

# Drug Overdose Deaths in the United States, 2001–2021

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## Key findings

### Data from the National Vital Statistics System

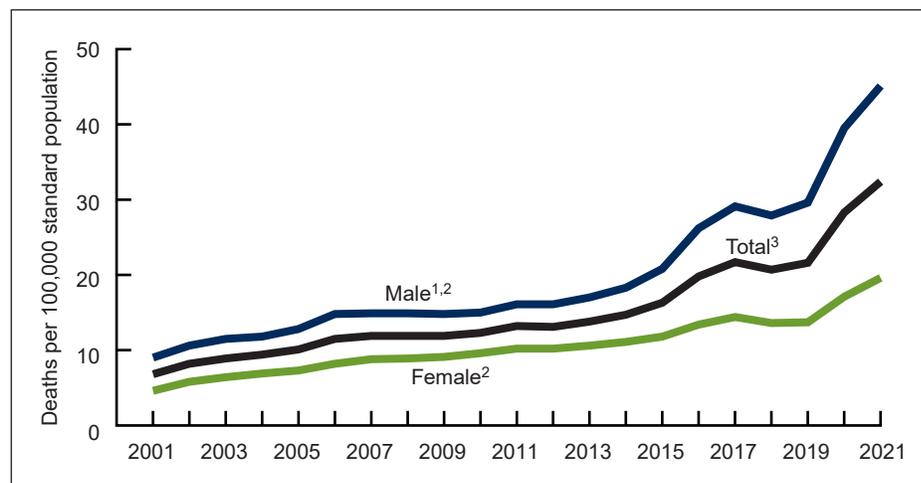
- In 2021, 106,699 drug overdose deaths occurred, resulting in an age-adjusted rate of 32.4 per 100,000 standard population in the United States.
- Adults aged 65 and over had the largest percentage increase in rates from 2020 through 2021.
- Drug overdose death rates increased for each race and Hispanic-origin group except non-Hispanic Asian people between 2020 and 2021.
- The rate of drug overdose deaths involving synthetic opioids other than methadone increased 22%, while the rate of deaths involving heroin declined 32% between 2020 and 2021.
- From 2020 through 2021, the rate of drug overdose deaths increased for deaths involving cocaine and those involving psychostimulants with abuse potential.

Drug overdose deaths have been rising over the past 2 decades in the United States (1–4). This report uses the most recent data from the National Vital Statistics System (NVSS) to update statistics on deaths from drug overdose in the United States, showing rates by demographic groups and by the types of drugs involved (specifically, opioids and stimulants), with a focus on changes from 2020 through 2021.

### The age-adjusted rate of drug overdose deaths rose more than 14% from 2020 through 2021 in the United States.

- In 2021, 106,699 drug overdose deaths occurred, resulting in an age-adjusted rate of 32.4 per 100,000 standard population (Figure 1).
- Among the total population, the age-adjusted rate of drug overdose deaths increased from 6.8 in 2001 to 11.5 in 2006, was stable from 2006

Figure 1. Age-adjusted rate of drug overdose deaths, by sex: United States, 2001–2021



<sup>1</sup>Rate for males is significantly higher than for females for all years,  $p < 0.05$ .

<sup>2</sup>Significant increasing trend from 2001 through 2021, with different rates of change over time,  $p < 0.05$ .

<sup>3</sup>Significant increasing trend from 2001 through 2006, stable trend from 2006 through 2013, then significant increasing trend from 2013 through 2021,  $p < 0.05$ .

NOTES: Drug overdose deaths were identified using *International Classification of Diseases, 10th Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Age-adjusted death rates were calculated using the direct method and the 2000 U.S. standard population. The number of drug overdose deaths in 2021 was 106,699. Access data table for Figure 1 at: <https://www.cdc.gov/nchs/data/databriefs/db457-tables.pdf#1>.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality File.



