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Increases in Methamphetamine Injection among Treatment Admissions in the U.S.

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Abstract

Background: Prior research indicates rising methamphetamine use and harms in the U.S., potentially related to increases in methamphetamine injection. To date, research on trends and correlates of methamphetamine injection is limited.

Methods: Analysis of trends and correlates of methamphetamine injection among treatment admissions among persons aged 12 whose primary substance of use at admission is methamphetamine. Data are from the Treatment Episode Data Set. Analyses includes descriptive statistics, trend analyses, and multilevel multivariable logistic regression.

Results: Primary methamphetamine treatment admissions increased from 138,379 in 2010 to 201,021 in 2019. Among primary methamphetamine admissions, injection as the usual route of use increased from 24,821 (18.0% of admissions) in 2010 to 55,951 (28.2% of admissions) in 2019. Characteristics associated with increased adjusted odds of reporting methamphetamine injection included: males (aOR=1.13, 95% CI=1.10–1.15); admission age 25–34 years (aOR=1.23, 95% CI=1.19–1.28) and 35–44 years (aOR=1.12, 95% CI=1.08–1.17) compared to age 18–24; dependent living (aOR=1.33, 95% CI=1.29–1.37) and homelessness (aOR=1.58, 95% CI=1.54–1.63) compared to independent living; part-time employment (aOR=1.08, 95% CI=1.02–1.14), unemployment (aOR=1.39, 95% CI=1.34–1.44) and not in labor force (aOR=1.43, 95% CI=1.37–1.49) compared to full-time employment; one to four prior treatment admissions (aORs ranging from 1.19 to 1.94) compared to no prior admissions; also reporting use of cocaine

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Dr. Jones lead conceptualization, conducted the analysis, study design, and manuscript drafting. Drs. Compton, Han, Seth, and Baldwin supported drafting and revising the manuscript, developing the research design, and interpreting the results. All authors provided critical revisions to the manuscript and approved the final manuscript as submitted. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, National Institutes of Health, or U.S. Department of Health and Human Services.

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(aOR=1.10, 95% CI=1.05–1.16), heroin (aOR=3.52, 95% CI=3.40–3.66), prescription opioids (aOR=1.61, 95% CI=1.54–1.67), or benzodiazepines (aOR=1.42, 95% CI=1.32–1.52) at treatment admission.

Conclusions: Findings lend further evidence to a resurgence of methamphetamine use that is intertwined with the ongoing opioid crisis in the U.S. Efforts to expand evidence-based prevention, treatment, and response efforts, particularly to populations at highest risk, are urgently needed.

Keywords

methamphetamine; injection drug use; stimulant injection; opioid and methamphetamine

1. Introduction

Use of the addictive and potent stimulant, methamphetamine, is a global concern, including in the U.S. (United Office on Drug and Crime (UNODC), 2021). Reports in the U.S. confirm increases in methamphetamine availability across the country, along with increases to record levels of purity and potency (Drug Enforcement Administration (DEA), 2020, DEA, 2021a, DEA 2021b, UNODC, 2021). This increased availability of methamphetamine has corresponded with a rise in use and harms. The number of persons aged 12 or older in the U.S. reporting past-year methamphetamine use in 2019 was 2.0 million, up from 1.4 million in 2016, and the number of individuals with past-year methamphetamine use disorder increased from approximately 684,000 in 2016 to 1,048,000 in 2019 (Han, 2020). Substance use treatment admissions for methamphetamine also increased approximately 50% between 2010 and 2017 (Jones et al., 2020). In addition, rates of overdose deaths involving psychostimulants other than cocaine, primarily methamphetamine, increased more than four-fold between 2013 and 2019 (Mattson et al., 2021), and provisional estimates indicate a continued rise through February 2022 (Centers for Disease Control and Prevention, 2022).

Accumulating evidence demonstrates that increases in methamphetamine-related harms are intertwined with the ongoing opioid overdose crisis in the U.S. (Jones et al., 2021). Among primary heroin substance use treatment admissions, the percentage reporting methamphetamine use at admission increased from 2.1% of admissions in 2008 to 12.4% in 2017, an average annual increase of 23% per year (Jones et al., 2019). Similarly, among primary methamphetamine treatment admissions, heroin use reported at treatment admission increased nearly four-fold during the same time period (Jones et al., 2020). Additionally, psychostimulant-involved overdose deaths in which opioids were also involved increased by 34% per year from 2010 to 2019 (Hedegaard et al., 2021), in some instances these deaths were likely the result of the increasing adulteration of methamphetamine with highly potent synthetic opioids such as illicitly made fentanyl and fentanyl analogs (Jones et al., 2021). In addition to fatal overdoses, the rate of emergency department visits involving both opioids and psychostimulants increased 14.0% per year from 2011 to 2016 (Hoots et al., 2020) and polydrug overdoses (predominantly comprising opioids and amphetamines) treated in emergency departments increased by 37.3% from 2018–2019 (Liu et al., 2020).

Emerging research suggests the rise in methamphetamine-related harms is attributed, at least in part, to increases in methamphetamine injection, including among persons injecting both methamphetamine and opioids. National, as well as several smaller, U.S. studies in both the general population and in treatment samples have documented increases in methamphetamine injection (Al-Tayyib et al., 2017; Glick et al., 2018; Jones et al., 2020; Glick et al., 2021; Han et al., 2021a;). These trends are consistent with increases in methamphetamine injection seen in other countries, including Vancouver, British Columbia, and Australia (Degenhardt et al., 2017; Back et al., 2020).

