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Original article

With friends like these . . . : Peer delinquency influences across age cohorts on smoking, alcohol and illegal substance use

C.J. Ferguson^{a,*}, D.C. Meehan^b

^a Department of Behavioral, Applied Sciences & Criminal Justice, Texas A&M International University, Laredo, TX 78045, USA

^b Miami University, USA

ARTICLE INFO

Article history:

Received 5 May 2010

Received in revised form 14 September 2010

Accepted 15 September 2010

Available online 9 November 2010

Keywords:

Smoking
 Alcohol Use
 Drug Use
 Mass Media
 Family Environment
 Peer Delinquency

ABSTRACT

Background. – Discussions and debate about youth smoking, alcohol use, and illegal substance use (collectively referred to as youth substance use) continue to receive wide attention among researchers, policymakers, and the general public. Previous research has suggested that peer delinquency is a particularly strong correlate of youth substance use. The current study focuses on the influence of delinquent peers on substance use, and how peer delinquency influences change across age cohorts of youth.

Method. – The current study examines multiple correlates for youth substance use in a sample of 8,256 youth (mean age 14), with the goal of identifying the influence of delinquent peers across age cohorts while controlling for other correlates. Data was collected from the Ohio version of the Youth Risk Behavior Surveillance System (YRBSS) developed by the Centers for Disease Control.

Results. – Results from multiple regression analyses identified peer delinquency as the strongest correlate of youth substance use even when other relevant factors related to family, neighborhood, and media use were controlled. Correlations between peer delinquency and substance use behavior increased across age cohorts and for individuals who first used in middle teen years (13–16) irrespective of current age.

Interpretation. – Age appears to be a moderating factor regarding the correlation between peer delinquency and youth substance abuse. Primary and secondary prevention and intervention strategies that focus on peers are potentially more likely to reduce youth substance use and improve peer relationships than those focused on other areas such as schools or media.

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Despite recent decreases in use in the United States, adolescent substance use and abuse remain as significant factors affecting the health and well-being of young people in our society. Based on “past month” prevalence data from the 2007 National Survey on Drug Use and Health report [23], 9.8% of adolescents aged 12–17 reported smoking cigarettes, 15.9% reported using alcohol, and 9.5% reported illicit drug use. These numbers are for any amount of use in the last 30 days for the substance in question whether light or heavy. Cigarette smoking prevalence rates increase with increasing age: 1.8% of 12–13 year olds, 8.4% of 14–15 year olds, and 18.9% of 16–17 year olds reported smoking cigarettes in the previous month. Similar “past month” prevalence rate trends are observed for alcohol use (3.5% of 12–13 year olds, 14.7% of 14–15 year olds, and 29.0% of 16–17 year olds) and illicit drug use (3.3% of 12–13 year olds, 8.9% of 14–15 year olds, and 16.0% of 16–17 year

olds) among adolescents. Given the exponential increases in use among U.S. adolescents as they age, it is imperative to understand the distinct factors within different age cohorts influencing young people to use and abstain from cigarettes, alcohol, and illicit substances, as well as the influence of substance use on behavioral well-being and academic success.

Empirically-supported models have emerged that indicate the role of multiple risk and protective factors in predicting substance abuse among adolescents and young adults [15]. These models suggest that having multiple risks in a variety of domains, such as intrapersonal/individual, familial, and interpersonal/social, contribute to an increased risk of using illicit substances among adolescents. Similarly, models suggest that having multiple protective factors across the varied domains increases the likelihood that youth will remain abstinent from illicit substances. Most previous research, however, has examined risk and protective factors associated with substance use among adolescents as a whole, failing to distinguish developmentally distinct patterns among the different age groups.

* Corresponding author. Tel.: +956 326 2636.

E-mail address: CJFerguson1111@Aol.com (C.J. Ferguson).

Much of the previous research surrounding adolescent substance use and abuse has focused on extrapolating the correlates that lead youth toward illicit use. Intrapersonal or individual correlates for youth substance use and abuse include sensation-seeking and impulse control [15,32], behavioral problems such as aggression or conduct disorder [15,10], risk-taking tendencies [11], hyperactivity [13,28], poor engagement with and commitment to school [15,3], and academic failure/difficulties [15,4]. Factors within the youth's familial/home environment have also been found to impact substance use and abuse, including conflict among family members [15,31] and lack of bonding/close relationship with family members [15,20]. Social factors that increase youths' likelihood to use include negative peer relationships [15,17], favorable norms and attitudes toward substance use [26,2], availability of illicit substances [15,24,30], poor socioeconomic conditions [15,1], and enjoyment of media advertisements related to tobacco and alcohol use [25].

