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Pick your Poison: Examining Adolescent Substance Use Through Opportunity Theory

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Abstract

The present study examines substance use behaviors of middle and high school students, focusing on how varying influences of opportunity measures impact use of specific types of substances. The data used in the present study come from almost 4,000 students within 89 school contexts from students attending public school in a Southern state. HLM is used to explore the influence of various opportunities at both the student and school-level on the use of different types of substances. Results indicate measures of opportunity at both the student and school-level were significant; however, measures at the individual level were consistently more influential.

Keywords

opportunity; routine activity theory; adolescent substance use

Drug and alcohol use among adolescents remains a significant problem in the United States. For example, Sickmund and Puzzanchera (2014) note that in 2010, 21% of 8th graders, 37% of 10th graders, and 48% of 12th graders had used some form of illegal substance. Also in that year, 50% of 10th graders and 70% of 12th graders used alcohol. The National Institute on Drug Use (2015a) estimates that 9.4% of the U.S. population ages 12 and older has used an illicit drug at least once in the last month. For adolescents, 23.6% of 12th graders, 16.5% of 10th graders, and 8.1% of 8th graders stated they had used some form of illicit drug in the last month (National Institute on Drug Use 2015b). Regarding adolescent alcohol use, 35.3% of 12th graders, 21.5% of 10th graders, and 9.7% of 8th graders stated they had at least one drink of alcohol in the last month.

While multiple theories and perspectives have been used, in an attempt, to better understand adolescent substance use, in a criminological landscape where opportunity theories are at the forefront, it is surprising that there is such a dearth of existing research examining adolescent substance use through an opportunity lens. While traditionally used to predict rates of crime, opportunity theory has begun to be applied to individual offending behavior

(see Osgood et al. 1996). The present paper extends this line of research by using routine activity theory to examine students' substance use behavior by exploring the influences of several measures of accessibility and supervision on five different substances, in an attempt to further tease out the unique effects of accessibility and supervision on specific types of substance use. Furthermore, this study uses multi-level data to explore whether school-level opportunity variables independently influence students' use of substances while controlling for student-level opportunity measures.

Theoretical Background

Criminologists began to move away from a focus on predispositions and psychopathologies for criminal behavior during the 1970s (Cornish and Clarke 2008; Clarke and Cornish 1983). At the time, criminology as a whole was moving more towards an understanding of the crime event and the opportunities associated with such events. This shift has allowed criminologists to study the role situations and environments play in affording granted motivated offenders opportunities to commit crime (Cornish and Clarke 2008). The environmental criminology perspective proposes that crime results from the daily activities of individuals, interactions with others, and interactions with their physical environment. The combination of these elements generates opportunities for crime and these opportunities are spatially patterned (Brantingham and Brantingham 1981; Wortley and Mazerolle 2008). Routine activity theory—arguably the hallmark of the environmental/opportunity perspective—claims that the most criminal opportunity exists when a motivated offender, suitable target, and lack of capable guardianship converge in time and space (Cohen and Felson 1979). The convergence of these three elements varies and is largely dependent on the patterns of daily life, hence, the reason this convergence of elements, is referred to as routine activity theory.

Routine activity theory (RAT) was originally developed and tested as a macro-level theory and largely focused on explaining victimization and crime rates. For example, Cohen and Felson (1979) in their original test of the theory, demonstrated that in post-World War II United States the pattern of daily activities changed (i.e. more women in the workforce, deindustrialization, etc.), which led to changes in crime patterns. Since its inception, RAT has been used to explain various types of victimization (e.g., Jensen and Brownfield 1986; Sampson and Wooldredge 1987) and criminal behaviors (e.g., Messner and Blau 1987) at the macro-level. Some studies have also examined the influence of routine activity elements, such as guardianship at both the macro and micro levels, examining a multi-level opportunity perspective (i.e., Wilcox, Madensen, and Skubak Tillyer 2007; Wilcox Rountree, Land, and Miethe 1994).

However, Cohen and Felson (1979) also argued how routine activity theory was applicable at the micro level. While of less focus, until rather recently, RAT has been applied to individual offending (Miller 2013; Osgood et al. 1996). In their development of a “routine activity theory of general deviance,” Osgood et al. (1996) claim that youths who spend more time with their peers in unstructured activities without supervision are provided optimal opportunity for deviance to occur because during these unstructured activities guardianship is absent. They found initial support for this claim by examining the influence of

unstructured activities on five types of deviant behavior, including substance use, on a sample of 18–26 year olds. Their analysis revealed that those individuals who spent more time in unstructured activities were more likely to participate in criminal behavior, heavy drinking, marijuana and other illicit drug use, and dangerous driving. Subsequent studies have found both individual and group-level unstructured and unsupervised time influence delinquency (see Osgood and Anderson 2004). More recently Miller (2013) built upon the previous work by recognizing that: 1) different settings or contexts will support different types of offending; and 2) routine activities do not have unconditional effects on various offending behaviors. In other words, not all routine activities have the same criminogenic or protective effects across all types of offending. The present study extends these propositions to substance use and proposes that the effects of routine activities likely vary across different types of substance use.

