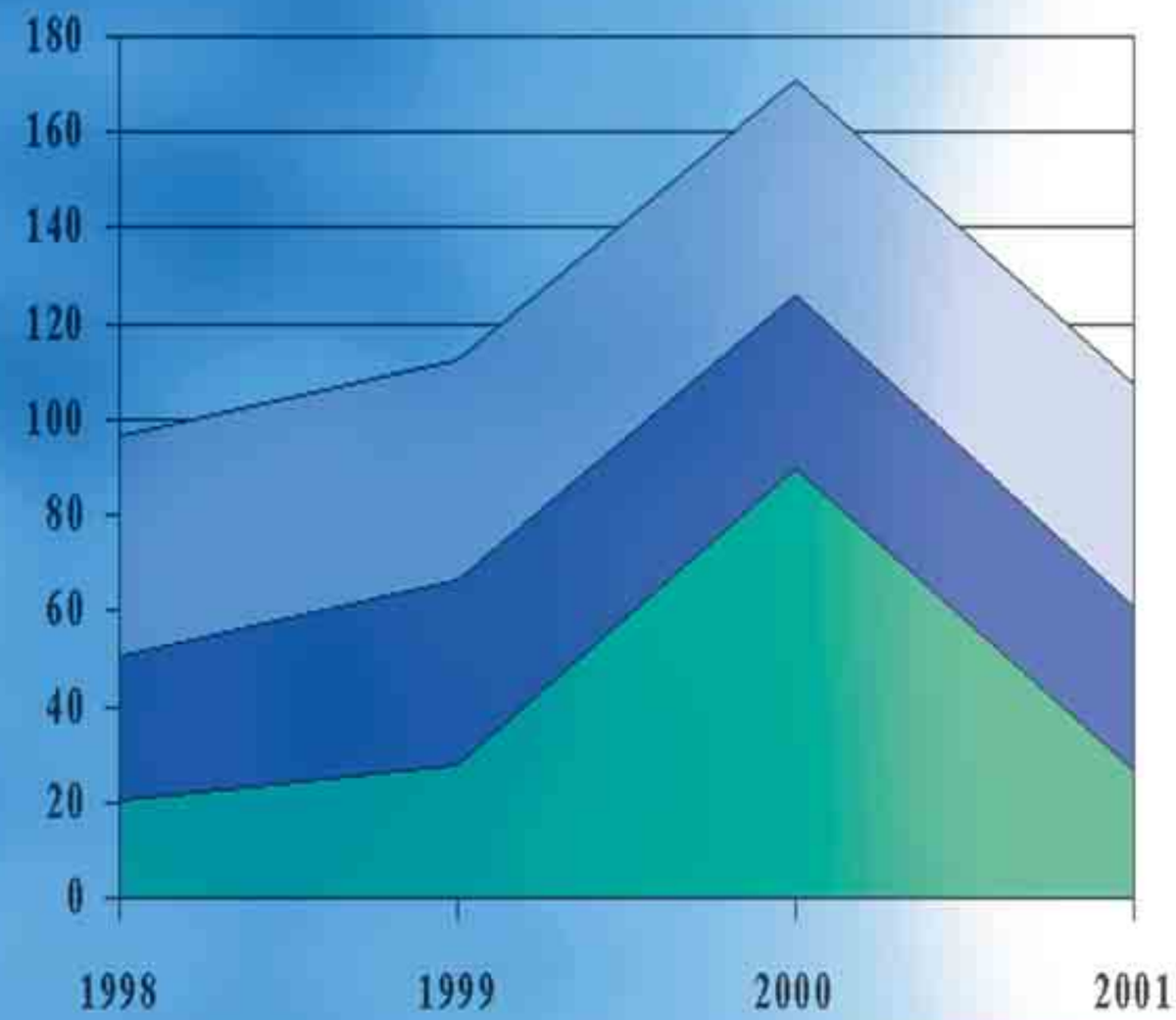
INJURY SURVEILLANCE GUIDELINES

Injury Surveillance Guidelines



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INJURY SURVEILLANCE GUIDELINES

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ACRONYMS

CDC	Centers for Disease Control and Prevention
DUI	Driving under the influence (of alcohol)
EMT	Emergency Medical Technician
ER	Emergency room
ICD	International Classification of Diseases
ICECI	International Classification of External Causes of Injury
ICU	Intensive care unit
MDS	Minimum data set
NGO	Nongovernmental organization
ODS	Optional data set
WHO	World Health Organization

FOREWORD

Injuries, unintentional or intentional, constitute a major public health problem, killing more than 5 million people worldwide each year and causing many more cases of disability. People from all economic groups suffer fatal injuries, but death rates due to injury tend to be higher in those in the lower income groups. The poor are also less likely to make a full recovery following an injury.

Historically, the injury problem has been neglected, largely because injuries were viewed as accidents or random events. Today, however, injuries are known to be preventable. The use of seat belts, car seats for children, designated drivers, fencing around water areas, flame-resistant clothing and smoke detectors, together with early childhood education and family counselling to prevent violence have all proved to be effective measures for preventing injuries.

To date, injury prevention has tended to be an issue only in wealthier countries. The highest rates of death and permanent disability due to injury are, however, currently found in the poorer nations; it is these countries therefore that have the most urgent need for prevention strategies that are appropriate, cost-efficient and effective. In this context, "appropriate" means taking into account the complexities of the problem, the availability of resources and, furthermore, what strategies have been shown to work elsewhere.

To develop effective prevention strategies, most countries need better information. In particular, countries need to know about the numbers and types of injuries that occur and about the circumstances in which those injuries occur. Such information will indicate how serious the injury problem is, and where prevention measures are most urgently needed.

To assist, the Injuries and Violence Prevention Department of the World Health Organization (WHO) has collaborated with agencies from all continents to develop the tools needed for collecting data on injuries. The first product of this collaboration is the International Classification for External Causes of Injuries (ICECI), a detailed classification scheme for injuries that complements the existing International Classification of Diseases (ICD). It provides guidance, to both dedicated researchers and practitioners in the field, on how to classify and code data on injuries according to agreed international standards.

The present manual is also aimed at researchers and practitioners and its purpose is to provide practical advice on how to develop information systems for the collection of systematic data on injuries. It is the result of collaboration between experts from the WHO and the US Centers for Disease Control and Prevention (CDC) who work, or have worked, in settings where resources, including trained staff and electronic equipment, are limited. In addition, experts from other organizations in more than 50 countries have commented on draft versions of the manual. The work has taken two years to complete.

Although the primary objective was to produce a manual applicable to all settings, it is hoped that the manual will be especially useful to those in settings where resources are scarce. The manual thus shows how to set up systems for collecting, coding and processing data even if there is no electronic equipment, few staff, and/or staff with many other demands on their time and no expertise in research. We hope it will lead to better information on injuries and, in turn, to prevention programmes which reduce the incidence of death and disability due to injuries.

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1. ABOUT THIS MANUAL

1.1 Injury: a major health problem worldwide

Based on mortality data for 1998, it is estimated that 5.8 million people die each year as a result of some form of injury. Although men are more likely than women to suffer a fatal injury (men accounted for two-thirds of the total number of deaths due to injury worldwide in 1998), injuries are a leading cause of death for both sexes and in all age groups. Among persons aged 15–44 years, the leading causes of fatal injury are: 1) traffic collisions; 2) interpersonal violence; 3) self-harm; 4) war; 5) drowning and 6) exposure to fire. Among people aged 45 years and over, the leading cause of fatal injury is self-harm (*1*).

Combined figures from Australia, the Netherlands, New Zealand, Sweden and the USA indicate that, in these countries at least, for every person killed by injury, around 30 times as many people are hospitalized and 300 times as many people are treated in hospital emergency rooms and then released. Many more are treated in other health care facilities, such as family doctors' offices and first-aid clinics (*2*). However, these figures reveal little about the extent of the injury problem in less wealthy countries. Typically, inhabitants of countries in the developing world experience a greater number and variety of hazards that lead to injury yet have fewer resources for injury prevention, treatment and rehabilitation. In all countries, people on low incomes are especially prone to injury and are less likely to survive or recover from disability.

The loss of productivity due to death and disability from injury represents a significant loss of economic opportunity in all countries. The treatment and rehabilitation of injured persons account for a large proportion of many national health budgets. Personal loss, to the injured and to those close to them, is immeasurable.

1.2 International cooperation to address the problem

In 1989, delegates to the first World Conference on Injury Prevention and Control held in Stockholm, Sweden, resolved to cooperate on finding ways to prevent injury, to reduce harm caused by injury, to treat injury, and to rehabilitate and reintegrate injured persons into their communities and workplaces. The Conference recognized, however, that there was a serious shortage of information on which to base plans for action in all of these areas (*2*).

Since then, improving injury surveillance has been a priority for the many national and international organizations that collaborate on addressing health problems. Good injury surveillance requires a standard system for classifying injuries, together with systems for keeping records on individual cases and producing summary statistics.

A standard system for classifying injuries has recently been devised and is now available for use. Its components are:

- expanded versions of Chapter XIX (Injury, poisoning, and certain other consequences of external causes) and Chapter XX (External causes of morbidity and mortality) in the *International Statistical Classification of Diseases and Related Health Problems, Tenth revision* (ICD-10)(*3*);
- a related classification scheme, the *International Classification of the External Causes of Injury* (ICECI), which provides classifications and codes for a range of factors that are associated with the occurrence of an injury event (*4*).

Other ongoing international actions aimed at preventing and reducing the impacts of injury are summarized in Appendix A.

1.3 What and who is this manual for?

The aim of this manual is to help people design, establish and maintain good injury surveillance systems. Such systems are intended to record information on individual cases of injury and produce statistical overviews of an injury problem, with all the relevant data being classified and coded according to agreed international standards. The benefits of establishing an injury surveillance system, in particular as a tool to aid planning, are explained in Box 1.1.

BOX 1.1
The uses of injury surveillance for planning purposes

In order to plan a health care system that makes the best use of available resources to address the problem of injuries, a planner needs to ask himself/herself four questions:

1. What is the problem? (Who and how many are being injured and in what ways?)
2. What is the cause? (What are the risks that contribute to injury?)
3. What works? (How can you intervene and which interventions best reduce the risks and the harm?)
4. How do you do it? (How do you make the best use of available resources to stop people from being injured or to reduce the harm done? How do you add to your resources if they are insufficient?)

A good injury surveillance system can provide answers to the first two questions. Firstly, it keeps records of individual cases. These may describe the person injured, the nature of their injury and when, where and how the injury happened. Records are the means by which you can keep track of anything you think it may be pertinent to know about a case.

Secondly, it assembles information from those records to build a database, from which you can readily generate a set of statistics that give you an overall picture of the injury problem confronting your agency, including a handle on how the problem changes over time. The system can tell you how many people, in total and broken down by category, are being injured and in what ways.

Although a surveillance system focuses on the first two questions, it can help to answer the other two questions. In addition to identifying injuries and their causes, the system also helps to monitor the results of interventions, so you can see how effective they are. This information, in turn, helps to identify the best way to use your resources to do a better job.

For example, you may wish to know how many females are experiencing injuries from domestic violence. You may also want to spot trends, from day-to-day, week-to-week, month-to-month or year-to-year. Trend analysis can tell you whether certain kinds of injuries are increasing or decreasing in frequency or severity and, thus, whether your interventions (such as prevention programmes targeted at that kind of injury) are making things better or worse.

The contents of this manual are relevant to a wide range of health care professionals, from epidemiologists, researchers and managers of national health departments to those doctors, nurses and paramedics who work at the front line of health care, handling individual cases of injury. The manual can be used to design injury surveillance systems that are appropriate for national, regional or local authorities, but also for individual hospitals and clinics.

This manual has been designed with particular regard to people working in settings where there may be severe constraints on the capacity to keep records or to assemble information from those records into sets of statistics. It may be that there is a shortage of staff, or perhaps a lack of staff with the appropriate training and/or skills that would qualify them as specialists in surveillance. There may be little or nothing in the way of computers, telephones and other equipment. Alternatively, equipment may be unreliable due to its age, condition and/or uncertain power supplies. Such settings may include low-income countries, small and remote communities, and agencies with small budgets.

1.4 What does the manual do?

The manual guides the reader through the process of designing an injury surveillance system that:

- fits the unique needs and circumstances of a particular setting, be it an agency, community, region or country;
- satisfies the needs of others for data that can be aggregated and compared, provided that the data in the system conform to standard classifications and codes.

The manual advocates that all agencies collect “core” data, i.e. the minimum amount of basic information that is considered necessary for planning purposes at all levels, local, national and international. However, there is ample scope for the inclusion of more detailed or “optional” data; various optional data sets are suggested and readers are encouraged to think of other data that might be useful for their own particular circumstances. The overriding aim is to make the results of surveillance as useful as possible to all parties concerned.

The manual is organized as follows. After this brief overview of the aims and objectives of the manual, Sections 2 and 3 provide an introduction to the terms, analytical tools and methods used by injury surveillance specialists.

Section 4 takes the reader, step-by-step, through the processes of designing an injury surveillance system. Individual modules for the surveillance of different types of injury at varying levels of detail, from core data through to the optional add-ons, are presented. As stated above, readers are urged to consider any other variables, not specifically mentioned in this manual, which might be relevant to their own settings. For instance, an agency operating in a village in the mountains, on a remote island or in the desert may well be faced with a unique set of injuries, or experience unique intervention problems, that will make it useful to collect pieces of data not mentioned in this manual.

For each module, sample forms for recording information on individual cases and for assembling that information into data sets are given. Further example sample forms are provided in the Appendices, and are referred to as appropriate. Some readers may find that the sample forms provided need only minor modifications in order to make them suitable for their purposes. Others may wish to alter them substantially. Those readers wishing to start from scratch and design their own forms may still find the examples provided useful as a source of ideas.

1.5 Getting the most out of the manual

In order to gain a clear understanding of what is involved, readers are urged to go through the manual at least once before designing their own systems according to the steps outlined in Section 4. Although the manual follows a certain logical order, in practice, some things presented later may happen concurrently with things presented earlier. In other words, having established a surveillance system, staff may subsequently find that they are entering information on several different forms at more or less the same time. Reading the manual right through before starting to design a system will help readers understand how parts of the system overlap or interconnect, and thus possibly avoid duplicated effort.

Finally, although we have done our best to make this manual easy to follow we accept that there is always room for improvement. We would therefore appreciate any comments and suggestions readers may wish to offer. For example, did the manual tell you everything you needed to know in order to design a system that works for your setting? Was it easy to understand or did you find parts of it difficult or confusing? Can you think of ways it could be improved? Please let us know, so we can make the manual as useful as possible for future readers.

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2. INJURY: AN INTRODUCTION TO TERMS AND ANALYTICAL TOOLS

2.1 What is an injury?

An injury is the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. It can be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e. air, water, warmth), as in drowning, strangulation or freezing. The time between exposure to the energy and the appearance of an injury is short.[1]

The energy causing an injury may be:

- mechanical (e.g. an impact with a moving or stationary object, such as a surface, knife or vehicle)
- radiant (e.g. a blinding light or a shock wave from an explosion)
- thermal (e.g. air or water that is too hot or too cold)
- electrical
- chemical (e.g. a poison or an intoxicating or mind-altering substance such as alcohol or a drug).

In other words, injuries are the acute, physical conditions listed in Chapter XIX (Injury, poisoning, and certain other consequences of external causes) and Chapter XX (External causes of morbidity and mortality) in the *International Statistical Classification of Diseases and Related Health Problems, Tenth revision* (ICD-10) (*3*).

Whereas the above definition of an injury includes drowning (lack of oxygen), hypothermia (lack of heat), strangulation (lack of oxygen), decompression sickness or "the bends" (excess nitrogen compounds) and poisonings (by toxic substances), it does NOT include conditions that result from continual stress, such as carpal tunnel syndrome, chronic back pain and poisoning due to infections. Mental disorders and chronic disability, although these may be eventual consequences of physical injury, are also excluded by the above definition.

The most common events causing injuries are: 1) interpersonal violence and sexual abuse; 2) collective violence including wars, civil insurrections and riots; 3) traffic collisions and 4) incidents at home, at work and while participating in sports and other recreational activities.

[1] The standard definition of an "injury" as used by WHO is: "Injuries are caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance. In some cases (for example, drowning and frostbite), injuries result from the sudden lack of essential agents such as oxygen or heat" (*5*).

2.2 Types of injury

Injuries may be categorized in a number of ways. However, for most analysis purposes and for identifying intervention opportunities, it is especially useful to categorize injuries according to whether or not they were deliberately inflicted and by whom. Commonly used categories are:

- unintentional (i.e. accidental);
- intentional (i.e. deliberate):
  - interpersonal (e.g. assault and homicide)
  - self-harm (e.g. abuse of drugs and alcohol, self-mutilation, suicide)
  - legal intervention (e.g. action by police or other law enforcement personnel)
  - war, civil insurrection and disturbances (e.g. demonstrations and riots);
- undetermined intent.

2.3 Epidemiology of injuries

2.3.1 What is epidemiology?

Epidemiology is a specialized field of medical research with its own vocabulary. Generally speaking, however, the term refers to the study all the factors that interact with each other to account for the presence or absence of disease or injury.[2] In the epidemiology of injury, as in the epidemiology of disease, these factors can be categorized as:

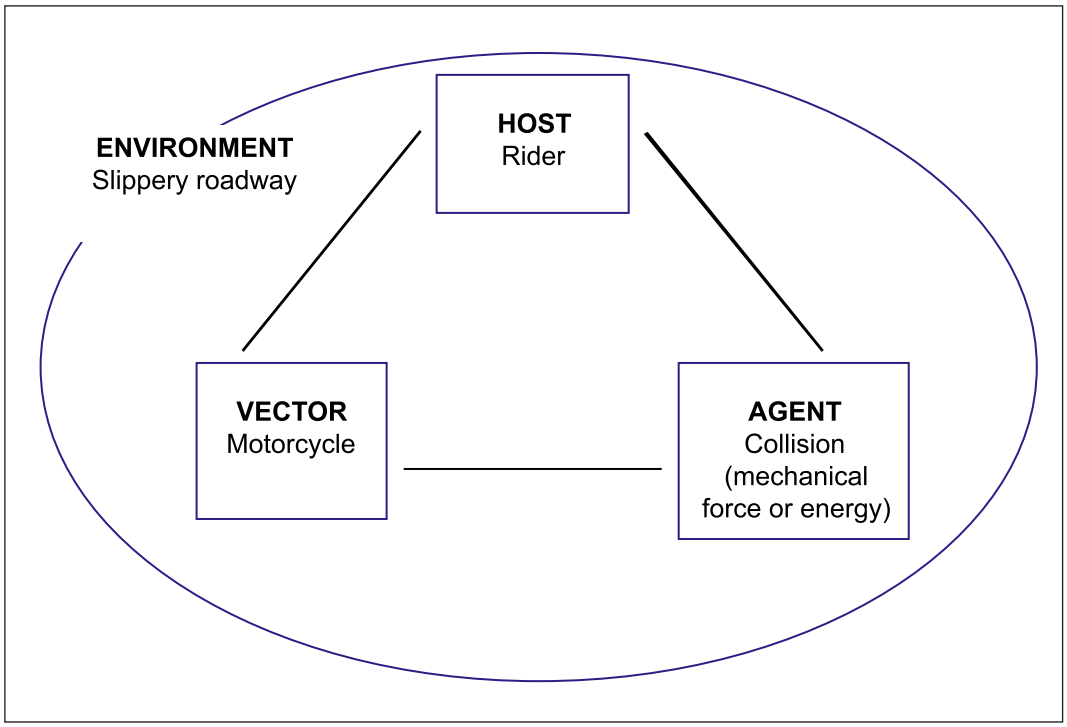
- the host (i.e. the person injured)
- the agent (i.e. the force or energy)
- the vector (i.e. the person or thing that applies the force, transfers the energy or prohibits its transfer)
- the environment (i.e. the situation or conditions under which the injury happens).

