

Consensus Recommendations for Injury Surveillance in State Health Departments



Report from the
Injury Surveillance
Workgroup (ISW5)



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Injury Surveillance Workgroup (ISW5)
State and Territorial Injury Prevention Directors Association

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Executive Summary

Surveillance is essential in the design, implementation and evaluation of injury prevention efforts at the state and local level. In the US, there have been multiple efforts since 1999 to improve and standardize state-based injury surveillance. A workgroup with representatives from the State and Territorial Injury Prevention Directors Association (STIPDA), Council of State and Territorial Epidemiologists (CSTE), Society for Advancement of Violence and Injury Research (SAVIR), National Center for Injury Prevention and Control (NCIPC), and the National Center for Health Statistics (NCHS) was convened in 2006-2007 to develop current recommendations for injury surveillance in state health departments. Additionally, comments were requested from Directors of injury and violence prevention programs at state health departments. The purpose of this report is to: summarize previous efforts to enhance state-based injury surveillance; describe injury surveillance principles; address issues that have arisen since the initial 1999 report on injury surveillance in state health departments; make recommendations regarding issues that have not yet been addressed; and acknowledge some future challenges in injury surveillance.

Great progress has been made since 1999 when the document *Consensus Recommendations for Injury Surveillance in State Health Departments* was first published to define the processes of establishing ongoing statewide injury surveillance and to standardize data collection across states (STIPDA, 1999). However, there continues to be many challenges still facing state injury and violence prevention programs. While ICD-9-CM external cause coding (E-codes) has increased substantially since 1999, there are still issues with completeness and accuracy of E-codes in morbidity data. It is imperative that states assess these issues in their hospital discharge and emergency department data and actively provide feedback to the data providers; additionally, opportunities to educate data coders and health care providers are encouraged.

The Workgroup recommends that the 14 injuries and injury risk factors and the 11 data sets recommended in the 1999 document continue to be the core data collected by states. Since 1999, case definitions have been created for 13 of the injuries/risk factors. There has been progress and success in the area of combining data from multiple datasets to provide a more comprehensive picture of the circumstances surrounding the injury than would be obtained by the use of a single dataset. Partnerships are important in all areas of public health, including surveillance, and state injury and violence prevention programs must continually build relationships that contribute to data collection, analysis, and dissemination. Dissemination of the injury surveillance data collected is a critical aspect of a comprehensive injury prevention program that contributes to public awareness, health education and promotion, policy development, and research development. States must strive to have injury-related morbidity, mortality, and behavioral risk factor data electronically available at the state and local level to public health professionals, researchers, policy makers, and the public.

Work being conducted nationally has raised concerns regarding the undercounting of injury cases when using the definition proposed in the 2003 STIPDA report *Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance* (STIPDA, 2003). The injury case definition for national injury surveillance involving ICD-9-CM coded emergency department (ED) data has been changed in many data products of the National Center for Health Statistics; this definition expands the 2003 STIPDA definition for hospital discharge

data by including not only the first-listed injury diagnosis codes but also valid E-codes where the initial diagnostic code is not an injury. To standardize reports, the Workgroup recommends states that are able to use this new definition should do so in ED analyses. The Workgroup also suggests that further state-based analyses are needed to study the effects of using this expanded definition in reporting both state ED and hospital discharge data.

Natural disasters or deliberate violent actions with multiple casualties occur in the US. State injury and violence prevention programs have a role to play in all phases of a disaster and should establish and maintain expertise in disaster surveillance and epidemiology in order to respond immediately to an event. Standardized reporting methods and data collection instruments must be created for disaster surveillance so that states can respond more efficiently to events. There is a need for continued national leadership informed by state-based input in this area.

A serious concern when using billing data (such as is used in statewide hospital discharge and emergency department data) for injury surveillance is the issue of duplicate reporting. In order to determine the incidence of injury (a critical measure for evaluating prevention efforts), it is important to count a person-injury event only once and to include only the first or initial visit for the injury. Currently, there are no standardized guidelines or recommendations on how to de-duplicate injury surveillance data. Thus, states use different criteria and techniques to deal with this problem. Standardization of de-duplication processes is an important future challenge that needs to be addressed and disseminated widely to state injury and violence prevention programs.

Finally, the need for emergency medical system (EMS) information systems and databases has been well established, and many statewide data systems have been created. However, these EMS systems vary in their ability to collect patient and systems data and their capacity for analysis. There are current activities to standardize data collection by state and local EMS services across the nation. These efforts need to continue and be supported at the state level.

To address many of these issues, the Workgroup made the following recommendations for injury surveillance in state health departments:

Recommendations for improving coding of injury surveillance data:

1. State injury and violence prevention programs should regularly evaluate the completeness and quality of external cause coding in their statewide hospital discharge and emergency department databases.
2. State injury and violence prevention programs should provide information on the uses and adequacy of external cause coding to those who produce the data as a way to improve data quality.
3. State injury and violence prevention programs should explore the possibility of using statutory tools, rule making or other policy actions to enhance the completeness and specificity of external cause coding.
4. States should support efforts at the national level to improve external cause coding.

5. States should explore opportunities to provide training for health care providers and hospital coders regarding the importance of documenting the circumstances and causes of the injury incident in the medical record.

Recommendations for improving state injury surveillance capacities:

1. Utilizing the STIPDA STAT guidelines, state injury and violence prevention programs should conduct a self-review of surveillance capacity.
2. State injury and violence prevention programs should calculate and report the recommended Injury Indicators annually. Consideration should be given to participation in the multi-state document compiled by NCIPC.
3. A standardized approach to the addition and expansion of the Injury Indicators should be developed.
4. State injury and violence prevention programs should have injury morbidity, mortality, and risk behavior data available to partners, policymakers, and the public via web-based query systems.
5. State injury and violence prevention programs should make it a priority to invest in training staff in injury surveillance and epidemiology.
6. State injury and violence prevention programs with no statewide hospital discharge or emergency department data systems or no ready access to data from existing systems should work with other organizations and agencies in their state to establish such data systems or gain access to the data if it exists.

Recommendations regarding new challenges in injury surveillance:

1. States should use the expanded ED-specific injury case definition in analysis of their state's emergency department data if they have the requisite data elements.
2. Each state and territory should establish and maintain expertise in disaster surveillance and epidemiology and collaborate with the state all hazards preparedness programs.
3. State injury and violence prevention programs should support efforts at the national level to establish standardized reporting methods and data collection instruments for disaster surveillance.
4. Further investigation of expanding the current hospitalized injury case definition to include cases identified using external cause of injury data in order to be consistent with the current adopted ED case definition should be conducted.

Recommendations regarding future challenges in injury surveillance:

1. States should understand the importance of de-duplication of statewide hospital discharge and emergency department data systems; states should support and consider participation in efforts to develop standardized guidelines for the de-duplication of statewide injury morbidity data.
2. States should encourage local and state-level compliance with the standards for EMS and trauma registry data collection.

Background

Injury surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data to stimulate public health action to reduce injury-related morbidity, mortality, and disability (Horan, 2003). Surveillance is the first step in the public health model (Sogolow, 2007) and one of the most critical elements of injury prevention and control (Davies, 2001). Surveillance is a primary function of public health practice. While national data are useful in monitoring nationwide trends and evaluating national regulation, legislation, and policies, they are not sufficient for identifying injury problems and patterns or for evaluating policies or prevention programs at the state or local level (Bonnie, 1999).

Surveillance data at the state and local level allow injury programs to:

- Determine the importance of injury as a public health problem;
- Assess the magnitude of injury morbidity, mortality and disability;
- Determine specific injury problems and temporal trends;
- Identify and detect changes in the prevalence of injury-related risk behaviors in the population;
- Determine state and local injury prevention priorities;
- Inform state and local prevention program design regarding causation, risk factors, populations at risk, geographic location, or temporal issues;
- Evaluate efficacy of prevention programs or control measures;
- Identify new and emerging injury hazards;
- Promote and evaluate policy changes;
- Monitor state progress toward achieving injury objectives in their individual strategic plans or the Healthy People 2010 Injury-Related Objectives (U.S. DHHS, 2000); and
- Direct injury research.

Population-based surveillance is the preferred method of monitoring the occurrence of injuries, because rates of injuries and injury risk factors can be calculated and generalized to the population. Within state health agencies, the responsibility and authority for preventing injuries is often delegated to the state injury and violence prevention program. In addition to serving the population of the state as a whole, state injury and violence prevention programs also work with counties and cities to develop community-based prevention projects to address local injury prevention priorities. Therefore, population-based surveillance systems that can provide specific information regarding counties and metropolitan areas are useful for assessing the need for and monitoring the effectiveness of local prevention projects.

The purpose of this report is to: summarize previous efforts to enhance state-based injury surveillance; describe injury surveillance principles and issues related to state surveillance capacities; address issues that have arisen since the initial 1999 report on injury surveillance in state health departments; make recommendations regarding issues that have not yet been addressed; and acknowledge some future challenges in injury surveillance. Major

recommendations are noted in boxes at the end of each major section; additional recommendations are noted in bold within sections throughout the report.

Efforts in Improving State Injury Surveillance

Significant progress has been made on important methodological issues related to injury surveillance since 1999 as the result of the effective collaboration of individual state injury and violence prevention programs, the State and Territorial Injury Prevention Directors Association (STIPDA), the Council of State and Territorial Epidemiologists (CSTE), the National Center for Health Statistics (NCHS), and the National Center for Injury Prevention and Control (NCIPC). With a goal of improving state injury surveillance systems, these four organizations have produced several foundational consensus documents:

- The *Consensus Recommendations for Injury Surveillance in State Health Departments* report was published in 1999 (STIPDA, 1999). The report set standards for surveillance capacities, and recommended 14 specific injuries or injury risk factors, and 11 data sets for core surveillance for all states (see <http://www.stipda.org/displaycommon.cfm?an=8>).
- CSTE has reviewed and adopted *Position Statements* and recommended inclusion of specific injuries in the *National Public Health Surveillance System* (NPHSS) (see <http://www.cste.org/PositionStatementsResolutions.htm>). These statements include goals and methods of surveillance, surveillance definitions, and sources of data to include in the surveillance system.
- The first *State Injury Indicators Report* was published in 2001 (Davies, 2001). This report provided standardization for data collection and reporting for 11 of the 14 injuries and risk behaviors recommended in the *Consensus Recommendations for Injury Surveillance in State Health Departments and CSTE Position Statements*. As the process of producing the Injury Indicators Report moved forward, additional key pieces of recommended surveillance methodology were developed.
 - Thirty-four states participated in the *State Injury Indicators Report: Third Edition-2004 Data* (Johnson, 2007).
 - The manual *State Injury Indicators: Instructions for Preparing 2005 Data* (Johnson, 2006) can be found on-line at: http://www.cdc.gov/ncipc/dir/State_Injury_Indicators_05.pdf. A pre-formatted rate calculation spreadsheet is also available from this site.
- Another Injury Surveillance Workgroup was convened to review and make recommendations regarding standardizing the use of hospital discharge data, and resulted in the publication of the *Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance* (STIPDA, 2003).
- *How States are Collecting and Using Cause of Injury Data: 2004 Update to the 1997 Report* summarizes the findings of a survey to assess the availability of external cause of injury data in statewide Hospital Discharge Data Systems, Hospital Emergency Department Data Systems, and other ambulatory care data systems (Abellera, 2005).

