CHAPTER 7

Epidemiology

Introduction

From the oldest days, control of diseases, both communicable and non-communicable, has been a key function of the public health system in Sri Lanka. A comprehensive disease surveillance system operates in the country, in which the Medical Officer of Health and his or her health team plays an indispensable role. Accordingly, a Range Public Health Inspector is involved in the general surveillance of all disease within the area, whereas the PHII attached to campaigns/ programmes handling specific diseases or groups of diseases are involved in the surveillance of that particular disease or groups of diseases. The Range PHI has to study the morbidity and mortality pattern in the area of work, and identify the specific causes of morbidity and mortality in the population, along with the possible contributory factors. This would enable him to plan and carry out, along with the local health team, effective interventions necessary to reduce the incidence of disease and the mortality, to the lowest possible levels, with the resources available.

This is accomplished through the system of disease surveillance which continuously scrutinizes all aspects of occurrence and distribution of a disease that has relevance on its effective control.

This section includes an account of disease surveillance system practiced in Sri Lanka in general, and describes the role of the PHI in the disease surveillance system.

7.1 Epidemiological Surveillance

Surveillance
Surveillance may be defined as a systematic collection, analysis, interpretation, and dissemination of data, for the purpose of taking appropriate action

Disease surveillance is important for the following reasons:

i. It measures progress towards achievement of disease reduction targets.
ii. It permits priorities to be selected on the basis of demonstrated morbidity and mortality.
iii. It is essential for good programme monitoring.

iv. It can give a better understanding of the local epidemiology of the disease, and may suggest the need for programme modification, if necessary.

v. It can help in identification of and finding solutions to operational problems.

vi. It is used by administrators for planning, implementing and evaluating of public health interventions and programmes.

vii. It is used to monitor the occurrence of disease outbreaks or epidemics, and to take the necessary preventive and control measures.

FUNCTIONAL ELEMENTS OF SURVEILLANCE

Surveillance has four functional elements.

1.1 Data collection

1.2 Data compilation and analysis

1.3 Taking action on reports

1.4 Feedback

1.1 Data Collection

Some of the diseases are easily recognizable while some others are comparatively difficult to diagnose. Because of these difficulties no single method of surveillance can be used with the same degree of reliability for all the diseases. The methods commonly used for data collection are:

1.1.1 Routine reporting of cases and deaths recorded at the treatment centre

1.1.2 Special investigations conducted on selected communicable diseases

1.1.3 Sentinel Surveillance

1.1.4 Active Surveillance

1.1.5 Outbreak investigation

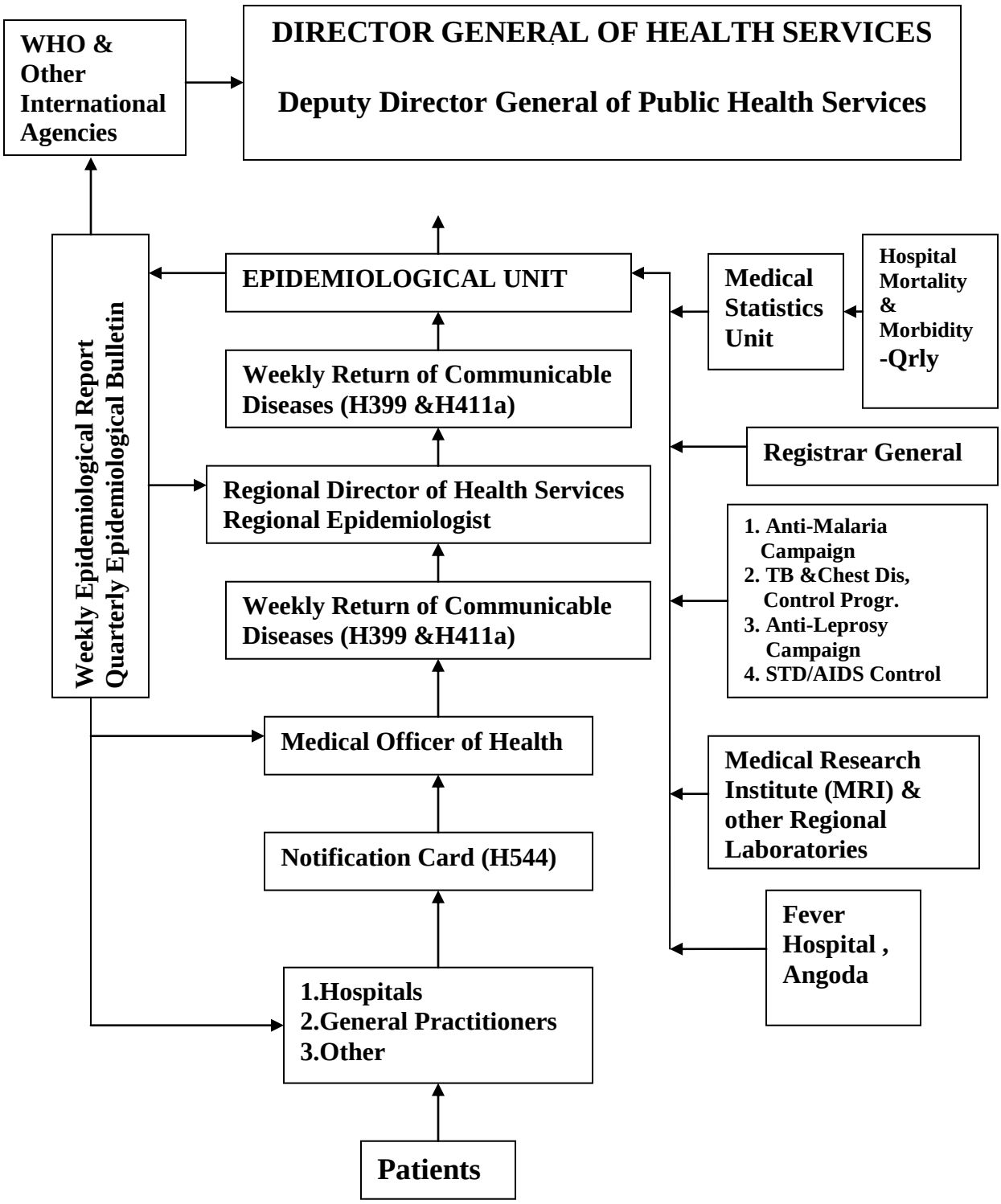
1.1.6 Sample Surveys

Each of these methods has its advantages and limitations. The different methods can be used either separately or in combination with each other, depending on technical and administrative feasibility, as well as the financial resources available for the purpose.

The Disease Surveillance System in Sri Lanka is shown in Figure I.

Figure I

Disease Surveillance System in Sri Lanka



1.1.1 Routine Reporting

(a) Indoor Morbidity and Mortality Reporting

Once the patient is discharged from hospital, the Bed Head Ticket (BHT) is sent to the Medical Records Office. The diagnosis on the Bed Head Tickets is entered in the Indoor Morbidity/ Mortally Register (IMMR), according to the International Classification of Diseases (ICD). This register is utilized to compile the Indoor Morbidity and Mortality Quarterly Return, which is sent to the Medical Statistician quarterly. These statistics are processed by the Medical Statistician to obtain information on the morbidity and mortality statistics in government hospitals, by Health Divisions. At present there is no routine system of recording disease statistics from out-patient departments, private practitioners, and private institutions.

(b) Notifiable Diseases Reporting System

The surveillance of Communicable Diseases in Sri Lanka is based on a system of notification of certain selected diseases. Figure II shows the Notification System in Sri Lanka.

The Quarantine and Prevention of Diseases Ordinance of 1897, and its subsequent amendments, ensure the necessary legislation for the implementation of this system. According to this Ordinance every practitioner treating a case belonging to the category of Notifiable Diseases, should notify such cases to the Medical Officer of Health (MOH) of the area where the patient resides.

The Notifiable Diseases are listed in Table 1. It should be noted that the list can change because diseases may be added or deleted from this list, from time to time. The following list gives the diseases that are notifiable at present.

Figure II: Notifiable Diseases Reporting System

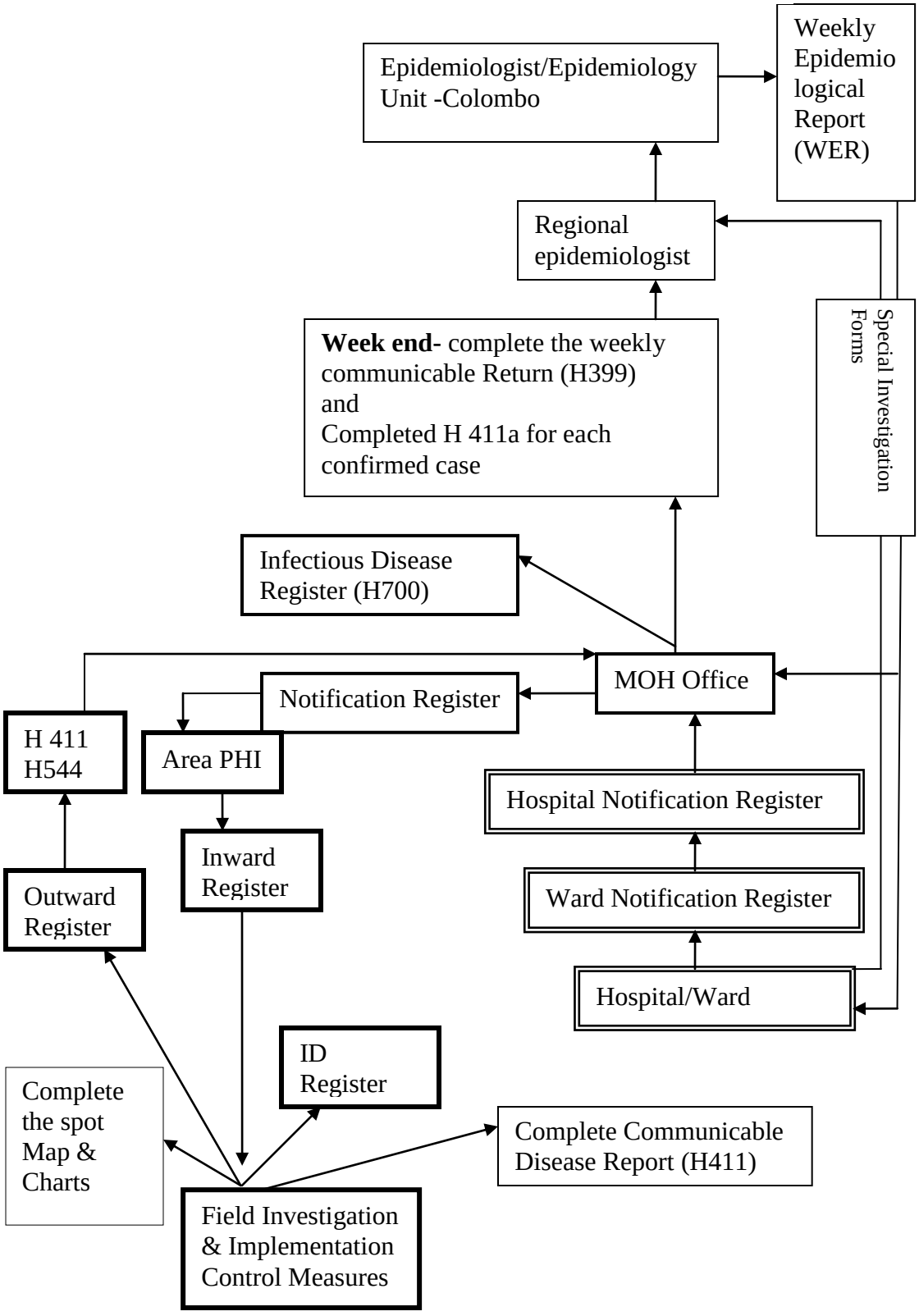


Table 1

LIST OF NOTIFIABLE DISEASES

(Approved by the Advisory Committee on Communicable Diseases on 11th February 2005)

