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Characterizing adolescent prescription misusers: a population-based study

Ty S. Schepis, Ph.D. and **Suchitra Krishnan-Sarin, Ph.D.**
Department of Psychiatry, Yale University School of Medicine

Abstract

Objective—To examine the risk factors associated with adolescent (ages 12–17) misuse of opioids, stimulants, tranquilizers and sedatives using a nationally representative sample. The characteristics associated with symptoms of abuse and/or dependence related to prescription medication misuse among adolescents were also analyzed.

Method—These questions were addressed using the 2005 National Survey on Drug Use and Health. Screening and full interview response rates were 91% and 76%, respectively, and data from 18,678 adolescents were used. Regression analyses, using population-based weights, were performed to identify characteristics associated with past year misuse of prescription medications and the presence of past year abuse or dependence symptoms related to misuse.

Results—Among adolescents, 8.2% misused a medication and 3.0% endorsed symptoms of a substance use disorder related to prescription medication misuse in the past year. The predictors of misuse from multivariate analyses were poorer academic performance (OR=2.9, 95% confidence interval [CI]=2.37–3.52), past year Major Depression (OR=3.1, 95%CI=2.62–3.74), higher risk-taking levels (OR=3.6, 95%CI=3.13–4.20), past year use of alcohol (OR=7.3, 95%CI=6.19–8.59), cigarettes (OR=8.6, 95%CI=7.43–9.91), marijuana (OR=9.9, 95%CI=8.53–11.44) or past year use of cocaine or an inhalant (OR=10.7, 95%CI=8.98–12.72). Past year Major Depression (OR=1.5, 95%CI=1.03–2.25), past year cocaine or inhalant use (OR=1.7, 95%CI=1.21–2.41) or ten or more episodes of past year prescription misuse (OR=3.0, 95%CI=2.13–4.17) was associated with having symptoms of abuse of or dependence among adolescent prescription medication misusers.

Conclusions—These risk factors could help clinicians identify those at risk for significant problems due to prescription misuse, allowing for prevention or early treatment in this population.

Keywords

Adolescents; Risk Factors; Prescription Medications; Misuse

Introduction

Recent reports have noted increases in the misuse (also termed illicit use, abuse or non-medical use) of prescription medications by adolescents in the United States.[1–4] Commonly misused prescription medications include opioids (which are used for the treatment of pain and include hydrocodone and oxycodone), stimulants (which include medications indicated for the treatment of ADHD, such as methylphenidate or amphetamine), tranquilizers (which include the benzodiazepines and other minor tranquilizers such as meprobamate or

Please address correspondence to Suchitra Krishnan-Sarin, Ph.D., Yale University School of Medicine, Department of Psychiatry, CHMC, S 208, 34 Park Street, New Haven, CT 06519. Address e-mail correspondence to suchitra.krishnan-sarin@yale.edu. Phone: 203-974-7595, Fax: 203-974-7606..

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carisoprodol) and sedatives (which include the barbiturates and chloral hydrate). All of these medications have important medical uses when taken properly. Misuse, however, carries notable risks. These include the potential for physical or psychological dependence and overdose.

Currently, only past month use of alcohol, tobacco or marijuana exceeds the rate of prescription misuse in adolescents.[5] Rates of prescription misuse vary both by the class of medications and the timeframe examined, but it appears that as many as 20% of adolescents have misused a prescription medication.[6] Rates of prescription misuse appear to be highest for the opioids, which are followed by the tranquilizers, stimulants and sedatives,[6–9] but this has not been adequately evaluated. Also, there is some evidence that adolescents are at greater risk for prescription medication misuse than adults over 25 years of age and at roughly equal risk to young adults between the ages of 18 and 25.[10] In turn, earlier misuse of prescription medications increases the risk for the later development of abuse of or dependence on a prescription medication, with a 5% drop in risk for each year misuse is delayed.[11]

While some studies have examined the risk and protective factors associated with adolescent prescription medication misuse, nearly all have concentrated on only stimulants or opioids. One of the initial investigations into stimulant misuse was conducted by Poulin,[12] using data from a 1998 survey of over 13,000 adolescent students in the Atlantic provinces of Canada. This study found that misuse was associated with past use of alcohol, cigarettes and marijuana, but that gender was not a risk factor; furthermore, misuse of stimulants was more likely in those who either gave away or sold their stimulant medications.[12] Poulin[13] later replicated the finding that addictive substance use served as a risk for stimulant misuse in a 2002 survey study of 12,990 adolescents in the Atlantic provinces of Canada. This investigation also expanded the previous findings by indicating that having depressive symptoms, having a likely ADHD diagnosis or being in a classroom where at least one student gave or sold stimulants increased the risk of stimulant misuse. Finally, males were at increased risk for stimulant misuse in this study, which was not found in the earlier investigation.[12, 13] Two studies of US adolescents by McCabe and colleagues[8, 14] found that poorer grades, increasing age and the use of cigarettes, cigars, alcohol, ecstasy or marijuana were risk factors for prescription stimulant misuse. Both studies also indicated that African-American race was protective.[8, 14] Herman-Stahl and collaborators[15] used a nationally representative sample of adolescents to investigate the risks for stimulant misuse and replicated many of the above results. This study also found that a tendency towards risk-taking, high conflict with parents and past mental health treatment were risk factors as well, with Hispanic adolescents protected from misuse.[15] In all, the literature appears to indicate that stimulant misuse is associated with increasing age, lower grade point average, and engagement in other risky behaviors, including addictive substance use.[8, 12–15] The role of gender appears to be less clear, with one study,[13] but no others, indicating that male gender was a risk factor for stimulant misuse.

