

Detroit Overdose Surveillance

2012-2020



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Abbreviations

ACS – American Community Survey

ADT – Admissions, Discharges, Transfers

CDC – Centers for Disease Control and Prevention

DHD – Detroit Health Department

ED – Emergency Department

EMS – Emergency Medical Services

FDA – Food and Drug Administration

HIDTA – High Intensity Drug Trafficking Area

ICD – International Classification of Diseases

MAT – Medication for Addiction Treatment

MDHHS – Michigan Department of Health and Human Services

MI – Michigan

MI-EMSIS – Michigan Emergency Medical Services Information System

MME – Morphine Milligram Equivalents

MODA – Michigan Overdose Data to Action

MSSS – Michigan Syndromic Surveillance System

n – Number

NAS – Neonatal Abstinence Syndrome

NIDA – National Institute on Drug Abuse

SAMHSA – Substance Abuse and Mental Health Services Administration

SBIRT – Screening, Brief Intervention, Referral to Treatment

US – United States

Detroit Health Department Behavioral Health Program

In 2017, the Department of Health & Human Services declared the opioid epidemic a public health emergency. As part of a broader strategy to reduce overdose fatalities in the city of Detroit, the Detroit Health Department (DHD) grew its capacity to combat the opioid crisis through multi-sector partnerships.

DHD's Behavioral Health program, 313 HOPE (Harm-reduction, Overdose Prevention & Education) Detroit provides trauma-informed training, intervention, outreach, screening and referrals to lay community members and frontline professionals who are dealing with behavioral health challenges. Behavioral health program areas include substance use, harm reduction, mental health, injury prevention, policy advocacy, and data & surveillance. 313 HOPE Detroit also uses digital storytelling and social media to amplify community organizations, programs, people and events that are committed to promoting pathways to wellness.



To date, thousands of Detroit stakeholders have engaged in live and virtual training, education, resources and events; program success is shared with our strategic partners (in alphanumeric order):

36th District Court
 Abundant Community Recovery Services
 Caleb's Kids
 Changing Lives And Staying Sober (CLASS) Agency
 Church of the Messiah
 Community Health Awareness Group (CHAG)
 Detroit Life is Valuable Everyday (DLIVE)
 Detroit Medical Center (DMC)
 Detroit Police Department
 Detroit Recovery Project
 Detroit Wayne Integrated Health Network
 Drug Enforcement Administration (DEA)

Love Detroit Prevention Coalition
 Metropolitan Organizing Strategy Enabling Strength (MOSES)
 Michigan Department of Health & Human Services (MDHHS)
 Michigan High Intensity Drug Trafficking Areas (HIDTA)
 Public Allies Metro Detroit
 Self-Help Addiction Rehabilitation (SHAR)
 Spectrum Human Services Inc.
 The Youth Connection
 University of Michigan Injury Prevention Center
 Vessels of Hope
 Wayne State University Center for Urban Studies
 Youth City

To get connected to resources or to partner, email 313hope@detroitmi.gov and follow @313hopedetroit on all social media platforms.

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Introduction

Over the past decade, more than 2,000 Detroiters have died from a drug overdose, with 364 deaths in 2019 alone. Of the 364 deaths, 86% involved an opioid, 76% involved a synthetic opioid (e.g. fentanyl, tramadol), and 41% involved cocaine. Provisional mortality data suggests a potential decline in fatal overdoses during the COVID-19 pandemic, with 283 deaths in 2020.

In addition to the large burden of overdose deaths, drug use has a substantial monetary cost. Illicit drug use costs an estimated \$193 billion annually in the United States (1). According to the 2014 Drug Strategies report, substance use costs Detroit alone an estimated \$925 million annually in healthcare, treatment and prevention programs, traffic crashes, foster care, and criminal justice economic burdens (2). The actual cost to the community can be assumed to be higher when accounting for indirect costs (e.g. lost wages, reduced productivity, child drug endangerment, other societal costs) and the steep rise in overdoses since the report was published.

This surveillance report summarizes available data as it relates to the current opioid epidemic in the City of Detroit. This includes opioid prescribing practices, naloxone administration, emergency department (ED) visits, and fatal overdoses. Future reports will build on this information, and include other data sources.

This report aims to:

- Provide a comprehensive understanding of the burden of overdose and related outcomes in Detroit, Michigan.
- Serve as a resource for the general public, and community partners; identify data gaps and needs
- Recommend opportunities for intervention for a diverse set of stakeholders, including health care systems, community-based organizations, law enforcement, and policymakers.

The Detroit Health Department, in partnership with long-standing community-based organizations, hospital systems, Michigan Department of Health and Human Services, and various foundations, is working to better understand and address the overdose epidemic in Detroit using a multi-pronged approach.

Included below is high-level summary of our findings, and recommendations that build on existing efforts.

Key Findings

Opioid Prescribing

- Opioid prescription, including high dose prescription (*i.e.*, ≥ 90 morphine milligram equivalents, or MME), rates are nearly double for Detroiters compared to Michiganders.
- Residents in ZIP codes 48203, 48212, and 48207 have the highest prescription rates for opioid prescriptions overall and non-MAT (*i.e.*, excluding medication-assisted treatment) opioids.
- ZIP code 48203 has the highest prescription rate of high dose opioid prescriptions excluding prescriptions used to treat addiction.

Fatal Overdoses

- Individuals age 45-64 years, males, and Black/African Americans make up the largest proportions of overdose deaths in Detroit.
- Overdose-related deaths have increased over four-fold from 1999 to 2019, most of which are related to opioids or cocaine.
- Synthetic opioids (e.g. fentanyl, tramadol) were involved in over twice as many deaths as heroin in 2019.

Treatment

- For Detroiters, the medication for addiction treatment (MAT) prescription rate is half of the rate for Michiganders.
- ZIP codes 48219 and 48228 have a high number of fatal overdoses and naloxone administrations.
- The rate of Detroit EMS naloxone administration in 2020 increased during the pandemic, whereas rates lull before April 2020.
- Residents in ZIP codes 48211, 48208, and 48207 had the highest MAT prescription rates and some of the largest counts of residents with MAT prescriptions.

Emergency Department Visits

- Detroiters ages 60-69 years (20%), Black/African Americans (72%), and males (50%) make up the greatest number of overdose emergency department (ED) visits.
- Among Detroiters seen in the ED for an overdose on more than one day in a given year, opioids were the most commonly used drug. For those seen in the ED with more than one substance involved, opioid was also the most prevalent.
- Of neonatal ED visits related to drug misuse, maternal use of cannabis was the most common.
- From 2018-2020, the rate of opioid overdose ED visits nearly doubled; that of stimulants tripled.
- The rate of overdose emergency department (ED) visits increased from 54 to 73 per 100,000 visits from 2018 to 2020, respectively.
- Although counts of ED visits decreased substantially during the pandemic, overdose visits were a large burden as overdose ED visits rates reached an all-time high in May.

Recommendations

Provided are some of the possible intervention points stakeholders may want to consider based on Detroit-specific evidence.

In response to....

Opioid prescription rates:

- Promote non-opioid alternatives for pain-management.
- Screen for substance use and history of use disorder.

MAT prescription rates:

- Promote MAT access & concurrent counseling.
- Foster strong referral pipelines from identification of overdose to treatment.
- Encourage employer adoption of Take Home Naloxone policy.

Substance use during the COVID-19 pandemic:

- Place peer recovery coaches in ED departments to improve linkage to treatment and recovery support services.

Neonatal exposure to cannabis:

- Engage women & their dependents in the Strengthening Families Program.
- Education on effects of cannabis on pregnancy and fetus.
- Connect mothers to harm reduction programs and services.

EMS naloxone administration:

- Increase naloxone access points in the neighborhoods (e.g. pharmacies, churches, recreation centers, restaurants).
- Train lay community members as opioid overdose first responders who are able to administer naloxone.
- Educate community on signs of overdose & expand naloxone distribution.
- Promote cross-sector collaboration and recognition of para-professionals (e.g., Recovery Coaches) in emergency department settings.
- Promote Good Samaritan Law (1).

Cocaine overdose mortality:

- Fund organizations to facilitate prevention- and treatment-focused curriculum such as Prime for Life and Prime for Solution to target kids and adults that make high-risk choices.
- Support evidence-based initiatives like Project ASSERT and SBIRT to increase early identification of cocaine misuse and understand barriers to cocaine-use treatment.
- Distribute fentanyl test strips to individuals who use illicit substances.

Opioid prescription mortality:

- Continue to promote DEA Prescription Drug Take Back initiative to increase safe disposal of medications.
- Increase public education in opioid overdose prevention, storage, and safe use amongst different opioid prescribers.
- Increase the number of lay community members trained to administer naloxone during an opioid overdose emergency.
- Provide academic detailing and continuing education to opioid prescribers and allied behavioral health professionals on prescribing practices, the Michigan Naloxone Standing Order, and alternatives for acute pain management.

Overdose ED visits & mortality among individuals age 45-64 years, males, and Black/African Americans:

- De-institutionalize the delivery of recovery support services by training members of peer organizations as health advocates.
- Build capacity within fraternities, men's clubs/associations, second-chance organizations for returning citizens (i.e. Chance for Life), sports programs and gyms, churches, bowling and senior gaming groups, Veteran's Administration, etc., to lead recovery and harm reduction efforts for their members.
- Collaborate with methadone clinics to introduce clients to paths to recovery and to provide clinic with academic detailing around tapering methadone dosage to reduce misuse.
- Equip older Black men to be Popular Opinion Leaders or Community Health Workers focused on substance use interventions.
- Encourage public health and behavioral health organizations to provide in-reach to prisons to facilitate overdose prevention education as well as SBIRT, motivational interviewing, and naloxone administration training.
- Certify inmates as Peer Recovery Coaches in preparation for reentry and support them with job placement upon returning.

Background

The Detroit Metropolitan – or, Tri-County – area is home to approximately 3.9 million residents. These counties in southeastern Michigan consist of Macomb, Oakland, and Wayne – including Detroit, which has an estimated population of 670,000.

Heroin

The heroin epidemic of the 1960s and 1970s translated into an increase in autopsies positive for heroin in the early 1980s in the Detroit area (10). Although heroin ED mentions declined during the cocaine epidemic, 80% of those that occurred were in the City of Detroit.

Around this time heroin was of high-purity, inexpensive, and primarily injected; drug trade continued to grow, although the cocaine epidemic was the predominate focus. The prevalence of injecting heroin during this time was important because by the 1990s cases of HIV and AIDS was increasing. By September 1990, 1,271 individuals in the metro area had AIDs, 799 (63%) of which were Detroiters (10).

Cocaine

During the late 1980s and early 1990s, there was a national epidemic of crack cocaine use. It was especially pronounced in the Detroit metro area, which then had an estimated population of just over one million residents (3)(10). Crack cocaine was popular in metropolitan areas because it was inexpensive, smokable, and a potent stimulant. Specifically, from 1983-1989 emergency department (ED) mentions of cocaine quadrupled in Detroit. By 1989, of those with a cocaine-related ED visit, 67% were males and 76% were Black/African Americans (10).

In response to the epidemic, the 1986 Anti-Drug Abuse Act mandated a minimum sentence for cocaine possession, five years for five grams of crack cocaine and five years for 500 grams of powder cocaine (10). The lower threshold for crack possession, combined with crack's popularity in metro areas (relatively poorer Black/African American communities), disproportionately institutionalized Black/African American residents (10).

GEOGRAPHIC FEATURES

The distinct geographic features of the Detroit Metropolitan area lend themselves to drug trade. Southeastern Michigan shares international borders with Canada via the Ambassador Bridge, the Detroit Windsor Tunnel, the Michigan Central Railway Tunnel, and Lake St. Clair. The Port of Detroit along the west side of the Detroit River is the largest seaport in the state where bulk cargo and passengers pass through its multiple terminals (4). Metro Detroit is also home to a major international airport. In addition, the advanced network of freeways and toll-free interstate highways provide ample transit opportunities through the area (5).

In 2007, the United States' (US) Department of Justice's High Intensity Drug Trafficking Area (HIDTA) program identified Detroit as a distributing center and one of the largest contributors to the state's drug market (6). Trafficking routes have included cannabis and MDMA (i.e., ecstasy) from Canada to Detroit and cocaine from Detroit to Canada. Still, much of the cocaine and cannabis has originated from the Mexican border region as transnational criminal organizations supply Detroit for drugs to be further trafficked to other major US markets. In addition, New York City, Chicago, southern California, and Florida, have also contributed to cocaine, cannabis, heroin, and MDMA in the Detroit area (6). While cannabis became legal in 2018, trafficking of the drug has not stopped and has only increased in recent years (7).

Opioid

In 1999, the first wave of the opioid epidemic began with prescriptions followed by waves of heroin and synthetics in 2010 and 2013, respectively (11). In 2006-2007 heroin mixed with fentanyl became more prevalent in the US, including Detroit (12). An outbreak of more than 1,000 fatal overdoses occurred in the US during this time, 300 of which occurred in the Detroit area. Investigations showed that heroin-fentanyl mixtures were obtained in Detroit, but nearly half of the fatalities were residents of neighboring jurisdictions (12).

Alcohol and cannabis, along with factors such as poverty, the economy, and demography, all deserve mentions, as they contribute to the landscape of substance use and the resulting health of Detroiters. This section only briefly describes some the city's history as a preface for the challenges and strengths this report highlights for Detroit in 2012-2020.

Opioid Prescription Availability

The Michigan Automated Prescription System (MAPS) data of Detroit residents provides information on the general availability of opioid prescriptions (see **Appendix B** for details). Opioid prescription estimates in morphine milligram equivalents (MME) translates to the relative strength of the prescribed dose (4)(5). MME is important because high doses (*i.e.*, ≥ 90 MME) are associated with increased risk of opioid use disorder and overdose mortality (4)(6).

In 2018 and 2019, opioids were prescribed at a higher rate to Detroit residents than Michigan residents overall. Among specifically high dose prescription opioids, the prescription rate to Detroit residents is nearly double the rate in Michigan. This pattern holds when excluding medications used for addiction treatment (MAT) (see **Intervention** section).

Table 1. Counts & rates of opioid prescriptions for Detroit & Michigan residents, 2018

	Detroit	Michigan
Opioid Prescriptions		
Residents	209,596	2,546,670
Count of Prescriptions	678,031	7,989,511
Prescription Rate	95.1	80.8
Count of High Dose Prescriptions	89,004	674,226
High Dose Prescription Rate	12.5	6.8
Non-MAT Opioid Prescriptions		
Residents	205,970	2,467,147
Count of Prescriptions	657,392	7,361,948
Prescription Rate	92.2	74.5
Count of High Dose Prescriptions	86,662	604,558
High Dose Prescription Rate	12.1	6.1

Data from Michigan Automated Prescription System, 2018.

Detroit population denominator 713,313. Michigan population denominator 9,883,640.

Rates per 100 persons.

High dose prescriptions: ≥ 90 MME (morphine milligram equivalents).

MAT: medication for addiction treatment (e.g., buprenorphine, methadone).

