Approaches to Syndromic Case Definitions for Drug Overdose Surveillance

R. Matt Gladden
Behavioral Scientist
Division of Unintentional Injury, CDC

Bradley J. Tompkins, M.S., M.P.H.
Infectious Disease Epidemiologist
Vermont Department of Health

Shayla F. Livingston, MPH
Public Health Analyst - Alcohol and Drug Abuse Programs
Vermont Department of Health
Agenda

- **Background**
  - Drug overdoses and opioid pain reliever (OPR) overdoses
  - State/CDC need for emergency department syndromic definitions

- **Tool**
  - Description and lessons learned
  - Case definitions

- **Validation**
  - Pilot
  - Draft findings

- **Next steps**
Drug overdoses have surpassed motor vehicle crashes as the leading cause of injury death.
Dramatic increase in overdose deaths related to opioid pain relievers (OPR) and heroin

Number of Deaths

Year


Opioid pain relievers

Cocaine

Heroin

4,030 OPR deaths

16,235 OPR deaths

CDC, National Center for Health Statistics, National Vital Statistics System
Need for Timely Data

- Timely monitoring of drug overdoses
  - Current time delays of >=1 year on mortality/morbidity
  - ED syndromic rapid data collection
  - 26 ED visits for every one OPR death

- Identify drug poisoning/overdose outbreaks
  - Lacing of heroin/cocaine with other drugs (e.g., fentanyl)
  - Interest in marijuana and synthetic marijuana (e.g., spice)

- More rapid assessment of promising prevention and response practices
  - CDC funding 14-16 states to establish OPR overdose prevention
  - Naloxone administered by EMS
State request to HHS Region 1 coordinator to enhance surveillance drug overdose morbidity
  - Region 1 states (CT, MA, ME, NH, RI, VT) and New Jersey
  - Enhanced timeliness of data to inform/evaluate prevention efforts focus for 4 states
    - 2-3 states interested in ED syndromic surveillance

One other state made a TA request related to syndromic surveillance

CDC need
  - Enhanced timeliness to track epidemic and evaluate prevention efforts
  - Support state and local data collection and response
Approach

Background

- General poisoning/drug overdose definitions available (e.g., BioSense and Rx Stat)
- Localities using comprehensive definitions (NYC & Boston)
- Previous CDC Epi-Aids to states

Goal of project

- Respond to state requests
- Build a word search tool that could be shared broadly and facilitate sharing of aggregate data
  - Search drug overdose
  - Search opioid and heroin-related overdoses
- Build diagnostic tools to assess and adapt case definitions
Approach

- Collaborators and acknowledgements
  - CDC Center for Surveillance, Epidemiology, and Laboratory Services (CSELS)
  - Vermont Public Health Department
  - Advice from Boston and NYC Health Departments
  - Division of Unintentional Injury and Prevention, CDC
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Draft SAS Tool

- Facilitate use
  - Word search of chief complaint
  - Output key syndromes to SAS datasets
  - Macros to handle different input datasets and variable names

- Flexibility
  - ICD-9-CM search on drug overdose cases

- Local adaptation and quality improvement
  - Count the frequency of words appearing in drug overdose ED visits
  - ED visits identified and uniquely identified by search terms
  - Provide access to all search drug search terms
SAS Macros to Customize to Data

******************************************************************************;
*STEP 1: ENTER IN KEY MACRO VARIABLES THAT ARE USED IN THE PROGRAM;
******************************************************************************;

-----------------------------------------------------------------------------;
*A. SPECIFY DIRECTORIES WHERE THE ED FILE IS STORED AND WHERE YOU WANT RESULTS EXPORTED;

    *THIS IS THE DIRECTORY THAT CONTAINS THE RAW FILE WITH THE CHIEF COMPLAINT INFORMATION;

    %LET INDIRX=<INSERT DIRECTORY FOR IMPORT FILES>;

    *Example: \example\a_PDO\State_technical\State_specific\;

    *THIS IS WHERE THE SAS DATASETS CREATED BY THE PROGRAM WILL BE SAVED;

    %LET OUTDIRX=<INSERT DIRECTORY FOR EXPORT FILES>;

    *Example: \example\a_PDO\State_technical\State_specific\;

-----------------------------------------------------------------------------;
*B. SPECIFY THE NAME OF THE INPUT DATASET;

