

MODULE

Health Consequences of Disaster

For the Ethiopian Health Center Team



**Ethiopia Public Health
Training Initiative**

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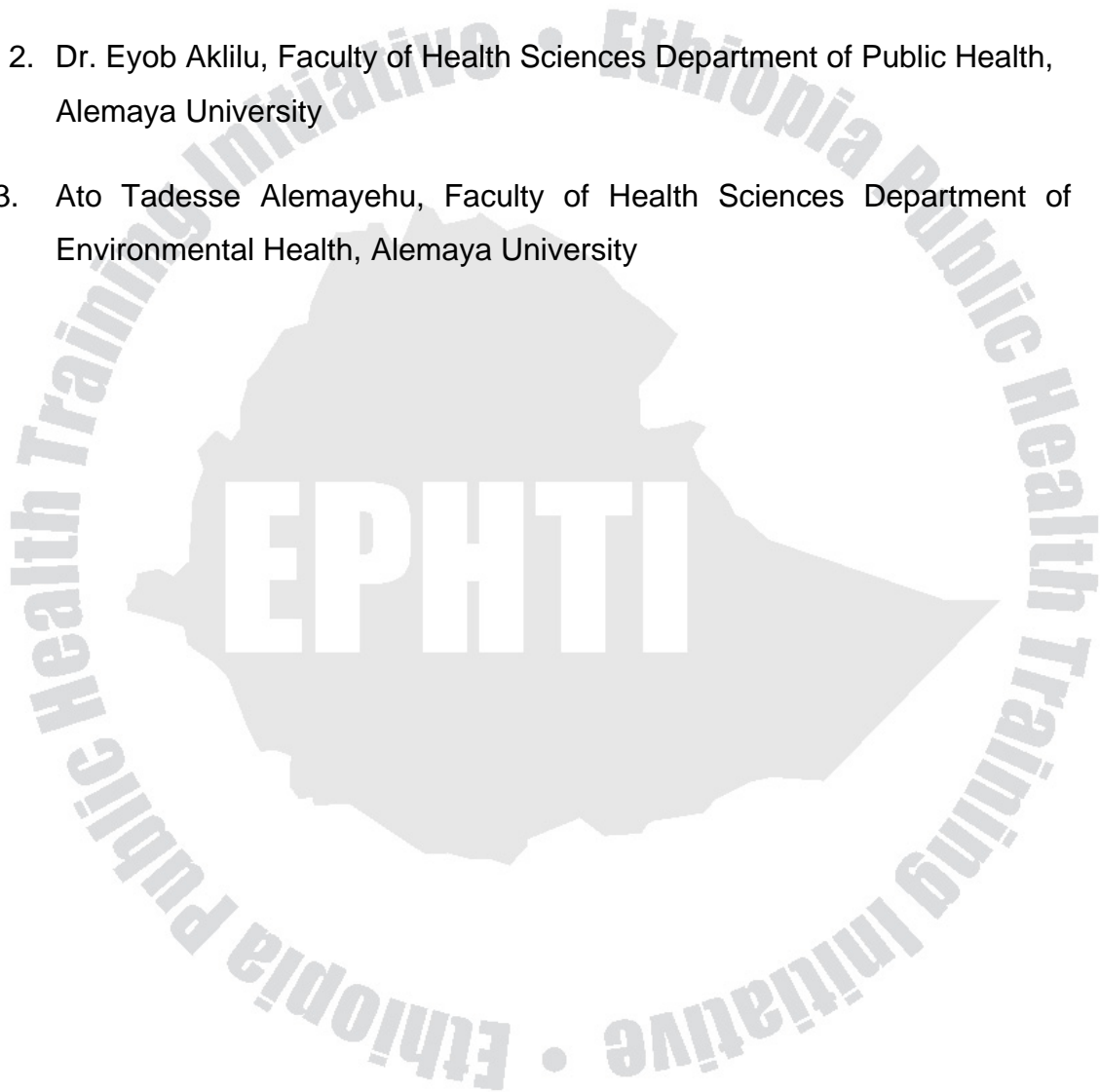
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TABLE OF CONTENTS

<u>TOPIC</u>	<u>PAGE</u>
Table of Contents.....	i
Contributors	ii
Acknowledgements.....	iii
UNIT ONE Introduction	
1.1. Purpose and use of the module	1
1.2. Directions for using the module.....	1
UNIT TWO Core Module	
2.1. Pre tests for all categories of health workers	3
2.2. Significance and brief descriptions of the problem	7
2.3. Learning objectives	8
2.4. Case study: learning activities.....	8
2.5. Definition	9
2.6. Epidemiology.....	9
2.7. Causes of Disasters	11
2.8. Health consequence of Disaster	12
2.9. Prevention and Control of Disaster	25
UNIT THREE Satellite Modules	
3.1. Satellite module for health officers	34
3.2. Satellite module for public health nurses.....	40
3.3. Satellite module for environmental health technicians	44
3.4. Satellite module for medical laboratory technicians	61
3.5. Satellite module for community health workers	67
3.6. Take Home Messages for care givers.....	72
UNIT FOUR Task Analysis for the Different Health Center Team Members	73
UNIT FIVE Glossary	76
UNIT SIX Abbreviations	75
UNIT SEVEN References	79
Annexes	
Annex 1. Answer keys for pre and post tests for all categories.....	81
Annex 2. Additional information for health officers and public health nurses ...	85

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UNIT ONE

INTRODUCTION

1.1. Purpose and Use of the Module

This module is intended to serve as a general learning material about the health consequences of disaster by the health center team: health officers, public health nurses, environmental health technicians (sanitarians), and medical laboratory technicians. The basic and general concepts about disasters and their health consequences, their causation, epidemiology, prevention and control strategies are discussed in a simple and understandable way. It can also be used by other categories of health professionals. It should be noted, however, that it is not a substitute to a standard text book. This module can also be used as a reference material for professionals working in health centers. It may be used as a learning material in training, workshops, and seminars for members of the health center team, community health workers, care givers and patients.

1.2. Directions for using the module

Before starting to read this module, please follow the directions given below:

- Go through all the contents of the core module by starting with the pre-test
 - Use a separate sheet of paper to write your answers and label it “pre-test answers.” The pre-test has two portions: Part I and Part II.

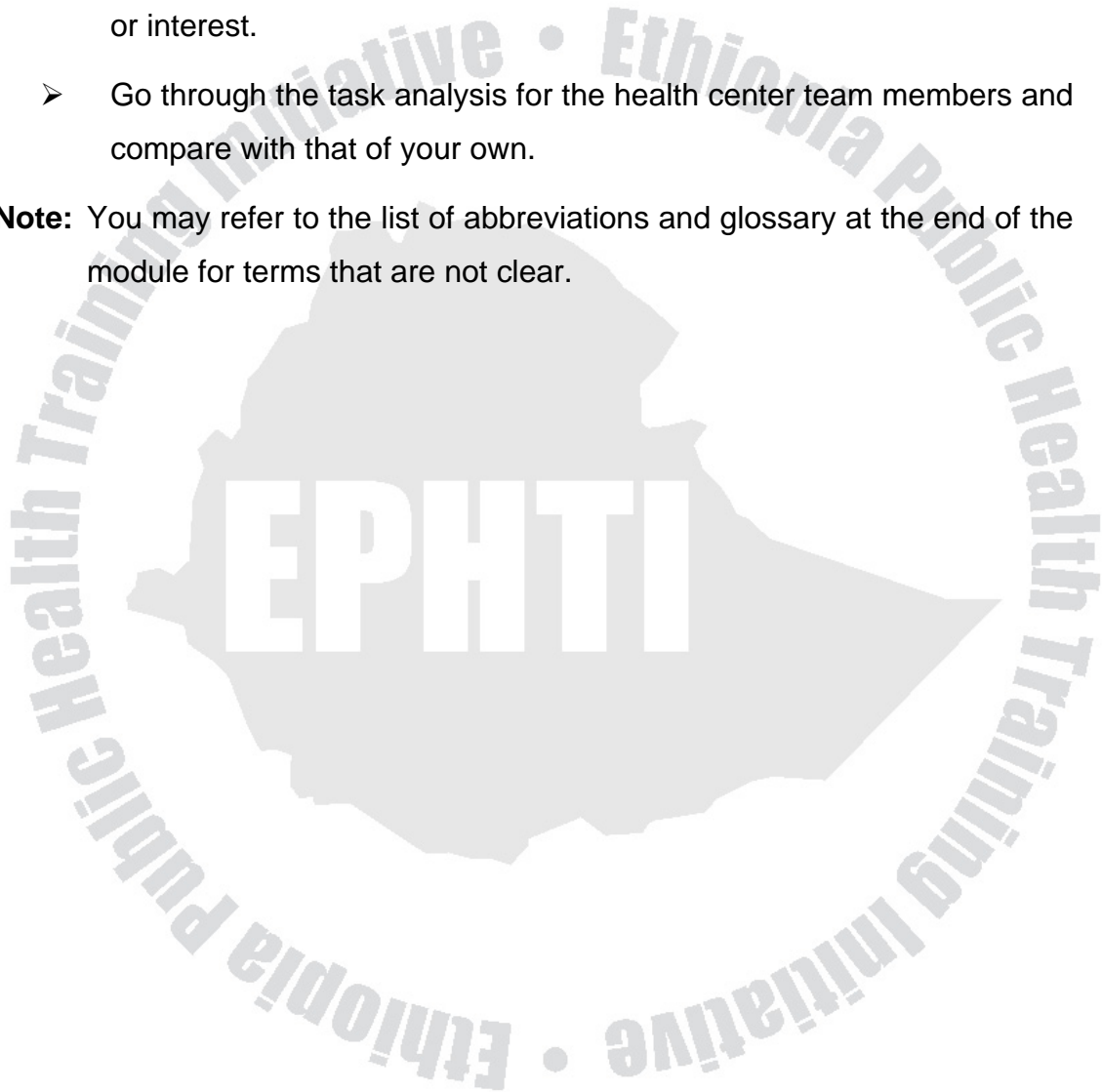
Part One: Contains common questions to be answered by all categories of the health center team.

Part Two: The questions are prepared for the specific categories; Health Officer (HO), Public Health Nurse (PHN), Environmental Health Technician (EHT) and Medical Laboratory Technician (MLT).

Select and do the questions of the portion appropriate to your professional category.

- When you are sure that you are through with the Core Module proceed to read the satellite module corresponding to your profession or interest.
- Go through the task analysis for the health center team members and compare with that of your own.

Note: You may refer to the list of abbreviations and glossary at the end of the module for terms that are not clear.



UNIT TWO

CORE MODULE

2.1. Pre-test:

2.1.1. Pre-test for all categories of health workers

1. Which is the most common immediate health consequences of flood?
 - A. Water washed disease
 - B. Malaria outbreak
 - C. Malnutrition
 - D. Death and injury
2. The adverse effects of pest infestation include
 - A. Famine
 - B. Food shortage
 - C. Economic stress
 - D. All
3. Which one of the following is not a preventive measure for landslide?
 - A. Hazard mapping
 - B. Community education
 - C. Legislation and land use regulations
 - D. None of the above
4. List some measures that can be taken by the health center team to prevent health consequences of flood.
5. List some of the impacts of drought on health.
6. Describe the role of the health center team to reduce health consequences in drought stricken areas.
7. What is the most common cause of famine in our country?
8. Where do you put fire and explosion in the classification of disaster?
9. Who in the community is most affected by a disaster due to fire and explosion?
10. List the health consequences of explosion.
11. Describe the health consequences of disaster.

12. What are the prevention and control measures for malaria epidemics?
13. What causes deforestation?
14. Describe the adverse effects of deforestation

2.1.2. Pre-test for health officers

1. How can a disaster be anticipated?
2. Which anthropometric measurements are used for nutritional assessment?
3. How is malnutrition diagnosed?
4. What are the specific duties of the health officer when disaster happens?
5. What is the role of the health officer in managing a disaster causing injuries?

2.1.3. Pre-test for public health nurses

1. What is the role of public health nurses in disaster preparedness?
2. What is the role of public health nurses in disaster response?
3. What is the role of public health nurses in disaster recovery?

2.1.4. Pre-test for environmental health technicians

1. Which of the following is not the effect of disaster on environmental health services?
 - a) Contamination of water and food
 - b) Damage to infrastructures of water supply and waste management services
 - c) Transportation failure
 - d) Increase in vector breeding sites
 - e) None of the above
2. Describe the recommended quantity of water needed for a person during disaster relief operations.
 - a) In field hospitals
 - b) In mass feeding centers
 - c) In temporary shelters and camps
 - d) In washing installations

3. During emergency situations after a disaster, over-chlorination of drinking water is recommended.
- A. True
 - B. False
4. Burial of the dead corpses from the disaster scenes is not the concern of health workers.
- A. True
 - B. False
5. The dosage of chlorine disinfectants is not affected by the quality of water to be treated.
- A. True
 - B. False
6. What are the strengths of commonly available halazone tablets and what amount of clear water is disinfected by these?
7. What are the common chlorine compounds that we use for disinfecting small amounts of water in emergency conditions?
8. What are the possible sources of drinking water for disaster-stricken population?
9. What is the chemical that we use to eliminate high chlorine concentration in disinfected water and what is the application rate of this chemical?
10. What are the commonly used excreta disposal methods in a disaster stricken area?
11. Which of the following is not a preferred option for the disposal of solid waste in a disaster affected area?
- A. Sanitary landfill
 - B. Burial
 - C. Incineration
 - D. Open dumping
 - E. None of the above

2.1.5. Pre-test for medical laboratory technicians

1. A commonly used disinfectant in laboratory is
 - A. Formaldehyde
 - B. 70% alcohol
 - C. Ether
 - D. Physiological saline
 - E. None
2. The preferable sites for capillary puncture adults include
 - A. Ear-lobe
 - B. Finger tip
 - C. Heel
 - D. A and B
3. Which of the following is a medium used for stool samples?
 - A. Cary – Blair medium
 - B. Buffered saline
 - C. Eosin
 - D. All

2.2 Significance and brief descriptions of the problem

Within the last two decades, disaster in the world has increased both in frequency and in its impact on human settlements. Disasters can affect one family at a time, as in a house fire, or they can kill thousands and have economic losses in the millions, as with floods, earthquakes, famines, and epidemics. The urbanization and overcrowding of cities have increased the danger of natural disaster because communities have been built in areas that are vulnerable to disasters. Overcrowding and urbanization have also increased human made disasters. The stress caused by overcrowding has promoted civil unrest and riots. In some part of the world, modern warfare waged over land rights and space has markedly increased the risk of injury and death from disaster (1).

Over the last 10 years, major natural disasters have caused a total economic loss of over 3.2 trillion Eth birr (2). The loss of life has also been dramatic. Approximately 3 million lives have been lost world wide in the past 20 years as a result of earthquakes, volcanic eruptions, landslides, floods, tropical storms, drought, and other natural disasters. In addition to mortality, 1 billion more people have had to cope with the injuries, diseases, and homelessness that always follow disasters (1).

The burden of natural disasters throughout the world falls disproportionately on developing countries; For example, a person living in a developing country is 12 times more likely to perish in a natural disaster than a person living in the developed countries (1).

According to report by Center for Research on the Epidemiology of Disaster, Ethiopia stood as one of the worst countries in the world with respect to average per year mortality related to disasters during 1960 - 1993 (3).

2.3. Learning objectives

Up on completion of this module, the learner will be able to:

1. Define disaster
2. Describe the epidemiology and significance of disaster
3. Classify the types and causes of disaster
4. Identify the most common types of disaster in Ethiopia
5. Describe the health consequences of disaster
6. Plan for the necessary intervention in cases of disaster
7. Design appropriate preventive and control measures in disaster situations
8. Identify the roles of CHW and care giver in management, control and prevention of disaster

2.4. Case study

Read the following story and answer the questions following it

Learning activity 1

Village Dunfo was a very natural green and healthy place to live just 10-15 years ago. People from the neighboring region were attracted to this village to have a better life, so rapid population growth occurred.

As the need to build houses and farming increased, deforestation was inevitable. Gradually the area started to lose its green nature. The climate was getting drier and hotter. The rain expected during wet season started to skip seasons. The harvest could not meet the need of the community as production decreased and population increased. Drought was becoming a common event.

Consequently, people became refugees as they left their homes when they could no longer support themselves. Those who have no place to go were

most vulnerable. They were made to stay in the nearby camp to get food and water by the regional authorities. After 3 days of being in the camp many children under 5 years of age started to have fever, vomiting and diarrhea after an unexpected 24 hours of intense rain. Many of the affected children died and later, even adults started to be affected by a similar illness.

