From E to VWXY
Cause of Injury Codes

(Fact Sheets)

**Children's Safety Network Economics
& Data Analysis Resource Center**

and

Consultation with the National Center for Health Statistics

1. INTRODUCTION

To prevent injuries, there must be an understanding of the extent of the problem, how injuries occur, and any contributing factors at a local or State level. Injury data can provide the information needed to make informed decisions regarding which injury, population, and geographic location should be prioritized for prevention efforts. Injury data also can help identify possible intervention points, select appropriate prevention strategies, garner support for the injury prevention strategy chosen, and monitor and evaluate injury prevention efforts. Using injury data to define the problem and identify intervention opportunities may also better position public health departments to leverage funding and establish policy support for the prevention of injuries.

The transition in the coding of injury mortality has given rise to several questions about how to interpret and present injury statistics. This series of factsheets explains the latest changes in coding and classification systems and their affect on our work in the field of injury prevention. These factsheets will be particularly useful for those who have a basic understanding of injury data, surveillance, and cause of injury codes.

2. OVERVIEW

The International Classification of Diseases (ICD) is a system designed to promote international comparability in the collection, processing, classification, and presentation of mortality statistics.[1,2] It provides a way to classify medical terms reported by physicians, medical examiners, and coroners on death certificates and data from physician offices and hospital inpatient and outpatient records so they can be grouped together for statistical purposes.

ICD VERSUS ICD-CM

In the United States, the ICD is used to code and classify mortality data from death certificates. The ICD Clinical Modification (CM) is used to code non-fatal-injury data from medical records (i.e., hospital records, emergency department records, and physician office data).

From 1979 to 1998, injury-related fatalities were coded using the 9th revision of the ICD (ICD-9) external cause of injury codes, more commonly referred to as E codes. In 1999, the 10th revision of the ICD (ICD-10) was implemented in the United States for coding deaths.

In the United States, nonfatal injuries are still coded for analysis using ICD-9-CM. The implementation date for ICD-10-CM has not been established, but a "near final" draft of ICD-10-CM is available at http://www.cdc.gov/nchs/about/otheract/icd9/abticd10.htm. Since the ICD-10-CM has not yet been implemented, discussion on the coding of nonfatal injuries in this series of factsheets is limited.

Comparison of ICD Versions

	ICD-9	ICD-10
ICD for Fatal Injuries	Used 1979 – 1998	Use began in 1999
ICD-CM for Nonfatal injuries	Used 1979 – present	Under development

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[1] Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. International Classification of Diseases 10th Revision (ICD-10). Atlanta: Author. Retrieved from the World Wide Web May 2002, http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm.
[2] World Health Organization. International Statistical Classification of Diseases and Related Health Problems, Tenth Revision. Geneva: World Health Organization. 1992.

Under ICD-9, the external cause of injury death was assigned an E code ranging from E800.0 to E999.9 based on information documented on the death certificate. External cause of injury codes describe the circumstances surrounding an injury death, such as a motor vehicle crash, drowning, or suffocation, as well as the intent of the injury (i.e., unintentional, homicide, suicide, intent undetermined, or other [legal intervention/operations of war]). In 1999, along with ICD-10, the injury E codes for fatalities were replaced with V, W, X, and Y cause codes along with special U codes for terrorism. For example, W67 is the code that represents deaths due to drowning and submersion while in a swimming pool. Some external cause of injury codes contain a decimal followed by another number. For example, V60.5 is the code that classifies a driver injured in a traffic accident.

	ICD-9[a]	ICD-10[b]
All Injury	E800 – E999	*U01-U03, V01 – Y36, Y85 –Y87, Y89
Unintentional	E800 – E869, E880 – E929	V01 – X59, Y85 – Y86
Suicide	E950 – E959	*U03, X60 – X84, Y87.0
Homicide	E960 – E969	*U01-*U02, X85 – Y09, Y87.1
Undetermined	E980 – E989	Y10 – Y34, Y87.2
Legal Intervention	E970 – E978	Y35 – Y36

[a]To view the entire ICD-9 cause of injury framework, see http://www.cdc.gov/nchs/about/otheract/ice/matrix.htm.
[b]To view the entire ICD-10 cause of injury framework, see http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm.