Similar results have been found for the misuse of opioid medications. McCabe and collaborators,[16] using a nationally representative US sample, found that males, those with poorer grades, and Caucasian adolescents were at an elevated risk of ever using some opioid analgesics. Also, this investigation indicated that use of cigarettes, alcohol, marijuana, cocaine and other addictive prescription medications, as well as a number of high-risk behaviors, raised the risk for opioid misuse.[16] Sung and colleagues[7] also used a nationally representative sample to examine opioid misuse among US adolescents and found, in a multivariate model, that misuse was associated with misuse of other prescription medications and illicit drugs. Gender was not a risk factor.[7] A more recent investigation by Boyd and colleagues[17] replicated previous findings that other addictive substance use served

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as a risk factor and found that increasing age was a factor. Unlike the findings of McCabe and collaborators,[16] female gender was a greater risk for opioid misuse in this study.[17] Thus, misuse of opioid medications appears to be associated with increasing age, poorer academic achievement, being Caucasian, engagement in other high-risk behaviors, and use of other addictive substances, including prescription medications.[7, 16, 17] Again, it is unclear whether males or females are at greater risk for opioid misuse, with conflicting findings in the literature.[7, 16, 17]

Finally, a study by McCabe and collaborators[6] examined the risk and protective factors for lifetime misuse of opioids, stimulants, tranquilizers or sedatives among a sample of 1086 urban US secondary school students from the Detroit, Michigan area. Misusers of any medication were more likely to have used other addictive substances.[6] Also, females were more likely than males to have misused opioids, Caucasian adolescents were more likely to have misused tranquilizers than African-American adolescents, and increasing age was a risk factor for the misuse of either opioids or tranquilizers.[6]

So, while many risk factors have been identified for the misuse by adolescents of opioid or stimulant medication, many issues remain unresolved. First, there is conflicting evidence about the role of gender in prescription misuse. Second, no investigation has used a nationally representative sample to examine the risk factors associated with the misuse of tranquilizers or sedatives. Third, no studies have used a nationally representative sample to examine misuse across all four classes of commonly misused medications in a single sample, which would allow for comparisons of risk factors between substances. Finally, there is a general lack of knowledge about the risk factors for the development of abuse or dependence on prescription medications among adolescents who use the medications. This investigation attempted to fill these gaps in the literature.

To the best of our knowledge, this is the first investigation to examine nationally representative US data on adolescent prescription medication misuse across the four classes of commonly abused medications. Most significantly, this investigation extends the literature by examining the risk and protective factors associated with the presence or absence of one or more DSM-IV[18] defined symptoms of a substance use disorder from prescription misuse. Symptoms of a substance use disorder from prescription misuse were chosen, as opposed to full diagnoses of abuse or dependence, because a greater percentage of misusers would have one or more symptoms of a substance use disorder from prescription misuse than have the full diagnosis. Furthermore, such a criterion should capture all adolescents who have begun to experience notable consequences from prescription misuse, and identification of these adolescents can allow for early intervention to prevent the development and/or entrenchment of abuse of or dependence on a prescription medication.

Methods

Data were obtained from the 2005 public use file of the National Survey on Drug Use and Health (NSDUH), which is a yearly in-home survey of the non-institutionalized US population. This survey has provided data for analyses of adolescent stimulant misuse,[15] adolescent opioid misuse,[7] adolescent inhalant use,[19] and the development of adolescent cannabis or alcohol use disorders.[20] Over 68,000 individuals were surveyed for the NSUDH, with 55,905 included in the public use file after individuals were excluded for confidentiality reasons. Of those, 18,678 were adolescents between 12 and 17 years of age, inclusive. The 2005 NSDUH was designed to oversample adolescents, young adults, African-Americans and people of Hispanic ethnicity, and it used an independent, multistage area probability sample for all states and the District of Columbia. Households were selected for screening, and an in-person screening to identify individuals aged 12 and older was

