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NON-MEDICAL USE OF PRESCRIPTION DRUGS AMONG YOUTH IN AN APPALACHIAN POPULATION: PREVALENCE, PREDICTORS, AND IMPLICATIONS FOR PREVENTION*

David Collins, Ph.D., Melissa Harris Abadi, Ph.D., Knowlton Johnson, Ph.D., Steve Shamblen, Ph.D., and Kirsten Thompson, M.A.

Pacific Institute for Research and Evaluation, Louisville, Kentucky

Abstract

This article examines prevalence of non-medical use of prescription drugs (NMUPD) in a sample of elementary and high school students in an Appalachian Tennessee county. We found that lifetime prevalence of NMUPD (35%) was higher than prevalence of cigarette use (28%) and marijuana use (17%), but lower than lifetime prevalence of alcohol use (46%). We examined characteristics, as well as risk and protective factors in several domains, as predictors of NMUPD. For comparison, we also examined these characteristics and factors as predictors of alcohol, cigarette, and marijuana use. Using survey data from a sample of late elementary school and high school students (grades 5, 7, 9, and 11), logistic regression analyses showed that the risk factors of friends' non-medical use and perceived availability, and the protective factors of perceived risk, parents' disapproval, school commitment, and community norms against youth NMUPD were significant predictors of lifetime prevalence of NMUPD. Implications for prevention are discussed.

INTRODUCTION

Non-medical use of prescription drugs (NMUPD) by teens in the United States is a growing public health concern. A 2007 NIH news release noted that while the last few decades have seen a downward trend in illicit substance use among teens, prescription drug abuse remains high (NIDA, 2007). The problem of prescription drug abuse has been tied to the wider societal availability of potent prescription drugs. NIDA's Director, Dr. Nora Volkow, noted it is not surprising that the availability of more, newer, and better psychotherapeutics was followed by an upswing in their non-medical use (Volkow, 2006).

The three classes of prescription drugs that are most often abused are:

1. opioids (e.g., Vicodin and Oxycontin), which are most often prescribed for pain;
2. stimulants (e.g., Dexedrine and Ritalin), which are prescribed to treat attention-deficit hyperactivity disorder (ADHD) and narcolepsy; and
3. central nervous system (CNS) depressants, which are prescribed to treat anxiety and sleep disorders (NIDA, 2005).

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Direct reprint requests to: David Collins, Pacific Institute for Research and Evaluation, 1300 South Fourth Street, Suite 300, Louisville, KY 40208, collins@pire.org.

CNS depressants are often referred to as sedatives and tranquilizers, and are further broken down into the categories of barbiturates, and benzodiazepines (the latter of which includes Valium, Librium, and Xanax) (NIDA, 2005).

Pain relievers are currently the most abused types of prescription drugs among teens, followed by stimulants, tranquilizers, and sedatives (SAMHSA, 2006). According to 2009 *Monitoring the Future* survey results, annual prevalence rates for abuse among 12th graders were 9.7% for Vicodin, 4.9% for Oxycontin, 6.3% for tranquilizers, 5.2% for sedatives, and 5.4% for Adderall (Johnston, O'Malley, Bachman, & Schulenberg, 2010).

The aim of this study was twofold. First, we sought to determine the prevalence of NMUPD in a sample of elementary and high school students in an Appalachian Tennessee county. Second, we sought to compare characteristics and factors that predict NMUPD with those that predict use of other substances (alcohol, cigarettes, and marijuana).

Predictors of NMUPD

Prior research, including student survey data from both national (Simoni-Wastila, Yang, & Lawler, 2008) and local samples (Boyd, McCabe, & Teter, 2006; Levine & Coupey, 2009; McCabe, Boyd, & Young, 2007) has found a number of individual characteristics and risk/protective factors to be associated with NMUPD. For prevention of NMUPD to be effective, it is important to continue this line of research to determine what characteristics and factors predict NMUPD among youth.

The current study contributes to the literature on this emergent public health issue in two ways:

1. we included a number of factors as potential predictors of NMUPD, including risk and protective factors often targeted through prevention efforts (NIDA, 2003); and
2. we compared how these factors are related to use of other substances (alcohol, cigarettes, and marijuana).

Other researchers (Cleveland, Feinberg, Bontempo, & Greenberg, 2008) have examined the relative influence of risk and protective factors across multiple domains on adolescent substance use, and the current study builds on that literature by focusing on NMUPD.

