Published in final edited form as:

J Child Psychol Psychiatry. 2010 January ; 51(1): 84–93. doi:10.1111/j.1469-7610.2009.02134.x.

The Role of Traumatic Event History in Non-medical Use of Prescription Drugs among a Nationally Representative Sample of U.S. Adolescents

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Abstract

Background—Building on previous research with adolescents that examined demographic variables and other forms of substance abuse in relation to Non-medical use of prescription drugs (NMUPD), the current study examined potentially traumatic events, depression, posttraumatic stress disorder (PTSD), other substance use, and delinquent behavior as potential correlates of lifetime non-medical use of prescription drugs.

Method—Nationally representative sample of 3,614 non-institutionalized, civilian, English speaking adolescents (aged 12-17 years) residing in households with a telephone. Demographic characteristics, traumatic event history, mental health, and substance abuse variables were assessed. NMUPD was assessed by asking if participants had ever used a prescription drug in a non-medical manner. Multivariable logistic regressions were conducted for each theoretically derived predictor set. Significant predictors from each set were then entered into a final multivariable logistic regression to determine significant predictors of lifetime NMUPD.

Results—NMUPD was endorsed by 6.7% of the sample (n=242). Final multivariable model showed that lifetime history of delinquent behavior, other forms of substance use/abuse, history of witnessed violence, and lifetime history of PTSD were significantly associated with increased likelihood of NMUPD.

Conclusions—Risk reduction efforts targeting NMUPD among adolescents who have witnessed significant violence, endorsed abuse of other substances and delinquent behavior, and/or endorsed PTSD are warranted. Interventions for adolescents with history of violence exposure or PTSD, or those adjudicated for delinquent behavior should include treatment or prevention modules that specifically address NMUPD.

Keywords

PTSD; Non-Medical Use of Prescription Drugs; Trauma; Adolescents; Substance Abuse; Delinquency

Nonmedical use of prescription drugs (NMUPD) has been defined as “using a psychotherapeutic drug, even once, that was not prescribed for you, or that you took for only

the experience or feeling it caused (SAMHSA, 2002).” According to recent estimates, over 2 million teens (aged 12 to 17 years; 9.3%) in the United States reported past year NMUPD, with teens accounting for over 15% of all past year prescription drug abusers (CASA, 2005). National estimates suggest that prevalence estimates of NMUPD among adolescents are second only to those for marijuana use in this population and that NMUPD (for pain relievers specifically) accounted for the largest number of first time illicit drug users between 2005 and 2006 (CASA, 2005; SAMHSA, 2006). In addition, rates of past-year NMUPD have steadily increased in the most recent decade for persons aged 12 and older, rising by more than 50% from 1991 to 2001 (Blanco et al., 2007; Zacny et al., 2003). Adolescent reports of NMUPD increased at a rate that was 2.6 times that of individuals over age 18, and more than half of new users in this timeframe were younger than age 18 (CASA, 2005; SAMHSA, 2006).

Research suggests that, although the majority of students prescribed psychotherapeutic medications use them appropriately, teens' illegal access to prescription drugs often occurs when prescription drug users give away or sell their medications at school (McCabe, Boyd, & Young, 2007; Poulin, 2001). In order to better balance the value of appropriate prescription drug use versus the threat of misuse among adolescents, proper identification of populations at risk for misuse is noted as an essential next step in research on NMUPD (Compton & Volkow, 2006).

Identification of risk factors for adolescent NMUPD is critical to inform prevention efforts. Data with population-based samples are limited to date, but several risk factors for adolescent NMUPD have been identified by previous research. Caucasian race, older age (i.e., late adolescence), and high rates of other substance use/abuse (including binge drinking, illicit drug use, and alcohol abuse) consistently have been associated with increased likelihood of NMUPD (CASA, 2005; McCabe, Teter, & Boyd, 2004; Sung, Richter, Vaughan, Johnson, & Thom, 2005; Wu, Pilowsky, & Patkar, 2008). National estimates find females to be significantly more likely to report NMUPD than males (CASA, 2005). However, research isolating some specific drug categories of NMUPD (e.g., stimulant use) has found that male adolescents are more likely to report non-medical use, suggesting that gender effects vary depending on the class of drugs (McCabe et al., 2004). With respect to psychosocial variables, lower family income, lower levels of parental involvement, and adolescent involvement in delinquent activities also have received some support as risk factors for adolescent NMUPD, whereas higher parental involvement has been indicated as a protective factor associated with decreased likelihood of NMUPD (Sung et al., 2005).

