Environmental Health - THE Mentor

community health nursing (Kenya Medical Training College)

ENVIRONMENTAL HEALTH

COMMUNITY HEALTH

Introduction

This unit focuses on the components of environment and their effect on humans, water and sanitation, appropriate methods of handling food, and the effects of housing on health. The final section will focus on how the community nurse should mobilise the community in the control of vectors and pests in their environment. Environmental health is one of the most important aspects of primary prevention of diseases. The community health nurse and all the other health workers have a responsibility to assist their communities to improve their environment.

This unit is composed of five sections:

Section One: Health and the Environment
Section Two: Water and Sanitation
Section Three: Appropriate Methods of Handling Food
Section Four: Housing
Section Five: Control of Vectors and Pests

Unit Objectives

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

- Explain the importance of environment to community health
- Describe water and sanitation in relation to health
- Outline appropriate methods of handling food
- Describe the effects of housing on health
- Mobilise the community in the control of vectors and pests

SECTION 1: HEALTH AND THE ENVIRONMENT

Introduction

Welcome to section one of the Environmental Health unit. Since the environment comprises all things that make up your surroundings, environmental health, therefore, describes the aspects of health related to or emanating from your interaction with the environment.

Objectives

- Define the environment
- Explain the components of the environment
- Describe the effects of environmental factors on health

Environmental Components and their Effect on your Health

The following factors can have an effect on your health:

- Biological environment
- Physical environment
- Socio-cultural environment
- Economic and political components of the environment

Biological Environment

The biological component of the environment is made up of living things, which include plants, people and animals. The adjacent figure shows some examples of biological components.

Plants

Vegetation prevents soil erosion and also protects our water sources. Trees act as windbreakers, provide firewood, charcoal, timber and paper among others. They also influence weather patterns. Flowers are a natural beauty and are often used for decoration. Plants provide vegetables, fruits, tubers and seeds as food.

A number of plants are used as herbal medicine for the treatment of various diseases, for example, the Neem tree locally known as muarobaine, is used for the treatment of malaria, among many other diseases. Garlic is used to treat hypertension. The aloe vera plant is used for prevention of cancer of the stomach and healing of wounds. On the other hand, some plants may adversely affect health. Occasionally, people react to pollen from blooming plants and may develop hay fever or asthma. Ingesting or touching some poisonous plants may have devastating effects.

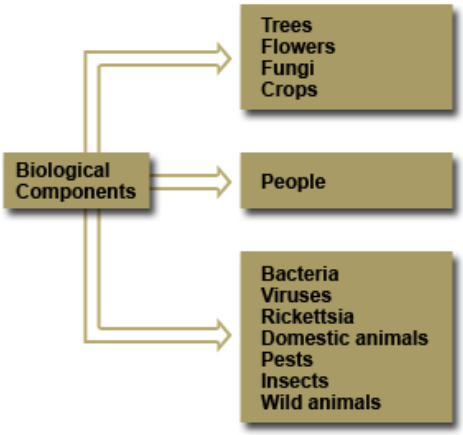
People

Human beings and their activities can be a big source of infection. For example, overcrowding and slum settlements brought about by urbanisation, can promote the transmission of diseases, especially those diseases that are spread through droplets and contact. Explosions from quarries produce a lot of dust, which causes respiratory and eye problems. When it rains, these quarries collect water and become breeding sites for mosquitoes and risky places for children.

The felling of trees provides firewood and charcoal but, at the same time, it destroys the water sources. Cultivating along riverbanks may contaminate the water supply through seepage of the fertilizers and pesticides used on the crops. Overgrazing causes soil erosion, destroys vegetation and contaminates water sources.

Animals

Domestic animals such as cattle, sheep, goats and poultry provide meat, milk and eggs for consumption. Some of them supply hides and wool for commercial purposes. They also provide manure, which is used to increase food produce. Wildlife is often a tourist attraction and acts as a source of income for our country. Cats and dogs are kept as pets, but they can also transmit diseases such as cat scratch fever and rabies, respectively. Other hazards include snakebites, which can be fatal and insect bites, which may act as vectors of various diseases. For example, mosquitoes are vectors of malaria, yellow fever and filariasis. Houseflies are vectors of dysentery and other diarrhoeal diseases. Bacteria, rickettsia and fungi are also part of the biological environment and are disease-causing organisms in man.

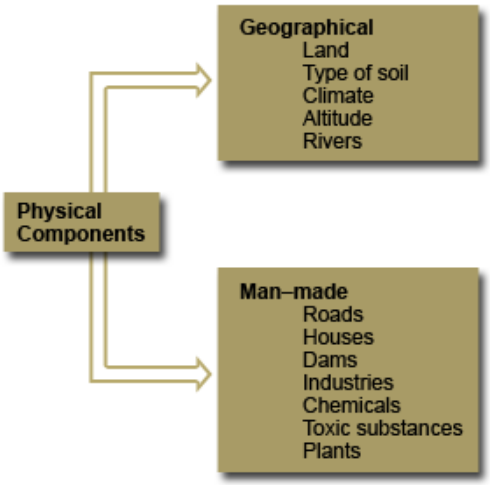


Physical Environment

The physical components of the environment are divided into geographical and man-made components. Land is used for settlements. When the land is fertile and well used, it provides enough food for consumption. On the other hand, when the land is infertile, the food supply will be inadequate, resulting into nutritional problems.

The type of soil, climate and altitude determine the type of crops that can be grown in a specific area. Some crops will do well in a hot climate, others will not.
For example, tea, peas and pyrethrum thrive in cool climates. However, cold climates encourage respiratory diseases and joint problems such as arthritis. In hot climates, most legumes and fruits such as oranges and mangoes do well. Diseases associated with hot climates include malaria.

Snakes are also common in hot areas and their bites can be fatal. Some disease outbreaks occur during the rainy season, for example, cholera, typhoid and malaria. Similarly, during dry seasons there may be a shortage of food leading to malnutrition. Persistent crop failure will lead to food insecurity and famine.



Each type of climate has its own pattern of vegetation and animals to control. Man has to adjust to the animals and the vegetation since they affect health. Additionally, to adjust to the different temperatures man has to use appropriate clothing.

Remember: Most micro-organisms that cause disease are transmitted through air, water and food.

Therefore, constructing houses too close to a dam or where animals are kept facilitates the transmission of vector borne diseases. Industrial wastes that consist of chemicals and toxic substances, may also pollute the water, air and food.

Moreover, dampness in houses favours the transmission of airborne diseases.

It is your responsibility as a health worker to identify ways of helping the community to improve their environment. You have to be a role model in your homes, health facilities and also in assisting various community development projects.

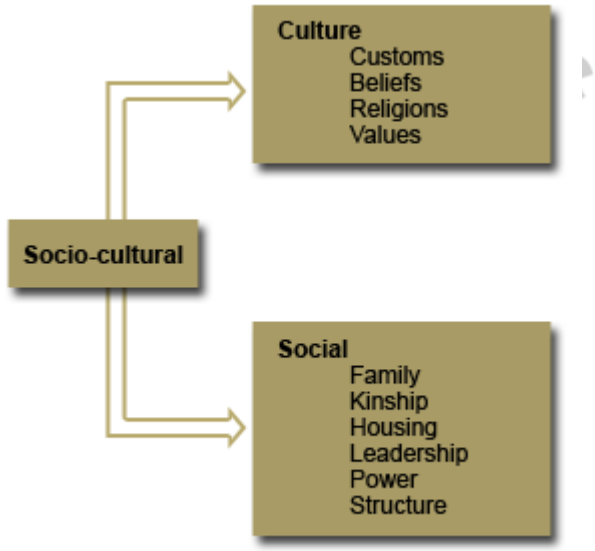
Pollution

Pollution is the term used to describe the spoiling of natural resources such as air, food and water by harmful substances. Industrial waste such as smoke can pollute the air and water. Other industrial wastes can pollute the soil and vegetation. In the rural areas, where people are involved in agricultural activities, pollution may result from the use of insecticides, pesticides and industrial waste.

