

Temporal Trends, Routes of Exposure, and Medical Outcomes Related to Nonmedical Use of Prescription and Illicit Stimulants: An Analysis of the National Poison Data System from 2001 to 2018

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Abstract

BACKGROUND In 2018, ~5.1 million people aged 12 years or older used prescription stimulants nonmedically in the past year. Additionally, overdose deaths involving psychostimulants increased 460% from 2011–2018. Despite widespread nonmedical use (NMU) of prescription and illicit stimulants, the differences in scope and associated-harms between the two classes remains to be fully understood. **PURPOSE** Using data collected from the National Poison Data System (NPDS), this study describes patterns of schedule II (CII) prescription stimulant NMU, compared to illicit stimulants, including temporal trends, routes of exposure, and medical outcomes. **METHODOLOGY** Covering the entire U.S. population, NPDS captures data from calls to U.S. poison control centers made by the public, healthcare professionals, and other individuals regarding exposures to prescription drugs and other substances. This study focused on closed human exposure cases involving NMU (i.e., intentional misuse or abuse) of CII prescription or illicit (i.e., cocaine and methamphetamine) stimulants. NPDS exposure cases involving NMU of prescription and illicit stimulants from 2001–2018 are reported by year and age. Route of exposure and medical outcomes were assessed for single-substance prescription and illicit stimulant NMU exposure cases. **RESULTS** Between 2001–2018, NPDS cases involving NMU of CII stimulants increased by 81%. The increase was largely driven by illicit methamphetamine, not prescription stimulants, which have decreased since 2012. 44.3% of NPDS cases involving NMU of CII prescription stimulants were among persons aged 13–19 years, compared to 11.8% for cocaine and 10.2% for illicit methamphetamine. Approximately 8% of exposure routes mentioned for NMU of CII prescription stimulants were non-oral (nasal/inhalation or injection), compared to ~35% for cocaine and illicit methamphetamine. Common clinical effects were similar for cases involving CII prescription and illicit stimulants: tachycardia, agitation, and hypertension. Severe medical outcomes were more common for illicit versus prescription stimulants. **CONCLUSION** NMU of CII prescription stimulants and illicit stimulants are widespread; however, patterns of use and associated-harms differ in important ways. CII prescription stimulant NMU is common among younger adults but has been declining overall, whereas illicit stimulant use is increasing, occurs more commonly via non-oral routes, and is associated with more severe medical outcomes.

Introduction

- Attention deficit hyperactivity disorder (ADHD) is one of the most commonly diagnosed conditions among children in the United States, and often continues through adulthood
- CII stimulant medications are widely prescribed to treat ADHD
- In 2018, people aged 12 years or older with past-year stimulant use:
 - Prescription stimulant NMU (~5.5 million)
 - Cocaine use (~5.1 million)
 - Methamphetamine use (~1.9 million)
- Overdose deaths involving psychostimulants (prescription and illicit) increased 460% from 2011–2018
- Patterns of CII prescription stimulant NMU, compared to illicit stimulants, including temporal trends, routes of exposure, and medical outcomes are not well understood

Materials and Methods

Data Source: National Poison Data System (2001 to 2018)
Case definition: Closed human exposure cases involving prescription and illicit stimulants (children aged 5 years or younger were excluded; N = 187)
Exposure reasons:

- Intentional – Misuse: “Intentional improper or incorrect use of a substance for reasons other than the pursuit of a psychotropic effect”
- Intentional – Abuse: “Intentional improper or incorrect use of a substance where the victim was likely attempting to gain a high, euphoric effect, or some other psychotropic effect”
- NMU: Defined as Intentional – Misuse or Intentional – Abuse
- Cases involving “Intentional - Suspected Suicide” or “Intentional - Unknown” reasons were excluded.

