A Profile of Drug Overdose Deaths Using the Michigan Automated Prescription System (MAPS)

Behavioral Health and Developmental Disabilities Administration

Office of Recovery Oriented Systems of Care

Michigan Department of Community Health

MDCH

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Executive Summary

Over the past decade, the number of drug poisoning deaths have increased dramatically in Michigan. The rate of death from unintentional drug poisoning has almost quadrupled since 1999, driven by an increase in overdoses involving prescription drugs. Opioid analgesics (e.g., oxycodone, hydrocodone) are narcotic drugs that are prescribed to relieve pain and were involved in a large number of Michigan's prescription drug overdose deaths. The Michigan Automated Prescription System (MAPS) is a prescription drug monitoring program which reported over 20.9 million prescriptions written for controlled substances in 2012. Hydrocodone remains the highest prescribed drugs since the creation of MAPS in 2003, accounting for 32.2% of all prescriptions in 2012.

From 2009 to 2012:

- The average age-adjusted unintentional or undetermined intent drug poisoning death rate was 12.3 per 100,000 Michigan residents (95% CI: 11.9-12.6).

- On average, 24% of drug overdose decedents had no prescription in MAPS filled within the 364 days prior to death.

- 1,299 (36%) of overdose decedents with at least one prescription filled within the 364 days prior to death had 5 or more prescribers per year.

- Among the 930 opioid-related overdose decedents:

  - 818 (88%) died from opioid without heroin or cocaine.

  - 276 (30%) decedents had no prescription in MAPS for an opioid filled within the 364 days prior to death.

- Opioid-related deaths with evidence of drug diversion (i.e., using a prescription drug without a prescription) were almost two times more likely to have cocaine or heroin in their system at time of death compared to opioid-related decedents with an opioid prescription filled within the 30 days prior to death.

- Of the 1,422 opioid or benzodiazepine decedents, more than one-third (36%) obtained a prescription for at least one opioid and at least one benzodiazepine within the 30 days prior to death.

- Of the 826 heroin-related deaths, 148 (18%) had a prescription for an opioid in the 30 days prior to death.

Prescription drug monitoring programs are an important tool in preventing further increases in drug poisoning deaths and reducing prescription drug misuse and abuse. Increased utilization of MAPS may help prescribers and pharmacies when making decisions related to treating patients who are at higher risk of addiction and overdose death. Additionally, patients with prescriptions for controlled substances must use them as directed by their healthcare provider in order to limit potential harm while effectively addressing health concerns.

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Overview and Trends

Figure 1. Unintentional Drug Poisoning Deaths by Drug Type: MI Residents, 1999-2012
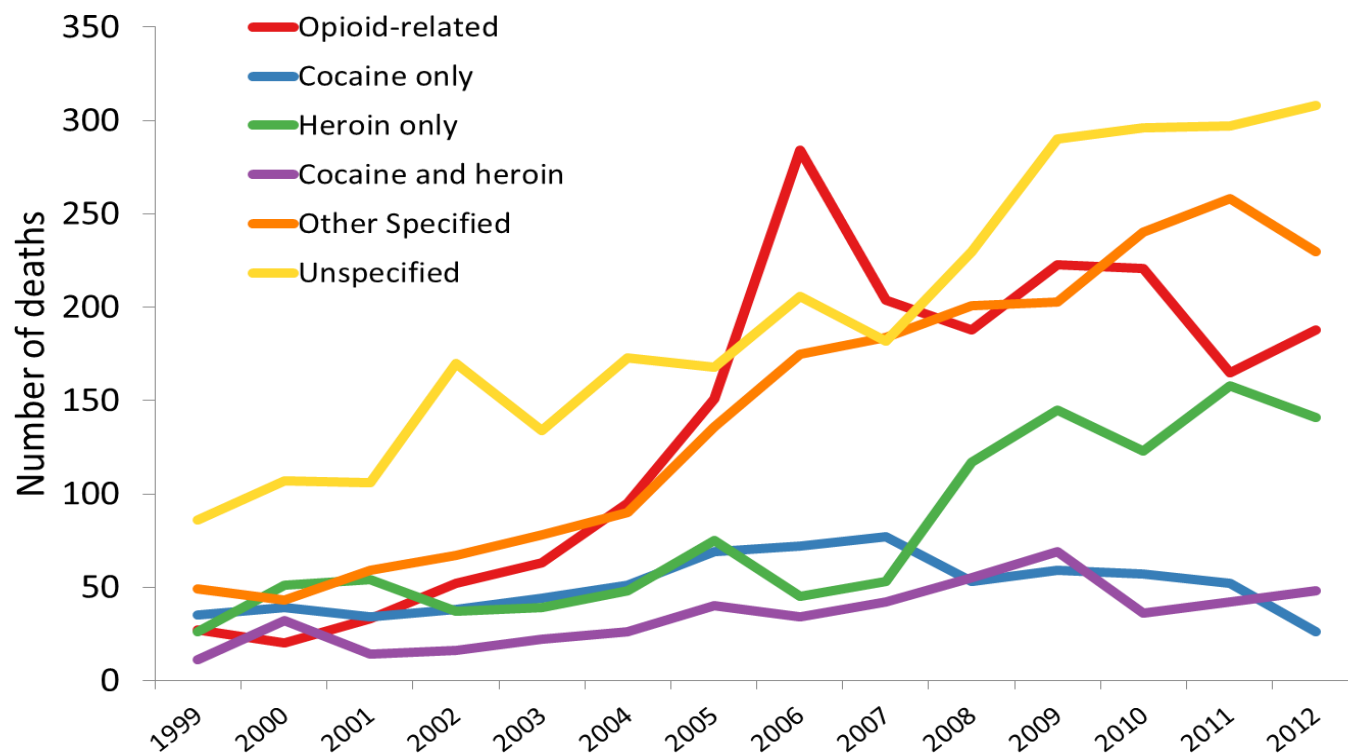
Unintentional poisoning deaths consist of the majority of all poisoning deaths. In 2012, 72% of drug poisoning deaths were unintentional, 12% were suicides, and 15% were of undetermined intent[1].

From 1999 to 2012, unintentional drug overdose deaths in Michigan increased from 235 to 941 per year (*Figure 1*). The age-adjusted unintentional drug poisoning death rate rose from 2.4 to 9.8 per 100,000 Michigan residents during this period. Nationwide, the age-adjusted death rate for unintentional drug poisoning increased from 4.0 deaths in 1999 to 9.7 deaths per 100,000 U.S. population in 2010.

Unintentional poisoning deaths in Michigan involving opioids comprise 20% of unintentional poisoning deaths in 2012, compared to 11% in 1999. Unintentional poisoning deaths involving opioids increased more rapidly than those from any other drug.

The *Healthy People 2020* objectives include preventing an increase in the number of poisoning deaths caused by unintentional or undetermined intent among all persons[2]. Mirroring these objectives, this profile focused on unintentional or undetermined intent drug overdose deaths in an effort to prevent further increases in drug poisoning deaths among all persons in Michigan.

Summary of Demographic Information

Overall, 4,772 Michigan residents died due to unintentional or undetermined intent poisonings from 2009 to 2012 (*Table 1*).

- The age-adjusted death rate for all unintentional or undetermined intent poisoning deaths in Michigan during this time period was 12.3 per 100,000 Michigan residents (95% CI: 11.9–12.6).

- Men were 1.6 times more likely to die from unintentional or undetermined intent poisoning than women. The rate of deaths from unintentional or undetermined intent poisoning in men was 14.9 (95% CI: 14.4–15.5). The overdose death rate for females was 9.5 (95% CI: 9.1–9.9).

- Almost three-quarters (73.5%) of all unintentional or undetermined intent poisoning deaths occurred between the ages of 25 and 54 years.

- The frequencies and rates of deaths from unintentional or undetermined intent poisonings were highest for Michigan residents between the ages of 25 and 54 years. The average age of death was 41.9 years. (*not shown in table*)

- American Indians had much higher rates of unintentional or undetermined intent poisoning than whites and blacks. The rate of overdose death in American Indians was 20.2 (95% CI: 15.4–25.1).

Definitions:

A **drug** is "a medicine or other substance which has a physiological effect when introduced into the body"[3].

An **unintentional poisoning** occurs when a drug is taken by an individual without the intent to harm. This includes accidental overdose of prescription or recreational drugs. Under the International Classification of Disease codes, volume 10 (ICD-10), such events fall under codes X40-X49. For the purposes of our study on prescription drug abuse, we focused on codes of X40-X44[4].

An **undetermined intent poisoning** is defined as a poisoning with insufficient evidence to distinguish an accident, self-harm, or an assault. The ICD-10 codes for classifying an undetermined intent poisoning for this study were Y10-Y14[4].

