

# 11. Control of communicable diseases and prevention of epidemics

## 11.1 The importance of communicable diseases in emergencies and disasters

The five most common causes of death in emergencies and disasters are diarrhoea, acute respiratory infection, measles, malnutrition and, in endemic zones, malaria. All except malnutrition are communicable diseases directly related to environmental health conditions, and even malnutrition is greatly exacerbated by communicable disease.

Disaster-affected people are particularly vulnerable to communicable diseases when the disaster and its immediate consequences reduce resistance to disease because of malnutrition, stress, fatigue, etc. and when post-disaster living conditions are unsanitary.

The control of communicable diseases depends on a healthy environment (clean water, adequate sanitation, vector control, shelter), immunization, and health workers trained in early diagnosis and treatment. Thanks to effective environmental health measures, epidemics following disasters are no longer common. Exceptions are the epidemics occurring in chronic emergencies triggered by drought and civil strife, such as those that occurred in Africa in the 1980s and 1990s, and the epidemics of communicable diseases that have swept refugee camps in Africa and other parts of the world. Functioning disease surveillance systems and intact environmental health services are crucial in protecting public health and in responding to these outbreaks when they occur in times of disaster.

The conditions leading to an epidemic are caused mostly by secondary effects and not by the primary hazard, except in the case of flooding, which can cause an increase in waterborne and vector-borne diseases (see Box 11.1). Other hazards may leave standing water or pollute, or interrupt drinking-water supplies. High winds, coastal storms, mud slides and even earthquakes can all result in standing water, especially where a “cascade” of physical effects occurs. For instance, in the Andes it is not uncommon for a volcanic eruption to melt ice and snow, creating floods, mud flows and rock falls. Earthquakes can trigger landslides that block rivers, causing flooding. In all these cases, excess standing water can promote the breeding of insect disease vectors, or contaminate water supplies with waste or sewage.

Both natural disasters and armed conflict may result in the breakage of water mains or the interruption of electricity supplies required to pump water. Sewer pipes and sewage treatment works may also be broken or rendered inoperable.

Besides waterborne and vector-borne disease, there may also be major epidemics of highly contagious diseases—those spread by personal contact. These are most commonly the result of crowding survivors living in crowded temporary accommodation without adequate ventilation or adequate facilities for personal hygiene and laundry.

The length of time that people spend in temporary settlements is an important determinant of the risk of disease transmission. The prolonged mass settlement of refugees in temporary shelters with only minimal provision for essential personal hygiene is typical of a situation that may cause epidemic outbreaks of infectious diseases (see Box 11.2). Camps established to provide food relief during famine are a special case, as large numbers of people who are already weak and possibly ill are likely to remain in such camps for a long time.

**Box 11.1 Flooding in the Czech Republic<sup>1</sup>**

Eastern areas of the Czech Republic were severely flooded in the summer of 1997. A total of 438 towns and villages were affected, and 2151 homes were destroyed. More than 200 000 people were left without electricity and 30 000 without gas. About 3500 wells and other water sources were contaminated and wastewater-treatment plants were rendered inoperable. The Centre of Microbiology of the Czech National Institute of Public Health took immediate action, in collaboration with the regional hygiene stations. All reports of outbreaks of typhoid fever, salmonellosis, shigellosis, acute diarrhoea, viral hepatitis A, tularaemia, invasive meningococcal disease, toxoplasmosis, leptospirosis and Lyme disease were evaluated, and a special hepatitis A vaccination programme was launched among 3–15-year-olds in selected areas. Postdisaster analysis showed that leptospirosis had increased threefold, but that there had been no demonstrable flooding effects in the other diseases targeted. No viral hepatitis A was reported from the populations vaccinated. Recommended follow-up measures included monitoring and controlling rodents.

<sup>1</sup> Source: B. Kriz, unpublished data, 1998.

**Box 11.2 Monitoring mortality among refugees in eastern Zaire<sup>1,2</sup>**

During the emergency phase of a relief operation, death rates should be expressed as deaths/10 000 per day to allow for the detection of sudden changes. In general, health workers should be concerned when crude mortality rates (CMRs) in a displaced population exceed 1/10 000 per day, or when under-five mortality rates exceed 2/10 000 per day.

In eastern Zaire in July 1994, the CMR among one million Rwandan refugees ranged from 34.1 to 54.5/10 000 per day, among the highest ever recorded. Between 6 and 10% of the refugee population died during the month after arrival in Zaire. This high mortality rate was almost entirely due to an epidemic of diarrhoeal diseases and inadequate water supply.