Disease	**Abbreviation ***
GROUP A	
CHOLERA	Chol
PLAGUE	Pg
YELLOW FEVER	YF
GROUP B	
ACUTE POLIOMYELITIS/ ACUTE FLACCID PARALYSIS	Polio
CHICKEN POX	CP
DENGUE FEVER/ DENGUE HAEMORRHAGIC FEVER	DF/DHF
DIPHTHERIA	Dip.
DYSENTERY	Dys.
ENCEPHALITIS	Enc.
ENTERIC FEVER	E.F
FOOD POISONING	F.P.
HUMAN RABIES	H.R.
LEPTOSPIROSIS	Lep.
MALARIA	Mal.
MEASLES	Mea.
MENINGITIS	Meng
MUMPS	Mum
RUBELLA/ CONGENITAL RUBELLA SYSDROME	Rub
SEVERE ACUTE RESPIRATORY SYNDROME (SARS) OR SUSPECTED FOR SARS	SARS
SIMPLE CONTINUED FEVER OF SEVEN DAYS DURATION OR MORE	S.C.F
TETANUS/ NEONATAL TETANUS	Tet.
TUBERCULOSIS	T.B.
TYPHUS FEVER	T.F.
VIRAL HEPATITIS	V.H.
WHOOPING COUGH	Wp

*The abbreviations used for different diseases, in filling up the Infectious Disease Register e.g. Lep/3/07 at MOH and PHI office

Acute Poliomyelitis/Acute Flaccid Paralysis - should be notified to

1. Epidemiologist
2. Regional Epidemiologist
3. Medical Officer of Health

By Telephone, Fax, E-mail or Telegram, and notification Form (H544)

Hospital Notification

Most notifications originate from hospitals. Notification of Communicable Diseases in the hospital should be made by the House Officer in charge of the ward, with the tentative diagnosis. Cases are notified using a standard notification card (Form Health 544). The address of patient should be written in the notification card clearly. The details in the notification card should be entered in the ward and hospital notification registers, and the notification card forwarded to the MOH of the area for investigation.

MOH Office

The MOH maintains a Notification Register and the notifications are referred to the Range Public Health Inspector (PHI) for investigation and confirmation. Range PHI should investigate the case and implement control measures in the field, and should send the Communicable Disease Report Part I (H411) and the notification card (Health 544) to the MOH office within 7 days of receipt of the notification card.

All investigation cards are returned to the MOH, and are recorded in the Infectious Diseases Register (Form Health 700). The last column in the Notification Register will be completed. The MOH consolidates the weekly data in the ID register every Friday and prepares the weekly return of Communicable Diseases (WRCD-Form Health 399) and sends it to the RDHS and the Chief Epidemiologist on Saturday, with detailed information on the confirmed cases by means of the Infectious Disease Report - part II (Form Health 411a).

Action taken at MOH Office (Before Investigation of the Case)

On receipt of a notification regarding a case of communicable disease (Notification Card, Form Health 544), the Medical Officer of Health should take necessary action to enter the following particulars in the Notification Register:

i. Serial number
ii. Name of patient
iii. Address
iv. Age
v. Sex
vi. Disease
vii. Date of Notification
viii. Notified by whom
ix. Date of receiving Notification Card

i. PHI area
ii. Date of sending Notification Card to PHI
iii. Date of receiving Notification Card from PHI
iv. Remarks

After entering the columns in the Notification Register, except columns 12 and 13, the MOH should send the Notification Card (H544) to the Range Public Health Inspector, for investigation and to implement control measures.

Action at PHI Office and at Field level

On the receipt of a notification card the PHI should:

- Enter in the Inward Register - Serial Number, Name, Age, Sex, Address, Disease, Date and other particulars of the patient
- Should visit the field, investigate, and take action in all cases of Communicable Diseases

Note- Cases reported directly to the PHI should also be promptly investigated.

After investigation:

- Range PHI should enter the following details in the Infectious Diseases Register (ID Register – Form Health 700) :-

  i. Serial Number
  ii. Case Number (abbreviations and serial number for the
  iii. year, e.g., polio/01, Dys/06)
  iv. Locality (Address)
  v. Name of patient
  vi. Other particulars of the patient

- He should fill the Communicable Disease Report Part I (Form Health 411)

- He should enter the necessary particulars of the patient in the Outward Register

- He should Return the Notification Card (Form Health 544) with the Communicable Disease Report Part I (Form Health 411) to the MOH office, ***within one week of receipt of the Notification Card***

- He should also update the spot map and charts on communicable diseases, maintained at his office

Action taken at MOH Office (after investigating the case and receipt of Communicable Disease Report –H411)

- On receipt of the Communicable Disease Report Part I (Form Health 411) with the Notification Card from the PHI (after investigating the case), the MOH should take necessary action to enter the date of notification card received from the PHI and remark, in the Notification Register (Column12 and 13).

- He should complete the Infectious Disease Register (ID Register Form Health 700) at the MOH Office. The details of the Register are as follows;

    i. Serial Number
    ii. Case Number (abbreviations and serial number for the year, eg: polio/01, Days/07)
    iii. Date of Receipt of Notification Card
    iv. AGA / Div. Secretary Division
    v. Locality – Address
    vi. Name of Patient
    vii. Age
    viii. Sex
    ix. Race, Occupation, Religion
    x. Nature of Disease etc.

Only the cases confirmed by the PHI are entered in the Infectious Disease Register.

- The MOH should also update the spot map and charts on communicable diseases maintained at the MOH Office.

Every Saturday, he should complete the Weekly Return of Communicable Diseases (Form H 399) and enter detailed information on the confirmed cases in Form Health 411a, and send them to the Epidemiologist, Colombo. A copy of the Weekly Return of Communicable Diseases (Form H 399) should be sent to the Regional Epidemiologist (RE) and a copy is kept at the MOH office.

Weekly Return of Communicable Diseases (WRCD) - Form 399

i. **Dispatch of Form** –
This form should be completed by 3.30 pm every Friday, and dispatched by 9.00 a.m on following Saturday, to reach the Epidemiologist on Monday (with a copy to Regional Epidemiologist).

ii. **Completion of Form –**
All cages should be completed, viz., Province, District, RDHS Division, MOH area, and the last date of the week covered by the Return.

PART I

All cases notified and entered in the Notification Register for the relevant week, should be entered according to the PHI area. The total number of cases for each disease notified should be entered in the last line in Part I, and line 1 in Part II.

PART II

Line 1 -Total no. of new cases notified during the week. This is the sum of all cases notified (same as the last line Part 1)

Line 2 - Cases notified earlier and awaiting confirmation at the beginning of the week. This should be the same as cases (figure in Line. 2 of this week = figure in Line. 7 of the previous week)

Line 3 - No. of cases decided as untraceable during the week

Line 4 - No. of cases investigated during the week, but decided as belonging to other MOH areas

Line 5 - No. of cases investigated during the week, and confirmed as a non-notifiable

Line 6 - Cases confirmed during the week should be the number of cases of different diseases, entered in the ID Register (H700) for the same week.

A copy of the Infectious Disease Report part II (Form 411a) should be submitted for every case treated as confirmed during the week.

The notification of TB

This differs from those other notifiable diseases. TB is notified by using the Form H 816, and the notification should reach the National Programme for Tuberculosis Control and Chest Diseases (NPTCCD). Address: NPTCCD, Public Health Complex, 555/5, Elvitigala Mawatha, Col – 5.

The Specialized Campaigns have separate and different surveillance systems. Morbidity and Mortality data are collected by each of the specialized campaigns and a quarterly return is forwarded to the Epidemiology Unit. The MRI also sends laboratory surveillance data to the Epidemiology Unit.

Acute Flaccid Paralysis (AFP) Surveillance

The last virologically confirmed Acute Poliomyelitis case was reported in Sri Lanka in 1993.The clinical manifestations of Acute Flaccid Paralysis (AFP) which appear in several other neurological conditions are similar to those of Acute Poliomyelitis. Therefore to detect any case of Acute Poliomyelitis, all clinically suspected cases of AFP have to be monitored and included in the Polio Surveillance system.

Acute Flaccid Paralysis is defined as acute flaccid paralysis in,

- Any child less than 15 years of age (including those diagnosed as having Guillain Barre Syndrome or Infective polyneuritis, for which no other cause can be identified)

  and

- Any case of AFP (in a person of any age) that appears highly suspicious as Poliomyelitis.

Action to be taken by the Hospital Staff following the detection of a suspected AFP Case

Inform **1. Epidemiologist**
2. DPDHS
3. Regional Epidemiologist
4. MOH
- by telephone / fax / e-mail / telegram

Collect **2 specimens** of stools, at least **24 hrs apart,** within **14 days** of onset of paralysis.

- Send specimens to the Medical Research Institute (MRI), with request for Polio Virology investigations
- Complete Form No. 1 (pink) and send to the Epidemiologist

Action to be taken by the MOH, PHI and PHM

- The case should be investigated **within 72 hours** of notification, **personally by the MOH**
- Visit the community in which the case is resident
- Note down the patient's movements within the last 28 days before onset of AFP
- Explain the importance of the investigations to parents, family members, and community
- Make a house to house visit and search for additional cases
- Request parents/ family members of contacts to make samples of stools available
- Collect and dispatch ONE sample of stool from 3-5 contacts
- Samples should be transported to MRI within 72 hrs of collection
- Complete the yellow form and send to Epidemiology Unit
- Assist in the follow up examination of patients **60/90/180 days** after onset of AFP

Collection and dispatch of samples of stools from contacts

- Containers should be packed in ice
- Collect 8-10 grams of stools (the size of 2-3 thumbnails /tamarind seeds) in a wide mouthed screw-capped bottle
- Transport to MRI as early as possible (preferably within 72 hours of collection)
- The samples should be kept in a refrigerator till they are ready for transport
- If a "reverse cold chain box" is available it should be used to transport the samples

Request letter accompanying the samples should have:

- Name of the contact
- MOH area
- Name of the AFP case
- Epid: number of the case if available
- Date of receipt of the last dose of OPV by the contact
- Date of collection of the sample

Immunization
One dose of Oral Polio Vaccine (OPV) to be given to all children under a specified age (irrespective of their immunization status), depending on the age of AFP case reported in that village/town, within an area of 2 kilometer radius) and covering up to maximum 200 children. Prior to the immunization the public health staff should inform the people about the place, date and time of the activity personally by visiting the area. The public address system and mass media should **NEVER** be used for this purpose as this would causes undue panic among public.