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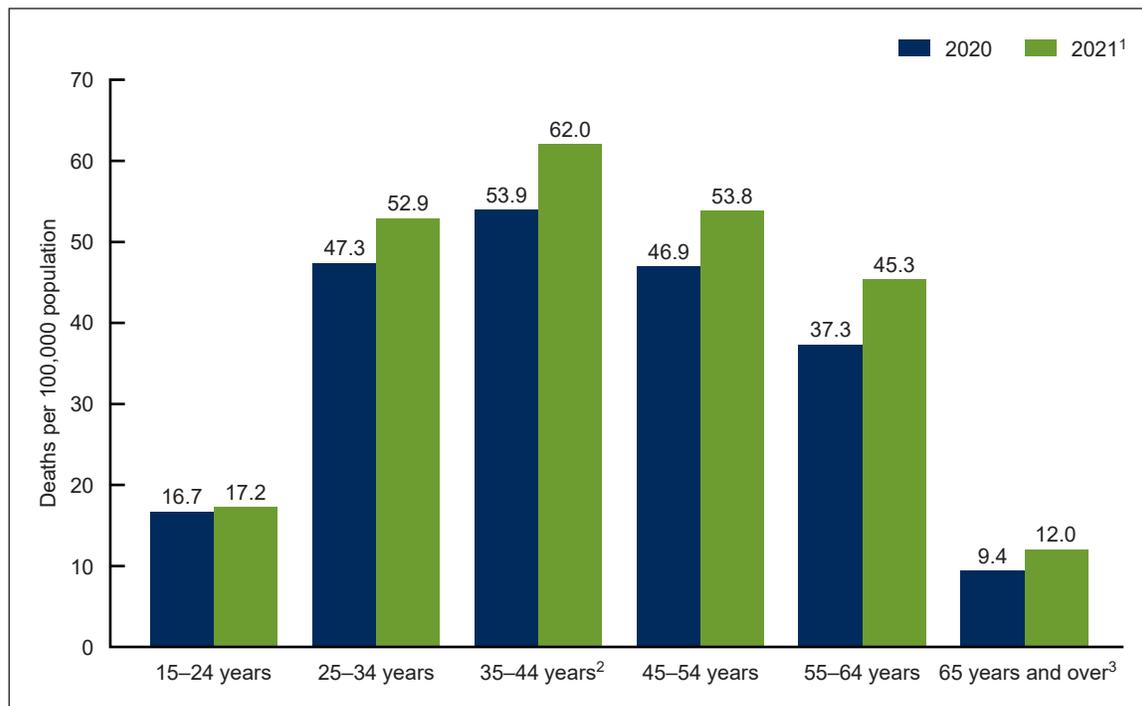
through 2013, then increased from 13.8 in 2013 to 32.4 in 2021; from 2020 through 2021, the rate increased 14%, from 28.3 to 32.4.

- From 2020 through 2021, the age-adjusted rate of drug overdose deaths for males increased 14% from 39.5 to 45.1, and the rate for females increased 15% from 17.1 to 19.6.
- For each year from 2001 through 2021, the rate for males was higher than for females.

### Drug overdose death rates were higher in 2021 than in 2020 for all age groups 25 and over.

- Among adults aged 25 and over, the rate of drug overdose deaths was significantly higher in 2021 compared with 2020. The observed increase for people aged 15–24 was not significant (Figure 2).
- In both 2020 and 2021, rates were highest for adults aged 35–44 (53.9 per 100,000 and 62.0, respectively) and lowest for people aged 65 and over (9.4 and 12.0, respectively).
- Adults aged 65 and over experienced the largest percentage increase in drug overdose death rates from 2020 through 2021, with a 28% increase.

Figure 2. Rate of drug overdose deaths, by selected age groups 15 and over: United States, 2020 and 2021



<sup>1</sup>Except for those aged 15–24, rates in 2021 were significantly higher than in 2020 for all age groups,  $p < 0.05$ .

<sup>2</sup>Age group with highest rate in 2020 and 2021,  $p < 0.05$ .

<sup>3</sup>Age group with lowest rate in 2020 and 2021,  $p < 0.05$ .