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Table 1. Unintentional or Undetermined Intent Drug Poisoning Deaths by Demographic Characteristics: MI Residents, 2009-2012					
			Death Rate‡	95% CI for Rate	
Sex	Count	%		Lower	Upper
Male	2,879	60.3%	14.9	14.4	15.5
Female	1,893	39.7%	9.5	9.1	9.9
Age Group (years)					
< 15	9	0.2%	*	*	*
15-24	475	10.0%	8.4	7.7	9.2
25-34	1,041	21.8%	22.1	20.8	23.4
35-44	1,071	22.4%	21.1	19.9	22.4
45-54	1,397	29.3%	23.4	22.2	24.6
55-64	630	13.2%	12.4	11.4	13.3
≥65	149	3.1%	2.7	2.3	3.1
Race					
White	3,975	83.4%	12.7	12.3	13.1
Black	632	13.2%	10.9	10.1	11.8
Native American	67	1.4%	20.2	15.4	25.1
Asian/Pacific Islander	8	0.1%	*	*	*
Total Deaths	**4,772**	**100.0%**	**12.3**	**11.9**	**12.6**

‡ All rates are per 100,000 MI residents age-adjusted to the 2000 U.S. Census population.
*Rate is based on fewer than 25 deaths and is considered statistically unreliable.

Definitions:

- An "age-adjusted death rate" allows us to make a fairer comparison between populations with different age distributions. By taking death rates calculated from the study population and adjusting them to the age distribution of a "standard" population, we are able to make meaningful comparisons among different groups.

- A confidence interval is a statistical measure that indicates the reliability of a given "point" estimate. A 95% confidence interval means that upon repeat measurements of different study populations, we expect the rate to fall within the lower and upper interval 95% of the time.

Unintentional or Undetermined Drug Poisoning Deaths by Substance

Figure 2. Proportion of Drug Poisoning Deaths[1] by Selected Drug Type: MI Residents 2009-2012
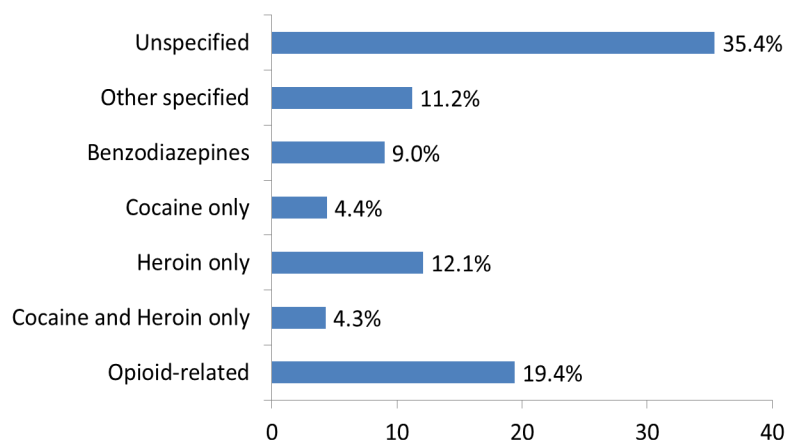
1. Drug Poisoning Deaths included in this figure are mutually exclusive.

Analyses for drug poisoning deaths by drug type indicated by the medical examiner on a decedent's death certificate found (*Figure 2*):

- Deaths due to unspecified drugs accounted for 1,687 (35.4%) of all drug poisoning deaths.

- A total of 930 individuals (19.4%) died from opioid-related causes (i.e., opioid analgesics found in system by medical examiner with possible inclusion of other illicit substances)

- Among the 930 opioid-related overdose deaths, 818 (88%) died from opioids without heroin or cocaine involvement.

- Heroin-only deaths accounted for 579 (12.1%) of all drug poisoning deaths.

- Benzodiazepine-only deaths accounted for 431 (9.0%) of all unintentional or undetermined intent drug poisoning deaths.

Definitions:

An **opioid** is a medication intended to relieve pain[5]. Examples of opioids include hydrocodone (Vicodin®), oxycodone (OxyContin®), and fentanyl (Duragesic®). Opioids are defined on death certificates with the ICD-10 code of T40.2-T40.4.

A **benzodiazepine** is a central nervous system depressant prescribed to treat anxiety, acute stress, and induce sleep[5]. Examples of benzodiazepines include diazepam (Valium®) and alprazolam (Xanax®). Benzodiazepines are defined on death certificates as ICD-10 code T42.4.

Cocaine is an illicit central nervous system stimulant derived from the coca plant that increases levels of chemicals which produce pleasure in the brain[6]. Cocaine has a high abuse and addiction potential. Cocaine is defined on death certificates as ICD-10 code T40.5.

Heroin is an illicit opioid with a powerful addictive potential. Heroin's lethality is due in part to its ability to affect the brainstem, an area of the brain responsible for critical life functions such as breathing[6]. Heroin is defined on death certificates as ICD-10 code T40.1.
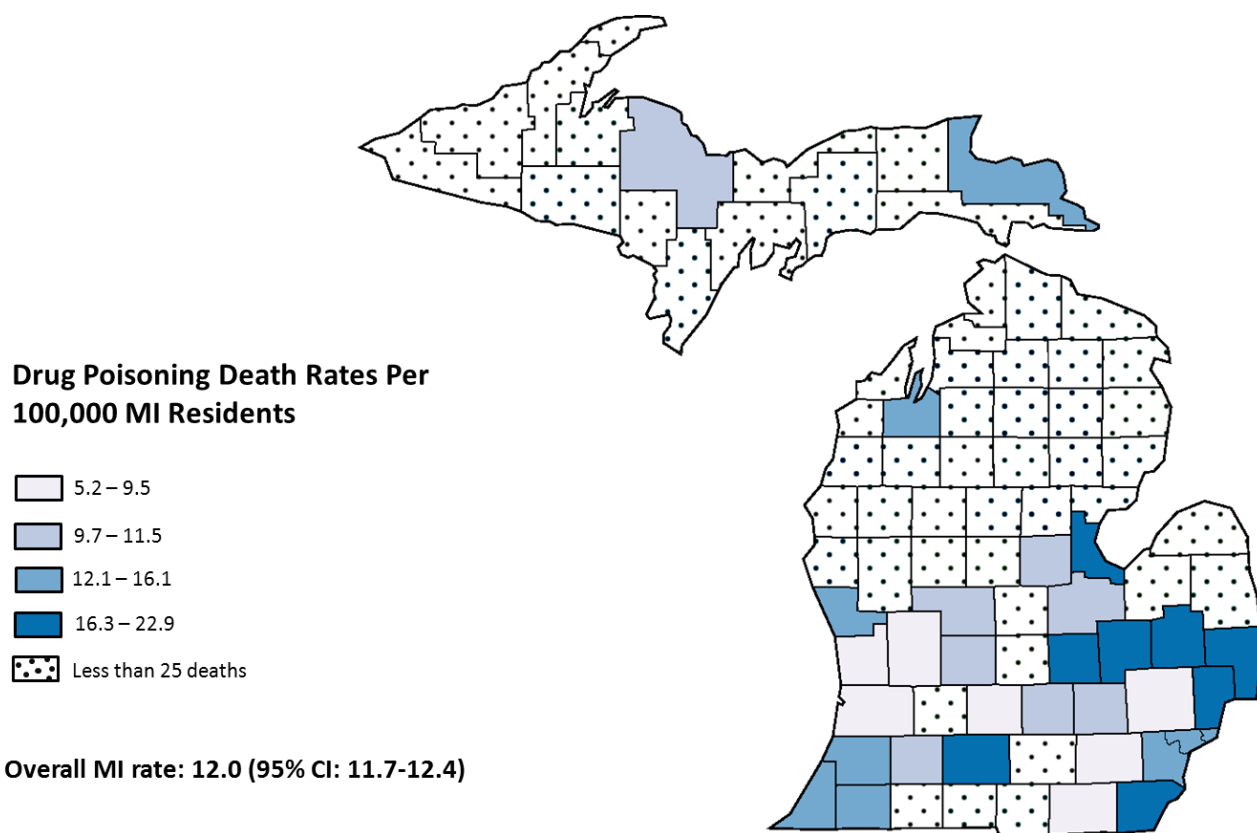
Other specified drugs are defined on death certificates as ICD-10 codes T36.0-T50.8, that *do not* include the ICD-10 codes listed for the above substances[7]. Examples of these drugs include hormones, blood pressure medications, and alcohol.

Death from **unspecified drugs** is defined as having ICD-10 code T50.9 with no other T-code indicated on a decedent's death certificate[7].

Unintentional or Undetermined Intent Poisoning Death Rates by County, 2009-2012

From 2009 to 2012, Michigan had a 4-year average crude unintentional or undetermined intent poisoning rate of 12.0 per 100,000 Michigan residents (95% CI: 11.7-12.4). The average crude death rate by county was calculated for 30 counties and the City of Detroit across the 4-year time period (*Figure 3*). Counties with fewer than 25 drug poisoning deaths from 2009-2012 did not have rates calculated as they may have been statistically unstable, and therefore unreliable.

