2022 Drug Overdose Hospital Discharges in Tennessee

Tennessee Department of Health

Office of Informatics and Analytics

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Contents

Executive Summary

This report describes hospital discharges related to drug overdoses in Tennessee (TN) in 2022 using data from the TN Hospital Discharge Data System. Inpatient and outpatient hospital discharges due to drug overdoses are described overall and by sex, race, age, and cost. Tennessee is still in the midst of increasing rates of drug overdose mortality and morbidity. The rates of opioid overdose deaths continue being high in TN. The age-adjusted rate for all drug overdose deaths was 56.6 per 100,000 residents in 2021 and 56 per 100,000 residents in 2022. The age-adjusted rate for all opioid overdose deaths was 45.6 per 100,000 residents in 2021 and 45.7 per 100,000 residents in 2022. The number and rate of nonfatal drug overdoses is much higher than for overdose deaths. There are more than 7 nonfatal overdose discharges per overdose death in TN. Briefly summarized below are key epidemiologic data trends for nonfatal drug overdoses in Tennessee:

Nonfatal overdoses due to any drug continue to increase for outpatient visits, but not inpatient stays

- In 2022, there were 26,211 all drug overdose hospital discharges among TN residents. Of these, 6,473 (24.7%) were inpatient stays and 19,738 (75.3%) were outpatient visits. About 14,292 (72.4%) discharges after an outpatient visit and 3,594 (55.5%) discharges after an inpatient stay for a drug overdose were discharged to home with or without follow-up.
- Both the rate of drug overdose outpatient visits and inpatient stays decreased from 2021 to 2022.
  - The rate of overdose outpatient visits decreased from 309.8[1] in 2021 to 296.2 in 2022 (a 4.4% decrease). The rate of overdose inpatient stays decreased from 99.4 in 2021 to 90.3 in 2022.
- The highest overdose rates for all drug outpatient visits were among males, persons aged 25-34 years, and Black Tennesseans. For inpatient stays, all drug overdose rates were highest among those aged 35-44 years, females, and Black Tennesseans.

Nonfatal opioid overdoses (excluding heroin) are likely to be treated in an outpatient setting

- In 2022, there were 7,549 hospital discharges for opioid overdoses (excluding heroin). Of these opioid overdose discharges, 80.6% were outpatient visits and 19.4% were inpatient stays.
- Between 2021 to 2022, the rate of opioid overdose outpatient visits increased 9.0% from 83 in 2021 to 90.7 in 2022. Inpatient stays remained about the same between these years at 19.6 in 2021 and 19.8 in 2022.
- Compared to males, females had lower rates for opioid overdose inpatient stays (16 vs. 23.5) and lower rates for outpatient visits (59.6 vs. 122). Opioid overdose rates were higher among Black Tennesseans (compared to White Tennesseans) for outpatient visits and for inpatient stays. Opioid overdose rates were highest among 25-34 year-olds for outpatient visits and among 55-64 year-olds for inpatient stays.

[1] All rates in this report are age-adjusted and per 100,000 residents unless otherwise specified.

Nonfatal heroin overdoses are decreasing, particularly for outpatient visits

- The rate of heroin overdose outpatient visits decreased from 53.6 to 35.5 from 2021 to 2022 (a 33.4% decrease in the number of visits). The rate of heroin overdose inpatient stays decreased from 8.2 to 5.1 from 2021 to 2022 (a 36.3% decrease). Rates were higher for White Tennesseans (compared to Black Tennesseans) and males (compared to females) for both outpatient visits and inpatient stays.

Nonfatal overdoses involving cocaine were treated primarily in an inpatient setting while nonfatal amphetamines were evenly distributed between both settings (inpatient stays and outpatient visits)

- Rates of cocaine and amphetamine (including methamphetamine) overdose outpatient visits and inpatient stays were higher among males (compared to females). Cocaine overdose rates were higher among Black Tennesseans (compared to White Tennesseans) while amphetamine overdose rates were higher among White Tennesseans (compared to Black Tennesseans).

The cost of nonfatal overdoses is not evenly distributed across TN Grand Divisions, overdose type, or hospital characteristics

- The cost of overdose is not evenly distributed across the state. West TN has the most expensive inpatient stays and outpatient visits.
- Nonfatal overdoses involving stimulants were the most expensive for inpatient stays, while overdoses involving benzodiazepine were the most expensive outpatient visits.
- Hospitals in the state with over 350 beds had the most expensive inpatient overdose stays and while those with less than 50 beds had the most expensive outpatient visits for overdoses.

Introduction

The purpose of this report is to describe drug overdose hospital discharges in the state of Tennessee (TN) in 2022. This report meets the legislative requirement to summarize aggregate claims data on all inpatient and outpatient discharges that include a drug poisoning diagnosis as reported for the calendar year two years prior to the current year by licensed hospitals.[2] Data presented here are from the TN Statewide Hospital Discharge Data System (HDDS) from 2021 to 2022.[3] The HDDS contains billing codes from discharges at hospitals statewide for inpatient hospitalizations and outpatient visits, including emergency department visits. These billing codes (since October 1st, 2015) are based on the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) and provide a standardized method for identification of drug overdoses using administrative data.

The current report includes discharges for TN residents at non-federal, acute care hospitals for eight drug overdose morbidity statistics:

(1) **All drug overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of drugs, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(2) **Opioid overdose (excluding heroin)** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of all opioid drugs regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(3) **Heroin overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of heroin, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(4) **Methadone overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of methadone, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(5) **Other synthetic opioid overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of other synthetic opioids, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(6) **Benzodiazepine overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of benzodiazepines, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(7) **Cocaine overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of cocaine, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

(8) **Amphetamine (including methamphetamine) overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of amphetamines, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

[2] Tennessee Code Annotated (T.C.A.), Section 68-1-108: http://www.lexisnexis.com/hottopics/tncode/

[3] https://www.tn.gov/content/dam/tn/health/program-areas/reports_and_publications/2020-Hospital-Discharge-Data-System-User-Manual.pdf

(9) **Fentanyl overdose** outpatient visits or inpatient stays - caused by nonfatal acute poisonings due to the effects of fentanyl, regardless of intent (e.g., intentional, unintentional, assault, or undetermined).

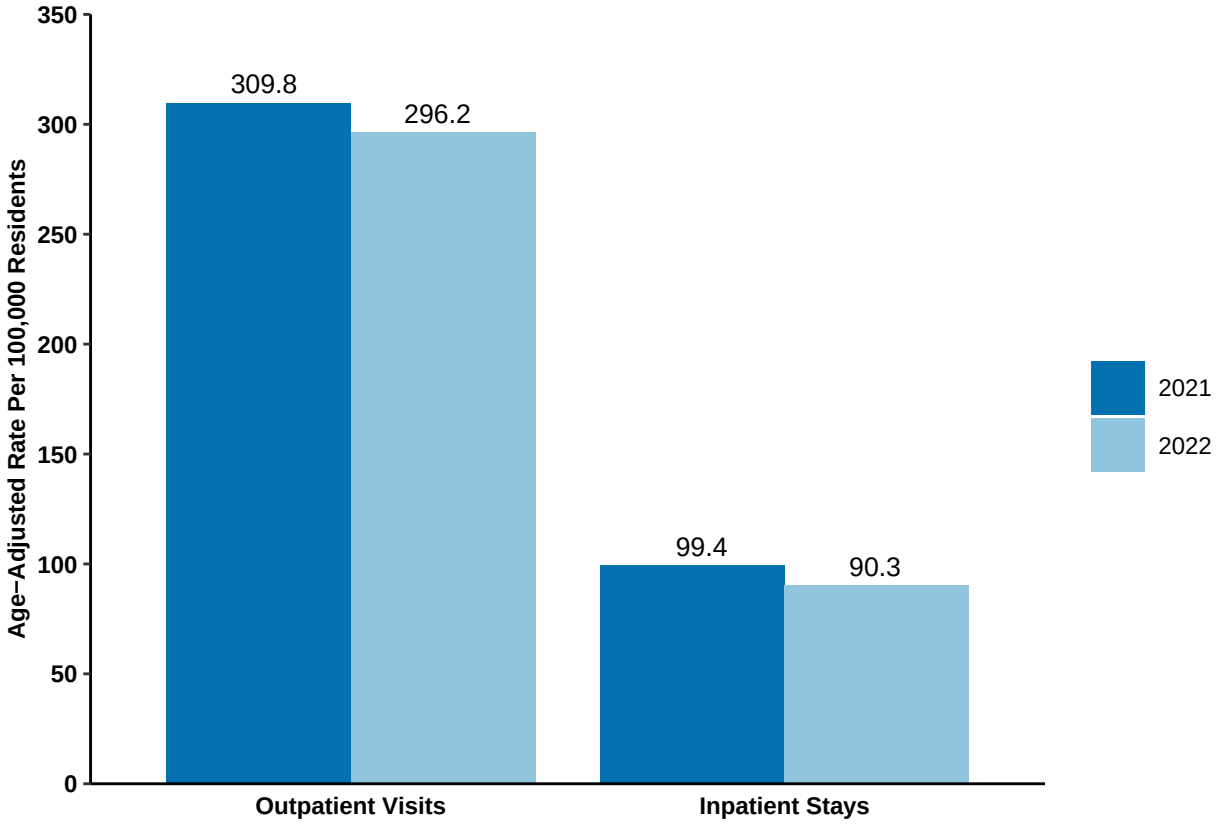
Events related to late effects, adverse effects, under-dosing, dependence, abuse, withdrawal and chronic poisonings due to the effects of drugs (e.g., damage to organs from long-term drug use), are excluded. Unless otherwise indicated, data exclude records with discharge status of deceased. As <0.2% of discharge records in Tennessee are coded as a subsequent encounter or sequela, morbidity statistics presented in this report are limited to only initial and missing encounters following Prevention for the States/Data-Driven Prevention Initiative Programs definitions.[4]

[4] Centers for Disease Control and Prevention (2018). CDC's Opioid Overdose Indicator Support Toolkit: Guidance for building and reporting on opioid-related mortality, morbidity, and PDMP indicators (Version 3.0). Atlanta, GA.

Drug Overdose Hospital Discharges

All Drug Overdose Outpatient Visits and Inpatient Stays

Age-Adjusted Rates for All Drug Overdose Outpatient Visits and Inpatient Stays in TN, 2021-2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

In 2022, there were 26,211 nonfatal[5] drug overdose hospital discharges among TN residents. This total is comprised of 6,473 inpatient stays (24.7%) and 19,738 outpatient visits (75.3%). The above figure shows age-adjusted rates for all drug overdose[6] outpatient visits and inpatient stays in TN during 2021 to 2022. For outpatient visits,[7] the age-adjusted rates decreased from 309.8 in 2021 to 296.2 in 2022. For inpatient stays, the age-adjusted rates decreased from 99.4 in 2021 to 90.3 in 2022.

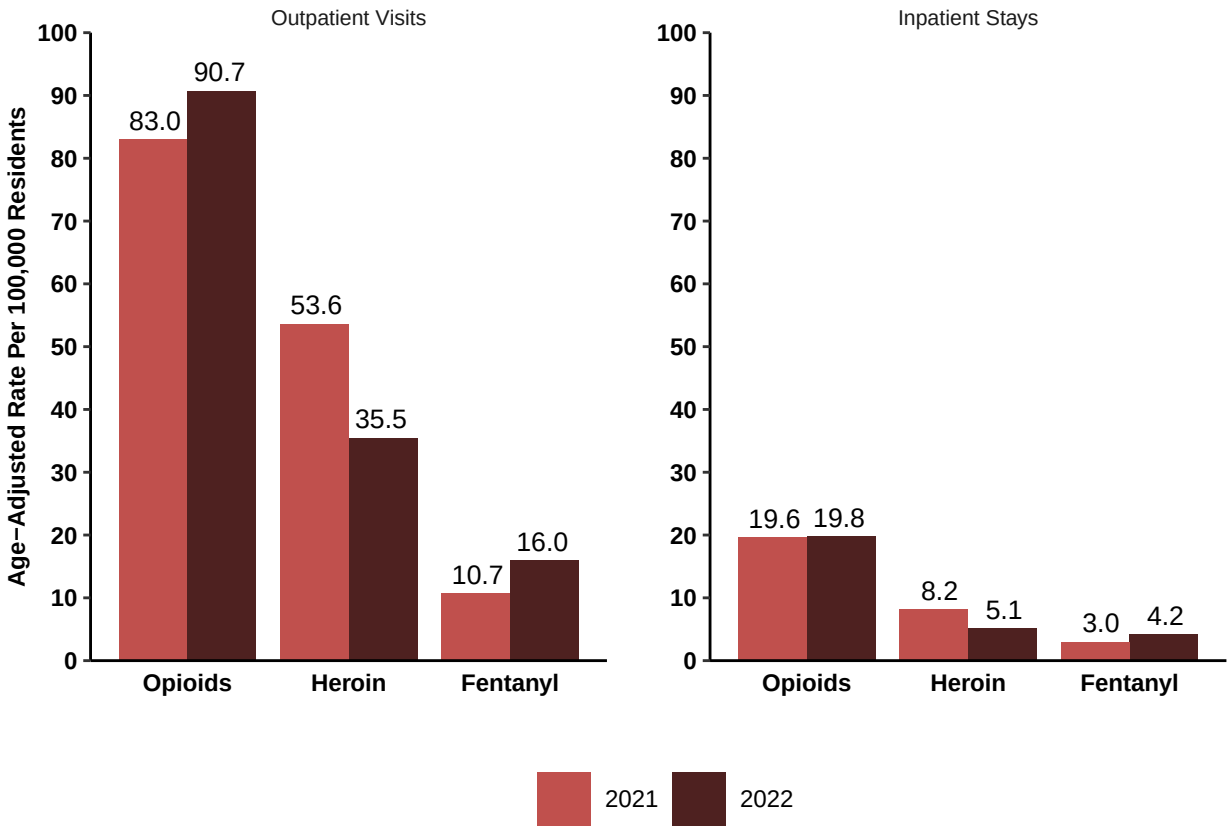
[5] This number does not include 312 TN residents (262 inpatients, 50 outpatients) who died of a drug overdose in the hospital.

[6] All drug overdose outpatient visits and inpatient stays are defined as drug overdoses caused by nonfatal acute poisonings due to the effects of drugs, regardless of intent (e.g., intentional, assault, unintentional, or undetermined). Identified using ICD10CM diagnosis codes (see Technical Notes for specific codes).

[7] Outpatient visits include primarily emergency department visits, but also include any observation period of 23 hours or less, ambulatory surgeries or certain diagnostic services (such as MRIs or CT scans).

