Estimates of Drug Overdose Deaths Involving Fentanyl, Methamphetamine, Cocaine, Heroin, and Oxycodone: United States, 2021

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Abstract

Objectives—Using literal text from the National Vital Statistics System, this report provides national drug overdose death rates involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone by sex, age, race and Hispanic origin, and public health region.

Methods—The study analyzed literal text from the National Vital Statistics System mortality data for deaths occurring in the United States among U.S. residents. Drug overdose deaths were limited to those with *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), or Y10–Y14 (undetermined intent). Specific drugs were identified using enhanced methods for searching literal text from death certificates. Trends from 2016 through 2021 were examined, as well as sex, age, race and Hispanic origin, and region-specific estimates for 2021.

Results—From 2016 through 2021, age-adjusted drug overdose death rates involving fentanyl, methamphetamine, and cocaine increased, while drug overdose death rates involving oxycodone decreased. In 2021, the age-adjusted death rates for males were higher than the rates for females for all drugs analyzed. Among those aged 25–64, the highest rate of drug overdose deaths involved fentanyl; although a similar pattern was observed among those aged 0–24 years and 65 and over, no significant differences were observed between the rates ($p < 0.05$). Fentanyl was also the most frequent opioid or stimulant drug involved in drug overdose deaths for the race and Hispanic-origin groups analyzed. Age-adjusted rates of drug overdose deaths varied by region. In 2021, for all regions except Regions 8 and 10, drug overdose deaths involving fentanyl were highest, while drug overdose deaths involving both fentanyl and methamphetamine were highest for Regions 8 and 10.

Keywords: drug involved • mortality surveillance • poisoning • specific substances • race and Hispanic origin • National Vital Statistics System

Introduction

Drug overdose deaths continue to be a significant public health burden in the United States, given the rise in rates over the past 2 decades. From 2001 through 2021, age-adjusted rates increased from 6.1 per 100,000 standard population to 32.4, with a 14% increase from 2020 to 2021 (1).

Fentanyl, methamphetamine, cocaine, heroin, and oxycodone are frequently involved in drug overdose deaths (2–5). Typically, deaths in the United States are coded to the *International Classification of Diseases, 10th Revision* (ICD–10) to classify underlying and multiple causes of death in the National Vital Statistics System (NVSS) (6). However, one limitation of the ICD–10 classification system is that, with a few exceptions, ICD–10 codes do not reflect specific drugs, but rather, broader categories. For example, the ICD–10 code for drug overdose deaths involving synthetic opioids (T40.4) includes deaths involving fentanyl, tramadol, and nitazenes. Analyzing data solely based on ICD–10 categorizations can make it difficult to monitor trends of specific drugs, such as drug overdose deaths involving fentanyl.

To address the limitations of ICD–10-coded mortality data, the National Center for Health Statistics has developed a method that searches the literal text of death certificates to identify mentions of specific drugs and other substances involved in the death (7). Death certificate literal text is the written

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information provided by the medical certifier, usually a medical examiner or coroner for drug overdose deaths, that describes the causes, manner, and circumstances contributing to the death (8). Using literal text from the NVSS mortality data, this report describes patterns in drug overdose deaths involving five opioid or stimulant drugs frequently involved in deaths, by year (2016–2021) and by age, sex, race and Hispanic origin, and public health region for 2021.

Data Source and Methods

Data source and study population

NVSS death certificate records are held in a dynamic database and considered provisional until the data have been processed, reviewed, verified, and released by the National Center for Health Statistics as a final data set. For this analysis, a file containing literal text and other mortality information from 2016 through 2021 was retrieved from the dynamic database on March 29, 2023. Because the dynamic database may continue to receive updates to death certificate data after the closeout of data, death counts may differ from other published sources.

Population estimates used for computing rates are postcensal estimates based on the 2010 decennial census. The study population included decedents who resided and died in the United States and had an underlying cause of death of drug overdose as identified by the following ICD–10 codes: X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), and Y10–Y14 (undetermined intent). Among drug overdose deaths between 2016 and 2021, 86.1%–92.2% were unintentional, 4.0%–8.0% were suicides, 3.6%–5.7% were of undetermined intent, and less than 1.0% were homicides.

Drugs involved in deaths were extracted from the literal text fields in NVSS: the causes of death from Part I, significant conditions contributing to the death from Part II, and a description of how the injury occurred. To be consistent in the methodology for identifying specific drugs involved in deaths, any deaths involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone were identified using the established methods for searching literal text from death certificates (2–4). The specific drugs involved in drug overdose deaths were identified from these text fields in the method described below.

Identifying drug mentions and involvement of the drug in the death

Specific drugs are identified as being involved in a drug overdose death when the drug or substance—or terms that provide context about the involvement of the drug in the death (that is, whether the drug contributed to the death)—are mentioned in the literal text of the death certificate. The drugs or substances mentioned in literal text fields are assumed to be involved in the death unless contextual information indicates otherwise. The methodology for searching literal text information to characterize drugs involved in deaths is briefly described below, as well as detailed in previous reports (2–4, 7).

Principal variants

This study used the Drugs Mentioned with Involvement (DMI) methodology to identify mentions of drugs and other substances using search terms, which include generic names, brand names, common usage or street names, abbreviations, metabolites, misspellings, and other variations (7). Each search term is mapped to a principal variant, the label assigned to a drug, a drug class, or exposure not otherwise specified. Principal variants are linked to a unique ingredient identifier, which describes the substance's molecular structure or descriptive information as generated by the Global Substance Registration System, maintained by the U.S. Food and Drug Administration. For example, terms such as COCAIEN, COCAINE CRACK, COCAINE HYDROCHLORIDE, and COCAINETOXICITY are all mapped

to the principal variant COCAINE. Principal variants also are categorized according to whether they referred to a specific drug or substance (for example, oxycodone), class of drug or substances (for example, opioid), or nonspecific references (for example, words such as DRUG, MULTIDRUG, or POLYPHARMACY).

