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

October 15th, 2014

Putting the Pieces Together for Comprehensive Care Conference

Michigan Department of Community Health
Office of Recovery Oriented Systems of Care
Deborah J. Hollis, Director
Objectives

- Learn the characteristics of unintentional and undetermined intent drug poisoning deaths
- Understand the role of prescription (Rx) drugs in the drug poisoning deaths
- Understand the characteristics of fatal overdose by opioids
In 2011, over 41,000 deaths were due to drug poisoning

41% (16,917) involved opioid analgesics with the death rate of 5.4 per 100,000.

“That’s one opioid-related death every half hour in the U.S.”

In 2012, 1,300 deaths were due to drug poisoning; about 72% of them were unintentional drug poisoning deaths.

From 1999 through 2012, unintentional drug overdose deaths in MI increased from 235 to 941 per year.

20% of these deaths involved opioids in 2012 vs. 11% in 1999.
Unintentional poisoning deaths involving opioids increased more rapidly than those from any other drug

- Opioids involvement: 6.0-fold increase
- Heroin only: 4.4-fold increase
- Other specified drugs: 3.7-fold increase
- Cocaine and heroin: 3.4-fold increase
Unintentional drug poisoning deaths by major drug type, 1999-2012
Unintentional drug poisoning deaths by major drug type, 1999-2012

- Opioid analgesic involvement
- Heroin only
Purpose for Linking Data from MAPS and Death Certificates

- Understand how prescription drugs are involved in drug poisoning deaths
- Characterize individuals who died of drug overdoses by:
  - Assessing decedents’ prescription histories in the year prior to their deaths
  - Examining the prescription drugs histories and the drug(s) mentioned as a cause of death
Data Sources

Death Certificates

- Maintained by the Michigan Department of Community Health’s (MDCH) Division of Vital Records and Health Statistics
- A death due to drug poisoning was determined when the coroner or medical examiner identified drug poisoning as the underlying cause of death
Data Sources

Michigan Automated Prescription System (MAPS)

- All pharmacies, dispensing practitioners and veterinarians who dispense controlled substances in Schedules 2-5 are required to electronically report daily.
The Office of Recovery Oriented Systems of Care (OROSC) identified Michigan residents who died of unintentional (X40-X44) and undetermined intent (Y10-Y14) drug poisoning from 2009 to 2012 from de-identified death certificate files.

Type of drug involved in death was categorized by related cause, using a range of T-codes regarding poisoning by drugs, medicaments and biological substances.

- Examples: T40.1 - Heroin
  T40.2 - Other opioid
  T40.5 - Cocaine
Methods (Cont’d)

- Vital Statistics provided identifiable information
  - Name
  - SSN
  - Address
  - Date of birth

- MAPS matched decedents by the identifiable information

- Returned data to OROSC
  - MAPS data included filled prescriptions filled within 364 days prior to death
Methods (Cont’d)

- Analysis limited to Michigan residents with prescriptions filled in Michigan
- Any records of prescription drugs filled after date of death were excluded
- Once merged, identifiable information deleted for analysis
MAPS-Death Certificate Linkage

Results
Study Population

- Total Cases: 4,772 from 2009 to 2012
  - X40-X44 (n=3,888)
  - Y10-Y14 (n= 884)

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1,235</td>
<td>1,184</td>
<td>1,215</td>
<td>1,138</td>
</tr>
</tbody>
</table>
Proportion of drug poisoning deaths by selected drugs, 2009-2012

- Unspecified: 35.4%
- Other specified: 11.2%
- Benzodiazepines: 9.0%
- Cocaine and Heroin, no opioids: 4.3%
- Cocaine only: 4.4%
- Heroin only: 12.1%
- All opioids: 19.4%

*Deaths are mutually exclusive*
### Overall Drug Poisoning Rates by Demographics, 2009-2012