Questions related to case study

1. What are the possible reasons for displacement of the people from the village Dunfo?
2. Who are the most vulnerable groups in such a disaster?
3. Why do you think large numbers of people are affected at the same time?
4. What can the health center team contribute in preventing the drought?
5. Which sectors in the community do you think are responsible for alleviating the drought?
6. What do you think is the most likely disease occurring in the camp?
7. What is the role of the health center team in tackling the epidemic?
8. What can the health center team do to prevent the occurrence of such disease in a mass displaced community?

2.5. Definition

Disaster is any human made or natural event that causes destruction and devastation that cannot be alleviated without assistance (1).

2.6. Epidemiology

The effects of a disaster vary depending on the characteristics of the exposed elements and on the nature of the event itself. The elements at risk are the environment, people, and socio economic structures: e.g. industries, housings, etc.

Among the various members of the community, it is possible to single out groups which had specific risks before disaster, may find themselves in increased difficulties after the disaster. This risk is determined by the

potentially harmful effects in these groups that the environment may exert after the disaster. The two aspects of the risk include: biological and social.

1. Biological: The specific relative weakness of certain individuals in relation to the difficulties that may arise after the disaster.

2. Social: The specific cultural and socio political factors that may place certain groups in difficulty (4).

The main causes of disaster are drought, locusts, wars, civil conflicts, floods, cyclones, food shortages, epidemics, and technological failures. They occur more often than they used to and are deadlier and more destructive.

Currently, new and complex chemical technologies are proliferating in the industrialized world. Simultaneously, more hazardous technologies are coming in to use in communities in the developing world. As a result, industrial and chemical accidents (technological disasters) are likely to become more frequent and larger in scope, and will probably have more serious consequences. For instance, the escape of 40 tons of toxic gas from the Union Carbide pesticide production plant in the Indian city of Bhopal in 1984 led to the death of 2,500 people. Over 100,000 others were seriously injured, 200,000 were partially disabled and 180,000 were adversely affected in one way or another some 150,000 others are still reported to be suffering from the adverse effect of the Bhopal catastrophe (5).

The total number of people affected by drought and famine since 1960 amount to over 245 million and nearly 2 million has been killed as a direct result of these events. According to the report by Center for Research for Epidemiology of Disaster, the first three causes of natural disaster were drought (36%) flood (21%) and epidemic (17%). Similarly, accidents (49%), civil strife (19%), and displacement (17%) were the leading causes of disasters occurring between 1960 and 1963 world wide (6).

The main causes of disaster are draught, locusts, wars; civil strife, floods, cyclones, food shortage, epidemics, and technological failure. They occur

more often than they used to and are deadlier and more destructive. Disasters in Africa have caused disability, displacement, epidemics, health hazards, psychological problems, famine, malnutrition, and the deterioration of the environment. (7)

Ethiopia is a country endowed with a wealth of human and natural resources. Yet its history is plagued by disasters. The most common ones include food shortages, famine, epidemics, and conflicts. For example the number of people affected by the humanitarian crises in Ethiopia has reached 10.5 million. This total includes 300,000 internally displaced persons in the Tigray region as a result of border conflict with Eritrea (4). Currently number of people suffering from famine has reached nearly 15,000,000 according to media reports.

2.7. Causes of disasters

Etiologically disasters can have two major causes.

1. Natural causes
2. Human causes (Human-made)

I. Natural causes: Natural disasters include storms, earth quakes, land slides, draughts, floods, epidemics and pests. Some natural disasters are difficult to predict although in some cases they can be controlled to a degree. Earth quakes, volcanic eruptions, tidal waves, and hurricanes are examples of hazards that cannot yet be prevented in practice, while floods, droughts, and landslides can be controlled or mitigated through public works involving drainage and soil stabilization.

II. Human causes: Human-made disaster can be caused deliberately or can be due to a technical defect that triggers a string of failures causing major disasters. There is a wide range of possible disasters of technological origin. At present, urban centers and ports are highly susceptible to this type of event due to high density of industry,

buildings and mass transportation of cargo and people (2). The following are examples of human made disasters: fire, environmental pollutions, conflicts and deforestation.

2.8. Health consequence of disaster

2.8.1 Health problems common to all disasters

Sudden natural disasters are often believed to cause not only widespread death but also massive social disruption and outbreaks of epidemic disease and famine which can leave survivors entirely dependent on outside relief. Systematic observation of the effects of disaster on human health has led to rather different conclusions, both about the effects of disaster on health and about the most effective ways of providing relief. Though all disasters are unique in that they affect areas with differing social, medical, and economic backgrounds, there are similarities between disasters which, if recognized, can optimize the management of health relief and use of resources. The following three points can be noted (8):

- a. There is a relationship between the type of disaster and its effect on health. This is particularly true of the immediate impact in causing injuries: earthquakes regularly cause many injuries requiring medical care, while floods and tidal waves cause relatively few.
- b. Some effects are a potential rather than an inevitable threat to health. For example, population movement and other environmental changes may lead to increased risk of disease transmission, although epidemics generally do not result from disasters.
- c. The actual and potential health risks after disaster do not all occur at the same time. Instead, they tend to arise at different times and to vary in importance within a disaster-affected area. Thus, casualties occur mainly at the time and place of impact and require immediate medical care, while the risks of increased disease transmission take longer to develop and are

greatest where there is crowding and standards of sanitation have declined.

Disaster-created needs for food, shelter, and primary health care are not a necessity for all types of disasters. Even displaced persons often salvage some of the basic necessities of life. Further, people generally recover quickly from their immediate shock and spontaneously engage in search and rescue, transport of the injured, and other private relief activities. (8). Thus the relief should be focused based upon an assessment of needs at the disaster site.

Effective health relief management depends on anticipating and as they arise identifying problems and delivering specific materials at the precise time and points where they are needed. The following are some of the common health problems arising in all types of disasters regardless of the type and causes (9).

1. Social reactions

Rumors spread quicker than many of other secondary effects of disasters such as diseases. They are also often difficult to extinguish. Rumors may cause considerable pressure on the authorities to undertake relief work such as mass vaccination against typhoid or cholera for which there is no sound technical reason. After earthquakes or before predicted floods, for example, people are reluctant to evacuate even if their homes have been or are likely to be completely destroyed.

2. Population displacements

When large spontaneous or organized population movements occur, an urgent need to provide relief is created. People may move to urban areas where public services cannot cope, and the result may be an increase in morbidity and mortality. If much housing has been destroyed, large population movements may occur within urban areas as people seek shelter with relatives and friends. This happened following the 2000 flood in Dubti, Awash (10)

3. Communicable diseases

Disasters do not usually result in outbreaks of infectious diseases, although in certain circumstances they do increase the potential for disease transmission. Theoretical risk for epidemics occurring after selected disasters that occur in Ethiopia is shown in table 2.1. The most frequently observed increases in disease are caused by fecal contamination of water and food; hence, such diseases are mainly enteric. The risk of epidemic communicable diseases is proportional to population density and displacement, which increases the load on water and food and its risk of contamination, as in refugee camps, disruption of preexisting sanitary services such as piped water and sewerage, and failure to maintain or restore normal public health programs in the immediate post disaster period.

Table 2.1: Theoretical risk for epidemics occurring after selected disasters that occur in Ethiopia (11)

Disaster type	Person to person	Waterborne	Food borne	Vector borne
Flood	Medium	High	Medium	High
Earthquake	Medium	Medium	Medium	Low
Fire	Low	Low	Low	Low
Famine	High	High	Medium	Medium
Refugees	High	High	High	Medium
Industrial accident	Low	Low	Low	Low

KEY: Person to person: meningitis, measles, tuberculosis, STIs

Waterborne: Typhoid, paratyphoid fevers, cholera, hepatitis, diarrheas.

Food borne: Similar to waterborne

Vector borne: Louse borne typhus, relapsing fever, malaria

4. Climatic exposure

Health hazards of exposure to the different types of climatic conditions are not serious even after disasters in cold countries. As long the climate is dry, people reasonably well clothed, and able to find windbreaks, death from exposure does not appear to be a major risk. The need to provide emergency shelter therefore varies greatly with local conditions. However, problems related to exposure to hot climate like dehydration and heat stroke should not be overlooked.

5. Food shortage and malnutrition

Food shortages in the immediate aftermath arise in three ways: First, chronic limited food supplies may cause food insecurity even in a non disaster situation. Second, food stock destruction with in the disaster area for example by armed conflict, flooding, and spoilage may worsen the already limited food supply. Third, disruption to distribution and access to available food supplies by the food distribution infrastructure may also worsen food shortages. This occurs during natural disasters such as earthquakes or floods as well as human-made disasters. As a result of the above factors food shortage may cause acute malnutrition in the affected individuals. The most vulnerable groups to malnutrition are children, pregnant and lactating women and the elderly.

6. Mental health

Anxiety, depression and other neurotic psychiatric problems following disasters are not major, acute public health problems, and family and neighbors can generally deal with them temporarily. Wherever possible, efforts should be made to preserve family and community social structures. Mental health problems in disaster are classified as those occurring during the acute phase and chronic phase. The acute phase includes anxiety neurosis, depression immediately after the event. Chronic phase includes depression, post traumatic stress disorder and somatization after months or years of event. The indiscriminate use of sedatives and tranquilizers during the emergency relief phase is strongly discouraged. In developed countries,

mental health problems are reported to be significant during long-term rehabilitation and reconstruction and may need to be dealt with during that phase.

2.8.2. Causes and health consequences of specific disasters

1. Deforestation

The major causes for deforestation are the spread of farming and grazing, fire wood collection and timber harvesting. The above causes contribute to other hazards by removing root systems which stabilize the soil, allow percolation of water in to the soil and retain moisture in soil. Deforestation results in loss of forest resources such as fruits and medicines. It also contributes to other hazards, like flooding, drought, famine, desertification, environmental pollution and global warming. Prevention of desertification includes protection of forests through legislation and management, reforestation, community education, promoting fuel alternatives to wood and initiating soil conservation measures (12).

2. Drought

Climate variability and more specifically drought are one contributing factor of African famine. Drought implies significant decrease in rainfall relative to the amount of water the society needs. Meteorological drought is reduction in water resources.

Drought occurrence may be due to human activity, natural climatic trends and random phenomena. Random phenomena like increased population are thought to play major role in droughts. Secondary effects of increase population include environmental degradation, caused by over-cultivation, overgrazing and deforestation. These expose bare soil and rock that reflect more solar radiation back in to the atmosphere than do grass, shrubs and trees. This keeps the atmosphere warmer, disperses clouds and reduces rainfall.

The most obvious health effects of drought are malnutrition, disease and death. However, mass population displacement and subsequent

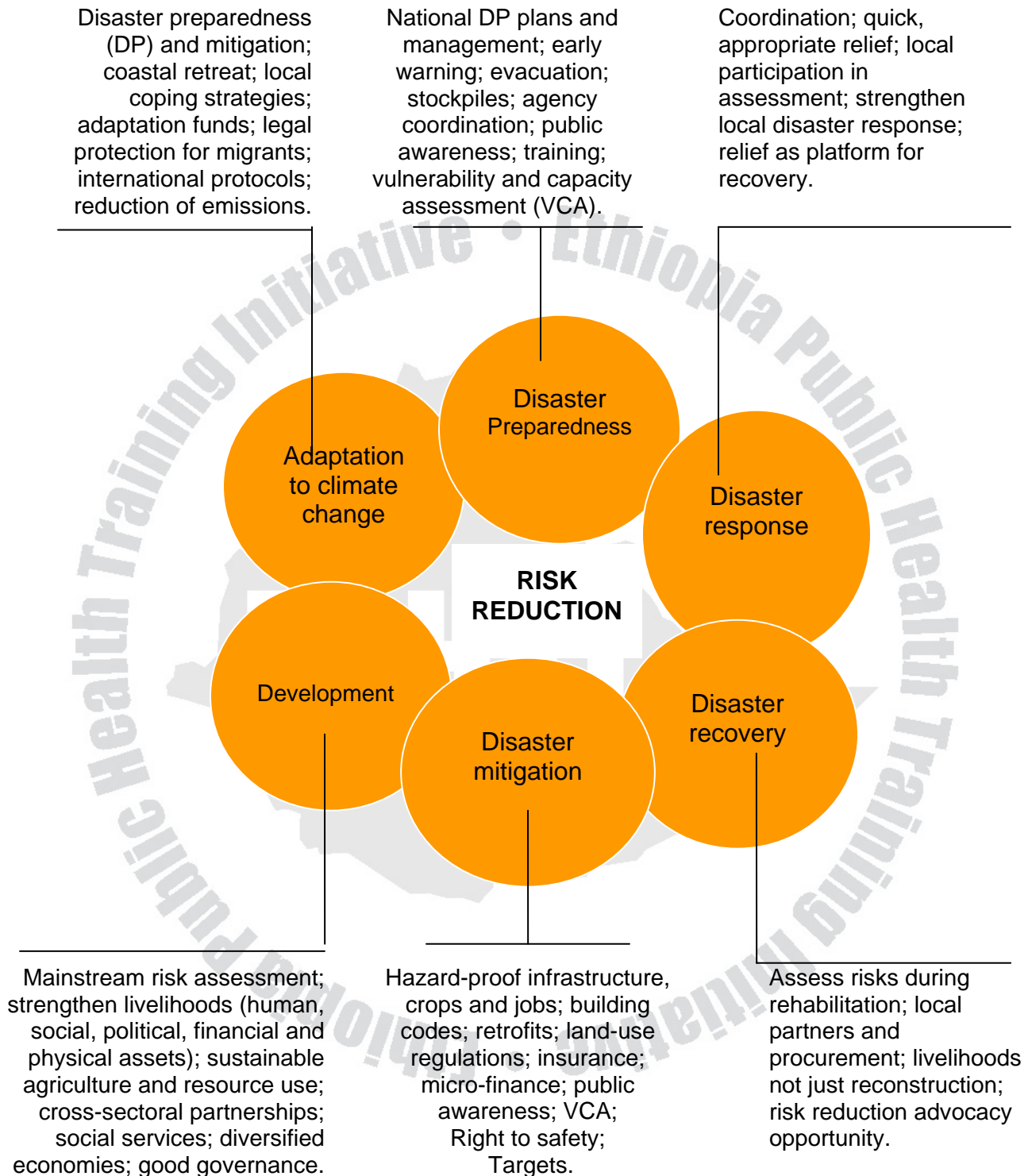
overcrowding in camps and food distribution sites and generally unsanitary conditions lead to increased disease transmission and communicable disease outbreaks. There are also psychological problems of apathy, despair and depression that affect famine victims.

3. Epidemic

Epidemics are increases in the frequency of illness or other health related conditions, e.g. more accidents than the normal rate of occurrence. Typically, in disaster these epidemics are enteric diseases (cholera or typhoid), vector borne diseases (malaria or louse borne typhus) or diseases due to close human contact (measles, meningitis...). Bacterial viral or parasitic infections are capable of causing epidemics of disastrous proportion. However, control of cholera, malaria, meningitis, and yellow fever is far below satisfactory in Africa (13). Epidemics are caused by population movements; which may lead to overcrowding when displaced persons move into areas in which physical structures have been damaged by the disaster. Overcrowding often causes a decrease in sanitation, with contamination of water or food supplies and a decline in nutritional status. Another cause of epidemics may be environmental change that favors breeding of vectors. (12).

The sudden creation of areas of high population density, such as camps for displaced masses of people, where there has been inadequate sanitary planning of accommodations is one of the typical ways in which disasters affect environmental health conditions and services. Epidemics in emerging settlement generally result in social and political disruption, economic losses, disability, death and increased trauma. The possible risk reduction measures are: structuring an emergency plan with an inventory of required resources and establishing an early warning system through routine surveillance and training of national staff in emergency operation. The specific preparedness measures could be intervention measures; (verify and confirm diagnosis, identify cases, find source of epidemic, treat cases and control spread, write report) and community health education. Refer to fig. 2.1 for more details.

