MiCelerity: How local health can leverage Michigan’s overdose surveillance system

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What is MiCelerity?

- Real-time drug poisoning surveillance system
- Fatal and non-fatal suspected overdoses
- Managed by the Michigan Overdose Data to Action (MODA) Surveillance Team within MDHHS
- Utilizes mandatory reporting of drug poisoning events
- Innovative data capture from Admission, Discharge, and Transfer (ADT) messages
  - Can be expanded to other injury events and chronic diseases
What data is captured in MiCelerity?

• Statewide
• Hospital emergency departments (primarily)
• Event-based system using diagnostic codes:
  • Drug poisonings (T36-T50);
  • Drug-related mental/behavioral disorders (F11-F16, F18-19);
  • Neonatal abstinence syndrome (P04);
  • Fetal alcohol syndrome (P96);
  • Events related to the toxic effect of alcohol (T51)
• Personally identifiable information for each event
  • Demographic and geographic information
How does MiCelerity differ from other surveillance systems?

• Individually identifying information for overdose events
  • Patient-level linkage across events
  • Longitudinal assessment
• Assists provider compliance with overdose reporting
• Collects death certificate data
  • Data on both fatal and non-fatal suspected overdoses
How can MiCelerity help my jurisdiction?

- Track trends
- Understand health disparities
- Target programmatic work
- Automated alerts

Local data to drive local decision-making
What can be done in MiCelerity?

• View and track trends
  • NEW! Dashboard with aggregated visualizations
• Export search output in pdf or csv
  • Search by desired criteria (time, diagnosis, geographic area)
  • Save search criteria for future use
• Set up alerts
  • Create rules for generating alerts
  • Can be for specific jurisdictions, facilities, diagnosis codes, drug classes
  • Can be based on raw count or statistical aberration
• Share data for multijurisdictional monitoring
Who can access MiCelerity?

A. Local health department (LHD) personnel;
B. Healthcare providers from reporting facilities; or
C. MDHHS personnel

- Users’ work must be relevant to addressing the overdose crisis in Michigan
- **Limited to 3 users per LHD**
- Epidemiologists (if available) are prioritized
MODA Public Dashboard
Michigan.gov/OpioidsData

Overdose Deaths in Michigan, Month-by-Month Comparison

The Michigan Overdose Data to Action (MODA) Team
Please send questions about this dashboard to MDDHS:
MODAsurveillance@michigan.gov.

The Michigan Department of Health and Human Services (MDHHS) MODA team is funded by the Centers for Disease Control and Prevention (CDC) Overdose Data to Action (OD2A) grant to bring surveillance and prevention.

Monthly Comparison and Disparities Data
The charts above display the most recent overdose death and non-fatal emergency department (ED) data available compared to the previous year by month and data regarding disparities in fatal and non-fatal overdoses by race/ethnicity among in Michigan. On the disparities chart, NH stands for "non-

Number of Overdose Deaths by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>2,354</td>
</tr>
<tr>
<td>2020</td>
<td>2,738</td>
</tr>
<tr>
<td>2021</td>
<td>2,809</td>
</tr>
</tbody>
</table>

January to December 2021
MiCelerity Dashboard

On average, MiCelerity receives data for 71% of diagnoses within 24 hours, 80% within 1 week, and 90% within 2 weeks. EDRS data will likely lag, the lag time is being explored and will be updated.

Visits over Time (Source: ABT Data)

30 out of 15,550 are missing admission date and not plotted on graph.

Visits by Patient Sex

Visits by Patient Age Category
Risk factors for experiencing multiple overdoses

Example analysis using MiCelerity data
Goal for this analysis

• Are any groups of Michigan residents at an increased risk of experiencing a second suspected overdose?
  • Surviving a past overdose can increase a person’s risk of overdosing*
  • Provide insights for substance use prevention
• Provide framework to LHDs for similar analyses

*Source: https://www.mass.gov/service-details/opioid-overdose-risk-factors
Data exported from MiCelerity

### Diagnosis Listing

- **Saved Search List:** All Valid Visits
- Displaying results 1-10 of 218172 found

<table>
<thead>
<tr>
<th>Admission or Death Date</th>
<th>Source</th>
<th>Drug Class</th>
<th>Poisoning Classification</th>
<th>Patient Name</th>
<th>Facility</th>
<th>Jurisdiction</th>
<th>Visit ID</th>
<th>Visit Sequence</th>
<th>Diagnosis ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>First Name</td>
<td>0</td>
<td>0</td>
<td>Visit ID</td>
<td>Visit Sequence</td>
<td>Diagnosis ID</td>
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<td>To</td>
<td>Select</td>
<td>Select</td>
<td>Select</td>
<td>Last Name</td>
<td>Select</td>
<td>Select</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Export button highlighted]
Data cleaning procedure

• Probable drug poisonings
• Deduplicated by 1) Visit ID then 2) Patient ID
• Michigan residents in Michigan Emergency Departments
• Excluded deceased cases
• Created RepeatOD variable
  • RepeatOD = 1 → more than one overdose
  • RepeatOD = 0 → only one overdose recorded
MiCelerity data for analysis

- 38,239 Michigan residents,
- accounting for 50,094 overdose events,
- between 01/01/2020 – 04/30/2022

5,871 (15.3%) residents with repeat overdoses
32,368 (84.7%) residents with only one overdose
Analysis procedure

