup 2009). Understanding this bilateral and potent function of peer effects on increasing risk for, and protection against, adverse outcomes has become foundational for prevention scientists. It is now evident that more detail is needed on how gender and racial characteristics interact within peer contexts to produce varying trajectories of risk or protection. Towards this end, the focus of this study is to test whether gender and race moderate the influence of close friends' attitudes on adolescent cigarette, marijuana, and alcohol use.

Our study is guided by the well-established principles of Social Cognitive Theory (SCT) (Bandura 1986), which posits that human behavior results from the dynamic and ongoing interaction of personal, environmental, and behavioral factors. According to SCT, personal variables, (e.g., demographic characteristics and family influences) interact with

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environmental variables (e.g., socioeconomic status and close friends' influences) to drive behavior. Behavior, in turn, influences an individual's personal and environmental domains and future behavior (Bandura 1986). SCT provides a useful framework for understanding the influence of personal and environmental factors on adolescent substance use behavior. Personal factors, such as demographic variables and family influences, also have been linked with adolescent substance use. Age, race, and gender have been demonstrated to have differential influences on youth substance use. For example, older youth report more substance use than younger adolescents (SAMHSA 2011); lower levels of substance use are reported by African American and Latino youth as compared to Caucasian youth (CDC 2012; Dauber et al. 2011) and by girls as compared with boys (SAMHSA 2011). Similarly, family structure has been linked with adolescent substance use; youth within single-parent homes report higher rates of substance use than their peers in two-parent families (Hemovich et al. 2011). Socioeconomic status (SES) has also been linked with youth substance use. There is growing evidence that adolescents with higher SES may be at risk for developing substance use disorders; researchers have demonstrated what appears to be an inverse relationship between SES and cigarette use among these higher SES samples (Goodman and Huang 2002).

Environmental factors, including peer influences, have been linked to adolescent substance use in the literature. A large body of research has revealed the strong influence of the peer environment on adolescent substance use; peers' own substance use and negative attitudes about substance use have consistently been found as a risk factor for adolescent substance use (e.g., Bauman and Ennett 1996; Hawkins et al. 1992; Iannotti and Bush 1992; Mason et al. 2010; Urberg et al. 1997; Valente et al. 2005). In contrast, researchers have shown that peer disapproval of substance use acts as a protective factor for adolescent substance use (Kumar et al. 2002).

Consistent with SCT, personal and environmental variables have been shown to interact in their influence on adolescent substance use behavior. For example, with regard to age, peer disapproval of substance use appears to provide a stronger protective effect for younger than older students (Kumar et al. 2002). Gender also interacts with peer factors; females and males derive differing benefits from social networks, suggesting they are differentially influenced by them (Crick and Zahn-Waxler 2003; Mason et al. 2009). Some preliminary evidence suggests that race/ethnicity also interacts with peer factors; recent research has demonstrated that multiracial youth report higher rates of yielding to peer pressure than some single-race youth, even after controlling for age, gender, and SES (Choi et al. 2012). Furthermore, perceptions of peers' substance use attitudes are an important determinant of individual substance use behavior (Iannotti and Bush 1992; Kandel 1996; Fite et al. 2009), interacting with personal beliefs to shape whether an individual actually uses substances.

Thus, age, gender, race/ethnicity, and peers appear to interact in the influence on the use of substances producing varying outcomes, supporting the need to advance this line of research. Based on the literature reviewed and our past work, we hypothesize that (1) perceived close friends' attitudes will be associated with use of cigarettes, alcohol, and marijuana, and (2) race and gender will moderate the effects of close friends' attitudes on adolescent substance use.

Method

For the present study, we used data from the 2010 National Survey on Drug Use and Health (NSDUH), a multistage area probability sample sponsored by the Substance Abuse and Mental Health Services Administration. The NSDUH uses in-person interviews with a national probability sample of 68,487 persons to estimate drug use in the USA. The sampling weights on the public use file were adjusted for subsampling and calibrated with respect to 45 demographic domains. Sampling design weights were adjusted in three steps via the following methods: (1) weighting class adjustments for nonresponse, (2) raking-ratio adjustments for poststratification, and (3) winsorization for extreme weights. We used the weighted data in our analyses so that estimates are representative of the U.S. adolescent population. Strategies for ensuring high rates of participation resulted in a screening response rate of 88.8 % and an interview response rate of 74.7 %. Respondents were assured that their identities and responses would be handled in strict compliance with federal law. Each respondent who completed a full interview was given a \$30 cash payment as a token of appreciation for his or her time. For our study, we used respondent data from adolescents ages 12 to 17 years old with no missing data in any of our variables of interest, resulting in a sample of 17, 865.