2.3.2 Using models to analyse the epidemiology of injuries

The four factors that are involved in injury, and the relationships between them, are illustrated in the diagram below (see Figure 1). The example given is based on an incident in which a man is injured when his motorcycle slides and crashes on a slippery roadway.

[2] The standard definition of the term "epidemiology" as used by WHO is: "Epidemiology is the study of the distribution and determinants of health-related events in a defined population and its application to the control of events" (*6*).

Figure 1:
Epidemiological model of an injury caused by a motorcycle collision



A similar model could be used for an act of interpersonal violence in which a man or woman slaps his or her partner. In this case the *host* would be the person slapped, the *agent* would be the mechanical force or energy (slap), the *vector* would be the person who does the slapping, and the *environment* would include the domestic situation and the societal norms or values that make such behaviour acceptable.

Using a model of this type can help to identify all the factors involved in an injury. It also helps people to think about where they might intervene to prevent such injuries from happening in the future or to reduce the harm done when they do happen. For instance, in the motorcycle collision model, there may be things about the rider, the motorcycle or the road that contributed to the crash. Perhaps there are things about motorcycle riders, motorcycles and/or road conditions that could be changed in order to prevent similar incidents in the future. Possible interventions that might occur to anyone thinking about the four elements of the motorcycle collision model are given in Table 1.

Table 1:
A motorcycle collision model: possible injury prevention strategies

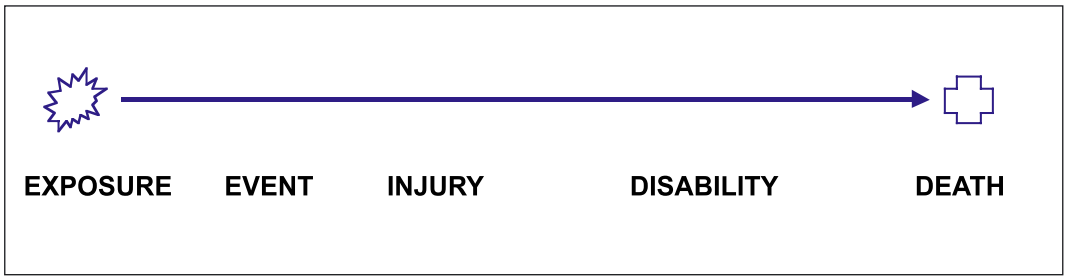
Factor	Possible interventions
Host	Protect motorcycle riders with helmets and stress-resistant clothing Provide better physical therapy to help people recover from injuries more quickly and more fully
Agent	Lower speed limits to reduce the energy involved in collisions
Vector	Ban the production and importation of motorcycles that are capable of speeds well in excess of maximum permissible limits Improve the design or features of motorcycles so they are less likely to slide out of control (e.g. require tyres with better traction)
Environment	Reduce the smoothness or oiliness of road surfaces in order to provide better traction Use road signs or speed bumps to slow down vehicles on bends

In sum, models of the type described above can be effectively used to analyse a given situation and thus identify interventions that may prevent future incidents and injury.

2.3.3 Using the injury spectrum

The so-called "injury spectrum" is another useful device for analysing injuries. The injury spectrum, which is illustrated in Figure 2, maps an injury over time, starting with the host's exposure to a hazard, followed by the event, through to the occurrence of the injury and finally the possible resultant disability and/or death.

Figure 2:
The injury spectrum



Like the injury model described previously, the injury spectrum helps people to think about what happened in a particular case and how interventions might have prevented the injury from happening or reduced the damage done.

Three levels of prevention are suggested by the injury spectrum:

- *Primary prevention* involves either preventing the event from occurring or preventing it from leading to injuries (primary prevention measures might include putting protective barriers around fires, discouraging people from smoking in bed, and wearing protective gear while working or participating in sports).
- *Secondary intervention* involves early diagnosis and appropriate management of an injury (e.g. applying basic first aid at the scene of an incident to stop an injury from having more serious consequences).
- *Tertiary intervention,* and improving the final outcome e.g. rehabilitation, involves preventing further complications in the form of more severe injury, disability or death (e.g. giving an injured person crutches or a cane).

2.3.4 Using Haddon's Matrix

In 1970, William Haddon Jr. designed another tool for analysing an injury event, a matrix that combines the features of the injury model and spectrum discussed above (*7*). Haddon's Matrix allows simultaneous consideration of both the factors (i.e. host, vector, environment) and the stages, over time, of an event. The matrix can therefore be used to analyse any type of injury event and to identify interventions that might prevent such an event from happening again or that might reduce the harm done (see Table 2).

Table 2:
Haddon's Matrix[a]

	Human (or host)	Vector	Physical environment	Socio-economic environment
Pre-event	Is host pre-disposed or overexposed to risk?	Is vector hazardous?	Is environment hazardous? Does it have hazard-reduction features?	Does environment encourage or discourage risk-taking and hazard?
Event	Is host able to tolerate force or energy transfer?	Does vector provide protection?	Does environment contribute to injury during event?	Does environment contribute to injury during event?
Post-event	How severe is the trauma or harm?	Does vector contribute to the trauma?	Does environment add to the trauma after the event?	Does environment contribute to recovery?

[a] The terms used in the table are modified versions of the terms originally used by Haddon. Source: Haddon (*7*)

Table 3 illustrates use of Haddon's Matrix to analyse a collision that happened when a male driver was returning home late one rainy night after attending a social event where he had been drinking heavily. Neglecting to fasten his seat belt, he skidded and crashed into a tree at the edge of the road. There he remained until the driver of a passing vehicle stopped and took him to the nearest hospital. The injuries were made worse by improper handling of the injured man. However, at the time, taking him to hospital seemed the better alternative to waiting for an ambulance, given that the ambulance service was notoriously slow and unreliable.

Table 3:
Analysis of a motor vehicle collision using Haddon's Matrix

	Human (or host)	Vector	Physical environment	Socio-economic environment
Pre-event	Substance misuse, poor driving habits	Faulty brakes, bald tyres	Slippery road due to rain	Social acceptance of high levels of alcohol use by males
Event	Not wearing seat belt	No airbag	Tree too close to the road	Ineffective enforcement of DUI* offences
Post-event	Elderly man, pre-existing medical condition		Slow emergency response, poor rehabilitation programme	Little help for reintegrating rehab patients into society

* DUI, driving under the influence (of alcohol)

Appropriate interventions to prevent such collisions from occurring in future might be:

- campaigns against drinking and driving;
- increased enforcement of drinking under the influence of alcohol (DUI) laws;
- random vehicle inspections to ensure that they are in good repair and safe;
- laws requiring that all vehicles have seat belts and airbags;
- laws requiring that all drivers use seat belts;
- installation of energy absorbing roadside barriers.

All of the above interventions would be classed as primary prevention strategies. Improved emergency response services would be an example of a secondary prevention strategy, and better rehabilitation programmes a tertiary prevention strategy.

The above example clearly demonstrates that use of Haddon's Matrix can help to clarify which interventions might work at any or all phases of an event and which might be targeted towards any or all of the factors.

3. INJURY SURVEILLANCE: AN INTRODUCTION TO TERMS AND METHODS

3.1 What is surveillance?

The term, "surveillance," as used in the public health field, refers to the ongoing and systematic collection, analysis, interpretation and dissemination of health information.[3] Generally speaking, it involves the keeping of records on individual cases, assembling information from those records, analysing and interpreting this information, and reporting it to others. "Others" may include health care practitioners, government officials, international agencies, the general public and anyone else with an interest in public health. Surveillance may be "active" or "passive", depending on your needs and resources (see Box 3.1). The term "surveillance" should not be confused with "survey"; whereas surveillance is an ongoing process, the term "survey" usually refers to a one-time event. These differences are explained further in Box 3.2.

BOX 3.1
Active versus passive surveillance

In *active surveillance*, injury cases are sought out and investigated; injured persons are interviewed and followed up. Active surveillance of child abuse cases, for example, would involve identifying and locating cases through a variety of sources, such as police reports, social service agencies and educational authorities. It then might involve seeking out the abused children, their parents or guardians and/or appropriate authorities, conducting interviews and following up with further interviews. Active surveillance usually requires large expenditures of human and financial resources.

In *passive surveillance*, relevant information is collected in the course of doing other routine tasks. That is to say, the generation of data is not necessarily the primary function of the system that yields the data. For example, doctors are routinely required to fill out death certificates for legal purposes, but it is possible to extract information entered on those certificates in order to obtain data on deaths from injuries. Forms filled out by doctors or nurses for medical insurance purposes can similarly serve a dual function; the medical information entered on insurance forms can also be used for surveillance purposes.

Passive surveillance usually requires less expenditure of resources, as front-line health care practitioners (i.e. doctors, nurses and paramedics), by filling out various forms for legal, administrative and other purposes are in effect also collecting the kind of data that are needed for surveillance. When the same information can serve dual purposes, it is important to make sure that the forms used to collect this information are designed with both purposes in mind. This requires careful consideration of the definitions and classifications used. Nevertheless, in most settings, the use of well-designed forms and, perhaps, the addition of just a few extra steps to an established routine, means that surveillance adds little in the way of costs.

This manual is intended to help readers design surveillance systems appropriate for situations where resources are limited. For that reason, it focuses on passive surveillance methods.

[3] The standard definition of "surveillance" as used by WHO is: "Surveillance is the ongoing, systematic collection, analysis and interpretation of health data essential to the planning, implementation, and evaluation of health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link of the surveillance chain is in the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis and dissemination linked to public health programs" (*8*).

BOX 3.2
Surveys versus surveillance

Although the terms, "survey" and "surveillance", are closely related, they refer to two fundamentally different ways of collecting data.

Surveys are usually one-time events. They are conducted by door-to-door or telephone interviews or by mailing out questionnaires. They may cover all members of a population (census) or only a representative portion thereof (sample). They allow for the collection of information on all types of injuries, covering a wide range of related variables in great depth. Because they are usually one-time events, they are excellent for providing baseline or 'snap-shot' data on a population. They can provide information on trends only if they are repeated periodically. Conducting a survey, however, generally requires a large expenditure of human and financial resources. Most agencies cannot afford such expenditures on a repeated basis, so surveys are generally not good for monitoring trends.

In contrast *surveillance* is an ongoing activity that can be built into the day-to-day operations of an agency. Depending on whether it is active or passive (see Box 3.1), it may add little to the cost of existing operations. It is generally the best way of monitoring trends, detecting emerging problems, identifying interventions and assessing the results of interventions in a timely manner.

Surveillance produces data that describe:

- the size and characteristics of a health problem (i.e. what are the number of cases of injury, broken down by type, and what are the characteristics of each type?);
- the populations at risk (i.e. which kind of people are most likely to incur each type of injury?);
- the risk factors (i.e. what things contribute to each type of injury, and what things are associated with each type of injury?);
- the trends (i.e. is a particular type of injury occurring more or less frequently, and is it doing more or less harm?).

Armed with such data it is possible to:

- design and apply appropriate interventions;
- monitor the results and assess the impacts of interventions.

Some additional benefits of surveillance are summarized in Box 3.3.

BOX 3.3
Advocacy and cooperation: added benefits of injury surveillance

Surveillance can help you argue for more resources. For instance, you may need an increase in the budget provided by your local, regional or national government. You may need more cooperation and support from other agencies in your area, or you may need more support from international agencies.

If you do a good job of surveillance, you can demonstrate that you have a good understanding of the injury problem confronting your community, region or country. You can show that you are doing your utmost to use existing resources to best advantage — you are achieving good results with what you have but you could get better results if you had more support.

In addition, by doing good injury surveillance, health care agencies can help each other. One of the best ways we have of assessing the injury problem confronting our agencies and of evaluating our success in addressing the problem is to compare surveillance results. If one region experiences greater or fewer numbers of certain types of injury than another, or if one agency achieves better or worse results with its interventions than another, then those regions or agencies have something to learn from each other.

3.2 Why do surveillance?

The scale of the injury problem is not a matter of dispute. As previously indicated, the number of people who die from injury every year runs into the millions. However', deaths are only a small part of the total injury problem; for every person killed, many more are seriously and permanently disabled and many more again suffer minor, short-term disabilities. The costs of injury mortality and morbidity are immense, not only in terms of lost economic opportunity and demands on national health budgets, but also in terms of personal suffering. Despite this, few countries have surveillance systems that generate reliable information on the nature and extent of injuries, especially with regards to non-fatal injuries. Those that do, tend to be in the more developed parts of the world.

Without reliable information, health care planners are severely handicapped. They are unable to allocate resources so as to achieve the greatest impact in preventing injuries, reducing the harm they do, and treating and rehabilitating injured persons. This is true for planners at all levels, whether they are concerned with the worldwide injury problem or national, regional or local injury problems. Planners need information specific to their areas of concern.

What little information is available tends to focus on fatal injuries and shows that:

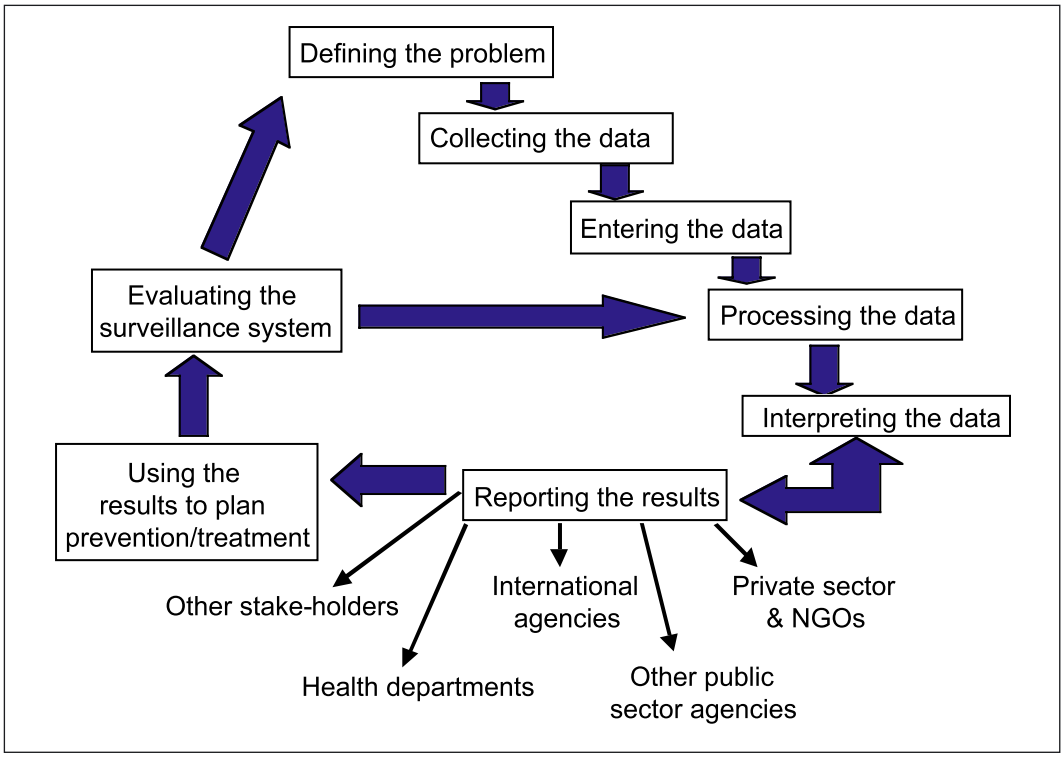
- Injury profiles vary greatly from country to country, with large differences in the total numbers of injuries, types of injuries, numbers of deaths and serious disabilities, and levels of intervention.
- Trends vary from country to country. Injury profiles can change suddenly in response to economic ups and downs, social upheaval, and rapid shifts in the levels of industrialization, urbanization and motorization.
- Injury problems tend to be greatest in those countries with the fewest resources. Low-income countries especially, are plagued by a greater number and variety of potential hazards, yet have the least capacity to prevent and treat injury.
- As injury classifications have only been standardized very recently, much of the information generated by surveillance systems up until now is not comparable between countries, or even within countries.

Local, regional and national injury surveillance systems, established in accordance with standard guidelines, will generate the data needed to plan and deliver effective injury and prevention programmes to community members and to regional and national populations. Moreover, by conforming to international standards, such systems will contribute international statistics that will not only enable comparisons between countries to be made, but will also provide an accurate global picture of the injury problem. In turn, country comparisons and an accurate global picture will help countries, through international agencies like WHO, to cooperate and coordinate their efforts to prevent and treat injuries.

3.3 What are the steps required for surveillance?

Figure 3 illustrates the logical sequence of conceptual steps or processes that are involved in developing an injury surveillance system. Each step in the sequence is discussed more fully in the subsequent subsections.

Figure 3:
Steps in a surveillance system



3.3.1 Defining the problem

The nature of the problem that you wish to define may be quite general or relatively specific. For example, you may wish to establish an injury surveillance system to provide you with information on the total numbers of persons injured. Alternatively, you may have a requirement for very specific information about a particular type of injury or a special set of circumstances. For instance, if a new roadway is about to be built through a school area, you may be concerned about the potential impact of that roadway on the numbers of road traffic injuries among children, in particular that the numbers of injuries will increase.