Although some evidence suggests an association between NMUPD and history of mental health service utilization for emotional problems, there is a dearth of nationally representative data that examines specific mental health outcomes or major life events as potential correlates of increased NMUPD risk in adolescents (Sung et al., 2005). Only one research group has examined this area. Wu et al. (2008) used data from the 2005 National Survey on Drug Use and Health to provide a recent prevalence estimate for past-year (N=18,678) and lifetime (N=36,992) prescription pain reliever misuse, estimating that nearly 7% of adolescents misused pain relievers in the past-year and 10% had misused pain relievers in their lifetime. Several health indices were examined in association with NMUPD, but Wu and colleagues (2008) only investigated two mental health variables: service utilization and major depression. They found that mental health service utilization was positively associated with NMUPD among females, (OR=1.53) and major depressive episode (MDE) was significantly associated with prescription pain reliever abuse and dependence. Whereas these studies mark the first steps toward exploration of the

relationship of NMUPD and mental health problems, to date, little is known about NMUPD in relation to mental health and traumatic event histories (e.g., abuse, violence exposure).

Research with adult samples offers some insight into the association between NMUPD and PTSD, MDE, and traumatic event experiences. For example, studies have indicated an association between posttraumatic stress disorder (PTSD) and potentially traumatic experiences with NMUPD. Findings from a nationally representative sample of adult men and women support MDE as a risk associate of NMUPD; however, this study did not assess PTSD (Huang et al., 2006). A recent study using a nationally representative sample of household women (aged 18 to 86 years; N=3,001) examined both MDE and PTSD as potential risk factors of NMUPD and found that PTSD, but not MDE, was significantly associated with NMUPD in the final model (McCauley et al., 2009). McCauley and colleagues also found support for an association between potentially traumatic life events (i.e., drug-alcohol facilitated rape) and NMUPD.

In sum, whereas a strong body of literature supports more broadly construed associations between traumatic experiences, PTSD, and other forms of substance abuse in adolescent populations, the extant research has yet to determine the nature of the associations between NMUPD, mental health variables, potentially traumatic experiences, and other forms of substance abuse (Kilpatrick et al., 2000; Kilpatrick et al., 2003). With respect to the association between PTSD, potentially traumatic experiences and substance abuse other than NMUPD, the extant literature has posited negative reinforcement models as a theoretical link between traumatic life experience and increased substance abuse. According to these models, individuals are thought to use substances as a method of avoiding or reducing (trauma-related) negative affect (e.g., self-medicating hypothesis; Baker, Piper, McCarthy, Majesikie, & Fiore, 2004). Whereas application of this model to the relation of PTSD and NMUPD has gained some support in adult samples, trends in NMUPD among adolescents have clearly differed from those of adults, and it is premature to assume that risk-factor findings with adult samples generalize to adolescent populations.

The current study extends the literature by examining potential risk factors associated with lifetime NMUPD using a nationally representative sample of 3,614 US adolescents (aged 12 to 17 years). In addition to inclusion of demographic (age, race/ethnicity, gender, geographic area, family income) and substance use risk correlates (binge drinking, alcohol abuse, illicit drug use, and delinquent behavior), mental health variables (PTSD, MDE, and lifetime delinquency) and traumatic event exposure variables (physical assault, sexual assault, and witnessed violence) have been included as potential associates. Given previous support for an association between PTSD and substance use documented in adolescents and the association between PTSD and NMUPD found in samples of adult women, we predicted that PTSD would be associated with increased likelihood of lifetime NMUPD in adolescents. We also predicted that traumatic event exposure would be related to lifetime NMUPD.

Method

Overview

The 2005 National Survey of Adolescents-Replication (NSA-R) is an epidemiologic study of 3,614 youth aged 12-17 years. The 2005 NSA-R was designed to enable: (a) identification of the population prevalence of major life stressors and traumatic event experiences, such as physical assault, sexual assault, dating violence, and witnessed violence in the home, school, and community; (b) identification of the population prevalence of specific mental health disorders known to be associated with exposure to traumatic events;

and (c) examination of risk factors associated with violence exposure and mental health outcomes.

