An Evaluation of Death Certificate Coding for Overdose for the Purposes of Improved Injury Data and Poisoning Surveillance in North Carolina

Presented by Kathleen Creppage, MPH

CSTE Annual Conference

June 11, 2013
Contributors:

Annie Hirsch, *Occupational and Environmental Epidemiology Branch, NC Division of Public Health*

Scott Proeschooldbell, *Injury and Violence Prevention Branch, NC Division of Public Health*

Margaret Warner, *National Center for Health Statistics*
Background
Background

The CDC states that for 2009 and 2010, “...91% of all unintentional poisoning deaths were caused by drugs. The class of drugs known as prescription painkillers, which includes such drugs as methadone, hydrocodone, and oxycodone, was most commonly involved, followed by cocaine and heroin.”
### International Classification of Disease (ICD-10) Coding for Drug/Medication Overdose

- **Heroin has one code for one drug**
- **Other opioids includes:**
  - Oxycodone
  - Hydrocodone
  - Morphine
- **Do we lose anything with these non-specific codes?**

<table>
<thead>
<tr>
<th>Description</th>
<th>ICD Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Cause of Death</strong></td>
<td></td>
</tr>
<tr>
<td>Unintentional poisoning</td>
<td>X40-X44</td>
</tr>
<tr>
<td>Suicide</td>
<td>X60-X64</td>
</tr>
<tr>
<td>Undetermined</td>
<td>Y10-Y14</td>
</tr>
<tr>
<td><strong>Contributing Cause of Death</strong></td>
<td></td>
</tr>
<tr>
<td>Heroin</td>
<td>T40.1</td>
</tr>
<tr>
<td>Cocaine</td>
<td>T40.5</td>
</tr>
<tr>
<td>Methadone</td>
<td>T40.3</td>
</tr>
<tr>
<td><strong>Other opioids</strong></td>
<td>T40.2</td>
</tr>
<tr>
<td><strong>Other synthetic narcotics</strong></td>
<td>T40.4</td>
</tr>
<tr>
<td><strong>Other and unspecified drugs</strong></td>
<td>T50.9</td>
</tr>
</tbody>
</table>
Purpose
Are We Accurately Reporting Drug/Medication Overdose Deaths in North Carolina?

- Compare death certificate literals and toxicology reports to death certificate coding outcomes
- Assess usefulness of literal text for statewide surveillance purposes and program evaluation
- Evaluate data quality
- Share inconsistencies, limitations and conclusions
Description of Statewide Poisoning Surveillance System
NC Vital Statistics Multiple Cause of Death File

- State produces annual multiple cause of death file with all deaths that occur in NC.
- Data elements include primary cause of death field and 19 contributing cause of death fields:
  - Primary: X44 (unintentional poisoning)
  - Contributing: T40.1 (heroin)
- Used for routine poisoning surveillance.
  - Fields contain ICD codes based on text on death certificate data.
  - Also includes name, sex, race, date of birth (DOB), date of death (DOD), death certificate number.
NCHS SuperMICAR Literal Text Files

- SuperMICAR is part of the NCHS software to code the causes of death
- “Literal text” is the text from the death certificate (Part I, Part II or how the injury occurred) that describes the cause of death.
  - Literals are either entered directly onto an electronic death certificate or transcribed from a paper certificate
  - Includes age, sex, death certificate number.

### CAUSE OF DEATH

**IMMEDIATE CAUSE** (Final disease or condition resulting in death)

<table>
<thead>
<tr>
<th>a. ANOXIA BRAIN INJURY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to (or as a consequence of):</td>
</tr>
<tr>
<td>b. SECONDARY TO INGESTION OF METHADONE</td>
</tr>
<tr>
<td>Due to (or as a consequence of):</td>
</tr>
<tr>
<td>c.</td>
</tr>
<tr>
<td>Due to (or as a consequence of):</td>
</tr>
<tr>
<td>d.</td>
</tr>
</tbody>
</table>

**UNDERLYING CAUSE** (disease or injury that initiated the events resulting in death)

Due to (or as a consequence of):

- ANOXIA BRAIN INJURY
- SECONDARY TO INGESTION OF METHADONE
- Due to (or as a consequence of):
  - SECONDARY TO INGESTION OF METHADONE

**PART II.** Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

- X42 Accidental poisoning and exposure to narcotics and psychodysleptics, NEC

**33. WAS AN AUTOPSY PERFORMED?**

- Yes
- No

**34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH?**

- Yes
- No

**35. DID TOBACCO USE CONTRIBUTE TO DEATH?**

- Yes
- Probably
- No
- Unknown

**36. IF FEMALE:**

- Not pregnant within past year
- Not pregnant at time of death
- Not pregnant but pregnant within 42 days of death
- Not pregnant but pregnant 43 days to 1 year before death
- Unknown if pregnant within the past year

**38. DATE OF INJURY**

(Mo/Day/Yr)(Spell Month)

**39. TIME OF INJURY**

**40. PLACE OF INJURY** (e.g., Decedent’s home, construction site, restaurant, wooded area)

**41. INJURY AT WORK?**

- Yes
- No

**42. LOCATION OF INJURY:**

- State: State:
- Street & Number: City or Town:
- Zip Code:

**43. DESCRIBE HOW INJURY OCCURRED**

**DRUG INGESTION**

- T50.9 Other and unspecified drug

**44. IF TRANSPORTATION INJURY, SPECIFY**

- Driver/Operator
- Passenger
- Pedestrian
- Other (Specify)
Office of the Chief Medical Examiner

- Network of medical doctors statewide who investigate deaths.
  - Blood and urine samples sent for toxicology testing.
  - Electronic file contains the medical examiner number.