    %LET INDATZ= <INSERT NAME OF SAS IMPORT FILE (DO NOT INCLUDE EXTENTIONS)>;

    *Example: overdose_edit ;
Components of Word Search

Drug Overdose

Drug Names

Drug Abuse

Special Terms
Drug Overdose Terms

- Search for words and phrases (SAS)
  - Word search helpful for abbreviations (e.g. OD, O.D.) and reduce exclusion terms
  - Phrases more inclusive

- Key target terms
  - *Overdose*: Abbreviation used commonly such as OD
  - *Poisoning*: Exclusion critical (e.g., alcohol, food, bite, etc.)
  - *Adverse reaction*: Broad definition of overdose/poisoning

- Terms only used if a drug name (e.g., Vicodin) or “drug”/“toxic” present AND “alcohol” absent
  - Intoxication
  - Ingestion
**Drug Overdose Terms: SAS and Excel**

*look for overdose;*

```
if findw(&chiefx, 'OD', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'OD/SD', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'SI/OD', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'O D', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'O.D.', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'OD', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'O/D', '!', $ % & ( ) * +, -, ./; < ^ | : ?', 'i')>0 or
findw(&chiefx, 'overdo', 'i')>0 or findw(&chiefx, 'averdose', 'i')>0 or findw(&chiefx, 'operdose', 'i')>0 or findw(&chiefx, 'overdose', 'i')>0 or findw(&chiefx, 'sobredosism', 'i')>0 then oflag1=1:
```

<table>
<thead>
<tr>
<th>SAS Name</th>
<th>Type of search</th>
<th>Target Word</th>
<th>Search Word or Phrase</th>
<th>Search String</th>
<th>Do not flag if the following phrase/word appears in the chief complaint</th>
<th>Other required keyword</th>
</tr>
</thead>
<tbody>
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<td>intox</td>
<td>a_overdose</td>
<td>Intoxication</td>
<td>Phrase</td>
<td>Intoxic</td>
<td>Alcohol, tobacco</td>
<td>Drug or other drug term</td>
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<td>Overdose</td>
<td>Phrase</td>
<td>Overdo, averdose, overdose, over dose, overdose, sobredosism</td>
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<td></td>
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<td>Word</td>
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<td>a_overdose</td>
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<td>Poison</td>
<td>Phrase</td>
<td>pois</td>
<td>food, alcohol pois, ethyl pois, sting, bite, ivy, plant, nark monoxide co co?</td>
<td></td>
</tr>
</tbody>
</table>
Drug Names

- Specific drug names appear in ED visits related to overdose and abuse
  - Class of drug not reported in many overdose ED visits

- Limited number of drugs searched
  - Lists of names/slang can exceed 20,000 terms

- Drug terms included
  - Likely to be reported at chief complaint stage by patient, EMS, or physician
  - Entered by hospital staff
  - Special area of interest (e.g., opioid / heroin)
**Type of Drugs: SAS and Excel**

```sql
*look for amphetamine;
if find(&chiefx,'ampheta','i')>0 then oflag101=1;

*look for methamphetamine;
if findw(&chiefx,'crystal','i') $ & & ( ) * + , - . / < ^ | ?:','i')>0 then oflag102=1;
if find(&chiefx,'metham','i')>0 or findw(&chiefx,'meth','i') $ & & ( ) * + , - . / < ^ | ?:','i')>0 then oflag103=1;

*look for ecstasy;
if find(&chiefx,'ecstasy','i')>0 or find(&chiefx,'extasy','i')>0 or find(&chiefx,'ectacy','i')>0 or find(&chiefx,'extacy','i')>0 or find(&chiefx,'ectasy','i')>0 or find(&chiefx,'ecstacy','i')>0 then oflag104=1;
```

<table>
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<th>Type of search</th>
<th>Target Word</th>
<th>Search Word or Phrase</th>
<th>Search String</th>
<th>Do not flag if the following phrase/word appears in the chief complaint</th>
<th>Other required key word</th>
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<td>d_Benzodiazepines</td>
<td>Oxazepam</td>
<td>Phrase</td>
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<td>Phrase</td>
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<td>Fentanyl</td>
<td>Phrase</td>
<td>Fentan</td>
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<td></td>
</tr>
</tbody>
</table>
Substance Abuse

