

# Mortality Reporting and Cause of Death Statements: An Analyst's Perspective

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How is a death certificate used?



# Cause of Death Text

## 37. MANNER OF DEATH

- Natural       Homicide
- Accident     Pending Investigation
- Suicide       Could not be determined

### CAUSE OF DEATH (See instructions and examples)

32. **PART I.** Enter the chain of events--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)

a. \_\_\_\_\_  
Due to (or as a consequence of):

Sequentially list conditions, if any, leading to the cause listed on line a. Enter the **UNDERLYING CAUSE** (disease or injury that initiated the events resulting in death) **LAST**

b. \_\_\_\_\_  
Due to (or as a consequence of):

c. \_\_\_\_\_  
Due to (or as a consequence of):

d. \_\_\_\_\_

Approximate interval:  
Onset to death

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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



| DCauseCodeR1 | DCauseCodeR2 | DCauseCodeR3 | DCauseCodeR4 | DCauseCodeR5 | DCauseCodeR6 | DCauseCodeR7 |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| X44          | T404         | T424         | T430         | T432         | T450         | T509         |
| X44          | T403         | T432         | T450         | T509         |              |              |
| X44          | F199         | T391         | T402         | T432         |              |              |
| X42          | T402         | T405         | T509         |              |              |              |
| X44          | T403         | T424         | T432         | T509         |              |              |
| X44          | T390         | T402         | T509         |              |              |              |
| X44          | T391         | T402         | T424         | T428         | T432         | T509         |
| X44          | F199         | T404         | T424         | T426         | T435         |              |
| X44          | T402         | T403         | T424         | T428         | T432         | T509         |
| X44          | F199         | T402         | T424         |              |              |              |
| X44          | T402         | T428         | T432         | T509         |              |              |
| X44          | T402         | T430         | T432         |              |              |              |

ICD-10  
Record Codes

TN

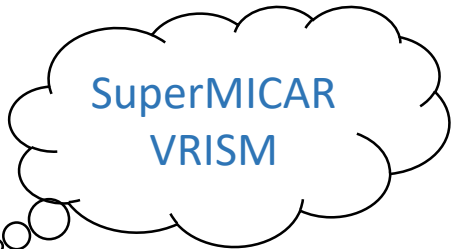
# Cause of Death Text

How do we go from a text-based cause of death to the record coding used to generate counts and related health statistics, such as indicators?

ICD-10  
Record Codes

Cause of  
Death Text

**MICAR200**



ICD-10 Entity  
Codes

**ACME  
TRANSAX**

ICD-10  
Record Codes

# What are indicators?

- Calculated per year
- State residents only
- **Must have an underlying CoD:** X40-X44, X60-X64, X85, Y10-Y14
- Separate indicators are calculated for specific drugs
- Some use T-code guidelines:
  - Heroin: T40.1
  - Prescriptions: T40.2, T40.3
- Some use CoD *text*:
  - Fentanyl: 'fentan'
  - Buprenorphine: 'bupre' OR 'norph'

## Bottom Line For Analytics:

1. Overdoses need to end up with an appropriate underlying code
2. Specific drugs need to be listed



What if drugs are not listed?



Table 1

Highest Frequency Record Codings for Overdose Indicator Deaths

| DCauseCodeR1 | DCauseCodeR2 | DCauseCodeR3 | DCauseCodeR4 | Frequency  |
|--------------|--------------|--------------|--------------|------------|
| <b>X44</b>   | <b>T509</b>  |              |              | <b>284</b> |
| X44          | T402         | T424         | T509         | 240        |
| X42          | T402         |              |              | 175        |
| X42          | T402         | T509         |              | 154        |
| X42          | F119         | T401         |              | 66         |
| <b>X64</b>   | <b>T509</b>  |              |              | <b>52</b>  |
| X42          | F149         | T405         |              | 51         |
| X42          | T403         |              |              | 50         |
| X42          | T405         |              |              | 50         |
| X42          | T404         |              |              | 49         |

Of the 6,605 overdoses in TN from 2012 to 2016, **5.1%** of them cannot be tracked by drug type due to lack of information



Table 2

Percentage of Indicator Counts that Result from Polypharmacy Overdose

| Indicator            | 2012  |                     | 2013  |                     | 2014  |                     | 2015  |                     | 2016  |                     |
|----------------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|---------------------|
|                      | Total | Polydrug Percentage | Total | Polydrug Percentage | Total | Polydrug Percentage | Total | Polydrug Percentage | Total | Polydrug Percentage |
| All Overdoses        | 1094  | 47.90               | 1166  | 61.75               | 1263  | 60.97               | 1451  | 64.44               | 1631  | 68.67               |
| All Opioids          | 698   | 62.75               | 754   | 72.81               | 861   | 70.27               | 1034  | 76.60               | 1186  | 80.27               |
| Prescription Opioids | 547   | 65.63               | 578   | 76.82               | 603   | 76.62               | 689   | 80.55               | 739   | 84.03               |
| Heroin               | 45    | 66.67               | 63    | 73.02               | 147   | 70.07               | 205   | 80.49               | 260   | 83.08               |
| Fentanyl             | 4     | 50                  | 53    | 75.47               | 69    | 68.12               | 169   | 81.66               | 294   | 83.33               |

From 2012 to 2016, 5.93% of general overdose deaths are identified as polypharmacy through *text alone*: ‘poly,’ ‘multi,’ ‘mixed,’ ‘combined,’ with no indication of the actual drug taken. Drug-specific indicators are therefore *underreported!*



How are underlying codes generated?



