



Differentiating patterns of prescription stimulant medical and nonmedical use among youth 10–18 years of age



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ABSTRACT

Objective: To assess the past 30-day prevalence of prescription stimulant use, report different forms of nonmedical use, and investigate different characteristics associated with Medical Users Only, Nonmedical Users Only, and youth who reported both medical and nonmedical use (MU + NMU youth).

Methods: The National Monitoring of Adolescent Prescription Stimulants Study recruited 11,048 youth aged 10–18 years from entertainment venues in 10 US cities.

Results: In this study, 6.8% youth used prescription stimulants in the past 30 days, with 3.0% reporting Medical Use Only (MU Only), 1.1% reporting Both Medical and Nonmedical Use (MU + NMU), and 2.5% reporting Nonmedical Use Only (NMU Only). Use of other's stimulants was the most frequently reported form of nonmedical use (88.4%), followed by using more than prescribed (38.9%), and using outside of the prescribed route (32.2%). Medical Users Only and MU + NMU youth did not differ from Non-Users in cigarette, alcohol, and illicit drug use. MU + NMU youth tended to have more conduct problem behaviors compared to Medical Users Only ($p=0.0011$) and Nonmedical Users Only ($p=0.0132$). Compared to MU + NMU youth, Nonmedical Users Only were more likely to have close friends who tried Adderall ($p=0.0123$), endorse binge drinking ($p=0.0118$) and illicit drug use ($p<0.0015$).

Conclusions: Future research should investigate the sources of the nonmedically used prescription stimulants and how they were diverted. Intervention programs need to acknowledge the differences between MU + NMU youth and Nonmedical Users Only, and employ different strategies to prevent nonmedical use in these subgroups.

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1. Introduction

Prescription stimulants are commonly used psychotropic medications among children, and they are the first-line therapeutic option for attention-deficit/hyperactivity disorder (ADHD: Antshel et al., 2011).

Although stimulant medications are effective in improving symptoms when used properly, the increase in ADHD diagnosis (Visser et al., 2014) and associated prescription rates (Zuvekas and Vitiello, 2012) have raised public health concerns because of the potential for nonmedical use, and subsequent adverse consequences. Abuse of stimulant drugs increases the risk of health complications including severe hypertension, tachycardia, respiratory failure, and cardiac arrest (Gerlach et al., 2014; Rosenfield

et al., 2011; Yu, 2012). The Drug Abuse Warning Network, collecting drug abuse-related emergency department (ED) visits in selected metropolitan areas, estimated 52.9% of ADHD stimulant medication-related ED visits involved nonmedical use for adolescents aged 12–17 years in 2010 (Substance Abuse and Mental Health Services Administration, 2013). Besides the adverse health effects, nonmedical use of prescription stimulants also increases the risk for other substance use (McCabe and West, 2013). In addition, individuals who initiated nonmedical use of prescription stimulants earlier in their adolescence were more likely to develop abuse and dependence disorder (McCabe et al., 2007b). Therefore, there is a strong need for epidemiological research to track the trend of this nonmedical use behavior among adolescents.

Prescription nonmedical use has been defined based on prescription status (e.g., any non-prescribed use), motives for use (e.g., use for euphoric effect), abuse or dependence criteria (e.g., DSM-IV), dose and frequency of use (e.g., use more than prescribed), and route of administration (e.g., use in ways not prescribed; Barrett et al., 2005; Compton and Volkow, 2006; Gerlach et al., 2014). Most studies on nonmedical use among adolescents only adopted

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one definition and were unable to describe different forms of inappropriate use. However, understanding the magnitude of different forms of nonmedical use is important for prevention program design.