Control, Predictor, and Moderator Variables

All measures were derived from the NSDUH items and are described below. We used three variables as covariates to control for the effects of demographic characteristics on substance use. *Age* (in years) was chosen as a covariate because of the well-established correlation with substance use. Household income was chosen as a covariate to control for SES, a characteristic which has been shown to be related to substance use. The *Income* variable was dichotomized into greater than \$50,000 per year (*income*=1) and less than \$50,000 per year (*income*=0), based on the median distribution for this sample. We also incorporated a variable capturing family structure because youth living with no biological parents or in single-parent households are less likely than children with two biological parents to exhibit behavioral self-control (Manning and Lamb 2003). The *Family Structure* variable

was dichotomized to encode households where both parents lived at home (family structure=1) versus other family structures (i.e., one-parent households or other; family structure=0). Parents were defined as biological parents, adoptive parents, stepparents, or adult guardians who live in the teen's household.

The key predictor variable of interest assessed adolescents' perceptions of their close friends' attitudes about substance use. Adolescents were asked about their close friends' attitudes on daily cigarette smoking, drinking alcohol nearly every day, and monthly marijuana or hashish use. The *Perceptions of Close Friends' Attitudes* (hereafter referred to as *Peer Attitudes*) construct consists of three substance specific items: (1) How do you think your close friends would feel about you smoking one or more packs of cigarettes per day, (2) How do you think your close friends would feel about you having one or two drinks of an alcoholic beverage nearly every day, and (3) How do you think your close friends would feel about you using marijuana or hashish once a month or more? All of these variables were dichotomized into values of "1" (friends disapprove), and "0" (friends are indifferent). We also sought to differentiate the perceived opinions of subjects' close friends from their own perceptions of risk of substance use by incorporating the *Perception of Risk* variable as a control to be used in tandem with the peer attitudes variable. For each type of substance use (cigarettes, alcohol, and marijuana), the perception of risk variable contains a value of "1" if the youth perceives a "great risk" of harming themselves physically and in other ways by using (i.e., smoking one or more packs of cigarettes per day, having one or two drinks of an alcoholic beverage nearly every day, using marijuana or hashish once a month or more) and a value of "0" otherwise.

The moderating variables included in the model were gender and race. The *Gender* variable encoded whether a subject was female (gender=1) or male (gender=0). *Race* was categorized for each subject as white, black (we used the NSDUH race categories), Hispanic, or Other Race. From this variable, we created dummy variables for each of the four race categories such that a value of "1" was given if a subject identified as that race, and otherwise a value of "0" was given. When the racial group variable was included in the models, the white group was used as the referent group compared against the other racial groups. But in the models

when the moderating effect of race was examined, we used each race separately (i.e., black vs. non-black), thus not including the three other dummy variables the model. Because the number of individuals included in the Other Race group (i.e., Asian, Native American/Alaskan Native, and Native Hawaiian/Pacific Islander) was too small to adequately examine their racial group effect, these groups were combined into one group.

Dependent Variables

Three dependent variables for *Substance Use* captured monthly cigarette, alcohol, and marijuana use, respectively. Monthly use is a more conservative measure of use, and more likely to indicate problem use, compared to annual or lifetime substance use. Each substance use variable (i.e., cigarette use, alcohol use, and marijuana use) was dichotomized into "0" (substance has not been used in the past month) and "1" (substance has been used in the past month).