Figure 3. Unintentional or Undetermined Intent Poisoning Death Rates, by County of Residence: MI Residents, 2009-2012

Drug Poisoning Death Rates Per 100,000 MI Residents

- 5.2 – 9.5
- 9.7 – 11.5
- 12.1 – 16.1
- 16.3 – 22.9
- Less than 25 deaths

Overall MI rate: 12.0 (95% CI: 11.7-12.4)

- Of the 31 regions with statistically stable rates, 8 had unintentional or undetermined intent poisoning rates that were significantly higher than the average state rate (Macomb, Wayne, Genesee, St. Clair, Calhoun, Monroe, Bay, and Shiawassee). Six counties had rates that were significantly lower than the average state rate (Oakland, Kent, Washtenaw, Ottawa, Eaton, and Allegan).

- The average rate for statistically stable counties (≥25 deaths) was 13.0.

- Calhoun county had the highest rate (22.9, 95% CI: 18.8-26.9) and Oakland county had the lowest rate (5.2, 95% CI: 4.5-5.8) of counties with greater than or equal to 25 deaths.

- Keweenaw county reported 0 unintentional or undetermined intent drug poisoning deaths in this time period.

Overview of MAPS

Definitions:

Controlled substances are drugs or chemicals whose use, possession, and manufacturing are regulated by the government. The Drug Enforcement Administration (DEA) has divided controlled substances into five schedules based on their accepted medical use, relative abuse potential, and addiction potential, with I being the highest potential for abuse and addiction and V being the lowest[9]. Some examples of drugs in each schedule are:

- **Schedule I —** Heroin, Ecstasy, Marijuana
- **Schedule II** — OxyContin®, Percocet®, Adderall®
- **Schedule III —** Vicodin®, Suboxone®, Tylenol® with Codeine
- **Schedule IV**— Xanax®, Klonopin®, Ambien®
- **Schedule V —** Robitussin AC®, Phenergan® with Codeine

MAPS reported over 20.9 million prescriptions for controlled substances were written in 2012. Some highlights from the MAPS data for 2012 include frequencies of prescribed controlled substance by *National Survey on Drug Use and Health*[8] category: pain relievers at 9.1 million, tranquilizers at 4.7 million, stimulants at 2.5 million, and sedatives at 1.6 million.

From 2003 to 2012, the biggest increase noted was with buprenorphine, a partial-opioid agonist used to treat opioid addiction. The number of prescriptions increased substantially (from 327 prescriptions in 2003 to 392,544 in 2012).

Increases in Schedule II drug prescriptions from 2003 and 2012 include: oxycodone (129%), methadone (151%), and hydromorphone (391%).

Hydrocodone remains the highest prescribed drug since MAPS's inception in 2003, accounting for 32.2% of all controlled substance prescriptions in 2012.

Linking Death Certificates with MAPS

By linking death certificate data with prescription histories reported to MAPS, valuable insight may be gained on the risk factors involved with prescription drug abuse that lead to death.

For our study purposes, decedent's name, social security number, and date of birth were used to match death certificate records with prescription history provided by MAPS. Prescription history provided by MAPS was limited to prescriptions filled within the 364 days prior to death. Analysis was limited to Michigan residents with prescriptions filled in Michigan, therefore the number of prescriptions and prescribers per decedent may be underestimated and drug diversion (i.e., using a prescription drug without a prescription) may be overestimated. Records of prescription drugs filled after date of death were excluded. Once data were merged, identifiable information was deleted for analysis.

Quick MAPS Facts

- Created in 2003
- The Centers for Disease Control and Prevention (CDC) lists 41 states that have operating prescription monitoring programs as of 2012[10].
- MAPS collects detailed information on Schedule 2-5 controlled substances.
- Currently reporting is done on the 1st and 15th of each month. Starting July 1st, 2014, daily reporting will begin.
- Data collected include:
    - Patient name
    - Substance name
    - National Drug Code (NDC) of substance
    - Physician DEA registration code
    - Dispensing pharmacy DEA code
    - Date of dispensation

Overview of Decedent Prescription History

Figure 4. Total Unintentional and Undetermined Intent Drug Poisoning Deaths[1] with Prescription History: MI Residents, 2009-2012

- Number of of drug poisoning deaths
- Number and percent of drug poisoning deaths who filled prescription within 364 days of death
- Number and percent of drug poisoning deaths who filled prescription within 30 days of death
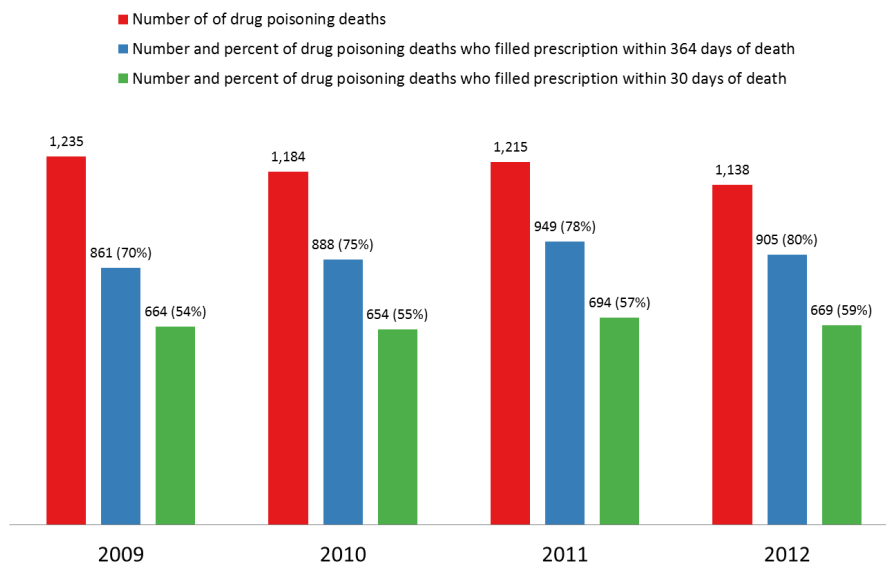
1. Unintentional and undetermined intent drug poisoning death defined as ICD-10 code "X40-X44" and "Y10-Y14", respectively.

Figure 5. Total Number of Prescriptions[1] Written and Proportion of Opioids[2] and Non-opioids Prescribed: MI Overdose Decedents, 2009-2012

- Percent opioid Rx
- Percent non-opioid Rx
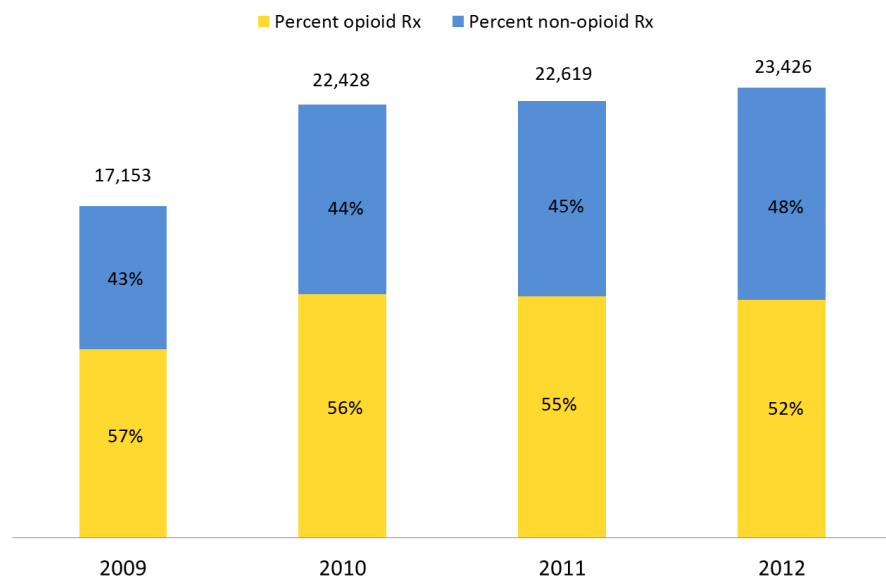
1. Includes only prescriptions filled in Michigan within the 364 days prior to death.
2. Opioid types included: Buprenorphine, Codeine, Fentanyl, Hydrocodone, Hydromorphone, Meperidine, Methadone, Morphine, Oxycodone, Oxymorphone.

Although overall poisoning deaths appear to have declined since 2009, the proportion of decedents with a prescription filled appears to be steadily increasing.

Among the 1,138 drug overdose deaths in 2012, more than three-quarters (80%) of decedents had at least one or more controlled substances filled within the 364 days prior to death. Since 2009, the proportion of decedents with a prescription filled within the 364 days of death has increased 14%. Similarly, the proportion of decedents with a prescription filled within 30 days of death has increased almost 10%. (*Figure 4*).

Figure 5 depicts the total number of prescriptions filled by the drug overdose decedents and the proportion of opioids prescribed from 2009 to 2012.

In 2012, a total of 23,426 prescriptions were filled for 1,138 individuals within the 364 days prior to their death. This marks a 37% increase in the number of prescriptions filled for decedents since 2009.