By the third week of the refugee influx, relief efforts began to have a significant impact. Routine measures, such as measles immunization, vitamin A supplements, standard disease-treatment protocols and community outreach programmes, were established in each camp, and the water-distribution system began to provide an average of 5–10 litres per person per day.

<sup>1</sup> Source: International Federation of Red Cross and Red Crescent Societies (1997b).

<sup>2</sup> Now the Democratic Republic of the Congo

A comprehensive overview of the public health consequences of various forms of disasters may be found in Noji (1997). Table 11.1 presents an overview of the disease problems most often encountered following disasters. Such problems are more likely to occur where predisaster conditions, such as those in many densely populated mega-cities, are unsanitary. Steps taken in advance to reduce poverty, increase the level of awareness and organization, and extend normal health and sanitary services will provide additional protection for the community if disaster strikes.

**11.2 Measures for controlling communicable diseases and epidemics****11.2.1 Preparedness and prevention**

Preparedness measures taken before a disaster can greatly increase the ability to control communicable diseases and prevent epidemics. Such measures include: training health and outreach staff in the identification and management of specific diseases considered

Table 11.1 Diseases affecting displaced populations in disasters

Disease	Symptoms	Environmental risk factors	Health hazards
Acute upper respiratory tract infections	All symptoms of the common cold, fever and heavy coughing. Chest pain and pain between shoulder blades in pneumonia.	Crowding, poor hygiene	Influenza and pneumonia may cause severe complications, especially in groups at risk
Diarrhoea	Watery stools at least three times a day, with or without blood or slime. May be accompanied by fever, nausea or vomiting.	Contaminated drinking-water or food, or poor sanitation	Dehydration, especially in children, shown by dark colouration of urine, dry tongue or leathery skin
Measles	A disease of early childhood, characterized by fever and catarrhal symptoms, followed by maculopapular rash in the mouth.	Crowding, poor hygiene	Severe constitutional symptoms, high case fatality rate
Malaria	Painful muscles and joints, high fever with chills, headache, possibly diarrhoea and vomiting.	Breeding of <i>Anopheles</i> mosquitoes in stagnant water bodies	Disease may rapidly become fatal, unless medical care is provided within the first 48 hours
Meningococcal meningitis	Infected persons may show no symptoms for a considerable time. When an epidemic is in progress, headache, fever and general malaise will suggest the diagnosis, which must be confirmed by lumbar puncture.	Crowding	Often fatal if untreated at an early stage; neurological problems in survivors
<i>Shigella</i> dysentery	Diarrhoea with blood in the stools, fever, vomiting and abdominal cramps.	Contaminated drinking-water or food, or poor sanitation, poor hygiene	Case fatality rate may be high
Viral hepatitis A	Nausea, slight fever, pale-coloured stools, dark-coloured urine, jaundiced eye whites and skin after several days.	Poor hygiene	Long-term disabling effects
Louse-borne typhus	Prolonged fever, headache, body pains.	Unhygienic conditions leading to lice infestations	May be fatal without treatment
Typhoid fever	Starts off like malaria, sometimes with diarrhoea, prolonged fever, occasionally with delirium.	As for diarrhoea	Without appropriate medical care, may lead to fatal complications in a few weeks
Cholera	Modest fever, severe, but liquid diarrhoea (rice water stools), abdominal spasms, vomiting, rapid weight loss and dehydration.	As for diarrhoea	As for diarrhoea
Dengue and dengue haemorrhagic fever (DHF)	High fever, headaches, pain in muscles and joints, red spots on skin.	Breeding of <i>Aedes</i> mosquitoes in natural or artificial containers, filled with water	Dengue usually runs a mild course. DHF, however, is often accompanied by heavy haemorrhages, which may be fatal
Diphtheria	Inflamed and painful throat, coughing.	Crowding, poor hygiene	A secretion is deposited in the respiratory tract, which can lead to asphyxiation

Table 11.1 (continued)

<b>Disease</b>	<b>Symptoms</b>	<b>Environmental risk factors</b>	<b>Health hazards</b>
Tetanus	Muscle spasms, starting in the jaws and extending to the rest of the body over several days	Poor hygiene, injury	Fatal
Rabies	Fatigue, headache, disorientation, paralysis, hyperactivity	Bite from infected animal host	Fatal if untreated
Relapsing fever (louse-borne or tick-borne)	Acute high fever at intervals	Unhygienic conditions leading to lice or tick infestations	Often fatal in untreated persons, depending on immunity levels
Heat stress	Elevated body temperatures, nausea, vomiting, headache	Excessive temperatures	Risk of coma

to be a threat; creating local stocks of supplies and equipment for diagnosis, treatment and environmental health measures in case of disease outbreaks; strengthening health-surveillance systems and practicing protocols for managing information on certain diseases; raising awareness among the population likely to be affected by a disaster on communicable diseases and the need for early referral to a health facility.