Accessibility and Supervision

Previous research using opportunity theory and studying adolescent offending has frequently focused on using measures of opportunity that reflect accessibility to the target and the lack of supervision. The extant literature, using a wide range of measures tapping unstructured socializing with peers, has consistently found that the more time spent with peers during unstructured socializing, the more likely adolescents are to be involved in a range of deviant and delinquent behaviors (see Anderson and Hughes 2009). Participation in extracurricular activities has also been explored (Hoffman 2006; Maimon and Christopher 2010). Work intensity, or the number of hours juveniles work per week, has also been explored as a measure of opportunity to predict adolescent criminal activity and is generally supported (see Frone 1999; Safron, Schulenberg, and Bachman 2001). Anderson and Hughes (2009) also make use of a “private transportation” concept, which is sometimes used as a measure of routine activity theory. Anderson and Hughes found that juveniles having access to private transportation (defined by answers to the question, “how many miles do you drive each week?”) is associated with increases in property crime.

Routine activity theory has been used to study delinquency, as well as a range of property and violent crimes. For example, Hay and Forrest (2008) predicted what they termed “general offending” using measures of unsupervised socializing from the National Longitudinal Study of Youth data [lack of parental monitoring has also been used to predict general offending in samples of young adults] (see Johnson et al. 2011). This is not a unique practice in the literature (see also Bernasco et al. 2013). In terms of property crime, Miller (2013) found in a sample of 15-year-olds that nightlife is associated with adolescent-perpetrated assault. Similar findings on the relationship between the absence of authority figures and unstructured socializing have been found to be strong predictors of youth violence (Maimon and Browning 2010) and delinquent gang perpetrated violence (Hughes and Short, Jr. 2014).

Additionally, little research has been performed to understand how both individual and contextual measures of routine activity theory predict indexed measures of delinquency in general (see Osgood and Anderson 2004). Osgood and Anderson (2004) determined in a sample of 4,358 eighth-graders across 36 schools in 10 cities that rates of delinquency varied

across adolescents at different schools by individual and contextual predictors of unstructured socializing with peers. Other scholars have pushed for a greater understanding of how opportunity influences criminal behavior in context and have pushed for multilevel opportunity approaches to offending/delinquency (see Guest and McRee 2009; Hoeben and Weerman 2016; Wilcox, Gialopsos, and Land 2012). For example, Hoffman (2006) examined how school-based contextual effects predict adolescent alcohol use. It was discovered that participation in extracurricular athletics was associated with increases in alcohol use for males and females, but that participation in non-athletic extracurricular activities were associated with decreases in alcohol use for males. Finally, Wilcox, Tillyer, and Fisher (2009) examined school-level measures of criminal opportunity, finding that such measures were related to crimes of juvenile theft and assault.

Research using routine activity theory has also been used to understand alcohol and drug use. As previously mentioned, Osgood et al. (1996:642) found individual alcohol and illicit drug use (including marijuana use) was predicted by several measures which mostly focused on “unstructured socializing with peers” such as, “riding around in a car for fun, getting together with friends informally, going to parties, and spending evenings out for fun and recreation.” More broadly, Barnes et al. (2007) found family time and peer time to be negatively and positively (respectively) associated with problem behaviors including heavy alcohol use, cigarette smoking, illicit drug use, delinquency, and sexual activity [see also Barnes, Welte, Hoffman, and Dintcheff (2005) and Miller (2013) on the relationship between peer delinquency and general adolescent substance use⁵]. Zill et al. (1995) found that U.S. teenagers do in fact have a considerable amount of spare time and identified positive associations between youths being arrested, smoking cigarettes, and using drugs when not participating in school-sponsored activities. Similarly, other research has found similar findings on the relationship between extracurricular activities and marijuana use specifically [see Darling (2005); and substance use more generally by organized activities Denault and Poulin (2009)], high school sports participation and increases in drunk driving Hartmann and Massoglia (2007), and family time and drinking (Crouter, Head, McHale, and Tucker (2004)]. Finally, studies focusing on the relationship between teenage work and substance use generally reveal that as teenagers work more hours per week they are using alcohol more often (Mortimer et al. 1996) or more likely to use substances in general (Frone 1999; Safron, Schulenberg, and Bachman 2001). In a similar vein, research has identified a positive relationship between expendable income and binge, frequent, and public drinking (Bellis et al. 2007). Considering the informal socialization practices of youth among their peers (in terms of sex), there is research to suggest young males are more likely to drink outside of their homes with drinking in the home more often done by females (Wells, Graham, Speechly, and Koval 2005). However, there is also research to suggest there is no difference in males and females in terms of the effects informal socializing has on substance use (Augustyn and McGloin 2013).