- Number of ED visits related to extended abuse and not overdose
  - Withdrawal
  - Detox
  - Abuse

- Classification strategy
  - Only used if no indication of drug overdose
  - No indication or acute of substance abuse, also grouped in this category

- Track “withdrawal” and “detox”
  - “Detox” is a request for service
  - “Withdrawal” symptoms of addiction
Special Terms

- **Exclusion terms**
  - “Alcohol” and “tobacco” critical when identifying drug overdose and substance abuse terms
  - “No” or “Denies”
  - If no evidence of acute overdose or repeat prescriptions:
    - “History of allergic reaction”
    - “Refill”

- **Drugs not related to substance abuse**
  - Insulin and anticoagulants
  - Grouped separately because have different public health implications

- **Alcohol and drug ED visits**
  - Broaden parameters to classify as overdose vs. substance abuse
Case Definitions

- Any drug-related ED visit
  - Drug overdose
  - Substance abuse
  - Drug not related to substance abuse

- Opioid analgesics
  - Any mention
  - Drug overdose
  - Substance abuse

- Heroin
  - Any mention
  - Drug overdose
  - Substance abuse
Case Definitions

- Narcotic: Cocaine, opioid analgesics, heroin, and “narcotic”
  - Drug overdose
  - Substance abuse
  - Drug not related to substance abuse

- Additional information available on:
  - Over 50 types of drugs
  - Over 20 types of opioid pain relievers
  - Limited to no information on some drugs
Limitations and Opportunities

- Many ED visits will not list a specific drug
- Consider including triage notes to capture more drug-related ED visits (e.g., symptom caused by drug overdose or substance abuse)
- Identification of opioid-related overdoses supported by two factors
  - EMS/community administration of naloxone
  - Scene evidence of heroin overdose, especially when injection
- Version 1.0
  - Multiple states
  - New drugs
Agenda

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- **Next steps**
Pilot in Vermont

Goal
- Test feasibility and utility of using syndromic ED data to monitor drug overdoses

Methods
- Develop SAS code
- Run and revise SAS code on ED chief complaint & triage notes
- Compare word search findings against ICD-9-CM codes for internal consistency
- Compare word search findings against ED drug overdose counts from finalized ED/hospital discharge files
- Create a SAS program that can be shared with other jurisdictions
Internal Consistency

- Compare primary diagnosis ICD-9-CM against word search findings to revise coding
  - Possible for 1/3 of ED visits

- Findings
  - Identify 95% or greater of ICD-9-CM cases for drug overdoses, overdoses related to OPR and heroin
  - Word search is identifying significantly more cases than just primary diagnosis ICD-9-CM
    - Review suggests word search is working properly
    - ICD-9-CM analysis ongoing, but discrepancy partially explained by primary ICD-9-CM code capturing symptoms
Drug overdose and all drug-related ED visits have similar curves.

*Y-axis not reported because data are preliminary and may change.
Preliminary Number of Drug Overdose ED Visits: ED Syndromic Surveillance & Discharge*

Similar 2011 to 2012, but slightly different pattern 2010 to 2011

*Y-axis not reported because data are preliminary and may change
Any mention of OPR and OPR overdose have similar patterns, but large difference in magnitude.
Preliminary Number of OPR-Related Overdose ED Visits: ED Syndromic Surveillance & Discharge*

OPR syndromic and ED discharge file display similar trends and magnitude.

*Y-axis not reported because data are preliminary and may change.
Any mention of heroin and heroin overdose have similar patterns.
Preliminary Number of Heroin-Related Overdose ED Visits: ED Syndromic Surveillance & Discharge*

ED heroin definition detects the rapid increase in heroin-related ED visits

*Y-axis not reported because data are preliminary and may change
Lessons Learned & Next Steps

- Lessons learned so far
  - ED syndromic data looks like a promising surveillance source
  - Heroin and opioid-related ED visits sufficient data to track trends
  - Importance of distinguishing substance abuse and drug overdose ED visits

- Current status
  - Expand testing to two more sites

- Next steps
  - More broadly release to interested states for use/revision within a few months
  - Identify ways to distribute and improve use
  - Share aggregate data with CDC and across state
  - CDC internal approval process
Thank You

R. Matt Gladden
mgladden@cdc.gov

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The findings and conclusions in this report are those of the author and do not necessarily represent the views of the Centers for Disease Control and Prevention.