1.1.2 Special Investigation of selected communicable diseases

In addition to the field investigation during routine surveillance of communicable diseases, special investigations are carried out for certain communicable diseases to obtain more details. It enables to detect confirmed cases out of the notified suspected cases. Investigation includes patient's clinical presentation, laboratory investigation and clinical conclusions.

DISEASES THAT REQUIRE SPECIAL INVESTIGATIONS

1. Poliomyelitis / Acute Flaccid Paralysis (AFP)
2. Diptheria
3. Pertusis
4. Tetanus/ Neonatal Tetanus (NNT)
5. Measles
6. Rubella/ Congenital Rubella Syndrome (CRS)
7. Viral Hepatitis-Hepatitis B
8. Encephalitis (Japanese Encephalitis)
9. Leptospirosis
10. Dengue/ DHF
11. Cholera
12. Human Rabies
13. Mumps
14. Meningitis
15. Chicken pox

Out of the 15 diseases first 7 are vaccine preventable diseases for which protection is given through Expanded Programme of Immunization (EPI). Dengue, Leptospirosis and cholera are important health issues which necessitate detailed investigation for each reported case. Human Rabies is a lethal disease and even a single case is considered as a outbreak and need prompt investigation.

It should be noted that the above diseases have been primarily investigated by the MOH staff and reported routinely to Epidemiology Unit through the WRCD. Epidemiology Unit send special investigations forms to the relevant MOH/ Institution to investigate the cases by MOH and the team (Field based special investigation) and the Infection Control Nursing Officer(Hospital based special investigation) respectively. After investigation, completed forms should be sent back to the Epidemiology Unit as soon as possible to be entered to the central database.

1.1.3 Sentinel Surveillance

Sentinel site surveillance is carried out in specially identified settings and designed to minimize the drawbacks of routine surveillance system. There are many advantages of sentinel surveillance system.

1. **Improves timeliness**
   Sentinel surveillance is carried out in institutions where surveillance mechanism is already developed which facilitate surveillance activity more efficient than routine surveillance system. Hence it improves timeliness which is essential for notification process for timely initiation of preventive and control measures.

2. **Improves accuracy of data**
   In sentinel surveillance, a secondary inquiry into a case yields more accurate data especially when information is obtained directly from patient's records, laboratory reports and the treating clinician. Hence the data generated from sentinel surveillance is more accurate and complete than routine surveillance.

3. **Improves usefulness**
   Sentinel surveillance system provides an opportunity for information collected, analyzed and used within the institution itself.

4. **Strengthen institutional capacity building**
   It improve surveillance capacities of institutional personnel's and facilitates expanding institutional logistics.

5. **Develop intersectoral relationships**
   It improves intersectoral relationships between public health staff and curative staff for working together to achieve a common goal.

There are major hospitals in the island assigned as sentinel sites to collect data of Acute Flaccid Paralysis (AFP), Neonatal Tetanus, Measles, Rubella/Congenital Rubella Syndrome and Dengue and Dengue Hemorrhagic Fever.
Sentinel surveillance is carried out to assess the HIV status of general population by randomly testing blood samples of pregnant mothers in ante natal clinics and Blood Banks.

1.1.4 Active Surveillance

Active surveillance is looking or searching actively for a particular type or group of disease in a community. The cases with mild or moderate forms of the disease (eg: Diarrhoea, Acute Respiratory Infection) may not seek treatment from the hospital. They may go to a Central Dispensary, General Practitioners or Traditional Healers. These will not be recorded under the routine reporting or institutional surveillance.

The Public Health Midwives inquire from the mothers regarding cases of diarrhoeal disease and acute respiratory infections (ARI) in under five children and submit a monthly report to the respective MOOH. The AMC officers also carry out active surveillance to find out suspected cases of malaria in the field and screening of fever patients for malaria in the out patient departments.

1.1.5 Epidemiological Investigation of Outbreaks

Outbreak defines as an occurrence of large number of cases of a disease more than expected in a given area, among a specific group of people over a particular period of time. The main objective of an outbreak investigation is to control the spread of the disease by indicating the most appropriate preventive measures.

Epidemiological investigations are undertaken to:

- To control ongoing outbreaks
- To prevent future outbreaks
- To provide statutorily mandated services
- To strengthen the surveillance at local level
- To advance the knowledge about a disease
- To determine the effectiveness of control measures
- To provide training opportunities

Protocol for investigating a disease outbreak

In the investigation of an infectious disease outbreak speed is essential. It is wise to follow a systematic routine to get the right answer, even though public reaction, urgency and local situation may make this difficult.

The 10 steps of outbreak investigation are presented here in conceptual order. In practice however several may be done at the same time or they may be done in different order. For example control measures should be implemented as soon as the source and mode of transmission are known.

i. Preparation for field work
ii. Establish the existence of outbreak
iii. Verification of the diagnosis
iv. Define and identify cases
v. Describe and orient the data in terms of time, place and person
vi. Develop hypothesis
vii. Evaluate hypothesis
viii. Refine hypothesis and carryout additional studies
ix. Implement control and prevention measures
x. Communicate the findings including report writing

Step 1: Prepare for field work

Before leaving to the field:

- Do a literature survey of the disease to gather information and organize the supplies and equipment needed eg. stationary, swabs etc.
- Make administrative and personal arrangements
- Consult with all parties to determine your role in the investigation

Step 2: Establish the existence of an outbreak

Verify that the suspected out break is real. Look whether observed number of cases exceeds the expected number of cases for the area in the given time. Usually you can compare the current number of cases with the previous few weeks or months or from a comparable period during the previous few years.
Source of data: notifiable disease surveillance records, hospital records etc.
If the current number of cases exceeds the expected number the excess may not necessarily indicate an outbreak.

It may be due to:

i. Changes in local reporting procedure
ii. Changes in case definition
iii. Increase interest because of local or national awareness
iv. Improvement of diagnosis procedures
v. Increase health facilities
vi. Changes of the population size

It should be noted investigation of an apparent problem not strictly tied to verifying the epidemic but other factors such as the severity of the illness, potential spread, political considerations, and public relations may come into play.

Step 3: Verify the Diagnosis

Identify as accurately as possible the specific nature of the disease. Review the clinical findings (the symptoms and features of illness) and laboratory results. Finally you should visit several of the people who became ill. If you do not have the clinical background to verify the diagnosis a doctor or other qualified clinician should do so. You may gather critical information by asking questions from patients.

- What were their exposures before becoming ill?
- What do they think caused the illness?
- Do they know anyone with the disease?
- Do they have anything common with others who have the disease?

Conversations with patients are very helpful in generating hypothesis about the cause, source and spread of the disease.

Step 4: Define and Identify cases

Next task is to establish a case definition. Case definition usually includes four components.

1. Clinical information about the disease e.g. fever, diarrhoea, vomiting and headache
2. Characteristics of the people who are affected e.g. People who attended a wedding or at a restaurant
3. Information about the location or place e.g. in a hostel, working plant
4. A specification of time during which outbreak occurred e.g. illness within past 4 days

Ideally case definition should include actual cases without capturing “false positives” (When the case definition is met, but the person actually does not have the disease in question).

Example:
People with fever, blood and mucus diarrhea and vomiting who attended a religious ceremony in town A between December 2nd and December 25th 2003

Recognizing the uncertainty of some diagnosis, often cases classify as "confirmed", "probable" and "possible".

- To be classified as confirmed, a case must have laboratory verification.
- A case classified as probable has clinical features of the disease without laboratory confirmation.
- A possible case usually has fewer of the clinical features.

When identifying cases you should use many sources e.g. hospitals, clinics, laboratories, field etc.

Traditionally information is collected on a standard case report form or data. Then selected critical items of the abstraction form are placed in a table called a "line listing "and a line list is shown in Table II. New cases are added to a line listing as they are identified.

Regardless of the disease, following information should be obtained in a line list.

1. Identifying information- (name, address, telephone numbers) Address allow mapping the geographical extent of the problem.
2. Demographic information- Age, Sex, Race and occupation and provide characteristics of population at risk
3. Clinical information- Verify the case definition has been met. Date of onset create a graph of the outbreak.
4. Risk factor information: It tailors your investigation to the specific disease in question e.g. in Hepatitis A you would look at exposure to food and water.

Table II- Line Listing

Serial No.	Name	age	sex	Address	Time of onset of symptoms	Symptoms				Food consumed at the function				
						Fever	Vomiting	Diarrhoea	Headache	Rice	Fried Potatoes	Dhal	Fish	Ice-cream
1	A	25	M	Ex	1.30pm	+	+	-	+	+	+	-	+	-
2	B	22	M	Ex	1.50pm	-	-	-	+	+	-	+	-	+
3	C	24	F	NF	1.35pm	+	+	+	+	+	+	+	+	+
4	D	12	M	MO	1.45pm	+	-	+	+	+	+	-	+	-
5	E	58	F	HI	2.00pm	+	+	+	+	+	-	+	-	+
6	F	4	F	HI	-	-	-	-	-	+	-	+	-	-
7	G	60	F	MO	1.45pm	-	-	-	+	+	+	-	-	+
.														
.														

Step 5: Describe and orient the data in terms of Time, Place and Person

Once you have collected data you can begin to characterize an outbreak by time, place and person which is called **"Descriptive Epidemiology**". This description lets you begin to assess the outbreak in light of what is known about the disease (i.e. the usual source, mode of transmission, risk factors and population affected)

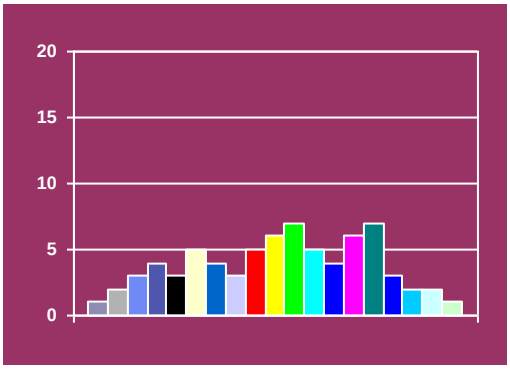
Time: Time course of the outbreak can be seen by drawing a graph of the number of cases (Y axis) by the unit of time/date of onset (X axis). This graph is called "Epidemic Curve" which gives a simple visual display of the outbreak's magnitude and time trend.

Interpreting Epidemic Curve

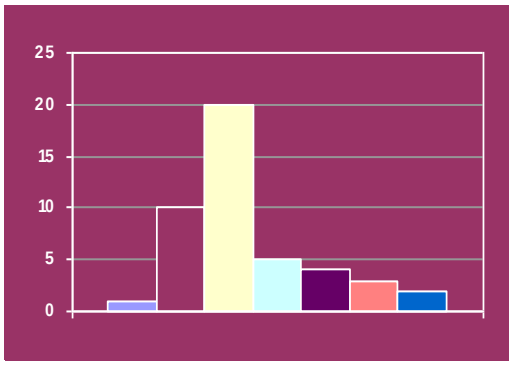
1. Shape of the curve (e.g point source, common source, continuing person to person. Figure 3)
2. 2.The period of time over which susceptible people are exposed (The minimum, average and maximum incubation periods)

Figure 3- Different Epidemic Curves

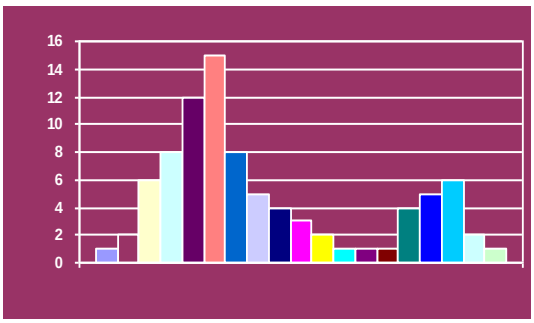
Continuing Common source



Point source



Multiple waves – continuing person



- An epidemic curve with a steep slope and a gradual down slope indicates single source or point source. In a point source epidemic all the cases occur within one incubation period.

