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# Opioid abuse and depression in adolescents: Results from the National Survey on Drug Use and Health

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ABSTRACT

*Objective:* To investigate the association of major depressive episode (MDE) with nonmedical prescription opioid use (NMPOU) and opioid abuse/dependence among adolescents aged 12 to 17.
*Methods:* We analyzed 5 years of data from the National Survey on Drug Use and Health (NSDUH). We used logistic regressions to study the relationship between MDE and NMPOU among all adolescents, as well as the relationship of MDE with opioid abuse/dependence among adolescents with NMPOU. Other covariates included: sociodemographics, alcohol abuse/dependence, nonopioid drug abuse/dependence, delinquency, school performance, religious services attendance, and family support/supervision.
*Results:* In the sample of all adolescents, 6% reported past year NMPOU, and 8% reported past year MDE. When NMPOU and MDE were comorbid, MDE usually preceded the NMPOU. In the sample of adolescents with NMPOU, 15% reported past year opioid abuse/dependence, and 20% reported past year MDE. In adjusted logistic regression, MDE was associated with both NMPOU (OR = 1.51, $p < 0.001$) among all adolescents and opioid abuse/dependence (OR = 2.18, $p < 0.001$) among adolescents with NMPOU.
*Conclusion:* MDE occurs commonly in adolescents and is associated with NMPOU and opioid abuse/dependence. In terms of population attributable risk, which is a function of both the prevalence and the strength of the association, MDE is an important risk factor for NMPOU among adolescents and opioid abuse/dependence among adolescents with NMPOU. Preventive and clinical programs to decrease NMPOU and opioid abuse/dependence among adolescents should consider the prominent role of depression.



## 1. Introduction

Prescription opioid misuse and abuse is a significant public health concern (Executive Office of the President of the United States, 2011). Further, opioids are the most common cause of accidental drug overdose in the United States (Compton and Volkow, 2006; Executive Office of the President of the United States, 2011; Paulozzi et al., 2006; Paulozzi and Xi, 2008), constituting an epidemic per the Centers for Disease Control and Prevention (2011). Adolescents are not immune from these problems (Banta-Green, 2012). Between 1999 and 2006, the annual death rate for fatal overdoses of opioids for individuals aged 15 to 24 rose 440%, from 0.7 per 100,000 to 3.8 per 100,000 (Warner et al., 2009), and adolescents are the age group in which the opioid overdose death rate increased most rapidly. According to data from the 2011 Monitoring the Future survey, 8.7% of 12th graders reported past year illicit use of prescription opioids, especially Vicodin, Percocet, and OxyContin (Johnston et al., 2012). Among adolescents, the National Survey on Drug Use and Health indicates that misuse of opioids is second only to misuse of marijuana in prevalence, and the number of past year initiates of opioid misuse is second only to the number who initiated marijuana use (Substance Abuse and Mental Health Services Administration, 2012c).

Research from adults suggests the importance of depression as a risk factor for opioid abuse and dependence (Edlund et al., 2010, 2007; Schepis and Hakes, 2011). In terms of population-attributable

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risk, which is a function of both the strength of the relationship and the frequency of the risk factor, depression may be the most important risk factor for opioid abuse/dependence in adults. The self-medication hypothesis is one prominent explanation for the empirically observed high rates of co-occurring depression and substance abuse, such as with opioids (Khantzian, 1997). This theory posits that individuals use psychoactive substances such as opioids to "self-medicate" painful or disturbing psychological symptoms.

Much of the research on opioid abuse/dependence and depression among adolescents is from the National Survey on Drug Use and Health (NSDUH). NSDUH is conducted annually, with approximately 20,000 adolescents aged 12 to 17, is nationally representative, and contains measures of opioid abuse/dependence (American Psychiatric Association, 2000) and nonmedical prescription opioid use (NMPOU), a less severe form of opioid misuse. It also contains a measure of DSM-IV major depressive episode (MDE; American Psychiatric Association, 2000). According to 2012 NSDUH data, 13% of adolescents with MDE reported NMPOU in the past year versus 6% of those without MDE (SAMHSA, 2012d). In an analysis of misuse of any prescription medication (not just opioids) among adolescents using 2008 NSDUH data, major depression was associated with misuse of prescription drugs (OR = 2.60; Havens et al., 2011), but the relationship for NMPOU was not investigated. Wu and colleagues found that there was generally, but not always, an association between depression and opioid abuse/dependence in adolescents (Wu et al., 2008b). Schepis and Krishnan-Sarin (2008), using data on adolescents from the 2008 NSDUH, found MDE to be associated with NMPOU in unadjusted models but did not report data on the relationship for adjusted models. In Vaughn's latent class analysis of adolescents with NMPOU, lifetime depression was not significantly associated with the latent class of nonmedical opioid use (Vaughn et al., 2012).