Characteristics—Among teens, females are more likely to use prescription drugs non-medically (Boyd et al, 2006; Ford, 2009; SAMHSA, 2006). Simoni-Wastila et al. (2008) found that being female was positively associated with NMUPD when prescription drugs were the only substance abused. One explanation is that females have easier access to prescription drugs, in part through the sharing of medications (Daniel, Honein, & Moore, 2003). Looking at race, a number of researchers have reported that White adolescents are significantly more likely than other racial/ethnic groups to engage in NMUPD (Ford, 2009; Simoni-Wastila et al., 2008). Considering age, *Monitoring the Future* results show that use rises consistently from 8th to 12th grade for tranquilizers and Vicodin, but for Oxycontin there is an increase from 8th to 10th grade and a slight drop in 12th grade (NIDA, 2010). In addition, whether a student has previously used prescription drugs medically has been shown to be predictive of NMUPD (Boyd et al., 2006).

Risk Factors—Risk factors in several domains are associated with substance use among youth. In the individual domain, sensation seeking has been shown to be a significant predictor of NMUPD among adolescents (Adams, Heath, Young, Hewitt, Corley, & Stallings, 2003; Herman-Stahl, Krebs, Kroutil, & Heller, 2006). Additionally, Harrell and Broman (2009) reported that delinquent behavior during adolescence was associated with

later NMUPD by young adults. In the peer domain, Collins and colleagues found that friends' use was a significant predictor of prevalence of marijuana, inhalants, and other drugs (including narcotics and uppers) (Collins, Pan, Johnson, Courser, & Shamblen, 2008). And, Peters, Meshack, and Kelder (2007) reported that peer reinforcement was a main reason given by youth for using Xanax (Alprazolam) non-medically the first time.

In the school domain, Dewey (1999) found that absenteeism, low grade point average, and truancy were all correlated with substance use. While research has not shown a specific relationship between skipping school and NMUPD, this variable may also be a predictor of NMUPD.

In the community domain, actual and perceived availability have been noted as especially important risk factors for NMUPD. An Office of National Drug Control Policy (ONDCP) report (2007) focused on prescription drug availability as a key contributing factor in NMUPD by teens. The 2005 Partnership Attitude Tracking Study noted the widespread availability of prescription pain relievers as a primary reason for abuse. For example, 62% responded that the pain relievers were "easy to get from parents' medicine cabinets" (Partnership for a Drug-Free America, 2006, p. 20). Another aspect of availability is diversion of prescription drugs by teens, which can occur through trading, selling, or giving the drugs away. Diversion has become more common as the numbers of teens having drugs prescribed to them has grown. For example, Poulin (2001) found that non-medical stimulant use was associated with the number of prescription stimulant users in the students' grade or homeroom. Boyd et al. (2006) found that of their sample of adolescents (ages 10–18), 34% reported getting prescription drugs from a family member and 17% reported obtaining prescription drugs from a friend. This type of diversion leads to the norm that prescription drugs are easily available and that self-medication is acceptable and safe.

Protective Factors—In the individual domain, perceived risk of use is often cited as a protective factor against substance use. Researchers have noted that adolescents who engage in NMUPD perceive such drugs as less harmful than street drugs (Quintero, Peterson, & Young, 2006), and an inverse relationship has been found between perception of risk and likelihood to use prescription drugs non-medically (Johnston, O'Malley, Bachman, & Schulenburg, 2006).

In the family domain, parental monitoring is an important correlate of substance use. Hawkins, Catalano, and Miller (1992) reported that risk of substance abuse appears to be lower when family practices include clear expectations for behavior, monitoring of behavior, and rewards for positive behavior. Beyers, Toumbourou, Catalano, Arthur, and Hawkins (2004) found that family management and family attachment were significant predictors of substance use. Additionally, substance use was found to be lower among teens age 12 to 17 who reported their parents "always" or "sometimes" monitored their behavior, versus teens who reported "seldom" or "never" (SAMHSA, 2009). These factors would likely influence NMUPD among teens as well.

