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## Racial and ethnic differences in heroin, methamphetamine, and cocaine use, treatment, and mortality trends in three national data sources –United States, 2010-2019

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### Abstract

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**Background:** As overdose deaths continue to rise, public health officials need comprehensive surveillance data to design effective prevention, harm reduction, and treatment strategies. Disparities across race and ethnicity groups, as well as trends in substance use, treatment, or overdose deaths, have been examined individually, but reports rarely compare findings across multiple substances or data sources.

**Objective:** To provide a broad assessment of the overdose crisis, we describe trends in substance use, treatment, and overdose mortality across racial and ethnic groups for multiple substances.

**Research Design:** We conducted a longitudinal, cross-sectional analysis comparing trends.

**Subjects:** We identified self-reported use from the National Survey on Drug Use and Health, substance use treatment admissions from the Treatment Episode Data Set-Admissions, and overdose deaths from the CDC's Multiple Cause of Death files.

**Measures:** We measured rates of substance use, treatment, and deaths involving heroin, methamphetamine, and cocaine among United States adults from 2010-2019.

**Results:** Heroin, methamphetamine, and cocaine use increased though not all changes were statistically significant. Treatment admissions indicating heroin and methamphetamine increased while admissions indicating cocaine decreased. Overdose deaths increased among all groups: methamphetamine (257%-1,115%), heroin (211%-577%), and cocaine (88%-259%). Changes in rates of use, treatment, and death for specific substances varied by racial and ethnic group.

**Conclusions:** Substance use, treatment, and overdose mortality changed considerably, though not always equivalently. Identifying diverging trends in substance-related measures for specific substances and racial and ethnic groups can inform targeted investment in treatment to reduce disparities and respond to emerging changes in the overdose crisis.

## Keywords

Data triangulation; overdose; substance use treatment; trends

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## Introduction

In the United States (US), the number of drug overdose deaths have risen over 160% since 2010, exceeding 100,000 for the first time in 2021.<sup>1</sup> As overdose deaths climb, public health officials need data-driven indicators to design effective prevention, harm reduction (e.g., naloxone distribution), treatment and recovery strategies.<sup>2</sup> Primary sources commonly used to monitor substance-related trends and inform a public health response in the US include self-reported substance use surveys,<sup>3</sup> substance use treatment admission data,<sup>4</sup> and death records.<sup>5</sup> While each data set captures a different aspect of the overdose crisis, the three data sets are rarely used together to triangulate the relationship between use, treatment, and death and how these may vary across racial and ethnic populations.

The benefits of triangulating data from multiple sources has improved prevalence estimates and informed care delivery for a range of chronic conditions.<sup>6,7</sup> In the US, modeling studies describe the anticipated impact of community-level interventions on overdose fatalities,<sup>8</sup> but national data remain limited. In Canada, the prevalence of substance use and treatment

availability is informed by the triangulation of surveillance sources.<sup>9,10</sup> Triangulating data helped identify specific gaps in treatment and resulted in increased overall funding and a realignment of resources to increase residential treatment services.<sup>9</sup> However, comparisons across multiple surveillance sources to describe the overdose crisis in the US are limited. Surveillance reports have combined findings from National Survey on Drug Use and Health (NSDUH) and Treatment Episode Data Set – Admissions (TEDS-A) to assess substance use among different age groups, but these findings were not disaggregated by race and ethnicity.<sup>11</sup> Recent studies compared the rates of methamphetamine and cocaine use and overdose deaths across a range of demographic characteristics.<sup>12,13</sup> Another recent study described diverging trends in treatment admissions and overdose deaths indicating opioids and/or stimulants across race/ethnicity and gender groups.<sup>14</sup> By comparing trends from two national data sources these studies explicitly identify important differences between substance use or treatment and overdose deaths by race and ethnicity.

Extant literature on substance use-related racial and ethnic group disparities in the US has largely focused on individual substances and single data sources.<sup>15-21</sup> These studies identified important disparities, and when taken together suggest certain groups maybe experiencing widening treatment gaps. For example, Black men and women both experienced the largest annual percent increase in methamphetamine-involved overdose deaths but the proportion of substance use treatment admissions indicating methamphetamine remains substantially lower for Black individuals compared to other groups.<sup>16,17</sup> Similarly, Black and White individuals reported similar rates of cocaine use, but Black individuals experienced substantially higher overdose rates between 2006 and 2019.<sup>18,19</sup> However, an approach which compares trends across all three indicators (e.g., use, treatment, and overdose death) for multiple substances may illuminate key trends in the US overdose crisis and provide policymakers with information needed to make decisions about targeted investments for specific populations.

To provide a broader view of the overdose crisis, we examined data across the NSDUH, TEDS-A, and the CDC's Wide-ranging Online Data for Epidemiologic Research (WONDER) Multiple Cause of Death files. We described trends in substance use, treatment admissions, and overdose mortality for heroin, methamphetamine, and cocaine among racial and ethnic groups between 2010 and 2019. Triangulating these data provides a more complete understanding of the overdose crisis to support substance use policy. Use, treatment, and mortality trends may change differentially across specific substances, or racial and ethnic groups. For example, differences in trends between use and treatment across race and ethnicity groups may indicate critical treatment gaps for specific populations. Differences in trends between use and overdose deaths across substances and/or race and ethnicity groups may reflect changes to the drug supply such as increasing fentanyl contamination. It is necessary to consider these trends together to guide appropriate responses to the overdose crisis such as expanding access to treatment developed for affected communities.

## Methods

### Data Sources

We used 2008-2019 data from three national sources to estimate rates of self-reported substance use (NSDUH), receipt of treatment (TEDS-A), and overdose-related mortality (WONDER) among adults aged 18 years or older.