- Standardized matrices for presenting injury mortality and morbidity data using International Classification of Disease (ICD) codes (WHO, 1992) have been important tools for increasing comparability of publications. The ***Recommended Framework for Presenting Injury Mortality Data*** (CDC, 1997) (see <http://www.cdc.gov/nchs/about/otheract/ice/matrix.htm>) and the ***ICD-9-CM Framework for Presenting Injury Morbidity Data*** (<http://www.cdc.gov/ncipc/whatsnew/matrix2.htm>) organize data by external cause and intent in ICD-9 and ICD-9-CM coded datasets. ***The ICD-10 Framework: External Cause of Injury Mortality Matrix*** similarly organizes external cause coded mortality data in ICD-10 coded datasets (see <http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm>) (NCHS, 2002). The ***Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury*** (<http://www.cdc.gov/nchs/about/otheract/ice/barellmatrix.htm>) provides a framework for the presentation of nature of injury and body region data using ICD-9-CM injury diagnosis codes (Barell, 2002). To standardize the presentation of more than 1200 ICD-10 "S" and "T" codes (excluding adverse effects and complications of medical and surgical care: T79, T80–T88, T98.3), the ***Injury Mortality Diagnosis Matrix*** (http://www.cdc.gov/nchs/about/otheract/ice/injury_matrix10.htm) was developed to classify multiple causes of death; the matrix cross-classifies the body region of injury by the nature of injury (Fingerhut, 2006).
- ***Consensus Recommendations for Surveillance of Falls and Fall-Related Injuries*** (STIPDA, 2006) was published in 2006 and contains recommendations regarding: definitions for core and expanded fall injury surveillance; national databases for data comparisons; leadership for data standards and policies; and fall surveillance research.

Another initiative important to increasing state level injury infrastructure began in 1999 when STIPDA initiated the **State Technical Assessment Team (STAT) Program** (<http://www.stipda.org/displaycommon.cfm?an=1&subarticlenbr=7>). This program is designed to assist state health departments in developing and enhancing injury prevention programs, including surveillance activities. STIPDA developed standards and indicators for core components of state injury and violence prevention programs, including data collection, analysis, and dissemination (i.e., surveillance) (see Appendix A). State injury and violence prevention programs can evaluate their capacity by comparing their surveillance program to these standards. In 2004, the **National Training Initiative for Injury and Violence Prevention (NTI)** released core competencies of the essential individual knowledge and skills on the fundamentals of injury and violence prevention (see <http://www.injured.org/> and State Injury Surveillance Capacities, Staffing and Training section of this document).

Injury Surveillance Principles

Classification and Coding of Fatal Injuries

The International Classification of Diseases (ICD) is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and hospital records. Injury deaths can either be coded as the underlying cause or as part of the multiple causes of death. The **underlying cause of death** is defined by the ICD as “(a) the disease or injury which initiated the chain of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury” (WHO, 1992). The underlying cause is chosen from the multiple causes of death that contributed to the fatal injury based on very specific selection rules and guidelines defined by ICD.

For injury deaths, the external cause rather than the injury diagnosis is always selected as the underlying cause because public health efforts are generally directed at preventing the incident that led to the death (e.g., motor vehicle traffic crash) rather than toward the injury diagnosis (e.g., skull fracture). For example, for a death resulting from a skull fracture sustained in a motor vehicle traffic crash, the underlying cause would be classified as a motor vehicle traffic crash rather than as the skull fracture.

Information beyond the underlying cause of death is typically reported on the death certificate. In Part I of the death certificate, those responsible for certifying the cause of death are asked to provide the chain of events leading to death beginning with the condition most proximate to death (i.e., the immediate cause) and working backwards to the underlying cause. In addition, the certifier is asked to report in Part II other conditions that may have contributed to death, but were not in the causal chain. When more than one cause or condition is included in Part I or Part II of the death certificate, the underlying cause is determined by 1) the sequence of conditions on the certificate, 2) provisions of the ICD, and 3) associated ICD classification rules (WHO, 1992).

Although the underlying cause is the condition or circumstance that is most commonly used in the analysis of cause of death, all cause of death data reported on the death certificate referred to as **multiple causes of death** are coded (up to 20 conditions) and available for analysis (Anderson, 2004). Multiple cause of death data include information about the types of injury diagnoses if reported on the death certificate. Some examples include a fracture of the leg or laceration of the arm, a burn covering multiple body sites, or the substance ingested (e.g., cocaine, etc.) in the case of a poisoning (Anderson, 2004).

Thus, a single injury diagnosis code is a two-dimensional cross-classification identifying the nature of the injury (and, in some instances, intent) and the body region that was injured. Examples of SAS (a commonly used statistical tabulation and analysis computer software package) statements that can be used for the tabulation of injury diagnosis codes in the multiple cause data can be found on the NCHS websites: http://www.cdc.gov/nchs/about/otheract/ice/injury_matrix10.htm and http://www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_10.pdf (page 124). At the request of the World Health Organization’s Family of International Classifications Mortality Reference Group (www.who.int/classifications/committees/mrg.pdf), efforts are currently underway to define a main injury in the multiple cause data.

From 1979-1998, fatal injuries or deaths were coded using ICD 9th Revision (ICD-9). For those years, the underlying cause of injury death was defined by the following ICD-9 external cause of injury codes: E800-E869, E880-E929, E950-E999, which include causes of unintentional and intentional injury and late effects. These codes exclude adverse effects of drugs in therapeutic use and complications of medical or surgical care. To standardize reporting of mortality data, a matrix organizing the injuries by cause and intent of injury was developed and reported in a 1997 Morbidity and Mortality Weekly Report, Recommended Framework for Presenting Injury Mortality Data (<http://www.cdc.gov/mmwr/preview/mmwrhtml/00049162.htm>) (CDC, 1997); see <http://www.cdc.gov/nchs/about/otheract/ice/matrix.htm> for the codes that correspond to the causes and intent of injuries in the matrix and for the associated SAS programming. For ICD-9, injury deaths classified by the nature of the injury (e.g., fracture, brain injury) include ICD codes 800-994, and 995.5; diagnosis codes for adverse therapeutic drug effects and complications of care are again excluded.

In 1999, coding of mortality data began using the 10th Revision of ICD (ICD-10). ICD-10 has alphanumeric categories rather than numeric categories and almost twice as many categories as ICD-9. The underlying external cause of death codes include ICD-10 codes *U01-*U03, V01-Y36, Y85-Y87, and Y89. Like the ICD-9 code set, deaths with an underlying cause due to adverse effects or complications of medical and surgical care are excluded. These codes are also categorized into a matrix for data comparative purposes and for easy dissemination (see <http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm>) (NCHS, 2002). An injury mortality diagnosis matrix for use with multiple causes of injury mortality data has also been developed using the following ICD-10 codes S00-T75, T90-T98.1; the matrix (http://www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_10.pdf) organizes the types of injuries (e.g., burn, fracture, internal organ injury, etc.) and injury body regions (e.g., head/neck, extremities, etc.) (Minino, 2006; Fingerhut, 2006).

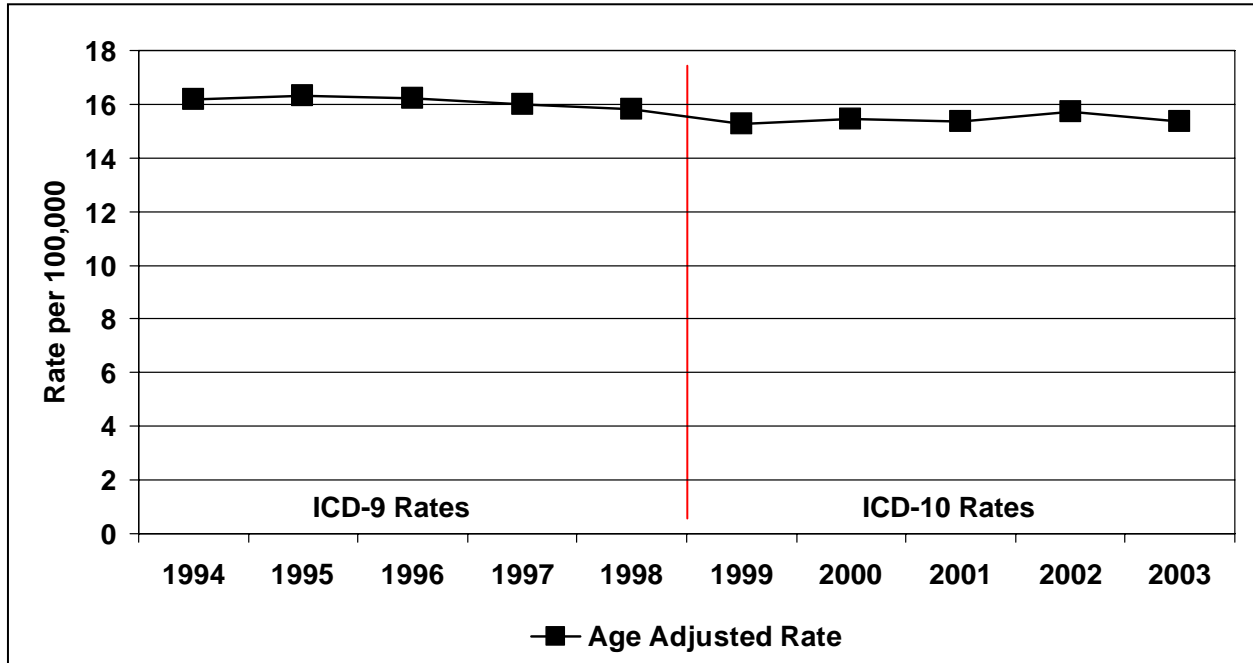
Comparability of Mortality Data: ICD-9 to ICD-10

The revisions of ICD coding, in some instances, create breaks in the comparability of a cause of death between two years (e.g., 1998-1999); thus, presenting mortality trend data before and after 1999 may be problematic. Studies of the comparability between revisions of the ICD are routinely done as part of the implementation of a new revision of an ICD. The key measure in a comparability study is a comparability ratio that represents the net effect of the new revision on cause-of-death statistics (see <http://www.cdc.gov/nchs/dataawh/nchsdefs/comparabilityratio.htm>) (Anderson, 2001). A comparability ratio of 1.00 indicates that the same number of deaths was assigned to the cause under both ICD-9 and ICD-10 denoting no net effect of ICD-10 on that particular cause of death. A ratio showing perfect correspondence between the two revisions does not necessarily indicate that the cause was totally unaffected by ICD-10, but merely that any increases in the allocation to the cause were completely offset by decreases in the allocation to another cause. A comparability ratio less than 1.00 results from fewer deaths being classified to the cause under ICD-10 compared with the comparable cause under ICD-9. The comparability ratio for all injuries between ICD-9 and ICD-10 is 1.0159. That is, using ICD-10 rather than ICD-9 resulted in 1.59% more deaths attributable to injury in 1999. Analysts must take that coding artifact into account in comparing 1998 to 1999 data. For a listing of the

comparability ratios for specific causes of injuries, see http://www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_10.pdf, page 112 (Minino, 2006).

Though the comparability ratios for most injuries in ICD-10 have suggested relatively small coding variability, **states should note the ICD coding change when presenting mortality trend data that includes 1998 and 1999.** The most common strategies are to highlight the change by a footnote or by placing a “line break” between 1998 and 1999 (Figure 1).

Figure 1. Age-Adjusted Motor Vehicle Crash Death Rates, United States, 1994-2003



Coding of Nonfatal Injury Data

Since 1979, nonfatal injury data in the US have been classified using ICD-9 Clinical Modification (ICD-9-CM) codes (see <http://www.cdc.gov/nchs/dataawh/ftpser/ftp9/ftp9.htm#guidelines>). Injury diagnosis codes are categorized into the Barell Matrix, an internationally accepted categorization (http://www.cdc.gov/nchs/data/ice/final_matrix_post_ice.pdf) (Barell, 2002). The codes and SAS programming for the matrix can be found at <http://www.cdc.gov/nchs/about/otheract/ice/barellmatrix.htm>. While a draft of ICD-10-CM codes exists and can be found at <http://www.cdc.gov/nchs/about/otheract/icd9/abtcd10.htm>, there is as yet no known date to implement ICD-10-CM codes in the US.