Environmental health problems however are usually more prevalent in towns and slums than in rural areas. As a health worker you can make a difference in the community by assisting individuals, families and the community to make their environment healthy.

Socio-Cultural Environment

The figure on your right illustrates some of the socio-cultural factors that may affect health and health practices.



Some of the health issues affected by these factors are food habits and cooking practices. Different communities have different food habits and cooking practices. For example, the Kikuyu community have maize and beans (Githeri) as their staple food whereas the Luo community have a cooked preparation of maize flour (Ugali) as their staple food.

Food taboos also vary from one community to the other. Examples of food taboos include prohibiting pregnant mothers from taking some types of meat, believed to affect the foetus. Wife inheritance and polygamy practices encouraged by some communities provide an opportunity for spreading sexually transmitted diseases and HIV/AIDS. Tattoos performed for beautification and circumcision are other practices where the procedures may be carried out using unsafe instruments and can easily transmit diseases like HIV/AIDS among others. Female genital mutilation can lead to difficult deliveries. Some people discourage breast-feeding practice considering it to be primitive. This denies the child all the benefits of breast-feeding. Other people do not make use of the available prenatal and delivery services. This affects the growth of the baby and the health of the mother.

Customs and beliefs have an effect on human health. Identify those beliefs that you think you need to discuss with the community to change and those to uphold. It is important to listen to the community's reasons for their beliefs and practices. This will facilitate the choice of the health measures and suitable solutions after discussion.

Economic and Political Components of the Environment

These components include work, money and government. The economic factor relates to both rural and urban economies as well as local community organisation. Rural and urban economics will determine to a great extent the quality of environmental health.
People can change their environment either positively or negatively. Some of these changes are described as development.

Some development projects may make the environment healthier, while others make it a suitable habitat for diseases. An example is that of irrigation schemes for growing rice, which is a cash crop. This improves the peoples' income, but at the same time, rice fields are breeding sites of mosquitoes and snails, which are vectors of malaria and schistosomiasis respectively.

Other examples of the relation between health and economic status abound. People of low economic status may resort to drinking as a way of relieving their stress. This is usually at the expense of the family budget for basic needs and may lead to health problems. The rich also may suffer from diseases of life style such as obesity, gout, and hypertension among others. The government involves political influences into development policies.

SECTION 2: WATER AND SANITATION

Introduction

The section is divided into three sub-sections. In the first one, you will look at water, identifying various water related diseases as well as sources of water, water contamination and the purification of water. In the second sub-section you will examine types of waste and finally, in the last sub-section, you will study methods of waste disposal.

Objectives

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

- Describe the importance of water in relation to health
- Explain different types of waste
- Describe various methods of waste disposal

Water

Water is essential for life. It is found in every cell in our body and is necessary for most basic functions, like respiration, digestion and other chemical processes. More than 50% of human body weight is made up of water. Water is thus vital to health and survival but it may itself become the source of diseases, therefore, it should be properly treated and made safe for domestic use.

What role does water play in the transmission of the following diseases?

- Scabies
- Cholera
- Schistosomiasis

Role Played by Water on the Transmission of Diseases

Water may contribute to the spread of diseases in several ways.

When there is not enough water, and people cannot observe basic personal hygiene, diseases like scabies, non-specific diarrhoeas, dysentery and trachoma spread. Such diseases whose spread is promoted by lack of adequate water are called **water-washed (water scarce) diseases**. Simply improving the quantity of water can prevent them.

Water can also contribute to the spread of diseases when it carries a specific disease-causing organism. Examples are typhoid, cholera, amoebiasis, hepatitis A, or poliomyelitis. Such diseases caused by contaminated water are called **water-borne diseases**, and the only way to prevent them is to improve the quality that is, the cleanliness of the water.

Finally, water can contribute to the spread of disease when it is necessary in the life cycle of a disease vector, for example malaria and schitosomomiasis. These diseases are called **water-related diseases.** Other water related diseases include: onchocerciasis (river blindness) and dracunculosis (guinea worm).

Summary of Water-Associated Diseases		
Type of Disease	**Cause**	**Example**
Water-washed	Due to lack of adequate water: a) For washing hands, utensils and vegetables. b) For washing face, eyes and body.	1. Dysentery 2. Diarrhoea 1. Skin diseases 2. Eye diseases
Water-borne	Due to water containing disease-causing organisms.	1. Typhoid 2. Cholera 3. Amoebiasis 4. Hepatitis A
Water-related	The vector needs water for its life cycle.	1. Malaria 2. Schistosomiasis 3. Onchocerciasis

Uses of Water

Water is used in various ways. These include:

- Human consumption for body needs
- Animal watering
- Industrial use for manufacturing
- For recreational activities such as swimming
- To produce electricity
- Sustaining of aquatic life, for example, fish for consumption and export
- Household purposes like washing and cooking

Simple improvements at the community level are required to ensure adequate quality and quantity of water.

Sources of Water

Water does not stay in one place for very long - it goes round in a cycle. It evaporates from seas and lakes and falls back to the earth as rain. After rainfall, some of the water evaporates and the rest is drained into streams, rivers, lakes and ponds.

The most important water for a community is the water that is held in the soil, by the roots of the trees in the forest. This is a community's long-term underground water store. This is why it is important for you to educate the community on the need to preserve their forests.

There are four main sources of water namely rain water, surface water, underground water and sea water.

Rain Water

This water is relatively pure and clean. Its state of cleanliness depends on levels of atmospheric pollution and how it is collected. The cleanest natural water available is that which is collected from iron sheets into gutters and led by pipes into clean closed tanks. When the first rainwater falls, the last part of the gutters leading to the tank should be removed for some time to ensure that dirt on the roof does not enter the tank. One disadvantage of this water source is that it is difficult to collect from thatched roofs.

The community health nurse can assist the community members to ensure collection of clean water.

Surface Water

This type of water includes shallow springs and shallow wells, streams, rivers, dams, ponds and lakes.

A spring is a natural issue of underground water. When the rainwater falls on the surface it sinks into the ground until it reaches the impermeable layer of rock, which it cannot go through.

All the water above this layer is called surface water. If it finds a point of issue it is called a **shallow spring**. If a well is dug into it, it is called a **shallow well**, despite its depth. The quantity of water yielded by shallow springs or wells varies according to the season. They may dry up during droughts and are liable to contamination by latrines.

A river is a large mass of flowing water. During the rainy season, its waters become turbid, while in the dry season they are clear. River water has a lot of impurities obtained from human and animal waste, washing, sewage, agricultural waste and industrial waste.
Other sources of water are dams, ponds and lakes. All these sources provide fresh water. Remember you have fresh water lakes in this country, which includes Lake Victoria, Lake Baringo, Lake Turkana and Lake Naivasha. However, the water from these sources is often unclean and not safe for drinking. It is therefore important to identify suitable ways of rendering
it safe.

The quality of water depends on the location of its sources. If the water source is from the forest, hills and valleys, it is clean and suitable for household use with little or no prior treatment. This is because there is no human settlement, which might be a source of potential pollutants, at or around the water source.
On the other hand, streams, rivers and lakes around or within towns and villages are likely to be contaminated by human and animal waste. It is, therefore, important to protect water sources from human settlement or animal grazing.