- If the duration of exposure is prolonged the epidemic called "Continuous Common source" Epidemic has a plateau instead of a peak.

- Person to person spread (a "propagated" epidemic) have a series of progressively taller peaks one incubation period apart.

- Cases that stand apart called outliers. An early case may represent a background (unrelated) case, a source of the epidemic or a person who have exposed earlier than most of the people affected (e.g. cook tasted food hours before serving at table).
  Similarly late cases may be unrelated to the outbreak, may have long incubation periods or may be secondary cases. Hence all outliers are worth examining carefully because their unusual exposure may point directly to the source e.g. Hepatitis A (human host) one of the early case may be a food handler who is the source of epidemic.

Place: It provides information on the geographical extent of the problem and may also show clusters or patterns that provide clues to identify the source. A simple and useful technique for looking at geographical pattern is to plot a "Spot Map".
Clustering of cases in a spot map in an institution indicates either a focal source or person to person spread, while scattering of cases through out the institution consistent with a common source (e.g. canteen).

Person: You can determine population at risk for the disease by personal characters (age, sex) or by exposure (occupation, tobacco).These factors are important because they may be related to the susceptibility of the disease and for opportunity for exposure.

Step 6: Develop the hypothesis

Next step to develop the hypothesis on the basis of information obtained from patients, health officials and community and considering the characteristics of outbreak by time, place and person. The hypothesis should address the source of the agent, the mode (vehicle or vector) of transmission and the exposures that caused the disease (risk factors).
The frequency of disease or health outcome is calculated in relation to the age, sex or socioeconomic variables or type of exposure status in Descriptive Epidemiology e.g. Attack Rate of gastroenteritis among people who ate particular food item.

Step 7: Evaluate Hypothesis

The next step is to evaluate the credibility of the hypothesis i.e. why attack Rate of Gastroenteritis is high among people who ate particular food?
There are two approaches:

1. Comparison of the hypothesis with the established facts
2. Analytic Epidemiology

Analytic Epidemiology

Two types of studies

i. Cohort Studies
ii. Case control studies

Cohort studies: Compare groups of people who have been exposed to suspected risk factors with groups who have not exposed. It is the best technique for analyzing outbreaks in a small well defined population e.g. Food poisoning in a ceremony. In this situation you would ask each attendee the same set of questions about potential exposure (eg. what type of food and beverages he/she had consumed at the function and whether she/he became ill with gastroenteritis).
Then you can calculate an attack rate for those who did not eat (non-exposed) and who ate (exposed).

$$\text{Attack Rate for Non-exposed} = \frac{\text{Number of people who did not eat the item but became ill}}{\text{Total number people who did not eat the item}}$$

$$\text{Attack Rate for Exposed} = \frac{\text{Number of people who ate the item and became ill}}{\text{Total number people who ate the item}}$$

Dividing the Attack Rates of exposed from non exposed give the mathematical association of Relative Risk. An example is shown in Table III.

Table III- Attack Rates by Items Served at a wedding Party in A city, April 2003

	Number of people who ate specified item				Number of people who did not eat specified item			
Food	**Ill**	**Well**	**Total**	**Attack Rate %**	**Ill**	**Well**	**Total**	**Attack Rate %**
Rice	29	17	46	63	17	12	29	59
Spinach	26	17	43	60	20	12	32	62
Fried potatoes	23	14	37	62	23	14	37	62
Cabbage salad	18	10	28	64	28	19	47	60
Dhal	16	7	23	70	30	22	52	58
Fish Fried	21	16	37	57	25	13	38	66
Chicken	18	9	27	67	28	20	48	58
Beef	2	2	4	50	44	27	71	62
Fried Brinjal	19	12	31	61	27	17	44	61
Water	13	11	24	54	33	18	51	65
Pudding	27	13	40	67	19	16	35	54
Ice Cream (vanilla)	43	11	54	80	3	18	21	14
Ice Cream (chocolate)	25	22	47	53	20	7	27	74
Fruit Salad	4	2	6	67	42	27	69	61

How to calculate the Relative Risk?
Scan the column of Attack Rates among those who ate the specified food items.

Which item shows the highest Attack Rate?
Is the Attack Rate is low among people who did not eat that item?

You can identify vanilla ice cream as the source. The Relative Risk is calculated as 80/14=5.7. This Relative Risk indicates that people who ate vanilla ice cream were 5.7 times more like to become ill than those who did not eat vanilla ice cream.
Exercise; Calculate the Relative Risks for other food items.

Case control studies: In most outbreaks the population is not well defined and cohort studies are not feasible. Compare the exposure among people with a disease with a group of people without the disease. Then can calculate a simple mathematical measure of association called an Odds Ratio to quantify the relationship between exposure and disease.

1.1.6 Sample Survey

A survey is an investigation which the information is systematically collected. Usually surveys are carried out in a sample of a defined population group within a specified time period. If surveys are carried out repeatedly at regular intervals surveys can form the basis of surveillance system.
A simple method of sample survey- Multistage Cluster Sampling Technique (recommended for vaccine coverage survey by WHO) often use to evaluate the vaccine coverage in Sri Lanka.

1.2 Data compilation and analysis

In order to monitor the incidence (number of new cases in a defined population during a specific period of time) of a disease, it is necessary to maintain charts and graphs which show the number of cases of the disease for each reporting period. With charts and graphs it is easy to visualize the number of cases which occurred in each reporting period. Charts and graphs are useful for diseases which occur more often. A map is commonly used to monitor the location of the disease during investigation.
After the data have been compiled for the most recent reporting period, it needs to be analyzed. The number of cases reported during the period under review should be compared with the data reported during the previous week/month and corresponding period of previous years. Is the number higher, lower or nearly the same? Whatever the answer the analysis is not complete until the most probable reason for the causation and spread of the disease is explained.

1.3 Action
Action has to be taken to correct any problem uncovered during routine reporting, epidemiological investigation or a survey.

1.4 Guideline for writing a report of a disease outbreak
When an investigation is complete, the final responsibility is to provide written documentation of events. This section explains the detailed explanation of a workable format for writing a report and what should be included in the report.

The first section of the report should be the introduction. The purpose of the introduction should be to supply sufficient background information to allow the reader to understand and evaluate results of the present outbreak investigation without having to read or refer to previous reports on the topic.

It should present first the nature of the problem investigated and how and when you came to know about the problem. It should also include the method of the investigation and the method of collection of data of morbidity, mortality, laboratory data from hospital and MOOH etc.

Purpose of the Report
Whether the report is being written in response to an outbreak or a single complaint, complete documentation is important for the following reasons:

1. A document for action
In some cases, control and prevention measures will only be instituted in response to a written report.

2. A record of performance
A well-written report documents the magnitude of health problems and justifies program activities.

3. A document for potential legal issues
An investigative report written by health professionals must be written objectively, honestly and fairly. Information in these investigations is frequently used in legal actions.

4. An enhancement of the quality of the investigation
The process of writing a report and viewing the data in written form may result in new insights.

5. An instrument to present control and preventive measures.
The primary reason to undertake an investigation is to control and prevent disease. The written report is an official medium to present control and preventive measures, and perform needs assessments.

A food borne illness outbreak report should include the following sections:

I. Summary
II. Introduction
III. Background
    A) Epidemiologic
    B) Environmental
    C) Laboratory and Clinical
VI. Results
    A) Epidemiologic
    B) Environmental
    C) Laboratory and Clinical
VI. Discussion
VII. Recommendations

I. Summary

The summary should consist of a paragraph or two, that provide the reader with an overview of the investigation (i.e., WHO, WHAT, WHERE and WHEN of the outbreak). It should describe what caused the outbreak or the causal hypothesis based on the evidence.

II. Introduction

Include the specific events that led to the investigation.

1) How the outbreak was first reported
2) Steps undertaken to confirm its existence
3) All who assisted in the investigation?

III. Background

Background information is important and it includes the type of establishment involved in the outbreak (e.g., take-out restaurant, wedding party, caterer, fast food establishment, retail store) and describes the food handlers. Explain epidemiological, environmental, laboratory and clinical factors related to the outbreak.

A. Epidemiologic factors

Explain how cases were defined. For example, even if you are investigating an outbreak of salmonella you are probably not confining yourself to only laboratory confirmed cases. Does a case have to experience diarrhoea or is abdominal cramping sufficient? The issues should be determined and explained in detail. Also describe how cases became known, questions you asked, and how asked. Include descriptions of interview techniques and copies of questionnaires or surveys if used.

B. Environmental factors

Clearly outline the kinds of environmental investigations you have been carried out. Investigation of kitchen, utensils, water sources, presence of pets in and around the kitchen, ventilation, lighting facilities, raw food storage etc. should be explained.

C. Laboratory and Clinical

Discuss any analyses performed. It is important to note what kinds of and how many specimens were submitted for laboratory analysis. Was food available for testing? Did cases submit stool specimens or other clinical specimens for analysis? Were food handlers required to submit stool samples for testing? Note where the specimens were sent, what kinds of analyses were performed and who completed the testing.

VI. Results

These results can be presented as tables, graphs, figures and also as text.
The results of your investigation should be presented under the following main groups:

(a) Place -Geographical distribution
PHI area, Village, Residence, Place of work etc.
(b) Person - Age, Sex, Race, and Occupation of persons affected
(c) Time -Year, Month, Day and Hour

Geographical Distribution

Eg: Distribution of (number) Cases of diarrhoea (Notified cases) in the Polonnaruwa MOH area by PHI areas – November 1986.

Serial No.	PHI Area	Population	No. of Diarrhoea Cases	% from the total	Rate per 10,000 population
1. 2. 3.	Polonnaruwa Minneriya **Total**				

Age Distribution

Eg. Age distribution of (number) Cases of Diarrhoea (Notified Cases) in the MOH area Polonnaruwa – November 1986

Age Groups	No. of Diarrhoea Cases	Percentage	Cumulative %	Age Specific Rates
0 – 1 1 – 4 years 5 – 9 ,, 10 – 14 ,, 15 – 19 ,, 20 – 24 ,, 25 – 29 ,, etc. **Total**				

Sex Distribution

Eg. Sex distribution of (number) cases of diarrhoea (Notified Cases) in the MOH Area Polonnaruwa – November 1986

Sex	Number	%
Male		
Female		
Total		

Following tables too could be drawn for diarrhoea cases/deaths:

- Distribution of cases/deaths by ethnic group (if relevant)
- Distribution of cases/deaths by occupation

Food poisoning outbreaks

1. Draw the epidemic curve in a case of food poisoning outbreak and calculate:
   - incubation period
   - food or meal specific Attack Rates
   - the Relative Risk
2. Analyze and present the results of the physical facilities inspection and the presence and status of any food trace backs.
3. Analyze and present the results of the culture or other laboratory results on food handlers or other individuals connected to the outbreak and also food tested.