External Cause Coding at the State Level

Several core datasets for state-level injury surveillance utilize external cause coding, including hospital discharge, emergency department, and death certificate data. However, external cause of injury codes in these datasets can be missing, inaccurate, or non-specific.

A 2004 survey documented that only 14 (64%) of the 22 states that had evaluated the completeness of external cause coding in their hospital discharge database had more than 90% of injury records with an external cause code (Abellera, 2005). Similarly, among the smaller number of states with statewide emergency department data systems, six of eight (75%) that had evaluated the completeness of external cause coding had more than 90% of injury records with an external cause code.

Some states have mandated the inclusion of external cause codes in their hospital discharge databases. Among states that have conducted evaluations for completeness of external cause of injury coding, those with a mandate, on average, have a higher percentage of records coded with an external cause of injury than states without such a mandate (94.5% vs. 82.2%). While mandates can improve external cause coding, they may not be politically possible to enact in all states at this time.

Even when an external cause code is present, however, it may be inaccurate, or non-specific (e.g., fall not otherwise specified), further eroding the quality of injury surveillance data. External cause codes typically are assigned by medical records staff based on information included in the medical record. Considerations such as the stigma or legal ramifications associated with certain kinds of injuries (e.g., intimate partner violence, suicide attempts) may affect a healthcare provider's willingness to document the cause of injury in the medical record. The lack of adequate documentation of causal information in the medical record by health care providers adversely affects external cause coding.

Several efforts are underway at the national level to advocate for improved external cause coding. In addition to supporting those efforts through organizations such as STIPDA and CSTE, states should undertake efforts internally to improve external cause coding. **State injury surveillance staff should evaluate the completeness and quality of the external cause coding in their state-specific datasets for injuries overall, as well as for specific categories (e.g., suicide by poisoning), since completeness and quality may vary substantially for different types of injuries.** It is critical that injury surveillance programs understand the limitations of the data they are using, as incomplete or poor quality external cause coding may be an important limitation, particularly for some types of injuries.

In addition, experience in many areas of public health has taught us that surveillance data generally will be of higher quality if those reporting data understand the value of their data submission, and know that public health professionals are actually analyzing and using the data. Providing feedback to data submitters on an ongoing basis about how the data are used can be helpful in improving reporting. Training healthcare providers on the preventability of injuries and on the importance of documentation may also be helpful, although this can be labor-intensive, and the most feasible and effective ways to do this have not been well defined.

Injury Severity

Injury severity generally describes the impact of an injury in terms of the extent of tissue damage (that is, the pathologic evidence of trauma) and/or the physiologic response of the body to that damage, though the effect on outcome may be mediated by age, gender, and the presence of

certain pre-existing conditions, including intoxication. In September 2004, the National Center for Health Statistics (NCHS) convened a meeting of experts to discuss injury severity measurement in administrative datasets. The discussion document that resulted from that meeting can be found at <http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>. Growth over the past two decades in the number and variety of injury severity scales reflects recognition that severity classification is critical for surveillance, epidemiological investigations, and evaluations of programs and policies aimed at mitigating the impact of injury at both the individual and societal levels (MacKenzie, 1984; Rivara, 2001). Some common injury severity measures are described below.

Abbreviated Injury Scale (AIS)

The AIS was introduced in 1971 and is in its 5th revision (Gennarelli, 2005). The AIS is a severity measure for a single injury (or applied to each injury when multiple injuries occur). It is a specialized trauma classification of injuries based mainly on anatomical descriptors of the tissue damage caused by the injury and is most often applied to records in specialized trauma registries. The AIS classification system was designed to distinguish between types of trauma of clinical importance and has been shown to provide a good basis for valid measurement of probability of death. AIS values are assigned within six body regions and have two components: (1) the injury descriptor (often referred to as the ‘predot’ code) which is a unique numerical identifier for each injury description; and (2) the severity score (often referred to as the ‘post-dot’ code). The severity score is based on four criteria: threat to life, permanent impairment, treatment period, and energy dissipation. The score ranges from 1 (relatively minor) to 6 (currently untreatable), and is assigned to each injury descriptor. There are documented discrepancies of the symmetry in scores between body regions (e.g., an AIS of 4 to the head may not be equal to an AIS of 4 to the extremities) (Clark, 2004).

In order to assess the severity effects of multiple injuries, many derivative severity scales have been developed. Examples of scales that combine the severities of multiple injuries and/or physiologic parameters to create a single composite score for each patient include: Injury Severity Score (ISS) (Baker, 1974), the New Injury Severity Score (NISS) (Osler, 1997), the Anatomic Profile (AP) (Copes, 1990) and the Anatomic Profile Scale (APS) (Sacco, 1999).

ICDMAP

One approach for using the ICD for severity assessment has been the development of software called ICDMAP that translates ICD-9-CM coded discharge diagnoses into AIS pre-dot codes, injury descriptors, and severity scores (MacKenzie, 1997). The software then uses the AIS severity scores to compute ISS, NISS, and the components of the Anatomic Profile Score for the injured individual. The mapping can result in some loss of information due to differences in the injury classification systems. Resulting severity scores referred to as ICD/AIS scores are considered to be conservative measures of injury severity. ICDMAP has been validated and shown to be useful in categorizing the severity of injuries when only ICD rubrics are available (MacKenzie, 1989; Mullins, 1994; Clark, 2004). There are limitations to the ICDMAP that should be considered: the software is proprietary; the current version of ICDMAP that corresponds to ICD-9-CM codes is out of date; and there is no map between ICD-9-CM and AIS2005. However, colleagues at the University of Navarra in Spain have produced a map between AIS2005 and ICD-10 (See http://www.unav.es/ecip/english/pagina_4.html).

ICD-9 Injury Severity Score (ICISS)

One family of empirically derived measures of injury severity based on the ICD is the ICD-9 Injury Severity Score, referred to as ICISS. The development of this approach to injury severity assessment is ongoing and shows great promise. ICISS, first proposed by Osler and colleagues using the North Carolina Hospital Discharge Data, is based on the calculation of survival risk ratios (SRRs) for each ICD-9 CM code (Osler, 1996; Rutledge, 1997). The SRRs are derived by dividing the number of patients that survive a given ICD-9-CM injury diagnosis code by the number of patients with that diagnosis code. ICISS, then, is the product of the SRRs corresponding to a patient's set of injuries. ICISS has been shown to outperform several important competitors, including the Injury Severity Score (Hannan, 1999; Sacco, 1999; Meredith, 2003; Hannan, 2005).

All measures of prediction (ICISS as well as methods based on AIS) are affected by the large proportion of deaths that occur before hospital admission as well as the large proportion of deaths in older patients that occur after hospital discharge. These probabilities will also change over time, and may be affected by extraneous factors such as patterns of health care utilization and quality of care.

Recommendations for improving coding of injury surveillance data:

1. State injury and violence prevention programs should regularly evaluate the completeness and quality of external cause coding in their statewide hospital discharge and emergency department databases.
2. State injury and violence prevention programs should provide information on the uses and adequacy of external cause coding back to those who produce the data as a way to improve data quality.
3. State injury and violence prevention programs should explore the possibility of using statutory tools, rule making or other policy actions to enhance the completeness and specificity of external cause coding.
4. States should support efforts at the national level to improve external cause coding.
5. States should explore opportunities to provide training for health care providers and hospital coders regarding the importance of documenting the circumstances and causes of the injury incident in the medical record.

State Injury Surveillance Capacities

The State Technical Assessment Team (STAT) Guidelines include criteria for assessing a state's capacity to conduct injury surveillance in the areas of data access, quality, analysis, and dissemination (Appendix A). In addition to these capacities, data linkage, confidentiality, appropriate staffing and training, and partnerships are essential. The following describes many of these surveillance capacity issues.

Access to Data

Access to existing data such as statewide hospital discharge (HD), vital statistics, emergency department (ED), and behavioral risk factor data is critical for state injury surveillance systems. States that have access to mortality data only have a limited capacity to evaluate the injury problem in the state or to design prevention programs as high-risk groups and causes of injury differ extensively for fatal and nonfatal injuries. States that do not have existing statewide HD or ED data or lack authority to collect more extensive morbidity data need statutory authority for injury reporting and surveillance at the state level. However, in many states the laws conferring authority for surveillance were written primarily to cover infectious disease surveillance, which was the primary concern for health departments at the time those laws were written. This lack of explicit authority for injury surveillance may present an obstacle for conducting surveillance of injuries, as medical providers or healthcare institutions may not be willing to provide surveillance data to the health department. The state injury and violence prevention program should look for opportunities to update state statutes or the agency surveillance regulations to include injury in the required conditions. This is most easily accomplished by public health rules and regulations, if possible. For example, the Oklahoma Board of Health added specific injuries (i.e., traumatic brain and spinal cord injuries, submersions, and burn/fire injuries) to the list of reportable conditions in 1987; this required a change of section title from "Reportable Communicable Disease Reporting Regulations" to "Disease and Injury Reporting Regulations". In addition, language was added that specified a section "Additional Diseases May Be Designated" and includes the following language: "The Commissioner of Health may designate any disease or condition as reportable for a designated period of time for the purpose of special investigation." This has been very useful in making injuries reportable during disaster-related events (e.g., Oklahoma City bombing, tornadoes), following legislative mandates for special study (e.g., motorcycle injuries), or when applying for grant monies for short-term surveillance projects of important health issues (e.g., intimate partner violence, suicide attempts, etc.).

A related concern is the application of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) to injury surveillance activities (CFR 45: 160-164). HIPAA requires healthcare providers to give notification and get consent from patients before sharing health information. However, HIPAA clearly confers on public health agencies a special authority that allows for the collection of individually identifiable health data for public health surveillance without the consent or notification of the person to whom those data apply (see Box 1) (CDC, 2003). Although the law explicitly provides this authority to public health, some hospitals or health care providers may invoke HIPAA as an obstacle to their providing public health agencies with required data and states will have to address this barrier.

Box 1. Protected health information (PHI) disclosures by covered entities for public health activities requiring no authorization under the HIPAA Privacy Rule

Without individual authorization, a covered entity may disclose PHI to a public health authority* that is legally authorized to collect or receive the information for the purposes of preventing or controlling disease, injury, or disability including, but not limited to

- reporting of disease, injury, and vital events (e.g., birth or death); and
- conducting public health surveillance, investigations, and interventions.

PHI may also be disclosed without individual authorization to

- report child abuse or neglect to a public health or other government authority legally authorized to receive such reports;
- a person subject to jurisdiction of the Food and Drug Administration (FDA) concerning the quality, safety, or effectiveness of an FDA-related product or activity for which that person has responsibility;
- a person who may have been exposed to a communicable disease or may be at risk for contracting or spreading a disease or condition, when legally authorized to notify the person as necessary to conduct a public health intervention or investigation; and
- an individual's employer, under certain circumstances and conditions, as needed for the employer to meet the requirements of the Occupational Safety and Health Administration, Mine Safety and Health Administration, or a similar state law.

Source: Centers for Disease Control and Prevention. HIPAA privacy rule and public health. *Morb Mort Wkly Rep* 2003;52:1-12. Adapted from [45 CFR § 164.512(b)].

* Or to an entity working under a grant of authority from a public health authority, or when directed by a public health authority, to a foreign government agency that is acting in collaboration with a public health authority.

National Sources of Data

National sources of injury data may be useful for states to obtain baseline statistics for comparative purposes. The National Center for Injury Prevention and Control has compiled an inventory of 44 federal data systems operated by 16 different agencies and three private data systems that provide national data on a variety of violence- and injury-related topics. These data systems provide information on injury incidence, violent events, behavioral risk factors, nonfatal injury and injury deaths. Some of these systems provide both national and state-based data. To access this Inventory of National Injury Data Systems and their associated web sites, see:

<http://www.cdc.gov/ncipc/osp/InventoryInjuryDataSys.htm>.