Participants

The full sample included a national household probability sample, as well as an oversample of urban-dwelling male and female adolescents. Recruitment of participants began after the study was approved by the Institutional Review Board of the Medical University of South Carolina. During recruitment, 6,694 households were contacted that resulted in both a completed parent interview and identification of at least one eligible adolescent. Of these, 1,268 (18.9%) parents refused adolescent participation. In 188 additional cases (2.8%), the parent consented, but the adolescent refused to be interviewed; and in another 119 (1.8%) cases, the adolescent interview was initiated but not completed. Finally, in 1,505 cases (22.5%), parent consent was given and a parent interview was completed but the identified eligible adolescent was unreachable or not available for interview at any of our contacts or callbacks to the family during the field period. The remaining 3,614 cases resulted in completed parent and adolescent interviews. This included 2,459 adolescents in the national cross section and an oversample of 1,155 urban-dwelling adolescents. To correct for oversampling, data were weighted to bring the sample in line with the adolescent U.S. population based on 2005 Census data.

Measures

Non-medical Use of Prescription Drugs (NMUPD)—To assess prescription drug use, adolescents were given the following information:

“Doctors sometimes prescribe medicine to calm people down or to help them to relax their muscles, to help people sleep, deal with pain, or lose weight. Besides the medical uses, people sometimes take these pills on their own or non-medically. By non-medically we mean from a source other than your own prescription, beyond the amount you were told to take, or some reason other than prescribed.”

Participants were then asked about lifetime non-medical use of various prescription drugs. These drugs included: tranquilizers (e.g., Valium, Librium, Xanax), sedatives (e.g., barbituates, Seconal, Qualuuds, Sonesta, Ambien, Halcion), stimulants (e.g., Ritalin, speed, Adderall, diet pills), and pain medicines (e.g., Percodan, Darvon, Codeine, Demerol, Morphine, Oxycontin). For each drug class, youth were asked, “Have you ever taken ‘on your own’ or non-medically (drug category) like (examples of medications in that category)?” Youth met criteria for lifetime NMUPD by endorsement of at least one instance of non-medical use of a prescription drug in their lifetime.

Mental Health—Lifetime PTSD was assessed using the PTSD module of the NSA survey ($\alpha=.88$), a structured diagnostic interview that assessed each *DSM-IV* symptom with a yes/no response (Kilpatrick, Resnick, Saunders, & Best, 1989). Research on this measure has provided support for concurrent validity and several forms of reliability (e.g., temporal stability, internal consistency, diagnostic reliability; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993; Ruggiero, Rheingold, Resnick, Kilpatrick, & Galea, 2006). The measure was validated against the PTSD module of the Structured Clinical Interview for the *DSM* (SCID) administered by mental health professionals (Kilpatrick et al., 1998). The inter-rater kappa coefficient was 0.85 for the diagnosis of PTSD, and comparisons between the NWS-PTSD module and SCID yielded a kappa coefficient of 0.77. Lifetime MDE was assessed using the Depression Module of the NSA survey ($\alpha=.82$), a structured interview that targets MDE criteria using a yes/no response format for each *DSM-IV* symptom. Psychometric data support the internal consistency and convergent validity of the Depression module (Kilpatrick, 2003; Boscarino, Galea, & Adams, 2004). The authors compared the depression

module against the depression scale of the Brief Symptom Inventory-18, yielding a sensitivity of 73% and specificity of 87% in detection of MDE as classified by our instrument. MDE identified by this measure is also associated with lower reported work quality and mental health treatment seeking after controlling key variables and assault history variables (Boscarino et al., 2004; Lewis et al., 2005). Delinquent behavior was considered present if youth endorsed at least one of the following behaviors in their lifetime: physically attacked someone, sold drugs, broken into a house, apartment, vehicle, etc. and tried to steal something, used force to get money or things from people, attacked someone with a weapon and/or with the intention of seriously injuring or killing someone, been arrested, or been sent to jail or juvenile detention.

Substance Use—Lifetime alcohol abuse/dependence was assessed separately via a series of inquiries about the frequency of use, age at onset, and presence and frequency of impairing or distressing experiences related to alcohol use, consistent with DSM-IV definitions of abuse/dependence (Kilpatrick et al., 2000). Research supports the construct validity of this measure (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997). Lifetime binge drinking was defined as endorsement of having ever consumed five or more alcoholic beverages in one (or a single) sitting. Lifetime drug use was defined as having ever used illicit (e.g., cocaine, heroin, marijuana) or club (e.g., ketamine, methamphetamine, ecstasy) drugs at least once.