Problem definition determines the structure and content of your surveillance system. It tells you what is to be placed under surveillance and what information is to be collected. This, in turn, allows you to identify potential sources of information, and to decide where and how the information should be collected. To use the "roadway through the school area" example, problem definition dictates that you want to know whether or not any children are injured in road traffic accidents in a given area, and assuming that they are, how many, in what ways and how severely. Police reports might be one source of information. However, you may well find that it is better to establish your main surveillance system in the local health care facility, assuming that is where injured children will be taken for treatment. The school nurse's office might be another possibility.

3.3.2 Collecting the data

Having defined the problem to be investigated, the next step is to collect the data. This requires that you determine what information is pertinent, what means you might use for recording that information (i.e. usually a form of some description), which people are best placed to fill out your forms, and where those people are located.

3.3.3 Entering and processing the data

Once your raw data have been sourced and collected together, you will need to decide how best to collate and process it. In some cases, these two steps may go together. This would be the case if, for example, the person who is responsible for filling out a form about a particular patient is able to enter, at the same time, relevant information onto another form (or set of forms) that has been designed to record information about all cases of injury. Alternatively, this person (or someone else) might go through all records on individual cases at the end of each day (or each week), and extract information from those relating to injuries. This information could then be entered either onto another form designed for the purpose, or into a computerized database set up to generate daily, weekly, monthly or yearly statistical reports.

3.3.4 Interpreting the data

Raw statistics are usually not enough; more often than not, there is a need for further analysis and interpretation of raw data in order to draw out the most important features and to present information in such a way so as to make it easy to understand.

3.3.5 Reporting the results

Once data have been collated and analysed, the results of surveillance need to be presented and disseminated. This is usually done in the form of written reports, geared to your target audience(s). Often one report will suit all intended readers. However, in some cases several reports, each containing varying levels of detail, may be necessary in order to satisfy the requirements of all of your readers. A planner with a national health authority, for example, may want more detail than a politician or a member of the general public.

3.3.6 Using the results to plan interventions

All of the previous steps of surveillance are directed towards this, the ultimate purpose of the system. The results of surveillance are intended to help planners respond to the problem under surveillance by developing new or improving existing policies and strategies for prevention or intervention. In this context, the term "planners", can be defined as narrowly or broadly as you like. It might be the specialists who do planning for larger agencies or the generalists (including doctors, nurses and paramedics) who do planning for smaller agencies.

It might include the managers and politicians who approve plans. It can even be members of the general public who endorse plans through their voting patterns or who seek amendments by lodging complaints and suggestions.

Surveillance for the sake of surveillance is a poor use of resources. As you design a surveillance system, you should keep in mind its ultimate uses and make sure that it is collecting the information needed for those uses and not wasting resources by collecting unnecessary or useless information.

3.3.7 Evaluating the surveillance system

A good surveillance system needs to be able to respond to changing needs and circumstances; in other words, it needs to be dynamic. If it turns out not to be producing all the up-to-date information needed or produces information that is not needed, then it should be adjusted. Mechanisms for continual evaluation and adjustment should therefore be built into the system at the design stage.

The end users of the information produced (the planners) will often be the best judges as to whether or not the system is serving its purposes well. Planners should be assured that you are always receptive to feedback, and that you always welcome their comments and suggestions.

3.3.8 Keeping the system up to date

Ongoing evaluation of your surveillance system will require that you repeat the above steps as you identify flaws or opportunities for improvement. It may be that the problem definition needs to be refined or expanded or perhaps the forms for collecting data need to be changed. Maybe you can improve the methods for processing, analysing and interpreting the data (e.g. you may now have a computer and a reliable source of electricity that you did not have before.) Maybe you need to change the focus of your reports, so they emphasize the information your end users need most.

3.4 What are the attributes of a good surveillance system?

Good surveillance systems have a number of attributes in common (*9*). These include:

- *Simplicity.* The system should produce all the data needed, but in the most simple and straightforward way possible. Forms for keeping records and compiling data should be easy to understand and complete, and should not waste staff time by requiring repeated entry of the same information. This is especially important where resources are limited and staff have many other demands on their time.
- *Flexibility.* The system should be easy to change, especially when ongoing evaluation shows that change is necessary or desirable. For example, you may want to add information on another type of event to the surveillance system, or change the target population to capture a particular type of injury.
- *Acceptability.* The system will only work if people are willing to participate in it. Involving staff in the design, evaluation and improvement of data entry forms may help ensure that they find them easy to fill out and understand their purpose. It is also important to ensure that end users are getting the results they need from the system and that you are always open to comments and suggestions for improvement.

- *Reliability.* Anyone using the data produced by a surveillance system should have complete confidence in the accuracy of that data. This means that the system should:
  - fully record injury events (or cases), with all pertinent information being described and classified according to stated definitions;
  - exclude non-injury events (e.g. a case of back pain that results from spinal deterioration or ongoing stress should not get classified as an injury);
  - detect all injury events within the relevant population (e.g. if your system is meant to collect data on all injuries in a community, you must be sure that you are not overlooking one of the community's several hospitals or clinics) or be able to detect a representative sample of injury events that can be shown to reflect the distribution of events in the whole population.

    If resources permit, you should try to avoid sampling. However, if resources do not permit and you are not a professional researcher/analyst yourself, you may wish to seek advice from a professional on how to sample. A representative national sample might be chosen, for example, by focusing on a selection of hospitals and clinics that are in some way typical. Reliable data has *high sensitivity* (i.e. detects all events) and *positive predictive value* (i.e. excludes all non-events). It need not result from *complete coverage* but coverage must be done in such a way as to show that all types of injury events in all kinds of circumstances are equally covered. This can be done through *representative sampling*.
- *Utility.* The system should be practical and affordable. It should not put unnecessary burdens on an agency's staff and budget.
- *Sustainability.* The system should function with the minimum of effort and be easy to maintain and update, so that it continues to serve its purposes well after it has been established.
- *Timeliness.* The system should be able to generate up-to-date information whenever that information is needed.

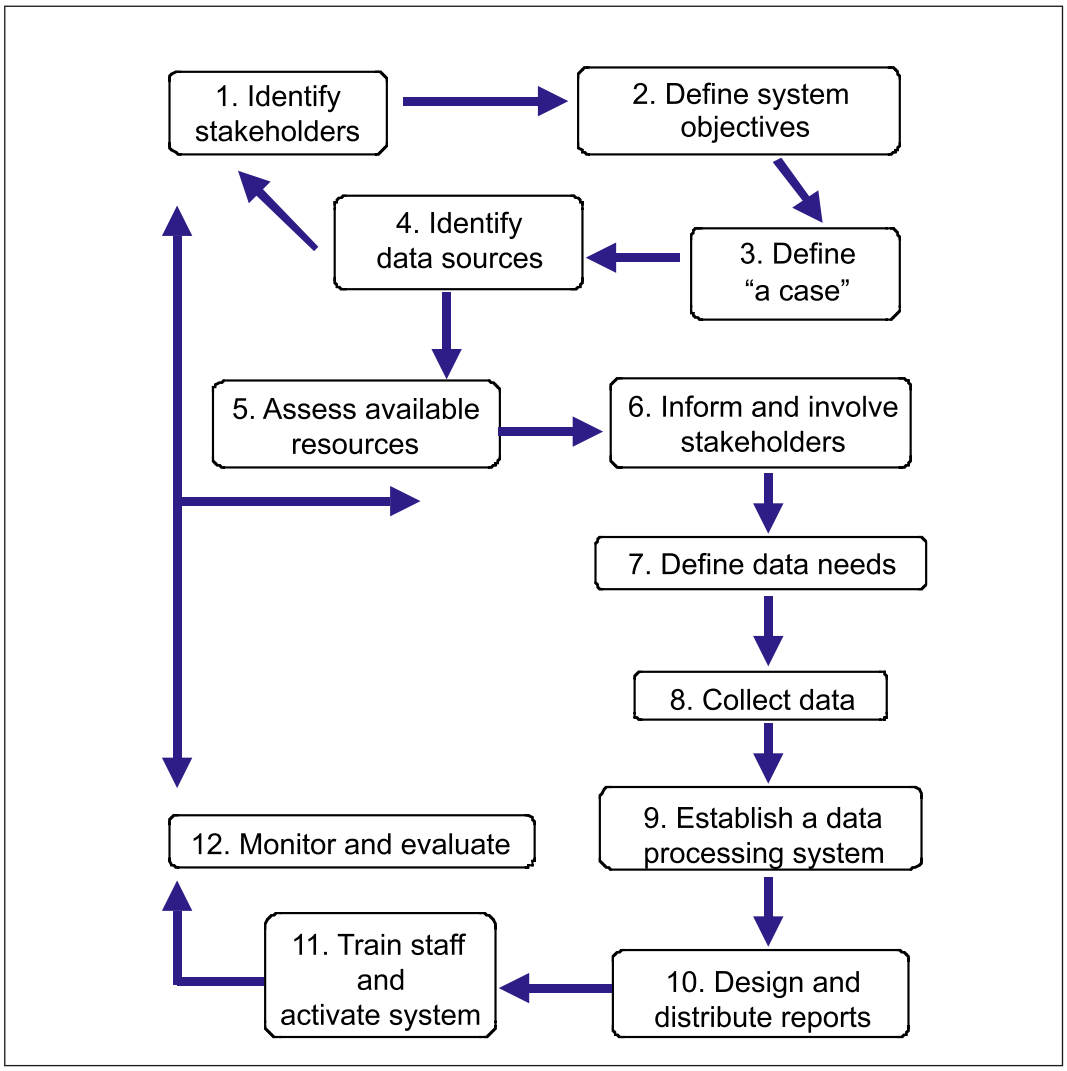
Security and confidentiality are two further very important features of a surveillance system. Records of individual cases should be kept entirely confidential. Surveillance reports should never reveal information on individuals. Moreover, the system should never expose personal information that embarrasses or threatens people, or that jeopardizes their jobs or their relationships.

4. HOW TO DESIGN AND BUILD AN INJURY SURVEILLANCE SYSTEM

4.1 Designing and building by steps

This part of the manual describes in detail the steps that are involved in designing and building an injury surveillance system. These twelve basic steps, which are the same regardless of the size and type of your agency be it a national health department, a community health authority, a hospital, a small clinic or any other kind of agency that deals with injury cases, are identified in Figure 4.

Figure 4:
Designing and building a surveillance system



4.2 Step 1: Identify stakeholders

Any agency or individual who is concerned about injuries and thus may have an interest in injury surveillance can be considered to be a potential stakeholder in your proposed system. You may find your stakeholders amongst those agencies or individuals best placed to collect and process data and/or they may be those most in need of the data your system generates. To identify all potential stakeholders, ask yourself the following two questions.

1. Who wants to place injuries under surveillance?

The answer to this question is likely to produce a list of potential stakeholders that includes health care workers, administrators and policy makers working for public agencies or for nongovernmental organizations (NGOs) with interests in health or injury issues. For example, your stakeholders may be working in a hospital environment or for specialist organizations concerned with the health care needs of particular sectors of the population, such as children or female victims of sexual abuse and violence.

Ministers or Secretaries of Health and Finance may also be important stakeholders. If their support (financial or otherwise) is required, it will be imperative to convince them that the system is necessary and will be well designed and efficient.

2. Who else should be involved?

Consider other agencies, from outside the health care sector, which may have an interest in collecting or using the data generated by a surveillance system. Possibilities include insurance companies, educational institutions, legal institutions and social welfare agencies. Some agencies, for example the insurance companies, may well be potential sources of funding for the system.

Consider also any community leaders who may not normally be associated with health issues, but are in a position to help you win support from the general public, political bodies and other influential groups.

4.3 Step 2: Define system objectives

Clearly define what you want to accomplish with the surveillance system by asking yourself the following questions.

1. Why do you and your other stakeholders want an injury surveillance system?

Some possible answers are:

- to assess the contribution of injuries in general to the overall burden of disease in your country or community;
- to determine the incidence and other characteristics of a particular type of injury;
- to identify populations at high risk from particular injuries;
- to identify areas where intervention is needed;
- to identify those areas where it might be possible to reduce public health costs by preventing injuries;
- to provide data that are critical to making good management decisions (e.g. how to allocate limited resources to produce the best results);
- to monitor and evaluate the effectiveness of injury prevention programmes over time.

2. Must the surveillance system be comprehensive (i.e. cover all types of injuries) and/or should it focus on particular injuries?

Surveillance systems can be comprehensive in their coverage (i.e. geared towards collecting information about all injured persons), or can focus on only certain types of injuries, for example, road traffic injuries (in which case you would only collect information on injuries caused by road traffic accidents). Alternatively, you might find that you wish to pay special attention to certain types of injuries while covering all injuries. Your criteria for selecting your exclusive or special focus might be:

- The severity of the injury:
  - fatal
  - serious enough to require hospitalization
  - slight (such as might be handled by a school nurse or first-aid clinic).

- The nature of the event resulting in the injury:
  - motor vehicle collision
  - occupational (on-the-job) incident
  - violent assault or homicide
  - sexual assault
  - incident involving firearms
  - suicide or attempted suicide
  - act of terrorism
  - war or civil insurrection
  - legal intervention (e.g. police incident)
  - fall.

- The nature of the injury:
  - neurotrauma
  - poisoning
  - burns
  - any injuries that present at a certain type of health care facility (e. g. an emergency room (ER)).

4.4 Step 3: Define "a case"

A single incident (e.g. a traffic collision) may injure several people; it may also result in each injured person having more than one contact with a hospital, doctor's office or other treatment facility. It is critical that you know what you mean by "a case." Does a case mean the incident itself, so that one case may involve more than one person? Does it mean the injury of one person, so that one case may involve multiple contacts with various treatment facilities? Or does a case mean one contact with one treatment facility, so that one person with one injury may account for several cases, one for each time he or she visits a treatment facility?

How you define "a case" depends on the objectives of your surveillance system. For example:

- If the objective is to monitor the *burden of care* on a given service, then a "case" will be any visit (first or repeat) to that service by an injured person or by a person who was not in fact injured but only suspected he/she might be injured.

- If the objective is to monitor the *incidence of different types of injury*, then a "case" will be an injury presented by one person for the first time. Repeat visits for the treatment of the same injury will not count as separate cases, otherwise you would be counting the same injury more than once. Non-injuries, such as suspected but not actual concussion or bone fracture, will not count as cases. If one person has dual or multiple injuries, each injury will count as a separate case. For example, if a person has a burn and a broken leg caused by the same accident, then each injury will count as one case.

- If the objective is to monitor the *incidence of injured persons*, then a "case" will be the first visit of one person, irrespective of whether that person has one injury or multiple injuries. Repeat visits and visits by non-injured persons will not count as cases.

4.5 Step 4: Identify data sources

Where can you find the data you need? Of what quality and reliability is that data? Are the existing systems for recording and processing the data manual or electronic? Can they be easily modified?

In many settings, the realities are such that:

- Individual agencies collect data on injuries in their own ways, using their own definitions and categories.

- Data collection is unreliable; in many agencies data collection methods catch some, but not necessarily all, injury cases, thus bringing into question the quality of that data.

- Even when data are collected consistently, much of it is in the form of hard-copy records that are processed manually, making further analysis tedious. Moreover, access to such data is often difficult because of restrictive rules and failures to recognize how useful data can be for surveillance and planning purposes.

- The availability of computers is limited, making it harder to access, analyse and distribute data.

- The available data are not representative, that is to say they do not necessarily reflect the situation in the entire population. This may be because some sectors of the population (e.g. persons living in "good neighbourhoods" in cities) have better access to treatment centres than others (e.g. persons living in remote rural areas).

4.5.1 Potential data sources

There are many potential sources of data that may be useful for injury surveillance purposes. Some of the more commonly used sources of data on all types of injury are listed in Table 4; the table also indicates which are the best data sources for injuries of different degrees of severity.

Table 4:
Possible sources of data on injuries, according to severity of injury

	No injury	Mild	Moderate	Severe	Fatal
Household (community) surveys					
Health clinic records					
Family doctors' records					
ER records					
Ward admission records					
ICU* admission records					
Death certificates					

* ICU, Intensive care unit; ER, Emergency room.

Other potential sources of data on fatal and severe injuries are listed below.

- For fatal injuries:
  - autopsy/pathology reports
  - police reports.
- For severe non-fatal injuries:
  - hospital in-patient records
  - trauma registries
  - ambulance or Emergency Medical Technician (EMT) records.

Additional sources of data on specific types of injury are:

- For motor vehicle injuries:
  - automobile insurance company records
  - police traffic "accident" reports
  - department of transport reports.
- For violent injuries (e.g. assaults/homicides, suicides/attempted suicides, acts of terrorism):
  - police reports.
- For occupational (on-the-job) injuries:
  - workplace records
  - labour inspector or national occupational safety records
  - national insurance schemes/workers' compensation bureau
  - rehabilitation centres.

4.5.2 Assessing and selecting data sources

Each potential source of data will have its own set of advantages and disadvantages. For instance, whereas one particular data source may provide relatively complete information, this information may be less reliable than that from other sources. Some data sources are likely to be more representative of the injured population than others. Some may suffer from problems of restricted access, depending on whether or not there are legal, jurisdictional or ownership issues. There may also be problems relating to the difficulty of recording, storing and retrieving information attached to some data sources.

Appendix B discusses the merits of the potential data sources listed in the preceding subsection. Please note that this list of sources is by no means exhaustive; you can probably think of several others, more appropriate to your own setting than those mentioned here.

To assess potential data sources and select the ones that are best suited to your surveillance purposes, the challenges are:

- to identify which sources have the most data of the kind you need;
- to develop relationships with the agencies responsible for collecting these data (see also Sections 4.6, 4.7 and 4.8);
- to develop mechanisms for assembling, processing, interpreting and reporting these data (see also Sections 4.9, 4.10, 4.11 and 4.12).

Use should be made of existing data sources and systems, whenever possible. If existing systems are not currently producing exactly the data you need, or are not using the standard definitions and categories appropriate for surveillance, then you should work towards making the necessary changes. It is almost always more economical to build on what already exists. Furthermore, your system is far more likely to be sustainable if it relies on systems that have long been in place and that are used for other purposes besides surveillance.

4.6 Repeat steps 1 through 4

At this point, it is advisable to take stock of what you have learned and decided so far, and then to go back to step 1 and revise your original list of stakeholders. By now, you may have identified some new potential stakeholders and/or ruled out some of those on your original list.

Having revised your list of stakeholders, review your objectives (step 2), what you mean by “a case” (step 3), and your list of potential data sources (step 4). You may well want to revise some of or all of these items.