Somewhat less research in the field of adolescent substance use and abuse has ascertained the resiliency factors that shield young people from becoming involved in the use of illicit substances. Among this research, only a small number of resiliency factors have emerged. Individual/intrapersonal protective factors include the ability to regulate emotions [27], behavioral/coping/social skills [14,18], and academic success [29]. Familial resiliency factors include family support/concern [29,16]. From a community standpoint, youth participation in organized community activities [9] appears to protect adolescents from substance use.

The Centers for Disease Control and Prevention (CDC) has developed the Youth Risk Behavior Surveillance System (YRBSS) to monitor risky behaviors among youth in grades 9–12 [5]. The behaviors monitored include: behaviors that contribute to unintentional injuries and violence; tobacco use; alcohol and other drug use; sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases (STDs), including human immunodeficiency virus (HIV) infection; unhealthy dietary behaviors; and physical inactivity. Obesity and asthma-related items are also included in the surveillance system. The YRBSS includes a school-based survey [6] that can be used by states to amass data regarding the risk behavior prevalence rates among their young people. States elect to use all or part of the survey items on a sample of the students in their jurisdiction.

The current study examines data collected from two counties that used the 2007 Ohio version of the YRBSS survey. The survey included items that evaluated the youths' "past month" use of cigarettes, alcohol, and other illicit drugs, age of first use, perceptions about the risk of using, and attitudes and beliefs about use. In addition, the 2007 Ohio version of the YRBSS included items assessing individual/intrapersonal, familial/home environment, and community-based risk and protective factors. Developmental trends related to risk and protective factors for substance use were examined. In the current analysis we focus on the influence of delinquent peers on youth substance use, with other factors controlled. Our purpose is to examine the degree to which peer delinquency influences may change regarding their correlation with youth substance use across age cohorts of youth.

1. Methods

1.1. Participants

Participants in the current study were 8256 youths from two predominantly Caucasian, suburban/rural counties in Ohio. Participants were almost equally distributed in terms of sex (50.3% were female). Regarding race, the vast majority of youth

were Caucasian (92.7%) with smaller amounts of African-American (2.4%), Native American (1.3%) or other groups (3.6%). In accordance with government parlance, Hispanic ethnicity was a separate category that could overlap with racial categories. In our sample, 3.7% of youth identified as Hispanic. The average age of our sample was 14 (range 11–18).

1.2. Materials

Data in the current study were drawn from the Ohio version of the Youth Risk Behavior Surveillance System (YRBSS). Description of the development and validation of the YRBSS can be found at [5,6]. This survey instrument included several scales of interest to the present study. These included the following.

1.3. Risk/resiliency factor variables

1.3.1. Family involvement

This subscale consisted of nine Likert scale items related to parental involvement in the lives of the participants. Questions on this scale asked about parental monitoring, perceived parental support, and expressed parental supervision on substance use issues. "In my family, there are clear rules about what I can and cannot do" is an example of a sample item from this subscale. Coefficient alpha was .73.

1.3.2. Depression

This scale consisted of five Likert scale items related to depression symptomology. Questions included items related to feelings of sadness, hopelessness, trouble relaxing and suicidal thoughts and behaviors. Coefficient alpha was .63. Analyses revealed that this variable was non-normal in distribution and a square-root transformation was used to normalize the data.

1.3.3. Sleep quality

A single item asked participants about their hours of sleep each night. This was included as a potential marker of general stress.

1.3.4. Antisocial traits

This consisted of six Likert scale items related to acceptance of rule-breaking and antisocial behavior. "How wrong do you think it is to attack someone with the idea of seriously hurting them" is an example from this subscale. Coefficient alpha was .79. Analyses revealed that this variable was non-normal in distribution and a square-root transformation was used to normalize the data.

1.3.5. Media usage

Two items measured frequency of television and video game screen time. Coefficient alpha was .51.

