



# Minnesota Drug Overdose and Substance Abuse Pilot Surveillance System (MNDOSA) – A Response to the Opioid Crisis

APHL Annual Meeting

June 3, 2018

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# Overview

- MNDOSA Planning & Scope
- Laboratory Component
- 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)

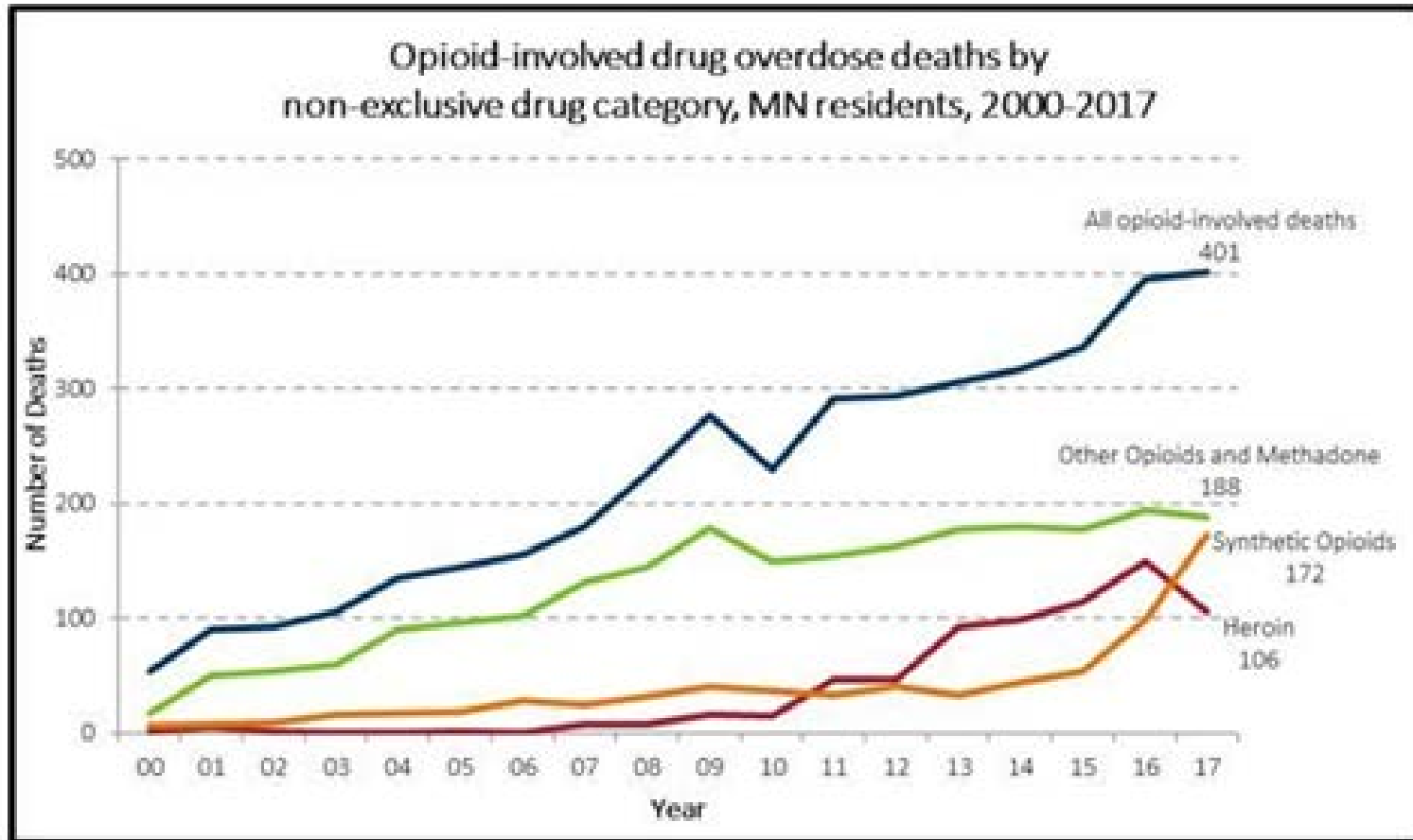
- CSTE

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

- CDC

- Enhanced State Opioid Surveillance (ESOOS) Grant
- Bulk of sample analyses

# Snapshot of Minnesota



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

# 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, NBOMe 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???**

# Review: **How** will reports be made to MNDOSA?

Clinician identifies patients in ED meeting MNDOSA reporting criteria:

- Signs/symptoms attributed to drug or substance use/abuse (excluding alcohol only cases)
- Drug or substance use/abuse was recreational, NOT:
  - **Accidental, unintentional overmedication** (i.e. tried to make up a missed dose, forgot they already took a dose, accidentally doubled the dose, etc.)
  - **Adverse reaction** to medication that was taken as recommended
  - **Accidental ingestion** (i.e. accidental child poisoning, took wrong medication unintentionally, etc.)
- Drug or substance use/abuse was NOT:
  - Intentional overdose (i.e. **suicide attempt**)
  - Assault (i.e. “date rape”, malicious poisoning, etc.)



