# NONFATAL AMPHETAMINE-INVOLVED DRUG POISONINGS
MICHIGAN 2018

Short-term Trends by Visit Type

Amphetamines comprise a class of drugs that includes prescription stimulants such as those used to treat attention-deficit hyperactivity disorder (ADHD) and illicitly produced stimulants like methamphetamine hydrochloride and 3,4-Methylenedioxymethamphetamine (MDMA), otherwise known as ecstasy. In 2018, acute-care hospitals treated and released an average of 44.1 (standard deviation=5.2) Michigan residents from the emergency department and admitted for inpatient care an average of 32.4 (standard deviation=5.4) Michigan residents each month for nonfatal amphetamine-involved drug poisonings. In total, there were 918 acute-care hospital visits for nonfatal amphetamine-involved drug poisonings, including both patients treated and released from the emergency department (529) and patients admitted for inpatient care (389). Amphetamine-involved drug-poisonings represented 2.5 percent of all nonfatal drug poisoning hospital visits. As shown in Figure 1, the largest number of hospital visits for amphetamine-involved drug poisonings among Michigan residents occurred in August.

Figure 1: Number of nonfatal drug poisonings involving amphetamines[†] among Michigan residents by visit type and month, 2018[‡]
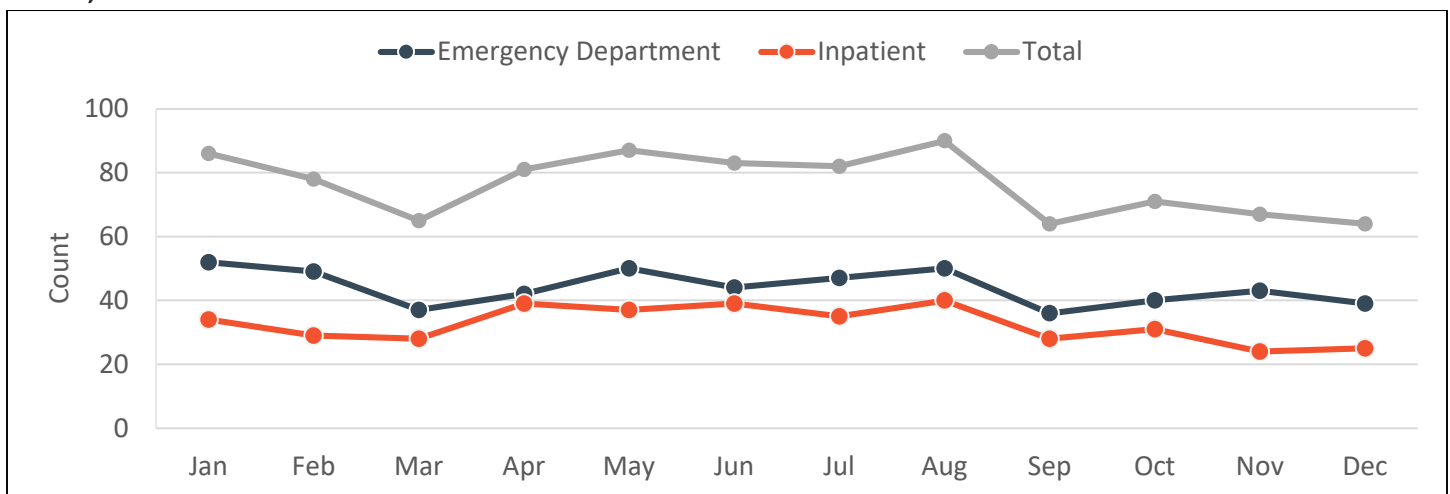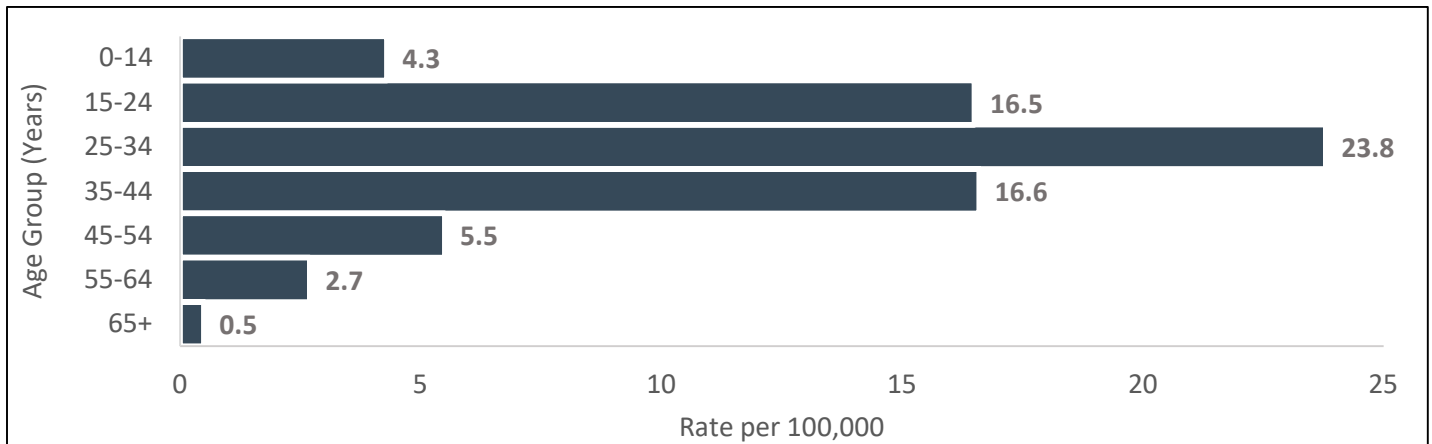