Sea Water

This water is salty and requires expensive purification processes to make it suitable for drinking. In your country you have several salty lakes, which are Lake Magadi, Lake Bogoria and Lake Elementaita. There are also the salty waters of the Indian Ocean.

Underground Water

The water that gets under the impermeable layer of rock is called underground water. It is the water between two impermeable layers of rock, one above and the other one below. This water finds an outlet through a fissure or crack in the upper layer of the rock. Water from this issue is obtained as a deep spring, a well or a borehole.

Sources of Water Contamination

Water has the ability to absorb substances and gases, for example, oxygen and carbon dioxide as it falls as rain. It also absorbs minerals, for example, different salts from rocks or even dangerous chemicals from industrial wastes.

Collecting surfaces for rainwater may have leaves, insects, bird droppings and animal faeces on them. When water runs over the earth it may become contaminated with human or animal excreta, refuse, fertilizers or industrial wastes.
Excreta and refuse may contaminate shallow wells. Wells may also be contaminated by the use of dirty containers for drawing water or by oil from a pump. Bathing, urinating, defecating in water, washing clothes and animal watering may contaminate rivers, lakes or dams.
Even piped water may become contaminated from leaks in the pipes, especially when they pass near dirty drains or when it is collected in contaminated containers. Water may go bad if it is uncovered or stored for too long in a pot or cistern. Finally, it is important to remember that water from any source may become contaminated if it is drunk from dirty or communal drinking vessels.

Remember: It is easier to prevent water from getting dirty than it is to clean it.

Protection of Water Sources

Water sources are precious and must be kept free from contamination.

Rain Water

The protection of rainwater sources is done by the use of gutters led by pipes into a small waste drain tank and into a clean closed tank. As you have seen earlier, the first rainwater cleans the roof and the last part of the gutter should be disconnected to render the water clean.

Surface Water

To protect surface water, people should not settle around springs, streams and rivers. People and animals should be kept away from water catchments areas, normally in the forest or up the hills.

Springs

- Clear the bush or long grass around the site of the spring.
- Put up a fence around the spring to prevent animals from grazing and children from playing around it.
- Dig a drain about 15 metres from the spring to divert surface water.
- Build a strong retaining wall around the 'eyes' point from which water flows out from underground. This wall holds water from the 'eyes' of the spring.
- Fix the delivery pipe at a height close to the level of the 'eye' but high enough to allow the water containers to stand below the pipe.
- Build steps to the spring as well as a platform on which to place the containers when collecting waters. The area behind the retaining wall should prevent contamination without interfering with the water flow.
- Design an area for washing and for watering the animals.
- Select a caretaker to maintain the protected springs.

With this knowledge, you will be able to work with the public health technician or officer in protecting water sources in the catchment area of your health facility.

Wells

- The site should be selected at least 100 metres from a pit latrine or other likely source of contamination.
- The sides of the well should be built with stones, rocks, or cement culvert.
- The sides above the surrounding ground should be constructed with a sloping water-proof area to avoid dirt from getting into to the well.
- A strong well cover should be put in place.

Remember: The well should be dug during the dry season to obtain adequate depth, filtration and constant water supply.

The community health nurse and community members should identify practical methods for protecting the water sources in the community. The public health technician or officer can offer technical knowledge on silting of springs and wells.

Purification of Water Sources

Chemicals can be used to purify water sources. Iodine is a disinfecting agent used as 2% tincture. Two drops are sufficient to disinfect one litre of water. Iodine tablets such as Globaline® and Potable Aqua® (trade names) are also used in the sterilisation of small amounts of water as directed by the manufacturer.
After the treatment of water, it is important to store the water safely to prevent recontamination. A safe storage container is a narrow mouthed container that has a lid. The drinking water should not be removed from its container by dipping a potentially contaminated vessel. Instead, it should be poured out of the container or the container should be fitted with a tap.

The community should be educated on simple and practical ways of protecting their water such as the safe water system.

Safe Water System

The safe water system is a household-based water quality intervention in response to the need for inexpensive, alternative means of water treatment and storage in the short to medium terms. The intervention has three components:

- Water treatment in the home
- Safe storage
- Behaviour change techniques

The main goals of safe water systems are:

- To improve the microbial quality of water in the home by means of sustainable technology
- To reduce morbidity and mortality of diarrhoea diseases related to contaminated water
- To improve hygienic behaviour related to water use

Chlorination

Chlorine is added to water that has been filtered on a large-scale for supply in cities and towns. Chlorination is the final safeguard of the quality of water.
The amount of chlorine added to the water should be proportioned to the volume of flow and to the chlorine demand of water. Chlorine should be properly mixed and there should be a minimum contact period of 30 minutes, for it to be effective against pathogenic organisms in water.
For household use, 1% of chlorine is recommended. This is normally in the form of Jik®, or Water Guard® which are trade names. Chlorine should be properly mixed and there should be a minimum contact period of 30 minutes.

Remember:
To treat water using these chemicals read the manufacturer's instructions carefully.

Sanitation

Types of Waste

Man produces waste wherever he is and it is necessary to manage this waste properly to prevent diseases.

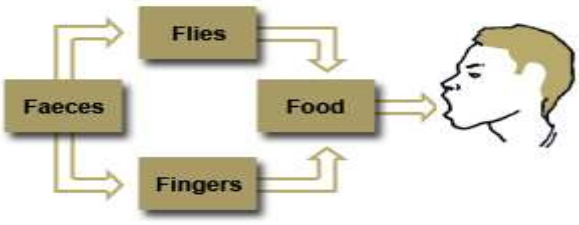
There are two types of waste: solid and liquid. Liquid waste includes excreta and wastewater. Solid waste is also known as refuse.

Liquid Waste

Human excreta are faeces and urine. They are a source of pathogenic organisms.
Excreta are offensive to both sight and smell and can also lead to the contamination of water and foods. Faecal organisms may infect people directly or indirectly through an intermediate host. Human excreta may spread the following diseases:

- Typhoid fever
- Cholera
- Intestinal worms
- Poliomyelitis
- Infective hepatitis A
- Bacillary and amoebic dysentery

Urine carries the infective ova of schistosoma heamatobium while faeces spread the schistosoma mansoni.
Faeces should not be accessible to fingers, feet, flies and food. The fingers and flies transfer the faeces to the food through the faecal-oral route transmission, known as the 4F connection, which is illustrated in the adjacent figure.
It is, therefore, necessary to help people understand the importance of proper excreta disposal by use of simple and cheap facilities.
As a nurse, you should be able to identify possible customs and beliefs, which hinder proper excreta disposal in the community and educate the people accordingly.



The 4 F Connection

Solid Waste

Solid waste or refuse is defined as any unwanted discarded material, the remains, residual or by-products of human activities which are no longer required for further use by the initial producer. This is normally in the process of:

- Preparation
- Manufacture
- Packing
- Other human related activities

If solid waste is not disposed of properly, it may create a number of problems:

- It may produce an offensive smell
- It attracts insects, vectors/pests particularly flies, cockroaches and rats
- Spreads diseases
- It can cause pollution of air, water or food
- It can cause accidents, for example, fires, cuts and falls

There are various sources of solid waste. These include domestic waste, street waste, industrial waste, hospital objectionable waste and garden/agricultural waste.

Now look at each of these **sources of solid waste**

Domestic Waste

This usually consists of all the garbage that emanates from inside a house, for example, food leftovers, potato and banana peelings, waste paper, worn out clothes, shoes, broken utensils, bottles and tins.

Street Waste

This type of refuse consists of paper, food and commercial refuse in public places such as markets and hotels. Scrap metals may also be included in this category.