Analytical Approach

Descriptive statistics were used to examine participant characteristics, substance use, and peer attitudes by gender and race. Pearson product-moment correlation analysis was conducted between past month substance use and peer attitudes to determine directionality and strength of the relationships among these variables. Logistic regression was employed to test the influence of peer attitudes on each substance use outcome in turn while controlling for gender, race, age, income, family structure, and perception of risk. Moderation effects of gender, race, and gender and race together were tested using the approach described by Hayes and Matthes (2009) and Hayes (2013), and visualized using interaction plots as described by Dawson and Richter (2006).

We first investigated the moderation of peer attitudes on substance use by gender and race independently by entering the relevant interaction terms for gender and each race category in separate logistic regression equations. We then tested for moderation by race and gender simultaneously by entering interaction terms composed of the combination of peer attitudes, gender, and race, for each race category independently, expressed as

$$U_s = \beta_0 + \beta_1 A + \beta_2 N + \beta_3 F + \beta_3 P + \beta_3 R + \beta_4 G + \beta_5 E + \beta_3 I_1 + \beta_3 I_2 + \beta_3 I_3 + \beta_3 I_4 + \epsilon$$

where U_s is the use of substance s (i.e., cigarette, alcohol, or marijuana) in the past month, A is age (centered), N is income, F is family structure, P is peer attitudes, R is perception of risk, G is gender, E is race (e.g., white vs. non-white), I_1 is the interaction term peer attitudes times

gender, I_2 is the interaction term peer attitudes times race, I_3 is the interaction term gender times race, I_4 is the interaction term peer attitudes times gender times race, ϵ is the error term, and β is a coefficient to be estimated. We use this approach because, in comparison to incorporating all race

Table 1 Percentages of participant substance use and friends’ disapproving by race and gender (*n*=17,865)

	Cigarettes		Marijuana		Alcohol	
	% Use	% Friends disapprove	% Use	% Friends disapprove	% Use	% Friends disapprove
White male	9.6	85.9	8.5	78.1	15.3	83.0
White female	10.5	89.6	7.0	82.7	15.7	88.3
Black male	7.7	82.2	10.1	76.8	11.5	80.5
Black female	4.5	89.0	7.2	83.3	12.5	87.8
Hispanic male	9.9	84.1	9.7	76.5	15.4	79.7
Hispanic female	6.3	89.7	6.7	84.4	15.2	86.2
Other race male or female	8.5	89.0	7.3	81.5	11.7	86.5

categories within a single equation, it simplifies each logistic regression equation to a manageable number of interaction terms to interpret, supports the comparison of the moderating effect of each race to the average effect of the other races, and supports the visualization (simple slopes) and comparison of the conditional effects of peer attitudes on substance use at different levels of the combined gender–race moderator, as described by Dawson and Richter (2006) and Hayes (2013).

Results

Descriptive statistics revealed that gender and racial group distributions of our sample closely resemble national percentages, with 49.4 % female, 60.2 % white, 17.3 % Hispanic, 13.2 % black, and 9.3 % Other Races. Younger teens (ages 12–14) made up 47.5 % of the sample, and 68.7 % of adolescents have both parents living at home. Households earning less than \$50,000 made up 31.7 % of the sample.

Table 1 lists percentages of past month cigarette, alcohol, and marijuana use and percentages of friends that disapprove of each substance by gender and race subgroups. White females use more cigarettes and alcohol, while black males use more marijuana compared to other subgroups. Across all subgroups, adolescents’ close friends disapprove of cigarette use more than marijuana and alcohol use, and disapprove of using alcohol more than marijuana. However, it should be noted that peer attitudes about cigarettes and alcohol reflect daily use, while for marijuana they reflect monthly use.

Table 2 shows the results of two logistic regression models for each substance where Model 1 includes the control and gender and race variables, and Model 2 adds the Peer Attitudes and Perception of Risk variables. For cigarettes, being older, white, living in a household with lower income, and not having two parents at home increase the likelihood that adolescents used cigarettes in the past

month. For alcohol, being older and not having two parents at home also increase the likelihood that adolescents used alcohol in the past month. White adolescents were found to be more likely to have used alcohol in the past month than black teens and those in the Other Race category, as were teens in higher income households, though only after accounting for Peer Attitudes. Females also were found to be more likely to use both cigarettes and alcohol, but only after accounting for the influence of peer attitudes. For marijuana, being older, lower income, and not having two parents at home increase the likelihood of past month use.