Referent drug groups

Referent drug groups serve as the unit of analysis for reporting drug overdose deaths of specific drugs. A referent drug group may include two or more principal variants reflecting a drug category. For example, the referent drug group fentanyl includes principal variants of fentanyl, which includes fentanyl analogs (CARFENTANIL), precursors (DEPROPIONYLFENTANYL), and metabolites (NORFENTANYL) of fentanyl. Findings in this report reflect referent group categories that are provided in an accompanying file, available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/VSRR/VSRR-27-Online-Table-nmc.xlsx. More than one drug can be reported on a death certificate; consequently, the resulting death counts do not form discrete, mutually exclusive categories.

Data analysis

Age-adjusted death rates were calculated using the direct method, adjusted to the 2000 standard population, and include all ages (6), using R statistical software, version 4.0.3 (9). Any differences between rates presented in this report are statistically significant (p values less than 0.05). Trends in age-adjusted death rates from 2016 through 2021 were evaluated using z tests (between years) as well as from the National Cancer Institute's Joinpoint Regression Program (Version 4.9.0.0) (10). The period from 2016 through 2021 was selected based on the availability and quality of the literal text in NVSS and consistency in reporting of specific drugs during the time period. Joinpoint software fitted weighted least-squares regression models to the rates on the

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log transformed scale. Allowing one observed time point at each end and two for the middle line segments, the grid search algorithm searched for a maximum of two joinpoints at an overall alpha level of $p < 0.05$ (10). Pairwise comparisons of rates to detect differences within demographic groups and regions were conducted using a z test statistic at the 0.05 level of significance (11).

Age-adjusted rates of drug overdose deaths by race and Hispanic origin for 2021 were reported using categories based on the Office of Management and Budget's 1997 standards for federal statistical and administrative reporting (12). All race categories are single race, meaning that only one race was reported on the death certificate. Only race and Hispanic-origin groups with statistically reliable estimates were reported. Data shown for the Hispanic population include people of any race. Non-Hispanic American Indian or Alaska Native (subsequently, American Indian or Alaska Native) and Hispanic people have been shown to be 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 (subsequently, Asian) and Hispanic people, and by an estimated 34% for American Indian or Alaska Native people (13). At this time, the extent of this misclassification has not been evaluated for all causes of death (as in drug overdose deaths); as a result, rates are not adjusted for misclassification. Geographic patterns in overdose deaths involving specific drugs are presented by the 10 U.S. Department of Health and Human Services (HHS) public health regions. These regions are used for public health prevention, preparedness, and agencywide coordination of HHS programs and policies (14). The regions, excluding U.S. territories, are:

- Region 1: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

- Region 2: New Jersey and New York

- Region 3: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia

- Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee

- Region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

- Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas

- Region 7: Iowa, Kansas, Missouri, and Nebraska

- Region 8: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming

- Region 9: Arizona, California, Hawaii, and Nevada

- Region 10: Alaska, Idaho, Oregon, and Washington

Results

Trends in age-adjusted death rates of drug overdose deaths from 2016 through 2021, by specific drug

The age-adjusted rate of drug overdose deaths involving fentanyl more than tripled over the study period, from 5.7 per 100,000 standard population in 2016 to 21.6 in 2021, with a 55.0% increase from 2019 (11.2) to 2020 (17.4), and a 24.1% increase from 2020 to 2021 (21.6) (Table 1, Figure 1). The rate of drug overdose deaths involving methamphetamine more than quadrupled, from 2.1 in 2016 to 9.6 in 2021. The rate of drug overdose deaths involving cocaine more than doubled, from 3.5 in 2016 to 7.9 per 100,000 in 2021. The rate of drug overdose deaths involving heroin decreased by 40.8%, from 4.9 in 2016 to 2.9 in 2021, although this decrease was not statistically significant. The rate of drug overdose deaths involving oxycodone decreased 21.0%, from 1.9 in 2016 to 1.5 in 2021.

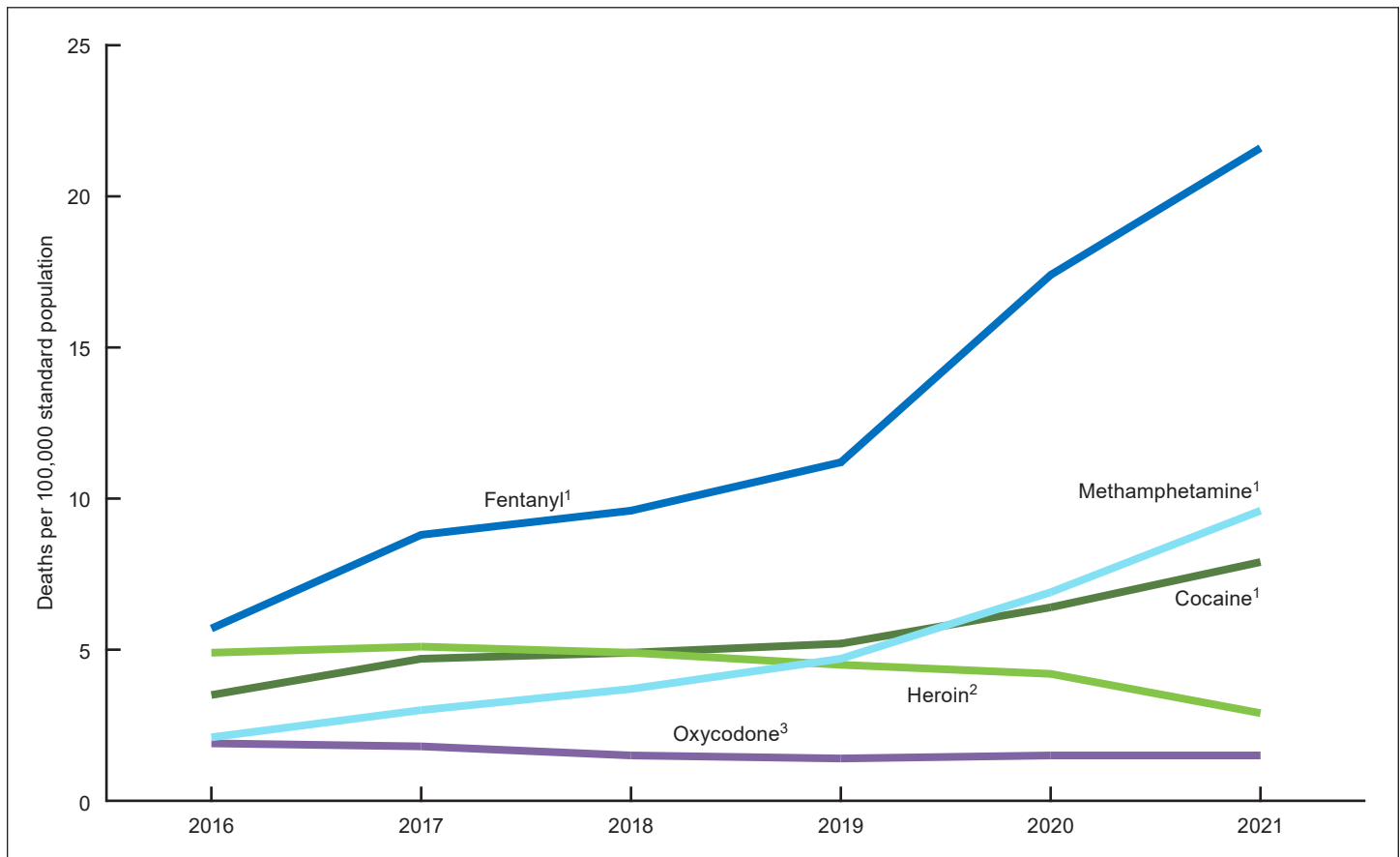## Age-adjusted death rates of drug overdose deaths in 2021, by selected drugs and sex