# Current participating sites

**St. Luke's Hospital – November 2017**

**Essentia Health - St. Mary's Medical Center – November 2017**

**Hennepin County Medical Center – February 2018**

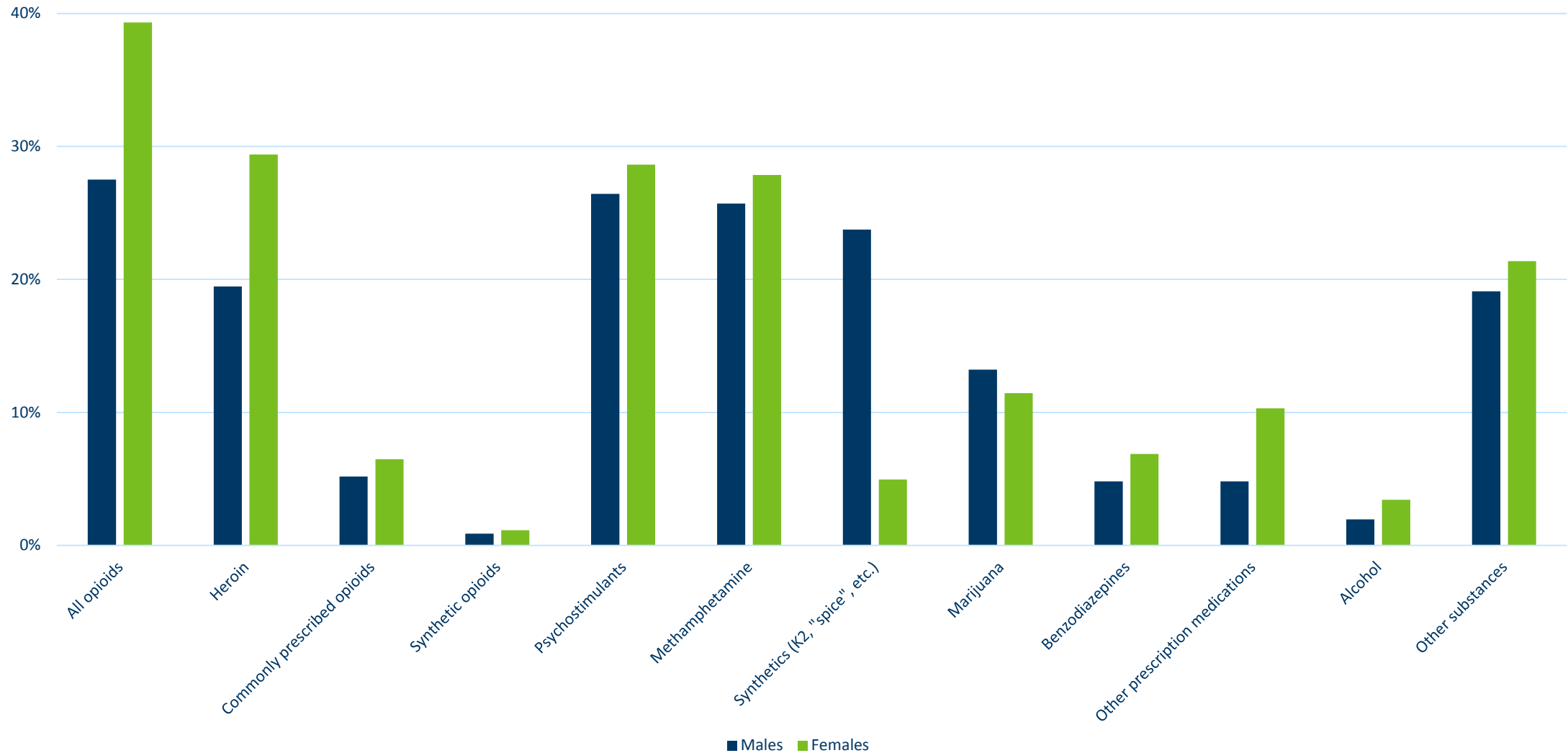
**(reports only)**

**(Four additional Essentia Health in NE MN being added.)**

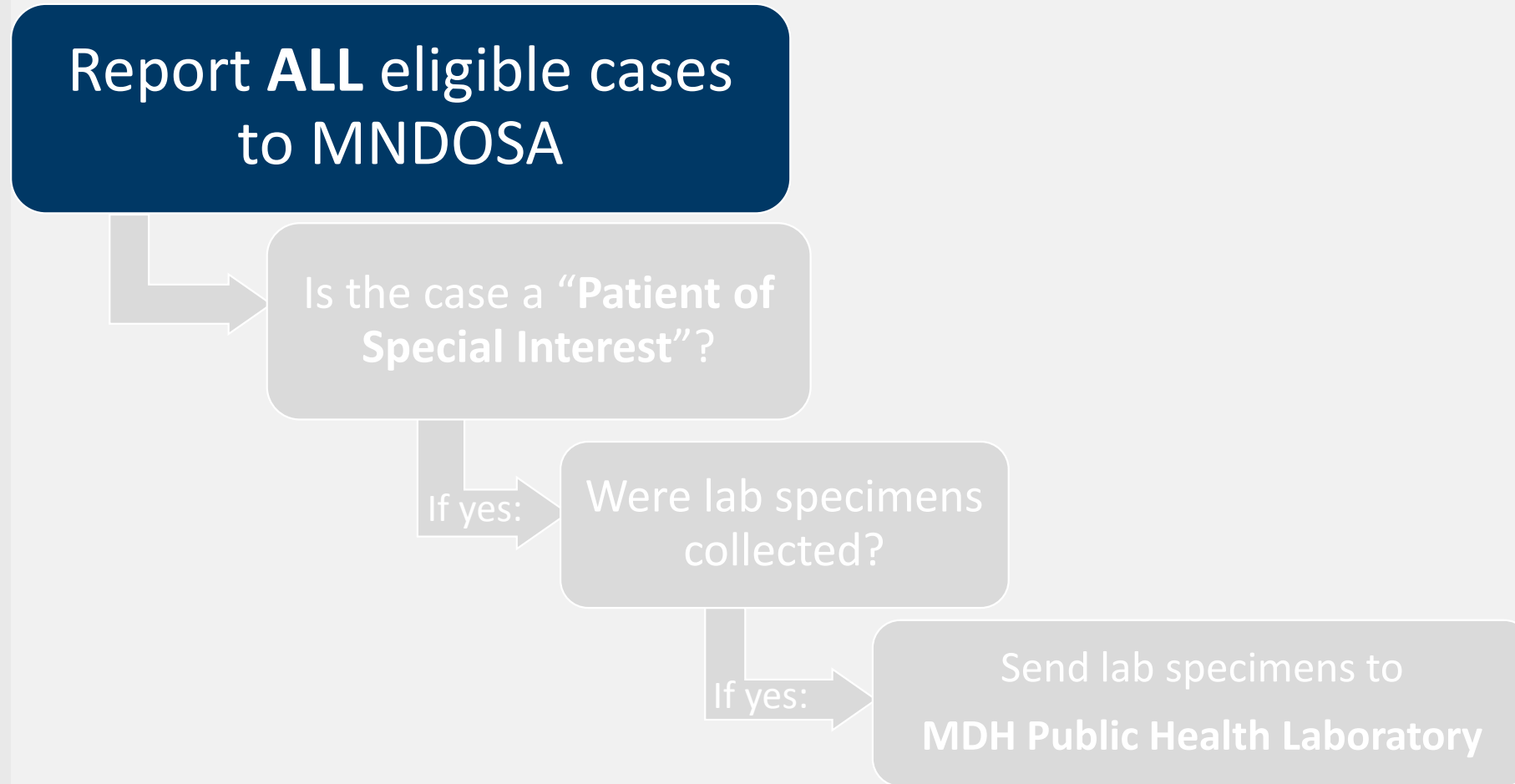
# MNDOSA reports, November 1, 2017 – May 28, 2018