1.3.6. Peer delinquency

These eleven Likert scale items examined peer involvement in illegal or rule-breaking activities. These questions tapped a range of delinquent behaviors ranging from weapons carrying, to participation in substance use to school academic and discipline problems. These questions tapped peer delinquent behavior, not peer-pressure, to engage in substance use. All 11 items are presented in Table 1 and Fig. 1 presents the distribution of scores on this scale. Coefficient alpha was .79.

Table 1
Items from the Peer Delinquency Scale.

Negative items
In the past year (12 months), how many of your best friends have
Been suspended from school
Dropped out of school
Carried a handgun
Sold illegal drugs, stolen or tried to steal a motor vehicle such as a car or motorcycle, or been arrested
Smoked cigarettes
Tried beer, wine or hard liquor (for example vodka, whiskey, or gin) when their parents didn't know about
Used marijuana, LSD, cocaine, amphetamines, or other illegal drugs
Positive (Reverse-Coded Items)
In the past year (12 months), how many of your best friends have
Participated in clubs, organizations or activities at school?
Made a commitment to stay drug-free?
Liked school?
Regularly attended religious services?

1.3.7. Negative community

Thirteen Likert scale items assessed the degree to which negative community influences predominated in the youths' neighborhoods. Questions related to the degree youth perceived adults in the community as supportive, the degree to which adults in the community approved of illegal activities and substance use, and the degree of community monitoring of illegal activities and substance use. An example item is "In your neighborhood, if you wanted to get a handgun, how easy would it be to get one?" Coefficient alpha was .72.

1.3.8. Positive school

Seven Likert scale items examined the potential positive influence of youths' schools. These questions assessed the degree to which the participant felt connected to their school community, the degree to which they felt supported by their school community and opportunities for positive development in their school. An example item is "There are lots of opportunities in our school to talk to a teacher one-on-one." Coefficient alpha was .64.

1.4. Outcome variables

1.4.1. Smoking

This four Likert scale item scale related to frequency of use of cigarettes and other forms of tobacco over the past 30 days (use in general, and use on school property specifically), as well as two items related to age of onset of use (cigarettes and other tobacco products). Coefficient alpha was .82.

1.4.2. Alcohol use

Seven Likert scale items related to frequency of use of different forms of alcohol (from beer to hard liquor). Four of these assessed frequency of use of various alcoholic beverages over the past 30 days, two assessed for frequency of use in the past year, and one assessed age of onset of alcohol use. Differing questions assessed use of varying alcoholic beverages including beer, wine and hard alcohol/liquor, or under differing circumstances such as while operating a motor vehicle. Coefficient alpha was .80.

1.4.3. Illegal substance use

This 14 Likert scale item scale measured the frequency of use of multiple forms of illegal drugs (from marijuana to "hard" drugs such as cocaine and heroin). One items tapped past year frequency of illegal substance use (of marijuana specifically), two tapped age of onset of illegal substance use (marijuana compared to "hard" drugs) and the remainder assessed 30-day frequency of use of various illegal substances. Coefficient alpha was .82.

1.4.4. Grades

Participants were asked to estimate their average grades over the past year.

Items on the scales described above were summed to create scale scores which were used in the regression equations described below. Data with non-normal distributions were given a square-root transformation to normalize the data, as described in the scale descriptions above.