First, we used data from the NSDUH, a nationally representative annual survey of the U.S. civilian population, to identify self-reported substance use.<sup>3</sup> To accommodate the small sample size of less populous racial and ethnic groups we calculated rolling three-year averages to obtain a weighted prevalence of substance use in each year (e.g., 2010 estimates are a weighted average of 2008, 2009, and 2010 data).<sup>22</sup>

Second, to measure substance use treatment, we used data from the TEDS-A. All specialized substance use treatment facilities in the US that receive public funding are required to report substance-related treatment admission data to their respective states, which then report data to the Substance Abuse and Mental Health Services Administration.<sup>4</sup> Because substance use treatment admissions may vary across states, we excluded data from the District of Columbia, Puerto Rico, and 8 states (Georgia, Kansas, Mississippi, Oregon, Pennsylvania, South Carolina, Washington, and West Virginia) which were missing data in one or more years.

Finally, to measure substance-involved deaths, we used multiple cause of death data from the CDC's WONDER. This national mortality data for US residents is based on death certificates and contains demographic information, a primary underlying cause of death, and up to twenty additional causes.<sup>5</sup> Data from the District of Columbia and the same eight states missing data in TEDS-A were excluded from the analysis of overdose deaths. We used census bureau population estimates from the WONDER database to estimate rates of treatment admissions and overdose deaths.

### Substance use, treatment, and death

In each data set, we generated non-mutually exclusive indicators for heroin, methamphetamine, and cocaine use, treatment, or death. In the NSDUH data we generated binary indicators for use if an individual reported any heroin, cocaine and/or crack, or methamphetamine use in the past 30 days.

In TEDS-A, up to three substances are listed as contributing to each admission. For each treatment episode, we created binary indicators for whether heroin, cocaine, or methamphetamine contributed to admission. These groups were not mutually exclusive.

To characterize deaths in CDC WONDER data, we first identified ICD-10 codes indicating the underlying cause of death as drug-poisoning (X40-X44, X60-X64, X85, Y10-Y14) and then in the multiple cause of death we identified the specific substances involved using the ICD-10 codes for heroin (T40.1), psychostimulant (T43.6) (referred to as methamphetamine throughout), or cocaine (T40.5).<sup>23,24</sup>

## Measures of Race and Ethnicity

We generated five mutually exclusive race and ethnicity categories: non-Hispanic White, non-Hispanic Black, non-Hispanic American Indian, non-Hispanic Asian or Pacific Islander, and Hispanic or Latinx. In NSDUH, respondents self-identified their race and ethnicity. In TEDS-A, an individual's race and ethnicity are reported at admission. In CDC WONDER, race and ethnicity information is often provided by surviving next of kin, and in the absence of an informant it is determined based on observation. CDC WONDER was missing ethnicity information for 1% of deaths in our sample. To generate comparable group definitions across data sources we excluded individuals missing race or ethnicity data as well as non-Hispanic respondents who identified more than one race in NSDUH (3% of observations) and individuals classified as "other single race" or "two or more races" (4.4% of observations) in TEDS-A.

## Statistical Analysis

First, we tabulated demographic characteristics for our three substance-related measures (use, treatment, and overdose deaths) stratified by the three substances of interest (heroin, methamphetamine, and cocaine) using 2010-2019 data. We then calculated three-year rolling averages for use, treatment admissions, and overdose death rates per 100,000 adults. Three-year rolling averages of rates of use were calculated with NSDUH's population estimates, while treatment admission and death rates were calculated with census population estimates. We first graphed the rate of substance use, treatment admissions, and deaths for each substance by race and ethnicity group in 2010 and 2019. Finally, we calculated percent change in rates of use, treatment and death since 2010 and plotted trends between 2010 and 2019. We assessed the statistical significance of percent change in self-reported use with Stata's post estimation *ncom* command. For each year we include a 95% confidence interval of the percent change in use to account for NSDUH's survey design. We did not include confidence intervals for treatment and overdose trends, as these data included the entire population of admissions and deaths, respectively. In a sensitivity analysis, we calculated treatment and overdose death rates by race and ethnicity, without excluding states missing data in one or more years. We used Stata 17.0 for all analysis. All data are publicly available and de-identified and thus this study is not considered human subjects research and did not require IRB review.

## Results

### Study Population

Between 2010 and 2019, among 409,521 unweighted NSDUH respondents, we identified individuals who reported past month use of heroin (N=855), methamphetamine (N=1,273), and cocaine (N=3,725). We also identified all treatment episodes and overdose deaths indicating heroin (treatment N=4,060,139; death N=89,811), methamphetamine (treatment N=22,044,679; death N=55,383), and cocaine (treatment N=3,115,240; death N=73,226) (Table 1). Across substances, a higher proportion of overdose deaths (70.5%-76.7%) were among males than treatment admissions (56.0%-65.3%) or use (57.1%-63.2%). Compared to individuals who reported cocaine use, a higher proportion of individuals who reported methamphetamine use were aged 30-49 (45.8%) and 50+ (10.4%). But a

larger proportion of treatment admissions for cocaine were among individuals aged 30-49 (55.0%) and 50+ (20.6%) than methamphetamine use. White individuals comprised a similar proportion of individuals reporting methamphetamine use (70.2%), treatment admissions for methamphetamine (70.2%) and methamphetamine-involved overdose deaths (75.5%). However, only 11.5% of individuals reporting cocaine use were Black, but 33.7% of all treatment admissions and 26.4% of all cocaine-involved overdose deaths were among Black individuals.