The highest number of prescriptions per individual from 2009 to 2012 were 161, 216, 169, and 165 respectively. More than half of the prescriptions were opioids in each year.
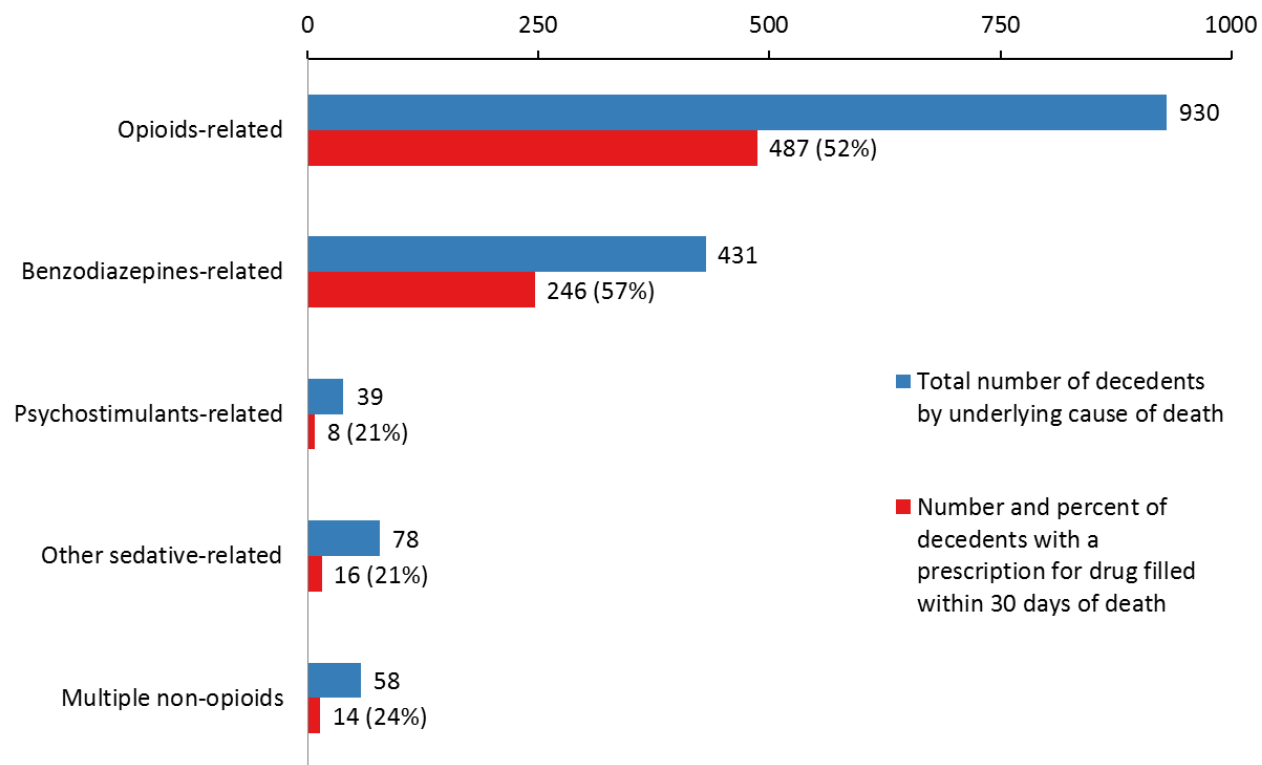
Linking Decedent Prescription History With Causes of Death

Figure 6. Decedents With a Recent Prescription Filled for the Drug Mentioned as a Cause of Death[1]: MI Overdose Decedents, 2009-2012

Category	Total number of decedents	Number and percent with prescription
Opioids-related	930	487 (52%)
Benzodiazepines-related	431	246 (57%)
Psychostimulants-related	39	8 (21%)
Other sedative-related	78	16 (21%)
Multiple non-opioids	58	14 (24%)

Legend:
- Total number of decedents by underlying cause of death
- Number and percent of decedents with a prescription for drug filled within 30 days of death

1. Deaths are mutually exclusive.

Definitions:

A **psychostimulant** is a drug that produces an increase in psychomotor activity, improving impulse control and concentration[11]. Examples of psychostimulants include Adderall® and Ritalin®.

Other sedatives are drugs that do not include opioids or benzodiazepines, which produce pain-relieving, anxiolytic, or sleep-inducing effects. Examples of other sedatives include Lyrica®, Ambien®, and Marinol®.

Examining recent prescription history of decedents (i.e., prescriptions filled within 30 days prior to death) may present stronger evidence for linking decedent prescription history and cause of death, compared to prescription history within the 364 days prior to death.

Out of 930 opioid-related deaths, nearly half (48%) of decedents had no prescriptions filled for opioids in the 30 days prior to death. Benzodiazepines contributed to 431 deaths, with 57% of decedents filling a prescription for benzodiazepines in the 30 days prior to death (*Figure 6*).

Characteristics of Individuals with Opioids Indicated as a Cause of Death

From 2009 to 2012, approximately one-fifth (20%) of all unintentional or undetermined intent drug poisoning decedents died of an opioid-related cause as indicated on the death certificate by a medical examiner. Figure 7 below describes the demographic characteristics of these decedents. Among the 930 decedents with opioids listed as a cause of death:

- Sixty-one percent (61%) were men. The death rate for men (3.0, 95% CI: 2.8-3.2) was 1.6 times higher than the death rate for women (1.8, 95% CI: 1.6-2.0).

- Eighty-three percent (83%) were white; 13% were black. There was no significant difference between the death rates for whites (2.5, 95% CI: 2.3-2.7) and blacks (2.1, 95% CI: 1.7-2.5).

- Three-quarters (75%) of opioid-related deaths involved decedents aged 25 to 54.

- Adults aged 35 to 44 had the highest death rate (4.5, 95% CI:3.9-5.1), followed by adults aged 45 to 54 (4.4, 95% CI: 3.8-4.9) and young adults between 15 and 24 (4.3, 95% CI: 3.7-4.9).

Figure 7. Demographic Characteristics of Decedents with Opioids[1] Listed as a Cause of Death (Percent): MI Overdose Decedents, 2009-2012
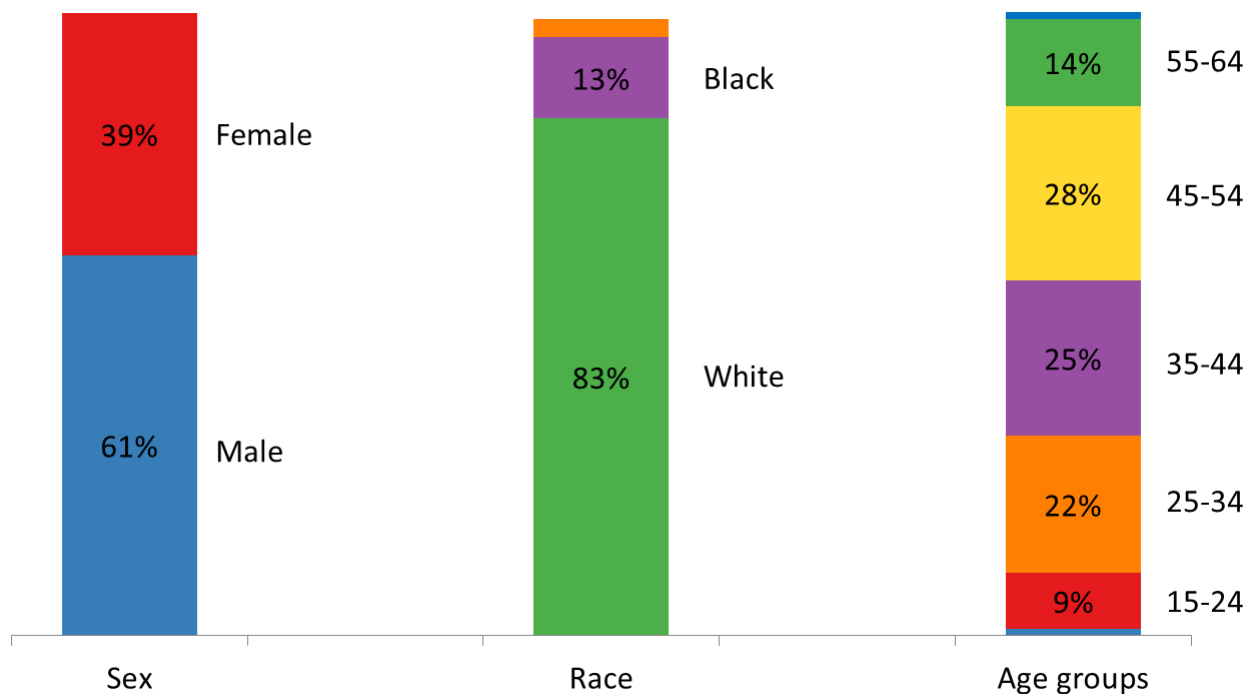
1. Opioid analgesic is defined as T40.2 (other opioid), T40.3 (methadone), or T40.4 (other synthetic narcotic).