<table>
<thead>
<tr>
<th></th>
<th>Total Deaths</th>
<th>Age-adjusted rate(^*) (95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>4,772</td>
<td>12.3 (11.9 – 12.6)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2,879 (60.3%)</td>
<td>14.9 (14.4 – 15.5)</td>
</tr>
<tr>
<td>Women</td>
<td>1,893 (39.7%)</td>
<td>9.5 (9.1 – 10.0)</td>
</tr>
</tbody>
</table>

\(^*\)Rate per 100,000 population age-adjusted to the 2000 U.S. standard population
# Overall Drug Poisoning Rates by Demographics, 2009-2012

<table>
<thead>
<tr>
<th>Race</th>
<th>Total Deaths</th>
<th>Age-adjusted rates* (95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>3,975 (83.4%)</td>
<td>12.7 (12.3 – 13.1)</td>
</tr>
<tr>
<td>Black</td>
<td>632 (13.2%)</td>
<td>10.9 (10.1 – 11.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Age-specific rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15</td>
<td>**</td>
</tr>
<tr>
<td>15-24</td>
<td>475 (10.0%)</td>
</tr>
<tr>
<td>25-34</td>
<td>1,041 (21.8%)</td>
</tr>
<tr>
<td>35-44</td>
<td>1,071 (22.4%)</td>
</tr>
<tr>
<td>45-54</td>
<td>1,397 (29.3%)</td>
</tr>
<tr>
<td>55-64</td>
<td>630 (13.2%)</td>
</tr>
<tr>
<td>≥65</td>
<td>149 (3.1%)</td>
</tr>
</tbody>
</table>

*Rate per 100,000 population age-adjusted to the 2000 U.S. standard population
** Rate is based on fewer than 25 deaths and is considered statistically unreliable
Drug Poisoning Death Rates Per 100,000 MI Residents

Unintentional and Undetermined Poisoning Death Rates By County of Residence: MI, 2009-2012

Overall MI rate: 12.0 (95% CI: 11.7-12.4)
## Matching with MAPS

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total drug poisoning deaths</strong></td>
<td>1,235</td>
<td>1,184</td>
<td>1,215</td>
<td>1,138</td>
</tr>
<tr>
<td><strong>Number of deaths with Rx history</strong></td>
<td>861 (69.7%)</td>
<td>888 (75.0%)</td>
<td>949 (78.1%)</td>
<td>905 (79.5%)</td>
</tr>
<tr>
<td><strong>Total number Rx written</strong></td>
<td>17,153</td>
<td>22,428</td>
<td>22,619</td>
<td>23,426</td>
</tr>
<tr>
<td><strong>Opioids</strong></td>
<td>9,758</td>
<td>12,603</td>
<td>12,497</td>
<td>12,297</td>
</tr>
<tr>
<td><strong>Hydrocodone</strong></td>
<td>5,533 (32.3%)</td>
<td>6,744 (30.1%)</td>
<td>6,390 (28.3%)</td>
<td>6,487 (27.7%)</td>
</tr>
<tr>
<td><strong>Non-opioids</strong></td>
<td>7,395</td>
<td>9,819</td>
<td>10,106</td>
<td>10,979</td>
</tr>
<tr>
<td><strong>Benzodiazepine</strong></td>
<td>5,625 (32.8%)</td>
<td>7,269 (32.4%)</td>
<td>7,281 (32.2%)</td>
<td>7,875 (33.6%)</td>
</tr>
</tbody>
</table>
## Deaths involving Rx written within 30 days of death and the drug mentioned as a cause of death, 2009-2012

<table>
<thead>
<tr>
<th>Deaths involving</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioids</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>With opioid Rx filled within 30 days</td>
<td>487</td>
<td>52.4</td>
</tr>
<tr>
<td>Benzodiazepines only</td>
<td>431</td>
<td></td>
</tr>
<tr>
<td>With Benzodiazepines Rx filled within 30 days</td>
<td>246</td>
<td>57.1</td>
</tr>
<tr>
<td>Psychostimulants only</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>With Psychostimulants Rx filled within 30 days</td>
<td>8</td>
<td>20.5</td>
</tr>
</tbody>
</table>
### Opioid-related decedents with opioid Rx filled within 30 days of death, 2009-2012 (n=487)

