Full length article

Nonmedical opioid use and heroin use in a nationally representative sample of us high school seniors☆

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ABSTRACT

Background: Nonmedical use of opioids has become increasingly problematic in recent years with increases in overdoses, treatment admissions, and deaths. Use also appears to be contributing to heroin initiation, which has increased in recent years. Further research is needed to examine which adolescents are at highest risk for nonmedical use of opioids and heroin and to explore potential links between nonmedical opioid use and heroin use.

Methods: Data were analyzed from a nationally representative sample of American high school seniors in the Monitoring the Future study (2009–2013, Weighted $N = 67,822$). We examined associations between frequency and recency of nonmedical use of opioids and heroin. Sociodemographic correlates of use of each drug were also examined.

Results: 12.4% of students reported lifetime nonmedical opioid use and 1.2% reported lifetime heroin use. As frequency of lifetime nonmedical opioid use increased, so too did the odds for reporting heroin use, with over three-quarters (77.3%) of heroin users reporting lifetime nonmedical opioid use. Recent (30-day) nonmedical opioid use was a robust risk factor for heroin use and almost a quarter (23.2%) of students who reported using opioids ≥40 times reported lifetime heroin use. Black and Hispanic students were less likely to report nonmedical opioid or heroin use than white students, but they were more likely to report heroin use in absence of nonmedical opioid use.

Discussion: Recent and frequent nonmedical opioid use are risk factors for heroin use among adolescents. Prevention needs to be targeted to those at highest risk.

1. Introduction

Nonmedical use of prescription opioids (i.e., narcotics, analgesics, pain killers) has become increasingly problematic in the US over the last decade. Although results from national surveys suggest prevalence of use has begun to decrease in recent years (Miech et al., 2015; Substance Abuse and Mental Health Services Administration (SAMHSA), 2014a), overdoses, emergency

department (ED) visits, treatment admissions, and deaths related to use have increased (Centers for Disease Control and Prevention (CDC), 2012; Chen et al., 2014; SAMHSA, 2013, 2014b). However, a new concern is that a subset of opioid users may be transitioning to heroin, which is often more likely to lead to deleterious outcomes. Research is needed to help identify adolescents at risk for nonmedical opioid and/or heroin use, and to delineate which opioid users are at highest risk for heroin use.

While medical use of opioids tends to be efficacious when used as prescribed to treat pain, nonmedical use – often through overprescribing or diversion from doctors (Wang et al., 2014; Shei et al., 2015) – has become a major public health issue. From 2004 to 2011, ED visits involving prescription opioids increased by 183% (SAMHSA, 2013) and opioid-related admissions to substance abuse treatment centers increased from 2% in 2002 to 10%

in 2012 (SAMHSA, 2014b). Results from National Vital Statistics demonstrate that the rate of opioid overdose deaths nearly quadrupled from 1999 to 2011, growing from 1.4 per 100,000 to 5.4 per 100,000 (Chen et al., 2014), and according to the CDC (2012), almost three out of every four prescription medication overdoses were associated with opioids. While the rate of increase in overdoses has slowed somewhat since 2006 (Chen et al., 2014), there is now concern that these decelerating rates of opioid-related deaths may be related to recent increases in heroin use, as individuals dependent on prescription opioids may be transitioning to heroin, which tends to be less expensive and more freely available (Cicero et al., 2014; Kanouse and Compton, 2015; Mateu-Gelabert et al., 2015). Heroin is among the most dangerous illicit drugs (Nutt et al., 2007; Gable, 2004) and use is associated with high rates of dependence, overdose, death, transmission of pathogens such as HIV and HCV, and social marginalization (Demaret et al., 2013; Hser et al., 2015; Hosztafi, 2011; Brown, 2015; Zhou et al., 2015). Heroin overdose deaths have increased since 2002, rising from 0.7 deaths per 100,000 to 2.7 deaths per 100,000 in 2013 (Jones et al., 2015). This rise was particularly dramatic from 2011 to 2013, when rates almost doubled.

Heroin user demographics appear to be shifting in the US. While rates of heroin initiation were similar between whites and non-whites decades ago (Cicero et al., 2014), now whites are at a higher risk for nonmedical prescription opioid use, as well as heroin use (Cicero et al., 2014; Fischer et al., 2008; Peavy et al., 2012; Pollini et al., 2011). While women previously used at substantially lower rates than men (Cicero et al., 2014), their use of opioids and transition to heroin is increasing, with prescription opioids appearing to serve as a stepping stone (Cotto et al., 2010). Furthermore, use of heroin is increasing (Cicero et al., 2015), particularly among individuals living in non-urban areas, whereas it used to be a predominantly urban phenomenon (Cicero et al., 2014). A recent analysis of the National Surveys on Drug Use and Health (NSDUH), a nationally representative sample of non-institutionalized individuals in the US, compared data from 2002–2004 to 2008–2010, and found that past-year heroin use increased among many sociodemographic groups, including whites, those with higher income and those with health insurance (Jones et al., 2015). Whites, young adults (age 18–25), and those with opioid abuse/dependence were also found to be at high risk for heroin use/dependence. Alarmingly, this recent study found that between 2002 and 2013 there was a 138% increase in heroin use among nonmedical opioid users. Other studies have also found that many heroin users have moved onto heroin after nonmedical opioid use (Lankenau et al., 2012; Peavy et al., 2012; Mateu-Gelabert et al., 2015). Nonmedical opioid users have been found to transition to heroin as they considered heroin more "practical" as it is reportedly less expensive and easier to acquire (Cicero et al., 2014; Mars et al., 2014), especially as availability is reduced due to abuse-deterrent formulations and prescription monitoring programs (Cassidy et al., 2014; Worley, 2012).