Table 3 shows the odds ratios of the interaction terms for logistic regression models of moderation by gender, race, and combined race and gender, of peer attitudes influence on cigarettes, alcohol, and marijuana use while controlling for age, income, family structure, and perception of risk¹. These results are complemented by Figs. 1, 2, and 3, which show the respective simple slopes of the subgroups by gender (Fig. 1), race (Fig. 2), and combined gender and race (Fig. 3). In these figures, the *y*-axis shows the probability of substance use predicted by the logistic regression, the *x*-axis shows the dichotomized values of the independent variable peer attitudes, and the lines represent the slope of the regression line for the different subgroups of the moderating variables.

Significant moderation effects were found for gender and cigarette use, where females are influenced to a greater degree by their peers’ attitudes as compared to males, as illustrated by the steeper slope of the female regression line as compared to males in Fig. 1 (left). Moderation by race was observed as well. For cigarettes and marijuana, whites were found to be more influenced by their peers’ attitudes as compared to non-whites, as is illustrated by the steeper slope of the regression lines for whites as compared to blacks and Hispanics in Fig. 2, left (cigarettes) and right (marijuana).

¹ For brevity, we provide the odds ratios of only the interaction terms in Table 3. Complete variable models are provided in Appendices 1 and 2.

Table 2 Odds ratios from logistic regression of cigarette, alcohol, and marijuana use ($n=17,865$)

Variables	Model 1	Model 2
Cigarette		
Age	1.69** (1.63–1.75)	1.62** (1.56–1.68)
Income	0.60** (0.53–0.68)	0.68** (0.60–0.77)
Family structure	0.66** (0.59–0.75)	0.70** (0.62–0.79)
Gender	0.95 (0.85–1.05)	1.12* (1.01–1.26)
Black	0.38** (0.31–0.46)	0.40** (0.32–0.48)
Hispanic	0.62** (0.53–0.72)	0.64** (0.55–0.75)
Other race	0.71** (0.58–0.86)	0.77* (0.63–0.94)
Peer attitudes		0.20** (0.18–0.23)
Perception of risk		0.52** (0.47–0.59)
Constant	0.16**	0.65**
AUC	0.74**	0.80**
Nagelkerke R^2	0.14	0.23
Alcohol		
Age	1.69** (1.64–1.74)	1.64** (1.59–1.69)
Income	1.04 (0.94–1.14)	1.12* (1.01–1.24)
Family structure	0.78** (0.70–0.86)	0.81** (0.73–0.90)
Gender	1.03 (0.95–1.12)	1.24** (1.13–1.35)
Black	0.65** (0.56–0.75)	0.70** (0.61–0.82)
Hispanic	0.97 (0.86–1.09)	0.98 (0.87–1.11)
Other race	0.67** (0.57–0.79)	0.69** (0.58–0.82)
Peer attitudes		0.36** (0.33–0.40)
Perception of risk		0.51** (0.47–0.56)
Constant	0.17**	0.46**
AUC	0.73**	0.77**
Nagelkerke R^2	0.14	0.20
Marijuana		
Age	1.73** (1.66–1.80)	1.47** (1.40–1.53)
Income	0.85* (0.75–0.97)	0.79** (0.69–0.91)
Family structure	0.61** (0.54–0.70)	0.71** (0.62–0.82)
Gender	0.77** (0.69–0.86)	0.94 (0.83–1.06)
Black	0.85 (0.71–1.01)	0.99 (0.82–1.19)
Hispanic	0.95 (0.82–1.12)	1.02 (0.86–1.20)
Other race	0.84 (0.68–1.03)	0.90 (0.72–1.12)
Peer attitudes		0.13** (0.11–0.15)
Perception of risk		0.21** (0.16–0.27)
Constant	0.11**	0.41**
AUC	0.74**	0.86**
Nagelkerke R^2	0.13	0.31

Confidence intervals (95 %) are reported in parentheses

* $p < 0.05$, ** $p < 0.005$

The effect of peer attitudes on the three types of substance use examined in our study differed based on adolescents' racial/ethnic background. The stronger influence of peer attitudes on substance use for whites was driven by the relatively weaker influence of peer attitudes on cigarette,

alcohol, and marijuana use for Hispanics, as well as the weaker influence of peer attitudes on marijuana use for blacks. Moderation for combined race and gender was significant only for cigarette use, where peer attitudes of cigarette use were found to be particularly strong for white females as compared to others, as shown by Fig. 3 (left), where the slope for white females is steeper than for any other gender–race subgroup.