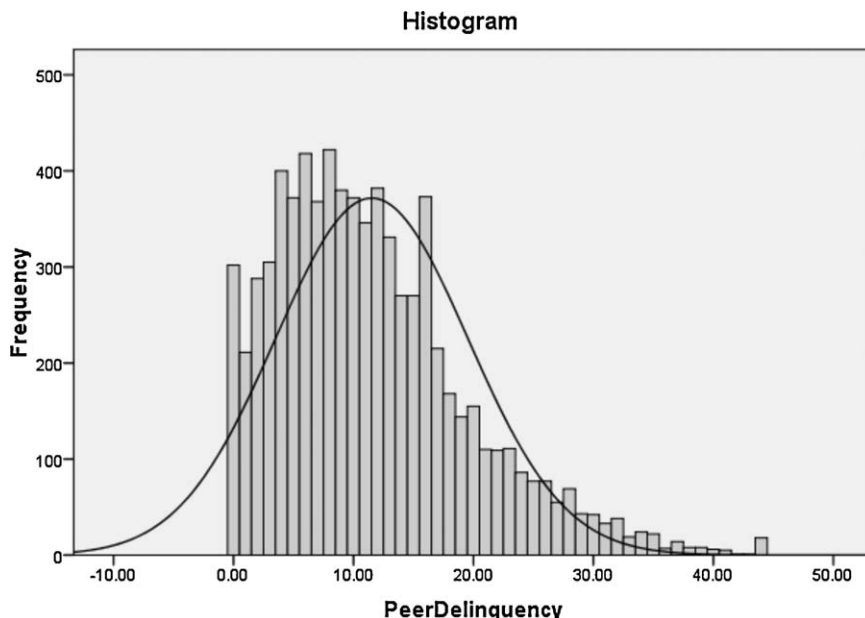


Fig. 1. Frequencies of peer delinquency variable.

Table 2
Intercorrelations between substance use variables and academic grades.

Correlate variable	Outcome variables			
	Smoking	Alcohol use	Illegal substance use	Grades
Smoking	1.00	.74 ^a (.73, .75)	.76 ^a (.75, .77)	-.36 ^a (-.38, -.34)
Alcohol use		1.00	.70 ^a (.69, .71)	-.28 ^a (-.30, -.26)
Illegal substance use			1.00	-.33 ^a (-.35, -.31)
Grades				1.00

Numbers inside parentheses denote 95% confidence interval.

^a Denotes significance at the $p = .01$ level.

1.5. Procedure

Two counties (Warren and Clinton) in Ohio were invited by the State of Ohio to participate in the YRBSS. Passive parental consent was used for all youth in grades 6 through 12, and children assented to the procedure. In most cases, participation was computer based, with survey responses entered through a Smarttrack web system in the school computer labs. Teachers proctored but remained at a distance to assure survey responses were anonymous. In two schools, scantron pencil/paper responses were used and entered into the database. All procedures were designed to meet federal standards for ethical research with human participants.

As a note, because of the large sample size for the current study, the risk of effects of small size achieving “statistical significance” despite limited practical significance is an important issue to consider. Past research has indicated that results with such small effect sizes tend to be unreliable and prone to Type I error [22]. In order to guard against this possibility with our current data set, we have selected to use more stringent criteria for statistical significance. First, we have adopted the lower $p = .01$ alpha level as indicative of statistical significance. Second, we have used a cut-off effect size of $r = .10$ as indicative of practical significance [7]. The more conservative $r = .20$ will also be employed to indicate results of particular practical merit [12].

2. Results

2.1. Descriptive results

In the current sample, 32.2% of youth reported any amount of smoking at any time in the past, 55.4% reported any amount of alcohol consumption, and 21.9% reported any level of illegal drug use at any time in the past. Little sex difference was found in respect to substance use with $r = .08$, $r = .04$, and $r = .06$ representing, respectively, the correlation between gender and smoking, alcohol use, and illegal drug use.

As indicated in Table 2, substance use was significantly correlated with lower grades. We examine this relationship specifically to note the negative correlational relationship between substance use and grades. Although in a correlational study it is not possible to determine causality in this relationship, we note it as a particular area of concern. Examining the correlation between substance use and grades is worth noting, despite not being part of our main analyses, thus we highlight this relationship here.

2.2. Correlates for substance use

Table 3 presents means and standard deviations for all variables across age cohorts. Table 4 presents the standardized regression coefficients for three multiple regressions examining correlates for smoking, alcohol use, and illegal substance use. All variables included met assumptions of normality (following square root transformations for depression and antisocial traits) and independence for use in multiple regressions. Multicollinearity was not a problem with all VIFs below 2.0 and all tolerances above .50. Association with delinquent peers was the best correlate of substance use outcomes. Antisocial traits and negative community influences also correlated with substance use, and family involvement with children was a protective factor, although these were generally weaker in effect size. Correlations with negative community and family involvement were seen for smoking and alcohol use, but not illegal substance use. Depression was only a correlate for illegal substance use. Gender, positive school environments, media use, and amount of sleep were not correlated with substance use. In all cases, peer delinquency displayed the highest correlation with youth substance use.