4.7 Step 5: Assess available resources

Consider the resources you already have or may need to acquire. These may include:

- personnel with sufficient expertise not only to complete forms and/or extract data from them, but also to process the data and produce reports;
- equipment and supplies (e.g. computers (if existing or affordable), reliable electricity supplies to run computers, manually operated devices, forms, computer diskettes).

Can existing staff and equipment handle any new tasks that may be required for surveillance? Do you need additional staff or additional training for existing staff? Do you need additional equipment and supplies? If you need more in the way of staff, training, equipment and supplies, how will you procure it? If you cannot procure it, how will you make do with what you already have?

Consider also the environment in which surveillance takes place, especially the first stages of surveillance, i.e. the point at which injured persons or their families and friends are asked for information. It is crucial that both the surroundings where this happens and the staff who are involved, make people feel comfortable about giving information. This is particularly important given that injured persons and their families are likely to be in states of emotional distress.

Emotional distress is often greatest in cases where people are injured by violence and sexual assault. In addition to being very agitated, they will be concerned about their privacy. Are there suitably private areas where interviews can take place? Do staff have the skills to conduct interviews sensitively? Are there safe shelters or counselling services that people can be referred to? If such things do not already exist within the agency or service that is collecting data for your surveillance purposes, it will be important to consider how they can be incorporated into that agency or service or, alternatively, handled elsewhere through other agencies.

A key consideration will be whether or not your surveillance system will be able to process information electronically, i.e. on computers with reliable supplies of electricity. If, currently, the system does not have a computer or access to a computer, is there some way it might acquire a computer or access to one in the foreseeable future, or will it have to rely on manual processing? You may need to refer to your country's ministry of finance or ministry of health in order to answer to these questions.

4.8 Step 6: Inform and involve stakeholders

The next step is to inform and involve all those agencies that you have identified as potential stakeholders in your surveillance system. You will have to convince your stakeholders that surveillance is useful, and you will need to secure their commitment to it. It will be of enormous benefit in the long run if it can involve your stakeholders in the design and establishment of the system. Should you be successful in this, your stakeholders will develop a strong sense of ownership of the completed system; this in turn will help to make it sustainable.

The material presented in this manual is intended to help you to achieve all of these objectives. It contains all the background information you should need not only to convince your stakeholders of the importance of surveillance and of the benefits of the system, but also to enlist their help and support in making it happen. Once you have engaged your stakeholders in the process of designing the surveillance system, you can use this manual to guide you all through the step-by-step process of setting up the system.

4.9 Step 7: Define data needs

4.9.1 Data sets: the building blocks of a surveillance system

How much, and what type of, data you decide to collect will depend on your priorities, as well as on your available resources. However, in this manual, we do recommend certain minimum data sets — that is to say there is a least amount of data that we consider a system needs to collect in order to be useful for injury surveillance purposes. Extra information can be readily added to these minimum data sets, according to your own specific requirements and circumstances.

To this end, it is convenient to divide the data collected by a surveillance system into two categories, “core” data and “supplementary” data. Each of these main categories can be further subdivided into “minimum” and “optional” data. This gives four distinct groups of data or data sets as described below.

1. Core data on all injuries

Core data are the data a surveillance system collects on all types of injuries, regardless of their characteristics, the circumstances in which they happened or the contributing factors or causes. Core data can be divided into:

1a. The core minimum data set (core MDS)

This is the minimum or least amount of data a surveillance system can collect on all injuries. It usually includes: 1) something to identify the person injured (probably not their name but a unique number); 2) age of the injured person; 3) sex of the injured person; 4) intent (e.g. whether the injury was unintentional or resulted from violence or self-harm); 5) place where the injury occurred; 6) nature of the activity or event being undertaken when the injury happened (e.g. swimming, driving), 7) mechanism or cause (e.g. traffic injury, drowning) and 8) nature of the injury. This data set, comprising eight variables, is the recommended basic international standard data set for comparison against countries.

1b. The core optional data set (core ODS)

This is data a surveillance system need not necessarily collect but may collect, if it is deemed useful and the system has the resources to collect and process it. Optional data may include such things as information on: 1) race or ethnicity of the person injured; 2) external cause of injury; 3) date of injury; 4) time of injury; 5) residence of injured person; 6) whether alcohol was a factor; 7) whether another substance was a factor; 8) severity of injury and 9) disposition of injured person (e.g. was the injured person treated in hospital and then discharged or admitted to hospital?). It is advisable to also include an “incident summary” variable, which can be used to record what happened to the patient verbatim. This type of free-form variable is useful when validating the information collected.

The optional data set can include anything that stakeholders agree is important to know and appropriate to record. It can accommodate special data needs for special circumstances. For example, if the surveillance system is for an island country or community where many people swim regularly or fish for a living, it may be important to include information pertaining to water activities and boats in the optional data set.

2. Supplementary data for particular types of injury

Supplementary data is the name given to the additional data that a surveillance system may wish to collect on specific types of injury, such as those resulting from traffic collisions, violent assaults and sexual assaults on women or children. It can be divided into:

2a. The supplementary minimum data set (supplementary MDS)

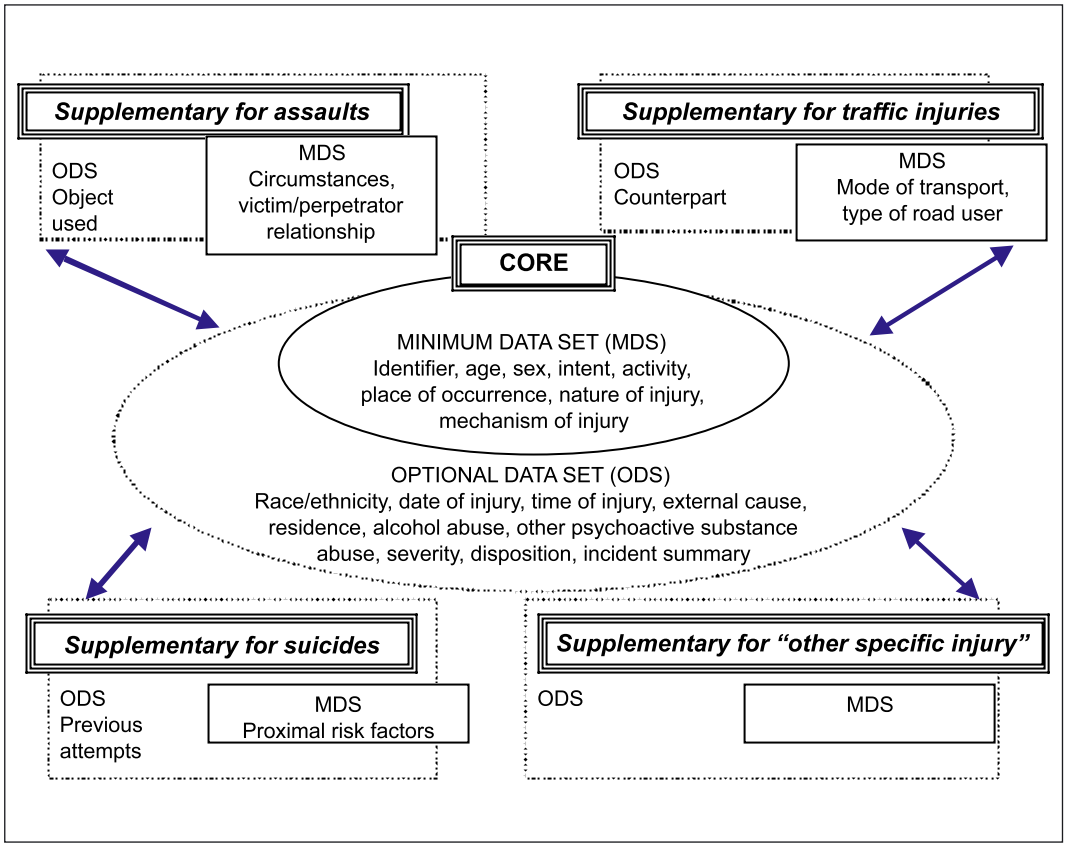
This is the least or minimum amount of additional data a surveillance system may collect on a particular type of injury; it supplements the data collected as part of the core data set for a given injury. For example, if violent assaults are a particular concern, it will be appropriate for the system to collect more detailed information about those injuries resulting from assault. Such information may include details about the context or circumstances of the assault (e.g. fight, robbery) and the relationship between the person injured and the person or persons inflicting the injury.

2b. The supplementary optional data set (supplementary ODS)

This is information a surveillance system need not necessarily collect about a particular type of injury but may collect, if it is deemed useful and if the system has the resources to collect and process it. For example, for violent assaults, in addition to the "minimum" information mentioned above, it may be useful to record information about the object used to inflict the injury and further details about the circumstances in which the injury happened. As in the case of the core data set, the supplementary optional data set may include information of particular relevance to a given setting. For example, if violent assaults in particular places (e.g. schools, bars, clubs) are of concern, it may be appropriate to collect additional information on such places.

The following diagram (Figure 5) shows how these data sets go together to make up an entire surveillance system. In this particular example there are four supplementary modules (for assaults, traffic injuries, suicides and "other specific injuries"); these are positioned at the corners of the diagram. Your own surveillance system may have fewer or greater numbers of supplementary modules, depending on your priorities.

Figure 5:
The building blocks (data sets) of an injury surveillance system



4.9.2 Choosing data sets and the data for each set

When deciding what kind of data your surveillance system absolutely needs to collect (i.e. your minimum data sets) and what kind of additional data may be desirable (i.e. your optional data sets), it is advisable to bear in mind the following:

- Your objectives, as agreed by all stakeholders. Often, there are data some stakeholders would like to have which is not of such high priority for all stakeholders that it is worth investing limited resources to collect.
- The limitations imposed by the resources you have at hand. If there are not enough staff or staff are too busy, they may not have enough time to collect and process more than the minimum amount of data needed for surveillance. Remember that the more data you collect, the more staff time it will take to process that data; this will be a particular concern if your system has to rely on manual data processing methods.
- The concerns and sensitivities of the injured persons and their families. Are questions about race, ethnicity, religion, personal habits and personal relationships appropriate? If you are asking for sensitive information, how can you ask for it so that people do not feel offended or threatened? Can you honestly assure people that their answers will be treated in the strictest confidence and that they cannot be identified in any of the reports produced by your surveillance system?

It is suggested that you build up your surveillance system as follows:

1. Start with your *core MDS*. Ideally, the contents of this data set should include all of the pieces of information given in our example (see Figure 5 and Section 4.9.5). You may want to add one or two other pieces of information that you consider absolutely essential to have on all cases of injury.
2. Consider the need for *supplementary MDSs* and agree on the ones that are essential or the most important. Here you may want to think about the two, three or four types of injury that most often cause death or hospitalization and so collect supplementary data on those. These may include, for example, traffic injuries and injuries resulting from violence. You may also wish to consider injuries that are of particular concern to the general public, for example, injuries resulting from violence and sexual assault against women and children.
3. Consider the need for the *core ODS*. Refer back to your objectives and pay close attention to your priorities and the limitations imposed by your resources. Add data according to your priorities. What other things about all injuries do you most want to know?
4. Finally, consider the need for *supplementary ODSs*. Again, refer back to your objectives and pay close attention to your priorities and resource limitations. Add data accordingly. What other information about particular injuries do you really need?

Remember that a well-designed form, which is easy to complete, will always deliver more reliable data than one that is not. Furthermore, try to use standard classifications and codes on your forms as much as possible (see below).

4.9.3 Using standard classifications and codes

To make your surveillance system as useful as possible, it is critical that you use standard classifications and codes. By doing this, you will ensure that data collected by your injury surveillance system can be compared and collated with data collected by other injury surveillance systems. This will enable community-by-community and country-by-country comparisons.

Ultimately, it will provide more accurate worldwide estimates of the extent of the injury problem. These comparisons and estimates will contribute to better planning at the local, national and international levels.

As already mentioned, WHO has been supporting efforts to establish international standards for classifying and coding data on injuries. The work is now complete and the results can be found in two publications:

- *International Statistical Classification of Diseases and Related Health Problems, Tenth revision* (ICD-10) [in particular expanded versions of Chapter XIX, "Injury, poisoning, and certain other consequences of external causes," and Chapter XX, "External causes of morbidity and mortality"] (*3);*
- *International Classification of the External Causes of Injury* (ICECI) (*4*).

All of the illustrations and examples given in this manual use the currently accepted classifications and codes as listed in the *International Classification of the External Causes of Injury* (ICECI) (*4*). Whereas the examples provided here may be adequate for the purposes of relatively simple and straightforward surveillance systems in developing countries and small communities, readers who want to incorporate pieces of information not shown in the examples or who want to go into greater detail on some aspects (e.g. on the factors contributing to a particular type of injury) are urged to refer to the ICECI data dictionary, Version 1.0. This is available on the WHO's web site at www.who.int/violence_injury_prevention.

4.9.4 Classifying and coding the data

Subsections 4.9.5 and 4.9.6 show you how to classify and code each piece of information that you have decided to include in your various data sets: the core minimum, the core optional, the supplementary minimum and the supplementary optional. The classifications suggest wordings you might like to use on your forms to describe the kind of information you want. For example, putting the word "Identifier" on a form should prompt staff to ask for something like a national identity number (if that is deemed to be the appropriate identifier for a case), and then to enter the answer in the appropriate space. Similarly, the word "Age" on a form should prompt staff to ask for the injured person's age or birth date and then to put the answer in the appropriate space or tick the box beside the appropriate age range. Section 4.10 (step 8: Collect data) provides further guidance on form design and refers to additional examples contained in the appendices.

The following terms are used:

- *"Class"* indicates the type of information or data sought.
- *"Definition"* describes the class.
- *"Obligation"* indicates whether data of a particular class are essential (i.e. mandatory), optional or conditional. In the core minimum data set, all classes of data are mandatory. In the core optional data set, most classes of data are optional. In the supplementary data sets, all classes are conditional.

  When obligation is said to be conditional, the "*condition*" is described. The condition is "mandatory" if an injury is one to which the supplementary minimum data set applies and "optional" if there is also a supplementary optional data set for that type of injury. For example, if your surveillance system requires that you collect supplementary data on any injury resulting from violence, then certain data on an injury will be mandatory and certain data will be optional.

- "*Code type*" indicates whether the code for that class of data will be numeric (a number), a character (a letter or symbol) or a character string (a series of characters, which can be a mixture of letters, symbols and/or numbers). A numeric code is always preferred, as numeric codes are easier to process and less prone to data entry errors.
- Under *"code choices"* there is a list of codes (usually numeric) that correspond to choices in a multiple-choice list of possible answers to the question implied by the particular class. For example, if the class is "Nature of injury," then one possible answer is "Burns." "Burns" is a classification in the ICECI, the code for which is 5.

In some of the examples, under "code choices," you will see items that are indented under other items. The indented items are sub-classifications. In general, the classifications show the minimum information desired and the sub-classifications show greater detail. You can add sub-classifications to any classification, if you want a greater level of specificity. For example, under the classification "school" you could add such sub-classifications as "kindergarten (didactic area)" and "kindergarten (play area)."

Please note that in the examples provided in this manual, the "code choices" generally use code numbers as listed in the ICECI. Although use of the code numbers is preferable, it is not necessary. However, it is important that you use the classifications and sub-classifications as given in the ICECI.

4.9.5 Classifying and coding core data

In the following subsections, example core data sets (i.e. information relating to all injuries) are classified and coded according to the ICECI. Please note that variables belonging to the minimum data set are shown in tinted boxes, while those that are optional are in boxes with white backgrounds.

4.9.5.1 Classifying and coding the core minimum data set (core MDS)

As previously indicated (see Figure 5 and Section 4.9.1), it is recommended that your core minimum data set comprise the following eight variables or "classes": identifier, age, sex, intent, place of occurrence, activity, nature of injury and mechanism of injury. These are coded as shown in the boxes below.

Class:	**IDENTIFIER**
Definition:	The identifier is something that uniquely identifies each case and is used to avoid double counting. An identifier may be assigned by the agency responsible for surveillance or it can be something that is specific to the person injured, such as national ID number with a date attached. Note that a national ID number alone is not sufficient to uniquely identify a case; should the same person present at another time with a different injury, it will need to be recorded as a separate case. Attaching a date to the ID number will distinguish between visits or incidents and so overcome this problem.
Obligation:	Mandatory
Code type:	Numeric

Class: **AGE**

Definition: The injured person's age at time of injury, in years, as of last birthday.
Obligation: Mandatory
Code type: Numeric
Code choices:

1 less than 5 (birth to 4 years)
2 5-14
3 15-19
4 20-24
5 25-44
6 45-64
7 more than 64 (65 or more)
9 Age unknown

Comments: It is best to record the actual age and then, later, assign it to one of the age groups. Staff should be instructed to estimate the age where they cannot get exact information.

Class: **SEX**

Obligation: Mandatory
Code type: Numeric
Code choices:

1 Male
2 Female
9 Sex unknown

Class: **INTENT**

Definition: The role of human intent in the occurrence of the injury incident.
Obligation: Mandatory
Code type: Numeric
Code choices:

1 Unintentional (accidental)
2 Intentional self-harm (suicide, attempted suicide)
3 Assault (interpersonal violence)
4 Undetermined (awaiting results of investigation)
8 Other (add subcategories, if appropriate, as follows:
  5 Legal interventions
  6 Operations of war and civil insurrection)
  9 Unknown

Class: **PLACE OF OCCURRENCE**

Definition: Type of place where the injury event occurred.
Obligation: Mandatory
Code type: Numeric
Code choices[4]:

1 Home, including garden and out buildings
2 School, including kindergarten and schoolyard
3 Street/highway
8(*98*) Other (add subcategories, if appropriate, as follows:
4 Residential institution
5 Sports and athletics area
6 Other transport area
7 Industrial/construction
8 Farm, excluding home
9 Commercial
10 Countryside, water, sea)
9(*99*) Unknown

Class: **ACTIVITY**

Definition: What was the injured person doing at time of injury?
Obligation: Mandatory
Code type: Numeric
Code choices:

1 Work, including travel for work (e.g. truck driving)
2 Education, including school sports
3 Sports
4 Leisure/play
5 Travelling not elsewhere classified
8 Other
9 Unknown

[4] If you use the full set of code choices, i.e. up to 10, then "Other" needs to be "98" not "8", and "Unknown" needs to be "99" not "9", assuming that you have left space for two digit placements in your database.