However, when routine activity theory is used to predict adolescent drug use, researchers often study drug use as part of an indexed measured of delinquency (often alongside violent

⁵Similarly, youths who are more likely to hang on the street often do not have peers who participate in structured activities (Persson, Kerr, & Stattin, 2007).

crime and property crime). Other ways of examining drug use often focus on the dependent measure of “drug use” as a whole. For example, Miller (2013) tested whether several different types of core routine activities (i.e., hanging around with friends locally, hanging around away from home, nightlife, cultural and consumer activities, and involvement in youth clubs and sports) predicted different types of offenses (i.e., vandalism, assault, shoplifting, and drug use). Using data collected from the Edinburg Study of Youth Transitions and Crime, Miller (2013) was not able to disaggregate by type of substance used; however, the analysis did reveal that four of the five measures of routine activity measures including: “hanging around away from home;” “nightlife;” “cultural and consumer activities;” and “youth clubs and sports” were positive and significantly associated with drug use.

Miller (2013)’s study made a significant contribution by examining the influence of individuals’ routine activities across various offending behaviors. The study did find that some routine activities were associated with certain offending behaviors, but not others; and in some cases, the routine activity increased offending and in others it decreased offending. More specifically, examining “substance use” as a single measure in which all substances are collapsed into one variable is problematic, as it does not allow researchers to predict whether the relationships between various measures of routine activity theory are similar across various types of substances (i.e. alcohol, marijuana, cocaine, etc.) or whether certain measures of routine activity theory are more or less important for certain types of substances. Therefore, the next step in better understanding the nature of various routine activities and substance is likely to disaggregate substance use into categories of the substances used. The theoretical propositions of routine activity theory and the existing literature support this. Routine activity theory focuses on the crime incident rather than the offender (Cohen and Felson 1979); this means each incident is unique and a potential offender will not behave the same way every time. According to Cohen and Felson (1979), legitimate routine activities provide suitable targets to motivated offenders. The suitability of the target is determined by factors such as the value of the target, inertia of the target, visibility of the target, and access to the target (Cohen and Felson 1979). Every target, or substance in the case of this study, is not suitable for every motivated offender. There are different opportunities surrounding each substance which makes it more or less suitable for the offender based on their legitimate routine activities and guardianship. Therefore, it is likely that students with different routine activities experience different types of guardianship (i.e., accessibility and supervision) leading to some substances being more suitable than others for certain offenders. For example, a student whose whereabouts are routinely monitored by a parent may not be able to attend parties where alcohol is routinely consumed, but he or she may be able to get access to tobacco products on his or her way home from school. Furthermore, the existing literature on substance use among adolescents has provided support for this notion. That is, students involved in certain routine activities are more or less likely to use various substances. It is only appropriate that this study examines each type of substance in order to tease out the unique relationships various measures of guardianship have across specific types of substance use. Furthermore, studies incorporating multi-level model techniques to study both individual and contextual predictors of the effects of routine activity theory measures on drug use are rare.

The Present Study

Drawing on opportunity theory, and here more specifically routine activity theory, this study examines the unique effects of various opportunity measures on adolescent substance use. With this goal in mind, the present study examines the influences of two categories of guardianship measures—accessibility and supervision—on five categories of substances. We use multi-level modeling to explore first to what extent measures of accessibility and supervision influence a variety of substance use outcomes; and second, whether it is largely individual-level opportunity measures that influence adolescent substance use, or if school-level opportunity measures also matter. Based on the broader routine activity literature, and the small amount of research on routine activity theory and substance use, the following hypotheses are presented:

H1: Individual-level measures of accessibility to the suitable target (a substance such as: alcohol, tobacco, etc.) will be positively associated with substance use.

H2: Individual-level measures of supervision (i.e., mother and father knowing where adolescent is) will be negatively associated with substance use.

H3: The influences of accessibility and supervision will vary across the different types of substances.

H4: While individual-level measures of both accessibility and supervision will be associated with substance use, even while controlling for these measures, school-level opportunity measures will also be associated with substance use.

Data

The present study uses student survey data from the *Rural Substance Use and Violence Project (RSVP)*, funded by the National Institute of Drug Use (DA-11317). This was a prospective longitudinal study conducted between the years of 2001 and 2004. For the present study, all four waves of the student component of the RSVP were used by pooling the four waves of data creating 10,160 individual data points. The student data consists of annual survey responses from a panel of public school students from a Southern state who were enrolled in seventh grade during the 2000–2001 academic year. The 3,976 students who provided data in at least one wave were embedded within a total of 89 unique school contexts over the course of the four-year study, as most students crossed from an elementary or middle school to a high school at some point during the study (for a more detailed discussion of the sampling procedure and research methods for the RSVP project see, Wilcox, Tillyer, and Fisher 2009).

Dependent Variables—There are five dependent variables in the current study: *tobacco use*, *alcohol use*, *inhalant use*, *marijuana use*, and *stimulant use*. These dichotomous variables measured whether students have used the specified substances in the present school year. Students were asked “In the present school year, how often have you done any of the following ...” The students then chose their response on an ordinal scale of 1 = *never* to 5 = *daily or almost daily*. For this study, the responses were then dichotomized and coded so that 0 = *never* and 1 = *any use during the current school year*. All responses which were

previously coded as 1 became a 0 and responses which originally ranged between 2 to 5 became a 1 to indicate *any use during the current school year*. Tobacco use was created by combining the responses to smoking cigarettes, smoking cigars, and using spit tobacco. Alcohol use was a combination of the responses to drinking alcohol and getting drunk. Marijuana and inhalant use were created by asking if the respondent had smoked marijuana or used inhalants, respectively. Finally, stimulant use included the responses to whether the student had used cocaine/crack, speed, or crystal meth. Descriptive statistics in Table 1 show that, on average, 27% used tobacco, 34% used alcohol, 14% used marijuana, 4% used inhalants, and 4% used stimulants.