[†]Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
[‡]2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association.

Demographic Patterns

Nonfatal amphetamine-involved drug poisoning rates were highest for residents age 25 to 34 years (23.8 visits per 100,000 residents), followed by residents aged 35 to 44 years (16.6 visits per 100,000 residents) and residents aged 15 to 24 years (16.5 visits per 100,000) (Figure 2). Individuals aged 65 years and older had the lowest rate of nonfatal amphetamine-involved drug poisonings at 0.5 visits per 100,000 residents.

Figure 2: Rate (per 100,000) of amphetamine-involved drug poisonings[†] by age group among Michigan residents, 2018[‡]
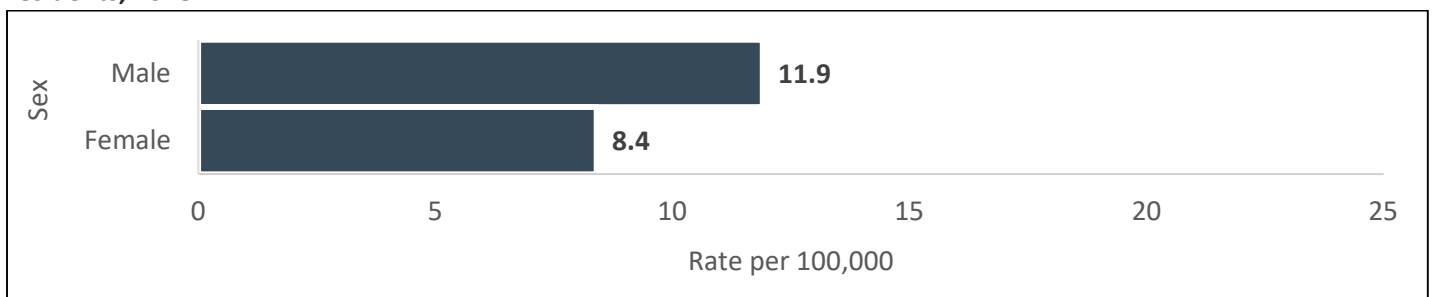

†Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
‡2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association. Population denominators derived from Vintage 2018 Postcensal Estimates of the Resident Population, National Center for Health Statistics.