The higher opioid prescription rates among Detroiters compared to Michiganders may be an indication of the underlying health of the populations. However, nearly 50% of those who use prescription opioids outside the prescriber’s recommendations obtain the medication from a friend or relative (7). Thus, jurisdiction-level comparisons of prescribing rates may not necessarily reflect individual-level patterns of use or health.

Table 2. Counts & rates of opioid prescriptions for Detroit & Michigan residents, 2019

	Detroit	Michigan
Opioid Prescriptions		
Residents	171,565	2,187,437
Total Number of Prescriptions	592,533	7,229,633
Prescription Rate	83.1	73.1
Total Number of High Dose Prescriptions	65,528	532,581
High Dose Prescription Rate	9.2	5.4
Non-MAT Opioid Prescriptions		
Residents	166,805	2,094,963
Count of Prescriptions	568,477	6,572,763
Prescription Rate	79.7	66.5
Count of High Dose Prescriptions	63,592	476,139
High Dose Prescription Rate	8.9	4.8

Data from Michigan Automated Prescription System, 2019.

Detroit population denominator 713,313. Michigan population denominator 9,883,640.

Rates per 100 persons.

High dose prescriptions: ≥ 90 MME (morphine milligram equivalents).

MAT: medication for addiction treatment (e.g., buprenorphine, methadone).

Unlike opioid and non-MAT prescription rates, the fentanyl prescription rate for Michigan residents overall is about 2.7-times higher than that for Detroit residents. This is true for high dose (*i.e.*, ≥ 90 MME) fentanyl prescriptions, as well.

Table 3. Counts & rates of fentanyl prescriptions for Detroit & Michigan residents, 2018-2019

	Detroit	Michigan
Fentanyl Prescriptions		
Residents	2,009	64,752
Count of Prescriptions	8,660	313,820
Prescription Rate	1.2	3.2
Count of High Dose Prescriptions	4,097	159,101
High Dose Prescription Rate	0.6	1.6

Data from Michigan Automated Prescription System, 2018-2019.

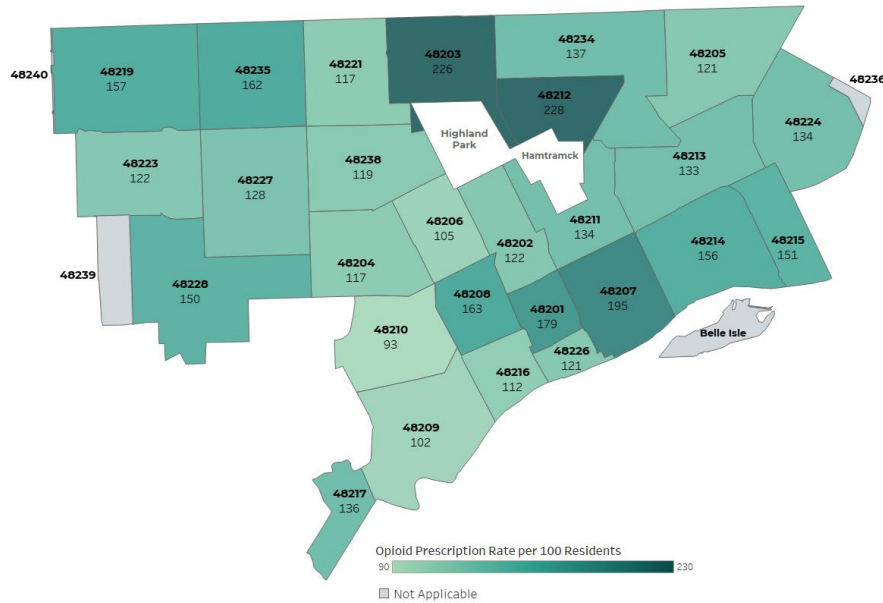
Detroit population denominator 713,313. Michigan population denominator 9,883,640.

Rates per 100 persons.

High dose prescriptions: ≥ 90 MME (morphine milligram equivalents).

Based on resident ZIP code, 48212 and 48203 had the highest prescription rates at 228 and 226 prescriptions per 100 residents, respectively, averaged between 2018 and 2019. Excluding MAT opioid prescriptions, 48212 and 48203 remained the ZIPs with the highest rates at 129 and 113 prescriptions per 100 residents, respectively, averaged over the same period.

Figure 1. Opioid prescription rates by resident ZIP code, 2018-2019



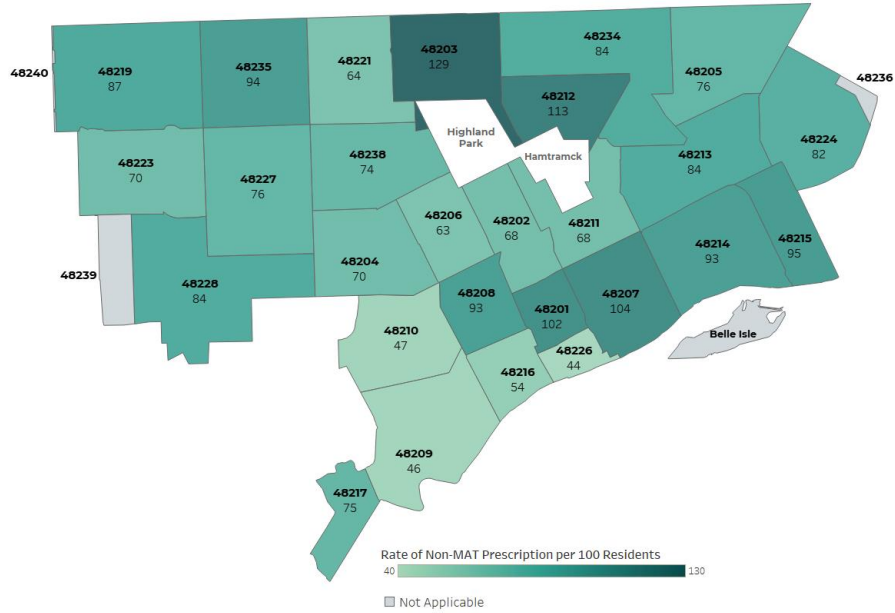
Data from Michigan Automated Prescription System, 2018-2019.
 Estimates averaged for 2018 and 2019.
 Rates per 100 persons; based on ZIP code specific population denominators.

During 2018-2019, ZIP 48203 had the highest non-MAT opioids and specifically non-MAT high dose opioids (i.e., ≥ 90 MME) prescription rate. Other ZIP codes with relatively high non-MAT opioid prescriptions with ≥ 90 MME include 48235, 48208, and 48213; each with an average of 13 prescriptions per 100 residents.

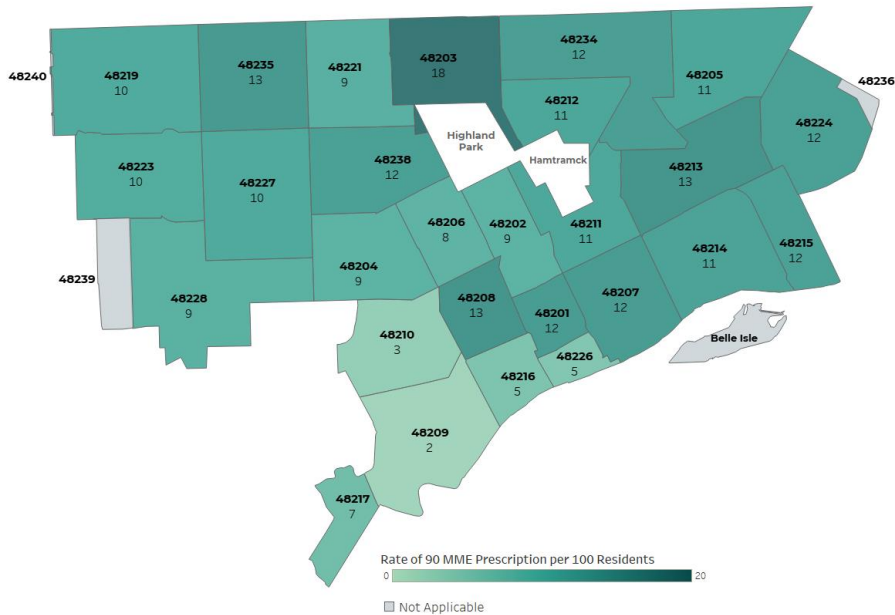
Comparisons among non-MAT opioid prescriptions with ≥ 90 MME are important because this category of prescriptions represents the highest risk of opioid prescriptions given these are of high dose and are not used for use disorder treatment purposes.

Figure 2. Non-medication for addiction treatment prescription rates by resident ZIP code, 2018-2019

Opioid Prescription Rates (excluding MAT)



High Dose (i.e., ≥ 90 MME) Opioid Prescription Rates (excluding MAT)



Data from Michigan Automated Prescription System, 2018-2019. Averaged over 2018 and 2019. Rates per 100 persons; based on ZIP code specific population denominators. High Dose: ≥ 90 MME: morphine milligram equivalents. MAT: medication for addiction treatment (e.g., buprenorphine, methadone).

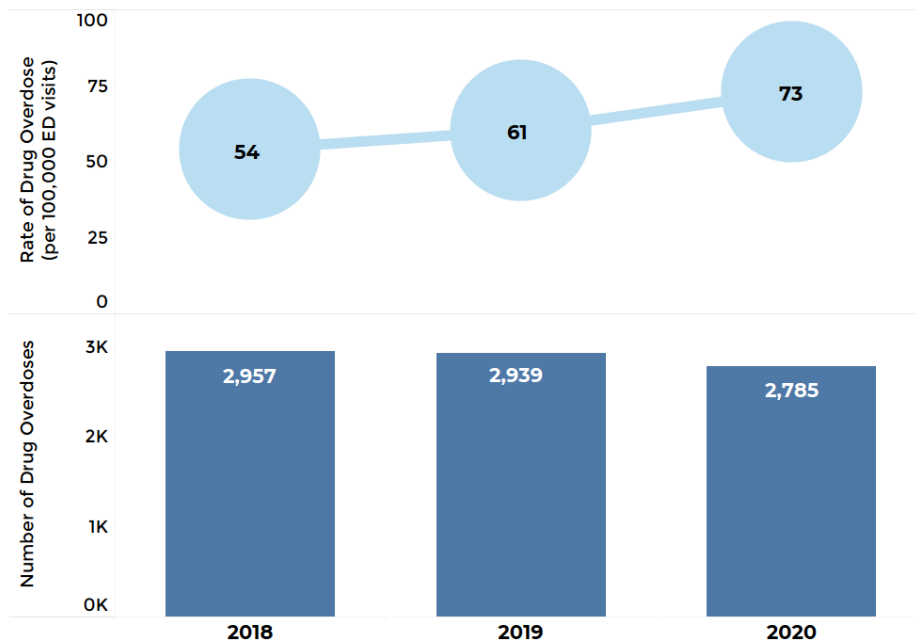
Emergency Department Visits

Trends

The Michigan Syndromic Surveillance System (MSSS) was established in the early 2000s for rapid detection of public health threats (e.g., infectious disease outbreaks, bioterrorism). While MSSS allows for near real-time surveillance in emergency departments (ED) and urgent cares, it has several limitations. For instance, estimates before 2018 are unreliable due to inconsistent ICD-9 and ICD-10 coding and are therefore not included in this report (8). (See **Appendices C & D** for more on MSSS data.)

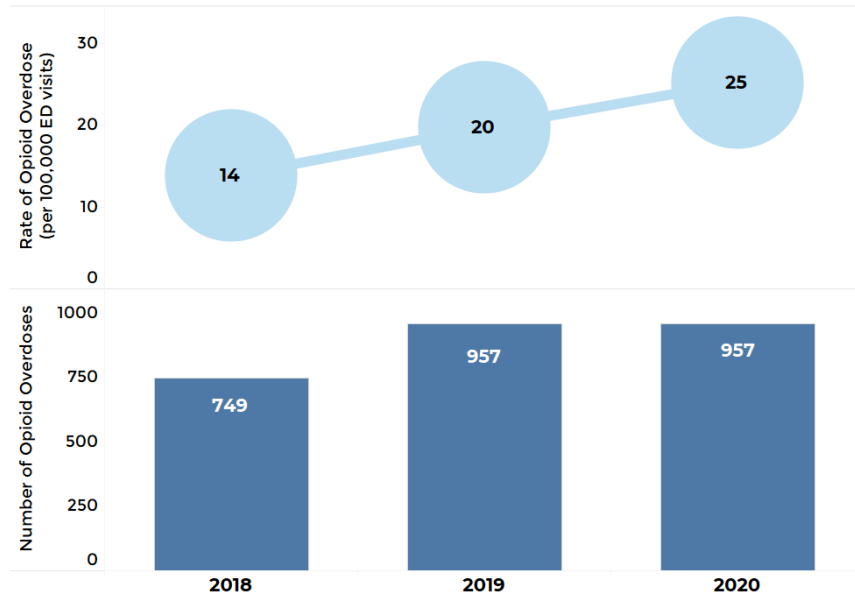
During 2018-2020, there were on average 2,900 overdose ED visits among Detroit residents each year. Although the number of overdose ED visits decreased in 2020, the rate of overdose ED visits increased. This is due to a decrease in the number of overall ED visits given COVID-19 pandemic restrictions and precautions.

Figure 3. Counts & rates of overdose emergency department visits by year, 2018-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
Rate per 100,000 ED visits.

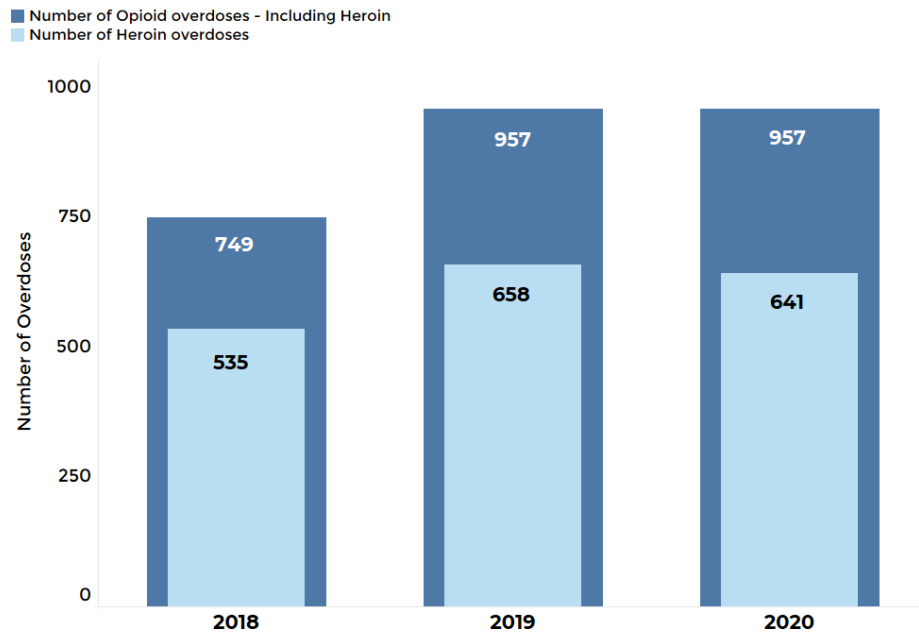
Figure 4. Counts & rates of opioid overdose emergency department visits by year, 2018-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
Rate per 100,000 ED visits.