V. Discussion

This section is where all aspects of the investigation are brought together and a conclusion is drawn.
NOTE: Not all outbreaks have a resolution. In fact, it is rare when everything comes together and a cause can be definitively determined. Do not be discouraged. In most cases, there will be enough evidence to present a plausible hypothesis. Be clear and present a detailed explanation on what has contributed to the conclusion.

VI. Recommendation

This is the opportunity to educate. Be detailed because these recommendations hopefully will be read by many people in the establishment that was investigated. The establishment has a vested interest in following the suggestions. If the outbreak has been large and disruptive, the establishment will not want it to reoccur.

In addition to listing general recommendations on good food handling procedures, include specific recommendations that address what might have been overlooked in the particular outbreak (e.g., attempting to transport food long distances at inadequate temperatures).

7.2 Communicable diseases

Introduction
Some diseases can be transmitted from person to person or from objects or animals to people. These are communicable diseases.

Communicable Disease Process
Communicable Diseases result from the interaction of an Agent, a Host and the Environment. This process is also called the "chain of infection", and has six components:

1. Causative Agent
2. Reservoir
3. Portal of Exit
4. Mode of Transmission
5. Portal of Entry
6. Host Susceptibility

Before starting control and preventive measures in a disease outbreak, the PHI should ask the following questions:

(1) What are the agents of infection?
There are six categories:
Protozoa, Metazoa, Bacteria, Virusus, Ricketsia and Fungi

(2) What is the reservoir of infection? i.e. habitat in which the infectious agent lives, multiplies and grows.
   (a) Human sources
      - Actual clinical cases
      - Carriers (in apparent infection, incubatory, convalescent or chronic)
   (b) Animals, insects
   (c) Environment (soil, water, etc.,)

(3) How do the agents escape from the reservoir? (Portal of exit)
Through the:
   (a) Respiratory system
   (b) Circulatory system
   (c) Digestive system
   (d) Genito- Urinary system
   (e) Skin and Mucous membrane
   (f) Placenta

(4) What is the path of infection? (mode of transmission)
How is the infection transferred?
   (a) Direct (contact, droplets)
   (b) Indirect - Animate (mosquito, flies, insects)
      - Inanimate (air, water, milk, food, clothes etc.)

(5) How do the agents enter into the susceptible host? (Portal of entry)
   (a) Respiratory system
   (b) Circulatory system
   (c) Digestive system
   (d) Genito-Urinary system
   (e) Skin, mucous membrane
   (f) Placenta

(6) Is the host protected?
Is he likely to come in contact with the disease?
Is he a susceptible host?

Host Susceptibility

A person or animal lacking sufficient resistance to a particular pathogenic agent to prevent occurrence of disease is defined as a susceptible host. The following factors can affect host susceptibility:
   (a) Genetic factors
   (b) Nutritional factors
   (c) Pre-existing illnesses
   (d) Immunity
   (e) General factors of resistance (skin, mucous membrane, gastric acid, cough reflex, etc.)

Immunity

Immunity is a property by which organisms resist and overcome infection. Immunity may be active or passive.

(1) Active (Antigen induced)
- Natural (After the illness, e.g. measles, mumps, chicken pox)
- Artificial (After an immunization, e.g. BCG, Triple, Polio, Measles, Japanese Encephalitis)

(2) Passive
- Natural (Transmitted from mother through the placenta – e.g. measles, mumps immunity lasts about 6 months)
- Artificial (After giving Anti-serum, e.g. Tetanus, Diphtheria – immunity lasts 2 to 3 weeks)

2. Ways of preventing the spread of communicable diseases

1. Isolation and treatment – By isolating a patient, spread of disease can be prevented by avoiding contact with others. Treatment of patients will eliminate the disease agents and thereby prevent spread.

2. Surveillance – Supervision of patient's contacts assist in detecting new cases and preventing further spread by isolating and treating them.

3. Immunization – Effective immunization can block the pathway of many infections for which vaccines are available.

4. Disinfection of clothes and bedding – Many diseases are spread by contact with contaminated clothes and bedding. Disinfection will prevent such spread.

5. Environmental Sanitation - This covers many important preventive measures: Supervision of wells and drinking water to prevent contamination; Disinfection of contaminated or suspected water sources; Sanitary disposal of excreta by providing latrines; Personal hygiene – washing hands, wearing shoes, keeping clean.

6. Control of Vectors and parasites – Destroying the vectors and parasites of diseases including removing the breeding places of these vectors can also block the path of infection.

7. Detection of Carriers – Find out who are carrying the disease. Check their blood samples, stool samples etc. Treat the carriers to prevent spread.

8. Control of Food – Ensure that all food supplies are clean and non-contaminated and that food is properly and hygienically prepared. Infected persons should not be allowed to handle food. Food should be properly stored to prevent contamination and growth of pathogenic organisms.

9. Sterilize Equipment – Ensure that all equipment is properly sterilized before use. Contaminated equipment can spread disease.

3. Immunization

The general immunization schedule is shown in Table 1.

General Contraindication for all Vaccines

1. Temperature of 100^0 F or over at the time of immunization
2. Progressive neurological illness

Please note

DPT- Temperature of over 103^0 F with or without convulsions following administration of a previous dose.
USE- DT for subsequent doses.

OPV- Diarrhoea - Repeat dose after six weeks.

Table 1: National Immunization Schedule for EPI Vaccines- Sri Lanka

Age	Vaccine	Remarks
DURING FIRST YEAR OF LIFE (INFANCY)		
0-4 weeks	BCG	Before leaving hospital, preferably within 24 hours of birth. (If a scar is not present re-vaccinate after 6 months up to 5 years).
Soon after the completion of 2nd Month	OPV & Pentavalent (DTP-HepB-Hib) (1st dose)	
4th Month	OPV & Pentavalent (DTP-HepB-Hib) (2nd dose)	Preferably 6-8 weeks after 1st dose
6th Month	OPV & Pentavalent (DTP-HepB-Hib) (3rd dose)	Preferably 6-8 weeks after 2nd dose
9th Month	Measles	Measles vaccine should be administered to all infants as soon as they complete 9 months
IN SECOND YEAR OF LIFE		
About 18 months	DTP (Booster) - 4th dose OPV (Booster) – 4th dose	
PRESCHOOL AGE		
On completion of 3 years of age	Measles and Rubella (MR)	One dose for all children

SCHOOL-GOING AGE		
At school entry (5 years)	OPV (Booster) – 5th dose DT	One dose for those who have received the primary course of DTP/DT.
In school (12-15 years)	aTd (Adult Tetanus and diphtheria)	One dose for those who have received the primary course of DTP/DT.
In school (12-15 years)	Rubella	One dose of Rubella vaccine should be administered to all children between the ages of 12 and 15 years.
PREGNANT WOMEN		
First pregnancy	Tetanus Toxoid – 1st dose (TT1) after the 12th week of pregnancy	Two doses of Tetanus Toxoid should be given during the first pregnancy to prevent Neonatal Tetanus
	Tetanus Toxoid – 2nd dose (TT2) 6-8 weeks after the first dose	The 2nd dose should be given at least 4 weeks before the EDD
Subsequent pregnancies	Tetanus Toxoid for the subsequent 3 pregnancies (TT3, TT4, TT5)	One dose of Tetanus Toxoid should be administered during every subsequent pregnancy, up to a maximum of five doses in all (i.e. TT1-TT5)
FEMALES IN THE CHILD-BEARING AGE GROUP		
15-44 years	Rubella	One dose of rubella vaccine to all females between 15 and 44 years of age, who have not been immunized earlier.

7.3 Prevention and Control of Chronic Non-Communicable Diseases

Introduction

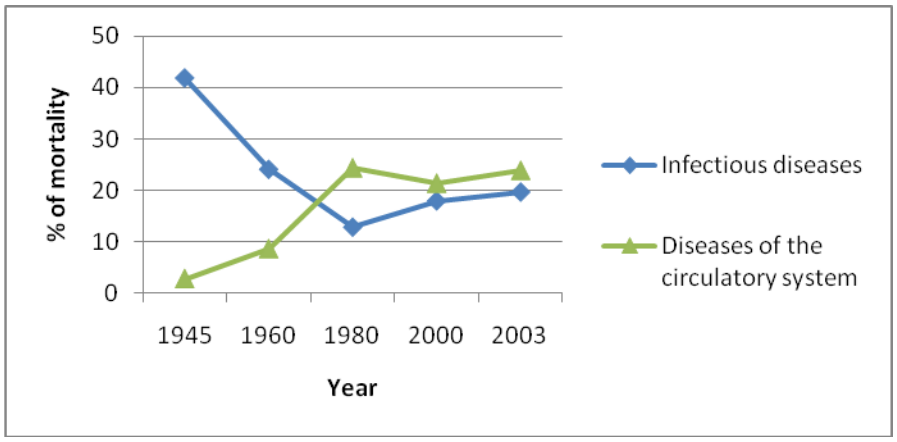
The major chronic non-communicable diseases (NCDs) are cardiovascular disease (including coronary heart diseases [CHD], cerebrovascular diseases [CeVD] and hypertension), diabetes, asthma, chronic obstructive pulmonary disease. In 2001 chronic NCDs accounted for 71% of all deaths in Sri Lanka, compared with 18% due to injuries, and 11% due to communicable diseases, and maternal and prenatal conditions. Analysis of age- standardized data for 1991-2001 has shown that the chronic NCD mortality is 20-30% higher in Sri Lanka than in many developed countries. Moreover, according to the Register General it also suggests that NCD mortality rates have been rapidly increasing during the past decade. The epidemiological, social and demographic transitions are responsible for the increasing NCD burden in Sri Lanka.

Current situation of chronic NCDs in Sri Lanka

The NCD burden is rising

During the past half-century the proportion of deaths due to circulatory disease (such as heart disease) has increased from 3 percent to 24 percent while that due to communicable diseases has decreased from 42 percent to 20 percent (Figure 1). Mortality rates from NCDs are currently 20–50 percent higher in Sri Lanka than in developed countries. The disparities are most substantial for cardiovascular disease and asthma. Unlike in developed countries, mortality rates from NCDs, especially cardiovascular disease, have not fallen significantly during the past three decades in Sri Lanka.

Figure1 Trend of proportion of deaths due to major causes, Sri Lanka, 1945–2003



The major chronic non-communicable diseases

Cardiovascular diseases (CVD)

a) ***Coronary Heart Diseases*** - When considering deaths due to coronary heart diseases (CHD), large proportion of deaths occurs due to myocardial infarction. Currently, ischemic heart disease (IHD) including myocardial infarction is the leading cause of mortality in hospitals in Sri Lanka. Sri Lanka has observed hospital admission rates due to IHD at 330 admissions per 100,000 population.

b) ***Cerebrovascular Diseases*** - Hospital admissions due to cerebrovascular diseases (CeVD) and related causes have increased by about 20% from 170,000 in 1999 to 210,000 in 2005.

c) ***Hypertension*** - According to a study done during 1998 – 2002, using a representative national sample by Wijewardene et al (2005), age standardized prevalence rate for hypertension was 19% in Sri Lanka, with little difference between men and women. Many studies that have been carried out in the last decade at district and national levels showed similar results.