Violence Exposure—Lifetime physical assault was defined as: (a) experiencing an attack with or without a weapon in which the participant was badly injured or beaten up; and/or (b) being threatened with a dangerous weapon (i.e., gun or knife) at least once in the youth's lifetime. Lifetime sexual assault was defined as: (a) forced anal, vaginal, and/or oral sex; (b) forced digital penetration and/or foreign object penetration; and/or (c) forced touching of genitalia at least once in the youth's lifetime. Lifetime witnessed violence was defined as including at least one incident of witnessed community violence (i.e., seeing violent attacks in real life) and/or witnessed parental violence (i.e. physical violence occurring between participants' parents) in the youth's lifetime.

Procedures

A highly structured telephone interview was designed to collect information across several domains, including demographic variables, traumatic event history, witnessed violence, and mental health history. Data collection procedures were similar to those used in the 1995 National Survey of Adolescents (Kilpatrick et al., 2000). Participants were selected using a multi-stage, stratified, random-digit dial procedure within each region of the country; the full sample included a national household probability sample as well as an oversample of urban-dwelling adolescents. The structured telephone interview took about 43 minutes to complete. The interview was administered in English by trained interviewers employed by Shulman, Ronca, and Bucuvalas, Inc., a survey research firm with significant experience managing survey studies. A computer-assisted telephone interview system aided this process by prompting interviewers with each question consecutively on a computer screen, and supervisors conducted random checks of data entry accuracy and interviewers' adherence to assessment procedures. Interviews began with parental consent and a brief parent interview consisting primarily of demographic questions, several of which were later corroborated by the adolescent. The majority of the interview was conducted with the adolescent. The data used in this study were obtained directly from the adolescent interview. The interview schedule is designed primarily with closed-ended questions requiring yes, no, or other one-word answers. Thus, if a respondent could be overheard within the residence, their answers were virtually content free. Parental consent and adolescent assent were obtained prior to interview.

Statistical Analyses

Logistic regression analyses were conducted to identify variables within each predictor set: demographics (age, ethnicity, gender, geographic area, family income), mental health (lifetime PTSD, lifetime MDE, lifetime delinquency), substance use (lifetime binge drinking, lifetime alcohol abuse, lifetime use of illicit/club drugs), and violence exposure (history of sexual assault, history of physical assault, history of witnessed violence) that were associated with NMUPD. Significant predictors emerging from these analyses were entered into a final multivariable logistic regression analysis statistically predicting non-medical use of prescription drugs. SUDAAN (version 10.0) was used for all regression analyses to account for complex survey design and sample weighting.

Results

Table 1 presents the sample characteristics and frequencies for all independent variables in the study for the full sample. Lifetime NMUPD in this sample was reported by 6.7% of participants ($n=242$), and Table 2 presents a breakdown of type of NMUPD. Of the adolescents who reported NMUPD, 6.8% were between the ages of 12 and 13, 33.9% were between the ages of 14 and 15, and 59.2% were between the ages of 16 and 17. The majority of NMUPD users were female (53.5%), and nearly half lived in an urban setting (49.9%). Family income among those endorsing NMUPD was over \$50,000 yearly for over half of participants (56.6%). In regard to mental health problems among those endorsing use, 24.8% met criteria for PTSD, 30.3% met criteria for MDE, and 58.4% had a history of delinquency. The most common potentially traumatic event category endorsed was witnessed violence (76.9%), followed by physical assault (41.9%), and 21.8% of participants had a history of sexual assault. Other forms of substance use were common among NMUPD users: 57.1% endorsed a history of binge drinking, 40.0% endorsed alcohol abuse, and 70.5% reported use of illicit or club drugs.

Demographics

As hypothesized, age was a significant predictor ($p < .001$). Compared to individuals ages 12-13 years, participants ages 14-15 year (Odds Ratio [OR] = 4.31, 95% confidence interval [CI] = 2.38-7.80), as well as 16-17 years (OR = 8.02, CI = 4.52-14.23), were more likely to misuse prescription drugs. Also consistent with hypotheses, racial/ethnic status was significantly associated with increased risk for NMUPD ($p = .01$); specifically, African American participants were at decreased risk of reporting NMUPD (OR=.44, CI=.26-.74) than Caucasian participants. Hispanic participants (OR=.60, CI=.34-1.06), or participants falling into the "other" racial/ethnic category (OR=.88, CI=.43-1.81) were at no greater risk for NMUPD than Caucasian participants. Gender, urban vs rural setting, and family income were not significant risk associates.

Mental Health

Within the mental health model, lifetime PTSD (OR=2.25, CI=1.39-3.63, $p < .001$), lifetime MDE (OR=2.38, CI=1.53-3.71, $p < .001$), and lifetime delinquency (OR=5.22, CI=3.85-7.07, $p < .001$) were all significant risk associates of prescription drug misuse.