Research shows that parental disapproval of youth substance use impacts actual use among youth. The 2006 National Survey on Drug Use and Health reports that 12–17 year olds whose parents express strong disapproval of substance use are far less likely to engage in substance use (SAMHSA, 2007). Beyers et al. (2004) found that both peer and parental attitudes favorable toward substance use were significantly related to actual use. Parental and peer attitudes toward substance use might also be important predictors of NMUPD.

Protective factors that influence substance use and NMUPD in the school domain include academic achievement and school commitment. Ford (2009) found that students with

stronger school bonding (e.g., going to school regularly, belief that school work is meaningful, and belief that things learned at school are important) were less likely to engage in NMUPD. Also, Maguin and Loeber (1996) found a significantly greater risk for substance use among students who had poor academic achievement. And, frequent substance use is negatively related to school commitment (Hotton & Haans, 2004) and school bonding (Shears, Edwards, & Stanley, 2006).

In the community domain, norms against substance use are seen as playing an important protective role. While little research has looked at the impact of community norms on NMUPD, Beyers et al. (2004) found that community norms favorable to substance use were significantly related to cigarette, alcohol, and marijuana use. It seems important to determine whether this relationship exists for NMUPD as well, especially since changing community norms has become more of a focus in recent decades with the trend in prevention moving toward environmental strategies (Conway, Greenaway, Casswell, Liggins, & Broughton, 2007; Fisher, 2006; Hirschfeld, Edwardson, & McGovern, 2005).

Research Questions

We pose the following research questions for this study:

1. What is the prevalence of non-medical use of prescription drugs (NMUPD) and how does it compare to prevalence for alcohol, cigarettes, and marijuana?
2. What demographic characteristics and risk/protective factors are associated with NMUPD and how do these associations differ from those associated with alcohol, cigarettes, and marijuana?

METHODS

Sample

Our sample consisted of students in grades 5, 7, 9, and 11 from two public school districts in an Appalachian county in Tennessee. The county population as of 2009 was about 52,000 and the majority (93%) were White (4% were African American; less than 1% were Asian and Alaska Native/American Indian; and about 1% were other races) (U.S. Census Bureau, 2010). All three school districts in the county were recruited to participate in the student survey. However, one declined (a small city district). Of the two participating districts, one (the county district) had two high schools and seven elementary schools, while the other (a small city district) had one elementary school. The two participating districts included 73% of 5th graders, 77% of 7th graders, 80% of 9th graders, and all of the 11th graders in public schools in the county.

Measures

Dependent Variables—The student survey contained measures of lifetime and past 30-day NMUPD (divided into items for sleeping medications, sedative or anxiety medications, stimulant medications, and pain medications). The survey also measured lifetime and past 30-day use of alcohol, cigarettes, and marijuana. Survey items regarding NMUPD were adapted from those used by Boyd and colleagues in a number of studies (Boyd et al., 2006; Boyd, McCabe, Cranford & Young, 2007). Specifically, the items asked: “How many times (if any) have you taken a sleeping medication/sedative or anxiety medication/stimulant medication/pain medication, in your lifetime/the past 30 days?” Common names for each type of medication were included: Ambien, Halcion, Restoril (sleeping medications); Xanax, Valium, Ativan (sedative or anxiety medications); Ritalin, Adderall, Concerta (stimulant medications); and Vicodin, Oxycontin, Tylenol 3 with Codeine (pain medications). The responses ranged from “0” to “40 or more times.” For our dependent variables, we re-coded

each item so that “no use” was coded “0” and any reported use was coded “1.” We also computed prevalence dependent variables for lifetime and past 30-day NMUPD, which included any reported non-medical use of any of the four types of medications asked about in the survey. Because the outcomes measuring non-medical use of prescription drugs were heavily left censored, dichotomizing had little practical consequences, and conferred the advantage of making the presentation of results easier to interpret.

Predictors of NMUPD

Individual characteristics: The student survey contained the following measures of participant characteristics: gender, age, race, Hispanic ethnicity, and rural place of residence. In our final analyses, the coding for these characteristics was as follows: gender (0 = male, 1 = female), age (0 = 13 or younger, 1 = 14 or older), and nonwhite (0 = white, 1 = nonwhite). Hispanic and rural place of residence were not included in our final analyses. The survey also contained measures of whether the respondent had ever been prescribed each of the four types of prescription medications. We created a composite variable, lifetime medical use of prescription drugs, which was coded as 1 if the respondent reported any lifetime medical use of any of the types of prescription medications.