Opioid Overdose Outpatient Visits and Inpatient Stays

Age-Adjusted Rates for Opioid (Excluding Heroin), Heroin, and Fentanyl Overdose Outpatient Visits and Inpatient Stays in TN, 2021-2022



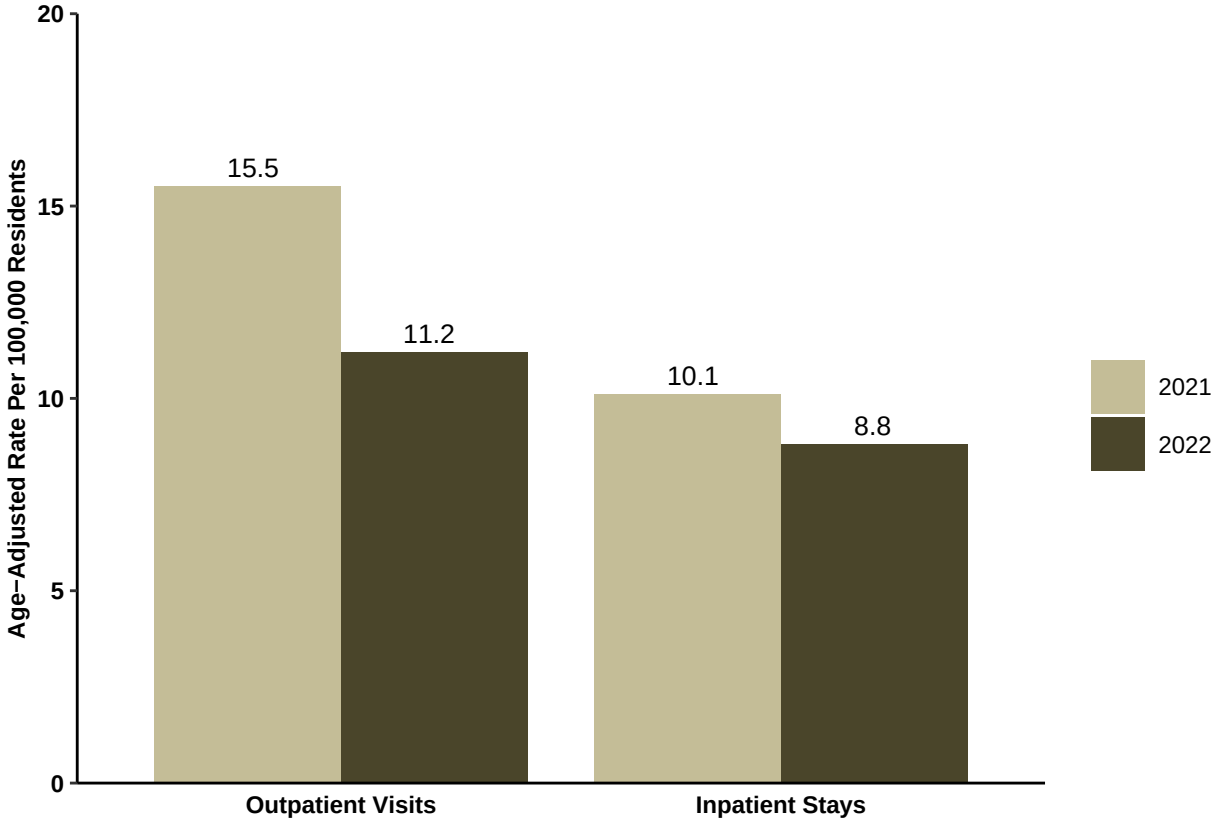
Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

In 2022, there were 7,549 hospital discharges for opioid overdose (excluding heroin). Of these opioid overdose discharges, 6,085 were outpatient visits and 1,464 were inpatient stays. Heroin overdose discharges accounted for 2,669 of all overdoses, including 2,328 outpatient visits and 341 inpatient stays. Fentanyl[8] alone accounted for 1,322 discharges (1,044 outpatient visits and and 278 inpatient stays). The above graph shows age-adjusted rates for outpatient visits and inpatient stays for both opioid, heroin, and fentanyl overdoses during 2021 and 2022. Rates for outpatient visits for opioids increased, while rates for inpatient stays remained about the same from 2021 to 2022. Outpatient visit rates for heroin overdoses decreased (53.6 in 2021 to 35.5 in 2022) and inpatient stays decreased slightly in 2022. Outpatient visit rates for fentanyl overdoses increased from 10.7 in 2021 to 16.0 in 2022, and inpatient stays also increased from 3.0 in 2021 to 4.2 in 2022.

[8] Effective October 1, 2020, the ICD10-CM code for poisoning by “other synthetic narcotics” was replaced and updated to allow for more specific classification of these overdoses by providing specific codes for poisoning by “fentanyl or fentanyl analogs”, “tramadol” and the remaining as “Other synthetic narcotics.

Benzodiazepine, Stimulant, and Synthetic Opioid Overdoses

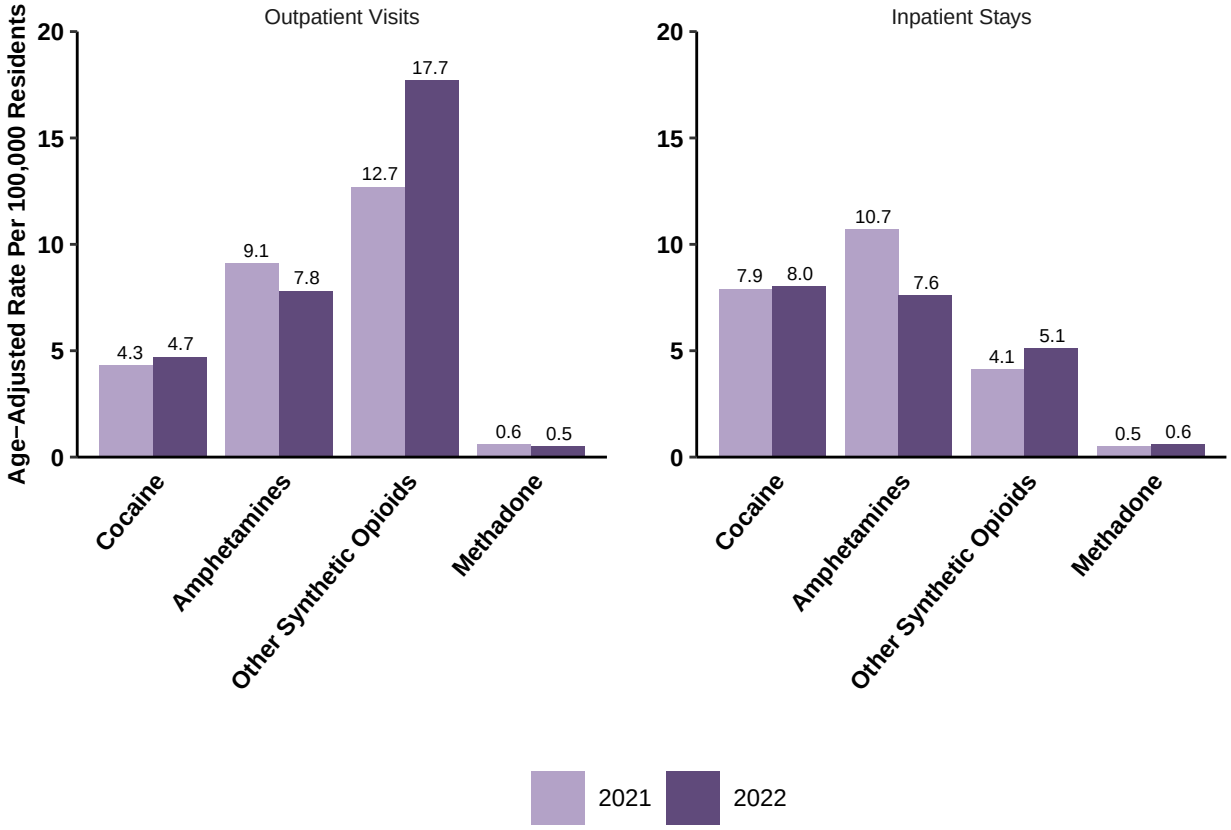
Age-Adjusted Rates for Benzodiazepine Overdose Outpatient Visits and Inpatient Stays in TN, 2021-2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

In 2022, there were 1,438 hospital discharges for benzodiazepine overdose. Of these benzodiazepine overdose discharges, 780 were outpatient visits and 658 were inpatient stays. The age-adjusted rates (per 100,000 TN residents) for outpatient visits and inpatient stays for benzodiazepine overdoses in 2021 and 2022 are shown above. There was a decrease in benzodiazepine overdose rates from 2021 to 2022 for both outpatient visits (15.5 in 2021 to 11.2 in 2022) and in inpatient stays (10.1 in 2021 to 8.8 in 2022).

Age-Adjusted Rates for Stimulant and Synthetic Opioid[9] Overdose Outpatient Visits and Inpatient Stays in TN, 2021-2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

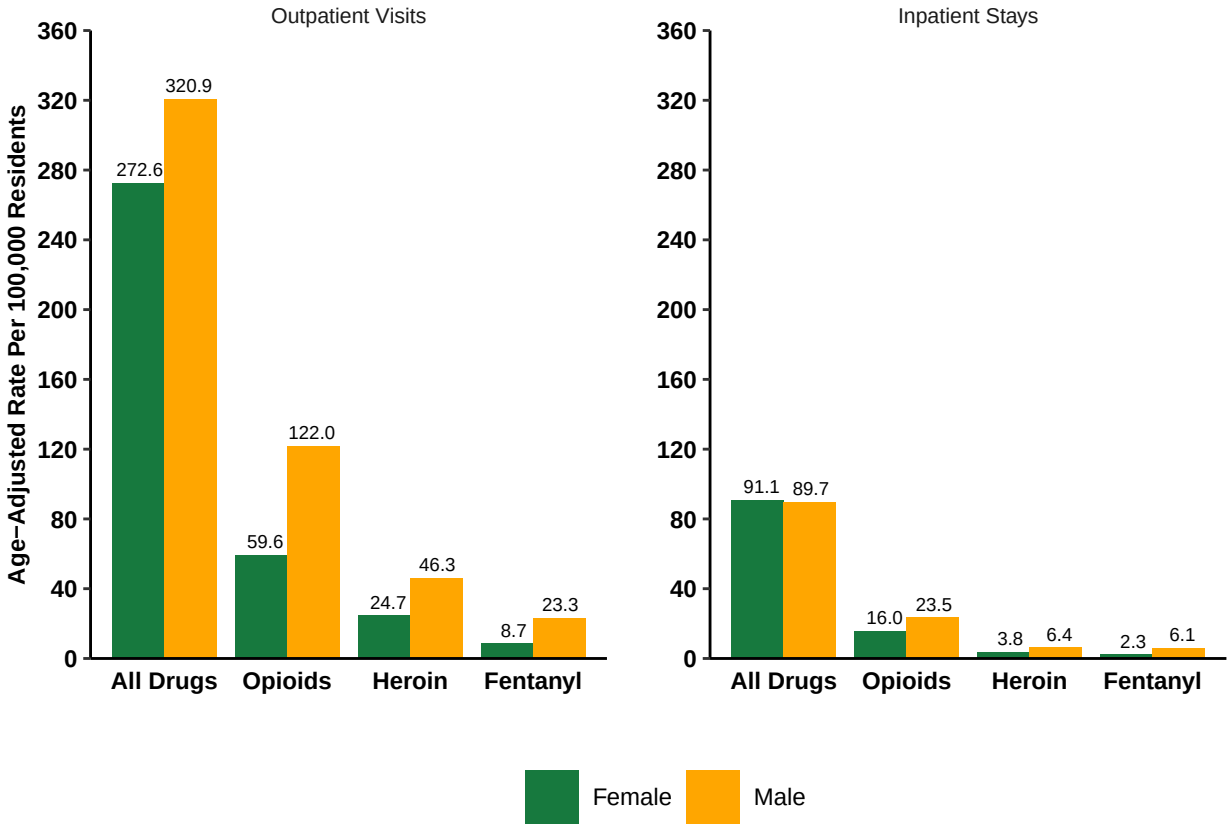
In 2022, the total number of other drug related overdose discharges were as follows: cocaine (892), amphetamine[10] (1,018), other synthetic opioids (1,504), and methadone (79). Cocaine overdoses were more frequently inpatient stays (n=573) as compared to outpatient visits (n=319). The number of outpatient visits for amphetamine overdoses were about the same as inpatient stays. But for other synthetic opioid overdoses, outpatient visits were higher (n=1,160) as compared to inpatient stays (n=344). The age-adjusted rates for cocaine and other synthetic opioid overdose outpatient visits increased from 2021 to 2022, while rates of outpatient visits for amphetamines decreased during the same period. Rates for inpatient stays for cocaine overdoses remained the same, while those for inpatient stays for synthetic opioids overdoses increased in 2022 and those for amphetamine overdoses decreased from 2021 to 2022.

[9] Synthetic opioid category also includes fentanyl

[10] Amphetamine overdoses include methamphetamine.