Table 4 provides the conditional effects of moderation by race of peer attitudes influence on cigarette, alcohol, and marijuana use for male and female subgroups. The moderating effect of race on close friends' attitudes impacting cigarette and marijuana use was generally stronger in magnitude and significance for females as compared to males. For cigarettes, for example, whites are more influenced by their peers' attitudes towards daily use as compared to non-whites, but this pattern is observed only for females, not males. Similarly, whites are more influenced by their friends' attitudes for marijuana use, though the magnitude of the moderating effect is felt more strongly for females than males for all races. The lone exception to this pattern appears to be for alcohol use, where Hispanics are less influenced by their peers' attitudes than non-Hispanics, but only among males.

Discussion

Understanding the role of peer attitudes on adolescent substance use and how these effects vary by gender and race is important for prevention science and practice. Research and intervention programming could be improved by addressing the robust and differentiating influence that peer attitudes have on substance use for adolescents. Given that these results are based upon a national representative sample, the findings provide generalizable evidence for the influence of peer attitudes on substance use and therefore have the potential to inform prevention science for U.S. youth. A unique contribution to this study was the focusing on the influence of close friends' attitudes. By using close friends, instead of the broader and less distinct term peers, we were better able to model the bilateral, micro-social processes (influence) that uniquely occur among adolescents' close friends. Further, by controlling for the effect of individual level attitudes' regarding substance use, we addressed the concern of "projection," i.e., adolescents' belief that other teens use at the same level as themselves, providing more confidence to the results. Next, these findings were unique in the specification of differing moderating roles of gender, race/ethnicity, on peer influence across three of the most commonly used substances. This level of specificity allows for differentiating research designs and interventions based upon gender, race/ethnicity, and the type of substance, which

Table 3 Odds ratios of interaction terms for logistic regression models of moderation by gender, race, and combined race and gender of the peer attitudes variable on cigarette, alcohol, and marijuana use ($n=17,865$)

Moderation	Cigarettes	Alcohol	Marijuana
Gender			
Gender×peer attitudes	0.70** (0.55–0.89)	1.01 (0.83–1.24)	0.97 (0.75–1.24)
Race			
White×peer attitudes	0.66** (0.51–0.84)	0.84 (0.68–1.03)	0.61** (0.48–0.79)
Black×peer attitudes	0.98 (0.67–1.45)	1.03 (0.76–1.41)	1.96** (1.40–2.74)
Hispanic×peer attitudes	1.90** (1.37–2.64)	1.36* (1.05–1.76)	1.46* (1.07–1.99)
Race and gender			
Gender×white×peer attitudes	0.59* (0.36–0.98)	1.09 (0.72–1.65)	0.81 (0.49–1.35)
Gender×black×peer attitudes	2.23 (0.99–5.01)	1.33 (0.71–2.49)	1.32 (0.67–2.62)
Gender×Hispanic×peer attitudes	1.24 (0.63–2.44)	0.76 (0.45–1.28)	1.25 (0.66–2.37)

Confidence intervals (95 %) are reported in parentheses
 * $p<0.05$, ** $p<0.005$

in theory would provide for more targeted and effective designs.

Across all subgroups, adolescents’ close friends’ attitudes toward substance use were strongly associated with the adolescents’ use of all substances while controlling for individual level perceptions of risk. Noteworthy is the finding that the influence of close friends’ attitudes varies by substance, with marijuana being the most peer-influenced substance and alcohol the least. These findings support other research that the type of peer effects (selection and influence) can vary by substance. A novel social network study found that peer selection effects are more prominent among drinkers and cigarette smokers and influence effects more prominent among cannabis users (Pearson et al. 2006). Thus, the variation found in the present study supports previous findings on the differing peer effects on adolescent substance use.