Risk and protective factors: Risk and protective factors were measured using survey items derived largely from the *Communities that Care* (CtC) survey (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002). Risk factors were: sensation seeking; antisocial behavior; friends’ use; school days skipped; perceived availability of ATOD; and perceived availability of prescription drugs (for non-medical use). Protective factors were: perceived risk of use; parental monitoring; parents’ disapproval of use; school commitment; school grades; and community norms against use. For some risk and protective factors (such as sensation seeking and parental monitoring) we used multiple-item scales. For others (such as perception of risk), we used single items which asked specifically about each of the substances we had as outcomes.

Sensation seeking was measured through four items (such as “I like to do frightening things”); responses ranged from 0 (disagree a lot) to 4 (agree a lot). *Antisocial behavior* was measured through eight items (such as “How many times in the last year have you taken a handgun to school?”); responses ranged from 0 (never) to 7 (40+ times). *Friends’ use of drugs* were measured through five items (such as “In the past year, how many, if any, of your four best friends have used marijuana?”); responses ranged from 0 to 4, indicating the number of friends. Number of *school days skipped* was measured through a single item (“During the last four weeks, how many whole days of school have you skipped or cut?”); responses ranged from 0 (none) to 6 (11 or more). *Perceived availability of alcohol and other drugs* was measured through four items (such as “If you wanted to get some cigarettes, how easy would it be for you to get some?”); responses ranged from 0 (very hard) to 3 (very easy). *Perceived availability of prescription drugs for non-medical use* was measured through five items that asked about the availability from different sources (such as “If you wanted to get some prescription drugs that were not prescribed to you, how easy would it be for you to get some by taking the drug from a medicine cabinet in your home?”); responses ranged from 0 (very hard) to 3 (very easy).

Perceived risk of use was measured through five items (such as “How much do you think people risk harming themselves (physically or in other ways) if they smoke marijuana regularly?”); responses ranged from 0 (no risk) to 3 (great risk). *Parental monitoring* was measured through ten items (such as “My parents ask if I’ve gotten my homework done”); responses ranged from 0 (NO!) to 3 (YES!). *Parents’ disapproval* of substance use was measured using five items (such as “How wrong do your parents feel it would be for you to smoke cigarettes?”); responses ranged from 0 (not wrong at all) to 3 (very wrong). *School*

commitment was measured using six items (such as “How important do you think the things you are learning in school are going to be for your later life?”); responses ranged from 0 to 4 where 4 indicated greater commitment. *Grades* in school were measured using a single item (“Putting them all together, what were your grades like last year?”); responses ranged from 0 (F’s) to 4 (A’s). *Community norms against use* was measured using four items (such as “How wrong would most adults (over 21) in your neighborhood think it was for kids your age to use marijuana?”); responses ranged from 0 (not wrong at all) to 3 (very wrong).

Data Collection

Written parental consent was required for students to take the survey. Consent forms were returned by parents or guardians of 75% of the students in the grades surveyed (1,424 of 1,917). Of the 75%, 61% had parental approval and were eligible to participate (1,177 of 1,424). Completed surveys were processed for a total sample of 1,105 students. Incomplete surveys were the result of students being absent the day of survey administration, as well as student refusals. The final participation rate was 58% (1,105 of 1,917). Although this rate is low, it is near the upper end of the range reported by Courser, Shamblen, Lavrakas, Collins, and Ditterline (2009) for student participation rates in studies using active consent—these authors reported an average range of 40% to 60%. Following training of survey administrators, the surveys were administered in regular class periods and took about 30 to 40 minutes to complete.

Data Analysis

We conducted validity checks on our data set of 1,105 cases using SPSS 18. We deleted data for respondents who reported use of a fictitious drug (“Derbisol”) and for those who reported past 30-day NMUPD without also reporting lifetime NMUPD. A total of 23 cases (2%) were eliminated through these validity checks, leaving a total of 1,082 cases for our analyses.