Drug Overdose Hospital Discharges by Sex

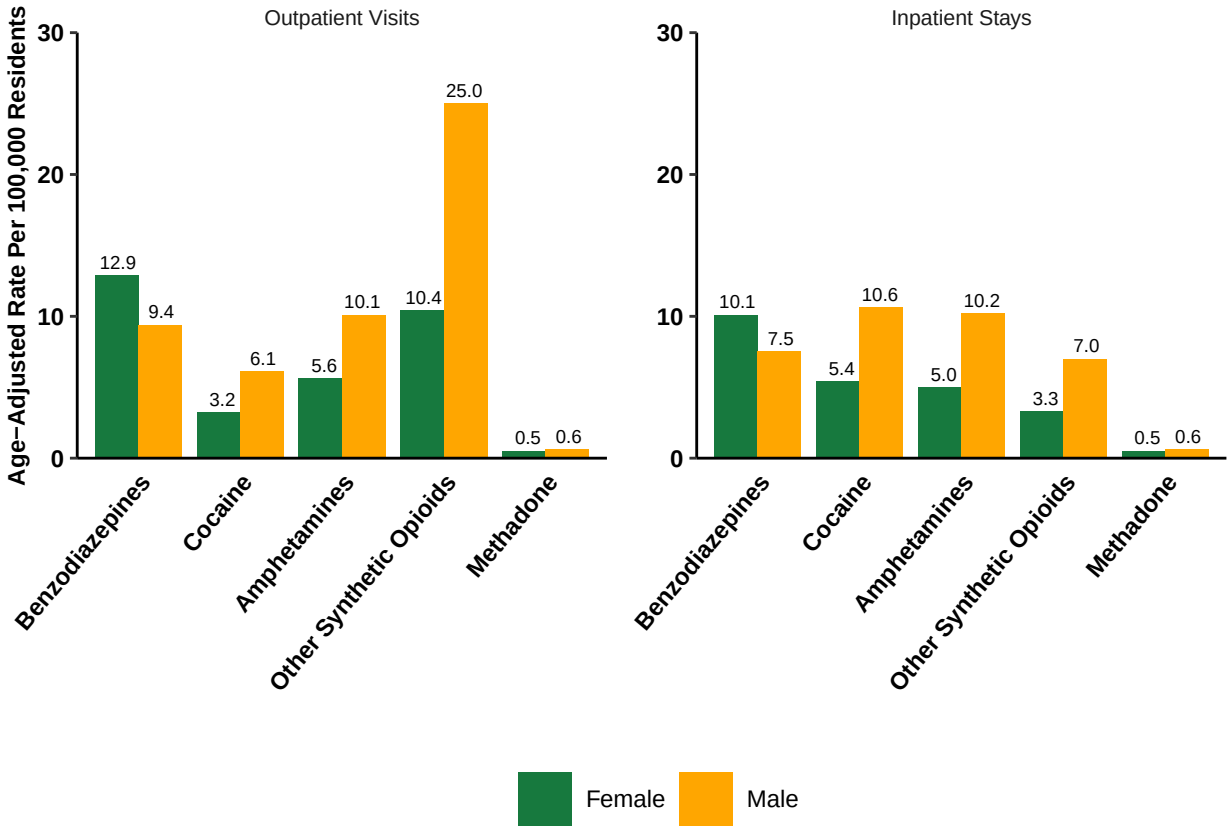
Age-Adjusted Rates for All Drug, Opioid, Heroin, and Fentanyl Overdose Outpatient Visits and Inpatient Stays by Sex in TN, 2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

In 2022, females accounted for 47.5% (12,459) of all drug overdose hospital discharges compared to 52.5% (13,749) for males. Outpatient visits were the most common type of discharge for both females (9,114) and males (10,621). The figure above displays the 2022 age-adjusted rates in TN for all drug, opioid (excluding heroin), heroin, and fentanyl overdoses among males and females. The rates of all drugs (320.9 vs. 272.6), opioid (122 vs. 59.6), heroin (46.3 vs. 24.7), and fentanyl (23.3 vs. 8.7) overdose outpatient visits were higher for males than females, while females had higher rates of all drug (91.1 vs. 89.7) overdose inpatient stays than males. Compared to females, males had higher rates of opioid (23.5 vs. 16), heroin (6.4 vs. 3.8), and fentanyl (6.1 vs. 2.3) overdose inpatient stays.

Age-Adjusted Rates for Benzodiazepine, Stimulant, and Synthetic Opioid Overdose Outpatient Visits and Inpatient Stays by Sex in TN, 2022



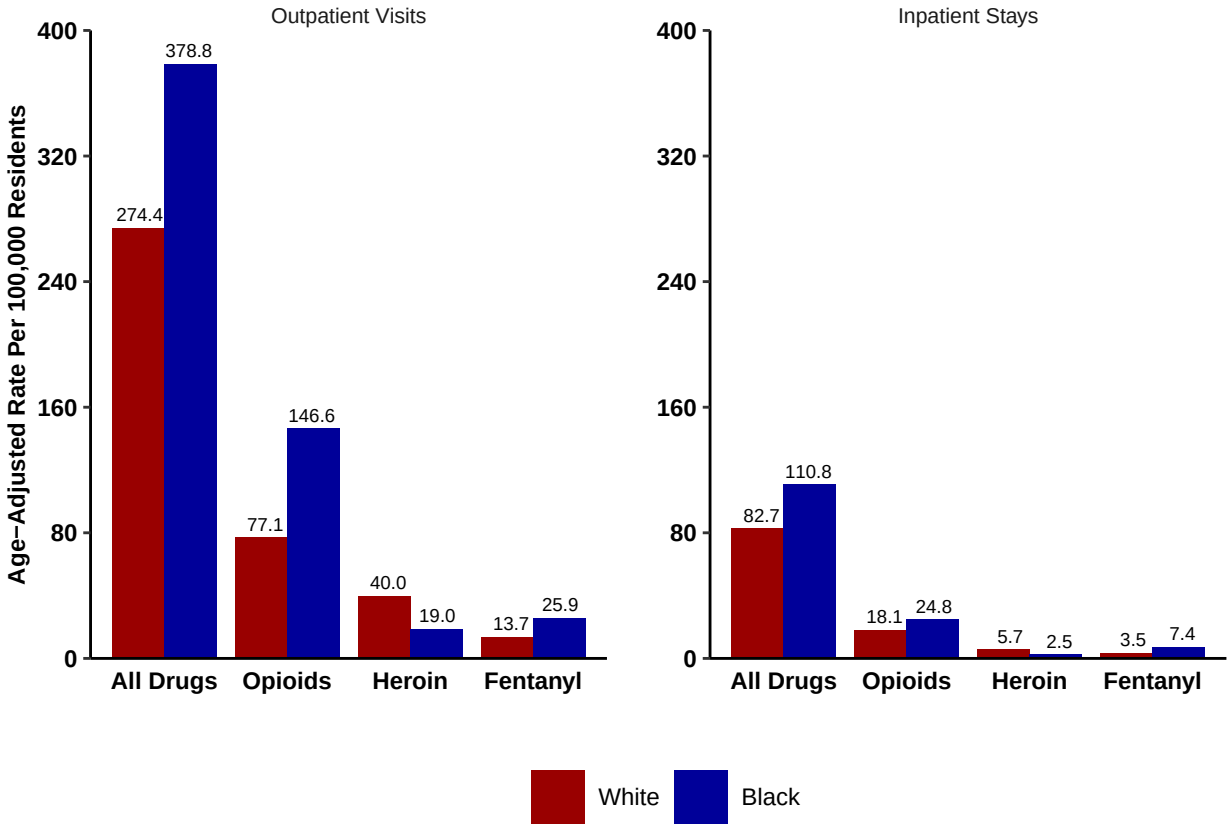
Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

The figure above shows age-adjusted rates for females and males in 2022 for select overdose discharges. Males had higher outpatient visits for cocaine (6.1 vs. 3.2), amphetamine [11] (10.1 vs. 5.6), and other synthetic opioid [12] (25.0 vs. 10.4) overdoses, compared to females. Rates of benzodiazepine overdose outpatient visits were higher for females compared to males (12.9 vs. 9.4). Similar patterns were observed for inpatient stays with males having higher rates of cocaine, amphetamine, and other synthetic opioid overdoses, and females having higher rates of benzodiazepine overdoses. Rates of methadone overdose outpatient visits and inpatient stays were similar for males and females.

[11] Amphetamine overdoses include methamphetamine.
[12] Synthetic opioid category also includes fentanyl

Drug Overdose Hospital Discharges by Race

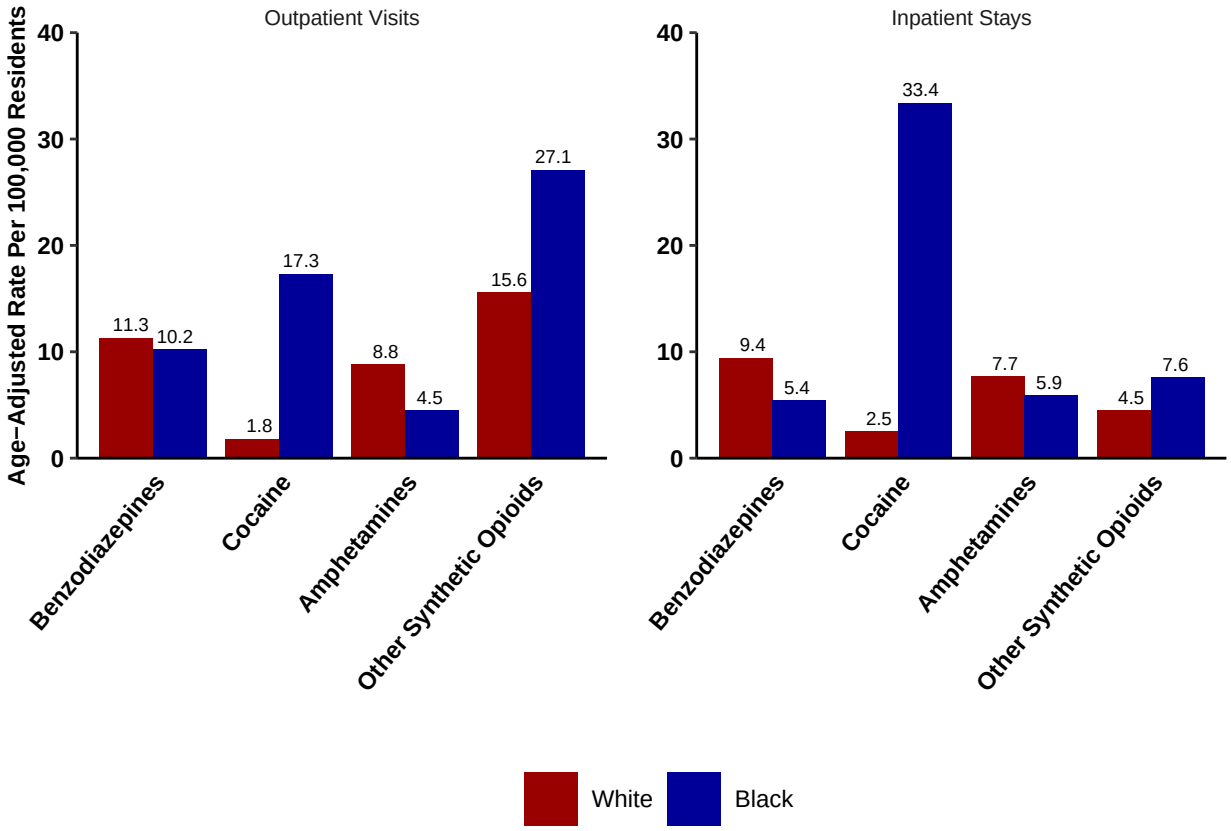
Age-Adjusted Rates for All Drug, Opioid, Heroin, and Fentanyl Overdose Outpatient Visits and Inpatient Stays by Race in TN, 2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

In 2022, White Tennesseans accounted for 18,798 (71.7%) of all drug overdose hospital discharges, Black Tennesseans made up 5,755 (22.0%), and other or unknown races accounted for the remaining 1,658 (6.3%) discharges. Outpatient visits were the most common type of discharge for both White (14,081) and Black (4,448) Tennesseans. The above figure shows the age-adjusted rates (per 100,000 TN residents) for all drug, opioid (excluding heroin), heroin, and fentanyl overdoses by race. Black Tennesseans had higher age-adjusted rates for all drug, opioid, and fentanyl overdoses in both outpatient and inpatient settings. White Tennesseans had higher rates of outpatient visits and inpatient stays for heroin overdoses than among Black Tennesseans.

Age-Adjusted Rates for Benzodiazepine, Stimulant, and Synthetic Opioid Overdose Outpatient Visits and Inpatient Stays by Race in TN, 2022



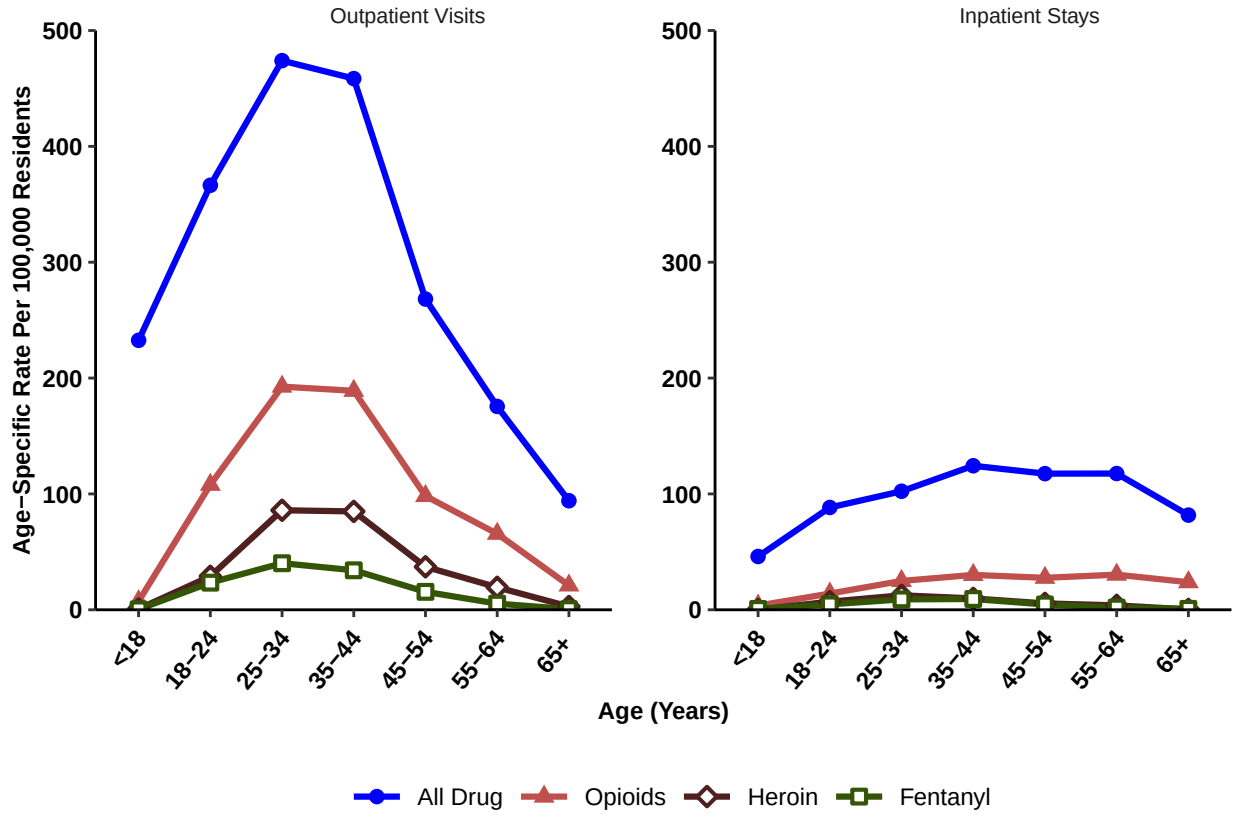
Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

The above figure shows the age-adjusted rates per 100,000 TN residents for benzodiazepine, cocaine, other synthetic opioids, and amphetamine [13] overdose outpatient visits and inpatient stays by race. In 2022, compared to Black Tennesseans, White Tennesseans had higher age-adjusted rates for benzodiazepine and amphetamine overdose outpatient visits and inpatient stays, while Black Tennesseans had higher rates for cocaine and other synthetic opioid [14] overdoses for outpatient visits and inpatient stays compared to White Tennesseans.