# Step #1: Entity Coding Using MICAR200

- MICAR200 performs a line-by-line *transliteration*
- Extremely sensitive to wording choices
- First pass ignores Part II of the cause of death
- Instruction Manual Highlights:
  - Drug intoxication listed as *due to treatment* will cause death to be coded as complication of therapy
  - The word 'acute' is only associated with the immediate following condition

# Transliteration Consequences

## Record #1

- I. (a) MULTIPLE DRUG OVERDOSE
- (b) (OXYCODONE, ALPRAZOLAM)
- (c)

### *Entity Coding:*

|      |      |
|------|------|
| X44  | T509 |
| T402 | T424 |

## Record #2

- I. (a) OXYCODONE & ALPRAZOLAM OVERDOSE
- (b)
- (c)

### *Entity Coding:*

|     |      |      |
|-----|------|------|
| X44 | T402 | T424 |
|-----|------|------|

## Record #3

- I. (a) MULTIPLE DRUG OVERDOSE (OXYCODONE,
- (b) ALPRAZOLAM)
- (c)

### *Entity Coding:*

|     |      |
|-----|------|
| X42 | T402 |
| X44 | T424 |



# Wording Choices

Table 3

*Failure Ratios of Specific Word Choices in Overdose Identification*

|      | “Overdose”    |                | “Toxicity”    |                | “Intoxication” |                |
|------|---------------|----------------|---------------|----------------|----------------|----------------|
|      | Contains Term | Not Identified | Contains Term | Not Identified | Contains Term  | Not Identified |
| 2014 | 293           | 3.41%          | 617           | 13.78%         | 455            | 9.67%          |
| 2015 | 300           | 4.67%          | 703           | 10.24%         | 529            | 6.24%          |
| 2016 | 292           | 2.40%          | 828           | 12.80%         | 627            | 6.38%          |

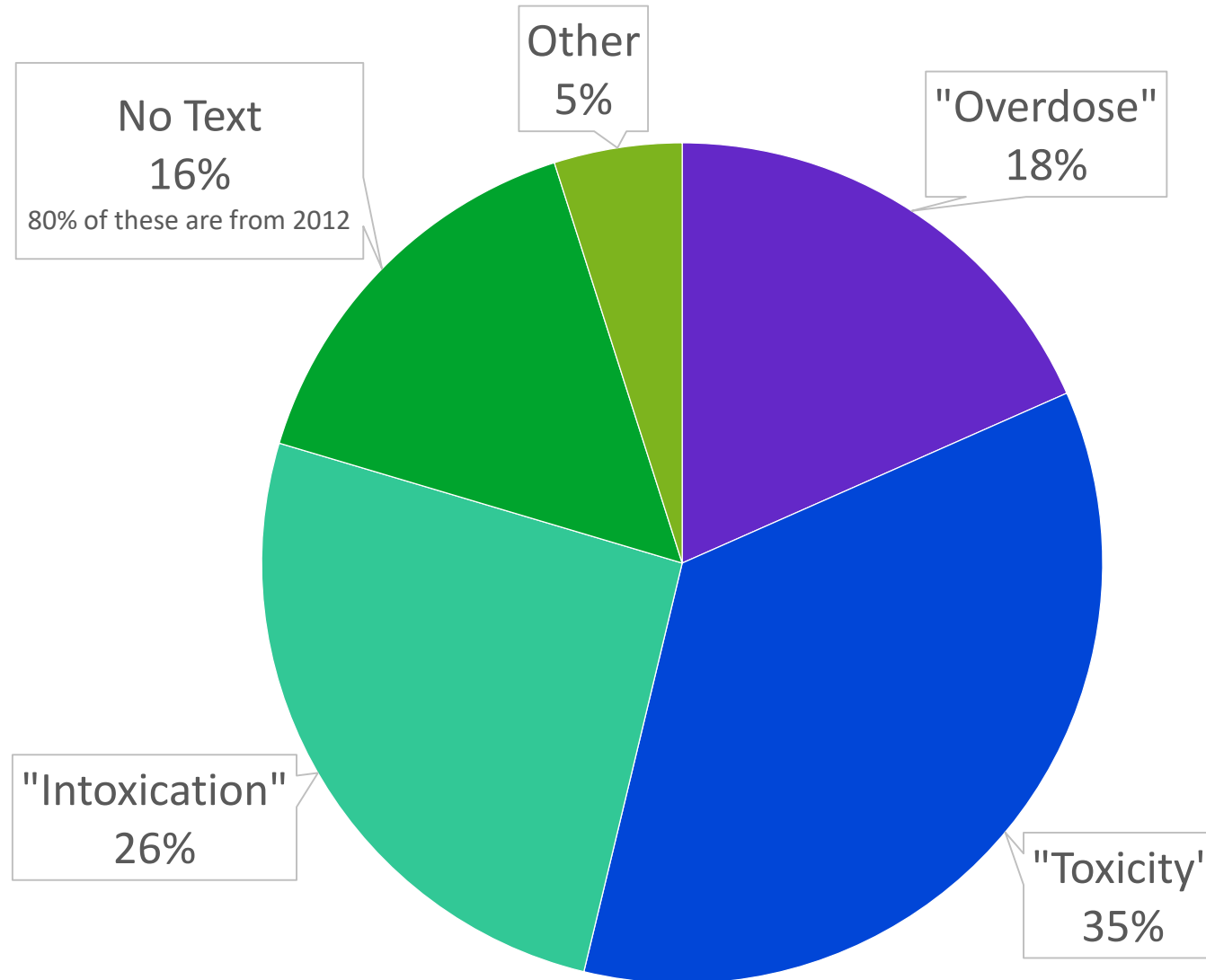
According to the **algorithm**, the most unambiguous, consistent term in identifying drug overdoses is *the word OVERDOSE!*