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conducted. Following identification of eligible households, full interviews were conducted on a random sample. Interviews for the NSDUH were conducted throughout the course of the 2005 calendar year, and all interviews occurred in the homes of respondents. The 2005 survey combined both interviewer-assisted computer survey methods and self-interview using audio computer-assisted methods. Full interviews started with the field interviewer setting up the computer for participant use, which was followed by the use of self-interview using audio computer-assisted methods to assess substance use and other psychosocial variables. During the self-interview using audio computer-assisted portion of the survey, the participant wore headphones to hear all questions and the field interviewer remained out of view of the computer screen; these procedures were employed to preserve the privacy of respondents and to increase the probability of honest responding to sensitive questions. Once all audio computer-assisted self-interview questions were asked, the field interviewer returned to conduct the interviewer-assisted computer survey questions on demographic variables.[21, 22]

All measures of illicit drug use, prescription medication misuse, symptoms of a substance use disorder from prescription misuse, mental health treatment and propensity towards risk-taking behavior were asked in the self-interview format using audio computer-assisted methods.[22] Age, race or ethnicity, gender, household composition, grades in school and recent household moves were assessed using the interviewer-assisted computer survey method.[22] The 2005 NSDUH included automatic skip-outs and questions that served as consistency checks based on previous participant answers; both were meant to increase full responding and the consistency of data. In cases where data were still inconsistent or missing, statistical imputation procedures were implemented to reduce missing data. The NSDUH is normed to the 2000 census and includes a participant payment of $30. Screening and full interview response rates for the 2005 NSDUH were 91% and 76%, respectively. Data were weighted to create unbiased population-based estimates for assessed behaviors.[21] For more information on the sampling procedures, methodology and questions used to assess behaviors, please see[21, 22].

As noted by Compton and Volkow,[2] integration of the extant research on prescription medication misuse is limited by a lack of common definitions. In line with their call for explicit definitions of terms used to describe non-medical use of prescription medications, we will define misuse as: “as any intentional use of a medication with intoxicating properties outside of a physician's prescription for a bona fide medical condition, excluding accidental misuse.” (p. S4).[2] We have chosen this definition of misuse, in part, because of its correspondence to the concept evaluated by the NSDUH.[21] Additionally, full diagnoses of abuse or dependence correspond to the definitions of substance abuse and dependence as given in the DSM-IV.[18] Throughout the majority of this manuscript, however, the outcome variable of interest will not be the presence or absence of a full substance use *disorder diagnosis* from prescription misuse; instead it will be the presence or absence of one or more *symptoms* of abuse of or dependence on a prescription medication, with these symptoms coming from the diagnoses of substance abuse or dependence in the DSM-IV.[18] Such symptoms of substance abuse or dependence from prescription misuse denote symptoms due only to prescription misuse and not due to the use of any other psychoactive substances. For clarity, which we will use the phrase “symptoms of a substance use disorder from prescription misuse” throughout the manuscript to describe this outcome variable.

Measures

Participant misuse of prescription medications was obtained by inquiring about non-medical use of medications from a specified list for each drug class. In order to aid participants' recall, cards with pictures of the medications were provided while participants answered questions about use of the four classes of prescription medications.[23] Participants who

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endorsed use within a class answered further questions about their misuse, including time since last use. For the purposes of this analysis, past year misuse of medications within each drug class was used. In addition, a variable was created to capture past year misuse of any of the prescription medications of interest, regardless of class. The NSUDH also inquired about substance abuse and dependence criteria for each prescription class, using questions based directly on the DSM-IV criteria for abuse and dependence.[18, 23] This information was used to create a variable coding for the presence or absence of any past year substance abuse or dependence symptoms related to the use of any of the four studied classes of prescription medication. Given the concordance to the DSM-IV criteria (and other measures assessing DSM-IV criteria, including the Structured Clinical Interview for DSM-IV Axis I Disorders[24]), questions assessing abuse or dependence due to prescription medication use are expected to have good reliability and validity.[25, 26]

Predictor variables of interest included: race, gender, age, having moved in the past year, presence of mother or father in the adolescent's household, average grades from the previous grading period, past confinement in jail or juvenile detention (JD), enjoyment of risk taking, past year mental health treatment, a past year Major Depressive Episode (MDE), past year use of alcohol, cigarettes, marijuana, inhalants or cocaine. Prevalence of a past year MDE was estimated using questions directly based on the DSM-IV criteria for this disorder.[18, 23] Again, this was expected to result in good reliability and validity for the measurement of past year MDE.[25, 26] These variables were chosen as predictors based on literature indicating a relationship between these variables and prescription medication use,[7, 15, 16] or because of evidence that they relate to the development of substance use disorders in adolescents.[27, 28]

Based on examination of past year misuse rates, age was dichotomized as under 15 years of age or 15 years and older. Past term grades were dichotomized into those whose average was a C or greater and those whose average was a D or F. Participants were coded as enjoying risk-taking if they answered “often” (as opposed to “sometimes”, “seldom” or “never”) to the question “How often do you get a real kick out of doing things that are a little dangerous?” Also, past year MDE was assessed through the use of structured questions to establish DSM-IV diagnosis. Finally, for the regression evaluating differences between adolescents with only past year prescription misuse and those with past year symptoms of abuse of or dependence on a prescription, number of times the adolescent misused any prescription was used as a predictor; this variable was dichotomized into less than 10 misuse events and 10 or more misuse episodes.

