

Drug Overdose Deaths in the United States, 1999–2017

Holly Hedegaard, M.D., Arialdi M. Miniño, M.P.H., and Margaret Warner, Ph.D.

Key findings

Data from the National Vital Statistics System, Mortality

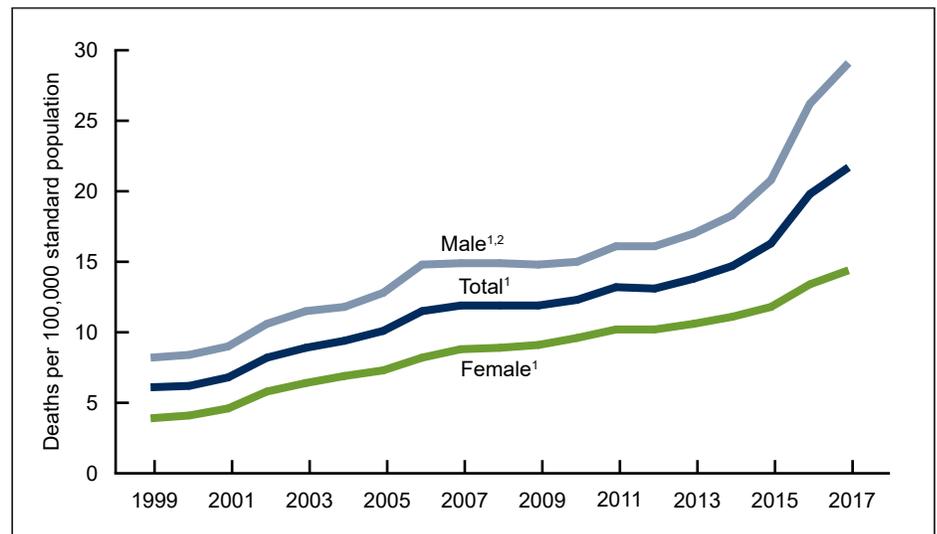
- In 2017, there were 70,237 drug overdose deaths in the United States.
- The age-adjusted rate of drug overdose deaths in 2017 (21.7 per 100,000) was 9.6% higher than the rate in 2016 (19.8).
- Adults aged 25–34, 35–44, and 45–54 had higher rates of drug overdose deaths in 2017 than those aged 15–24, 55–64, and 65 and over.
- West Virginia (57.8 per 100,000), Ohio (46.3), Pennsylvania (44.3), and the District of Columbia (44.0) had the highest age-adjusted drug overdose death rates in 2017.
- The age-adjusted rate of drug overdose deaths involving synthetic opioids other than methadone (drugs such as fentanyl, fentanyl analogs, and tramadol) increased by 45% between 2016 and 2017, from 6.2 to 9.0 per 100,000.

Deaths from drug overdose continue to be a public health burden in the United States (1–5). This report uses the most recent final mortality data from the National Vital Statistics System (NVSS) to update trends in drug overdose deaths, describe demographic and geographic patterns, and identify shifts in the types of drugs involved.

In 2017, the age-adjusted rate of drug overdose deaths in the United States was 9.6% higher than the rate in 2016.

- In 2017, there were 70,237 drug overdose deaths in the United States (Figure 1).
- The age-adjusted rate of drug overdose deaths increased from 6.1 per 100,000 standard population in 1999 to 21.7 in 2017. The rate increased

Figure 1. Age-adjusted drug overdose death rates: United States, 1999–2017



¹Significant increasing trend from 1999 through 2017 with different rates of change over time, $p < 0.05$.

²Male rates were significantly higher than female rates for all years, $p < 0.05$.

NOTES: Deaths are classified using the *International Classification of Diseases, 10th Revision*. Drug-poisoning (overdose) deaths are identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. The number of drug overdose deaths in 2017 was 70,237. Access data table for Figure 1 at: https://www.cdc.gov/nchs/data/databriefs/db329_tables-508.pdf#1.

SOURCE: NCHS, National Vital Statistics System, Mortality.