Independent Variables—Theoretically important independent variables at the individual level included measures of the lack of capable guardianship which ultimately facilitate opportunity. The opportunity variables focused on two types of the lack of capable guardianship: accessibility to the suitable target, (i.e., substances); and supervision. The present study included three measures of accessibility including: 1) money to spend; 2) sold drugs; and 3) access to drugs. *Money to spend* asks students, “On average, how much money do you have to spend on yourself each week (example: money from allowances, job, and so on)?” Theoretically, the more money the student had accessible, the greater the opportunity to purchase drugs and other substances. On average, students had \$28.37 to spend on themselves each week (s.d. = \$53.98). Direct access to use substances was measured by the variables *sold drugs* and *access to drugs*. *Sold drugs* was a dichotomous variable indicating whether the student had sold marijuana or other drugs even once in the present school year (yes = 1; no = 0). While only 6% of students reported selling drugs, for those involved in selling drugs, they clearly had more access to drugs than those not selling. *Access to drugs* measured how easy it is to get cigarettes, alcohol, inhalants, marijuana, or stimulants (cocaine/crack, speed, and crystal meth); the index ranges from 1 = difficult to obtain any substance to 9 = easy to obtain most substances (Cronbach’s $\alpha = .88$). The average student found it was not easy to obtain most substances with a mean of 2.38 (s.d. = 1.09).

Related to the variable *money to spend*, was a variable measuring the number of hours the student spends working (including babysitting, family farm labor, etc.). Responses ranged on an ordinal scale from 0 = *none* to 5 = *over 30 hours*. This variable is related to opportunity on several dimensions. On one hand, students who work more hours are likely to have more spending money for used substances.⁶ On the other hand, a job is typically indicative of guardianship because it is time that students are being supervised and are less able to use substances. Therefore, we hypothesize that hours working will influence substance use; however, we do not hypothesize whether hours working will increase or decrease substance use. On average, students worked 10 hours or less a week (s.d. = 1.12).

Variables related to guardianship through direct or indirect supervision include: *skipped school*, *father knows where*, *mother knows where*, *sports*, and *school activities*. Students were asked how often in the present school year they had skipped school. The responses were coded as 0 = *never* to 4 = *daily or almost daily*. The average student skipped school less than once a month to never skipping school (s.d. = 0.62). Students who skip school lack

⁶The variables money to spend and hours working are significantly correlated with a coefficient of .231.

guardianship during those hours while skipping school because either their parents are away at work or their parents are not aware they are missing school, which presents opportunity for the students to use drugs and alcohol. *Father knows where* and *mother knows where* respectively asked the respondent how often they agreed with the statements: “My father [mother] knows where I am when I am away from home.” Responses were coded as 0 = *never* to 4 = *always*. The average student’s father sometimes knew where he or she was; while the average student’s mother often knew where he or she was when away from home. Theoretically, students whose parents know where they are when they are away from home have higher levels of guardianship; and therefore, less opportunity to use substances. *Sports* and *school activities* could also provide guardianship in the after-school hours during which the student might otherwise be unsupervised. These variables were measured by asking: “During the school year, about how often do you take part in the following:” school sports; other school activities? The responses ranged from 0 = *never* to 4 = *every day*. On average, students participated in school sports and school activities less than once per week and have respective standard deviations of 1.58 and 1.53.

Several additional student-level variables which extant theory and research suggests are related to substance use were controlled for in our analysis: school attachment, peer attachment, delinquency, delinquent peers, impulsivity, GPA, age (wave), gender, and parental socioeconomic status (SES). *School attachment* was measured with an index that averaged student responses across six items. The questions asked how strongly the students agreed or disagreed (on a four-point scale) with various statements about their relationships with teachers, the importance of education, and their attitudes towards school (Cronbach’s $\alpha = .71$).

Delinquent peer association was measured with a 17-item measure asking respondents whether their closest friends participated in a series of delinquent behaviors during the present school year (1 = yes, 0 = no). These behaviors included things such as drug and alcohol use, truancy, drunk driving, school suspension, carrying a weapon at school, being arrested, drug dealing, theft, assault, and vandalism. To calculate the respondents’ exposure to delinquent peers, the responses to these 17 dichotomous items were averaged (Kuder-Richardson reliability = .91).