Information on the cause and intent of an injury is essential for designing an effective injury prevention program. For example, an unintentional death due to burns from hot water can be distinguished from a homicide resulting from steam or hot vapors using cause of injury codes (X11 versus X98, respectively). Thus, injury prevention researchers, epidemiologists, public health, and policy administrators need and rely upon cause-coded data.

3. WHY THE CHANGE?

The ICD is developed collaboratively between the World Health Organization (WHO) and 10 international centers, for purposes of ensuring that medical terms reported on death certificates are internationally comparable and lend themselves to statistical analysis.[3] The ICD has been revised approximately every 10 years since 1900. These revisions reflect advances in the medical field, changes in our understanding of disease mechanisms and terminology, and are designed to maximize the amount of information and flexibility a code can provide. ICD-10 more closely reflects current medical knowledge than ICD-9.

4. IMPORTANCE OF ACCURATE REPORTING

As with any change, it takes time for all the involved parties to become accustomed to the new codes and classification scheme. Attending physicians, coroners, and medical examiners need to recognize the importance of reporting the most complete information possible regarding the decedent and the circumstance(s) of the death. What is written on the death certificate is translated into an ICD code, and statistical analyses are based on those codes.

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[3] Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. *International Classification of Diseases 10th Revision (ICD-10).* Atlanta: Author. Retrieved May 2002, from http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm.

5. INJURY REPORTING FRAMEWORK

To facilitate the use of external cause of injury codes for injury prevention purposes, the Centers for Disease Control and Prevention (CDC), the National Center for Health Statistics (NCHS), and the National Center for Injury Prevention and Control (NCIPC), along with members of the American Public Health Association's Injury Control and Emergency Health Services Section (ICEHS), and the International Collaborative Effort on Injury Statistics developed a framework for presenting injury mortality data. The first version of the framework was developed based on the ICD-9 external cause of injury codes and was published in the August 1997 *Morbidity and Mortality Weekly Report (MMWR)*[4] (online: www.cdc.gov/mmwr/PDF/rr/rr4614.pdf).

These efforts were the result of a need to provide standard groupings to analyze injury data and examine intent as well as mechanism of injury. The framework is in the form of a table with one axis showing the mechanism of injury (i.e., burn, fall, poisoning), and the other axis showing intent of injury (i.e., unintentional, homicide, suicide, undetermined, or other). Each cell within the table contains the ICD codes to classify the injury deaths due to a given mechanism and intent. An example of a single cell within the table, the number of suicides (intent) due to cutting and piercing objects (mechanism), is shown below:

Mechanism	Suicide (Intent)
Cutting/Piercing Objects	X78 (ICD-10)

To accompany the release of ICD-10, NCHS posted the ICD-10 injury mortality framework online at http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm. On the same web page, NCHS has also provided SAS (Statistical Analysis Software) code to produce the external cause code matrix using ICD-10 codes.

It is extremely important to ensure that the ICD framework used for data analysis and presentation correlates with the corresponding years of data and with the appropriate outcome (either mortality or morbidity).

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[4] Centers for Disease Control and Prevention. Recommended framework for presenting injury mortality data. *MMWR Recommendations & Reports,* 1997 Aug 29; 46 (RR-14): 1-30.

6. CLASSIFICATION OF INJURY DEATHS

The ICD includes coding rules for causes of death. These rules allow a coder to identify the single condition on the death certificate that is considered most informative from a public health point of view, referred to as the **underlying cause of death**. The reporting of injury mortality statistics is most often based on the underlying cause of death. "For example, the underlying cause for a death resulting from a skull fracture sustained in a motor vehicle traffic crash would be classified under motor vehicle traffic crash rather than skull fracture."[5] This is because from a public health and prevention standpoint, knowing that the death resulted from the motor vehicle traffic crash is more informative.

The underlying cause of death derived from the death certificate is one of up to 20 conditions that can be reported on the death certificate. The additional listed conditions are referred to as **multiple causes of death**. "The underlying cause of death provides information only on the mechanism and intent of the injury. The multiple causes of death, on the other hand, provide information on the nature of the injuries sustained (i.e., the injury diagnosis such as a skull fracture, arm laceration, penetrating injury to the thorax)."[4]

Under ICD-10, injury deaths are classified with an underlying cause of death coded to one of the following ICD-10 codes: *U01-*U03, V01-Y36, Y85-Y87, or Y89. The ICD-10 nature of injury codes are S00-T78, T90-T98 and are used exclusively for multiple cause classification and are never used as underlying cause codes. The ICD-10 nature of injury codes is located in the Injury and Poisoning Chapter of the ICD-10 manual.