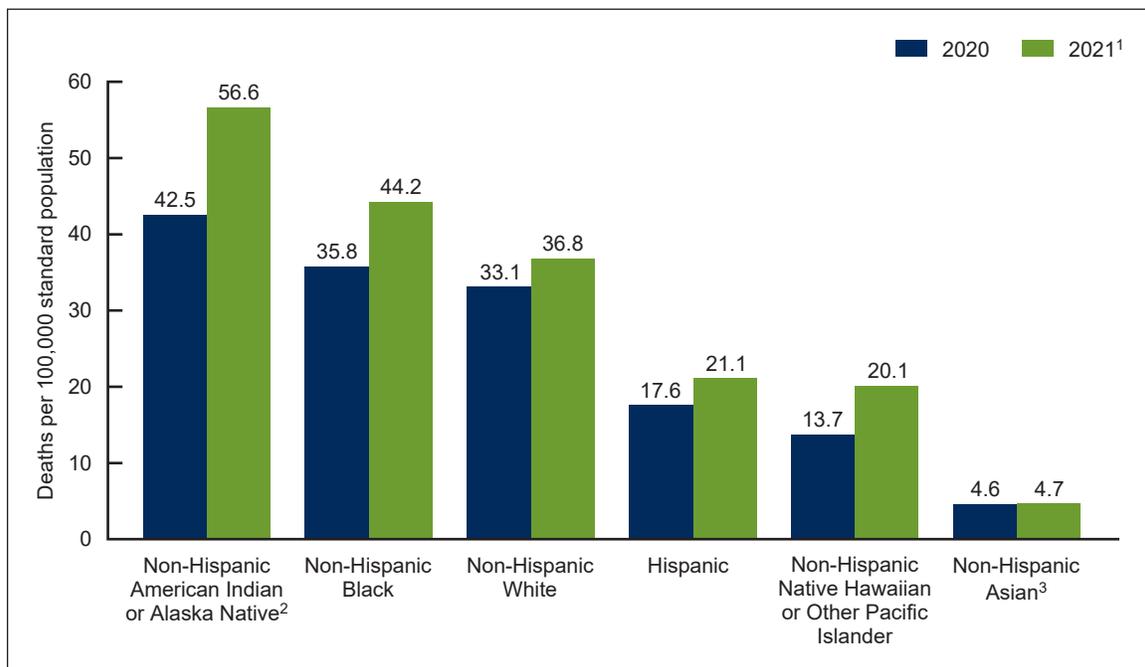
NOTES: Drug overdose deaths were identified using *International Classification of Diseases, 10th Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Access data table for Figure 2 at: <https://www.cdc.gov/nchs/data/databriefs/db457-tables.pdf#2>.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality File.

## Non-Hispanic American Indian or Alaska Native people had the highest drug overdose death rates in both 2020 and 2021.

- Except for non-Hispanic Asian people, the rate of drug overdose deaths increased from 2020 through 2021 for all race and Hispanic-origin groups (Figure 3).
- In both 2020 and 2021, rates were highest for non-Hispanic American Indian or Alaska Native (AIAN) people (42.5 per 100,000 and 56.6, respectively), and lowest for non-Hispanic Asian people (4.6 and 4.7, respectively).
- Non-Hispanic Native Hawaiian or Other Pacific Islander (NHOPI) and non-Hispanic AIAN people experienced the largest percentage increases in drug overdose death rates from 2020 through 2021, with rates increasing 47% (13.7 to 20.1) and 33% (42.5 to 56.6), respectively.

Figure 3. Age-adjusted rate of drug overdose deaths, by race and Hispanic origin: United States, 2020 and 2021



<sup>1</sup>Except for non-Hispanic Asian people, rates in 2021 were significantly higher than in 2020 for all race and Hispanic-origin groups,  $p < 0.05$ .

<sup>2</sup>Race and Hispanic-origin group with highest rate in 2020 and 2021,  $p < 0.05$ .

<sup>3</sup>Race and Hispanic-origin group with lowest rate in 2020 and 2021,  $p < 0.05$ .