Impulsivity was measured with the average score from an 11-item index assessing multiple dimensions of low self-control, including frustration, temper control, attention span, and restlessness (Cronbach’s $\alpha = .91$). Each of the eleven items used a four-point Likert response scale (1 = low to 4 = high). *Socioeconomic status* was measured as the average of mother’s and father’s educational attainment, with response categories ranging from 1 (completed grade school or less) to 7 (graduate or professional school). Student’s *race* and *gender* were measured dichotomously (nonwhite = 1, white = 0; female = 1, male = 0).

There are also several theoretically important opportunity variables at the school level: *guards*, *police*, *backpacks*, *metal detectors*, *aggregated measure of amount of money to spend*, and *proportion of school body that were drug dealers*. Guards, police, backpacks, and metal detectors were all dichotomous variables which gauge if a certain security measure was allowed in a school. Having guards, police, and metal detectors in schools should

increase guardianship; and should therefore, make substance use or distribution more difficult, at least while at school. Backpacks can lead to a lack of guardianship because they enable used substances to be more easily concealed. Of the 89 schools included in the present analysis, 39% of the schools employed guards, 45% of schools had police officers, 75% of schools allowed the use of backpacks, and 31% of schools used metal detectors. *Amount of money to spend* at the school-level measures the average amount of money students had to spend at each school. At the average school, students had \$27.92 to spend on themselves each week (s.d. = \$10.87). Similar to the variable at the individual level, the more disposable income students had, the higher the likelihood of substance use in the school. *Proportion of drug dealers* measured the average number of students per school that identified themselves as having sold drugs. On average, a school had one student who identified themselves as selling drugs (s.d. = 0.12). The higher the number of drug dealers at a school the easier it is for the students to access used substances. The control variables used at the school level were: *free lunch/reduced lunch*, *percent male*, and *percent non-white*.

Analysis Plan

The analysis is conducted using hierarchical logistic modeling (HLM), specifically using the HLM 6 software. This method is appropriate because the RSVP data consists of students who are clustered non-randomly within schools. In the present study, the focus is on the influence of students' accessibility to substances and supervision measures on students' substance use, while also controlling for school-level measures such as police in the school and the proportion of students that are drug dealers. Further our focus is not on the intra-individual change in substance use. Therefore, to optimize the number of school contexts represented in the analyses presented below, the student data was pooled across all four waves of the study.⁷

We estimated five two-level hierarchical logistic models that examined each category of substance use. Our analysis consisted of three steps for each substance category. First, we estimated the intercept-only, or null model to confirm that significant variation in the dependent variable across schools existed. Second, we estimated models, with all individual-level opportunity variables and control variables. Third, we added the school-level variables to the model to examine any possible contextual effects of the opportunity variables.

Results

The results shown in Table 2 present the findings from five two-level hierarchical logistic models. Each model tests opportunity and control variables against use of a particular substance: tobacco, alcohol, marijuana, inhalants, and stimulants. We present the analysis for each substance and then conclude with a discussion comparing across the 5 substances.

⁷Due to the pooling the data, it is possible that the same individual is in the data set up to four separate times; and therefore, correlated error may be an issue. To assess to what degree correlated error may be influencing the results previously presented and discussed, some ancillary analyses were conducted. Three-level models parallel to the two-level models estimated with HLM for all dependent variables were run with Stata in order to better control for the correlated error that might have been generated by pooling the data. This analysis revealed that, when comparing the results from the two-level models against the three-level models, all coefficients which were significant in the two-level models remained significant, and at the same level of significance, in the three-level models. Therefore, due to the nature of the present study's research questions, we thought it best to present the two-level models.

Tobacco.

Three of the four accessibility variables and four of the five supervision variables were significantly associated with tobacco use. Students who spent more hours working, sold drugs, and had more access to substances were significantly more likely to use tobacco. Money available to spend was not significantly associated with tobacco use. Guardianship through direct and indirect supervision was also important in determining the likelihood of a student using tobacco products. Skipping school, both father and mother knowing where the student was, and school activities were all significantly associated with tobacco use in the theoretically expected direction. Students who skipped school were more likely to use tobacco and those students whose parents tended to not know where their children were, were also more likely to use tobacco. When students skipped school, they are likely lacking guardianship during school hours, providing more opportunity to use tobacco products than students who do not skip school. Further, when parents know where their children are they provide guardianship through indirect supervision and by not allowing them to go to places likely to have tobacco products. Regarding school activities, students involved these types of activities had less unsupervised time, or higher levels of guardianship; and therefore, less opportunity to use tobacco.

In addition to the key opportunity variables, several control variables were also significant at the individual level. The more attached a student felt to his or her school, the less likely he or she was to use tobacco. Related to this, having a higher GPA was also significantly and negatively related to tobacco use. Engaging in delinquent activities, having delinquent peers, and impulsivity all increased the likelihood of using tobacco products. Wave was significantly and positively related to tobacco use which indicates that as the respondent gets older, the more likely they were to report tobacco use. Finally, race was positive and significant which reveals whites were more likely to use tobacco products than non-whites.

