How to Measure and Evaluate Community Health

Jane McCusker

HOW TO MEASURE AND EVALUATE COMMUNITY HEALTH

A self-teaching manual for
rural health workers

This series has been set up specifically to meet the needs of trainee and practising medical personnel in the tropical and sub-tropical developing countries. Many of the books will also appeal to others involved in Community work such as school teachers, public health inspectors, environmental health officers and parents.

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HOW TO MEASURE AND EVALUATE COMMUNITY HEALTH

A SELF-TEACHING MANUAL FOR RURAL HEALTH WORKERS

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M
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EDUCATION

ACKNOWLEDGEMENTS

PREFACE

This book was originally conceived during a two-year period, 1973—74, which I spent at the University of Dar es Salaam, Tanzania, in the Division of Community Medicine of the Faculty of Medicine. Rural community health work is appropriately being emphasized in Tanzania, in the training both of doctors and of other cadres of health professionals: medical assistants and rural medical aides. This training aims to prepare these students for work in a country-wide system of rural health centres, each providing clinical and community health services for a catchment population of approximately 50,000. The medical assistants who run these rural health centres are supervised by the District Medical Officer to whom they refer their more seriously ill patients. These medical assistants, in turn, are responsible for supervising the work of rural medical aides in satellite dispensaries as well as running clinics at the health centre, and mobile clinics which visit outlying rural areas.

This book attempts to cover those skills and concepts, necessary to the work of the medical assistants, which may loosely be termed "epidemiological". These include making a community diagnosis of major health problems in the population, selecting priorities, setting goals, organizing and evaluating the results of services. To do this work requires: a certain facility with basic statistics and the ability to prepare and interpret tables and graphs; a knowledge of the goals of primary, secondary and tertiary preventive services; application of some basic demographic principles to the catchment population; and some approaches to evaluating the effectiveness and quality of health services.

The ten units which comprise this book have been organized around those educational objectives thought necessary for the medical assistant to carry out his community health work effectively. Some or all of the units may also be appropriate for other cadres of health workers. The material in each unit is presented in a self-paced learning format which allows students to proceed at their own rate, with frequent opportunities to test their understanding of the unit material. I believe that this format is particularly appropriate for situations in which there are large class sizes and considerable variability in student experience and ability.

An earlier version of the book published by the African Medical and Research Foundation was aimed primarily at an East African audience. In this revision I have attempted to make the material more widely applicable by removing references to specifically East African examples and by carefully reviewing the entire book for accuracy, consistency and clarity of the material presented. I hope that the book will now be useful to a variety of students in many different countries and I would welcome comments and suggestions on it both from students and teachers.

J. McC.

HOW TO USE THIS BOOK

Advice for students and instructors

To the student

This book is probably different from others that you have used. The method that it uses is *self-learning*: you learn the material *on your own* and more importantly *at your own pace*. You are likely to get most benefit from studying this book if you read and follow the instructions given below carefully.

The book is divided into 10 units. Each unit will take most students between 1 and 2 hours to work through. It is better to work through each unit *without interruptions* so be sure you have enough time before you start.

The first part of each unit is the *Introduction* which tells you something about the material to be covered in the unit. The second part of each unit is the *Objectives* which tell you what you should be able to do after working through the unit. Read through these when you start the unit and read them again very carefully when you have finished the unit. You should feel confident that you can now do everything listed in the Objectives: if you can't, you should read through the unit again. If part of the unit is still not clear to you, talk to an instructor.

After the Objectives, the rest of each unit is presented in sections, with several *Practice Questions* during and at the end of each section. These Practice Questions are to help you find out whether you understand and are learning the material. It is very important for you to attempt all of these questions without looking back in the unit. When and *only when* the instructions tell you to check your answer should you look up the correct answer to each question given at the end of the unit: if you get any answers wrong, you should review the preceding section carefully. If the section is still unclear you should talk to an instructor before continuing with the unit. When you reach the end of the unit *and* feel confident that you have mastered it, you should turn to the *Post-test* for that unit at the back of the book. If you have truly mastered the unit you should be able to do all the Post-test questions correctly, *without looking back at the unit*.

To the instructor

This book is not intended to substitute for regular teaching activities such as lectures, seminars, field work, projects, etc. If it is used correctly, however, we believe that it will help you to make more efficient use of the teaching time you have available.

The 10 units are intended to be used in the order in which they appear, each building on information learned in previous units. It is not advisable, therefore, to omit any units except, perhaps, Unit 7, which involves somewhat more difficult concepts and may not be considered

essential for a basic course in community health.

It is recommended that you assign each unit as homework for your class. Try to be available in case any of the students encounters problems working through the unit. Then plan a class session based on the unit, showing students how the ideas in the unit can be used in their work, using local data, etc. Many of the units are excellent starting points for practical work and projects and several even contain suggestions for projects which can be carried out in health centres and dispensaries.

Definitions of all the technical terms and concepts are given at the end of the book.

TABLE OF CONTENTS

WHAT IS COMMUNITY HEALTH?

1.1 Introduction

As a health worker you will spend much of your time with patients who have come to you with specific complaints or symptoms. You will take histories, examine patients and perhaps carry out laboratory tests in order to make a diagnosis and prescribe a treatment. These tasks are part of clinical medicine and an important part of your work. In this unit you will learn about some community health tasks which will be equally important parts of your work. You will start to think about other people living in the community who also may have health problems but who do not or cannot come to you at the health centre. You will also think about ways of preventing some of the diseases in your community.

1.2 Objectives

After completing this unit, you will be able to:

1. Identify the two separate parts of your work: clinical tasks and community health tasks.

2. Define "risk factor" and apply it correctly to different diseases.

3. Describe how disease can be prevented by finding and attacking risk factors.

4. Describe the subclinical and clinical stages of disease and list three possible outcomes of disease.

5. List four ways of making a community diagnosis and identify those ways which are the most accurate.

6. Define users and non-users of health services and give one example of how each could be measured.

1.3 Clinical medicine and community health

Health workers perform many tasks.

Question 1   *Put a tick beside each of the tasks that health workers perform:*

(a) *Diagnosing and treating sick patients*

(b) *Giving immunizations*

(c) *Giving health education*

(d) *Conducting antenatal clinics*

(e) *Delivering babies*

(f) *Special care of patients with tuberculosis and leprosy*

(g) *Detecting epidemics of disease*

(h) *Conducting surveys to detect people with disease who are not already receiving medical treatment.*

(Now check your answers.)

Now let us decide whether these tasks are clinical or community medicine tasks.
The following tasks include diagnosis and treatment of health problems of *individual patients:*

(a) Diagnosing and treating sick patients
(e) Delivering babies.

The following tasks include diagnosing and managing health problems of *people in the community.* They are of greater importance to the health of all people in the community. These tasks include:

(b) Giving immunizations

    (c) Giving health education
    (g) Detecting epidemics of disease in the areas you serve
    (h) Conducting surveys to detect people with disease who are not already receiving medical treatment.

An essential part of the following tasks is the way we *organize* our work for special groups of people:

    (d) Conducting antenatal clinics
    (f) Special care of patients with tuberculosis and leprosy.

The important *community health* objectives of these programmes for special groups are:

For antenatal clinics:

ALL pregnant women in the community receive antenatal care, and women who are likely to have problems during pregnancy or delivery are identified early enough to receive special care and advice.

For special care of tuberculosis and leprosy patients:

ALL the patients with tuberculosis and leprosy in the community are known and are followed carefully to be sure that all are receiving treatment, that complications are detected early and that contacts are investigated.

To perform community health tasks, you will need to learn special skills and ways to organize your work. When you have worked through these units you will have learned many of these skills and ways of organization.

Question 2   Beside each of the tasks performed by health workers listed below, tick if you think the task belongs to clinical medical work or to community health work.

	Clinical medicine	Community health
(a) *Treating a patient with malaria*	_____	_____
(b) *Doing a survey for deafness in school children*	_____	_____
(c) *Giving health education about immunization*	_____	_____
(d) *Making a diagnosis in a patient with cough and fever*	_____	_____
(e) *Organizing mobile maternal and child health teams for a rural area*	_____	_____

(Check your answers before you try Question 3.)

Question 3   Beside each of the tasks performed by health workers listed below, tick if you think the task belongs to clinical medicine work or to community health work.

	Clinical medicine	*Community health*
(a) Giving health education about nutrition	———	———
(b) Treating a patient with a fracture	———	———
(c) Organizing immunization clinics	———	———
(d) Making a diagnosis of appendicitis	———	———
(e) Carrying out a survey for anaemia in a village	———	———

(Check your answers: if you get any part of these questions wrong, read through section 1.3 again.)

This section has shown you some differences between clinical medicine and community health. In your work there will be much overlap and you should not try to separate them.

1.4 Health, disease and risk factors

It is easier to understand what we mean by a sick person than by a healthy person. A *sick person* has signs and/or symptoms of disease and is usually not able to do his or her normal work, or not able to do it as well or as quickly as usual. A *healthy person* is not only someone who is not sick, but someone whose body and mind are working as well as possible.

It is better to try to prevent disease before it starts than to treat disease in a sick person. We therefore need to know how a healthy person can stay healthy and how we can prevent him or her from becoming sick.

Here is an example to show how a healthy person becomes sick. A healthy boy lives near a pond which contains cercariae (the larval form of schistosomes). When the boy is an infant he stays close to his mother and is usually carried around by her. As he gets older, he wanders further from home, exploring his environment, and begins to play in the pond with other children. He becomes infected with the cercariae and develops schistosomiasis.

Two of the factors which have made the boy become sick are:

1. infected water near his home;

2. the boy's behaviour (playing in the infected water).

Both of these factors *increased the risk* that the boy would get schistosomiasis. We call these factors "RISK FACTORS" for schistosomiasis.

A "RISK FACTOR" FOR A DISEASE IS A FACTOR WHICH MAY CAUSE A PERSON TO GET THE DISEASE

Risk factors for schistosomiasis

We talk about people who have certain risk factors as being at *high risk* for certain diseases. For example, we say that a child who plays in infected water is at "high risk" for schistosomiasis.

How could these risk factors have been changed to *prevent* this boy from getting sick?

Question 4   *Which of these two actions would be the best to prevent schistosomiasis?*

(a) *The pond could have been filled in or treated with molluscicides to remove the source of infection.*

(b) *The boy's mother could have told him not to play in the pond.*

(Check your answer.)

We have identified two risk factors for schistosomiasis. Only one of them can be easily changed. It is important to identify risk factors which *can* be changed by health services.

Question 5   A healthy child develops hookworm disease after playing around his home without any shoes on. Can you name some risk factors which could have caused him to get the disease? Can any of these risk factors be changed?

(Now check your answers to this question.)

Here are some risk factors which you may find in pregnant women. A woman who has any of these risk factors has a *high-risk pregnancy*, either because *she* is likely to get sick during the pregnancy or during the delivery, or because the *baby* is likely to die.

1. Previous stillbirths
2. Previous Caesarean section
3. High blood pressure
4. Severe anaemia
5. Height below 146 cm (because it may cause cephalo-pelvic disproportion: the baby's head will not pass through the mother's pelvis).

Some of these risk factors can be changed by treatment, and others can be attacked by making sure that the woman is delivered in hospital.

Question 6   Which of these five risk factors could be attacked by making sure that the woman is delivered in hospital?

(Check your answer.)

> ### DISEASE CAN BE PREVENTED BY FINDING
> ### RISK FACTORS AND THEN CHANGING OR ATTACKING THEM

Question 7   A two-year-old child develops malnutrition. Write down some risk factors which might have caused the malnutrition. Can these risk factors be changed or attacked?

(Check your answer.)

Question 8   Define "risk factor".

(Check your answer before continuing.)

Question 9   Four risk factors which have been discussed in this unit are listed below. For each risk factor, write in the disease *it may cause and the* action *which is necessary to prevent it causing disease.*

Risk factor	Disease	Action
Defaecation outside		
Water infected with cercariae		
Ignorance of mother		
Height below 146 cm		

(Check your answers before trying Question 10.)

Question 10 Here are four risk factors. For each one, write in the disease *it may cause and the* action *which is necessary to prevent the disease.*

Risk factor	Disease	Action
(a) Recent infection with measles or whooping cough		
(b) Previous Caesarean section		
(c) Not wearing shoes		
(d) Playing in infected water		

(Check your answers carefully: if you got any part of these questions wrong, look over section 1.4 again.)

1.5 The stages of disease

We have looked at some of the factors which may cause a healthy person to become sick. Now we shall learn about the different stages of disease. The *two* important

stages to know about are:

1. The subclinical stage.
2. The clinical stage.

The subclinical stage

In this stage there are no signs or symptoms and the patient does not know that he has any disease. In many infectious diseases the bacterium (or virus or parasite) may enter a person and multiply in the body without causing any symptoms or signs of disease. If we examine stool specimens from apparently healthy school children, we may find that some of them have parasite ova in them, but that the children have no signs or symptoms of the disease. Often the only way we know that a person has had a subclinical infection is to do blood tests for antibodies. For example, many adults have antibodies in their blood to the virus of polio disease. Very few of these adults (less than one in a hundred) have ever had any signs or symptoms of polio disease but because of their positive blood test we know that they must have had a sub-clinical infection sometime in their childhood.

The subclinical stage of disease may lead to the clinical stage, *or* an individual may recover without developing any signs or symptoms of the disease.

This diagram shows the stages you have learned about so far:

```
              ┌─────────────────────┐
              │   HEALTHY PERSON    │
              └─────────────────────┘
                         │
                         ▼
              ┌─────────────────────┐
              │ SUBCLINICAL DISEASE │
              └─────────────────────┘
                      ╱      │
   ┌──────────────┐  ╱       │
   │   RECOVERY   │◄╱        │
   └──────────────┘          │
                             ▼
              ┌─────────────────────┐
              │  CLINICAL DISEASE   │
              └─────────────────────┘
```
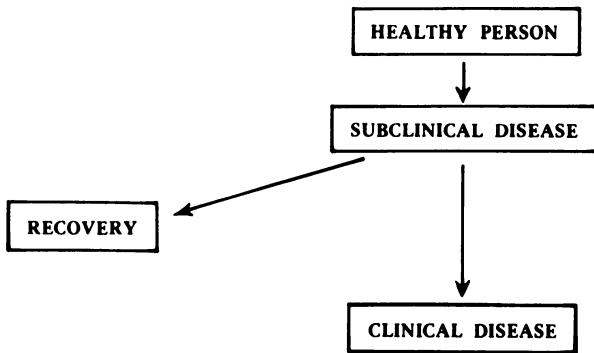
The clinical stage

In this stage the person has signs and symptoms of the disease. If the symptoms become severe the person may seek help. Some diseases, such as chickenpox and the common cold, have a clinical stage which is short and mild and almost everyone re-covers quickly. Other diseases, like rabies and polio, are very serious. Most of the people who become infected with rabies die from it. Many of the patients who develop signs and symptoms of polio disease will develop complications; some may

die from paralysis of the muscles of respiration and others may be disabled for the rest of their lives. Thus, the clinical stage of disease may have several possible outcomes: recovery, or disability, or death.