We computed risk and protective factor scale scores, each of which included multiple items. These scales included sensation seeking, rebelliousness, antisocial behavior, perceived availability of prescription drugs for non-medical use, parental monitoring, and school commitment. All component scale items had factor loadings greater than .50 and all scales were internally consistent (Cronbach’s $\alpha > .70$). In addition, the psychometrics for these scales were established in a large-scale study which used student survey data from 29 Tennessee counties (Shamblen, Collins, Harris, Johnson, & Thompson, 2010). Two protective factors—school grades and school days skipped—consisted of single items. For other risk and protective factors, rather than using multiple-item scales, we used single items which referred specifically to alcohol, cigarettes, marijuana, and NMUPD. These risk and protective factors included: friends’ use; perceived availability of ATOD; perceived risk of use; and parents’ disapproval of use. For example, to measure friends’ use, separate items asked how many of the respondent’s four best friends used alcohol, cigarettes, marijuana, and prescription drugs without a prescription.

To address the extent of prevalence of non-medical use of prescription drugs (Research Question 1), we used descriptive analyses. To address an examination of predictors of non-medical use (Research Question 2), we used logistic regression to predict lifetime use of NMUPD, as well as lifetime use of cigarette, alcohol, and marijuana use.¹

RESULTS

The following describes the characteristics of the students in the final sample. Females made up 57% of the sample, Whites made up 90% of the sample, and 53% were over age 13.

Thirty-seven percent of the students reported having at least one of the four types of prescription medications prescribed to them in their lifetime.

Extent of Non-Medical Use of Prescription Drugs

Table 1 shows lifetime prevalence rates for NMUPD, and for alcohol, cigarette, and marijuana use. The table shows that alcohol use was the most prevalent among this sample (46%), followed by NMUPD (35%), cigarettes (28%), and marijuana (17%). Among elementary school students (5th and 7th graders), the prevalence rate of NMUPD (27%) exceeded that of alcohol use (24%) as well as other substances. Table 1 also shows the prevalence of the four types of prescription drugs asked about on the survey. Pain medications were the most often used (27%), followed by sleeping medications (16%), sedatives (10%), and stimulants (6%).

Predictors of Non-Medical Use of Prescription Drugs

Research Question 2 asked what demographic characteristics and risk/ protective factors are associated with NMUPD and how these associations differ from those with other substances (alcohol, cigarettes, and marijuana). Table 2 presents descriptive statistics for the risk and protective factors that we used as predictors.

Table 3 presents odds ratios for demographic characteristics and risk/protective factors, which were produced through separate logistic regression analyses for each of the lifetime prevalence outcomes (NMUPD, alcohol use, cigarette use, and marijuana use).

The number of friends a student reported as having engaged in non-medical use was a risk factor predictive of one's own NMUPD. Perceived availability of prescription drugs for non-medical use was also predictive of a student's NMUPD. In terms of protective factors, students who reported greater perceived risk of NMUPD were less likely to report non-medical use. Students who reported that their parents disapproved of non-medical use were less likely to report NMUPD. Also, reporting greater school commitment was protective against NMUPD, as was reporting community norms against youth using prescription drugs non-medically.

For lifetime alcohol use, being older and nonwhite was predictive of use. In terms of risk factors, having a higher score on sensation seeking and having more friends who drank alcohol were predictive of alcohol use, as was reporting greater availability of alcohol. Perceiving greater risk was protective against alcohol use, as were parental monitoring of the child's behavior and parental disapproval of alcohol use.

For cigarette use, being high in sensation seeking, reporting more antisocial behavior, having more friends who smoke, and reporting greater availability of cigarettes were predictive of lifetime use. Protective factors against lifetime cigarette use included higher grades in school reported in the last school year, and community norms against youth smoking cigarettes.

¹We tested for multicollinearity (among the student characteristics, and risk and protective factors) by reviewing multicollinearity diagnostic statistics produced through linear regression analysis using SPSS. Although our final models are logistic regression analyses, we still can assume that dichotomous variables are normally distributed under the central limit theorem (Hannan & Murray, 1996). Only one predictor variable, *disapproval of use*, showed evidence of possible multicollinearity and this variable was omitted from our analyses. Prior to conducting the logistic regression analyses, we first conducted multilevel analysis using HLM (because our data involved students within 10 schools). However, we found that the random effect at the school level (Level 2) was not significant for NMUPD, nor was it significant for alcohol, cigarette, or marijuana prevalence. Based on this evidence, we assumed the effects of random variation among schools was nominal, and all models were performed using logistic regression assuming no clustering effects (see Raudenbush & Bryk, 2002).