Nonmedical opioid use is associated with poor health outcomes such as opioid dependency, sexual violence, overdose, and death (Jamison and Mao, 2015; Frank et al., 2015; Jessell et al., 2015); however, moving onto heroin from prescription opioids appears to be a dangerous (and understudied) emerging pattern among younger populations. While studies focusing on national data have begun to examine associations between nonmedical opioid use and heroin use and dependence, more information is needed regarding frequency and recency of nonmedical opioid use as it relates to heroin use—in both a bivariable and multivariable manner. Assessing the risk factors associated with nonmedical opioid use, and how its use may increase risk for heroin use is critical to developing appropriate prevention, intervention, and harm reduction programming geared toward adolescents at highest risk. An examination of a nationally representative sample of adolescents allows us to determine which subgroups of high school students are at highest risk for nonmedical opioid use and heroin use. This study examines the correlates of nonmedical use of opioids and heroin and examines how frequency and recency of opioid use relates to heroin use in a nationally representative sample of high school seniors.

2. Methods

2.1. Procedure

Monitoring the Future (MTF) is a nationally representative cross-sectional study of US high school students. Approximately 15,000 high school seniors (12th graders) are surveyed every year from approximately 130 public and private schools throughout 48 states. MTF uses a multi-stage random sampling procedure: geographic areas are selected, then schools within areas are selected, and then classes within schools are selected. Since the main outcome (heroin use) is rare, in order to have adequate power, this analysis focused on aggregated data collected from the five most recent cohorts with available data (2009–2013). MTF protocols were approved by the University of Michigan Institutional Review Board (IRB) and the authors' IRB deemed this secondary data analysis exempt from review.

2.2. Drug use

Students were asked about lifetime heroin use, and answer options were use on (1) 0 occasions, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions. Students were also asked about nonmedical use of opioids ("narcotics other than heroin"). They were first informed that, "There are a number of narcotics other than heroin, such as methadone, opium, morphine, codeine, Demerol, Vicodin, OxyContin, and Percocet. These are sometimes prescribed by doctors." They were then asked, "On how many occasions (if any) have you taken narcotics other than heroin on your own—that is, without a doctor telling you to take them...in your lifetime?" They were also asked the same question with regard to use in the last 12 months and the last 30 days, with the same ordinal response options.

In order to examine frequency of use of opioids and heroin, we created a series of dichotomous variables indicating lifetime use (ever used; ≥1 times), and use ≥6 times, ≥10 times, and ≥40 times. Ordinal cutoffs were based on previous MTF studies that focused on use of other drugs (Boyd et al., 2015; Palamar and Acosta, 2015; Palamar et al., 2014a, 2015a,b). In order to examine recency of use, for both opioids and heroin we also created categorical variables (which were also examined as indicator variables) with the following categories: (1) no use, (2) lifetime use, but not 12-month use, (3) 12-month use, but not 30-day use, and (4) 30-day use.

2.3. Sociodemographic variables

Students reported their sex, age (public data predefined by MTF as <18, ≥18 years) and race/ethnicity (i.e., black, white, Hispanic). Population density of students' residences were defined as non-, small-, or large-metropolitan statistical areas (MSAs). Small MSAs are counties or groups of counties with at least one city of ≥50,000 inhabitants and the 24 largest MSAs are defined as large MSAs. Non-MSAs are the remaining areas. Level of religiosity was assessed via two ordinal items asking about level of religious attendance and importance. We computed these items into a composite and divided it into tertiles to indicate low (1.0–2.0), moderate (2.5–3.0) and high (3.5–4.0) religiosity. To assess family composition, we examined the number of parents students resided with. Answers were coded into two parents vs. no parents or one. Students were also asked about level of educational attainment of each parent and answer options were (1) grade school, (2) some high school, (3) high school graduate, (4) some college, (5) college graduate, and (6) graduate school. A mean score for both parents (or a raw score if only one parent) was coded into tertiles to represent low (1.0–3.0), medium (3.5–4.0), and high (4.5–6.0) education. Students were asked how much money they earn during the average week from (1) a job or other work, and (2) from other sources. Responses for each of these two items were coded into $10 or less, $11–50, or $51 or more. Coding of sociodemographic variables was based on previous MTF analyses that focused largely on socioeconomic status (SES; Palamar et al., 2014b; Palamar and Ompad, 2014; Wallace et al., 2009).

2.4. Statistical analyses

Analyses focused on students with complete opioid and heroin use data (Weighted $N = 67,822$; Unweighted $N = 67,896$). We first examined descriptive statistics for all variables. We then examined how lifetime opioid use related to lifetime heroin use in a bivariable manner using Rao–Scott χ^2 tests (Rao and Scott, 1984). We examined potential differences between opioid frequency and recency and whether lifetime heroin use was reported (yes/no). We then repeated these computations, but to examine potential differences by heroin use ≥6 times, ≥10 times, and ≥40 times. To test if and how each level of opioid use relates to lifetime heroin use, we constructed two separate logistic regression models, controlling for all sociodemographic variables. Thus, each level of opioid use in both models