Decedents with Recently Prescribed Opioids

| Table 2. Decedents with Opioid Prescription Filled Within the 30 Days Prior to Death: MI Overdose Decedents, 2009-2012				
Prescriptions per decedent	**1 (%)**	**2 (%)**	**≥3 (%)**	**Total (%)**
Sex				
Male	531 (46.5)	304 (26.6)	308 (26.9)	1143 (100)
Female	414 (40.3)	281 (27.4)	332 (32.3)	1027 (100)
Age (years)				
<15	0	0	0	0
15-24	43 (53.1)	19 (23.5)	19 (23.4)	81 (100)
25-34	188 (49.1)	85 (22.2)	110 (28.7)	383 (100)
35-44	224 (42.7)	144 (27.5)	156 (29.8)	524 (100)
45-54	298 (39.2)	211 (27.8)	251 (33.0)	760 (100)
55-64	160 (45.6)	101 (28.8)	90 (25.6)	351 (100)
≥65	32 (45.1)	25 (35.2)	14 (19.7)	71 (100)

Overall, 2,170 of overdose decedents filled an opioid prescription in the 30 days prior to death. A number of males and females had only one prescription for opioids (46.5% and 40.3%, respectively). Almost one third (29%) of males and females had more than 3 prescriptions for opioids in the 30 days prior to death. Of decedents who filled at least one prescription for an opioid within the 30 days prior to death, 33% of adults aged 45 to 54 filled 3 or more opioid prescriptions within that time period (*Table 2*).

Among overdose decedents with opioid prescriptions within the 30 days prior to death, approximately 70% of both men and women obtained a prescription for hydrocodone.

Among men and women, the percent of decedents with a hydrocodone prescription (71%) was almost 4 times greater than the next closest opioid, oxycodone (18%) (*Figure 8*).

Figure 8. Frequently Filled Opioids Within the 30 Days Prior to Death[1], by Sex: MI Overdose Decedents, 2009-2012
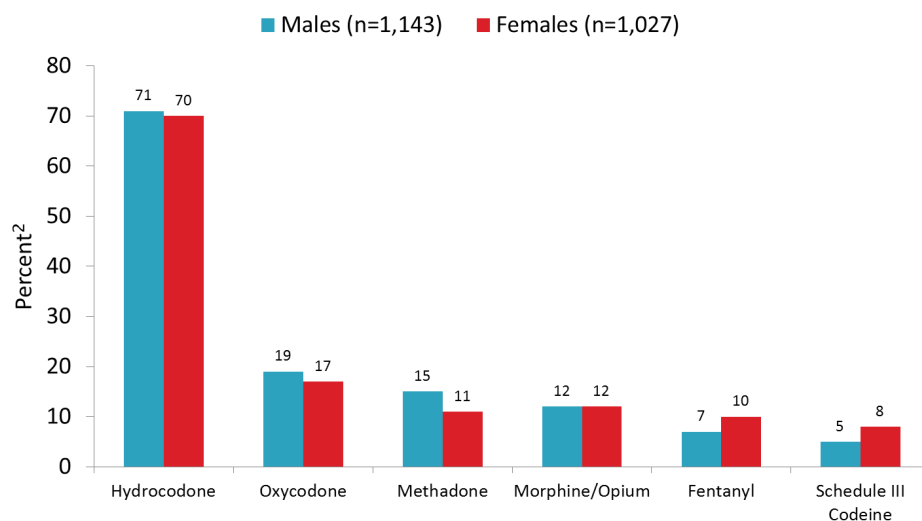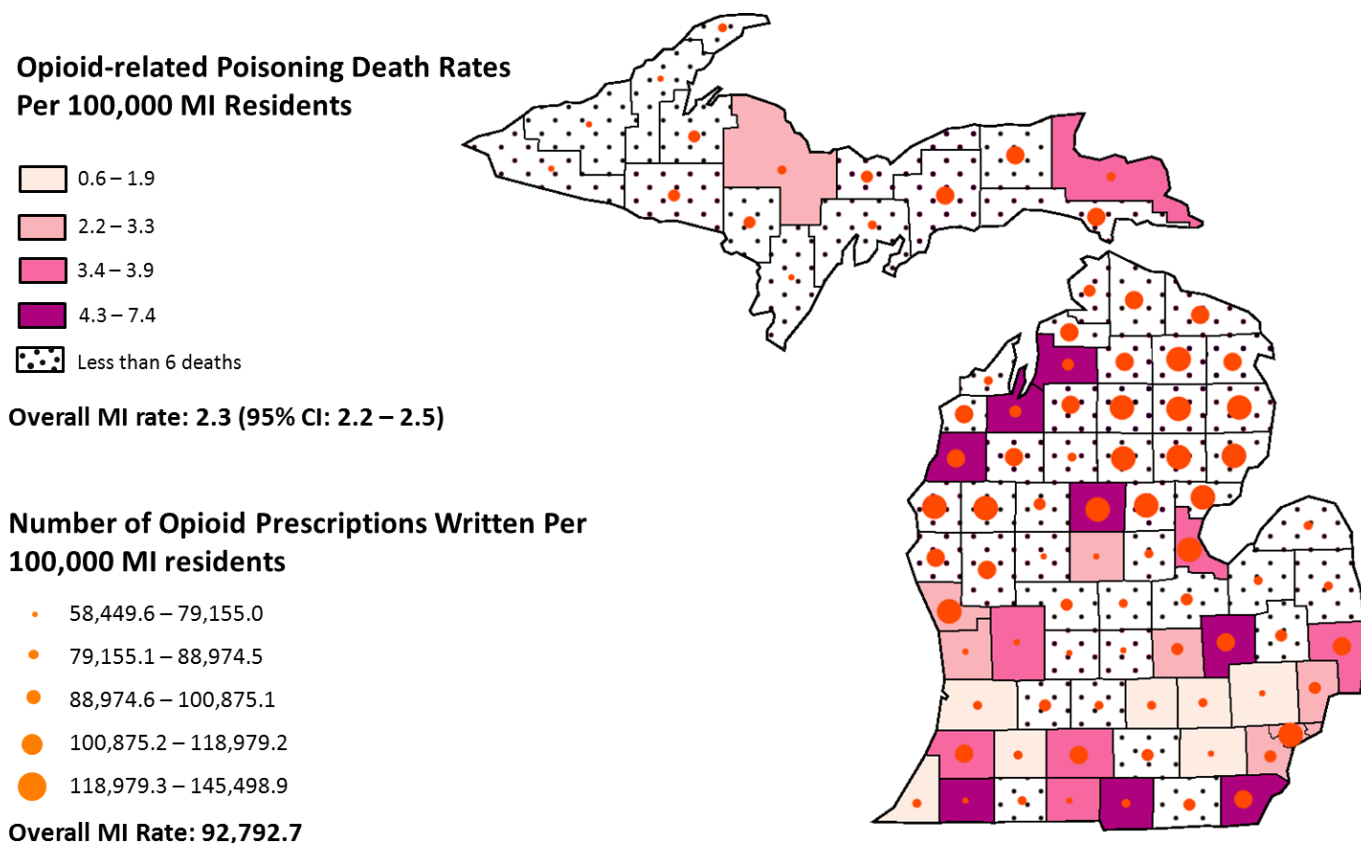

1. Decedents may have filled prescriptions for multiple opioid types.
2. Percent is based out of all individuals (by sex) who have obtained at least one opioid within last 30 days.

Opioid-related Death Rates and Number of Opioid Prescriptions Written by County, 2009-2012

From 2009 to 2012, Michigan had a 4-year average crude opioid-related drug poisoning rate of 2.3 per 100,000 (95% CI: 2.2-2.5). The average crude opioid-related death rate by county was calculated for 29 counties and the City of Detroit across the 4-year time period (*Figure 9*). Additionally, number of opioid prescriptions written were calculated by county. Counties with fewer than 6 opioid-related drug poisoning deaths from 2009-2012 did not have rates calculated as they may have been statistically unstable, and therefore unreliable. Of the 30 regions with greater than or equal to 6 deaths between the years 2009 and 2012:

- Four counties had death rates that were significantly higher that the state rate (Genesee, Grand Traverse, Monroe, and Kent).

- The average rate for statistically stable counties (≥6 deaths) was 3.4.

- Antrim county had the highest rate of 7.4 (95% CI: 1.9-13.0), while Oakland county had the lowest rate of 0.6 (95% CI: 0.4-0.8) of counties with greater than or equal to 6 deaths involving opioids.

- Ten counties did not have any overdose deaths involving opioids during this period (Arenac, Baraga, Benzie, Dickinson, Gratiot, Houghton, Keweenaw, Lake, Luce, and Ontonagon).