Substance Abuse

All variables in the substance abuse model were associated with increased odds of ever having misused prescription drugs. Specifically, lifetime history of binge drinking (OR=2.23, CI=1.49-3.35, $p < .001$), lifetime alcohol abuse (OR=2.75, CI=1.82-4.15, $p < .001$), and lifetime use of illicit/club drugs (OR=8.67, CI=5.83-12.90, $p < .001$) were significantly associated with NMUPD.

Violence Exposure

Within the violence exposure model, history of sexual assault (OR=2.29, CI=1.54-3.41, $p<.001$), physical assault (OR=2.55, CI=1.85-3.52, $p<.001$), and history of witnessed violence (OR=3.76, CI=2.65-5.33, $p<.001$) were associated with NMUPD.

Final Model

All significant variables from the above-described models were entered into a final multivariable model (see Table 3). Racial/ethnic status remained a significant risk associate, with Hispanic participants being less likely than Caucasian participants to misuse prescription drugs. Among the mental health variables, lifetime PTSD and lifetime delinquency remained significant in the final model, whereas MDE was no longer significant. All substance use variables also remained significantly associated with increased risk of NMUPD (lifetime binge drinking, lifetime alcohol abuse, lifetime illicit/club drug use). Among the violence exposure variables, only history of witnessed violence remained significantly associated with increased odds of prescription drug misuse.

Discussion

Based on a nationally representative sample of adolescents 12-17 years, lifetime prevalence of prescription drug misuse (including tranquilizers, sedatives, stimulants, and pain medicines) was 6.7%. With an average of 1 in 14 adolescents in the US non-medically using prescription drugs, relative to the average of 1 in 100 adolescents who abuse nonprescription drugs, these data speak clearly to the need for prevention efforts in this area targeting youth populations (Wu, Riingwalt, Mannelli, & Paktar, 2008).

To our knowledge, this is the first study examining the role of traumatic event exposure and PTSD in relation to NMUPD. We had predicted that exposure to specific traumatic events would be related to lifetime NMUPD. However, the only traumatic event that ultimately remained a significant risk factor for NMUPD in the final model was witnessing violence, with teens reporting witnessing violence having twice the odds of also reporting lifetime NMUPD. Further investigation with the data revealed that a vast majority of teens reporting sexual assault (69%) and physical assault (75%) also reported witnessing violence. Both sexual assault and physical assault (phi correlations of 0.15 and 0.19, $p<.001$, respectively) were significantly correlated with NMUPD on the bivariate level, as well as within our initial predictor set model. However, when entered with witnessed violence into the logistic regression, witnessed violence emerged as the only *unique* predictor of NMUPD. Thus, it is our conclusion that witnessing violence potentially serves as a proxy variable for a more broadly adverse environment. For example, one reason that youth who reported witnessing violence were at increased risk for NMUPD may be that they may represent a subgroup of the adolescent population who are less likely to be monitored or supervised by caregivers. Youth who are more frequently exposed to community violence are those whose parents may be less likely to be supervising their behavior (Dahlberg, 1998). Similarly, youth exposed to parental violence may be living in homes where they are subject to less supervision and monitoring, either due to parents' distraction by conflict (e.g., domestic violence) or due to the adolescent's avoidance of such conflict by spending more time outside the home and increasing opportunities for observation of community violence. In turn, this limited parental supervision may also be linked with adolescents' increased access to and opportunities for substance use, including NMUPD. Although the current study is limited in that we did not directly assess caregiver monitoring and supervision, this hypothesis should be tested by future research.

In addition to witnessing violence, all other lifetime substance abuse variables (i.e., binge drinking, alcohol abuse, illicit drug/club drug use) were related to increased risk for NMUPD. This finding is not surprising, in that lifetime use of multiple substances is common among youth. This association may be, at least in part, due to logistical factors, such as an already substance-using adolescent knowing where and how to access prescription drugs (e.g., through peers), receiving less parental monitoring that increases opportunities for access, and decreased decision-making skills as a function of being under the influence of other substances. In addition, adolescents who binge drink, abuse alcohol, or use drugs may be seeking the same feeling (or lack thereof) in prescription medications that they receive from alcohol and illicit drugs. These findings speak not only to the need for prevention and treatment efforts targeting polydrug use, but also to the need for more mechanistic research to elucidate reasons for NMUPD among adolescents.