Confidentiality and Human Subjects Issues in Injury Surveillance

Surveillance is a core activity supporting all aspects of public health practice, including public education and awareness, policy initiatives, and implementation and evaluation of community-based injury prevention efforts. The authority to conduct surveillance derives from the police powers conferred on states by the United States Constitution, and is further elaborated in state-specific statutes and rules. In creating those statutes, state legislatures determine the appropriate balance between the protection of the rights of individuals and the protection of community health. Public health practice is required by law and the government funds public health practice in order to protect the population's health; it is not an optional undertaking.

By contrast, research while extremely valuable, is not required by law. Research is a systematic investigation-- including research development, testing, and evaluation-- to develop or contribute to generalizable knowledge. Research efforts may define causes or risk factors for injury or evaluate the efficacy of practices and interventions. The Office for Human Research Protections

(OHRP) within the federal Department of Health and Human Services oversees human subjects protection for research supported by that Department, which includes the National Institutes of Health, the Agency for Healthcare Research and Quality, and the Centers for Disease Control and Prevention. The OHRP implements the Federal Policy for the Protection of Human Subjects, which is also known as the Common Rule. For most activities determined to be human subjects research, the Common Rule requires a prospective review by an Institutional Review Board (IRB) or medical ethics board. IRBs review research proposals to assess the extent to which research subjects are protected during and after the research activities, including whether there is appropriate individual or guardian consent for data collection, the privacy of identifiable information is protected, appropriate data safety monitoring is provided, and vulnerable populations (e.g., children, prisoners, mentally-disabled) are protected, among other issues.

The distinctions between public health practice and research are often misunderstood. Although injury surveillance shares some characteristics with human subjects research, it is fundamentally different. Because surveillance is grounded in state law and is mandatory in nature, the Common Rule does not govern public health practice, and therefore public health practice activities do not typically require IRB review. To help public health practitioners determine whether an activity should be deemed public health practice or human subjects research, CSTE, with the help of several experts on public health law, has published a document outlining how to distinguish between the two. The document¹ is available at:

<http://www.cste.org/pdffiles/newpdffiles/CSTEPHResRptHodgeFinal.5.24.04.pdf> (CSTE, 2004) and includes a detailed discussion of the legal and ethical issues and a checklist for making this distinction.

Confidentiality and protection of personal health information is a critical function of injury surveillance programs. Inappropriate handling of sensitive health data can cause serious harm to individuals. In addition, a public scandal about inappropriate data safeguards will have negative and lasting consequences for public health agencies. The public health community has a long history of protecting individual privacy and confidentiality when handling sensitive and personal information. The emergence of new technologies makes it easier to collect, transmit, and store personal information. Legislation and technical security measures are important means of protecting privacy and confidentiality, but they are not sufficient. Most state health departments have a written confidentiality policy that applies to all individually identifiable information in all formats including paper-based and electronic records. These policies should clearly define the user's responsibility to maintain confidentiality, what constitutes a breach of confidentiality, and the penalties for the inappropriate use or disclosure of information. In most states, the State Epidemiologist is familiar with these issues and can be an important resource. If the state health agency does not have a formal confidentiality policy, the state injury and violence prevention program should implement its own policy and/or promote development of an agency confidentiality policy. State injury and violence prevention program staff should provide confidentiality training to all persons who have access to confidential information to increase knowledge and awareness of appropriate behavior. It is advisable that all staff sign a written confidentiality statement that certifies the individual has received a copy of the confidentiality

¹ It should be noted that although this description represents the state of affairs at the time of publication of this document, there is a great deal of discussion currently underway to clarify these issues. It is possible that in the future different standards may be applied.

policy, understands the terms, including the penalties for violation of the policy, and agrees to comply with the policy.

Core Injuries, Injury Risk Factors, and Datasets for State Injury Surveillance

It is recommended that the 14 injuries and injury risk factors and 11 data sets (Table 1) in the *Consensus Recommendations for Injury Surveillance in State Health Departments* report (STIPDA, 1999) continue to be the core data collected by state injury surveillance systems. These injuries were originally chosen because they both represent a substantial public health burden and were feasible to gather by the majority of states. These underlying principles should be retained as additional indicators are considered.

Table 1. Core Injuries, Injury Risk Factors, and Data Sets for State Injury Surveillance.

Injury/Injury Risk Factor	Vital Records	Hospital Discharge Data	FARS	BRFSS, YRBSS**	Emergency Department	Medical Examiner	Child Death Review	Other
Fall injuries	X	X			(X)	(X)	(X)	(EMS)
Firearm injuries	X	X			(X)	(X)	(X)	(UCR, EMS)
Fire and burn injuries	X	X			(X)	(X)	(X)	(EMS)
Smoke alarm use				BRFSS			(X)	
Homicide	X	X			(X)	(X)	(X)	(UCR)
Motor Vehicle Injuries	X	X	(X)		(X)	(X)	(X)	(EMS)
Alcohol in MV deaths			(X)			(X)		
Self-reported seat belt/safety seat use				Both				(OPU)
Poisoning	X	X			(X)	(X)	(X)	(EMS)
Submersion injuries	X	X			(X)	(X)	(X)	(EMS)
Suicide	X	X			(X)	(X)	(X)	
Suicide attempts		X		Both	(X)			(EMS)
Traumatic brain injuries	X	X			(X)	(X)	(X)	
Traumatic spinal cord injuries*	(X)	(X)			(X)	(X)	(X)	

() Parentheses indicate data sets that are considered supplementary. All other data sets are considered essential.

* Indicates there are no specific recommendations for traumatic spinal cord injuries (TSCI). Vital records systems have very low predictive value positive in the detection of TSCI. Surveillance systems for TSCI that have been developed in several states have depended on medical record abstraction of hospitalized cases for reliable data collection. Developments of a less costly and less labor-intensive approach would put TSCI surveillance more realistically within reach for all state health departments.

Abbreviations: FARS=Fatality Analysis Reporting System data, BRFSS=Behavioral Risk Factor Surveillance System data, YRBSS=Youth Risk Behavior Surveillance System data, OPU=National Occupant Protection Use Survey data, UCR=Uniform Crime Reporting System data, EMS=emergency medical services data.

**BRFSS and YRBSS data is variable across states and years; injury-related variables should be reviewed annually for inclusion.

For all of the injuries listed (except spinal cord injuries), case definitions can be found on the NCIPC State Injury Indicators website <http://www.cdc.gov/ncipc/dir/StateIndicatorsIntro.htm>. The calculation of injury statistics in a standardized and comparable way is facilitated through the Injury Indicators. Participation in the calculation of the indicators benefits individual states by familiarizing them with the core data sets and basic injury surveillance methods. It also connects them with other state injury surveillance colleagues and gives a reference tool for comparing state rates. Beginning with 2004 data, instructions for preparing injury data are delineated in annual data instruction manuals and preformatted rate calculation spreadsheets are available. The current list of recommended indicators is not exhaustive of the myriad of important injury topics and consideration of expansion needs to be addressed.

Data Quality

The evaluation of surveillance systems is an important task to determine the quality, completeness, and timeliness of the data. Evaluating surveillance systems is not easy; there is no perfect system and trade-offs are usually necessary. Since each system is unique, there is often a need to balance the effort and resources put into each of its components if the system is to achieve its intended goal.

According to the *“Updated Guidelines for Evaluating Public Health Surveillance Systems,”* some of the more useful surveillance system attributes to evaluate are: simplicity; flexibility; acceptability; sensitivity; predictive value positive (PVP); representativeness; and timeliness (CDC, 2001). Errors and bias can make their way into a surveillance system at any stage. Because surveillance data are used to identify high-risk groups, to target interventions, and to evaluate interventions, it is important to be aware of the strengths and limitations of the information in the system. The quality, usefulness and representativeness of surveillance data depend on their completeness and validity. It is also especially important to assess the completeness and validity of external cause coding in surveillance systems. As sensitivity (the proportion of cases that are identified) and PVP (the proportion of identified cases that are true cases) approach 100%, a surveillance system is more likely to be representative of the population being monitored. However, as sensitivity increases, PVP may decrease. Efforts to increase sensitivity and PVP tend to make a surveillance system more complex, potentially decreasing its acceptability, timeliness, and flexibility. Efforts to increase sensitivity, PVP, timeliness, and representativeness tend to increase the cost of a surveillance system, although savings in efficiency with automation may offset some of these costs.

Data Linkage

Linking data from more than one data set can provide a more comprehensive picture of circumstances surrounding the injury than the use of a single data set. The National Violent Death Reporting System is an example of a state-based surveillance system that uses data linkage. This system is currently in place in 17 states, and further expansion is planned. Each participating state collects information on violent deaths from death certificates, medical examiner or coroner files, law enforcement records, and crime laboratories. Deaths occurring in the same incident are linked. This linkage enables: timely reporting of events; characterization of perpetrators; recording of incidents of violence, such as suicide-homicides; and a description of

the circumstances surrounding the violent incident (Paulozzi, 2004). Additionally, the Crash Outcome Data and Evaluation System (CODES) funded by the National Highway Traffic Safety Administration (NHTSA) links multiple data sets (traffic collision, emergency medical services, hospital discharge, and vital statistics data) at the state and national level and has allowed states to more accurately assess the occurrence, costs, and outcomes of transportation-related injuries and to evaluate the efficacy and cost-savings associated with highway safety initiatives (NHTSA, 2000). States can then provide policy makers extensive scientific information for their consideration regarding public safety and health care cost containment issues.

Dissemination of Data

Dissemination of injury surveillance data is a critical aspect of a comprehensive state injury and violence prevention program that contributes to public awareness, health education and promotion, policy development, and research development. State programs should make every effort to make injury-related mortality, morbidity, and behavioral risk factor data available at the state and local level to policy makers, public health professionals, and the public for use in program planning and evaluation, policy decisions, and public education. Data dissemination plans should include the use of a well-organized home page on the internet that allows for timely access to data collected in the state through death certificates, a statewide hospital discharge data system, a statewide emergency department data system, a statewide trauma registry, behavioral risk factor surveys, and health interview surveys. These data can be made available through topic-specific (e.g., suicide) fact sheets, statistical tables and graphs, electronic summary reports, and interactive web-based data query systems. Some states have developed Internet home pages and online injury data query systems, such as:

- California's EPIC system (<http://www.applications.dhs.ca.gov/epicdata/>),
- Wisconsin's WISH system (<http://dhfs.wisconsin.gov/wish/index.htm>),
- Colorado's Health Information Dataset (<http://www.cdphe.state.co.us/cohid/>),
- Minnesota's MIDAS (<http://www.health.state.mn.us/injury/midas/>),
- Oklahoma's OK2SHARE (<http://www.health.ok.gov/ok2share/>), and
- other state systems (<http://www.injurycontrol.com/icrin/stats.htm>).

National and state-based injury mortality data are available online through CDC WONDER (<http://wonder.cdc.gov/>) and CDC WISQARS (<http://www.cdc.gov/ncipc/wisqars>). National data on nonfatal injuries treated in hospital emergency departments from the National Electronic Injury Surveillance System All Injury Program are also available on WISQARS. Hospital discharge data are available online using HCUPnet (<http://hcup.ahrq.gov/HCUPnet.asp>). The National Center for Health Statistics has an "Injury" home page on its web site that guides users to data and reports from ongoing NCHS data systems and surveys (e.g., National Vital Statistics System, National Hospital Discharge Survey, National Hospital Ambulatory Medical Care Survey and the National Health Interview Survey) (<http://www.cdc.gov/nchs/injury.htm>). The U.S. Consumer Product Safety Commission also has an online query system for national data on consumer product-related injuries from the National Electronic Injury Surveillance System (<http://www.cpsc.gov/library/neiss.html>). State-based injury-related behavioral risk factor data are available on line through CDC BRFSS (<http://apps.nccd.cdc.gov/brfss/index.asp>) and in some states, such as Utah's IBIS-PH query system (<http://ibis.health.utah.gov/query/introduction.html>).