Industrial Waste

This varies with the type of industry. Modern industries produce chemical wastes, which are potentially hazardous to man and other living things. The wastes may be toxic, caustic, acidic or flammable. This means that they need special disposal. If the chemical waste is to be discharged into a stream it should be processed first. If it is solid, it should not be dumped on land as it may eventually seep underground and contaminate water sources.

Hospital Waste

This is the most familiar waste that nurses are aware of. It includes the following:

- Sharps, that is, needles and syringes
- Gauze and cotton wool swabs
- Vials and Lotions
- Drugs and vaccines
- Tubing, gloves and papers
- Foetuses

Health workers have the responsibility of maintaining infection prevention by proper decontamination and disposal of the above waste.

Garden/Agricultural Waste

Agricultural waste from coffee, sugarcane, sisal, pesticides and fertilizers may result in the pollution of natural resources such as air, food, and water.

Waste Disposal

You will now look at various methods of waste disposal, covering the disposal of both liquid and solid wastes.

Liquid Waste Disposal

The best method of excreta disposal in rural areas is a pit latrine, while toilets are suitable for urban areas. As a health worker, it is important for you to know how a pit latrine is constructed. There are some general guidelines that should be considered when choosing the site for a pit latrine to ensure that water sources among others are not contaminated.

Some of these guidelines are:

- Pit latrines and cesspools should be at least two to three metres respectively above the water table
- Latrines should be located at least six metres away from the buildings
- Wells should be located upstream to avoid contamination of the well by ground water passing through the pit latrine or cesspool

The excreta disposal system is divided into **two categories**.
These are:

- ✓ water carriage system
- ✓ non-water carriage system

The water carriage system, excreta are disposed by the use of a flush toilet, which is also called a water closet. The flush toilet is the most permanent and hygienic method of excreta disposal. This system is used where there is a permanent, continuous and adequate piped water supply system. This is mainly in cities and towns.

Water closets are reliable and convenient for any permanent building. The excreta are carried by water pressure into a septic tank or sewage pit. The clear fluid effluent needs further bacteriological treatment to become inactive. It is then led over stones and sand in underground drains for completion of biological decomposition. The solid part of the

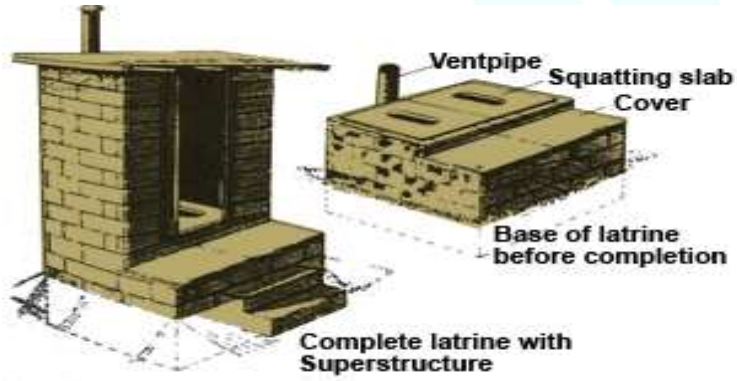
excreta (sludge) settles at the bottom. The sludge relies on natural decomposition. It is reduced in volume and is ultimately converted into inoffensive unstable product. However, the water carriage system is very expensive, technical and requires sewage treatment works.

The Non-water carriage system

In this method, excreta are disposed of by deposition in a pit latrine. The pit latrine is the most important waste disposal method in the rural areas. In its simplest form, the pit latrine consists of the following:

- A hole in the ground
- A squatting place for sitting or standing
- A hut or shelter for privacy

In this way the excreta is safe from fingers, feet, flies and food. Making a concrete slab, which is easier to wash and keep clean, should strengthen the squatting place. The hole should have a cover with a handle, which ensures that flies do not breed or get in and out of the latrine.



You need to consult your public health officer to give you more information on ventilated improved pit latrines, which are found in many villages.
These latrines feature vent pipes designed for controlling flies. You will have seen them in the community.

The main advantages of a pit latrine are:

- It does not require piped water supply
- It is cheap to construct as the materials are locally available
- The community does not need close supervision during the construction

As already mentioned, there are various other **types of pit latrines**.
The borehole latrine is bored into the ground about six metres deep and four metres in diameter instead of digging a pit. It has a smaller volume and fills up faster than a pit. It is faster to install, and is appropriate following disasters where there is urgent need to install many latrines.
The trench latrine is a latrine where a trench is dug and a number of holes with dividing partitions constructed over it. These types of latrines are used in temporary work camps.
Bucket latrines are also known as pail closets and are used where the water tables are high. A squatting slab or seat is placed above the bucket, which is filled within a few days. Some of

the negative aspects of this type of latrine are the unpleasant job of emptying it and the spillage, which attracts flies.
Finally, the **composting pit latrine** is suitable where the water table is too high for a deep pit latrine to be dug.
From this description of liquid waste disposal, you should now be in a position to assist the community to construct and use hygienic disposal methods.

Solid Waste Disposal

The amount and type of refuse produced varies from one community to another, as does the means of disposal. Usually, solid refuse disposal is not a problem in the rural areas except around shops, markets or other places where people aggregate. However, in big cities such as Nairobi, Kisumu and Mombasa, there is indiscriminate dumping of domestic and industrial refuse.
Health facilities, especially, should set a good example by employing hygienic methods of refuse disposal.
Refuse in towns should be stored in proper containers. These containers should be:

- Watertight plastic or metal with a tight-fitting lid or polythene bags
- Rust resistant
- Easily filled, emptied and cleaned
- Have side handles
- Rest on a concrete slab to ensure cleanliness of adjacent ground

In towns collection should be regular, systematic and reliable. Specially constructed vehicles for this purpose can be found in big towns such as Nairobi, Kisumu, Nakuru and Mombasa. In rural areas you should get the support of the village health committee and arrange for refuse to be collected and disposed of regularly, especially after market days. Simple methods of refuse collection should be encouraged in rural areas.

Advantages of Proper Waste Disposal

Proper solid waste disposal has several advantages. These include the prevention of:

- Breeding of pests and vectors
- Foul smells
- Contamination of water sources
- Accidents from sharp objects
- Overcrowding where space can be created for better utilisation

The health department and municipalities are responsible for refuse disposal in towns. The choice of disposal method is determined by its cost. In the rural areas the health worker and the village health committee are responsible for refuse disposal in individual houses, shops, hotels and markets.

Storage and collection of refuse in the community

Dumping
This can be in the sea or river. In Kenya, this method is most often used in the towns along the coast. This becomes a health hazard and the littering of the shoreline is an unpleasant sight. Another commonly used method is open dumping, which should be discouraged. Open dumps provide breeding places for rats, mosquitoes and flies.

Burning
This may be done in a number of ways. These include:

- Simple open air burning
- Burning in a trench
- Using a simple mud-brick incinerator

The open burning of combustible refuse is frequently used but it is not very effective. This method often leaves tins and broken bottles littering the surrounding area. This can cause accidents, especially to children. The smoke and odour contribute to air pollution. There is a fire risk and the rubbish sprawls all over while awaiting burning. It may become a breeding place for rodents and insect vectors.

Incinerators are an improved way of burning combustible refuse. Incinerators can be simple and cheap, or complex and expensive. Among the cheap ones is the bin incinerator made out of a drum with fire bars across it and air holes underneath. A more expensive one is built out of brick and fitted with chimneys. These incinerators allow more complete combustion and produce less smoke. Most hospitals use incinerators.