In 2021, the age-adjusted rate of drug overdose deaths was highest for deaths involving fentanyl (21.6 per 100,000 standard population), followed by methamphetamine (9.6), cocaine (7.9), heroin (2.9), and oxycodone (1.5). Patterns were similar when stratified by sex (Table 2, Figure 2).

Males had higher rates of drug overdose deaths for all drugs analyzed. For drug overdose deaths involving fentanyl, the rate for males was 2.6 times the rate for females (31.3 compared with 11.9); for deaths involving methamphetamine, the rate for males was 2.6 times the rate for females (13.8 compared with 5.4); for deaths involving cocaine, the rate for males was 2.5 times the rate for females (11.3 compared with 4.5); for deaths involving heroin, the rate for males was 2.8 times the rate for females (4.2 compared with 1.5); and for deaths involving oxycodone, the rate for males was 1.3 times the rate for females (1.7 compared with 1.3).

Age-specific rates of drug overdose deaths in 2021, by selected drugs and age group

In 2021, among those aged 25–34 and 35–44, the drug overdose death rates were highest for fentanyl (40.8 and 43.5, respectively), followed by methamphetamine (15.4 and 20.3) and cocaine (11.5 and 14.9) (Table 2, Figure 3). While the drug overdose death rates were highest for fentanyl among those aged 45–54 and 55–64, at 32.7 and 24.8, respectively, the rate of drug overdose deaths was similar for deaths involving cocaine and methamphetamine. Among those aged 0–24 years and 65 and over, although the drug overdose death rate involving fentanyl was higher compared with other drug types, it was not significantly different; drug overdose death rates for all other drugs analyzed

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Figure 1. Age-adjusted rates of drug overdose deaths, by selected drugs: United States, 2016–2021

[1]Significant increasing trend from 2016 through 2021; $p < 0.05$.
[2]Stable trend from 2016 through 2021.
[3]Significant decreasing trend from 2016 through 2021; $p < 0.05$.
NOTES: Drug overdose deaths are identified using *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Deaths involving more than one drug (for example, a death involving both heroin and cocaine) are included in both totals. Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population. Caution should be used when comparing rates across years. The reporting of at least one specific drug or drug class in the literal text, as identified by multiple cause-of-death codes T36–T50.8, improved from 85% of drug overdose deaths in 2016 to 95% in 2021.
SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

(methamphetamine, cocaine, heroin, and oxycodone) were similar.