Data Analysis

Analysis initially employed univariate logistic regression analysis to find significant correlates of prescription medication misuse and the presence of symptoms of a substance use disorder from prescription misuse over previous year. Unadjusted odds ratios and 95% confidence intervals were then calculated. Finally, multivariate logistic regression was employed to identify the most robust risk and protective factors for past year prescription medication misuse or the presence of symptoms of a substance use disorder from prescription misuse among either the entire adolescent sample (Table 3) or only the portion of the adolescent sample that had misused a prescription in the past year (Table 4). Independent variables were entered in a block, with the significance value set a p level of .05 or below. All analyses used the population-based weights in order to control for the effects of sampling bias. All analyses were conducted in SAS version 9.0 (Cary, NC).

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Results

An estimated 2,081,322 (8.2%) adolescents misused at least one prescription medication over the preceding year. For symptoms of a substance use disorder from prescription misuse, an estimated 748,666 (3.0%) adolescents exhibited one or more DSM-IV symptoms in the past year; this is 36.0% of past year misusers. The most commonly endorsed symptoms were tolerance (1.84% of whole sample), spending a great deal of time obtaining, using or recovering from the effects of the substance (1.29% of entire sample), and withdrawal (0.75% of the sample). Finally, an estimated 161,708 (0.6%) adolescents met the DSM-IV criteria for a full diagnosis of substance abuse, and 201,082 (0.8%) met criteria for a full diagnosis of substance dependence from prescription medication misuse. Combined, this is 17.4% of all adolescents who had misused a prescription medication in the past year. Of those who met the full DSM-IV criteria for substance abuse or dependence, 63.5% met criteria solely due to opioid misuse; of the remaining individuals, 21.5% met the full substance abuse or dependence criteria for more than one prescription, 6.5% solely due to tranquilizer misuse, 6.4% solely due to stimulant misuse and 2.1% met the full criteria for either substance abuse or dependence solely due to sedative misuse. These data, stratified by prescription class, are provided in Table 1. Data about alcohol, marijuana and inhalant use, use disorder symptoms, full diagnosis of substance abuse and full diagnosis of substance dependence are also provided in this table for the purpose of comparison.

Univariate Regression Analyses (Prescription Misuse Only)

Nearly all variables examined as potential correlates of any prescription medication misuse were significant at a $p < .05$ level. The calculated odds ratios for these correlates ranged from 1.25 (female gender) to 10.69 (past year use of cocaine and/or inhalants; see Table 2). Sociodemographic factors generally were associated with the lowest elevations of risk, with the exceptions of being 15 years or older (OR = 2.95) or having average grades of a D or worse (OR = 2.89). Asian and African-American adolescents were protected from misuse, when compared to Caucasian adolescents. Mental health variables, risk-taking and delinquency were associated with odds ratios between 2.11 (past year mental health treatment) and 3.62 (higher propensity towards risk-taking), which were generally greater than sociodemographic but less than drug use factors. Past year use of cigarettes, alcohol, marijuana or cocaine and/or inhalants was associated with the greatest risk for prescription misuse, with odds ratios all in excess of 7. This pattern tended to hold across individual medications. For the stimulants, tranquilizers and sedatives, the absence of the adolescent's mother from the home was not a significant predictor; the same was true for absence of the adolescent's father. Also, gender was not significantly related to sedative misuse, and having moved in the past year was not associated with stimulant misuse. These odds ratios are listed in Table 2, with notations for variables significant at a $p \leq .05$ level and a $p \leq .001$ level. The $p \leq .001$ level was included because the multiple comparisons and large data sample would tend to result in a greater likelihood of Type I error.

Multivariate Regression Models for Misuse and Symptoms of a Substance Use Disorder from Prescription Misuse

Significant univariate predictors were entered in a multiple regression model to attempt to identify the most robust predictors for prescription misuse across classes or symptoms of a substance use disorder from prescription misuse. For past year misuse of any medication, the significant predictors were being 15 years of age or older, poor academic performance, a past year MDE, past year mental health treatment, risk-taking preference, and all four substance-related variables (past year use or cigarettes, alcohol, marijuana or cocaine or inhalants). A nearly identical profile of risk factors appears to predispose adolescents to having symptoms of a substance use disorder from prescription misuse, with one difference

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from the multivariate regression for past year misuse: being over the age of 14 was significant associated only at a trend level. These regressions are captured in Table 3.