Acute respiratory infections and diarrhoea are most often the major killers in emergency situations. To prevent them, hygiene promotion, the provision of adequate quantities of safe water, sanitation facilities and appropriate shelter are absolutely necessary. Measles outbreaks are a common hazard in emergencies, often with a high case fatality rate. Early vaccination campaigns should be considered before any cases appear.

### 11.2.2 Public-health surveillance

Public-health surveillance is the collection, analysis and dissemination of health information to enable appropriate action to be taken. This is particularly important in disasters and emergencies because of the particular vulnerability of the affected population, the sudden changes that can occur in health due to the unstable nature of the situation, and the need to share quantitative data rapidly with a range of partners to enable rapid and effective action to be taken (Médecins Sans Frontières, 1997a).

It is important to designate specific health staff for public-health surveillance. Neighbourhood and community health workers, as well as the personnel of temporary relief centres and hospitals, should be alert to patients presenting with any of a list of diseases, including typhoid or paratyphoid fever, cholera, typhus, plague, encephalitis or meningitis, as well as to excessive numbers of poisonings (including food poisoning) or cases of malaria. Histories should be taken from these patients, contacts identified, and the source of the disease isolated. Surveillance of public-health problems may be possible to some extent even under the worst conditions of large-scale population movement. Existing reporting systems can be extended to create an area-wide surveillance system that covers priority diseases, including serious water- and sanitation-related epidemic diseases.

Figure 11.1 is a specimen weekly surveillance summary sheet to report results from health-care centres to a central epidemiological surveillance unit. This may need to be adapted for specific emergencies.

Active surveillance of population movements can provide data for planning emergency interventions and for general disease surveillance. A system will be required for tracking the locations of large, dense settlements and for surveillance of population

Figure 11.1 Specimen weekly surveillance summary sheet<sup>1</sup>

<b>WEEKLY MORBIDITY/MORTALITY SURVEILLANCE FORM</b>						
District/Town/Settlement/Camp:						
Health clinic: Reporting period: Name and signature of reporting officer:						
Reported main cause of illness/death (final diagnosis)	<5 YEARS		5 YEARS AND OLDER		Total	
	CASES	DEATHS	CASES	DEATHS	CASES	DEATHS
Acute watery diarrhoea						
Bloody diarrhoea						
Suspected cholera						
Severe RTI/pneumonia						
Suspected malaria/fever of unknown origin						
Malnutrition						
Measles						
Meningitis						
Trauma						
Acute jaundice syndrome						
Other/unknown						
<b>Total</b>						

Average crude mortality rates (deaths/10 000 total population/day) \_\_\_\_\_  
 Average under five year old mortality rates (deaths/10 000 total under fives/day) \_\_\_\_\_

<sup>1</sup>RTI = respiratory tract infection.

movements. Small teams of observers at key transport nodes—bridges, passes and major junctions—can help to provide detailed information on movement patterns, e.g. the numbers and demographic profile of people moving on foot, the numbers and types of vehicles, their occupants and average loading, the types of possessions carried, and the stated destinations. This information can help staff to anticipate future patterns of settlement. Aerial surveillance can also assist. The most effective approach is usually to extend the routes and patterns of reporting used by existing administrative structures in the areas where people are arriving.

### 11.2.3 Outbreak control

Suspected disease outbreaks, indicated by information from a health surveillance system, should be rapidly investigated using standards protocols for assessment (Médecins Sans Frontières, 1997a; World Health Organization, 1999b). The assessment should enable decisions to be taken on how to control the outbreak.

The two main strategies for controlling outbreaks of communicable disease are to reduce the number of cases through preventive activities and to reduce mortality due to the disease through early case detection and effective treatment. These measures should be put into place rapidly, and should not be delayed while waiting for laboratory confirmation of the disease in question. The key to effective outbreak control is a rapid response, before the outbreak develops into a major epidemic. Mass immunization is a priority in emergency situations, where people are displaced, there is disruption of normal services, there are crowded or insanitary conditions and/or where there is widespread malnutrition, regardless of whether a single case of measles has been reported or not. One confirmed case of cholera should prompt all diarrhoea cases to be treated as cholera.

Preventive and curative measures work together to reduce the sources of infection by rapidly isolating and treating patients and controlling animal reservoirs; to protect susceptible groups through immunization, nutritional support and possibly chemoprophylaxis (e.g. to protect vulnerable individuals in the case of a malaria outbreak); and to reduce transmission through improvements in hygiene conditions and hygiene behaviour.