The age-adjusted rate of nonfatal amphetamine-involved drug poisonings was about 40% higher for males than females (Figure 3). Males accounted for 59.6% of the 918 hospital visits for nonfatal amphetamine-involved drug poisonings of Michigan residents in 2018.

Figure 3: Age-adjusted rate (per 100,000) of amphetamine-involved drug poisonings[†] by sex among Michigan residents, 2018[‡]

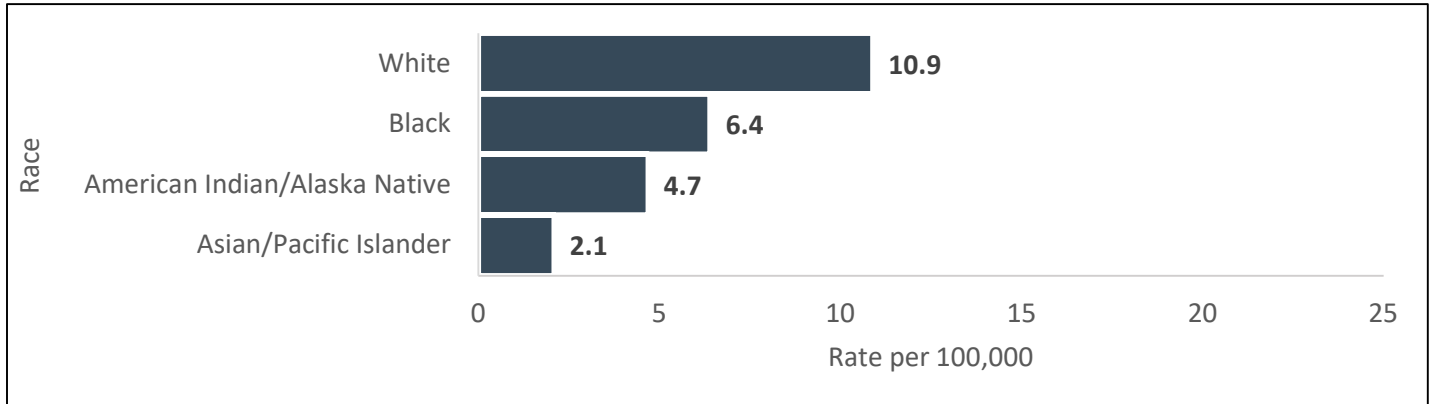

†Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
‡2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association. Population denominators derived from Vintage 2018 Postcensal Estimates of the Resident Population, National Center for Health Statistics.
Note: Rates were age-adjusted to the 2000 US population by the direct standardization method.

White Michigan residents had the highest age-adjusted nonfatal amphetamine-involved drug poisoning rate in 2018, with 10.9 visits per 100,000 residents (Figure 4). Black residents had the second highest rate of nonfatal amphetamine-involved poisonings (6.4 visits per 100,000), which was 41.3% lower than the rate for White residents. Rates could not be calculated for residents with a race classified as 'other', due to the unavailability of a denominator. Race was unknown for 2.6% of hospital visits.

Figure 4: Age-adjusted rate (per 100,000) of amphetamine-involved drug poisonings[†] by race among Michigan residents, 2018[‡]

†Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
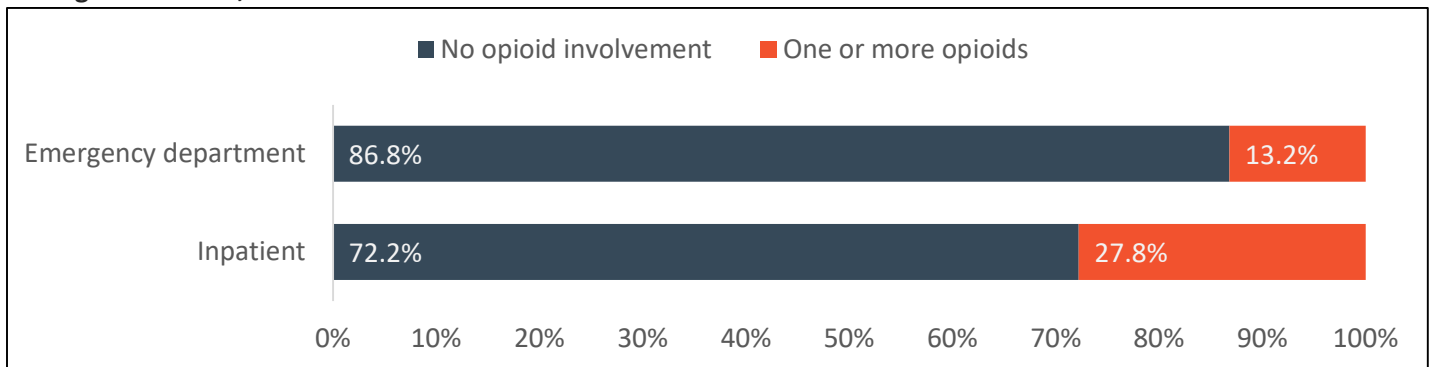‡2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association. Population denominators derived from Vintage 2018 Postcensal Estimates of the Resident Population, National Center for Health Statistics.
Note: Rates were age-adjusted to the 2000 US population by the direct standardization method.

Opioid Involvement

Almost one in five (19.4 percent) amphetamine-involved drug poisonings also involved one or more opioids (Figure 5). Nonfatal amphetamine-involved drug poisonings treated in an inpatient setting were 2.1 times more likely to involve opioids than those treated and released from the emergency department.

Figure 5: Percent of nonfatal amphetamine-involved poisonings[†] by opioid involvement[§] and visit type among Michigan residents, 2018[‡]
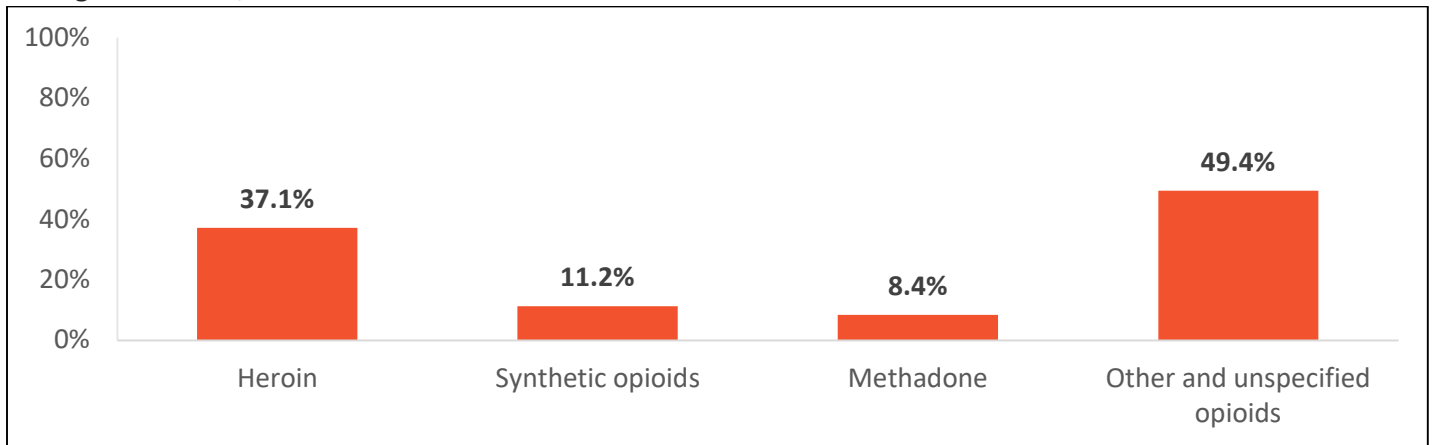

†Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
§Includes initial visits with an ICD-10-CM code of T40.0-T40.4, T40.6, or T40.69 listed as a principal or any secondary diagnosis.
‡2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association.