Figure 2.1: Elaboration of risk reduction measures source (14)



4. Pests

Pests are creatures which are undesirable in a particular situation, for reasons of health, hygiene, comfort and acceptability e.g. Locusts (14). Pest infestation could be caused by increased in pest numbers due to ecological factors. These include; temperature, monoculture of crops, introduction of plants to new locations, migration and conducive weather patterns. There are other factors that contribute to the vulnerability of a community to pest infestation like large numbers and varieties of pests, lack of control on improved plant products, constraints on resources to predict and treat pest infestation, and under development of agricultural technologies. Pest infestations may result in adverse effects, which include food shortages, famine and stress on economic systems. Before pest infestations occur it is possible to minimize the risk by physical controls, cultural controls, crop plant resistance, biological controls, chemical controls.

5. Floods

Floods are climatological phenomena which are influenced by the geology, (geo-morphology) soil and vegetation conditions. Flooding occurs because of a variation in hydrological cycle. Metrological and hydrological processes can be fast or slow. These processes can produce flash floods or more predictable, slow developing, river floods. Human action intensifies floods by removing forest cover, by denuding the land of other vegetation, and by exacerbating erosion of soils.

The health effects of flood and tropical storms may be divided in to those resulting from primary exposures (acute and long-term effects) and those arising from secondary exposures.

I. Primary exposure

- **Acute effects:** Floods may cause large numbers of deaths. Mortality is mainly due to drowning and individuals are either killed or survive without serious injury. Deaths and injuries are sometimes

caused by floating debris and other accidents but the number of orthopedic casualties is likely to be relatively small. Numbers of deaths in flooding are related to factors like: absence of flood warning, high flood water velocity and level, and rapid onset of flood. Deaths tend to selectively affect young and elderly who are least able to act on receipt of warning.

- **Long-term effects:** These can be sub-divided in to those affecting the health of flood victims as a direct or indirect result of being flooded, and those disruptive effects on society and economy which lead to dislocation of food production and transportation. Food shortage may lead to malnutrition and subsequent predisposition to other illness. For example, investigators have reported rises in morbidity and ill health in flooded areas after the flood occurs. There are also increased psychological problems among the people living in flooded areas for five years following a disaster (14).

II. Secondary exposures and effects

Flood affects water supply system including water purification plants, and sewage disposal systems. Toxic waste sites, storage tanks, and chemical stores may be flooded, so that water may be contaminated. The increased exposure to biological and chemical agents can lead to outbreak of diseases. An increased risk of communicable diseases following flooding is inevitable because migrant flood victims and clustering in temporary camps increase exposure of susceptible people. Common serious diseases following flood are water-borne-diseases like typhoid, cholera and bacillary and amoebic dysenteries. There is an inherent risk of increased incidence of malaria following flood because mosquitoes are likely to multiply. Secondary effects of flood include disruption of “normal” health and social service programs.

Preventive measures: Measures employed to prevent floods include both structural measures (e.g. large and small scale engineering

modification of buildings) and non-structural measures (warnings, land use controls, evacuations, strong building standards, limitation of resource use in known hazard areas). Long term non-structural flood mitigation measures include the wise use of land and limitation of the indiscriminate removal of vegetation.

Reducing health effects: This can be achieved by making people aware of flood-prone areas. It is important to inspect flood embankments, buildings and dams. Following flooding, quality of water supplies should be carefully monitored. When contamination is suspected, people should be provided with alternative supplies of clean water or simple disinfection techniques such as boiling water and using chemical disinfectants. To prevent the risk of malaria water should not be stored in open tanks because this will increase breeding opportunities.

6. Landslides

Landslides are down slope transport of soil and rock resulting from naturally occurring vibrations, changes in direct water content, removal of lateral supports, loading with weight, weathering, or human manipulation of water courses and slope composition. Consequences of landslide includes physical damage (any thing on top of or in the path of the landslide will suffer damage), fatalities due to slope failure, and death due to catastrophic debris slides or mudflows. Measures to be taken to prevent or minimize the consequences of landslides include: Hazard mapping, land use regulations, insurance, community education, medical assistance, and emergency shelter for the homeless (12).

7. Pollution

There are several types and causes of pollution. Factors contributing to pollution are high levels of industrialization and per capita consumption, lack of regulation of pollutants and insufficient resources to counteract the impact of pollution. The most common ones are as follows:

Air pollution: Pollutants such as sulphur dioxide, nitrogen oxides, particulates, carbon monoxide and lead from industry and transport are the commonest causes of pollution.

Marine pollution: Sewage, industrial effluents, marine litter, petroleum spills and dumped radio active substances.

Fresh water pollution: Discharge of human and domestic waste in to lakes and rivers, industrial effluents, use of irrigation and pesticides, run off nitrogen from fertilizers.

Global warming: Accumulation of carbon dioxide from combustion of fossil fuels, deforestation, and methane from livestock'.

Ozone depletion: Chlorofluorocarbons (CFC) released into the atmosphere deplete the ozone shield against ultraviolet light and increase global warming.

Health consequences of pollutions include: Damage to agricultural crops, forest, aquatic systems, structural materials and human health, spread of pathogens, injury to marine life, and spread of chemicals to the environment affecting the health of humans, animals and sea life, sea level rise, climate change, temperature rise inducing skin cancer, cataract and reduction in immune system function.

8. Fires and explosions

Fire is the most common of all hazards created by humans. Every year fires cause thousands of injuries, billions of dollars in property damage and deaths. The underlying contributing factors for fire are: negligence in using different machines in the work place and utensils in the house, lack of skill of using different machines, conflicts at individual or national level and burning left over crops for human production to increase the fertility of the soil. Children, aged people and women are at special risk of suffering the health consequences of fire. The common effects of fire on humans are:

A. Burns

Burns can occur on any part of the body to different extents from mild to severe forms. Some people can die from extensive burns due to fluid losses, secondary infections; organ failure, or from inhalation of smoke. Even those who survive may be left with some consequences like paralysis and loss of some part of the body. After burns especially children are at high risk because they have a high body surface area to volume ratio, greater fluid losses and less strong immunity.

B. Structural loss

Fire in its broader sense can cause destruction of communal properties or households. People may suddenly lose whatever they had saved including food stores, money etc. A particular household may totally lose its self sufficiency. People may develop adjustment disorder, become careless of the family and might not be able to recover from the situation quickly. Hence members of the family may be affected by problems like malnutrition. In addition to these post traumatic stress is a common adjustment problem which occurs after many disasters.

We should always have plans to prevent the occurrence of fires in the workplace, or household. These include:

1. Increasing awareness about the utensils we are manipulating
2. Increasing the awareness on how to reach a fire brigade
3. Taking care of children and debilitated individual in a household
4. Having a facility inspected for fire hazard
5. Distributing fire safety information to employees
 - how to prevent fires in the work place
 - how to contain a fire
 - how to evacuate the facility
 - where to report a fire

6. Instructing personnel to use stairs and to crawl on hands and knees when escaping a hot or smoke filled area.
7. Establishing procedures for the safe handling and storage of flammable liquids and gases
8. Providing for the safe disposal of smoking materials
9. Establishing a preventive maintenance schedule to keep fire fighting equipment operating safely.
10. Placing fire extinguishers in appropriate locations
11. Training employees in the use of fire extinguishers
12. Establishing a system of warning by installing fire alarms.

C. Explosions

Explosions are becoming very common events these days. The causes of explosions are occupational hazards, accidents at workplace especially mining areas, factories and conflicts between individuals, groups and nations.

Explosions are known to cause grave damage to different parts of our body even more than those caused by fire. Blindness, deafness, amputations are usual consequences of explosive disasters. Death rates due to such disasters are usually high. Explosions have long term consequences to the health of a community because of exposure to toxic substances that are blasted. To see such effect it's enough to see the consequence of the September 11, 2001 attack of the Twin Towers in New York. Asbestos was used as fire-proofing in the construction of the north tower which was blasted free during the attacks. Inhalation of free asbestos is found to predispose to lung cancer and mesothelioma after a long time. Workers at the site are at risk of exposure to silica, lead, benzene and other combustion produces. For many weeks after the event, communities near the trade center continued to be subjected to the smell of acidic smoke from the long burning fires at the base of the site (16).

Children live closer to the ground than adults and thus are more likely to inhale any materials stirred up from dust. They breathe more air per kg of body weight per day. They also have potentially more life time in which to develop mesothelioma or other delayed diseases that may result from exposure to asbestos or other toxic materials.

The problem of post traumatic stress disorder although common to many disasters, is grave and severe with respect to explosions. People suffer from a range of symptoms including flash backs, blackouts and feelings of grief and devastation. Alcoholism, depression and even suicide are quite possible. Careful assessments of psychological status and the provision of extensive counseling to survivors are vital.

In order to prevent such consequences, certain precautions should always be kept in mind as part of the community and as a health promoter of a society. These include:

- Awareness of the proper procedures when using potentially explosive equipment
- Children should not be left alone to play in areas that were once used in war or that have potentially flammable chemicals.
- Appropriate measures to clear land mines meticulously
- Psychiatric stability of individuals whenever conflict arises
- Government policies should be developed in such a way that they don't harm individuals and nationality rights.

2.9. Prevention and control of disaster

The early warning system is a program established to monitor and warn in the event of disasters ahead of time so that appropriate measures can be planned and executed as early as possible. It is the cornerstone of the policy on disaster prevention and management. The immediate objective of the program is to monitor the likely occurrence of disasters through time, identify potential threats as early as possible and advise all concerned about their

likely magnitude, including identifying causes and consequences of the disasters, areas and population groups at risks and numbers of people likely to need support.

2.9.1. Declaration of disaster

A disaster is declared to save the lives and livelihoods of people threatened by the occurrence of such event. It can be declared at different levels like Woreda, zone, region and so on. To declare a disaster, the disaster prevention committee of the concerned administrative level should have convincing evidence that such a measure is warranted. The relief requirement can be met through regional budgetary and non budgetary resources (17).

2.9.2. Relief plan

This is a comprehensive plan which includes measures to be taken to prevent the occurrence of a disaster, and alleviate the suffering of victims at different stages of a disaster when it occurs. The plan is formulated to set in motion measures which can be taken to relieve current distresses and future occurrences.

In the relief plan scheme, the health service has important role. Periodic visits to the affected areas by the health team allow required treatments to be given for communicable and other diseases and ensure that all the necessary medicine is adequately supplied.

2.9.3. Health intervention

Health activities during disaster include developing health action plans and taking appropriate interventions during the three important phases of disaster: Pre-disaster, inter-disaster and post-disaster phases. Health intervention activities in each phase are discussed below.

Health action plan

Disasters are often associated with health problems as the susceptibility of people to diseases increases with deprivation of basic necessities such as food and shelter. Every time a disaster is anticipated, a health plan should, be drawn up by the Woreda Health Office in consultation with and with the assistance of the zonal and regional health bureaus. It should include the following tasks:

- Health and nutritional surveillance of the affected areas.
- Mass immunization of vulnerable population in the event of likely outbreak of epidemics, particularly immunization against measles and meningitis
- Regular and periodic disinfestations of sources of drinking water
- Medical examinations of children in schools and supplementary nutritional support and supplementary vitamins e.g. vitamin A
- Early detection of malnutrition
- Activities concerning the establishment and utilization of therapeutic feeding centers
- Visits to the sites and provision of medical assistance
- Coordination of NGO activities with respect to health measures
- Provision of basic sanitation services
- Timely procurement of commonly used medicines and sanitation materials

Objectives of health disaster preparedness and response

The objectives of disaster preparedness and response activities in the health sector are as follows:

- To prevent excess mortality due to the disasters, which can be caused by the direct impact of the disaster, delays in rescue and relief activities, lack of appropriate and timely health care, the disruption of the normal health care assistance and breakdown of preventive measures, and sometimes due to malnutrition.

- To provide appropriate and timely care for casualties due to the disasters like injuries, trauma and burns, malnutrition, treatment for acute cases in epidemics and chemical disasters.
- To prevent exposure to adverse climatic and environmental conditions (lack of food, water, sanitation, shelter, clothing, poisoning)
- To prevent short term and long term disaster related morbidity: Outbreaks of communicable diseases, increases in morbidity due to destruction of health infrastructure and inability to provide basic health services, introduction of new diseases due to resettlement or imported by external relief workers, occurrence of widespread malnutrition.
- To reestablish health services to or above pre disaster levels, with special attention to reconstruction and repair of damaged health facilities, renovation of health facilities on adequate and appropriate basis, reorganization of health services based on primary health care.

Phases of disaster

There are three distinct phases of disaster.

- **Non disaster and inter disaster phase**

Long before disaster strikes is the time for prevention and preparedness measures. This includes training and educating the community. The awareness and interest in disaster planning of the community and policy makers will greatly depend on the occurrence of recent disasters within the country. Therefore, in areas less prone to disasters, it's essential to reinforce and stress information on possible adverse consequences of disasters in order to increase community awareness and interest.

- **Pre-disaster phase**

Just before disaster strikes is the time for warning, protective actions and possible evacuation of the population. The effectiveness of

protective actions will largely depend on the level of preparedness of the population particularly at community level.

Early warning

Early warning is based on prediction of the impending disaster. Unfortunately not all disasters are preceded by preliminary signs and even when these are present the decision to issue a warning is often a difficult one. To issue a warning too early means losing credibility if nothing actually happens, while doing it too late may not allow enough time for the implementation of protective measures. The community must be prepared to understand and react to the warning. For example, floods, droughts and epidemics can well be predicted. Complex emergencies and refugees following armed conflicts can more or less be predicted as well.

Implementation of protective measures

Sudden natural disasters often do not allow enough time for the implementation of protective measures. In long term disasters or when an early warning system is used, protective measures will depend on the awareness and preparedness of the community and of the local authorities and health staff.

During the emergency phase, effective management of the victims depends on the preparedness of local health facilities and the adequacy of external aid.

The principal aspects of health management following a disaster include

- **Initial rapid assessment**

The main objectives are to:

- Determine existing and potential health problems, including magnitude of mortality, serious injuries, malnutrition and other morbidity

- Determine the services and health resources needed immediately to treat serious injuries and prevent further morbidity and mortality
- Determine the quantity and quality of locally available resources
- Initiate procurement of essential external resources
- Determine what additional information might be needed.
- Provide an assessment and recommendations to appropriate relief authorities
- Identify locations that could be used to establish temporary health facility

The rapid assessment should provide information about the affected population which is factual and not based on rumor. Sources of information include the affected community, local administration, relief workers, regular reporting systems and surveys.

- **Management of mass casualties and acute illnesses**

Principles of mass causality management include:

- Search, rescue and first aid
- Transport to health facilities with treatment as necessary
- Redistribution of patients between health facilities when necessary
- Feeding and provision of safe and adequate water, in case of severe shortage of food or famine

In epidemics, local health services will have the responsibility for diagnosis and treatment of the increasing number of cases during the initial phases. The local availability of trained health personnel, basic diagnostic facilities and essential drugs and vaccines are essential for fighting outbreaks and reducing the mortality rate. Furthermore it is important to have pre-established and readily available standardized treatment protocols and procedures which are already well known to the health personnel.

- **Post-disaster epidemiological surveillance**

Natural disasters are often accompanied by outbreaks of communicable diseases such as measles, malaria, and diarrhea. The probability of increased transmission of communicable diseases in a disaster situation is related to:

- Sudden increases in population density
- Displacement of large population
- Disruption of pre-existing sanitary services
- Disruption of the normal public health program
- Inadequate food supply
- Ecological changes

If a standard reporting system does not exist, a special surveillance system can be established in response to the disaster, utilizing other sources of data including community sources, newspaper accounts, information from political sources and reports from relief workers. The system should collect information only on diseases which cause epidemics (e.g. cholera meningitis, measles).

Disease control activities

Disease control programs should be implemented immediately after the disaster, based on previous observations following similar emergencies.

In situations where the population is confined to camps where there is overcrowding, poor sanitation and inadequate water supply, children should be immunized against measles and diarrheal diseases.

Environmental health management

Environmental health is of primary importance in emergency health management after a disaster. Physical disruption of infrastructure and services may be aggravated by the displacement of large sectors of the population. The consequent alteration in their daily environment has potentially hazardous health consequences.

Post-disaster environmental health measures can be divided in to two priorities

- Provision of adequate and safe water, basic sanitation facilities, disposal of excreta and liquid and solid wastes and shelter.
- Food protection, vector control measures and the promotion of personal hygiene. Locally available human resources should be actively involved in providing the services needed in emergency situations.