Of particular interest to the present study is the potency of peer attitudes operating across all substances and uniquely among various substances. We found that perceived disapproval

(as opposed to indifference) by peers was significantly associated with decreased use for each substance, even after controlling for individual perception of risk. The effect of peer attitudes is strongest on previous month marijuana use, nearly three times as strong as the effect on previous month alcohol use, and nearly twice as strong as compared to the influence of cigarette use in the past month.

Another finding of interest is that across all subgroups, adolescents think their closest friends disapprove of their cigarette use more than they disapprove of marijuana and alcohol use. Further, teenagers think that their close friends disapprove of their using alcohol more than marijuana. This finding may point to the positive results of the long-term public health campaign against tobacco use coupled with the more recent decreasing perception of the harmfulness of marijuana use (Johnston et al. 2012). It should be noted that the items about peer attitudes focused on heavy daily use (one or more packs of cigarettes daily and one or two drinks nearly every day), while marijuana (or hashish) was asked in terms of

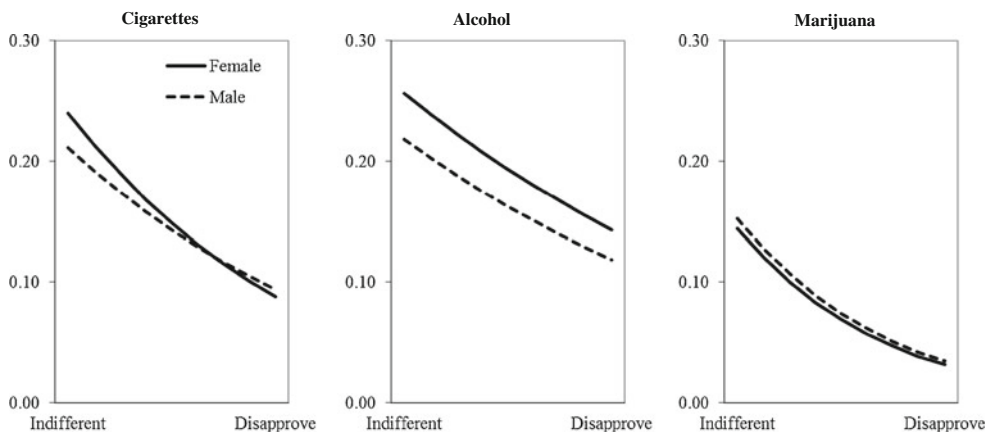
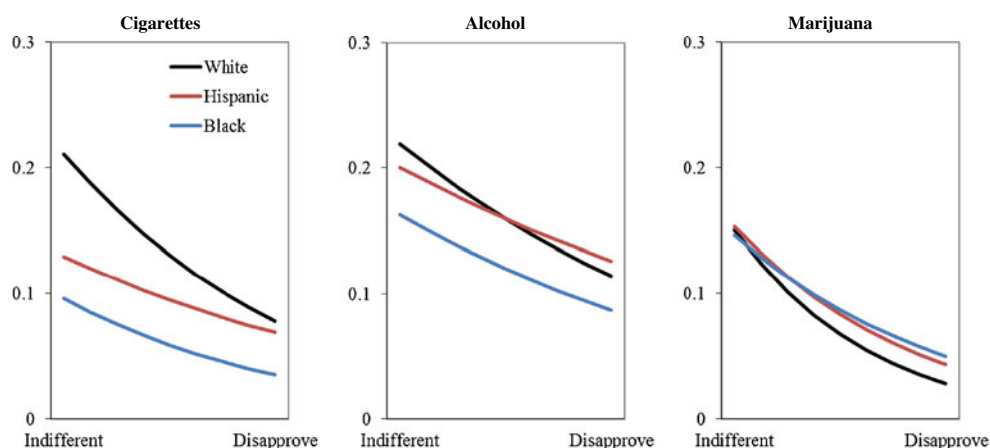


Fig. 1 Interaction plots showing the moderation by gender of the peer attitudes variable on cigarette (left), alcohol (middle), and marijuana use (right) outcomes. The y-axis shows the probability of substance use predicted by the logistic regression, the x-axis shows the values of the

independent variable peer attitudes, and the lines represent the slope of the regression line for males and females, after controlling for age, income, family structure, race, and perception of risk of use