Diabetes

Prevalence of diabetes in Sri Lanka has gradually increased over the last two decades. This is evident from many studies conducted over the last 20 years. One in five adults in Sri Lanka has pre-diabetes or diabetes, and one third of them were found to be undiagnosed according to a report by Katulanda et al (2008). The same study indicated that age and sex standardised diabetes prevalence in those above 20 yrs was 10.3%. Higher overall prevalence (age standardized) of 13.9% and 14.1% for diabetes and pre-diabetes respectively was reported from a study by Wijewardene et al (2005) that involved 6047 participants representing four provinces of Sri Lanka. Hospital admissions due to diabetes and related complications has shown a parallel rise from 86 to 226 per 100,000 over the last two decades.

Chronic respiratory diseases

Chronic respiratory diseases include asthma, chronic obstructive pulmonary disease (COPD), respiratory allergies, occupational lung diseases and pulmonary hypertension. Prevalence of bronchial asthma among adults in Sri Lanka varies from 15%- 20% depending on the geographical region. Over the last two decades, hospital admissions and deaths due to bronchial asthma have increased significantly.

Chronic renal disease (CKD)

Chronic renal disease of unknown etiology is an emerging public health issues which has been reported from the North Central and North Western provinces. The specific causes are still being investigated and appropriate specific interventions may be required in the future.

Major risk factors for chronic NCDs

There are few shred modifiable risk factors that are responsible for all major chronic NCDs, namely smoking, unhealthy diet, physical inactivity and harmful alcohol use. Prevalence of these risk factors at population level has a major influence on morbidity and mortality due to NCDs.

Smoking

According to the risk factor survey carried out by the Ministry of Health, the prevalence of (current) smokers among adult male is 22.8% while among female is less than 1 %. Although a declining trend is observed over the past few years, this is not reflected in the drop of overall sales for tobacco related products.

Unhealthy diet

According to the risk factor survey carried out by the Ministry of Health, unhealthy food could be defined as foods that contain high-salt content, high-sugar content, high trans-fatty acids and saturated fat. High consumption of fruits and vegetable is strongly associated with better health outcomes. Although the traditional Sri Lankan diet is vegetable based, a large proportion of adults (82%) do not consume adequate amount of vegetables. Despite the availability of an abundance and variety of fruit in Sri Lanka,

the average consumption is found to be inadequate. Despite a modest consumption of fat (15%-18%) by the Sri Lankans, higher percentage of saturated fats is included in the diet compared to unsaturated fat. Higher saturated to unsaturated fat ratio is an important risk factor for development of cardiovascular diseases. The daily intake of salt (10g /day) and added sugar (60g/day –based on food consumption data, 35 g/day based on individual dietary records) is also high in Sri Lankan diet when compared to WHO recommendations.

Physical inactivity

According to the risk factor survey carried out by the Ministry of Health, moderate level physical activity is a protective factor against many NCDs. Majority of Sri Lankans (78 %) are engaged in moderate or higher level physical activities (> 600 Metabolic Min /Week). However, only a small proportion is engaged regularly in recreational activity. Female are significantly sedentary (30%) compared to males (19%) and this is also reflected in the higher mean BMI of the former.

Alcohol consumption

Percentage of current drinkers is significantly higher in males (26.0%) compared to females (1.2%). However, less than five percent of male population takes alcohol more than 4 days per week.

Other risk factors-

Stress - stress is an imprecise term which has different scientific meanings and associated with several psychosocial conditions. An Australian Expert Working Group (2003) examined the association between stress and cardiovascular diseases, concluded that only certain conditions (depression, social isolation and acute life events) associated with “stress” are risk factors for cardiovascular diseases.

Air pollution - Air pollutants consist of gaseous pollutants, odors and suspended particulate matter. Air pollution has both acute and chronic health effects which is a known risk factor for chronic respiratory diseases and cardiovascular diseases. In Sri Lanka Industrial emissions and vehicular emissions are the main contributing factors for outdoor air pollution. Indoor air pollution is mainly identified in rural areas mainly in closed kitchens and in industries where air quality is not being maintained properly.

Obesity

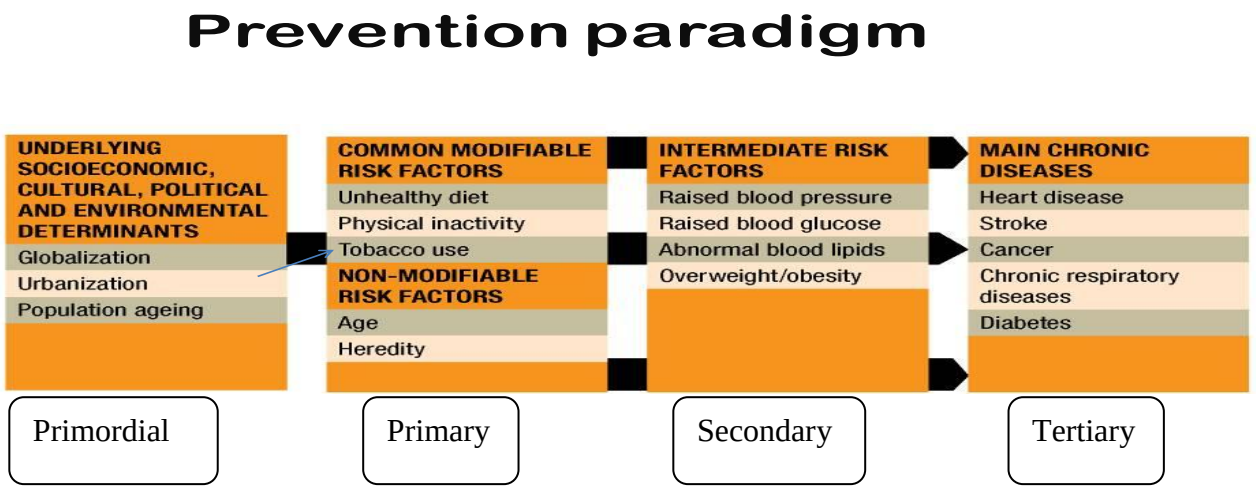
Obesity is a risk factor for CVD and diabetes, and it also plays a role in some cancers. Overall obesity levels in Sri Lanka have been increasing for the past 20 years.

Wijewardene et al. (2005) found that 20.3 percent of men and 36.5 percent of women aged 30–65 years were obese (body mass index [BMI]≥25 kg/m^2), compared with 25.0 percent and 24.7 percent of men and women in the United

States, and 12.0 percent and 28.5 percent of men and women in the Russian Federation.

Prevention and control of chronic NCD'S

The epidemiological principals applied for prevention of NCDs are the same as communicable diseases. This include primary, secondary and tertiary prevention of the diseases. The following diagram shows a useful model to understand the development of chronic diseases and the prevention and control applicable to each stage of paradigm.



National chronic NCD program

The national NCD policy has been approved by the cabinet of ministers in 2010 which lay down the foundation for the national NCD prevention and control program. There are key nine strategic areas which encompass health promotion, primary, secondary and tertiary prevention activities.

Main goal of the national NCD prevention and control policy

To reduce premature mortality (less than 65 years) due to chronic NCDs by 2% annually over the next 10 years through expansion of evidence-based curative services, and individual and community-wide health promotion measures for reduction of risk factors

Key Strategies in the national NCD prevention and control program

The following strategic areas are identified and prioritized for achieving the policy objective:

I) Support prevention of chronic NCDs by strengthening policy, regulatory and service delivery measures for reducing level of risk factors of NCDs in the population

II) Implement a cost-effective NCD screening program at community level with special emphasis on cardiovascular diseases

III) Facilitate provision of optimal NCD care by strengthening the health system to provide integrated and appropriate curative, preventive, rehabilitative and palliative services at each service level

IV) Empower the community for promotion of healthy lifestyle for NCD prevention and control

V) Enhance human resource development to facilitate NCD prevention and care

VI) Strengthen national health information system including disease and risk factor surveillance

VII) Promote research and utilisation of its findings for prevention and control of NCDs

VIII) Ensure sustainable financing mechanisms that support cost-effective health interventions at both preventive and curative sectors

IX) Raise priority and integrate prevention and control of NCDs into policies across all government ministries, and private sector organisations

Main components of prevention and control of NCD

1. Health promotion and primary prevention of NCDs
2. Early detection
3. Treatment and follow up of patients
4. Surveillance

Program coordination and implementation –

The national level planning, implementation and monitoring will be carried out by the NCD unit which is the focal point for NCD prevention and control activities. However, district level activities will be planned, implemented and monitored by the Medical Officer in charge of NCDs (MO/NCD) at the office of the Regional Director of Health Service (RDHS) under the guidance and supervision of the RDHS. At the divisional level, the NCD prevention and control program is conducted by MOH and respective primary and secondary care curative institutions of the area.

Functions of the PHI in NCD prevention and control program

Public Health Inspector, as a member of the Primary Health Care staff has an important role to play in the National NCD prevention and control program. In consistent with the National NCD programme, it is PHI's duty to assist the Medical Officer of Health in implementing the prevention and control of NCD in his respective area.

The following are the main functions of the PHI in his respective area, while he is expected to contribute to coordinated action by all other primary health care staff in implementing the NCD programme in the MOH area.

1. Coordinate with relevant departments/agencies to create conducive environment for prevention and control of major NCD at the different settings; Home, School and Community (Collaborative activities with other stakeholders would be; promotion of Home gardening, health promoting schools , Community Recreational areas/activities , anti smoking and alcohol activities)
2. Enforce Laws/Regulations related to NCD.
   e.g. Tobacco and Alcohol Act, School Canteen Policy
3. Contribute in social mobilization and community empowerment for NCD prevention and control
   - Conduct awareness (health education) in the schools , work places and other community settings
   - Create community awareness on NCD prevention and control
   - Promotion of healthy lifestyle to prevent major NCD in the stakeholder sectors/agencies; local authority, youth centers, agriculture sector, social sector, sports and civil organizations etc.
   - Organized health check up in different settings
   - Disseminate updated information in relation to NCD
4. Assist in prevention and control of NCD
   (PHI should pay attention to the following while attending to his routine duties)
   - Detect early symptoms and refer for care
   - Follow up of patients' compliance
5. Assist in surveillance activities
   - Provide routine collection of data
   - Assist in special surveys when required (risk factor survey)

Other Non Communicable Diseases

There are other NCDs, prevalent in significant amounts confining to specific areas. The examples are Thalassaemia in Uva, North-western and North –central provinces and Chronic Renal Disease of unknown origin in Anuradhapura and Polonnaruwa districts. Intensified focused interventions to intervene these diseases are launched in these areas, the PHII should assist the MOH in conducting special programmes accordingly.

Prevention and Control of Acute Non-Communicable Diseases (Injuries)

1. Definition and categorization of injuries

The standard definition of an injury as used by WHO is: “a bodily lesion resulting from an acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionizing radiation or an impairment of function from sudden lack of essential agents such as air, water, warmth as in drowning, strangulation or freezing. Injuries are the acute, physical conditions listed in Chapter XIX and Chapter XX in the *International Statistical Classification of Diseases and Related Health Problems, Tenth revision* (ICD-10).