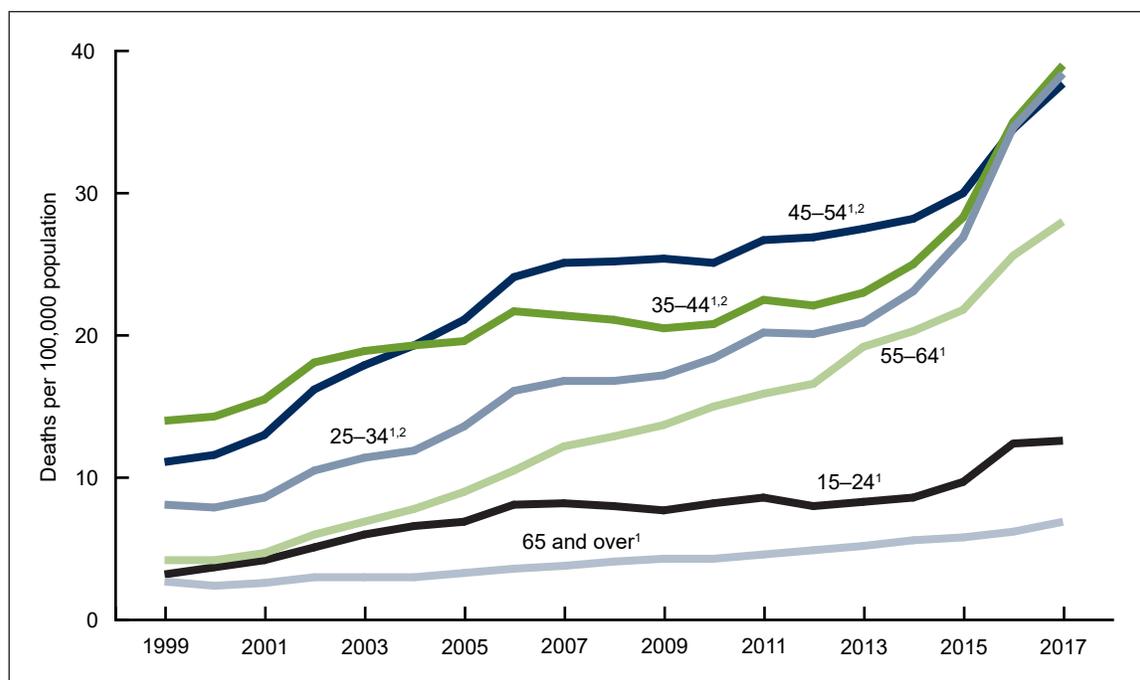
on average by 10% per year from 1999 through 2006, by 3% per year from 2006 through 2014, and by 16% per year from 2014 through 2017.

- For each year, rates were significantly higher for males than females. For males, the rate increased from 8.2 in 1999 to 29.1 in 2017. For females, the rate increased from 3.9 in 1999 to 14.4 in 2017.

Among persons aged 15 and over, adults aged 25–34, 35–44, and 45–54 had higher rates of drug overdose deaths in 2017 than those aged 15–24, 55–64, and 65 and over, while those aged 65 and over had the lowest rates.

- The rates of drug overdose deaths increased from 1999 to 2017 for all age groups studied (Figure 2).
- In 2017, rates were significantly higher for age groups 25–34 (38.4 per 100,000), 35–44 (39.0), and 45–54 (37.7) than for those aged 15–24 (12.6), 55–64 (28.0), and 65 and over (6.9).
- In 2017, rates were lowest for adults aged 65 and over (6.9).
- From 1999 to 2017, the greatest percentage change in drug overdose death rates occurred among adults aged 55–64, increasing from 4.2 per 100,000 in 1999 to 28.0 in 2017, a more than 6-fold increase.