Rising rates of methamphetamine injection pose several important public health challenges. Prior research shows that compared to other routes of use, persons who inject methamphetamine are more likely to engage in syringe sharing and reuse and are at greater risk for infectious disease transmission, including HIV, viral hepatitis, skin and soft tissue infections, and infective endocarditis (Binswanger, et al., 2000; Young et al., 2018; Rezaei et al., 2020; Wagner et al., 2021; Yen et al., 2021; Zhao et al., 2021). Increases in rates of viral hepatitis and outbreaks of HIV in the U.S. in recent years are linked to methamphetamine use (Cai et al., 2020; Lyss et al., 2020; Wagner et al., 2021), and a recent meta-analysis estimated that stimulant injection could contribute to 9–29% of new HIV infections and 7–20% of new hepatitis C virus (HCV) infections in the following year (Cepeda et al., 2020).

Methamphetamine injection has also been associated with increased risk for overdose (Yen et al., 2021). This risk may be particularly pronounced among persons injecting both methamphetamine and opioids (Jones et al., 2021). Compared with only injecting heroin (Al-Tayyib et al., 2017), injecting both substances is associated with a nearly 3-fold increase in the risk of having a nonfatal overdose in the past year, greater frequency of drug use, injecting daily, developing a dependence, sharing syringes and other injection equipment, and injecting in the femoral or jugular vein in the past three months (McKetin et al., 2008; Glick et al, 2021).

Although prior research has documented an overall increase in methamphetamine injection in recent years, little is known nationally about demographic groups that are contributing to the increase in methamphetamine injection, and limited research has examined the individual characteristics associated with methamphetamine injection compared to other routes of use. This study uses substance use treatment admissions data in the U.S. to examine trends and correlates of methamphetamine injection between 2010 and 2019. These findings can be used to inform prevention, treatment, and harm reduction efforts based on evolving substance use patterns.

2. Material and methods

2.1 Data source

Treatment admissions data are from the 18,393,313 treatment admissions reported in the 2010–2019 Treatment Episode Data Set (TEDS) public use files (Substance Abuse and Mental Health Services Administration (SAMHSA), 2021). TEDS, reported annually by the Substance Abuse and Mental Health Services Administration, provides information on

substance use treatment admissions among persons aged 12 or older to state-licensed or certified substance use treatment facilities in the U.S. that receive federal public funding. TEDS represents a compilation of data collected through the individual data collection systems of the state agencies for substance use treatment (SAMHSA, 2021). Data from 46 states and the District of Columbia were included in the analysis. Data from South Carolina, Oregon, Washington, and Georgia were excluded due to missing data during at least one year of the study period.

2.2 Substance use measures

TEDS captures data on the primary, secondary, and tertiary substances of use at treatment admission, usual route of administration (i.e., injection, smoking, snorting, oral/other), age of first use for each reported substance, and number of prior treatment admissions, based on self-report by persons at treatment admission. TEDS may include multiple treatment admissions for the same patient. Thus, TEDS data represent admissions, not individual patients. This study focuses on admissions where methamphetamine was the primary substance of use at treatment admission.

2.3 Sociodemographic measures

Sociodemographic measures include: 1) sex; 2) age; 3) race and ethnicity; 4) U.S. census region (based on U.S. Census Bureau definition) of treatment facility; 5) living arrangement: independent living, dependent living (i.e., living in a supervised setting such as a residential institution, halfway house or group home, and children under age 18 living with parents, relatives, or guardians or in foster care), or homelessness (i.e., no fixed address, includes shelters); and 6) employment status: full-time (working ≥ 35 hours per week), part-time (working <35 hours per week), unemployed (looking for work in past 30 days or on layoff from job), or not in labor force.

2.4 Statistical analyses

First, we calculated the annual number of drug-related treatment admissions, the number of primary methamphetamine treatment admissions, and the percentage of drug-related treatment admissions that were primary methamphetamine admissions for each year from 2010 to 2019. Second, the percentage of primary methamphetamine treatment admissions by usual route of use were estimated for each year from 2010 to 2019. Third, the annual number of primary methamphetamine treatment admissions reporting methamphetamine injection as the usual route of use were calculated by sex, age group, race/ethnicity, U.S. census region, number of prior treatment admissions, and whether opioid use (illicit use and/or prescription opioid misuse) were reported at treatment admission as a secondary or tertiary substance of use. In addition, we calculated the percentage of primary methamphetamine treatment admissions within each of these sociodemographic groups who reported methamphetamine injection as the usual route of use.

The Joinpoint regression program (v 4.9.0.0, NCI, 2019) using a log-linear model assessed changes in trends by incorporating point estimates and their standard errors and testing a regression model using a Monte Carlo permutation method with no joinpoints (i.e., no changes in trends occurring during the assessed time period) against alternative models to

determine whether and where more joinpoints (i.e., significant changes in trend) should be added (Kim et al., 2000). We used the Joinpoint calculated average annual percentage change (AAPC) to reflect the overall trend (annual percentage change, on average) during the study period (i.e., 2010–2019).

Finally, using 2019 data, a multilevel multivariable logistic regression model was used to examine characteristics associated with methamphetamine injection compared to non-injection routes of use among primary methamphetamine admissions. Variables included in the multivariable model were sex, age group, race and ethnicity, U.S. census region, living arrangement, employment status, age of first methamphetamine use, number of prior treatment admissions, and other substances reported at treatment admission. In the model, the state of an admitting treatment facility was included as a level two random intercepts parameter to control for the similarity of admissions within the same state. Multicollinearity was assessed using variance inflation factors and was not identified in the final models. Data analyses were conducted with STATA version 15.0 (Stata Corp. College Station, TX). For all analyses, $P < .05$ (2-tailed) was considered statistically significant.

3. Results

3.1 Trends in number of drug-related treatment admissions, primary methamphetamine admissions, and percentage of drug-related admissions that were primary methamphetamine admissions.