Among nonfatal amphetamine-involved drug poisonings that also had opioid involvement, more than one-third (37.1 percent) involved heroin and nearly half (49.4 percent) involved other or unspecified opioids (Figure 6). An amphetamine-involved drug-poisoning may involve multiple opioids; therefore, a single hospital visit may be represented in more than one opioid category.

Figure 6: Percent of nonfatal drug poisonings involving both amphetamines[†] and opioids[§] by type of opioid(s) present, Michigan residents, 2018[‡]

†Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.

§Includes initial visits with an ICD-10-CM code of T40.1 (heroin poisoning), T40.3 (methadone poisoning), T40.4 (synthetic opioid poisoning) and/or T40.0, T40.2, T40.6, T40.69 (other and unspecified opioids) listed as a primary or any secondary diagnosis.

‡2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association.
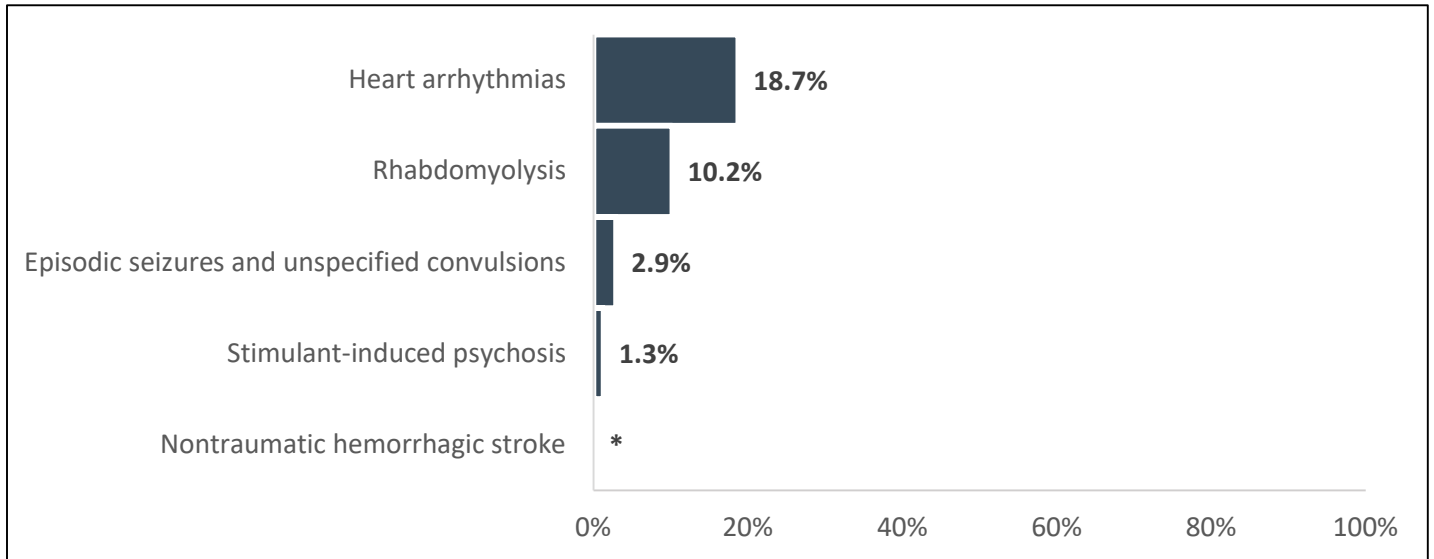
Note: An amphetamine-involved drug-poisoning may involve multiple opioids; therefore, a single hospital visit may be represented in more than one opioid category.