It is important to consider multiple causes of death when analyzing injury mortality data to obtain a more complete picture of the number of deaths due to a particular injury. Considering both the underlying cause of death as well as multiple causes of death under ICD-10 prevents the loss of valuable information. For example, a poisoning-related death from carbon monoxide can only be identified by using both the underlying cause of injury code X47 with the nature of injury diagnosis code T58 in the multiple cause data.[4]

	ICD-9	ICD-10
Underlying Cause of Injury Death Codes	E800 – E869, E880 – E929 E950 – E999	*U01-*U03, V01-Y36, Y85-Y87, or Y89
Multiple Causes of Injury Death Codes	800– 994, 995.5	S00-T78, T90-T98

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[5] Anderson RN, Minino AM, Fingerhut LA, Warner M, Heinen MA. *Deaths: Injuries 2001. National Vital Statistics Reports*; Vol 52 No. 21. Hyattsville, Maryland: National Center for Health Statistics. 2004.

7. WHAT'S CHANGED?

In terms of coding injury-related deaths, ICD-10 differs from ICD-9 in several respects.[6]

- The external cause of injury codes form Chapter 20 in the ICD-10 manual and are prefixed with the letters V, W, X, and Y.

- *U codes have been added for terrorism-related deaths. The U is always prefixed with an * to denote its use is not mandatory for all countries.

- Nature of injury and poisoning codes begin with the letter S or T.

- There is a new injury mortality framework to accompany ICD-10 external cause of injury codes.

- There have been changes to the rules for selecting the underlying cause of death on death certificates.

- Using the 4th digit in ICD-10 in some cases provides more detailed information (primarily with transportation-related deaths).

EXAMPLES OF CHANGES TO SPECIFIC INJURY CATEGORIES UNDER ICD-10:

- **Homicide** is now termed "assault."

- **Suicide** is now termed "intentional self-harm."

- **Drowning**: The detail is on the type of water involved (e.g., bathtub, swimming pool, natural water). In ICD-9, the emphasis was on the activity being undertaken at the time of the event, for example, swimming, water-skiing, and diving. Therefore, information on the activity before the incident is lost in ICD-10. Water-transportation-related drowning codes (i.e., V90 and V92) are included in the "other transport" codes rather than with drowning codes.

- **Poisoning**: Although ICD-10 is generally more detailed, ICD-10 external cause codes for unintentional and intentional poisoning are substantially less detailed than in ICD-9. However, using multiple cause-of-death poisoning codes in combination with the external cause codes can regain poisoning details lost under the revision.

- **Transport accidents:** In ICD-10, transport accidents are grouped by the characteristics of the injured person (e.g., pedestrian, pedal cyclist, car occupant). Under ICD-9, transport accidents were grouped according to the type of vehicle involved in the accident (e.g., railway, motor vehicle, water transport accidents).

  - Two rows have been added to the ICD-10 injury mortality matrix regarding transport:

    - "All transport" includes all transport related deaths that were classified as unintentional, suicide, homicide, intent undetermined

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[6] Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. *ICE ICD-10 Injury Mortality Framework-Overview and Implications.* Retrieved December 2002, from http://www.cdc.gov/nchs/about/otheract/ice/matrix10impl.htm.

and operations of war. In ICD-9, the codes for suicide and intent undetermined by crashing of a motor vehicle were included with motor vehicle traffic injuries.

- ◆ "Other land transport" was added to accommodate new codes in ICD-10.

— Because substantial changes were made in the classification of transport-related injuries in ICD-10, a more detailed categorization of transport codes is offered (see http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm). There are more shifts and changes among the transportation codes. Items 3-5 on the NCHS website list these changes: http://www.cdc.gov/nchs/about/otheract/ice/matrix10impl.htm

- **Bites and stings:** The subcategory of "Bites and Stings" in the ICD-9 framework was dropped from the ICD-10 matrix. In ICD-10, "bitten by" has been combined with "contact with" and/or "struck by" for some relevant codes.