Correlates of DSM-IV Symptoms of a Substance Use Disorder from Prescription Misuse among Past Year Prescription Misusers

Among the adolescents with one or more symptoms of a substance use disorder from prescription misuse, 18.9% also met the criteria for alcohol abuse and 19.4% met the criteria for alcohol dependence (38.3% met for either), 10.6% met the criteria for cannabis abuse and 22.7% met the criteria for cannabis dependence (33.3% met for either). These numbers are greater than those of all adolescents: only 5.6% were estimated to meet the criteria for either alcohol abuse or dependence, and only 3.5% were estimated to meet the criteria for either cannabis abuse or dependence.

In order to evaluate what factors are important for the development of symptoms of a substance use disorder from prescription misuse, a multivariate regression was performed among only those adolescent who misused a medication in the past year comparing those with symptoms of a substance use disorder from prescription misuse to those without symptoms of a substance use disorder from prescription misuse. Only three variables were significant in this regression: having a past year MDE, past year cocaine or inhalant use or having misused a prescription 10 or more times in the past year. Having 10 or more instances of misuse was the most robust predictor in this model, with an odds ratio of nearly 3 (OR = 2.98); having a past year MDE and having used cocaine or inhalants in the past year were each associated with an odds ratio below 2 (MDE OR = 1.52, cocaine or inhalant use OR = 1.71). This regression is captured in Table 4.

Discussion

This study investigated risk factors associated with adolescent misuse of prescription medications and the presence of one or more symptoms of a substance use disorder from prescription misuse. These findings are the first to report on tranquilizer and sedative misuse in an adolescent population, and are the first to describe adolescents who have developed symptoms of a substance use disorder from prescription misuse. In all, poorer academic performance, enjoyment of risk-taking, a past year MDE, and use of cigarettes, alcohol, marijuana, and cocaine and/or inhalants were associated with both prescription misuse and having one or more symptoms of a substance use disorder from prescription misuse. As such, these results indicate that the risk factors are similar for either prescription medication misuse (across the four medication classes) or for the presence of one or more symptoms of a substance use disorder from prescription misuse. Thus, it does not appear that one risk factor necessarily indicated a predisposition for misuse of a specific prescription medication or that one risk factor signaled an increased risk for the development of symptoms of a substance use disorder from prescription misuse. Instead, these risk factors appear to co-occur with prescription misuse and symptoms of a substance use disorder from prescription misuse in a more general fashion.

Furthermore, many of the risk factors for prescription medication misuse identified here function in a similar fashion for the use of other licit and illicit drugs by adolescents. Risk-taking,[29] poor academic performance,[30] depressive symptoms[28] and other substance use[31, 32] regularly co-occur with the use of marijuana, alcohol and tobacco in adolescents. It is notable that previous confinement in jail or juvenile detention (JD) was not a risk factor for prescription misuse in the multivariate analysis, despite being significantly associated with misuse across all classes of prescriptions in the univariate analysis (with odds ratios equal to or greater than 2). This is particularly striking given the very high rates of alcohol or other substance use disorders among those adolescents currently in juvenile detention.[33]

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Perhaps other factors mediated the lack of association, including family income,[34] a lack of prescription availability, or the greater availability of other addictive substances. A likely candidate for mediation is a greater risk-taking disposition, which was significant in both multivariate analyses and is likely to be present in those adolescents who have been jailed or placed in JD.

One important finding is that adolescent females are more likely to misuse all medications except for the sedatives. This result is concordant with some,[6, 7] but not all[16], studies. Examinations of adult prescription medication misuse have been equivocal with regards to gender differences in risk for misuse. While one analysis of a nationwide survey found that adult men were at greater risk for abuse,[35] other studies have found that women are more likely to misuse these medications.[36, 37] Overall, though, accumulating findings seem to indicate that females are at greater risk for prescription misuse than are males. The greater risk imparted by female sex is remarkable when considering that adolescent males generally are more likely than adolescent females to use other addictive substances.[38] One of the most important future directions for research on prescription misuse is to identify the factors that predispose adolescent females to prescription drug misuse, but not greater use of other addictive substances. Female adults are more likely to be prescribed potentially addictive medications,[39] so greater availability may be a factor. Also, Friedman[1] suggests that misuse of prescription medication is perceived as less dangerous than the use of illicit drugs. The perceived safety of prescription medications[1, 40] may make them more attractive for females, who tend to have lower rates of risk-taking behavior than males. [41, 42] That said, it is important to temper the findings that female adolescents are at greater risk for prescription misuse by noting that gender was not significant in either multivariate regression. Thus, while female gender is a risk, it is not one of the most robust risks for either misuse or for having symptoms of a substance use disorder from prescription misuse.