### **Heroin use, treatment, and death**

In 2019, rates of heroin use were similar for the White, Black, and American Indian groups (Figure 1a). Between 2010 and 2019, there were no substantial differences in the percent change in use between groups (Figure 2a and Tables 1-5, Supplemental Digital Content which shows raw data for figures 2-4). Self-reported heroin use among White individuals increased 103% (95% CI: 40%-167%;  $p=0.001$ ) but percent changes in heroin use among other racial and ethnic groups were not statistically significant. Treatment admissions substantially increased among Asian (89%) White (103%), and American Indian (212%), but remained largely unchanged among Black (18%) and Hispanic (3%) groups (Figure 2b). Heroin-involved overdose deaths increased substantially for all racial and ethnic groups, until 2017 when it decreased among White and Asian/Pacific Islander groups but continued to increase among other racial and ethnic groups (Figure 2c). The largest percent increases in deaths were among Asian/Pacific Islander (577%) and Black (475%) groups. Heroin treatment and death rates did not change substantially in the sensitivity analysis (See Figure, Supplemental Digital Content 2, which shows results from sensitivity analysis).

### **Methamphetamine use, treatment, and death**

Between 2010 and 2019, increases in methamphetamine use was statistically significant among White (133% 95%, CI: 77%-188%;  $p<0.001$ ) and Hispanic groups (247%, 95% CI: 58%-435%;  $p=0.01$ ). However, upward trends among other race and ethnicity groups were not statistically significant (Figure 3a and Tables 1-5, Supplemental Digital Content). In 2019, the American Indian group had a substantially higher rate of methamphetamine use (1250/100,000 individuals; 95% CI: 800-1940) than other groups (Figure 1a). Between 2010 and 2019, methamphetamine treatment admissions fell 11% among the Asian/Pacific Islander group but increased 42%, 114%, 174%, and 193% among Hispanic, White, American Indian, and Black groups, respectively (Figure 3b). Methamphetamine-related treatment admissions were notably higher among the American Indian group throughout the study period (230 admissions/100,000 adults in 2010 and 630 admissions/100,000 adults in 2019) (Figure 1b). Methamphetamine-involved overdose deaths increased for all groups between 2010 and 2019. The largest percent increases were among the Black (1,115%) and American Indian (744%) groups (Figure 3c). By 2019, the methamphetamine-involved overdose death rate among the American Indian (13.3/100,000 individuals) was over twice as high the White group (5.5 deaths/100,000 individuals) (Figure 1c). In a sensitivity analysis, the methamphetamine treatment rates for the Native American group were higher in 2010, but lower in 2019 (See Figure, Supplemental Digital Content 2, which shows results from sensitivity analysis).

## Cocaine use, treatment, and death

No statistically significant changes were detected in the reported prevalence of cocaine use for any race or ethnicity group (Figure 4a and Tables 1-5, Supplemental Digital Content). From 2010 to 2015 cocaine treatment admissions declined among all groups. Despite increasing after 2016, admission rates for cocaine treatment remained lower in 2019 than 2010 for all groups (Figure 4b). Black individuals had the highest treatment admission rate (717/100,000 individuals) in 2010, but also experienced the largest absolute (313/100,000 individuals) as well as relative (44%) declines in treatment admission rate (Figure 1b). Treatment admissions decreased the least among White individuals (12%) (Figure 4b). Cocaine-involved overdose deaths remained relatively stable between 2010 and 2014, before increasing among all groups (Figure 4c). Black individuals had a substantially higher cocaine-involved overdose death rate throughout the study period (Figure 1c). In a sensitivity analysis, we found higher cocaine treatment rates for the Black group, but no substantial differences for other race and ethnicity groups (See Figure, Supplemental Digital Content 2, which shows results from sensitivity analysis).

## Discussion

We are among the first to use triangulated data from three national sources to provide new insights into the ongoing US overdose crisis. Between 2010 and 2019, the rate of heroin, methamphetamine, and cocaine-involved overdose deaths increased more than treatment admission rates among all racial and ethnic groups in the US. By triangulating these measures, we showed that despite changes in treatment composition and volume, treatment admissions are rising slower than overdose deaths, potentially indicating a treatment gap, among all groups.<sup>25</sup> Treatment admission rates for cocaine notably decreased substantially between 2010 and 2019. Overall, using multiple data sources, we found that trends in substance use, treatment, and mortality often diverge, indicating potential gaps between treatment and need. The approach used here to describe the substance use landscape in the US could be used to better tailor treatment capacity to the shifting trends in substance use and mortality. Specifically, identifying where treatment is not keeping pace with increases in mortality suggests expanded access to treatment is needed for people most at risk of death. For example, regulatory changes that support expanding behavioral approaches such as contingency management may reduce the gap between methamphetamine/cocaine related treatment and overdose deaths.

Our triangulated analysis of substance use, treatment, and death also identified multiple disparities by race and ethnicity. The rate of heroin treatment admissions for White individuals (103%) increased more compared with Black individuals (18%), while heroin-involved overdose deaths increased more among Black individuals (475%) compared with White individuals (341%). This finding is consistent with previous research identifying disparities in treatment for opioid use among Black individuals.<sup>26</sup> Also consistent with previous reports, we found Black communities experienced substantially higher mortality rates related to cocaine compared with other racial and ethnic groups despite similar rates of use.<sup>12,18</sup> Triangulation of substance use, treatment, and overdose data suggest that decreases in cocaine treatment may disproportionately impact Black individuals and

contribute to differences in mortality. Combined, these findings highlight the importance of examining differences between race and ethnicity groups across specific substances as well as indicators (e.g. use, treatment, and death) to identify opportunities to more equitably allocate treatment resources. The trends in overdose mortality and access to treatment by race and ethnicity we identified in this study ultimately stem, in part, from structural racism codified through policy within health care, criminal justice, housing, education, and public health systems, in addition to differential patterns of substance use.<sup>26-29</sup> Both qualitative and quantitative studies have begun to describe barriers to substance use treatment for specific race and ethnicity groups.<sup>30,31</sup> In the present paper we find disparities differ by specific substance which can inform the development and analysis of interventions designed to improve access to treatment for marginalized communities.