The role of outreach workers in these three activities is important. They can inform people about the disease and encourage early referral of patients to a treatment/isolation centre; identify vulnerable families and individuals requiring particular support or protection; and encourage improvements in hygiene conditions and hygiene behaviour by identifying areas where facilities need to be improved and protective hygiene behaviours need to be promoted.

### 11.3 The control of cholera: an example

Cholera is used as an example because the disease remains endemic in many parts of Africa, Asia and Latin America. In the early 1990s, cholera epidemics affected millions of people in Africa and Latin America. Its prevention and control in emergencies provide examples of general approaches to be adopted with other epidemics.

“Healthy” cholera carriers (i.e. people carrying *Vibrio cholerae* with no manifest disease) are now common in the general population of many developing countries. Although most cases of cholera are mild and treatable with simple measures, the disease can rapidly progress and result in death from dehydration. It can also spread easily where there is rudimentary sanitation and crowding, as in a refugee camp. It is therefore important to plan ahead in order to prevent cholera by the proper management of the water supply, sanitation and food hygiene in camps.

Those responsible for routine health surveillance should be alert to the possibility of cholera, should be familiar with the signs of the disease and should report suspected cases promptly to the authorities. Plans should also be made for the necessary steps to be taken if cholera does break out. These should specify the additional health and environment measures to be taken, as well as how to treat cholera patients.

A case of cholera should be suspected when:

- in an area where the disease is not known to be present, a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhoea;
- in an area where there is an outbreak of cholera, any patient aged 5 years or more develops acute watery diarrhoea, with or without vomiting (World Health Organization, 1993b).

Although cholera can be treated, it cannot be controlled by vaccinations or by mass chemotherapy, but only by redoubling efforts to safeguard water supplies; maintaining a high free residual chlorine level (preferably 0.4–0.5 mg/l) in water supplies; disposing

of faeces so as not to contaminate water or food; encouraging hand washing with soap or ashes; and encouraging hygienic preparation and storage of food. The role of hygiene education in these control measures is critical.

Patients suspected of suffering from cholera should be treated in a place set aside for this purpose. One arrangement for dealing with cholera in a refugee camp is described in Box 11.3. In areas where an outbreak of cholera is possible, supplies and equipment for outbreak control and treatment should be stored locally to deal with the first stages of an outbreak; staff should be trained in case management; and the population should be made aware of the risk of an outbreak, the need for early referral of patients with diarrhoea, and preventive measures they can take. For further information on clinical treatment of cholera see: World Health Organization (1993b).

## 11.4 Further information

For further information on:

- the control of communicable diseases in emergencies, see: Benenson (1995), Perrin (1996), Médecins Sans Frontières (1997a), Sphere Project (2000);
- planning medical supplies, equipment and drugs, and handling donated drugs in general, see: United Nations Development Programme, Inter-Agency Procurement Services Office (1995).

### Box 11.3 Epidemic cholera in refugee camps<sup>1</sup>

Cholera can spread very quickly in overcrowded living areas. If an epidemic breaks out:

#### Control

- An emergency treatment facility should be established.
- Apart from patients, people visiting the facility should be limited to those giving care.
- Stored drinking-water should be purified with at least 0.2mg per litre of free residual chlorine.
- Sodium hypochlorite or calcium hypochlorite should be added to water at the following chlorine concentrations:
  - 0.05% (0.5 g per litre) for washing;
  - 0.2% (2 g per litre) for cleaning walls and floors;
  - 1% (10 g per litre) for disinfecting contaminated bedding and clothes, and for cleaning latrines.

#### Public-health measures

- Treat wells in the affected area; cover them if possible. Appoint someone to treat each collected bucket of water with sodium hypochlorite or calcium hypochlorite. Ideally this should be done at every well when the water is collected.
- Health workers should regularly visit households to detect cases.
- Gatherings of people should be restricted.
- Carry out precautionary measures to reduce contamination of food sold in markets.
- Test samples of water for the presence of *Escherichia coli*. This indicates faecal pollution and the possible presence of bacteria that cause diarrhoea.
- Send stool samples for laboratory testing, if possible, to confirm the presence of cholera.
- Good record keeping (number of cases and deaths) at clinics and treatment centres will help in assessing whether the epidemic is getting worse, or whether public-health measures are having a positive effect.
- Use patient records to plot outbreaks on a map of the camp.
- Disinfect homes of patients if resources are available.

<sup>1</sup> Source: Chartier, Diskett & UNHCR (1991).