Composting
Composting is “a process in which, under suitable environmental conditions aerobic micro-organisms break down organic matter to fairly stable humus” (A. D. Luca and H.M. Gilles, 2003). The decomposition process occurs naturally on the ground when droppings from the trees and animals are converted by micro-organisms to humus. Aerobic composting is normally odour free.
This method is, cheap, convenient and recommended especially in rural areas. Wet and dry refuse is heaped in alternative layers on to a plot about 2.5 square metres to a depth of about 1.5 square metres. The refuse is then covered with grass and earth. Compost requires frequent turning after 30 days then after 60 days. This turning helps to distribute all parts of the heap to undergo the high temperature of the interior. After 90 days the refuse is ready to be used as manure.

Controlled Tipping
This method involves depositing refuse into depressions or large holes in the ground. These tips should be situated at least half a kilometre away from settlement, preferably out of sight and down wind. This is an effective method for hygienic disposal of refuse. It can be used where sufficient land is available. The method consists of three steps as illustrated in the diagram on your right.

Recycling

This is a method of re-using non-biodegradable refuse such as paper, bottles, plastics, metal cans and so on. Although it requires special processes to render the items suitable for reuse, it is a method that should be encouraged.

SECTION 3: APPROPRIATE METHODS OF HANDLING FOOD

Introduction

Welcome to section three of this unit. In this section you will cover food and principles of food hygiene. Food is essential for growth, development and in the provision of energy. However, food could also be responsible for the spread of some diseases. The aim of food hygiene is to prevent the contamination of food at any stage.
These stages are production, collection, storage, sale, preparation and consumption.

Objectives

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

- Describe the sources of food
- Describe methods of food storage
- Describe preparation and preservation of food

Sources of Food

Sources of food vary widely. They include rearing, feeding, marketing, crop production and slaughter of animals. Foods that are of animal origin should only be derived from animals that are legally allowed for human consumption, for example, some countries ban game meat. Meanwhile, crop production should follow rules in agricultural practice, which involve spraying crops against pests. Farmers are advised on safe use of pesticides.
During food processing certain standards of food hygiene are applied, for example, in milk treatment, drinks and tinned foods. The chemicals used as preservatives are also regulated for the safety of the consumers. The slaughter of animals is governed by several rules and acts, for example, the Meat Control Act, the Veterinary Act and the Public Health Act.
Food can be contaminated by excreta, dirty fingers, flies, poisonous insecticides or pesticides on vegetables or chemical preservation of food. It can also be contaminated if it is derived from infected animals, for example, animals with tapeworms or brucellosis.
You will now look at the recommended conditions for storing different types of food.

Food Storage

Storage will depend on the type and packaging of the food.

Dry Foods

These include foods like maize, beans, and wheat (cereals). Such foods should be stored in dry, airy conditions in improved granaries.

Bagged Foods

These foods should be stored on raised shelves at least 18 inches above the floor or ground level. This enables the store to be swept and washed easily. It also allows for easy inspection for pest detection.

Perishable Foods
These are foods that go bad within a short time. Such foods include dairy products, meat and fish. They should be refrigerated to inhibit the multiplication of bacteria.

Food Preservation
This is defined as any method used to treat food for the purpose of prolonging its life without appreciable loss of its quality and appeal. Most human food is of biological origin and there is continuous metabolism to produce the end product. This applies to food of both animal and plant origin, for example, meat, milk, fish, leaves, tubers and seeds. When an animal or plant dies, they lose the mechanism of protection from bacteria, fungi and moulds.

Thus, you preserve food in order to:
- Increase its shelf-life, for example, canned foods
- Render the food safe for consumption, for example, highly perishable foods like milk
- Conserve the food for use during the periods of scarcity, for instance, dried cereals and vegetables
- Avail seasonal foods, like fruits, throughout the year

Principles of Food Preservation
There are 2 principles of food preservation.

Principle 1
Destroy organisms responsible for spoilage through heat treatment.

Principle 2
Inhibit the micro-organisms through cold treatment.

Moulds
Affect the surfaces of foods containing high sugar and salt. They also affect dry foods that may become damp due to poor storage.

Yeasts
Affect foods that have acid or sugar in high concentration, for example, dried fruits, and concentrated fruit juices.

Bacteria
Affect foods under various conditions apart from dry food.

Heat Treatment
The following are methods of destroying organisms through heat treatment.

Cooking
This is a heating process, which aims to produce more palatable food. Cooked food generally keeps longer than raw foods as long as re-contamination is minimised. Cooking destroys or reduces micro-organisms and potential toxins in food. Cooking also inactivates undesirable

enzymes in food. It alters the colour, texture and flavour and improves the digestibility of food. On the other hand, cooking may cause degradation of food nutrients, for example, over cooking vegetables destroys vitamin C.

Blanching

This is the process where most vegetable foods are heat treated at 70 - 100°C for 2 - 10 minutes. This is done by immersing food in boiling water or exposing it to steam. Blanching is used before freezing, canning or drying. This process inactivates enzymes, drives out air bubbles trapped in food, enhances retention of green colours and reduces micro-organisms.

Pasteurisation

This is a relatively slow method of heat treatment. Pasteurisation is generally carried out at a temperature of below 100°C. This method is used to increase the life span of the product. This method reduces organisms that cause spoilage and eliminates pathogens.

Sterilisation

In this method heat is used to kill all micro-organisms and their spores at a temperature of above 100°C. The sterilised food must be stored in an airtight container to prevent the entry of and recontamination by micro-organisms.

Canning

In this method, the food is first heated at a temperature that kills all bacteria and it is then sealed up in sterile cans or bottles. This prevents bacteria from getting into it and enables it to remain safe for a long time at room temperature.

Cold Treatment and Other Methods

Freezing

This is the most satisfactory method currently available for long-term preservation of food. When properly done, freezing is effective for retaining the colour, texture, flavour and nutritive value. Food must be deep-frozen at 0-4°C to remain palatable. This keeps food fresh for weeks or months.

Salting

This is the saturation of food with salt or sugar, for example, ham, jam and jelly. The added solute reduces microbial activity due to its dehydrating effect. The salt and sugar solutions are more concentrated than the cytoplasm inside the cell. Therefore, the water passes out of the cell into the concentrate, dehydrating the cell.

Smoking and Drying

Drying and smoking makes food unsuitable for the bacteria to grow and multiply. Fish or meat may be preserved by these methods. A wood rack is made and fish or meat is placed on it. A wood fire, which generates heat and thick smoke, is made under the rack. The heat will dry the fish or meat, and the smoke gets inside the food to act as a preservative. Green vegetables, cereals and legumes can be preserved by drying them in the sun. If food is preserved by drying, it must be stored in a dry place until it is used.

Food Safety

Preparation of Food
Adequate personal hygiene must be observed when preparing food in order to prevent disease.

Health
Individuals suffering from respiratory infections such as colds or sore throat should not work with food until they get well. This also applies to people with infected cuts, skin eruptions and diarrhoeal diseases like dysentery and typhoid.

Clothing
Individuals working with food should wear clean washable outer garments. Every worker in the kitchen or washing dishes should wear a clean uniform or apron. These clothes should be worn when the worker is in the premises where food preparation is taking place. This avoids cross-food contamination.

Head Covering
To avoid hair from getting into food, hair bands, caps or nets should be used to cover the head when handling food.

Personal Hygiene
A daily bath is necessary for every individual. Wash hands before handling the food, use clean utensils and avoid habits such as nose picking. Nails should be kept short and clean.