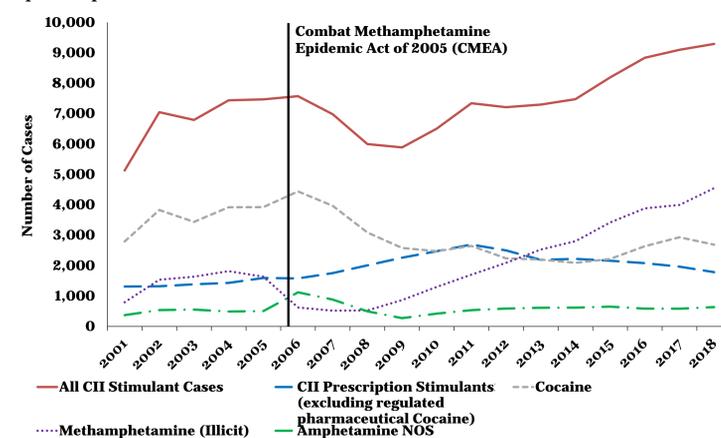
Exposure routes: Oral, inhalation/nasal, injection, other, and unknown
Medical outcomes:

- Minor Effect: Minimally bothersome symptoms without residual effects
- Moderate Effect: Symptoms were more prolonged or more of a systemic nature than minor symptoms; however, no residual effects experienced
- Major Effect: Symptoms were life-threatening or resulted in significant residual disability or disfigurement
- Death: Due to the exposure or as a direct complication of the exposure
- Severe medical outcome: Include moderate, major and death

Search criteria: Generic and product codes found in Micromedex® Solutions and the 2019 AAPCC Pharmaceutical and Non-Pharmaceutical Generic Code List – February 2019 version
Pharmaceutical preparations: Amphetamine (if clearly documented as manufactured prescription product), dextroamphetamine, mixed amphetamine salts, lisdexamfetamine, methylphenidate, dexmethylphenidate, and methamphetamine
Illicit stimulants: Methamphetamine (unless product coded as “prescription methamphetamine”), and cocaine (pharmaceutical or illicit)
Amphetamine Not Otherwise Specified (NOS): Slang terms or codes that do not reference a specific prescription or illicit product

Results and Discussion

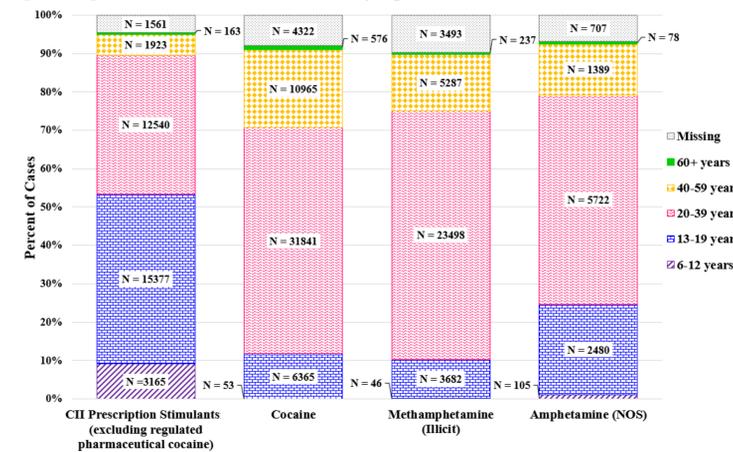
Figure 1. National Poison Data System exposure cases involving NMU of prescription and illicit stimulants, 2001 to 2018



Key Result: Between 2001–2018, cases involving CII stimulants have increased 81%, largely driven by illicit methamphetamine, while cases involving prescription stimulants have remained relatively stable.