Figure 9. Opioid-related Drug Poisoning Death Rates and Opioid Prescriptions Written, by County of Residence: MI Overdose Decedents, 2009-2012

Opioid-related Poisoning Death Rates Per 100,000 MI Residents

- 0.6 – 1.9
- 2.2 – 3.3
- 3.4 – 3.9
- 4.3 – 7.4
- Less than 6 deaths

Overall MI rate: 2.3 (95% CI: 2.2 – 2.5)

Number of Opioid Prescriptions Written Per 100,000 MI residents

- 58,449.6 – 79,155.0
- 79,155.1 – 88,974.5
- 88,974.6 – 100,875.1
- 100,875.2 – 118,979.2
- 118,979.3 – 145,498.9

Overall MI Rate: 92,792.7

Demographic Characteristics of Doctor Shopping Overdose Decedents

"Doctor shopping" is a term defined by the CDC as a patient obtaining a controlled substance from multiple health care practitioners without the prescriber knowing of the patient's other prescriptions[12]. Previous research has defined doctor shopping as obtaining 5 or more controlled substances within the past year[13].

Only overdose decedents with at least one prescription obtained within the 364 days prior to their death were eligible for doctor shopping consideration. Of these 3,603 individuals, more than one-third (36%) of them had doctor shopped. In all age categories doctor shopping behavior was more common in women than men, with 50% of women aged 35 to 44 with at least one prescription having doctor shopped. Doctor shopping was most common for decedents between the ages of 25 and 44 in both sexes (*Figure 10*).

When examining doctor shopping by race, there was no significant difference between the proportion of black decedents who doctor shopped (40%) compared to white decedents (36%) (*Figure 11*).

Figure 10. Percent of Decedents Who Doctor Shopped Within the 364 Days Prior to Death, by Age and Sex: MI Overdose Decedents, 2009-2012
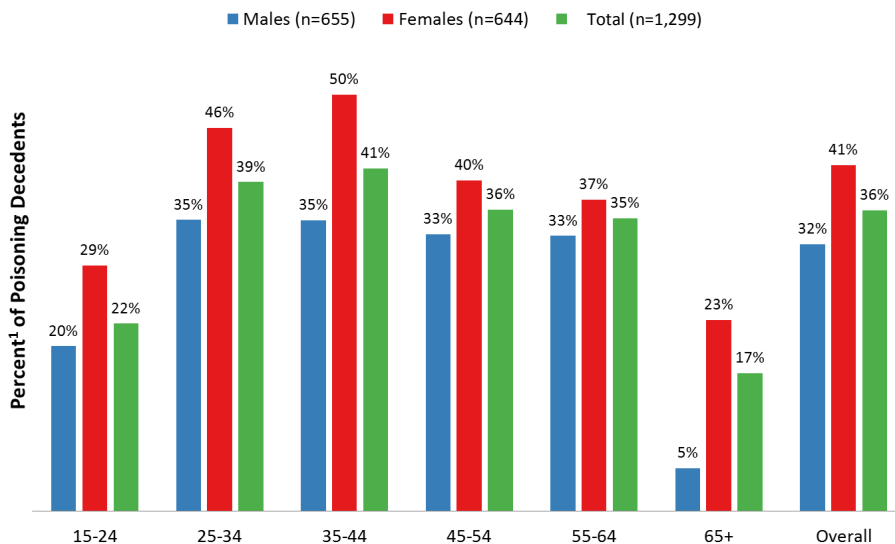
1. Percent calculated by dividing number of doctor shopping decedents by total number of decedents with at least one prescription filled within the 364 days prior to death.

Figure 11. Number and Percent of Decedents Who Doctor Shopped[1] Within the 364 Days Prior to Death, by Race: MI Overdose Decedents, 2009-2012
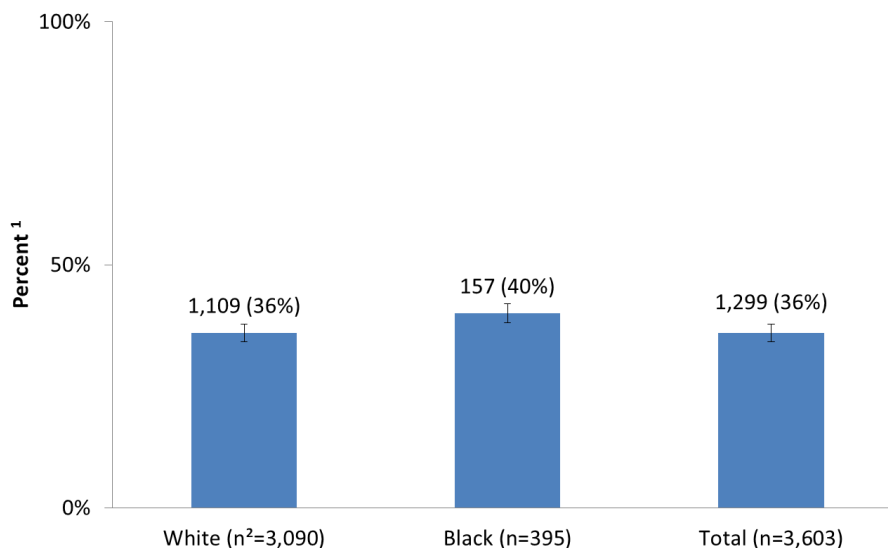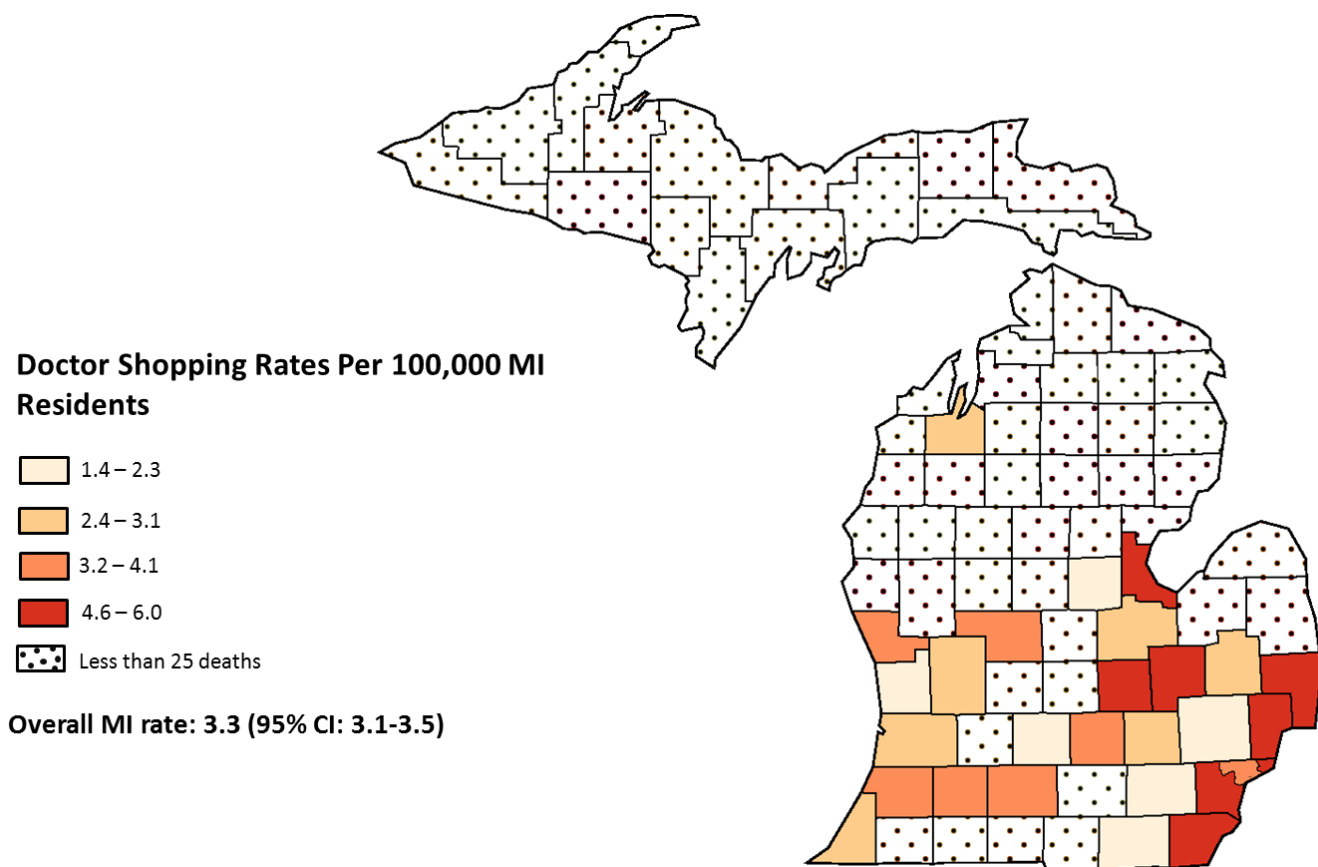
1. Percent calculated by dividing number of doctor shopping decedents from the total number of decedents in a particular race with at least one prescription filled within the 364 days prior to death.
2. Number of decedents in a particular race with at least one prescription filled within the 364 days prior to death.