Prior research has identified a number of individual characteristics and risk factors associated with prescription stimulant nonmedical use among adolescents (Boyd et al., 2009; Collins et al., 2011; Fleary et al., 2011; Ford, 2008a, 2008b; Havens et al., 2011; Herman-Stahl et al., 2006; Kroutil et al., 2006; McCabe et al., 2007b, 2004a, 2004b; McCabe and West, 2013; McCauley et al., 2010; Poulin, 2007, 2001; Schepis and Krishnan-Sarin, 2008; Simoni-Wastila et al., 2008; Sweeney et al., 2013; Viana et al., 2012). However, there remains a lack of research assessing differences among the youth who took their stimulants as prescribed (Medical User Only), individuals who had a prescription/refill and reported nonmedical use (MU + NMU youth), and those who only used stimulants nonmedically (Nonmedical User Only). Youth who have a prescription and at the same time report nonmedical use have not been well distinguished from those youth who only use stimulants nonmedically. MU + NMU youth are indicative of future nonmedical use and diversion, because they could be the source of diversion of prescription stimulants. More research is needed to understand why they initiate nonmedical use and the form of nonmedical use (e.g., use more than prescribed, use in ways not prescribed), since they have already had health problems that need treatment and the nonmedical use of prescription stimulants may cause further health risks. On the other hand, Nonmedical Users Only may be poly-substance users, or they use stimulants as a substitute for illicit drugs which are harder to get access to. Distinguishing these two subgroups of nonmedical users could help design tailored preventive-interventions.

The purpose of this study was to: (1) assess the past 30-day prevalence of medical and nonmedical use of prescription stimulants among youth 10–18 years of age, (2) report different forms of past 30-day nonmedical prescription stimulant use, and (3) investigate whether Medical Users Only, Nonmedical Users Only, and MU + NMU youth differ in their demographic characteristics, family and peer influences, conduct problem behaviors, and substance use behaviors.

2. Methods

2.1. Study design

The National Monitoring of Adolescent Prescription Stimulants Study (N-MAPSS) was a national study that assessed use, nonmedical use, and diversion of prescription stimulants among youth 10–18 years of age in 10 cities in the United States (Cottler et al., 2013). This cross-sectional study was carried out in four waves from 2008 to 2011. Standard federal regions were selected according to the US Office of Management and Budget. Within each region, states with the highest volume of stimulant prescriptions dispensed and city within each with the highest dispensing volume were identified using the IMS Health database. Four N-MAPSS cities represented the eastern US (Boston, MA; New York, NY; Philadelphia, PA and Tampa, FL), three represented the central US (St. Louis, MO; Cincinnati, OH and Houston, TX), and three represented the western US (Denver, CO; Los Angeles, CA and Seattle, WA).

To ensure the adequate participation of youth from suburban and rural areas prior to data collection, N-MAPSS established a 50% – 30% – 20% recruitment goal for each city identified as urban, suburban, and rural respectively. ZIP codes located within the administrative boundaries of a city were designated urban. Those adjacent to the urban ZIP codes with population density less than urban but more than rural were defined suburban. Rural ZIP codes were defined as those with population density less than 1000 persons per square mile provided they were contiguous to suburban areas. N-MAPSS employed an entertainment-venue intercept method to approach and recruit potential participants, and administered surveys in youth friendly entertainment venues. For more details on N-MAPSS, see Cottler et al. (2013).

2.2. Sample

During the four N-MAPSS waves, 21,444 youth were approached. Among the approached, 24.7% (5201/21,444) declined to talk to the interviewer, leaving

75.3% (16,143/21,444) potentially eligible. Additionally, 21.1% (3403/16,143) were ineligible due to age, language, or zip code criteria, and another 10.0% (1272/12,740) refused to participate. After eliminating poor quality responses (3.7%, 420/11,468), the final sample included 11,048 youth (Cottler et al., 2013).

In the final sample, 12.7% were between the ages of 10 and 12, 39.7% were between the ages of 13 and 15, and 47.6% were between the ages of 16 and 18 years. Nearly half (47.6%) resided in urban areas, 37.3% resided in suburban areas, and 15.1% resided in rural areas. Overall, 52.2% of participants were female, 43.0% were Caucasian, 19.8% were African American, 18.4% were Hispanic/Latino, 7.8% were Asian, and 11.0% were from other racial group.