Class: **NATURE OF INJURY**

Definition: The physical nature of the injury, real or suspected, which brought the person to the agency. If more than one injury, focus on the most serious.

Obligation: Mandatory

Code type: Numeric

Code choices:

1 Fracture
2 Sprain, strain or dislocation
3 Cuts, bites or open wound
4 Bruise or superficial injury
5 Burns
6 Concussion
7 Organ system injury
8 Other
9 Unknown

Class: **MECHANISM OF INJURY**

Definition: How the injury was inflicted, i.e. how the person was hurt. If more than one mechanism, record the one that precipitated the injury.

Obligation: Mandatory

Code type: Numeric

Code choices:

1 Traffic injury
2 Sexual assault
3 Fall
4 Stuck/hit by person or object
5 Stab or cut
6 Gun shot
7 Fire, flames or heat
8 Choking or hanging
9 Drowning or near-drowning
10 Poisoning
98 Other
99 Unknown

4.9.5.2 Classifying and coding the core optional data set (core ODS)

There are many other pieces of information you could usefully collect as part of your injury surveillance system; listed below are just 10 possible variables that could make up your optional data set for information on all injuries:

Class:	**RACE/ETHNICITY**
Definition:	This may be relevant for certain types of injuries and in specific environments. However, questions about race or ethnicity are often thought to be inappropriate; consider carefully whether this class is necessary.
Obligation:	Optional
Code type:	Numeric
Comment:	Code choices to be defined by surveillance system designers.

Class:	**EXTERNAL CAUSE OF INJURY**
Obligation:	Conditional
Condition:	Wherever ICD-10 coding is routinely performed, this attribute is mandatory.
Codes:	As per ICD-10 Classification
Code type:	Character
Comment:	For developing countries, this data element is optional, since "Mechanism of injury" included as part of the core MDS is equivalent to an abbreviated External Cause ICD-based classification scheme. However, where data are routinely coded and sufficient skills reside (e.g. in health insurance, other health agencies, worker's compensation bureau), this data element should be included in the MDS.

Class:	**DATE OF INJURY**
Definition:	Date that the injury event occurred.
Obligation:	Optional
Code type:	Character string
Comment:	Code using whatever date format convention is appropriate, for example,YYYY/MM/DD.

Class: **TIME OF INJURY**

Definition: Time of day that the injury event occurred.

Obligation: Optional

Code type: Numeric

Code choices:

1 00:00 – 03:59
2 04:00 – 07:59
3 08:00 – 11:59
4 12:00 – 15:59
5 16:00 – 19:59
6 20:00 – 23:59
9 Unknown

Comments: a) If resources permit, capture actual time of injury event.

b) Use the 24-hour clock.

Class: **RESIDENCE**

Definition: Injured person's normal place of residence.

Obligation: Optional

Code type: Character string

Comment: Naming convention to be determined by the application area. It may be a region, state, village, community, or some appropriately defined physical area.

Class: **ALCOHOL USE**

Definition: Suspicion or evidence of alcohol use before the injury event, by the injured person or others directly involved in the incident.

Obligation: Optional

Code type: Numeric

Code choices:

1 Suspected (by report or observation) or confirmed by biological evidence.
2 No information available.

Class: **OTHER PSYCHOACTIVE SUBSTANCE USE**

Definition: Suspicion or evidence of use of a psychoactive substance, legal or illegal (e.g. heroin, cocaine, benzodiazepam) before the injury event by the injured person or others directly involved in the incident.

Obligation: Optional

Code type: Numeric

Code choices:

1 Suspected (by report or observation) or confirmed by biological evidence.

2 No information available.

Class: **SEVERITY**

Definition: Assessment of the degree of injury.

Obligation: Optional

Code type: Numeric

Code choices:

1 No apparent injury

2 Minor or superficial (e.g. bruises, minor cuts)

3 Moderate, requiring some skilled treatment (e.g. fractures, sutures)

4 Severe, requiring intensive medical/surgical management (e.g. internal haemorrhage, punctured organs, severed blood vessels)

Class: **DISPOSITION**

Definition: Action taken or injured person's status after arrival at health facility.

Obligation: Optional

Code type: Numeric

Code choices:

1 Treated and discharged

2 Admitted or referred to hospital

3 Died

8 Other

9 Unknown

Class: **INCIDENT SUMMARY**

Definition: A free text field that describes the circumstances surrounding the incident. It may show answers to the following questions: "What were you doing at the time of the incident?" and "How did it happen?"

Obligation: Optional

Code type: Character string

4.9.6 Classifying and coding supplementary data

4.9.6.1 Classifying and coding supplementary data for traffic injuries

If traffic-related injuries are a particular concern, you may wish to consider collecting more detailed information about injuries of this nature as part of your surveillance system. As in the case of core data, you can divide your supplementary data on a given type of injury into minimum and optional data sets. The following variables, "Mode of transport" and "Road user", are proposed as candidates for a supplementary minimum data set for traffic injuries.

Class: **MODE OF TRANSPORT**

Definition: How was the injured person travelling at the time of the injury event?

Obligation: Conditional

Condition: If the injury event involved a vehicle or device made and used for conveying persons and goods, this information is mandatory.

Code type: Numeric

Code choices:

1 Pedestrian
2 Non-motorized vehicle (i.e. cart, bicycle)
3 Motorcycle
4 Car
5 Pickup, van, jeep, minibus (i.e. bus seating less than 10 persons)
6 Truck
7 Bus (seating 10 or more persons)
8 Train
89 Other, including boat and airplane
99 Unknown

Class: **ROAD USER**

Definition: What was the role of the injured person?

Obligation: Conditional

Condition: If the injury event involved a vehicle or device made and used for conveying persons and goods, this information is mandatory.

Code type: Numeric

Code choices:

1 Pedestrian
2 Driver or operator of the transport, including bicyclists and motorcyclists
3 Passenger, including motorcycle passengers
8 Other
9 Unknown

If you have the resources, or if it is important for prevention efforts, you could include a "Counterpart" variable as part of your optional supplementary data set on traffic injuries. This variable records specific information about the nature of the collision that caused the injury and may be coded as shown below.

Class: **COUNTERPART**

Definition: With what did the injured person (or his vehicle) collide?

Obligation: Conditional

Condition: If the injury event involved a vehicle or device made and used for conveying persons and goods, this information is optional.

Code type: Numeric

Code choices:

1 Pedestrian
2 Non-motorized vehicle
3 Motorized vehicle
4 Fixed object
5 Non-collision
9 Unknown

4.9.6.2 Classifying and coding supplementary data for assaults and homicides

Those who are particularly concerned about the impacts of interpersonal violence (i.e. assaults and homicides) are likely to require additional information about injuries resulting from such acts. Two variables are proposed for the supplementary minimum data set, "Context" and "Perpetrator/victim relationship"; these record information about the circumstances that resulted in the injury. The variable, "Object used", might form part of an optional data set for assaults and homicides.

Class: **CONTEXT**

Definition: The factor(s) that precipitated the assault.

Obligation: Conditional

Condition: If the injury resulted from assault, this information is mandatory.

Code type: Numeric

Code choices:

1 Quarrel, fight
2 Burglary or robbery
3 Drug-related
4 Sexual assault
5 Gang activity
6 Committing a crime (other than above)
8 Other
9 Unknown

Comment: If resources permit, more than one factor may be selected. Otherwise, select the one that most directly led to the incident.

Class: **PERPETRATOR/VICTIM RELATIONSHIP**

Definition: The relationship of the perpetrator to the victim.

Obligation: Conditional

Condition: If the injury resulted from assault, this information is mandatory.

Code type: Numeric

Code choices:

1 Spouse, partner (present or past)
2 Parent or step-parent
3 Other relative (e.g. child, grandparent, brother)
4 Acquaintance or friend
5 Stranger
8 Other (add subcategories, if appropriate as follows:
  6 Care-giver
  7 Legal authorities)
9 Unknown

Class: **OBJECT USED**

Definition: The object that inflicted the injury.
Obligation: Conditional
Condition: If the injury resulted from assault, this information is optional.
Code type: Numeric
Code choices:

1 Club or stick
2 Knife, machete or other cutting/chopping implement
3 Fire
4 Gun or other firearm
5 Person, including parts of the body (e.g. fists, feet)
8 Other
9 Unknown

4.9.6.3 Classifying and coding supplementary data for suicides/attempted suicides

The following two variables could be included as part of a supplementary data set or module on injuries caused by self-harm (i.e. suicides/attempted suicides). "Risk factors" would be an appropriate candidate for the supplementary minimum data set; information about previous suicide attempts could be considered to be optional, and added to the system if resources permit.

Class: **RISK FACTORS**

Definition: The circumstances that may have led to the suicide attempt. If resources permit, select all that apply. If not, select the one that triggered the event.
Obligation: Conditional
Condition: If the injury resulted from self-harm, this information is mandatory.
Code choices:

1 Conflict with family member
2 Physical illness
3 Psychological/psychiatric condition
4 Financial problems
5 Legal system encounters
8 Other (add subcategories if appropriate, as follows
  6 Death of a family member
  7 Victim of sexual or physical abuse)
9 Unknown

Class:	**PREVIOUS SUICIDE ATTEMPTS**
Definition:	The actual number of previous suicide attempts.
Obligation:	Conditional
Condition:	If the injury resulted from self-harm, this information is optional.
Code type:	Numeric

4.9.6.4 Classifying and coding supplementary data for other types of injury

For information and guidance relating to the classification and coding of data on other types of injury, the reader is referred to various specialist texts on the subject. Guidelines for the surveillance of neurotrauma injuries have been published by Thurman (*10*). In the case of injuries caused by landmines, guidelines have been produced by Sethi and Krug (*11*). Details of both of these works are available on WHO's Injury and Violence Prevention Department web site.

The ICECI (*4*) contains guidelines for the surveillance of sports and occupational injuries. An in-depth discussion on the surveillance of noncommunicable diseases and injuries is provided by WHO in "The STEPwise approach to surveillance (STEPS) of the major NCD risk factors: a WHO perspective." (*12*) This document recommends that all surveillance systems use standardized data collection methods but acknowledges that systems also need to be sufficiently flexible to accommodate the unique circumstances of different settings, from those with the least to those with the most resources. The STEPwise model thus allows for the incremental development of an increasingly comprehensive surveillance system.

4.10 Step 8: Collect data

Once you have decided what data you want to collect, your next step is to decide how you are going to collect it. You will need to consider questions such as who will collect the data and where will this take place?

4.10.1 Choosing the best location(s) for injury surveillance

Build on existing systems, whenever possible. If there is a system in place that already collects and processes most or even some of the data you want, consider using it as the basis for your surveillance system. It may be possible to extend the existing system to gather all of the data you need, with only minor modifications to the forms already in use and with little or no added burden on the staff that currently operate the system.

Another possibility is to coordinate several existing systems. If there are several independently operating systems (for example, ones run by individual hospitals and clinics), each collecting some of the data you need, consider trying to coordinate them. You might be able to persuade the separate agencies to use the same forms or, at least, revise their forms so that they are consistent.

If you are going to rely on the coordination of several independent systems, you will need to think carefully about how you are going to achieve this. It will be necessary to secure commitment to the exercise from all of the agencies concerned and a coordinating mechanism will need to be put in place. This mechanism might consist of an all-agency committee, together with a staff member dedicated to the task of coordination. You will also need to reach agreement on where and how the information will be gathered into one place, collated and processed, and then interpreted and reported.

Staff already engaged in data collection and processing are usually heartened to learn that what they are doing is useful to others and, moreover, are happy to cooperate in any efforts to make their work even more useful. There may be some resistance, however, if there are any jurisdictional or legal problems. Ideally, any problems of this kind should have been addressed in Steps 4 to 7 (i.e. when you were revising your list of stakeholders, assessing resources, informing and involving stakeholders and specifying your data needs). If there are issues that remain unresolved, then you may need to revisit those steps at this point.

A third possibility is that you will find no existing system that can function satisfactorily as a surveillance system. If this is the case, you will have to assess the available options open to you. To assess the possible locations for your system, ask yourself the following questions:

- Does the agency you are considering have the potential to collect the data you need? For example, is it a hospital or clinic that receives injury cases? Does it receive the majority of cases or, at least, a large number of cases?
- Will the data collected be of use to the location itself? In other words, will the hospital, clinic or whatever kind of agency you are considering have the incentive to collect your data because in doing so, it will help it to keep better records and monitor its own activities more effectively?
- Does it have adequate resources (i.e. staff and equipment) to collect and process the data? If not, how might these be provided?

4.10.2 Designing data collection forms

If you decide to build on an existing system, you will need to work with the agency operating the system in order to modify their existing data collection forms, replace them with new ones or, possibly, supplement them with new ones. You should give the agency a lead role in this exercise or, at least, defer to its needs for the information it already collects. At the same time, however, it will be necessary to involve the other stakeholders to ensure that the agency's system now begins to function as a good surveillance system for all concerned. Similar statements apply if you decide to build on several existing systems by modifying and coordinating their efforts so they function as one surveillance system.

Whether building on an existing system or systems, or establishing a new one, we recommend that you do the following as you revise existing forms or design new ones:

- Seek input from all stakeholders, especially the staff who will actually be filling out the forms when the surveillance system is in place. Their experience of handling injury cases and extracting information from patients will be invaluable. Recognize and use their expertise.
- Seek advice from a statistician, if possible. A statistician can help with form design and ensure that the information obtained is as easy as possible to collate and process.
- Make the form easy on the eye, easy to understand, and, above all, easy to complete.
- Decide whether or not to pre-code the forms (i.e. print the codes on the forms themselves beside the data to be entered). It is usually better to pre-code, in which case it is best to have as few opportunities as possible to enter "other" or "unknown" or to answer questions with unique words or phrases. There are, however, situations where it may be preferable to leave questions open-ended, allow staff to fill in whatever words seem appropriate to them, and then extract and code the information afterwards. For example, in a busy emergency ward where staff are pressed for time, it may be easier for them to write down, as they see fit, a description of each case. A clerk might then take this description and abstract and code the relevant bits of data onto another form.

- Wherever possible, use numbers rather than letters or symbols to code information, i.e. use numeric codes rather than character codes. Numbers are easier to process and less prone to entry errors.

- Test the form(s) before adopting it/them for general use. Arrange for the staff that will be filling out the form(s) regularly to use it/them on a trial basis. Note any difficulties that staff may have in understanding questions or recording responses, and be prepared to revise the forms, if necessary.

A number of example data collection forms are given in the Appendices; you may wish to use them as models for designing your own form(s). Appendices C to G are sample forms for collecting core data and supplementary data:

- *Appendix C*: is a form to collect core minimum data on any case of injury.

- *Appendix D:* is a surveillance log to collect core minimum data on a number of cases of injury.

- *Appendix E*: is a form to collect core minimum and optional data on any case of injury.

- *Appendix F*: is a form to collect core minimum data on any case of injury plus supplementary minimum data on a case of traffic injury.

- *Appendix G:* is a form to collect core minimum and optional data on any case of injury plus supplementary minimum and optional data on a case of injury resulting from assault.

Appendices H to K are examples of forms that are actually used by established injury surveillance systems; they are all taken from places where resources are limited:

- *Appendix H*: is a patient record form used by the Accident and Emergency Department, Princess Margaret Hospital, Bahamas.

  When the hospital's existing data collection system was asked to perform as an injury surveillance system, existing forms were modified to take account of the system's added role. Appendix H shows the modified version of the form. The new form is designed to collect data for injury surveillance, as well as data for surveillance of other health conditions. It usually has a second page, not shown here (but see Appendix I).

- *Appendix I*: is an injury/poisoning form used in Jamaican Hospital.

  This form is a modified version of the supplementary Injury/Poisoning Form that is attached as a second page to the form for patient records used in the Bahamas (see Appendix H). It may be used to collect supplementary data as in the Bahamas, or as a stand-alone surveillance instrument. Note that it asks some open-ended questions. These require further work by records clerks, who extract and code information from the forms after others have filled them out.

- *Appendix J*: is an emergency room registration form used in Servicio de Emergencias, Hospital Santiago Jinotepe, Nicaragua.

  This form gives fixed choices for answers, with codes attached.

- *Appendix K*: is a non-fatal injury surveillance form used in South African emergency rooms.

This form uses most of the ICECI classifications and codes plus some additional ones, appropriate to unique national situations. A “shebeen,” for example, is an unlicensed drinking house.

4.10.3 Deciding who completes forms and prepares them for processing

In most settings, surveillance forms are completed while patients are being interviewed about their injury, either during triage, registration and/or treatment. The interview should be conducted in an atmosphere sensitive to the patient’s feelings and to the need for confidentiality. Every effort should be made to avoid duplication of work and to avoid asking patients to answer the same questions several times. Duplication can be avoided by using forms that serve dual or multiple purposes.

Ideally, a member of the medical staff (i.e. a doctor, nurse or paramedic) treating an injury case should complete the injury surveillance form, one copy of which becomes part of the patient’s medical record, while another is used for surveillance purposes. Unfortunately, medical staff are often overburdened with work or simply lack an interest in surveillance. They see filling out forms as dispensable work, not as an integral part of managing patients.

If physicians cannot be persuaded to fill out your surveillance forms, consider asking either the triaging officer (if one exists), a nurse involved in caring for the patients or a registration clerk to complete them. In such circumstances, treating physicians should be asked to review any completed forms relating to their own patients. This may be accomplished by placing the relevant form(s) at the front of a patient file, so that the physician can easily check it/them over when next examining that patient.

A third option is self-administration, i.e. to ask patients to complete their own forms. However, this requires a high level of literacy and an understanding of the mechanism of injury that is generally beyond the knowledge of the average layperson. Self-administration is not appropriate for most environments.

Whoever fills out your surveillance forms, they should be provided with adequate background information and training. Ideally, they will have been involved in designing or modifying the forms; this experience alone may well provide staff with most of the information and training they need.

Having determined who will fill out and check your forms, you must now determine who will be responsible for preparing the data for processing. If the form has not been pre-coded, this will normally involve assigning one member of staff to the task of extracting and coding data from the completed forms. This may not be a problem in places where this type of work is routinely done for other purposes. However, in many developing countries and small communities there are severe staff shortages and so these extra tasks may be an unmanageable burden. For this reason it is preferable to pre-code and otherwise simplify forms as much as possible.

Arrive at the most efficient and acceptable procedures through discussion with all stakeholders. It is very important that all parties concerned agree on these procedures and that the agreement be documented and available for future reference. Included in the agreement should be designation of the staff member who will be responsible for monitoring the system and ensuring that it is working according to plan. This staff person should also be responsible for making sure that forms are completed properly in all cases, so that data are as complete and accurate as possible.