<b>Number of ED visits reported</b>	854
<b>Number of patients reported</b>	736
<b>"Patients of Special Interest"</b>	
Deceased	4 (< 1%)
Hospitalized	180 (21% of all visits)
Atypical clinical presentation	49 (6% of all visits)
<b>Number of Visits, n (%)</b>	
Single visit	658 (89%)
Two visits	58 (8%)
Three visits	14 (2%)
Four or more visits	6 (1%)

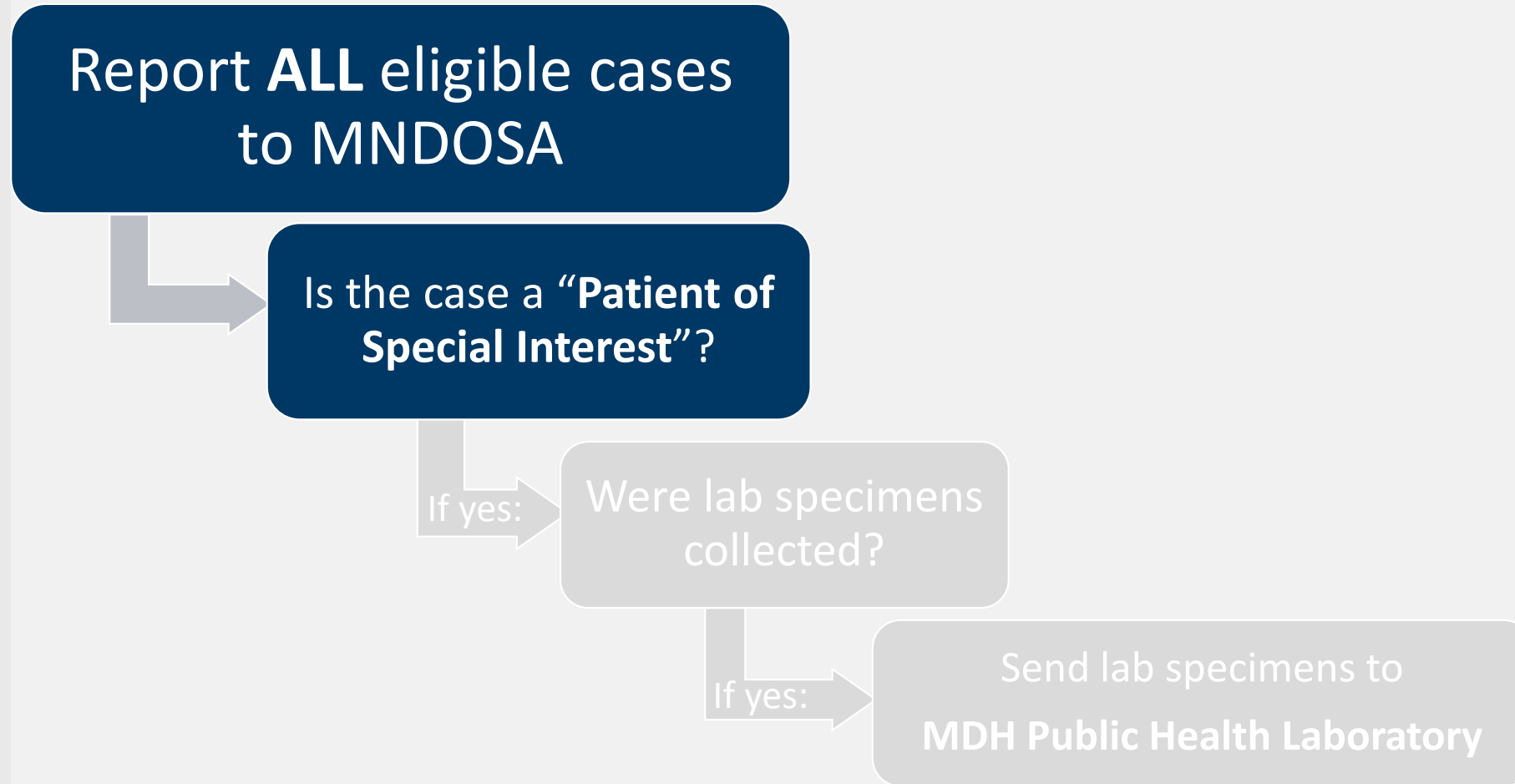
# Suspected drug/substance, non-exclusive drug category (as reported to MNDOSA)



