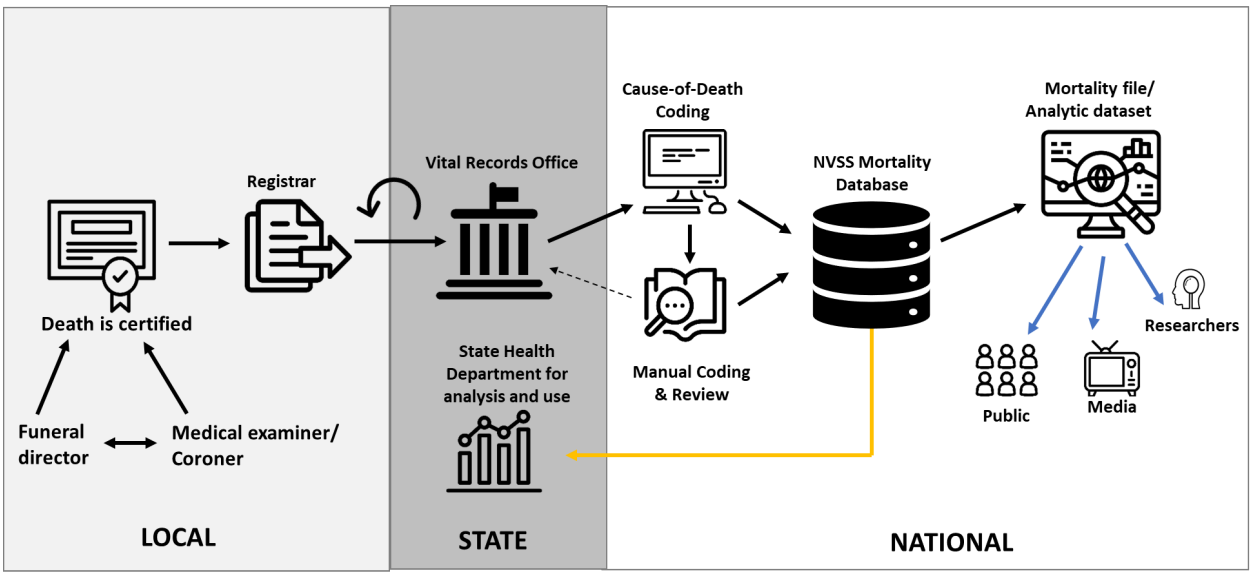
Injury Mortality Surveillance – Data, Frameworks, Quality Control, and Resources

This resource is intended for epidemiologists analyzing injury mortality data working with International Classification of Diseases, 10th Revision (ICD-10) coded death certificates.

Death Certificate Data Flow

Death certificates are certified at the local level by funeral directors, coroners and/or medical examiners. These are provided to health departments in all 50 states, the District of Columbia, New York City, and United States territories who forward the death certificates to the National Center for Health Statistics for ICD-10 coding (see Figure 1). ICD-10 codes for external causes of injury describe the intent (whether the injury was unintentional, inflicted purposefully to another person and/or self-harm) and the mechanism (e.g., the source of the injury such as falls, motor vehicle traffic crashes, burns, and drownings).

Figure 1. Data Flow Process of Death Certificate Data from Certification to Publication



Source: National Center for Health Statistics

Estimates of the burden of deaths due to injury are derived from the National Vital Statistics System, Mortality (NVSS-M) which assigns ICD-10 codes from the cause-of-death using literal text on the death certificate. Both the underlying and multiple-cause-of-death codes are assigned.

NVSS-M releases mortality data annually, after receiving all state updates, and the data have been fully reviewed for completeness and quality. Provisional mortality data are released periodically for injuries involving drug overdoses and suicide. The provisional data has not been reviewed for quality and may be revised with future releases.

Injury Frameworks

To analyze injury mortality data, it is necessary to understand the Injury Mortality Diagnosis Matrices which create a uniform framework of categorizing injury diagnoses. An injury death uses the Underlying Cause-of-Death field, with codes ranging between V01-Y36, Y85-Y87, Y89, U01-U03. Both injury matrices exclusively use the Underlying Cause-of-Death field to classify injuries. Some injury surveillance, particularly drug mortality surveillance, uses multiple cause codes in combination with the underlying causes.

1. Injury Mortality Diagnosis (IMD) Matrix Based on ICD-10 Codes for Multiple Cause of Death Coding refers to nature of the injury (e.g., fracture, laceration, burn, dislocation) and the body region (e.g., arm, leg, head). More information can be found at: ICD-10 Injury Mortality Diagnosis Matrix.

2. External Cause-of-Injury Mortality Matrix Based on ICD-10 Codes includes both the mechanism and the intent of the injury, also referred to as the "manner of death." Intent of injury categories include unintentional, homicide/assault, suicide/intentional self-harm, legal intervention or war operations, and undetermined intent. The external cause matrix uses ICD-10 external cause codes to group injuries by the mechanism and intent of injury.