Despite the largest percent increases in overdose-involved deaths, we did not observe a statistically significant change in self-reported heroin or methamphetamine use among Black, American Indian, and Asian/Pacific Islander populations. Underreporting and small sample sizes may limit our ability to detect statistically significant changes in self-reported use among smaller race and ethnicity groups.<sup>22</sup> This highlights the importance of considering multiple surveillance data sources when allocating resources to reduce disparities between racial and ethnic groups. This approach may help ensure resources are not inadvertently prioritized for the majority group, whose change in use is most likely to be statistically significant. This study focused on informing the substance use treatment system in the US, however primary and secondary prevention strategies remain important tools to reduce the incidence of substance use disorders.<sup>25</sup> Future data triangulation efforts may better identify at risk populations and similarly inform primary and secondary prevention.

To demonstrate the importance of describing trends among race and ethnicity groups across three surveillance data sources, we focused on trends for single substances measured in all three sources between 2010 and 2019. Combining findings across data sources illustrates whether treatment is expanding to accommodate changes in risk posed by specific substances to different populations. However, polysubstance use (e.g. co-use of synthetic opioids and stimulants) increasingly contributes to morbidity and mortality. These recent trends have been documented in multiple data sources including treatment admissions and overdose deaths.<sup>32,33</sup> Overdose deaths and treatment admissions involving both opioids and methamphetamine or cocaine have recently increased across race and ethnicity groups.<sup>14</sup>

In this paper we focused on acute overdose deaths, identified by drug-induced underlying cause of death consistent with CDC reporting, to compare trends with use and treatment. However other substances, such as alcohol and tobacco, are associated with significant morbidity and high mortality from chronic causes.<sup>34-36</sup> Additionally, heroin, cocaine, and methamphetamine use may be differentially associated with other causes of death (e.g., suicide or injury) and co-morbidities such as cardiovascular disease.<sup>37</sup> Future analysis of these associations and how they may have changed over time can help inform improvements to the healthcare system to better treat substance use-related co-morbidities.

This study has limitations that should be considered in interpretation of the results. Some differences exist across the data sources which may affect comparisons. First, surveillance



data sources collect race and ethnicity data differently which could limit direct comparisons of groups across data sources. For example, if a next of kin is not available to identify a deceased individual's race and ethnicity, then it is determined by observation, potentially misclassifying individuals.<sup>38</sup> However, this bias is unlikely to differ between substances or years of the study period. Previous research has found that rates of unspecified overdose varied between racial and ethnic groups until 2015, which may affect the trends in overdose deaths we observe.<sup>39</sup> Second, state-level indicators were not available in the NSDUH data which may affect interpretations if rates of use differed significantly in the 8 states for which we excluded treatment admission and death data, however we did not find that rates differed substantially in a sensitivity analysis. Third, TEDS-A includes data at the treatment admission, rather than individual-level, so that individuals may be represented multiple times. In previous work we have shown that limiting the sample to treatment admissions for individuals with no prior treatment does not substantially affect the results.<sup>40</sup>

Previously identified limitations of each data source may affect interpretations of specific trends. Estimates from NSDUH likely understate the prevalence of less commonly used substances.<sup>22</sup> TEDS-A data does not include all substance use treatment (e.g. treatment in a private doctors office and some privately funded treatment at specialty treatment facilities). However, our findings on racial disparities in treatment admissions for heroin use mirror racial disparities in ambulatory care visits involving buprenorphine.<sup>41</sup> Furthermore, although TEDS does not include all substance use treatment paid for by commercial insurance, individuals from racial and ethnic minority groups are more likely to have Medicaid insurance suggesting disparities identified here may underrepresent the overall disparities in treatment access.<sup>42</sup> Finally, the identification of overdoses and the substances involved has been shown to vary geographically.<sup>43</sup> Limitations of each data source may affect specific prevalence estimates. However, consistent over or underreporting will not bias our trends unless the factors associated with misclassification change over time. The unique limitations of each single data source motivate an approach, like ours, to integrate findings from multiple surveillance data sources to provide a more comprehensive understanding of the overdose crisis.

We show that data from NSDUH, TEDS-A, and CDC WONDER can be evaluated across a consistent timeframe for specific substances and comparable racial and ethnic groups to identify where trends in use, treatment, and death are consistent or diverge. Using three national data sources, we found that the direction and magnitude of substance use, treatment, and death trends varied substantially by substance as well as racial and ethnic group. Our analyses revealed emerging and concerning disparities that underscore the importance of triangulating data sources to examine substance-related measures across racial and ethnic groups. As the US overdose crisis increases in intensity and complexity, this approach should be replicated in local jurisdictions. The national trends we describe may motivate state-level analyses to inform state policy and treatment resource allocation.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Funding:

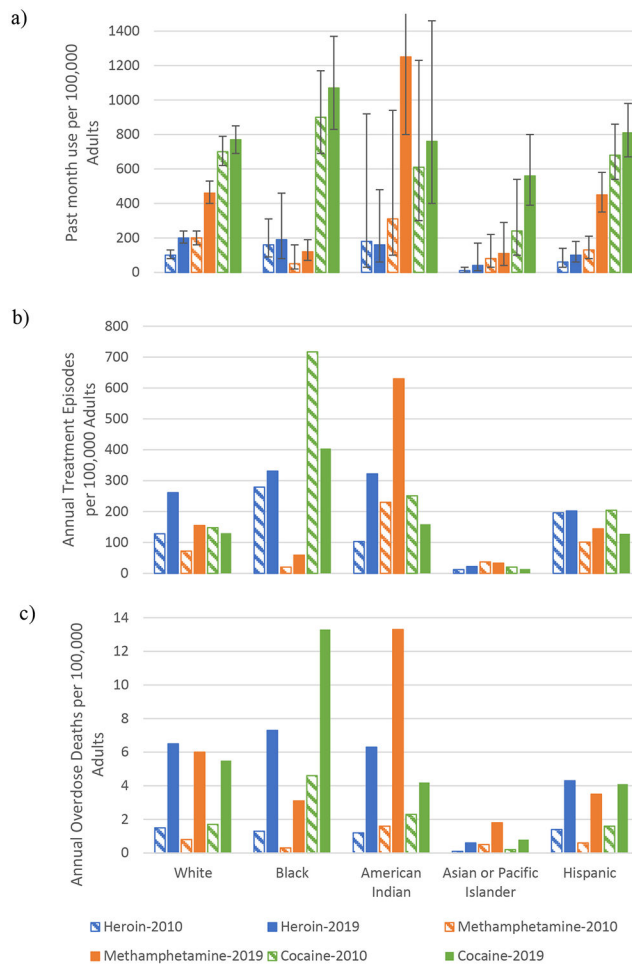
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## References