At the school-level, the only significant opportunity related variable was the mean number of students who reported selling drugs. As expected, the more drug dealers at a school, the more likely students were to use tobacco. Control variables significant at the school-level included free/reduced lunch and the percentage of non-white students. Free/reduced lunch was positively related to tobacco use and the percentage of non-white students in a school was significantly and negatively related to tobacco use. For tobacco use it appears that individual-level opportunity variables measuring both accessibility and supervision were important in understanding students' use of tobacco. The school-level opportunity variables used in the present study were largely unimportant.

Alcohol.

Similar to tobacco use, both accessibility and supervision measures of opportunity were significantly related to alcohol use. Regarding accessibility, all four variables were significantly and positively associated with alcohol use. The more money a respondent had to spend and the more hours a respondent worked, the greater the likelihood of using alcohol. Also, as expected, having access to substances and selling those substances at school were significantly and positively related to alcohol use.

Like tobacco use, this model found variables that measured direct and indirect supervision to be an important aspect of guardianship. Skipping school was positively and significantly associated with alcohol use indicating that the more a student skipped school, the greater the lack of capable guardianship during school hours; and therefore, the likelihood of using alcohol increases. As with tobacco use, the variables of the mother and father knowing where the student was when not at home were negative and significantly associated with alcohol use. This indirect supervision enhances capable guardianship by setting rules and increasing the likelihood of the student getting caught if they use alcohol. Unlike the tobacco model, the alcohol model did not find engaging in after school activities to be significantly associated with alcohol use. However, this model did find that the more involved a student was in after school sports, the more likely he or she was to use alcohol. This is consistent with the existing literature. For example, in a review of 34 quantitative studies on the relationship between high school and college sports and drug use, 22 of the 29 studies that examined alcohol use found that athletes were more likely to use alcohol (Lisha and Sussman 2010). While the data used here do not allow us to test this, we hypothesize that this might have something to do with the culture or competitive nature of sports which potentially encourages alcohol use.

All control variables at the individual-level were significant. As with tobacco, having a higher level of attachment to school and a higher GPA were both negatively associated with alcohol use. Students with higher levels of attachment to peers, who engaged in acts of delinquency, had delinquent peers, with lower self-control, and a higher socioeconomic status were all significantly and positively related to alcohol use. These findings, as well as the positive significance of sports, may signify that alcohol use is related to peer relationships and group activities. Wave was positive and indicates that older students were more likely to use alcohol. Females were more likely to use alcohol than males and whites were more likely to use than non-whites.

Only two variables were significant at the school-level. First, having police in schools was significant and negatively related to alcohol use. Also, the percentage of male students in a school was significant and positively related to alcohol use. This is an interesting finding because at the individual level females were found to be more likely to use alcohol than males. It is possible that females were pressured by males to engage in alcohol use. These findings provide further evidence that alcohol use was likely related to peer activities. Similar to tobacco use, individual level variables appear to be much more important than school-level opportunity measures. Also, both accessibility and supervision variables were important. Three major differences exist between the individual-level models of tobacco and alcohol. First, money to spend is significant for alcohol, but not for tobacco. Second, sports were positive and significant in the alcohol model, but nonsignificant in the tobacco model; and third, school activities decreased the likelihood of using tobacco, but it was not significantly associated with alcohol.

Marijuana.

Moving on to marijuana, again several of both accessibility and supervision variables were important. Here, money available to spend, having sold drugs, and having more access to

drugs were all significantly and positively associated with marijuana use. These findings were generally consistent with the tobacco and alcohol use models. Similar to the previous findings, skipping school was also positively associated with marijuana; and the variables of the mother and father knowing where the student was when not at home were both significant and negatively associated with marijuana. In addition, students participating in more after school activities was negatively associated with marijuana. As with previous models, most of the control variables were also significant. Higher levels of school attachment and GPA significantly decreased the likelihood of marijuana use. Engaging in delinquent acts, delinquent friends, and lower levels of self-control all increased the likelihood of using marijuana. Age (wave) was positively associated with marijuana, indicating that as students became older, they were more likely to use marijuana. At the school-level, the police presence in school was significant and negatively related to marijuana use; and the more males present in a school the more likely marijuana was used.

Inhalants.

There were fewer accessibility and supervision variables significantly associated with inhalant use compared to the previous models. For example, neither the money to spend or hours working were significant. Considering substances used for inhalant use can come from household objects, this is not necessarily unexpected. Similar to the other models, having sold drugs and having more access to substances were significant and positively associated with inhalant use. Contrary to previous models, the supervision variable of mother knowing where the student was did not reduce the likelihood of inhalant use. However, fathers' knowing where a student was when not at home was significant and negatively associated with inhalant use. Also, participating in sports decreased the likelihood of inhalant use.

Fewer of the control variables also had significant relationships with inhalant use compared to the previous models and some of the significant relationships were in the opposite direction. As expected, engaging in delinquency and having delinquent peers were positively associated with inhalant use. Like the previous substances discussed, age (wave) was significant; however, it was negatively associated with inhalant use. This is not unexpected because younger adolescents likely have more access to items used as inhalants around their home and the items used as inhalants typically do not have an age requirement to buy the product like tobacco or alcohol. Females were also more likely to use inhalants than males. School-level results were somewhat counter to expectations. Police presence in a school significantly increased the likelihood of inhalant use. Additionally, individuals attending schools with a higher proportion of non-whites were more likely to use inhalants. Based on these findings, it appears that guardianship measures related to inhalant use were considerably different from other substances. These differences were likely to exist due to the nature in which inhalants are acquired compared to other substances. Here, students can merely open kitchen cabinets or a drawer in the garage and find chemicals to inhale. On the other hand, all of the other substances require more planning or work to access them.