Also, these findings shed some light on the role of race or ethnicity for adolescent prescription misuse. African-American and Asian-American adolescents are protected from prescription misuse, when compared to Caucasian, Native American, Hispanic or Multiracial adolescents, all of whom were at roughly equal risk. These results support the findings by McCabe and collaborators[6, 8, 14] that African-American adolescents are at lower risk of stimulant or tranquilizer misuse but are discrepant with those of Herman-Stahl and colleagues,[15] who found that Hispanic adolescents were less likely than Caucasian adolescents to misuse prescription stimulants.[15]

The prevalence of adolescent past year prescription medication misuse exceeded rates of use all other addictive substances queried in the NSDUH except for alcohol, tobacco or marijuana; the same holds for the presence of symptoms of a substance use disorder from prescription misuse.[21] These misuse rates are concerning, especially since 36% of past year misusers had developed at least one symptoms of a substance use disorder from prescription misuse. This finding may indicate that prescription misuse results in high rates of concerning sequelae and that these medications can be highly addictive when misused. Multivariate analyses indicated that a past year MDE, past year use of cocaine or inhalants or a higher frequency of past year medication misuse (10 or more times in the past year) served as a risk for the presence of symptoms of a substance use disorder from prescription misuse among adolescents who misused a medication in the past year. So, while a host of variables may predispose adolescents to past year misuse, fewer relate to the progression from misuse to the development of symptoms of a substance use disorder from prescription misuse. Furthermore, the number of times an adolescent misuses a medication seems to be the most important determinant among the characteristics evaluated of whether adolescent prescription misusers develop symptoms of a substance use disorder from prescription misuse.

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These results also have implications for clinicians. First, it is important for clinicians to include questions about prescription misuse when screening adolescents for addictive substance use, given the high rates of prescription misuse. Furthermore, it is important to screen for symptoms of a substance use disorder from prescription misuse in adolescents who admit to prescription misuse, as 36% will have developed such symptoms. Second, clinicians should consider educating parents about the potential for misuse or diversion[8] of these prescription medications. Parents should also be urged to discuss the addictive potential of these medications with their children, as it appears that many adolescents believe that prescription misuse is safer than use of other addictive drugs. Finally, evidence from the NSDUH indicates that a sizeable minority of adolescents obtained medications for misuse from physicians.[21] This finding reiterates the need for careful screening prior to the prescription of controlled medications.

A few limitations of the current study should be noted. First, the data analyzed were cross-sectional in nature, which makes it difficult to establish causal relationships between some of the variables examined here and prescription misuse or use disorder symptoms. Future studies should attempt to establish the causal relationships between prescription misuse and the risk factors found here. Second, as this was a secondary analysis of collected data, any measures in this study were not necessarily designed to suit the needs of the specific analyses of this investigation; also, some questions or measures may not have been fully valid and reliable (e.g., estimates of time since last misuse of a prescription medication or illicit drug), and this could limit the conclusions that can be drawn. Furthermore, the self-reported nature of the data can lend to biases based on misreporting or inaccurate reporting of prescription misuse, substance use, and other psychosocial or demographic variables. Finally, given that the full response rate for the 2005 NSUDH was 76%, some degree of selection or self-selection bias is possible and may limit the conclusions made here. In summary, this paper presented the risk factors associated with prescription misuse and the presence of symptoms of a substance use disorder from prescription misuse in adolescents. It is hoped that the findings here will prompt future research into this underevaluated population; equally important, it is hoped that the risk factors identified here will aid clinicians in screening for and treating adolescents who have begun to experience consequences from prescription misuse.

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Table 1

Population-Based Estimates of Past Year Misuse and Use Disorder Symptoms of Various Drugs (Adolescent NSDUH sample n = 18,678)

	Any Prescription	Alcohol	Marijuana	Inhalants
Past Year Misuse	2,081,322 (8.2%)	8,530,331 (33.6%)	3,352,736 (13.2%)	1,141,765 (4.5%)
[Opioids]	[1,736,717 (6.8%)]			
[Stimulants]	[489,916 (1.9%)]			
[Tranquilizers]	[493,525 (1.9%)]			
[Sedatives]	[113,546 (0.4%)]			
Presence of One or More Symptoms of a Substance Use Disorder from Prescription Misuse	1,135,861 (4.5%)	3,687,730 (14.5%)	1,940,712 (7.7%)	563,355 (2.2%)
Past Year Dependence	201,082 (0.8%)	550,536 (2.2%)	481,881 (1.9%)	34,853 (0.1%)
Past Year Abuse	161,708 (0.6%)	881,348 (3.5%)	393,353 (1.6%)	74,567 (0.3%)

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Table 2

Population-Based Univariate Predictors of Adolescent Past Year Prescription Medication Misuse (Odds Ratios with 95% CIs)