This study builds upon past work by using NSDUH data to investigate three key issues not previously addressed in the literature. First, among adolescents with both NMPOU and MDE, we investigated the frequency with which the onset of NMPOU precedes the onset of MDE, and the frequency with which the onset of MDE precedes the onset of NMPOU. Although not definitive, temporal progression can give insight into causality. Consistent with the self-medication hypothesis (Khantzian, 1997), we hypothesized that MDE preceding NMPOU would be more common than NMPOU preceding MDE. Second, we used logistic regression to study the determinants of NMPOU among all adolescents and to study the determinants of opioid abuse/dependence among adolescents with NMPOU. These steps represent the development of abuse/dependence—going from no use to NMPOU (experimentation and recreational use) and, among those with NMPOU, from NMPOU to abuse/dependence (addiction). As an extension of the self-medication hypothesis, we posited that the effects of depression would be stronger for the second step than for the first. That is, some adolescents with depression and NMPOU find that opioids help their depression (at least temporarily) and increase their opioid use, progressing to addiction. Finally, we investigated possible moderators of the relationship of MDE with NMPOU and opioid abuse/dependence. We posited that among depressed adolescents, there are "buffering factors" that decrease the magnitude of the association of the relationship of MDE with NMPOU and opioid abuse/dependence. In particular, we hypothesized that the magnitude of the association of MDE with NMPOU and opioid abuse/dependence would be smaller among adolescents with greater parental support, compared with those with less parental support and smaller among those who attend church more frequently, compared with those who attend church less frequently.

## 2. Methods

### 2.1. Sample

We used cross-sectional data from NSDUH, which the Substance Abuse and Mental Health Services Administration (SAMHSA) conducts annually and is the primary source of information on illicit drug, alcohol, and tobacco use in the United States. Consistent with SAMHSA policy, all sample sizes in the following text and tables have been rounded to the nearest hundred to protect confidentially of respondents.

To increase the statistical power, we combined 2008–2012 NSDUH data. We investigated factors associated with NMPOU in the sample of all adolescents aged 12–17 ($n$ = 112,600), and factors associated with opioid abuse/dependence among adolescents aged 12–17 with past year NMPOU ($n$ = 7100). In the total sample, approximately 11,650 had missing data for one of the independent variables. Therefore, three independent variables (past year MDE, number of religious services attended in the past year, grades in last semester or grading period completed) were imputed using weighted sequential hot-deck imputation (Cox, 1980) with imputation classes based on age, race, and gender.

After the study was described to participants, informed consent was obtained verbally from parents or guardians, and assent was obtained verbally from the adolescents. Written consent was not obtained because the names of respondents are not used in the screening and interview process. The study was approved by the RTI International IRB. Detailed information on the survey methodology is available in Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings (SAMHSA, 2014).

### 2.2. Measures

*Dependent variables:* The two outcomes of interest were (1) past year NMPOU and (2) past year opioid abuse/dependence. These represent differing severity of misuse, with NMPOU including individuals with any misuse, and abuse/dependence representing those meeting formal criteria from DSM-IV (American Psychiatric Association, 2000). NMPOU was defined by answers to the following question: "Have you ever, even once, taken (names of prescription opioids) that was not prescribed for you or that you took only for the experience or feeling it caused?" Those answering affirmatively were coded as having NMPOU. Any past year opioid abuse/dependence was defined using standard DSM-IV criteria. Adolescents were also asked about age of first use and most recent use (past 30 days, past year, lifetime), from which the age of onset of NMPOU and past year NMPOU and opioid abuse/dependence were constructed.

*Independent variables:* We identified a set of correlates of NMPOU and opioid abuse/dependence based on results from the literature (Havens et al., 2011; McCabe et al., 2012; Nargiso et al., 2015; Schepis and Krishnan-Sarin, 2008; SAMHSA, 2012b; Wu et al., 2008a; Young et al., 2012). Our independent variables comprised three domains: (1) diagnostic variables; (2) sociodemographic characteristics; (3) and other risk/protective factors.

*Diagnostic variables:* In NSDUH, MDE for adolescents was assessed using a questionnaire based on the depression module in the National Comorbidity Survey—Adolescents (NCS-A, 2010; SAMHSA, 2012a). Alcohol use disorder was defined as meeting criteria for alcohol abuse or alcohol dependence in the past 12 months according to criteria specified in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 2000). We also constructed a variable describing past 12-month nonopioid drug abuse or dependence. Again, this was based on DSM-IV TR criteria, and included