Food and nutrition

Not all disasters result in food shortages and cause harmful change to the nutritional status of the population. Certain disasters like drought and refugee movements are almost always characterized by severe food shortages. Others like floods, tidal waves affect food availability directly and may completely destroy standing crops and family food stocks. The priorities in alleviating food problems are:

- Making an initial estimate of likely food needs in the affected area
- Locating or procuring stocks of food and assessing their quality and fitness for consumption
- Supplying food immediately where there appears to be an urgent need (isolated populations, institutions, displaced population)
- Monitoring information on nutritional status and food needs so that procurement, distribution and other programs may be modified as the situation changes
- Management of health relief supplies

In natural disasters, health relief supplies should consist mainly of essential drugs and medical equipment for treating casualties and acute illness as well as preventing communicable disease (vehicle, cold chain equipment etc.)

The rehabilitation phase

Rehabilitation can lead to improvement of health structures and the health condition of the affected population, linking disaster to overall developmental

activities. Following a disaster, the pattern of health needs will change from causality and acute patient management towards the provision of primary health care. Priorities will shift from health care to environmental health measures and epidemiological surveillance. There are three main areas of assistance which should not be overlooked following health emergency operation. These are:

- Long term problems caused by the disaster, including the extended need for medical care for some victims, surveillance of communicable diseases and care for orphans
- Reestablishment of normal health services, taking into consideration the opportunity provided for making major changes in health care methods
- Assessment, repair and reconstruction of damaged facilities and buildings as well as the local economy

Finally, the reconstruction phase following a disaster should lead to restoration of at least the pre disaster conditions. The reconstruction period is also the time for thinking about the lessons learnt. This is the time to develop preparedness plans on the basis of newly acquired experience. It's the beginning of a new inter-disaster phase. (See figure 2.1 for summary of phases of disaster).

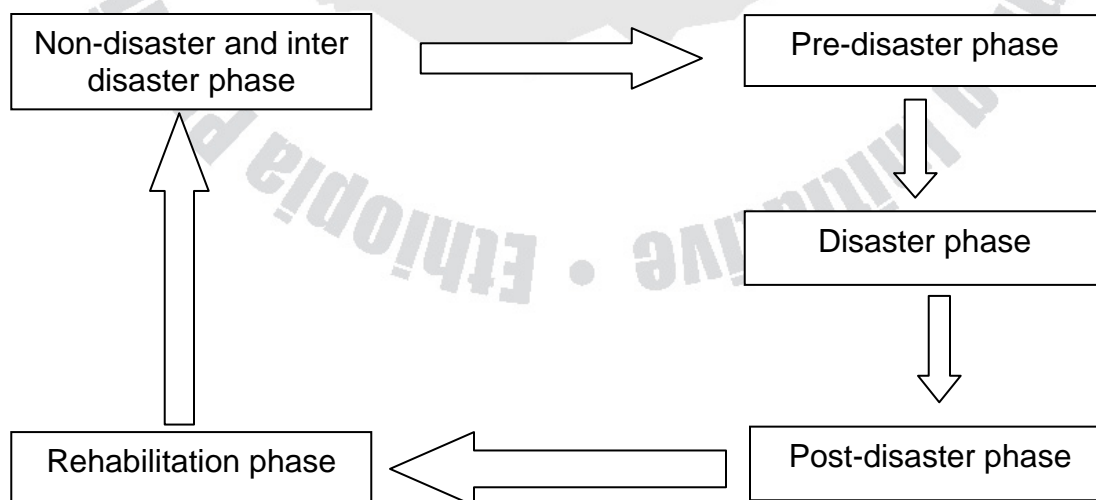


Figure 2.1: Summary of phases of disaster

UNIT THREE

SATELLITE MODULES

3.1. Satellite module for health officers

3.1.1. Direction for using this module

- Before reading this satellite module, be sure that you have completed the pretest and studied the core module
- Continue reading this satellite module

3.1.2. Learning objectives

After completing this module, the reader will be able to:

- identify the specific role of the health officer in the event of disasters
- identify the specific role of the health officer in the prevention and control of disasters

3.1.3. Role of the health officer in the event of disaster

Each category of the health center team has its own role during the different phases of disaster. (See task analysis section).

As part of the health center team, the health officer plays an important role in the event of disaster. These are:

1. Nutritional assessment

Nutritional insufficiencies in a community can follow any type of disaster. The health center team is primarily responsible for assessing nutritional status of a community and the health officer is in charge of coordinating the activity, compiling data, and planning for intervention in coordination with local Disaster Prevention and Preparedness Commission (DPPC) office.

Anthropometric measurements (measurements of body weight and height) are used to give an approximation of the nutritional status of a population.

The data can be used to decide whether the individual should be included in supplementary feeding program or treated for severe malnutrition.

In emergency nutritional assessment, one should focus on children aged 6-59 months because this is the most vulnerable group. By comparing body measurements of a child with those of healthy children of the same weight or age, one can classify his/her nutritional status.

Three commonly used nutritional indices are weight for height, weight for age and height for age.

- Weight for height – reflects recent malnutrition with loss or gain. It is best indicator of wasting.
- Height for age – reflects skeletal growth. It is best indicator of stunting.
- Weight for age – composite index, which reflects either wasting or stunting. Refer to “Growth Monitoring Chart “which is based on this principle

The presence of edema should also be noted during emergency assessment as bilateral pedal edema is a key indicator of kwashiorkor. Weight for age is the most commonly used nutritional index in emergencies is the nutritional survey because it tells about the current situation (acute weight loss). Refer to table 3.1 for classification of acute malnutrition based on weight for age and edema. The other commonly used index in emergency situation is Mid Upper Arm Circumference (MUAC). It is a rapid and effective predictor of death when below 11 cm in children from 12-59 months.

The nutritional indices (combination of measurements) will be compared to a reference.

Table 3.1: Classification of acute malnutrition based on weight for age and edema

	< 60% standard	60-80% of standard	>80%
Edema absent	Marasmus	under weight	Normal
Edema present	Marasmic-kwashiorkor	kwashiorkor	

2. Diagnosis and treatment of specific diseases

Certain disasters are known to cause disease entities either directly or indirectly e.g. famine. The occurrence and type of malnutrition is diagnosed by the health officer using different methods like history taking, and detecting physical signs specific to certain types. The health officer can diagnose epidemics and associated diseases e.g. malaria, measles based on his/her previous training using history taking, physical examination and important laboratory investigations.

The management and treatment of a disease entity is purely the job of the health officer. Treatment includes following the course of illness from the onset of drug intake and may go as far to surveillance of response to treatment in the community. Additionally, using alternative treatments in cases of treatment failure is also the task of the health officer.

When disaster causes major injures, applying the ABC rule of life as well as cleaning and disinfecting wound area. This may include doing minor surgeries like debridement of dead tissue and giving an appropriate antibiotic. When cases are difficult to handle, early referral to the nearby higher center is mandatory.

The ABC rule

To have the best chance of survival and recovery, all injured patients must be assessed using the ABC rule. Severe cases have the best chance of survival if resuscitated within the first hour "The Golden Hour". There are different

aspects to the management of the trauma victim, among these primary survey and resuscitation (ABC rule) is the most important initial duty.

This consists of assessment and management of:

- Airway and cervical spine control
- Breathing and ventilation
- Circulation and hemorrhage control

After ABC, one should assess neurologic responses to assess “D” disability, and “E” external signs of injuries.

Airway and cervical spine control

- The airway must be inspected to ensure patency and any blockages removed.
- Maintain the airway in unconscious patients with a chin lift, jaw thrust or rigid airway (Oropharyngeal tube)
- Protect the cervical spine – neck movements should be avoided by the use of cervical splints, collar, or tape the top of the forehead to hold the patient’s head in neutral position until the possibility of injury to the cervical spines is ruled out.

After the patency of the airway is ensured and if the victim is not breathing, artificial respiration should be started with mouth to mouth breathing if masks are not available. Oxygen, if available, should be given at the highest concentration possible.

Sucking chest wound (open pneumothorax) should be covered and tension pneumothorax relieved by inserting a needle into the affected side.

Circulation and hemorrhage control

External blood loss is controlled by direct pressure, not by tourniquets.

- Intravenous infusion should be started with normal saline preferably, or other crystalloids
- Assessment of consciousness level, color and pulse rate and volume is a quick guide to assess blood loss

- An irregular pulse may signify heart or pericardial problems.

Following the above measures, the patient should be evacuated to a trauma center as soon as possible. The injury and status of the patient should be clearly communicated to the center.

3. Organization and proper management of the health service

During a disaster health activities must adapt to effectively protect the affected population. The responsibility of the health officer is to ensure effective deployment and re-engagement of staff. This will later be assessed by the Woreda health office and regional health bureau. The health center team leader is also responsible for procurement of necessary drugs and sanitary materials in collaboration with the regional health bureau (as in the cases of epidemics). In cases of famine, in addition to food supply, demand for micronutrient supplements will increase.

Non governmental organizations may get involved in nutritional and health activities. Their involvement may be in support of an ongoing program by the Woreda health office or by initiating new programs. The Woreda health office should be responsible for monitoring, supporting, coordinating, and initiating these activities. As health intervention is sensitive and requires qualified personnel, the health worker team leader should closely monitor their activities locally in collaboration with the woreda health office.

3.1.4. Role of the health officer in disaster prevention

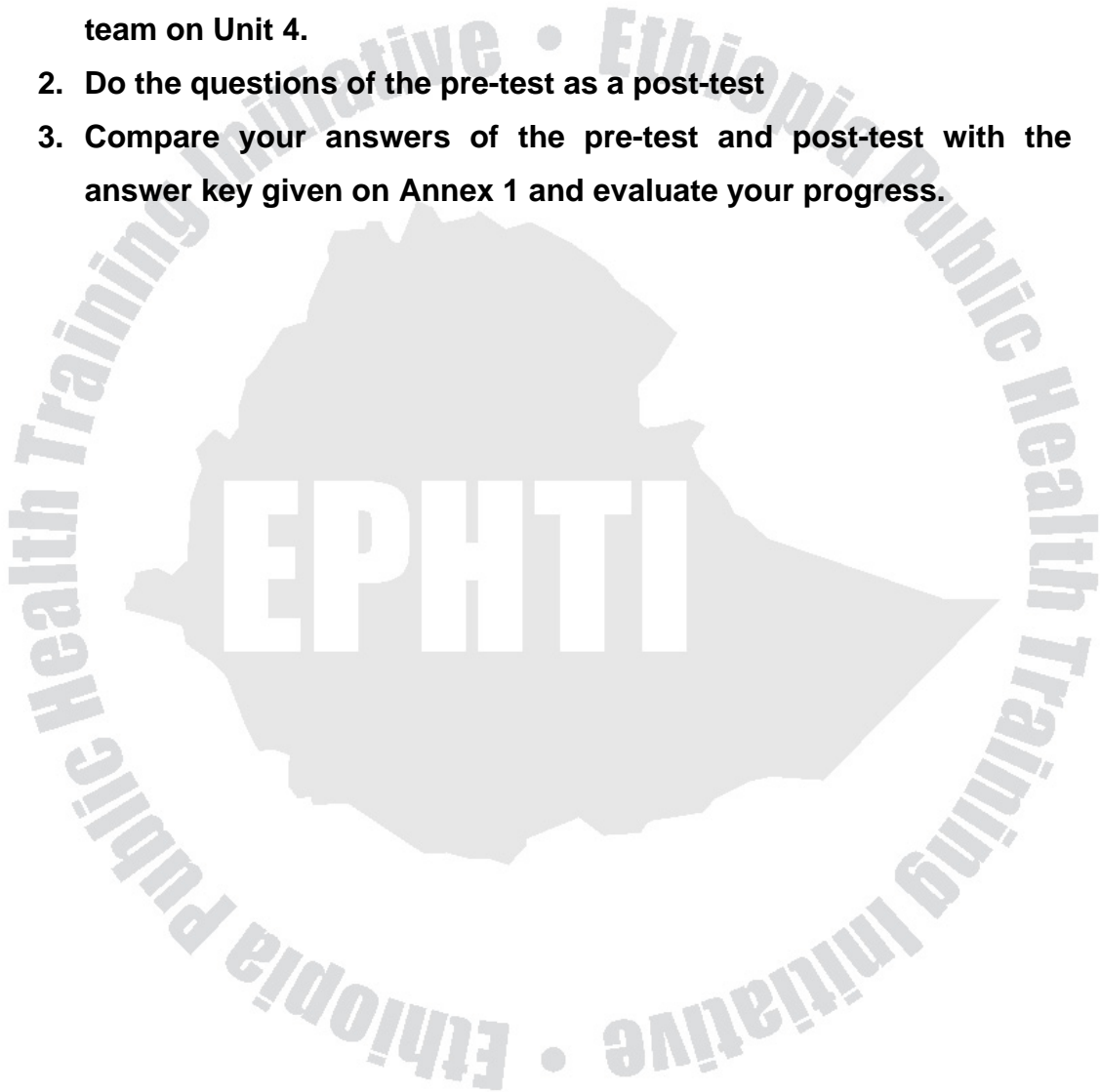
Reviewing previous experiences when sporadic cases of certain diseases increase, and when what preceded the previous disaster occurs, one can anticipate disaster.

When anticipating disasters, the health officer should notify and work with the health bureau to give prophylaxis treatment, to conduct mass screening like nutritional status there to prevent the occurrence of major disasters. There

should be procurement of important drugs and other equipment with respect to the anticipated diseases before disaster occurs.

Now you are through with satellite module for the health officer; there are still some activities remaining as stated below.

- 1. Read the task analysis for different categories of the health center team on Unit 4.**
- 2. Do the questions of the pre-test as a post-test**
- 3. Compare your answers of the pre-test and post-test with the answer key given on Annex 1 and evaluate your progress.**



3.2. Satellite module for public health nurses

3.2.1. Learning objectives

By the end of this module you will be able to:

1. Describe the role of a nurse in disaster preparedness.
2. Describe the role of a nurse in disaster response.
3. Describe the role of a nurse in disaster recovery.

3.2.2. Direction for using this module

- Before reading this satellite module, be sure that you have completed the pretest and studied the core module
- Continue reading this satellite module

3.2.3. Role of the nurse in disaster preparedness

Nurses in disaster preparedness facilitate preparation within the community and place of work. The nurse is in a unique position to provide an updated record of the vulnerable population within the community. In addition to knowing where these populations exist, the nurse should be involved in educating the vulnerable population about what impact the disaster might have on them.

As community advocates, nurses help maintain a safe environment. Recalling that disasters are not only natural, but human-made as well, nurses in the community need to assess and report environmental hazards. For example, the nurse should be aware of and report unsafe equipment, faulty structures and the beginning of epidemics such as measles or diarrhea.

The nurse should also understand what community resources are available and how the community members will work together.

For nurses to work actively in disaster situations, they need to take following steps

1. Join the local disaster action team
2. Liaise with local health facilities
3. Determine the health related appropriateness of shelter sites.
Plan with other health center team members how to facilitate services for disaster victims.
4. Plan for and retain necessary supplies depending on the type of disaster
5. Teach the community about disaster.

3.2.4. Role of the nurse in disaster response

The major role of the nurse in disaster response is community assessment, case finding and referral, disease prevention, health education, surveillance and working with aggregates (refer to specific modules on epidemic control, EPI, nutrition and health). Nurses working as members of an assessment team need to furnish accurate information to relief managers to facilitate rapid rescue and recovery. Nurses should make home visits to gather needed information. Types of information that may be included in initial assessment report include the following:

- Geographic extent of the disaster's impact
- Population at risk and the affected area
- Presence of continuing hazards
- Injuries and deaths that have resulted from the disaster
- Current level of water and sanitation facilities
- Status of health care infrastructure and distance from the victims

In addition to these, the nurse may be the first to arrive on the scene. In such circumstances, an immediate plan for triage should begin immediately.

3.2.4.1. Medical Triage: is the process of separating casualties and allocating treatment based on the victim's potential for survival. Highest priority is always given to victims who have life threatening injuries but who have a

high probability of survival once stabilized. Second priority is given to victims with injuries with systemic complications that are not yet life threatening and who would be able to wait up to 45 to 60 minutes for treatment. Lowest priority is given to those victims with local injuries without immediate complications and who can wait several hours for medical attention. These assessments help to match available resources to populations' emergency needs. Lack of or inaccurate information regarding the scope of the disaster and its initial effects may contribute to the misuse of resources.

Ongoing surveillance reports are just as important as initial assessments. They indicate the continuing status of the affected population and the effectiveness of ongoing relief efforts.

3.2.4.2. Shelter management: Nurses, because of their role in delivering aggregate health promotion, disease prevention and emotional support, make ideal shelter managers especially, for the elderly, women, children and the chronically ill. Many of the problems in shelters involve stress. The shock of the disaster itself, loss of personal possessions, fear of the unknown, living in close proximity to total strangers, and even boredom can cause stress.