Frequency of Severe Clinical Signs and Symptoms

Clinical signs and symptoms of amphetamine poisoning include a rapid or irregular heartbeat (arrhythmia), agitation, increased body temperature, hallucinations, convulsions, and in some cases, a serious condition known as rhabdomyolysis.[1] Rhabdomyolysis is characterized by the rapid breakdown of muscle tissue and in severe cases can lead to acute renal failure.[2] Chronic amphetamine use can result in anxiety, insomnia, mood disturbances and psychosis.[3] All recorded diagnosis codes for nonfatal amphetamine-involved drug poisonings were examined to determine the percent of visits that had a co-occurring physical or mental health diagnosis typically associated with amphetamine misuse.

More than one in four (26.3 percent) nonfatal amphetamine-involved drug poisonings had a diagnosis of at least one of the severe clinical signs or symptoms and 3.5 percent had more than one severe clinical sign or symptom (Figure 7). The most commonly recorded condition was heart arrhythmia, including tachycardias. More than one in ten nonfatal amphetamine-involved drug poisonings had a diagnosis of rhabdomyolysis. Episodic seizure disorders and unspecified convulsions, stimulant-induced psychosis, and nontraumatic hemorrhagic stroke were diagnosed in less than 3 percent of nonfatal amphetamine-involved drug poisonings.

Figure 7: Percent of nonfatal amphetamine-involved drug poisonings[†] with specified co-occurring diagnoses[§] among Michigan residents, 2018[‡]

Geographic Patterns

Rates of nonfatal amphetamine-involved drug poisoning hospital visits were highest in the Michigan Counties of Iron, Kalkaska, Crawford, Roscommon and Clare counties (Figure 8). Rates are not displayed for counties with between one and five amphetamine-involved drug poisonings due to statistical unreliability. Rates are also suppressed for counties that contain hospitals with 100 or more licensed beds that did not report emergency department data.

Figure 8: Age-adjusted rate (per 100,000) of nonfatal amphetamine-involved drug poisonings[†] by county of residence, Michigan 2018[‡]

Age-adjusted rate per 100,000 residents

- 0.0 - 7.1
- 7.2 - 17.1
- 17.2 - 38.1
- 38.2 - 65.7
- 65.8 - 113.8
- Suppressed*