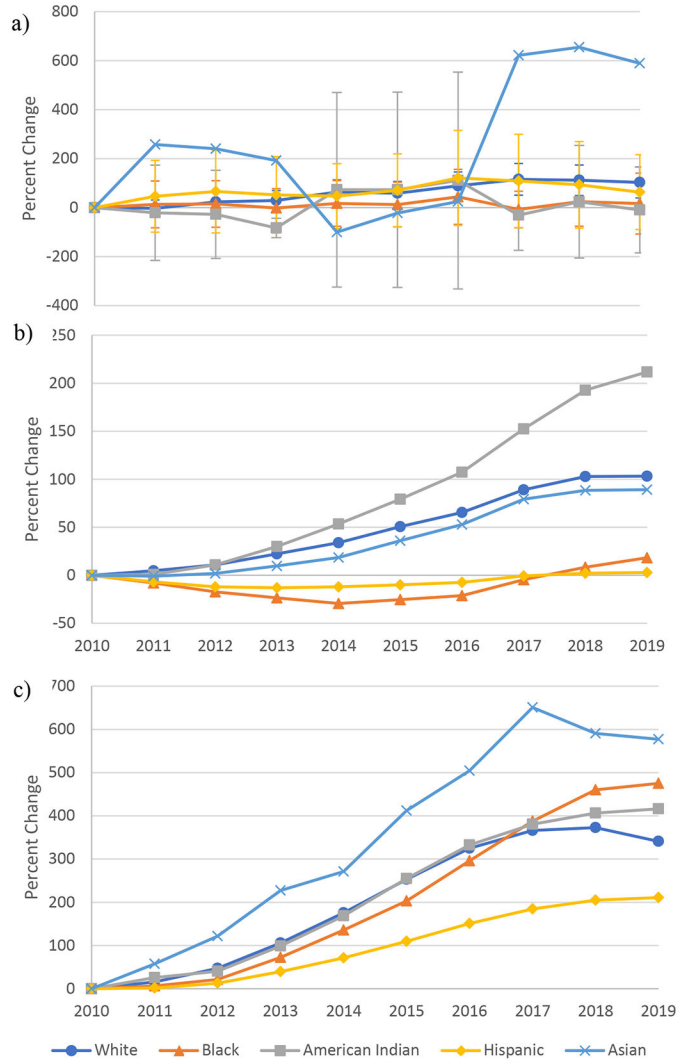
- Centers for Disease Control and Prevention. Drug Overdose Deaths in the U.S. Top 100,000 Annually [Internet]. 2021 Nov [cited 2021 Nov 19]. Available from: [https://www.cdc.gov/nchs/pressroom/nchs\\_press\\_releases/2021/20211117.htm](https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2021/20211117.htm)
- Blanco C, Wall MM, Olfson M. Data needs and models for the opioid epidemic. *Mol Psychiatry*. 2021 Oct 29;1–6. [PubMed: 33972691]
- Substance Abuse and Mental Health Services Administration. 2019 National Survey on Drug Use and Health Public Use File Codebook. 2020.
- Substance Abuse and Mental Health Services Administration. Treatment Episode Data Set (TEDS): 2018 [Internet]. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2020 [cited 2021 Jan 28]. Available from: <https://www.datafiles.samhsa.gov/sites/default/files/field-uploads-protected/studies/TEDS-A-2018/TEDS-A-2018-datasets/TEDS-A-2018-DS0001/TEDS-A-2018-DS0001-info/TEDS-A-2018-DS0001-info-codebook.pdf>
- National Center for Health Statistics. Multiple Cause of Death Data on CDC WONDER [Internet]. [cited 2021 Sep 13]. Available from: <https://wonder.cdc.gov/mcd.html>
- Rutherford GW, McFarland W, Spindler H, White K, Patel SV, Aberle-Grasse J, et al. Public health triangulation: approach and application to synthesizing data to understand national and local HIV epidemics. *BMC Public Health*. 2010 Jul 29;10:447. [PubMed: 20670448]
- Rajendran R, Hodgkinson D, Rayman G. Patients with diabetes requiring emergency department care for hypoglycaemia: characteristics and long-term outcomes determined from multiple data sources. *Postgrad Med J*. 2015 Feb;91(1072):65–71. [PubMed: 25595126]
- Linas BP, Savinkina A, Madushani RWMA, Wang J, Eftekhari Yazdi G, Chatterjee A, et al. Projected Estimates of Opioid Mortality After Community-Level Interventions. *JAMA Netw Open*. 2021 Feb 1;4(2):e2037259. [PubMed: 33587136]
- Rush B, Tremblay J, Brown D. Development of a Needs-Based Planning Model to Estimate Required Capacity of a Substance Use Treatment System. *J Stud Alcohol Drugs Suppl*. 2019 Jan;Sup 18:51–63.
- Vigo D, Jones W, Dove N, Maidana DE, Tallon C, Small W, et al. Estimating the Prevalence of Mental and Substance Use Disorders: A Systematic Approach to Triangulating Available Data to Inform Health Systems Planning. *Can J Psychiatry*. 2021 Apr 8;7067437211006872.
- Mattson M, Lipari RN, Hays C, Van Horn SL. A Day in the Life of Older Adults: Substance Use Facts. In: *The CBHSQ Report* [Internet]. Rockville (MD): Substance Abuse and Mental Health Services Administration (US); 2013 [cited 2021 Jun 2]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK436750/>
- Cano M, Oh S, Salas-Wright CP, Vaughn MG. Cocaine use and overdose mortality in the United States: Evidence from two national data sources, 2002–2018. *Drug Alcohol Depend*. 2020 Sep 1;214:108148. [PubMed: 32702620]
- Han B, Compton WM, Jones CM, Einstein EB, Volkow ND. Methamphetamine Use, Methamphetamine Use Disorder, and Associated Overdose Deaths Among US Adults. *JAMA Psychiatry* [Internet]. 2021 Sep 22 [cited 2021 Sep 26]; Available from: 10.1001/jamapsychiatry.2021.2588
- Jones AA, Shearer RD, Segel JE, Santos-Lozada A, Strong-Jones S, Vest N, et al. Opioid and stimulant attributed treatment admissions and fatal overdoses: Using national surveillance data to examine the intersection of race, sex, and polysubstance use, 1992–2020. *Drug Alcohol Depend*. 2023 Jun 20;249:109946. [PubMed: 37354584]
- Garnett M, Hedegaard H, Spencer MR. Age-Adjusted Rates of Drug Overdose Deaths Involving Heroin, by Race/Ethnicity — National Vital Statistics System, United States, 1999–2017. *MMWR Morb Mortal Wkly Rep*. 2019 Sep 20;68(37):810. [PubMed: 31536483]