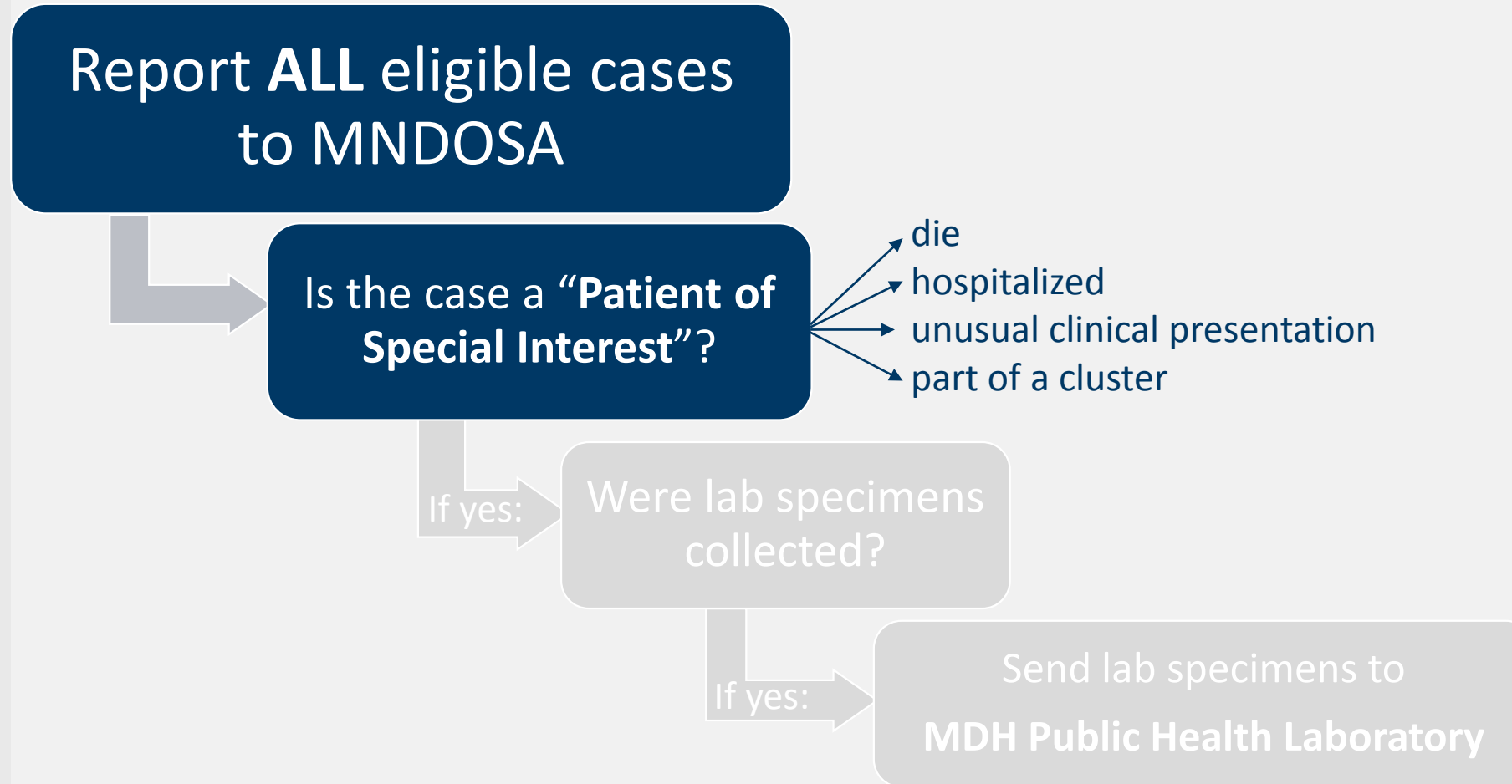
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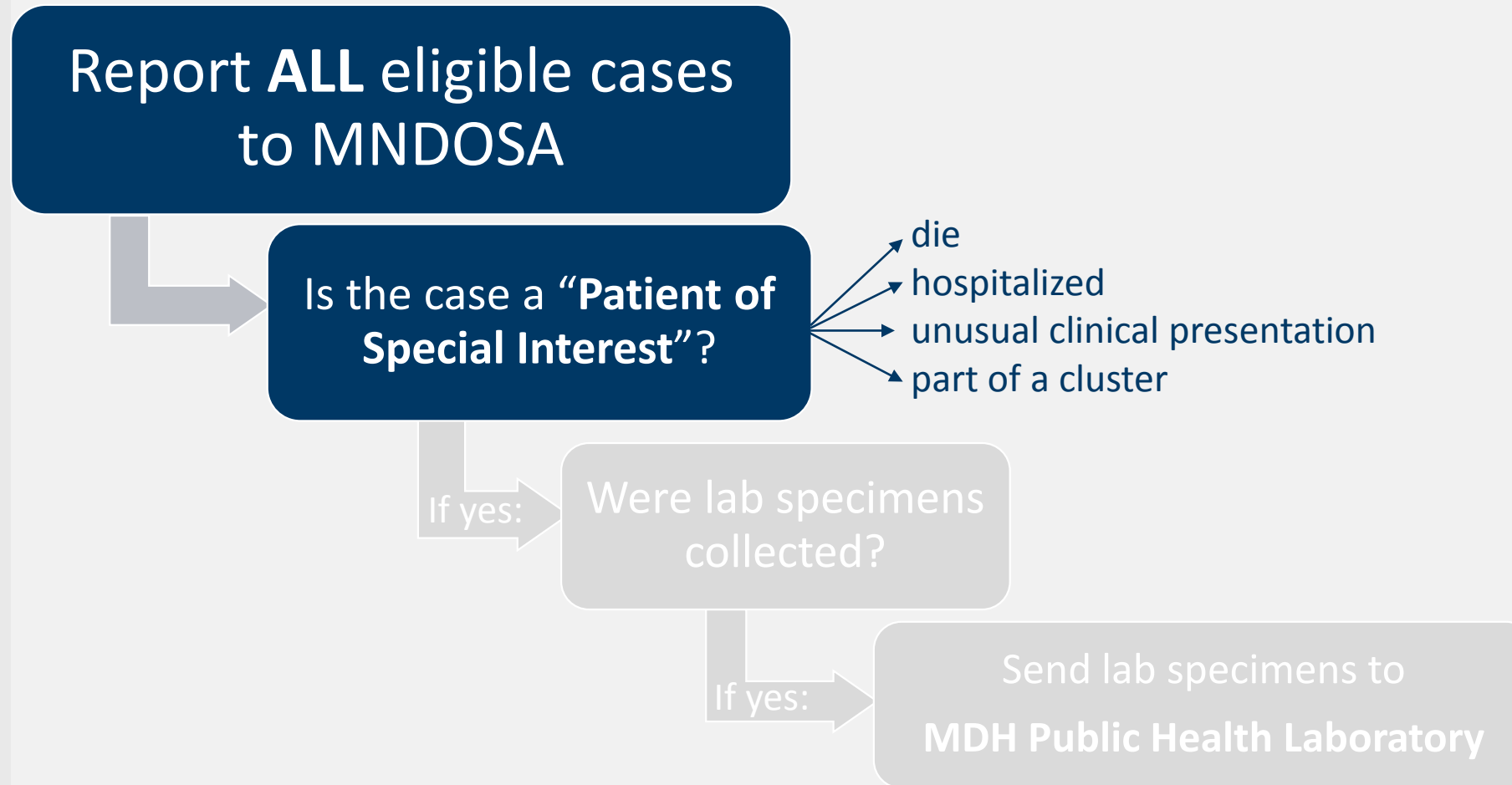
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