2.3. The influence of delinquent peers across age cohorts

Our initial results indicated that peer delinquency was the strongest correlate of substance use with our sample. However, it is possible that the correlation of peer delinquency and youth substance use may change at differing age ranges. Put another way, peer delinquency influences may change in their impact on youth

Table 3
Means and standard deviations for study variables across age cohorts.

Variable	Age cohorts				F-Test	P-value
	11–12	13–14	15–16	17–18		
Depression	1.19 (1.56)	1.47 (1.69)	1.86 (1.90)	1.97 (1.86)	74.44	.001
Antisocial traits	2.19 (2.60)	3.29 (3.14)	4.34 (3.38)	4.57 (3.44)	221.52	.001
Family involvement	20.97 (2.38)	19.66 (3.82)	17.83 (4.30)	16.54 (4.71)	394.15	.001
Delinquent peers	8.65 (5.57)	10.60 (7.28)	13.42 (9.06)	14.94 (8.91)	218.42	.001
Negative community	3.70 (3.59)	5.39 (4.15)	8.01 (4.55)	8.78 (4.52)	521.90	.001
Positive school	15.74 (3.57)	14.87 (3.69)	14.03 (3.77)	13.75 (3.94)	95.41	.001
Media use	5.12 (2.82)	5.25 (3.84)	5.20 (2.83)	4.79 (2.85)	7.72	.001
Sleep	3.88 (1.45)	3.42 (1.41)	2.99 (1.39)	2.72 (1.44)	220.43	.001
Smoking	0.85 (3.18)	2.10 (4.72)	4.56 (6.67)	6.11 (7.41)	316.11	.001
Alcohol use	1.90 (3.86)	3.57 (5.08)	6.16 (6.62)	6.91 (7.02)	289.27	.001
Illegal substance use	0.68 (3.87)	1.21 (4.20)	2.76 (5.93)	3.52 (7.12)	65.69	.001

Numbers in parentheses are standard deviations.

Table 4

Multiple regression results for smoking, alcohol use and illegal substance use.

Correlate Variable	Outcome variables		
	Smoking	Alcohol use	Illegal substance use
Male Gender	.06	.00	.02
Depression	.08	.07	.12 ^a (.10, .14)
Antisocial Traits	.17 ^a (.15, .19)	.27 ^b (.25, .29)	.23 ^b (.21, .25)
Family Involvement	-.11 ^a (-.09, -.13)	-.13 ^a (-.11, -.15)	-.09
Delinquent Peers	.41 ^b (.39, .43)	.30 ^b (.28, .32)	.37 ^b (.35, .39)
Negative Community	.14 ^a (.12, .16)	.18 ^a (.16, .20)	.06
Positive School	.07	.08	.04
Media Use	-.06	-.03	-.04
Sleep	-.01	-.01	.01
R ² Model	.49 ^b	.53 ^b	.44 ^b

Reported values are standardized regression coefficients (i.e., Beta weights). Numbers inside parentheses denote 95% confidence interval.

^a Denotes significance at the $p=.01$ level, and meets minimum $r=.10$ for practical significance

^b Denotes results that meet the $r=.20$ level for practical significance

across differing age ranges. In order to examine for this possibility, we split our sample into 2-year age ranges (11–12, 13–14, 15–16, 17–18), and reran the regression analyses described above. The resultant age-cohort trends are presented in Fig. 2 (a–c). Fig. 2 follows those correlates that met criteria for significance in any outcomes, although our particular focus was on the peer delinquency effects. The regression analyses included all variables, but only significant variables are presented in these figures for clarity purposes. As can be seen, across all outcomes, the importance of peer delinquency rises across age groups, considerably dwarfing other correlates in later teens. The importance of other correlates tends to remain steady or diminish over age groups. These findings highly significant age differences regarding the correlation between peer delinquency and other variables and youth substance use.

2.4. The influence of delinquent peers across age of first use cohorts

We also wished to examine the differential correlational impact of peer delinquency across cohorts of youth who began using substances earlier or later. To do so, we once again divided the sample into age-cohorts, this time looking at age of first use rather than current age. The regression analyses were once again rerun using all variables, although the results presented in Fig. 3 (a–c) show only significant correlates. Given that individuals who had never used would have no variance in the dependent variable, regression equations were not run for this category of youth.