Staffing and Training

Staffing

Performing injury surveillance requires staff with adequate training. A 2004 survey (CSTE, 2005) of epidemiologic capacity in state health departments documented that there were only 74 injury epidemiologists working in state health departments, while the need is estimated at 205, almost three times the current number. Only 19% of state health departments described the extent of their epidemiologic or surveillance capacity in injury prevention as substantial, almost full or full capacity. Despite increases in public health funding (primarily for preparedness) and an increase in the total number of epidemiologists at state health departments between 2001 and 2004, the number of injury epidemiologists in state health departments declined 6% in that same period. Not only is the number of injury epidemiologists low, but the level of professional training of those epidemiologists is also low; only 42% of epidemiologists working in injury prevention had a degree in epidemiology.

Because of the shortage of trained injury epidemiologists, injury prevention programs may need to “grow” epidemiologists from other subject areas in public health. However, mentoring of injury epidemiologists within health departments is also a problem; only 27% of state health departments reported that they had sufficient injury epidemiologists to mentor students, new hires or trainees. Several universities have training programs or summer institutes on injury epidemiology that may be useful for “developing” new injury epidemiologists (See Training below). In addition, the Council of State and Territorial Epidemiologists have a fellowship program for state-based epidemiologists that also should help increase the pool of staff trained in state-based injury epidemiology.

States should also have access to statistical consultation when necessary; for example, public health officials may need to consult a statistician if injury surveillance in the state is going to be conducted using a representative sample of hospitals, if a formal evaluation is conducted of a statewide hospital discharge or ED data system for use in injury surveillance, or if the statistical analysis of surveillance data becomes complicated. If statistical services are not available in the state health department, an alternative source might be a nearby university statistics or biostatistics department. An excellent resource for state injury and violence prevention programs regarding the collection, analysis and utilization of data is the National Emergency Medical Services for Children Data Analysis Resource Center at <http://www.nedarc.org/nedarc/index.html>.

Training

There are training opportunities for state health department staff offered by the Indian Health Service and several universities including the Johns Hopkins University, Harborview Medical Center, the University of Michigan, and others, and many of these courses are summer sessions and specific to injury epidemiology. Additional training opportunities are available through STIPDA at the annual conference (see www.stipda.org). In 2004, the **National Training Initiative for Injury and Violence Prevention (NTI)**, formed by the Society for the Advancement of Violence and Injury Research (SAVIR) and STIPDA released core competencies (<http://www.injured.org/competencies.htm>) of the essential individual knowledge and skills on the fundamentals of injury and violence prevention. Core Competency #2 includes

the following learning objective: **Ability to access, interpret, use and present injury and/or violence data.**

To achieve this core competency, participants will be able to:

1. Describe key sources of data at the national, state and community level and describe their strengths and weaknesses.
2. Describe the strengths and weaknesses of the International Classification of Diseases (ICD) system and its use.
3. Describe the differences between primary (“self-collected”) and secondary data (“existing data”) and provide examples of appropriate uses of each method.
4. Describe how data can be used to identify disparate populations.
5. Explain how data can be used to identify emerging issues in injury and/or violence.
6. Identify the ethical and legal issues involved in the collection and use of data.
7. Identify how a variety of factors (including age, gender, race, ethnicity, access to economic resources, community norms, etc.) may influence the collection, interpretation, and use of injury and/or violence data.
8. Define quantitative and qualitative forms of data and give examples of their use in constructing and evaluating injury and/or violence prevention programs. Describe the benefits and limitations of each kind of data.
9. Explain the importance of data for use in priority setting, program planning, quality improvement, evaluation, and advocacy in injury and/or violence prevention.
10. Describe how qualitative and quantitative data can be used in conducting an asset and needs assessment of a community of interest.
11. Demonstrate the ability to present data in a clear and understandable manner for different audiences.

States should strive to have an adequate number of staff that are proficient in these competencies.

Partnerships

While partnerships are important in all areas of public health, for injury prevention they are particularly critical because multiple agencies often have responsibility for different aspects of injury prevention. These agencies may have substantial data resources that injury prevention programs could utilize for injury surveillance. Within a State Health Agency, injury programs are often separate from Vital Records (birth and death records), BRFSS and YRBS initiatives, and MCH data collection efforts, making it imperative that injury staff members cultivate and nurture strong working relationships within their own agency. Child Death Review Committees have comprehensive data from a number of sources on child deaths. Healthcare providers have treatment-related data, which usually apply only to those who have been injured. Law enforcement agencies (local, state and federal) and court systems have information about the perpetrators of violent acts, which is important for violence prevention activities. Transportation agencies collect a broad range of information related to the circumstances of motor vehicle crashes and other transportation-related injuries. Departments of Natural Resources collect data

pertaining to many outdoor recreational activities: drowning, firearm injuries, snowmobile and all-terrain vehicle events, falls from deer stands, and animal attacks. The State Fire Marshal may collect information about the circumstances of fire-related injuries. State Departments of Human Services, Vocational Rehabilitation, Labor and Industry, and Revenue can each assist with describing the impact of long-term disability associated with injury and violence. Additionally, state chapters of the Brain Injury Association and Coalitions Against Sexual Assault are uniquely able to describe treatment resources necessary post-injury. Finally, the State Medical Examiner, which not all states have, can be a rich source of data on both violent and unintentional injury deaths (Horan, 2003; Comstock, 2005). State health department injury prevention programs should seek to build relationships with these partners, especially for injuries of importance in their jurisdiction.

Recommendations for improving state injury surveillance capacities:

1. Utilizing the STIPDA STAT guidelines, state injury and violence prevention programs should conduct a self-review of surveillance capacity.
2. State injury and violence prevention programs should calculate and report the recommended Injury Indicators annually. Consideration should be given to participation in the multi-state document compiled by NCIPC.
3. A standardized approach to the addition and expansion of the Injury Indicators should be developed.
4. State injury and violence prevention programs should have injury morbidity, mortality, and risk behavior data available to partners, policymakers, and the public via web-based query systems.
5. State injury and violence prevention programs should make it a priority to invest in training staff in injury surveillance and epidemiology.
6. State injury and violence prevention programs with no statewide hospital discharge or emergency department data systems or no ready access to data from existing systems should work with other organizations and agencies in their state to establish such data systems or gain access to the data if they exist.

New Challenges in Injury Surveillance

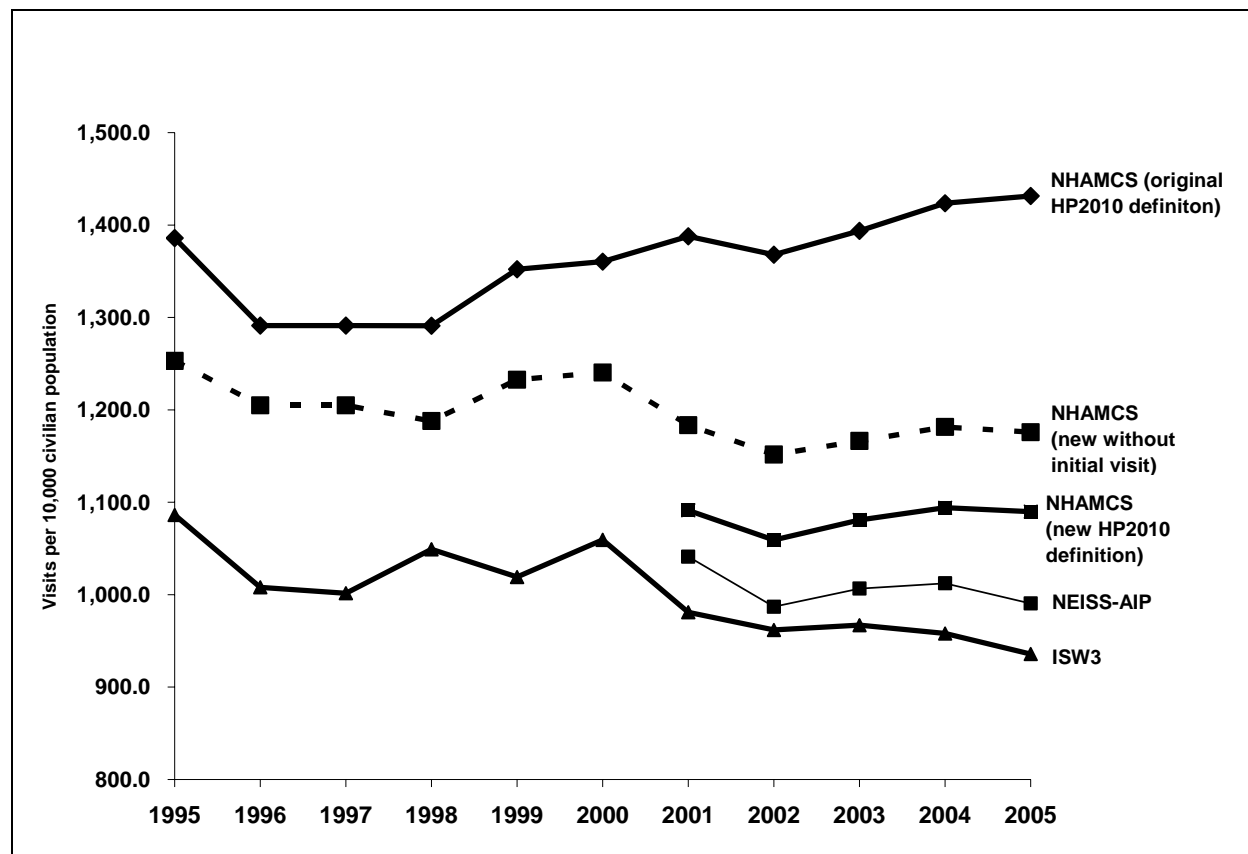
Injury Surveillance in Statewide ED Datasets

Many states are developing statewide emergency department (ED) datasets; in 2006, about half of states reported having such a system (NAHDO, 2005). The datasets are not standardized across states, limiting the usability of these data for comparisons across states or with national data sources.

Despite this limitation and since many injuries are seen only in the emergency department (and therefore would not be counted in a hospital discharge database), this is a dataset of emerging importance for injury surveillance. Some states that have state-based emergency department data systems have adopted the 2003 consensus case definition for hospital discharge data (STIPDA, 2003) for use with ED data. However, based on recent analyses at NCHS using ED data from the National Hospital Ambulatory Medical Care Survey (NHAMCS-ED) and the National Electronic Injury Surveillance System All Injury Program (NEISS AIP), concern was raised that this 2003-based hospitalized case definition may substantially underestimate the number of injuries treated in hospital EDs. Figure 2 represents the age-adjusted ED injury visit rates for different data sources and case definitions in the US for 1995-2005. See

<http://www.cdc.gov/nchs/products/pubs/pubd/hestats/injury/injury.htm> for the case definitions for the five lines (NOTE: line 5 in the report correlates with the ISW3 definition).

Figure 2. Age-adjusted ED injury visit rates for different definitions: US, 1995-2005



This NCHS report provides recommendations for an ED-specific case definition that includes nature of injury, external cause of injury, and initial injury visits that can be used as a benchmark for states that have state level ED data on injury diagnoses, external causes, and initial visit status. This expanded definition will lead to a substantially more accurate count of injury incidence based on emergency department billing data.

In order to help standardize how these data might be used for injury surveillance, the following definition of an Emergency Department injury visit is recommended by NCHS:

Include initial visits to an ED for an injury episode when either:
The first-listed diagnosis reflects an injury based on the Barell matrix definition of an injury (Barell, 2002), regardless of any mention of an external cause-of-injury code; or valid external cause-of-injury code (see <http://www.cdc.gov/ncipc/whatsnew/matrix2.htm>), based on the recommended framework for external causes of injury.