According to MSSS, heroin is involved in more than 50% opioid overdose ED visits each year.

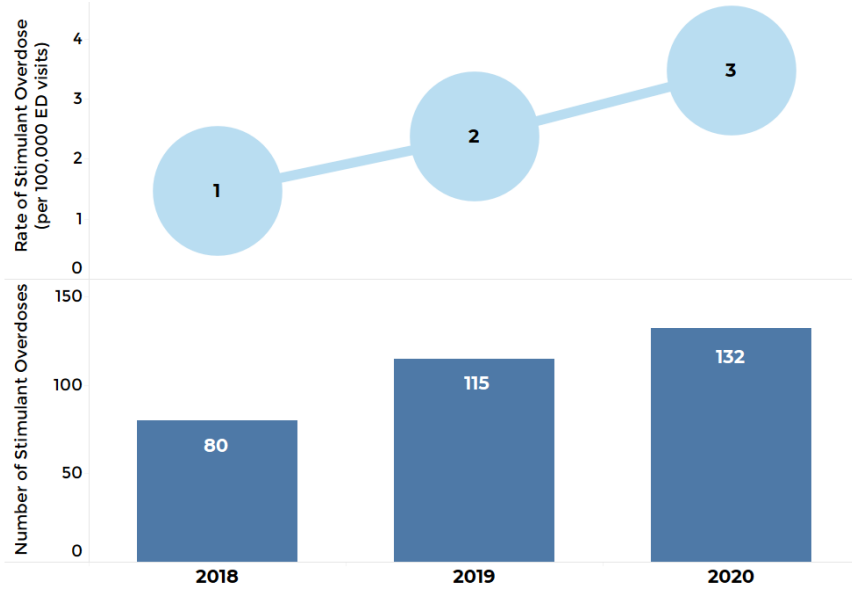
Figure 5. Counts of opioid & heroin overdose emergency department visits by year, 2018-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
Heroin is included in opioid category.

Stimulant overdose ED visits follow the same trajectory as that of opioids.

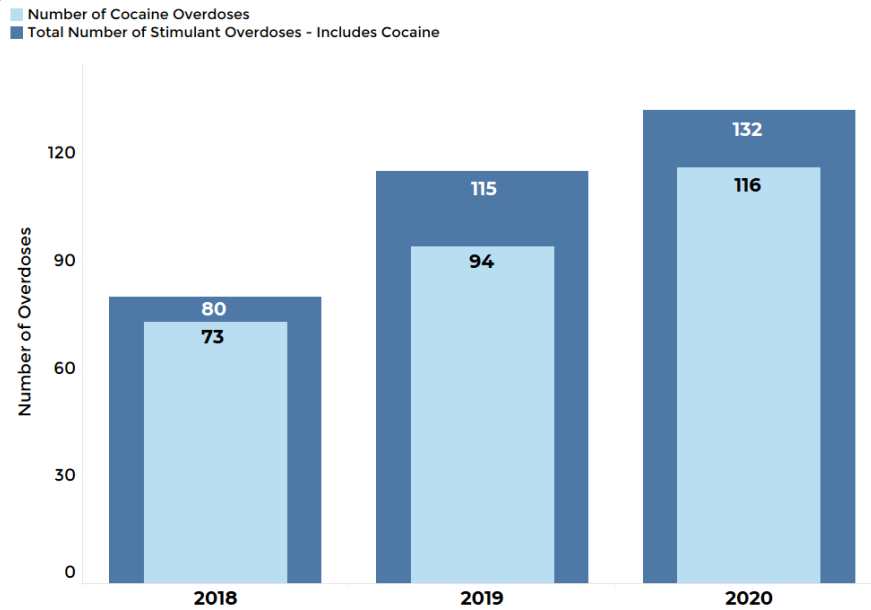
Figure 6. Counts & rates of stimulant overdose emergency department visits by year, 2018-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
Rate per 100,000 ED visits.

Cocaine was responsible for the majority of stimulant overdoses

Figure 7. Counts of stimulant & cocaine overdose emergency department visits by year, 2018-2020



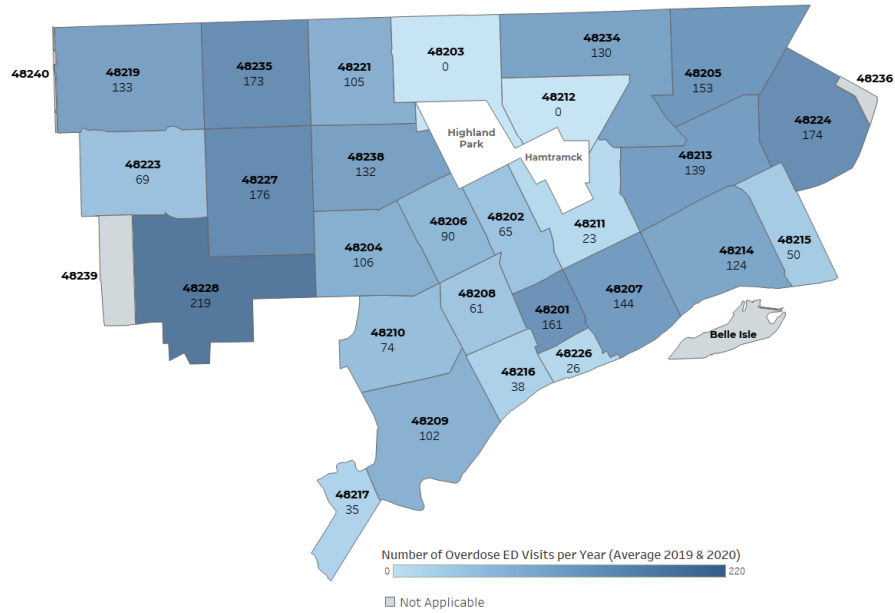
Data from MDHHS, Michigan Syndromic Surveillance System, 2017-2020.
Counts based on ICD or text mentions of poisonings/overdoses.
Cocaine is included in stimulants category.

Residents in ZIP 48228 had the highest number of overdose ED visits during 2019-2020, with an average of 219 visits annually. ZIP codes 48227, 48224, and 48235 followed with an average of 176, 174, 173 overdose ED visits, respectively.

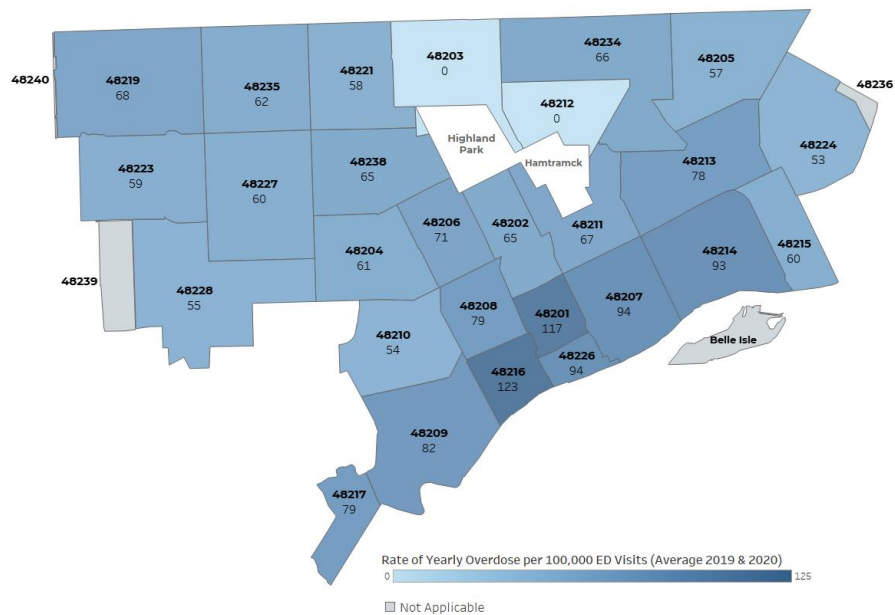
ZIP code 48216 had the highest rate of overdose ED visits with an average of 123 visits per 100,000 ED visits in 2019-2020. The overdose ED rate is different from other rates calculated in this report, because it takes into consideration the total number of ED visits among residents in the ZIP, rather than the ZIP population. The second largest overdose visit rate was among 48201 residents with an average rate of 117 overdoses per 100,000 ED visits during the same timeframe.

Figure 8. Average counts & rates of overdose emergency department visits by resident ZIP code, 2019-2020

Overdose ED visits



ED Overdose rates (per 100,000 visits)



Data from MDHHS, Michigan Syndromic Surveillance System, 2019-2020. Counts based on a match to either an ICD-10 code diagnosis or a text mention. Rates refer to the number of overdoses out of 100,000 ED visits within that ZIP code. Counts and rates are averaged across 2019-2020.

Demographic Characteristics

MiCelerity is a public health surveillance system for overdose ED visits launched in fall 2019. It is similar to MSSS in that it provides close to real-time data on ED visits, but MiCelerity is distinct in that it includes: 1) drug-specific overdoses, 2) detailed patient demographic information, and 3) multiple events per patient.

1,859 Detroit residents accounted for 2,406 overdose ED visits between March 2020 and February 2021. Events included drug overdoses and alcohol toxicity. Roughly 82% (n=2,039) were considered accidental or unintentional events (person may have taken the drug intentionally, but the toxic effect was unintentional; includes instances of incorrect drug or dose). Additionally, 218 neonatal events were seen among Detroit residents and non-Detroiters admitted to Detroit facilities. (See **Appendix B: Definitions.**)

Among the 1,859 residents that visited an ED due to an overdose, 72% were Black/African American, 20% were age 60-69 years, and 50% were male. All but 3% of events were either non-Hispanic/non-Latino or of unknown ethnicity.

Table 4. Demographic characteristics of residents with overdose emergency department visit, 2020-2021

Demographic Characteristics	Count (%)
Age Groups (Years)	
< 1	19 (1)
1-9	109 (6)
10-19	145 (8)
20-29	270 (15)
30-39	236 (13)
40-49	238 (13)
50-59	328 (18)
60-69	378 (20)
70-79	95 (5)
≥ 80	32 (2)
Sex	
Female	765 (41)
Male	923 (50)
Unknown	171 (9)
Race	
Black/African American	1,330 (72)
White	304 (16)
Other	125 (7)
Unknown	100 (5)
Ethnicity	
Hispanic	47 (3)
Non-Hispanic	1,162 (63)
Unknown	650 (35)

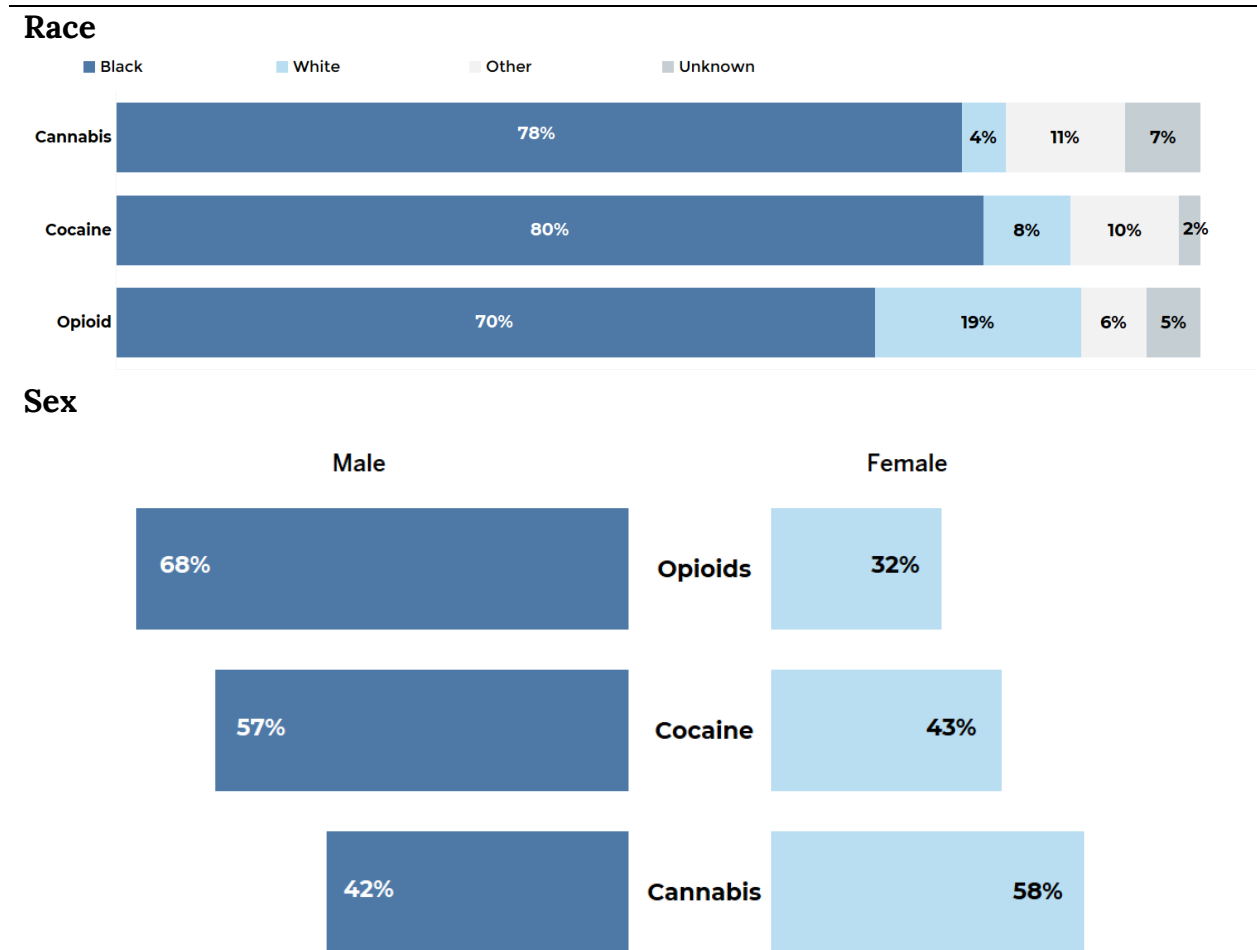
Data from MDHHS, MiCelerity, March 2020-February 2021.

Residents with multiple events are represented by the demographics recorded during their first event; percentages based on denominator of n=1,859 unique residents.

Unique males made up a larger proportion of both opioids (58%) and cocaine (57%) overdose ED visits with known gender. Conversely, females (58%) made up a larger proportion of cannabis-related overdoses.

The predominance of females among residents with a cannabis overdose ED visit aligns with the 2017 Youth Risk Behavior Survey (YRBS) results for 9th – 12th graders in Detroit. Twenty-three percent of females reported currently using cannabis (*i.e.*, at least one use within 30 days before survey), while 20% of males reported the same (9). Likewise, 22% of females, compared to 13% of males, reported currently drinking alcohol (*i.e.*, at least one drink within 30 days before survey)(9).