4.11 Step 9: Establish a data processing system

Data processing systems can be either manual or electronic. Although electronic data processing methods offer a number of obvious advantages, they can only be used if:

- computers are in use already, or it is possible to acquire computers;
- staff know how to use computers or can be trained to do so;
- there is a reliable electrical supply;
- reliable maintenance is readily available.

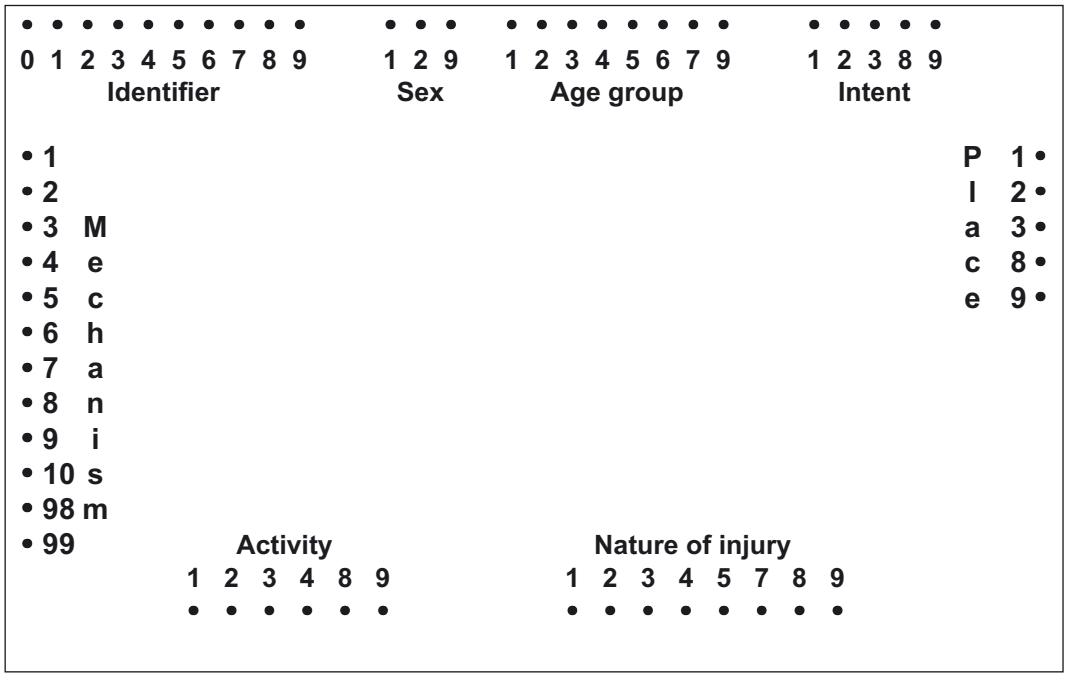
Manual data processing methods will be appropriate in settings where staff are not trained to use computers, there are no computers, or the electricity supply is too unreliable to depend on computers functioning.

4.11.1 Manual data processing

Manual methods are capable of providing simple, cheap yet very effective ways of processing data. In particular, simple card-based systems, such as the one described below, can be used to great effect.

A card-based system uses cards with holes punched near the four edges as forms. Put the numbers corresponding to the code choices for each class of information just below, above or next to the holes, being careful to make sure there is no mistaking which code number goes with which hole. Print the names of the classes that go with the codes just below, above or next to the appropriate number or code. Your card should look something like the one shown in Figure 6.

Figure 6:
A card (form) designed for manual data processing system



To complete such a form, use a hole-punch to cut out the bits of card separating the holes from the outside edge, selecting only those holes that correspond to the appropriate number or code. To tabulate data, stack the cards pertaining to many cases, stick a needle through a hole and shake the stack until a selection of cards fall out. The cards that fall out will be all the cases to which the particular code applies.

To illustrate, if the injured person's sex is female and the code for female is 2, punch out the bit of paper between the outer edge and the hole corresponding to the 2 in the area of the card corresponding to the class, "Sex". To pick out all females from a stack of cards, stick a needle through the hole corresponding to the 2 and shake. All the cards that fall out will be those pertaining to females. In the same manner, you can select all females of a certain age and then all females of that age who live in a certain place and so on.

Although this method could be time-consuming if you have a lot of data on each case punched out on the cards, it works very well with manageable amounts of data. Card-based systems like this are widely used and have proven to be an excellent way of processing data in areas with limited resources.

4.11.2 Electronic data processing

In general, electronic surveillance will be the preferred option for those agencies and staff who currently use or can use computers for other tasks, such as the registration of patients and production of administrative reports. Such agencies will have the keenest appreciation of how computers can make routine work easier and free up staff time.

If electronic processing is appropriate in your setting, you might like to make use of free data processing software. For example, Epi Info is a software package you can download, free of charge, from the Internet at site http://www.cdc.gov/epiinfo. Alternatively, you can get a copy on disk by writing to the Epidemiology Program Office, Centers for Disease Control and Prevention, 1600 Clifton Road, Atlanta, GA 30333, USA (*13*).

Be aware that you may need to update your software periodically. If you choose to use commercially available data processing software (e.g. software that came with the computer), this will be an additional cost at sometime in the future and, depending on the software, that cost can be significant.

Whichever method of processing is selected, electronic or manual, it is important that data storage and processing procedures preserve the confidentiality of sensitive information provided by patients for the surveillance system. The patients themselves are important stakeholders in the system. Their contributions should be recognized and respected, as should your agreement, stated or implied, to protect their privacy.

4.12 Step 10: Design and distribute reports

The next step is to design the basic reports the system will produce and agree on their frequency of production and distribution. These basic reports are the means by which the results of surveillance are conveyed to all stakeholders. In general, they should be produced and distributed to most stakeholders at least quarterly. However, the needs of all stakeholders should be considered when making decisions about report design and production frequency.

If electronic means of data processing are used, the production of basic reports should be both automatic and prompt. If all stakeholders have computer access and are connected to the Internet (or via an intranet), it should be possible to send and receive the latest information on demand.

A set of basic reports for results generated by a surveillance system that collects core minimum data on all injuries is given in Appendix L. This type of summary information should be produced by any injury surveillance system, including ones that rely on manual data processing. If electronic data processing is used, it should be a relatively straightforward exercise to express the information presented in these tables in a graphical format (i.e. as bar graphs and pie charts).

In addition to basic reports, there may be a need for a higher level of reports, i.e reports which aggregate information from a number of sources, analyse and interpret this data, compare data from different places and comment on trends. Reports of this type are often produced and distributed by regional or national health authorities. Typically, they will be published annually and distributed to all stakeholders; they might also be made more widely available, for example to the general public. Higher level reports can be a critical part of regional or national surveillance systems, not only because they tend to increase compliance and commitment to the system, but also because they enable local authorities and agencies to see how they compare to others.

4.13 Step 11: Train staff and activate the system

In all of the preceding steps, there will have been active participation by all stakeholders, including the staff responsible for filling out forms and processing data. To reinforce their commitment to the system, plan and conduct training of everyone who will be involved, however tangentially, in the operation of the system and/or the use of the data it will produce. Training should be conducted at three levels, with everyone taking the first level, some taking the second level, and a select few taking the third level (see Table 5).

Table 5:
Recommended levels of training for staff involved in injury surveillance

Training level	Target audience	Training content
I	Everyone concerned with surveillance, from supervisors and staff who operate the system to end users of information produced by the system	Introduction to injury surveillance and epidemiology; an overview of the system including its objectives and potential uses.
II	Anyone who will complete forms or process data.	Detailed review of the form(s) with emphasis on understanding the classes of data and their coding; how to elicit the required data from patients; and how to conform to agreed procedures, including ones that guarantee confidentiality.
III	Anyone who will code and process data, manually or electronically; anyone who should be familiar with data processing methods and software.	Hands-on practice in extracting data from forms and coding it; and operating the manual or electronic data processing system.

The surveillance system can be activated as part of the training exercise. Once people become adept at completing forms and processing data they can continue doing so as part of their normal work routine. Documents outlining system procedures and training materials should be made readily available for reference and for the training of new recruits.

4.14 Step 12: Monitor and evaluate the system

Once it is up and running, your surveillance system should be continually monitored and periodically evaluated, so that problems are detected and remedied as soon as they emerge. One person should be assigned responsibility for the day-to-day monitoring of the system and the reporting of problems. This person should monitor the interviewers, unobtrusively, as they record or enter data onto forms; forms should also be checked for completeness.

After the system has been operating for a period of at least six months, a detailed evaluation should be carried out to determine how well the system is meeting its objectives viz:

- the ability of the system to identify each injury case and to record and correctly categorize data on each case;
- the accuracy and quality of the reporting (i.e. do the reports produced by the system correctly and accurately identify all cases of injury, without missing any);
- the ease of use of the forms and data processing system (i.e. how easy are the forms and system procedures to understand; how easy is it to elicit information from injured persons?);
- the relevance and usefulness to the end users of the data produced by the system.

Instructions for conducting retrospective, process and system environment evaluations are presented in the subsequent subsections. Further information relating to the evaluation of surveillance systems is given in “Guidelines for evaluating surveillance systems” (*9*).

4.14.1 Retrospective evaluation of an injury surveillance system

Retrospective evaluations, which determine how well a system is operating by looking back at recent performance, are highly recommended. This should be conducted in the following manner, using the form shown in Appendix M:

1. Randomly select at least **one week day** and **one weekend day** from the period to be reviewed (this can be either one week or one month). Include the full 24-hour period of each day selected.
2. Ask the individuals who complete or file patient records to make available all forms filled out for all patients seen on those two days, regardless of whether they are injury cases or not. It is a good idea to make your request some time before the days in question, by asking staff not to file the forms for those two days but to set them to one side. This may avoid the extra work of retrieving records after they have been filed. Ideally, you should ask without explaining why you are making this request. If you explain why, staff may be extra diligent in filling out forms on those days and thus give a distorted impression of normal practice. Ask staff to separate the forms into two piles, one for injury cases and one for all other cases.
3. Count the total number of forms, i.e. the total number of all cases processed on each day, both injury cases and other cases. Enter this information at Weekday “A’ “ and Weekend day “A” “ on a form like the one shown in Appendix M.
4. Then carefully examine each form in both piles, making sure that they have been sorted correctly, i.e. into injuries and non-injuries. Return all the forms that you consider not to be related to injuries (i.e. the non-injuries) to staff for filing in the normal way. It is important to do this so as not to delay routine filing procedures.

If you have decided to conduct a weekly review, you should set the forms from your two days aside and do your thorough review of the forms during the following week, or whenever the report for the week containing your two days becomes available. If you have decided upon a monthly review, choose days towards the end of the monthly period and do your thorough review whenever the report for the whole month containing your two days becomes available.

5. The pile of records designated as “injuries” by you, the evaluator, becomes the “gold standard” against which the surveillance data will be evaluated. Count these for each day to determine the true number of injury cases recorded on those days. Enter this information at Weekday “ B’ “ and Weekend day “ B” “ on the form in Appendix M.

6. Now refer to the report produced by the surveillance system. Enter the numbers of injury cases it reported for those two days on the form in the two places marked ‘C’ on the form.

7. Subtract ‘C’ from ‘B’ for both days. This gives you the difference, if any, between the “true” number of injury cases as determined by you, the evaluator, and the number of injury cases reported by the surveillance system.

8. If there is a difference in these two numbers, closely re-examine each form pertaining to injuries and determine the following:

   - Was it correctly and clearly identified as an injury?
   - If not, set aside and then count the number of cases that had been designated as injuries by staff but which were not in fact injuries. Enter the result for each day at the two places marked ‘D’.
   - For every true injury case, was every class of data correctly recorded and coded?
   - If not, set aside and then count the number of cases where data were not correctly recorded, i.e. some data were missing. Enter the result for each day in the two places marked ‘E’ on the form.
   - Now set aside and count the number of cases where data were not correctly coded. Enter the result for each day in the two places marked ‘F’ on the form.

The results produced by the process evaluation thus far are likely to give you a rough idea of whether or not the system is failing. A difference between B (the true number of injury cases) and C (the number of injuries reported by the system), for example, immediately suggests that the system is either missing some injuries (i.e. true injuries are being coded and reported as non-injuries) or is overcounting (i.e. reporting non-injuries as injuries). If, however, further analysis is required, the form shown in Appendix M suggests some other calculations that could be performed to help pinpoint the source of the errors. These include:

- B/A, expressed as a percentage; this is the “Injury rate”, the number of injury cases as a percentage of the total number of all cases.

- C/B, expressed as a percentage; this is the rate of error and is a reflection of the accuracy of the system.

- C/(C+D), expressed as a percentage; this provides a measure of the predictive value of your injury system. Ideally, it should be 100%. If it is only 95 %, then you know you have significant error in your system.

- (C-E-F)/C, expressed as a percentage; this is the “Accuracy rate”, the percentage of injuries that have been accurately coded. Again, ideally, it should be 100 %. In practice, most systems will score slightly less than 100 %, and this does not usually indicate a serious problem; a score of much less than 100 %, however, indicates a significant problem.

It is worth doing the above calculations for weekdays and weekend days separately, as this allows identification of problems that may be specific to one type of day. For example, there may be fewer staff working on weekends and they may be more inclined to make errors.

If you are using a computer, it would be a relatively simple matter to incorporate this type of calculation into the overall data processing system so that the calculations are performed automatically. However, the calculations are not so complicated that they cannot be done manually. In either case, you may wish to involve someone who is trained or naturally adept at analysing data in the evaluation.

4.14.2 Process evaluation of an injury surveillance system

In addition to the retrospective evaluation, as described above, it is advisable to carry out a process evaluation. This involves:

1. Viewing the operation of the surveillance system at different periods of a workday. Follow at least six injury cases that present themselves that day over a period of 2 hours; for each case review the form that was just filled out for the case and complete an evaluation form such as the one shown in Appendix N. (For a larger agency, handling many cases, you may want to increase the numbers of cases looked at.)

2. After completing the evaluation form, summarize your findings with notes and comments, as appropriate. Some questions your notes might answer are: If there was an error, was it a kind of error that turns up more frequently for certain types of injury; at certain times of day; or on forms filled out by particular categories of staff?

Check carefully for the following:

- *duplicate cases*, i.e. cases where the same injury was counted twice because separate forms were filled out at separate visits for treatment of the same injury;
- *wrongly classified cases*, i.e. cases which did not meet the criteria for inclusion as injury (e.g. chronic conditions such as back pain, or cases of food-poisoning due to an infectious agents such as salmonella)
- *missed cases,* i.e. cases that should have been counted as an injury but were not (e.g. near drowning, deliberate poisoning, sexual assault, child abuse)
- *incorrect codes.*

4.14.3 System environment evaluation of an injury surveillance system

A system environment evaluation looks at how well staff are able to operate the system. Do they have all the training and supplies they need? Do they experience problems?

To do such an evaluation, interview staff and complete a questionnaire such as the one attached as Appendix O.

Finally, feed the results of all three types of evaluation back to supervisors and administrators, as well as to the staff who operate the system (i.e. staff who complete forms and process data) for further comment. Regular evaluation of the surveillance system might result in changes to the data capture form and/or in the methods of data collection. Such changes will result in improved quality of data.

5. CONCLUSIONS

We hope this manual helps you to design and build an injury surveillance system that works for your organization. Please keep in mind that the manual is intended to provide guidelines, not hard and fast rules. Every organization has it own unique problems and needs. Only you and the other stakeholders in your organization can determine what will work and what won't work in your situation. There are two final pieces of advice for anyone designing and building an injury surveillance system:

1. Be aware of any factors that may be unique to your organization and that may present problems or opportunities for good injury surveillance.

2. Above all, use common sense.

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APPENDIX A:

SOME OTHER EXAMPLES OF INTERNATIONAL COOPERATION TO PREVENT INJURY AND REDUCE THE HARM DONE BY INJURY[1]

Injury became a focus of international attention in 1989, when the first World Conference on Injury Prevention and Control was held in Stockholm, Sweden. Delegates spoke of the full range of injuries, including those resulting from:

- incidents in homes, schools, offices and factories, and on streets, farms and playing fields;
- wars and civil strife, including land mines abandoned after the cessation of war;
- violence and sexual abuse in homes and communities;
- self-harm, including suicide and drug and alcohol abuse;
- earthquakes, floods and other natural disasters.

The Conference also discussed the full range of consequences of injuries, including:

- death;
- hospitalization;
- treatment on an out-patient basis in hospital emergency wards;
- treatment by family doctors;
- treatment by nurses and paramedics in schools, first-aid stations and other similar health care facilities;
- rehabilitation by physiotherapists and help with reintegration into work and the community from social workers and other counsellors.

Delegates agreed that injury was amongst the foremost public health problems in many countries and worldwide. While this statement is generally held to be true, it was acknowledged that accurate information about the size and characteristics of the injury problem is lacking, especially in some parts of the world. As described in the main body of this manual, much effort has been expended in recent years on improving injury surveillance in order to generate more detailed and reliable information. Indeed, the this manual is, itself, one of those efforts.

In addition to its work on injury surveillance, the World Health Organization (WHO) has been involved in several other collaborative programmes aimed at preventing injury and reducing the harm done. A number of these initiatives are briefly outlined below.

[1] For further details and references please consult the VIP website at http://www.who.int/violence_injury_prevention/index.html

- In 1993, the United Nations General Assembly adopted the Declaration on the Elimination of Violence Against Women. In response to this Declaration, WHO's Injury and Violence Prevention Department and Gender and Women's Health Development, in conjunction with other agencies, are conducting research into the role played by health care agencies in preventing sexual violence and other forms of violence against women (within and outside of their families), and are looking at ways in which the consequences of violence against women can best be managed.

- In 1997, the World Health Assembly endorsed a Plan of Action on Violence and Health. Subsequently, WHO and the Global Forum for Health Research launched their Initiative on Child Abuse Prevention, as part of a series of programmes designed to implement parts of this action plan. WHO's contribution to work on child abuse takes place alongside its work on other types of violence, in particular, violence against women.

- Signatories to the 1997 Mine Ban Treaty have agreed to prohibit the production, sale and use of land mines, to find and destroy mines left after past wars, and to assist victims with treatment, rehabilitation and reintegration into their communities. WHO's Violence and Injury Prevention Department is working with the International Committee of the Red Cross and other international and national agencies to put the treaty into effect. Efforts to locate and destroy mines and to develop the Integrated Mine Victim Assistance Programme are currently underway.