Basic measures that can be taken by the nurse in managing a shelter include the following:

- Listen to victims, let them tell and retell their feelings related to the disaster and their current situation
- Encourage victims to share their feelings with each other if it seems appropriate to do so
- Help victims make decisions about personal matters.
- Delegate tasks (reading, crafts, and playing games with children) to teenagers and others to help combat boredom.
- Provide the basic necessities (food, clothing, rest, etc)

- Attempt to get necessary items like drugs for suspected health problems
- Provide preventive and curative health care according to the type of disaster faced
- Provide basic compassion and dignity (including privacy when appropriate)
- Provide counseling or referral to counseling services as needed

3.2.5. Role of the nurse in disaster recovery

The role of the nurse in the recovery phase is as varied as in the other two phases of the disaster mentioned earlier. Nurses must remain observant in teaching proper hygiene and making sure immunization records are up to date.

Acute and chronic illnesses can be exacerbated by the prolonged effect of disaster. The psychological stress resulting from the disaster can cause feeling of severe helplessness, depression and grief. Although the majority of people eventually recover from disaster, mental distress may persist in vulnerable populations. Referral to mental health professionals should continue as long as the need exists.

In addition, the nurse needs to be alert to environmental hazards and assess the danger of live or dead animals that are harmful to health. Home visits should be undertaken to uncover hazardous conditions in the home. This may continue for years.

Now you are through with satellite module for the public health nurse; there are still some activities remaining as stated below.

- 1. Read the task analysis for different categories of the health center team on Unit 4.**
- 2. Do the questions of the pre-test as a post-test**
- 3. Compare your answers of the pre-test and post-test with the answer key given on Annex 1 and evaluate your progress.**

Satellite module for environmental health technicians

3.3.1. Purpose and use of the satellite module

This satellite module is prepared for environmental health technicians to be used as a guide when disaster occurs. The module emphasizes only areas that were not covered by the core module.

3.3.2. Directions for using the module

- Before reading this satellite module, be sure that you have completed the pretest and studied the core module
- Continue reading this satellite module

3.3.3. Learning objective

After studying this satellite module the learner will be able to:

- Describe the effects of disaster on environmental health
- Describe the management of disaster created environmental health conditions
- Explain the sanitation requirements during disaster.

3.3.4 Learning activity

A case study continued from the core module

The displaced people from village Dunfo were made to stay in a camp. The numbers of displaced people were estimated to be 3500.

Questions for discussion

1. What are the points that should be considered in choosing an appropriate site for the camp?
2. Estimate the area of land required for the camp, if tents are chosen for Sheltering

3. What types of excreta disposal facilities do you recommend for emergency uses in the camp?
4. If shallow trench latrines are taken as an option, how many trenches are required to serve the campers where the length of the trenches is fixed to be 3.5m?
5. What type of emergency water purification methods would you advise for the people in the camp?
6. What type of solid waste disposal method do you think is feasible for the settlement area?

3.3.5. Effect of disaster on environmental health

The adverse environmental conditions that may accompany disasters vary according to the type of disaster. Disasters cause considerable deterioration of environmental conditions, which may lead to partial or total disruption of environmental health services

The following are some of the common effects of disasters on environmental health services.

- Damage to civil engineering structures of water supply, waste water disposal, solid waste handling and home sanitation services.
- Transportation failure of the water supply, solid waste handling and food handling services
- Overloading of the water supply and waste disposal systems due to shifts in population
- Contamination of water and food
- Power cuts negatively affect the proper supply of water and food handling
- Proliferation of vector breeding sites, increase in human vector contacts and disruption of vector borne disease control programs.

The sudden creation of areas of high population density (such as camps for displaced people where there has been no planning for the sanitary accommodation of the large number of people) is one of the typical ways in which disasters affect environmental health conditions and services. Because of their inadequate environmental health facilities and services, establishing camps for displaced people can result in secondary emergencies, consequently, even more time and scarce resources will be needed than are required to address the original emergency situation.

Disruption or overloading of water supply systems, excreta and liquid waste removal systems, and solid waste disposal systems also are likely consequences of disasters. The probability of water-borne and food-borne diseases increases. Other water-related diseases and environmental nuisances are also more likely to affect disaster stricken populations. Whenever access to normal water sources is hampered or cut off, it is critical that authorities make sufficient quantities available for human consumption.

As sanitation decreases with the disruption of solid waste disposal systems, the contamination of food and water supplies and the proliferation of vectors increase the risk of disease. The growth in population of vectors of diseases such as malaria, yellow fever and typhus is a further common consequence of disasters, particularly in areas where such diseases otherwise are incidental.

Decreased standards of general housing sanitation and personal hygiene are among the most common effects of disasters. When displaced people move in areas in which physical structures have been damaged by the disaster, overcrowding often causes housing sanitation to decline. The lack of proper clothing, water, soap, and basic cleaning and washing facilities makes it difficult to maintain the usual standards of personal hygiene; as a result there are increases in diarrheal diseases, vector-borne diseases (e.g. Typhus, and scabies), in areas where they were already prevalent before the disaster.

3.3.6. Management of disaster created environmental health conditions

There are different major environmental health concerns to address as soon as the full impact of the disaster begins. Some of the specific concerns that must be addressed in the immediate post disaster emergency period are described in detail below.

3.3.6.1. Shelter

Immediately following a disaster, displaced persons usually seek accommodation with families or friends. In some cases, public shelter has to be provided temporarily until more permanent locations can be planned. Existing public buildings such as schools, meeting halls, churches, and mosques are chosen as temporary shelters because they can be converted easily into dormitories. They are also likely to have sources of water supply and waste disposal and bathing and washing facilities. Some even have cooking and mass feeding facilities.

Relief operations for the displaced people can be undertaken in tent camps or in buildings. The site selection and the facilities required in these places are described below: (15,16,17).

1. Tent camps

During relief operations, sites for tent camps should be chosen where the slope of the land and the nature of the soil favor easy drainage and where there is protection from adverse weather. Sites must be away from mosquito breeding places, refuse dumps, and commercial and industrial zones. The layout of the site should meet the following specifications:

1. 3-4 hectares of land for each 1000 persons
2. Roads of at least 10 meters width
3. Minimum distance between edge of roads and tents should be 2 meters
4. Minimum distance between tents of 8 meters
5. Minimum floor area of each tent of 3 square meters

Water distribution in camp sites should meet the following specifications

1. Minimum capacity of tanks of 200 liters
2. Minimum capacity of tanks per capita of 15 liters per day
3. Maximum distance of tanks from farthest tent of 100 meters

Solid waste disposal containers in tent camps should be waterproof, insect-proof, and rodent-proof; the waste should be covered tightly with a plastic or metallic lid. The final disposal should be by incineration or by burial. The capacities of solid waste units should be 50-100 liters for each 25-50 persons.

Excreta and liquid waste should be disposed in bore-holed or deep trench latrines in tent camps. These should be 30-50 meters away from tents and one seat should be provided for 10 persons.

Modified soakage pits should be used for waste water by replacing layers of earth and small pebbles with layers of straw, grass, or small twigs. The straw needs to be removed on a daily basis and burned. Washing should take place on an ablution bench, which is 3 meters in length and double-sided. 2 should be provided for each 100 persons.

2. Buildings

Buildings used to accommodate victims during relief should provide the following:

The floor area should have a minimum floor area of 3.5 square meters per person, and minimum air space of 10 square meters person and there should be separate washing blocks for men and women.

Washing facilities should be provided as follows. One hand basin per 10 persons; or one wash bench of 4-5 meters for each 100 persons and one shower head per 50 persons in temperate climates and one shower head per 30 persons in hot climates.

Toilet accommodations in buildings housing displaced persons should meet requirements of one seat for 25 women and one seat plus one urinal for 35 men with a maximum distance from building of 50 meters.

Refuse containers should be plastic or metallic and have closed lids. One container of 50-100 liters capacity should be provided for 25-50 persons.

3.3.6.2. Water supply

Adequate drinking water should immediately be made accessible to victims and relief workers in essential locations, such as hospitals and treatment centers. Water can then be made available in peripheral areas of urban centers, in densely settled rural areas and scattered rural sites. After drinking water is secured within stricken areas, making water available for domestic uses (such as cleaning and washing) should be considered.

Drinking water should be obtained from operational water distribution systems. However, it also should be sought from undamaged, private sources (such as power plants, breweries, and other similar establishments); from undamaged springs, wells, or rain water cisterns; and from newly constructed water structures such as bore-holed wells. All water supplies must be carefully evaluated in order to eliminate the risk of water-borne infection and poisoning. The advice of an environmental health specialist (e.g. a sanitary engineer or sanitarian) should be sought when auxiliary water supplies are chosen.

Water suspected of contamination by human or chemical waste should not be used until it has undergone laboratory analysis. Sources located in the vicinity of sewage out-falls, chemical plants, solid waste disposal fields, abandoned mines, and other hazardous places should be considered suspect until such time that an environmental health specialist familiar with local conditions recommends otherwise.

Water distributed to disaster stricken populations must be kept safe until consumed. This is ensured by disinfecting all supplies, particularly the ones from surface sources and flood structures (such as wells, reservoirs, and rain water cisterns).

The residual concentration of chlorine in the distribution system should be increased after disaster. This reduces contaminants that can enter the system because of inadequate water treatment and allows detection of any water already contaminated that penetrates the distribution system. However, care must be taken to avoid over chlorination of drinking water; therefore, the chlorination program should be supervised by an environmental health specialist.

If water supplies in the disaster area are not being chlorinated because chlorination systems within the distribution network are not functioning, water must be disinfected in small quantities. This can be accomplished by boiling the water or by adding agents in the form of pills, powder, or solution. Some of the methods and agents for disinfecting small amount of waters during emergency situations are described as follows.

1. Chlorine compounds

Chlorine is available in different forms. The following are some forms of chlorine compounds used for water disinfection.

A. Tablets

The most common chlorine compound in use is known as halazone tablets. Instructions for use of halazone tablets are usually present on the bottle. If not, one tablet (4mg) should be used in each liter of water. If the water is turbid or highly colored, the dosage should be doubled. The water should be stirred and left to stand for at least ten minutes before it is consumed.

Halazone tablets lose strength quickly once the wax seal on the bottle is broken. They should, therefore, be used as soon as possible, and the bottle should be capped between uses.

Higher strength tablets (160 mg) are available in larger tablet size. Halazone (160mg) can be used to disinfect 40 liters of clear water or 20 liters of turbid or highly colored water. Care must be taken not to utilize halazone (160 mg) in the same tablet-to-water ratio as that prescribed for halazone (4 mg) tablets.

Personnel involved in distribution should be aware of this precaution and should educate users.

B. Granular calcium hypochlorite

This dry powder, called HTH (High Test Hypochlorite), contains 60 to 70 percent available chlorine. It remains quite stable when stored in tightly sealed containers in dark, dry and cool places. Once the container has been opened, it loses 5 percent of its initial available chlorine in forty days.

Care must be taken not to contaminate the powder with oil or combustible organic materials when it is mixed, because to do so may cause fire. To use HTH, add and dissolve one heaping teaspoon (approximately 7 grams) per 8 liters of water, thus producing a stock solution of 500 milligrams/liter. Add the stock solution to the water to be disinfected in the proportion of 1 part solution to 100 parts water. Let this stand for thirty minutes. If the taste of chlorine is too strong, allow it to aerate by standing another few hours or by pouring it several times from one clean container to another. The stock solution should be used within two weeks after it is prepared.

C. Sodium hypochlorite bleach

Common household bleach contains a compound that can, in emergencies, be used to disinfect water. The content of available chlorine (usually 3 to 10 percent) should be determined. It should be added to the water as shown in table 3.2.

Table 3.2: Percent of available chlorine in sodium hypochlorite bleach and their application to clear and turbid water

Available chlorine	Drops/liter of clear water	Drops/liter of turbid or colored water
1%	10	20
4-6%	2	4
7-10%	1	2

If the strength of available chlorine in the bleach is unknown, ten drops of bleach should be added. After mixing the treated water, allow it to stand for thirty minutes. There should be a slight odor of chlorine. If not, repeat the dosage and allow the water to stand for fifteen minutes.

2. Iodine

Iodine is available in different forms. The following are some forms of iodine compounds used for water disinfection.

A. Tablets

The most convenient and reliable iodine tablet forms are those that contain approximately 20 milligrams of tetraglycine hydroperiodine, 90 milligrams of disodium dihydrogen pyrophosphate, and 5 milligrams of talc. These tablets will dissolve in less than one minute at about 20°C, liberating 8 milligrams of elemental iodine per tablet. This amount will be adequate to treat 1 liter of most natural waters within ten minutes.

B. Iodine tincture

Common household tincture of iodine from a first aid kit (2 percent tincture of iodine) can be used to disinfect water. Five drops of tincture of iodine will be sufficient to disinfect 1 liter of clear water. For turbid water, however, add ten drops. Let the water stand for at least thirty minutes.

3. Potassium permanganate (KMnO₄)

Potassium permanganate is seldom used because of its long contact time. It is usually considered as a disinfectant for large quantities of water in wells, springs, or storage tanks. Potassium permanganate is of doubtful efficacy against pathogenic organisms, with the possible exception of *Vibrio cholerae*.

To use the chemical, prepare a solution by dissolving 40 milligrams of KMnO₄ in 1 liter of warm water. The solution will disinfect approximately 1 cubic meter of water after twenty-four hours of contact time.

Water consumption

During evacuation of people from disaster stricken area, water from suspicious sources must be boiled for one minute or it must be disinfected. The minimum amounts of water to be provided during evacuation are: 3 liters/person/day in cold and temperate climates and 6 liter/person/day in hot climates.

During relief operations while the disaster affected population are in hospitals, mass feeding centers or temporary shelters, the daily water consumption and the provision of safe water supply is recommended as follows.

- 40-60 liters/person in field hospitals
- 20-30 liters/person in mass feeding centers
- 15-20 liters/person in temporary shelters and camps
- 35 liters/person in washing installations

Water disinfection as protection

For disinfecting water used by disaster affected population, the following dosage can be used:

- for routine chlorine residual, 0.7-1.0 milligrams/liter is used
- for disinfection of pipes, 50 milligrams/liter available chlorine for 24 hours contact; or 100 milligrams/liter for 1 hour contact is used
- for disinfection of wells and springs, 50-100 milligrams/liter for 12 hours contact is applied.
- for elimination of high chlorine concentration in disinfected water, use 0.88 grams of sodium thiosulfate/1000 milligrams chlorine

To protect water from pollution, the distance between the water source and sources of pollution must be at least 30 meters. Keeping the bottoms of cesspools and latrines 1.5-3 meters above the water table and with impervious casing 30 centimeters above and 3 meters below ground surface can protect wells. A concrete platform around a well of 1 meter radius and fenced area of 50 meters radius are also essential protective measures.

3.3.6.3. Food sanitation and inspection

Locally available food products can become degraded or contaminated as a result of a natural disaster. Food usually becomes contaminated by polluted flood waters and, in some cases, by disease vectors and by unsanitary handling, especially in mass feeding facilities. Degradation results from long periods of power cuts that disrupt refrigeration and from contact with water, fraudulent adulteration, and the use of old stocks of food products.

Since consumption of contaminated and degraded food leads to poisoning or infection, it has serious health implications. These consequences are best dealt with by appropriate location of available food supplies and investigating their fitness. Priority should be given to the consumption of uncontaminated, perishable food, particularly if the food supply originates in areas where there has been a power cut. All food, however, needs to be inspected. The analysis of food products should be of low priority, because it often is too complex an undertaking to initiate in areas affected by the disaster. Adequate inspection, nevertheless, can be made with simple kits for testing food, such as phosphate determination kits.

A qualified environmental health technician should inspect all damaged places of food production and distribution before operations are carried out. The activities at mass feeding facilities also should be supervised by a technician.

To avert health problems related to food degradation and contamination, the public should be informed about measures that can be taken to guarantee the safety of domestic supplies. The public should know which foods are safe to consume and the best methods of preparing them.

3.3.6.4 Environmental sanitation

Environmental sanitation measures are necessary to protect the environment from the human wastes which may be responsible for the contamination of food and water. Such measures also counteract the development of breeding sites of disease vectors, pests and rodents. Excreta disposal should receive

primary consideration. Improper disposal not only leads to the contamination of water and food supplies; it also attracts flies and other disease-carrying pests. Other measures that should be taken are providing a sanitary solid waste disposal system, including receptacles, means of transportation, and incineration and burial facilities at camps; providing a disposal system for liquid wastes; and restoring municipal disposal services.