Age-adjusted death rates of drug overdose deaths in 2021, by selected drugs and race and Hispanic origin
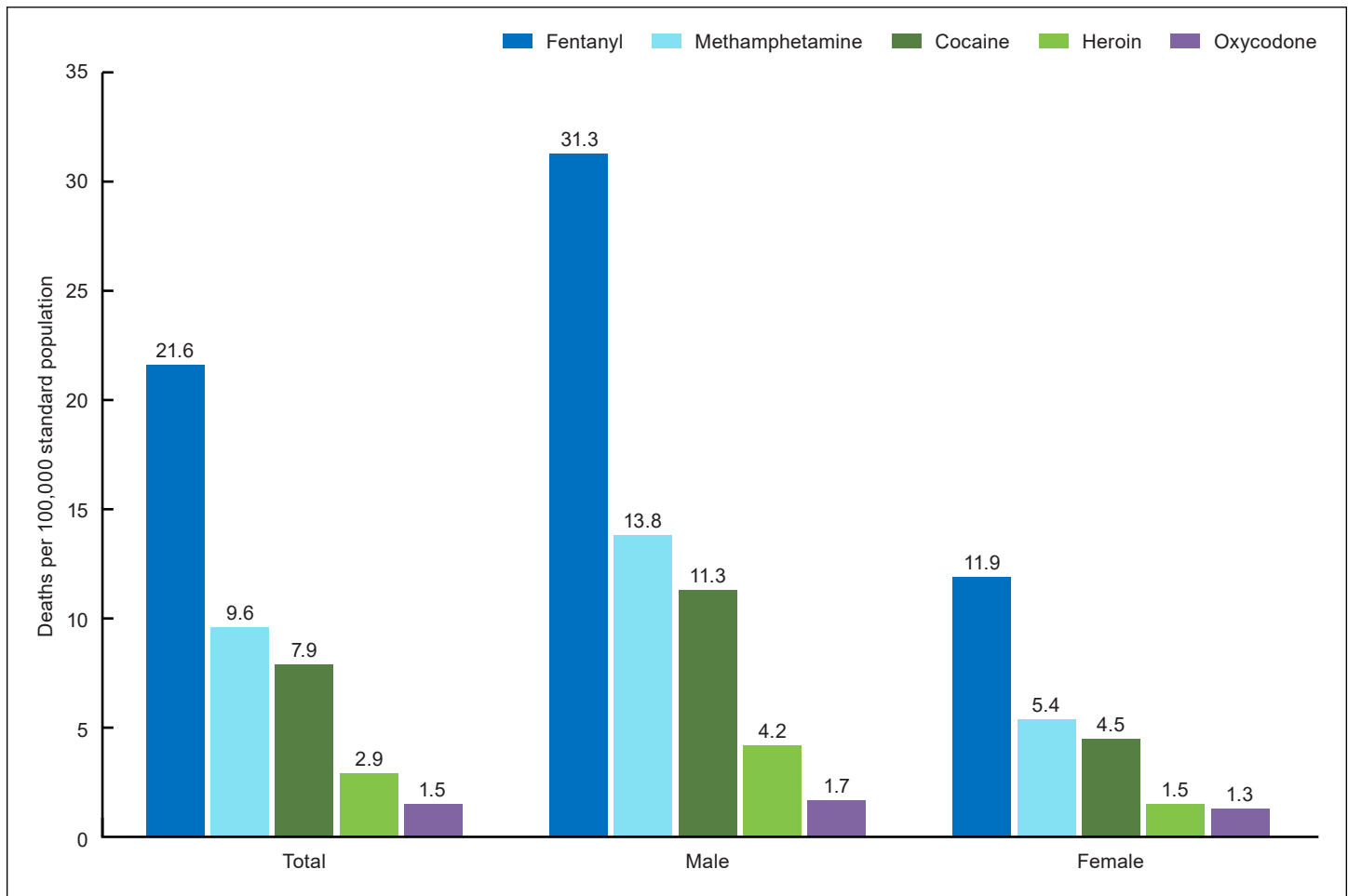
In 2021, among non-Hispanic Black people, the highest age-adjusted rate of drug overdose deaths involved fentanyl (31.3), followed by cocaine (20.6) and methamphetamine (7.0) (Table 2, Figure 4). Among American Indian or Alaska Native people, the highest drug overdose death rate involved fentanyl (33.1), followed by methamphetamine (27.4) and cocaine (7.4). Among non-Hispanic White people, the highest drug overdose death rates involved fentanyl

(24.6), methamphetamine (12.0), and cocaine (6.8). Among Hispanic people, the rate of drug overdose deaths was highest involving fentanyl (14.1), followed by methamphetamine (6.2) and cocaine (5.8). Among Asian people, the rate of drug overdose deaths involving fentanyl (2.3) was higher compared with other drug types, followed by methamphetamine (1.4) and cocaine (1.0).

Age-adjusted death rates of drug overdose deaths in 2021, by selected drugs and public health region

In 2021, for all regions except Regions 8 and 10, the drug overdose death rates were highest involving fentanyl compared with methamphetamine, cocaine, heroin, and oxycodone (Table 2, Figure 5). For Regions 8 and 10, drug overdose death rates involving fentanyl and methamphetamine were similar. For all regions except Regions 1 and 7, rates were lowest for drug overdose deaths involving oxycodone. For Regions 1 and 7, drug overdose rates for oxycodone and heroin were similar, but oxycodone deaths were lower than other drug types.

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Figure 2. Age-adjusted rates of drug overdose deaths, by selected drugs and sex: United States, 2021

NOTES: Drug overdose deaths are identified using *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Deaths involving more than one drug (for example, a death involving both heroin and cocaine) are included in both totals. Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population. Differences in rates between selected drugs for all groups were significant ($p < 0.05$). SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

The drug overdose death rate involving fentanyl was highest in Regions 1 (32.2) and 3 (32.0), while the death rate involving methamphetamine was highest in Region 9 (14.1). The drug overdose death rate involving cocaine was highest in Region 1 (15.9), and the rate for deaths involving heroin was highest in Region 2 (5.0).

Discussion

This report presents the trend in drug overdose deaths for the five most frequent opioids and stimulant drugs involved in deaths in the United States from 2016 through 2021, and then focuses on differences by sex, age group, race and Hispanic origin, and public health region in 2021. The rate of drug overdose deaths increased by 279% for drug overdoses involving fentanyl during the study period, from 5.7 per 100,000 standard population in 2016 to 21.6 in 2021. The rate of drug overdose deaths involving methamphetamine and cocaine also increased over the study period. Conversely, the rate of drug overdose deaths involving heroin decreased by 40.8% (nonsignificant), and the rate involving oxycodone decreased by 21.0%. Findings on these trends may differ from earlier reports examining different time periods because statistical results using the Joinpoint software may vary according to the number of data points. Drug overdose death rates vary by sex. In 2021, rates for males were higher than the rates for females among the specific drugs analyzed, including fentanyl, methamphetamine, cocaine, heroin, and oxycodone. Variations were observed in the distribution by age group. Among those aged 25–34 and 35–44, the highest drug overdose death rates involved fentanyl and methamphetamine, while among those aged 45–54 and 55–64, after fentanyl (the most frequently involved drug), the highest drug overdose death rates involved both cocaine and methamphetamine. Moreover, geographic differences were observed, where rates of drug overdose deaths involving fentanyl were highest in Regions 1–7 and 9 compared with other drugs in this analysis.