- **Terrorism Codes:** In light of the events of September 11, 2001, NCHS developed a set of new codes within the ICD-10 framework (*U01-*U03) and for ICD-9-CM (E979). These new codes allow for the identification of deaths from terrorism reported on death certificates through the National Vital Statistics System, as well as for injuries and illnesses from terrorism reported on medical records used for statistical purposes and for reimbursement.[7]

  — The classification of death and injury resulting from terrorism is posted at http://www.cdc.gov/nchs/about/otheract/icd9/terrorism_code.htm.

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[7] Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. Classification of Death and Injury Resulting from Terrorism. Retrieved June 2002, from http://www.cdc.gov/nchs/about/otheract/icd9/terrorism_code.htm

8. TREND ANALYSIS

The introduction of new classifications is not only costly to the Federal Government and to individual States, but also can introduce disruptions in trend analyses. When looking at trends in annual numbers of death and death rates by mechanism/cause of injury, changes in numbers from 1998 to 1999 could be a result of the change in code definitions and coding rules.

Unless absolutely necessary, combining data from 1999 onwards with previous years' data by cause-of-injury categories to obtain average annual numbers of death and death rates are **not** recommended. Instead, States should explore the following options:
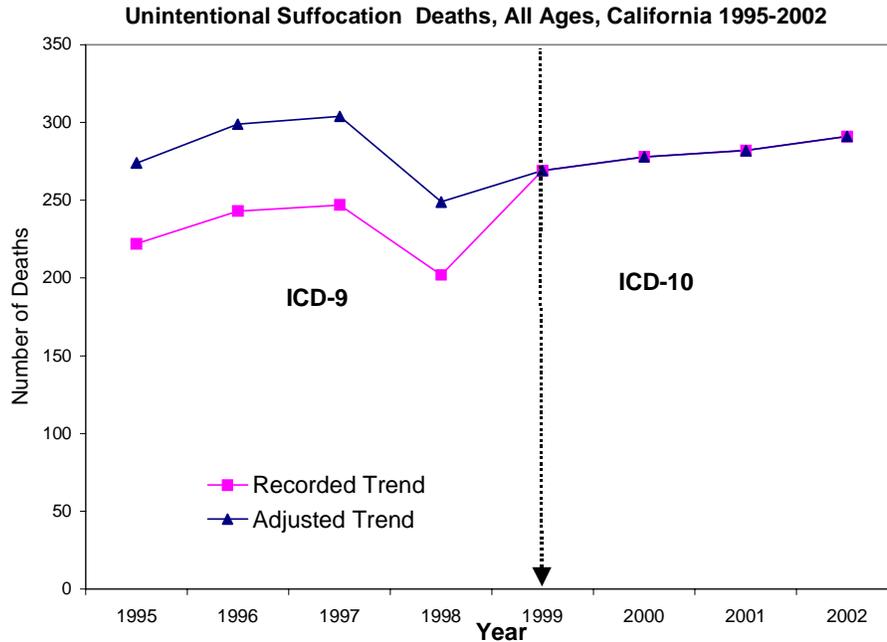
- Begin new trends with data-year 1999. If you have a graph or table showing data before 1999 along with data from 1999 onwards, you should point to the place on the graph or table where ICD-10 was implemented and footnote the change (see example on next page).

- For trend analyses, the comparability ratio (CR) should be applied to data-year 1998 (show the adjusted and unadjusted number or rate for 1998) to adjust for any affects of the switch to ICD-10. A comparability ratio is the ratio of the number of deaths coded to an injury cause in ICD-10 to the number coded to the equivalent cause in ICD-9:

$$CR = \frac{\text{\# deaths due to a cause classified by ICD-10}}{\text{\# deaths due to a cause classified by ICD-9}}$$

- Examine the codes involved and their CR and then decide whether the likelihood of error is great or small. You might be able to avoid a discontinuity in a specific code by aggregating to a more general set of codes. For example, use Motor Vehicle Traffic (CR=0.9545) instead of Motor Vehicle Occupant (0.6191).

Maternal and Child Health agencies that use mortality data to track their core and State-selected performance measures should be aware of all the changes and limitations introduced by ICD-10 while monitoring their progress. States that have studied the changes in mortality trends as a result of the new coding may provide us with a better understanding of how we can interpret and present injury mortality statistics in light of the ICD-10 revision.

