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Gender differences in trends for heroin use and nonmedical prescription opioid use, 2007–2014

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ABSTRACT

Background: Trends in the current opioid epidemic in the United States show that use of heroin is increasing while nonmedical use of prescription opioids is slowing. Understanding gender differences in these trends is essential to efforts to address the opioid epidemic. This study compared gender difference in trends in heroin and nonmedical prescription opioid use in the U.S. between 2007 and 2014.
Methods: Data from the National Survey on Drug Use and Health (NSDUH) were used to trace prevalence and to estimate risk for heroin and nonmedical prescription opioid use in the last year for women and men.
Results: Prevalence rates in the total sample ($N = 447{,}188$) indicate a notable increase in heroin use and a steady decline in the nonmedical use of prescription opioids between 2007 and 2014 for both women and men. Women are increasing heroin use at a faster rate than men but decreasing nonmedical prescription opioid use at a slower rate than men. Overall, risk factors for both heroin use and nonmedical prescription opioid use are similar to other illicit substances, but the magnitude of associations indicates that women may be at greater risk for the nonmedical use of prescription opioids than for the use of heroin.
Conclusions: Trend analyses reveal a linear increase in heroin use and a quadratic decline in nonmedical prescription opioid use at the population level. The differential rates of change between men and women in use of both opioids highlight the need for comprehensive, gender-sensitive approaches to prevention and treatment for both heroin and nonmedical prescription opioid use. Future research should continue to explore gender differences in treatment access, including access to medication-assisted treatments and treatments integrated with health and social services, especially for women.

1. Background

Trends in the current opioid epidemic in the U.S. show that use of heroin is increasing while nonmedical use of prescription opioids may be slowing, and suggest that understanding gender differences in prevalence trends is essential to combating the epidemic (Compton, Jones, & Baldwin, 2016). Although studies show that men still exceed women in the prevalence of both heroin use and nonmedical prescription opioid use (defined as the use of opioids that have not been prescribed or that are taken only for the experience or feeling that they cause) as well as overdose deaths, women's rates of increase may be exceeding men's. For example, overdose deaths for women from use of prescription opioids increased five times compared to 3.6 times for men between 1999 and 2010 (Centers for Disease Control and Prevention [CDC], 2013). Moreover, while women's nonmedical use of prescription opioids has been decreasing in recent years (Jones, 2017), their use of heroin has been increasing. Studies show a 100% increase in heroin use for women compared to a 50% increase for men between 2002 and 2013 (Jones, Logan, Gladden, & Bohm, 2015). Given this evidence, accounting for gender disparities in use of heroin and nonmedical prescription opioids is necessary for addressing the opioid epidemic generally, and the impact of the epidemic on women specifically (Office on Women's Health, 2017; Volkow, 2014).

Opioids that are most commonly involved in overdose deaths include heroin, oxycodone, methadone, morphine, hydrocodone, and fentanyl (Hedegaard, Warner, & Miniño, 2017; Warner, Trinidad, Bastian, Ninion, and Hedegaard, 2016). Opioids, such as oxycodone, hydrocodone, morphine, and fentanyl, are prescribed legally to treat acute or chronic pain. Heroin, the other substance type contributing to the current epidemic, is an illegal opioid that has been the target of substance use disorder treatment and control efforts for more than three decades. Although multiple drug use is often involved in overdose deaths, concern that nonmedical use of prescription opioids may lead to the initiation of heroin use has led to a particular focus on these two substance types as drivers of the opioid epidemic (Cicero, Ellis, Surratt, & Kurtz, 2014; Compton et al., 2016; Jones, 2017; Lipari & Hughes, 2015; Muhuri, Gfroerer, & Davies, 2013). Indeed, the opioid crisis is increasingly characterized as two epidemics intertwined: the heroin epidemic and the nonmedical use of prescription opioids epidemic

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(National Academies of Sciences, Engineering, and Medicine, 2017; Unick, Rosenblum, Mars, & Ciccarone, 2013).

Opioid medications and heroin are natural substitutes since they produce the same neuropharmacologic effects (Compton et al., 2016). A clinical trajectory of concern is one where individuals begin with medically appropriate use of prescription opioids, escalate to nonmedical use of prescription opioids, and ultimately transition to heroin — a substance which may be more accessible and less expensive in some parts of the country (National Academies of Sciences, Engineering, and Medicine, 2017). Most studies of the association between nonmedical use of prescription opioids and heroin use are descriptive and point-in-time studies that show a link between nonmedical use of prescription opioids and heroin use (Muhuri et al., 2013; National Academies of Sciences, Engineering, and Medicine, 2017).

Few prevalence studies provide a comparison of trends over time in the use of heroin and nonmedical prescription opioids at a population level. Even fewer studies examine differential trends by gender in prevalence or in risk factors related to heroin and nonmedical use of prescription opioids. It is the purpose of this study to document the impact of the opioid epidemic on women and men by 1) comparing gender differences in prevalence trends for the use of heroin and nonmedical prescription opioids, and 2) comparing risk factors predicting use of both substances.

1.1. National trends in gender differences in opioid use

Available studies on prevalence trends using extant nationally representative data have shown a significant increase in heroin use for both women and men from 2002 to 2013 (Jones et al., 2015) and a decrease in nonmedical use of prescription opioids for both women and men from 2003 to 2014 (Jones, 2017). Both studies use data from the National Survey on Drug Use and Health (NSDUH), the only nationally representative study of self-reported drug use behavior in the United States. The studies analyze trends for use of heroin and nonmedical prescription opioids separately precluding comparison of gender differences in trends.