Methods based on the literal text are dependent on the quality and completeness of the information provided, which may vary from jurisdiction to jurisdiction due to

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Figure 3. Age-specific rates of drug overdose deaths, by selected drugs and age group: United States, 2021
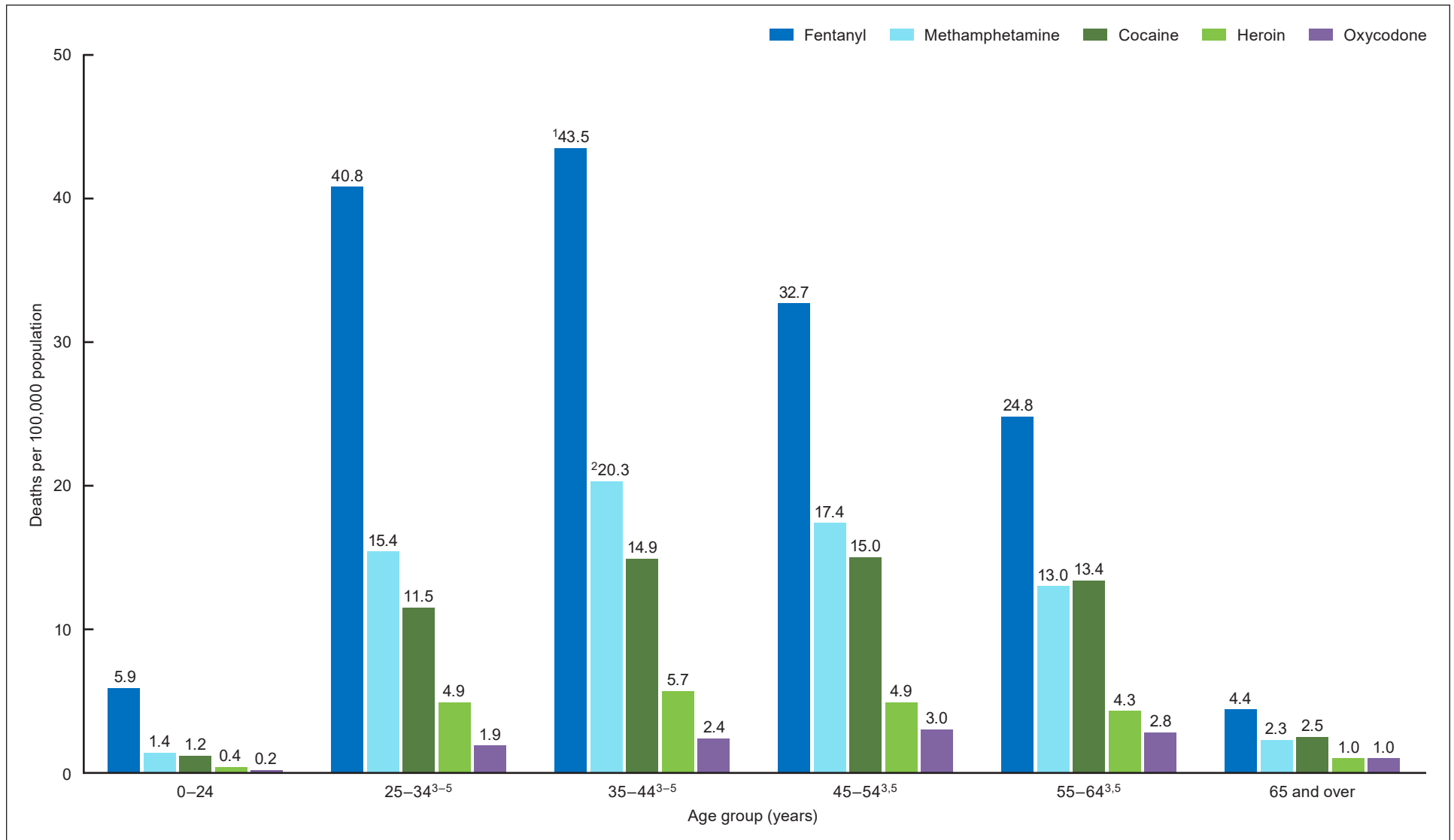
[1]Significantly higher than all other age groups ($p < 0.05$).
[2]Significantly higher than all other age groups ($p < 0.05$) except 45–54.
[3]Rate of deaths involving fentanyl was highest compared with the rate of deaths involving methamphetamine, cocaine, heroin, and oxycodone ($p < 0.05$).
[4]Rate of deaths involving methamphetamine was highest compared with the rate of deaths involving cocaine, heroin, and oxycodone ($p < 0.05$).
[5]Rate of deaths involving oxycodone was lowest compared with the rate of deaths involving fentanyl, methamphetamine, and cocaine ($p < 0.05$).
NOTES: Drug overdose deaths are identified using *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Deaths involving more than one drug (for example, a death involving both heroin and cocaine) are included in both totals. Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population.
SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