Figure 2. Drug overdose death rates, by selected age group: United States, 1999–2017

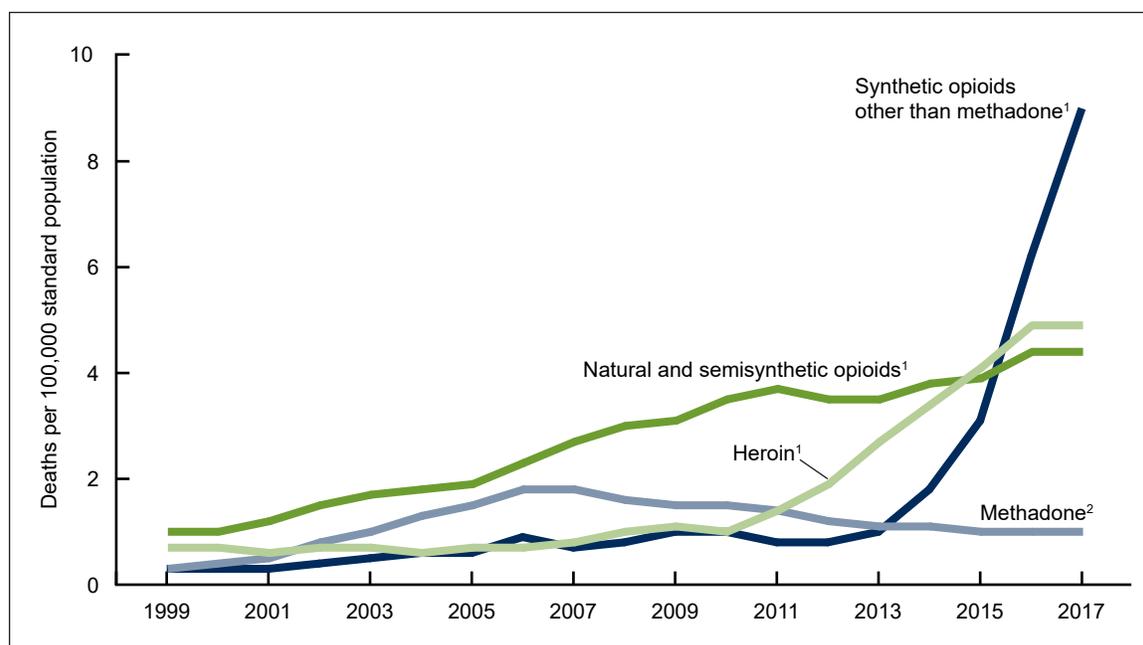


¹Significant increasing trend from 1999 through 2017 with different rates of change over time, $p < 0.005$.
²2017 rates were significantly higher for age groups 25–34, 35–44, and 45–54 than for age groups 15–24, 55–64, and 65 and over, $p < 0.05$. The rate for age group 35–44 was significantly higher than the rate for age group 45–54 and statistically the same as the rate for age group 25–34.
 NOTES: Deaths are classified using the *International Classification of Diseases, 10th Revision*. Drug-poisoning (overdose) deaths are identified using 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/db329_tables-508.pdf#2.
 SOURCE: NCHS, National Vital Statistics System, Mortality.

The age-adjusted rate of drug overdose deaths involving synthetic opioids other than methadone increased by 45% from 2016 to 2017.

- The rate of drug overdose deaths involving synthetic opioids other than methadone, which include drugs such as fentanyl, fentanyl analogs, and tramadol, increased from 0.3 per 100,000 in 1999 to 1.0 in 2013, 1.8 in 2014, 3.1 in 2015, 6.2 in 2016, and 9.0 in 2017 (Figure 4). The rate increased on average by 8% per year from 1999 through 2013 and by 71% per year from 2013 through 2017.
- The rate of drug overdose deaths involving heroin increased from 0.7 in 1999 to 1.0 in 2008 to 4.9 in 2016. The rate in 2017 was the same as in 2016 (4.9).
- The rate of drug overdose deaths involving natural and semisynthetic opioids, which include drugs such as oxycodone and hydrocodone, increased from 1.0 in 1999 to 4.4 in 2016. The rate in 2017 was the same as in 2016 (4.4).
- The rate of drug overdose deaths involving methadone increased from 0.3 in 1999 to 1.8 in 2006, then declined to 1.0 in 2016. The rate in 2017 was the same as in 2016 (1.0).