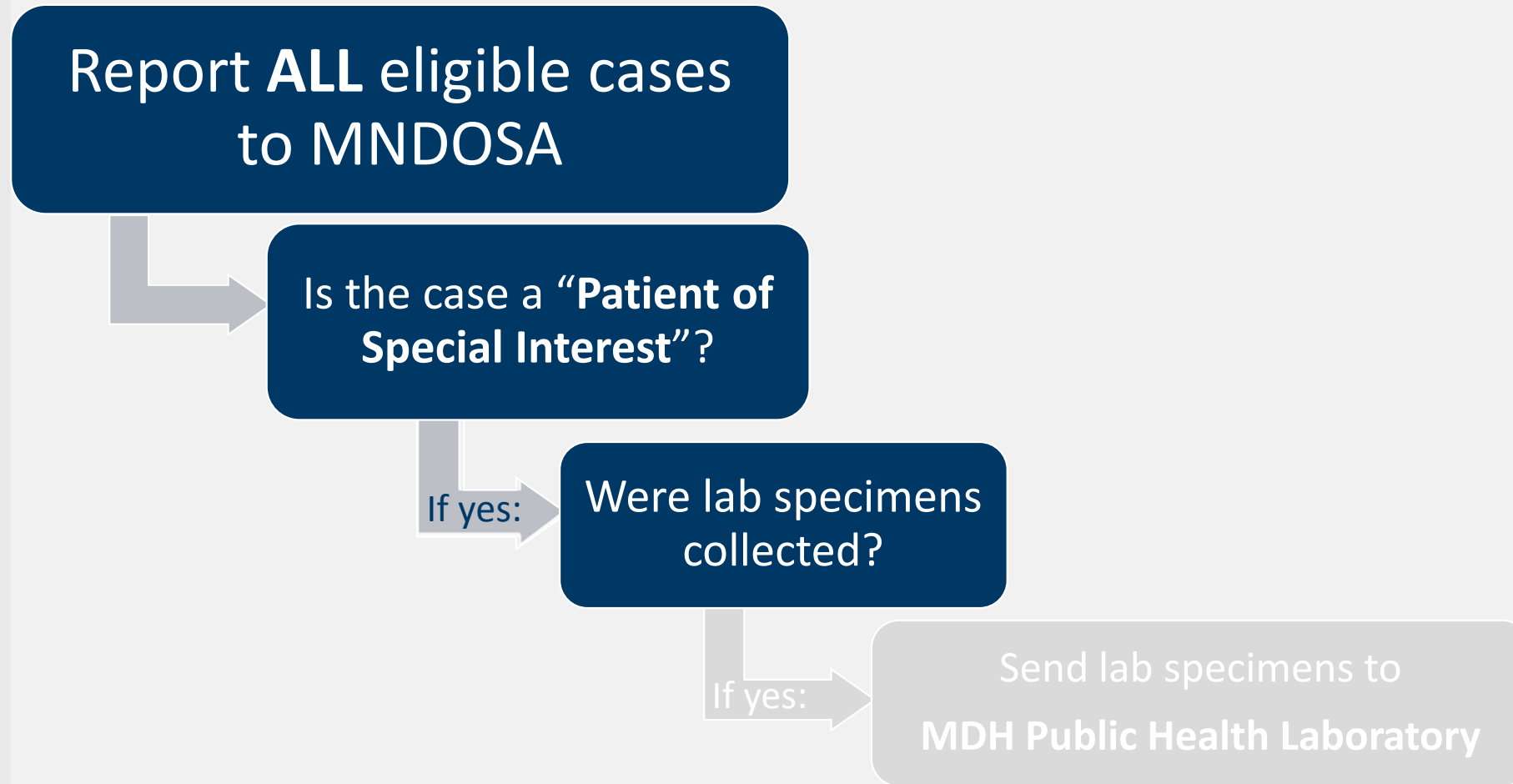
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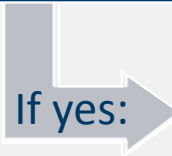