Stimulant Use.

Both accessibility and supervision measures were significantly related to stimulant (cocaine/crack, speed, crystal meth) use. The accessibility measures of having money to spend and

the number of hours the respondent works were both significant. However, while having more money to spend was positively associated with abusing stimulants, the more hours worked was negatively related. While both measures indicate the amount of money a student may have to spend on substances, it is possible that consistent use of stimulants would lead to the student being unable to maintain a steady job. As expected, selling drugs was positively related to stimulant use. However, having access to drugs was not significant in this model, which is contrary to all previous results. Significant supervision related measures included skipping school which was positively associated with stimulant use. Mother knowing where the student was when not at home was significant and negatively associated with stimulants. Here, participating in sports was negatively associated with stimulant use while participating in after school activities was positively related to stimulant use. While it is unclear why partaking in after school activities might increase the likelihood of stimulant use, it is probable that the physical effects of stimulant use make these substances unappealing for athletes.

Only two control variables were significant in the stimulus model. Students who partook in delinquent activities and females were more likely to use stimulants. Notably different from the other models, delinquent peers and low self-control were not significant. The only significant measure at the school-level was the percentage of non-white students. The higher the percentage of non-white students in a school, the less likely the use of stimulants.

Discussion and Conclusion

The findings indicate that there are some general measures which can be implemented to reduce the opportunity for most, if not all substances. For example, school administrators should focus on preventing truancy by monitoring the bathrooms and exits of the building during school hours. Parental awareness of the student's whereabouts was also found to be an important guardianship measure in most of the models. Schools can encourage this through a variety of measures including assigning students to complete a daily journal of their activities that their parents must read and sign. Encouraging students to participate in after school activities through offering students a variety of incentives, for example extra credit, will also decrease the opportunity for several types of substance use. Parents should be made aware that limiting the number of hours a student works and the amount of money the student has to spend can help to prevent substance use.

While these general guardianship measures will impact opportunity for most substances, targeted opportunity reduction should also occur. For instance, most of the substances are more likely to be used by older respondents, the exception to this finding is inhalants which are significantly likely to be used by younger students. Schools need to focus on early substance use prevention education on inhalants and should inform parents of the materials that can be used in inhalant use. Future research should examine to see if inhalant use leads to abusing different substances as the student gets older. Another form of targeted opportunity which needs to be explored is the relationship of gender and substance use. The models found that alcohol, inhalants, and stimulants were more likely to be used by females than males. Guardianship measures should specifically target females for these substances. In the future, research should explore the relationship between opportunity, gender, and

substance use to determine if females are exposed to different opportunities to use substances. Finally, the impact of playing school sports on substance use is unclear. Alcohol use was found to be positively associated with sports while inhalant and stimulant use had a negative association. Based on these findings, sports teams should be specifically targeted with alcohol prevention education as well as given closer supervision by their coaches and parents. Future research should further explore the impact of playing sports on the use of specific substances.

Although this study is important in identifying the unique relationships between various measures of accessibility and supervision on the use of specific types of substances, it is not without its limitations. Specifically, generalizability may be an issue with this study because the sample only includes students from public schools in Kentucky. It is possible that these results may not be applicable to the private schools or to states with a different demographic make-up than Kentucky. However, there is no theoretical reason as to why opportunities presented to Kentucky public school students should be greatly different from students in other states and school settings. Another limitation can be found in the measures used for supervision. While parents knowing the whereabouts of a student is important, as indicated by this study, there may be stronger aspects of supervision which were not being directly measured here. Future research should aim to include more direct measures of supervision. Also, this study uses pooled data rather than implementing a longitudinal methodology. While the results are no less valid from using pooled data, a longitudinal study may find that the opportunity for particular substances evolve over time. Future research should examine if students' opportunities for substance use change as they age. Despite these few limitations discussed, the present study contributes to the adolescent substance use literature by first, using routine activity theory to understand the variation in substance use. Second, by disaggregating substances into five categories, the current study is able to examine whether the various guardianship measures herein consistently influence substance use or whether certain guardianship measures are more or less important for reducing the use of specific substances. It was revealed that only one of the guardianship measures—sold drugs—was statistically significant in predicting use of all 5 substances. For the remaining guardianship measures, most were important for at least three of the five substances; however, the substances for which they were important varied depending on the guardianship measure. Third, this study explored not only the influence of individual-level guardianship measures, but also several school-level guardianship measures. School-level guardianship measures were much less consistently important in understanding students' substance use.