<table>
<thead>
<tr>
<th>Prescriptions per decedents</th>
<th>1 (%)</th>
<th>2 (%)</th>
<th>≥3 (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>127 (46.2)</td>
<td>73 (26.6)</td>
<td>75 (27.2)</td>
<td>275 (100)</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>64 (30.2)</td>
<td>64 (30.2)</td>
<td>84 (39.6)</td>
<td>212 (100)</td>
</tr>
<tr>
<td>&lt;15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-24</td>
<td>9 (52.9)</td>
<td>3 (17.7)</td>
<td>5 (29.4)</td>
<td>17 (100)</td>
</tr>
<tr>
<td>25-34</td>
<td>41 (45.1)</td>
<td>23 (25.3)</td>
<td>27 (29.6)</td>
<td>91 (100)</td>
</tr>
<tr>
<td>35-44</td>
<td>49 (39.8)</td>
<td>33 (26.8)</td>
<td>41 (33.4)</td>
<td>123 (100)</td>
</tr>
<tr>
<td>45-54</td>
<td>52 (34.2)</td>
<td>41 (27.0)</td>
<td>59 (38.8)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>55-64</td>
<td>31 (36.5)</td>
<td>30 (35.3)</td>
<td>24 (28.2)</td>
<td>85 (100)</td>
</tr>
<tr>
<td>≥65</td>
<td>9 (47.4)</td>
<td>7 (36.8)</td>
<td>3 (15.8)</td>
<td>19 (100)</td>
</tr>
</tbody>
</table>
Frequently filled opioids in the 30 days prior to death among opioid-related decedents, 2009-2012

- Hydrocodone: 64%
- Methadone: 20%
- Oxycodone: 18%
- Morphine/Opium: 14%
- Fentanyl: 13%
Deaths involving opioids (n=930) demographics, 2009-2012

- **Sex**: 61% Male, 39% Female

- **Race**:
  - Male:
    - Spanish: 25%
    - Black: 22%
    - White: 28%
  
  - Female:
    - Spanish: 14%
    - Black: 13%
    - White: 83%

- **Age groups**:
  - 15-24: 9%
  - 25-34: 22%
  - 35-44: 25%
  - 45-54: 28%
  - 55-64: 14%
Opioid-related Drug Poisoning Death Rates by County of Residence: MI, 2009-2012

Overall MI rate: 2.3 (95% CI: 2.2 – 2.5)
Opioid-related Drug Poisoning Deaths Rates by County of Residence: MI, 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
Deaths involving opioids but no opioid Rx filled (n=276) demographics, 2009-2012

- **Sex**
  - Male: 63%
  - Female: 37%

- **Race**
  - White: 76%
  - Black: 19%

- **Age groups**
  - 15-24: 13%
  - 25-34: 23%
  - 35-44: 24%
  - 45-54: 26%
  - 55-64: 11%
## Odds of having illicit* drugs between drug diversion cases and non-drug diversion cases for opioids

<table>
<thead>
<tr>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioids as underlying cause of death but no opioids filled within 30 days of death</td>
<td>1.9 (1.3, 2.9)</td>
</tr>
</tbody>
</table>

* Illicit drugs include cocaine and heroin

- Among 930 deaths involving opioids
  - 443 (48%) decedents had NOT filled an opioid prescription within 30 days prior to death
  - 276 (30%) decedents had NOT filled an opioid prescription within 364 days of their death

- Opioid involving deaths with NO opioids Rx filled within 30 days of death are 1.91 times more likely to have illicit drug(s) compared to opioids deaths with opioids Rx filled within 30 days of death
Doctor Shopping

- Referred to as obtaining controlled substances from multiple health care practitioners without the prescribers’ knowledge of the other prescriptions.
  - For our study purposes we defined this as visiting and obtaining controlled substances from 5 or more prescribers within a year.