[13] Amphetamine overdoses include methamphetamine.
[14] Synthetic opioid category also includes fentanyl

Drug Overdose Hospital Discharges by Age

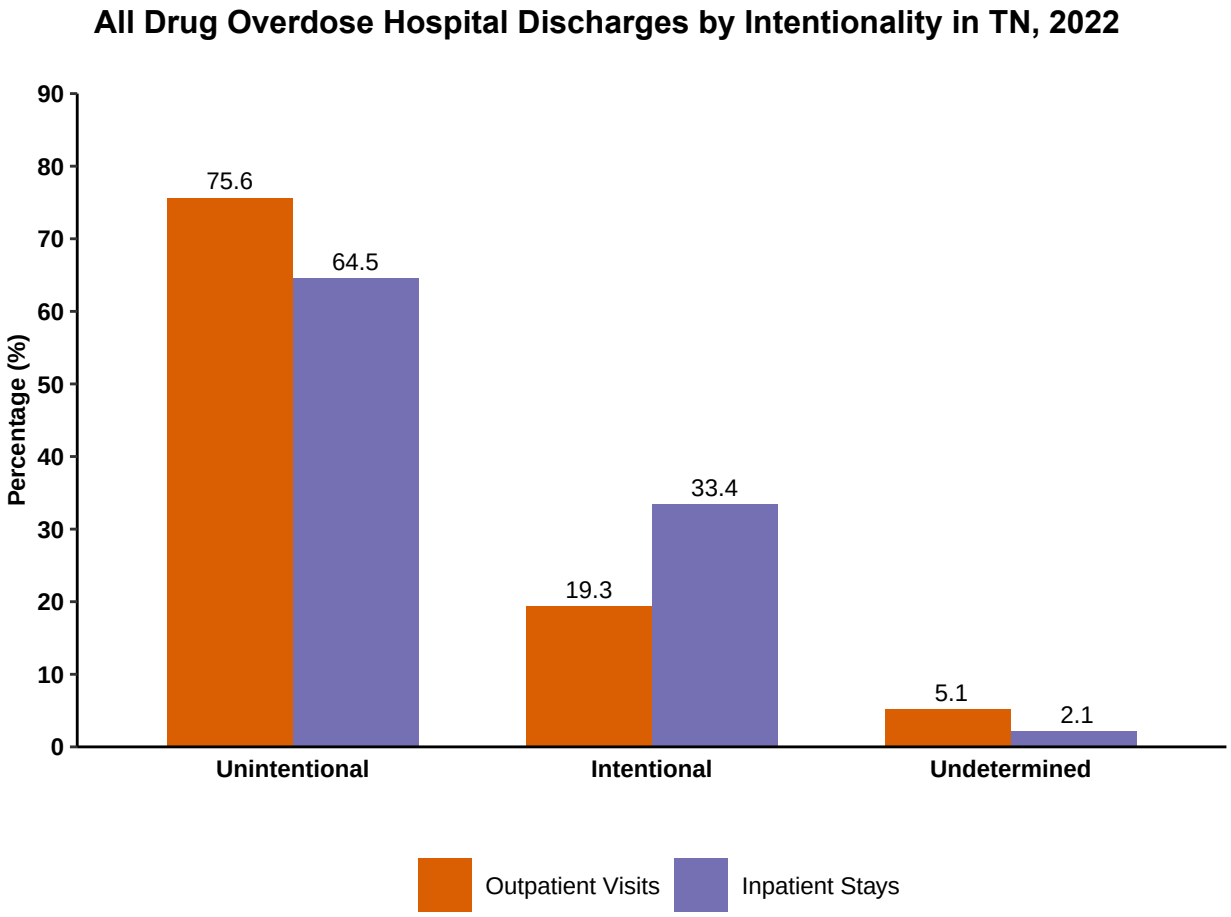
Age-Specific Rates for Drug Overdose Outpatient Visits and Inpatient Stays by Age groups in TN, 2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

The figure above displays 2022 age-specific rates (per 100,000 residents) for all drug, opioid (excluding heroin), heroin, and fentanyl overdoses in TN. Patients aged 25-34 years had the highest rates of all drugs (474), opioid (192.6), and heroin overdose (85.9) outpatient visits. Rates for heroin overdose outpatient visits were lower than the rates for opioid overdose outpatient visits among those aged 45 years or older and in those younger than 24 years. For inpatient stays, all drug (124.3) overdose rates were highest among those aged 35-44 years and opioid (30.3) overdose rates were highest among those aged 55-64 years. Heroin overdose rates were highest among those aged 25-34 years (12.5). Patients aged 25-34 years had the highest rates of fentanyl overdose outpatient visits (40.2) and 35-44 years for inpatient stays (9.3).

Drug Overdose Hospital Discharges by Intentionality

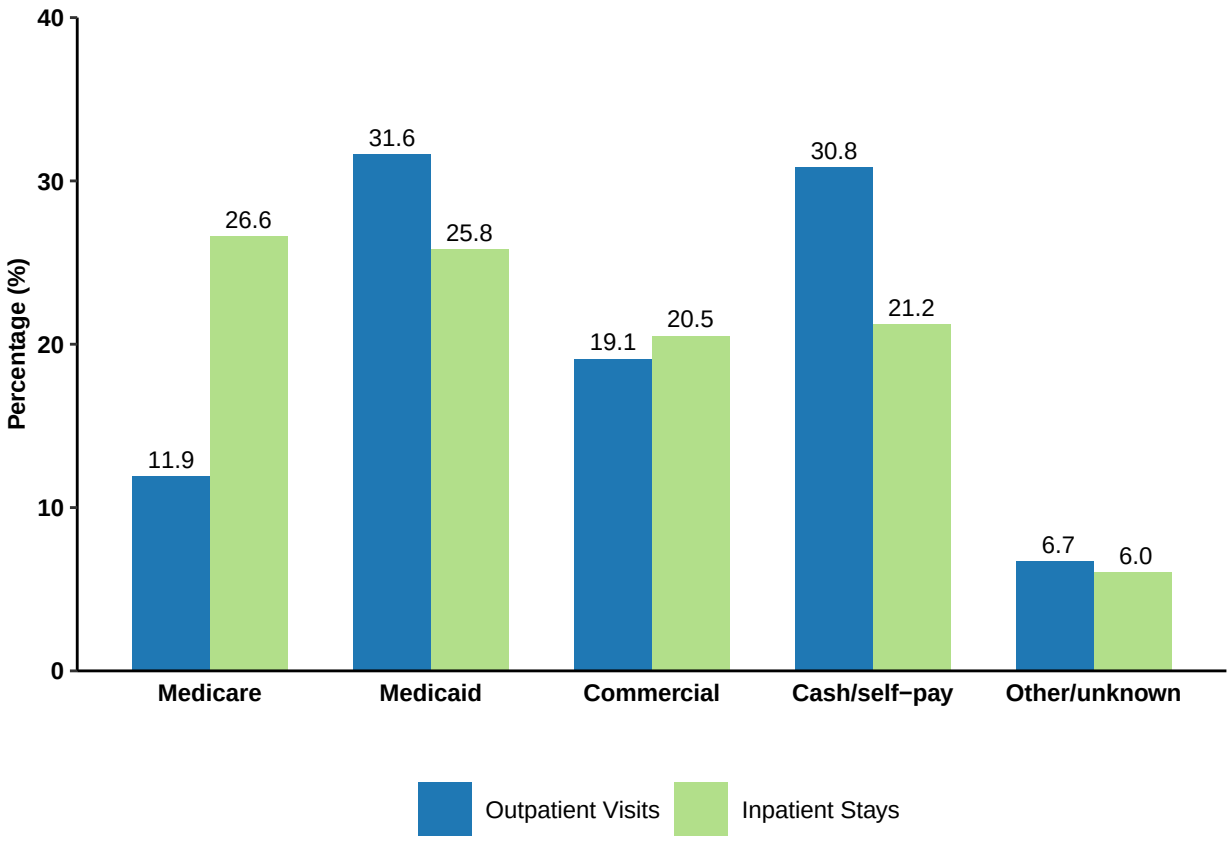


Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

The above figure shows all drug overdose intent in the outpatient and inpatient setting. In 2022, about 75.6% of all drug overdose outpatient visits (n=14,917) and 64.5% of inpatient stays (n=4,174) in Tennessee were due to unintentional poisoning while 19.3% of outpatient visits and 33.4% of inpatient stays were intentional. About 4.3% of all drug overdose discharges were undetermined, while overdoses due to assault were 0.1% (not shown above).

Drug Overdose Hospital Discharges by Primary Payer

All Drug Overdose Hospital Discharges by Primary Payer[15] Type in TN, 2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

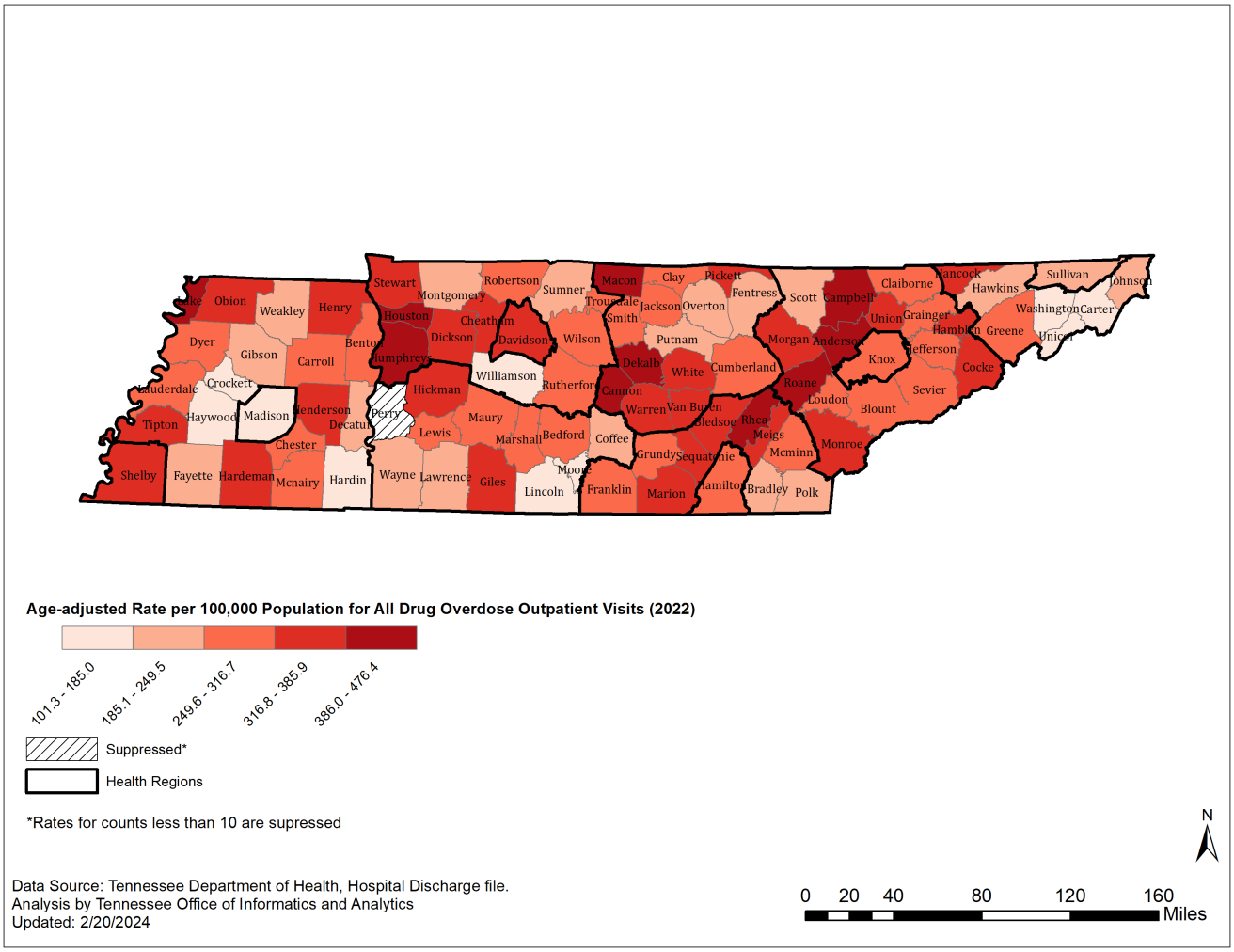
The above figure shows the payers billed for hospital discharges due to all drug overdoses. In 2022, among all drug overdose outpatient visits, Medicaid (including TennCare) and Cash/self-pay were the most common primary payers billed for all drug overdose visits (about 30% of outpatient visits for each payer), followed by commercial insurance (19.1%). For inpatient stays related to all drug overdoses, the most common primary payer was Medicare (26.6%) followed by Medicaid (25.8%) and cash/self-pay (21.2%).

[15]Primary Payer is determined according to the name or type of payer organization from which the hospital first receives payment for the bill.