- WHO is collaborating with a number of agencies, including Sweden's Karolinska Institutet, on the Safe Communities programme. Through this programme, cities, towns and villages around the world are assisted in the building up of community networks of those agencies responsible for health, policing, education and recreation in order to document the location, cause and frequency of injuries and also to promote safety.

- Traffic injuries, which kill more than 1 million people worldwide each year, are ranked tenth in the list of leading causes of death; they disable millions more. Young adults, particularly males, have been identified as a high-risk group for this type of injury. Factors that contribute to traffic injuries include driving while under the influence of alcohol, speeding, failure to wear a seat belt and poor road design. All of these things are avoidable. In 2001, WHO hosted a consultative meeting to develop a five-year strategy for traffic injury prevention.

- In 2001, WHO's Injury and Violence Prevention Department will publish the first World Report on Violence and Health. Resulting from international consultations, the report will describe the nature, frequency and impact of violence. It will focus on violence and sexual abuse against women, children and elders; youth violence; self-harm; and collective violence. It will summarize what is known about risk and prevention and will examine the range of policies adopted by different countries to tackle the problem. The report will also recommend actions and suggest directions for future research.

APPENDIX B:
POTENTIAL SOURCES OF DATA ON INJURIES

The relative merits of various potential sources of data on different types of injury are summarized below.

1. Fatal injuries

Death certificates

In many countries, but by no means all, most fatal injuries are certified. However, such registry systems can — and frequently do — break down during times of emergency such as those caused by natural disasters, wars or periods of civil unrest.

Death certificates rarely provide timely information on deaths due to injury, because 'non-natural' deaths are often subject to autopsy and/or inquests, which may take up to several years to complete and resolve. Some data may be of questionable reliability; for example, a physician may certify a death as unintentional even though it was known to be a suicide, in order to protect the reputations of the victim and the victim's family or so as to not jeopardize an insurance settlement. Furthermore, death certificates do not tend to carry information about the circumstances of an injury, or even the cause.

Despite these limitations, death certificates can be a useful source of information for estimating the incidence of fatal injuries. It might be possible to make death certificates more useful; anyone designing a surveillance system may want to involve the appropriate authorities as stakeholders and work with them on redesigning certificates. Certificates could be made to include information on the circumstances and causes of deaths, using definitions and categories appropriate for surveillance purposes.

Autopsy/pathology reports

Data from autopsy and pathology reports suffer from many of the same problems as that obtained from death certificates, mentioned above. Although these types of reports generally include information about the nature of the injuries sustained, they contain very little on the circumstances or causes. Also, autopsy reports tend to be fairly inaccessible, primarily because of concerns about confidentiality but also because they are not often recognized as a useful source of data. As there are no requirements that autopsies be performed in all cases, even in the most industrialized countries, autopsy reports may not provide a representative sample of deaths from injury.

It may be worth considering ways in which autopsy reports might be made more useful for surveillance purposes. For example, it may be possible to redesign the forms to take in more information about the cause of the injury, and/or the circumstances surrounding the injury.

Police reports

When an incident is thoroughly investigated and a report conscientiously completed, police reports can be excellent sources of information about the circumstances surrounding serious injury, especially in cases of intentional injury. Unfortunately, thorough investigating and reporting is not usually the norm.

Police reports are often inaccessible for legal reasons; they may record unproven allegations and may be protected as possible evidence in upcoming court cases. Furthermore, as the police do not tend to interact with health authorities on a regular basis, they may not be aware of the potential relevance of their reports to injury surveillance. Finally, given that many incidents of fatal injury, even ones involving violence, are not reported to the police, reliance on police reports as a source of data on injury mortality runs the risk of under-reporting.

2. Severe non-fatal injuries

Hospital in-patient records

Most hospitals keep relatively detailed records about the patients under their care; these typically comprise Intensive Care Unit (ICU) records, ward admission records and/or discharge summaries. In theory, these records should be amongst the most reliable sources of information on injury. Unfortunately, most hospitals do not require good record keeping from their doctors and nurses. Their priority is the treatment of patients. Many doctors and nurses are unaware that the information they record might be useful for surveillance purposes, with the result that forms are frequently filled out in a cursory manner, with many blanks, and are often illegible.

Involving hospitals and their doctors and nurses as stakeholders in a surveillance system is usually critical. Doctors and nurses are not only the providers of the data for the system, but are also important beneficiaries. Good surveillance can help doctors and nurses to plan for improved care and argue for more resources.

Emergency room (ER) records

Emergency rooms provide excellent opportunities for collecting injury data. They typically handle cases that are admitted to wards as well as cases that are treated and then discharged. However, like in-patient records, ER records tend to be less than adequate.

Some hospitals have specialized “triaging officers,” who triage (i.e. sort and allocate) patients according to the nature and seriousness of their injuries. Triaging officers, together with registration clerks and attending nurses, are generally involved in keeping records on ER cases, and so are obvious candidates for consideration as stakeholders in a surveillance system.

Trauma registries

Trauma registries typically contain a lot of detail about the clinical condition of an injured person. Sometimes, but not always, they include information about the circumstances or causes of injury.

Ambulance or Emergency Medical Technician (EMT) Records

Ambulance or Emergency Medical Technician (EMT) records are used primarily for describing and monitoring the medical status of an injured person. Nevertheless, where such records are kept, they may carry some information on the circumstances surrounding the incident that caused the injury. They are unlikely to be an appropriate source of data for environments where emergency response facilities are non-existent or poor.

3. Mild and moderate injuries

Health clinic (or peripheral health centre) records

Health clinic records are often good sources of basic patient information, i.e. age, sex, external cause of injury and, sometimes, nature of injury. Since health clinics tend to treat a wide range of injuries, from severe to mild, information extracted from these types of records is capable of providing a relatively broad overview the injury situation.

Family doctors' records

Family doctors' records are not generally rich sources of information on injury. Even fairly mild injuries tend to be perceived as emergencies when they happen, so injured persons tend to present at hospital emergency rooms or first-aid stations rather than at doctors' surgeries. Furthermore, general practitioners' records tend to be of variable quality. Despite these limitations, they are potential sources of injury information. Involving doctors as stakeholders in a surveillance system could result in more useful record keeping.

4. Motor vehicle injuries

Automobile insurance company records

Insurance records can be an excellent source of information on road traffic injuries, but the quality can be highly variable. Records will only be available for those collisions that are reported, i.e. usually the more severe ones, in terms of damage to vehicles or injury to people. Access to this data may be difficult, since insurance companies pay investigators, own the data and may have various legal and other reasons for keeping data confidential.

Police traffic "accident" reports

Police traffic accident reports also vary in quality. Data quality could be improved by recognizing police as stakeholders in a surveillance system and working with them to modify their reporting practices.

Department of transport reports

National, state or provincial departments of transport often keep records of traffic collisions, their locations and circumstances, and thus provide a possible source of information for injuries of this type.

5. Assault/homicides

Police reports

See discussion of “Police reports” under item 1. Fatal injuries, above.

6. Suicides/attempted suicides

Police reports

Data on suicides from police reports may be unreliable. In most countries, suicide is not only a crime but also a taboo. Families of the victim, their doctors and others may cover it up.

7. Acts of terrorism

Police reports

8. Occupational (on-the-job) injuries

Workplace records

Workplaces that are very safety conscious (e.g. mines and oil refineries) tend to keep good records and thus any injuries that occur are likely to be well documented. However, most workplaces in developing countries do not maintain records of injuries in the workplace.

Labour inspector or national occupational safety records

Where there is a national body concerned with safety in the workplace, its records are likely to be a useful source of data. However, such bodies tend to be understaffed, with the result that the data they collect may not accurately reflect the total incidence of workplace injury.

National insurance schemes/ workers’ compensation bureau

Detailed information on work-related injuries are gathered by these types of bodies as part of the routine claims process. As in the case of private insurance companies, however, such bodies may restrict access to their data for legal or jurisdictional reasons.

Rehabilitation centres

These are sources worth exploring for information on all injuries that result in disability, including occupational injuries.

APPENDIX C:

FORM TO COLLECT CORE MINIMUM DATA ON ANY CASE OF INJURY

Registration or Identification Number	

Age | | |

Sex | Male | Female | Unknown |

Place : ***Where were you when you were injured?***		
1. Home	2. School	3. Highway/Street
8. Other (specify)		9. Unknown

Activity : ***What were you doing when you were injured?***		
1. Work	2. Education	3. Sport
4. Travelling	8. Other (specify)	9. Unknown

Mechanism : ***How were you hurt? Or How was the injury inflicted?***		
1. Traffic injury	2. Sexual Assault	3. Fall
4. Other Blunt Force	5. Stab/Cut	6. Gun Shot
7. Fire, heat	8. Choking/hanging	9. Drowning
10. Poisoning	98. Other (specify)	99. Unknown

Intent		
1. Unintentional	2. Self-Harm	3. Intentional (assault)
8. Other (specify)		9. Unknown

Nature of Injury		
1. Fracture	2. Sprain/Strain	3. Cute, bite, open wound
4. Bruise	5. Burn	6. Concussion
7. Organs system injury	8. Other (specify)	9. Unknown

APPENDIX D:

SURVEILLANCE LOG TO COLLECT CORE MINIMUM DATA ON A NUMBER OF CASES OF INJURY

ID	Sex	Age	Intent	Place of occurrence	Activity	Mechanism of injury	Nature of injury
1	M	32	Assault	Bar	Drinking	Knife	Stab wound

APPENDIX E:

FORM TO COLLECT CORE MINIMUM AND OPTIONAL DATA ON ANY CASE OF INJURY

Registration or Identification Number	**Date** d d m m y y y y	**Time** h h m m

Age | | **Residence** |

Sex | Male | Female | Unknown |

Place : ***Where were you when you were injured?***		
1. Home	2. School	3. Highway/Street
8. Other (specify)		9. Unknown

Activity : ***What were you doing when you were injured?***		
1. Work	2. Education	3. Sport
4. Travelling	8. Other (specify)	9. Unknown

Mechanism : ***How were you hurt? Or How was the injury inflicted?***		
1. Traffic injury	2. Sexual Assault	3. Fall
4. Other Blunt Force	5. Stab/Cut	6. Gun Shot
7. Fire, heat	8. Choking/hanging	9. Drowning
10. Poisoning	98. Other (specify)	99. Unknown

Intent		
1. Unintentional	2. Self-Harm	3. Intentional (assault)
8. Other (specify)		9. Unknown

Alcohol Use : ***Did you use alcohol within 6 hours of the incident?***	
1. Suspected by report or confirmation	2. No information

Substance Use : *Did you use a mood-altering substance*	
1. Suspected by report or confirmation	2. No information

Injury Severity			
1. No injury	2. Minor	3. Moderate	4. Severe

Disposition		
1. Treated and discharged	2. Admitted/referred to hospital	3. Died
8. Other (specify)		9. Unknown

Nature of Injury		
1. Fracture	2. Sprain/Strain	3. Cute, bite, open wound
4. Bruise	5. Burn	6. Concussion
7. Organs system injury	8. Other (specify)	9. Unknown

APPENDIX F:

FORM TO COLLECT CORE MINIMUM DATA ON ANY CASE OF INJURY PLUS SUPPLEMENTARY MINIMUM DATA ON A CASE OF TRAFFIC INJURY

Registration or Identification Number	

Age | | | **Sex** | Male | Female | Unknown |

Place : ***Where were you when you were injured?***		
1. Home	2. School	3. Highway/Street
8. Other (specify)		9. Unknown

Activity : ***What were you doing when you were injured?***		
1. Work	2. Education	3. Sport
4. Travelling	8. Other (specify)	9. Unknown

Mechanism : ***How were you hurt? Or How was the injury inflicted?***		
1. Traffic injury	2. Sexual Assault	3. Fall
4. Other Blunt Force	5. Stab/Cut	6. Gun Shot
7. Fire, heat	8. Choking/hanging	9. Drowning
10. Poisoning	98. Other (specify)	99. Unknown

If mechanism = 1, complete the following two sections

Mode of Transport : ***How was the injured person travelling?***		
1. Pedestrian	2. Non-motorised vehicle, bicycle, cart, etc	
3. Motorcycle	4. Car	5. Pickup, van, minibus
6. Truck	7. Bus	8. Train
89. Other (specify)		99. Unknown

Type of Road User : ***What was the injured person doing?***		
1. Pedestrian	2. Driver (or operator) of the vehicle	3. Passenger
8. Other (specify)		9. Unknown

Intent		
1. Unintentional	2. Self-Harm	3. Intentional (assault)
8. Other (specify)		9. Unknown

Alcohol Use : ***Did you use alcohol within 6 hours of the incident?***	
1. Suspected by report or confirmation	2. No information

Nature of Injury		
1. Fracture	2. Sprain/Strain	3. Cute, bite, open wound
4. Bruise	5. Burn	6. Concussion
7. Organs system injury	8. Other (specify)	9. Unknown

APPENDIX G:

FORM TO COLLECT CORE MINIMUM AND OPTIONAL DATA ON ANY CASE OF INJURY PLUS SUPPLEMENTARY MINIMUM AND OPTIONAL DATA ON A CASE OF INJURY RESULTING FROM ASSAULT

Registration or Identification Number	**Date**	d	d	m	m	y	y	y	y	**Time**	h	h	m	m

Age | | | **Residence** |

Sex | Male | Female | Unknown |

Place : ***Where were you when you were injured?***		
1. Home	2. School	3. Highway/Street
8. Other (specify)		9. Unknown

Activity : ***What were you doing when you were injured?***		
1. Work	2. Education	3. Sport
4. Travelling	8. Other (specify)	9. Unknown

Mechanism : ***How were you hurt? Or How was the injury inflicted?***		
1. Traffic injury	2. Sexual Assault	3. Fall
4. Other Blunt Force	5. Stab/Cut	6. Gun Shot
7. Fire, heat	8. Choking/hanging	9. Drowning
10. Poisoning	98. Other (specify)	99. Unknown

Intent		
1. Unintentional	2. Self-Harm	3. Intentional (assault)
8. Other (specify)		9. Unknown

If Intent 3, then complete the following three questions

Context :			
1. Quarrel	2. Drug-related	3. Sexual Assault	4. Gang activity
5. Other crime	8. Other (specify)		9. Unknown

Perpetrator/Victim Relationship :			
1. Partner, past or present	2. (Step) parent	3. Other relative	4. Friend, acquaintance
5. Stranger	8. Other (specify)		9. Unknown

Object Used :			
1. Club, stick	2. Knife, cutting tool	3. Fire	4. Firearm, gun
5. Person	8. Other (specify)		9. Unknown

Alcohol Use : ***Did you use alcohol within 6 hours of the incident?***	
1. Suspected by report or confirmation	2. No information

Substance Use : ***Did you use a mood-altering substance***	
1. Suspected by report or confirmation	2. No information

Injury Severity			
1. No injury	2. Minor	3. Moderate	4. Severe

Disposition		
1. Treated and discharged	2. Admitted/referred to hospital	3. Died
8. Other (specify)		9. Unknown

Nature of Injury		
1. Fracture	2. Sprain/Strain	3. Cute, bite, open wound
4. Bruise	5. Burn	6. Concussion
7. Organs system injury	8. Other (specify)	9. Unknown

Incident Summary

APPENDIX H:

PATIENT RECORD FORM USED BY ACCIDENT AND EMERGENCY DEPARTMENT, PRINCESS MARGARET HOSPITAL, BAHAMAS

1. ACCOUNT NO.	2. FAMILY NAME:	3. FIRST NAME: MI	4. MAIDEN NAME:	5. HOME PHONE	6. MED. REC. NO.

7. LOCAL ADDRESS:	8. CITY:	9. STL ST/ISL	10. P.O.BOX	11. SEX	12. AGE	13. DATE OF BIRTH

14. PERMANENT ADDRESS:	15. CITY:	16. STL ST/ISL	17. ZIP CODE	18. FIN. CL.	19. LANG.	20. M.S.:	21. NAT:

22. MOTHER'S MAIDEN NAME:	23. FATHER'S NAME:	24. NATIONAL INS. NO.	25. RELIGION:

26. NAME OF NEXT OF KIN:	27. ADDRESS:	28. HOME PHONE	29. WORK PHONE	30. RELATIONSHIP

31. PATIENT'S OCCUPATION:	32. EMPLOYER'S NAME:	33. WORK ADDRESS:	34. WORK PHONE:

35, TRIAGE 1 2 3 4	36. LOC'N	37.TEMP °C	38. PULSE	39. RESP.	40. BLOOD PRESS.	41.WGT. KG	42. EAR LAST TT	43. ALLERGIES	44. CURRENT DRUGS

45. REASON FOR VISIT: *For an injury, please complete the Injury Reporting Form*	46. X-RAY	47. HGB	48. UREA			
	49. ECG	50. HCT	51. GLUCOSE	52. Na	53. FIO	54. PCO
	55. URINE	56. WBC	57. CREAT.	58. K	59. PH	60. HCO
	61. MSSU	62. PLAT	63. CK	64. Cl	65. PO	66. O
	67. THROAT SWAB	68. PT	69. LDH	70. CO	75. TIME	ADMISSION DATE: AM/PM
	71. BIOL. HAZARD	72. PTT	73. AST	74. H		

76. DOCTOR:	77. PROCEDURES
	78. ORDERS:

79. EYE OPENING		80.VERBAL RESPONSE		81. MOTOR RESPONSE		82. GLASGOW COMA SCORE		83. PSYCHOACTIVE SUBSTANCES:	Yes	No
Spontaneous	4	Oriented	5	Obeys Commands	6	E	[ ]	Suspect Alcohol	[ ]	[ ]
To Voice	3	Confused	4	Localizes Pain	5	V	[ ]	Marijuane	[ ]	[ ]
To Pain	2	Inappropriate Words	3	Withdraw (pain)	4	M	[ ]	Cocaine	[ ]	[ ]
None	1	Incomprehensible Words	2	Flexion (pain)	3	TOTAL	[ ] [ ]	Other.....	[ ]	[ ]
		None	1	Extension (pain)	2					
				None	1					

84. NATURE OF INJURY *Select the three most severe injuries* MOST SEVERE	85. CODE	86. BODY PARTS *Write the body part for each of the injuries at left*	87. CODE

84. NATURE OF INJURY *Select the three most severe injuries*	85. CODE	86. BODY PARTS *Write the body part for each of the injuries at left*	87. CODE
MOST SEVERE			
SECOND			
THIRD			

88. PRINCIPAL DIAGNOSIS:	89. ICD CODE	90.INTENT: *for injury* Unintentiona [ ] Intentional selfharm [ ] Assault [ ] Other ..... [ ]
91. UNDERLYING CAUSE OF ABOVE:	92.	
93. FOR TRAUMA, SPECIFY EXTERNAL CAUSE:	94.	95. AUTOPSY: Requested [ ] Performed [ ]

96. PATIENT DISPOSITION: *Tick as appropriate* 01 Treated & Discharged [ ] 03 Admitted to Observation [ ] 05 Transferred to ..... [ ] 02 Discharged against advice [ ] 04 Admitted to Ward ..... [ ] 06 Died [ ]	97. DISCHARGE TREATMENT/ADVICE	98. SICK LEAVE [ ] [ ] [ ] DAYS

99. DISCHARGING/REFERRING PHYSICIAN:		100. DISCHARGING NURSE'S SIGNATURE		101. DISCHARGE DATE:
PRINT:	SIGNATURE:	PRINT:	SIGNATURE:	TIME: AM/PM

APPENDIX I:

INJURY/POISONING FORM USED IN A JAMAICAN HOSPITAL

JAMAICA HOSPITAL INJURY/POISONINGS SCREEN ***Reg. No.*** _____

Complete only on first attendance of this injury and tick appropriate circles.
Please answer all questions, giving as much detail as possible. If unknown, state this.