Figure 9. Percentage of overdose emergency department visits by race, sex, & drug, 2020-2021



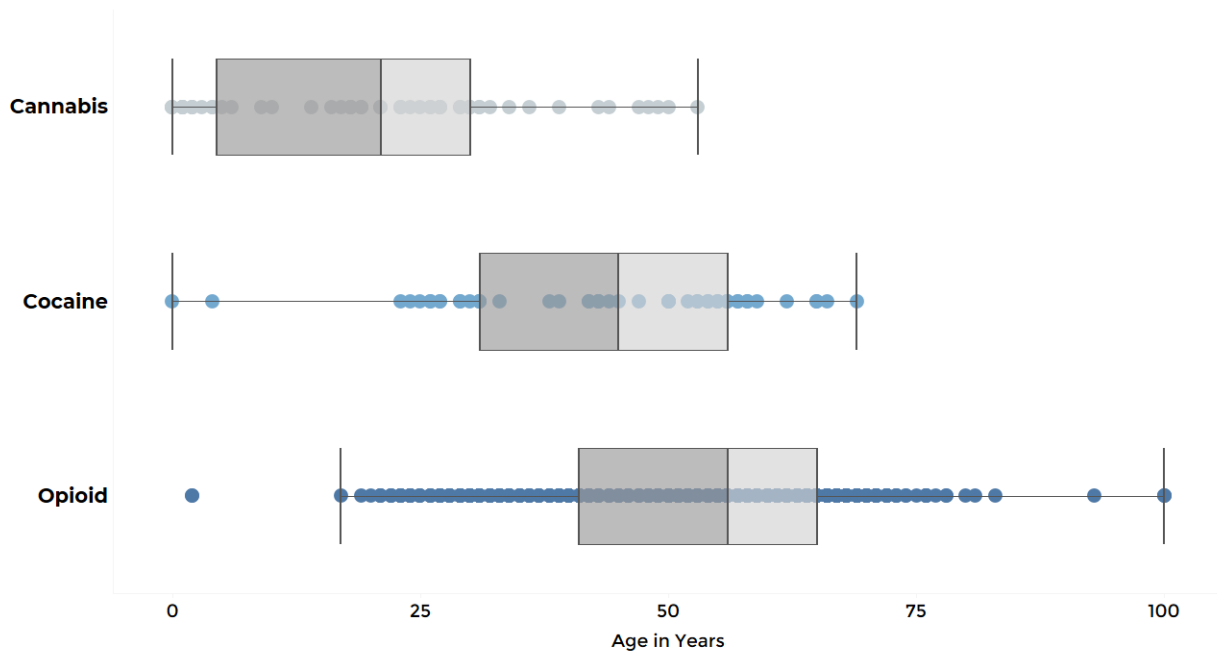
Data from MDHHS, MiCelerity, March 2020 – February 2021.

Unique residents may be represented in multiple drug categories; within category residents represented only once.

Observations with missing data not included (race: cannabis n=55, cocaine n=50, opioid n=665 residents) (sex: cannabis n=50, cocaine n=47, opioid n=596 residents).

ED visits for cannabis overdose tended to be among younger individuals, with a median age of 21 years. ED visits for opioids and cocaine overdoses tended to be among older individuals, with median ages of 56 and 45 years, respectively.

Figure 10. Boxplots of overdose emergency department visit patient age by drug, 2020-2021



Data from MDHHS, MiCelerity, March 2020 – February 2021.

Unique residents may be represented in multiple drug categories; within category residents represented only once.

Ages based on date of birth and admission date; those over 100 years excluded due to suspected data entry errors.

How to interpret: The dividing line between the two shaded portions of each box is the median (midpoint) of all the data values. Each box contains the middle 50% of all the data. The dots to the left of the shaded box represent the bottom 25% of the data. The dots to the right of the shaded box show the top 25% of the data.

Severity

In 2020-2021, 78% of individuals (n = 1,451) were seen in the ED for an overdose only once that year and had only one drug involved in the overdose at that time. Thus, in a given year the majority of individuals did not go repeatedly to the ED for an overdose and experienced overdoses that only involved one drug. Note that these results do not necessarily rule out polysubstance use as the analysis was based on diagnoses and cannot guarantee the inclusion of all drugs potentially present in the patient's body at the time of visit.

Twenty-two percent (n=408) of individuals were seen for more than one event (either same day or separate dates) and 13% (n=233) of individuals were seen for multiple drug classes over time. For individuals with overdose events in multiple drug classes, opioids were most commonly involved.

Similarly, 11% of individuals (n = 206) were seen in the ED on more than one day from March 2020 to February 2021. The number of repeat visits per individual ranged from 1 to 10 visits. Opioids were the most common drug involved in repeat ED visits. While this may relate to the high prevalence of opioid use, it may also relate to the high risk of use disorder and overdose following use. That is, compared to individuals who use non-opioid drugs, individuals who use opioids may present in EDs more frequently due to their development of opioid use disorder and/or their need for medical treatment to prevent mortality.

Neonatal Events

Neonatal events are ED visits related to prenatal or infant exposure (e.g., breastmilk), neonatal withdrawal symptoms, and fetal alcohol syndrome. During March 2020 – February 2021, there were 218 neonatal events representing 178 unique infants in Detroit EDs. Among the 190 events, 35% (n=77 events) represented events due to maternal cannabis use; 32% (n=70 events) represented instances of neonatal withdrawal.

Note that ED neonatal events may be less severe and may be an underestimation of infants affected by maternal substance use. This is because neonatal intensive care units (NICUs) are typically where newborns are treated; infants seen in the ED would have been well enough to go home after birth. Lastly, while MiCelerity can capture neonatal abstinence syndrome (NAS), there is no standard national public health surveillance system for NAS, which likely leads to underestimation (10)(11).

COVID-19 Impact

The coronavirus pandemic has had a substantial impact, both direct and indirect, on the health and lives of vulnerable communities across the globe. In addition to the increasing number of infections, hospitalizations, and high mortality rate among Detroit residents, it has also indirectly contributed to a number of serious health consequences, including decreased health care seeking behavior for non-COVID-19 conditions and increased burden of mental health conditions (e.g., anxiety) (21)(22). In fact, 47% of Detroiters surveyed during the pandemic were very concerned about getting the healthcare they needed, including that for mental health (23).

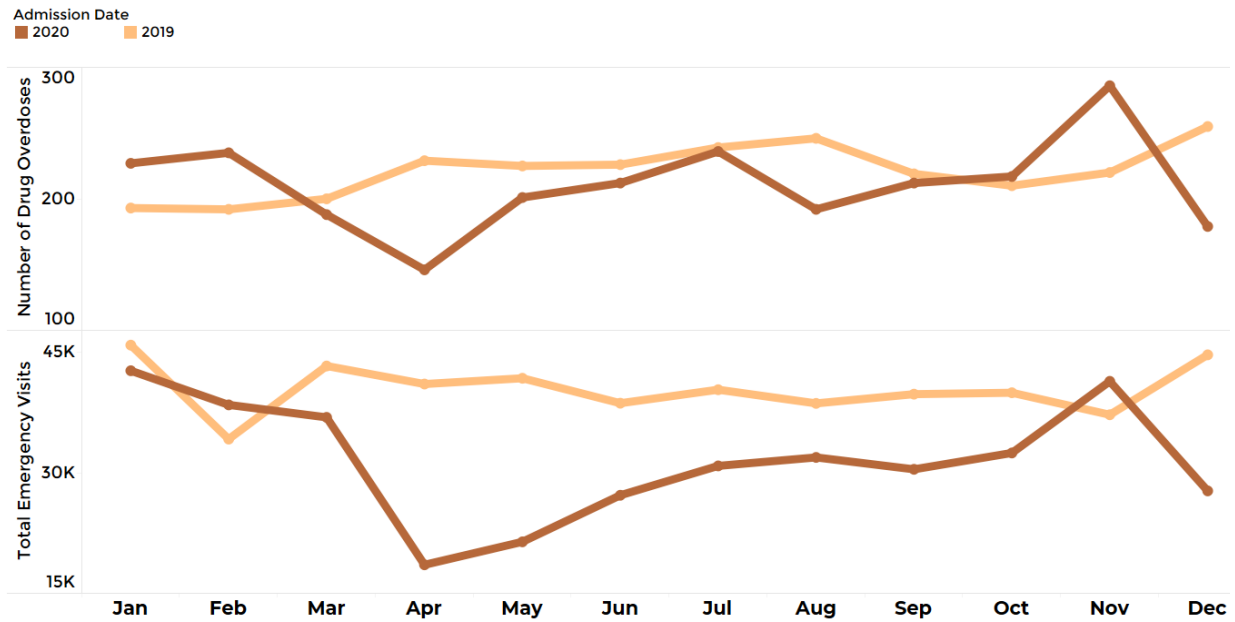
Substance use during the pandemic has also been a concern. Across the country, 13% of individuals have started or increased substance use to cope with stress or emotions related to COVID-19 (22). This increase was predominantly among non-Hispanic Black/African American and Hispanic individuals at 18% and 22%, respectively (22).

Emergency Department & Urgent Care Visits

During Michigan's Stay at Home Order, the total number of ED visits, as well as the number of overdose ED visits substantially decreased. However, during the same time, the rate of overdose ED visits was higher than it was in April 2019 followed by an all-time high around May 2020. Opioid and heroin overdose visit rates were nearly parallel. These measures may speak to Detroit EDs' capacity as well as overdose burden.

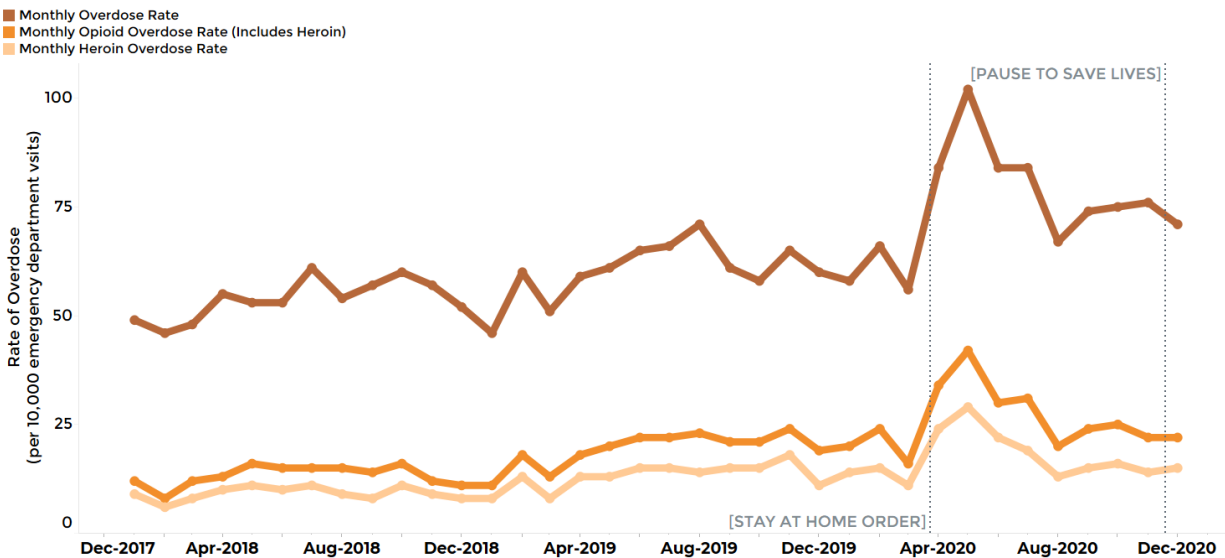
Statewide, despite a decline in ED visits overall and overdose ED visits, opioid overdose ED visits increased between April-August 2020 relative to the same period in 2019. Monthly estimates of all measures show an April decrease followed by an upward trend. [Data not shown (24).]

Figure 11. Monthly overdose emergency department visit counts, 2019-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2019-2020.
Counts of ED visits with overdose mentioned in chief complaint.

Figure 12. Opioid & heroin overdose emergency department visit rates, 2018-2020



Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
Based on ICD or text mentions of poisonings/overdoses.
Rates calculated with total visit denominator each month; per 10,000 visits.
Stay at home order = 3/24/2020
Pause to save lives = 11/18/2020

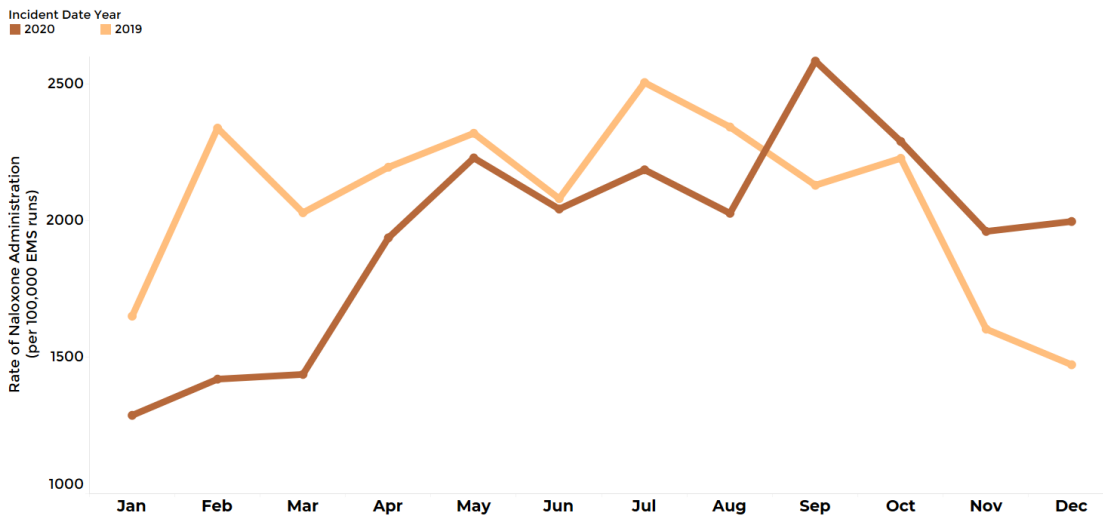
EMS Naloxone Administrations

Between November 2019 and March 2020, rates of EMS naloxone administration lullled substantially. By April 2020, rates increased and were above the two-year average of 2,000 per 100,000 EMS runs for most of the year with a peak around September. Thus, in the face of the COVID-19 pandemic and limited healthcare capacity, the demand for EMS naloxone administration was sizeable.

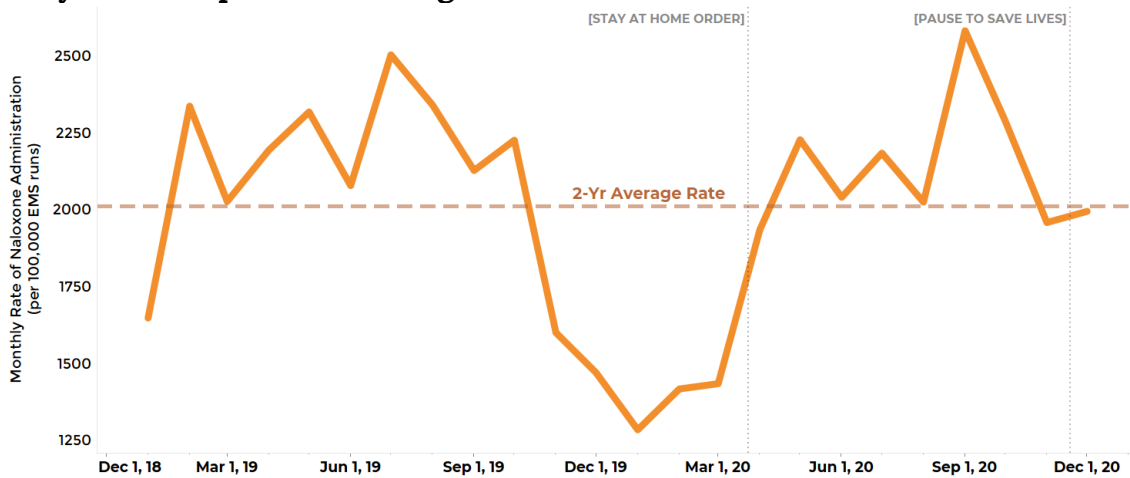
Statewide, the number of EMS overdoses responses increased, including the percentage of transport refusals among opioid overdose patients (April-August 2020 relative to the same period in 2019). [Data not shown (25).]