2.3. Measures

N-MAPSS assessed the past 30-day use of 5 brand-name prescription stimulants (Adderall® or Adderall XR®; Concerta®; Daytrana®; Ritalin®, Ritalin LA® or Ritalin SR®; and Vyvanse®) by asking participants: “In the last 30 days, have you taken [specific brand name]? Examples are pictured above.” All formulations (immediate and extended release) and the common dosage were queried with pictures of particular tablets, capsules, and patches.

Nonmedical use was assessed by: (1a) use other than by mouth (for Adderall, Concerta, Ritalin and Vyvanse: “In the last 30 days, what are all the ways you used [specific brand name]?”) or (1b) use other than prescribed (“In the last 30 days, have you used Daytrana in a way other than prescribed?”), (2a) use of someone else’s medication (“In the last 30 days, have your used [specific brand name] that belonged to . . .?”) or (2b) “In the last 30 days, how many days did you use [specific brand name] that belonged to someone else?”), and/or (3) more than prescribed (“In the last 30 days, how many days did you use [specific brand name] more than prescribed?”). Past 30-day medical users were identified as those who only took their prescription stimulants as prescribed.

Respondents who answered “Yes” to the question “In the last 30 days, have you gotten a prescription or refill for [specific brand name] from a psychiatrist or your doctor?” were defined as having a prescription. Users who reported both medical and nonmedical prescription stimulant use (MU + NMU youth) were identified as those who had a prescription and at the same time reported nonmedical use, or those who reported nonmedical use of one or more brands but medical use of another brand. In this study, there were four mutually exclusive groups of past 30-day prescription stimulant use: (1) individuals who did not use any prescription stimulant (Non-User); (2) individuals who only used prescription stimulants as prescribed (Medical User Only); (3) individuals who reported both medical and nonmedical use (MU + NMU youth); and (4) individuals who exclusively used prescription stimulants nonmedically (Nonmedical User Only).

Demographic characteristics included gender, age, race/ethnicity, and the area of residence. Family and social characteristics included living with both parents at the same time in the last 7 days, and having close friends who tried Adderall or Adderall XR. Conduct problem behavior was considered present if youth had been suspended from school, received tickets or warnings from police, been arrested, got into a lot of trouble at home or at school or ran away from home overnight, or used a weapon or threatened someone with a weapon. Cigarette use was measured by asking respondents if they smoked cigarettes at the time of the survey, and if respondents answered “Yes”, they were asked if they smoked cigarettes everyday or some days. Alcohol use was assessed by asking respondents how many days they drank alcohol in the last 30 days. Binge drinking was defined as reporting five or more alcoholic drinks within a few hours. Lifetime illicit drug use included use of marijuana, cocaine, crack, heroin, club drugs (like ecstasy), hallucinogens (like LSD or mushrooms), anabolic steroids, cough syrup/purple drank’ to get high, methamphetamine, and/or inhalants (like gasoline or paint).”

2.4. Statistical analysis

First, we computed descriptive statistics to summarize the data and report the frequencies of past 30-day prescription stimulant use. Second, we reported the rate of different forms of nonmedical use and examined the difference between Nonmedical Users Only and MU + NMU youth in their forms of nonmedical use. Third, Multinomial logistic regression analyses with ‘No Use’ as the reference were conducted to examine the association of past 30-day prescription stimulant use status with the potential predictors: demographic characteristics (age [10–18 years], gender [male/female], race/ethnicity [Caucasian/other], and the area of residence [rural/other]), family and social influence (living with both parents [yes/no], and having friends who tried Adderall [yes/no]), number of conduct problem behaviors, and substance use history (cigarette [no current use/use some days/use everyday], alcohol [no use/use but not binge drinking/binge drinking], and illicit drug [yes/no]). Adjusted odds ratios (AORs) with 95% confidence interval (CI) were presented. The final analytic sample selection procedure is shown in Fig. 1. SAS software version 9 (SAS Institute Inc, Cary, NC) was used to perform all analyses.

3. Results

Among 750 youth reporting prescription stimulant use in the past 30 days, 45.6% ($n = 334$) reported medical use only (MU Only),

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