[†]Includes initial visits with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis.
[‡]2018 Michigan Resident Inpatient File and 2018 Michigan Resident Outpatient File, Michigan Health and Hospital Association. Population den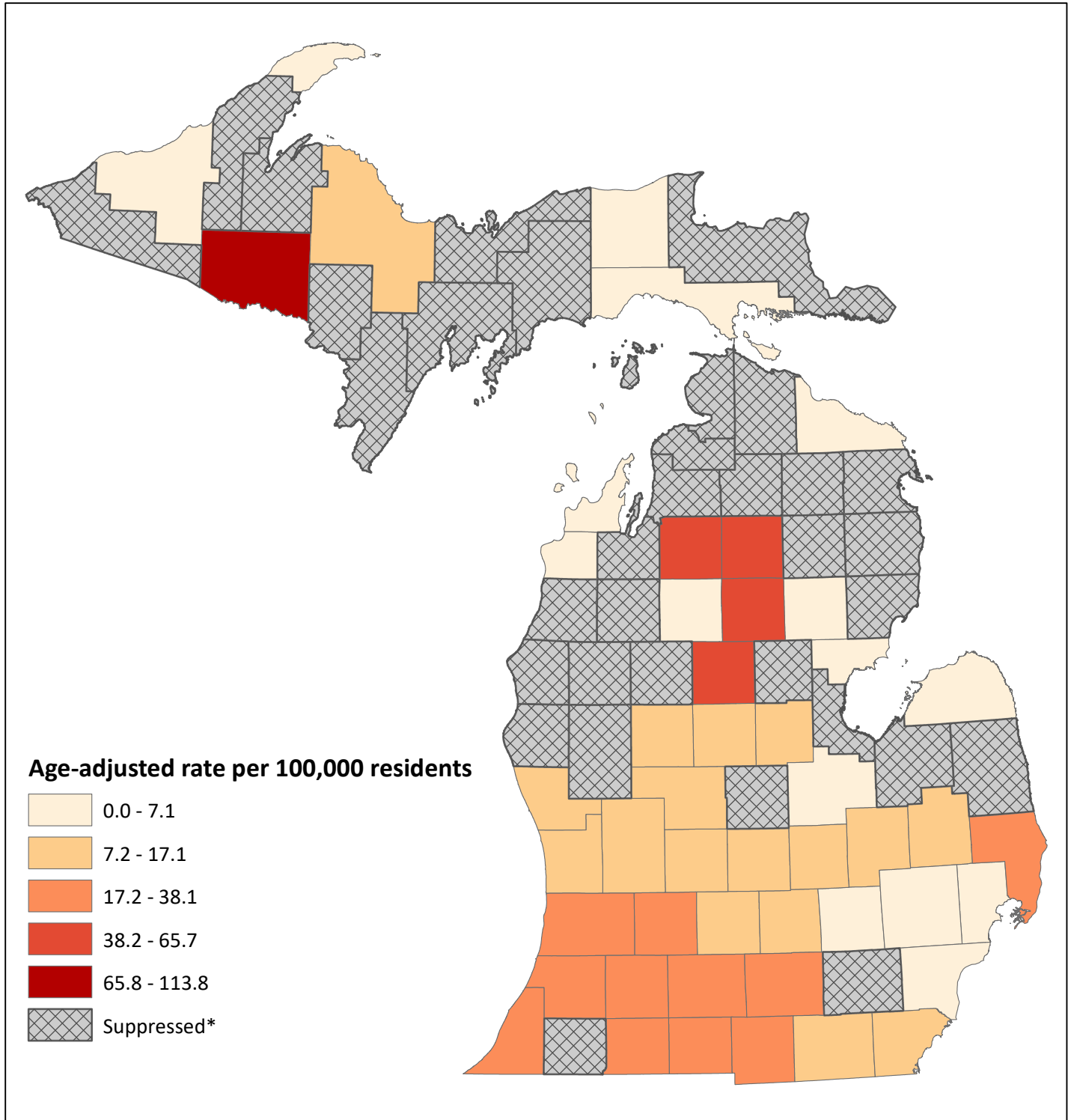ominators derived from Vintage 2018 Postcensal Estimates of the Resident Population, National Center for Health Statistics.
*Rates are not displayed for counties with between one and five amphetamine-involved drug poisonings. Rates are also suppressed for counties that contain hospitals with 100 or more licensed beds that did not report emergency department data.
Notes: Rates were age-adjusted to the 2000 US population by the direct standardization method. Counties are shown grouped into five categories based on the natural breaks of the distribution of age-adjusted rate of nonfatal amphetamine-involved drug poisonings.

Methods

Data Sources

- 2018 Michigan Resident Inpatient File (MRIF), created using data from the Michigan Inpatient Database, obtained with permission from the Michigan Health and Hospital Association.
- 2018 Michigan Resident Outpatient File (MROF), created using data from the Michigan Outpatient Database, obtained with permission from the Michigan Health and Hospital Association.
- Vintage 2018 postcensal estimates of the resident population of the United States (April 1, 2010, July 1, 2010-July 1, 2018), by year, county, single-year of age, bridged race, Hispanic origin, and sex. National Center for Health Statistics. Prepared under a collaborative arrangement with the U.S. Census Bureau. Available from: http://www.cdc.gov/nchs/nvss/bridged_race.htm as of June 25, 2019.

Case Definitions

Nonfatal amphetamine-involved drug poisonings include emergency department visits and inpatient admissions of Michigan residents at acute-care hospitals with an ICD-10-CM code of T43.621-T43.624 or T43.641-T43.644 listed as a principal or any secondary diagnosis. ICD-10-CM codes T43.641-T43.644 were introduced in October 1, 2018 to identify MDMA (ecstasy) poisonings. From January 1, 2018 through September 30, 2018, these poisonings would have been included under T43.621-T43.624.