This analysis is different from the previous age cohort analysis in several respects. First, removing individuals who never used each substance changes the variance, which is unavoidable, but should be noted. Second, this analysis allows for the examination of factors correlated with substance use for individuals who initiated substance use earlier or later in their teen years. In this analysis, a slightly different pattern of peer delinquency influences emerged. While peer delinquency generally remained the largest correlate of youth substance use across outcomes, the relationship was curvilinear for age of onset, rather than linear as for current age. This relationship was less pronounced for alcohol use related to smoking or illegal drug use, but generally held across variables. Peer delinquency correlations with substance use were strongest for individuals who began using in the middle teen (i.e., 13–16) years rather than earlier or later. For smoking, male gender was correlated with smoking across the age of onset cohorts, but not with other substances. The correlation between antisocial traits and substance use became more pronounced for individuals whose age of first use was later across substances. Trends for other variables were generally less clear or consistent.

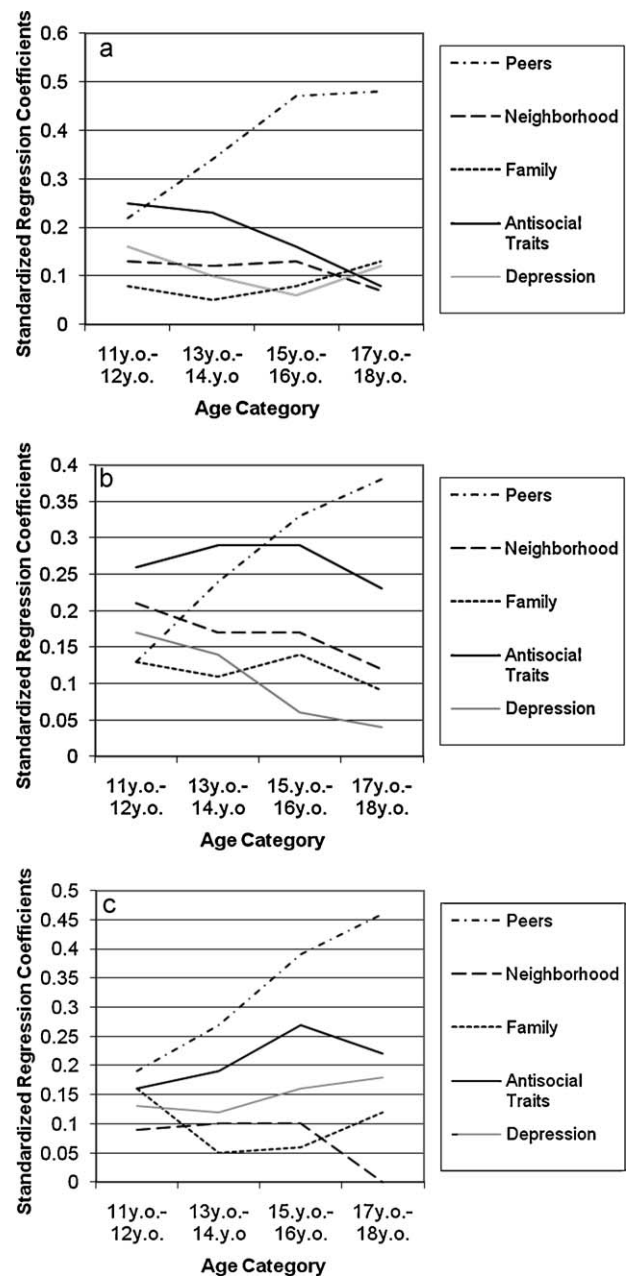


Fig. 2. (a) Age cohort patterns for teen smoking; (b) Age cohort patterns for teen alcohol use; (c) Age cohort patterns for teen illegal substance use.