   In order to apply the injury matrices, here is sample SAS program code. For analyses that use other statistical software programs, the following steps should be followed:

   a. Identify all death certificates with at least one ICD-10 injury code
   b. Classify the cause of death according to the External Cause-of-Injury Mortality Matrix
   c. Classify the intent of the injury
   d. Classify details of external cause of injury (e.g., for motor vehicle crashes: occupant, pedal cyclist, pedestrian, other)

Background materials on ICD-10 for injury mortality surveillance can be found at:

- Injury Data and Resources - Tools and Frameworks
- Recommended Framework for Presenting Injury Mortality Data

Quality Control of Data

Since the National Center for Health Statistics codes the causes of death for all 50 states, the District of Columbia, New York City, and United States territories, there is consistency in the coding that does not require additional validation at the state level. However, the level of specificity written in the underlying cause of death fields does vary by jurisdictions across the country. The following measures are important to assess the quality of death certificate data.

1. Percent of Injury Deaths Assigned a Nonspecific-Injury-Mechanism Code

Issue/Impact: It is important to assess whether the codes are useful for determining the mechanism of injury involved. When substantial detail is lacking, nonspecific codes are assigned.

Records assigned an "unspecified" external cause of injury code provide limited information. If the percent of injury records assigned an "unspecified" external cause of injury code is high, it may be difficult to use the data for injury surveillance and prevention purposes. Variability between states in the specificity of coding makes it difficult to conduct state-to-state comparisons; and rates for specific categories of codes may appear artificially low if a high percentage of deaths are assigned nonspecific codes.

How to Assess: Determine the proportion of injury deaths assigned unintentional injury deaths with X59, exposure to unspecified factor causing other or unspecified injury, as the underlying cause of death. Examine the percent of death certificates with "unspecified" mechanism of injury.

For specific types of unintentional injuries, examine the following codes indicating a nonspecific-injury-mechanism underlying cause:

Intent and Mechanism of Injury	Code(s) Indicating a Nonspecific-Injury-Mechanism Underlying Cause
Drowning	W74, Unspecified drowning and submersion
Fall	W19, Unspecified fall
Fire and Flames	X09, Exposure to unspecified smoke, fire, and flames
Hot Object and Substance	X19, Contact with other and unspecified heat and hot substances
Firearm-Related	W34, Discharge from other and unspecified firearms
Suffocation	W84, Unspecified threat to breathing
Drug Poisonings	X44, Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances T50.9, Other and unspecified drugs, medicaments and biological substances (multiple cause code)
Non-Drug Poisoning	X49, Accidental poisoning by and exposure to other and unspecified chemicals and noxious substances T65.9, Toxic effect of unspecified substance (multiple cause code)
Motor Vehicle Traffic	V89.2, Person injured in unspecified motor-vehicle accident, traffic

A high value indicates that a high percentage of deaths lack sufficient information to be assigned a more specific injury mechanism code.

2. Percent of Intentional Injury Deaths Assigned Unspecified Codes

Issue/Impact: When substantial detail on the cause of intentional injuries such as homicide, suicide, and self-harm is lacking, nonspecific codes are assigned limiting understanding of the mechanism of harm.

How to Assess: Determine the proportion of injury deaths due to homicide assigned, Y09 - assault by unspecified means, as the underlying cause of death.

For specific types of intentional injuries, examine the following codes indicating a nonspecific injury-mechanism underlying cause:

Intent and Mechanism of Injury	Code(s) Indicating a Nonspecific-Injury-Mechanism Underlying Cause
Suicide and intentional self-harm	
Firearm-Related	X74, Intentional self-harm by other and unspecified firearm discharge
Drug Poisoning	X64, Intentional self-poisoning by and exposure to other unspecified drugs, medicaments and biological substances T50.9, Other and unspecified drugs, medicaments and biological substances (multiple cause code)
Non-Drug Poisoning	X69, Intentional self-poisoning by and exposure to other and unspecified chemicals and noxious substances, T65.9, Toxic effect of unspecified substance (multiple cause code)
Homicide	
Firearm-Related	X95, Assault by other and unspecified firearm discharge

A high value indicates that a high percentage of deaths lack sufficient information to be assigned a more specific injury mechanism code.

3. Examine Time Trends to Identify Anomalies

Issue/Impact: Large changes in the number of deaths in a specific category need to be examined further before declaring it to be a valid trend or emerging public health issue. Sometimes increases or decreases are due to changes in coding, such as inclusion of a drug that was not previously included in toxicology panels.

How to Assess:

a. Review trends by quarter or month.
b. Has there been a change in the external cause of injury code?
c. Has there been a change in the intent of injury?
d. If either (b) or (c) has occurred, these may be the result of coroners/medical examiners completing the death certificate differently. Further examine the death certificates to determine whether these changes are universal or if they are from certain jurisdictions.

Further information can be found in this publication: *Evaluating the cause-of-death information needed for estimating the burden of injury mortality: United States, 2019.*