- Only overdose decedents with $\geq 1$ Rx obtained within 364 days of death were eligible for doctor shopping consideration.
Doctor Shopping

Males (n=655)  Females (n=644)  Total (n=1299)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>29%</td>
<td>35%</td>
<td>32%</td>
</tr>
<tr>
<td>25-34</td>
<td>22%</td>
<td>35%</td>
<td>32%</td>
</tr>
<tr>
<td>35-44</td>
<td>46%</td>
<td>39%</td>
<td>41%</td>
</tr>
<tr>
<td>45-54</td>
<td>50%</td>
<td>41%</td>
<td>47%</td>
</tr>
<tr>
<td>55-64</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>65+</td>
<td>23%</td>
<td>5%</td>
<td>17%</td>
</tr>
<tr>
<td>Overall</td>
<td>32%</td>
<td>36%</td>
<td>34%</td>
</tr>
</tbody>
</table>
Doctor Shopping Rates Among Drug Poisoning Decedents with at Least One Prescription Filled in 364 Days Prior to Death, by County of Residence MI, 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)
Between 2009 and 2012, the unintentional and undetermined intent drug poisoning deaths rate was higher among men, whites, and adults aged 45-54.

Seventy-six percent (76%) of drug overdose decedents had at least one (1) prescription filled within 364 days of death.
443 (48%) of opioid-related decedents had NOT filled an opioid prescription within 30 days of their death. → opioids through drug diversion.

Opioid overdose decedents with NO recent opioid prescription were almost twice as likely to have cocaine or heroin at the time of death compared to those who had an opioid Rx filled within 30 days prior to death.

Of overdose decedents with ≥1 Rx filled, 36% did doctor shopping. A higher proportion of women doctor shopped compared to men, and doctor shopping was most common for decedents between 25 and 44 for both sexes.
Current/Future Plans

- Present to State Epidemiological Outcomes Workgroup (SEOW), MAPS, Bureau of Disease Control, Prevention, Epidemiology, Pain Management, and Clinical Advisory Committee

- Present to Michigan Primary Care Association, Michigan State Medical Society

- Publication/presentation/factsheets and on the website to raise awareness among stakeholder organizations

- Assist in Partnership for Success II Grant activities on reducing prescription drug misuse and OROSC Rx/(over-the-counter (OTC) Drug Abuse Strategic Plan
Increase multi-system collaboration

Broaden statewide media message
- www.michigan.gov/doyourpart

Broaden Rx/OTC drug education and use of brief screenings

Increase access and use of the MAPS
Poisoning Deaths due to Unspecified Drugs in Michigan, 2009-2012

Between 2009-2012, 4,772 Michigan residents died of unintentional or undetermined intent drug poisoning. For 35% (1,680) of these deaths, the type of drugs involved was not specified on the death certificate (i.e., ICD-10 code T50.9).

Percent of Drug Poisoning Deaths due to Unspecified Drugs, by County: MI Residents, 2009-2012

Note: Counties with fewer than 25 drug poisoning deaths from 2009-2012 did not have individual rates calculated as they may have been statistically unstable and therefore unreliable.

Of the 31 regions with statistically stable proportions, 8 had unspecified proportions that were significantly higher than the state average: Saginaw, Calhoun, Lenawee, Lapeer, Oakland, Midland, Berrien, and St. Clair.

An examination of decedent prescription histories within 30 days of death may indicate the substance involved:
- Eighty-three percent (83%) had at least one prescription for an opioid filled (e.g., Vicodin®, OxyContin®).
- More than three-quarters (77%) had at least one benzodiazepine filled (e.g., Valium®, Xanax®).
- Almost one-fifth (19%) filled a prescription for a sedative that was not classified as an opioid or benzodiazepine (e.g., Ambien®, Lyrica®).
- Nine percent (9%) filled a prescription for a psychostimulant (e.g., Adderall®, Ritalin®).

Specific language on death certificates is critical for accurately reporting the influence particular drugs pose in an individual’s death. Better death investigation is recommended to reduce the use of nonspecific ICD-10 coding, thus improving mortality surveillance.

Acknowledgement

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  - Rana Kabeer

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  - Glenn Radford
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