Example toxicology screen results sheet from medical examiner file:

- **P** = Primary (capable of causing death independently)
- **A** = Additive (capable of causing death only in combination with other drugs)
- **C** = Contributing (contributed to death indirectly/behavioral)
- **Blank** = did not contribute to death/absent

<table>
<thead>
<tr>
<th></th>
<th>Alprazolam</th>
<th>Ethanol</th>
<th>Nicotine</th>
<th>Methadone</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Methods of Evaluation
Case Selection (SuperMICAR Inclusion)

Requested NC resident deaths with X40-X44, X60-X64, X85, Y10-Y14

Merge with NC multiple cause of death file (death certificate #)

Link with electronic toxicology file (medical examiner #)

2,438
Multiple causes
Resident/Non-Resident

2,289
Overdose deaths

2,217
NC Residents

149
Other causes

2,217
NC Residents

71 exclusions
Unavailable at OCME/mismatches

1,972 cases
Evaluation Based on Toxicology

2,146 cases
Literal Text Analysis

174 Cases Missing from E-Tox File

1,972 cases
Evaluation Based on Toxicology

2,146 cases
Literal Text Analysis

174 Cases Missing from E-Tox File

1,972 cases
Evaluation Based on Toxicology
## Criteria for Matching

<table>
<thead>
<tr>
<th>Scenario</th>
<th>ICD-10</th>
<th>Literals</th>
<th>Toxicology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single drug present</td>
<td>Correct code</td>
<td>Drug name/brand name in any field</td>
<td>Drug present</td>
</tr>
<tr>
<td>Multiple drugs present*</td>
<td>All correct codes</td>
<td>Drug names in any of the fields</td>
<td>All drugs present</td>
</tr>
<tr>
<td>T50.9 Alone</td>
<td>T50.9 only</td>
<td>Multi-drug/multiple meds</td>
<td>?</td>
</tr>
<tr>
<td>T40.6</td>
<td>T40.6</td>
<td>Opiate/opioid</td>
<td>NOT be oxycodone, morphine, etc.</td>
</tr>
</tbody>
</table>

*If one drug was missing or miscoded then it was considered to be mismatched for that category

### Exceptions:
- Variations in spelling for the literal text
- Alcohol was NOT COUNTED as a drug but was flagged as a poly-drug
- Many drugs marked as “C” but were actually “A”
Example Evaluation Form from Microsoft Access – Select Fields

- **Primary Cause of Death Field**
  - CDeath1
  - CDeath3
  - CDeath4
  - CDeath5
  - CDeath6
  - CDeath7
  - CDeath8
  - CDeath9
  - CDeath10

- **Contributing Cause Fields**
  - DESCRI
    - N1
  - DESCRI
    - N2
  - DESCRI
    - N3
  - DESCRI
    - N4
  - DESCRI
    - N5
  - INJ_DESCR

- **ICD-10 Codes From Vital Statistics**
- **Multiple Cause of Death File**

- **Literal text Fields from the Death Certificate**

- **Query1 subform**
  - | ME_Number | Substance | Tox_Code |
  - |-----------|-----------|----------|
  - | Medical Examiner Number | Drug/Substance | P, A, or C |

- **Toxicology Results from Medical Examiner**

- **Explanation**
  - **P** = capable of causing death independently
  - **A** = capable of causing death only in combination with other drugs
  - **C** = contributed to death indirectly
Example 1: All Drugs Coded (Additive Drugs)

<table>
<thead>
<tr>
<th>CDeath1</th>
<th>X44</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDeath3</td>
<td>T403</td>
</tr>
<tr>
<td>CDeath4</td>
<td>T424</td>
</tr>
</tbody>
</table>

- **ICD-10 Codes**

- **Literal text**

- **Toxicology Results**

Query1 subform:

<table>
<thead>
<tr>
<th>ME_Number</th>
<th>Substance</th>
<th>Tox_Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>F201002131</td>
<td>Alprazolam</td>
<td>A</td>
</tr>
<tr>
<td>F201002131</td>
<td>Methadone</td>
<td>A</td>
</tr>
</tbody>
</table>
Example 2: No Drugs Coded (T50.9 Alone)