Other research from cohort and regional studies on gender differences in opioid use has focused primarily on heroin use, and it remains unclear whether findings generalize to nonmedical use of prescription opioids. Prevalence research consistently shows higher rates of heroin use among men (Substance Abuse and Mental Health Services Administration (SAMHSA), 2014a,b; Wu, Lind, Burchett, Blazer, Shostak, & Woody, 2010). Despite the greater prevalence of heroin use among men, studies focusing on women and heroin or cocaine use have shown that women report greater susceptibility to craving (Fox, Morgan, & Siha, 2014; Kennedy, Epstein, Phillips, & Preston, 2013; Robbins, Ehrman, Childress, & O'Brien, 1999) and more episodes of relapse (Kippin et al., 2005), as well as more co-occurring health and social problems than do men (Cao, Marsh, Shin, & Andrews, 2011; Marsh, Cao, & D'Aunno, 2004; Marsh, Cao, & Shin, 2009; Marsh, D'Aunno, & Smith, 2000). Although co-morbidity in mental health and substance use disorders is a significant problem for both women and men, findings suggest that women enter treatment with greater severity of mental health problems than do men (Chatham, Hiller, Rowan-Szal, Joe, & Simpson, 1999; Grella, Karno, Warda, Niv, & Moore, 2009; Grella, Scott, & Foss, 2005).

Compared to studies of heroin use, there are fewer prevalence studies focused on nonmedical use of prescription opioids and their evidence on gender differences is mixed. Some clinical studies show that women exceed men in their nonmedical use of prescription opioids (Green, Serrano, Licari, Budman, and Butler, 2009; Kelly et al., 2008), while other studies show the reverse (Back, Payne, Simpson, & Brady, 2010). Similar to heroin use, evidence also shows that women users of nonmedical prescription opioids are more likely to enter treatment with psychiatric problems (i.e., both major depression and anxiety disorders), as well as with social problems related to employment and family (Back et al., 2010; Grella et al., 2005, 2009; Huang et al., 2006; Martins, Keyes, Storr, Zhu, & Chilcoat, 2009; McHugh, Neilsen, & Weiss, 2015; Wu et al., 2010).

2. Methods

2.1. Data and sample

Data for the current study come from the Substance Abuse and Mental Health Services Administration (SAMHSA)'s National Survey on Drug Use and Health (NSDUH). NSDUH surveys use a multistage area probability sample for each of 50 states and the District of Columbia. Using an annual survey with a cross-sectional study design, NSDUH collects self-report data on the prevalence of mental health and substance use from a random sample of the non-institutionalized U.S. population aged 12 years or older. NSDUH provides national-level estimates of the use of illicit drugs, including nonmedical use of certain prescription drugs, alcohol, and tobacco SAMHSA, 2014a,b.

The current study used public-use-file data from the 2007 through 2014 surveys, the most recent data available to evaluate trends in heroin use and nonmedical use of prescription opioids. The study population was comprised of 447,188 individuals aged 12 or older. The weighted interview response rates for the study period ranged from 71.2% in 2014 to 75.6% in 2009. Sample weights were applied for the analysis to adjust the sampling method and nonresponse, and to represent the findings in the national population. Analyses were conducted using Stata version 14.0 (StataCorp, 2015).

2.2. Measures

All measures used in the analysis are self-reports of drug use collected from NSDUH surveys. The question prompts for each of the measures were the same for every year from 2007 to 2014.

The two dependent variables include *heroin use in the past year* and *nonmedical prescription opioid use in the past year*. The NSDUH survey collected data on opioid use with the following questions: "how long has it been since you last used heroin?" and "how long has it been since you last used any prescription pain reliever that was not prescribed for you or that you took only for the experience or feeling it caused?" The response options we used to estimate opioid use were: (1) past-year use of heroin (1 = yes, 0 = no), and (2) past-year use of nonmedical prescription opioids (1 = yes, 0 = no). Although the use of both substances is not mutually exclusive, we examined these substances separately to assess potential gender differences in patterns of use and risk factors.

The independent variable, *gender*, was measured as a dichotomous variable (1 = men; 0 = women).

Additionally, we adjusted for several covariates that have a documented association with opioid use and that may potentially confound the relation between gender and opioid use (Back et al., 2010; Brady, Back, & Greenfield, 2009; Greenfield et al., 2007). First recognizing the current discourse questioning whether white individuals are at increased risk of nonmedical use of prescription opioids or heroin use, we used a binary variable for *race and ethnicity* (1 = non-Hispanic white, 0 = non-white respondents). *Age* was coded as a continuous variable. *Education level* was captured as a dichotomous variable (1 = high school or below; 0 = some college or above). *Family income* was assessed through two categories: (1) earning less than $20,000 and (2) earning $20,000 or more (reference group). To account for county-size variation in which respondents reside, we included a variable assessing *county size* through three categories: non-metro, small, large (reference group). Moreover, as receipt of mental health treatment may suggest the severity of mental health problems and could serve as a proxy for mental health status, *mental health treatment* was measured as a binary variable assessing whether respondents reported having received any mental health treatment in the past year (1 = yes; 0

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