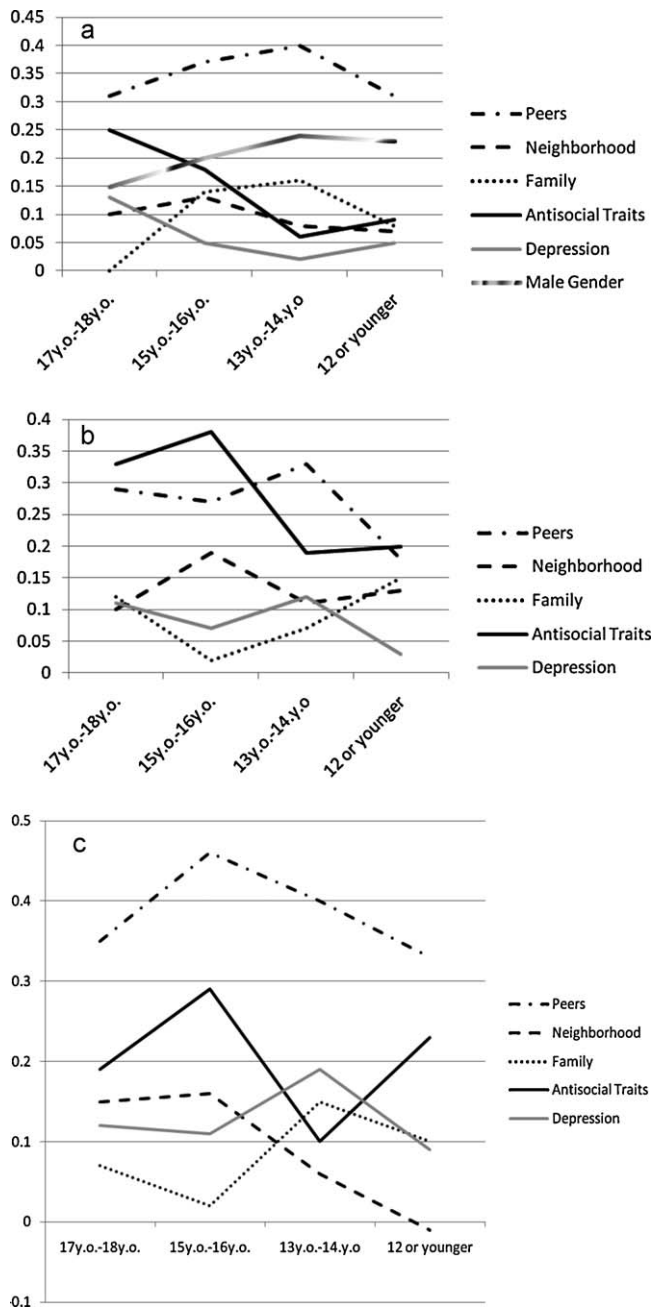


Fig. 3. (a) Age of first use patterns for teen smoking; (b) Age of first use patterns for teen alcohol use; (c) Age of first use patterns for teen illegal substance use.

3. Discussion

Results from the current study provide evidence for the particular importance of peer delinquency as a correlate of youth substance use. Generally speaking, correlates were consistent across all three outcomes, smoking, alcohol use, and illegal substance use. Namely, peer delinquency was the strongest and most consistent correlate of youth substance use. Peer delinquency may prove a particularly valuable avenue to consider for intervention and prevention efforts, as this was a relatively strong correlate of substance youth, and an environmental factor that may be amenable to intervention efforts. This appeared to be increasingly true in later teen years. Although current findings are correlational, they do suggest that the negative influence of peer delinquency is higher among older teens than among younger

teens. Although speculative, this may indicate greater peer conformity among older teens, with reduced emphasis on family influences. Alternatively, it is also reasonable to speculate that teens who become further involved in substance use may gravitate toward peers with similar habits.

When age of first use was considered, peer delinquency retained a generally dominant correlational role. However, the correlation between peer delinquency and substance use was curvilinear, with peer delinquency and substance use having the highest relationship for individuals who had first used in their middle teen years (13–16) irrespective of their current age. Taken together, these results suggest that it may be important to consider both a youth's current age and age of first use when considering targeted intervention or prevention efforts.

Intervention or prevention efforts which target the family may be particularly useful in the early teen or preteen years when family influences were generally strongest. This is not to suggest that the family should be neglected at any age, although generally speaking family influences tend to diminish across time whether examining current age or age of first use.