Demographic Details , if not automatically transferred from the ER Patient Record

Admission Date: _____ Admission Time: _____

Date of Birth: _____ Sex: _____ Residence Status: _____

Occupation: _____

1. **WHEN did the incident happen?** DATE: _____/_____/_____ TIME: _____: _____ ☐ am ☐ pm

2. **WHERE did the incident occur**? *(e.g. work, schoolyard, street)* .....

Address: .....

.....

3. **HOW did you get hurt i.e. what caused the injury?** *(e.g., fell, was driving, in a fight)*

.....

.....

4.. **If the injury was sustained via**

Motor Vehicle Collision	**Assault/Homicide**	**Suicide**	**Legal Intervention**
a. Type of Road User	a. Who did this to you?	a. Why did you do it?	a. Type of Intervention
.....	.....	.....	.....
b. Vehicle Involved	b. Why?		
.....	.....	.....	.....
c. Counterpart	c. With What?		
.....	.....	.....	.....
d. Using Safety Gear? What?			
.....	.....	.....	.....

5. **Briefly describe what happened.**

.....

.....

6. **How did you get to hospital?**

☐ Ambulance ☐ Private Transport ☐ Taxi ☐ Other .....

Informant's Name: _____ **Tel:**(H) _____ (W) _____

APPENDIX J:

EMERGENCY ROOM REGISTRATION FORM USED IN SERVICIO DE EMERGENCIAS, HOSPITAL SANTIAGO JINOTEPE, NICARAGUA

I. SOCIODEMOGRAPHIC DATA

Record #:.....# ER Registry **Date:** _____/_____/_____ **Arrival Time**:_____: _____ am/pm

Name : ..... **Sex** 1. ☐ Male 2. ☐ Female

Age ..... years **Father/Mother/Tutor**: .....

Address: ..... **Neighbourhood/Province**: ..... **Municipality**: .....

Ocupation: ..... **Reason for Consult**: 1. ☐ Injury 2. ☐ Illness .....

Date of Injury : ..... **Time**:_____: _____ am/pm **Place of Injury .....**

If you haven't marked injury please go to part IV of questionnaire.

II. GENERAL INFORMATION ON EVENT

Intent :

1. ☐ Not intentional (accidental) 2. ☐ Self-inflicted (suicide or suicide attempt)
3. ☐ Intentional (violence, assaults) 8. ☐ Other ..... 9. ☐ Don't know

Object that caused injury:

1. ☐ Blunt 2. ☐ Knife, penetrating 3. ☐ Fire 4. ☐ Pistol or other Firearm
5. ☐ Person 6. ☐ Landmine 8. ☐ Other..... 9 ☐ Don't know

Place: *Where were you when you got injured ?*	**Activity:** *What were you doing when you got injured ?*	**Mechanism:** *How was the Injury produced ?*	
1. ☐ Home	1. ☐ Working	1. ☐ Traffic injury	7. ☐ Strangulation
2. ☐ Street	2. ☐ Travelling	2. ☐ Sexual assault	8. ☐ Drowning
3. ☐ School/ Place of study	3. ☐ Studying	3. ☐ Fall	9. ☐ Poisoning
4. ☐ Work	4. ☐ Playing/recreation	4. ☐ Blunt force/object	10. ☐ Fire
8. ☐ Other	5. ☐ Playing sports	5. ☐ Firearm	11. ☐ Explosion
9. ☐ Don't know	8. ☐ Other.....	6. ☐ Knife/sharp object	98. ☐ Other.....
	9. ☐ Don't know		99. ☐ Don't know

III. SPECIFIC INFORMATION ON EVENT

Traffic or transportation injuries		Assaults		Self-inflicted
Type of User:	**Type of Transport:**	**Relationship of assailant to victim**:	**Context:**	**Precipitating factors:**
1. ☐ Pedestrian	1. ☐ Pedestrian	1. ☐ Current or previous partner	1. ☐ Fight	1. ☐ Conflicts with the family
2. ☐ Driver	2. ☐ Bicycle	2. ☐ Parents or stepparents	2. ☐ Robbery	2. ☐ Physical illness
3. ☐ Passenger	3. ☐ Motorcycle	3. ☐ Other family	3. ☐ Drugs	3. ☐ Psychological problems
8. ☐ Other	4. ☐ Automobile	4. ☐ Friends	4. ☐ Sexual assault	4. ☐ Financial problems
9. ☐ Don't know	5. ☐ Pick-up truck,	8. ☐ Other	5. ☐ Other crimes	5. ☐ Problems with the justice system
	6. ☐ Truck	9. ☐ Don't know relationship	6. ☐ Gang-related	6. ☐ Death in family
	7. ☐ Bus (10 or more passengers)		8. ☐ Other	7. ☐ Sexual or physical assualt
	8. ☐ Animal pulled		9. ☐ Don't know	8. ☐ Other .....
	98. ☐ Other (airplane, ship)			9. ☐ Don't know
	99. ☐ Don't know			

IV. CLINICAL INFORMATION

USE OF ALCOHOL:

1. ☐ No information available 2. ☐ Not suspected or no evidence 3. ☐ Suspected or evidence

USE OF DRUGS:

1. ☐ No information available 2. ☐ Not suspected or no evidence 3. ☐ Suspected or evidence

DIAGNOSIS: (ICD-10 CODES)

.....

.....

Nature of injury:

1. ☐ Fracture 2. ☐ Sprain 3. ☐ Cut or open wound
4. ☐ Haematomas, superficial wound 5. ☐ Burn 6. ☐ Cerebral contusion
7. ☐ Injury other organs 8. ☐ Other ..... 9. ☐ Don't know

SEVERITY:

1. ☐ No apparent injury 2. ☐ Superficial injury 3. ☐ Moderate (required sutures) 4. ☐ Severe (Required surgery or ICU)

RESULTS:

1. ☐ Treated and sent home 2. ☐ Admitted or referred to other hospital 3. ☐ Died
8. ☐ Other ..... 9. ☐ Don't know

NAME OF PHYSICIAN: .....

APPENDIX K:

NON-FATAL INJURY SURVEILLANCE FORM USED IN SOUTH AFRICAN EMERGENCY ROOMS

NAME OF HOSPITAL	HOSP NO

GENDER	M	F	RACE	A	B	C	W	HOME LANGUAGE		AGE	

DATE & TIME OF INJURY	D	D	M	M	Y	Y	Y	Y		H	H		DATE & TIME OF TREATMENT	D	D	M	M	Y	Y	Y	Y		H	H

CITY / TOWN WHERE INJURY TOOK PLACE		SUBURB WHERE INJURY TOOK PLACE	

SCENE OF INJURY (Please tick the one that applies)			ACTIVITY AT THE TIME OF INJURY (please tick the one that applies)	
1 Private House & Yard (incl pool)	10 Medical Service Area		1 Paid work	6 Education
2 Informal settlement/squatter camp	11 Farm		2 Unpaid work	7 Sleeping/eating/resting etc
3 Residential Institute	12 Sea, Lake, River, Dam		3 Travelling	8 Nothing in particular
4 Bar, Shebeen, N'Club, Disco	13 Open Land, countryside		4 Playing sport	89 Other
5 Road/street/highway	14 Prison/In Custody		5 Leisure/playing	99 Unknown
6 Public transport & area surrounding	15 Sports & athletics area		**WAS ALCOHOL USED BY PATIENT PRIOR TO INJURY?**	
7 Industrial & construction area	16 Recreational area		Yes/suspected	No Unknown
8 Commercial area	89 Other		**WERE DRUGS USED BY PATIENT PRIOR TO INJURY ?**	
9 School/Educational area	99 Place Unknown		Yes/suspected	No Unknown

CAUSE OF INJURY (Place a tick in appropriate box)	Transport	Other Accident	Attempted suicide	Violence

Please complete the section appropriate for the cause of injury

TRANSPORT		OTHER ACCIDENT / UNINTENTIONAL INJURY		ATTEMPTED SUICIDE / SELF INFLICTED	
Vehicle Involved	**Traffic User**	**Specific cause**		**Specific method used**	
1 Car/bakkie	1 Driver/rider/ cyclist	1 Sharp object	11 Struck against/ caught between	1 Sharp object	8 Hot liquid burn
2 Minibus taxi	2 Passenger	2 Blunt object	12 Near drowning	2 Blunt object	9 Chemical burn
3 Bus	3 Pedestrian	3 Firearm	13 Hanging	3 Firearm	10 Electrical burn
4 Truck	89 Other	4 Hot liquid burn	14 Paraffin poisoning	4 Hanging	11 Fire burn
5 Motorcycle	99 Unknown	5 Chemical burn	15 Other poisoning	5 Jump	89 Other
6 Bicycle	**Safety belt/ chair/helmet used**	6 Electrical burn	16 Dog bite	6 Near drowning	
7 Train		7 Fire burn	17 Other bite/sting	7 Poisoning	99 Unknown
8 Aircraft	1 Yes	8 Fall on level	18 Machinery	If attempted suicide by overdose or poisoning, please state substance(s) taken	
89 Other	2 No	9 Fall on stairs	89 Other		
99 Unknown	99 Unknown	10 Fall from height	99 Unknown		

VIOLENCE												
Specific cause				**Type of violence**						**Perpetrator - Victim Relationship**		
1 Sharp object	7 Choking/ strangulation			1 Interpersonal			5 War/civil insurrection			1 Spouse/ partner	6 Friend/ acquaintance	
2 Blunt object	8 Fire burn			2 Rape/sexual			6 Gangs/syndicate			2 Parent	7 Police/legal authority	
3 Firearm	9 Other burn			3 Child abuse			89 Other			3 Other relative	8 Stranger	
4 Explosion	10 Poisoning			4 Legal intervention			99 Unknown			4 Unrelated caregiver	89 Other	
5 Push/kick/fist	89 Other			**How many perpetrators were involved?**						5 Acquaintance	99 Unknown	
6 Human bite	99 Unknown			1	2	3	4 or more	Unknown		**Gender of main perpetrator**	M	F U

SEVERITY OF INJURIES	PLACEMENT AFTER INITIAL ASSESSMENT		FORM COMPLETED BY
1 Minor	1 Discharged	4 Died	
2 Moderate	2 Admitted to ward	5 Absconded	
3 Severe	3 Admitted to ICU	6 Transferred	
4 Mortal	7 Referred to:		Please print name and sign

APPENDIX L:

PROPOSED FORMAT FOR A BASIC SET OF REPORTS FOR THE RESULTS OF SURVEILLANCE COLLECTING CORE MINIMUM DATA ON ALL INJURIES

Report L1:
Injuries by age-group, sex and intent

Age & Sex	0 – 4 Yrs		5– 14 Yrs		15–19 Yrs		20-24 Yrs		25–44 Yrs		45–64 Yrs		>64 Yrs		Unknown		TOTAL		
Intent	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Both Sexes**
Unintent.																			
Self-harm																			
Assaults																			
Other																			
Unknown																			
TOTAL																			

Report L2:
Injuries by age-group, sex and place of occurrence

Age & Sex	0 – 4 Yrs		5– 14 Yrs		15–19 Yrs		20-24 Yrs		25–44 Yrs		45–64 Yrs		>64 Yrs		Unknown		TOTAL		
Place	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Both Sexes**
Home																			
School																			
Street																			
Other																			
Unknown																			
TOTAL																			

Report L3:
Injuries by age-group, sex and activity

Age & Sex	0 – 4 Yrs		5– 14 Yrs		15–19 Yrs		20-24 Yrs		25–44 Yrs		45–64 Yrs		>64 Yrs		Unknown		TOTAL		
Activity	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Both Sexes**
Work																			
Education																			
Sports																			
Travelling																			
Leisure																			
Other																			
Unknown																			
TOTAL																			

Report L4:
Injuries by age-group, sex and mechanism

Age & Sex	0 – 4 Yrs		5– 14 Yrs		15–19 Yrs		20-24 Yrs		25–44 Yrs		45–64 Yrs		>64 Yrs		Unknown		TOTAL		
Mechanism	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Both Sexes**
Traffic injury																			
Sexual ass.																			
Fall																			
Stuck/hit by																			
Stab/cut																			
Gun shot																			
Fire, heat																			
Choking																			
Drowning																			
Poisoning																			
Other																			
Unknown																			
TOTAL																			

Report L5:
Injuries by age-group, sex and nature of injury

Age & Sex	0 – 4 Yrs		5– 14 Yrs		15–19 Yrs		20-24 Yrs		25–44 Yrs		45–64 Yrs		>64 Yrs		Unknown		TOTAL		
Nature of Injury	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Both Sexes**
Fracture																			
Sprain/ strain																			
Cut, bite, open wound																			
Bruise																			
Burn																			
Concussion																			
Organ sys.																			
Other																			
Unknown																			
TOTAL																			

Report L6:
Injuries by activity and place of occurrence

Activity	Work	Education	Sports	Travelling	Leisure	Other	Unknown	TOTAL
Place								
Home								
School								
Street								
Other								
Unknown								
TOTAL								

Report L7:
Injuries by activity and intent

Activity	Work	Education	Sports	Travelling	Leisure	Other	Unknown	TOTAL
Intent								
Unintentional								
Self-harm								
Assault								
Other								
Undetermined								
TOTAL								

Report L8:
Injuries by nature of injury and intent

Intent	Unintentional	Self-harm	Assault	Other	Undetermined	TOTAL
Nature of Injury						
Fracture						
Sprain/strain						
Cut, bite, open wound						
Bruise						
Burn						
Concussion						
Organ system						
Other						
Unknown						
TOTAL						

Report L9:
Injuries by nature of injury and activity

Activity	Work	Education	Sports	Travelling	Leisure	Other	Unknown	TOTAL
Nature of Injury								
Fracture								
Sprain/strain								
Cut, bite, open wound								
Bruise								
Burn								
Concussion								
Organ system								
Other								
Unknown								
TOTAL								

APPENDIX M:

FORM FOR CONDUCTING A RETROSPECTIVE EVALUATION OF AN INJURY SURVEILLANCE SYSTEM

Attribute	Weekday		Weekend day		Indicator
	#	%	#	%	x 100 (%)[a]
No. of all cases (injury or not)	A'		A"		A=A'+A"
No. of injury cases detected by evaluator	B'		B"		B=B'+B"
Injury rate (% of all cases that are injuries)		**B'/A'**		**B"/A"**	**B/A**
No, of injuries reported by surveillance	C'		C"		C=C'+C"
No. of non-injuries reported as injuries	D'		D"		D=D'+D"
Accuracy of injury surveillance system		**C'/B'**		**C"/B"**	**C/B**
Predictive value of injury surveillance System		$\frac{\mathbf{C'}}{\mathbf{C' + D'}}$		$\frac{\mathbf{C"}}{\mathbf{C" + D"}}$	**C/(C+D)**
No. of injuries with missing data	E'		E"		E=E' + E"
No. of injuries with incorrect coding	F'		F"		F=F' + F"
Accuracy rate (% of injuries accurately coded)		$\frac{\mathbf{C'-E'-F'}}{\mathbf{C'}}$		$\frac{\mathbf{C"-E"-F"}}{\mathbf{C"}}$	$\frac{\mathbf{C-E-F}}{\mathbf{C}}$

[a] Results of calculations shown in bold type are to be multiplied by 100 to yield percentages.

APPENDIX N:

FORM FOR CONDUCTING A PROCESS EVALUATION OF AN INJURY SURVEILLANCE SYSTEM

Day of the week: ..... Registration number: .....

Time of day: 06:01 – 12:00 12:01 – 18:00 18:01 p.m. – 24:00 00:01a.m. – 06:00

1. Did the clerk recognize this case as an injury? ☐ Yes ☐ No

2. Was an injury entry made at time of contact/registration? ☐ Yes ☐ No

3. If not, how long after patient was seen, was information collected? ____ hrs 99 Never

4. Were all relevant data elements completed? ☐ Yes ☐ No

   a) If no, indicate which ones were not completed:

   ..... , ... , ... ,

   ..... , ... , ... ,

   ..... , ... , ... ,

5. Of the data elements completed, were there any incorrect? ☐ Yes ☐ No

   a) If yes, indicate which elements were incorrect:

   ..... , ... , ... ,

   ..... , ... , ... ,

   ..... , ... , ... ,

6. Was confidentiality assured? .....

   .....

   .....

   Comments:

   .....

   .....

   .....

   .....

   .....

   .....

APPENDIX O:

FORM FOR CONDUCTING A SYSTEM ENVIRONMENT EVALUATION OF AN INJURY SURVEILLANCE SYSTEM

Have all categories of the staff involved in the Injury Surveillance System been oriented re:

Its operation?	☐ Yes	☐ No
Registration clerks?	☐ Yes	☐ No
Nursing staff?	☐ Yes	☐ No
Medical staff?	☐ Yes	☐ No

Have all operators of the system, i.e. registration clerks, been trained to operate it?

☐ Yes ☐ No

Have the staff had difficulty (lack of supplies, poor understanding) in operating the system?

☐ Yes ☐ No

If yes, state .....

.....

.....

Are confidentiality issues respected? .....

Is there a referral support system for patients who need them? .....

Is the manual (or any other resource material, i.e. coding guides) readily accessible? .....

Are reports generated? .....

How frequently? .....

Disseminated to whom? .....

Insert appropriate categories of stakeholders

Are the data discussed and/or used in planning or for programme evaluations? .....

Notes:

.....

.....

.....

.....