Drug Overdose Hospital Discharges by County of Residence

All Drug Overdoses

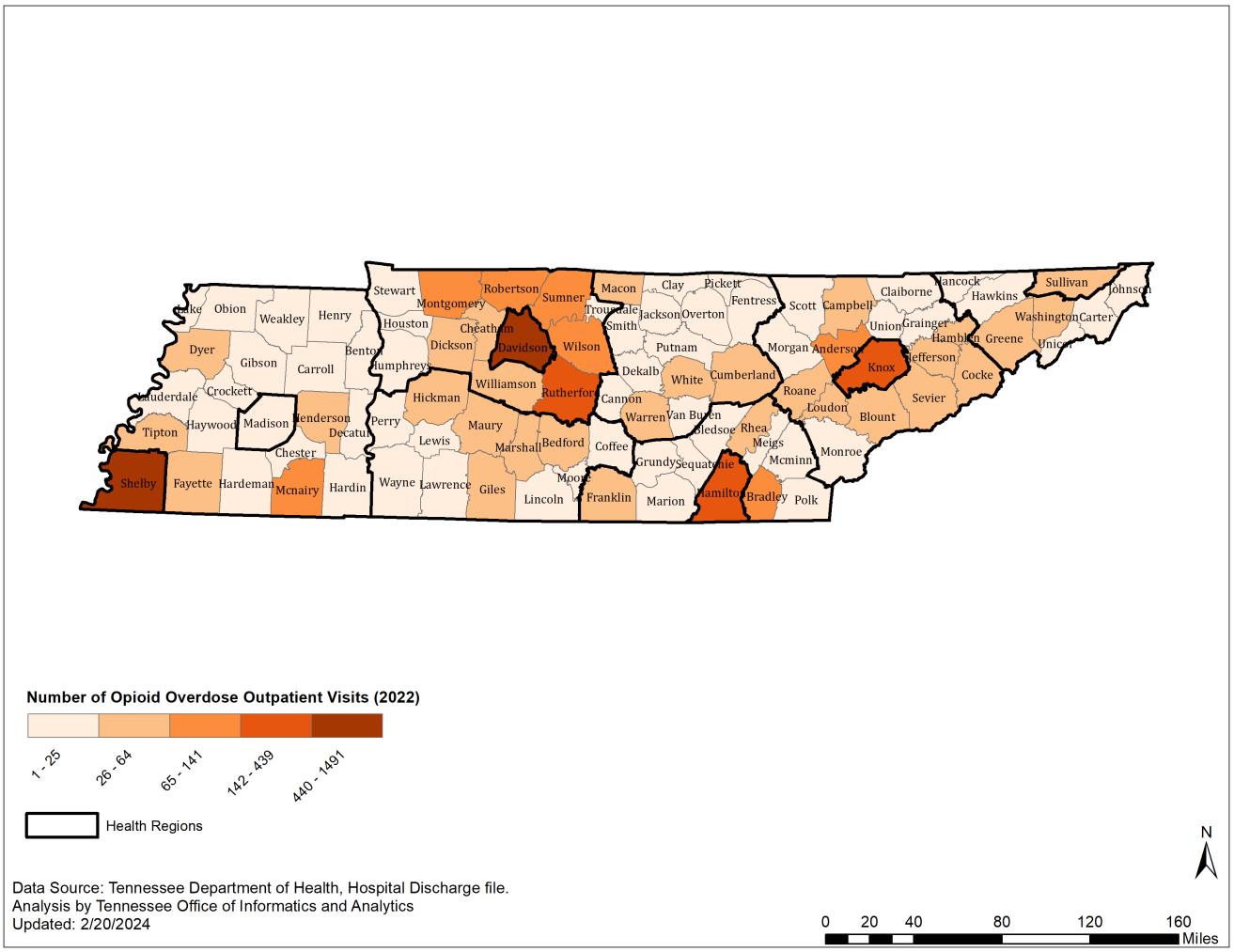
Age-Adjusted Rates for All Drug Overdose Outpatient Visits in TN, 2022



The above map shows age-adjusted rates per 100,000 residents for all drug overdose outpatient visits in 2022 by TN county of residence. The rates ranged from 101.3 in Madison County to 476.4 in Houston County for all drug overdose outpatient visits. Campbell, Rhea, Macon, Roane, Lake, Humphreys, Cannon, DeKalb, Anderson, and Houston counties had the highest rates for all drug overdose outpatient visits in 2022 (386 or higher).

Opioid (Excluding Heroin) Overdoses

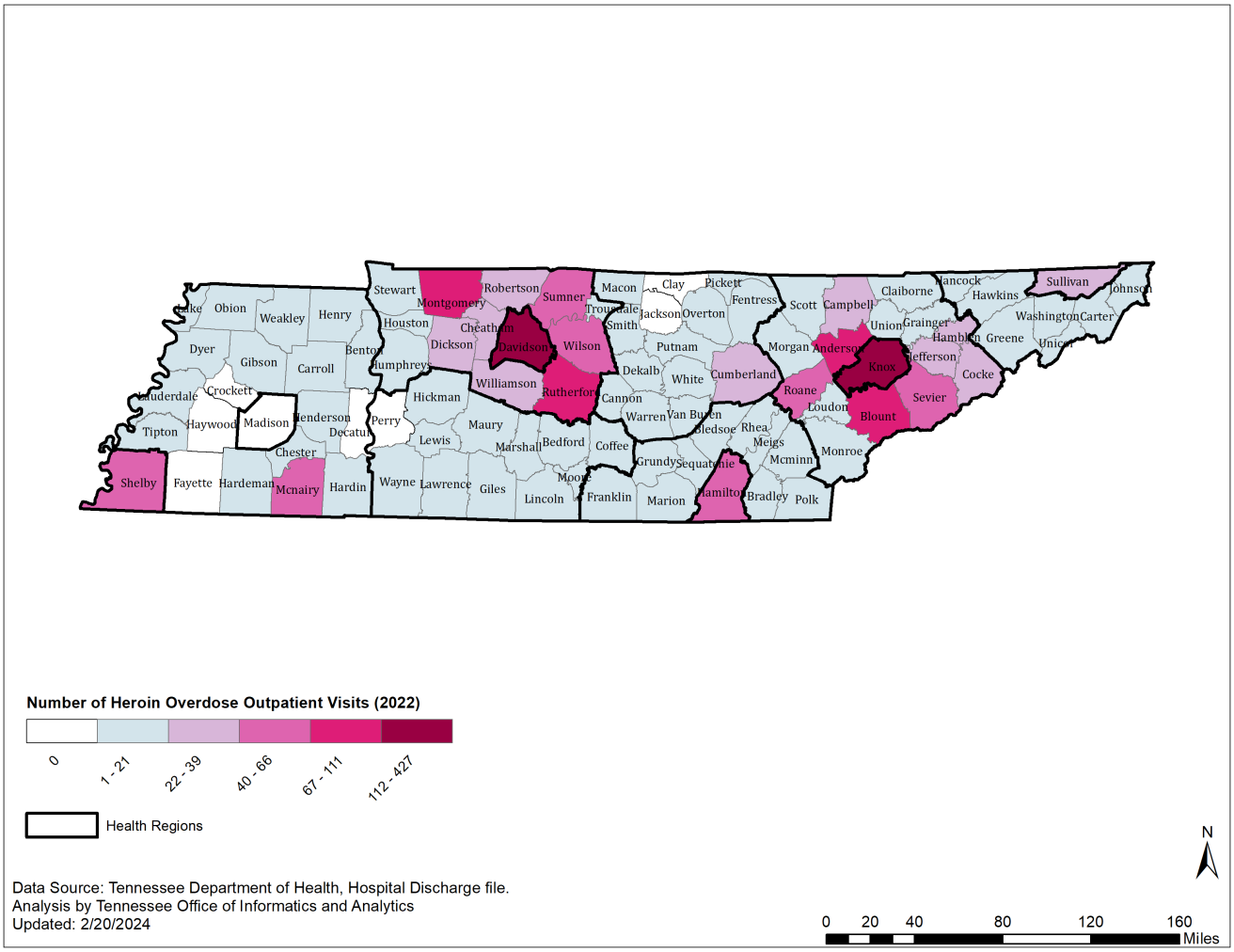
Number of Opioid (Excluding Heroin) Overdose Outpatient Visits in TN, 2022



The above map shows the number of opioid (excluding heroin) overdose outpatient visits in 2022 by TN county of residence. All counties had at least 1 opioid overdose outpatient visit. Hamilton, Knox, Rutherford, Davidson, and Shelby counties had 142 or more opioid overdose outpatient visits in 2022.

Heroin Overdoses

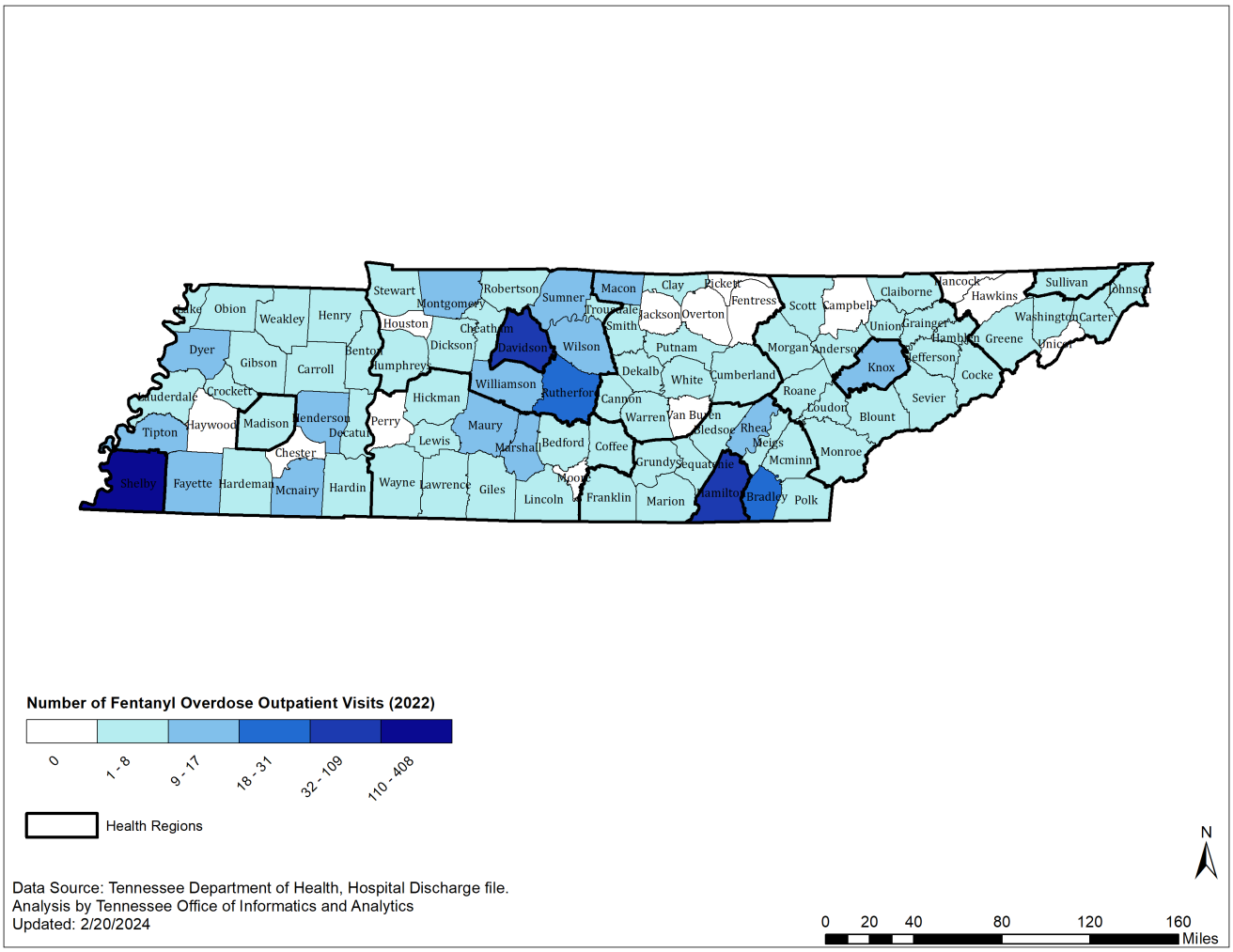
Number of Heroin Overdose Outpatient Visits in TN, 2022



The above map shows the number of heroin overdose outpatient visits in 2022 by TN County of residence. Residents of seven counties (Clay, Crockett, Decatur, Fayette, Haywood, Jackson, Madison, and Perry) had no heroin overdose outpatient visits. Six counties (Montgomery, Anderson, Blount, Rutherford, Knox, and Davidson) had 66 or more heroin overdose outpatient visits in 2022.

Fentanyl Overdoses

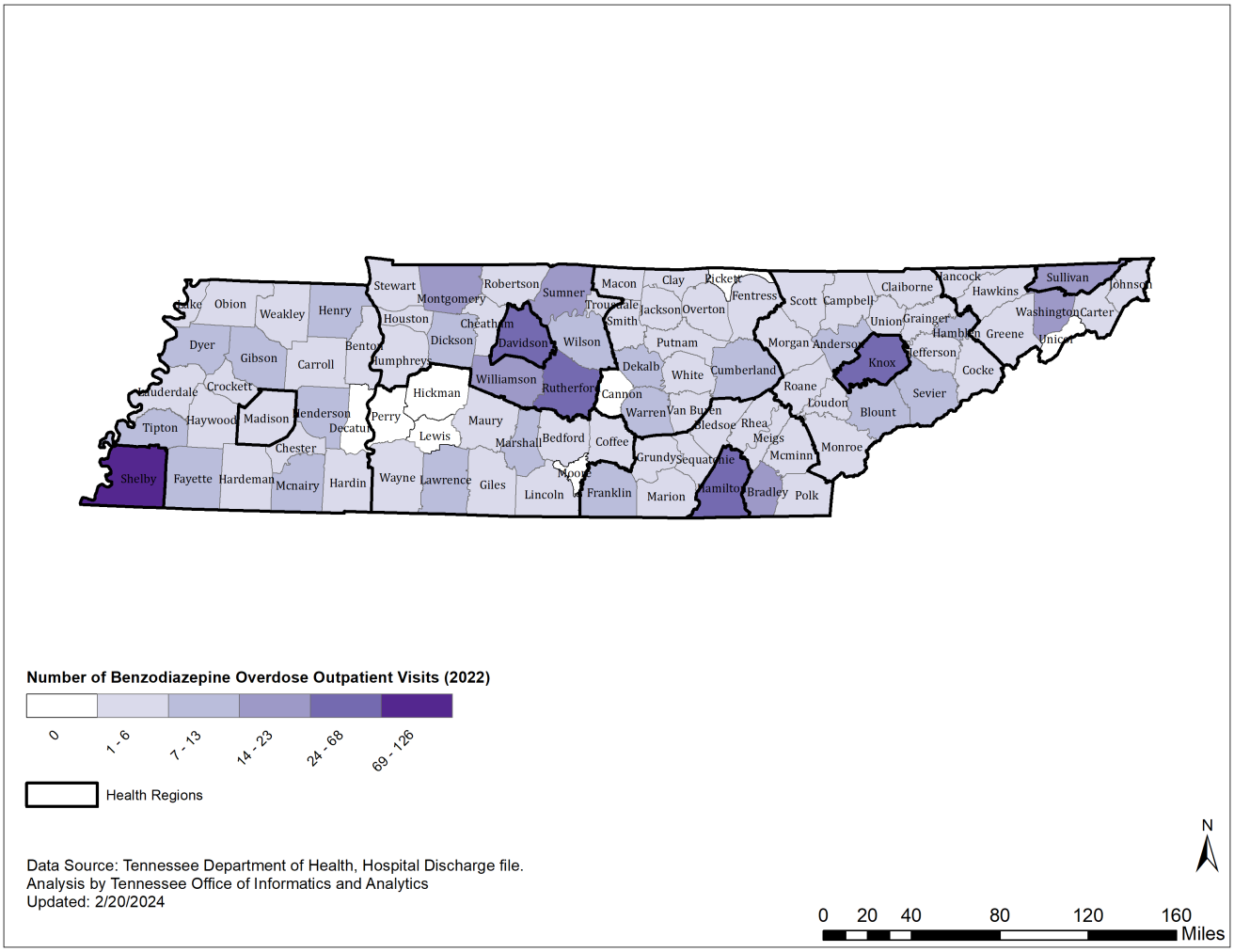
Number of Fentanyl Overdose Outpatient Visits in TN, 2022



The above map shows the number of fentanyl overdose outpatient visits in 2022 by TN County of residence. Fourteen counties (Campbell, Chester, Fentress, Hancock, Hawkins, Haywood, Houston, Jackson, Moore, Overton, Perry, Pickett, Unicoi, and Van Buren) had no fentanyl overdose outpatient visits. Three counties (Hamilton, Davidson and Shelby) had 100 or more fentanyl overdose outpatient visits in 2022.