Delinquent behavior, which is a well known correlate of substance use (Neighbors, Kempton, & Forehand, 1992), also emerged as a strong predictor of NMUPD. In fact, adolescents who reported having engaged in at least one delinquent behavior were over five times more likely to misuse prescription drugs. This finding is consistent with Sung and colleagues (2005) who found that youth who engaged in opioid misuse were significantly more likely to report having ever sold illegal drugs (OR = 1.66). Underlying this link between NMUPD and delinquent behavior is the reality that youth misusing prescription drugs may be likely to acquire these drugs through delinquent acts—namely stealing. Prescription drugs may be more accessible than other types of illegal drugs (e.g., being stored in an unlocked medicine cabinets, purses left in public areas, etc.) — providing opportunities for youth to “take” the drugs relatively easily. Further, it has been suggested that other related forms of delinquent acts (i.e., pharmacy robberies, shoplifting incidents, and healthcare fraud) are consequences of misuse of addictive medications (NDIC, 2001; Sung et al., 2005). Additional research is warranted to better understand the temporal relation of delinquent behavior and NMUPD, which would help inform timing and primary focus of prevention efforts among this high risk population. In addition, these results offer additional evidence for inclusion of caregivers in prevention efforts, including increasing their awareness of NMUPD among adolescents and educating them about risk reduction strategies (e.g., keeping prescription drugs in the home locked up; utilizing contingency management strategies when discovering misuse).

Also consistent with our primary hypotheses, PTSD is associated with increased likelihood of lifetime NMUPD in adolescents. One potential explanation for this association between PTSD and NMUPD is that adolescents struggling with the distressing and debilitating symptoms of PTSD may be seeking relief in the form of prescription drugs. Such negative reinforcement models, where individuals are thought to use substances as a method of avoiding or reducing (trauma-related) negative affect (e.g., self-medicating hypothesis), have been proposed extensively in the literature and have some empirical support (Baker et al., 2004). Specifically, several studies have demonstrated a strong link between PTSD and drug and alcohol use in adolescent and adult samples. Kilpatrick and colleagues (2003) found that PTSD diagnostic status was associated with increased risk of marijuana and hard drug abuse or dependence in an epidemiological sample of adolescents (i.e., the 1995 NSA), with victimized youth beginning substance use at an earlier age than non-victimized youth. On a related note, adolescents struggling with PTSD symptoms may not be proactive in seeking mental health treatment or, as referenced previously in our discussion of witnessed violence, may live in adverse social environs and may not have ready access to mental health resources. Additionally, many adolescents who experience traumatic events do not disclose such experiences to parents or others, which may impede their ability to report trauma-related symptoms to caregivers that could facilitate mental health referrals (Hanson et al., 2003; Ruggiero et al., 2004). This and other barriers to appropriate treatment may

render youth vulnerable to seeking prescription drugs from others as an attempt to “self-medicate.”

Interestingly, depression was not associated with increased risk for NMUPD among this national sample of adolescents. This finding is somewhat contrary to results reported by Wu and colleagues, who found depression to be a significant predictor of prescription pain reliever abuse and dependence among adolescents (Wu et al., 2008). Given the differences in focus between the current study and the Wu et al. investigation (i.e., use of various forms of prescription misuse *vs* abuse/dependence specific to pain relievers, respectively), multiple possible explanations exist for the discrepancy in findings. First, the relation between misuse of prescription drugs and depression may be specific to pain relievers. Research indicates that the great majority of depressed patients report physical pain (e.g., stomachache, neck and back pain, headaches; Lepine & Briley, 2004). Thus, depressed adolescents may be susceptible to abuse or dependence on pain relievers that they perceive will minimize the discomforts of physical symptoms associated with depression. Second, the relation between misuse of prescription drugs and depression may only become salient once misuse crosses the threshold to abuse or dependence. Given the low base rate of pain reliever abuse and dependence reported in the Wu et al. study (i.e., 1% of approximately 37,000), it is possible that our sample (N=3,614) did not have enough adolescents with prescription drug abuse or dependence to allow for findings regarding their relations with depression.

A range of demographic variables were significantly related to lifetime NMUPD. The finding from the current study that Caucasian youth are at greater risk for NMUPD is consistent with previous literature (Poulin, 2001). However, this finding is not a result of higher socioeconomic status, as previously proposed, as higher family income did not serve as a significant risk factor in the current sample (Sung et al., 2005). A recent study reported in JAMA demonstrated that doctors are more likely to prescribe opioid blockers to white individuals *vs.* ethnic minority individuals in the emergency department (Plechter, Kertesz, Kohn, & Gonzales, 2008). Thus, our finding of increased risk among Caucasians may be due to greater access to family members' prescription drugs. Also, since peer behavior is a strong driving force in predicting substance use in this age group, prescription drugs may be more popular among social circles primarily constituted of white youth (Hussong, 2002).