We can now make another diagram to add these outcomes you have learned about. Study this diagram carefully, then answer the questions.

```
                          ┌─────────────────────┐
                          │   HEALTHY  PERSON   │
                          └─────────────────────┘
                                    │
                                    ▼
                       ┌─────────────────────────┐
                       │  SUBCLINICAL  DISEASE   │
                       └─────────────────────────┘
         ┌──────────────┐      ╱            │
         │  RECOVERY    │ ◄───╱             │
         └──────────────┘                   ▼
                             ┌─────────────────────┐
                             │  CLINICAL  DISEASE  │
                             └─────────────────────┘
   ┌──────────────┐    ╱            │            ╲    ┌──────────────┐
   │  RECOVERY    │ ◄─╱             │             ╲─► │    DEATH     │
   └──────────────┘                 ▼                 └──────────────┘
                          ┌─────────────────────┐
                          │     DISABILITY      │
                          └─────────────────────┘
```
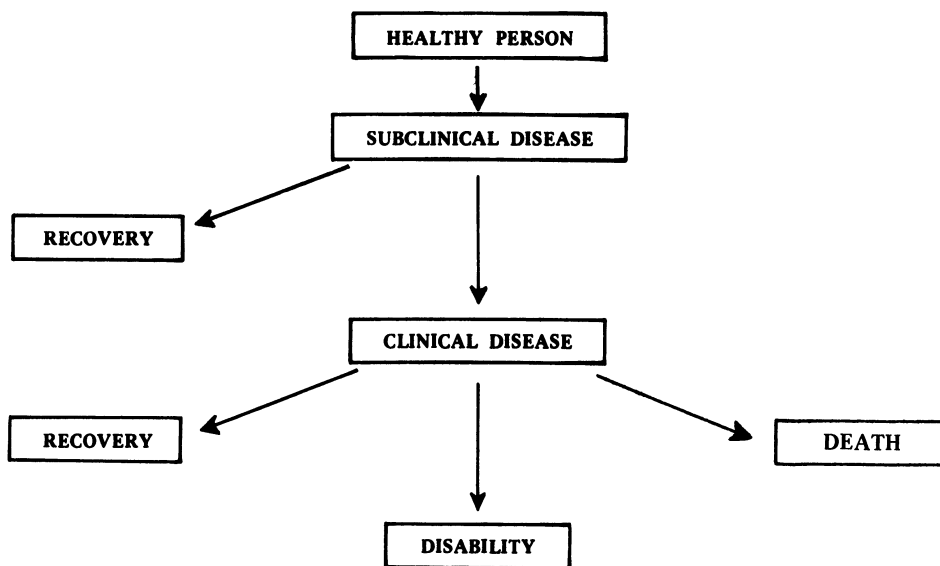
Question 11 Fill in the gaps below:

There are..................................important stages to all diseases.
The first stage, in which the patient has no signs or symptoms is called the

..............................stage.
The second stage, in which signs and/or symptoms are present is called the

..............................stage.
The main outcomes of this second stage are...,

.., or ....

(Check your answers carefully.)

Questions 12–16   Circle TRUE or FALSE in the statements below:

12. All individuals in the subclinical stage of a disease will go on to the clinical stage.

<p align="center">*TRUE   FALSE*</p>

13. *If an individual has polio antibodies in his blood, he must at some time have had clinical polio disease.*

<div align="center">

TRUE   *FALSE*

</div>

14. *If an individual has polio antibodies in his blood, he must at some time have had polio infection, either clinically or subclinically.*

<div align="center">

TRUE   *FALSE*

</div>

15. *Disability or death are the only outcomes of clinical disease.*

<div align="center">

TRUE   *FALSE*

</div>

16. *A patient with subclinical measles infection has no signs or symptoms of measles.*

<div align="center">

TRUE   *FALSE*

</div>

(Check your answers to questions 12–16; if you made any mistakes, read through section 1.5 again.)

1.6 Community diagnosis

You have learned about the stages of disease that an individual goes through. We shall now see how these stages affect different people in the community. As an epidemic of polio spreads through a community we can divide people into the following groups:

1. Healthy people, not infected with the virus of polio disease.

2. Apparently healthy people with subclinical disease.

3. People with mild clinical disease only (fever, vomiting, etc).

4. People with severe clinical disease (paralysis).

   Out of 400 or more people with subclinical disease, only *one* will develop symptoms and signs of clinical disease.

Question 17 What could be two reasons that a person does not become infected in an epidemic of polio in his community?

   (a)

   (b)

(Check your answer.)

Question 18 *An epidemic of polio occurs in a community and 10 cases of paralytic disease are reported. What would you guess to be the true number of people infected in the epidemic? (Circle the best answer.)*

A. *none*

B. *about 10*

C. *about 50*

D. *about 100*

E. *more than 1000*

(Check your answer.)

When a health worker makes a diagnosis in a patient he takes a history, examines the patient carefully and does special tests or investigations.

A community health worker approaches the community he is working with in a similar way. He questions and examines some or all of the people in that community to make a *community diagnosis* of the important health problems of the community.

Here are some of the ways you could *make a community diagnosis* in a village:

1. *Talk to village leaders and health workers* (such as political or religious leaders, member of community organizations, teachers, rural medical aides, village medical helpers) and ask them what the main health problems of the village are.

2. *Attend village gatherings* and talk to and observe the people. You might notice, for example, some children with reddish-brown hair indicating that malnutrition could be a problem.

3. *Look at any local medical records.* Sometimes only treatments given are recorded: in this case you would have to make a good guess as to what diseases or conditions the treatments were prescribed for.

4. *Visit people in their homes:*
   (a) question them about their health problems (e.g. ask if anyone has had a cough for more than 4 weeks);
   (b) do physical examinations (e.g. look for anaemia);
   (c) collect specimens for laboratory tests (e.g. skin snips for leprosy).

Each of these ways of making a community diagnosis will give you different information. For example, a local leader might tell you that tuberculosis was a serious problem in the village because some members of his family have the disease. When you look at the records in the dispensary, however, you find that

A health worker visiting in the home

out of 200 patients visiting the dispensary in a certain week, only one came with tuberculosis. When you visit people in their homes you find that only 1 person out of 500 questioned has had a cough for more than 4 weeks.

Question 19 *Which of the four methods of making a community diagnosis do you think would give you the best estimate of the number of tuberculosis cases in the village? (Circle one answer.)*

    A. *talk to village leaders*

    B. *attend village gatherings*

    C. *look at existing medical records*

    D. *visit people in their homes and ask who has had a cough for more than 4 weeks.*

(Check your answer.)

You may want to find out if malnutrition is a serious problem in the village. None of the village leaders mentions malnutrition to you and the dispensary records

show that only one child out of 100 seen at the dispensary has malnutrition. Yet when you go from house to house examining the children, you find that one child in 5, or 20% of the children, have clinical signs of malnutrition.

Question 20 Why do you think the village leaders did not mention malnutrition?

(Check your answer.)

Question 21 Why do you think the dispensary records showed so few cases of malnutrition?

(Check your answer.)

Although talking to community leaders and looking at dispensary records can help you make a community diagnosis, these methods are not as accurate as questioning and examining some or all of the people, either in their homes or at a place you have asked them to come. In Unit 6: Samples and Surveys you will learn some skills which will help you to make a community diagnosis.

1.7 Users and non-users of health services

In your community health work you need to think about why people with health problems do not always use health facilities for treatment.

When a healthy person becomes sick, the early stages of the disease may be subclinical and the person does not even know that he is sick. When he begins to develop the clinical disease he still may not visit the dispensary or health centre, perhaps because of one of the following reasons:

1. The symptoms of the disease are not severe and he can still work.

2. He lives too far from the health centre or dispensary to get there easily.

3. He is too sick to walk to the health centre or dispensary and doesn't know anyone who could give him a ride there.

4. He uses traditional treatment.

Distance may delay attending for treatment

**PATIENTS WHO *USE* HEALTH SERVICES
ARE NOT THE ONLY PEOPLE IN THE
COMMUNITY WHO *NEED* HEALTH SERVICES**

The people in the community who have clinical diseases but do not come to the dispensary still *need* treatment. These *non-users* of health services are an important community health problem.

In the following diagram are 10 people with clinical disease who *need* health services: 6 of them are *users* of health services and 4 are *non-users.*

Users of health services   Non-users of health services

People who need health services
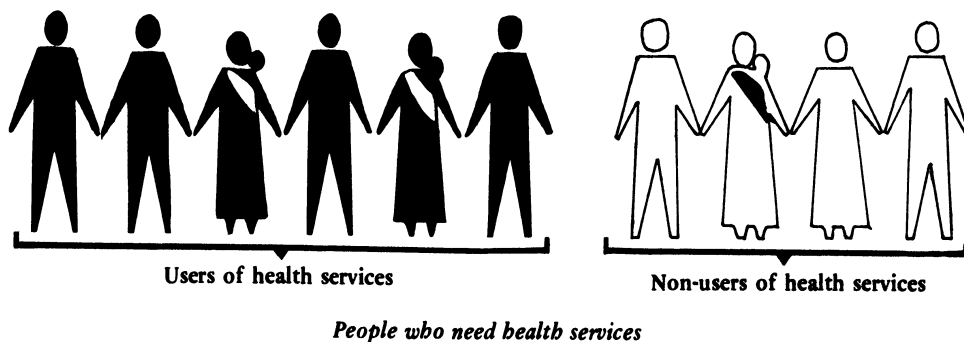
The map below may help you to understand these ideas. This is a map of a community which is served by a health centre. The health centre lies in the centre of the community, but a large river divides the community into two groups: a group living on the same side of the river as the health centre and a group living on the other side of the river. A major road also passes through the community. The health centre is situated beside this road,which has a bridge over the river. There are no other bridges or ferries which cross the river in this community.

The figures on the map are the patients with tuberculosis who live in the community. These are people who *need* health services. Some of the figures are dark. These are the patients with tuberculosis who come to the health centre for treatment. These people are the *users* of health services. The *non-users* of health services are shown as white figures.

○ Health Centre

Tb patients *not* under treatment

Tb patients under treatment
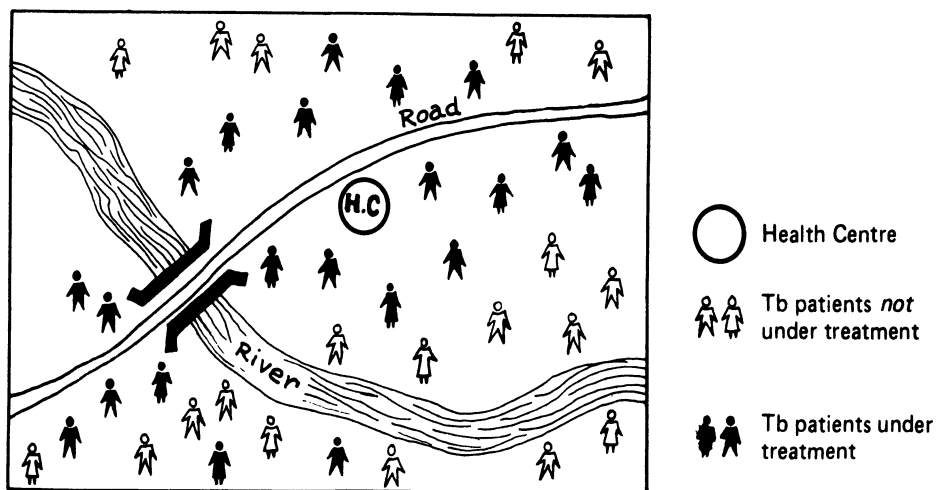
Question 22 Where do the tuberculosis patients who are non-users *of health services live?*

(Check your answer carefully.)

Question 23 Which of the following could be reasons that these non-users *are not using the health centre for treatment? (Tick all that apply.)*

    A. *They live too far from the health centre.*

    B. *They use traditional treatments.*

    C. *They are too sick to walk to the health centre.*

    D. *They do not have severe symptoms and can still work.*

(Check your answer to question 23.)

Question 24 How would you count the number of people needing *health services in a village, both users and non-users? (Circle the best answer.)*

    A. *From patients attending the dispensary.*

    B. *From a survey of people in their homes.*

Question 25 How would you count the users *of health services in a village? (Circle the best answer.)*

    A. *From patients attending the dispensary.*

    B. *From a survey of people in their homes.*

Question 26 Who are the non-users *of health services in a village? (Circle the best answers.)*

    A. *People attending health services who are not sick.*

    B. *People attending health services who are sick.*

    C. *People with real health problems who are not attending health services.*

Question 27 The best way to make a community diagnosis is to count (circle the best answers):

    A. *Users of health services.*

    B. *Non-users of health services.*

    C. *Both A and B.*

Questions 28–30 Circle TRUE or FALSE below each of the following statements:

28   *To make a community diagnosis it is usually better to visit and examine people in their homes than to look at medical records.*

<div align="center">

TRUE   FALSE

</div>

29   *The best way to find out who uses health services is to look at existing medical records.*

<div align="center">

TRUE   FALSE

</div>

30   *Non-users of health services for Tb in a village are people with Tb who are not receiving treatment at the dispensary.*

<div align="center">

TRUE   FALSE

</div>

(Now check your answers to questions 24–30: if you made any mistakes, read through section 1.7 again.)

You have now completed Unit 1: What is Community Health?

Turn back to 1.2 Objectives and make sure that you feel confident about all the objectives listed. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post-Test.

1.8 Answers to practice questions

1. You should have ticked *all* of the tasks. They are all tasks of health workers.

2. (a) Clinical medicine
    (b) Community health
    (c) Community health
    (d) Clinical medicine
    (e) Community health.

3. (a) Community health
    (b) Clinical medicine
    (c) Community health
    (d) Clinical medicine
    (e) Community health.

4. Filling in the pond or using molluscicides would be much better than trying to stop the boy playing in the pond.

5. (a) The presence of infective hookworm larvae in the ground due to defaecation outside. This risk factor could be changed by building latrines.
    (b) The boy's habit of not wearing shoes. This would be hard to change.

6. These risk factors could be attacked by arranging for hospital delivery: women who have had previous stillbirths; previous Caesarean section; height below 146 cm.

7. Here are some of the risk factors which might have caused the malnutrition:
    (a) The child was weaned at this time (probably due to the mother becoming pregnant again) and was not given an adequate weaning diet.
    (b) The child suffered a severe illness, such as measles or whooping cough.
    (c) The child's family did not have sufficient food for all the family, due to a poor harvest, the father losing his job, or some other reason.
    (d) The mother died or suffered serious illness producing emotional problems in the child which prevented him from eating normally.
    (e) The mother was ignorant about diet.

    If you gave any different answers, please discuss them with your instructor.

    For each of these risk factors, education about proper nutrition in young children is needed to prevent malnutrition. Immunization could have prevented (b).

8. A "risk-factor" for a disease is a factor which may cause a person to get the disease.

9.

Risk factor	Disease	Action
Defaecation outside	Hookworm	Build latrines and use them
Water infected with cercariae	Schistosomiasis	Fill in pond. Molluscicides
Ignorance of mother	Malnutrition of child	Health education about diet
Height below 146 cm	Cephalo-pelvic disproportion	Arrange hospital delivery

10.

Risk factor	Disease	Action
(a) Recent infection with measles or whooping cough	Malnutrition	Immunization to prevent the risk factor *or* health education
(b) Previous Caesarean section	Obstructed labour leading to death of mother and baby	Arrange for hospital delivery
(c) Not wearing shoes	Hookworm	Health education on importance of wearing shoes
(d) Playing in infected water	Schistosomiasis	Fill in pond or molluscicides or health education to try to stop playing in infected water

11. There are *two* important stages to all diseases. The first stage, in which the patient has no signs or symptoms is called the *subclinical* stage. The second stage, in which signs and/or symptoms are present is called the *clinical* stage. The main outcomes of this second stage are *recovery, disability* or *death.*

12. False (some may recover).

13. False (he could have had clinical *or* subclinical polio).

14. True

15. False (recovery is another outcome).

16. True

17. (a) He has not come into contact with the infection.

    (b) He is already immune to the polio virus causing the epidemic, either because of previous infection with the virus or because he has been immunized with polio vaccine.

    If you gave any different answers, please discuss them with your instructor.

18. E (about 4,000)

19. D (A, B and C may give you biased or inaccurate results. You will learn more about bias in Unit 6).

20. Perhaps because:

    (a) They did not recognize the clinical picture of the disease.

    (b) They did not associate it with diet.

    (c) Because of pride: they did not want you to think that the people in the village could not produce enough food for their children.

21. Any of these reasons:

    (a) Mothers of malnourished children did not bring them to the dispensary.

    (b) The dispensary worker did not recognize malnutrition.

    (c) Malnourished children were brought to the dispensary only when they had other diseases, (e.g. respiratory infections, measles) and the dispensary worker recorded the first diagnosis only.