Benzodiazepine Overdoses

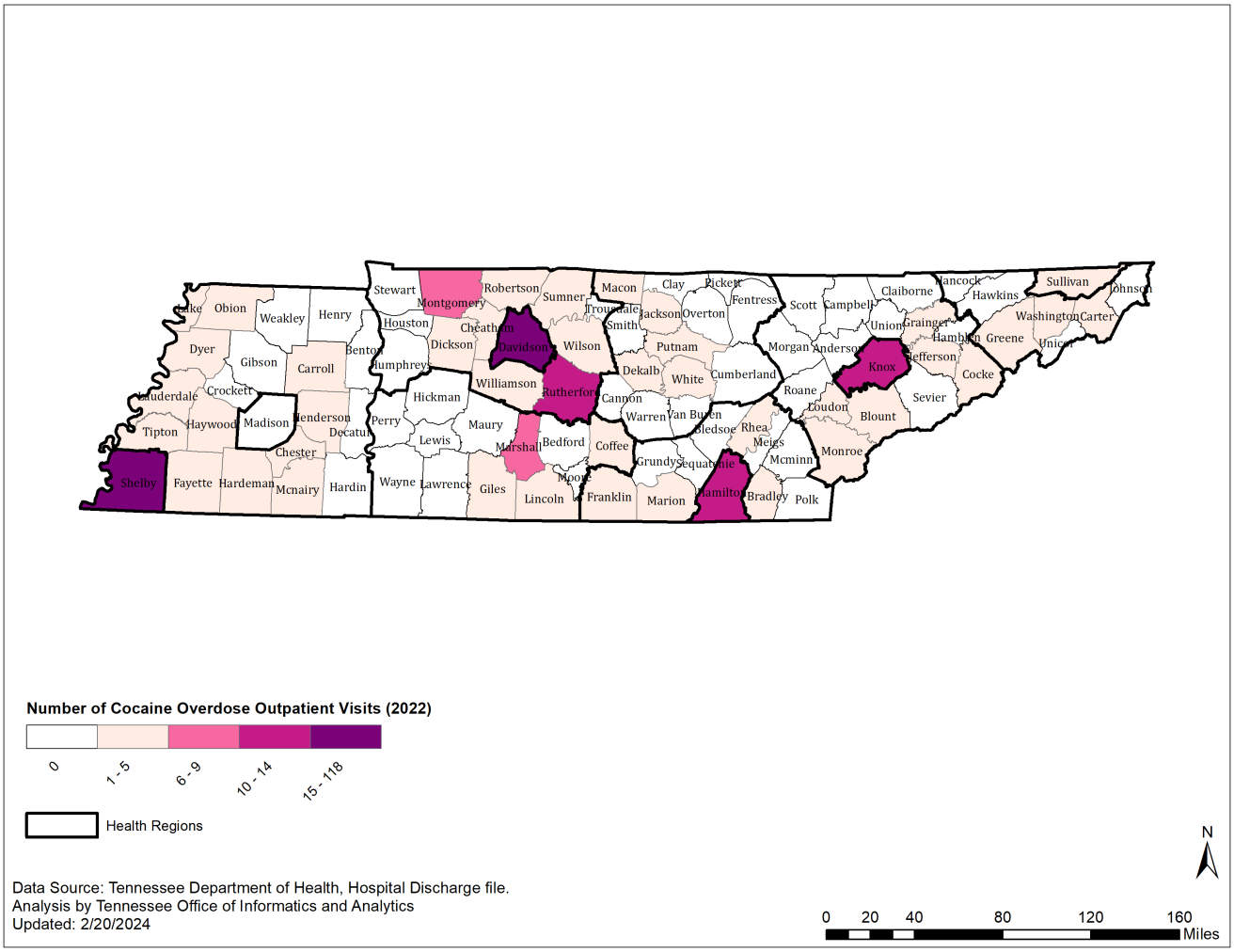
Number of Benzodiazepine Overdose Outpatient Visits in TN, 2022



The above map shows the number of benzodiazepine overdose outpatient visits in 2022 by TN county of residence. Residents of eight counties (Cannon, Decatur, Hickman, Lewis, Moore, Perry, Pickett, and Unicoi) had no reported benzodiazepine overdose outpatient visits. Five counties (Knox, Hamilton, Rutherford, Davidson, and Shelby) had 35 or more benzodiazepine overdose outpatient visits in 2022.

Stimulant Overdoses

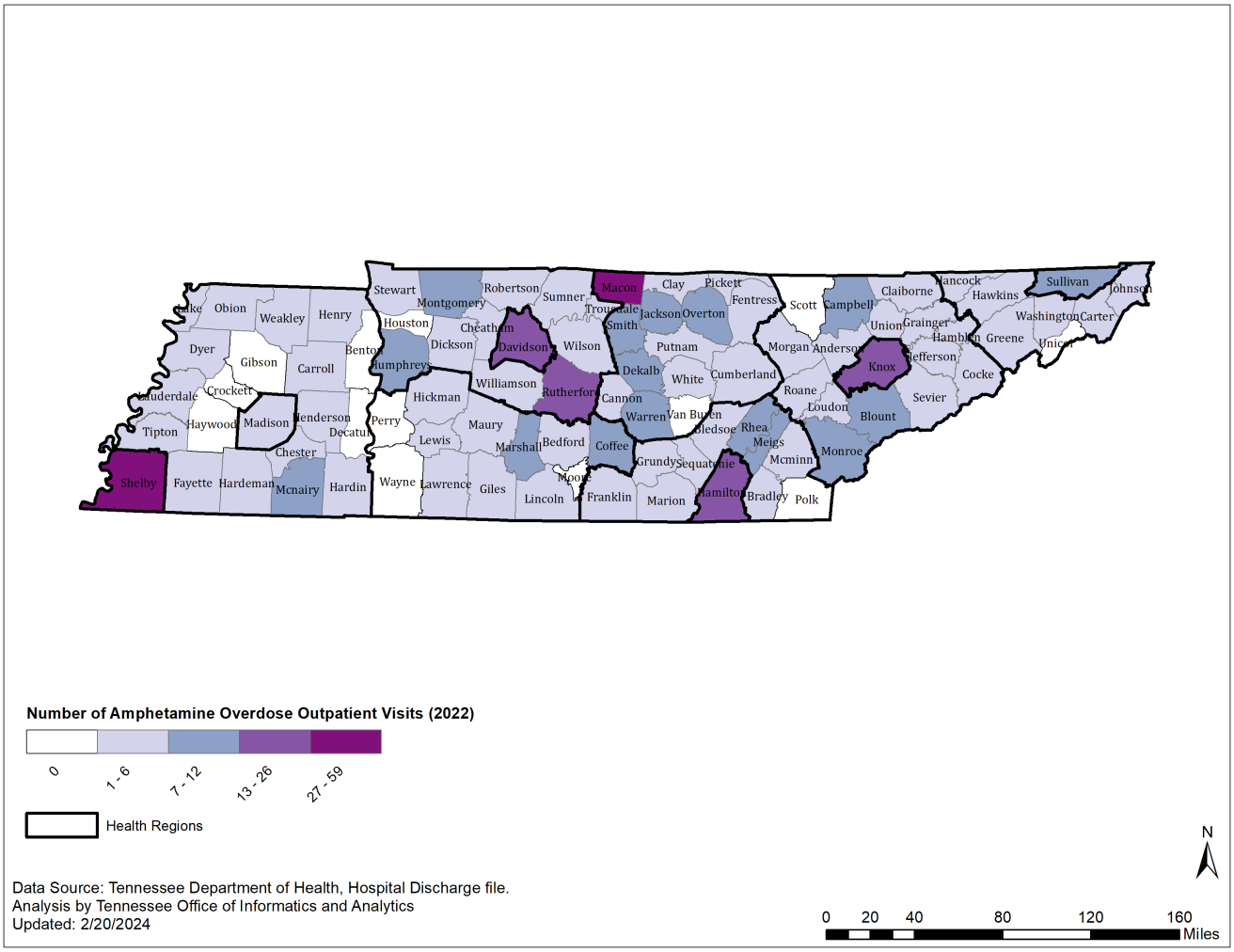
Number of Cocaine Overdose Outpatient visits in TN, 2022



Data Source: Tennessee Department of Health, Hospital Discharge file.
Analysis by Tennessee Office of Informatics and Analytics
Updated: 2/20/2024

The above map shows the number of cocaine related overdose outpatient visits in 2022 by TN county of residence. Shelby (118 visits) and Davidson counties (77 visits) had the highest number of cocaine overdose outpatient visits in 2022.

Number of Amphetamine Overdose Outpatient Visits in TN, 2022



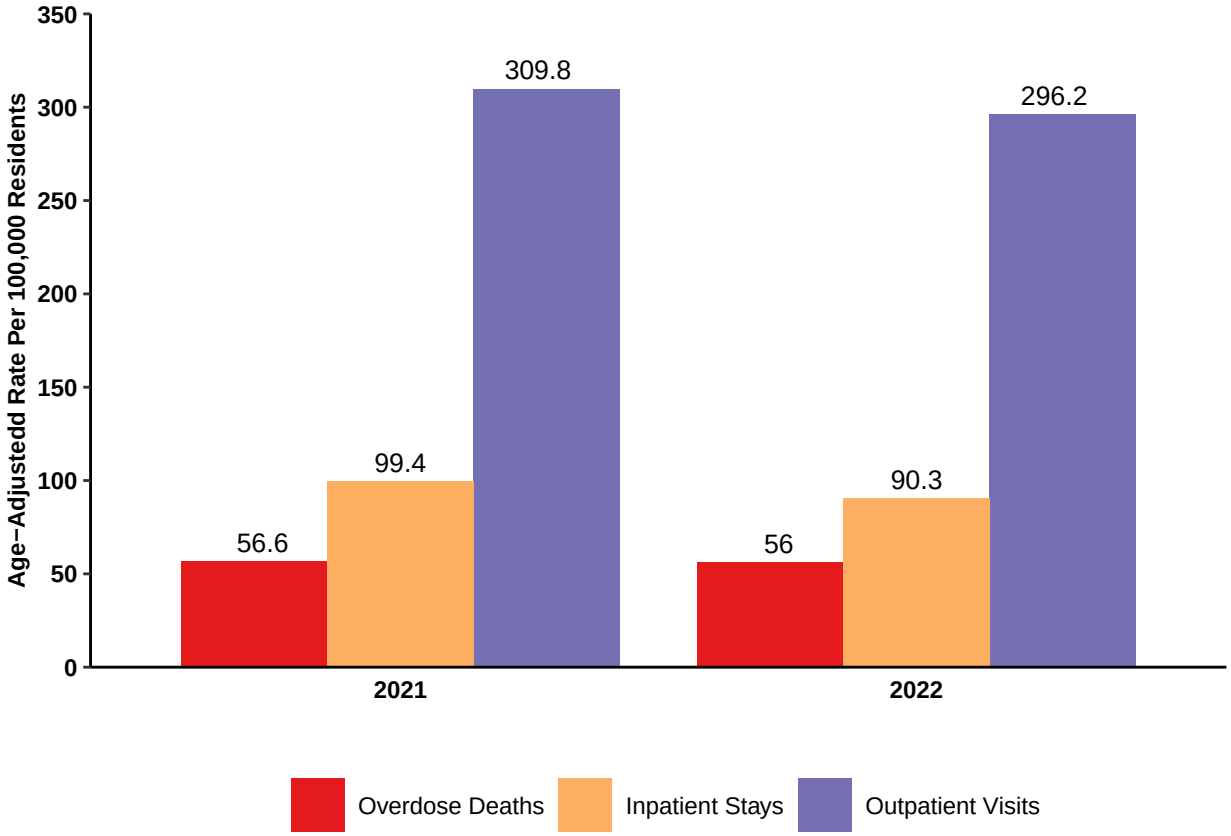
The above map shows the number of amphetamine [16] overdose outpatient visits in 2022 by TN county of residence. Residents of thirteen counties (Benton, Crockett, Decatur, Gibson, Haywood, Houston, Moore, Perry, Polk, Scott, Unicoi, Van Buren, and Wayne) had no reported amphetamine overdose outpatient visits. Knox, Rutherford, Hamilton, Macon, Shelby, and Davidson counties had the highest number (13 or more) of amphetamine overdose outpatient visits.

[16] Amphetamine overdoses include methamphetamine.

Fatal and Nonfatal Drug Overdose Trends

The following figure shows nonfatal overdose hospital discharge rates alongside fatal overdose rates from 2021 to 2022. The death rates are derived from the TN Vital Statistics Death Statistical File and include overdose deaths that occur both in and out of hospitals. The majority of overdose deaths occur outside of hospitals. In 2022, 3,826 TN residents died of a drug overdose. Among hospital discharge patients, 262 inpatients and 50 outpatients were reported deceased. The nonfatal hospital discharge rates presented below exclude records with the discharge status of deceased.

Age-Adjusted Rates for All Drug Overdose Hospital Discharges and Deaths in TN, 2021-2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System.

Rates of death from all drug overdoses decreased slightly from 56.6 in 2021 to 56 in 2022. Concurrently, rates for outpatient visits and inpatient stays declined slightly in 2022.

