Selecting a Main Injury Diagnosis in the Multiple Cause-of-Death File, United States 1999

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Background

Why do we need to choose the main injury?

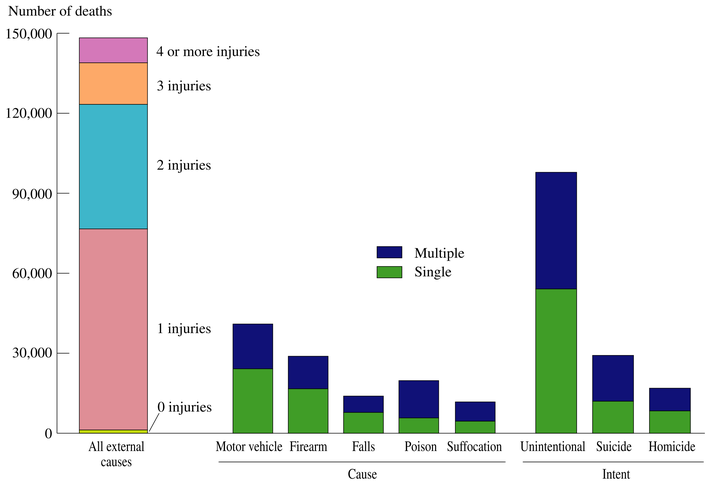
- Selecting a main injury is important because the number of injury diagnoses recorded on death certificates varies due to multiple factors.
- Multiple cause-of-death data contain all diagnoses on the death certificate, including injuries, external causes, and disease conditions associated with the death.
- In 1999 the number of injuries recorded on U.S. death certificates ranged from 0-13 and the average number of injury diagnoses per injury fatality was 1.7. Some of the differences may be related to:
  - Level of detail recorded by certifier
  - Demographics, such as age
  - Cause-of-death and intent
- The number of injuries recorded varies between countries. Some of the differences may be related to:
  - Space available on the death certificate to list the causes of death
  - Artifacts of coding - particularly coding multiple injuries

Number of diagnoses by country

	Mean number of injury diagnoses	*Percent of deaths by number of injury diagnoses*		
		1	*2*	*3 or more*
United States (1999)	1.74	50.8	31.9	16.5
Sweden (1987-96)	1.48	61.7	27.9	10.4
Scotland (1996-98)	1.26	74.7	21.0	3.0
England & Wales (1996-98)	1.34	74.5	19.3	6.2

Cox CS, Rooney C, Fingerhut LA. What can multiple cause of death analyses tell us about patterns and comparability of injury mortality from a variety of countries? 5th World Injury Conference, New Delhi, India. March 2000.

Number of injury diagnoses per death



Methods

Three methods tested for selecting a main injury

First Listed Diagnosis

- Select the first listed injury diagnosis within the ICD-10 range of S00-S99, T00-T35, T79, T90-T98.

ICD-9 Precedence List

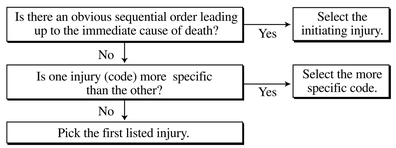
- Select the first listed injury diagnosis in the top ranking category of the ICD-9 Precedence List:

1. Fracture of skull and/or broken neck
2. Internal injury of chest, abdomen, and/or pelvis
3. Fracture of face bones, spine, and/or trunk
4. Other head injury, open wounds of neck and chest, traumatic amputation of limbs, and spinal cord lesion without evidence of spinal bone injury
5. Fracture of limbs
6. Burns
7. Other

NOTE: ICD-9, Volume II, Section IX, Translated to ICD-10 codes using WHO Translator ICD9 to ICD10.

ICD-10 Injury Selection Guidelines

- Select using the interpretations of ICD-10 Volume II, Section 4.2.10.



Analytic methods

Data source:

- From the 1999 multiple cause-of-death data, 148,286 deaths with an external cause of injury (V01-Y36,Y85-Y87, Y89) were selected.

Sample:

- A sample of 500 deaths with more than one unique ICD-10 code within S00-S99, T00-T35, T79, T90-T98 was randomly selected.
- ICD-10 codes not on Precedence List were excluded.

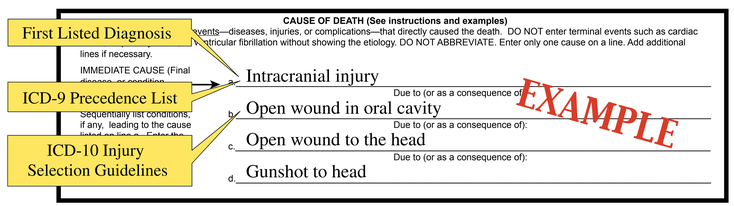
Selection methods:

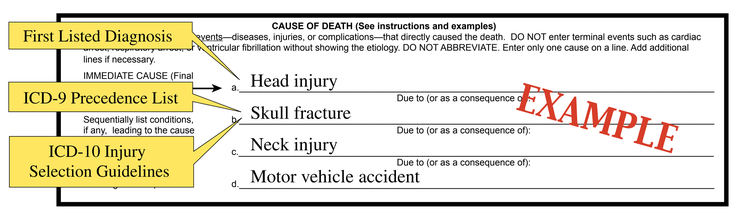
- For each death, three methods were used to select a main injury.