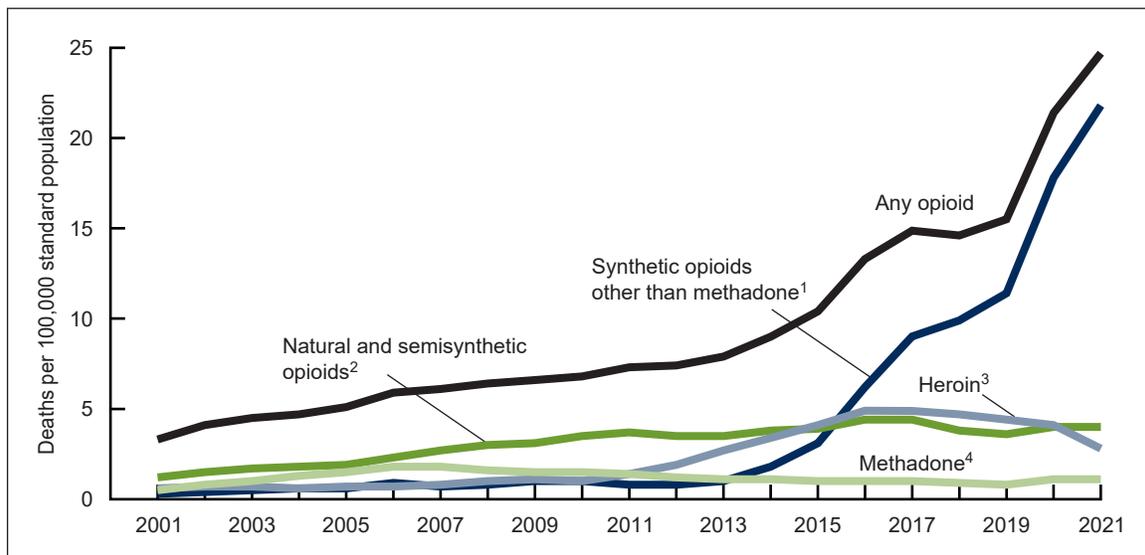
NOTES: Misclassification of race and Hispanic origin on death certificates results in the underestimation of death rates by as much as 34% for American Indian or Alaska Native people and 3% for non-Hispanic Asian and Hispanic people. Drug overdose deaths were identified using *International Classification of Diseases, 10th Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Age-adjusted death rates were calculated using the direct method and the 2000 U.S. standard population. Access data table for Figure 3 at: <https://www.cdc.gov/nchs/data/databriefs/db457-tables.pdf#3>.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality File.

## Age-adjusted rates of drug overdose deaths involving synthetic opioids other than methadone have increased over the past decade.

- The age-adjusted rate of drug overdose deaths involving synthetic opioids other than methadone, which includes drugs such as fentanyl, fentanyl analogs, and tramadol, increased from 2001 through 2021, with different rates of change over time (Figure 4).
- The age-adjusted rate of drug overdose deaths involving heroin decreased 32% from 4.1 in 2020 to 2.8 in 2021.
- The age-adjusted rate of drug overdose deaths involving natural and semisynthetic opioids, which includes drugs such as oxycodone and hydrocodone, increased from 1.2 in 2001 to 3.5 in 2010, then did not change significantly from 2010 through 2021 where the rate remained at 4.0 in 2020 and 2021.
- The rate of drug overdose deaths involving methadone increased from 0.5 in 2001 to 1.8 in 2006, decreased through 2019 (0.8), and was then stable through 2021 (1.1).

Figure 4. Age-adjusted rate of drug overdose deaths involving opioids, by type of opioid: United States, 2001–2021



<sup>1</sup>Significant increasing trend from 2001 through 2021 with different rates of change over time,  $p < 0.05$ .

<sup>2</sup>Significant increasing trend from 2001 through 2010, then stable trend from 2010 through 2021,  $p < 0.05$ .

<sup>3</sup>Significant increasing trend from 2001 through 2015 with different rates of change over time, stable trend from 2015 through 2019, then significant decreasing trend from 2019 through 2021,  $p < 0.05$ .

<sup>4</sup>Significant increasing trend from 2001 through 2006 with different rates of change over time, significant decreasing trend from 2006 through 2019, then stable trend from 2019 through 2021,  $p < 0.05$ .