Doctor Shopping Rates for Drug Poisoning Decedents by County, 2009-2012

From 2009 to 2012, Michigan had a 4-year average crude doctor shopping rate among drug poisoning decedents of 3.3 per 100,000 MI residents (95% CI: 3.1-3.5). The average crude doctor shopping rate by county was calculated for 26 counties and the City of Detroit across the 4-year time period among all decedents who obtained at least one prescription in the 364 days prior to death (*Figure 12*). Counties with fewer than 25 drug poisoning deaths from 2009-2012 did not have doctor shopping rates calculated as they may have been statistically unstable, and therefore unreliable. Of the 27 regions with greater than or equal to 25 deaths between the years 2009-2012:

- Four counties had death rates that were significantly higher that the state rate (Macomb, Wayne, Genesee, and Monroe).

- The average rate for statistically stable counties (≥25 deaths) was 3.5.

- Macomb county had the highest rate of 6.0 (95% CI: 5.1-6.8), while Oakland county had the lowest rate of 1.4 (95% CI: 1.1-1.7) of counties with greater than or equal to 25 decedents with at least one prescription in the 364 days prior to death.

- Two counties did not have decedents eligible for doctor shopping consideration during this period (Keweenaw and Ontonagon).

Figure 12. Doctor Shopping Rates Among Drug Poisoning Decedents with at Least One Prescription Filled Within the 364 Days Prior to Death, by County of Residence: MI Overdose Decedents 2009-2012


Doctor Shopping Rates Per 100,000 MI Residents

- 1.4 – 2.3
- 2.4 – 3.1
- 3.2 – 4.1
- 4.6 – 6.0
- Less than 25 deaths

Overall MI rate: 3.3 (95% CI: 3.1-3.5)

Characteristics of Opioid Drug Diversion

Drug diversion is the practice of channeling a prescription drug into an illegal use[9]. A method of statistically analyzing the prevalence of drug diversion in this study was examining decedents who have a particular drug listed as a cause of death but no prescription history of said drug (e.g., having an opioid-related death with no prescription of opioids obtained within the 364 days prior to death).

Out of the 930 reported opioid-related deaths from 2009 to 2012, 276 of them (30%) were a result of opioid diversion. Figure 13 presents characteristics of opioid-related drug diverters:

- Of opioid-diverters, 174 (63%) were men compared to 102 (37%) women. Men (0.9, 95% CI: 0.8-1.0) died at a rate 1.7 times greater than women (0.5, 95% CI: 0.4-0.6).

- There was no significant difference between the rates for opioid-related death through diversion for whites (0.7, 95% CI: 0.6-0.8) and blacks (0.9, 95% CI: 0.7-1.2).

Figure 13. Percent of Decedents with an Opioid-related Death but No Opioid Prescription Filled Within the 364 Days Prior to Death: MI Overdose Decedents, 2009-2012

- Opioid-related death through diversion was most common among decedents between the ages of 25 and 54 years (73%).
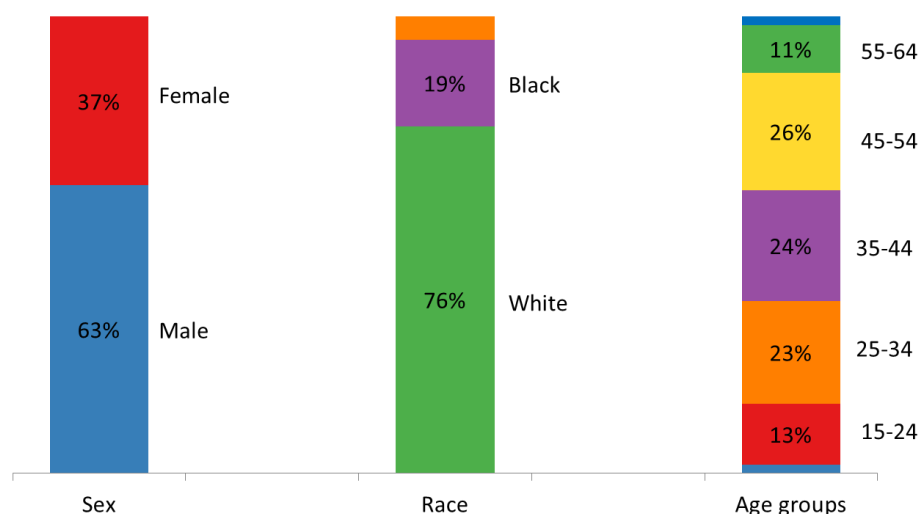
Table 3. Odds of Having Illicit[1] Drugs Listed on Death Certificates Between Drug Diversion Cases and Non-Drug Diversion Cases for Opioids: MI Overdose Decedents, 2009-2012

	Odds Ratio (95% CI)	p-value
Opioids as underlying cause of death but no opioids filled within the 30 days prior to death	1.9 (1.3 – 2.9)	0.002

1. Illicit drugs are defined as heroin (T40.1) and cocaine (T40.5).

The bivariate logistic regression results (*Table 3*) showed that opioid-related deaths through drug diversion were 1.9 times more likely (OR=1.9, 95% CI: 1.3-2.9) to have cocaine or heroin in their system at the time of death compared to opioid-related decedents with an opioid prescription filled within the 30 days prior to death.

## *Deaths Involving the Combination of Opioids and Benzodiazepines*

Co-administration of both opioids and benzodiazepines is an increasing trend to manage chronic pain. However, patients who use opioids concurrently with benzodiazepines are at higher risk for adverse events, overdose, and death[14].

Figure 14 below offers insight on opioid and/or benzodiazepine decedents who have obtained both types of prescriptions prior to death. Opioids and/or benzodiazepine drug overdoses contributed to 1,422 (30%) of all unintentional or undetermined intent drug poisoning deaths in Michigan from 2009 to 2012.

Of the 1,422 opioid or benzodiazepine decedents, more than one-third (36%) obtained a prescription for at least one opioid and at least one benzodiazepine within the 30 days prior to death.

The proportion of female decedents with an opioid or benzodiazepine-related death who obtained at least one opioid and one benzodiazepine within the 30 days prior to death was 44%. This was significantly higher than the proportion of men with an opioid or benzodiazepine-related death who obtained both types of drugs within the 30 days prior to death (31%).

Figure 14: Proportion of Opioid and/or Benzodiazepine-related Decedents Who Obtained at Least One Opioid and One Benzodiazepine Prescription Within the 30 Days Prior to Death, by Sex: MI Overdose Decedents, 2009-2012
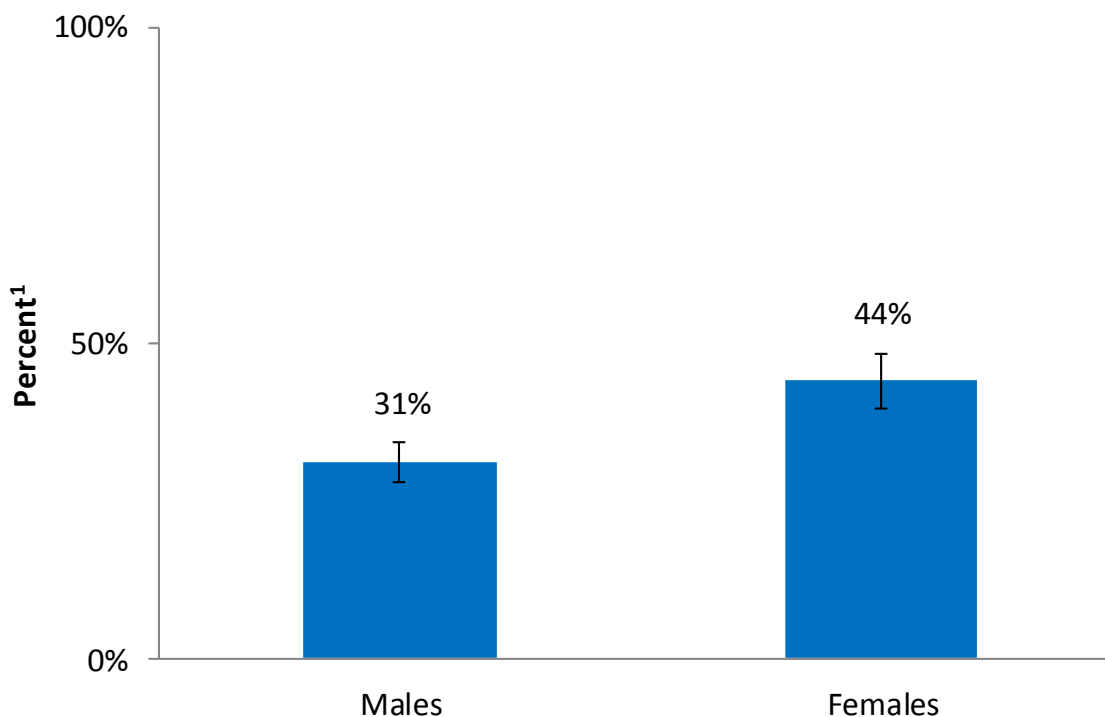
1. Percent is based off of total number of decedents, by sex.