For appropriate excreta disposal, trench latrines should be dug at camps and relief worker settlements. When this is not feasible, toilet facilities such as portable units should be provided. The trench latrines should be made accessible in densely populated areas if excreta disposal facilities have been destroyed. Tools and other materials should be given to the population, who should be instructed about constructing such facilities under the supervision of an environmental health technician. Moreover, a health education program in latrine usage is essential to the sanitary upkeep of latrines.

As soon as excreta disposal systems have been provided, attention should be turned to public sewage systems. First, sewer lines and manholes that cause flooding in the streets and basements of densely populated areas should be unclogged. The next step is to repair sewer lines, manholes, sewer outfalls, and treatment units. Sewage tank trucks can be used to empty the overflow from septic tanks in public buildings used to accommodate displaced persons, casualties, and relief workers.

During evacuation and relief operations for the disaster stricken population, sanitation facilities (such as latrine and refuse disposal) are recommended in the following types and dimensions.

1. Excreta disposal

The following environmental problems may be created if excreta are not disposed of properly

- Creation of fly breeding places
- Development of unpleasant odors
- Contamination of soil and sources of water

- Contamination of food by flies and dust
- Increase in the incidence of disease, especially, enteric and helminthic diseases.

Different types of excreta disposal systems (latrines) can be used during emergency situations for disaster affected population. Some common types of these latrines are the following.

A. Shallow trench latrine

The trench should be 30cm wide and 90-150 cm deep. The length depends on the number of users: 3.5m are necessary for each 100 persons. Separate trenches should be provided for men and women. The earth (soil) from the trench should be piled up at the side. Shovels should be left at the site and people should be instructed to cover feces with soil each time they use the latrine. Constructing a complete super structure for the latrine using locally available materials could provide privacy.

B. Deep trench latrine

This type of latrine is recommended for camps of longer duration, from a few weeks to a few months. The trench should be 1.8-2.5 m deep and 75-90 cm wide. The length depends on the number of users: 3.5 m of length is necessary for 100 persons. Other requirements are the same as the shallow trench latrine.

C. Borehole latrine

Where the sub soil is not rocky, this type of latrine offers a fast solution for excreta disposal in emergencies. It consists of a bore hole over which the squatting slab is placed and super structure is constructed. The bore hole is prepared with 56m deep and 40 cm diameter. One borehole is required for every 20 persons.

D. Pit privies

Where the sub soil is loose and easy to dig up, a pit privy may be built for each family or for each tent sheltering a few families. If tools are provided, the users can do most of the work themselves. Mass production of flat concrete slabs for the latrine floors may be undertaken at the camp site.

2. Solid waste disposal

There is a relation between the improper disposal of solid waste and the incidence of vector-borne diseases. If the disaster area is urban and possesses a proper collection and disposal service close to a municipal service, efforts should be made to restore or extend the existing system.

Separate containers should be provided for storing organic and inorganic wastes. The containers should be washable, watertight and provided with tight-fitting, overlapping covers. The capacity of the container should not exceed 100 liters. Three or four containers should be provided for every 100 persons.

The quantity and type of solid waste should be estimated to determine the subsequent management systems like frequency of collection, number and size of the vehicles, personnel required, method of final disposal and selection of sites. In emergency situations, all types of trucks can be used. Compacting type trucks can reduce the number of trips and hazards associated with the scattering of solid waste. A truck with a capacity of 10 m³ managed by one driver and two helpers, can make three trips per day and thus serve 5000-8000 people. Different methods, such as sanitary landfill, burial, incineration, and open dumping may be appropriate for the final disposal of solid wastes.

A. Sanitary landfill:

In most situations sanitary landfill is the preferred method of final disposal. Heavy earth moving equipments for the landfill purpose may be available from the army or public works department, Ethiopian Roads Authority, municipality,

and any other construction companies. Solid waste should be deposited, compacted and properly covered with earth during the landfill operation.

B. Burial:

This method is suitable for small camps where earth moving equipments are not available. A trench 1.5 m wide and 2 m deep is excavated and at the end of each day the refuse is covered with 20-30 cm of earth. When the level in the trench is 40 cm below the ground level, the trench is filled with earth and compacted, and a new trench is dug out. If the trench is 1m in length, it should be filled in about one week for every 200 persons.

C. Incineration:

Where burial is not practicable, solid waste should be incinerated. If the waste is very wet, fuel is needed to facilitate burning. Waste from first aid stations and hospitals that contain pathogenic materials should be incinerated, regardless of the method adopted for disposal. A basket incinerator, which is simply a wire basket standing on an iron drum or stone support, may be used for this purpose. Incinerators made of corrugated iron sheets or of bricks and stones are more suitable for long-term use.

In the construction of incinerators used for final disposal, it is essential to observe the following points.

- The incinerator should be located away from and downwind of the camp or temporary shelters.
- The incinerator should be built on a hard or strong bases
- The air intake must be sufficiently large
- The stoking gates should be designed suitably so that waste materials can be added from above.
- A long chimney is necessary for a closed incinerator.

3. Disposal of wastewater:

Waste water from field hospitals, mass-feeding centers and water points requires proper disposal. The usual way is to discharge waste in water to a

seepage pit. To prevent rapid clogging of the pit, an absorption trench may be constructed in advance of the pit. Liquid waste from feeding centers and bath houses contains grease and soap and this can clog the seepage pits. It is therefore necessary to install a grease trap at the upper end of the inlet pipe to the drain and pit.

4. Disposal of animal carcasses:

The problem of disposing of dead animals may assume serious proportions in certain disaster situations, particularly floods. Burial is slow and laborious: to bury a dead horse, a pit 3m deep is required. When there are many dead animals, it is difficult to bury all of them unless heavy excavation machinery is available. The burning of dead animals, especially the large ones is also difficult unless special incinerators are built. Therefore, heavy equipment should be obtained for burial or if the equipment is not available, a combination of burial and burning can be used, that is, burial of internal organs and burning of the carcass with the aid of fuel. Carcasses ready for burial should be sprinkled with kerosene or crude oil to protect them from predatory animals.

5. Burial of the dead:

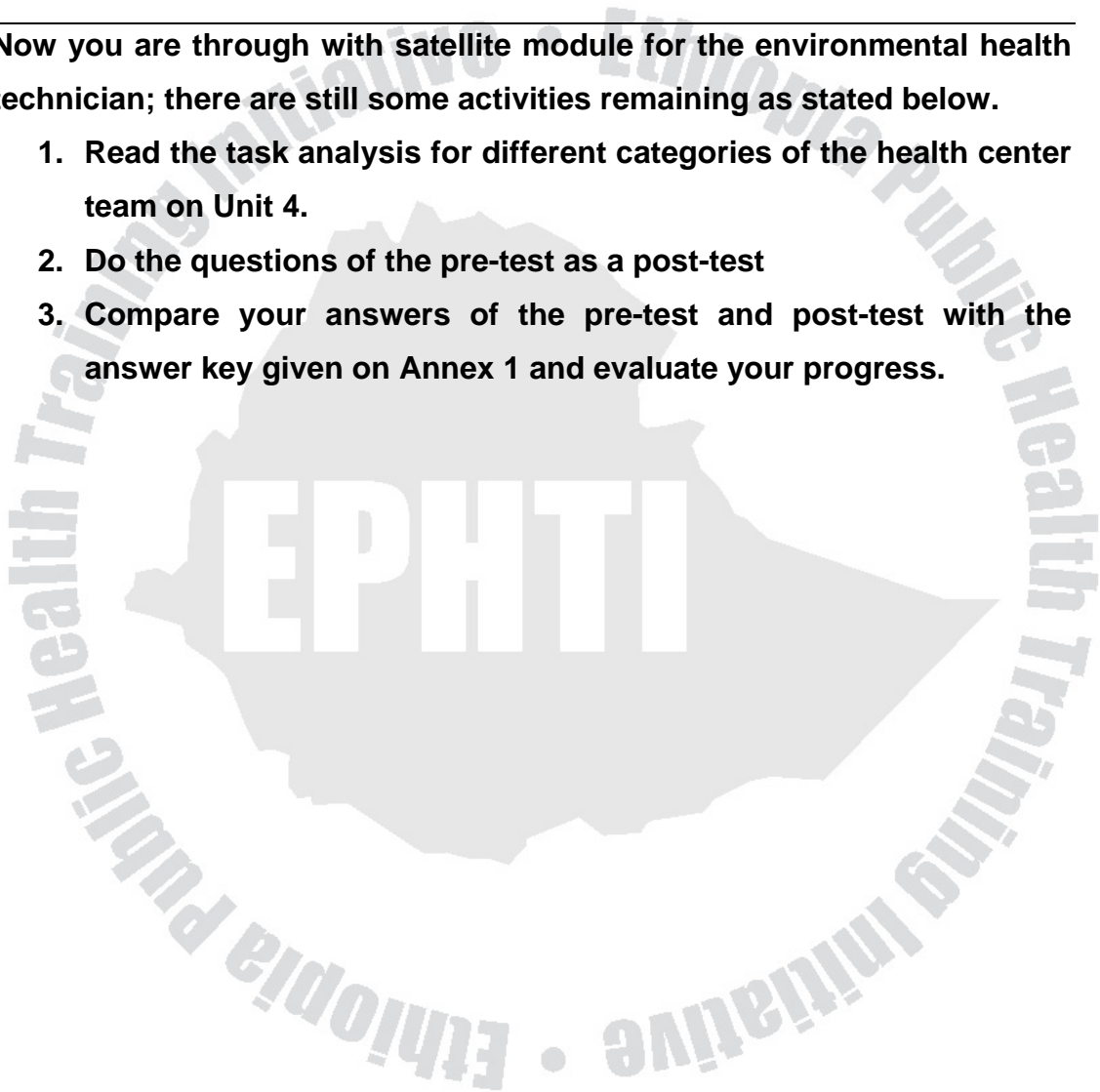
The removal of dead bodies from the scene of disaster should be carried out by the rescue teams. Sanitation personnel should cooperate with other workers when the situation demands. Quick removal of bodies from public view plays an important role in maintaining morale. Mass burial of dead bodies in a common grave should be avoided. The location of graves should be indicated on maps and identified with tag numbers. Areas selected for burial should be with good depth of soil, well drained and at a distance of about half a mile from the periphery of the camp. Burial places should not be located near water sources and should be dug at least 1.5 m deep and 1.2 m apart in any direction. Sufficient number of graves must be dug in advance to prevent delay in burying corpses. In the case of epidemics, burning of the corpses may be considered as an option where there is no religious objection

and fuel is procurable. In the event of epidemics, personal belongings should be disinfected before they are returned.

Materials required for burial work are; stretchers, leather gloves, rubber gloves, overalls, caps, soap and disinfectants, cotton clothes, picks and shovels, heavy earth moving materials and trucks.

Now you are through with satellite module for the environmental health technician; there are still some activities remaining as stated below.

- 1. Read the task analysis for different categories of the health center team on Unit 4.**
- 2. Do the questions of the pre-test as a post-test**
- 3. Compare your answers of the pre-test and post-test with the answer key given on Annex 1 and evaluate your progress.**



3.4. Satellite module for medical laboratory technicians

3.4.1. Purpose and use of the satellite module

This satellite module is prepared for environmental health technicians to be used as a guide when disaster occurs. The module emphasizes only areas that were not covered by the core module.

3.4.2. Directions for using the module

- Before reading this satellite module, be sure that you have completed the pre-test and studied the core module
- Continue reading this satellite module

3.4.3. Learning objectives

At the conclusion of this chapter, the learner will be able to:

- Prepare the necessary materials, and chemical reagents before going to a disaster area.
- Collect samples that are commonly requested in a disaster area
- Transport samples for test that could not be performed in that area

3.4.4. Preparation of equipment, chemicals and reagents

A. Microscope

Electricity supplies may not be available in the disaster area. It is better to have a microscope that can work both by electric or solar power

B. Slides and cover slides

The slide and cover slides should be clean and free from any scratches

C. Disinfectants

Chemical disinfectants, usually 70% alcohol, should be available to clean the site for blood sample collection as well as to disinfect the area after the collection procedure has been accomplished.

D. Staining reagents

Giemsa stain is commonly used to stain blood films for examination of malaria and *Borrelia recurrentis*. Gram stains can also be done in disaster area.

Giemsa stain preparation

To make about 500 ml you will need:

- Giemsa powder 3.8 g
- Glycerol (glycerin) 250 ml
- Methanol (methyl alcohol) 250 ml

1. Weigh the Giemsa on a piece of clean paper and transfer to a dry brown bottle of 500ml capacity which contains a few glass beads.
2. Using a dry cylinder, measure the methanol, add to the stain and mix well
3. Using the same cylinder, measure the glycerol, add to the stain and mix well
4. Place the bottle of stain in a water bath at 50-60⁰ C, or if not available at 37⁰ C, for up to 2 hours to help the stain to dissolve, mix it well at intervals
5. Label the bottle, and mark flammable and toxic. Store in dark room and at room temperature. If kept well-stoppered, the stain is stable for several months. To use it filter a small amount of the stain on to a stain-dispensing container.

E. Transport media

If stool culture is requested, it should be transported to a well equipped microbiology laboratory by using transport media e.g. Cary-Blair transport medium. It can preserve an enteric pathogen like *shigella* and *vibro cholerae* for several days.

Preparation and formula of Cary-Blair medium

To make about 70 bottles you will need:

- Sodium thioglycollate 0.75 gm
- Disodium hydrogen phosphate 0.55 gm
- Sodium chloride 2.5 gm
- Agar 2.5 gm
- Calcium chloride 4.5 gm
- Distilled water 495 ml

1. Dissolve the dry ingredients in water by heating the container in boiling water (do not boil the medium)
2. Allow the medium to cool to 50⁰ C and then add 4.5 ml of the freshly prepared calcium chloride solution. Mix well.
3. Adjust the pH to 8.4 using 0.1 mol/l sodium hydroxide.
4. Dispense the medium in 7 ml amounts in screw cap bottles of 9ml capacity.
5. Sterilize by steaming with caps loosened for 15 minutes. When cool, tighten the bottle caps. Label the bottles.
6. Date the medium and give it a batch number. Record the expiry date (six months from preparation) on each bottle.

The preparation should be stored in a cool dark place.

F. Physiological saline

0.85% sodium chloride to use in stool sample examination

Preparation of physiological saline (0.85% sodium chloride)

To make 1 liter you will need:

- Sodium chloride 8.5 gm
- Distilled water 1 liter

1. Weigh the sodium chloride, and transfer to a clean bottle made to hold a liter
2. Add distilled water to the 1 liter mark, and mix until the salt is fully dissolved.
3. Label the bottle, and store at room temperature. The reagent is stable for several months.

G. Hemometer

This kit is used to determine the hemoglobin level of a patient.

H. Lancet

A sterile lancet is used to take sample from capillary (peripheral) blood

I. Sample container (stool cup)

The sample container which is used for collection of stool sample should be wide mouthed, clean and dry.

3.4.5. Collection and transportation of samples

a. Capillary or peripheral blood

Can be obtained from finger tip, ear lobe (for adults) and heel and toes (for infants)

Material required:

- 70% alcohol
- Sterile lancet
- Dry cotton

Procedure

1. Massage the tip of the body part if it is cold
2. Clean the area with 70% alcohol cotton swab
3. Allow it to dry
4. Make a deep and sharp puncture of about 3 mm depth.

5. Wipe off the first drop of blood, never press out blood
6. After having the required amount of blood, apply a slight pressure over the area with sterile swab.

b. Stool

Materials required:

- Clean, wide mouthed container
- Physiological saline
- Transport media
- Slide, cover slide
- Applicator stick
- Cotton wool swab

Procedure

Give the patient a labeled, clean, wide mouthed container and tell him or her to bring very small amount of feces, avoiding contamination with urine and other contaminants

i. If the specimen is to be transported,

- Transfer a portion of the specimen to a cotton wool swab
- Insert the swab in a container of sterile transport medium (Cary-Blair transport medium)
- Break off the swab stick to allow the bottle cap to be replaced tightly.
- Label the specimen and send it with a request form to reach the appropriate laboratory within two hours.