For marijuana use, being older was predictive of use. Engaging in antisocial behavior, having more friends who use marijuana, and reporting greater availability of marijuana were associated with greater odds of lifetime use. Reporting higher grades in school was associated with lower odds of reporting lifetime marijuana use.

DISCUSSION

In our overall sample of students from an Appalachian county in Tennessee, lifetime prevalence of NMUPD was higher than any other substance besides alcohol. In the elementary school portion of our sample, lifetime prevalence of NMUPD was higher than lifetime prevalence of alcohol use as well as other substances. The prevalence rates reported here are much higher than those seen in most of the literature on non-medical use of prescription drugs (e.g., Boyd, McCabe, Cranford, & Young, 2007), although Levine and Coupey (2009) reported similar prevalence from a sample in a rural Vermont high school (34%). In addition, non-medical use of opioids, which was the medication most frequently used non-medically in our sample, is especially high in Tennessee. A report by ONDCP (2007) listed Tennessee as one of seven states with the highest teen rates of non-medical use of prescription pain medications.

None of the characteristics we included in our analyses (gender, race, age) were significant predictors of lifetime NMUPD. Prior research suggests that being female may be related to NMUPD through greater exposure to prescription drugs, sharing of prescription drugs, and a number of other factors, but our findings did not indicate that gender was associated with NMUPD. Although not reported in our final results, we also conducted another regression analysis in which we included lifetime medical use of prescription drugs as a predictor of NMUPD. We wanted to use the same predictors across the four types of substances we were examining, yet we recognized the importance of looking at medical use. Similar to other studies (Boyd et al., 2006), we found that lifetime medical use was the single most important predictor of NMUPD in this sample (odds ratio = 4.72). This highlights the importance of physicians and pharmacists making their patients aware of the risks associated with NMUPD.

The risk factors of friends' use and perceived availability were significant predictors of NMUPD as well as use of the other three substances included in our analyses (alcohol, cigarettes, and marijuana). Therefore, friends' use being predictive of NMUPD is consistent with this factor's prediction of use of a number of types of substances (Hawkins et al., 1992). Similarly, perceived availability is often predictive of use of multiple substances and this pattern held true for NMUPD. It is often noted that prescription drugs for non-medical use are readily available to teens from multiple sources (including from the home, friends, relatives, and others) (Twombly & Holtz, 2008).

Of the six protective factors included in our analyses, four (perceived risk of non-medical use, parental disapproval of use, school commitment, and community norms against use) were significant predictors of NMUPD. Of these, three were significant predictors of prevalence of other substances: perceived risk was protective against alcohol, cigarette, and marijuana use (marginally so for cigarette use); parental disapproval was protective against alcohol use; and community norms against use was protective against cigarette use.

We found that perceived parental disapproval of NMUPD was associated with decreased odds of NMUPD. This is in line with Sung, Richter, Vaughan, Johnson, and Thorn's (2005) research which found that teen non-medical use of opioids was correlated with parental disapproval of illicit substance use (specifically, marijuana use). Our review of the literature did not find any studies that examined parental disapproval of NMUPD as a specific

predictor of teen NMUPD. However, our finding suggests that seeking to change parental norms may be important to preventive efforts aimed at reducing teen NMUPD.

Our findings did not indicate that parental monitoring predicts NMUPD, which is in contrast to Ford's (2009) theory that one way in which bonding to parents might reduce the risk of NMUPD could be through having behavior monitored by parents. However, our finding is consistent with Sung et al.'s (2005) findings that how often parents check a student's homework (which was one of the component items of our parental monitoring scale) was *not* a significant predictor of non-medical use of opioids.

School commitment predicted NMUPD, which is consistent with the findings of Ford (2009). Ford reported that both school bonding and family bonding were correlates of NMUPD, but that school bonding was a more robust predictor. It was theorized that school bonding provides a stake in conformity, whereas use of substances runs counter to such conformity.

Community norms against youth NMUPD was a significant predictor of NMUPD, such that a higher score for perceived community norms against such use was negatively associated with prevalence. In a study of how neighborhood norms are related to teen use of alcohol, cigarettes, and marijuana, Musick, Seltzer, and Schwartz (2008) found weak associations between norms and teen substance use. The authors found that, of alcohol, cigarettes, and marijuana, there was only a significant relationship between cigarette use and neighborhood norms against use and teens' use. Although Musick and colleagues used different analyses, our results also showed that, for cigarettes (but not for alcohol or marijuana), there was an inverse relationship between community norms against use and students' reported use. Further research is clearly needed to help explain the relationships between community and neighborhood norms and teen NMUPD.