Figure 4. Age-adjusted drug overdose death rates, by opioid category: United States, 1999–2017



¹Significant increasing trend from 1999 through 2017 with different rates of change over time, $p < 0.05$.

²Significant increasing trend from 1999 through 2006, then decreasing trend from 2006 through 2017, $p < 0.05$.

NOTES: Deaths are classified using the *International Classification of Diseases, 10th Revision*. Drug-poisoning (overdose) deaths are identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Drug overdose deaths involving selected drug categories are identified by specific multiple-cause-of-death codes: heroin, T40.1; natural and semisynthetic opioids, T40.2; methadone, T40.3; and synthetic opioids other than methadone, T40.4. Deaths involving more than one opioid category (e.g., a death involving both methadone and a natural and semisynthetic opioid) are counted in both categories. The percentage of drug overdose deaths that identified the specific drugs involved varied by year, with ranges of 75%–79% from 1999 through 2013 and 81%–88% from 2014 through 2017. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db329_tables-508.pdf#4.

SOURCE: NCHS, National Vital Statistics System, Mortality.

Summary

This report updates statistics on deaths from drug overdoses in the United States and includes information on trends since 1999 as well as key statistics for 2017.

Rates of drug overdose deaths continued to increase. In 2017, the age-adjusted rate of drug overdose deaths (21.7 per 100,000) was 3.6 times the rate in 1999 (6.1). Rates increased for both males (from 8.2 in 1999 to 29.1 in 2017) and females (from 3.9 in 1999 to 14.4 in 2017). Rates also increased for all age groups studied. In 2017, among persons aged 15 and over, rates were highest for adults aged 25–34 and 35–44 at 38.4 and 39.0 per 100,000, respectively. In 2017, 20 states and the District of Columbia had age-adjusted drug overdose death rates that were statistically higher than the national rate, 8 states had rates that were comparable to the national rate, and 22 states had lower rates.

The pattern of drugs involved in drug overdose deaths has changed in recent years. The rate of drug overdose deaths involving synthetic opioids other than methadone (drugs such as fentanyl, fentanyl analogs, and tramadol) increased 45% from 6.2 per 100,000 in 2016 to 9.0 in 2017. The rates of drug overdose deaths involving heroin (4.9 per 100,000), natural and semisynthetic opioids (4.4), and methadone (1.0) were the same in 2016 and 2017.

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 such drugs as morphine, codeine, hydrocodone, and oxycodone.

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

Data source and methods

Estimates are based on the NVSS multiple-cause-of-death mortality files (6). Drug poisoning (overdose) deaths were defined as having 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 2017, 87% were unintentional, 7% were suicides, 5% were of undetermined intent, and less than 1% were homicides. The type of drug(s) involved are indicated by ICD–10 multiple-cause-of-death codes: heroin (T40.1); natural and semisynthetic opioids (T40.2); methadone (T40.3); and synthetic opioids other than methadone (T40.4).

Age-adjusted death rates were calculated using the direct method and adjusted to the 2000 U.S. standard population (7). Trends in age-adjusted death rates were evaluated using the Joinpoint Regression Program (Version 4.3.1.0) (8). Joinpoint software fitted weighted least-squares regression models to the rates on the log transform scale. Analyses were set to allow a maximum of three joinpoints across the period, a minimum of three observed time points from any given joinpoint to either end of the data, and a minimum of four observed time points between any two joinpoints. The permutation tests for model (number of joinpoints) significance were set at an overall alpha level of 0.05 (9). Differences between national and state estimates were evaluated using two-sided significance tests at the 0.05 level, with the national rate treated as a fixed parameter. References to rates being higher or lower indicate that differences are statistically significant at the 0.05 level. References to rates being similar or not different indicate a lack of statistical significance even though rates may appear to differ (7).

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 for which at least one specific drug was identified as being involved varied by year, ranging from 75%–79% from 1999 through 2013 and from 81%–88% from 2014 through 2017.

Additionally, drug overdose deaths may involve multiple drugs; therefore, a single 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 heroin and fentanyl would be included in both the rate of drug overdose deaths involving heroin and the rate of drug overdose deaths involving synthetic opioids other than methadone.

About the authors

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