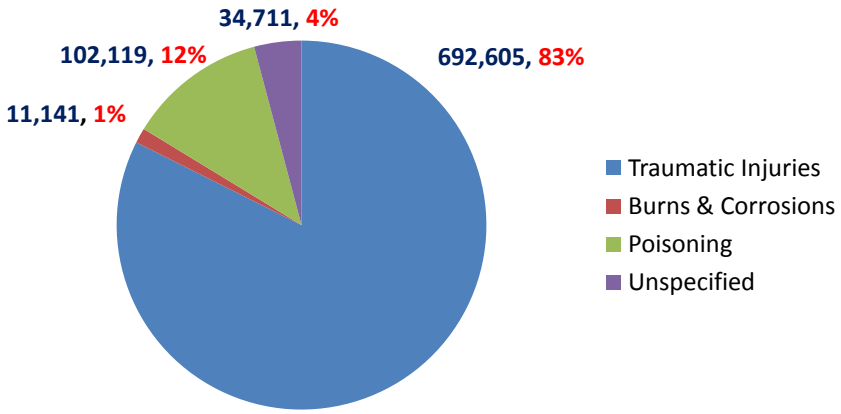
Injuries can be categorized in a number of ways. However for identifying intervention opportunities they are categorized by the intent – intentional and unintentional injuries. Intentional injuries include ‘self inflicted, interpersonal violence and collective violence’. Unintentional injuries are sub-divided by the causal mechanism: Road Traffic Injuries (RTI), Drowning, Burns/Fires, Falls and Poisoning. Unintentional injuries can also be sub-divided based on the place of injury – Road traffic injuries, Home injuries, Occupational injuries, Leisure injuries etc.

2. Burden due to injuries

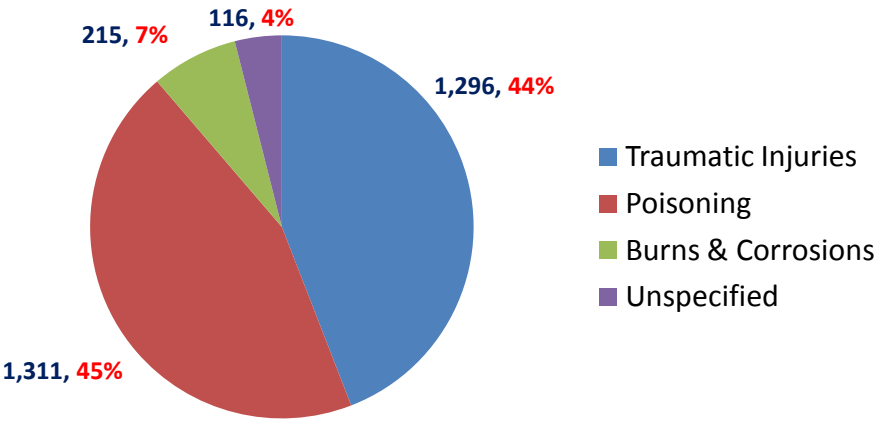
Injuries are a leading cause of death, hospitalization and disability throughout the world accounting for 9% of all deaths and 16% of the burden of disability annually. Injuries ranked 5 th among all causes of death in the Region. More than 90% of injury-related deaths occur in low and middle income countries where unsafe conditions of living, working and travel greatly increase the risk and where prevention efforts, access to high-quality treatment and rehabilitation services are usually lacking. Injuries contribute to significant socioeconomic losses in terms of lost economic opportunity, the heavy and rising demand on national health budget and also in terms of personal suffering. Health sector absorbs a substantial portion of the direct costs arising from injury including emergency care, surgery and rehabilitation.

In 2005, injuries accounted for 23.1% of all registered deaths in Sri Lanka. Traumatic injuries continue to be the leading cause of hospitalization since 1995. According to annual health statistics, in 2007, there were 669,052 admissions (14.5% of the total) and 1389 deaths (3.6% of the total) in the government hospitals due to traumatic injuries. In the same year, there were 62,721 (1.4% of the total) admissions due to poisoning. This includes 17,723 (28.3 %) due to pesticides and 44,998 (71.7%) due to substances such as drugs, medicaments and biological substances and non-medicinal substances. Poisoning leads to 4.0% (1561) of deaths reported in the government hospitals. Furthermore, there was a total of 13,409 (0.3%) hospital admissions and 292 deaths (0.8%) due to burns and corrosions.

Injuries - Admissions to Government Hospitals (IMMR, 2008)



Injuries- Deaths in Government Hospitals (IMMR, 2008)



Among unintentional injuries, Road Traffic Injuries (RTI) represents the major fraction. According to statistics from the Department of Police, in 2008, there were a total of 31872 RTI of which 2176 were fatal accidents resulting in 2328 deaths. In Sri Lanka, RTIs kill at least one person in every four and half hours and six road traffic related crashes happen, injuring three persons on the road per day. Industrial Safety Division of the Ministry of Labour reports that every year, Sri Lanka losses around 500,000 man-

days owing to occupational accidents. In 2008, 49 fatal and 1525 non fatal accidents were reported. Home accidents are another important area where due consideration is needed. The exact magnitude of this problem is not known.

According to a community based study carried out in 2003, Galle District, 2% of individuals reported non-fatal injuries during preceding 30 days, giving an age-sex-sector adjusted annual incidence of 24.6 per 100 population. Among those, 93.3% reported non-fatal unintentional injuries. The leading causes were falls 26.7% and mechanical injuries 25.6%, followed by road traffic injuries 20.5%.

3. Prevention of Injuries

Prevention of injuries can be classified according to the epidemiological model of prevention.

a) Primary prevention - Reductions in the exposure to risk and prevention of injuries from occurring, through the adoption of safer behaviours and safer environments.

b) Secondary prevention - In the event of an injury, reductions in the severity of injury and its impact e.g. early diagnosis and appropriate management of an injury by applying basic first aid at the scene of an incident, early transport to a hospital, emergency care and inward trauma care, to stop an injury from having more serious consequences.

c) Tertiary prevention - Reductions in the consequences of injury through physical and psychological rehabilitation to prevent further complications

4. The National programme on injury prevention and management in Sri Lanka

The national policy for injury prevention and management has been drafted and the national programme on injury prevention and management is formulated according to the eight strategic objectives of the National Policy. Key action areas are identified for each of the strategic objectives.

The strategic objectives

a) Establish a lead agency to strengthen coordination for injury prevention and management within the health sector and with other agencies
b) Strengthen advocacy and multi-sectoral involvement
c) Develop population-wide injury prevention interventions
d) Review, update, introduce legislative and regulatory mechanisms and support for enforcement of safety law and measures
e) Empower the community and healthcare providers for prevention of injuries and disabilities, and harnessing health literacy
f) Strengthen the organization capacity to improve pre-hospital care and institutional care for emergency and rehabilitation at all levels of care

g) Strengthen injury surveillance and information systems
h) Monitor and evaluate on-going activities

5. The key activities identified according to the strategic objectives of the national policy

1. Increasing awareness among: general public, school children and preventive health staff (MOH, PHI, PHM) on safety promotion, injury prevention and first aid
2. Strengthening pre-hospital care for the injured through establishment of formal and informal Emergency Medical Services (EMS)
3. Strengthening institutional care for injured (provision of emergency care and inward trauma care) through regular training to medical & para-medical staff and provision of basic facilities
4. Establishment of a National Injury Information System linked with non-health Health injury surveillance systems (e.g. Registrar General's, Police, Labour, JMO)
5. Carrying out research to identify suitable injury prevention interventions suited to Sri Lanka

6. Implementation of the National programme on injury prevention and management

At the national level: planning, coordinating implementation of the policy, monitoring and evaluation will be carried out by the NCD unit, which is the focal point for both chronic and acute NCD programmes. At the district level planned, implementation, monitoring and evaluation will be carried out by the Medical Officer in charge of NCDs (MO/NCD) at Regional Directors Health Service (RDHS) office under the guidance and supervision of the RDHS. At the divisional level the injury prevention and management program will be conducted by Medical Officer of Health (MOH) and respective primary and secondary care curative institutions of the area.

Trauma Secretariat and National Poison and Drug Information Centre: are the national advisory bodies for implementing strategic objective 6 in the national policy.

7. Role of the Public Health Inspector in the National Pprogramme on Injury Prevention and Management

The Public Health Inspector shall assist the Medical Officer of Health (MOH) in implementing the National Pprogramme on Injury Prevention and Management within his area.

The following are some of the key activities:

1. Assist the MOH to coordinate injury prevention activities with relevant agencies (local authority, Police, schools, factories, youth centers, civil organizations etc.)
2. Assist the MOH to develop awareness programmes on safety promotion & injury prevention (safe behaviors, safe environments) depending on the local priorities

2. Conduct awareness programmes on safety promotion & injury prevention (safe behaviors, safe environments) : to the general public, factory workers, school children (through the existing school health programme), non-health sector staff (e.g. Samurdhi officers, Grama Niladari Officers) and Community based organizations
3. Assist the MOH to promote safe environments in collaboration with non-health stakeholders (e.g. placing road signs at Black spots to prevent RTI and placing warning signs at high risk spots to prevent drowning in collaboration with Local Authorities, liaising with Authorized Officers for prevention of occupational injuries).
4. Assist the MOH to organize training on First Aid in collaboration with NGOS (St. Jones, Red Cross, Sarvodaya etc): to school children, general public etc.
5. Assist the MOH for the establishment and maintenance of basic emergency care in the primary health care institutions within the MOH area (i.e assist in organizing of training of medical and para-medical staff on basic Trauma Care)
6. Assist the MOH for the establishment and maintenance of an injury information system within the MOH area (i.e assist in linking with non-health sector injury data - police, factories etc.)

7.4 Emerging and Re-emerging Infectious Diseases

Emerging Infectious Diseases have been defined by WHO as the infections, the incidence of which in humans has either increased during the last two decades or unknown and newly identified diseases which cause public health problems either locally or internationally and threaten to increase in near future.

Emerging Infectious Diseases

- HIV infection which causes AIDS
- Ebola Haemmorahagic fever
- New forms of Cholera
- Hepatitis C &E
- Legionnaires' Diseases
- Lyme disease
- Creutzfeldts-Jakob diseases proven to be associated with Bovine Spongiform Encephalopathy of cattle

Re-emerging Infectious Diseases are those that have reappeared after a significant decline in their incidence and they were no longer considered a public health problem. Appearance of Plague in an explosive form in 1994 after a period of quiescence of almost 27 years is an important example of re-emerging infections.

Re-emerging Infectious Diseases

- Tuberculosis- increasing due to close association with HIV infection
- Cholera
- Dengue Fever, DHF

- Malaria
- Shigella dysenteries [SD1]
- Meningococcal meningitis
- Japanese encephalitis
- Food borne trematodes
- Rift valley fever
- Trypanosomiasis
- Lassa fever

What causes emergence or re-emergence of infectious diseases?
Several factors contribute to the emergence and re-emergence of infectious diseases.