16. Han B, Cotto J, Etz K, Einstein EB, Compton WM, Volkow ND. Methamphetamine Overdose Deaths in the US by Sex and Race and Ethnicity. *JAMA Psychiatry*. 2021 Jan 20;
17. Jones CM, Olsen EO, O'Donnell J, Mustaquim D. Resurgent Methamphetamine Use at Treatment Admission in the United States, 2008–2017. *Am J Public Health*. 2020 Apr;110(4):509–16. [PubMed: 32078347]
18. Kariisa M, Seth P, Scholl L, Wilson N, Davis NL. Drug overdose deaths involving cocaine and psychostimulants with abuse potential among racial and ethnic groups – United States, 2004–2019. *Drug and Alcohol Dependence*. 2021 Oct 1;227:109001. [PubMed: 34492555]
19. Mustaquim D, Jones CM, Compton WM. Trends and correlates of cocaine use among adults in the United States, 2006–2019. *Addictive Behaviors*. 2021 Sep 1;120:106950. [PubMed: 33940336]
20. Palamar JJ, Han BH, Keyes KM. Trends in characteristics of individuals who use methamphetamine in the United States, 2015–2018. *Drug and Alcohol Dependence*. 2020 Aug 1;213:108089. [PubMed: 32531703]
21. Schuler MS, Schell TL, Wong EC. Racial/ethnic differences in prescription opioid misuse and heroin use among a national sample, 1999–2018. *Drug Alcohol Depend*. 2021 Apr 1;221:108588. [PubMed: 33639569]
22. Reuter P, Caulkins JP, Midgette G. Heroin use cannot be measured adequately with a general population survey. *Addiction*. 2021 Mar 2;
23. Segel JE, Winkelmann TNA. Persistence and Pervasiveness: Early Wave Opioid Overdose Death Rates Associated With Subsequent Overdose Death Rates. *Public Health Rep*. 2021 Mar 1;136(2):212–8. [PubMed: 33301695]
24. Ruhm CJ. Corrected US opioid-involved drug poisoning deaths and mortality rates, 1999–2015. *Addiction*. 2018;113(7):1339–44. [PubMed: 29430760]
25. Williams AR, Nunes EV, Bisaga A, Levin FR, Olfson M. Development of a Cascade of Care for Responding to the Opioid Epidemic. *Am J Drug Alcohol Abuse*. 2019;45(1):1–10. [PubMed: 30675818]
26. Andraka-Christou B. Addressing Racial And Ethnic Disparities In The Use Of Medications For Opioid Use Disorder. *Health Affairs*. 2021;40(6):920–7. [PubMed: 34097509]
27. Ray B, Lowder E, Bailey K, Huynh P, Benton R, Watson D. Racial differences in overdose events and polydrug detection in Indianapolis, Indiana. *Drug Alcohol Depend*. 2020 Jan 1;206:107658. [PubMed: 31734032]
28. Drake J, Charles C, Bourgeois JW, Daniel ES, Kwende M. Exploring the impact of the opioid epidemic in Black and Hispanic communities in the United States. *Drug Science, Policy and Law*. 2020 Jan 1;6:2050324520940428.
29. Skewes MC, Blume AW. Understanding the Link Between Racial Trauma and Substance Use among American Indians. *Am Psychol*. 2019 Jan;74(1):88–100. [PubMed: 30652902]
30. Pinedo M, Zemor S, Rogers S. Understanding Barriers to Specialty Substance Abuse Treatment among Latinos. *J Subst Abuse Treat*. 2018 Nov;94:1–8. [PubMed: 30243409]
31. Hollander MAG, Chang CCH, Douaihy AB, Hulsey E, Donohue JM. Racial Inequity in Medication Treatment for Opioid Use Disorder: Exploring Potential Facilitators and Barriers to Use. *Drug Alcohol Depend*. 2021 Oct 1;227:108927. [PubMed: 34358766]
32. Hedegaard H. Co-involvement of Opioids in Drug Overdose Deaths Involving Cocaine and Psychostimulants [Internet]. National Center for Health Statistics; 2021 Apr [cited 2021 Apr 8]. Available from: <https://stacks.cdc.gov/view/cdc/103966>
33. Jones CM, Underwood N, Compton WM. Increases in methamphetamine use among heroin treatment admissions in the United States, 2008–17. *Addiction*. 2020;115(2):347–53. [PubMed: 31503384]
34. Spencer M, Curtin S, Garnett M. Alcohol-induced Death Rates in the United States, 2019–2020 [Internet]. National Center for Health Statistics (U.S.); 2022 Nov [cited 2023 Jun 22]. Available from: <https://stacks.cdc.gov/view/cdc/121795>
35. U.S. Alcohol-Related Deaths Grew Nearly 50% in Two Decades: SHADAC Briefs Examine the Numbers among Subgroups and States [Internet]. SHADAC. 2021 [cited 2021 Jun 1]. Available from: <https://www.shadac.org/news/us-alcohol-related-deaths-grew-nearly-50-two-decades>