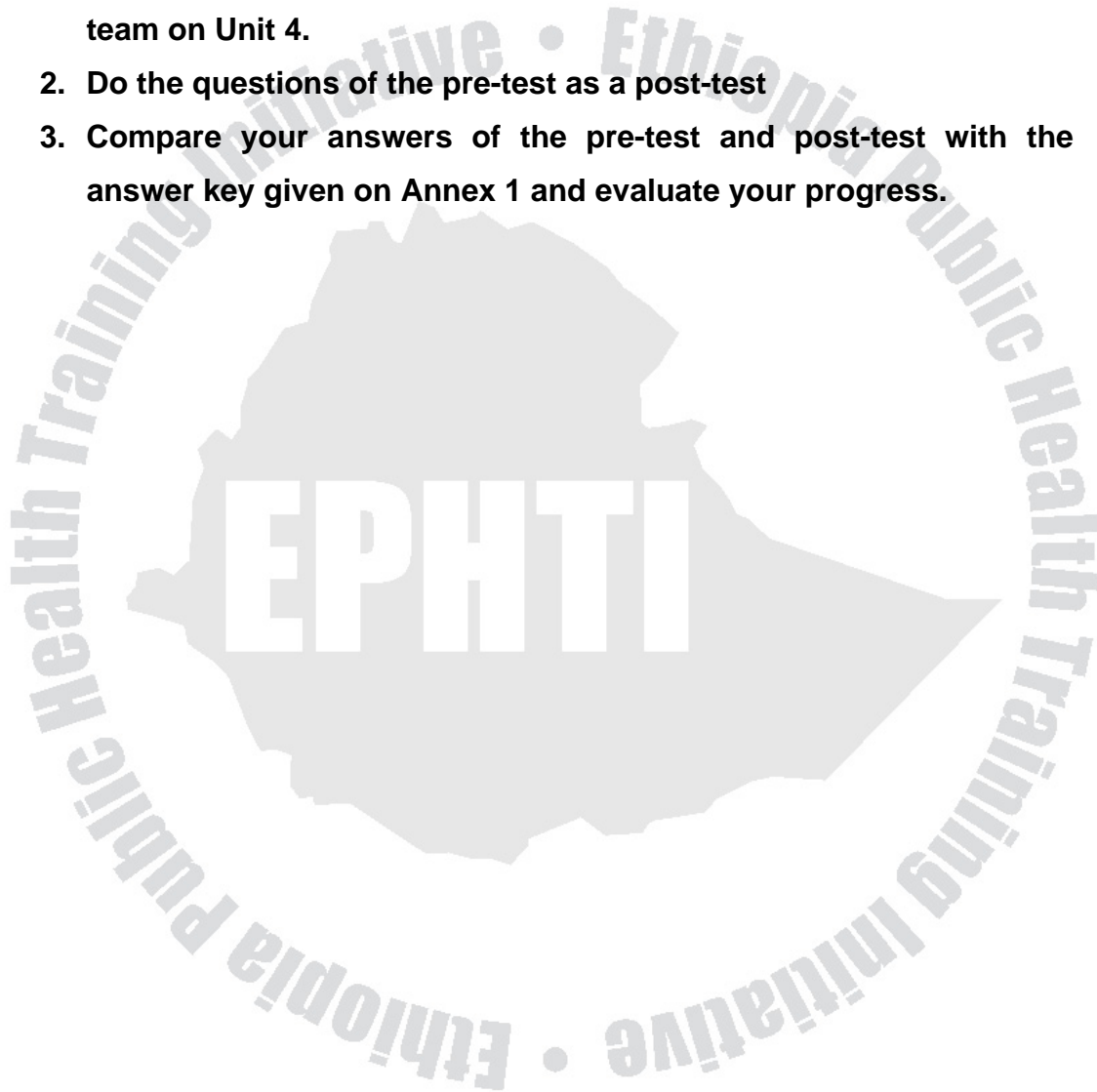
ii. If the specimen does not need transportation,

- Place a drop of physiological saline on a clean slide
- Using an applicator stick, take a small amount of specimen and mix with the saline
- Cover the preparation with cover slide
- Examine the preparation with 10x and 40x objective of the microscope.

- iii. There may be a need to examine bodily secretions and discharges. Use the appropriate procedure for each.

Now you are through with satellite module for the medical laboratory technician; there are still some activities remaining as stated below.

1. Read the task analysis for different categories of the health center team on Unit 4.
2. Do the questions of the pre-test as a post-test
3. Compare your answers of the pre-test and post-test with the answer key given on Annex 1 and evaluate your progress.



3.5. Satellite module for community health workers

3.5.1. Purpose and use of the module

This module is intended to be used by the community health workers to provide them with basic information to serve the community in the prevention and control of disasters. It will help them recognize their role when case disaster occurs.

3.5.2. Direction for using this module

- Start with the pretest questions for community health workers
- Study the text including the task analysis

3.5.3. Pre-test questions

1. List the most common types of disaster in Ethiopia?
2. List the common health problems arising after disasters?
3. What major roles can community health workers play in disaster Prevention and control?

3.5.4. Learning objectives

After completion of this module, the community health worker should be able to:

- Define disaster
- Identify types and cause of disasters
- Describe health consequences of major disasters
- Explain the role of community health workers in preventive and control measures of disaster.

3.5.5. Definition

A disaster is an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community.

3.5.6. Causes of disaster

Disasters have two major causes

1. Natural causes like earthquakes, landslides, floods, droughts and epidemics
2. Human-made causes like fires, explosions, accidents, environmental pollutions, and deforestations

The most common types of disaster in Ethiopia are drought and armed conflict.

3.5.7. Health consequences of disaster

There is a relationship between the types of disaster and its effect on health. Some of them cause the effects like population movements and environmental changes causing increased risk of disease transmission. The following are some of the common health problems arising after disasters.

1. Social reaction

People may have different responses to disasters. They may invent exaggerated rumors especially in epidemics which force authorities to take seemingly inappropriate relief work. At times they may not cooperate with measures planned by authorities, for example rejecting mass vaccination.

2. Population displacement

Destruction of housing by floods is known to cause large population movements and so does armed conflict.

3. Communicable diseases

Outbreaks of infections, especially those caused by fecal contamination of water and food, are likely to occur. The risk of epidemic communicable disease is proportional to population density and displacement

4. Food shortages

Food stock destruction within the disaster will reduce the reserve food available. The other cause for food shortage is disruption of the distribution system due to disasters.

5. Mental health problems

Anxiety and depression are some of the problems that follow disaster. Efforts should be made to preserve family and community social structures.

6. Trauma of different body parts

This may result from all types of disaster although some disasters bring about more serious consequences as in the case of earthquakes, explosions and armed conflicts.

3.5.8. Prevention and control of disasters

Community Health Workers can very well participate well in disaster prevention and its control. They play a major role in the early warning system by making the community aware of and prepared for the impending disaster.

The initial rapid assessment after disaster should focus on determining existing and potential health problems including morbidity and mortality, severe injuries and malnutrition. Providing assessment and recommendations to appropriate relief authorities is also expected from the Community Health Worker. In the management of mass casualties, giving first aid, and transporting patients to health facilities are also the task of the Community Health Worker. Finally, the community health worker should be involved in the rehabilitation phase by giving care to the victims and orphans and contributing to the repair and reconstruction of damaged facilities and buildings, either by direct participation or by mobilizing the community for such activities. The Community Health Workers should communicate well the lessons learnt from the disaster to the community. Please refer to table 3.3. for task analysis of community health workers.

Table 3.3: Task analysis for community health workers

Objectives	Knowledge activities	Attitude activities	Practice activities
To define disaster	Define disaster		
To identify causes and types of disaster	List the causes of disaster List the types of disaster	Believe that there are different causes and types of disaster	-
To identify health consequences of common disasters in Ethiopia	Describe the health effect of commonly occurring disasters in Ethiopia	Accept that disasters can result in different health problems	-
To develop actions to protect against the health consequences of disaster	-	-	<ul style="list-style-type: none"> • Mobilize the community towards control of the health consequences of disaster • Health education • Take action to prevent bad health consequences
To identify the prevention and control measures for disaster	Describe the preventive and control measures of disaster at the community level	Recognize that human-made disaster can be prevented and controlled at the community level	-
To perform the preventive and control measures	-	-	<ul style="list-style-type: none"> • Participate in the prevention and control activities of disaster • Raise health awareness about disaster

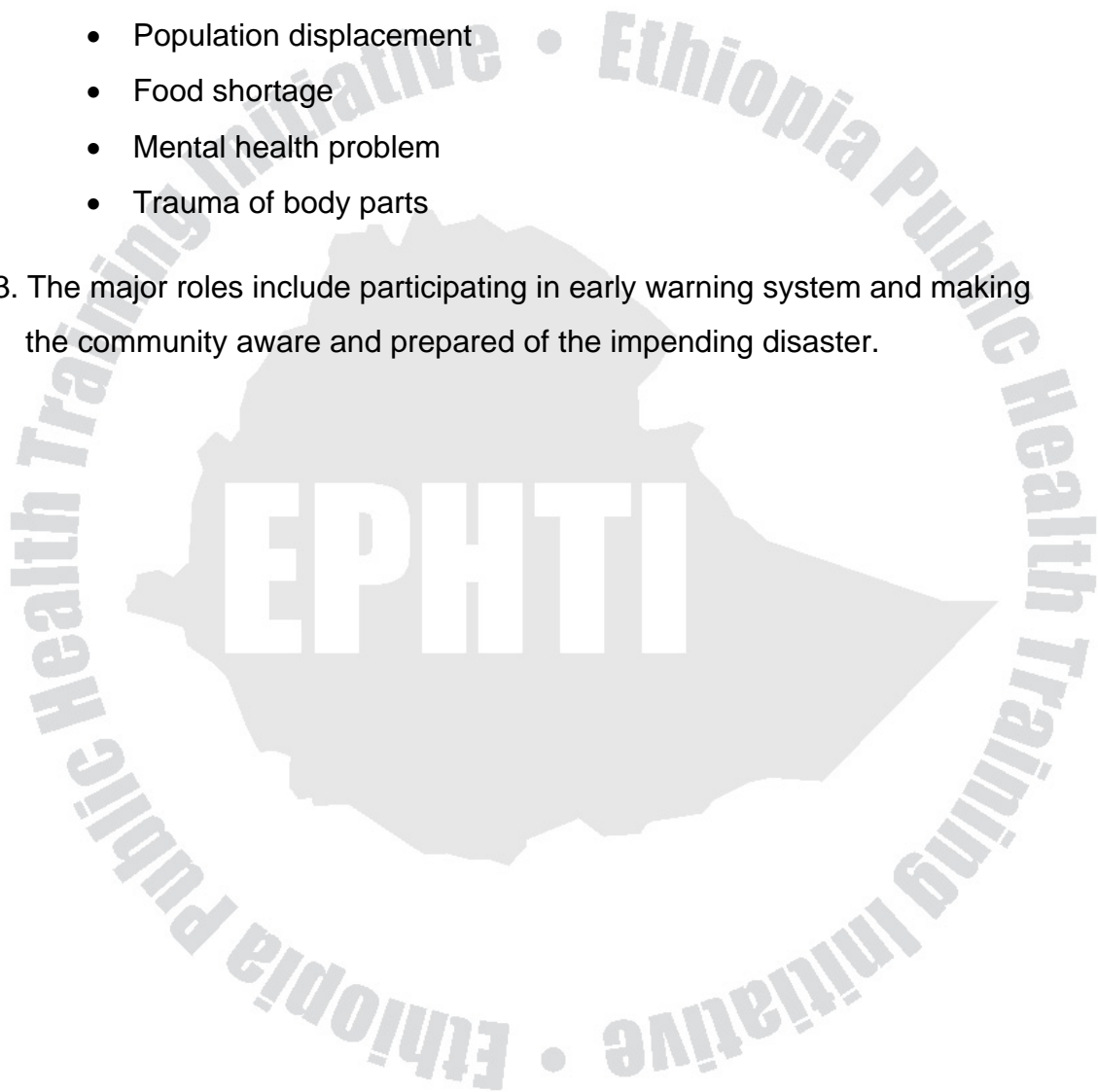
3.5.9. Answer key for pre-and post-test for community health workers

1. Drought and armed conflict

2. The common health problems are:

- Social reaction
- Communicable disease
- Population displacement
- Food shortage
- Mental health problem
- Trauma of body parts

3. The major roles include participating in early warning system and making the community aware and prepared of the impending disaster.



3.6. Take home messages for care givers

1. **Definition:** Disaster is an occurrence of an event that can endanger the normal existence of the community beyond the capacity of the community to adjust. It can result in loss of life bodily injury and loss of property.
2. **Types of disaster:** Disaster can be caused by
 - **Natural causes:** for example earthquakes, floods, droughts, etc
 - **Human-made causes:** resulting from activities human beings that favor disasters. For example, cutting of trees, overgrazing, motor vehicle accidents, armed conflicts etc.

There are different health consequences following disasters. Some of these are mass displacement of people which predispose people to diseases that affect many people at the same time or others like injuries and traumas following flooding or earth quake.

Disasters can be prevented or controlled by the active participation of the community, the community leaders and the health workers. The role of the health worker includes giving information about the early warning system and identifying any possible disasters that can affect that community and making efforts to decrease the vulnerability of the community. In the case of disaster the role includes helping the injured and cooperating with the community leaders and other health workers in disaster control activities.

UNIT FOUR

ROLES AND TASK ANALYSIS OF THE HEALTH CENTER TEAM MEMBERS

Table 4.1: Knowledge objectives and activities

Learning objectives	Learning activities			
	HO	PHN	EHT	MLT
To define disaster	Define disaster	Define disaster	Define disaster	Define disaster
To describe the epidemiology and significance of disasters	Explain the global magnitude of disasters and their significance	Explain the global magnitude of disasters and their significance	Explain the global magnitude of disasters and their significance	Explain the global magnitude of disasters and their significance
To classify the causes and types of disaster	Classify the causes and types of disaster	Classify the causes and types of disaster	Classify the causes and types of disaster	Classify the causes and types of disaster
To identify the most common types of disasters in Ethiopia	Identify the most common types of disasters in Ethiopia	Identify the most common types of disasters in Ethiopia	Identify the most common types of disasters in Ethiopia	Identify the most common types of disasters in Ethiopia
To describe the consequences of disasters on health	Describe the effects of disasters on health	Describe the effects of disasters on health	- Describe the effects of disasters on health - Discuss the effects of disasters on the environment	Describe the effects of disasters on health
To explain the preventive and control measures of disaster	Describe the preventive and control measures including early warning system	Identify the proper disaster preventive methods; early warning system, preparedness. Describe the preventive and control measures	Identify the proper disaster preventive methods; early warning system, preparedness. Describe the preventive and control measures	Identify the proper disaster preventive methods; early warning system, preparedness. Describe the preventive and control measures
To prepare health intervention plan for disaster	Describe the health intervention plan for a disaster	Describe the health intervention plan for a disaster	Describe the health intervention plan for a disaster	Describe the health intervention plan for a disaster

Table 4.2: Attitude objectives and activities

Learning objectives	Learning activities			
	HO	PHN	EHT	MLT
- To understand that disaster is a public health problem	- Advocate the social economic and health impacts of disaster	- Advocate the social economic and health impacts of disaster	Advocate the social economic and health impacts of disaster	Advocate the social economic and health impacts of disaster
- To believe that prevention and control measures reduce the health consequences of disaster	- Give emphasis to preparedness for disaster	- Give emphasis to preparedness for disaster	Give emphasis to preparedness for disaster	Give emphasis to preparedness for disaster

Table 4.3: Practice objectives and activities

Learning objectives	Learning activities			
	HO	PHN	EHT	MLT
- To plan for appropriate intervention in cases of disaster	- Design appropriate intervention plan in cases of disaster	- Design appropriate intervention plan for specific activities	Design appropriate intervention plan for specific activities	Design appropriate intervention plan for specific activities
- To carry out appropriate actions in cases of disaster	- Organize and co-ordinate intervention activities, give health education monitor and evaluate the program	- Give vaccination and health education, evaluate the nursing activities	Give health education and perform other environmental activities	Give health education prepare the necessary lab equipment and materials
- To design appropriate preventive and control measures	- Perform preventive and control measures	- Perform preventive and control measures	Perform preventive and control measures	Perform preventive and control measures