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Figure 4. Age-adjusted rates of drug overdose deaths, by selected drugs and race and Hispanic origin: United States, 2021
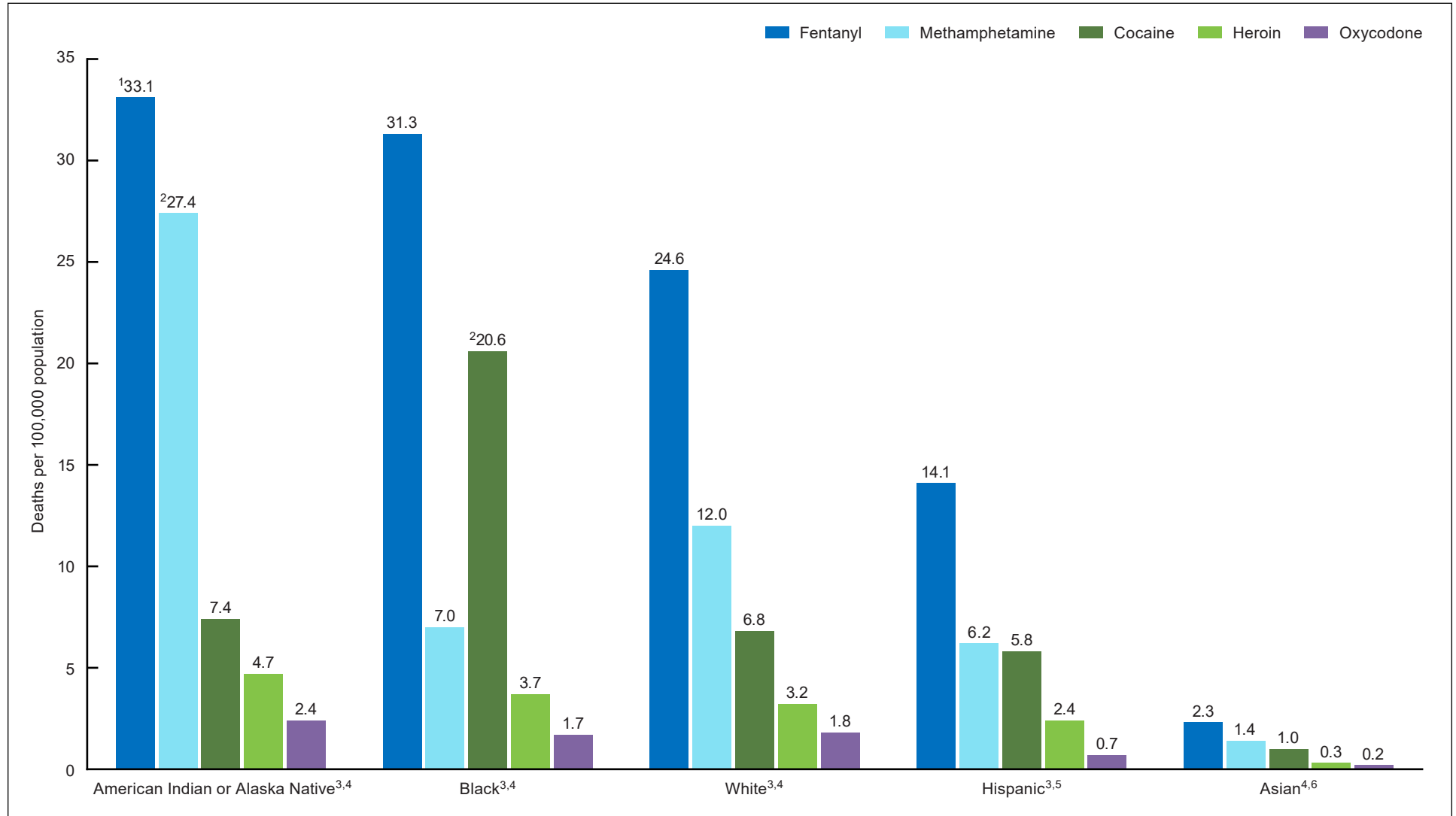
[1]Significantly higher than all other race and Hispanic-origin groups ($p < 0.05$) except non-Hispanic Black.
[2]Significantly higher than all other race and Hispanic-origin groups ($p < 0.05$).
[3]Differences in rates between selected drugs were statistically significant ($p < 0.05$).
[4]Race groups are non-Hispanic.
[5]People of Hispanic origin may be of any race.
[6]Differences in rates between selected drugs were statistically significant ($p < 0.05$), except between heroin and oxycodone.
NOTES: Drug overdose deaths are identified using *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Deaths involving more than one drug (for example, a death involving both heroin and cocaine) are included in both totals. Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population.
SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