Complications of care and adverse effects are excluded from both the diagnosis codes as well as the external cause codes because both the Barell matrix and the external cause of injury matrix, which are used internationally to categorize injury diagnoses and mechanisms of injury, exclude them. It has been generally accepted that these conditions are not amenable to the traditional work of state injury programs (CDC, 1997).

This definition has been adopted by NCHS for use in web-based query systems including **Health Data for All Ages and Trends in Health and Aging**, and in the recently published **Healthy People 2010 Midcourse Review**. **Health, United States** also plans to implement this definition in its 2008 report. States that wish to compare their data with these products will need to take this definitional issue into account.

Rationale for an incidence-based ED injury visit definition

The rationale for developing a specific ED injury visit definition is based, in part, on the need to increase the relevance of the national statistics by using a methodology that can be replicated at the state level. To this end, ED data systems and availability of specific types of data have been considered. Specifically, the following points were considered:

- All states with ED visit data have the ability to define a first-listed injury diagnosis (e.g., a fracture or an internal organ injury) based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) injury diagnosis codes.
- A consensus definition of injury for use in statewide hospital discharge datasets was published in 2003 (STIPDA, 2003). The codes used to define diagnoses are the same in both EDs and inpatient settings.
- Some states can identify external causes of injury (e.g., motor vehicle crashes, falls, and firearm-related injuries) using ICD-9-CM, and hence should include ED visits with the relevant external cause codes (STIPDA, 2003). States that cannot identify external causes of injury visits are strongly encouraged to add that information to their dataset.
- Although most states are not currently able to identify whether an ED visit was an initial or follow-up visit, we believe that estimating incidence is preferable when possible. This brings estimates based on the recommended definition closer to the estimated number of

people who visit EDs for different injuries than does the traditional approach. Because states that do not have the ability to identify initial visits will overestimate incidence of injuries, the recommendation still has merit for encouraging states to add a variable to their dataset that will allow them to identify initial visits.

The Workgroup also suggests that further state-based analyses of the effects of expanding the injury definition in the STIPDA 2003 report to include external cause of injury data be conducted in hospital discharge data systems.

Disaster Surveillance

Disasters may be caused by natural forces or by deliberate or unintentional human actions (Rutherford, 1983). Disaster surveillance and epidemiologic studies can be used in determining: the magnitude, nature and severity of health/injury problems; groups at high-risk for and factors associated with adverse health effects; the relation between exposures and injury incidence; the efficacy of surveillance systems; the strength of emergency response measures and the effectiveness of the relief efforts; and effective intervention strategies that may reduce the morbidity and mortality burden of future disasters (Glass, 1992; Noji, 1997; Dominici, 2005).

State injury and violence prevention programs have a role to play in all phases of disasters (pre, during, and post). Within each state's emergency management plan, public health is tasked to provide health and medical services in response to a disaster. Emergency Support Function (ESF) # 8 provides coordinated health and medical services to augment local resources. In this context, state injury and violence prevention programs have an opportunity to provide their expertise in injury surveillance/epidemiology and injury prevention in disaster situations. The state injury and violence prevention program could provide the lead or a supporting role in the following activities following a disaster:

- Conduct public health surveillance for timely detection of injuries;
- Conduct descriptive and/or analytic epidemiologic investigations (e.g., case-control, cohort);
- Conduct rapid public health needs assessments;
- Define individuals and populations at risk for injuries;
- Provide internal/external expertise or access to reference material on injury risk factors and effective prevention strategies;
- Provide assistance in evaluating emergency preparedness, response activities, and recovery operations; and
- Disseminate findings from injury investigations and lessons learned from injury response to disasters.

State injury and violence prevention programs need the authority (see Access to Data) to conduct surveillance following a disaster. Data may need to be collected under highly adverse conditions early in the disaster; to address these difficult problems, state injury and violence prevention programs must be innovative and adapt to potentially challenging and stressful situations. **As an example, following the Oklahoma City bombing, 40 agencies in and around the bombsite were**

displaced to new locations and many had “missing employees”; these agencies were contacted within one week of the event to determine a census of persons in the buildings and risk factor information on the population at risk (Mallonee, 1996). Follow-up surveys directly from the survivors were extremely helpful to determine risk factors and the long-term health impact (Shariat, 1999). This level of investigation may require state programs to temporarily redirect attention and manpower from “routine” to “disaster surveillance response” in order to address the immediate public health needs emerging in a disaster. The flexibility to redirect ongoing surveillance activity of the state injury and violence prevention program to the disaster surveillance mode is ideal; however, with terrorism preparedness funding, state public health agencies may be able to draw upon existing resources found in other programmatic areas (e.g., communicable or chronic disease) or request federal assets to assist in disaster surveillance activities. STIPDA has representatives skilled in disaster epidemiology to assist states when technical assistance is needed. A recent resolution by STIPDA recommended, in part, that each state and territory establish and maintain expertise in disaster epidemiology (STIPDA, 2006).

The Role of State Injury Prevention Programs in Natural Disaster Preparation and Response (ASTHO, 2006) found lessons learned from states that frequently experience severe weather events include:

- Injuries are often more common during the preparation and response to a disaster, than during the actual event;
- Expanded and enhanced risk communication and public education before the storm are necessary;
- During the recovery phase, opportunities for injury prevention and public health education will arise;
- Inter-agency emergency operation procedures are critical. Each agency should have its response outlined in a memorandum of understanding;
- Most states have not developed a standard operations procedures manual for natural disaster response;
- Medical records and treatment data from emergency departments and emergency medical services are typically incomplete or non-existent after major disasters;
- Disasters affecting rural areas are exacerbated by limited public health and injury control infrastructure in those regions;
- State and local disaster epidemiology capacity is often insufficient to respond to the vast data collection needs following a severe event;
- Standard data collection protocols are typically not in place, limiting the ability to assess needs and impact across jurisdictions; and
- Human, financial, and equipment resource availability is often lacking immediately before, after, and during a natural disaster (ASTHO, 2006).

With increased federal attention (and funding) for emergency preparedness for “all hazards”, state capacity in this area is expected to improve in the coming years. Injury programs should consult with those tasked with emergency preparedness in their health departments to clarify expectations for injury surveillance in response to a disaster. Also, funding for emergency preparedness may provide opportunities for improving injury surveillance capacity.

The Centers for Disease Control and Prevention (CDC) has recommended a *Disaster Surveillance Mortality Form* be completed by medical examiners, coroners, hospitals, nursing and funeral homes and sent to the state health department during natural or man made disasters (http://www.bt.cdc.gov/disasters/surveillance/pdf/Disaster_mortality6%20form.pdf) (NCEH, 2006) and they have developed a *Hurricane Morbidity Report Form for Active Surveillance in Clinical Care Settings* (<http://www.bt.cdc.gov/disasters/hurricanes/asccs.asp>). However, more state-based, standardized reporting methods and data collection instruments for disasters need to be developed (Horan, 2003; STIPDA, 2006). There is a continued need for national leadership in this area to organize state-based professionals and persons with disaster experience to create these instruments and methodology.

Recommendations regarding new challenges in injury surveillance:

1. States should use the expanded ED-specific injury case definition in analysis of their state's ED data if they have the requisite data elements.
2. Each state and territory should establish and maintain expertise in disaster surveillance and epidemiology and collaborate with the state all hazards preparedness programs.
3. State injury and violence prevention programs should support efforts at the national level to establish standardized reporting methods and data collection instruments for disaster surveillance.
4. Further investigation of expanding the current hospitalized injury case definition to include cases identified using external cause of injury data in order to be consistent with the current adopted ED case definition should be conducted.

Future Challenges in Injury Surveillance

Determining Incidence: De-Duplicating Injury Morbidity Data

Forty-seven states and the District of Columbia have access to statewide hospital discharge data for routine injury surveillance. Additionally, about half of states have access to statewide emergency department (ED) data (NAHDO, 2005). In most instances, the data in these statewide hospital discharge and ED data systems are derived from standard billing forms, such as the Universal Billing (UB)–92. The specific limitations of these administrative data sets have been described elsewhere (STIPDA, 2003).

A serious concern when using billing data for injury surveillance is the issue of duplicate reporting. Duplicate reporting can occur when a patient has multiple records that either have exact duplicate information or describe different aspects of the same “person-injury event.” For example, an injured person might be transferred between two or more hospitals, or be transferred to other in-hospital services (e.g., skilled nursing, long-term swing beds, rehabilitation) that bill separately within the same hospitalization. Additionally, persons may be re-hospitalized intermittently following the initial hospitalization for various procedures or complications. In instances such as these, more than one record for the same “person-injury event” could appear in the hospital discharge data set. Persons who return multiple times to the ED for the same injury have multiple visits included in the statewide ED dataset. **In order to determine the incidence of injury (a critical measure for evaluating prevention efforts), it is important to count a person-injury event only once and to include only the first or initial visit for the injury.**

Currently, there are no standardized guidelines or recommendations on how to de-duplicate injury surveillance data. Thus, states use different criteria and techniques to deal with this problem. Standardization of de-duplication processes is an important future challenge that needs to be addressed and disseminated widely to state injury and violence prevention programs.

Capturing Complete Data from Hospitalized Injuries

Length of hospital stay, charges, and complications (e.g., amputations, etc) are important indicators of injury outcomes. Capturing complete information such as this from a person-injury event using billing data may also be a challenging task for state injury and violence prevention programs. Hospitals often transfer patients to different billing services (e.g., swing bed, skilled nursing, rehabilitation, etc) within the same acute care stay resulting in duplicate records. States must decide what to do with the information in these duplicate records that describe aspects of the patient’s care. For example, Table 2 outlines a scenario in which a patient is transferred to skilled nursing care within the same acute hospital stay. If the surveillance system only counted the first admission and deleted the record for the skilled nursing stay, the system would report a hospital length of stay (LOS) of 3 days and charges at \$5,203 instead of the total LOS of 14 days and charges at \$17,766. In cases where multiple records exist for the same person-injury event, deletion of records from stages of the patient’s care could result in an underestimate of the true impact of an injury event. In order to incorporate all information available, either the data from multiple records needs to be consolidated into a single record or the individual records for a given person-injury event need to be flagged in some manner so information is not lost.

Table 2. Example of duplicate reporting of patient within one hospitalization*

Admit Date	Discharge Date	Discharge Status	Length of Stay	Hospital Charges
05-31-2007	06-03-2007	Transferred to skilled nursing	3	\$5,203
06-03-2007	06-14-2007	Transferred to another type of institution	11	\$12,563

* Records included same patient name, hospital facility, and ICD codes

Emergency Medical Service (EMS) Data

Efforts funded by the National Highway Traffic Safety Administration (NHTSA), Health Resources and Services Administration (HRSA), and the CDC are underway to establish the National Emergency Medical Services Information System (NEMSIS) (<http://www.nemsis.org>). NEMSIS aims to standardize data collection by state and local EMS services across the nation and provide a national repository that will be used to potentially store EMS data from every state. Since the 1970s, the need for EMS information systems and databases has been well established, and many statewide data systems have been created. However, these EMS systems vary in their ability to collect patient and systems data and their capacity for analysis. This effort is being led by a Technical Assistance Center at the University of Utah in Salt Lake City and an EMS Performance Improvement Center at the University of North Carolina at Chapel Hill. A standard set of data elements and a data dictionary have been developed and many EMS software vendors have or are in the process of incorporating these standards in their software. As of July 2007, 5 states (NH, MN, NC, UT, NV) are reporting EMS data to a centralized database at the University of Utah. Recruiting is underway to add other states. These data have the potential to be very useful for:

- Developing a nationwide EMS training curriculum;
- Evaluating patient and EMS system outcomes;
- Facilitating research efforts;
- Determining fee schedules and reimbursement rates;
- Addressing resources for disaster and domestic preparedness;
- Providing valuable information on other issues or areas of need related to EMS care;
- Providing information on incident circumstances useful for injury surveillance;
- and much more.

