Bio-Surveillance of Non-Fatal Overdoses in Minnesota: A View a Bit Farther Down the Pathology of Substance Use

APHL Annual Meeting
June 3, 2019
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Overview

• MNDOSA Overview – Recap
• Laboratory Results
• Lessons Learned (to date)
MNDOSA Objectives

• Determine the burden of substance use/overdoses seen in select emergency departments and hospitals in Minnesota.

• Identify clusters of drug overdoses.

• Identify substances causing clusters, unusual or atypical clinical presentation, and severe illnesses in order to inform approaches to treatment and prevention.

• Describe the populations most affected to help focus and guide prevention efforts.
Funding

• LRN-C
  • Staff time
  • Instrumentation
  • Vendor contract (SOPs, calibrators, controls)

• CSTE
  • Grant (via SAMHSA)
  • Medical Records Abstractor
  • Small amount for analysis

• CDC
  • Enhanced State Opioid Surveillance (ESOOS)
  • Bulk of sample analyses for initial rollout

• For this past year and moving forward:
  • OPIS-S2 CoAg for Crisis Response
  • Overdose Data to Action (OD2A)
    • Applied: Special Projects
Snapshot of Minnesota

![Graph showing opioid-involved drug overdose deaths by non-exclusive drug category, MN residents, 2000-2017.]

**Opioid-involved drug overdose deaths by non-exclusive drug category, MN residents, 2000-2017**

- **All opioid-involved deaths**: 401
- **Other Opioids and Methadone**: 188
- **Synthetic Opioids**: 172
- **Heroin**: 106

**NOTE:** Data are preliminary and likely to change when finalized. Also, the category other opioids and Methadone includes prescription opioids.

PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS
Review: Who will be reported with MNDOsa?

- All patients who are hospitalized or present to the ED (regardless of discharge status) where the principal diagnosis is attributed to the recreational use of one or more of the following (including withdrawal symptoms):
  - **Traditional illicit drugs**, including:
    - amphetamines
    - cocaine
    - PCP
    - LSD
  - **Opioids** (including heroin)
  - **Synthetic**, non-prescription drugs, including:
    - synthetic **cannabinoids** (K2, spice, etc.)
    - synthetic **cathinones** (i.e. bath salts)
    - other synthetic hallucinogens (2-C compounds, NBOMBe or “super LSD”, etc.)
  - **Prescription drugs**, including:
    - cold medicines
    - barbiturates
    - benzodiazepines
    - other anticonvulsants (Lyrica, gabapentin, etc.)
    - sleep medications
    - stimulants (Adderall, Ritalin, etc.)
    - antidepressants
    - antidiarrheal medications (loperamide, etc.)
    - muscle relaxants
  - **Drug combinations**, including:
    - Speedball (cocaine and heroin)
    - Methamphetamine and fentanyl
  - **Natural** substances used for recreational purposes, including:
    - marijuana
    - mushrooms
    - psychoactive drugs
    - hallucinogens
    - other herbal substances with intoxicating effects
  - **Other substances**, including:
    - inhalants
    - other???
Current participating sites

- Healthcare locations submitting reports samples for Minnesota Drug Overdose and Substance Abuse (MNDOSA) Study.
  - **Essentia Health System** – 6 Hospitals in the Northeast Portion of the state submitting (Duluth Area)
  - **Hennepin Healthcare** – Submitting reports only
### Aggregate results – all sites, Nov. 1, 2017 – April 4, 2019

<table>
<thead>
<tr>
<th>Number of ED visits reported</th>
<th>1,174</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>752 (66%)</td>
</tr>
<tr>
<td>Female</td>
<td>390 (34%)</td>
</tr>
<tr>
<td>&quot;Patients of Special Interest&quot;</td>
<td></td>
</tr>
<tr>
<td>Deceased</td>
<td>5 (1%)</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>193 (26%)</td>
</tr>
<tr>
<td>Atypical clinical presentation</td>
<td>46 (6%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Median age</td>
<td>33</td>
</tr>
<tr>
<td>Age range</td>
<td>13 - 69</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>77 (10%)</td>
</tr>
<tr>
<td>Black</td>
<td>251 (33%)</td>
</tr>
<tr>
<td>White</td>
<td>308 (41%)</td>
</tr>
<tr>
<td>Asian (including Native Hawaiian/Pacific Islander)</td>
<td>8 (1%)</td>
</tr>
<tr>
<td>Multirace</td>
<td>2 (&lt; 1%)</td>
</tr>
<tr>
<td>Other</td>
<td>24 (3%)</td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>82 (11%)</td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>45 (12%)</td>
</tr>
</tbody>
</table>