Protective factors in the school and community domains appear to be predictive of NMUPD. The finding that school commitment is protective against NMUPD suggests that efforts to develop greater bonding with this key institution could be productive. Within the community domain, perceived availability and community norms were significant predictors. These findings suggest that it would be advantageous for community strategies to raise awareness of the issue of NMUPD and to foster community norms that NMUPD is not acceptable.

Several limitations of this study should be noted. The data are from a single county, limiting generalizability due to the small geographic scope; however, one advantage of these data is that the sample consisted of both elementary and high school students, and our examination of the literature on NMUPD found few studies that included elementary school students. The population is also primarily white (93%), which represents a limitation. However, the county is similar to many in mid-Appalachia which tend to have higher proportions of white residents than non-Appalachian counties of the same states (MDC, 2002). Also, the study was cross-sectional, so that a temporal relationship cannot be established between NMUPD and the predictors we examined.

Nevertheless, our study suggests that factors in the individual, family, school, and community domains may be protective against youth NMUPD. The findings that parental disapproval of NMUPD and community norms against NMUPD were significant predictors of youth non-medical use suggest the need for further research into these and other factors within multiple domains, including how preventive messages may be designed to strengthen protection in these domains. The development of preventive messages for families and communities regarding prescription drugs will face unique challenges, given the unique nature of prescription drugs in our society. For example, while acknowledging the importance of the use of these medications as prescribed, parents and others need to be made

aware of the risks of NMUPD, and the myth that it is safe to use prescription drugs for recreational or self-medicated use needs to be corrected (Center for Health Policy, 2008). In addition, our finding that school commitment reduces the risk of NMUPD supports findings by other researchers (Ford, 2009) and suggests that the school system can play an important role in prevention of non-medical use. Here, as in the family and community domains, more research is needed to determine how the protective nature of the school environment can be strengthened to deal with this emergent issue.

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Table 1

Lifetime Prevalence Rates for NMUPD, Alcohol, Cigarette, and Marijuana Use

Substance use	Total sample	Elementary school	High school
Alcohol use (<i>n</i> = 1067)	46%	24%	66%
Non-medical use of prescription drugs (<i>n</i> = 1075)	35%	27%	43%
Cigarette use (<i>n</i> = 1068)	28%	13%	42%
Marijuana use (<i>n</i> = 1070)	17%	3%	30%
Non-medical use of pain medications (<i>n</i> = 1055)	27%	19%	34%
Non-medical use of sleeping medications (<i>n</i> = 1058)	16%	11%	20%
Non-medical use of sedative medications (<i>n</i> = 1056)	10%	4%	15%
Non-medical use of stimulant medications (<i>n</i> = 1055)	6%	4%	8%

Table 2

Descriptive Statistics: Risk/Protective Factor Predictors

Variable	Range	# items	Mean	SD	α	N
Risk factors						
Sensation seeking	0-4	4	2.25	1.1	.78	1076
Antisocial behavior	0-7	8	.08	.3	.88	1076
Friends' NMUPD	0-4	1	.45	1.0	n/a	1069
Friends' use of alcohol	0-4	1	1.13	1.5	n/a	1071
Friends' use of cigarettes	0-4	1	.85	1.3	n/a	1075
Friends' use of marijuana	0-4	1	.64	1.2	n/a	1070
School days skipped	0-6	1	.58	1.2	n/a	1070
Perceived availability of alcohol	0-3	1	1.08	1.2	n/a	1061
Perceived availability of cigarettes	0-3	1	1.20	1.3	n/a	1056
Perceived availability of marijuana	0-3	1	.80	1.2	n/a	1049
Perceived availability of prescription drugs	0-3	5	.87	.8	.77	1056
Protective factors						
Disapproval of use of alcohol	0-3	1	2.30	1.0	n/a	1075
Disapproval of use of cigarettes	0-3	1	2.38	1.0	n/a	1072
Disapproval of use of marijuana	0-3	1	2.55	.9	n/a	1070
Disapproval of NMUPD	0-3	1	2.53	.8	n/a	1072
Perceived risk of alcohol use	0-3	1	2.03	1.0	n/a	1061
Perceived risk of cigarette use	0-3	1	2.37	.9	n/a	1069
Perceived risk of marijuana use	0-3	1	2.45	1.0	n/a	1057
Perceived risk of NMUPD	0-3	1	2.32	.9	n/a	1062
Parental monitoring	0-3	10	2.50	.5	.85	1073
Parents' disapproval of alcohol use	0-3	1	2.68	.7	n/a	1069
Parents' disapproval of cigarette use	0-3	1	2.72	.7	n/a	1066
Parents' disapproval of marijuana use	0-3	1	2.87	.5	n/a	1065
Parents' disapproval of NMUPD	0-3	1	2.74	.6	n/a	1065
School commitment	0-4	6	2.72	.8	.81	1077
School grades	0-4	1	3.18	.8	n/a	964