Fig. 2 Interaction plots showing the moderation by race of the peer attitudes variable on cigarette (*left*), alcohol (*middle*), and marijuana use (*right*) outcomes. The *y*-axis shows the probability of substance use predicted by the logistic regression, the *x*-axis shows the values of the independent variable peer attitudes, and the *lines* represent the slope of the regression line for whites, Hispanics, and blacks, after controlling for age, income, family structure, gender, and perception of risk of use



using it once a month or more. Nevertheless, these findings are important and illuminate current peer effects within the contexts of specific substances.

Our moderation analysis provides, to our knowledge, the first detailed examination of peer effects on specific types of substance use, race, and gender subgroups, with a nationally representative dataset. One important finding is that not only are white females more likely to smoke cigarettes than other subgroups but also they are also influenced to a greater degree by their close friends' attitudes toward smoking. White females appear more sensitive and susceptible to substance use based on peer attitudes. One interpretation for female substance use being associated with peer attitudes is that because they are more likely to derive psychologically relevant information about themselves and others through interpersonal relationships, adolescent females are more vulnerable when they encounter interpersonal distress and therefore often experience increased disturbance when their relational ties are

threatened, particularly with friends (Crick and Zahn-Waxler 2003; Cross and Madson 1997; Geary 1998). Adolescent females may not smoke cigarettes when close friends disapprove, in an effort to reduce or prevent interpersonal conflict. While we don't know exactly why white females in particular are more sensitive to peer attitudes, the finding signifies that peer effects are operating differentially among subgroups with different substances.

Our finding of variation by racial and ethnic difference-related peer effects suggests that culture may also play a role in driving adolescent substance use behavior. Culture has been defined as the non-genetic information shared within a population; this information is purported to pass from one individual to another and to endure for several generations (Kashima et al. 2012). Within the Social Cognitive Theory model put forth in the present study, culture is conceptualized as one personal factor influencing substance use behavior. As a personal factor, culture dynamically interacts with

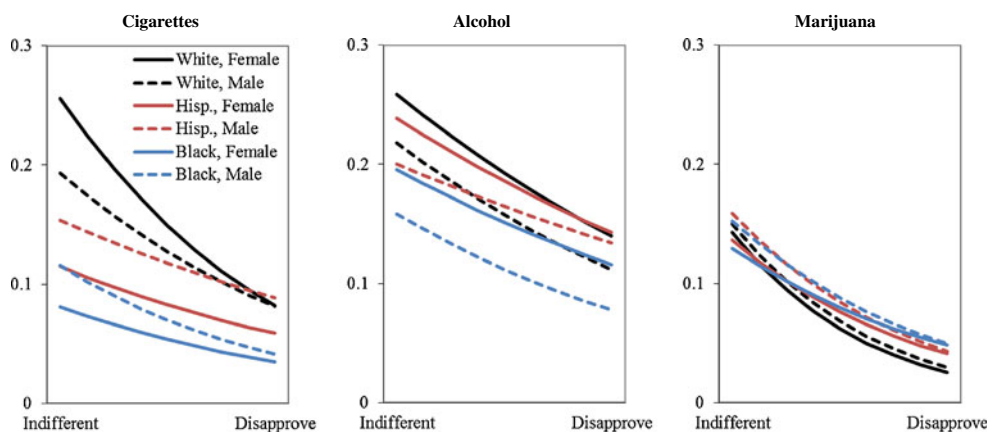


Fig. 3 Interaction plots showing the moderation by race and gender of the peer attitudes variable on cigarette (*left*), alcohol (*middle*), and marijuana use (*right*) outcomes. The *y*-axis shows the probability of substance use predicted by the logistic regression, the *x*-axis shows the

values of the independent variable peer attitudes, and the *lines* represent the slope of the regression line for race-gender subgroups, after controlling for age, income, family structure, and perception of risk of use

Table 4 Conditional effects for male and female subgroups of the moderation by race of the peer attitudes variable on cigarette, alcohol, and marijuana use ($n=17,865$)