Gender distribution:
- Male: 752 (66%)
- Female: 390 (34%)

Patients of Special Interest:
- Deceased: 5 (1%)
- Hospitalized: 193 (26%)
- Atypical clinical presentation: 46 (6%)

Age distribution:
- Median age: 33
- Age range: 13 - 69

Race distribution:
- American Indian/Alaskan Native: 77 (10%)
- Black: 251 (33%)
- White: 308 (41%)
- Asian (including Native Hawaiian/Pacific Islander): 8 (1%)
- Multirace: 2 (< 1%)
- Other: 24 (3%)
- Missing or unknown: 82 (11%)
Hospitalized MNDOSA cases, all sites, Nov. 1, 2017 – April 4, 2019

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>193 (26% of all male MNDOSA cases)</td>
<td>120 (31% of all female MNDOSA cases)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median age</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>Age range</td>
<td>14 - 69</td>
<td>13 - 80</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>16 (8%)</td>
<td>20 (17%)</td>
</tr>
<tr>
<td>Black</td>
<td>38 (20%)</td>
<td>18 (15%)</td>
</tr>
<tr>
<td>White</td>
<td>100 (52%)</td>
<td>58 (48%)</td>
</tr>
<tr>
<td>Asian (including Native Hawaiian/Pacific Islander)</td>
<td>2 (1%)</td>
<td>6 (5%)</td>
</tr>
<tr>
<td>Multirace</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (2%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>33 (17%)</td>
<td>16 (13%)</td>
</tr>
</tbody>
</table>
### Suspected drug/substance (non-exclusive drug category)

<table>
<thead>
<tr>
<th>Suspected Drug/Substance</th>
<th>Male (N = 752)</th>
<th>Female (N = 390)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methamphetamine</td>
<td>226 (30%)</td>
<td>133 (34%)</td>
</tr>
<tr>
<td>All opioids</td>
<td>222 (30%)</td>
<td>138 (35%)</td>
</tr>
<tr>
<td>Heroin</td>
<td>150 (20%)</td>
<td>101 (26%)</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>12 (2%)</td>
<td>4 (1%)</td>
</tr>
<tr>
<td>Other opioids</td>
<td>33 (4%)</td>
<td>21 (5%)</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>6 (&lt; 1%)</td>
<td>3 (&lt; 1%)</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>41 (5%)</td>
<td>25 (6%)</td>
</tr>
<tr>
<td>Other prescription medications</td>
<td>34 (5%)</td>
<td>32 (8%)</td>
</tr>
<tr>
<td>Marijuana</td>
<td>104 (14%)</td>
<td>62 (16%)</td>
</tr>
<tr>
<td>Synthetic drugs</td>
<td>159 (21%)</td>
<td>20 (5%)</td>
</tr>
<tr>
<td>Cocaine</td>
<td>79 (11%)</td>
<td>47 (12%)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>23 (3%)</td>
<td>20 (5%)</td>
</tr>
<tr>
<td>Other substances</td>
<td>50 (7%)</td>
<td>26 (7%)</td>
</tr>
</tbody>
</table>
All MNDOSA reports: suspected substance(s), by gender

% of all MNDOSA reports

- Methamphetamine
- All opioids
- Heroin
- Oxycodone
- Other opioids
- Fentanyl
- Benzodiazepines
- Other prescription medications
- Marijuana
- Synthetic drugs
- Cocaine
- Alcohol
- Other substances

Male | Female

PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS
Lab specimen results

- Lab results will be used for **surveillance purposes only**, and reported to:
  - MDH
  - the site contact
- Lab results **will not be used for diagnostic or clinical purposes**
  - Our methods are on our CLIA scope of testing, also seeking ISO 17025 forensic accreditation
- Lab results **will not go in the patient’s medical record**
- Each site will receive an aggregated monthly report, summarizing all patients reported to MNDOsA and aggregate lab results
- Lab will get “convenience” samples for testing (blood and/or urine)
Current Analytical Method