Drug-related treatment admissions where methamphetamine was not the primary substance of use remained stable during the study period with 1,361,233 admissions in 2010 and 1,146,234 admissions in 2019. The Average Annual Percentage Change (AAPC) was -1.1 (95% CI: -2.4 – 0.2) per year. In contrast, primary methamphetamine treatment admissions increased from 138,379 admissions in 2010 to 201,021 admissions in 2019; AAPC= 5.0 (95% CI: 2.1 – 8.1). The percentage of drug-related treatment admissions where methamphetamine was the primary substance of use increased from 9.2% of admissions in 2010 to 14.9% of admissions in 2019; AAPC= 5.9 (95% CI: 4.1 – 7.6).

3.1 Trends in number and percentage of primary methamphetamine treatment admissions reporting methamphetamine injection

Among primary methamphetamine treatment admissions, admissions reporting injection as the usual route of use increased from 24,821 admissions in 2010 to 55,951 in 2019; admissions reporting smoking methamphetamine as their usual route of use increased from 96,866 admissions in 2010 to a peak of 132,426 admissions in 2017 before declining to 115,439 admissions in 2019 (Figure 1). Between 2010–2019, the Average Annual Percentage Change (AAPC) for number of primary methamphetamine treatment admissions reporting methamphetamine injection was 8.9 (95% CI: 6.7 – 13.1) per year (Table 1).

The percentage of primary methamphetamine treatment admissions reporting injection as the usual route of use increased from 18.0% of admissions in 2010 to 28.2% in 2019; the percentage of admissions reporting smoking methamphetamine as their usual route of use declined from 70.3% of admissions in 2010 to 59.0% in 2019 (Figure 2). Between 2010

to 2019, the AAPC for the percentage of primary methamphetamine admissions reporting injection was 5.2 (95% CI: 3.5–6.9) per year (Table 1).

Methamphetamine injection among primary methamphetamine treatment admissions increased among almost all demographic groups (Table 1). Among females, the number reporting methamphetamine injection increased from 11,293 in 2010 to 23,906 in 2019 (AAPC=9.0; 95% CI: 5.6–12.4), and the percentage of primary methamphetamine treatment admissions reporting injection also increased, from 17.8% in 2010 to 27.7% in 2019 (AAPC=4.6; 95% CI: 3.9–5.4). Among males, methamphetamine injection admissions increased from 13,522 to 31,996 (AAPC=10.5; 95% CI: 7.4–13.7), and the percentage reporting methamphetamine injection increased from 18.2% to 28.5% (AAPC=5.2; 95% CI: 3.4–7.1). Among age groups, persons aged 25–34 had the largest number (25,263) and percentage (31.3%) of primary methamphetamine treatment admissions reporting methamphetamine injection in 2019, followed by persons aged 35–44 (16,697 and 28.2%) and 18–24 (7,085 and 29.3%).

Among racial and ethnic groups, admissions of non-Hispanic White persons accounted for the largest number of admissions reporting methamphetamine injection in 2019 (43,426), with 32.8% of primary methamphetamine treatment admissions reporting methamphetamine injection (Table 1). Admissions of non-Hispanic American Indian/Alaska Native persons had the highest percentage reporting methamphetamine injection (34.8%). The largest AAPCs for number of primary methamphetamine admissions reporting methamphetamine injection were found among admissions of non-Hispanic Black (AAPC=16.4; 95% CI: 12.3–20.8) and non-Hispanic American Indian/Alaska Native (AAPC=16.4; 95% CI: 12.9–20.0) persons during 2010–2019.

The number and percentage of primary methamphetamine treatment admissions reporting methamphetamine injection increased among those who were entering substance use treatment for the first time as well as those that had prior treatment admissions (Table 1). Among admissions with no prior treatment, the number reporting methamphetamine injection increased from 7,661 in 2010 to 21,212 in 2019 (AAPC=13.2; 95% CI: 11.4–15.0). The percentage of admissions reporting methamphetamine injection increased in an incremental stepped manner as the number of prior treatment admissions increased. For example, in 2019, it increased from 21.3% for those with no prior treatment admissions to 41.1% for those with four or more prior admissions.

Among primary methamphetamine treatment admissions not reporting opioid use, the number of admissions reporting methamphetamine injection increased from 21,086 in 2010 to 40,637 in 2019 (AAPC=8.1; 95% CI: 5.0–11.3). Among those reporting opioid use at treatment admission, the number reporting methamphetamine injection increased from 3,735 in 2010 to 15,314 in 2019 (AAPC=16.2; 95% CI: 12.1–20.5). In 2019, the percentage of primary methamphetamine treatment admissions reporting methamphetamine injection was higher (51.1%) among those who also reported opioid use at treatment admissions compared to those who did not report opioid use (24.1%).

3.2 Multilevel multivariable logistic regression analysis

Among primary methamphetamine treatment admission in 2019, prevalence estimates and treatment admission characteristics associated with methamphetamine injection are found in Table 2. Characteristics associated with increased adjusted odds of reporting methamphetamine injection at treatment admission among primary methamphetamine treatment admissions included: males compared to females [adjusted odds ratio (aOR), 1.13, 95% CI, 1.10–1.15]; persons aged 25–34 (aOR, 1.23, 95% CI, 1.19–1.28) and 35–44 (aOR, 1.12, 95% CI, 1.08–1.17) compared to those aged 18–24; dependent living (aOR, 1.33, 95% CI, 1.29–1.37) and homelessness (aOR, 1.58, 95% CI, 1.154–1.63) compared to independent living; part-time employment (aOR, 1.08, 95% CI, 1.02–1.14) and unemployed (aOR, 1.39, 95% CI, 1.34–1.44) and not in labor force (aOR, 1.43, 95% CI, 1.37–1.49) compared to full-time employment; one to four or more prior treatment admissions (aORs ranging from 1.19 to 1.94) compared to no prior treatment admissions; and reporting the use of the following substances at treatment admission: cocaine (aOR, 1.10, 95% CI, 1.05–1.16), heroin (aOR, 3.52, 95% CI, 3.40–3.66), prescription opioids (aOR, 1.61, 95% CI, 1.54–1.67), or benzodiazepines (aOR, 1.42, 95% CI, 1.32–1.52).