36. Tobacco-Related Mortality [Internet]. Centers for Disease Control and Prevention. 2022 [cited 2023 Jun 22]. Available from: [https://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/health\\_effects/tobacco\\_related\\_mortality/index.htm](https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/tobacco_related_mortality/index.htm)
37. Shover CL, Friedman JR, Romero R, Buhr R, Chu B, Tang A, et al. Longitudinal changes in co-involved drugs, comorbidities, and demographics of methamphetamine-related deaths in Los Angeles County. *Journal of Substance Use and Addiction Treatment*. 2023 Jun 12;209101. [PubMed: 37315796]
38. Arias E, Heron M, National Center for Health Statistics, Hakes J, US Census Bureau. The Validity of Race and Hispanic-origin Reporting on Death Certificates in the United States: An Update. *Vital Health Stat 2*. 2016 Aug 1;(172):1–21.
39. Milam AJ, Furr-Holden D, Wang L, Simon KM. Health Data Disparities in Opioid-Involved Overdose Deaths From 1999 to 2018 in the United States. *Am J Public Health*. 2021 Jun 29;e1–9.
40. Shearer RD, Shippee ND, Vickery KD, Stevens MA, Winkelman TNA. A longitudinal cross-sectional analysis of substance use treatment trends for individuals experiencing homelessness, criminal justice involvement, both, or neither - United States, 2006-2018. *The Lancet Regional Health - Americas*. 2022 Mar 1;7:100174. [PubMed: 35382494]
41. Lagisetty PA, Ross R, Bohnert A, Clay M, Maust DT. Buprenorphine Treatment Divide by Race/Ethnicity and Payment. *JAMA Psychiatry*. 2019 Sep 1;76(9):979–81. [PubMed: 31066881]
42. Donohue JM, Cole ES, James CV, Jarlenski M, Michener JD, Roberts ET. The US Medicaid Program: Coverage, Financing, Reforms, and Implications for Health Equity. *JAMA*. 2022 Sep 20;328(11):1085–99. [PubMed: 36125468]
43. Denham A, Vasu T, Avendano P, Boslett A, Mendoza M, Hill EL. Coroner county systems are associated with a higher likelihood of unclassified drug overdoses compared to medical examiner county systems. *The American Journal of Drug and Alcohol Abuse*. 2022 Jun 6;0(0):1–12.

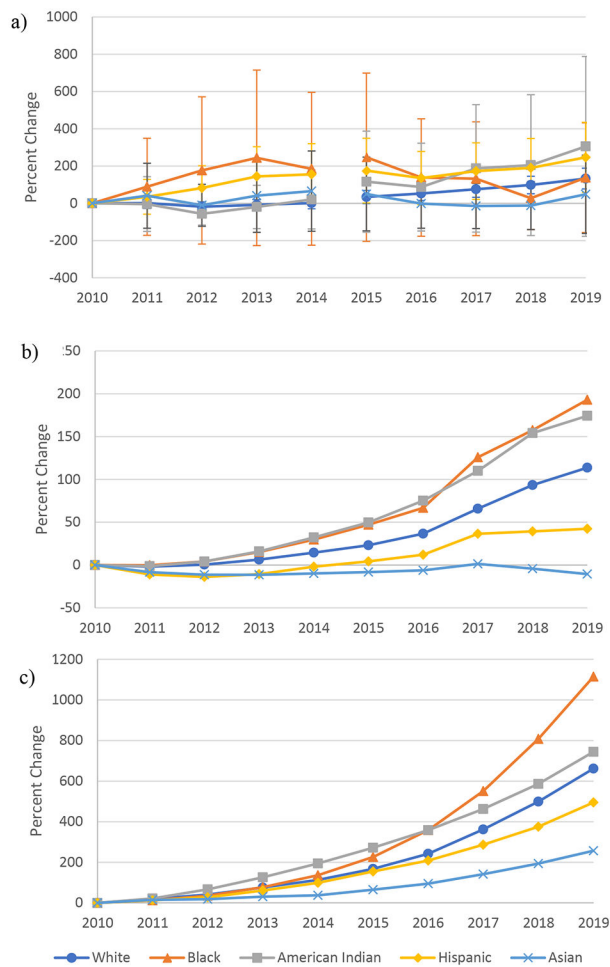


**Figure 1.** Rates of heroin, methamphetamine, and cocaine a) use, b) treatment admission, and c) overdose death, United States 2010 and 2019  
 The 95% confidence interval for past month methamphetamine use among American Indians was 800 to 1940 per 100,000 adults.