Despite the medical community’s agreement that *overdose* is a non-specific term and counter to the recommendation against using it, the **algorithm** appears to favor this word.



Figure 1

Terminology Usage In All Overdose Deaths, 2012-2016



N = 6,933\*

n<sub>od</sub> = 1,274

n<sub>tox</sub> = 2,453

n<sub>intox</sub> = 1,792

n<sub>miss</sub> = 1,073

n<sub>other</sub> = 341





# ABUSE

- An overdose is an **external** cause of death, an X-code or a Y-code
- Drug abuse is a 'natural' **behavioral** cause of death, an F-code
- Of the 2,066 deaths containing the text 'ABUSE' with no reference to overdose or toxicity, only 16 of them are coded as an overdose
- Conclusion: The word 'ABUSE' **cannot** be used to indicate overdose

# Step #2: Record Coding Using ACME/TRANSAX

- General Principle: Select the condition on the lowest line of Part I only if it could cause all above conditions
- Rule #1: If GP does not apply, select the cause of the first-mentioned sequence
- Rule #2: If there is no sequence, select the first-mentioned condition
- Rule #3: If previous rules lead to a condition that is obviously caused by something else on the certificate, report that instead
- Other Useful Rules:
  - Time intervals will always be obeyed
  - A linkage in Part I will *always* be preferred over Part II
  - **The most specific chain will always be chosen**

# Order Matters

## Record #1

- I. (a) HYPERTENSIVE CARDIOVASCULAR DISEASE AND ACUTE HYDROCODONE, ALPRAZOLAM AND
- (b) DIPHENHYDRAMINE INTOXICATION.

*Underlying Code:*

**I119:** Hypertensive heart disease without heart failure

## Record #2

- I. (a) ACUTE RESPIRATORY DEPRESSION
- (b) MULTIPLE DRUG INGESTION

*Underlying Code:*

**E669:** Obesity, unspecified

Issues here: Part II lists 'MORBID OBESITY', Manner of Death is coded as *Natural*

## Record #3

- I. (a) RESPIRATORY ARREST
- (b) SEVERE COPD
- (c) POLYPHARMACY OVER MEDICATION
- (d) DEMENTIA – ALTERED MENTATION

*Underlying Code:*

**J449:** Chronic obstructive pulmonary disease, unspecified

Maybe issue: Manner of Death is coded as *Natural*

Manual states that dementia cannot be underlying CoD



# Manner of Death

- Causes of death are **natural** or **external**
  - If the selected manner of death is ‘natural,’ it is far less likely that an overdose will be detected by the algorithm
- Specific drug names generate **nature of death** T-codes
  - Nature of death codes must appear *beside* an appropriate cause of death code
  - Deaths caused by external factors can have multiple external cause of death codes
  - Deaths caused by natural factors are not *supposed* to have any external codes

What's the takeaway?



1. List drugs if at all possible
2. Our data suggest that the most unambiguous way to indicate overdose is to use the actual word 'overdose' in the cause of death text
  - Even though other sources\* recommend against using this word, the *algorithm* appears to behave differently
3. Order matters: if a death is an overdose, the causal chain needs to be appropriately specified for the algorithm to work
4. Manner of death needs to be appropriately indicated as other than natural in overdose cases
5. If multiple contributing factors, including potential overdose, be aware that algorithm will 'pick' the most specific chain



\*Goldberger BA, Maxwell JC, Campbell A, Wilford BB. Uniform standards and case definitions for classifying opioid-related deaths: recommendations by a SAMHSA consensus panel. *J Addict Dis.* 2013;32(3):231-43.

# Want to learn more?

- The manuals describing how these algorithms work are found at:  
[https://www.cdc.gov/nchs/nvss/instruction\\_manuals.htm](https://www.cdc.gov/nchs/nvss/instruction_manuals.htm)
- NVSS recommendations for writing cause of death statements:  
[https://www.cdc.gov/nchs/nvss/writing\\_cod\\_statements.htm](https://www.cdc.gov/nchs/nvss/writing_cod_statements.htm)