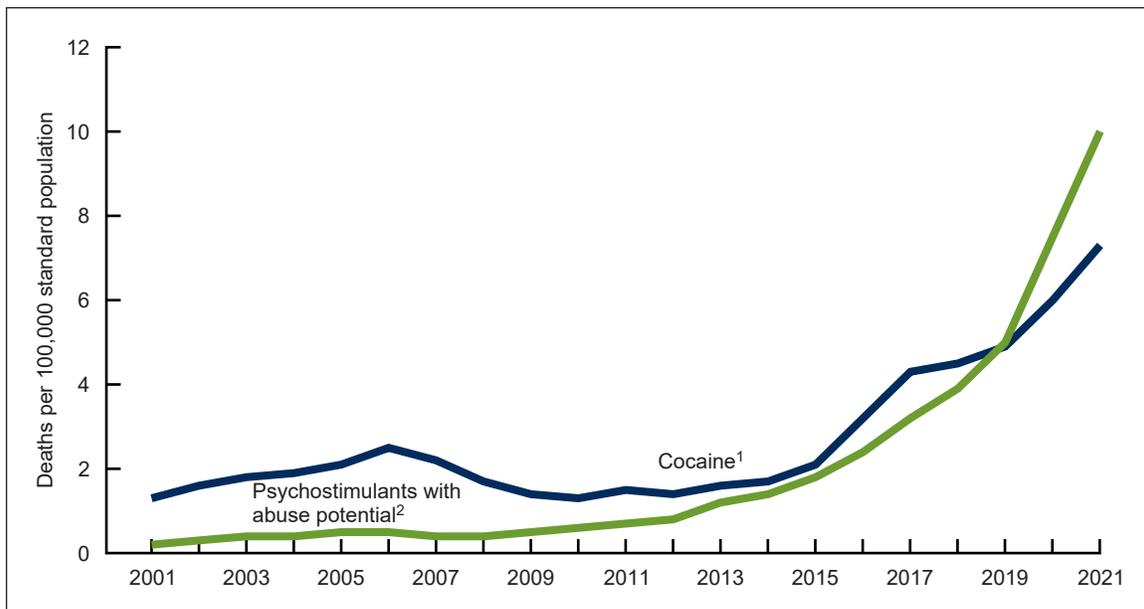
NOTES: Drug overdose deaths were identified using *International Classification of Diseases, 10th Revision (ICD-10)* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Among these deaths, the following ICD-10 multiple cause-of-death codes indicate the drug type(s) involved: T40.0–T40.4, T40.6, any opioid; T40.1, heroin; T40.2, natural and semisynthetic opioids; T40.3, methadone; and T40.4, synthetic opioids other than methadone. Age-adjusted death rates were calculated using the direct method and the 2000 U.S. standard population. Deaths involving more than one opioid category (a death involving both methadone and a natural or semisynthetic opioid, for example) were counted in both categories. The percentage of drug overdose deaths that identified the specific drugs involved varied by year, ranging from 75% to 79% from 2000 through 2013 and increasing from 81% in 2014 to 95% in 2021. Access data table for Figure 4 at: <https://www.cdc.gov/nchs/data/databriefs/db457-tables.pdf#4>.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality File.

## Age-adjusted rates of drug overdose deaths involving cocaine have been rising since 2012.

- The age-adjusted rate of drug overdose deaths involving cocaine increased from 1.3 per 100,000 in 2001 to 2.5 in 2006, decreased to 1.5 in 2011, then increased to 7.3 in 2021. The rate in 2021 was 22% higher than the rate in 2020 (6.0) (Figure 5).
- The age-adjusted rate of drug overdose deaths involving psychostimulants with abuse potential, which includes drugs such as methamphetamine, amphetamine, and methylphenidate, increased from 0.2 in 2001 to 0.5 in 2005, remained stable through 2008, then increased from 0.4 in 2008 to 10.0 in 2021, with different rates of change over time. The rate in 2021 was 33% higher than the rate in 2020 (7.5).

Figure 5. Age-adjusted rate of drug overdose deaths involving stimulants, by type of stimulant: United States, 2001–2021



<sup>1</sup>Significant increasing trend from 2001 through 2006, significant decreasing trend from 2006 through 2011, then significant increasing trend from 2011 through 2021,  $p < 0.05$ .

<sup>2</sup>Significant increasing trend from 2001 through 2005, stable trend from 2005 through 2008, then significant increasing trend from 2008 through 2021 with different rates of change over time,  $p < 0.05$ .

NOTES: Drug overdose deaths were identified using *International Classification of Diseases, 10th Revision* (ICD-10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Among these deaths, the following ICD-10 multiple cause-of-death codes indicate the drug type(s) involved: T40.5, cocaine; and T43.6, psychostimulants with abuse potential. Age-adjusted death rates were calculated using the direct method and the 2000 U.S. standard population. Deaths may involve more than one drug. The percentage of drug overdose deaths that identified the specific drugs involved varied by year, ranging from 75% to 79% from 2000 through 2013 and increasing from 81% in 2014 to 95% in 2021. Access data table for Figure 5 at: <https://www.cdc.gov/nchs/data/databriefs/db457-tables.pdf#5>.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality File.