Food
Raw food should be separated from cooked food. All vegetables should be cleaned thoroughly before preparation for cooking. Fruits should be washed before eating. The food should be hygienically prepared and cooked adequately. All food utensils should be cleaned properly after use and left to dry before being stored in a clean place

Environment
The environment pertaining to the preparation of food should be clean throughout. The area should be dust free. This includes the floors and all the surfaces used for food preparation. The facility itself should be clean and with adequate ventilation and lighting.

Common Food Borne Diseases and Their Causes

Disease	Cause
Illness affecting the mental function	Some naturally poisonous plants
Poisoning	Chemicals such as lead, arsenic
Ascariasis Taeniasis Amoebiasis	Parasites e.g. Askaris lumbricoides Taenia solium/sagnata Entamoeba histolytica
Typhoid fever Paratyphoid fever Food poisoning Bacillary dysentery Milliary Tuberculosis Brucellosis Cholera	Salmonella typhi Salmonella paratyphi Salmonella typhiniurium Shigella Bovine tuberculosis Brucella Vibrio cholera

Food Safety Regulations

The safety of food is so important that our government has passed laws to protect the public. These laws cover many aspects of food handling and health officers are generally responsible for enforcing these laws. Agricultural personnel assist them, where necessary. You will look at some of the factors that should be considered when preparing or handling food and some of the food-borne diseases.

Remember:
The Public Health Act Cap 242 is an Act of Parliament to make provision for securing and maintaining health. This act is divided into 15 parts. Each part deals with a specific aspect of public health.

Part 10 of the Act deals 'with protection of foodstuffs'. This part regulates the construction of buildings used for storage of foodstuffs. Secondly, it prohibits residing or sleeping in kitchens or food stores.
Part (II) deals with 'milk, meat and other articles of food'. This part prohibits the sale of unwholesome foods. It gives powers to authorised officers to inspect and examine food, seize and recommend disposal at any time. These laws aim at protecting the public and the public health officers are responsible for enforcing them. As a community health nurse you need to work closely with public health officers to apply the food safety regulations.

The following are some of the areas that need close supervision.

Meat
Meat is one of the commonest foods that cause problems to the public. Therefore, it is important that inspection of slaughterhouses, cows, sheep, goats and pigs be carried out. The same case applies to butcheries where meat is sold.

Milk
Milk is one of the foods that are easily contaminated and cause problems to the public. Inspection of shops where milk is sold is of paramount importance. The milk should be safe and clean. It should be obtained from healthy cows as it can transmit bovine tuberculosis among other diseases. The room for handling milk should be clean, dustless and separate from the barn. The pails, cans, bottles, coolers and other equipment, which comes into contact with the milk, should be thoroughly cleaned.

Homes
It is the responsibility of the community health nurse to share health messages with community members on food hygiene. These include maintenance of personal hygiene as covered earlier, that is cleaning the utensils, handling them with clean hands, and storing them in clean and dry cupboards or containers.

Farms
The community should follow the regulations on the use of insecticides and pesticides in form of sprays and fertilizers. This will help them to use each of them correctly depending on the age of the crop. Your role as a community health nurse is to encourage the community to adhere to the instructions from the agricultural field educators. Moreover, instructions are given on the respective containers of these pesticides. You should teach the community about regulations of food storage and preservation of different types of food. The harvest should be carried out when the crops are completely ripe or ready to facilitate longer preservation. The cereals and legumes should be dried properly before storage to avoid spoilage. All perishable foods should be consumed at the right time.

Markets
All types of foodstuffs are sold in markets. The markets should be designed in a manner that considers stations where similar types of food should be stored and sold, for example, vegetables of all kinds, dry foods like cereals, fruits and cooked foods. The market should be kept clean and proper refuse disposal maintained. The food sold should be clean and fit for human consumption. This, therefore, explains the importance of inspecting markets by public health officers. These officers have the power to close markets and condemn foods to prevent disease outbreaks.

Hotels
Hotels, restaurants and food shops should also be inspected under hygiene regulations. They require regular inspection by the public health officers. All the food handlers should be supervised and a regular medical examination is mandatory for them to prevent spread

of diseases through food handling. Licenses should only be given to hotel owners who have met the requirements. Laboratory examinations may be necessary for food such as pre-cooked meat. The use of uniforms, aprons, head coverings, as described earlier, should be observed in the hotels. Proper personal and environmental hygiene in the hotel premises should be maintained.

The hotel should store, preserve, prepare, cook and serve the food according to public health regulations. The law also empowers closure of hotels which do not meet the regulations.

SECTION 4: HOUSING

Introduction

The provision of good housing is an essential aspect of environmental health. Good housing is a requirement for every human being because it provides shelter and protection from environmental hazards.

Think of some health problems that would be associated with the following poor housing conditions:

- Overcrowding and poor ventilation
- Unscreened windows
- Cooking fires on the floor
- Earth walls and dirty floors

Housing Condition	Health Risk
Overcrowding and poor ventilation	Airborne droplet infections
Unscreened windows	Malaria
Cooking fires on the floor	Accidents and burns in children
Earth walls and dirty floors	Breeding of flies and bedbugs

A combination of dampness, lack of light, poor ventilation and overcrowding will contribute to the spread of airborne and droplet infections.
Earth floors and walls permit the entry and breeding of flies and bedbugs, while unscreened windows permit entry of mosquitoes.

Cooking fires on the floor are hazards to small children. Inadequate space to talk and play, especially in town houses, is one of the reasons why fathers and children leave home thereby adding to social problems. For these reasons it is important to improve the quality of housing. You can help your community live in safe houses, by making simple improvements using locally available materials.

Objectives

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

- Describe the types of houses
- Describe the criteria for an adequate house
- Describe a suitable building site
- Describe the characteristics of poor housing
- Describe how you would involve the community in improving housing

Types of Housing

A house can be permanent, semi-permanent or temporary. These structures will be considered in turn.

Permanent Houses

This type of house has a stone foundation, a cemented floor and plastered walls. The roof is covered with iron sheets, tiles or stones in the case of flats or maisonettes. This type of house has advantages in that it is easy to keep the floor and walls clean. However, the floor should be kept dry to avoid accidental falls. Permanent houses are not cheap to construct and it is necessary to budget for the activity.

Semi-Permanent Houses

This is a type of house whereby the floor is usually cemented but does not necessarily have a stone foundation. The walls are made of iron sheets or sometimes timber. The house is iron roofed. If you work in a rural community then you must have come across this type of a house. It is satisfactory and easy to keep clean. However, appropriate preservatives for timbers have to be used or else termites destroy it. In many places mud bricks are used and they are an appropriate method of improving houses. Since it is less expensive than a permanent house, you have the responsibility of encouraging members of the community to try and acquire at least this type of a house.

Temporary Houses

This type of house may be found in rural and slums areas. The floor is earthen, the walls are made of cardboard, polythene paper, grass or mud. The roof is thatched with the same material as the walls. This type of a house does not provide for privacy and can easily catch fire. Temporary houses are a health hazard and do not meet the requirements for good housing. They should be discouraged as much as possible

Criteria for an Adequate House

A good house should meet biological, physical and social criteria.

Biological Criteria

Good housing minimises the risk of transmission of diseases. The spread of gastro-intestinal infections is minimised by some important factors. These include:

- Good water supply
- Good food storage, preservation and preparation
- Adequate facilities for washing utensils and well-designed kitchens
- Adequate methods of refuse disposal

Physical Criteria

The house should be safe for every occupant. This means that home accidents should be prevented. It is, therefore, necessary that appropriate safety devices be provided for. The house should also be free from air pollution.

Social Criteria
Good housing should be designed to enable the family function effectively in regard to its cultural background. This means that the required privacy for adults should be catered for. It should have a suitable setting for bringing up children.

Characteristics of Adequate Housing

The following are the characteristics of a good house.