Variable	Range	# items	Mean	SD	α	N
Community norms against youth use of alcohol	0-3	1	2.32	.9	n/a	1067
Community norms against youth use of cigarettes	0-3	1	2.26	1.0	n/a	1065
Community norms against youth use of marijuana	0-3	1	2.54	.8	n/a	1071
Community norms against youth NMUPD	0-3	1	2.52	.8	n/a	1066

Table 3

Predictors of Lifetime NMUPD, Alcohol, Cigarette, and Marijuana Use

	NMUPD (n = 890)			Alcohol (n = 902)			Cigarettes (n = 898)			Marijuana (n = 890)		
	B	OR	CI	B	OR	CI	B	OR	CI	B	OR	CI
Female	-.08	.92	.7-1.3	.23	1.26	.9-1.8	.35 ⁺	1.41	.9-2.1	-.05	.95	.6-1.6
Age	.19	1.21	.8-1.7	.64 ^{**}	1.90	1.3-2.9	.16	1.18	.7-1.9	1.32 ^{***}	3.75	1.7-8.4
Nonwhite	.06	1.06	.6-1.8	.79 [*]	2.20	1.2-4.0	.22	1.25	.7-2.3	.28	1.32	.6-2.8
Sensation seeking	.15	1.16	1.0-1.4	.40 ^{***}	1.49	1.2-1.8	.25 [*]	1.28	1.0-1.6	.23	1.26	.9-1.7
Antisocial behavior	.69	1.99	.8-5.1	.10	1.11	.4-2.8	1.02 [*]	2.77	1.1-7.1	1.33 [*]	3.78	1.1-12.7
Friends' use	.39 ^{***}	1.48	1.2-1.8	.47 ^{***}	1.60	1.3-1.9	.50 ^{***}	1.65	1.4-1.9	.55 ^{***}	1.73	1.4-2.1
School days skipped	.10	1.10	1.0-1.3	.04	1.04	.9-1.2	-.03	.97	.8-1.2	.19 ⁺	1.21	1.0-1.5
Perceived availability	.27 [*]	1.31	1.0-1.7	.29 ^{**}	1.33	1.1-1.6	.53 ^{***}	1.70	1.4-2.0	.46 ^{***}	1.58	1.2-2.1
Perceived risk of use	-.25 ^{**}	.78	.6-9	-.38 ^{***}	.69	.6-8	-.22 [*]	.80	.6-1.0	-.63 ^{***}	.53	.4-.7
Parental monitoring	-.10	.91	.6-1.4	-.61 [*]	.55	.3-9	-.15	.86	.5-1.4	-.12	.89	.5-1.6
Parents disapproval of use	-.72 ^{***}	.49	.4-.7	-1.00 ^{***}	.37	.2-.5	-.31 ⁺	.74	.5-1.0	-.03	.97	.6-1.6
School commitment	-.25 [*]	.78	.6-1.0	-.14	.87	.6-1.2	-.00	1.00	.7-1.4	.06	1.07	.7-1.6
School grades	.09	1.10	.9-1.3	-.13	.88	.7-1.1	-.46 ^{***}	.64	.5-.8	-.46 ^{**}	.63	.5-.9
Community norms against use	-.22 [*]	.80	.7-1.0	-.08	.92	.7-1.2	-.29 ^{**}	.75	.6-.9	.06	1.06	.8-1.5

⁺ $p < .10$;^{*} $p < .05$;^{**} $p < .01$;^{***} $p < .001$.