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# Trends in non-medical prescription opioids and heroin co-use among adults, 2003–2014

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## HIGHLIGHTS

- We assess nationally-representative data on trends in NMPO, heroin and co-use use.
- From 2003 to 2014, prevalence of NMPO declined slightly while heroin and co-use increased.
- Co-use of NMPO and heroin grew 248.17% from 2003 to 2014.
- Prevalence of and growth in co-use differs by demographic, drug use and mental health sub-groups.

## ARTICLE INFO

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## ABSTRACT

**Background:** Patterns in non-medical prescription opioid (NMPO) and heroin use have recently shifted, with evidence that NMPO-only users transition to NMPO and heroin co-use. Co-use is associated with increased risk of morbidity and overdose, highlighting the need for further investigation. This study aims to quantify, describe, and explore trends in co-use.

**Methods:** Using data from the 2003–2014 National Surveys on Drug Use and Health, we compared co-use to NMPO- and heroin-only use across demographic, substance use and mental health characteristics with chi-squared tests. Logistic regression models assessed trends in opioid use overall, and among co-users.

**Results:** From 2003 to 2014, the prevalence of all opioid use (NMPO-only, heroin-only, and co-use) and NMPO-only use decreased 6.08% ( $p < 0.01$ ) and 4.65% ( $p < 0.001$ ), respectively, while prevalence of heroin-only use increased 21.32% (non-significant). Co-use increased 248.17% ( $p < 0.001$ ) overall, and did so in all demographic, substance use, and mental health groups. Demographic, substance use, and mental health characteristics of co-users were more similar to the heroin-only group than to NMPO-only. The highest co-use prevalence was among those: without health insurance (8.72%), aged 26–34 (9.76%), reporting unemployment (12.08%), and with a major depressive episode, psychological distress, and who illicitly use or abuse drugs other than opioids or marijuana in the past year (9.33%, 10.75%, 11.87%, and 16.81%, respectively).

**Discussion:** The increased prevalence of co-use and differences across demographic, substance use, and mental health characteristics highlight the need for targeted prevention and response interventions for this emerging, high-risk group.

## 1. Background

Patterns of non-medical prescription opioid (NMPO) and heroin use have been highly dynamic in recent years, paving the way for co-use of both opioids (Compton, Jones, & Baldwin, 2016). Prescription opioids (POs) and heroin share similarities in the high potential for dependence and the euphoric high provided (National Institute of Drug Abuse, 2014). The rise in NMPO use and associated outcomes is evidenced by 25 million NMPO initiates between 2002 and 2011 and the quadrupling of opioid-related overdoses from 1999 to 2008. It triggered

implementation of various interventions aimed at reducing prescription opioid availability (Dart et al., 2015; Dowell, Haegerich, & Chou, 2016; Kuehn, 2010; Centers for Disease Control and Prevention, 2011; Office of National Drug Control Policy, 2011). Following implementation of these interventions, trends in NMPO use stabilized, but problem NMPO use, including abuse and dependence, increased (Franklin et al., 2015; Han, Compton, Jones, & Cai, 2015; Levy, Paulozzi, Mack, & Jones, 2015). Previously stable rates of heroin use also increased 63% from 2002 to 2013, an increase many attribute to the decreased supply of prescription opioids (POs) (Cicero, Ellis, & Surratt, 2012; Jones, Logan,

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Gladden, and Bohm, 2015; Unick, Rosenblum, Mars, & Ciccarone, 2013). The steepest increase in heroin use was among those who reported NMPO use, suggesting NMPO use may be a gateway to heroin use and subsequent co-use (Jones et al., 2015).

Transitions from NMPO-only use to NMPO and heroin co-use are well-documented in the literature, but studies have not explored the size and characteristics of co-users over time. Recent national studies showed that 80% of heroin initiates reported previous NMPO use and that heroin abuse or dependence is 40 times more likely with concurrent PO abuse or dependence (Jones et al., 2015; Muhuri, Gfroerer, & Davies, 2013). In qualitative studies, NMPO users turned to heroin as a less expensive, more accessible, and similarly effective alternative when faced with opioid dependency and limited PO availability (Canfield et al., 2010; Cicero, Ellis, Surratt, & Kurtz, 2014; Inciardi, Surratt, Cicero, & Beard, 2009; Lipari & Hughes, 2013; Mars, Bourgeois, Karandinos, Montero, & Ciccarone, 2014). A shift in administration route to injection and expansion from NMPO-only use to co-use of both opioids, depending on availability, are also reported (Guarino, Marsch, Deren, Straussner, & Teper, 2015; Kuehn, 2014; Mars et al., 2014; Mateu-Gelabert, Guarino, Jessell, & Teper, 2015). Reduced availability of POs suggests that more NMPO users transitioned and co-use increased, but we lack empirical evidence establishing this trend.