Figure 13. Monthly EMS naloxone administration rates, 2019-2020

Administration rates



Monthly rate compared to average



Data from Michigan Emergency Medical Services Information System, 2019-2020. Detroit EMS naloxone administrations do not represent unique persons. Rates based on denominators of month-specific total EMS runs; per 100,000 runs.

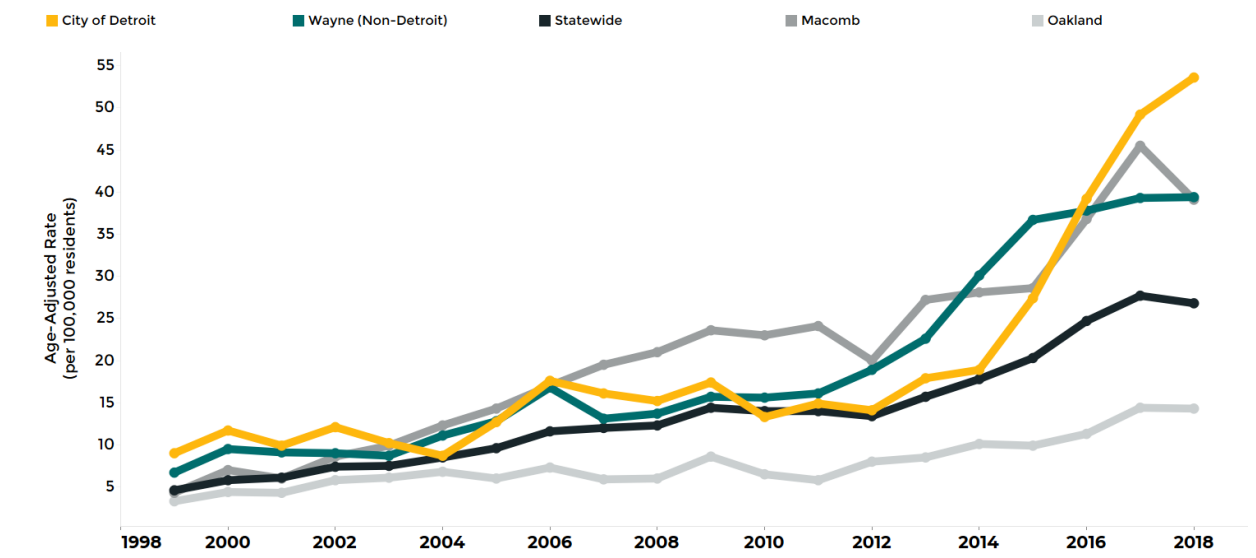
Mortality

Across the US, overdose mortality has been on the rise since 1999 (12). Age-adjusted rates across states have highlighted Michigan having one of the highest overdose mortality rates since 2016 (13). Counties in Southeastern Michigan have had significant increases in overdose mortality. Around 2005, the overdose mortality rate started to increase in Macomb and Wayne (excluding Detroit) Counties, and Detroit, started to increase. It was after 2014 that Detroit’s mortality rate sharply increased and surpassed neighboring jurisdictions.

Temporal Trends & Demographic Characteristics

Research suggests overdose mortality is underestimated across the US, including Michigan (14). (See **Appendix C: Data Sources.**)

Figure 14. Age-adjusted overdose mortality rates by jurisdiction, 1999-2018

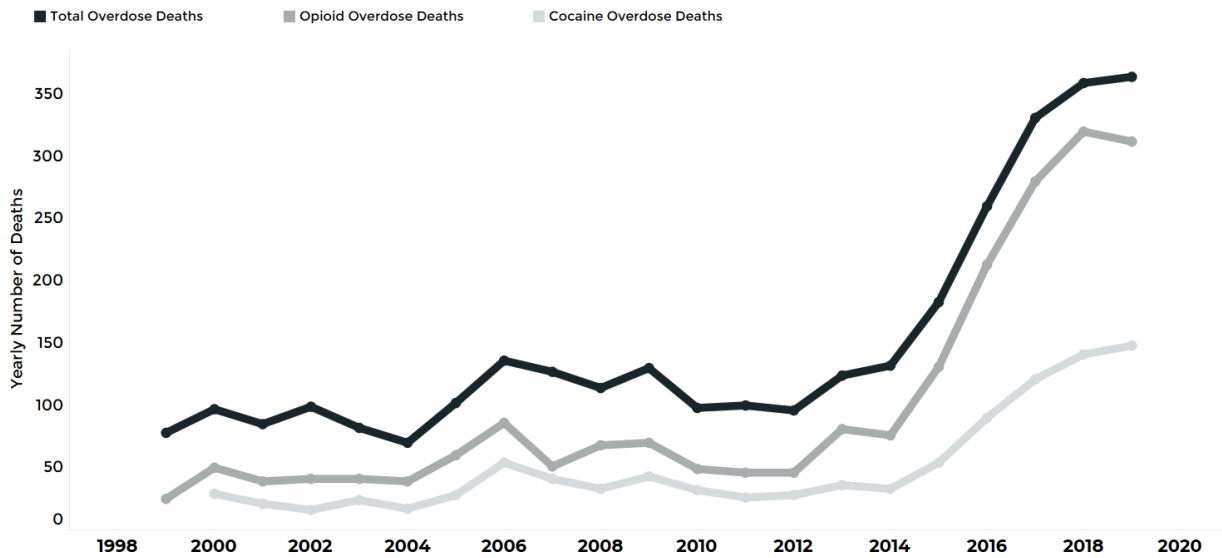


Data from MDHHS, MiTracking 1999-2018.
Rates per 100,000 population.

Similar to the US overall, the number of overdose deaths in Detroit more than quadrupled during 1999-2019 from 78 to 364 individuals. Nationally, much of this increase involved opioids or cocaine (15). Throughout the US, overdose mortality has been predominantly among males and those age 25-54 years (12)(15). While nearly all racial and ethnic groups have experienced increases in mortality, age-adjusted rates are largest among non-Hispanic White individuals (15).

While Detroit mirrors US trends in mortality with males being disproportionately affected, Detroit’s experience has differed in mortality being predominantly among Black/African American and relatively older (i.e., age 45 - 64 years) individuals than the US. Detroit’s prevalence of Black/African Americans affected by overdose mortality is proportional to the city’s demographic distribution.

Figure 15. Counts of overdose mortality by drug, 1999-2019



Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates 1999-2019.
 Drug categories not mutually exclusive.

The largest increase in overdose mortality involves opioids, which can include prescription opioids, heroin, and/or synthetic derivatives. Among all opioid-related deaths, those age 45-64 years have had the highest risk compared to other age groups from 2012-2018. Likewise, males and Black/African Americans have been the predominate groups affected compared to females and other races, respectively.

Table 5. Opioid overdose mortality demographic characteristics, 2012-2019

YEAR	2012	2013	2014	2015	2016	2017	2018	2019
(n)	(46)	(81)	(76)	(131)	(213)	(280)	(320)	(312)
Count (%)								
Sex								
Male	26 (57)	63 (78)	51 (67)	87 (66)	141 (66)	188 (67)	207 (65)	222 (71)
Female	20 (43)	18 (22)	25 (33)	44 (34)	72 (34)	92 (33)	113 (35)	90 (29)
Race								
White	-	23 (28)	21 (28)	28 (21)	57 (27)	68 (24)	55 (17)	62 (20)
Black	31 (67)	54 (67)	50 (66)	99 (76)	151 (71)	205 (73)	245 (77)	245 (79)
Age Groups (Years)							2012-2019 Count (%)	
	< 25						-	
	25-34							198 (14)
	35-44							227 (16)
	45-54							395 (27)
	55-64							429 (29)
	≥ 65							152 (10)

Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 2012-2019 (n=1,459 deaths).

ICD-10 codes: T40.0, T40.1, T40.2, T40.3, T40.4 and T40.6

(-) and unknown/other race estimates too small/unreliable to report.

Sex and race specific percentages based on year totals; may not sum to 100 due to rounding.

Of opioid related mortality, synthetic derivatives have had the steepest increase with the burden in 2019 being more than 200-times that in 1999. (Estimates of overdose mortality involving synthetic derivatives too small/unreliable to report before 2015.) In 2019, synthetic opioids were involved in 76% of all overdose deaths.

Mortality involving opioid pain relievers (e.g., oxycodone, morphine), which can include both natural and synthetic classes, became more prevalent in 2015 in Detroit. Prior to that cases totaled less than 35 each year. In 2019, opioid pain relievers were involved in 82% of all overdose deaths. Related mortality was predominantly among males, Black/African American individuals, and those age 45-64 years.

Table 6. Opioid pain reliever overdose mortality demographic characteristics, 2015-2019

YEAR (n)	2015 (86)	2016 (177)	2017 (250)	2018 (306)	2019 (299)
Count (%)					
Sex					
Male	57 (66)	114 (64)	168 (67)	198 (65)	215 (72)
Female	29 (34)	63 (36)	82 (33)	108 (35)	84 (28)
Race					
White	16 (19)	45 (25)	59 (24)	54 (18)	61 (20)
Black	67 (78)	127 (72)	184 (74)	235 (78)	234 (78)
Age Groups (Years)				2015-2019 Count (%)	
< 25					-
25-34					151 (14)
35-44					174 (16)
45-54					294 (26)
55-64					332 (30)
≥ 65					126 (11)

Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 2012-2019 (n=1,118 deaths).

ICD-10 code: T40.2, T40.3, or T40.4

(-), 2012-2014, and unknown and other race estimates too small/unreliable to report.

Sex and race specific percentages based on year totals; may not sum to 100 due to rounding.

Table 7. Synthetic opioid overdose mortality by year, 2015-2019

Year	Count (%)
2015	63 (34)
2016	144 (55)
2017	223 (67)
2018	282 (79)
2019	277 (76)

Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 1999-2019. (n=989 deaths)

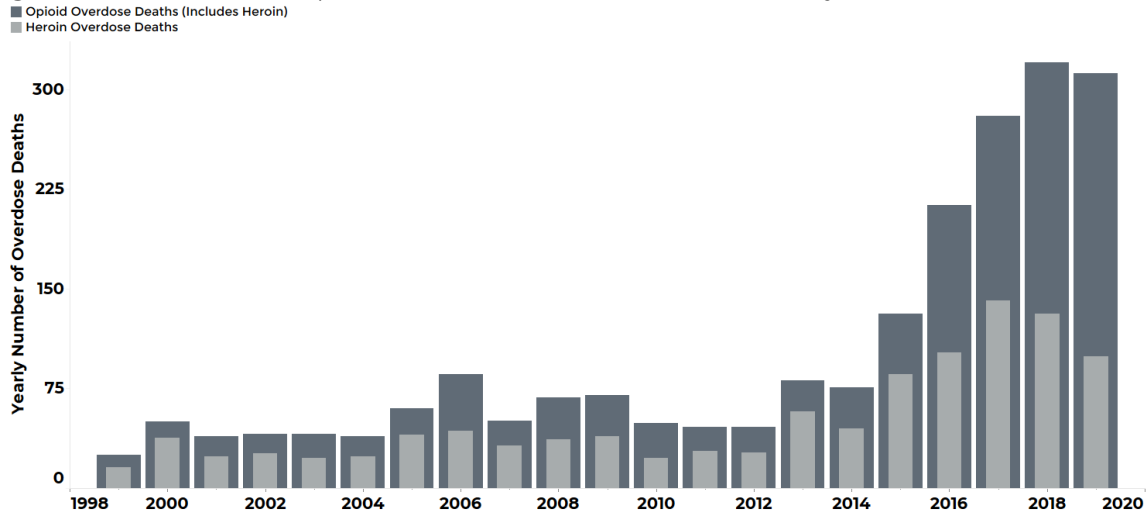
ICD-10 code: T40.4.

Estimates before 2015 too small/unreliable to report (2006, n=49).

Percent based on denominator of year-specific total of overdose deaths.

Mortality involving heroin increased 8-fold from 1999 to 2018. While heroin-related deaths decreased in 2019, it still represented 27% of all overdose mortality that year. From 2012 to 2019, the deaths were predominantly among Black/African American individuals, those age 45-64 years, and males.

Figure 16. Counts of opioid & heroin overdose mortality, 1999-2019



Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 1999-2019. Opioids include heroin.

Table 8. Heroin overdose mortality demographic characteristics, 2015-2019

YEAR	2015	2016	2017	2018	2019
(n)	(86)	(102)	(141)	(131)	(99)
Count (%)					
Sex					
Male	58 (67)	70 (69)	99 (70)	84 (64)	72 (73)
Female	28 (33)	32 (31)	42 (30)	47 (36)	27 (27)
Race					
White	21 (24)	26 (25)	36 (26)	21 (16)	-
Black	63 (73)	73 (72)	103 (73)	103 (79)	84 (85)
Age Groups (Years)					
< 25	2015-2019 Count (%)				
25-34	65 (12)				
35-44	75 (13)				
45-54	148 (26)				
55-64	180 (32)				
≥ 65	83 (15)				

Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 1999-2019. (n=559 deaths) ICD-10 code: T40.1.

(-), 2012-2014, and unknown and other race estimates too small/unreliable to report. Sex and race specific percentages based on year totals; may not sum to 100 due to rounding.

Like opioid-related mortality, cocaine-related deaths are predominantly among those ages 45-64 years, males, and Black/African American Detroiters. Cocaine-related deaths have steadily increased since 2014; cocaine was involved in 41% of all overdose deaths in 2019. While heroin, synthetic, and prescription opioids all slightly decreased in 2019, cocaine mortality continued to increase.

Table 9. Cocaine overdose mortality demographic characteristics, 2015-2019

YEAR (n)	2015 (54)	2016 (90)	2017 (121)	2018 (141)	2019 (148)
Count (%)					
Sex					
Male	37 (69)	61 (68)	77 (64)	88 (62)	91 (61)
Female	17 (31)	29 (32)	44 (36)	53 (38)	57 (39)
Race					
White	-	28 (31)	26 (21)	24 (17)	24 (16)
Black	40 (74)	59 (66)	92 (76)	109 (77)	119 (80)
Age Groups (Years)				2015-2019 Count (%)	
	< 25				-
	25-34				68 (12)
	35-44				92 (17)
	45-54				192 (35)
	55-64				141 (25)
	≥ 65				40 (7)

Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 1999-2019. (n=554 deaths)

ICD-10 code: T40.5

(-), 2012-2014, and unknown and other race estimates too small/unreliable to report.