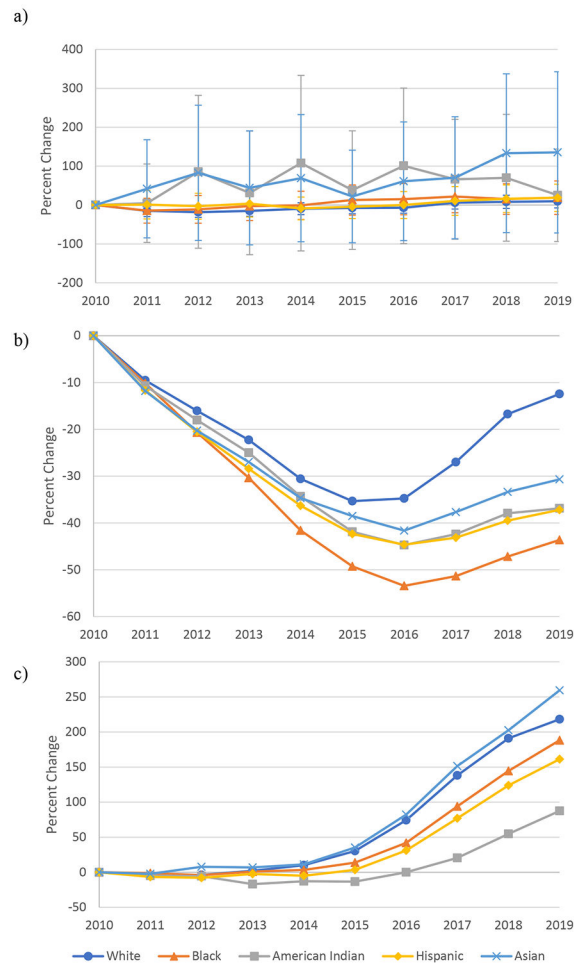


**Figure 2.** Percent change of heroin a) use, b) treatment admission, and c) overdose death rates, United States 2010-2019

Error bars are excluded from past month heroin use (a) for the Asian/Pacific Islander group to not distort the axis scale. The 95% confidence interval included 0% for each year.



**Figure 3.** Percent change of methamphetamine a) use, b) treatment admission, and c) overdose death rates, United States 2010-2019  
NSDUH survey design changes in 2015 are represented by a break in trends between 2014 and 2015 in self-reported past month methamphetamine use (a).



**Figure 4.** Percent change of cocaine a) use, b) treatment admission, and c) overdose death rates, United States 2010-2019



**Table 1.**

Sociodemographic characteristics of study population, United States 2010-2019

	Use <sup>a</sup>		
	Heroin n=855	Methamphetamine n=1,273	Cocaine n=3,725
Age			
18-20	96 (11.2%)	141 (11.1%)	657 (17.6%)
21-29	401 (46.9%)	417 (32.8%)	1,860 (49.9%)
30-49	297 (34.7%)	583 (45.8%)	966 (25.9%)
50+	61 (7.1%)	132 (10.4%)	242 (6.5%)
Gender			
Male	538 (62.9%)	727 (57.1%)	2,355 (63.2%)
Female	317 (37.1%)	546 (42.9%)	1,370 (36.8%)
Race			
Asian/Pacific Islander	8 (0.9%)	29 (2.3%)	106 (2.9%)
Black	78 (9.1%)	50 (3.9%)	428 (11.5%)
Indigenous	12 (1.4%)	62 (4.9%)	65 (1.7%)
Hispanic	101 (11.8%)	239 (18.8%)	700 (18.8%)
White	656 (76.7%)	893 (70.2%)	2,426 (65.1%)
Treatment (Admissions)			
	Heroin n=4,060,139	Methamphetamine n=2,044,679	Cocaine n=3,115,240
Age			
18-20	134,460 (3.3%)	79,777 (3.9%)	73,754 (2.4%)
21-29	1,373,194 (33.8%)	683,442 (33.4%)	686,536 (22.0%)
30-49	1,949,155 (48.0%)	1,116,234 (33.4%)	1,713,228 (55.0%)
50+	603,330 (14.9%)	165,226 (8.1%)	641,722 (20.6%)
Gender			
Male	2,649,944 (65.3%)	1,144,466 (56.0%)	2,016,128 (64.7%)
Female	1,410,195 (34.7%)	900,213 (44.0%)	1,099,112 (35.3%)
Race			
Asian/Pacific Islander	22,393 (0.6%)	43,183 (2.1%)	17,671 (0.6%)
Black	622,666 (15.3%)	91,617 (4.5%)	1,048,442 (33.7%)
Indigenous	36,788 (0.9%)	71,842 (3.5%)	28,625 (0.9%)
Hispanic	651,907 (16.1%)	403,574 (19.7%)	468,273 (15.0%)
White	2,726,388 (67.2%)	1,434,463 (70.2%)	1,552,229 (49.8%)
Death			
	Heroin n=89,811	Methamphetamine n=55,383	Cocaine n=73,226
Age			
18-20	2,210 (2.5%)	921 (1.7%)	1,047 (1.4%)
21-29	22,095 (24.6%)	8,723 (15.8%)	11,251 (15.4%)
30-49	44,496 (49.5%)	27,803 (50.2%)	36,282 (49.5%)

50+	21,010 (23.4%)	17,936 (32.4%)	24,646 (33.7%)
Gender			
Male	68,845 (76.7%)	39,020 (70.5%)	52,895 (72.2%)
Female	20,966 (23.3%)	16,363 (22.3%)	20,331 (27.8%)
Race			
Asian/Pacific Islander	611 (0.7%)	1,434 (2.6%)	650 (0.9%)
Black	11,135 (12.4%)	3,618 (6.5%)	19,343 (26.4%)
Indigenous	754 (0.8%)	1,300 (2.3%)	482 (0.7%)
Hispanic	10,914 (12.2%)	7,203 (13.0%)	8,949 (12.2%)
White	66,397 (73.9%)	41,828 (75.5%)	43,802 (59.8%)

<sup>a</sup>Unweighted survey responses

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