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Table 1:

Descriptive Statistics

Variables	M	SD	Minimum	Maximum	n
<i>Dependent Variables</i>					
Tobacco Use	0.27	0.44	0	1	10025
Alcohol Use	0.34	0.47	0	1	10021
Marijuana Use	0.14	0.34	0	1	10055
Inhalant Use	0.04	0.20	0	1	10067
Stimulant Use	0.04	0.20	0	1	10055
<i>Independent Variables</i>					
Level 1					
Money to Spend	28.37	53.98	0	500	9537
Hours Working	0.78	1.12	0	5	10027
Sold Drugs	0.06	0.25	0	1	10160
Access to Drugs	2.38	1.09	1	9	10054
Skipped School	0.23	0.62	0	4	10068
Father Knows Where	2.61	1.39	0	4	9640
Mother Knows Where	3.31	1.01	0	4	9930
Sports	1.65	1.58	0	4	10045
School Activities	1.31	1.53	0	4	10031
School Attachment	3.18	0.56	1	4	10091
Peer Attachment	3.75	0.77	1	5	10010
Delinquency	1.13	0.34	1	5	10078
Delinquent Peers	0.24	0.26	0	1	10160
Low Self Control	1.82	0.68	1	4	10024
GPA	4.01	0.90	1	5	9915
Wave	2.21	1.07	1	4	10160
Sex	0.52	0.50	0	1	10160
Race	0.90	0.30	0	1	10132
Socio-economic Status (SES)	4.35	1.56	1	7	8994
Level 2					
Guards	0.39	0.46	0	1	89
Police	0.45	0.33	0	1	89
Backpacks	0.75	0.37	0	1	89
Metal Detectors	0.31	0.38	0	1	89
Mean Amount of Money to Spend	27.92	10.87	10.06	62.85	89
Mean Drug Dealers	1.13	0.12	1	1.79	89
Free Lunch	45.90	21.03	3	93	89
Percent Male	51.95	2.72	43.82	59.25	89
Percent Non-white	9.91	12.03	0	52.77	89

Table 2:

Hierarchical Linear Model for Adolescent Substance Use

	Tobacco Use	Alcohol Use	Marijuana Use	Inhalant Use	Stimulant Use
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Level 1					
Intercept	-1.18 **	-0.76 **	-2.64 **	0.05 **	0.04 **
Money to Spend	0.00	0.00 **	0.00 *	-0.00	0.00 **
Hours Working	0.09 **	0.05 *	-0.06	-0.00	-0.00 *
Sold Drugs	1.52 **	1.47 **	3.24 **	0.14 **	0.19 **
Access to Drugs	0.11 **	0.19 **	0.15 **	0.01 **	0.00
Skipped School	0.23 **	0.17 *	0.21 *	0.01	0.02 **
Father Knows Where	-0.13 **	-0.15 **	-0.20 **	-0.00 *	-0.00
Mother Knows Where	-0.19 **	-0.32 **	-0.27 **	-0.01	-0.01 **
Sports	0.04	0.08 **	-0.04	-0.00 *	-0.00 *
School Activities	-0.07 **	-0.03	-0.13 **	0.00	0.00 *
School Attachment	-0.45 **	-0.35 **	-0.19 *	-0.01 *	-0.00
Delinquency	1.03 **	1.17 **	0.50 *	0.19 **	0.17 **
Delinquent Peers	1.85 **	1.75 **	2.06 **	0.04 **	0.02
Low Self Control	0.29 **	0.15 **	0.24 **	0.01	0.00
SES	-0.02	0.05 *	0.01	0.00	0.00
GPA	-0.41 **	-0.13 *	-0.33 **	0.00	-0.00
Wave	0.20 **	0.41 **	0.43 **	-0.01 *	-0.00
Gender	0.04	0.36 **	0.10	0.02 **	0.02 **
Race	0.86 **	0.57 **	0.40	0.01	0.01
Level 2					
Guards	0.06	-0.09	0.13	-0.01	-0.00
Police	-0.01	-0.33 *	-0.55 **	0.01 *	-0.01
Backpacks	0.042	-0.16	-0.30	0.00	-0.00
Metal Detectors	-0.02	-0.07	-0.01	0.00	-0.00
Mean Amount of Money to Spend	-0.00	0.01	-0.00	-0.00 *	-0.00
Mean Drug Dealers	1.25 *	-0.32	0.46	0.05	0.04
Free Lunch	0.01 **	-0.00	0.00	0.00	0.00
Percent Male	0.02	0.03 *	0.06 *	0.00	0.00
Percent Non-White	-0.02 **	0.00	0.00	-0.00 **	-0.00 *
Random Effects					
Variance Component	0.14 **	0.11 **	0.11 **	0.00 *	0.00
SD	0.37	0.33	0.33	0.01	0.01

	Tobacco Use	Alcohol Use	Marijuana Use	Inhalant Use	Stimulant Use
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Chi-Square	199.70	186.19	123.96	108.66	92.87
Level-1 Error Variance Component				0.03	0.03
Level-1 Error SD				0.17	0.16

**
p .01

*
p .05

Schools (N = 89); Individuals (n = 10,160)