Amphetamine poisonings that also involved opioids were identified by the presence of one or more of the following ICD-10-CM codes: heroin (T40.1); methadone (T40.3); synthetic opioids (T40.4); other and unspecified opioids (T40.0, T40.2, T40.6, T40.69). Adverse effects and underdosing of amphetamines were not included. Subsequent and sequela visits (identified by an ICD-10-CM seventh character of 'D' or 'S') and visits with a patient discharge disposition of 'expired' were also not included.

Severe Clinical Symptoms

Heart arrhythmias included paroxysmal tachycardia (ICD-10-CM code I47), atrial fibrillation and flutter (I48), other cardiac arrythmias (I49), and unspecified tachycardia (R00.0). Rhabdomyolysis was identified by the inclusion of the ICD-10-CM code M62.82. Episodic seizures and unspecified convulsions were identified by the inclusion of an ICD-10-CM code of G40.5 or R56.9. Stimulant-induced psychosis was identified by the inclusion of an ICD-10-CM code of F15.15, F15.25, or F15.95. Nontraumatic hemorrhagic stroke included nontraumatic subarachnoid hemorrhage (I60), nontraumatic intracerebral hemorrhage (I61), and other and unspecified nontraumatic intracranial hemorrhage (I62). The specified severe clinical symptoms were included if the diagnosis code was recorded as the primary or any secondary diagnosis.

Figure 8 Additional Notes

Rates are not displayed for counties with between one and five amphetamine-involved drug poisonings due to statistical unreliability. To reduce the effect of non-reporter bias, data were also suppressed for counties that contain hospitals with 100 or more licensed beds that did not report emergency department data. All hospitals with 100 or more licensed beds reported inpatient data. Counties were grouped into five categories based on the natural breaks of the distribution of age-adjusted rates of nonfatal amphetamine-involved drug poisoning. Natural breaks classification is designed to minimize variation within a category and maximize variation across categories. This classification is based on the Jenks' Natural Breaks algorithm.

Data Source Notes

The MROF and MRIF collect data from hospitals with membership in the Michigan Health and Hospital Association. The MRIF includes all inpatient admissions and the MROF includes all visits that were treated and released from the emergency department. Hospital visits that originate in the emergency department and are subsequently admitted for inpatient care are classified as an inpatient admission. Each record in the MROF and MRIF represents a unique healthcare visit. Individuals who have had multiple unique hospital visits for amphetamine poisoning during 2018 will be

counted more than once. In 2018, 128 Michigan acute-care facilities reported inpatient data (92.8 percent of all acute-care hospitals in Michigan) and 135 facilities reported emergency department data (95.1 percent of all emergency departments in Michigan).

Statistical Notes

The standard deviation is a measure of how dispersed the data are from the average. A standard deviation close to zero indicates that the data points tend to be close to the average. The standard deviation becomes higher when the data points are further from the average. The standard deviation is calculated by taking the square root of the average squared difference between each data point and the average of all data points.

Suggested Citation

Rockhill S. Nonfatal Amphetamine-Involved Drug Poisonings, Michigan 2018. Lansing, MI: Michigan Department of Health and Human Services, Division of Environmental Health, March 2020.

References

1. Vasan S, Olango GJ. Amphetamine Toxicity. [Updated 2019 Nov 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470276/
2. Torres PA, Helmstetter JA, Kaye AM, Kaye AD. Rhabdomyolysis: pathogenesis, diagnosis, and treatment. *Ochsner J*. 2015;15(1):58–69.
3. Akindipe T, Wilson D, Stein DJ. Psychiatric disorders in individuals with methamphetamine dependence: prevalence and risk factors. Metab Brain Dis 2014; 29:351-7.