Annual Cost of Nonfatal All Drug Overdose Discharges in TN, 2022

Introduction

Substance use disorder and related overdose events, even if nonfatal, have been shown to have large, long-term costs for our society.[17] These can come in the form of physical and emotional distress, lost wages and productivity, shortened lifespans, costs of treatment, and more. Overdoses that are treated in a hospital often come with a particularly large and immediate cost. Healthcare resources are expensive, and many parties may end up covering the cost of these services: the patient, their insurance provider, the government, or sometimes the hospital itself. Quantifying this cost is therefore critical to understanding the true financial burden of overdose in TN.

Calculating the cost of care can be done in a variety of ways, but it is usually not possible to generate the precise final amount that each payer spent on a given overdose event. Healthcare billing is extraordinarily complicated, and a wide variety of factors can impact these values. Instead, many researchers calculate the estimated cost of all healthcare resources utilized during a visit, using a well-tested standard method called a Cost to Charge Ratio (CCR).[18] This method is ideal for analysis because it provides a standardized estimate of what a hospital spent in treating a patient, removing variation due to pricing differences, profit margins, and other factors. This standardization is critical because hospitals often have dramatically different pricing schemes, which can make their raw bills difficult to compare.[19]

Hospital data needed for cost of care calculations was provided by the Joint Annual Report (JAR),[20] a comprehensive financial survey completed each year by every non-federal general acute care hospital in the state. Full details on the methodology used to calculate the cost of care is presented [on pages 33-34]. The final value, hereinafter referred to as “cost” for simplicity, should be interpreted as the estimated total amount that the hospital spent during each overdose event, even for treatments not directly related to the overdose.

In this section, the costs of overdose in TN are reported for several key metrics. For all analyses, the costs are reported separately for inpatient stays and outpatient visits, because these two categories have very different costs. The median 2022 cost of overdose by TN Grand Division, overdose type, hospital type, and hospital bed size are presented. Caution should be exercised in the interpretation and use of the values presented here. These costs are estimates, and should not be interpreted as real values that any party actually paid for the care received. Due to health insurance negotiation rates, copays, deductibles, and other factors, the patient and their insurer are unlikely to pay either the full amount charged, or the amount calculated as the cost of a visit.

[17] Florence, Curtis, Feijun Luo, and Ketra Rice. 2021. “The Economic Burden of Opioid Use Disorder and Fatal Opioid Overdose in the United States, 2017.” Drug and Alcohol Dependence 218:108350. doi: 10.1016/j.drugalcdep.2020.108350.

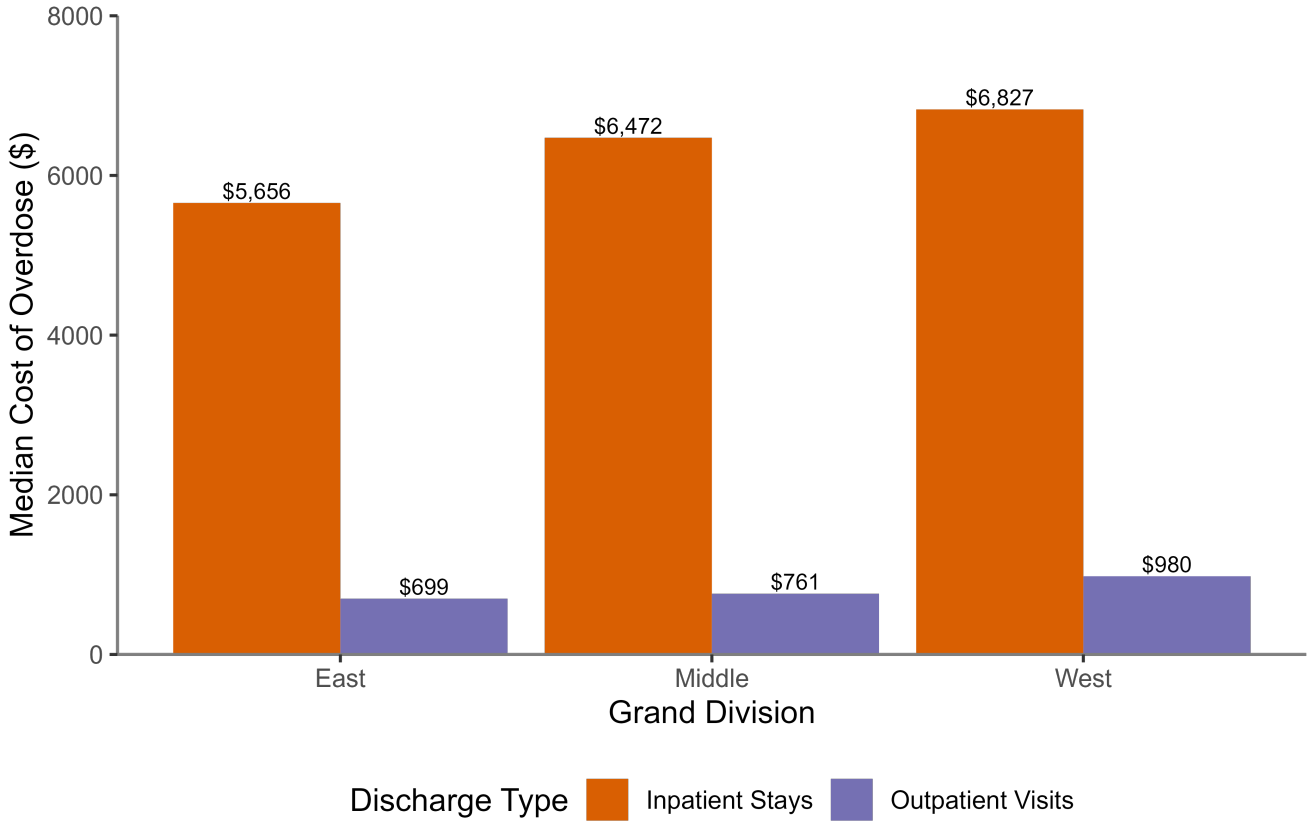
[18] Hsu, Douglas J., Ellen P. McCarthy, Jennifer P. Stevens, and Kenneth J. Mukamal. 2017. “Hospitalizations, Costs and Outcomes Associated with Heroin and Prescription Opioid Overdoses in the United States 2001-12.” Addiction (Abingdon, England) 112(9):1558-64. doi: 10.1111/add.13795.

[19] Amphetamine overdoses include methamphetamine.

[20] JAR Reports information can be accessed at: https://www.tn.gov/health/health-program-areas/statistics/health-data/jar.html

Annual Cost by Grand Divisions and Discharge Type

Median Annual Cost of Nonfatal All Drug Overdose in TN by Grand Divisions[21] and Discharge Type, 2022



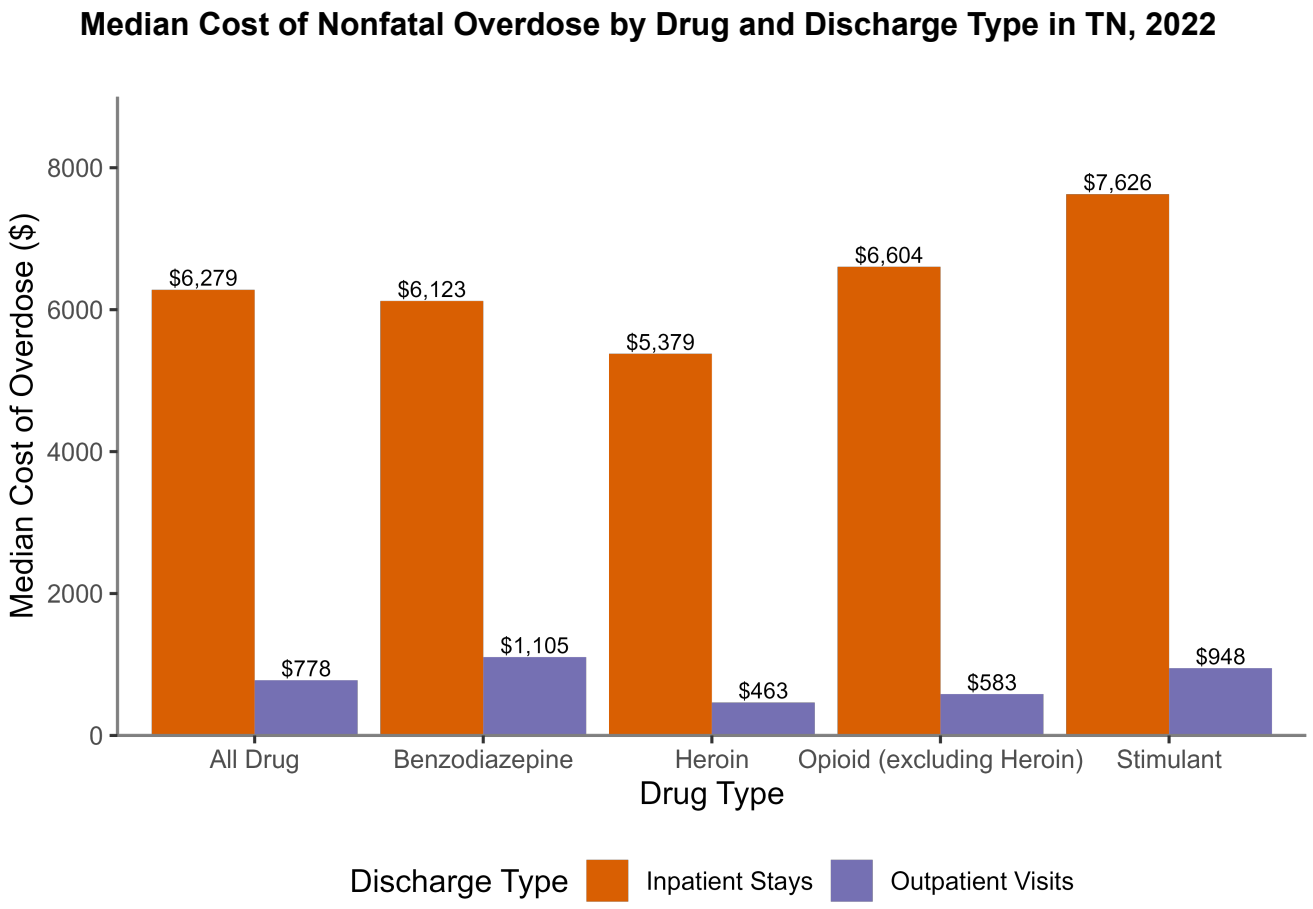
Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System and Joint Annual Report.

The graph above presents the median cost of an overdose in each grand division of Tennessee. An overdose that involves an inpatient stay was the most expensive in West TN, at $6,827 [IQR[22]: $4,417.79-$11,384.88], also an outpatient visit was the most expensive in West TN, costing $980 [IQR: $489.71-$1,785.57]. Regional variation in cost may be explained by regional differences in both patient factors (complexity of the overdose, quickness of treatment, comorbidities) and hospital characteristics (size, ownership type, efficiency).

[21] https://tncounties.org/TCCA/Resources/Grand-Divisions-Map/TCCA/Resources/Grand-Divisions-Map.aspx?hkey=849aa91a-5940-404b-b5b2-151bca37ec88

[22] Interquartile Range: The top and bottom values of the middle 50% of the data, presented here as the 25th and 75th percentile of the costs.

Annual Cost by Drug and Discharge Type



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System and Joint Annual Report.

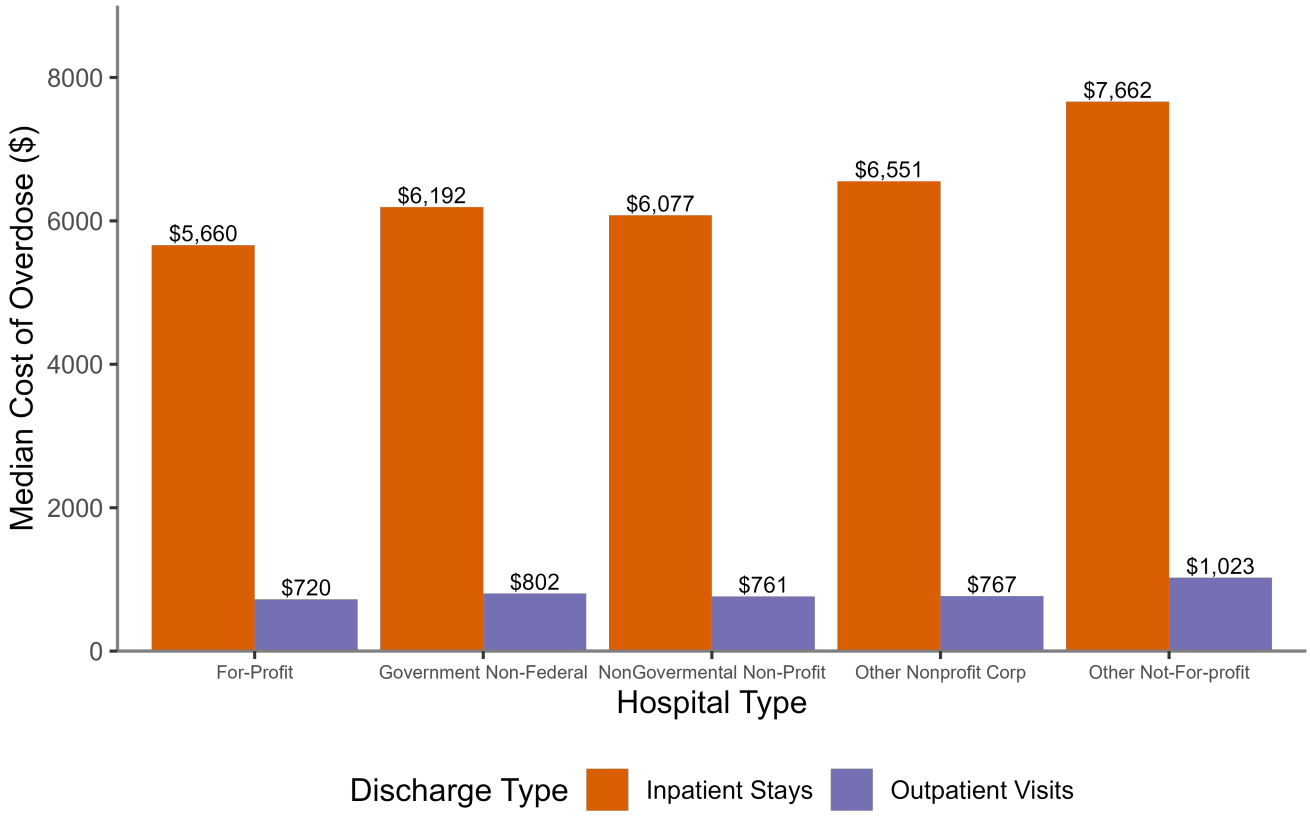
The above graph presents the median cost of an overdose by drugs involved in the overdose[23]. These categories are not mutually exclusive, as a patient may overdose simultaneously on two or more of the substances presented above, and would be included in both estimates.[24] Nonfatal stimulant overdoses were the most expensive for inpatients ($7,626, IQR*: $4,637.02-$13,164.25). Benzodiazepine overdoses were the most expensive for outpatients ($1,105, IQR: $710.17-$1,737.51). Heroin overdoses were the least expensive for both categories, with median inpatient stays costing $5,379 [IQR: $3,432.39-$9,397.6] and median outpatient stays costing $463 [IQR: $260.93-$835.43].