Sex and race specific percentages based on year totals; may not sum to 100 due to rounding.

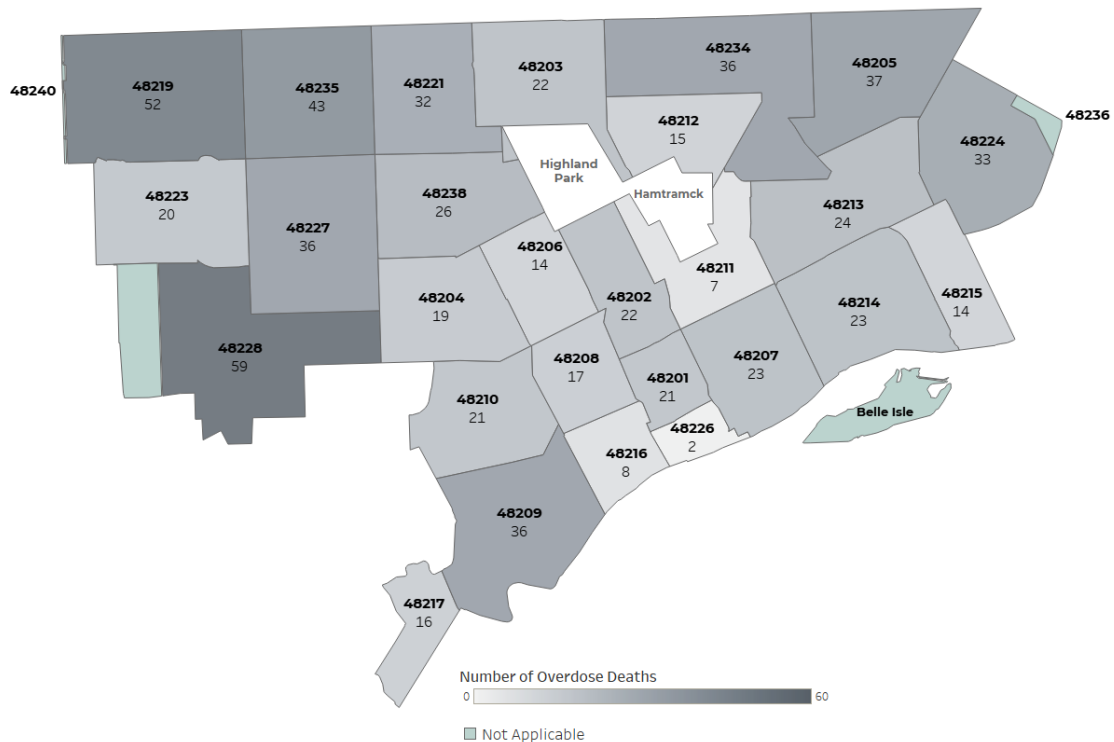
Overdose Mortality by Resident ZIP Code

Maps below represent counts of overdose deaths by resident ZIP code from 2017 through 2020. Importantly, 2020 estimates are provisional and subject to change.

ZIP code 48228 has the largest count of overdose deaths (n=59) among its residents across years 2017-2020. ZIP codes 48219 and 48235 followed with 52 and 43 deaths, respectively, during the same period. Of opioid overdose mortality, 48228 had the largest count of any opioid and opioid pain reliever deaths at 56 and 52 deaths, respectively. Other ZIP codes with leading opioid pain reliever deaths include 48219 (n=43), 48235 (n=32), and 48209 (n=30). Heroin overdose mortality counts were greatest in 48224 (n=18), 48235 (n=17), and 48219, 48228, and 48209 (n=16 each).

Geographic differences in overdose mortality can reflect variations in intervention effectiveness, drug purity, and/or behavior (16)(17). Naloxone may be more effective in reversing the effects of heroin compared to synthetic opioids, especially fentanyl (17). Similarly, variations in drug purity and adulterations are common and are known to impact the risk of mortality (17).

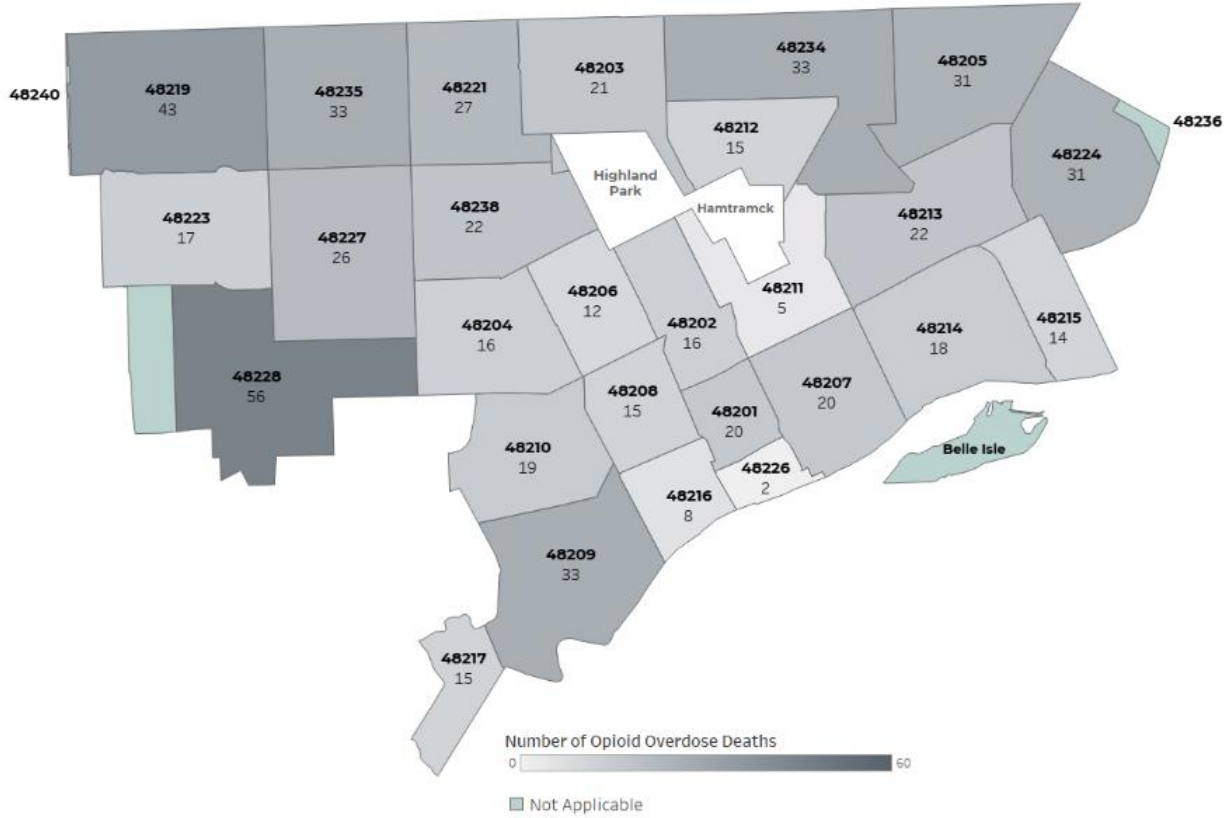
Figure 17. Counts of overdose mortality by resident ZIP code, 2017-2020



Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 2017-2020. (2020 data is provisional; estimates subject to change.)
 20 deaths not represented due to missing ZIP code data.

Figure 18. Counts of overdose mortality by opioid type & resident ZIP code, 2017-2020

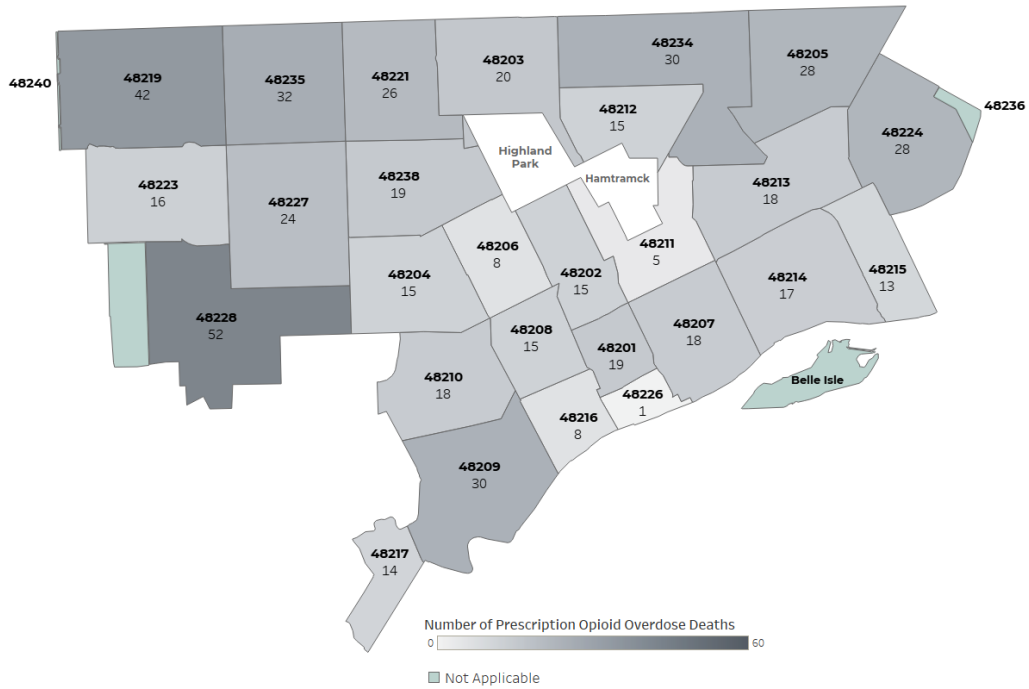
Any Opioid



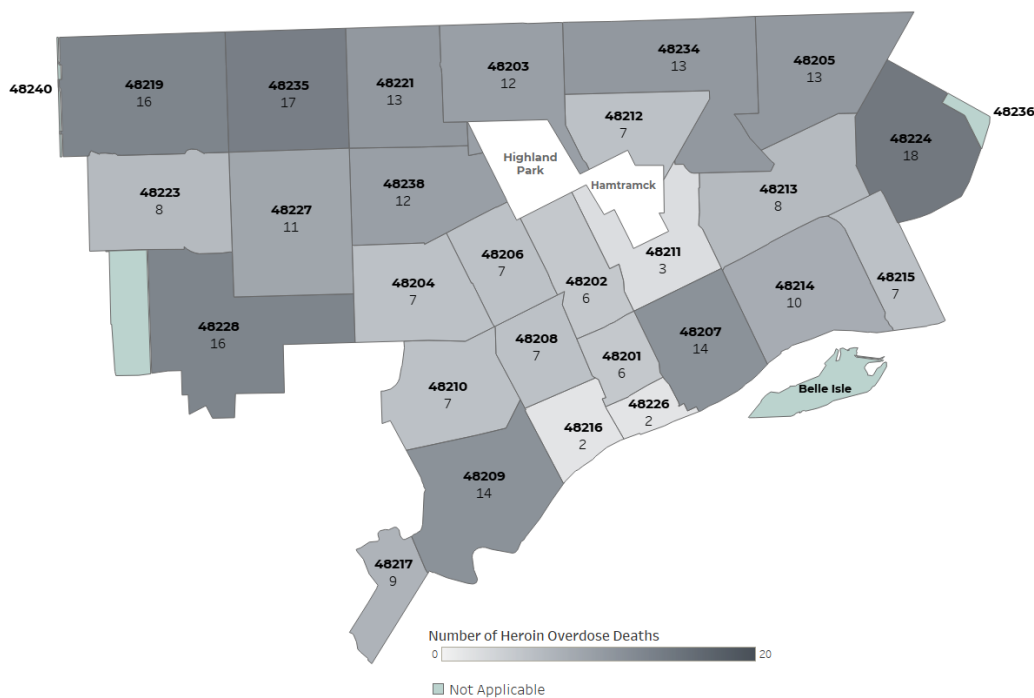
Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 2017-2020. (2020 data is provisional; estimates subject to change.) Opioid types not mutually exclusive.
 < 20 deaths not represented due to missing ZIP code data.

Figure 18 Continued. Counts of overdose mortality by opioid type & resident ZIP code, 2017-2020

Opioid Pain Reliever



Heroin



Data from MDHHS, Division for Vital Records & Health Statistics, Michigan Death Certificates, 2017-2020. (2020 data is provisional; estimates subject to change.)

Opioid types not mutually exclusive.

< 20 deaths not represented due to missing ZIP code data.

Intervention

Medications for Addiction Treatment

Medications for addiction treatment (MAT), also known as medication-assisted treatment and medication for opioid use disorder, are prescriptions approved for the treatment of opioid use disorders including methadone, buprenorphine, and naloxone formulations (18)(19). Unlike overall opioid prescription rates, there is not an excess for Detroiters' MAT rates relative to all Michigan residents (see Opioid Prescription Availability section). The Michigan MAT opioid prescription rates were approximately double that of Detroit in both 2018 and 2019. This finding suggests more Detroiters are prescribed opioids, both non-MAT and high dose prescriptions (i.e., ≥ 90 MME), compared to Michiganders overall. Yet, Detroiters are less likely than Michiganders overall to be prescribed MAT.

Interpret these results cautiously as there are several challenges to MAT prescribing and limitations in MAPS data (20). Results may not accurately reflect the demand for MAT or likelihood of someone with opioid use disorder getting a MAT prescription. The individuals that are prescribed opioids are often not the same individuals using them outside of the prescribing physician's recommendations (7). It is possible that those obtaining non-MAT opioids and those prescribed MAT are different populations with different spatial distributions. Lastly, this sample may be truncated due to premature mortality from opioid use.

Table 10. Counts & rates of medication for addiction treatment prescriptions for Detroit & Michigan, 2018-2019

	Detroit	Michigan
2018		
Residents	3,626	79,523
Count of Prescriptions	20,639	627,563
Prescription Rate	2.9	6.3
Count of High Dose Prescriptions	2,342	69,668
High Dose Prescription Rate	0.3	0.7
2019		
Residents	4,760	92,474
Count of Prescriptions	24,056	656,870
Prescription Rate	3.4	6.6
Count of High Dose Prescriptions	1,936	56,442
High Dose Prescription Rate	0.3	0.6

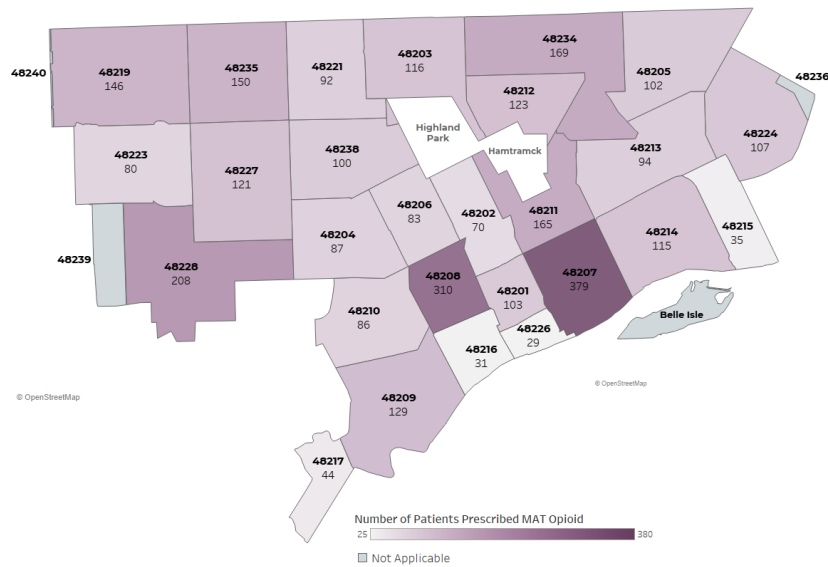
Data from Michigan Automated Prescription System, 2018-2019.