**Outcome** = experiencing more than one overdose

1. Univariate logistic regression

2. Assessed multivariate model for:
   1. Collinearity
   2. Interaction
   3. Confounding

3. Present Odds Ratios from multivariate model
   Who is more likely to experience more than one overdose?
Michigan residents who experienced one or more than one suspected overdose by sex (January 2020 - April 2022)

Female: 52.4% One overdose, 47.7% More than one overdose
Male: 47.1% One overdose, 52.0% More than one overdose
Unknown: 0.5% One overdose, 0.3% More than one overdose
Results

Median age: 34 for both overdose categories

Michigan residents who experienced one or more than one suspected overdose by age group (January 2020 - April 2022)

- 65+ years: 13.7% (One overdose), 10.3% (More than one overdose)
- 55-64 years: 10.3% (One overdose), 10.8% (More than one overdose)
- 45-54 years: 10.4% (One overdose), 11.0% (More than one overdose)
- 35-44 years: 14.3% (One overdose), 17.7% (More than one overdose)
- 25-34 years: 17.9% (One overdose), 24.5% (More than one overdose)
- 15-24 years: 20.2% (One overdose), 19.3% (More than one overdose)
- 0-14 years: 13.2% (One overdose), 6.2% (More than one overdose)
Michigan residents who experienced one or more than one suspected overdose by race (January 2020 - April 2022)

- White/Caucasian: 67.8% more than one overdose, 63.9% one overdose
- Black/African American: 12.0% more than one overdose, 14.1% one overdose
- Asian & Pacific Islander: 0.5% more than one overdose, 0.6% one overdose
- Alaska Native/American Indian: 0.8% more than one overdose, 0.7% one overdose
- Other: 5.0% more than one overdose, 6.2% one overdose
- Unknown: 14.0% more than one overdose, 14.5% one overdose
Results

Univariate Regression Analysis of Experiencing More than One Suspected Overdose among Michigan Residents by Sex and Age Group (January 2020 - April 2022).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Male</td>
<td>0.87 (0.82, 0.94)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td><strong>Age groups (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-14</td>
<td>0.48 (0.42, 0.56)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>15-24*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25-34</td>
<td>1.27 (1.14, 1.40)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>35-44</td>
<td>1.19 (1.07, 1.33)</td>
<td>0.0017</td>
</tr>
<tr>
<td>45-54</td>
<td>1.05 (0.93, 1.19)</td>
<td>0.4044</td>
</tr>
<tr>
<td>55-64</td>
<td>1.05 (0.93, 1.19)</td>
<td>0.4369</td>
</tr>
<tr>
<td>65+</td>
<td>0.79 (0.69, 0.89)</td>
<td>0.0002</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Black/African American</td>
<td>0.85 (0.76, 0.94)</td>
<td>0.0011</td>
</tr>
<tr>
<td>Asian &amp; Pacific Islander</td>
<td>0.98 (0.63, 1.53)</td>
<td>0.9348</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>1.10 (0.79, 1.54)</td>
<td>0.5705</td>
</tr>
<tr>
<td>Other</td>
<td>0.84 (0.71, 1.00)</td>
<td>0.0530</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.98 (0.81, 1.19)</td>
<td>0.8672</td>
</tr>
</tbody>
</table>

*Reference group
Results

Odds Ratios of Experiencing More than One Suspected Overdose among Michigan Residents by Sex and Age Group (January 2020 - April 2022).

- Female v. Male: 0.89
- 0-14 years v. 15-24 years: 0.49
- 25-34 years v. 15-24 years: 1.40
- 35-44 years v. 15-24 years: 1.28
- 45-54 years v. 15-24 years: 1.10
- 55-64 years v. 15-24 years: 1.10
- 65+ years v. 15-24 years: 0.81

Less likely — Equally likely — More likely
Conclusions

Those who are more likely to experience more than one overdose:

- Males
  - vs females
- Cases 15-64 years old
  - vs younger cases (0-14 years old) and older cases (65+ years old)
  - Age group 15-34 years old are most likely
    - Followed by those 35-44 years old

*All statistically significant at alpha level 0.05*
Limitations to this analysis

• Years available in MiCelerity
  • January 2020 – Present
• Missing race/ethnicity data
  • 5,580 (14.4%) cases had an unknown race
  • 10,258 (26.6%) cases had an unknown ethnicity
• Model was limited to variables included in the data set
• Fatal overdoses were not included
Next steps for this analysis

- Share analysis code with LHD MiCelerity users
  - Jurisdiction-specific analyses
  - Available for SAS and R
- Incorporate fatal overdose events using EDRS data
  - Who is more likely to experience a fatal overdose?
  - How do the risk factors for a second overdose compare to the risk factors for a fatal overdose?
- Time-to-event analysis using fatal overdose data
Next steps for MiCelerity

- Insurance data for each suspected overdose
  - Retrospective data available back to April 2022
- Exploring possible data linkages:
  - EMS data (BioSpatial)
  - Data on housing and homelessness
  - Medicaid data
- Meeting with LHD users for collaboration
  - Next quarterly meeting is July 22\textsuperscript{nd}
Any questions?
Thank you!

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Please contact
MDHHS-MODASurveillance@Michigan.gov
if you would like access to MiCelerity