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Figure 5. Age-adjusted rates of drug overdose deaths, by selected drugs and public health region: United States, 2021
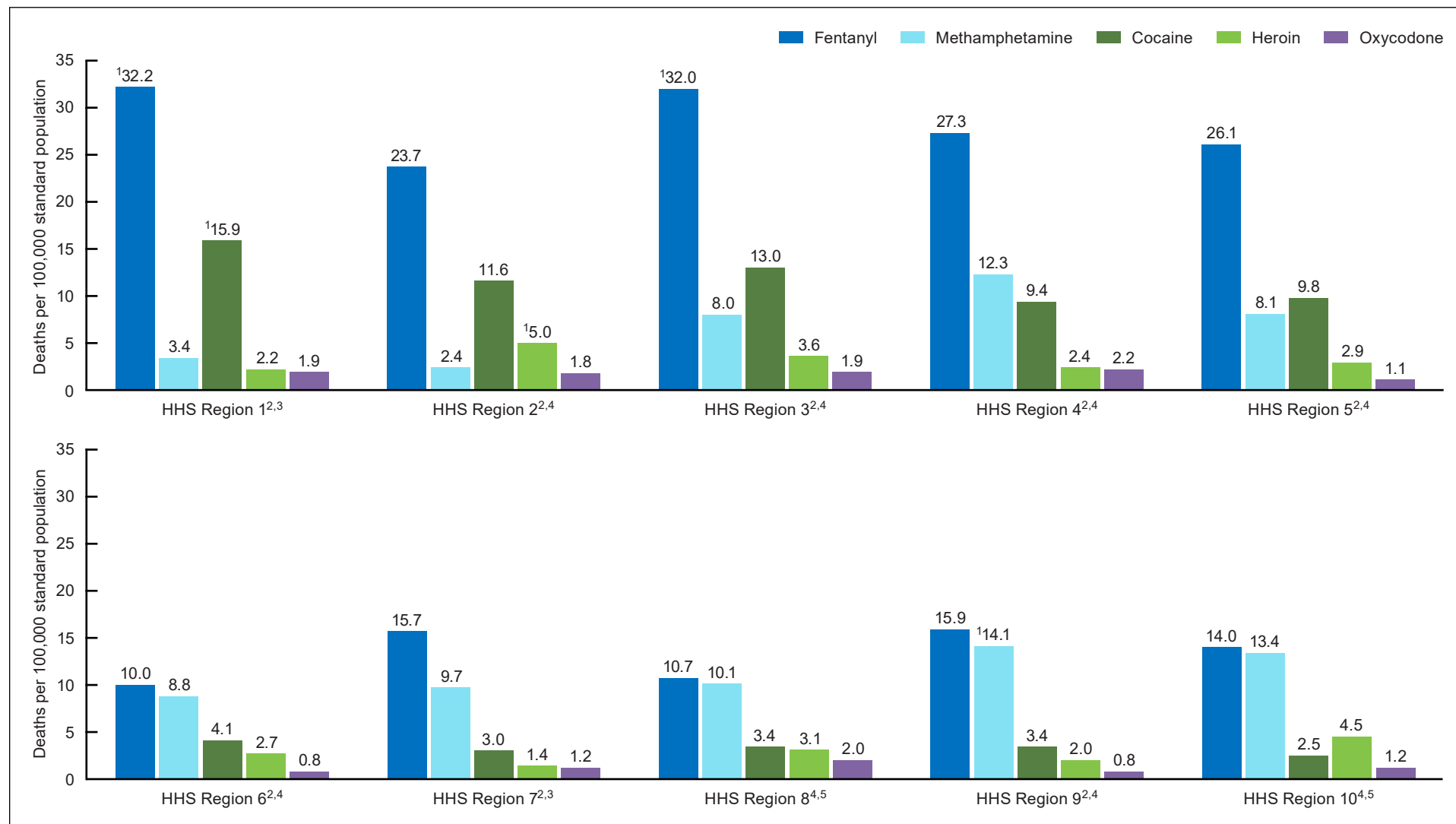
[1]Rate of deaths involving this drug is significantly higher than all other regions ($p < 0.05$).
[2]Rate of deaths involving fentanyl was highest compared with the rate of deaths involving methamphetamine, cocaine, heroin, and oxycodone ($p < 0.05$).
[3]Rate of deaths involving oxycodone was lowest compared with the rate of deaths involving fentanyl, methamphetamine, and cocaine ($p < 0.05$).
[4]Rate of deaths involving oxycodone was lowest compared with the rate of deaths involving fentanyl, methamphetamine, cocaine, and heroin ($p < 0.05$).
[5]Rate of deaths involving fentanyl was highest compared with the rate of deaths involving cocaine, heroin, and oxycodone ($p < 0.05$).
NOTES: The 10 U.S. Department of Health and Human Services (HHS) public health regions are: Region 1 (CT, MA, ME, NH, RI, and VT); Region 2 (NJ and NY); Region 3 (DC, DE, MD, PA, VA, and WV); Region 4 (AL, FL, GA, KY, MS, NC, SC, and TN); Region 5 (IL, IN, MI, MN, OH, and WI); Region 6 (AR, LA, NM, OK, and TX); Region 7 (IA, KS, MO, and NE); Region 8 (CO, MT, ND, SD, UT, and WY); Region 9 (AZ, CA, HI, and NV); and Region 10 (AK, ID, OR, and WA). Drug overdose deaths are identified using *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Deaths involving more than one drug (for example, a death involving both heroin and cocaine) are included in both totals. Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population.
SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

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differences in reporting practices in systems that conduct death investigations and certify the cause and manner of unnatural and unexplained deaths (medicolegal death investigation systems) across the United States (15–17); interpretations of these findings should consider these limitations. Additionally, regional differences in the quality and completeness of death investigation and reporting must be considered when reviewing these findings.

Variations in the way drug overdose deaths are reported on death certificates, including the level of detail on specific drugs involved, can impact comparability. During 2016–2021, the reporting of at least one specific drug among drug overdose deaths improved from 85% in 2016 to 95% in 2021 (18). These improvements in specificity could affect the magnitude and distribution of deaths due to specific drugs. However, earlier research that adjusted for improved reporting practices found similar patterns between the observed and adjusted rates and, consequently, reported solely the observed rates (4). Similarly, this report provides only the observed rates. Trends in rates of drug overdose deaths should also be interpreted considering improvements in quality of the data over the study period.

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List of Detailed Tables

Report tables

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Table 1. Age-adjusted rate of drug overdose deaths involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone: United States, 2016–2021

[Rates are per 100,000 standard population]

Year	Fentanyl		Methamphetamine		Cocaine		Heroin		Oxycodone	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
2016.	18,499	5.7	6,830	2.1	11,404	3.5	16,005	4.9	6,238	1.9
2017.	27,530	8.8	9,438	3.0	15,050	4.7	16,047	5.1	6,094	1.8
2018.	30,286	9.6	11,784	3.7	15,689	4.9	15,496	4.9	5,070	1.5
2019.	35,436	11.2	15,049	4.7	16,985	5.2	14,517	4.5	4,624	1.4
2020.	55,785	17.4	22,523	6.9	21,071	6.4	13,636	4.2	5,121	1.5
2021.	69,943	21.6	31,170	9.6	26,198	7.9	9,471	2.9	5,060	1.5

NOTES: Drug overdose deaths are identified using the *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population. Caution should be used when comparing rates across years. The reporting of at least one specific drug or drug class in the literal text, as identified by multiple cause-of-death codes T36–T50.8, improved from 85% of drug overdose deaths in 2016 to 95% in 2021.

SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

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Table 2. Number and rate of drug overdose deaths involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone, by demographic characteristics: United States, 2021

[Rates are per 100,000 standard population in 2021]