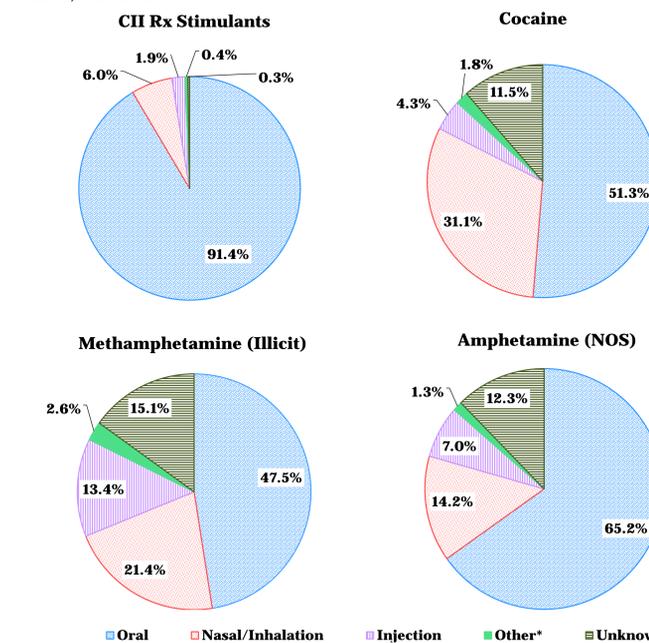
Results and Discussion

Figure 2. National Poison Data System exposure cases involving NMU of prescription and illicit stimulants, by age, 2001 to 2018



Key Result: Cases involving CII prescription stimulants (53.4%) were more likely to involve people < 20 years of age compared to cases involving cocaine (11.9%), methamphetamine (10.3%) or amphetamine NOS (24.7%).

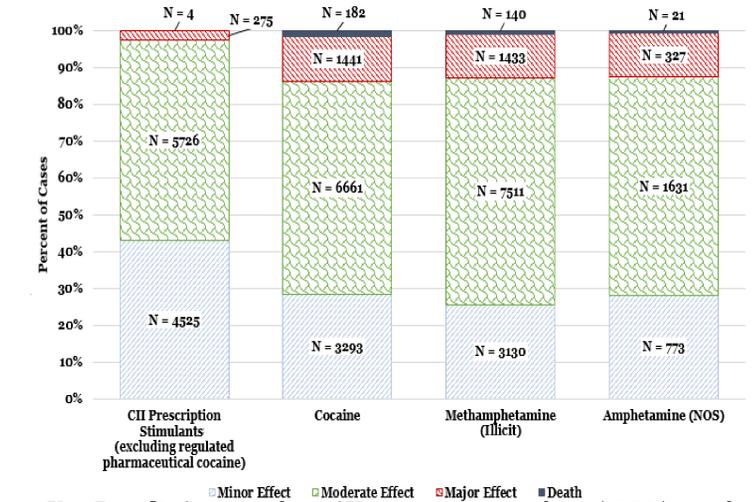
Figure 3. Routes of exposure involved in NMU of prescription and illicit stimulants in National Poison Data System single-substance exposure cases, 2001 to 2018



Other includes aspiration, bite/sting, dermal, ocular, other, otic, rectal, and vaginal.

Key Result: Cases involving CII prescription stimulants (91.4%) were more likely to mention oral NMU compared to cases involving cocaine (51.3%), methamphetamine (47.5%) or amphetamine NOS (65.2%).

Figure 4. National Poison Data System single-substance exposure cases involving NMU of prescription and illicit stimulants, by related medical outcome, 2001 to 2018



Key Result: Cases involving CII prescription stimulants (57.0%) were less likely to result in severe medical outcomes (i.e., moderate, major, or death) compared to cases involving cocaine (71.6%), methamphetamine (74.4%), or amphetamine NOS (71.9%).

Key Result: The most common clinical effects related to both CII prescription and illicit stimulant misuse/abuse cases were tachycardia, agitation, and hypertension. Some potential serious clinical effects (e.g., elevated creatine phosphokinase, hyperthermia, diaphoresis, and confusion) were more commonly seen in illicit stimulant compared to CII prescription stimulant cases.

Conclusions

- National Poison Data System exposure cases involving CII stimulants are increasing, largely driven by illicit stimulants
- Compared to CII illicit stimulants, the number of exposure cases involving CII prescription stimulants have declined slightly and are concentrated among adolescents and younger adults
- Nonoral use was mentioned more often for cases involving CII illicit stimulants than CII prescription stimulants
- Severe medical outcomes were more common among cases involving CII illicit stimulants compared to CII prescription stimulants
- Although nonoral use was more commonly associated with severe medical outcomes, the largest number cases involving severe medical outcomes mentioned oral NMU
- Some limitations of NPDS include: does not capture all NMU or adverse events, case data completeness varies, deaths are under-ascertained, exposures are self-reported, and poison center utilization may vary over time and by drug

Take Home Message

NMU of CII prescription stimulants and illicit stimulants are widespread; however, patterns of use and associated-harms differ in important ways.