22. The non-users are scattered over the area, but most are far from the health centre and far from the road.

23. A, B, C and D could *all* be reasons.

24. B (A would be just the users).

25. A

26. C

27. C

28. True

29. True

30. True

PREVENTING AND TREATING DISEASE

2.1 Introduction

You have learned about the stages of disease and how a healthy person becomes sick. As health workers, your job is to prevent healthy people from becoming sick. If this is not possible, then the aims are: (1) to prevent sick people from developing chronic sickness and disability and (2) to prevent the disabled from further complications and death. In this unit you will learn what preventive methods can be used for each of the stages of disease.

2.2 Objectives

After completing this unit you will be able to:

1. Define the terms primary, secondary, and tertiary prevention and name the stage of disease where each is used.

2. List the main methods of primary, secondary, and tertiary prevention and name some of the diseases where these methods can be used.

2.3 The stages of prevention

Some important tasks of health workers are preventing people from getting sick, and preventing sick people from becoming disabled or chronically sick, or dying. There are usually several stages in a disease where health workers can take action to stop or to slow down the progress of the disease.

For example, health workers can take action against measles either (1) in the healthy stage, to prevent people from becoming infected with measles, or (2) in the clinical stage of disease to treat complications and to prevent death and disability. Let's find out more about these actions that health workers can take against measles:

1. *In the healthy stage* There is little health workers can do to prevent children from being exposed to measles because patients with measles are infectious to others before they develop the typical rash. But health workers can give children measles *vaccine*, which will protect them against measles even if they are exposed to it.

2. *In the clinical disease stage* Health workers can examine children with measles and treat any complications that may be present, e.g., conjunctivitis, pneumonia, otitis. They can also educate parents on nutrition, because measles is much less serious in well-nourished children.

Question 1   *What actions can health workers take against measles?*

> *(a) In the healthy stage.*

> *(b) In the clinical disease stage.*

(Check your answers before continuing.)

If you want to take action against a disease, you need to have a good knowledge of the *risk factors* of the disease and the *subclinical* and *clinical* stages of the disease.

Question 2   *(a) What is a risk factor?*

> *(b) What is the difference between clinical and subclinical disease?*

(Check your answers before continuing.)

There are three important ways that health workers can prevent the progress of disease:

1. Preventing healthy people from becoming sick. This is called PRIMARY PREVENTION (or 1° prevention).

2. Detecting people who already have the disease as early as possible, to cure the

patient. This is called SECONDARY PREVENTION (or 2° prevention).

3. Prevention of more disability and death in a patient who cannot be cured. This is called TERTIARY PREVENTION (or 3° prevention).

We shall discuss each of these methods of prevention in turn and give examples of each.

2.4 Primary prevention

> **PRIMARY PREVENTION OF DISEASE =**
> **PREVENTING HEALTHY PEOPLE FROM BECOMING SICK**

In order to carry out primary prevention, we must ask why healthy people become sick. We must know who is most "at risk" of getting the disease. To answer this we must identify the risk factors for the disease.

Question 3 (a) *Name an important risk factor for measles.*

(b) *What method of primary prevention of measles attacks this risk factor?*

(Check your answers.)

Question 4 *Name two risk factors for schistosomiasis and suggest a method of primary prevention for each risk factor.*

(Check your answer.)

We have mentioned several methods of primary prevention for schistosomiasis and for measles. These methods can be helpful in the primary prevention of many different diseases.

Immunization is one of our most powerful weapons for the primary prevention of infectious diseases. Smallpox was once a serious disease which infected many people. It has now been eradicated as a result of well-organized vaccination campaigns. Poliomyelitis, whooping cough, diphtheria, tetanus, tuberculosis and measles are all serious diseases which can be effectively prevented by immunization.

Provision of a safe water supply for cooking and drinking, as well as for bathing in, is one of the most important ways to protect the health of a community. Cholera, typhoid, hepatitis and amoebiasis are some of the diseases which can be prevented by a safe water supply.

Primary prevention—immunization against infectious diseases

Changing people's behaviour by health education can prevent disease, but it is very difficult to stop people from bathing in infected water or to teach people to boil their drinking water. It is better to provide a safe water supply.

There are many other ways in which people's behaviour can cause disease:

—malnutrition can be caused by people eating the wrong foods;

—death of mothers and babies in pregnancy and labour happens because many mothers do not attend antenatal clinics;

—children still get preventable diseases because mothers do not bring their children for immunizations.

We need to find out more about how people can be taught to eat more nutritious food or how to get mothers to attend antenatal clinics and bring their children for immunization.

Some other important methods of primary prevention which we shall not have the time to discuss here are:

—provision of adequate housing;

—safe disposal of human excreta;

—control of vectors of disease.

As you learn about specific diseases and the risk factors of those diseases you will be able to identify the best methods of primary prevention for each one.

Question 5   What is meant by primary prevention of disease?

Question 6   Name three diseases for which immunization is a good method of primary prevention.

Question 7   Name three diseases for which providing a safe water supply is a good method of primary prevention.

(Check your answers to these questions before continuing.)