<table>
<thead>
<tr>
<th>CDeath1</th>
<th>X44</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDeath3</td>
<td>T509</td>
</tr>
<tr>
<td>CDeath4</td>
<td></td>
</tr>
<tr>
<td>CDeath5</td>
<td></td>
</tr>
<tr>
<td>CDeath6</td>
<td></td>
</tr>
<tr>
<td>CDeath7</td>
<td></td>
</tr>
<tr>
<td>CDeath8</td>
<td></td>
</tr>
<tr>
<td>CDeath9</td>
<td></td>
</tr>
<tr>
<td>CDeath10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ME_Number</th>
<th>Substance</th>
<th>Tox_Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>F201003477</td>
<td>Propoxyphene</td>
<td>A</td>
</tr>
<tr>
<td>F201003477</td>
<td>Paroxetine</td>
<td>A</td>
</tr>
<tr>
<td>F201003477</td>
<td>Diazepam</td>
<td>A</td>
</tr>
<tr>
<td>F201003477</td>
<td>Amitriptyline</td>
<td>A</td>
</tr>
</tbody>
</table>
Evidence and Findings to Date
Findings: Usefulness of the Literals

- Examples of projects utilizing routine surveillance data:
  - Unintentional Poisonings in North Carolina (publication)
  - North Carolina Naloxone/Good Samaritan Law (April 2013)
  - Changes to the Controlled Substance Reporting System (NC Senate Bill 222)

- Examples of where Literal Text could be utilized:
  - Sentinel surveillance
  - Exploratory analysis into specific drugs and combinations of drugs
  - Examine number of deaths attributable to each drug when toxicology not available
  - Identifying specific substances in “other specified” ICD-10 drug categories
  - Monitoring increases in deaths associated with drug substances not specifically identified in ICD-10
Drug Overdose Deaths with Narcotics Mentioned by ICD-10 Code, 2010-2011

(Alcohol Listed for Comparison)

Source: Death Data, NC State Center for Health Statistics, 2010-2011
SuperMICAR Literal Text Files, NCHS, 2010-2011
Drug Overdose Deaths by Specific Narcotic Mentioned, 2010-2011

T40.2 Other Opioids

<table>
<thead>
<tr>
<th>Narcotic</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxycodone</td>
<td>206</td>
<td>190</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>92</td>
<td>67</td>
</tr>
<tr>
<td>Morphine</td>
<td>81</td>
<td>76</td>
</tr>
<tr>
<td>Oxymorphone</td>
<td>58</td>
<td>118</td>
</tr>
</tbody>
</table>

T40.4 Other Synthetic Narcotics

<table>
<thead>
<tr>
<th>Narcotic</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>98</td>
<td>102</td>
</tr>
<tr>
<td>Propoxyphene</td>
<td>33</td>
<td>6</td>
</tr>
<tr>
<td>Tramadol</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>Methadone</td>
<td>180</td>
<td>191</td>
</tr>
</tbody>
</table>

Source: Death Data, NC State Center for Health Statistics, 2010-2011
SuperMICAR Literal Text Files, NCHS, 2010-2011
Percent of Deaths with Consistency Between Data Sources, 2010-2011

- ICD10 vs. Tox: 65%
- Literals vs. Tox: 71%
- ICD10 vs. Literals: 90%
- All Match: 63%

*For ICD vs. toxicology, there was 1 case where the response was Don’t Know
*For literals vs. toxicology, there was 1 case where the response was Not Applicable and 1 where the response was Don’t Know
*For ICD vs. literals, there were 2 cases where the response was Don’t Know
35% of Drug Overdose Deaths with Inconsistency Between Toxicology and ICD-10 Coding, 2010-2011

- Primary Drug:
  - Code Present/No Error: 55%
  - Inconsistency with Code: 24%

- Additive Drug:
  - Code Present/No Error: 2%
  - Inconsistency with Code: 84%
Conclusions
Conclusions

• How useful is the literal text?
  • In North Carolina, toxicology is better for routine surveillance.
  • In states without access to toxicology, literal text would add more information than the ICD-10 coded multiple cause of death files.

• Where are the inconsistencies?
  • Some inconsistencies in coding additive drugs.
  • Could be procedural errors and issues with closing files.
Limitations with Electronic Files

- **SuperMICAR Files**
  - Did not acquire all NC drug overdose deaths

- Request “Amended File”
  - 12% of all resident deaths were pending and required hard copy abstraction of the literal text at the OCME

- **Typos on Death Certificate**

- **Electronic Toxicology Files**
  - Did not contain all toxicology records for all overdose deaths
Acknowledgements

- CDC/CSTE Applied Epidemiology Fellowship Program
- Injury and Violence Prevention Branch, North Carolina Division of Public Health
- North Carolina Office of the Chief Medical Examiner
- National Center for Health Statistics
- North Carolina State Center for Health Statistics
Questions?

Kathleen Creppage
CDC/CSTE Applied Epidemiology Fellow
Injury and Violence Prevention Branch
Chronic Disease and Injury Section
NC Division of Public Health
kathleen.creppage@dhhs.nc.gov
(919)-707-5438

www.injuryfreenc.ncdhhs.gov