Predictors	Any Medication	Opioids	Stimulants	Tranquilizers	Sedatives
Race (Caucasian is reference group)					
African-Amer.	0.77 (0.613–0.958) *	0.84 (0.668–1.065)	0.34 (0.144–0.777) **	0.18 (0.098–0.321) **	0.57 (0.196–1.654)
Hispanic	0.97 (0.938–1.007)	0.96 (0.920–0.998) *	0.95 (0.888–1.021)	0.85 (0.781–0.929) **	1.07 (0.942–1.209)
Multi-racial	1.05 (0.974–1.122)	1.06 (0.986–1.148)	1.05 (0.930–1.184)	1.00 (0.885–1.138)	1.04 (0.852–1.263)
NA/AN	1.03 (0.823–1.279)	1.01 (0.786–1.291)	1.26 (0.953–1.662)	0.81 (0.567–1.154)	1.18 (0.649–2.162)
Asian	0.76 (0.653–0.891) **	0.79 (0.668–0.928) *	0.36 (0.220–0.585) **	0.41 (0.252–0.675) **	(No Use)
Female Gender	1.25 (1.087–1.430) *	1.18 (1.015–1.366) *	1.83 (1.376–2.422) **	1.30 (1.001–1.686) *	1.20 (0.681–2.126)
Age (15 or older)	2.95 (2.512–3.452) **	2.75 (2.317–3.272) **	4.09 (2.850–5.877) **	6.12 (4.311–8.678) **	2.46 (1.377–4.386) *
Past Year Move	1.40 (1.198–1.632) **	1.46 (1.236–1.731) **	1.18 (0.852–1.631)	1.92 (1.455–2.522) **	1.94 (1.061–3.543) *
No Mother at Home	1.28 (1.026–1.588) *	1.38 (1.090–1.736) *	0.98 (0.618–1.556)	1.24 (0.830–1.850)	0.83 (0.329–2.106)
No Father at Home	1.32 (1.139–1.533) **	1.36 (1.157–1.600) **	1.22 (0.898–1.653)	1.12 (0.849–1.485)	0.94 (0.511–1.714)
Grades: D or Worse	2.89 (2.365–3.521) **	2.84 (2.290–3.513) **	2.95 (2.036–4.262) **	4.07 (2.952–5.614) **	5.94 (2.932–12.021) **
Past Year MDE	3.13 (2.620–3.735) **	2.91 (2.405–3.523) **	4.18 (2.998–5.828) **	3.24 (2.380–4.404) **	5.52 (3.154–9.673) **
Past Year MH Tx	2.11 (1.824–2.432) **	2.08 (1.781–2.431) **	3.00 (2.271–3.959) **	2.99 (2.297–3.895) **	3.46 (1.946–6.164) **
Past Jail/Detention	2.24 (1.823–2.761) **	2.00 (1.604–2.489) **	2.76 (1.863–4.089) **	3.19 (2.255–4.513) **	2.92 (1.376–6.191) *
Likes Risk-Taking	3.66 (3.073–4.355) **	3.54 (2.936–4.271) **	4.91 (3.661–6.576) **	5.62 (4.200–7.531) **	4.83 (2.572–9.055) **
1-Yr Cigarette Use	8.58 (7.432–9.914) **	7.75 (6.640–9.049) **	15.74 (11.245–22.017) **	18.68 (13.923–25.049) **	7.84 (4.472–13.738) **
1-Yr Alcohol Use	7.29 (6.194–8.587) **	7.00 (5.849–8.369) **	17.69 (11.736–26.656) **	14.49 (9.763–21.494) **	6.86 (3.570–13.171) **
1-Yr Marijuana Use	9.88 (8.534–11.438) **	9.40 (8.033–10.997) **	17.65 (12.868–24.199) **	17.29 (12.937–23.098) **	9.83 (5.697–16.970) **
1-Yr Cocaine or Inhalant Use	10.69 (8.983–12.720) **	10.08 (8.409–12.084) **	17.40 (13.091–23.314) **	16.11 (12.290–21.113) **	10.51 (5.866–18.817) **

NA/AN = Native American or Alaska Native; MH Tx = Mental Health Treatment

* denotes predictors significant at a $p \leq .05$ level

** denotes predictors significant at a $p \leq .001$ level

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Table 3

Population-Based Multivariate Regression for Any Prescription Misuse or Symptoms of a Substance Use Disorder from Prescription Misuse