The NEMSIS Data Dictionary has a core set of variables that overlap core variables with common definitions in the American College of Surgeon's (ACS) National Trauma Data Bank (NTDB) Standard Data Dictionary (www.ntdb.org and www.ntdsdictionary.org). This could eventually allow EMS data submitted to the NEMSIS to be linked to trauma data from NTDB on injury and outcome measures (e.g., severity, diagnosis, hospitalization, discharge disposition). As described in the ACS Resources for Optimal Care of the Injured Patient 2006, all ACS verified trauma centers (Levels I, II, III) will be required to submit trauma registry data to the NTDB using the new National Trauma Data Standard (NTDS). It is important for state injury

surveillance systems that standardized EMS data be collected and utilized in all states; **thus, support for NEMSIS and NTDS is imperative to complete this effort in the future.**

Recommendations regarding future challenges in injury surveillance:

1. States should understand the importance of de-duplication of statewide HD and ED data systems; states should support and consider participation in efforts to develop standardized guidelines for the de-duplication of statewide injury morbidity data.
2. States should encourage local and state-level compliance with the standards for EMS (NEMSIS) and trauma registry (NTDS) data collection.

Injury surveillance in the US has made significant progress since 1999. Substantial improvements in data access, quality, and standardization have been achieved. States must continue to assess their surveillance capacity and effectiveness in promoting injury prevention efforts, public health education, and policy and research development. With collaborative efforts of STIPDA, CSTE, SAVIR, NCIPC, and NCHS, the status of state and national injury surveillance should be continually assessed to promote improvements and innovation in all aspects of injury data collection, analysis, and dissemination.

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Sponsoring Organizations

About STIPDA

The State and Territorial Injury Prevention Directors Association (STIPDA) is a national non-profit organization comprised of professionals committed to protecting the health of the public by sustaining, enhancing and promoting the ability of state, territorial and local health departments to reduce death and disability associated with injuries. To advance this mission, STIPDA engages in activities to increase awareness of injury as a public health problem; provide injury prevention and control education and training; enhance the capacity of public health agencies to conduct injury prevention and control programs; and support public health policies designed to advance injury prevention and control. For more information about STIPDA or the Injury Surveillance Workgroup, please visit the STIPDA Web site at www.stipda.org.

About CDC/NCIPC

The Centers for Disease Control and Prevention (CDC) is one of the 13 major operating components of the Department of Health and Human Services (HHS), which is the principal agency in the United States government for protecting the health and safety of all Americans and for providing essential human services, especially for those people who are least able to help themselves. CDC began studying home and recreational injuries in the early 1970s and violence prevention in 1983. From these early activities grew a national program to reduce injury, disability, death, and costs associated with injuries outside the workplace. In June 1992, CDC established the National Center for Injury Prevention and Control (NCIPC), with the mission to reduce morbidity, disability, mortality, and costs associated with injuries. As the lead federal agency for injury prevention, NCIPC works closely with other federal agencies; national, state, and local organizations; state and local health departments; and research institutions. For more information, please visit the Web site at www.cdc.gov/ncipc.

About CSTE

For more than five decades, the Council of State and Territorial Epidemiologists (CSTE) and the Centers for Disease Control and Prevention (CDC) have worked in partnership to improve the public's health by supporting the efforts of epidemiologists working at the state and local level in promoting the effective use of epidemiologic data to guide public health practice and improve health. CSTE and its members represent two of the four basic components of public health – epidemiology and surveillance – and provide technical advice and assistance to the Association of State Public Health Officials and to federal public health agencies including CDC. Since 1951, CSTE has grown into a professional association of over 850 epidemiologists representing all 50 states, 8 territories and Puerto Rico. Areas of expertise include: infectious diseases, immunizable diseases, environmental health, chronic diseases, occupational health, injury control, genomics, and maternal and child health. For more information about CSTE, please visit the Web site at www.cste.org.

About SAVIR

The Society for Advancement of Violence and Injury Research, SAVIR (formerly the National Association of Injury Control Research Centers, NAICRC) is devoted to promoting scholarly activity in injury control and addressing issues relevant to the prevention, acute care and rehabilitation of traumatic injury. These aims are achieved through multiple member activities in research, research dissemination, program development and evaluation, consultation, education and training. For more information about SAVIR, please visit the Web site at www.naicrc.org.

List of Commonly Used Acronyms

AIS	Abbreviated Injury Scale
AP	Anatomic Profile
APS	Anatomic Profile Scale
ASTHO	Association of State and Territorial Health Officers
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CDR	Child Death Review
CODES	Crash Outcome Data and Evaluation System
CSTE	Council of State and Territorial Epidemiologists
DHHS	Department of Health and Human Services
ED	Emergency Department
EMS	Emergency Medical Services
ESF	Emergency Support Function
FARS	Fatality Analysis Reporting System
HIPAA	Health Insurance Portability and Accountability Act
HD	Hospital Discharge
HDD	Hospital Discharge Data
HRSA	Health Resources and Services Administration
ICD	International Classification of Diseases
ICISS	ICD-9 Injury Severity Score
IRB	Institutional Review Board
ISS	Injury Severity Score
LOS	Length of stay
MCH	Maternal and Child Health
ME	Medical Examiner
MMWR	Morbidity and Mortality Weekly Report
NAHDO	National Association of Health Data Organizations
NCEH	National Center for Environmental Health
NCHS	National Center for Health Statistics
NEISS-AIP	National Electronic Injury Surveillance System All Injury Program
NEMESIS	National Emergency Medical Services Information System
NHAMCS-ED	National Health and Medical Care Survey of Emergency Departments
NHTSA	National Highway Traffic Safety Administration
NISS	New Injury Severity Score
NPHSS	National Public Health Surveillance System
NTDB	National Trauma Data Bank
NTI	National Training Initiative for Injury and Violence Prevention
OHRP	Office for Human Research Protections
OPU	National Occupant Protection Use Survey
PHI	Protected Health Information
PVP	Predictive value positive
SRR	Survival Risk Ratios
UCR	Uniform Crime Report
VR	Vital Records
WHO	World Health Organization
WISQARS	Web-based Injury Statistics Query and Reporting System
YRBSS	Youth Risk Behavior Surveillance System

APPENDIX A

STIPDA STAT Review Guide

Data Collection, Analysis & Dissemination

I. The injury and violence prevention program has access to and/or collects injury and violence related data.

- a. The injury and violence prevention program accesses the 11 core data sets identified in the *Consensus Recommendations for Injury Surveillance in State Health Departments* report.
 - Use attachment at the end of this Review Guide to summarize program access regarding the 14 recommended conditions
 - Other
- b. The injury and violence prevention program collaborates with offices responsible for vital records, hospital discharge data and behavioral risk surveys to develop plans for optimal use of the data.
 - Reports, records or plans of efforts, or outcome reports to improve data accessibility, data collection, and analysis and use (e.g., work plans or meeting minutes)
 - Other
- c. The injury and violence prevention program collaborates with offices/agencies that have data on specific types or mechanisms of injury, by providing input on the development of plans for optimal use of their data, improving the quality of the data, and improving the data's utility for prevention purposes.
 - Reports or records of efforts to improve data collection and analysis and indicators of results of those efforts (e.g., work plans or meeting minutes)
- d. The injury and violence prevention program conducts needs assessments to support effective program implementation, including original data collection and use of existing data sets.
 - Data collection instruments
 - Reports of the findings from needs assessments
 - Examples of data-based program activities
 - Other
- e. The injury and violence prevention program maintains data or information systems about priority injuries.
 - Variable lists for specific data sets (e.g., playground injuries, firearm-related injuries, or other priority injuries)
 - Other
- f. The injury and violence prevention program promotes integration of injury surveillance and information systems with general public health surveillance, consistent with the *Consensus Recommendations for Injury Surveillance in State Health Departments* report.
 - State surveillance plan that includes injury as an integral component
 - Reports of data analyses showing that the data office in the state health department routinely analyzes injury data along with their other data
 - Demonstration that individual data sets (e.g., vital statistics, hospital discharge data, BRFSS) are used for multiple surveillance purposes
 - Other

- g. The injury and violence prevention program provides technical assistance to other groups and agencies about surveillance systems and data use (either suggesting new systems or improving existing systems).
 - Reports of technical assistance provided and results of that technical assistance
 - Other

II. The injury and violence prevention program strives to improve data quality.

- a) The injury and violence prevention program has assessed the completeness and accuracy of all 11 core data sets.
 - Description of reported cases compared to population represented by the data set
 - Results of the specific studies or assessment by data set managers
 - Reports of surveillance system evaluations
 - Documents describing data limitations, strengths and implications for use
 - Other
- b) The data collected or maintained by the injury and violence prevention program meet rigorous quality standards.
 - Protocol for protecting data confidentiality and evidence of implementation
 - Variable definitions that are consistent with research and surveillance data sets used by injury and violence prevention program
 - Protocol for eliminating data duplication in other sources
 - Documentation of adherence to IRB and other research subject/data protection protocols
 - Other
- c) When reporting on injury incidence rates, the injury and violence prevention program has assessed whether each injury event was counted only once.
 - Documentation of use of unique patient identifier in each data set or removal or duplicate cases
 - Summary of results from specific studies on data quality
 - Other
- d) The injury and violence prevention program collaborates with other agencies and community groups to establish and periodically reassess the variables, assigned values and grouping of values in each data set.
 - List of variables and assigned values that have been used to assess injury outcome disparities and explanation of the selection process
 - Other
- e) The injury and violence prevention program establishes clear operational definitions of variables such as “race,” “ethnicity,” and “socioeconomic status” and provides those definitions in all reports that use the terms.
 - Definitions of variables used
 - Other

III. The injury and violence prevention program conducts data analysis and regularly monitors injury and violence indicators.

- a) The injury and violence prevention program conducts surveillance of the 14 recommended conditions identified in the *Consensus Recommendations for Injury Surveillance in State Health Departments* report.
 - Use attachment at the end of this Review Guide to summarize surveillance efforts regarding the 14 recommended conditions
 - Other

- b) Surveillance data are used to track injury incidence, determine the frequency of different mechanisms of injury, identify groups at highest risk for different mechanisms of injury, and recommend prevention priorities.
 - Reports of data identifying or tracking leading cause(s) of injury
 - Documentation of how surveillance data have been used to establish prevention priorities and programs
 - Other
- c) The injury and violence prevention program monitors and reports disparities in injury rates among different groups (e.g., age group, gender, race/ethnicity, rural/urban, counties/regions).
 - Reports of disparities in injury rates
 - Documentation of how surveillance data have been used to monitor disparities in injury rates
 - Other
- d) As with other health conditions, a mechanism is in place to alert state and local health officials to injury hazards and injury clusters and risk factors that require timely investigations or field studies.
 - A protocol for alerting officials about injury hazards, trends, or clusters that require a timely reaction
 - Examples of health alerts issued
 - Evidence that such events have been identified and investigated
 - Other
- e) The injury and violence prevention program uses the results from behavioral risk surveys to monitor trends in injury and violence prevention beliefs and practices.
 - Documentation of how behavioral risk survey results have been used to monitor trends
 - Other
- f) The injury and violence prevention program links data sets when it is appropriate and useful to do so.
 - Identification of common data elements, if any, in the 11 core data sets, that enable linkage
 - Data file utilizing at least two of the data sets
 - Other

IV. The injury and violence prevention program regularly disseminates data.

- a) The injury and violence prevention program disseminates reports to relevant coalitions and partners, including appropriate programs within the state health department (e.g., MCH, Health Statistics, Rural/Minority Health), local health departments and public health agencies, hospitals and trauma centers, other state agencies, prevention advocates and practitioners, and all levels of government (state and local), as well as the general public.
 - Data request log
 - Examples of data provided
 - Other
- b) The injury and violence prevention program distributes reports on injury disparities and invites feedback from other agencies, organizations, and community groups.
 - List of variables and assigned values that have been used to assess injury outcome disparities and explanation of the selection process
 - Documents requesting feedback on reports
 - Summaries of feedback from other agencies, organizations and community groups
 - Other

- c) Program reports (e.g. state publications, peer-reviewed articles, websites, newsletters) are readily accessible.
 - Recent publications
 - Program reports that have been adapted or formatted for different target audiences (e.g., policy makers, local health departments, media)
 - Other
- d) Injury and violence prevention staff participate in or make presentations to local, state, and national groups about injury and violence data.
 - Examples or lists of presentations about injury and violence data
 - Other
- e) Data files or custom data reports are provided to individuals or groups upon request and in a timely fashion, consistent with any data protection regulations.
 - Protocol for obtaining data
 - Data request log
 - Other

V. The injury and violence prevention program conducts and/or participates in research activities.

- a) The injury and violence prevention program collaborates with injury control research centers and/or academic centers to conduct research that is related to injury and violence prevention program priorities presented in the state injury plan and are supportive of effective program implementation and evaluation.
 - Documentation of injury research priorities
 - Documentation that the injury and violence prevention program has collaborative relationships with other researchers addressing injury and violence prevention (e.g., researchers at academic institutions and Injury Control Research Centers)
 - Other
- b) Data requirements for research are established in collaboration with program development staff and other stakeholders.
 - Documentation of collaboration for research design
 - Other

References

Abellera J, Conn J, Annest L, Kohn M. *How States are Collecting and Using Cause of Injury Data: 2004 Update to the 1997 Report*. Council of State and Territorial Epidemiologists. Atlanta, GA. 2005. Accessed at url: <http://www.cste.org/pdffiles/newpdffiles/ECODEFinal3705.pdf>.