[23] Fentanyl cost charges have not been separately captured from the rest of the opioids.

[24] The only exception to this rule is heroin: a heroin overdose may also include other opioids, but the opioid overdoses exclude heroin by definition.

Annual Cost by Hospital and Discharge Type

Median Cost of Nonfatal All Drug Overdose by Hospital and Discharge Type in TN, 2022



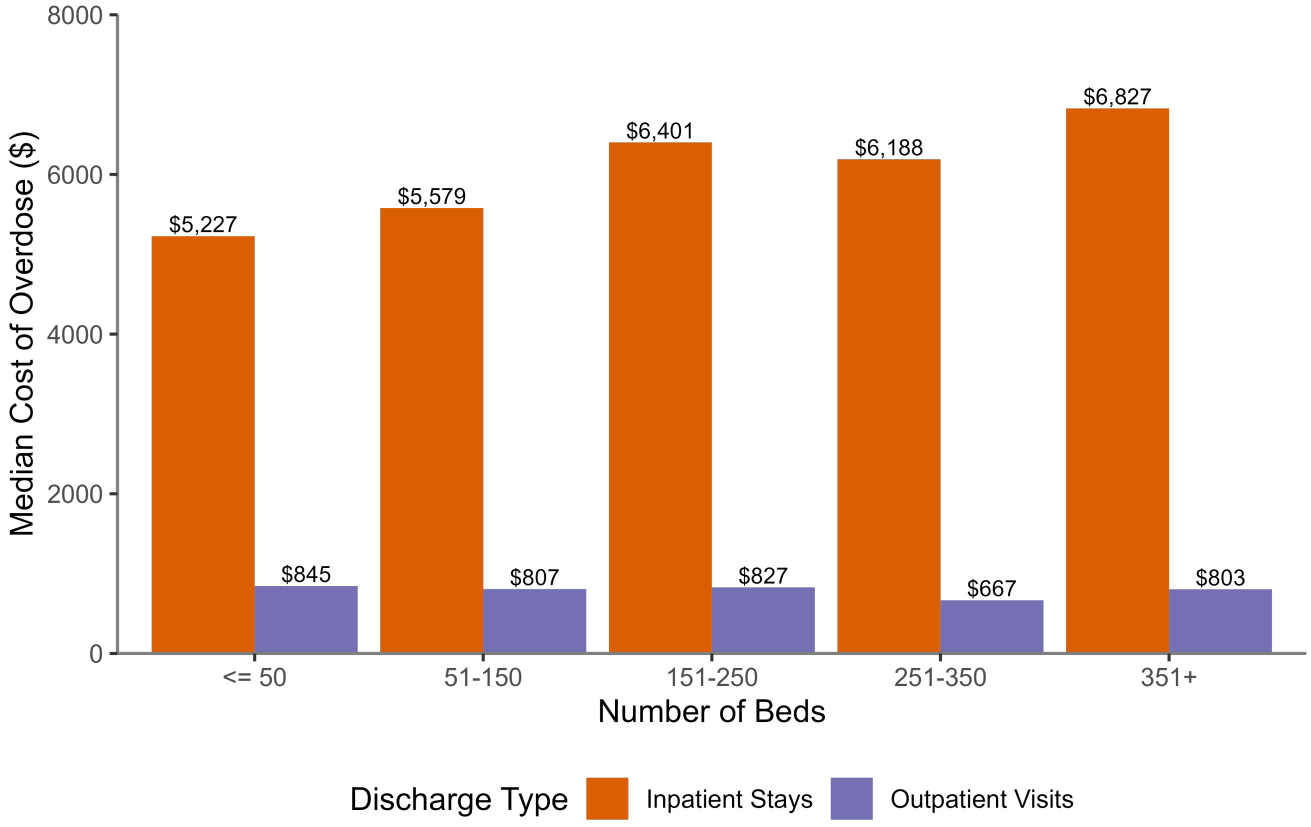
Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System and Joint Annual Report.

This graph presents the median cost of nonfatal overdose by hospital type. Hospitals with non-standard categories (N=2) are excluded[25]. Other not-for-profit hospitals (N=5) have the most costly outpatient visits and inpatient stays, while for-profit hospitals (the most common type of hospital with an N of 37) had the least costly outpatient visits and inpatient stays. The median cost differences between the most costly and least costly inpatient categories are separated by $2,002, and outpatient values are similarly close.

[25]These counts only include hospitals that treated at least one overdose during 2022.

Annual Cost by Bed Size and Discharge Type

Median Cost of Nonfatal All Drug Overdose by Bed Size and Discharge Type in TN, 2022



Analysis by the Office of Informatics and Analytics, TDH (last updated February 16, 2024). Limited to TN residents. Data Source: Hospital Discharge Data System and Joint Annual Report.

This graph presents the median cost of care by bed size. Small hospitals with 50 or fewer beds have the lowest median inpatient costs, but the highest outpatient costs. Hospitals with more than 350 beds have the highest median inpatient costs. The lowest median outpatient costs were in hospitals with 251-350 beds. It should be noted that hospital bed size is related to location. Smaller hospitals are often in more rural areas, while larger hospitals are generally located in metropolitan areas. Severe patients with complex cases may also be transferred to these larger facilities for more intensive treatment, which can drive up costs. In TN, hospitals[26] with between 51-150 beds are the most common (N=47), followed by those with <=50 beds (N=25). In 2022, there were 15 hospitals (11%) in the state with over 350 beds, but those facilities treated 33% of all nonfatal overdoses. There were also 12 hospitals in the 151-250 category, and 14 in the 251-350 category, who combined treated 35% of all nonfatal overdoses.

[26]These counts only include hospitals that treated at least one overdose during 2022.

Technical Notes

List of Figures:

Definition of Measures

Inpatient stays are inpatient hospitalizations generally lasting longer than 24 hours while outpatient visits are those less than 24 hours. Outpatient visits include primarily emergency department visits but also include any observation period of 23 hours or less, ambulatory surgeries or certain diagnostic services (such as MRIs or CT scans).

Overdose is determined by the International Classification of Disease, Clinical Modification, 10th revision codes (ICD-10-CM). Tennessee's Hospital Discharge Data System (HDDS) includes up to 18 diagnosis fields and three fields for external causes of injury codes (abbreviated as e-codes). Coding may or may not be based on urine/tox screens and rely on patient report, clinician diagnosis, and the availability of appropriate billing codes, and therefore may not accurately represent the actual drugs present during the overdose. Relevant ICD-10-CM codes for each revision are listed for each drug indicator definition below.

Age-adjusted rates for all drug overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of drugs, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T36-50 (poisoning by drugs, medicaments, and biological substances) with intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for opioid overdose excluding heroin outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of all opioids excluding heroin, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T40.0X (poisoning by opium),
  - T40.2X (poisoning by other opioids),
  - T40.3X (poisoning by methadone),
  - T40.4X (poisoning by synthetic narcotics),
  - T40.41 (poisoning by fentanyl or fentanyl analogs),
  - T40.42 (poisoning by tramadol),
  - T40.49 (poisoning by other synthetic narcotics),
  - T40.60 (poisoning by unspecified narcotics), or
  - T40.69 (poisoning by other narcotics) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
  - Exclusions: T401.1X (poisoning by heroin), any intent/any encounter type.
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for heroin overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due

to the effects of heroin, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T40.1X (poisoning by heroin) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for fentanyl overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of fentanyl, regardless of intent
  - Any mention of ICD10CM diagnosis codes:
  - T40.41 (poisoning by fentanyl or fentanyl analogs) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator Yearly state population in 100,000s

Age-adjusted rates for benzodiazepine overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of benzodiazepine, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T42.4X (poisoning by benzodiazepine) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for other synthetic opioids overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of other synthetic opioids (excludes methadone), regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T40.4X (poisoning by synthetic opioids),
  - T40.41 (poisoning by fentanyl or fentanyl analogs),
  - T40.42 (poisoning by tramadol),
  - T40.49 (poisoning by other synthetic narcotics) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for methadone overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of methadone, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T40.3X (poisoning by methadone) with

  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for cocaine overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of cocaine, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T40.5X (poisoning by cocaine) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age-adjusted rates for amphetamine (includes methamphetamine) overdose outpatient visits and inpatient stays

- Numerator - count of outpatient visits or inpatient stays caused by acute poisonings due to the effects of amphetamines, regardless of intent
  - Any mention of ICD-10-CM diagnosis codes:
  - T43.62 (poisoning by amphetamines) with
  - intent codes 1-4 (unintentional, intentional, assault, or undetermined) and encounter code A (initial encounter) or missing (not subsequent encounter or a sequela)
- Denominator - Yearly state population in 100,000s

Age/Race/Sex stratification

- Age is determined according to date of birth and at date of admission to hospital.
- Race and sex are reported by the hospital to the hospital discharge data system.
- Due to low numbers, patients of unknown race, Native American, Alaskan Native, Asian or Pacific Islander were not included in the analyses.

Age-adjustment is used for all nonfatal overdose rates except for those stratified by age. Age-adjusted rates were calculated using 2000 U.S. standard population for age-adjustment. The rate for a specific age group in a given population was multiplied by the proportion of people in the same age group in the 2000 U.S. standard population; adding across age groups yields the final age-adjusted rate.

Primary Payer Type

Primary Payer is determined according to the name or type of payer organization from which the hospital first receives payment for the bill. The payer types for this report are categorized as

- Medicare
- Medicaid
- Commercial
- Cash/self-pay

- Other/unknown (including Cover TN, Cover Kids, workers compensation, Division of Health Services, federal, military, medically indigent).

Detailed Explanation of How the Cost of Care is Calculated

In order to calculate the cost of care, we need the total amount charged to a patient and a hospital's Cost-to-Charge Ratio (CCR). Annual CCR values for hospitals in TN are calculated using the Joint Annual Report (JAR), a comprehensive financial survey completed each year by every non-federal general acute care hospital in the state. This survey is required, and thus has minimal missing data (no facilities that treated an overdose were missing data in 2020). The total annual cost reported by each hospital is divided by the total revenue reported over the same time period to obtain each facility's CCR. These CCRs are calculated annually, as a hospital's circumstances and pricing may change over time. On the patient side, the HDDS provides the total reported charges for each overdose. These charges reflect the maximum bill that was incurred during the visit, and include all relevant resources (such as nursing, room and board, treatments, supplies, and more). The only expense that may not be included is doctor fees, if the physician was not a direct employee of the hospital. Patient charges are matched with the appropriate hospital's CCR using the hospital's JAR ID, a TN-specific hospital ID code, and the year of care. Total charges are then multiplied by the CCR to arrive at an estimated cost for that visit (how much the hospital may have actually spent on their care). The table below defines each number used to calculate the final cost. While the final cost is an estimate, all other numbers used in the calculation are directly from existing data sources.

Number	Unit	Definition	Source
Total Charges	Patient	The total amount billed by the hospital to the patient for care provided during the overdose event, before any deductions are applied due to insurance, copays, or other factors.	HDDS
Total Revenue	Hospital	The total (gross) amount that a hospital earned in a year, including all patient payments for all services	JAR
Total Cost	Hospital	The total amount that a hospital reported spending in a year on all services	JAR
Cost-to-Charge Ratio (CCR)	Hospital	Total Cost divided by Total Revenue. Represents the ratio of a hospital's revenue that was spent and is almost always less than 1 (hospitals generally earn more than they spend).	Calculated
Cost of Care	Patient	Total Charges multiplied by CCR. This estimates the total amount of money that the hospital spent on a patient's care. This adjustment corrects for the portion of a patient's charges that were really contributing to a hospital's revenue, not the cost of care.	Calculated

An Example: A patient experienced a nonfatal outpatient overdose. The hospital charged him $800 for his visit, which included the cost of naloxone, nursing, and the use of an ER bed for three hours. This number was reported to the HDDS. In last year's JAR, the hospital reported earning $1,000,000, but only reported spending $500,000. This means that their cost to charge ratio is 0.5 (500,000/1,000,000)-roughly 50% of their income is used on the cost of care, and the rest is revenue. With this ratio, we can estimate that 50% of the patient's bill

was covering the cost of treating him, and the other 50% was revenue for the hospital. This means that the hospital spent $400 ($800 * 0.5) on his care. His final cost of care would be reported as $400. Different hospitals have very different ratios of revenue. Small rural facilities may spend 90-95 percent of their revenue on costs, while larger urban hospitals may spend only 30-40 percent. Utilizing this ratio allows for comparison of patients across hospitals and get a clear estimate of how much these facilities are actually spending on overdoses. These costs influence how much payers spend, as hospitals will not generally accept payment lower than the cost of care.

Time Period 2021 - 2022

Inclusion/Exclusion Criteria

- Only Tennessee residents were considered
- Only discharges from non-federal, acute care hospitals were included
- Excludes patients discharged as dead/deceased
- Late effects, adverse effects, under-dosing, and chronic poisonings due to the effects of drugs were excluded

Data Sources

- Tennessee Hospital Discharge Data System (HDDS) 2021-2022
- Hospital data was obtained from the 2021 Joint Annual Report . See https://www.tn.gov/health/health-program-areas/statistics/health-data/jar.html for more details.
- Fatal overdose data come from the Tennessee Death Statistical File
- Population data was obtained from CDC Wonder bridged race population estimates. The vintage year of the populations corresponds to the year of the indicator. (See http://wonder.cdc.gov/bridged-race-population.html and https://wonder.cdc.gov/single-race-population.html for more details).

General Limitations of the Measures

- Nonfatal overdoses are only captured as hospital discharges and do not include those nonfatal overdoses that do not end up at an acute-care facility.
- Limited to non-federal acute care-affiliated facilities. Excludes Veterans Affairs and other federal hospitals, rehabilitation centers, and psychiatric hospitals.