• Targeted semi-quantitative analysis with qualitative reporting; LC/MS/MS

• Due to the number of targeted compounds and existing methodologies, three analytical methods were developed (six when including both matrices)
  • Opioids (fentanyl and fentanyl-analogs) – 40 compounds (was 19)
    • (CDC panel of 140 fentanyl compounds being added to spectral library)
  • Designer Drugs (e.g., synthetic cannabinoids, cathinones) – 93 compounds (was 68)
    • (vendor panel of 350 more being added to spectral library)
  • Multi-Drug Panel (e.g., stimulants, benzos, barbiturates, etc.) – 136 compounds (was 131)
PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS
Number of Panel Analytes Reported per Sample

PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS
Results – June 2019

Number of Panel Analytes Reported by Sample
(Only Samples with MNDOSA Reports (n = 195 samples))
To date the Lab has analyzed samples from 141 Subjects:

- Blood: 116 samples tested
- Urine: 110 samples tested

93 subjects submitted both blood and urine for analysis.
Summary of Results

• Fentanyl and Acetyl Fentanyl detected in both matrices
  • Detected Fentanyl in 10 subjects who submitted both matrices.
  • One subject had Norfentanyl detected in blood and Fentanyl detected in urine
  • Acetyl Fentanyl and Acetyl Norfentanyl were positive for subjects in both matrices, if submitted.
    • One subject detected Acetyl Fentanyl in blood, and both Fentanyl and Acetyl Norfentanyl in urine.

• Methamphetamine was most prevalent illicit drug detected.
  • In subjects who test positive for meth, both matrices (if given) had positive results.
  • Concentrations have been extremely high in urine samples.

• Synthetic Cannabinoids – Majority of positives we in blood. Had two positives in urine.
Results – June 2019

Detected substance

- Methamphetamine
- Specimens with at least one opioid
- Heroin or 6-MAM
- Specimens with fentanyl
- Specimens with at least one benzodiazepine
- Cocaine
- Specimens with at least one synthetic cannabinoid or cathinone

Percentage distribution by gender:
- Males (N = 80)
- Females (N = 42)
MDH lab results, 127 MNDOSA encounters represented

<table>
<thead>
<tr>
<th>Lab results</th>
<th>Detected substance (by MDH Lab testing)</th>
<th>Suspected substance (from MNDOSA report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methamphetamine</td>
<td>89</td>
<td>59</td>
</tr>
<tr>
<td>Specimens with at least one opioid</td>
<td>58</td>
<td>33</td>
</tr>
<tr>
<td>Heroin or 6-MAM</td>
<td>9</td>
<td>24</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Specimens with fentanyl*</td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>Specimens with at least one benzodiazepine**</td>
<td>62</td>
<td>10</td>
</tr>
<tr>
<td>Cocaine</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Specimens with at least one synthetic cannabinoid or cathinone</td>
<td>10</td>
<td>19</td>
</tr>
</tbody>
</table>

*Nine specimens that were positive for fentanyl were also positive for acetyl fentanyl

**May have been administered for clinical care
Lessons Learned...So Far

• Looking beyond just opioids has been important

• Calibration range considerations – OD patients different from drug screens

• If starting, up pros and cons of analyte panel size
  • Smaller is easier to start and less expensive to maintain, but more likely to miss important analytes and adding additional compounds can require method changes
  • Larger/expanded panels means tracking many expiration dates, challenges finding blank matrix, more supplies and inventory to track.

• Balancing between adding new compounds and analyzing samples.
Lessons Learned...So Far

• The number of drugs of abuse, metabolites, and adulterants keeps getting larger

• Conclusion: A better strategy will be to use a non-targeted screening method

• Patient Care vs. Public Health – in MN participation far from universal
  • Expanding participation has been slower than anticipated
  • Need advocacy higher up within and external to department to promote benefits
  • Looking to other states (e.g., Rhode Island) for more universal reporting and sampling
Acknowledgments

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• Mark Kinde
• Nate Wright

MDH State Epidemiologist

• Ruth Lynfield
Questions?

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