Characteristic	Fentanyl		Methamphetamine		Cocaine		Heroin		Oxycodone	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Sex										
Female.	19,096	11.9	8,661	5.4	7,317	4.5	2,439	1.5	2,194	1.3
Male.	50,847	31.3	22,509	13.8	18,881	11.3	7,032	4.2	2,866	1.7
Age group (years)										
0–24.	6,100	5.9	1,395	1.4	1,273	1.2	387	0.4	188	0.2
25–34.	18,573	40.8	7,006	15.4	5,224	11.5	2,236	4.9	840	1.9
35–44.	18,899	43.5	8,828	20.3	6,474	14.9	2,474	5.7	1,046	2.4
45–54.	13,298	32.7	7,082	17.4	6,088	15.0	1,975	4.9	1,220	3.0
55–64.	10,595	24.8	5,554	13.0	5,726	13.4	1,858	4.3	1,216	2.8
65 and over	2,469	4.4	1,298	2.3	1,412	2.5	539	1.0	550	1.0
U.S. Department of Health and Human Services region										
Region 1	4,770	32.2	473	3.4	2,377	15.9	326	2.2	313	1.9
Region 2	6,956	23.7	669	2.4	3,461	11.6	1,506	5.0	542	1.8
Region 3	9,859	32.0	2,397	8.0	4,126	13.0	1,100	3.6	609	1.9
Region 4	17,345	27.3	7,804	12.3	6,228	9.4	1,559	2.4	1,544	2.2
Region 5	13,250	26.1	4,010	8.1	5,188	9.8	1,538	2.9	607	1.1
Region 6	4,200	10.0	3,741	8.8	1,795	4.1	1,144	2.7	370	0.8
Region 7	2,082	15.7	1,300	9.7	436	3.0	179	1.4	163	1.2
Region 8	1,318	10.7	1,239	10.1	421	3.4	381	3.1	252	2.0
Region 9	8,131	15.9	7,515	14.1	1,797	3.4	1,054	2.0	467	0.8
Region 10	2,032	14.0	2,022	13.4	369	2.5	684	4.5	193	1.2
Race and Hispanic origin										
American Indian or Alaska Native[1]	792	33.1	649	27.4	183	7.4	114	4.7	57	2.4
Black[1]	13,552	31.3	2,926	7.0	9,045	20.6	1,675	3.7	714	1.7
White[1]	45,033	24.6	22,709	12.0	12,773	6.8	5,983	3.2	3,786	1.8
Hispanic[2]	8,818	14.1	3,768	6.2	3,544	5.8	1,418	2.4	401	0.7
Asian[1]	464	2.3	291	1.4	206	1.0	58	0.3	38	0.2

[1]Race groups are non-Hispanic.
[2]People of Hispanic origin may be of any race.

NOTES: Drug overdose deaths are identified using the *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Deaths may involve other drugs in addition to the referent drug (that is, the one listed). Age-adjusted death rates were calculated using the direct method and the U.S. 2000 standard population. The 10 U.S. Department of Health and Human Services (HHS) public health regions are: Region 1 (CT, MA, ME, NH, RI, and VT); Region 2 (NJ and NY); Region 3 (DC, DE, MD, PA, VA, and WV); Region 4 (AL, FL, GA, KY, MS, NC, SC, and TN); Region 5 (IL, IN, MI, MN, OH, and WI); Region 6 (AR, LA, NM, OK, and TX); Region 7 (IA, KS, MO, and NE); Region 8 (CO, MT, ND, SD, UT, and WY); Region 9 (AZ, CA, HI, and NV); and Region 10 (AK, ID, OR, and WA).

SOURCE: National Center for Health Statistics, National Vital Statistics System, death certificate literal text data.

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Technical Notes

Nature and source of data

Literal text data from the National Vital Statistics System

Mortality data from the National Vital Statistics System are held in a dynamic database and considered provisional until the data have been processed, reviewed, verified, and released to the public as a final, static data set. States may continue to send updated death certificate information after the data year is considered final; these updates are not reflected in annual final mortality data files and official summary reports. Because the final data set does not include literal text data, the data used in this report come from the live National Vital Statistics System database. As noted, this dynamic database may include updates to death certificate data received after the closeout of the data year, and death counts may differ from other published sources.

Census population data

The population estimates used for computing rates are postcensal estimates, which originate from the U.S. Census Bureau and are based on the 2010 census. These estimates are available on CDC WONDER from: https://wonder.cdc.gov/single-race-population.html.

Cause-of-death classification

Causes of death were classified according to World Health Organization regulations, which specify that member countries classify and code causes of death according to the current revision of the *International Classification of Diseases* (ICD). ICD provides the basic guidance used in virtually all countries to code and classify causes of death. Effective with deaths occurring in 1999, the United States began using the 10th revision of this classification (ICD–10) (19).

In this report, cause-of-death statistics are based solely on the underlying cause of death. The underlying cause is defined by the World Health Organization as "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury." The underlying cause is selected from the conditions entered by the medical certifier in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the medical certifier, the underlying cause is determined by the sequence of conditions on the certificate, provisions of ICD, and associated selection rules and modifications. Drug overdose deaths were identified using ICD–10 underlying cause-of-death codes X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), and Y10–Y14 (undetermined intent). To be consistent in the methodology for identifying specific drugs involved in deaths, any deaths involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone were identified using the established methods for searching literal text from death certificates that were informed from exploratory analyses of the literal text (2–4).

Considerations for the DMI methodology

The methods to identify specific drugs involved in the death (referred to as the DMI methodology) are routinely enhanced to better search the literal text from death certificates (7). The newest list of search terms found in the literal text used to identify drug overdose deaths are available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/VSRR/VSRR-27-Online-Table-nmc.xlsx.

The search list used for identifying referent groups was originally compiled from the DMI methodology enhanced with results from text analytical studies of the 2011–2016 literal text using external resources from the Scientific Working Group for the Analysis of Seized Drugs, monographs authored by the U.S. Drug Enforcement Administration, and the U.S. Food and Drug Administration's Substance Registration System, among others, as described elsewhere (2–4, 7). The DMI search list has since been updated using additional internal analyses of death certificate literal text, incorporation of input from domain experts, including toxicologists, and the addition of emerging illicit forms of specific drugs as identified from public health surveillance system alerts in 2020 and 2021 (20). As the DMI text methods continue to improve over time, the reporting of drug overdose deaths involving specific drugs may differ from previous reports.

Two limitations were observed in the categorization of specific drugs reported. First, determination of the source of the drugs or whether the drug was illicitly manufactured cannot be determined from the literal text. Second, drug-specific counts are subject to change as additional search terms for drugs are identified. As such, findings from this report may differ from other reports that used final or provisional mortality data.

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