The investigation on the increasingly prevalent problem of prescription medication misuse, which represents an important first step towards understanding abuse or dependence with these types of substances, has been identified as a growing public health concern (Blanco et al., 2007). Implications for prevention that extend from the current study are as follows: 1) Medical professionals should educate parents, who are prescribed, or who have children who are prescribed commonly misused drugs, on the dangers of non-medical use. This may be particularly relevant for Caucasian families, although psychoeducation would likely benefit families of all ethnic/racial backgrounds; 2) Youth who witness community and/or domestic violence are at increased risk for NMUPD. Community-level prevention efforts may be warranted in areas where levels of community violence are high. Police and other first-responders identifying youth in communities with high rates of violence also should be educated on appropriate resources and referrals specifically targeting risk reduction for NMUPD, as well as other forms of substance misuse; 3) Clinicians working with youth who present with PTSD should bolster positive coping skills and provide psychoeducation about the risks of NMUPD in tandem with efforts targeted at abuse of other substances; and 4) Adolescents identified as abusing alcohol and other illicit drugs, or those adjudicated for delinquent acts may particularly benefit from early interventions targeting prescription drug misuse. Finally, it is important to recognize the high degree of comorbidity of the predictors examined in this study; teens presenting with NMUPD are most likely to also present with a range of other presenting problems (including traumatic event exposure, PTSD, delinquent

behavior, and polysubstance use). As such, treatment protocols implemented among this population of youth should jointly focus on reduction of both current psychological distress as well as risk for future exposure to traumatic events.

The current study offers unique information regarding trauma-related risk factors for NMUPD among a nationally representative sample of adolescents. Nonetheless, limitations of this investigation should be noted. Potential recall biases may have impacted participants' reports, as the assessment was retrospective and based solely on self-report. In addition, the cross-sectional design of the investigation prohibited the study of the temporal relation between PTSD, specific traumatic event exposure, and NMUPD. The use of telephone interviews also serves as a potential limitation, as adolescents who resided in homes without telephones, institutionalized adolescents, and homeless adolescents were not able to be recruited into the study. However, it should be noted that relatively few adolescents constitute these excluded populations. Although our data are from a large, nationally representative sample, our non-response rate to interview was notable (approximately 46%), potentially limiting the generalizability of findings. Additionally, given the low base rates of several of our variables (e.g., PTSD, MDE), it was not possible to examine risk factors unique to misuse of each drug category (e.g., sedatives, pain relievers). On a similar note, given the phrasing of our assessment of non-medical use of prescription drugs, the current study cannot differentiate non-prescribed use from misuse of prescribed medication and did not specifically assess for non-medical use of antidepressants (which is not often considered a drug with high abuse potential). Future research should differentiate not only by type of prescription drug, but also by method of attainment. This study did not examine the relation between non-medical prescription drug abuse or dependence and PTSD. Finally, our lifetime prevalence of NMUPD is comparable to the past year prevalence reported recently by Wu and colleagues, who found pain medication misuse prevalence also to be approximately 7% in a large epidemiological sample of adolescents (Wu et al., 2008). Given that the current study assessed non-medical use of multiple forms of prescription drugs over the lifetime, and not just pain medication in the past year, we would have expected our prevalence estimate to be higher, and this discrepancy is likely due to the cost-prohibitive nature of conducting large epidemiologic studies that limited our measurement of NMUPD and did not allow us to assess for every medication by trade and generic name. However, given our current findings, future research should extend the literature in this direction.

Conclusions

The current study further highlights the need for primary and secondary prevention/treatment efforts to reduce violence-exposed youths' risk for subsequent misuse of substances. Specifically, given the elevated risk for NMUPD conferred by witnessing violence, meeting diagnostic criteria for PTSD, and abusing other substances, risk reduction efforts targeting NMUPD are warranted. Mental health providers working with adolescents who present with one or more of these issues should assess for NMUPD. Although there are may be many contributors to adolescents' non-medical use of prescription drugs, trauma-focused interventions for adolescents should include treatment or prevention modules that specifically address risk for NMUPD.

Key Points

- Building on previous research with adolescents that examined demographic variables and other forms of substance abuse in relation to NMUPD, the current study examined potentially traumatic events, depression, and posttraumatic stress disorder (PTSD) as potential correlates of lifetime non-medical use of prescription drugs.