4. Discussion

Among primary methamphetamine treatment admissions across 46 states in the U.S., we found the number of admissions reporting methamphetamine injection more than doubled over the past decade, resulting in more than 1 in 4 admissions reporting methamphetamine injection as their usual route of use by 2019. This shift towards injection of methamphetamine was accompanied by a decline in smoking methamphetamine during 2010–2019. Increases in methamphetamine injection were quite widespread and impacted diverse populations, in that they were found among both men and women, nearly all age groups, all racial and ethnic groups, and across all regions of the U.S. In addition, increases in methamphetamine injection were seen among persons entering treatment for the first time as well as those who had prior substance use treatment admissions. Indeed, the largest increase was found among persons entering treatment for the first time, increasing 13% per year on average during 2010–2019. These findings are consistent with a recent study of community-dwelling adults showing an increase in the number and diversity of populations using methamphetamine as well as higher risk patterns of methamphetamine use in the U.S. between 2015 and 2019 (Han et al., 2021a). Trends in overdoses involving psychostimulants with abuse potential other than cocaine – largely methamphetamine – also mirror those observed with methamphetamine injection treatment admissions after 2010 (Hedegaard et al., 2021; Hoots et al., 2020; Mattson et al., 2021). Notably, non-fatal and fatal overdoses involving psychostimulants have increased markedly during this time period with significant increases seen among multiple demographic groups (Hedegaard et al., 2021; Hoots et al., 2020; Kariisa et al., 2021; Liu et al., 2020; Mattson et al., 2021; O’Donnell et al., 2019; Vivolo-Kantor et al., 2020). In addition, increases in psychostimulant-involved overdose deaths have been documented across geographic regions in the U.S. with the Northeast, Midwest, and South seeing the largest increases since 2013 (Cano et al., 2021; Mattson et al., 2021), consistent with the geographic trends for rising methamphetamine injection found

in this study and drug supply data showing increased methamphetamine availability across the U.S. (DEA, 2020, DEA, 2021a, DEA 2021b).

Our results also add to the growing research documenting the relationship between rising methamphetamine use and the ongoing opioid crisis. Among primary methamphetamine treatment admissions, those also reporting opioid use at treatment admissions had higher rates of methamphetamine injection (51% in 2019) compared to those not reporting opioid use (24.1%); however, both groups experienced significant increases in the number of admissions and percentage of admissions reporting methamphetamine injection during 2010–2019. These findings are consistent with increases in fatal overdoses involving psychostimulants with and without opioid co-involvement, including among both sexes, in all racial and ethnic groups, and most age groups with males, non-Hispanic Black persons, American Indian and Alaskan Native persons, and persons aged 25–54 years old particularly impacted since 2011 (Han et al., 2021b; Kariisa et al., 2021; O'Donnell et al., 2019). Furthermore, overdose deaths co-involving psychostimulants and opioids began occurring at a greater rate than overdoses without co-involvement after 2017 with illicitly manufactured fentanyl and fentanyl analogs being a primary driver of these increases (Hedegaard et al., 2021; O'Donnell et al., 2019). Taken together, these findings suggest that while the resurgence of methamphetamine is intertwined with the opioid crisis, it is also occurring among persons who are not using opioids.

Our study carries important implications for public health and clinical practice. The rise in injection as the usual route of use underscores the need for strategies to address both overdose and infectious disease prevention. Expansion of interventions to identify and link persons using methamphetamine to evidence-based treatment and support services along with community-based harm reduction interventions are urgently needed. This should include strategies aimed at reducing drug use-related harms among PWID such as comprehensive syringe services programs (SSPs) that provide sterile syringes, needles, and injection equipment, screening for and linkage to substance use and infectious disease prevention and treatment services, naloxone, fentanyl test strips, and overdose prevention education (Broz et al., 2021).

The increases in methamphetamine injection also foreshadow challenges with methamphetamine treatment and recovery efforts moving forward. Prior research suggests treatment outcomes for methamphetamine use are suboptimal for persons who inject compared to those who smoke or snort (Rawson et al., 2007). Given the lack of medication-based treatment for methamphetamine use disorder, scaling up the provision of multiple treatment modalities, such as combining contingency management, which uses incentives for behavior change, and community reinforcement approach or cognitive behavioral therapy (De Crescenzo et al., 2018) is essential for achieving optimal outcomes. These efforts should be done in tandem with the expansion of recovery support services such as stable housing, food, and transportation. Given the large annual average increases seen among certain racial and ethnic minority groups such as non-Hispanic black persons and non-Hispanic American Indian and Alaska Native persons, it will be critical that efforts to expand access to prevention, treatment, harm reduction, and support services are implemented in a manner that reduces historical inequities in access to these services.

Although adolescents aged 12–17 in our study accounted for a small proportion of primary methamphetamine admissions reporting injection, the percentage of admissions injecting methamphetamine in this age group doubled over the study period. Coupled with the finding of a strong dose-response relationship showing increased risk of methamphetamine injection among individuals who initiated methamphetamine use at earlier ages highlights the importance of substance use prevention programs as a key long-run strategy for reducing methamphetamine use and its related health and social consequences. Universal substance use prevention programs that focus on youth social-emotional learning skills and strengthening other protective factors and reducing risk factors have demonstrated lasting protective effects in reducing substance use, including both methamphetamine and opioid use (Spoth et al., 2006; Spoth et al., 2007; Spoth et al., 2017). These evidence-based programs can be a central component of efforts to prevent substance use during youth and adulthood in communities.