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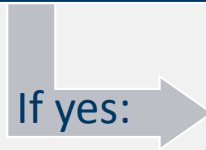
Report **ALL** eligible cases to MNDOSA




Is the case a “Patient of Special Interest”?



Were lab specimens collected?



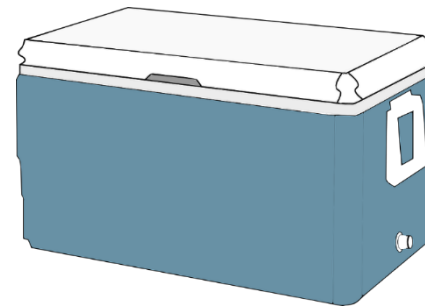
Send lab specimens to **MDH Public Health Laboratory**

 <b>Biological Sample Submission</b>		Minnesota Department of Health Environmental Laboratory 601 Robert St. North St. Paul, MN 55155 651-201-5300 <a href="http://www.health.state.mn.us/dhr/pbl/environmental/index.html">www.health.state.mn.us/dhr/pbl/environmental/index.html</a>		Page <b>1</b> of <b>1</b>	
Lab Use Only	Program Code (3 Letters)	Project Name	Client / Agency		
	Submitting Client / Agency		City		
	Contact Name		Contact Phone #		
	Contact Email Address				
	Report to Name				
	Report to Phone #		Report to Fax #		
	Report to Email Address			# of Containers / Matrix	
	Sampled by (print)				
	↓ Analyses ↓				
	MDH # (Lab Use Only)				

# Lab specimen submission

Submit remaining blood and/or urine specimens for “**Patients of Special Interest**” who had toxicology samples drawn

- Urine
  - 5mL
  - collected in small vials
  - specimen must be **frozen** if not shipped the day it was collected
- Whole blood
  - collected in EDTA preserved (purple top) tubes
  - **kept cold**

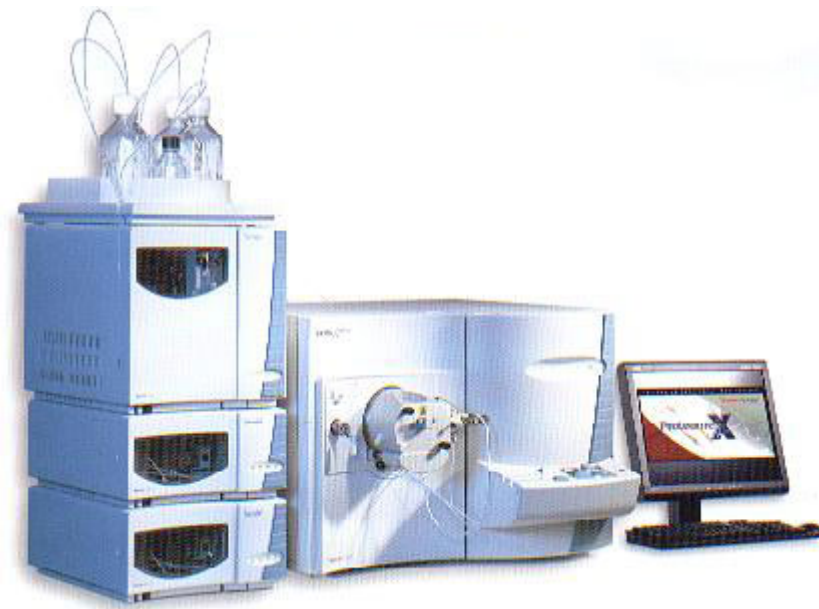


# Lab specimen results

- 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**
- 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

# Laboratory Testing

- Analytical Method Adaptation
- Analytes
- Validation
- CLIA
- Results
- Lessons Learned



# Analytical Method

- Developed on an LC-QQQ (Agilent 6460) for qualitative (presence/absence) reporting, adapted from PinPoint Testing, LLC analytical methods
- Four calibrators and a single QC per compound, isotopically-labelled IS when available
  - Intent to evaluate potential for full quantitative method
- Blood and urine matrix
- Due to the large number of compounds and existing methodologies, used 3 analytical methods
  - Opioids (fentanyl and fentanyl-analogs) – 19 compounds (15 more being brought online)
  - Designer Drugs (e.g., synthetic cannabinoids, cathinones) – 68 compounds (additions here as well)
  - Multi-Drug Panel (e.g., stimulants, benzodiazepines, barbiturates, etc.) – 131 compounds