Anderson RN, Miniño AM, Fingerhut L, Warner M, Heinen M. *Deaths: injuries, 2001*. National Vital Statistics Reports 2004;52(21):pp 4. National Center for Health Statistics. Hyattsville, MD. Accessed at url: http://www.cdc.gov/nchs/data/nvsr/nvsr52/nvsr52_21.pdf.

Anderson RN, Miniño AM, Hoyert DL, Rosenberg HM. *Comparability of cause of death between ICD-9 and ICD-10: preliminary estimates*. National Vital Statistics Report 2001;9(2):1-32. National Center for Health Statistics. Hyattsville, MD.

Association of State and Territorial Health Officials (ASTHO). *The Role of State Injury Prevention Programs in Natural Disaster Preparation and Response*. Washington D.C., May 2006. Accessed at url: <http://www.astho.org/pubs/naturaldisastersissuebrief--FINAL.pdf>.

Baker SP, O'Neill B, et al. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974;14(3):187-96.

Barell V, Aharonson-Daniel L, Fingerhut L, Mackenzie E, et al. An introduction to the Barell body region by nature of injury diagnosis matrix. *Inj Prev* 2002;8:91-6.

Bonnie RJ, Fulco CE, Liverman CT, Committee on Injury Prevention and Control. *Reducing the Burden of Injury: Advancing Prevention and Treatment*. Institute of Medicine. National Academy Press, Washington D.C., 1999: 74-75.

Centers for Disease Control and Prevention (CDC). Recommended Framework for Presenting Injury Mortality Data. *Morb Mort Wkly Rep* 1997;46(RR14):1-30. Accessed at url: <http://www.cdc.gov/mmwr/PDF/rr/rr4614.pdf>.

Centers for Disease Control and Prevention (CDC). Updated guidelines for evaluating public health surveillance systems. *Morb Mort Wkly Rep* 2001;50(RR-13):1-35. Accessed at url: <http://www.cdc.gov/mmwr/PDF/rr/rr5013.pdf>.

Centers for Disease Control and Prevention (CDC). HIPAA privacy rule and public health. *Morb Mort Wkly Rep* 2003;52:1-12. Accessed at url: <http://www.cdc.gov/mmwr/preview/mmwrhtml/m2e411a1.htm>.

Clark DE, Winchell RJ. Risk adjustment for injured patients using administrative data. *J Trauma* 2004;57(1):130-40.

Comstock RD, Mallonee S, Jordan F. A comparison of two surveillance systems for deaths related to violent injury. *Inj Prev* 2005;11:58-63.

Copes WS, Champion HR, et al. Progress in characterizing anatomic injury. *J Trauma* 1990;30(10):1200-7.

Council of State and Territorial Epidemiologists. *Public health practice vs. research*. Atlanta, GA. 2004. Accessed at url: <http://www.cste.org/pdffiles/newpdffiles/CSTEPHResRptHodgeFinal.5.24.04.pdf>.

Council of State and Territorial Epidemiologists. *CSTE 2004 National Assessment of Epidemiologic Capacity: Findings and Recommendations*. Atlanta, GA. 2005. Accessed at url: <http://www.cste.org/Assessment/ECA/pdffiles/ECAfinal05.pdf>.

Davies M, Connolly A, Horan J. *State Injury Indicators Report*. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Atlanta, GA. 2001. Accessed at url: <http://www.stipda.org/associations/5805/files/StateIndicatorsed2.pdf>.

Dominici F, Levy JI, Louis TA. Methodological challenges and contributions in disaster epidemiology. *Epidemiol Rev*. 2005;27:9-12.

Fingerhut L A, Warner M. The ICD-10 injury mortality diagnosis matrix. *Inj Prev* 2006;12:24-29.

Gennarelli T, Wodzin E. *The Abbreviated Injury Scale- 2005*. Association for the Advancement of Automotive Medicine. Des Plaines, IL. 2005.

Glass RI, Noji EK. Epidemiologic surveillance following disasters. Halperin W, Baker EL, editors. In: *Public health surveillance*. New York: Van Nostrand Reinhold, 1992:195-205.

Hannan EL, Farrell LS, et al. Predictors of mortality in adult patients with blunt injuries in New York State: a comparison of the Trauma and Injury Severity Score (TRISS) and the International Classification of Disease, Ninth Revision-based Injury Severity Score (ICISS). *J Trauma* 1999;47(1):8-14.

Hannan EL, Waller CH, et al. A comparison among the abilities of various injury severity measures to predict mortality with and without accompanying physiologic information. *J Trauma* 2005;58(2):244-251.

Horan J, Mallonee S. Injury Surveillance. *Epidemiol Rev* 2003;25:24-52.

Johnson RL, Sarmiento K. *State Injury Indicators: Instructions for Preparing 2005 Data*. Centers for Disease Control and Prevention. National Center for Injury Prevention and Control. Atlanta, GA. 2006.

Johnson RL, Thomas RG, Thomas KE, Patel N, Sarmiento K. *State Injury Indicators Report, Third Edition — 2004 Data*. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Atlanta, GA. 2007.

MacKenzie EJ. Injury severity scales: overview and directions for future research. *Am J Emerg Med* 1984;2(6):537-49.

MacKenzie EJ, Steinwachs DM, et al. Classifying trauma severity based on hospital discharge diagnoses. Validation of an ICD-9CM to AIS-85 conversion table. *Med Care* 1989;27(4):412-22.

MacKenzie EJ, Sacco W, et al. *ICDMAP-90: A users guide*. The Johns Hopkins University School of Public Health and Tri-Analytics, Inc. Baltimore. 1997.

Mallonee S, Shariat S, Stennies G, Waxweiler R, Hogan D, Jordan F. Physical injuries and fatalities resulting from the Oklahoma City bombing. *JAMA* 1996;276 (5):382-387.

Meredith JW, Kilgo PD, et al. A fresh set of survival risk ratios derived from incidents in the National Trauma Data Bank from which the ICISS may be calculated. *J Trauma* 2003;55(5):924-32.

Miniño AM, Anderson RN, Fingerhut LA, Boudreault MA, Warner M. *Deaths: Injuries, 2002*. National Vital Statistics Reports 2006;54(10). National Center for Health Statistics. Hyattsville, Maryland.

Mullins RJ, Veum-Stone J, et al. Outcome of hospitalized injured patients after institution of a trauma system in an urban area. *JAMA* 1994;271(24):1919-24.

National Association of Health Data Organizations. *ED Data Development Toolkit*. Salt Lake City, UT. 2005. Accessed at url: <http://www.nahdo.org/documents/StateSummary.pdf>.

National Center for Environmental Health. Health Studies Branch, Disaster Epidemiology and Assessment Team. Centers for Disease Control and Prevention. Atlanta, GA. 2006.

National Center for Health Statistics. *ICD-10 framework: external cause of injury mortality matrix*. Hyattsville, MD, 2002. Accessed at url: <http://www.cdc.gov/nchs/about/otheract/ice/matrix10.htm>.

National Highway Traffic Safety Administration. *Revised catalog of types of CODES applications implemented using linked state data*. Department of Transportation. Technical report DOT HS 808 058. Washington D.C., 2000.

Noji EK. The use of epidemiologic methods in disasters. Noji EK, editor. In: *The public health consequences of disasters*. Oxford University Press. New York. 1997:21-32.

Osler, T., R. Rutledge, et al. ICISS: an international classification of disease-9 based injury severity score. *J Trauma* 1996;41(3):380-6.

Osler T, Baker SP, et al. A modification of the injury severity score that both improves accuracy and simplifies scoring. *J Trauma* 1997;43(6):922-5.

Paulozzi LJ, Mercy J, Frazier L, Annett JL. CDC's National Violent Death Reporting System: background and methodology. *Inj Prev* 2004;10:47-52.

Rivara FP. *Injury control: a guide to research and program evaluation*. Cambridge; New York, Cambridge University Press, 2001.

Rutherford WH, de Boer J. The definition and classification of disasters. *Injury* 1983;15:10-12.

Rutledge R, Hoyt DB, et al. Comparison of the Injury Severity Score and ICD-9 diagnosis codes as predictors of outcome in injury: analysis of 44,032 patients. *J Trauma* 1997;42(3):477-87.

Sacco WJ, MacKenzie E J, et al. Comparison of alternative methods for assessing injury severity based on anatomic descriptors. *J Trauma* 1999;47(3):441-6.

Shariat S, Mallonee S, Kruger E, Farmer K, North C. A prospective study of long-term health outcomes among Oklahoma City bombing survivors. *J Okla State Med Assoc* 1999;92(4):178-186.

Sogolow ED, Sleet DA, Saul J. Dissemination, implementation, and widespread use of injury prevention intervention. In: *Handbook of injury and violence prevention*. Ed: Doll LS, Bonzo SE, Sleet DA, Mercy JA. Springer New York. 2007.

STIPDA: Planning Comprehensive Injury Surveillance in State Health Departments Working Group. *Consensus recommendations for injury surveillance in state health departments*. State and Territorial Injury Prevention Directors Association, Marietta, GA. 1999. Accessed at url: <http://www.stipda.org/displaycommon.cfm?an=8>.

STIPDA. Injury Surveillance Workgroup 3. *Consensus recommendations for using hospital discharge data for injury surveillance*. State and Territorial Injury Prevention Directors Association, Marietta, GA. 2003. Accessed at url: <http://www.stipda.org/displaycommon.cfm?an=8>.

STIPDA. Injury Surveillance Workgroup 4. *Consensus recommendations for surveillance of falls and fall-related injuries*. State and Territorial Injury Prevention Directors Association, Atlanta, GA. 2006. Accessed at url: <http://www.stipda.org/displaycommon.cfm?an=8>.

STIPDA. Policy Resolution: Disaster Epidemiology and Injury Mitigation. State and Territorial Injury Prevention Directors Association, Marietta, GA. October, 2006. Accessed at url: http://www.stipda.org/associations/5805/files/disaster_epi%20resolution.pdf

U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. U.S. Government Printing Office, Washington D.C. 2000. Accessed at url: <http://www.health.gov/healthypeople>.

World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision*. World Health Organization. Geneva. 1992.



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