Other potential correlates including gender, positive school environment, media use, and sleeping habits did not prove to be correlated with youth substance use. The lack of a gender effect (with the exception of smoking in the age of first use cohort analysis) in the current analyses may indicate one of two things. First, gender differences in substance use may have begun to equalize in recent generations of youth, either owing to a decrease in male substance use or an increase in female substance use, or both. Second, although gender differences in substance use may exist, they may be too unspecific as a correlate. Thus, other more idiographic features may function more efficiently as correlates of substance use. Particularly in multivariate analyses, it may be that specific features found more often in one gender such as males correlate highly with substance use rather than broad gender categories. For example, greater male proclivity for antisocial traits or delinquent peers may be more important a correlate than male gender itself. The lack of an effect for depression, aside from illegal substance use, was somewhat surprising [19], although it may be that substance use has less to do with mood management in youth, and more to do with peer acceptance, particularly in later teen years. Media use also was not correlated with youth substance use. Although some previous studies have found a link between media use and substance use [8], we did not replicate these findings once other variables were controlled. In fact, media use was slightly protective of substance use, although the effect sizes did not meet our criteria for practical significance.

It is worth noting that our study has several limitations. Current data is correlational and it is important that causal inferences are not drawn from such data. The current study is also self-report in nature, and thus social desirability may influence results. Although teachers remained a discrete distance away during administration, it is nonetheless possible that their presence may have influenced the results. Next, we divided our sample into 2-year age cohorts. It should be noted that no age-related division is perfect. Youth across different ages may share the same grade, for instance. Further, development across the teenage years is unlikely to be either linear or clearly dividable into distinct age categories. As such some caution is advised when interpreting age cohorts. However, we feel that use of this procedure allows for a window into age-related cohort differences in peer delinquency influences on youth substance use. Several of the items scales in the study consisted of only one or two items (i.e., sleep, media use). It is possible that negative findings may be due to limitations of these variables regarding reliability and construct validity. Although the current study made use of a survey developed by the Centers for Disease Control which is widely used, it has not been subjected to

the level of validity analyses as have clinical measures of youth behavior. Further, given that we here report archival data collected by the State of Ohio, we did not have access to participation rates. An inquiry to the State of Ohio revealed that participation rates were not tracked. Thus, the current sample should not be regarded as representative. Finally, it is not possible to consider all potential correlates for smoking in a single study and it should be noted that other potential correlates may exist that were not identified here.

Current findings are consistent with previous literature noting the important role of peer delinquency as a correlate of youth substance use. However, these results move the field forward in several ways. First, our multivariate results identify peer delinquency as a relatively large and important correlate of youth substance use, in comparison with other significant correlates. The intent is not to downplay the importance of variables such as family or antisocial traits, but rather to note the particular role of peer delinquency. Second, we examine patterns of peer delinquency influences across age cohorts and across age of first use cohorts. Our results suggest that, while peer delinquency generally remains important across categories, it is nonetheless important to consider both the current age of a given youth, and the age of first use when investigating potential influences on youth substance use.

This article provides some understanding of the interplay between correlates for youth substance use with a particular focus on peer delinquency influences. Delinquent peer influences appear to be potentially fruitful targets for intervention or prevention efforts with previous research suggesting contingent management strategies offering particular promise [21]. We suggest that practitioners may wish to play closer attention to delinquent peer influences on substance use, particularly in the later teen years. The correlational nature of our results cannot distinguish between peer pressure, peer modeling, or self-selection into delinquent peer groups. However, practitioners may wish to be alert for each of these processes as potential forces linking peer delinquency with the substance use of their patients. By contrast, family influences may be a particularly fruitful target of prevention and intervention efforts in preteen and early teen years, but may wane somewhat in the later teen years. This is not to say that we recommend practitioners ignore families when working with older teens. However, although we are careful to note the correlational nature, it may be that the functioning of the family may have progressively less impact on treatment success in the later years, with peers exerting a more dominant influence. We hope that this article may guide further clinical and public policy efforts regarding to youth substance use.

Conflict of interest statement

Neither author has a conflict of interest to declare.

Acknowledgements

The authors would like to thank the Mental Health Recovery Services of Warren and Clinton Counties, Ohio as well as the Family and Children First Councils of Warren and Clinton Counties for their role in administering the YBRSS and gathering the data described herein. We also thank Ms. Patti Ahting, Sandy Smoot and Marsha Wagstaff for their assistance and support.

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