## Summary

Drug overdose deaths have risen fivefold over the past 2 decades. In 2021, 106,699 deaths occurred, resulting in an age-adjusted rate of 32.4 per 100,000 standard population. From 2020 through 2021, the rate for males increased from 39.5 to 45.1, and the rate for females increased from 17.1 to 19.6. In both 2020 and 2021, adults aged 35–44 had the highest rate among people aged 15 and over. Between 2020 and 2021, the largest percentage increase in rates occurred among those aged 65 and over (28%). In both 2020 and 2021, rates were highest for non-Hispanic AIAN people; however, the greatest percentage increase in rates from 2020 to 2021 occurred for non-Hispanic NHOPI people.

The rates of drug overdose deaths involving different types of opioids and stimulants also increased from 2020 to 2021. Increases in rates occurred for drug overdose deaths involving psychostimulants with abuse potential (from 7.5 to 10.0), synthetic opioids other than methadone (17.8 to 21.8), and cocaine (6.0 to 7.3). Rates were similar for drug overdose deaths involving natural and semisynthetic opioids, as well as deaths involving methadone. Of the drugs examined, only drug overdose deaths involving heroin had a lower rate in 2021 than in 2020 (2.8 and 4.1, respectively).

## Definitions

Drug poisoning (overdose) deaths: Includes deaths resulting from unintentional or intentional overdose of a drug, being given the wrong drug, taking a drug in error, or taking a drug inadvertently.

Natural and semisynthetic opioids: Includes drugs such as morphine, codeine, hydrocodone, and oxycodone.

Psychostimulants with abuse potential: Includes drugs such as methamphetamine, amphetamine, and methylphenidate.

Synthetic opioids other than methadone: Includes drugs such as fentanyl, fentanyl analogs, and tramadol.

## Data source and methods

Estimates are based on the NVSS multiple cause-of-death mortality files (5). Drug poisoning (overdose) deaths were defined with an *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death code of X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), or Y10–Y14 (undetermined intent). Of the drug overdose deaths in 2021, 92.1% were unintentional, 4.1% were suicides, 3.6% were of undetermined intent, and less than 1.0% were homicides. The drug type(s) involved were indicated by ICD–10 multiple cause-of-death codes: T40.1 (heroin), T40.2 (natural and semisynthetic opioids), T40.3 (methadone), T40.4 (synthetic opioids other than methadone), and T43.6 (psychostimulants with abuse potential).

Race and Hispanic origin were categorized based on the Office of Management and Budget 1997 standards for federal statistical and administrative reporting (6). All of the race categories are “single race,” meaning that only one race was reported on the death certificate. Data shown

for the Hispanic population include people of any race. Death rates for non-Hispanic Asian, non-Hispanic AIAN, and Hispanic people are affected by misclassification of race and Hispanic origin on death certificates. This misclassification results in underestimation of death rates for these groups, by about 3% for non-Hispanic Asian and Hispanic people, and by about 34% for non-Hispanic AIAN people (7). The extent of this misclassification has not been evaluated for all causes of death (that is, drug overdose deaths) at this time. As a result, drug overdose death rates presented in this report are not adjusted for race and Hispanic-origin misclassification on death certificates.

Age-adjusted death rates were calculated using the direct method and adjusted to the 2000 U.S. standard population (8). Trends in age-adjusted death rates were evaluated using the Joinpoint Regression Program (Version 4.8.0.1) (8). Joinpoint software fitted weighted least-squares regression models to the rates on the log-transform scale. The permutation tests for model (number of joinpoints) significance were set at an overall alpha level of 0.05 (9). Pairwise comparisons of rates (for example, age-adjusted rates for males compared with females and year-to-year comparisons) were conducted using the *z* test with an alpha level of 0.05 (8).

Several factors related to death investigation and reporting may affect measurement of death rates involving specific drugs. At autopsy, the substances tested for and the circumstances under which the toxicology tests are performed vary by jurisdiction. This variability is more likely to affect substance-specific death rates than the overall drug overdose death rate. The percentage of drug overdose deaths that identified the specific drugs involved varied by year, ranging from 75% to 79% from 2000 through 2013, and increasing from 81% in 2014 to 95% in 2021. Additionally, drug overdose deaths may involve multiple drugs; as a result, a death might be included in more than one category when describing the rate of drug overdose deaths involving specific drugs. For example, a death that involved both fentanyl and cocaine would be included in both the rate of drug overdose deaths involving synthetic opioids other than methadone and the rate of drug overdose deaths involving cocaine.

## About the authors

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*Keywords: opioids • fentanyl • heroin • cocaine • methamphetamine • National Vital Statistics System*

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