Natural Light
The sun provides natural light, which is essential for physical growth, especially in young children. Lighting is also essential for proper vision. The presence of sunlight into the house kills some micro-organisms. This underscores the need for sunlight in the house. Some insects are also driven away by adequate lighting.

Artificial Lighting
This type of lighting is needed at night. The sources are electricity, oil lamps and gas. The type of lighting used should correspond to the purpose for which it is needed in the house.

Ventilation
Fresh air is necessary for our health. Ventilation of a house is the removal of impure air and pouring in pure air. This is achieved through windows and door ventilators. Good ventilation in the house is important, because it keeps the air on continuous movement without creating draught, cools the housing and maintains the room temperature at a constant.

Room Separation
The house should have adequate rooms to provide separate accommodation for adults and children. The shelter for animals should be separate from the main house. There should also be separate rooms for food storage and preparation.

Others
The house should have, where possible, cemented floor and plastered walls to protect against insects and should be rodent-proof. It should also have water supply in adequate and reliable quantity and quality. It should have a good latrine and a clean compound. It should be equipped with proper methods of refuse disposal, for example, composting, burning or burying waste. The house should be dry. The cooking arrangements should be satisfactory to avoid home accidents. Generally, there should be an effort to protect against all types of home accidents, for instance, those caused by fire, tools and chemicals

Remember:
It may not always be possible to meet all the necessary requirements for adequate housing. However, housing can be improved in a number of simple and practical ways.

Suitable Building Sites

The following factors should be considered when selecting a suitable site for a house:

- The soil should be suitable for construction.
- The site should be dry, sunny and exposed to free air.
- The surroundings should be hygienic and healthy.
- The site should be away from noisy factories, cinema halls and heavy traffic.
- It should be on high ground to avoid water from standing and stagnating. This will prevent breeding of mosquitoes.

Characteristics of Poor Housing

A poor house does not protect its inhabitants from environmental hazards. It may have some or all the following negative characteristics:

Characteristics

- Dampness due to poor drainage.
- Overcrowding is a common feature in poor housing. This is due to an insufficient number of rooms. Dampness and overcrowding enhance the spread of common respiratory diseases such as colds, influenza, tuberculosis and pneumonia.
- Earthen floors and walls encourage breeding of fleas and bed bugs while unscreened windows encourage entry of mosquitoes.
- Unprotected fire places with poor cooking arrangements cause home accidents with children. Working tools can cause accidents if not properly stored.
- Water supply and storage, which lacks hygiene, poses a health hazard for the transmission of water-borne diseases.
- Proper storage of clean utensils is often lacking in poor housing. This is accompanied by poor personal hygiene in the preparation and serving of food.
- The home environment may lack a good latrine, usually accompanied by improper excreta and inadequate refuse disposal. This increases the chances of getting hookworm infestation.
- Compounds with tall grass, pools of water and sprawling litter may provide good breeding places for mosquitoes, rodents and other vectors responsible for transmission of many communicable diseases.

Community Involvement in Improving Housing

It is very important to explain to the community the reasons they need to adopt new hygienic practices. If the members of the community are not well convinced, your environmental health measures will fail. This is because new practices mean a change in people's behaviour and they will not be willing to change unless they see personal advantages in it. Avoiding diseases, making more money or just being more comfortable are some of the advantages that must be emphasised to the community. You must make the new idea attractive. The following are only some ways of how to introduce change.

- Find out what people think about the problem. Do they see it as a problem? If they do not, then you will have to help them understand that the problem exists and needs to be given attention.

- Encourage them to think of possible solutions and guide them towards those that are technically possible and suitable for the situation. Encourage community participation.
- Aim to set an example in your health facility or home.
- Talk and work with people, encourage them to ask for advice or help in solving their problems, for example, inadequate water supplies, waste disposal, food safety regulations and hygiene, improved housing, controlling of vectors and pests.

The community would enjoy living in good housing. A little effort is needed to improve housing by using locally available resources.

Sensitisation

Sensitisation is the process of creating awareness. Community health nurses come in contact with the communities and should make use of these opportunities to share health messages with them. You should start at the health facility then extend your efforts to their homes. The health team will have conducted a community diagnosis so as to have valid information on the problem.
The following steps can be followed when trying to involve the community.

Meeting the Health Team Members

The first step involves planning to meet and explain the need for community involvement, with the health team members. Ensure that the relevant consultants and government officers dealing with housing are invited so that they can give pertinent information on housing matters according to the Housing Act. In this meeting, the health team members will deliberate on community sensitisation and identify ways of improving housing in the community. All the health team members should be committed to carrying out their plans for solving the housing problem.

Sharing Health Messages Daily at the Health Facility about Improving Housing

The second step will be to start sensitising the community at the primary health care facility. This will be accomplished by sharing health messages on improved housing. In this way, the patients and clients will get pertinent information on types of houses, criteria for adequate housing, effects of housing on health, characteristics of poor housing and diseases associated with poor housing. This will make the community aware of the problem and the need to improve housing for the family.

Meeting the Community Leaders

The third step is where the community health nurse organises to meet and go over the subject with the community leaders of the area. These leaders include formal leaders in government offices, for example, the District Commissioner, the District Officer, Chief and Assistant Chief. The informal leaders, such as opinion leaders, community own resource persons, leaders of women, men and youth groups should also be involved. Moreover, you should target community-based health workers, traditional birth attendants and community-based distributors of family planning. These leaders will be aware of the

problem and the need for improved housing in their community. They will identify and suggest ways of improvement. You should be able to guide them on the techniques of carrying out the health activities. You may use clinical records to confirm the health problem and the need for community involvement.

Identifying Ways of Improvement

Through the previously-mentioned meetings and activities, the health team and the community leaders will identify many ways of improving housing. From their list they will select the best alternative and then plan and organise their resources, that is, manpower, money, materials, and time to carry out the selected activities. Some of these activities will be the provision of outreach clinic services. During the clinic session, the same content on improved housing will be covered in the health messages.

During home visits, the nurse, public health technician and community-based health worker should inspect the houses and focus on simple practical ways of improvement. This will enhance the implementation as the solutions are being provided directly at home.

A school health service is another community health activity where this knowledge may be imparted for the children to share with their parents. The community health nurse, with her team members, conducts regular supervisory visits to the centres of community-based health care activities. These supportive visits help the groups to build their self-confidence and improve their skills. They are encouraged to explore solutions to their housing problems. They also encourage mutual respect and understanding between the health team and community members.

Evaluation of Housing Activities

After the implementation of the housing activities it will be necessary to evaluate the extent of community participation. Community participation builds the confidence of the community members. It enables the members to examine their situation.

You are able to obtain information from reports on home visiting, outreach clinic services, also from the public health technician and community-based health workers. The reports can be gathered from the community's formal leaders.

The Ministry of Housing will also give their reports.

Finally, the patients and clients will also be interviewed on improved housing. It will be necessary for the nurse to carry out a community survey in the area to assess the community participation. This will be carried out at the time suggested for evaluation. The questionnaire will include all the necessary aspects of housing and focusing on new improvements. The findings of this survey will be communicated to the community leaders and the community. This will enable the community to take appropriate action.

SECTION 5: CONTROL OF VECTORS AND PESTS

Introduction

This is the final section of unit three.
In this section you will learn about vectors and pests.

Objectives

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

- Describe diseases associated with vectors and pests
- Describe methods of control of vectors and pests
- Describe how you will involve the community in the control process

Diseases Associated With Vectors

A vector is an organism, usually an insect, which transmits a pathogen from a source of infection to a susceptible host. Insects are controlled because of the role they play in disease transmission, destruction of food and building materials. To control vectors you have to deprive them of suitable breeding places, food and harbour.