Detroit population 713,313. Michigan population 9,883,640. Rates per 100 residents. Medication for addiction treatment (MAT) includes methadone, buprenorphine, and naloxone formulations.

High dose: ≥ 90 MME (morphine milligram equivalents)

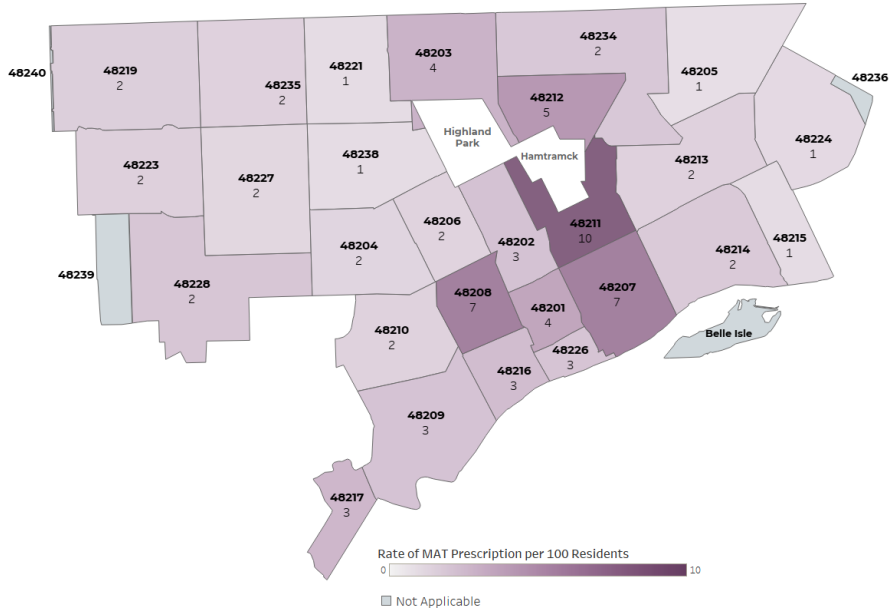
ZIP code 48207 had the largest number of residents with MAT prescriptions (2018-2019 average n=379). The ZIP codes with large counts of residents with MAT prescriptions include 48208 and 48228 with an average of 310 and 208 residents, respectively. Residents of ZIP codes 48211, 48208, and 48207 also had some of the highest MAT prescription rates at 10, 7, and 7 MAT prescriptions per 100 residents, respectively.

Figure 19. Counts of residents prescribed medication for addiction treatment by resident ZIP code, 2018-2019



Data from Michigan Automated Prescription System, 2018-2019. Medication for addiction treatment (MAT) includes methadone, buprenorphine, and naloxone formulations. Estimates averaged for 2018 and 2019.

Figure 20. Medication for addiction treatment prescription rates by resident ZIP code, 2018-2019



Data from Michigan Automated Prescription System, 2018-2019.
 Medication for addiction treatment (MAT) includes methadone, buprenorphine, and naloxone formulations.
 Estimates averaged for 2018 and 2019.
 Rates based on ZIP code specific population denominators; per 100 residents.

Naloxone Administrations

Through the MI-EMSIS database, it is possible to track Detroit EMS naloxone administrations. Between January 2019 and December 2020 there were 5411 Detroit EMS naloxone administrations, the largest portions made up of males (70%) and Black/African Americans (67%). Females and White/Caucasian individuals represented up 30% and 28% of the administrations, respectively.

The largest amount of naloxone administrations occurred in ZIP code 48205 (n=412 administrations). This ZIP code has the second highest count of administrations with a patient residence within the ZIP code (n=238 administrations). ZIP code 48228, had the second largest burden of administrations (n=333) and largest number of administrations with a patient residence within the ZIP (n=252). The relative burden of naloxone administrations based on ZIP code of administration relative to ZIP code of resident have about the same distribution, which may speak to behavior surrounding drug use.

The short timeframe in which naloxone can successfully reverse an overdose means EMS must act quickly. To the extent that suspected overdoses are not true overdoses, estimates may not be accurate. In addition, EMS response depends on individuals seeking treatment, which may not occur if individuals use drugs alone or those around them are unaware (or not trusting) of Michigan's Good Samaritan Law (21). In addition, this data does not include naloxone administered by non-EMS responders and community members. While EMS naloxone administration is not always an accurate proxy for opioid overdoses, the data may speak to the demand for naloxone administration and emergency overdose response in Detroit.

Importantly, effective overdose response goes beyond administering naloxone and can include other stabilizing measures such as CPR. Non-EMS responders and lay community members need training for this intervention to reach its full potential.

Figure 21. Demographic characteristics of Detroit EMS naloxone administrations, 2019-2020

Race/Ethnicity

American Indian or Alaska Native	0%
Asian	0%
Black or African American	67%
Hispanic or Latino	3%
Native Hawaiian or Other Pacific Islander	0%
Other Race or Missing	1%
White	28%

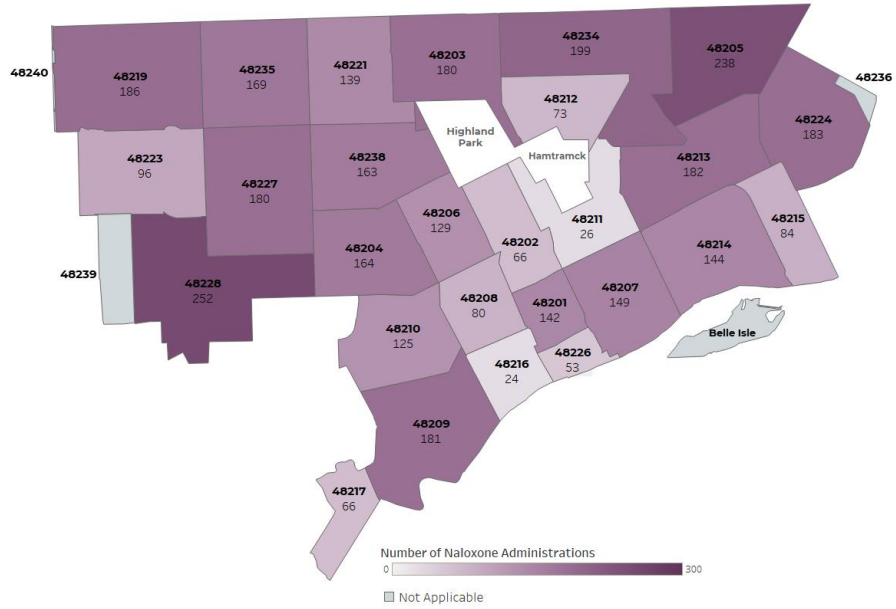
Gender

Female	30%
Male	70%
Unknown	0%

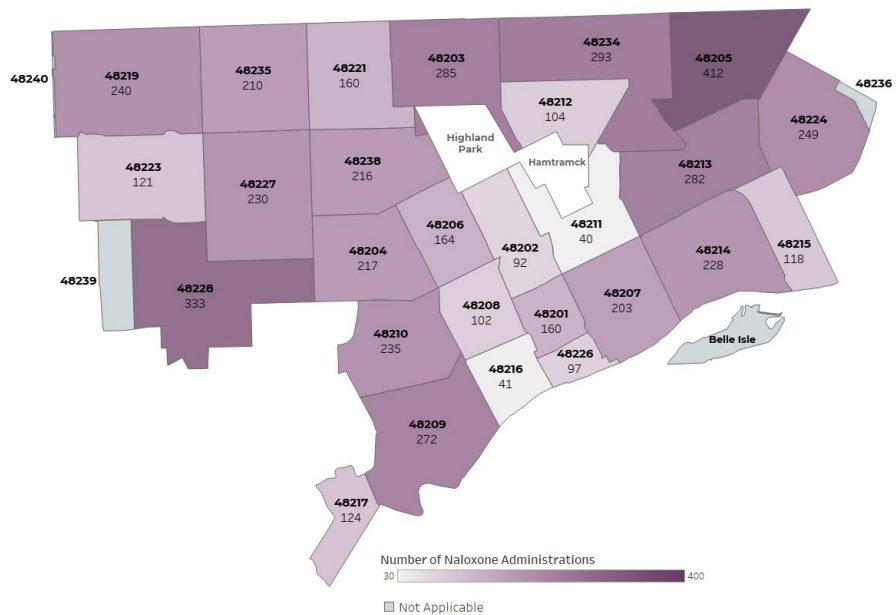
Data from Michigan Emergency Medical Services Information System, 2019-2020. Observations represent administrations and not unique persons.

Figure 22. Detroit EMS naloxone administrations by resident & event ZIP code, 2019-2020

Residents' ZIP Code



Event ZIP Code



Data from Michigan Emergency Medical Services Information System, 2019-2020.

Syringe Service Program

The Syringe Service Program (SSP) is a harm reduction approach to substance use intervention that provides individuals who inject drugs intravenously with clean syringes and other treatment resources. Research shows that providing these clean syringes and resources reduces the risk of spreading HIV and Hepatitis C by as much as 50% each (22). Moreover, through the utilization of SSP resources and referrals for treatment of substance use disorder, individuals are up to five-times more likely to access recovery services and stay enrolled in those services compared to those not utilizing SSPs (22).

The MDHHS SSP and affiliated programs' best practice is to provide more syringes to individuals than requested to promote sharing of excess with their peers who may not be utilizing SSP services. Most programs do not have requirements for any individual to receive syringes, but some may require the exchange of used syringes for clean ones.

Figure 23. Counts of Syringe Service Program resources distributed in Detroit, 2018-2020



Data from MDHHS, Syringe Service Program, October 2018 - December 2020.

May include participation by non-Detroit residents.

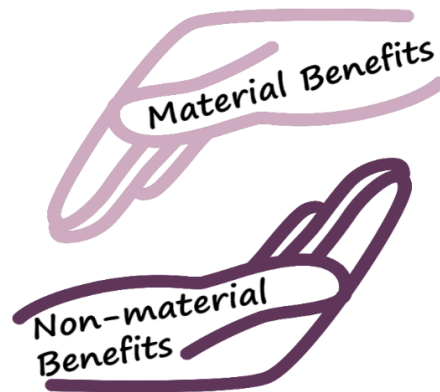
*Substance use disorder treatment.

Resource counts may be underestimated due to other program initiatives not included in SSP data.

Community

Limited resources are a major factor in individuals' behaviors, including substance use (23). Social networks, daily routines, legal employment, and net financial gain are just some of the factors that influence individuals to transition from chronic substance use to abstinence (23)(24).

Thus, to effectively promote treatment, individuals need both material benefits (e.g., resources) and non-material benefits (e.g., social support, a sense of purpose, agency) (23)(24).



Intervention for substance use is an issue important to many Detroiters surveyed in the Detroit Metro Area Community Study (25). Eighty-five percent feel that providing more education and treatment of illegal substance use is a high or very high priority to improve the health of their community (25). Eighty-one percent feel that providing education and treatment to alcohol abuse is a high or very high priority to improve the health of their community (25). Seventy-two percent feel that providing more education and treatment for tobacco use (e.g., chewing, smoking, snuff) is a high or very high priority to improve the health of their community (25). Ninety percent feel that increasing help for people with mental health problems is a high or very high priority to improve the health of the community (25).

Appendix A: Behavioral Health Program

Resources

Strengthening Families

Strengthening Families 10-14 is a seven-session program for families with young adolescents that aims to strengthen family protection and resilience-building processes and reduce family risk related to adolescent substance abuse and other problem behaviors. The weekly two-hour sessions include separate parent and child skills-building followed by a family session where parents and children practice the skills they have learned independently, work on conflict resolution and communication, and engage in activities to increase family cohesiveness and positive involvement of the child in the family. Parents are taught how to clarify expectations based on child development norms relating to adolescent substance use, how to use appropriate disciplinary practices, how to manage strong emotions regarding their children and how to communicate effectively. Children are taught refusal skills to help them deal with peer pressure and other skills for personal and social interaction. These sessions are led by three-person teams and include an average of eight families per session.

For more information about Strengthening Families Program locations in Detroit, contact:

The Youth Connection

(313) 826-7099

info@theyouthconnection.org

Changing Lives And Staying Sober (CLASS)

(313) 412-2160

info@class-agency.org

Appendix B: Definitions

Alcohol Toxicity: Cases with ICD-10 codes relating to the toxic effects of alcohol (T51) (26).

Drug Names & Classifications:

Cannabis: Commonly known as marijuana, cannabis is produced from the hemp plant (*Cannabis sativa*) and contains delta-9-tetrahydrocannabinol (THC) which can produce psychoactive experiences when used (27).

Cocaine: Cocaine is a part of the stimulant drug class and is made from the leaves of the coca plant (*Erythroxylon coca*). Both cocaine powder and its crystalized form, known as crack, are included in reference to cocaine (27).

Heroin: Heroin is a semi-synthetic opioid derived from the opium poppy (*Papaver somniferum*) that has no approved medical uses. This drug acts on opioid receptors in the nervous system and produces effects that resemble those of opium (27).

Opioid: This refers to all natural, semi-synthetic, and synthetic opioids that resemble the effects of opium, found in the poppy (*Papaver somniferum*) and act on opioid receptors of the nervous system. Opioids include heroin, prescription opioids, fentanyl, and fentanyl derivatives. Often opioids and opiates are used interchangeably (outside of this report), although opiates are specific to natural and semi-synthetic opioids (28).

Opioid Pain Relievers: This refers to all approved medications within the opioid drug class including both natural (e.g., morphine) and synthetic opioid formulations (e.g., hydrocodone, fentanyl). Prescription opioids are commonly referred to as pain relievers, but may also be used for their antitussive and antidiarrheal effects (27).

Stimulant: This drug class refers to chemicals that act on the central nervous system to increase alertness, attention, blood pressure, heart rate, and breathing rate, among other side effects. Stimulants include cocaine, amphetamine, and methamphetamine; some of which are approved prescriptions and others are illicitly made (27).

Synthetic Opioid: Synthetic opioids are drugs that act on opioid receptors in the nervous system to produce opium-like effects but made completely without the opium poppy (*Papaver somniferum*). This includes both approved prescription medications and illicitly made formulations (28).