2.5 Secondary prevention

```
SECONDARY PREVENTION OF DISEASE =
DETECTING AND TREATING PEOPLE WHO
ALREADY HAVE THE DISEASE AS EARLY
              AS POSSIBLE
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When primary prevention has failed, a healthy person becomes sick. Secondary prevention involves the detection and treatment of these people in the subclinical or the early clinical stages of disease. It is important to detect disease as early as possible so that treatment can begin early. Usually, the earlier the treatment is started, the greater the chance of curing the patient.

Question 8   How can a person in the subclinical stage of disease be detected?

(Check your answer.)

There are two methods of early detection of disease which are related to the stage of disease:

1. Detection of *subclinical* disease using laboratory tests.

2. Detection of *early clinical* disease using a physical examination with laboratory tests if necessary.

In order to carry out effective secondary prevention you should not wait until patients come to you complaining of symptoms. By the time symptoms appear the disease may have progressed so far that it can no longer be cured, and secondary prevention will no longer be possible. You will have to actively seek out early cases of disease in the community, perhaps by carrying out a household survey, or by telling people to come to the clinic to be examined. A good example of this is malnutrition in children (kwashiorkor or marasmus). If you wait for mothers to bring children with malnutrition to the clinic, you will only see very serious, advanced cases which may never be cured completely. It is much better to try to detect these children early when you can teach the mother about good nutrition and the children can be cured.

Secondary prevention—weighing children to detect malnutrition

Question 9   How would you carry out secondary prevention for malnutrition in children?

(Check your answer.)

Another example is the secondary prevention of anaemia.

The early detection of patients with anaemia would consist of looking for anaemia (either clinically, by examining conjunctivae or mucous membranes, or by laboratory tests such as the haemoglobin) in individuals who are not complaining of symptoms of anaemia, such as shortness of breath and body weakness. The idea is to try to pick up anaemic patients *before* they develop signs and symptoms of late clinical disease.

Question 10 What is meant by secondary prevention of disease?

Question 11 How would you carry out secondary prevention for eclampsia in antenatal clinics?

(Check your answers.)

2.6 Tertiary prevention

> **TERTIARY PREVENTION OF DISEASE =**
> **PREVENTION OF MORE DISABILITY**
> **AND DEATH IN A PATIENT WHO**
> **CANNOT BE CURED**

Tertiary prevention has two aims:

1. Treatment to prevent more disability and death.

2. New training and special education to help the patient to return to some useful work and life in the community.

In some diseases, tertiary prevention is needed because primary and secondary prevention have failed. Blindness due to vitamin A deficiency happens when primary prevention (adequate nutrition) and secondary prevention (early detection of corneal ulcers) have failed and the damage to the cornea (keratomalacia) cannot be treated. Tertiary prevention can help the blind or partly blind patient to learn to do useful work and return to the community.

Tertiary prevention—training the handicapped. A blind man earning his living as a telephone operator

In other diseases, tertiary prevention is needed because primary and secondary prevention do not work. In diabetes we cannot use primary prevention because we do not know enough about what causes diabetes. Also, diabetics cannot be cured: they will always have the disease. The goal of tertiary prevention in diabetes is to keep the patients blood sugar under control as well as possible, using drugs and/or diet, and to treat complications promptly, e.g., infections.

Question 12 What is meant by tertiary prevention of disease?

Question 13   When and how would you carry out tertiary prevention in a patient with leprosy?

(Check your answers before continuing.)

2.7 Prevention of poliomyelitis

Now let us put together all our knowledge about primary, secondary and tertiary prevention and the stages of disease. We shall use poliomyelitis as an example and list the stages of disease on the left and the specific prevention methods which are appropriate to each stage on the right. Study this information carefully and then answer Question 14.

STAGE OF DISEASE	PREVENTIVE METHOD
I. No disease Some important risk factors are: 1. No immunity (most common in young children). 2. Overcrowding. 3. Poor hygiene (favouring transmission of polio virus).	*Primary prevention* 1. Immunization with polio vaccine. 2. Improved housing. 3. Safe water supply and health education on personal hygiene.
II. Subclinical and early clinical stage 1. Early symptoms: fever, headache, and vomiting. 2. Late symptoms: paralysis.	*Secondary prevention* 1. Health education of community during epidemics to recognize early symptoms. 2. Treatment of paralysed patients with emphasis on bed rest to prevent permanent paralysis.
III. Stage of chronic disability 1. Permanent paralysis.	*Tertiary prevention* 1. Physiotherapy to prevent contractures. 2. Vocational (job) training. 3. Provision of splints and walking aids.

Question 14 Beside each of the preventive methods used against poliomyelitis, circle either primary (1°), secondary (2°), or tertiary (3°) prevention:

(a) Treatment of paralysed patients to prevent permanent paralysis.	1°	2°	3°
(b) Immunization with polio vaccine.	1°	2°	3°
(c) Physiotherapy for permanently paralysed patients.	1°	2°	3°
(d) Providing splints for permanently paralysed patients.	1°	2°	3°
(e) Health education on personal hygiene.	1°	2°	3°
(f) Health education on early recognition of symptoms.	1°	2°	3°
(g) Improved housing and water supplies.	1°	2°	3°

(Check your answers to this question before continuing.)

Question 15 Decide whether the following preventive methods used in various diseases are methods of primary, secondary, or tertiary prevention:

(a) The use of mosquito nets to prevent malaria.	1°	2°	3°
(b) A community survey to detect early cases of tuberculosis.	1°	2°	3°
(c) Health education to mothers on the nutrition of their healthy children.	1°	2°	3°
(d) Immunization with BCG.	1°	2°	3°
(e) Treatment of diabetics.	1°	2°	3°
(f) Checking women at antenatal clinics for oedema.	1°	2°	3°

(Check your answers.)

You have now completed Unit two: Preventing and Treating Disease. If there are any parts of this unit which are still unclear to you, go back to the appropriate section of the unit. If necessary, discuss these aspects with your instructor.

When you feel confident about this unit, take the post test.

2.8 Answers to practice questions

1. (a) Immunization with measles vaccine.

   (b) Treat complications; nutrition education.

2. (a) A "risk factor" for a disease is a factor which may cause a person to get the disease (or make him "at risk" for the disease).

   (b) There are signs and symptoms in the clinical stage, but not in the subclinical stage.

3. (a) No specific immunity to measles (either because no previous measles infection or no measles vaccine received).

   (b) Immunization of children using measles vaccine.

4. Two risk factors for schistosomiasis (which were mentioned in Unit 1) are:

   1. Presence of water source contaminated with cercariae. 1° prevention of this risk factor would be to fill in the pond or treat the water with molluscicides.

   2. Behaviour which brings people into contact with the contaminated water (e.g., children playing in contaminated pools). 1° prevention of this risk factor would be health education to prevent the unhealthy behaviour.

5. Primary prevention of disease means preventing healthy people from becoming sick.

6. Any three of the following: smallpox, tuberculosis, poliomyelitis, whooping cough, diphtheria, tetanus, measles.

7. Any three of the following: cholera, typhoid, hepatitis, amoebiasis, schistosomiasis.

8. By laboratory tests. (For example, subclinical hypertension is detected by taking the blood pressure; subclinical anaemia is detected by a haemoglobin test.)

9. You could use two methods:

   (a) Ask mothers to bring their children under 5 years old regularly to MCH clinics: examine the children and measure the children's weights and heights. Early cases of malnutrition can be detected in this way.

   (b) Carry out a household survey: visit households and examine all children under 5 years old in these households, and weigh and measure them.

10. Secondary prevention of disease means detecting and treating people who already have the disease as early as possible.

11. By taking blood pressures routinely on antenatal patients, examining for oedema, and testing for protein in the urine.

12. Tertiary prevention of disease means the prevention of more disability and death in a patient who cannot be cured.

13. When the patient develops complications which cannot be cured, e.g., neurological compli- cations. You could educate the patient to avoid injury, such as burns.

14. (a) 2°

   (b) 1°

   (c) 3°

   (d) 3°

   (e) 1°

   (f) 2°

   (g) 1°

15 (a) 1°

   (b) 2°

   (c) 1°

   (d) 1°

   (e) 3°

   (f) 2°

Unit three

USING NUMBERS AND GRAPHS

3.1 Introduction

Using numbers and graphs is an important part of your work. You may receive reports from regional or national health departments or ministries of health which describe the activities of district health centres in terms such as:

the *average* (or *mean*) daily patient attendance;

the *percentage* of beds occupied.

You should be able to interpret this information so that you can compare your health centre with others.

In addition, you may be asked to submit reports and tabulations such as:

frequency distribution of the most common diseases seen at your health centre;

average (or *mean*) duration of inpatient stay at the health centre;

the *percentage* of children seen at MCH clinics whose weights are below normal for their age.

In this and the next unit you will learn how to perform these tasks, which all involve using numbers.

An important rule to follow when answering the practice questions in these units is:

> **ALWAYS DO EVERY CALCULATION AT LEAST TWO TIMES**

This is a good way to check on the accuracy of your calculations.

Make sure you have a sharp pencil, an eraser and a ruler with you before starting the unit.

3.2 Objectives

After completing this unit you will be able to do the following with a group of numbers or measurements:

1. Calculate percentages from numbers and numbers from percentages.

2. Calculate the range.

3. Make a frequency distribution.

4. Present a frequency distribution as a table and as a graph (a histogram).

5. Understand and interpret tables and graphs (including population pyramids) which have been prepared by others.

3.3 Numbers and percentages

The first thing you need to learn is the difference between numbers and percentages. Percentages are used to compare one number with another. For example: in one school of 300 children there are 30 with scabies. In another school of 250 children there are 50 with scabies. In which school is there a bigger problem with scabies? The best way to answer this is to change both sets of numbers into percentages. At the first school, the percentage with scabies is

$$\frac{30}{300} \times 100 = 10\%$$

At the second school, the percentage with scabies is

$$\frac{50}{250} \times 100 = 20\%$$

The percentage with scabies at the second school is twice as great as at the first school showing that scabies is a greater problem at the second school.

The percentages were calculated by dividing the number of people in the group with a characteristic (in this case, scabies) by the total number of people in the group and then multiplying by 100. At the first school:

number of people
with characteristic

$$\frac{30}{300} \times 100 = 10\%$$

total number of
people in the group

**A PERCENTAGE IS THE NUMBER OF PEOPLE
IN A GROUP WITH A CHARACTERISTIC,
DIVIDED BY THE TOTAL NUMBER OF PEOPLE
IN THE GROUP, AND MULTIPLIED BY 100**

Here are the ages of 25 children seen at an MCH clinic.

Age group (months)	Number of children
0 – 5	8
6 – 11	10
12 – 17	2
18 – 23	1
24 – 29	4
Total	25

The *percentage* of children aged less than 6 months = $\dfrac{8}{25} \times 100 = \dfrac{800}{25} = 32\%$

The *percentage* of children aged 18 months or older = $\dfrac{(1+4)}{25} \times 100 = \dfrac{5}{25} \times 100$

$$= \dfrac{100}{5} = 20\%$$

Question 1   *100 patients attend a dispensary in one week. 20 of them attend on Monday. What percentage attend on Monday?*

Question 2   *Of the 20 patients attending on Monday, 6 have malaria and 4 have gastroenteritis. What percentage of these 20 patients have other conditions?*

Question 3   *In an antenatal clinic one day, 5 patients are found to be high risk and 10 are not high risk. What percentage are high risk?*

(Check your answers to questions 1–3.)

As well as being able to change numbers into percentages, you should be able to change percentages into numbers. If you are told that 60% of a class of 20 children have hookworm infection, you should be able to work out the *number* of infected children by *dividing the percentage* by 100 and *multiplying by the number of children in the class*:

$$\text{number of children} = \frac{60}{100} \times 20 = \frac{1200}{100} = 12 \text{ children}$$

Questions 4–5
In a dispensary, on a certain day, you find that 30 patients out of 120 are presenting with upper respiratory infections (URI).

Question 4   *Calculate the percentage with URI.*

Question 5   *80% of the children with URI also have a fever. How many children have a fever?*

(Repeat the calculations, then check your answers before continuing.)

Question 6   *60% of 50 Tb patients in a rural area are non-users of health services. How many patients are non-users?*

(Check your answer before continuing.)

Turning numbers into percentages and percentages into numbers is very important. Here are some additional questions.

Question 7 *20 women at an antenatal clinic were asked whether they had ever used any method of family planning. The results were:*

Yes, regularly:	*3*
Yes, but not regularly:	*4*
Never used:	*13*

Turn these numbers into percentages.

Question 8 *One health centre 'A' serves a population of 40,000 which has 10,000 children under the age of 5. Another health centre 'B' serves a population of 60,000 with 15,000 children under the age of 5. Calculate the percentage of under-5s in the 2 populations. For which health centre are services for the under-5s more important?*

Question 9 *30% of the patients with leprosy in a district are not using health services. There are estimated to be 50 leprosy patients altogether in the district. What number of patients are non-users?*

Question 10 *There are 2,500 births every year in the population of a health centre. 20% of them take place at the health centre. What percentage of births does not take place at the health centre? What number of births does not take place at the health centre?*

(Check your answers. Be sure you understand percentages before going on to 3.4.)

3.4 The range

In this unit and in unit 4 you will learn about different ways of analysing numbers and measurements by solving a problem. The problem is to find out about the weights of 25 children who are weighed in MCH clinics: do the weights tell us that the children weigh less than they should, or more than they should, or that the

children are normal? (The weights and ages of the 25 children are on Table 1 on a fold-out sheet, at the end of the unit 3.8, so that you can refer to it throughout.) To solve this problem you need to know some ways of *organizing* and analyzing the measurements to answer the questions.

The first way of organizing the measurements tells us how much they are spread out, or how big the *range* is between the highest and the lowest measurements.

> THE *RANGE* IS THE DIFFERENCE
> BETWEEN THE HIGHEST AND
> LOWEST MEASUREMENT

We shall start by calculating the range of the ages. For this you need to find the *highest* and the *lowest* ages in this series. The difference between these two values gives us the range of ages in this group of children.

Question 11 The highest *age (oldest child)*   *months.*

Question 12 The lowest *age (youngest child)*   *months.*

Question 13 The difference *between the highest and*
            lowest ages (the range)   *months.*

(Repeat your calculations and then check your answers. If you made any mistakes, look over the definition of range again.)

Question 14 *Now look at the* weights *of the children in Table 1 and calculate the range of the*
            weights.

(Repeat your calculations, then check your answer.)

Question 15 *How would you calculate the range of a group of measurements? What does it tell*
            you about those measurements?

(Check your answer.)

If you got either question 14 or 15 wrong, or you still feel unsure about the range, do questions 16 and 17.

Question 16 *What is the range of the following haemoglobin values (given in grammes)?*

    11.3,   *10.2,*   *12.7,*   *10.5,*   *9.6*

Question 17 What is the range of the following class scores in a test (marked out of 20)?

18,	15,	20,	7,	11,	15,	17

3.5 Frequency distributions

Our next step in analysing the weights of the children is to group them into a frequency distribution.

There are 3 steps involved:

1. Selecting the groups.

2. Counting the number of measurements in each group.

3. Adding up and checking your results.

Step 1: Selecting the groups

Here are two sets of groups for the weights of the children: look at them carefully and decide how useful they would be for grouping the 25 weights.

4.0– 5.0 kg	2.0– 3.9 kg
5.0– 7.0 kg	4.0– 5.9 kg
7.0– 9.0 kg	6.0– 7.9 kg
9.0–10.0 kg	8.0– 9.9 kg
	10.0–11.9 kg
1st set of groups	*2nd set of groups*

The 1st set of groups has several problems:

(a) The groups do not include weights which are less than 4.0 kg or greater than 10.0 kg. We have seen that the actual range of weights is from 3.6 kg to 11.4 kg so that some of the weights *could not be fitted into these groups.*

(b) The groups are of *different width*: the first group (4.0–5.0 kg) is 1 kg wide, while the second (5.0–7.0 kg) is 2 kg wide. In order to compare the numbers of weights falling into each group you must make the groups equally wide.

(c) The groups *overlap*. Both the first and second groups include 5.0 kg; both the second and third groups include 7.0 kg etc. For example, you don't know which group you should put child 'P' (weight 5.0 kg) into.

These three problems have been solved in the 2nd set of groups which follow the rules for selecting groups:

1. THE GROUPS MUST INCLUDE THE RANGE OF MEASUREMENTS so that every measurement can fit into one of the groups.

2. THE GROUPS MUST BE EQUALLY WIDE so that you can compare the counts in different groups.

3. THE GROUPS MUST NOT OVERLAP so that there is no confusion about which group a measurement belongs to: each measurement should belong to one and *only* one group.

Question 18 Look at the ages of the children in Table 1. Can you suggest five age groups which follow the three rules above?

(Check your answer before continuing.)

Question 19 Which age groups would you use if you wanted each age group to be a 3-month group instead of a 6-month group? (Write down all the age groups you would need to include the full range of measurements.)

(Check your answer.)

Step 2: Making a count

After selecting convenient groups for your frequency distribution, the next step is to count how many children fall into each group. Let us use the 6-month age groups we have already selected and make a count from the table as follows:

We work in an orderly way down the list of children making a mark against the correct age group for each child. The first five children on the list would be counted as follows:

Age group	Count
0– 5 mths	
6–11 mths	IIII
12–17 mths	I
18–23 mths	
24–29 mths	

Children A, B, C, and E all had ages in the 6–11-month group, while child D fell into the 12–17-month group. (As you work down the list, make a small tick beside each measurement as you enter it in the count. If you do this you will not miss out a measurement or enter one measurement twice in the count. Also if someone disturbs you when you are in the middle of making a count you won't forget where you are!)

Let us enter the next five children in the count (children F, G, H, I and J).

Age group	Count
0– 5 mths	‖
6–11 mths	⊬⊬⊬ ‖
12–17 mths	‖
18–23 mths	
24–29 mths	

Notice that child H was counted by making a horizontal mark crossing over the previous four marks in the 6–11-month group. Our count is therefore made in groups of five which makes it easier to add everything up at the end.

Question 20 Now make the complete count on your own using the table below and add up the number of children falling into each age group.

Age group	Count	Number of children
0– 5 mths		
6–11 mths		
12–17 mths		
18–23 mths		
24–29 mths		

(Don't check your answer until you have read the next section!)

Step 3: Adding up and checking the results

You should now add up the numbers in each group to check that the total is the same as the total number of measurements that you started with. In this case, the total should add up to 25 as we started with ages from 25 children. If your total does *not* add up to 25 you should repeat your count. If it does add up to 25 turn to the answers to check that you have made the count correctly.

You have now completed a *frequency distribution* which can be presented in a table with a title which tells you what the measurements are:

Ages of 25 children at an MCH clinic

Age group (months)	Number
0- 5	8
6-11	10
12-17	2
18-23	1
24-29	4
Total	25

Question 21 Using the weights of the children in Table 1 and the weight groupings suggested (2.0-3.9, 4.0-5.9 kg, etc), make a count and a frequency distribution of the weights.

What would be a good title for a table of this frequency distribution?

(Repeat the count and remember to check your total before looking at the answer.)

Here are a few final questions before we finish these sections on the range and frequency distribution.

Question 22 What is the range of a series of measurements?

Question 23 Name three important rules for selecting groups for a frequency distribution:

(1)

(2)

(3)

(Check your answers to these questions.)

Question 24 *Make a frequency distribution from this group of measurements which are the distances in km that a group of patients travel to reach a dispensary (the distances are rounded off to whole numbers, so that 0 km means less than 0.5 km, 1 km means between 0.5 and 1.5 km etc.).*

0	1	0	1	2	1	1	2	0
3	2	0	5	1	0	0	0	1
1	1	1	1	0	1	7	1	2
0	6	9	0	3	1	3	2	1
6	3	1	2	7	1	2	4	2

Total distance	Count	Number of patients
0–1 km		
2–3 km		
4–5 km		
6–7 km		
8–9 km		

(Check your results carefully and make a table of your results. Give a title to your table. Check your answers.)

If you had any problem doing question 24 do questions 25 and 26 to get some more practice *before* you go on to section 3.6.

Question 25 *Suggest suitable groups for the following ages:*

Ages of patients attending a dispensary (in years)

5	27	17	20	52
22	1	23	5	14
25	40	12	41	55
49	2	31	3	50

Question 26 Make a frequency distribution for the following measurements (haemoglobin levels) using the groups indicated.

Haemoglobin levels of 50 patients (given in grammes)

9.2	10.2	8.6	11.3	8.5
6.5	10.9	14.0	14.6	12.4
8.0	7.5	10.5	14.4	8.3
13.1	8.9	9.1	10.0	12.2
8.4	8.2	7.2	15.0	12.6
11.1	8.1	6.8	9.5	10.1
9.4	14.2	8.8	9.6	10.7
12.0	13.3	7.0	14.8	12.8
15.1	6.9	7.3	7.1	10.3
11.5	7.7	13.0	9.3	8.7

Hb group (in g)	Count	Number
6.0- 7.9		
8.0- 9.9		
10.0-11.9		
12.0-13.9		
14.0-15.9		

3.6 Graphs of frequency distributions

You have learned how to make a frequency distribution and how to make a table out of the results. Another way of showing the results which is often clearer than a table is with a graph. For example, here is the table of the ages of the 25 children from Table 1:

Ages of 25 children at an MCH clinic

Age group (months)	Number
0- 5	8
6-11	10
12-17	2
18-23	1
24-29	4

The graph opposite shows how this frequency distribution could be drawn.

Ages of 25 children at an MCH clinic
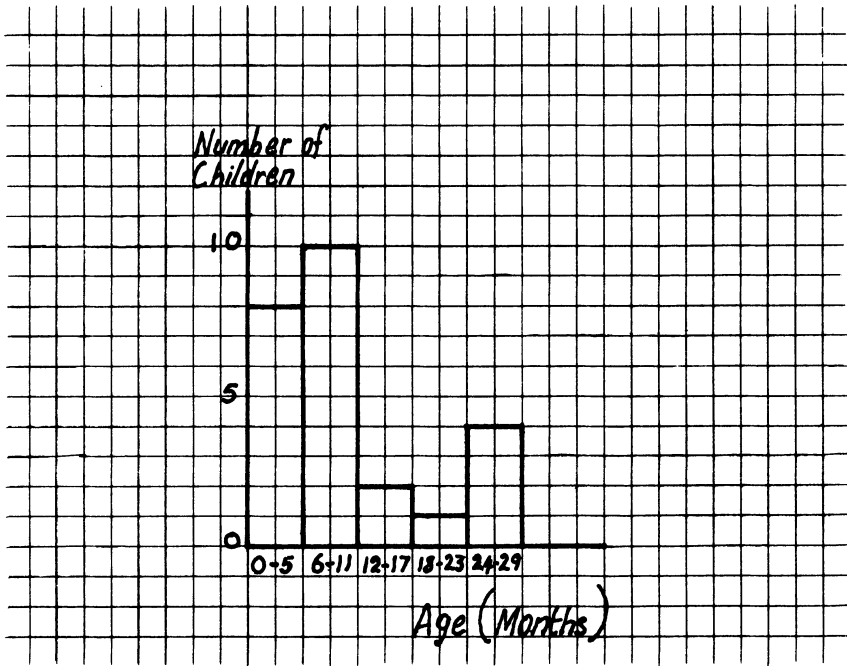
Note the following about this graph, which is known as a HISTOGRAM.

1. The graph is constructed around two lines, or *axes*: a *vertical axis* which corresponds to the *count* or *number* in the table and a *horizontal axis* which corresponds to the groups of measurements (in this case, to the age groups).
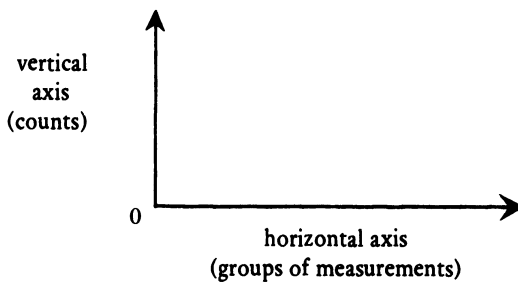
2. The point where the two axes meet has a value of 0 *both* for the count and for the groups of measurements.

3. The age group 0–5 mths *touches* the vertical axis to show that it includes 0.

What does this graph tell you about the measurements? The *shape* of the graph quickly tells you that most of the children are under 12 months old. You can see this more quickly from a graph than from a table.

Question 27 Now try to make a histogram from the following frequency distribution (the axes have been labelled for you already):

Weights of 25 children attending an MCH clinic

Weight (kg)	Number
2.0– 3.9	1
4.0– 5.9	7
6.0– 7.9	7
8.0– 9.9	7
10.0–11.9	3
Total	25
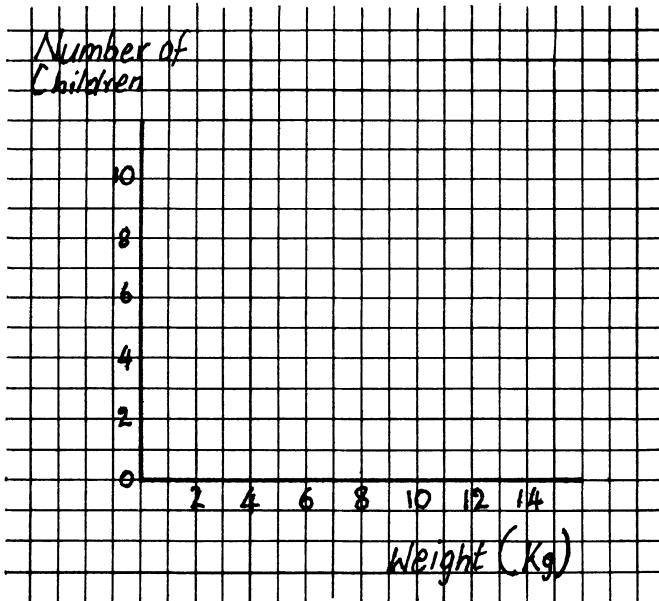
(Check your graph very carefully with the one shown in the answers.)

Question 28 What is the shape of this graph? What does it show you about the children's weights?

(Check your answer before continuing.)

Question 29 Now try to draw a histogram from the following table. This time the axes have not been labelled for you. Make sure you label them carefully.

Ages of 50 women attending antenatal clinic

Ages (years)	Number
15–24	28
25–34	13
25–44	6
45–54	3
	Total 50
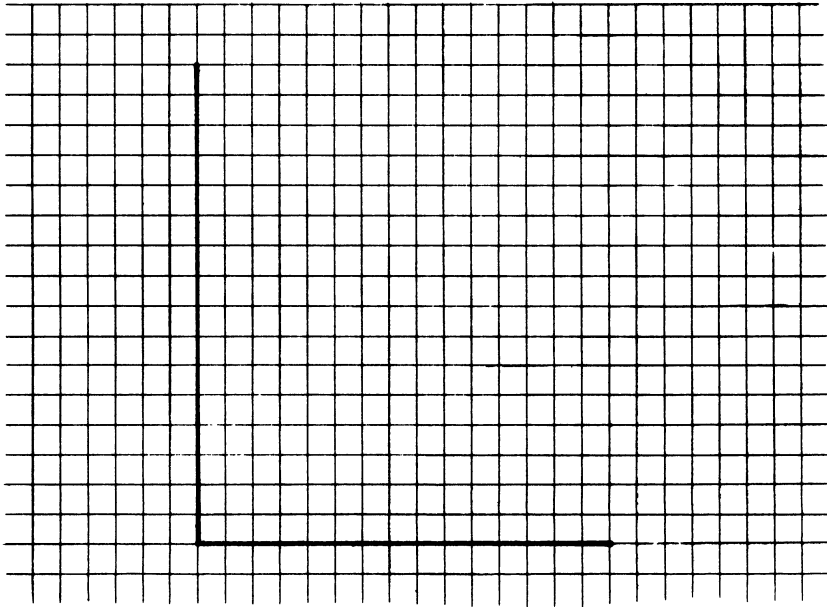
(Check your graph carefully with the one shown in the answers.)

Question 30 What shape is this graph? What does it tell you about the ages of the women?

(Check your answer.)

In drawing this last histogram you may have tried to start the labelling of the horizontal axis at 10 or 15 years because there were no women under 15 years old. If you do this you should show that you have "broken" the scale on the horizontal axis by two lines crossing the axis where it is broken:

The completed graph would look like this:

Ages of 50 women attending antenatal clinic
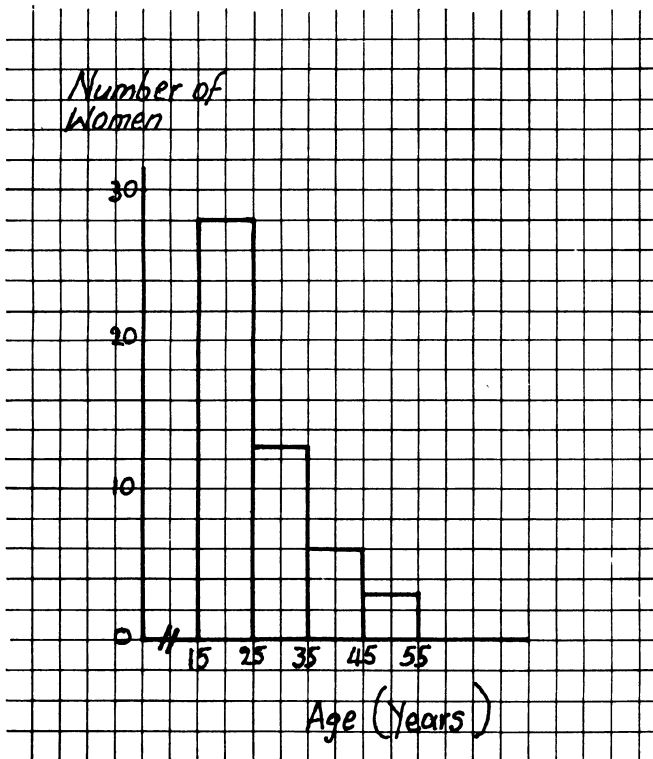
Question 31 Now draw a histogram from the following frequency distribution:

Haemoglobin values of 66 patients with hookworm disease

Hb (g)	Number
4.0– 4.9	5
5.0– 5.9	9
6.0– 6.9	15
7.0– 7.9	11
8.0– 8.9	12