Characteristics of Heroin-related Deaths

As members of the opioid family, prescription medication such as Vicodin® and OxyContin® can produce similar effects to heroin when abused. Previous research has suggested opioids may lead to future heroin abuse, as heroin can often be cheaper and easier to obtain than prescription opioids[15].

Figure 15 below shows demographic characteristics of Michigan overdose decedents who had heroin-related deaths. Overall, 826 (17%) of individuals who died of an unintentional or undetermined intent drug poisoning death in Michigan had heroin as a related cause of death on their death certificate. Of these 826 deaths:

- Men were 3.4 times more likely to die from heroin-related causes than women. The heroin-related death rate for men was 3.3 (95% CI: 3.0-3.6). The death rate from heroin-related causes for women was 1.0 (95% CI: 0.8-1.1).

- There was no significant difference between the heroin-related death rate for whites (2.2, 95% CI: 2.0-2.3) compared to blacks (2.5, 95% CI: 2.1-2.9).

- Nearly three-quarters (74%) of all heroin-related deaths occurred between the ages of 25 to 54.

- Young adults aged 15 to 24 years had the highest heroin-related death rate (4.4, 95% CI: 3.8-4.9), followed by adults aged 35 to 44 years (4.1, 95% CI: 3.5-4.6) and 25 to 34 years (3.2, 95% CI: 2.7-3.8).

- Nearly one-fifth (18%) of heroin-related decedents had obtained a prescription for opioids in the 30 days prior to death (*data not shown*).

**Figure 15: Demographic Characteristics of Heroin-related Deaths (Percent):
MI Overdose Decedents, 2009-2012**
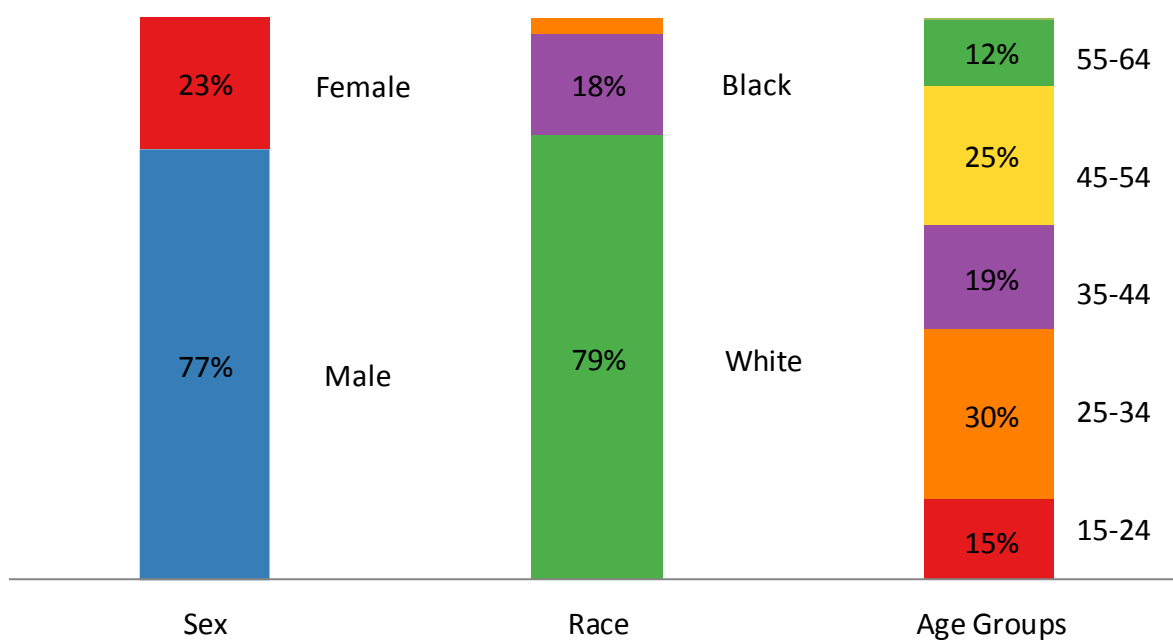
MDCH Response to Drug Overdose Deaths

During May of 2012, in response to the increasing number of unintentional injuries and deaths attributable to nonmedical use of prescription drugs and opioids, the Office of Recovery Oriented Systems of Care (OROSC) published a multi-year Prescription and Over-The-Counter (Rx/OTC) Drug Abuse Strategic Plan.

The plan includes the following four overarching goals:

1. **Increase Multi-System Collaboration**

2. **Broaden Statewide Media Messages**

3. **Broaden Rx/OTC Drug Education and Use of Brief Screenings**

4. **Increase Access and Use of the Michigan Automated Prescription System (MAPS)**

The following includes strategies employed and those to be employed in the immediate future to meet the goals set forth in the Rx/OTC Drug Abuse Strategic Plan and the agencies responsible.

Goal 1: Increase Multi-System Collaboration at State and Community Levels

Strategy 1.1: Assure and monitor CAs/PIHPs to develop and implement action plans for the prevention of prescription and over-the-counter drugs to prevent unintentional deaths from drug overdoses.

Agency Responsible: Behavioral Health and Developmental Disabilities Administration (BHDDA)/OROSC

Strategy 1.2: Provide training to strengthen infrastructure to enhance substance use disorder prevention and mental health promotion at the community/coalition level to prevent unintentional deaths from drug overdoses.

Agency Responsible: BHDDA/OROSC

Strategy 1.3: Seek and secure funding to implement evidence-based practice and mental health promotion programs designed to address nation's top substance abuse prevention priorities including preventing prescription drug misuse and abuse.

Agency Responsible: BHDDA/OROSC; DCH Public Health Administration

Strategy 1.4: Collaborate with relevant agencies and organizations to emphasize the effectiveness of treatment of addiction to opioid analgesics to prevent unintentional deaths from drug overdoses.

Agency Responsible: BHDDA/OROSC; DCH Public Health Administration

Strategy 1.5: Promote to develop leadership structure combining MDCH, Licensing and Regulatory Affairs (LARA), Law Enforcement, and other stakeholders to oversee surveillance, intervention, education and enforcement to prevent illegal distribution and use of controlled substances.

Agency Responsible: Governor's Policy Academy on Opioid Overdose Prevention consisting of representatives from the agencies listed above including primary care entities

Goal 2: Broaden Statewide Media Messages

Strategy 2.1: Promote the use of statewide media campaign entitled: *Do Your Part: Be the Solution to Prevent Prescription Drug Abuse,* featuring a website that includes informative sections and information portals for parents, physicians, youth, educators and the general public interested in learning about prescription drug and opioid abuse.

Agency Responsible: BHDDA/OROSC

Strategy 2.2: Ensure responses to requests from Michigan residents and health care providers on information regarding prescription misuse and abuse as well as the consequences of abusing opioid analgesics.

Agency Responsible: BHDDA/OROSC; DCH Public Health Administration

Goal 3: Broaden Rx/OTC Drug Abuse Education and Use of Brief Screenings in Behavioral and Primary Health Care Settings

Strategy 3.1: Ensure that public health approaches to the delivery of early intervention - such as Screening, Brief Intervention, and Referral to Treatment (SBIRT) - are implemented in behavioral and primary health care settings by providing funding and training.

Agency Responsible: BHDDA/OROSC via training contracts with federally and state funded entities

Strategy 3.2: Implement educational intervention to raise public awareness about the magnitude, risks of overdose, preventive behaviors, and available emergency and treatment resources.

Agency Responsible: Governor's Policy Academy on Opioid Overdose Prevention

Strategy 3.3: Ensure on-going surveillance to monitor data relevant to drug overdoses and deaths from drug overdoses.

Agency Responsible: BHDDA/OROSC; DCH Public Health Administration; LARA

Goal 4: Increase Access to, and Use of, Michigan Automated Prescription System (MAPS)

Strategy 4.1: Coordinate and collaborate with LARA to access the MAPS data to characterize drug poisoning deaths by analyzing how decedent prescription drug history differs across groups and drug types listed as the underlying cause of death (e.g., opioids, heroin).

Agency Responsible: BHDDA/OROSC; DCH Public Health Administration; LARA

Strategy 4.2: Provide training in cooperation with LARA to and PIHP staff on the use of the MAPS to gain an understanding of the MAPS and its data.

Agency Responsible: BHDDA/OROSC; LARA

In accordance with the Michigan Department of Community Health's 2014 Strategic Priorities, the Office of Recovery Oriented Systems of Care will continue to focus on reducing prescription drug abuse and misuse, and preventing unintentional deaths from drug overdoses consistent with the four goals listed above.

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