Given the marked increases in overall treatment admissions as well as the proportion of persons admitted who report methamphetamine injection, several major areas of research are needed. The first and most acute need is for the development of more effective treatments for methamphetamine use disorder (Paulus et al., 2020). While recent work suggests that combinations of bupropion and naltrexone may be useful in methamphetamine use disorder treatment (Trivedi et al., 2021), work is needed to confirm these initial findings and develop other medications. In addition, research and policy development is needed in the U.S. to allow widespread implementation of contingency management approaches which have shown consistent positive impacts but have not been widely used and have known implementation and sustainability challenges (Higgins et al., 2019; Murphy et al., 2015; Petry et al., 2017). Given the particular increases in injection methamphetamine use, research is urgently needed on its impact on HIV and other infectious disease transmission along with testing of approaches to reducing the spread of infectious diseases (Groves et al., 2020).

The study is subject to several limitations. First, TEDS comprises a significant proportion of all admissions to substance use treatment in the U.S.; however, it does not capture every admission. TEDS includes admissions at facilities licensed or certified by the state substance abuse agency (SSAs) or administratively tracked for other reasons. States may include or exclude reporting by certain treatment sectors such as detoxification facilities and programs in the criminal justice system, and this may change over time. Some agencies regulate private facilities, methadone clinics, and/or individual practitioners and require them to report TEDS data. Second, the primary, secondary, and tertiary substances of use reported to TEDS are those that led to the treatment episode, not necessarily a complete enumeration of all drugs used. Third, TEDS is based on self-report data and thus may be subject to social desirability and recall bias. Fourth, these data should not be interpreted as prevalence estimates of drug use as TEDS captures admissions to treatment, not the general population using substances; the characteristics and patterns of methamphetamine use among treatment admissions may differ from those using methamphetamine but not engaging in substance use treatment. Fourth, TEDS admissions data do not include treatment outcomes or length of stay information; thus, we were not able to examine differences in these outcomes by route of use. Fifth, TEDS does not capture information on sexual orientation or identity.

Sixth, TEDS may include multiple treatment admissions for the same patient. Thus, TEDS data represent admissions not individual patients. Finally, data from TEDS after 2019 are not yet available; thus, we are not able to explore the impact of the COVID-19 pandemic on treatment admissions, methamphetamine use, or methamphetamine injection. The currently available mortality data indicate that deaths involving psychostimulants (e.g., methamphetamine) both with and without opioid co-involvement increased during the pandemic and have continued to increase through at least February 2022 (CDC, 2022; Hedegaard et al., 2022). Future research should examine the impact of the COVID-19 pandemic on methamphetamine-related treatment and use patterns.

5. Conclusions

Over the past decade, reporting methamphetamine injection as the usual route of use among persons entering treatment for methamphetamine use has more than doubled. Importantly, increases were seen among virtually all demographic groups examined and across all regions in the U.S. These findings lend further evidence to a resurgence of methamphetamine use in the U.S. that is impacting more diverse populations, intertwined with the ongoing opioid crisis, and characterized by riskier patterns of use. Efforts are urgently needed to rapidly expand evidenced-based prevention, treatment, and response efforts, particularly to populations at highest risk.

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Highlights

- Treatment admissions reporting methamphetamine injection doubled over past decade
- Over 1 in 4 methamphetamine treatment admissions reported injection as usual route in 2019
- Increases in methamphetamine injection were found among nearly all demographic groups
- Efforts to expand prevention, treatment, and response efforts are urgently needed