Mechanical Transmission

In this mode of transmission, the vector carries the infective pathogen or agent on its body or limbs. Alternatively, the infective agent may be ingested by the vector and excreted unchanged in its faeces.

Biological Transmission

The vector acquires the infective agent from the blood or skin tissue of the infected host and the infective organism undergoes some development in the vector. The infective vector may also inoculate the infective agent from its salivary secretion into a new host to cause disease, for example, in the transmission of malaria.

Contamination of Skin or Mucous Membranes

The host may be infected through contamination of skin or mucous membranes by the infective faeces of the vector, for example, louse borne relapsing fever.

Ingestion

The host may acquire infection by ingesting the vector, for example, guinea worm.

Vector	Disease Transmitted
Houseflies	1. Amoebic and bacillary dysentery 2. Typhoid
Tsetse flies	1. Sleeping sickness in man 2. Trypanosomiases/Nagana in animals
Mosquitoes	1. Malaria by female Anopheles mosquito 2. Filariasis by culex mosquito 3. Yellow fever by aedes aegypti mosquito 4. Dengue fever by aedes aegypti mosquito
Fleas	1. Bubonic plague 2. Murine typhus fever. It is less severe than the louse borne
Bed bugs	1. Insomnia 2. Severe nuisance
Lice	1. Human relapsing fever. It is caused by crushing an infected louse into a bite, abrasion of the skin or a wound. 2. Louse borne typhus fever. It is caused by rubbing faeces or crushed louse into a bite, abrasion of the skin or wound.
Snails	Schistosomiasis
Mites	Scabies
Cockroaches	No specific disease known but like flies it is a mechanical vector of pathogenic organisms
Ticks	Tick borne relapsing fever

Pest-Related Diseases

A pest is an organism, which in a given circumstance adversely affects human health or the economy. Rats and mice are pests and they belong to a group of animals called rodents. Insects such as white ants, weevils, aphids are also pests. Pests have to be numerous in order to cause a serious problem.

Insecticides and pesticides are used to eliminate pest infestations. The safest and the most economical methods available are used.

Rodents	Diseases Transmitted
Rats and Mice	1. Bubonic plague, refer to fleas 2. Murine endemic typhus fever 3. Salmonellosis. This is transmitted through food, which is contaminated with the infected faeces or urine of an infected rodent. 4. Haemorrhagic jaundice (Weil's disease). This is transmitted to humans through eating food contaminated with faeces or urine from an infected rodent, bathing in contaminated water or handling infected rats or excreta from rodents. 5. A bite from an infected rodent causes a rat bite fever. Their noise is a nuisance in the houses.

Insects and rodents also cause property destruction.

- Rodents destroy all types of dry grains in houses' granaries and in the fields.
- In food processing regulations, the evidence of rodent droppings and urine stains causes condemnation and disposal of large quantities.
- They can destroy buildings by gnawing wood, water pipes, electric cables and they can cause fire outbreaks.

Methods of Pest Control

The following methods may be used to control pest infestations.

Personal Hygiene

This includes thorough hand washing, which should be practised before preparing or eating food and after visiting the toilet. Short and clean nails should be kept and a daily bath should be taken. Wearing of shoes will prevent infestation by jiggers and hookworms. The hair should be kept short and clean. The use of shampoo, which has a suitable insecticide, is helpful for cases of head lice.

Clothing

Clothing should be washed at least once a week and ironed.

Bedding

Bedding should be cleaned thoroughly at least weekly and dried well in the sun. If infested with mites and lice it should be boiled and ironed, in order to kill them.

Food

Food stores, cupboards and tables should be kept clean. All foodstuffs should be covered to prevent flies gaining access to them. All food utensils should be kept clean and dry. Make use of the improved methods of preservation of food that have previously been covered.

Environmental Hygiene

The following factors should be considered.

Drainage of Water

The aim of proper water drainage is to destroy all mosquito-breeding sites. Drain any stagnant water or slow moving water around the house. All holes and ditches should be filled to avoid standing water. All receptacles likely to retain water, for example, used cans and tins, bottles, coconut husks, vehicle tyres and so on should be collected and properly disposed of. Slow moving streams should be canalised to facilitate faster water flow.

Roof gutters should be cleared regularly to prevent blockage of water flow by leaves and other materials. Clearing of the vegetation around the buildings, and water banks removes damp areas where mosquitoes breed.

Cleanliness

The home or village environment should be kept clean. Animal shelters should be at a reasonable distance away from the main house.

Waste and Excreta Disposal

This should follow the proper methods of waste disposal as described in section two of this unit.

Improved Housing

Floors and Walls

These should be cemented so that they can easily be swept and washed. The floors should be cleaned after meals to clear all the food on the floor. All the crevices and cracks in the walls and floors should be plastered.

Beds and Other Furniture

People should not sleep on the floor but on raised beds. Beds and mattresses should be regularly taken outside in the sun to kill any lice, mites and bed bugs. Boiling water can be poured on the bed stands for the same purpose. Joineries of furniture with cracks and crevices should be filled up with plastic wood filler.

Buildings and Food Stores

Rat proof buildings and food stores should be constructed. In malaria areas, buildings should be mosquito proof, with wire gauze to cover all ventilation openings, doors and windows. Buildings should be inspected regularly
for pests.

Use of Chemical Substances such as Pesticides and Insecticides

Chemicals used to kill the pests are in the form of insecticide sprays, dusting powders, miticides, rodenticides, emulsions, oils and molluscides.

Farmers are advised on the safe use of pesticides, for example, spraying vegetables such as cabbages, tomatoes, sukumawiki (kale) and spinach. There are instructions on the containers of these pesticides, which indicate the right age of the plant for specific use of a pesticide. Precautions are also given concerning protective clothing and washing after using the chemicals.

After harvesting, the cereals and legumes are dried in the sun and then treated with pesticides in the form of dust or powder. This protects the grains against pests for at least six months.

Remember: Crop production should follow the rules of agricultural practice, which involves spraying crops against pests.

For cats, dogs and cows, the appropriate insecticide is used to dust or wash them regularly to kill any fleas and ticks. Rodents are controlled by the use of rodenticides, which are available in most shops, for example, Rat & Rat, Rat Rid, Fuko Kill and so on. The floors and walls of houses may also be treated with insecticides regularly. Mattresses and bedsteads can be treated in the same way. Heavily infested buildings should be treated with residual insecticidal sprays. Kerosene is also used to kill bed bugs and white ants when worked into cracks and crevices by use of an applicator like a feather. Insecticides and larvicides in the form of oils and emulsion are sprayed on the water surface to kill insects in water.

Molluscides may be applied in water to kill the snails, which spread schistosomiasis.

Community Involvement

Community health nurses and other health workers have the responsibility to share health messages in the community. This facilitates community participation in keeping the environment safe.

i)Identification of Resources

You can conduct a community diagnosis. Make an effort to utilise the skills of, and work with the agricultural field officers in the community. Identify the shops or chemists where community members can buy agro-chemicals, for example, rodenticides, insecticides, fungicides and fertilizers.
You should also identify and utilise co-operative societies depending on the crops grown in the region, for example, tea, coffee, horticulture, pyrethrum, grains and cereals.

ii)Utilisation of Insecticides

The health team will meet with community leaders including the agricultural field officers. This meeting would be most effective in a chief's baraza where many community members will be present. This will serve to give the implementers, that is, the health and agricultural officers and the community a big moral boost. They will gain confidence in the utilisation of agro-chemicals. The information can also be distributed as the officers visit the homes during their fieldwork.