1. First Listed Diagnosis
2. ICD-9 Precedence List
3. ICD-10 Injury Selection Guidelines

Analysis:

- Percent agreement was used to show the level of agreement between the selection methods.
- The kappa statistic was calculated to measure agreement for deaths with two injuries listed. Cells with zero were given a value of one for calculating kappa.





Results

Percent agreement and kappa among selection methods

Selection methods	*Number of injury diagnoses/death*				*Selected causes and intents*				*Kappa*	*Interpretation (Fleiss)*
	Total (n=500)	*2 (n=339)*	*3 (n=106)*	*4 or more (n=55)*	*All motor vehicle (n=191)*	*All firearm (n=128)*	*All homicide (n=93)*	*All suicide (n=85)*		
First Listed & Precedence List	67.2	69.3	64.2	60.0	71.2	63.3	61.3	77.7	0.01	Poor
First Listed & ICD-10 Guidelines	73.2	79.9	56.6	63.6	80.1	57.8	60.2	61.2	0.02	Poor
Precedence List & ICD-10 Guidelines	57.4	65.8	42.5	34.6	62.8	46.1	43.0	58.8	0.01	Poor
All three methods	49.8	57.5	34.0	32.7	58.1	34.4	33.3	49.4		

Conclusions

- There was agreement among the three methods, but some is expected by chance.
  - For instance if a death certificate has two listed injury diagnoses then the expected percent agreement is 50 percent and with three listed injury diagnoses it is 33.3 percent.
- If the death certificates are completed correctly, the three methods tested are selecting the injury diagnosis based on different logic:
  - The first listed method of selection should be selecting the immediate cause-of-death.
  - ICD-10 Injury Selection Guidelines should be selecting the initiating cause-of-death.
  - The Precedence List was intended to select the most severe injuries.
- For firearm-related deaths, the sequential order tended to be obvious, therefore, the initiating injury was chosen over the immediate cause of death. This resulted in a lower agreement between First Listed and the ICD-10 Injury Selection Guidelines.
- For motor vehicle-related deaths, it was difficult to discern from the data available if there was a sequential order, as the injuries appear to happen simultaneously; therefore, the ICD-10 Injury Selection Guidelines often chose the first listed injury. This resulted in a higher agreement between the First Listed and the ICD-10 Injury Selection Guidelines.
- It is difficult to determine sequential order based on coded data, therefore, if the ICD-10 Injury Selection Guidelines are to be adopted in the United States it will be necessary to apply them based on the original death certificate.

Limitations

- Injury diagnoses not included in the ICD-9 Precedence List were excluded.
- The ICD-9 Precedence List was applied to the ICD-10 codes. The codes are not directly comparable. For instance, they vary in specificity, such as ICD-10 multiple injury codes (T00-T07).
- ICD-10 Injury Selection Guidelines have not been applied to U.S. data, and there are no guidelines other than the limited instructions in ICD-10 4.2.10.
- The main injury was selected using coded data rather than from the original text on the death certificate. This limited the ability to obtain any sequential order.

Discussion

First Listed Diagnosis

PROS:
- Easy to use.

CONS:
- Assumes death certificates were filled out correctly and that the first listed injury diagnosis is truly the immediate cause-of-death.
- The death certificates are known to be filled out inconsistently, which results in misclassification using this method.

ICD-9 Precedence List

PROS:
- Can be easily applied consistently.

CONS:
- Comparability ratios between ICD-9 and ICD-10 are not available yet.
- Assumption about the order of severity has not been tested. For instance, multiple injuries (ICD-9 959.8) are in the last ranked category but may be the most severe.
- Does not include poisonings by drugs, medicaments, and biological substances (T36-T50); toxic effects of substances chiefly non-medicinal as to source (T51-T65); other and unspecified effects of external causes (T66-T78); complications of surgical and medical care, not elsewhere classified (T80-T78).
- The order the injury appears on the death certificate plays a major role in the injury diagnosis selected. Approximately 30 percent of the sample deaths had more than one injury listed in the top ranking category and the first listed diagnosis of these were chosen.

ICD-10 Injury Selection Guidelines

PROS:
- WHO endorses this approach.
- Some countries are currently using this method, such as England and Wales.

CONS:
- For some causes, the injury sequence is inherent. For other causes the injuries occur simultaneously, and this selection method is less appropriate.
- The initiating injury may not be the most critical injury.
- Rules may not be applied consistently.
- The order the injury appears on the death certificate plays a major role in the injury diagnosis selected.

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