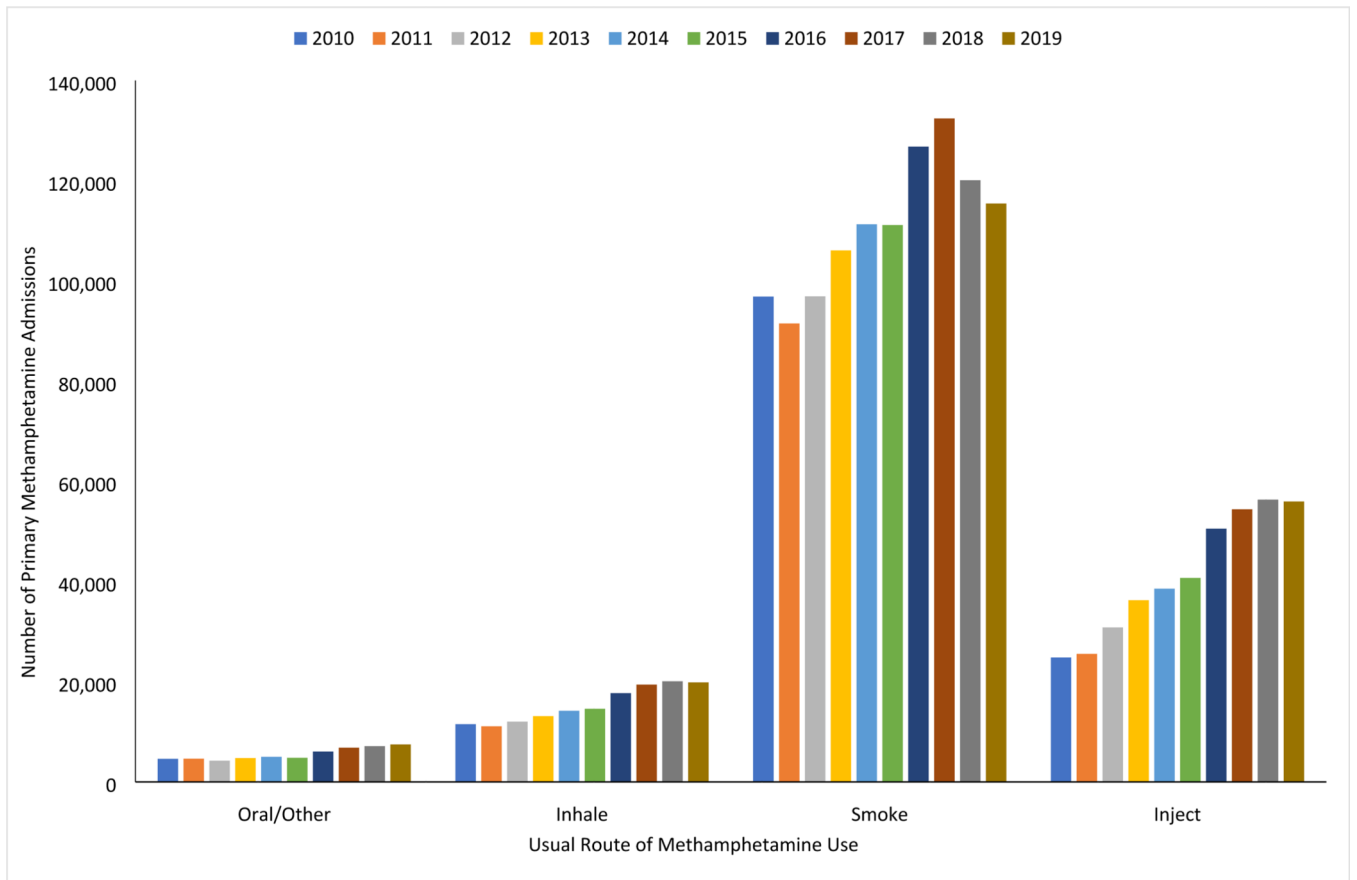


Figure 1. Number of Primary Methamphetamine Treatment Admissions by Route of Use, 2010–2019

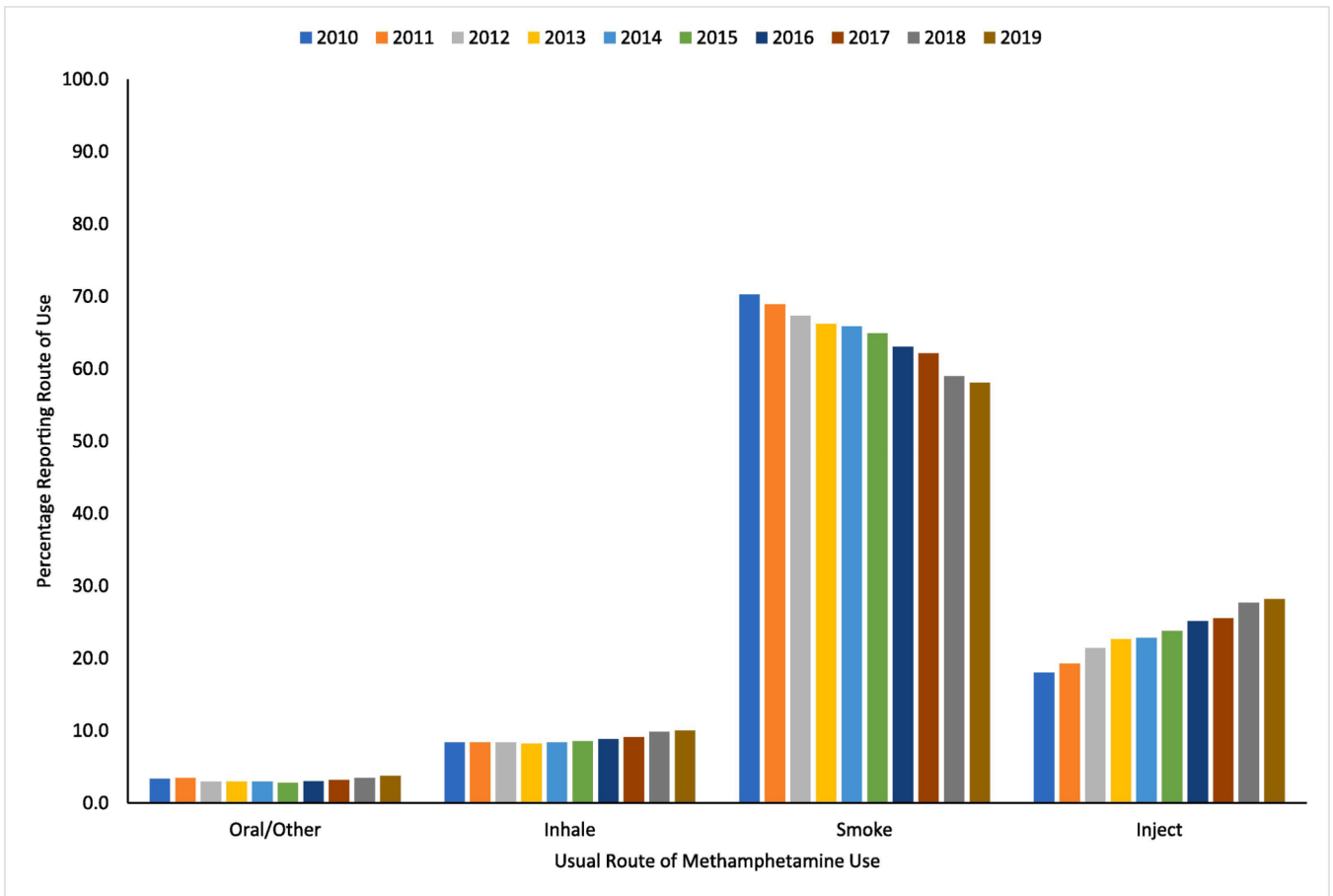


Figure 2. Percentage of Primary Methamphetamine Treatment Admissions by Route of Use, 2010–2019

Table 1.