Medication for Addiction Treatment: Medications for addiction treatment (MAT), also known as opioid use disorder (MOUD) and medication-assisted treatment, are methadone, buprenorphine, and naloxone formulations approved by the Food & Drug Administration (FDA) to treat opioid use disorders (18)(19). Some formulations are approved for the treatment of alcohol use disorder, as well. Medications reduce the chances of disordered use and overdose, along with relieving some of the physiological effects of craving opioids (18).

Morphine Milligram Equivalent: The morphine milligram equivalents (MME) are a measure of the relative morphine exposure of a (non-morphine) prescribed opioid medication (4). MME allow for comparisons across opioid medications given the varying potencies/strengths of different opioid formulations. Research has shown doses equal to 50 MME double the risk of overdose; 90 MME increase the risk of overdose by 10-fold (5).

Mortality: Overdose related mortality are cases with an underlying cause of death ICD-10 codes X40-X44, X60-X64, X85, Y10-Y14. This includes intentional and unintentional overdoses (e.g., wrong drug, taking a drug in error). Overdose mortality categories are not mutually exclusive since death may involve more than one drug (29).

Opioids: Case meeting the above mortality definition and has at least one contributing cause of death coded as T40.0, T40.1, T40.2, T40.3, T40.4, or T40.6 (29). Examples include all opioid types: heroin, opioid pain relievers, and synthetic opioids.

Heroin: Case meeting the above mortality definition and has at least one contributing cause of death coded as T40.1 (29).

Opioid Pain Relievers: Cases meeting the above mortality definition and has at least one contributing cause of death coded as T40.2, T40.3 or T40.4 (29). Examples include methadone, fentanyl (*i.e.*, prescribed or illicitly manufactured), oxycodone, and morphine.

Synthetic Opioids: Case meeting the above mortality definition and has at least one contributing cause of death coded as T40.4 (29). Examples include tramadol and fentanyl (*i.e.*, prescribed or illicitly manufactured).

Naloxone Administration: Refers to emergency medical service (EMS) administration of naloxone, which is standard EMS protocol for all suspected opioid overdoses. Administrations (*i.e.*, at least one dose) can serve as a proxy for opioid overdoses, although results should be interpreted cautiously (30)(31).

Neonatal Event: Cases with ICD-10 codes relating to prenatal exposure, exposure through breastmilk, neonatal withdrawal symptoms, or fetal alcohol syndrome (P04.13, P04.14, P04.16, P04.17, P96, Q86, P04.3, P04.4, P96.1, Q86.0). This also refers to cases with patient age recorded as less than one year and meeting other overdose criteria (26).

Overdose: Overdoses refer to the adverse effects of drugs, which are also referred to as poisonings in MSSS and MiCelerity databases (26)(32). The events captured in the databases may include drug overdoses, behavioral and mental disorders related to drug use (excluding alcohol and cannabis), fetal/neonatal events, and alcohol toxicity. In this report, all events (*i.e.*, ED visits) are referred to as overdoses.

Accidental Overdose: ICD-10 codes that include “accidental (unintentional)” indicate accidental overdoses. These codes are assigned by the treating facility (26).

Possible Overdose: Events with ICD-10 codes indicating the mental and behavioral disorders due to opioid use (ICD-10 code F11) (26). These events were excluded from MSSS and MiCelerity overdose ED visit analyses.

Probable Overdose: Events with ICD-10 overdose codes T36.0-T50.9 (26). MSS and MiCelerity overdose ED visit analyses were based on these events. Examples are considered accidental or unintentional events in which a person may have taken the drug intentionally, but the toxic effect was unintentional, including instances of incorrect drug or dose.

Recovery Support Service: Non-clinical services that assist individuals and families to recover from addiction and contribute to wellness and improved quality of life (*i.e.* social support, linkage to and coordination among allied service providers, and a full range of holistic and human services).

Appendix C: Data Sources

Selection Criteria

The selection of data sources was based not only on those that could describe the burden of substance use in Detroit, but also on the availability and timeliness that requested data could be received by DHD. Most all observations represent Detroit residents, although a small portion may be non-Detroiters. Specifically, EMS naloxone administrations and syringe service resources may go to individuals that do not reside in Detroit but are in the city at the time of receipt.

Data Sources

American Community Survey

The American Community Survey (ACS) is an annual survey conducted by the US Census Bureau that measures community-level demographic, housing, economic, and other related characteristics (33). Each year a random sample of households are surveyed and resulting data are statistically weighted to be representative of Detroit's population

Detroit Metro Area Community Study

The Detroit Metro Area Community Study (DMACS) is a survey of Detroit residents who are recruited by an address-based sample of households (25). Resulting samples are statistically weighted to represent Detroit's population based on the US. Census Bureau's estimates of gender, race, age, education, and income.

Michigan Automated Prescription System

The Michigan Automated Prescription System (MAPS) is a prescription-monitoring database used to track controlled substances, assess individual patient risk, and prevent the nonmedical use and diversion of drugs (34). All pharmacies and dispensing practitioners, including dispensing veterinarians, are required to electronically report prescription data to MAPS daily (34).

Michigan Emergency Medical Services Information System

The Michigan Emergency Medical Services Information System (MI-EMSIS) is an EMS database for public and private EMS services in Detroit (31). Observations are generated based on pre-hospital calls (*i.e.*, 9-1-1 calls) that prompt EMS "runs." Data elements are collected and entered by EMS personnel and describe patient demographics, location (*i.e.*, event, residence), patient activity, emergency department chief complaint, and patient contact. All MI-EMSIS runs included in this report represent naloxone (*e.g.*, Narcan®) administrations for suspected opioid overdoses and are 9-1-1 requests (not transfers between facilities). Patient refusals of transport are included, as well as those that ended up at a hospital.

Michigan Syndromic Surveillance System

The Michigan Syndromic Surveillance System (MSSS) is a real-time surveillance system that tracks chief complaints presented at EDs and urgent care centers (35). By tracking symptoms prior to a confirmed diagnosis, MSSS can serve as an early warning system for public health concerns (e.g., flu outbreaks, opioid overdoses). MSSS is an event-based surveillance system that captures admissions, discharges, and transfers (ADT) and utilizes ICD-9 and ICD-10-CM codes. ICD-10 codes first appear in the MSSS system as early as 2014 data, ICD-9 codes also appear in 2014-2020 data, but rarely. The diagnosis field itself did not contain any text or codes prior to 2014. Most diagnosis fields were empty prior to 2016. In January 2019 72% of Michigan EDs reported ICD-10 codes, and by Dec 2020 that was up to 89%. Given variation in ICD coding, overdose ED visit estimates before 2018 are not included in this report.

MiCelerity

MiCelerity is a real-time drug overdose surveillance system released in 2020; data collection began October 2019 (10). Data received by the system prior to February 2020 may be incomplete due to system changes and updates. Observations are primarily from ED visits, with long-term care facilities, skilled nursing facility also contributing to the data. The event-based ADT system captures drug overdoses, drug-related mental and behavioral disorders, neonatal abstinence syndrome, fetal alcohol syndrome, and events related to the effects of alcohol based on ICD-10-CM codes. MiCelerity coverage is statewide since EDs that communicate with the Michigan Health Information Network (MiHIN) are represented in the system. Healthcare providers and organizations that are not currently able to transmit data via ADT messages are able to report overdoses to MiCelerity manually.

Michigan Environmental Public Health Tracking

The Michigan Environmental Public Health Tracking system (MiTracking) is a data portal that houses aggregate health and environmental data for Michigan overall, as well as by jurisdiction (29). This report includes overdose mortality results for Detroit, surrounding counties, and Michigan residents. Population denominators are based on the National Center for Health Statistics. For years 2010-2017, Vintage 2017 post-censal population estimates were used. For years 2000-2009, July 1, 2000-July 1, 2009 revised bridged-race inter-censal population estimates were used (released 10/26/2012). For 1999, the July 1, 1990-July 1, 1999 bridged-race inter-censal estimates were used (released 7/26/2004). Age-adjustment by direct standardization used the 2000 Standard US population as the reference population.

Syringe Service Program

The MDHHS Syringe Service Program (SSP) is a harm reduction program that distributes syringes, naloxone kits, and referrals to substance use treatment (22). Data reflects these materials distributed in Detroit along with the frequency of naloxone overdose reversals for the past two years. Recipients of resources may include non-Detroit residents.

Michigan Death Certificates

MDHHS, Division for Vital Records and Health Statistics, Michigan death certificates are population-based data encompassing all deaths in Michigan (36). This report relied on death certificates for Detroit residents where underlying or contributing cause of death information indicated a drug overdose. Deaths related to drug overdoses includes deaths resulting from unintentional or intentional overdose of a drug (e.g., being given the wrong drug, taking a drug in error or inadvertently). Drug poisoning deaths may involve multiple drugs, thus deaths among drug classes are not mutually exclusive. For example, counts of deaths involving opioid- and cocaine-related overdoses may not be deaths among unique/de-duplicated individuals.

Limitations

Death Certificates: The medical death investigation system in Michigan is a county-based medical examiner system, rather than other centralized, coroner, or hybrid options (37). Research shows that the percentage of drug overdose death certificates with a specific drug listed vary by system, with decentralized county medical examiner systems having a lower percentage (71%) than centralized medical examiner systems (92%) (14). ICD-10 coding practices may vary by medical examiner/coroner, which may particularly influence what drugs are reportedly involved. In addition, not all deaths are investigated by a medical examiner. Michigan deaths that are unexpected are to be investigated, but it is possible that not all deaths involving drugs are identified. For all of these reasons, overdose mortality may be underestimated.

Emergency Departments: Using ED data it is not possible to determine whether prescribed or illicit drugs were responsible for overdose. Data may have inconsistencies based on facilities' differing in coding practices, toxicology testing, and intermittent gaps associated with systems transitions or feed drops. Findings may be underestimated and/or may not be representative of all Detroit overdoses, as many do not present in facilities. Explanations include: 1) more severe reactions (e.g., vomiting) or the use of multiple substances at a time being more likely to be associated with seeking treatment (38), 2) individuals' hesitancy to seek healthcare given use of illegal substances, 3) experiences related to social determinants of health (e.g., medical mistrust, access), and 4) truncation from overdose mortality.

Emergency Medical Services: EMS data on naloxone administration is a convenience sample and is not representative of all overdoses or all overdoses with naloxone administration. Explanations may include individuals' hesitancy to seek care given their use of illegal substances and experiences related to social determinants of health (e.g., medical mistrust, access). Data entry is dependent on EMS personnel with unknown accuracy and reliability. Naloxone administrations by community members or law enforcement are not captured in the EMS system. Data are de-identified and unique persons cannot be determined. Changes in the amount of naloxone administrations may not reflect a change in the burden of overdoses given synthetic opioids necessitates a more aggressive response (e.g., doses) for successful reversal (39).

Prescribed Opioids: The MAPS database includes opioid medication dispensed by veterinarians, although results are unable to shed light on what impact this has on opioid availability. The scientific community is uncertain of the proportion of medication prescribed to animals that is diverted to humans. A survey of veterinarians in Colorado found that 13% of veterinarians knew that an animal owner harmed an animal or made the animal seem ill to obtain opioid medication. Forty-four percent of vets knew an animal owner or veterinary staff member who had misused opioids and 12% knew of veterinary staff misuse and diversion (40).

Surveys: Survey results are dependent upon who chooses to participate and how truthfully those participants answer questions. While surveys are intended to be representative of their target population, the extent to which the probability of selection (for participation) is related to the topics surveyed on may introduce bias.

Appendix D: Data Tables

Overdose Emergency Department Visits

Table 11. Counts & rates of overdose emergency department visits by year & drug, 2018-2020

Year	ED Visit Types						
	All Visits	Overdose		Opioid Overdose		Stimulant Overdose	
	Count	Count	Rate	Count	Rate	Count	Rate
2018	544,788	2,957	54	749	14	80	2
2019	485,560	2,939	61	957	20	115	2
2020	380,067	2,785	73	957	25	132	4

Data from MDHHS, Michigan Syndromic Surveillance System, 2018-2020.
 Rates based on denominator of total visits each year; per 10,000 visits.

Table 12. Counts & rates of monthly overdose emergency department visits, 2019-2020

Counts												
Yr.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'19	214	208	225	243	255	254	269	275	245	234	245	272
'20	249	256	209	157	220	230	260	215	227	246	317	199
Dif.	▲ 35	▲ 48	▼ -16	▼ -86	▼ -35	▼ -24	▼ -9	▼ -60	▼ -18	▲ 12	▲ 72	▼ -73
Rates (per 100,000 visits)												
Yr.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'19	47	61	52	59	61	66	67	71	62	59	66	61
'20	58	67	57	85	103	85	84	67	75	76	77	72
Dif.	▲ 11	▲ 6	▲ 5	▲ 26	▲ 42	▲ 19	▲ 17	▼ -4	▲ 13	▲ 17	▲ 11	▲ 11

Data from MDHHS, Michigan Syndromic Surveillance System, 2019-2020.
 (2019 n=2,939; 2020 n=2,785 overdose visits)

Detroit EMS naloxone administrations do not represent unique persons.

Rates based on denominator of total ED visits; per 100,000 visits.

Difference based on 2019 administrations subtracted from 2020.

See **COVID-19 Impact Section**.

Overdose Mortality

Table 13. Counts of overdose mortality by drug, 1999-2019

Year	Counts of Overdose Deaths		
	All Drug-Related	Opioid-Related	Cocaine-Related
1999	78	25	-
2000	97	50	29
2001	85	39	21
2002	99	41	16
2003	82	41	24
2004	70	39	17
2005	102	60	28
2006	136	86	54
2007	127	51	41
2008	114	68	33
2009	130	70	43
2010	98	49	32
2011	100	46	26
2012	96	46	28
2013	124	81	36
2014	132	76	33
2015	183	131	54
2016	260	213	90
2017	331	280	121
2018	359	320	141
2019	364	312	148

Data from MDHHS, Michigan Death Certificates, 1999-2019.

A unique individual may be represented in both opioids and cocaine overdose deaths.

Overall includes all drug overdose deaths.

-Estimates too small/unreliable to report.

Detroit Emergency Medical Services Naloxone Administrations

Table 14. Counts & rates of monthly naloxone administrations, 2019-2020

Counts												
Yr.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'19	171	225	219	232	252	218	281	248	230	238	196	208
'20	184	213	214	229	252	238	269	240	255	219	186	194
Dif.	▲13	▼-12	▼-5	▼-3	0	▲20	▼-12	▼-8	▲25	▼-19	▼-10	▼-14
Rates (per 100,000 runs)												
Yr.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'19	1,650	2,339	2,029	2,195	2,320	2,080	2,506	2,343	2,130	2,228	1,603	1,472
'20	1,287	1,420	1,437	1,937	2,230	2,043	2,186	2,027	2,585	2,290	1,961	1,997
Dif.	▼-363	▼-919	▼-592	▼-258	-90	-37	-320	-316	▲455	▲62	▲358	▲525

Data from MI-EMSIS, 2019-2020.

(2019 n=2,718; 2020 n=2,693 administrations)

Detroit EMS naloxone administrations do not represent unique persons.

Rates based on denominator of month-specific totals of EMS runs; per 100,000 runs.

Difference based on 2019 administrations subtracted from 2020.

See **COVID-19 Impact Section**.

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