Transition and co-use are concerning for several reasons. First, injection drug use often coincides with heroin use initiation and is more likely among co-users compared to NMPO-only users (Guarino et al., 2015; Kuehn, 2014; Mars et al., 2014; Mateu-Gelabert et al., 2015). This puts co-users at higher risk for HIV and Hepatitis C (Cherubin & Sapira, 1993; Thorpe et al., 2002; Zibbell et al., 2015). Second, co-use is associated with severe comorbidities including other substance use and mental health disorders, compared to NMPO and heroin use alone (Al-Tayyib, Koester, & Riggs, 2017; Fischer, Patra, Cruz, Gittins, & Rehm, 2008; Rigg & Monnat, 2015). Also, poly-drug use is associated with a higher risk of overdose; over half of fatal prescription opioid-related poisonings involved more than one type of drug (Warner, Chen, & Makuc, 2009; Fischer et al., 2008; Jones, Mack, & Paulozzi, 2013). Finally, a large number of NMPO users are susceptible to transition and co-use and may experience stigma and marginalization associated with heroin use if they transition (Cherubin & Sapira, 1993; Han et al., 2015). Stigma and marginalization impede health service utilization and productivity, further driving the health and social burdens related to drug use. These concerns about co-use underscore the need to identify and reach those at risk.

The composition of populations affected by opioid use and related consequences has also evolved, particularly among demographic groups with historically lower rates of use. For example, opioid-related overdose deaths in non-urban counties increased at a rate six-times that of urban counties from 1999 to 2004 (Unick et al., 2013). Additionally, opioid-related hospital admissions increased among Whites at a rate double that of African Americans from 1993 to 2009 (Paulozzi & Xi, 2008). Heroin use increased among women at a rate double that of men, increased among non-Hispanic Whites but decreased among other race/ethnicities, and increased among those with private health insurance and those reporting other illicit substance use from 2002 to 2013 (Jones et al., 2015). Studies have not examined trends in co-use among these groups, thereby hindering our ability to target interventions that prevent and respond to co-use.

Guided by Trend Theory, the goal of this study is to analyze characteristics of co-users and trends in co-use. To our knowledge, existing studies have not explored differences between NMPO-only use and co-use, are limited to cross-sectional analyses, or only focus on dependence, not use (Cicero, Ellis, & Harney, 2015; Fischer et al., 2008; Rigg & Monnat, 2015). Trend Theory emphasizes the importance of frequent examination of drug use trends and individual-level characteristics related to use, as trends are dynamic and incidence is likely to increase in some groups more than others (Agar & Reisinger, 2001). It posits that drug use initiation is more likely among people: 1) marginalized from

power; 2) with access to drugs through a new delivery system; and 3) affected by changes in policies related to drug use. This theoretical framework provides context to recent changes in the subgroups affected by opioid misuse including non-Hispanic Whites, those in non-urban areas, females, and those with health insurance. It also suggests that emerging types of drug use affect those with other substance use and mental health co-morbidities. Given this, an investigation of the demographic, substance use, and mental health characteristics associated with co-use and changes over time is timely.

We applied Trend Theory to examine 12 years of nationally representative data to: 1) describe current opioid use by demographic, substance use, and mental health characteristics; 2) compare differences in these characteristics by opioid-use type (NMPO-only, heroin-only and co-use); and 3) analyze trends in opioid use overall and in co-use. Guided by evidence of transition, we hypothesized that co-use is growing faster than the growth in NMPO- and heroin-only use. We also hypothesized that the growth in co-use will be highest among demographic groups with a recent surge in opioid use and among those with substance use and mental health co-morbidities. Characterizing co-users will inform targeted interventions to prevent this transition and forecast treatment needs. This investigation will also highlight the unique needs of this high risk group that treatment services can address through co-location or integration of treatment with other health and social services (Wu, Woody, Yang, & Blazer, 2011).

## 2. Methods

### 2.1. Data source

We examined data from the 2003–2014 National Surveys on Drug Use and Health (NSDUH) conducted annually by the Substance Abuse and Mental Health Administration (SAMHSA). NSDUH provides nationally representative data regarding illicit drug use on the civilian, non-institutionalized population. Detailed documentation of NSDUH sampling and data collection procedures are provided elsewhere (Center for Behavioral Health Statistics and Quality, 2015). In brief, NSDUH employs a multi-stage stratified probability sampling design. For this study, we combined data from adults (aged 18 and older) in the 2003–2014 public-use files in six 2-year time intervals. Response rates for NSDUH ranged from 82% to 91%, depending on the year. As secondary analyses of publicly available data, this study was exempted from Emory University's IRB approval.

### 2.2. Measures

We grouped respondents into four mutually exclusive outcome categories of opioid use type: no opioid use, NMPO-only use, heroin-only use, and NMPO and heroin co-use. NSDUH defines NMPO use as use of POs without a prescription or use only for the feeling caused by the substance (Substance Abuse and Mental Health Administration, 2002). Consistent with the literature, current use was defined as any use within the past 12 months (Han et al., 2015; Jones et al., 2015). Co-use was defined by the use of both heroin and NMPOs within the past 12 months (Rigg & Monnat, 2015).

We examined demographic, substance use, and mental health correlates of opioid use (Agar & Reisinger, 2001; Han et al., 2015; Han, Gfroerer, & Colliver, 2010; Rigg & Monnat, 2015). Demographic characteristics included: sex (male, female), age (18–25, 26–34, 35–40, 50+), race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic other, Hispanic), rurality (urban [county with city of at least 10,000], non-urban [county without city of at least 10,000]), educational attainment (less than high school, high school graduate/some college, college graduate), employment status (full time, part time, unemployed, not in labor force), marital status (married, divorced/separated/widowed, never married) and health insurance coverage (covered, not covered).

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