- NMUPD was endorsed by 6.7% of the sample (n=242).
- Lifetime posttraumatic stress disorder (PTSD), other forms of substance use/abuse, lifetime history of delinquent behavior, and history of witnessed violence were significantly associated with increased likelihood of NMUPD.
- Risk reduction efforts targeting NMUPD among adolescents who have witnessed significant violence, endorsed PTSD, delinquent behavior and/or abuse other substances are warranted.
- Interventions for adolescents with history of violence exposure or PTSD should include treatment or prevention modules that specifically address NMUPD.

Acknowledgments

This research was supported by National Institute of Child Health and Human Development Grant 1R01 HD046830-01 (principal investigator: Dean G. Kilpatrick). Views in this article do not necessarily represent those of the agency supporting this research.

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Abbreviations

NMUPD	Non-medical use of prescription drugs
MDE	Major Depressive Episode
PTSD	Posttraumatic Stress Disorder
NSA-R	National Survey of Adolescents-Replication

Table 1
Frequencies for Independent Variables (N=3614)

Variable	N	%
Demographics		
Age		
12-13	1184	32.8
14-15	1219	33.8
16-17	1202	33.3
Race/Ethnicity		
Caucasian	2488	71.0
African American	464	13.2
Hispanic	373	10.7
Other	179	5.1
Gender		
Male	1851	51.2
Female	1763	48.8
Living in Urban Area		
No	1586	44.5
Yes	1981	55.5
Family Income		
<\$20,000	414	12.8
\$20,000-50,000	1047	32.4
>50,000	1767	54.7
Mental Health		
Lifetime PTSD		
No	3345	93.0
Yes	250	7.0
Lifetime MDE		
No	3255	90.1
Yes	359	9.9
Lifetime Delinquency		
No	2863	79.2
Yes	751	20.8
Substance Abuse		
Lifetime Binge Drinking		
No	3127	86.5
Yes	487	13.5
Lifetime Alcohol Abuse		
No	3354	93.0
Yes	252	7.0
Lifetime Illicit/Club Drug Use		
No	3060	84.7

Variable	N	%
Yes	555	15.3
Violence Exposure		
History of Sexual Assault		
No	3304	92.5
Yes	269	7.5
History of Physical Assault		
No	3045	84.3
Yes	567	15.7
History of Witnessed Violence		
No	2129	58.9
Yes	1485	41.1

Table 2
Frequencies for lifetime non-medical use of prescription drugs (N=3,614 adolescents)

Variable	N	%	population estimates *
Any Non-medical Use **			
Yes	242	6.7%	787,490
Tranquilizers			
Yes	79	2.2%	258,579
Sedatives			
Yes	67	1.9%	223,317
Stimulants			
Yes	96	2.7%	317,357
Pain Relievers			
Yes	130	3.6%	423,129
Steroids			
Yes	7	0.2%	23,507

* population estimates based on 2000 U.S. Census estimates

** Individuals could report non-medical use of multiple categories of drugs. Therefore, categories do not sum to equal “any non-medical use” total.

Table 3
Final Model: Non-Medical Use of Prescription Drugs

Predictor	OR	95% CI	p-value
Age			
12-13	1.00	-	.06
14-15	2.15	1.10-4.20	
16-17	2.19	1.13-4.27	
Race/Ethnicity			
Caucasian	1.00	-	<.01
African American	.48	.25-.92	
Hispanic	.36	.19-.69	
Other	.56	.27-1.20	
Lifetime PTSD			
No	1.00	-	.04
Yes	1.79	1.02-3.14	
Lifetime MDE			
No	1.00	-	.13
Yes	1.46	.89-2.38	
Lifetime Delinquency			
No	1.00	-	<.01
Yes	1.88	1.28-2.76	
Lifetime Binge Drinking			
No	1.00	-	.03
Yes	1.62	1.04-2.52	
Lifetime Alcohol Abuse			
No	1.00	-	<.001
Yes	2.40	1.56-3.68	
Lifetime Illicit/Club Drug Use			
No	1.00	-	<.001
Yes	5.24	3.52-7.80	
History of Sexual Assault			
No	1.00	-	.33
Yes	1.28	.78-2.09	
History of Physical Assault			
No	1.00	-	.62
Yes	1.11	.74-1.67	
History of Witnessed Violence			
No	1.00	-	<.001
Yes	1.99	1.33-2.99	