UNIT FIVE

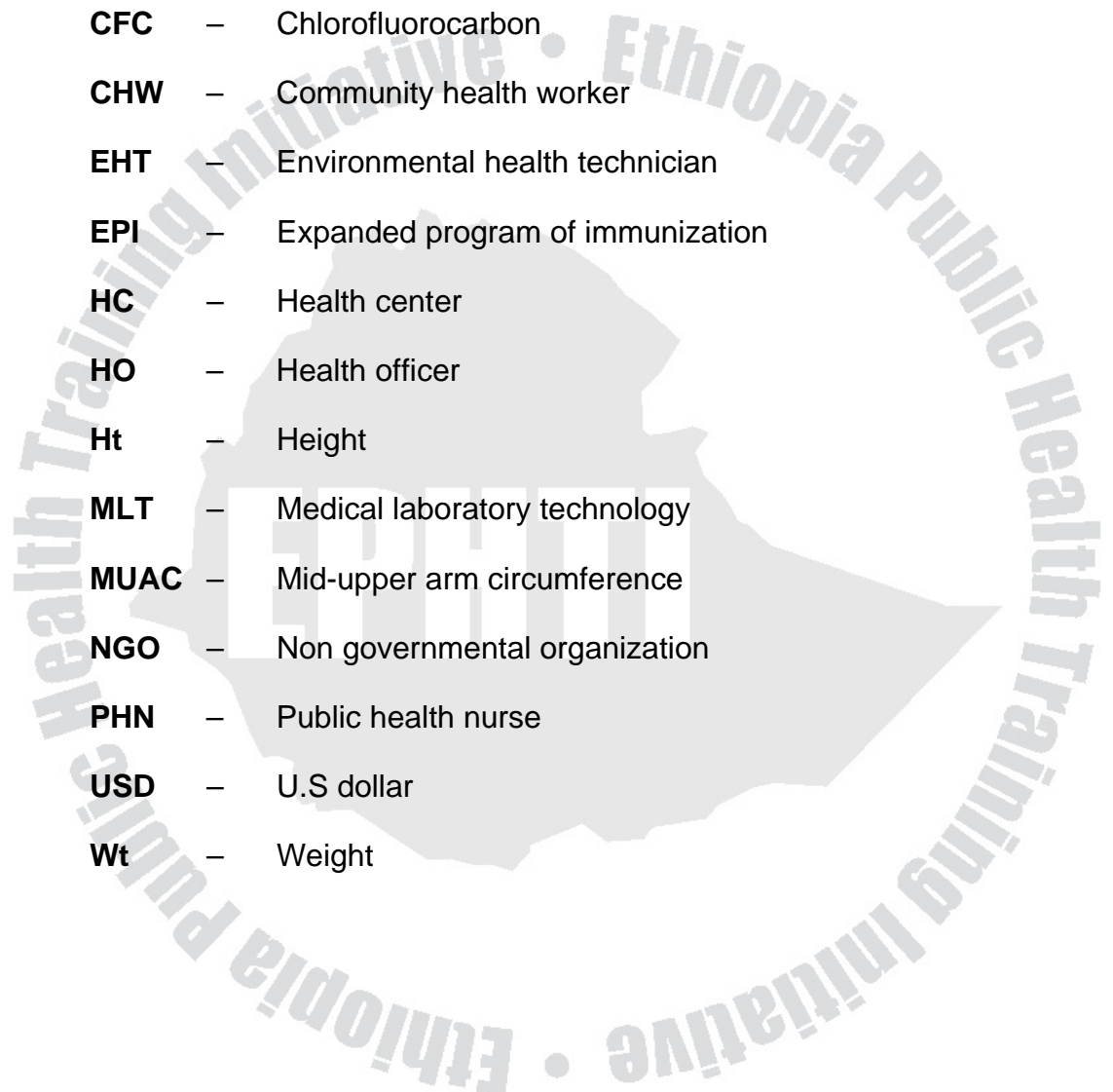
GLOSSARY

- Adjustment disorder:** Development of emotional or behavioral symptoms in the context of one or more identified psychosocial stressors.
- Amputation:** Removal of limbs surgically
- Anxiety:** A pathological state characterized by a feeling of dread accompanied by somatic signs that indicate a hyperactive autonomic nervous system.
- Apathy:** Lack of feeling, emotion, interest or concern: common in depression
- Blackouts:** Loss of memory/consciousness for a short time
- Cataract:** Opacity of the lens of the eye that impairs vision.
- Cyclone:** A very violent wind moving very rapidly in a circle with a calm central area.
- Depression:** Feeling low, characterized by sadness, apathy, pessimism and a sense of loneliness
- Edema:** Accumulation of fluid in the interstitial space (out of the blood vessels)
- Enteric:** Something related with gastro intestinal system
- Flashback:** Distressing experience of impaired perception after an event
- Inhalation:** Drawing air in to the lungs
- Kwashiorkor:** A form of severe malnutrition caused by a deficiency of protein-rich food
- Marasmus:** A form of severe malnutrition caused by a deficiency of energy-rich food
- Mesothelioma:** A malignant tumor of the pleura, the membrane lining the chest cavity

- Micronutrient:** Essential nutrients needed by the body in very small amount (vitamin and minerals)
- Morbidity:** The number of cases of disease occurring within a particular number of the population
- Mortality:** The number of deaths in a given period in a particular population
- Neurosis:** A chronic or recurrent non-psychotic disorder, characterized by anxiety that is experienced or expressed directly or is altered through defense mechanisms.
- Orthopedics:** A branch of medicine dealing with the correction of diseased, deformed or injured bones, muscles and joints
- Per capita consumption:** The amount consumed per each person.
- Post traumatic stress:** Anxiety produced by extraordinary major life stress.
- Procurement:** Obtaining goods by careful attention or effort
- Sedative:** Drugs and other measures which soothe the excitement of nervous system.
- Sporadic:** Occurring here and there, as opposed to epidemic outbreaks or endemic situation
- Stunting:** Lower value of height for the expected age
- Supplementary nutrition:** Additional nutrition provided in the form of tablets or direction especially of micronutrients.
- Surveillance:** Systematic collection, analysis and dissemination of data on ongoing basis
- Survey:** One time assessment
- Tranquillizer:** Drug which induces a mental state free from agitation and anxiety and renders the patient calm and peaceful.
- Wasting:** Low value of weight for the expected age
- Water-borne disease:** Diseases caused by agents which depend on water for their living

UNIT SIX

ABBREVIATIONS



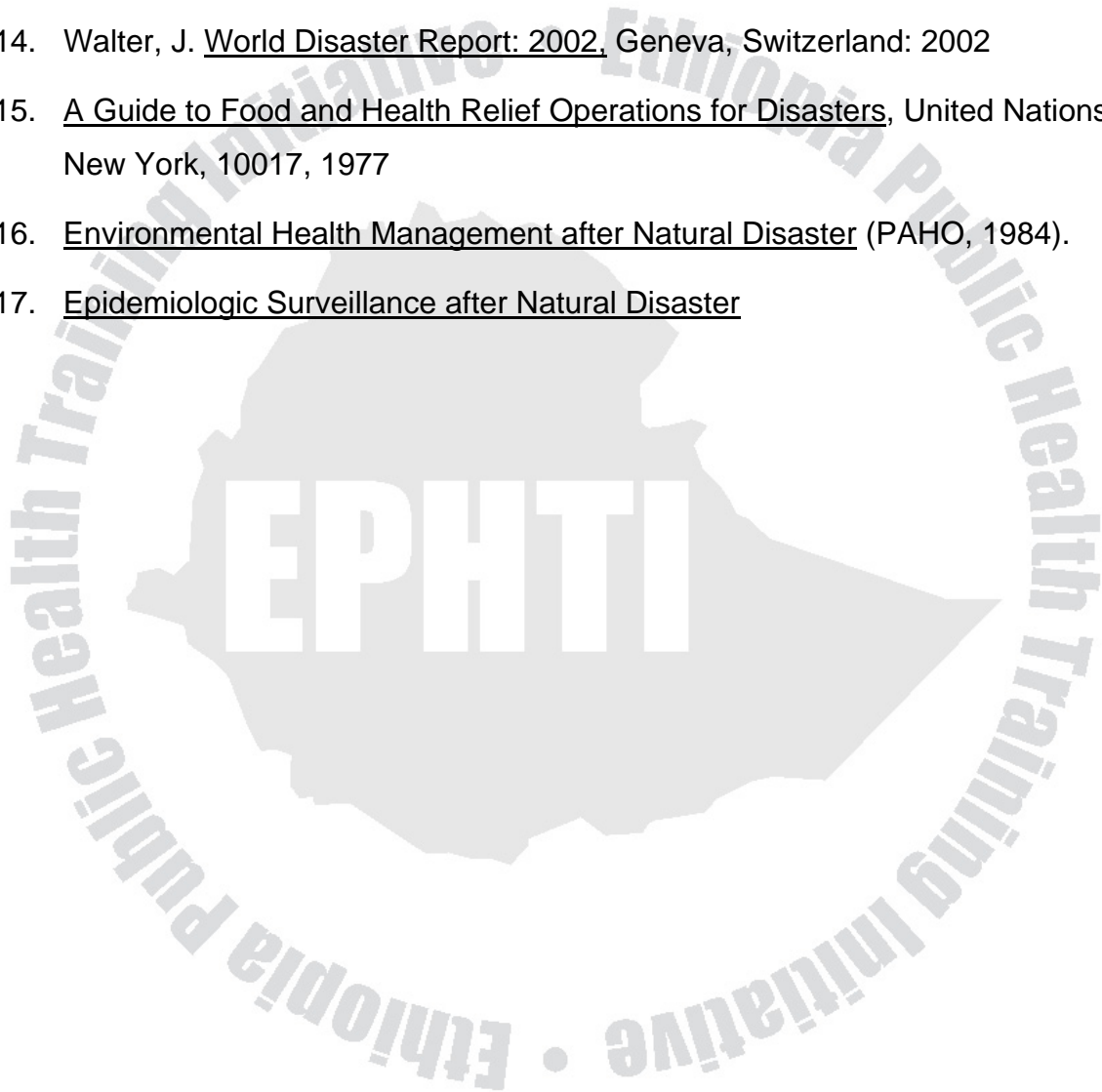
ABC	–	Airway, breathing, circulation
CFC	–	Chlorofluorocarbon
CHW	–	Community health worker
EHT	–	Environmental health technician
EPI	–	Expanded program of immunization
HC	–	Health center
HO	–	Health officer
Ht	–	Height
MLT	–	Medical laboratory technology
MUAC	–	Mid-upper arm circumference
NGO	–	Non governmental organization
PHN	–	Public health nurse
USD	–	U.S dollar
Wt	–	Weight

UNIT SEVEN

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ANNEXES

Annex 1. Answer keys

1.1. Answer keys for pre- and post-test for all categories of the health center team

1. D
2. D
3. D
4. a. Make people aware about flood prone areas.
b. Following flooding – continuously monitor quality of water supply and when contaminations is suspected, look for alternative water supply sources, take precautions like giving advice on bringing water to vigorous a boil before use.
c. Tell people not to store water in open tanks that facilitate mosquito breeding.
5. a) Under nutrition
b) Death
c) Mass displacement
d) Over crowding with increased risk of communicable diseases
e) Psychological problems – apathy, despair and depression.
6. a) Health and nutritional surveillance
b) Mass immunization and vaccination
c) Regular and periodic disinfection of drinking water
d) Medical examination of children
e) Provision of basic sanitary services
f) Increased occurrence of water-washed and water-born diseases.
7. Drought
8. Human causes – sudden occurrence
9. Children, aged and women
10. Injury to the body, long term effects due to inhalation of toxic combusted substances psychiatric illness due to post traumatic stress

11. Population movement, over crowding, contamination of water or food supply, decline in nutritional status
12. Structuring an emergency plan, establishing an early warning system, training of national staff in emergency operations.
13. Spread of farming and grazing
 - Fire wood collection
 - Timber harvesting
14. Loss of free products from forest such as fruits and medicine
 - Decline in tradition culture
 - Contributes to other hazards like:
 - Flooding drought, famine, desertification, pollution

1.2. Answer keys for health officer satellite module

1. - by taking, into consideration past experience
 - by noting increasing number of cases of sporadic diseases
 - by noting preceding disasters
2. - Measurements of body weight and height
 - Measurement of the Mid Upper Arm Circumference (MUAC)
3. - by taking proper history
 - picking specific physical signs
 - taking anthropometric methods
4. - Nutritional assessment
 - Diagnosis and treatment of specific diseases
 - Organization and proper management of the health service
5. - Securing ABC rule of life
 - Disinfecting and clearing wound area
 - Doing minor surgeries like debridement of dead tissue
 - Giving appropriate antibiotics.

1.3. Answer keys for of public health nurse satellite module

1. Role of the nurse in disaster preparedness includes:

- Helping in keeping safe environment
- Assessing and reporting environmental hazards
- Reporting the beginning of epidemics
- Identifying available community resources
- Teaching the community about disaster

2. Role of the nurse in disaster response includes:

- Community assessment
- Health education
- Surveillance
- Mass vaccination
- Shelter management for displaced people
- Triage during accidents

3. Role of the nurse in disaster response includes:

- Home visiting
- Environmental assessment
- Follow-up and referral of patients

1.4. Answer keys for environmental health technician satellite module

1. E

2. a. 40-60 liters/person in field hospitals

b. 20-30 liters/person in mass feeding centers

c. 15-20 liters/person in temporary shelters and camps.

d. 35 liters/person in washing facilities.

3. False

4. False

5. False

6. - One tablet of 4 mg is used to treat one liter of clear water

- One tablet of 160 mg is used to treat 40 liters of clear water.

7.
 - a) Halazone tablets
 - b) Granular calcium hypochlorite or HTH (High Test Hypochlorite) powder
 - c) Sodium hypochlorite bleach
8.
 - From operational water distribution systems
 - From undamaged private sources such as power plants, breweries, and other similar establishments
 - From undamaged springs, wells, or water cisterns, and
 - From newly constructed water structures such as bore-hole wells
9. 0.88 grams of sodiumthiosulfate/100 milligrams of chlorine
10.
 - Shallow trench latrines
 - Deep trench latrines
 - Bore-hole latrines
 - Pit privies
11. D

1.5. Answer keys for medical laboratory technician satellite module

1. B
2. D
3. A

Annex 2. Additional information for health officers and public health nurses

Anthropometric measurements

How to take weight of a child using a hanging spring balance.

1. Install a 25 kg hanging spring scale (graduated by 100 g). If mobile weighing is needed, the scale can be hooked on of tree or a stick held by two people.
2. Suspend weighing pans from the lower hook of the scale and recalibrate to zero.
3. Remove child's clothes, and any jewelry and place him/her in weighing pans, older children may hold on to the bar and lift themselves off the ground.
4. Ensure nothing is touching the child.
5. Read the scale at eye level (if the child is moving about and the needle does not stabilize, estimate the weight by using the value situated at the mid-point of the range of escalation).
6. Announce value to assistant who repeats, verifies and records.

Height and length

Procedure for measuring the length of a child less than 85 cm

1. Shoes should be removed.
2. The child is placed gently against the measuring board, the soles of the feet against the fixed vertical part, the head near the cursor on the moving part, the child should lie straight on the middle of the board, looking directly up.
3. The assistant holds the feet firmly against the foot board, and places one hand on the knees of the child, while the measurer gently holds the child's head, places the cursor against the crown of the head.
4. The measurer reads and announces the length to the nearest 0.1 cm.

Procedure for measuring height for a child taller than 85 cm

1. Place the measuring board upright in a location where there is room for movement around the board.
2. Remove the child's shoes and stand her/him against the middle of the measuring board.
3. An assistant firmly presses the child's ankle and knees against the board.
4. Ensure that the child's head, shoulder, buttocks, knees and heels touch the board.
5. The measurer positions the head and the cursor at right angles, the mid-ear and eye socket should be in line and the hair should be compressed by the cursor.
6. The measurer reads and announces the height to the nearest 0.1cm.

How to check for edema

Moderate thumb pressure is applied to just above the ankle or the dorsum of the feet for about two seconds. If there is edema, an impression remains for some time (at least for seconds).

MUAC

Procedure for measuring MUAC

1. Elevate the left arm until it is 90 degree to the body
2. Place measuring tape along the upper arm and find mid-point of the upper arm (between the shoulder and elbow)
3. Mark the mid-upper arm point with a pen
4. Let the left arm hang relaxed at the side of the body
5. Place the MUAC measuring tape on the mid way point marked
6. Pull the tape until it fits tightly around the arm. The tape should not be made too slack nor pulled too tightly.
7. Record mid arm circumference to the nearest 0.1 cm