Final comparability ratios for the categories of the ICD external cause of injury mortality matrix will be published in a forthcoming report from NCHS on 2002 injury mortality. In addition, a complete file used to calculate comparability ratios is located at http://www.cdc.gov/nchs/datawh/statab/unpubd/comp.htm.

Unintentional Suffocation Deaths, All Ages, California 1995-2002

Recorded Trend: Actual number of deaths recorded under ICD-9 and ICD-10

Adjusted Trend: Deaths **1998 and prior** are adjusted to account for ICD coding changes using US comparability ratio for unintentional suffocation (CR = 1.2320).[8]

Source: California Department of Health Services, EPIC, EPICenter.

For more information on comparability ratios and their application, visit: http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm and www.doh.wa.gov/ehsphl/chs/chs-data/death/icd10/ICD10Gud.pdf

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[8] Anderson RN, Minino AM, Hoyert DL, Rosenberg HM. Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates. *National Vital Statistics Reports.* 2001 May 18; 49(2): 1-32.

9. WHERE TO GO FOR HELP

The Children's Safety Network Economics and Data Analysis Resource Center can work with you and your epidemiologist/data analyst to decide the best approach for adjusting for the affects of the switch to ICD-10 for trend analyses of your injury data, rate calculations, and application of comparability ratios based specifically on your data needs. Our contact information is on the cover page.

The NCHS has a wealth of information on its web site regarding ICD-10 and also can answer any questions and provide support related to this issue. You can contact the NCHS Data Dissemination Branch at (301) 458-4636 (phone) or (301) 458-4027 (fax).

To obtain meaningful data, it is crucial that you work with your State or local epidemiologist and/or the agency that collects and maintains your data. It is important to share your analyses with people who know the dataset intimately for comment and to ensure that you have not drawn conclusions in your analyses that the data do not support. Giving a copy of the final report to the agencies that helped you obtain the data will be appreciated. This thoughtful gesture can help to foster a working relationship that will be invaluable over time.

10. SOURCES OF ICD-10 CODED DATA

The major source for injury mortality data is your State office of vital statistics or vital records. Mortality data are typically first collected at the county level, reported to the State, and then reported to the Federal Government.

Also, listed below are two CDC web sites where you can find injury mortality data. Due to the distinct changes in coding definitions and rules from ICD-9 to ICD-10, these sites present mortality data for 1999 and beyond separately from data for 1998 and earlier.

- **WISQARS** (http://www.cdc.gov/ncipc/wisqars)
  The National Center for Injury Prevention and Control has a web-based injury statistics query and reporting system that provides customized injury-related mortality data. It is an interactive database system that provides customized reports of injury-related fatal injuries and nonfatal injuries. County-level data are not available via this system.

- **WONDER** (http://wonder.cdc.gov)
  The CDC Wonder Database for Searches & Queries is one avenue for finding county, State and national injury mortality data. You will be asked to sign-on to the WONDER system. You may enter the system anonymously or select a user name and password. You need to be familiar with ICD-9 and ICD-10 codes to use this database. Counts and rates of death can be obtained by cause of death, State, county, age, race, sex, and year.

Individual States have initiated their own online data-query systems. For example:

- **EPICenter:** California Injury Data Online
  (http://www.dhs.ca.gov/EPICenter)
  The Epidemiology and Prevention for Injury Control Branch (EPIC) under the California Department of Health Services has an injury data site where you can get data on fatal injuries and nonfatal hospitalized injuries from 1991 onward. You can create custom tables with breakdowns such as year, county, demographics, principal diagnosis (e.g., skull fracture) and detailed external causes (e.g., contact with hot household appliances).

- **Utah Health Data Committee**:
  (http://hlunix.hl.state.ut.us/hda/databases.htm)
  The Utah Hospital Discharge Database has results based on 18 types of injuries coded by ICD-9 E code, number of discharges, average charges, and summation of length of stay and total charges.

- **Wisconsin Interactive Statistics on Health (WISH)**:
  (http://dhfs.wisconsin.gov/wish/)
  This interactive site provides information about health indicators in Wisconsin including injury mortality and injury hospitalization data.