9.0– 9.9	8
10.0–10.9	6
	66
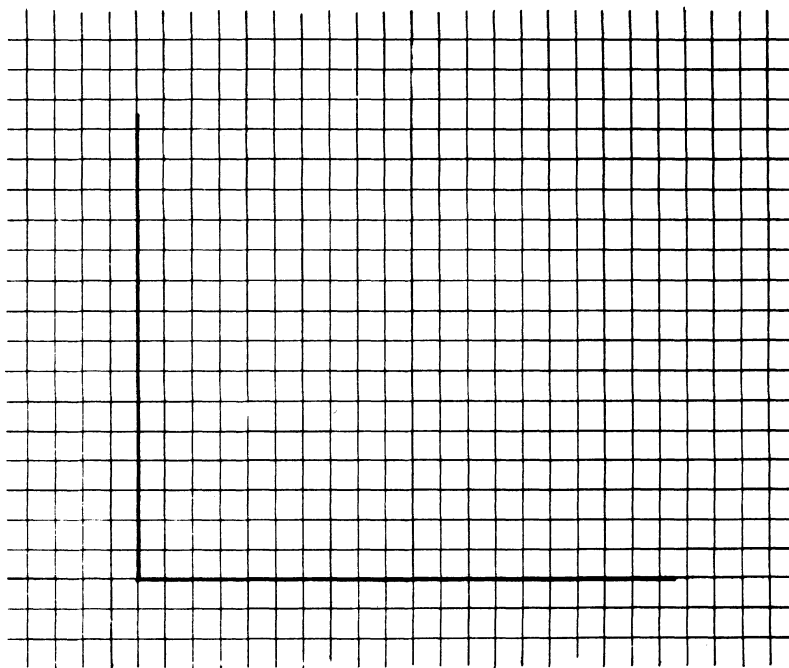
(Check your graph very carefully.)

Question 32 What shape is this graph? What does it tell you about the Hb values?

3.7 Population pyramids

A frequency distribution which is important in planning health services is the age and sex distribution of the population. Special services need to be provided for the under-fives, for school children and for mothers. Older people also have special health problems. We need to know what percentage of the population falls into each of these age and sex groups.

In a population census, the whole population of a country is counted and their age, sex, place of residence and other characteristics important for national planning are recorded. The percentages of people falling into each 5-year group for males and females are calculated and are shown in the graph below which is called a population pyramid.

The population of a country by age and sex

Total males 6,000,000

Total females 6,300,000

males   %   females
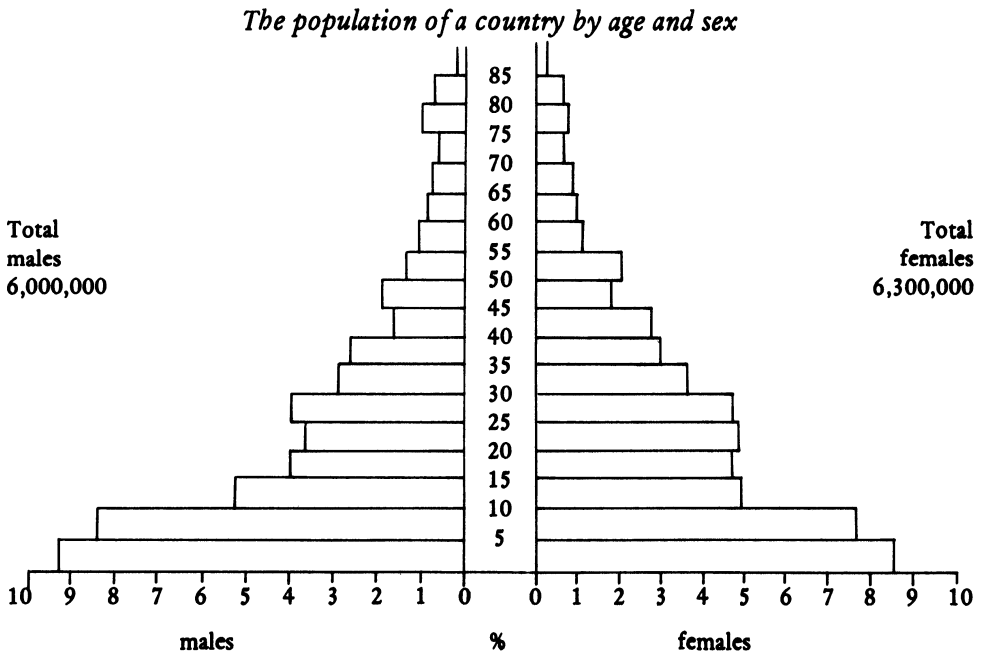
Look first on the left-hand side of the "pyramid" which gives the age distribution for males in 5-year groups. If you can imagine turning this part of the graph on its

side so that the number of people is shown on the vertical axis and age groups on the horizontal axis, the following graph would result:

The male population of a country by age
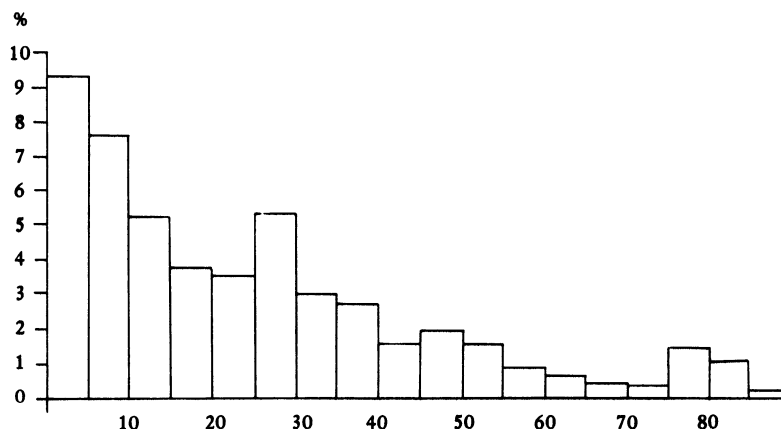
This is the same sort of graph that you learned to draw in this unit. Make sure that you can interpret this graph by answering the following questions about it:

Question 33 (a) *How many males under the age of 5 are there (to the nearest million)?*

(b) *Which group of males is larger: the under 15-year-olds or the 55 years and older group?*

(c) *What is this type of graph called?*

(Check your answers before continuing.)

If you look at the female side of the population pyramid you can see that this is also a histogram of the female age distribution which has been turned on its side and placed the other way around on the paper so that it looks almost like a mirror reflection of the male graph. It is not the same shape as the male graph however. If you look closely you can see places where the two sides differ.

The population pyramid of this country is truly shaped like a pyramid, with a wide base composed of children and young adults and a narrow apex (the top of the

pyramid) of older people. This pyramid shape is typical of the age distribution of many developing countries. This shape is due to high birth rates together with high death rates in every age group.

Question 34   *If none of the children age 0–5 in the population die before they reach the age of 10, what would happen to the lowest 2 bars of the population pyramid (0–4 and 5–9 years)?*

(Check your answer before continuing.)

Question 35   *As a country becomes more developed, birth rates and death rates usually drop. What would happen to the shape of the population pyramid?*

(Check your answer.)

Question 36   *Look at the differences between the two population pyramids in the answer to question 35. How will the health services needed in the developed country differ from the health services needed by the developing country because of these differences?*

(Check your answer.)

    In Unit 5 you will learn more about how the age and sex of the population of a health centre are important to the people working at the health centre.

    You have now finished Unit 3. Look back at the objectives in 3.2. If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

3.8 Answers to practice questions

1. $\dfrac{20}{100}$ x 100 = 20% attended on Monday.

2. 20 - 6 - 4 = 10 patients with other conditions.
    Percentage with other conditions = $\dfrac{10}{20}$ x 100 = 50%.

3. Altogether (5 + 10) = 15 patients are seen at the antenatal clinic. Percentage that is high risk
    = $\dfrac{5}{15}$ x 100 = 33%

4. $\dfrac{30}{120}$ x 100 = 25% have URI.

5. $\dfrac{80}{100}$ x 30 = 24 children

6. $\dfrac{60}{100}$ x 50 = 30 patients

7.
Yes, regularly	3	15%	(Notice that when you calculate the
Yes, but not regularly	4	20%	percentages for all members of a group,
Never used	13	65%	these percentages should add up to 100.)
Total	20	100%	

8. Health centre 'A': $\dfrac{10,000}{40,000}$ x 100 = 25%

    Health centre 'B': $\dfrac{15,000}{60,000}$ x 100 = 25%

    The percentages are the same so services for the under-5s are equally important in the two health centres.

9. $\dfrac{30}{100}$ x 50 = 15 patients

10. 100 - 20 = 80% of births do not take place at the health centre

    $\dfrac{80}{100}$ x 2,500 = 2000 births

11. The highest age (oldest child) is 28 months old (child O).

12. The lowest age (youngest child) is 2 months old (child K and N).

13. The difference between the highest and lowest ages (the range) = 28 - 2 months = 26 months.

14. The range of weights is from 3.6 kg (child J) to 11.4 kg (child Y), a difference of 7.8 kg.

15. By subtracting the lowest from the highest measurement. It tells you how much the measurements are spread out.

16. Range = 12.7 - 9.6 g = 3.1 g

17. Range = 20 - 7 = 13

18. Appropriate age groups would be:
    0- 5 months
    6-11 months
    12-17 months
    18-23 months
    24-29 months

    Note that these age groups follow the three rules that were given: they include the lowest and highest ages; they are equally wide (6-month groups); the boundaries do not overlap.
    (Note that the boundaries could be given to a greater degree of accuracy to eliminate confusion. This could be important if other children's ages were added. Each child should fit into one and only one age group. The group boundaries could then be calculated from the child's birthday: if the child had been born on April 16th and he was seen at the clinic the following October 15th, then he would fall into the 0-5-month group. But if he was seen one day later, on October 16th, he would fall into the 6-11-month group.)
    Note that the following age groups would not be so suitable, although they also follow the rules given:
    0- 4 months
    5- 9 months
    10-14 months
    15-19 months
    20-24 months
    25-29 months

    Can you think why? The reason is that there are twelve months in a year and people usually talk about children's ages in years: 1½ (18 months), 2 (24 months), etc.

19. 3-month age groups would be:
    0- 2 months
    3- 5 months
    6- 8 months
    9-11 months
    12-14 months
    15-17 months
    18-20 months
    21-23 months
    24-26 months
    27-29 months

20.

Age group	Count	Number of children
0- 5 mths	⊦⊦⊦⊦ ⊦⊦⊦	8
6-11 mths	⊦⊦⊦⊦ ⊦⊦⊦⊦	10
12-17 mths	⊦⊦	2
18-23 mths	⊦	1
24-29 mths	⊦⊦⊦⊦	4

If you made any mistakes in this table, go back and repeat the count again. It is important to be able to do this accurately.

21.

Weight (kg)	Count	Frequency distribution
2.0- 3.9	⊦	1
4.0- 5.9	⊦⊦⊦⊦ ⊦⊦	7
6.0- 7.9	⊦⊦⊦⊦ ⊦⊦	7
8.0- 9.9	⊦⊦⊦⊦ ⊦⊦	7
10.0-11.9	⊦⊦⊦	3
	Total	25

A title for this table would be "Weights of 25 children at an MCH clinic". To be more specific you could include their ages, "Weights of 25 children, aged 2–28 months, at an MCH clinic".

22. The *range* of a series of measurements is the difference between the highest and the lowest of the measurements.

23. Three rules for selecting groups for a frequency distribution are:
(1) The groups must include the whole range of measurements.
(2) The groups should be equally wide.
(3) The group boundaries should not overlap.

24.

Distance	Count	Number of patients
0-1 km	⊦⊦⊦⊦ ⊦⊦⊦⊦ ⊦⊦⊦⊦ ⊦⊦⊦⊦ ⊦⊦⊦⊦ ⊦	26
2-3 km	⊦⊦⊦⊦ ⊦⊦⊦⊦ ⊦⊦	12
4-5 km	⊦⊦	2
6-7 km	⊦⊦⊦⊦	4
8-9 km	⊦	1
	Total	45

25. Groups could be (in years)

1- 4	Or	1- 9
5-14		10-19
15-24		20-29
25-34		30-39
35-44		40-49
45-54		50-59
55-64		

The first grouping would be more useful because as health workers we are particularly interested in young children (under 5s), school-age children (age 5–14) and adults, even though it breaks rule 2 above. If, on occasion, we do particularly want to use groups of different sizes, we must be very careful how we handle them.

26.

Group (in g)	Count	Number
6.0– 7.9	~~HHH~~ IIII	9
8.0– 9.9	~~HHH~~ ~~HHH~~ ~~HHH~~ I	16
10.0–11.9	~~HHH~~ ~~HHH~~	10
12.0–13.9	~~HHH~~ III	8
14.0–15.9	~~HHH~~ II	7
		50

27. Check your graph carefully against the graph below:

Weights of 25 children attending an MCH clinic
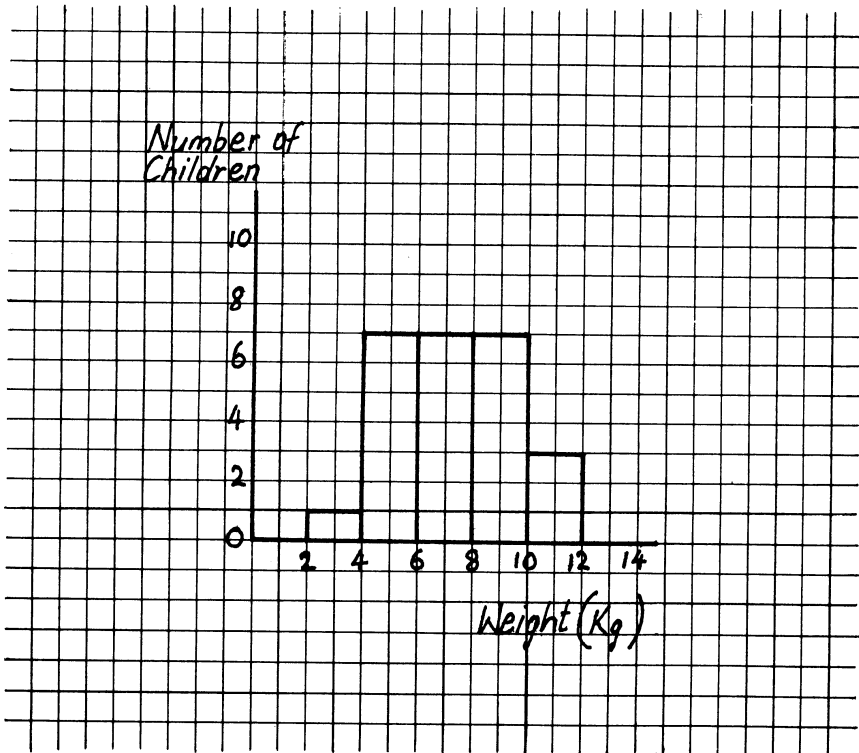
28. This graph is shaped like a hill ⌢ It shows you that most of the weights are in the middle (4–10 kg) with a few weights less and a few more than this.

29. Check your graph carefully against the graph below:

Ages of 50 women attending antenatal clinic
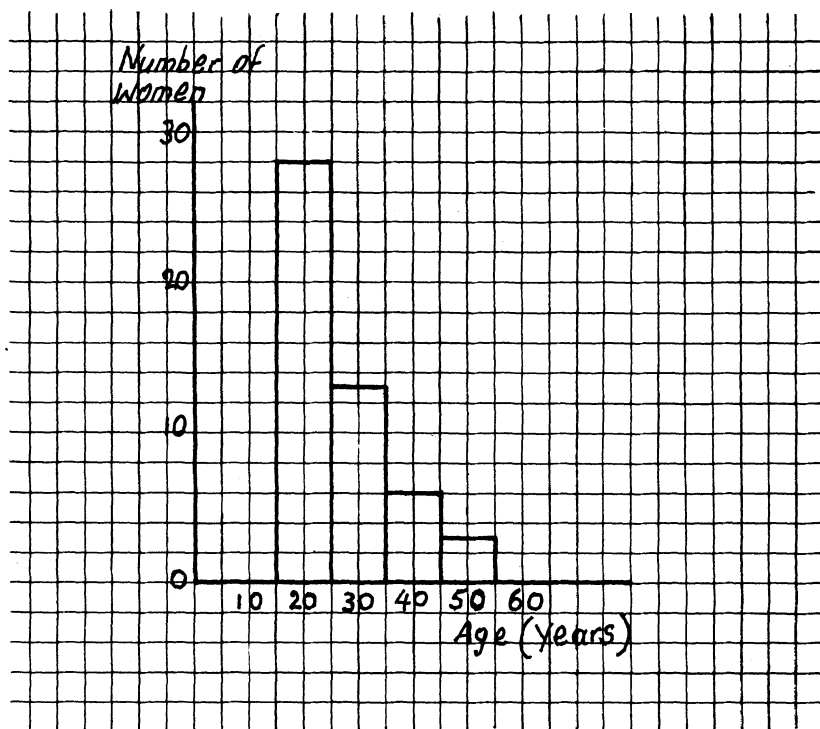
Check each of the following parts of your graph:

(a) Is the vertical axis labelled in a similar way?

(b) Is the horizontal axis labelled in a similar way?

(c) Did you leave a space between 0 and 15 years on the horizontal axis as shown above? Remember that the horizontal axis begins at zero.

30. This graph is shaped like half of a hill: none of the women are under 15 and at older ages there are fewer women.

31. Check your graph carefully against the graph below:

Hb values of 66 patients with hookworm disease
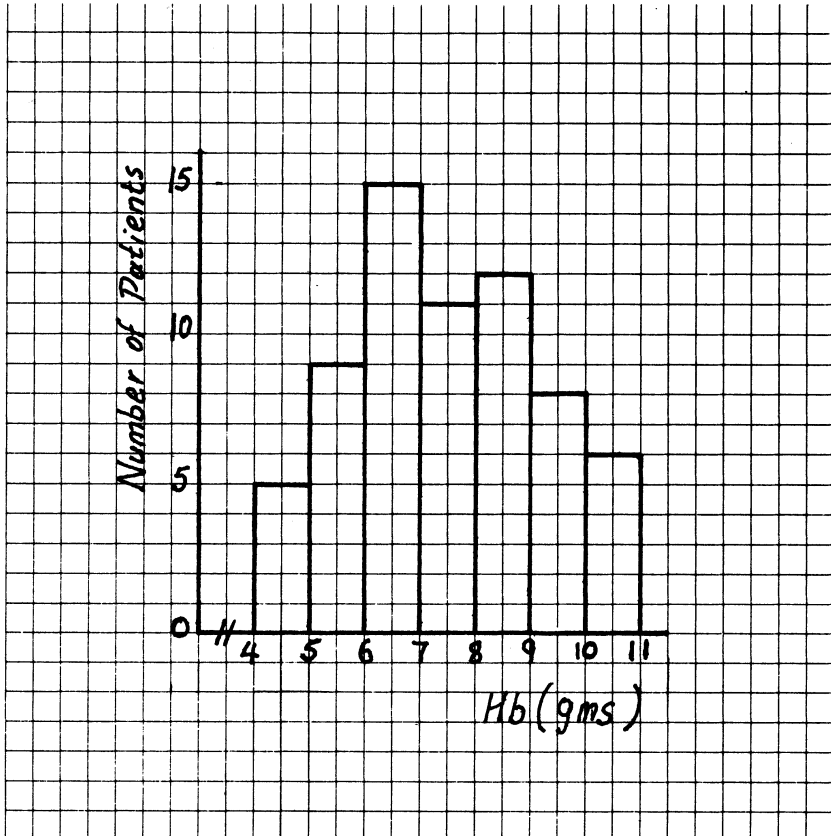
Did you include the following in your graph?
(a) Title.
(b) Labelling of horizontal axis.
(c) Labelling of vertical axis.
(d) Lines showing where you broke the scale.

32. This graph is shaped like a hill, like the children's ages in question 19. The top of the hill is between 6 and 9 g. Most of the Hb values fall into the middle groups.

33. (a) Roughly, 9% of 12,300,000 which is 1,107,000.
    (b) The under 15s are a larger group than the 55s and over.
    (c) A histogram.

34. The two bars would be the same size. On the real population pyramid the 5–9-year-old bar is shorter than the 0–4-year-old bar because a large percentage of children die before they reach the age of 10.

35. The population pyramid would be less pyramidal and more rectangular in shape (see below):
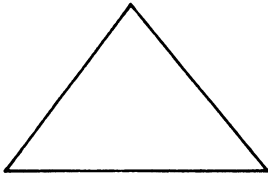
Population of developing country   *Population of developed country*
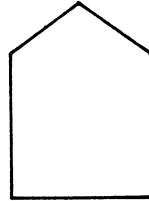
36. The population of the developing country has high birth rates and death rates and a larger percentage of the population is young. Health services must emphasize maternal and child health.

     The population of the developed country has low birth and death rates and a large percentage of the population is old. Health services must emphasize management of chronic diseases of older people (heart disease, stroke, cancer, etc.).

Table 1 Weights and ages of 25 children seen at an MCH clinic

Child No.	Age (mths)	Weight (kg)
A	9	7.9
B	8	7.5
C	8	6.4
D	12	7.6
E	8	6.6
F	4	8.3
G	14	8.2
H	7	6.2
I	10	5.4
J	3	3.6
K	2	4.2
L	9	7.7
M	3	4.1
N	2	4.4
O	28	9.7
P	3	5.0
Q	24	8.2
R	4	10.8
S	7	5.8
T	9	9.0
U	21	10.5
V	5	4.2
W	24	8.9
X	7	8.8
Y	24	11.4

Unit four

MORE USES OF NUMBERS AND GRAPHS

4.1 Introduction

In the last unit you learned some useful ways of using the kinds of numbers you will come across during your work. You also learned how to organize these numbers into tables and graphs for including in reports.

In this unit you will continue to work with the problem of detecting malnutrition in MCH clinics and will learn ways to present the results of the clinics.

Make sure you have a sharp pencil, an eraser and a ruler with you before starting this unit.

4.2 Objectives

After completing this unit you will be able to:

1. Define and calculate the following:
    (a) average (mean)
    (b) percentage of standard weight for age.
2. Plot weight for age measurements onto a Growth Chart and interpret the

graph.

3. Plot and interpret line graphs for information collected over a period of time.

4.3 Measurements in MCH clinics

Look at the weights and ages of the 25 children in the fold-out Table 1 in Unit 3. These children were seen at a mobile MCH clinic held in a certain village.

Question 1   The purpose of weighing children at MCH clinics is (tick one):

        A.   Primary prevention of malnutrition.

        B.   Secondary prevention of malnutrition.

        C.   Tertiary prevention of malnutrition.

        D.   All of the above.

        E.   None of the above.

(Check your answer.)

In order to prevent malnutrition, you must be able to identify those children who have early malnutrition and whose weights are falling below normal values. It is important for you to know whether the percentage of children with early malnutrition in this particular village is more or less than the percentage in other villages or rural areas that are served by your health centre.

Question 2   Why is this important to know?

(Check your answer.)

You need to understand two ways of working with the ages and weights of the children so that you can identify those children who have early malnutrition: the average (or mean) and the percentage, of standard weight for age.

4.4 The average (mean)

The first child in Table 1 weighs 7.9 kg. Is this a normal weight for a child of 9 months? To answer this you need to know the *average* weight of normal, healthy children aged 9 months. Let us start by calculating the average weight of all the children in Table 1 who are 9 months old. Their weights are as follows:

Child	Age (mths)	Weight (kg)
A	9	7.9
L	9	7.7
T	9	9.0

We calculate the average by adding up the three weights and dividing by three:

$$\text{Average} = \frac{7.9 + 7.7 + 9.0}{3} \text{ kg}$$

$$= \frac{24.6}{3} \text{ kg}$$

$$= \underline{\underline{8.2 \text{ kg}}}$$

Question 3   Now calculate the average weight of all the children in Table 1 who are 8 months of age (round your answer to 1 decimal place for this and all other questions in this unit).

(Check your answer.)

In both these examples the average weight lay somewhere between the highest and the lowest weight.

> **THE AVERAGE (MEAN) OF A GROUP OF**
> **MEASUREMENTS IS THE SUM OF**
> **THOSE MEASUREMENTS DIVIDED BY**
> **THE NUMBER OF MEASUREMENTS**

For example, the average of the ages of 6 children can be calculated as follows:

Ages: 3, 4, 4, 5, 6, 8 years

Number of children (N) = 6

Sum of ages = 3 + 4 + 4 + 5 + 6 + 8 = 30

Average = $\dfrac{\text{sum}}{\text{N}}$ = $\dfrac{30}{6}$ = 5 years

The average age of the children is 5 years, which is near the middle of the ages. The average of a group of measurements is *usually* somewhere near the middle. If you calculate an average which is not near the middle of the measurements, it is a good idea to repeat the calculation.

The average is a useful measure as it allows us to compare different groups of measurements using only one number for each group. You found that the average weight for children in Table 1 aged 9 months was 8.2 kg, while the average for children aged 8 months was 6.8 kg. You have *summarized* the weights of each age group using two weights instead of six.

If you found that the average age of children attending one MCH clinic was 10.5 months while the average age of children attending a second MCH clinic was 15.6 months, you could conclude that mothers attending this second clinic tended to bring somewhat older children.

Warning: If you are given an average you should always ask: How many measurements were used to calculate it?

> **AN AVERAGE WHICH USES A LARGE
> NUMBER OF MEASUREMENTS IS MORE
> RELIABLE THAN ONE WHICH USES A
> SMALL NUMBER OF MEASUREMENTS**

For example, if 50 children had attended the first MCH clinic, but only 2 had attended the second clinic you would not want to draw the same conclusion.

Question 4   *Calculate the average age of the following children:*

9, 8, 7, 12, 9 months

Question 5   *Calculate the average weight of the following children:*

7.9, 7.6, 6.4 kg

(Repeat your calculations, then check your answers.)

4.5   Standard weight for age

In Section 4.4 you calculated the average weights at 8 and 9 months of the children in Table 1. But you learned that averages which use a small number of measurements are not reliable and each of these averages used only three weights. For reliable figures you need the average weight at each age calculated from large numbers of normal, well-nourished children.

This is not easy information because children seem to grow at different rates in different countries, and a child who is considered *normal* in one country might be considered *underweight* in another country. The average weights at different ages of large numbers of North American children who were carefully studied are widely used as standards for judging children's weights. The weights of these children are known as the *Harvard Standards*. Although these weights may not be normal for children in other countries, they may be used until these countries develop their own standards.

The standard weight of a child of 9 months from the Harvard Standards is 8.9 kg.

Question 6   What is the difference between the Harvard Standard at 9 months and the average weight at 9 months in Table 1? (Calculated in section 4.4.)

(Check your answer.)

Calculating the *difference* (by subtraction) between the weight of a child and the standard weight for that age is not the best way to use the standard. For example, child A weighs 7.9 kg which is 1 kg less than the standard at 9 months. A 1 kg difference from the standard is much more important at 9 months than, say, at 5 years of age where the standard weight is 18.4 kg.

A *better* way to compare children's weights with the standard is to calculate the *percentage* of the standard weight. For example: the standard weight at birth is 3.4 kg.

$$80\% \text{ of the standard is } \frac{80}{100} \times 3.4 \text{ kg } = 2.7 \text{ kg}$$

$$60\% \text{ of the standard is } \frac{60}{100} \times 3.4 \text{ kg } = 2.0 \text{ kg}$$

(Check these two calculations yourself to be sure you understand them.) Thus, a birth weight over 2.7 kg is over 80% of the standard. A birth weight between 2.0

and 2.7 kg is 60–80% of the standard. A birth weight less than 2.0 kg is less than 60% of the standard.

The 60% and 80% of the standard weights are frequently used to group children into three categories:

Category	*Percentage of standard weight for age*
Normal, healthy	over 80%
Mildly malnourished	60–80%
Severely malnourished	under 60%

Question 7   *The standard weight at 1 month is 4.2 kg.*

   (a) What is 80% of the standard?

   (b) What is 60% of the standard?

(Check your answers before continuing.)

Question 8   *On the following page you will find a table showing 80% and 60% of standard weight for age from birth to 30 months calculated in the same way as shown above. On the page following that you will find the ages and weights of the 25 children from Table 1. For each child decide which of the three categories he belongs to, based on his weight for age. To help you, the results for the first three children have been filled in.*

(Check your answers for children D, E, and F before proceeding with the rest of the children.)

Table 2 Table of 80% and 60% of standard weight for age (based on Harvard Standards)

Age (months)	Weight (kg) 80% standard	Weight (kg) 60% standard		Age (months)	Weight (kg) 80% standard	Weight (kg) 60% standard
0	2.7	2.0				
1	3.4	2.5		16	8.7	6.6
2	4.0	2.9		17	8.9	6.7
3	4.5	3.4		18	9.0	6.8
4	5.0	3.8		19	9.2	7.0
5	5.5	4.2		20	9.4	7.1
6	5.9	4.5		21	9.6	7.2
7	6.3	4.9		22	9.7	7.3
8	6.7	5.1		23	9.8	7.4
9	7.1	5.3		24	9.9	7.5
10	7.4	5.5		25	10.1	7.6
11	7.7	5.8		26	10.3	7.7
12	7.9	6.0		27	10.5	7.8
13	8.1	6.2		28	10.6	7.9
14	8.3	6.3		29	10.7	8.0
15	8.5	6.4		30	10.8	8.1

Weights and ages of 25 children seen at an MCH clinic

Child No.	Age (mths)	Weight (kg)	Percentage of standard weight for age		
			more than 80%	60–80%	less than 60%
A	9	7.9	X		
B	8	7.5	X		
C	8	6.4		X	
D	12	7.6			
E	8	6.6			
F	4	8.3			
G	14	8.2			
H	7	6.2			
I	10	5.4			
J	3	3.6			
K	2	4.2			
L	9	7.7			
M	3	4.1			
N	2	4.4			
O	28	9.7			
P	3	5.0			
Q	24	8.2			
R	4	10.8			
S	7	5.8			
T	9	9.0			
U	21	10.5			
V	5	4.2			
W	24	8.9			
X	7	8.8			
Y	24	11.4			

Now let us try to analyse these results a little further:

Question 9   *Add up the totals in each of the three percentage of standard weight for age categories, and write them in the table below:*

Percentage of standard weight for age	Count	Number
More than 80%		
60–80%		
Less than 60%		
Total		

Question 10 What percentage of the children fall into the severely malnourished category (less than 60% of the standard)?

Question 11 What percentage of the children fall into the mildly malnourished category (60–80% of the standard)?

(Repeat the calculations and check your answers.)

This is a useful way of analysing the information we started with on weights and ages. We can now compare the percentages of severely malnourished and of mildly malnourished children attending this clinic with similar percentages in other clinics, to find out where malnutrition is the biggest problem.

Question 12 Fill in the blanks in the table below:

Category	Percentage of standard weight for age
Normal, healthy	
Mildly malnourished	
Severely malnourished	

(Check your answers to question 12 before continuing.)

4.6 Growth Charts

The Growth Chart is used in many MCH clinics to graph the changes in a child's weight in the first 5 years. It can also be used to graph the weights of a group of children attending a clinic.

Look at a Growth Chart over the page. Notice that it is a graph with a vertical axis and a horizontal axis.

Question 13 (a) What is the vertical axis?

(b) What is the horizontal axis?

(Check your answers before proceeding.)

Now look at the graph itself and you will see three lines drawn on it. The top and middle lines are boundaries of an area shaded [   ] (sometimes green). The middle and lower lines are boundaries of an area shaded [▨▨▨] (sometimes grey). Below the lower line is shaded [▨▨▨] (sometimes red).*

Question 14 Using your knowledge of percent of standard weight for age, from the previous section, complete the following sentences:

The top line represents...

The middle line represents...

The bottom line represents...

(Check your answers before continuing.)

Using the definition of normal, mildly malnourished and severely malnourished from the last section:

—children whose weights fall in the area shaded [   ] or above it can be called normal

—children whose weights fall in the area shaded [▨▨▨] can be called mild mildly malnourished

—children whose weights fall in the area shaded [▨▨▨] can be called severely malnourished.

Note: There are several variations of the Growth Chart. Some charts have colours instead of shading; others only have lines—sometimes 2,3, or 5. In all cases the lines indicate percent of standard adapted to local conditions.

Question 15 *Plot the weights of the first ten children in Table 1 (child A to child J) on the Growth Chart. Use a* pencil *and make an X at the correct place. After you have plotted the first two or three check with an instructor to make sure you are plotting correctly. If not, erase the Xs and start again.*
    When you have finished, add up the Xs to see:

(a) *How many of the children have weights over 80% of the standard?*

(b) *How many of the children have weights between 60% and 80% of the standard?*

(c) *How many of the children have weights less than 60% of the standard?*

(Check your answers before continuing.)

Question 16 *Now continue to plot the weights of the remaining children in Table 1 on your Growth Chart. Make sure you have plotted 25 points altogether. Add up your results and enter them in the table below:*

Percentage of standard weight for age	Number of children
More than 80%	
60–80%	
Less than 60%	
Total	*25*

(Check your answers.)

    Compare these results with those you obtained in question 9. Instead of using a table to assign each child to a category of percentage weight for age, you have done the same thing using a graphical method. This is a quick and useful way to show the results of a nutrition survey, or to illustrate the work of an under-5s clinic, by plotting the weights of the children seen from a certain village.

    The other and more customary use of the Growth Chart is to plot a child's weight gain as he grows older. By connecting the points on such a graph, you have a *line graph* of that child's weight gain over time.

GROWTH CHART

(This graph is a simplification of the chart in current use in one country omitting, for clarity, the printed sections for information relating to identity, immunizations, family planning advice, etc.)
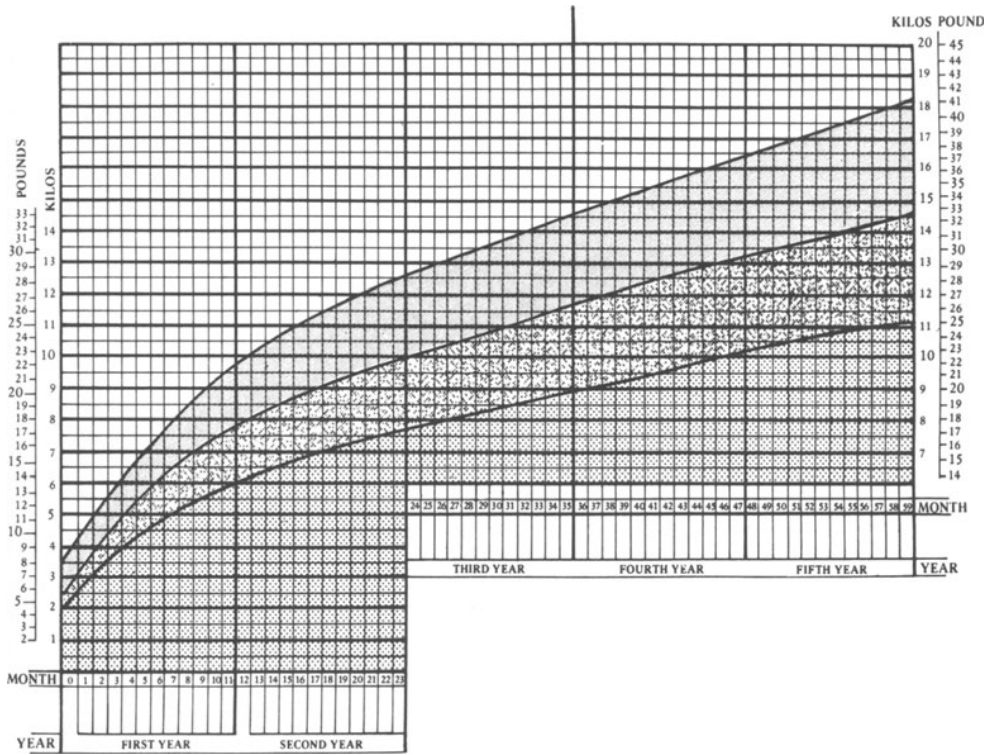
Question 17 *Complete the following sentences, referring to the three lines on the Growth Chart.*

(a) *The line graph for a healthy child always*..

....

(b) *The line graph for a child who has become mildly malnourished*...........................

....

(c) *The line graph for a child who has become severely malnourished*........................

....

(Check your answers.)

By using the Growth Chart you can detect a child who fails to gain weight over a period of several months, or who is actually losing weight. You must be able to recognize both these situations and take prompt action when you recognize them.

4.7 Other line graphs

Other types of line graphs are used to look at changes that take place over time. For example, you might want to make a graph which shows the number of patients attending a dispensary each week over a period of several months. This will show you whether more people use the dispensary at certain times of year. You collect the following information:

Week	Number of attendances
1	252
2	210
3	185
4	150
5	163
6	155
7	195
8	225

Question 18 *Plot this information on the graph paper opposite making an X for each point. When you have finished, check each point carefully, then join the points* using a ruler *to draw a straight line between each pair of points.*
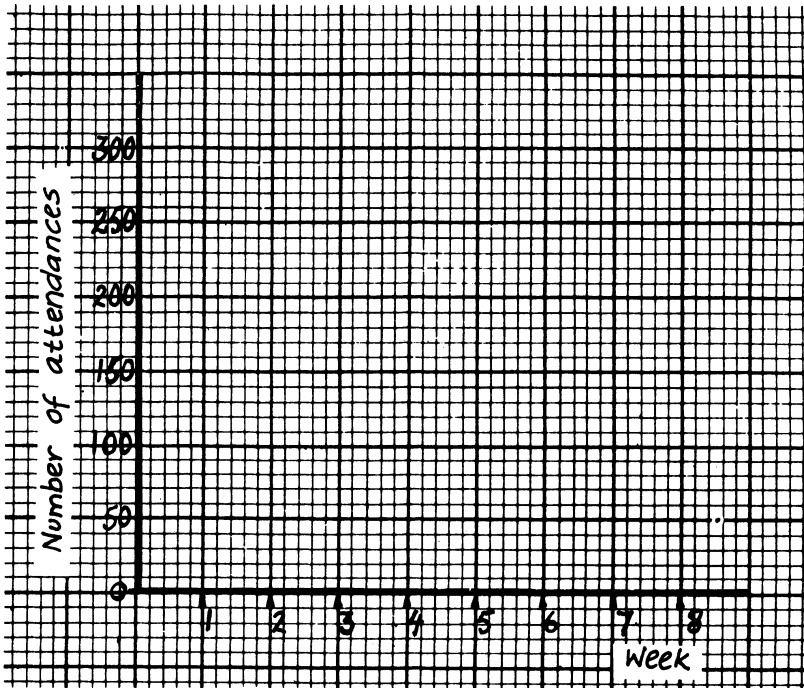
Question 19 What shape is the graph you have drawn? Why do you think it might be this shape?

(Check your answer before continuing.)

Drawing a line graph like this can help you study changes over time. You could also draw a line graph to show you how many people with certain diseases, say measles, attend the dispensary each day or week so that you can find out when epidemics of measles occur. You will learn more about this in Unit 10.

Question 20 *Here are numbers of patients attending a dispensary in a certain country each month with fever:*

	Number of patients
January	82
February	116
March	150
April	138
May	120
June	85
July	90
August	81
September	91
October	126
November	124
December	111

Draw a line graph for this information. Label the axes carefully and give the graph a title.
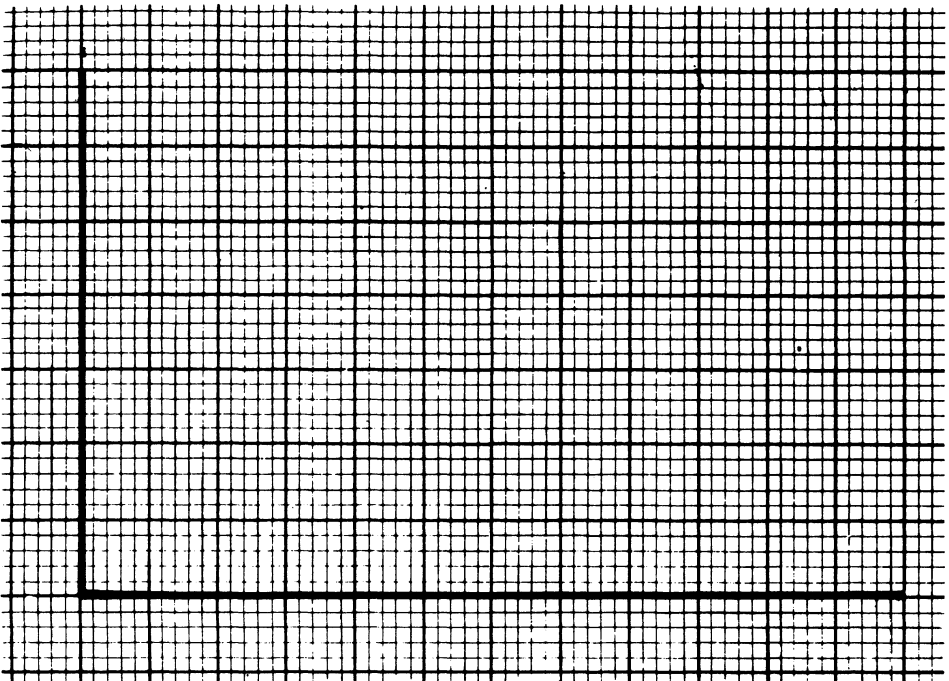
Question 21   What shape is the graph? Can you think of any reason why it might be shaped like
this?

(Check your answer.)