Trends in Number and Percentage of Primary Methamphetamine Treatment Admissions Reporting Methamphetamine Injection Overall and by Demographic Group, 2010–2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Annual Percent Change, 2010–2019 % (95% CI)	
Overall	Number	24,821	25,534	30,800	36,263	38,562	40,703	50,542	54,392	55,951	9.8 (6.7–13.1)	
	Percentage	18.0	19.2	21.4	22.6	22.8	23.8	25.1	25.5	27.7	28.2	5.2 (3.5–6.9)
Sex												
Female	Number	11,293	11,818	13,887	16,496	17,305	17,724	21,927	23,554	24,574	23,906	9.0 (5.6–12.4)
	Percentage	17.8	18.9	20.8	22.5	22.6	22.9	24.5	25.1	27.1	27.7	4.6 (3.9–5.4)
Male	Number	13,522	13,704	16,898	19,761	21,234	22,962	28,601	30,813	31,720	31,996	10.5 (7.4–13.7)
	Percentage	18.2	19.6	21.9	22.8	23.0	24.5	25.7	25.9	28.2	28.5	5.2 (3.4–7.1)
Age												
12–17	Number	148	183	255	311	286	288	303	308	238	171	5.1 (–4.3–15.4)
	Percentage	5.8	6.9	8.9	9.2	9.8	10.5	10.3	12.0	13.8	12.0	9.7(3.7–16.0)
18–24	Number	3,929	4,296	5,355	6,474	6,924	7,067	8,203	8,482	8,028	7,085	6.8 (3.2–10.6)
	Percentage	16.7	19.9	22.5	24.2	25.7	26.4	27.1	28.2	29.8	29.3	6.4 (5.1–7.7)
25–34	Number	10,494	10,757	13,072	15,474	16,722	17,655	22,422	24,445	25,542	25,263	10.9 (7.6–14.3)
	Percentage	19.1	20.0	22.3	24.0	24.4	25.1	27.1	27.7	30.6	31.3	5.4 (4.7–6.1)
35–44	Number	6,968	6,868	8,052	9,187	9,615	10,377	13,374	14,616	15,863	16,697	11.5 (9.9–13.1)
	Percentage	19.0	20.1	22.2	23.1	22.3	23.7	25.1	25.3	27.4	28.2	4.1 (3.4–4.9)
45–54	Number	2,907	3,030	3,626	4,186	4,330	4,523	5,229	5,370	5,392	5,388	7.1 (4.6–9.7)
	Percentage	16.5	17.2	18.7	19.2	19.2	20.0	20.4	20.1	21.2	21.6	3.1 (1.7–4.5)
55 or older	Number	375	400	440	631	685	793	1,011	1,171	1,267	1,347	16.3 (12.3–20.4)
	Percentage	15.7	15.3	14.1	16.1	14.2	15.9	16.1	15.7	15.9	16.3	0.9 (–0.2–2.0)
Race/Ethnicity												
White, NH	Number	20,291	20,555	24,661	28,703	29,601	31,268	38,266	41,536	43,550	43,426	9.7 (8.0–11.5)
	Percentage	24.8	25.9	28.5	30.1	30.2	31.0	32.2	32.3	32.6	32.8	3.4 (2.4–4.3)
Black, NH	Number	361	497	560	813	938	1,081	1,302	1,568	1,544	1,629	16.4 (12.3–20.8)
	Percentage	7.3	9.8	9.9	11.7	11.7	12.7	12.8	13.4	15.8	16.0	7.1 (5.4–8.9)
AI/AN, NH	Number	611	657	855	996	1,189	1,423	1,941	2,065	2,360	2,154	16.4 (12.9–20.0)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Annual Percent Change, 2010–2019 % (95% CI)
Percentage	23.5	25.0	28.9	29.2	30.6	34.0	36.1	35.0	34.6	34.8	4.1 (2.8–5.5)
Number	200	169	205	293	312	313	409	398	356	396	9.0 (2.5–15.9)
Percentage	4.7	4.0	4.7	6.5	6.5	6.5	8.1	8.3	10.5	12.4	12.3 (9.5–15.2)
Number	634	648	735	928	1,152	1,130	1,427	1,447	1,331	1,431	10.0 (5.7–14.4)
Percentage	14.6	15.5	16.6	18.8	20.9	20.6	22.3	22.0	22.8	24.4	5.9 (4.3–7.5)
Number	2,324	2,569	3,304	3,979	4,749	4,690	6,078	6,196	5,550	5,231	9.6 (5.7–13.6)
Percentage	6.6	7.7	9.3	9.9	10.8	11.1	12.4	12.6	15.2	15.0	8.4(6.1–10.7)
U.S. Census Region											
Number	198	239	308	413	538	606	891	1,386	1,980	3,107	35.3 (32.8–37.9)
Percentage	21.1	21.9	25.8	27.5	29.7	29.5	31.1	34.6	35.2	37.3	5.8 (4.9–6.7)
Number	5,898	5,704	7,688	9,326	10,237	11,728	15,806	17,941	21,661	22,745	17.9 (15.9–20.0)
Percentage	30.1	29.5	32.5	32.9	32.8	33.6	34.9	34.6	34.4	34.3	1.5 (0.5–2.5)
Number	3,728	4,401	4,934	6,337	6,194	7,982	10,517	12,440	13,993	14,570	17.5 (15.0–20.0)
Percentage	32.7	33.2	36.9	38.8	36.9	38.0	38.6	37.7	36.1	34.3	0.2 (–1.5–1.9)
Number	14,997	15,190	17,870	20,187	21,593	20,387	23,328	22,625	18,696	15,529	0.9 (–2.6–4.4)
Percentage	14.2	15.3	16.9	17.7	18.1	18.0	18.6	18.2	19.4	19.0	3.3 (2.2–4.4)
Prior Treatment Admissions											
Number	7,661	7,921	9,401	11,190	12,133	12,842	16,608	17,543	21,593	21,212	13.2 (11.4–15.0)
Percentage	13.7	14.7	16.5	17.7	18.1	19.2	21.2	21.3	21.7	21.3	4.9 (3.6–6.2)
Number	5,877	6,130	7,384	8,554	8,955	9,364	11,507	12,349	10,658	9,644	5.6 (2.3–9.0)
Percentage	16.7	17.7	20.0	21.2	21.3	22.4	24.1	24.1	28.9	30.5	6.4 (5.1–7.7)
Number	3,983	3,834	4,659	5,488	5,571	5,710	6,926	7,320	6,790	6,310	5.6 (1.5–9.9)
Percentage	20.7	21.1	23.6	24.9	24.7	24.9	25.7	26.6	31.3	32.2	4.6 (3.2–6.1)
Number	2,321	2,595	3,020	3,423	3,719	3,813	4,516	5,005	4,322	4,290	6.4 (3.8–9.0)
Percentage	23.3	26.6	26.7	27.7	27.9	28.1	28.5	30.3	34.7	36.5	4.3 (2.4–6.2)
Number	4,604	4,855	6,099	7,329	7,867	8,570	10,229	10,942	10,710	11,969	11.0 (8.0–14.1)
Percentage	31.1	32.0	34.1	35.0	34.5	35.0	34.8	35.2	40.8	41.1	2.8 (1.6–4.1)
Opioid Use At Admission											
Number	21,086	21,081	24,863	28,689	30,328	31,577	38,614	40,863	41,351	40,637	8.1 (5.0–11.3)