	Any Prescription Misuse						One or More Symptoms of Abuse or Dependence					
Predictor	**B**	**SE(B)**	**Wald**	***p*-value**	**OR**	**95% CI**	**B**	**SE (B)**	**Wald**	***p*-value**	**OR**	**95% CI**
Caucasian	−.028	.100	0.077	.782	0.97	(0.800–1.182)	−.080	.150	.282	.595	0.92	(0.688–1.239)
Female Gender	.079	.088	0.815	.367	1.08	(0.911–1.286)	.178	.141	1.584	.208	1.19	(0.906–1.575)
Age (15 or older)	**.347**	**.106**	**10.752**	**.001**	**1.42**	**(1.150–1.740)**	.287	.158	3.280	.070	1.33	(0.977–1.816)
Past Year Move	.168	.103	2.675	.102	1.18	(0.967–1.447)	.175	.153	1.301	.254	1.19	(0.882–1.608)
No Mother at Home	−.221	.152	2.114	.146	0.80	(0.595–1.080)	**−.167**	.231	0.521	.470	0.85	(0.539–1.331)
No Father at Home	.122	.101	1.450	.229	1.13	(0.926–1.378)	**−.043**	.152	0.080	.777	0.96	(0.711–1.291)
Grades: D or Worse	**.441**	**.119**	**13.724**	**<.001**	**1.56**	**(1.231–1.963)**	**.369**	**.179**	**4.270**	**.039**	**1.45**	**(1.019–2.053)**
Past Year MDE	**.591**	**.118**	**25.261**	**<.001**	**1.81**	**(1.434–2.274)**	**.697**	**.173**	**16.179**	**<.001**	**2.01**	**(1.429–2.818)**
Past Year MH Tx	**.273**	**.094**	**8.355**	**.004**	**1.31**	**(1.092–1.581)**	.245	.145	2.863	.091	1.28	(0.962–1.695)
Past Jail/Detention	.018	.141	0.016	.900	1.02	(0.772–1.343)	.240	.191	1.582	.209	1.27	(0.875–1.848)
Likes Risk-Taking	**.485**	**.109**	**19.686**	**<.001**	**1.63**	**(1.311–2.013)**	**.420**	**.168**	**6.248**	**.012**	**1.52**	**(1.095–2.116)**
1-yr Cigarette Use	**.851**	**.109**	**61.369**	**<.001**	**2.34**	**(1.893–2.898)**	**.824**	**.174**	**22.489**	**<.001**	**2.28**	**(1.621–3.203)**
1-yr Alcohol Use	**.908**	**.116**	**61.185**	**<.001**	**2.48**	**(1.974–3.111)**	**.664**	**.197**	**11.387**	**<.001**	**1.94**	**(1.321–2.857)**
1-yr Marijuana Use	**.909**	**.103**	**78.472**	**<.001**	**2.48**	**(2.030–3.036)**	**.638**	**.187**	**11.612**	**<.001**	**1.89**	**(1.311–2.732)**
1-yr Cocaine or Inhalant Use	**1.355**	**.112**	**147.667**	**<.001**	**3.88**	**(3.116–4.824)**	**1.453**	**.163**	**79.076**	**<.001**	**4.28**	**(3.104–5.889)**

Bolded variables are significant at a $p < .05$ level

MDE = Major Depressive Episode; MH Tx= Mental Health Treatment

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Table 4

Population-Based Multivariate Regression for Symptoms of a Substance Use Disorder from Prescription Misuse (Among Misusers Only)

Predictor	B	SE (B)	Wald	*p*-value	OR	95% CI
Caucasian	.035	.198	.032	.859	1.04	(0.638–1.429)
Female Gender	.136	.168	.648	.420	1.15	(0.824–1.592)
Age (15 or older)	−.046	.206	.051	.822	0.96	(0.638–1.429)
Past Year Move	.113	.187	.366	.545	1.12	(0.776–1.615)
No Mother at Home	.086	.271	.101	.750	1.09	(0.641–1.855)
No Father at Home	−.201	.176	1.300	.254	0.82	(0.579–1.156)
Grades: D or Worse	−.185	.206	.808	.369	0.83	(0.555–1.244)
Past Year MDE	**.423**	**.202**	**4.374**	**.037**	**1.53**	**(1.027–2.268)**
Past Year MH Tx	.046	.169	.076	.783	1.05	(0.753–1.458)
Past Jail/Detention	.184	.231	.635	.426	1.20	(0.764–1.892)
Likes Risk-Taking	.087	.188	.212	.645	1.09	(0.754–1.576)
1-yr Cigarette Use	.076	.224	.116	.733	1.08	(0.696–1.673)
1-yr Alcohol Use	−.286	.260	1.208	.272	0.75	(0.451–1.251)
1-yr Marijuana Use	−.084	.226	.140	.709	0.92	(0.591–1.430)
1-yr Cocaine or Inhalant Use	**.534**	**.177**	**9.148**	**.003**	**1.71**	**(1.207–2.411)**
10 or More Episodes of Past Year Prescription Misuse	**1.089**	**.171**	**40.491**	**<.001**	**2.97**	**(2.124–4.155)**

Bolded variables are significant at a $p < .05$ level

MDE = Major Depressive Episode; MH Tx= Mental Health Treatment