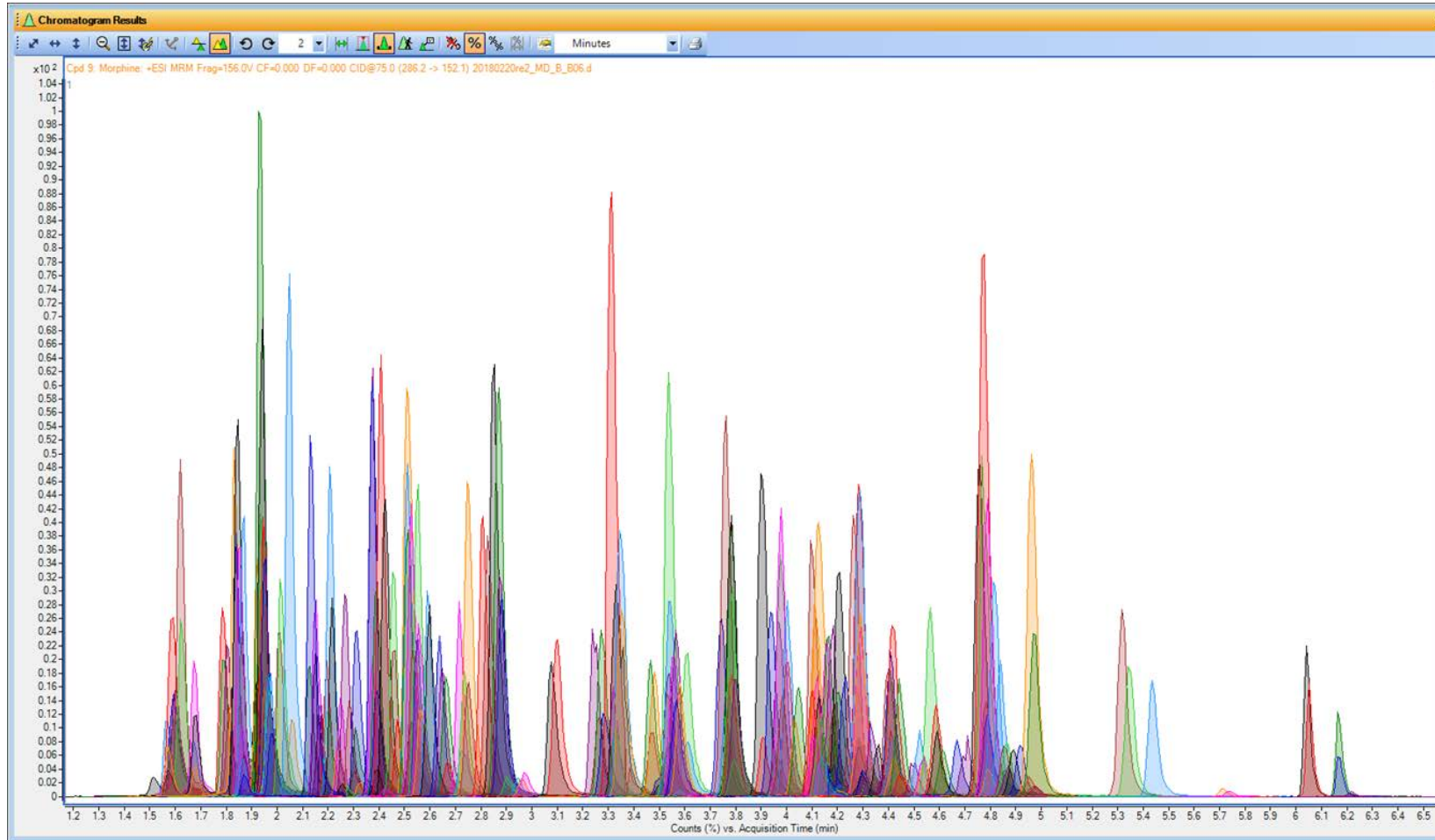
# Analytical Method

- Single sample clean-up procedure (SLE) for all three analytical methods (allows parallel processing), created Zephyr application for automation
- Urine panel – deconjugation step
- Same column (Phenomenex Kinetex Phenyl-Hexyl 50 x 2.1mm, 1.7 $\mu$ m) and mobile phases for the methods
- Dynamic (dMRM) acquisition mode (scheduled MRM)
  - Example - Multi-Drug Method: 246 MRMs/5 minutes, minimum dwell 3.44ms at 2 scans/sec

# Validations

- Extraction recovery was consistent and sufficient to detect all compounds
- No false positives or false negatives
- Accuracy and precision was very good for most compounds
- See the extracted MRM screenshot
- See the Multi-Drug Panel QC Accuracy pdf (excludes aripiprazole)