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average Annual Percent Change, 2010–2019 % (95% CI)
Percentage	16.3	17.1	18.8	19.7	19.9	20.6	21.7	21.9	23.7	24.1	4.3 (3.3–5.3)
Number	3,735	4,453	5,937	7,574	8,234	9,126	11,928	13,529	14,979	15,314	16.2 (12.1–20.5)
Percentage	46.1	47.6	49.8	51.1	50.0	50.0	51.9	51.7	51.0	51.1	1.2 (0.1–2.3)

Table 2.

Characteristics Associated with Reporting Methamphetamine Injection at Treatment Admission among Primary Methamphetamine Treatment Admissions in 2019

	Unadjusted Prevalence of Methamphetamine Injection *	Adjusted Odds Ratio aOR (95% CI)
Sex		
Female	27.7%	Ref
Male	28.5%	1.13 (1.10–1.15)
Age		
12–17	12.0%	0.32 (0.27–0.38)
18–24	29.3%	Ref
25–34	31.3%	1.23 (1.19–1.28)
35–44	28.2%	1.12 (1.08–1.17)
45–54	21.6%	0.88 (0.84–0.93)
55 or older	16.3%	0.69 (0.64–0.74)
Race/Ethnicity		
White, NH	32.8%	Ref
Black, NH	16.0%	0.49 (0.46–0.52)
American Indian/Alaska Native, NH	34.8%	1.00 (0.93–1.06)
Asian/Pacific Islander, NH	12.4%	0.38 (0.34–0.43)
Other, NH	24.4%	0.79 (0.74–0.85)
Hispanic	15.0%	0.53 (0.51–0.55)
Census Region		
Northeast	37.3%	Ref
Midwest	34.3%	1.03 (0.73–1.46)
South	34.3%	1.19 (0.85–1.66)
West	19.0%	0.92 (0.65–1.32)
Living Status		
Independent	26.5%	Ref
Dependent	31.0%	1.33 (1.29–1.37)
Homeless	30.8%	1.58 (1.54–1.63)
Employment Status		
Full-time	22.7%	Ref
Part-time	22.5%	1.08 (1.02–1.14)
Unemployed	31.9%	1.39 (1.34–1.44)
Not in Labor Force	26.6%	1.43 (1.37–1.49)
Age First Use of Methamphetamine		
14 or younger	31.8%	Ref
15–17	30.7%	0.84 (0.81–0.87)
18–20	28.8%	0.72 (0.70–0.76)

	Unadjusted Prevalence of Methamphetamine Injection *	Adjusted Odds Ratio aOR (95% CI)
21–24	28.0%	0.68 (0.65–0.71)
25 or older	23.9%	0.55 (0.53–0.57)
Prior treatment admissions		
None	21.3%	Ref
One	30.5%	1.19 (1.15–1.23)
Two	32.2%	1.34 (1.29–1.40)
Three	36.5%	1.61 (1.53–1.69)
Four or more	41.1%	1.94 (1.87–2.01)
Other Substances Reported At Admission		
Alcohol	27.5%	1.00 (0.97–1.03)
Marijuana	28.6%	0.97 (0.95–0.99)
Cocaine	31.2%	1.10 (1.05–1.16)
Heroin	56.0%	3.52 (3.40–3.66)
Prescription Opioids	44.8%	1.61 (1.54–1.67)
Benzodiazepines	43.7%	1.42 (1.32–1.52)

* among primary methamphetamine admissions

NH=Non-Hispanic

Bold text indicates statistically significant result