Model	White	Black	Hispanic
Cigarette			
Female	-0.75***	0.51	0.81***
Male	0.23	-0.29	0.59**
Alcohol			
Female	-0.14	0.17	0.16
Male	-0.22	-0.11	0.44*
Marijuana			
Female	-0.61***	0.84***	0.51*
Male	-0.41*	0.56*	0.29

* $p<0.05$, ** $p<0.010$, *** $p<0.005$

peer influence (an environmental factor) to drive substance use. This dynamic, ongoing interaction creates individual outcomes through the triadic reciprocal determinism of personal and environmental factors with behavior. For example, within the broader understanding of African American culture, youth have been reported to receive greater support from their extended and “fictive kin” family members, and thus may be less influenced by their peers, compared to European American youth (Taylor et al. 1993). In another study, African American adolescents reported less perceived peer pressure compared to European Americans (Giordano et al. 1993). Similarly, Epstein and colleagues (2007) found that for Hispanic youth, perceived sibling behavior was more influential than that of friends, on poly-drug use. Finally, meta-analytic research across multiple racial/ethnic groups suggests that peers, siblings, and friends are a greater source of influence than parents on substance use (Allen et al. 2003). Therefore, our findings suggest that peer influence on adolescent substance use is a stronger risk factor for some racial/ethnic groups. Specifically, peer influences are more important in white female subgroups, where the role of family may be less emphasized in comparison to other racial/ethnic groups. Unfortunately, our study did not have access to data as to the reasons why and how peer attitudes influence substance initiation and continuation. Including these items in future studies would be greatly informative towards understanding these complex processes.

In considering the preventive implications for these findings, the first contribution of this is that close friends’ attitudes are potent predictors of substance use, vary by gender and race/ethnicity, vary by substance, and should be addressed by prevention researchers. Recommendations for prevention and intervention programs have generally emphasized comprehensive programming across all subgroups. However, our findings are representative of adolescent

behaviors and peer-based attitudes and thus provide justification for programming that is tailored toward unique adolescent subgroups. Preventive programming may need to emphasize different interventions in different subgroups (e.g., increased time and resources focused on choosing positive peer groups, or assertiveness training for white females vs. improved family communication and effective parenting practices in black or Hispanic subgroups), or the modality may need to change to target the social context that is most salient for the target subgroup (e.g., multi-family groups vs. in-school peer interventions). An approach respecting the influence of gender and culture, as opposed to “one size fits all” programming, is consistent with the literature on effective prevention programs (Biglan, et al. 2004; Botvin et al. 1995; Flay et al. 2004; Hawkins et al. 1992; Greenberg 2004; Kellam and Langevin 2003; Winters et al. 2007) and is supported by our findings as well as studies that show the important contributions of both peers and parents in adolescent drug use (Allen et al. 2003). Peer influence-based interventions could target subgroups by type of substance where data-driven differences exist. For example, targeting peer influence on cigarette and marijuana use for white adolescents would make sense, but would be less salient to Hispanics for cigarette, marijuana, and alcohol use. Because of relative weaker influence of peer attitudes on marijuana use for blacks, a peer influence approach may be less effective. Understanding the level of peer effects for particular subgroups could inform intervention implementation as well as the development of targeted (focusing on peer or family influence, e.g.), nuanced gender and culturally sensitive interventions.

There are limitations from this study that should be considered when interpreting these findings. First, the data were captured at a single point in time, and thus reduce our ability to understand the longitudinal variations by subgroup and limit our ability to provide causal explanations associated with our findings. Another limitation of these data is the lack of power to further specify racial and ethnic subgroups beyond the broad categories used in our analyses. Future analyses using smaller sub-groupings would be helpful to further examine other racial and ethnic groups not included in this study. Finally, capturing more information about adolescents’ perceptions of close friends attitudes as well as direct peer-based data would add to the explanatory power of peer effects and increase our understanding of these issues.

In all, these results provide a unique insight into the effects of peer attitudes on adolescent substance use by gender and racial/ethnic subgroups. The differing outcomes add further support to the need to create and target gender and racially informed preventive research and interventions. As peer attitudes are related to adolescent health and well-being, the study of peer effects continues to be an important and meaningful area of investigation for prevention science.

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