# Analytes





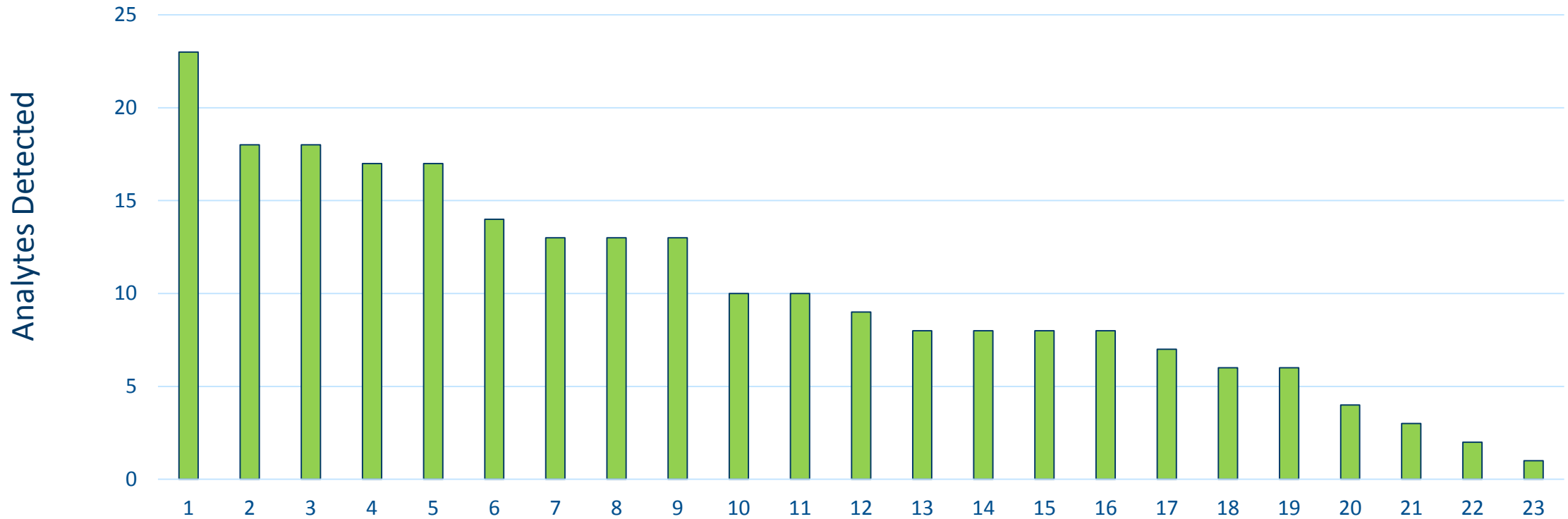


- LRN-C and Biomonitoring
  - SOPs
  - Validations
  - Reports



# Results

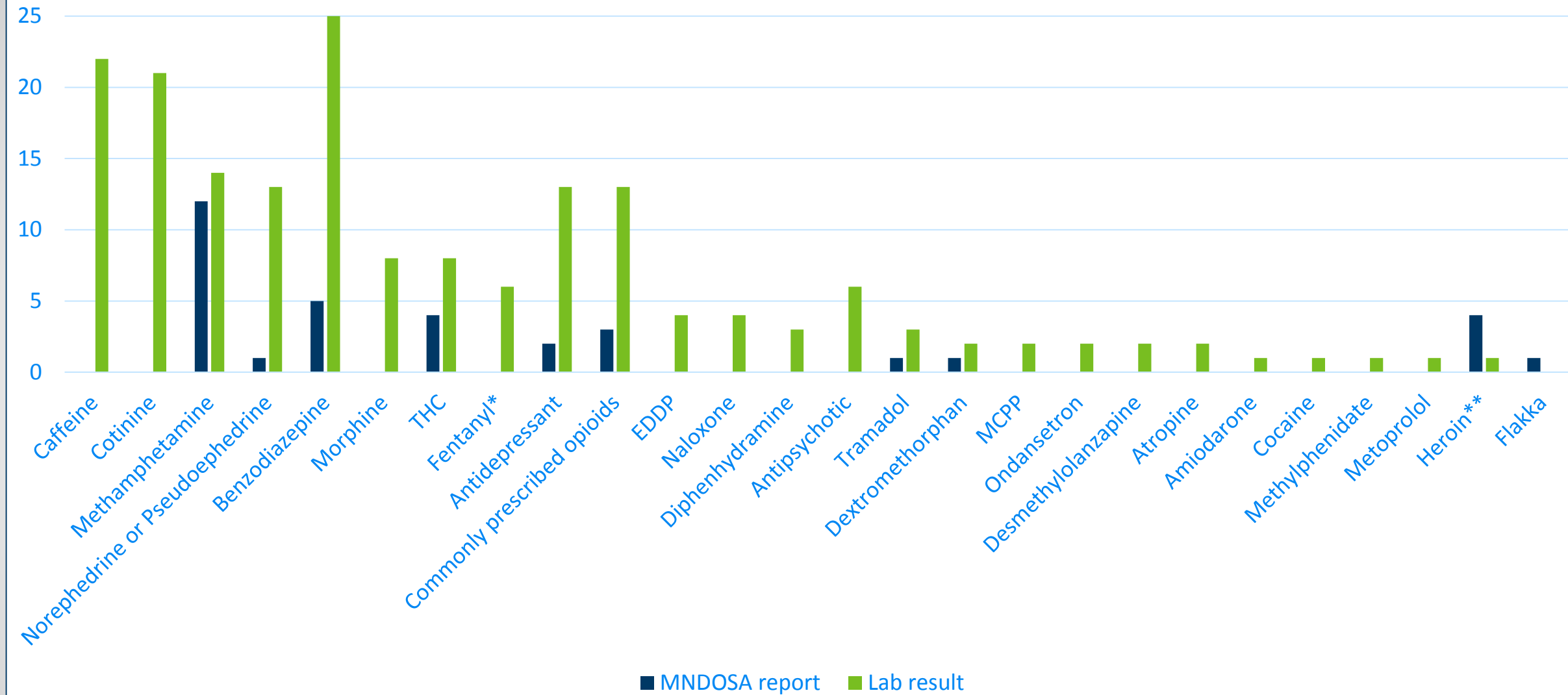
Number of Panel Analytes Reported per Sample



# Results

- Acetyl Fentanyl, Acetyl Norfentanyl, alpha-hydroxyalprazolam, Alprazolam, Amphetamine, Bupropion, Caffeine, Codeine, Cotinine, Diphenhydramine, EDDP, Fentanyl, Lorazepam, MCPP, Methadone, Methamphetamine, Metoprolol, Midazolam, Morphine, Norephedrine, Norfentanyl, Pseudoephedrine, Trazodone
- 6-MAM, Amphetamine, Caffeine, Codeine, Cotinine, Desmethyloanzapine, Dextromethorphan, Dextrorphan, Diphenhydramine, Fentanyl, Lorazepam, Methamphetamine, Morphine, Norbuprenorphine, Norephedrine, Norfentanyl, Pseudoephedrine, THC-COOH

## Substances on board



\*Includes Fentanyl, Norfentanyl, Acetyl Fentanyl, Acetyl Norfentanyl

\*\*All reports of heroin (n=4) tested positive for fentanyl or a fentanyl analogue, one also tested positive for 6-MAM

# Lessons Learned...So Far

- Lack of knowledge and experience using public health condition codes in medical records
- Creating lab order panels in Electronic Medical Record systems in order to submit specimens to health laboratories can be challenging for hospitals
- Efficient and successful transportation of samples from the hospitals to the lab can be expensive
- The Agilent 6460 LC-QQQ performed well, needed upgraded acquisition software and firmware
- Potential for quantitative methods on the LC-QQQ, however the number of compounds per method is limited

# Lessons Learned...So Far

- The number of drugs of abuse, metabolites, and adulterants keeps getting larger
- Targeted QQQ methods have hard limits on the number of compounds that can be included
- Epidemiologists always want more data
- Conclusion: A better strategy might be to use a targeted and non-targeted screening method (e.g., high resolution MS/MS or QTrap QQQ scan) for compound identification, and then follow-up with quantitation with a targeted LC-QQQ (or QTOF MRM-HR) method, if desired/necessary. (Are we doing it backwards?)

# Acknowledgments

## MDH-PHL

- Joanne Bartkus
- Jason Peterson\*
- Stefan Saravia
- Matt Wogen\*\*
- Carin Huset
- Mark Lunda

## MDH – Injury Prevention

- Terra Wiens (Project Coordinator)
- Jon Roesler
- Mark Kinde
- Nate Wright

## MDH State Epidemiologist

- Ruth Lynfield



# Questions?

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