- Increasing population, overcrowding in cities with poor sanitation
- Rapid and intense both national and international travel
- Changes in handling and processing of large quantities of food
- Increase exposure of humans to disease vectors and reservoirs in nature
- Deterioration of public health infrastructure which is unable to cope with population demands
- Antibiotic resistance linked with increase misuse of drugs
- Environmental changes (climate and defrostration)

Key tasks in dealing with emerging diseases

- Evidence based clinical practice
- Surveillance
  - epidemiological
  - laboratory
  - ecological
  - anthropological
- Investigation and control measures
- Implementation of preventive measures
  - behavioural
  - environmental
- Monitoring and evaluation

Approaches for better surveillance

- Surveillance standards
- Integrated surveillance systems
- Outbreak verification and response
- Field epidemiology training
- Strengthening of Laboratories

Surveillance of Emerging and Re-emerging Diseases

- Data collection/Information – e.g. Notification
- Data analysis; Disease pattern/trend etc.
- Inform relevant authority for action
- Follow up -continuous monitoring
- Evaluation

7.5 International Health Regulations

The International Health Regulations or IHR are the most important legally binding set of regulations for WHO member states to protect themselves against serious Public Health threats whether of biological, chemical or radio-nuclear origin. At the same time IHR is expected to ensure that there are no unnecessary or excessive restrictions in international traffic or trade for public health purposes.
The latest version of the IHR – which was adopted by World Health Assembly in 2005 defines the purpose and scope of the IHR as to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.

Historical back ground

Travel has always been a means by which disease has spread across the world. In the 14th century in the city-state of Venice it resulted in protective legislation which has evolved over the centuries, into the currant International Health Regulations.
The first recorded quarantine regulations were written in Venice in 1377 to protect the city state from diseases carried by ship borne rats.
Nearly five centuries later in 1851, the first International sanitary conference laid down certain principles for protection against disease, but another century elapsed before a wide variety of measures were forged into the International Sanitary Regulations of 1951, providing a frame work on quarantine measures.

These were revised and became the International Health Regulations (IHR) in 1969 with six diseases being included for notification namely Cholera, Yellow fever, Plague, Small pox, typhoid and relapsing fever. IHR was further revised to include notification only for Plague, Yellow fever and Cholera. Thus the IHR (1969) which was in force up to 15 June 2007 was limited to notification of just three diseases, and lack mechanisms for collaboration and capacity to take risk-specific measures directed at control of out breaks of diseases. Taking these deficiencies and other weaknesses in the IHR (1969) and changes in health situation in the world into consideration, WHO and member countries revised the IHR, which was adopted by the World Health Assembly in May 2005 and the new regulations came into force in June 2007.

IHR (2005)

On 23 May 2005, the World Health Assembly adopted the new International Health Regulations (IHR). The revised IHR came into force on 15 June 2007 in 193 member countries of the World Health Organization. The goal of the IHR is prevent the international spread of emerging infectious diseases such as severe acute respiratory syndrome (SARS), as well as other public health emergencies such as chemical and industrial accidents, that may affect populations across borders. The IHR (2005) are an update of the IHR (1969), which were limited to the reporting of just 3 infectious diseases, cholera, plague and yellow fever.
The IHR (2005) are broader in scope and require each country to report to the WHO any Public Health Emergency of International Concern (PHEIC), whether nuclear, biological or chemical in nature irrespective of the origin. Diseases notifiable under the IHR (2005) include unusual diseases such as small pox, wild poliovirus infection, human influenza (new subtype) SARS, epidemic prone diseases such as cholera,

pneumonic plague, Yellow fever, viral hemorrhagic fevers, West Nile fever and diseases of special regional concern such as dengue fever.

Requirements of the IHR 2005

The Requirements that need to be fulfilled by WHO member countries to comply with the IHR (2005) include.

I. Designing a national IHR focal point
II. Strengthening core capacity to detect report and respond rapidly to public health events
III. Assessing events that may constitute a PHEIC within 48 hours and notifying WHO within 24 hours of assessment
IV. Providing routine inspection and control activities at international airports, ports and ground crossings.
V. Examining national laws, revising health documents / forms and certificates and building a legal and administrative framework in line with the IHR requirements.

Notification Procedure

The IHR (2005) broaden the scope of the 1969 regulation to cover existing, new and re-emerging diseases including emergencies caused by non infectious agents.
The revised IHR, unlike the IHR (1969) which requests notification of only three diseases, has a wider scope. Hence the term Public Health Emergency of International Concern (PHEIC) was coined. It requires notification of all Public Health Emergencies of International Concern, including such diseases and public health events on a decision matrix developed to assess and notify such events.

National Focal Points

Designation of a national IHR focal point is a new concept in the revised IHR.
The role of the national focal point includes;

- Direct operational link of member states with WHO for notification and information sharing purposes.
- Implementing the revised regulations.

In Sri Lanka epidemiology and quarantine units are designated as joint IHR focal points.

Definition of core capacities

Another important area of change is defining core capacities required at the various levels for surveillance, early recognition, notification and response to PHEIC. The revised IHR clearly outline the various capacities required at points of international arrivals and departures, at central, district and community levels.

Recommended Measures

The regulations provide temporary and standing (continuous) recommended measures to be applied by member countries during Public Health Emergencies of International Concern.

These recommendations will be based on the assessed risk and severity and recommended measures commensurate with the WHO and may make such temporary or standing recommended measures following the assessment of PHEIC.
Routine sanitary measures at ports of arrival and departure would continue to be necessary.

External advice regarding IHR

The revised IHR has provisions for member states to seek external as required and for WHO to offer this support. An advisory panel of experts, an IHR emergency committee (for emergency recommendations) and an IHR review committee to settle disputes that may arise among counting are established. These committees will offer standing recommendation and advice an IHR functioning.

Definition of core capacities

The IHR (2005) set out the basic Public Health Capacities a state must develop, strengthen and maintain at the primary intermediate and national levels in order to detect, report and respond to public health risks and potential Public Health Emergencies of International Concern; In addition, specific capacities are required for the implementation of measures at designated international airports, ports and ground crossings.

These requirements are defined in Annex- 1 of the Regulations. The required public health capacities are summarized below.

1. Disease surveillance and response
2. Strengthen health security in international travel and airport

Minimum core capacity (Annex- 1.B) requirements

Strengthen Disease surveillance, reporting, notification, verification, response and collaboration activities.

At all times

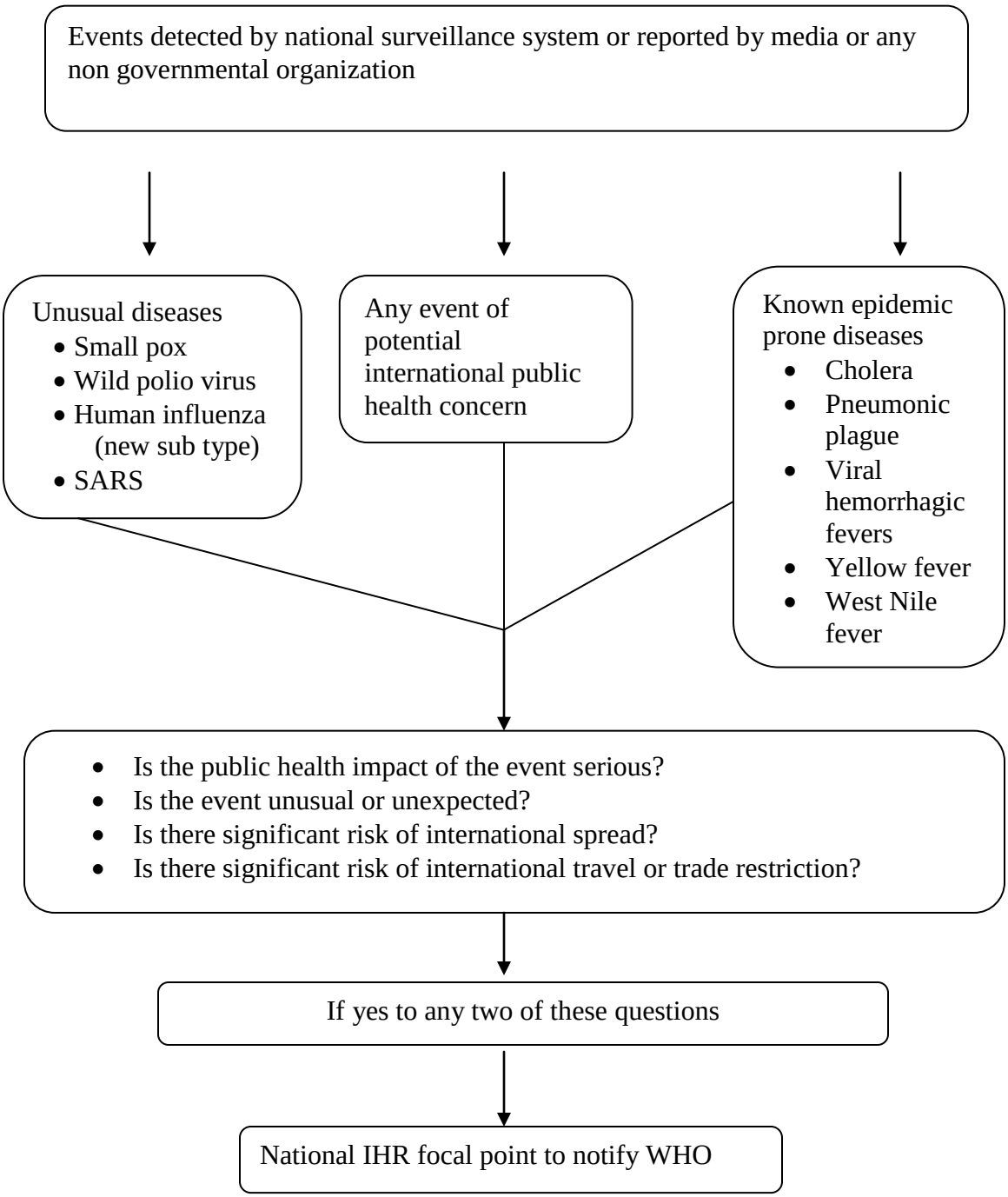
- Access to medical service
- Transport of ill travelers
- Inspection of conveyances
- Control of vectors / reservoirs

For responding to events

- Emergency contingency plan
- Arrangement for isolation (human / animal)
- Space for interview / quarantine
- Apply specific control measures

Notification

Each member country has to assess disease outbreaks and other public health emergencies using the decision instrument. And if found to be notifiable, should notify WHO within 24 hours of assessment. It is necessary to provide WHO with accurate and detailed public health information available to it on the notified event including case definitions, laboratory results, sources and type of the risk, number of cases and deaths, conditions affecting the spread of the disease and the health measures employed.



Simplified version of the decision instruments

According to IHR (2005) “Competent Authority” means am authority responsible for the implementation and application of health measures under the regulations. The Port health officer and airport health officers are the competent authority for Port and Air Ports respectively on matters related to public health.

Port health officer and airport health officers are assisted by Public Health Inspectors and Food and Drug Inspectors to carry out the public health functions under the regulations.

Some of the tasks the competent authority is expected to perform are;

1. Monitor vessels and goods to ensure that they are free of infection, contamination, disease vectors or reservoirs, granting of pratigue, ensure facilities such as canteens, toilets used by travelers at the air ports and ports are maintained in a sanitary condition; ensure air ports and ports premises are free from vectors such as mosquitoes and disease reservoirs; be responsible for supervision of fumigation, disinfection of vessels / containers / baggages, safe disposal of waste etc.

2. Monitor and control the discharge by ships of sewage, refuse, ballast water and other potentially disease causing matter which might contaminate the water of a port; responsible for supervision of health staff including the conduct of inspections and medical examinations as necessary.
Prepare a contingency plan to deal with an unexpected public health event or public health emergency.