You have now completed Unit 4. Look back at objectives in 4.2. If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

4.8 Answers to practice questions

1. B (early detection of malnutrition).

2. So that you can decide which village or area you will need to concentrate on with nutrition education programmes.

3. Children 8 months of age: B (7.5 kg)

   C (6.4 kg)

   E (6.6 kg)

   Average weight $= \dfrac{7.5 + 6.4 + 6.6}{3} = \dfrac{20.5}{3}$

   $= 6.83$ kg

   $= 6.8$ kg   (rounded to 1 decimal place)

4. Average age $= \dfrac{9 + 8 + 7 + 12 + 9}{5}$ months $= \dfrac{45}{5} = 9$ months

5. Average weight $= \dfrac{7.9 + 7.6 + 6.4}{3}$ kg $= \dfrac{21.9}{3}$ kg $= 7.3$ kg

6. The Harvard Standard (8.9 kg) is higher than the average weight at 9 months (8.2 kg) in Table 1. It is 0.7 kg higher.

7. (a) 80% of standard $= \dfrac{80}{100}$ x 4.2 $= 3.36$ kg $= 3.4$ kg (rounded to 1 decimal place)

   (b) 60% of standard $= \dfrac{60}{100}$ x 4.2 $= 2.52$ kg $= 2.5$ kg (rounded to 1 decimal place)

8. The following children had weights which were greater than 80% of the standard:

   A, B, F, K, L, N, P, R, T, U, X, Y

   The following children had weights which were between 60% and 80% of the standard:

   C, D, E, G, H, J, M, O, Q, S, V, W

   (Child V falls into this group as his weight of 4.2 kg falls exactly on the 60% of standard.) Only one child (I) had a weight which was less than 60% of the standard.
   Check your answers carefully against the results above.

9.

Percentage of standard weight for age	Count	Number
More than 80%	̶H̶H̶ ̶H̶H̶ II	12
60-80%	H̶H̶ H̶H̶ II	12
Less than 60%	I	1
Total		25

10. Percentage of severely malnourished children = $\dfrac{1}{25} \times 100 = 4\%$

11. Percentage of mildly malnourished children = $\dfrac{12}{25} \times 100 = 48\%$

12.

Category	Percentage of standard weight for age
Normal, healthy	more than 80%
Mildly malnourished	60-80%
Severely malnourished	less than 60%

13. (a) The vertical axis is weight in kilos and in pounds.

(b) The horizontal axis is the child's age, from birth to 5 years, in months.

14. The top line represents the standard weight for age; the middle line represents 80% of the standard weight; the bottom line represents 60% of the standard weight.

15. (a) 3 children (A, B, F).

(b) 6 children (C, D, E, G, H, J).

(c) 1 child (I).

16.

Percentage of standard weight for age	Number of children
More than 80%	12
60-80%	12
Less than 60%	1
Total	25

17. (a) stays above the middle line (in the area shaded [   ] or above).

 (b) stays between the middle and lower lines (in the area shaded [   ]).

 (c) falls below the lower line (in the area shaded [   ]).

18. Check your graph carefully against the graph below:
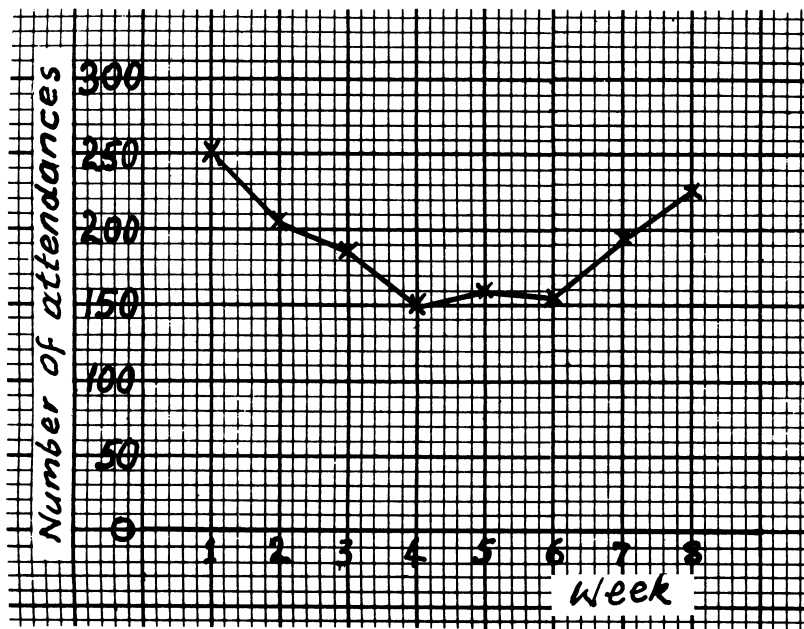
19. The graph is shaped like a U or a valley. The number of attendances drops down to a low level between weeks 4 and 6 and then starts to rise again. The reason for this might be harvest time between weeks 4 and 6, or perhaps heavy rains and flooding which prevented some people from coming to the dispensary.

20. Check your graph carefully, including labels and title, against the graph opposite.

Dispensary attendances for fever
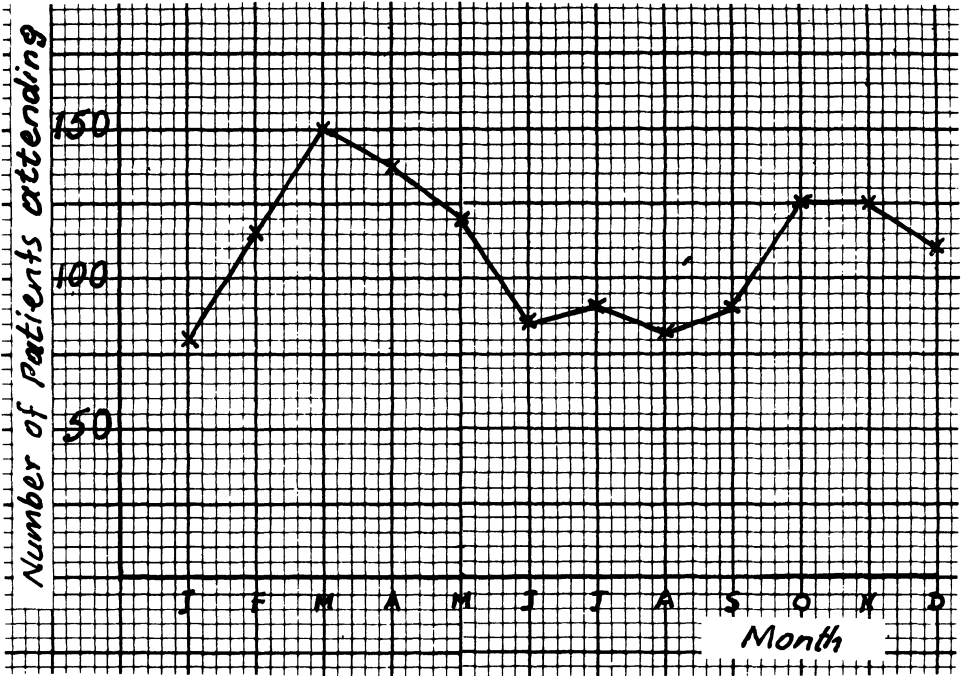
21. The graph has 2 peaks: in March and again in October and November. As malaria may be a frequent cause of fever, these peaks may be caused by increased breeding grounds for Anopheles during the rainy seasons (which occur in the country where this information was collected).

Unit five

HEALTH CENTRES AND THEIR POPULATIONS

5.1 Introduction

When you work in a health centre, the methods of primary, secondary and tertiary prevention which you use will be more effective if you know something about the people you are serving and whether they are users or non-users of health services. In this unit you will learn some ways of measuring users and non-users of health services so that the people who *need* health services will receive them.

5.2 Objectives

After completing this unit you will be able to:

1. Define and calculate the following:
   (a) catchment population of a health centre
   (b) birth rate
   (c) percentage age-sex structure
   (d) death rate
   (e) rate of natural increase
   (f) use (or utilization) rate of health services.

2. Calculate the following for the catchment population of a health centre, if given the percentage age-sex structure, the birth and death rates:
   (a) number of individuals in various age and sex groups
   (b) number of births occurring per unit time
   (c) number of deaths occurring per unit time.

5.3 Catchment population

The "catchment population" of a health facility (hospital, health centre or dispensary) is the population living around a health facility who are supposed to use that facility rather than another one when they need health services.

> **CATCHMENT POPULATION OF A HEALTH FACILITY =**
> **THE POPULATION WHICH THAT FACILITY**
> **IS SUPPOSED TO SERVE**

Question 1   Why is it important to know something about your health centre catchment population?

(Check your answer before continuing.)

   What do you need to know about your catchment population?

1. How big is the population?
2. Where does the population live?
3. What type of health services do they need?
4. What health services are they using?

   In this unit you will learn how to answer these questions. As you work through the unit, try to answer these same questions about the catchment population of *your* health centre.

   In some countries, the goal is to provide one health centre for every 50,000 people. In other words, the catchment population of each health centre will be 50,000 people (on average).

   In order to describe the catchment population of a health centre, we need to understand some of the reasons a patient chooses to go to one health centre rather than to another. One reason is which of the two health centres is closer to the

patient. But sometimes we find that a patient will choose to go to a health centre which is further from his home.

Question 2   *Try to think of two reasons why a patient might choose to go to health centre A further from his home rather than to health centre B which is closer.*

(a)

(b)

(Check your answers.)

   People often do not visit health centres or dispensaries when they are sick, perhaps because they cannot take time off work or because they are consulting with traditional healers. One of the important reasons is walking distance from the nearest health centre or dispensary. Studies have shown that people are usually un-willing to walk more than 5 km and very unwilling to walk more than 10 km to a health facility.

   If we make a map of a health centre and draw a circle around it of radius 10 km then the people living inside the circle would have to travel less than 10 km to reach the health centre.
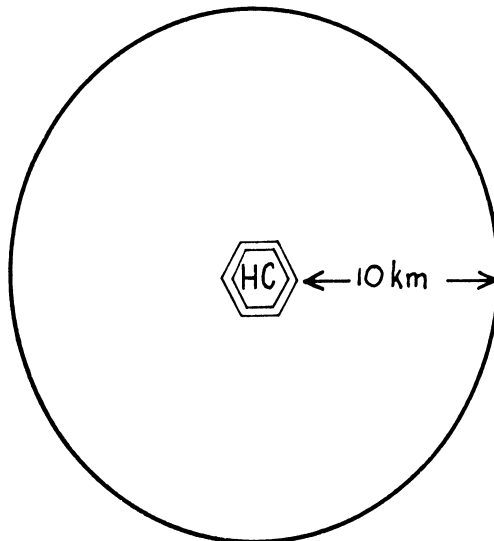
(HC = health centre)

If we count all the people who live inside the circle, this would be a *rough* way of counting the catchment population living within 10 km. If we draw a map of the whole country with all the health centres and other health facilities shown on it with circles of 10 km radius around them, and then estimate the numbers of people living *inside* the circles and the number living *outside* the circles, then we have a good idea of what percentage of the total population can fairly easily get to any health facility.

Question 3   *In a certain country, about 20% of the population lives more than 10 km from any health facility. What percentage of the population lives within 10 km of any health facility?*

Question 4   *Why is 10 km a useful distance to use here?*

(Check your answers before continuing.)

The catchment population is not usually found in a neat circle around a health centre. Natural or man-made features of the countryside can influence the size and shape of the catchment population. For example:

1. Mountains, rivers, and other natural barriers make it *harder* for people living on the far side of the barrier to reach the health centre.

2. Roads, railways, and other paths of communication make it *easier* for people living close to the road or railway track to reach the health centre, even though they may live more than 10 km away.

Look at the map below of the area surrounding a health centre:
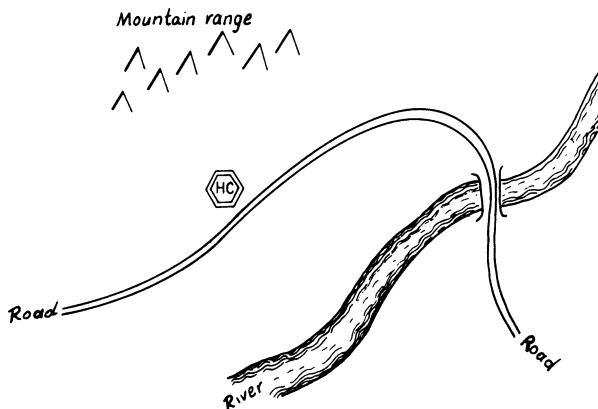
The catchment population of this health centre might look something like this:

Mountain range

Boundary of Catchment population

Road

River

Road
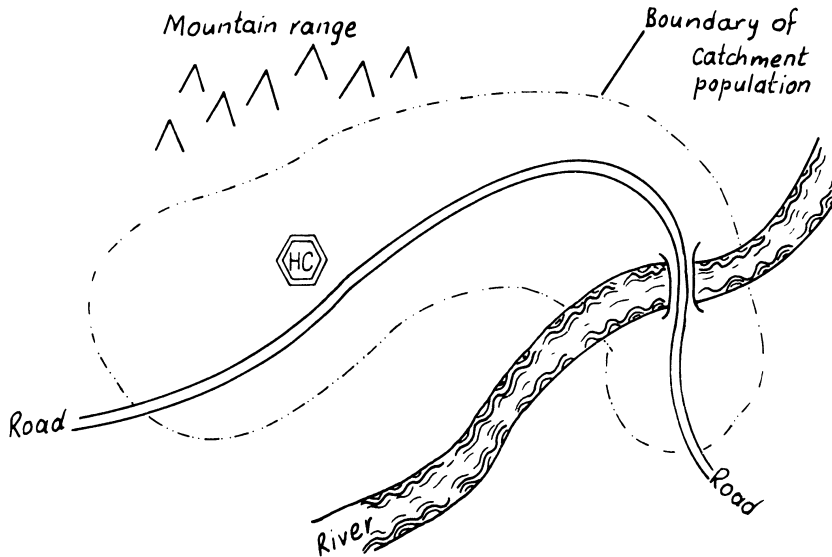
Question 5   What do we mean by the "catchment population" of a health centre?

(Check your answer before continuing.)

Suggested exercise: Make a map of your health centre with its satellite dispensaries and the area surrounding it. Show the villages, rivers, roads and other important features. Find out how long it takes people from various villages to get to the health centre and sketch in a line to include the population who lives within 10 km or 2 hours' travelling time from any health facility. What percentage of the population lives outside this line?

5.4 Needs for health services

What health services does the catchment population need? One simple way to answer this question is to find out what special age groups need certain special services. The two most important groups are probably children under 5 years old and women in the childbearing years (roughly, 15–44 years old).

Mothers and children are two important groups in the community who need health services

Question 6   What special services do these two groups need?

(Check your answer before continuing.)

Question 7   Are the services you described in Question 6 methods of primary, secondary or tertiary prevention?

(Check your answers.)

Table 1 shows the population of a health centre broken down into these age and sex groups:

Table 1 The catchment population of a health centre by age and sex

Age (years)	Males	Females	Total
0–4	4,200	4,600	8,800
5–14	6,200	6,600	12,800
15–44	10,600	10,700	21,300
45 and over	3,300	3,800	7,100
Total	24,300	25,700	50,000

Study Table 1 carefully and answer the following questions:

Question 8   (a)   How many children under the age of 5 live in the catchment population?

(b)   How many women of childbearing age live in the catchment population?

(Check your answers before continuing.)

It may be useful to change the age-sex distribution in Table 1 into a *percentage* age-sex distribution.

Question 9   When would a percentage age-sex distribution be useful?

Question 10   What is the percentage of under-5s in the population in Table 1?

(Check your answers before proceeding.)

Find out what the percentage is in your district or region and in your country, and compare these percentages.

    % in your district _____   *% in your country* _____

Here is the catchment population from Table 1 converted into a percentage age-sex distribution:

Table 2 Percentage distribution of catchment population by age and sex

Age (years)	Males %	Females %	Total %
0–4	8.4	9.2	17.6
5–14	12.4	13.2	25.6
15–44	21.2	21.4	42.6
45 and over	6.6	7.6	14.2
Total	48.6	51.4	100.0

Question 11 What percentage of the catchment population is under the age of 15?

(Check your answer before continuing.)

Question 12 Information on the age-sex distribution of your catchment population can be used for (tick one):

    A. Finding out about people who need *health services.*

    B. Finding out about people who use *health services.*

    C. Finding out about people who do not use *health services.*

Question 13 Which are the two most important age-sex groups needing health services?

(Check your answers before continuing.)

5.5 Users and non-users of health services

In section 5.4 you learned about some ways of counting people needing health services in your catchment population. Not all those who need health services actually receive them. How can you find out who are the non-users of health services?

    One way is to look at the people who are using the health centre and dispensaries. For example, you might ask the people in charge of these clinics to record the sex and age group of each person visiting the clinic over a period of time, say 2 weeks. The following results are obtained:

Table 3 People visiting the health centre and dispensaries during a 2-week period, by age and sex*

Age (years)	Males	Females	Total
0–4	20	30	50
5–14	60	80	140
15–44	70	130	200
45 and over	50	60	110
Total	200	300	500

***NB** This table shows the number of *people*, not the number of visits. People visiting twice or more during the 2-week period would be counted only once.

Which of these age-sex groups is the greatest user of health services?

To answer this question you need to compare Table 3 with Table 1 and find out, in each age-sex group, the use rate, or what percentage of the population used health services during this 2-week period.

<div style="border:1px solid">

USE RATE:
NUMBER OF PERSONS USING HEALTH SERVICES
PER 100, 1,000 or 10,000 POPULATION
DURING A SPECIFIC TIME PERIOD

</div>

For example: In the 0–4 age group, there were 50 visits in a population of 8,800. The percentage using health services was

$$\frac{50}{8,800} \times 100 = 0.57\%$$

This percentage is very small and is easier to understand if it is multiplied by 100 and given as a *use rate* of 57 per 10,000.

Question 14 Calculate the use rate per 10,000 in the 5–14 age group. (Round your answer to the nearest whole number.)

(Check your answer.)

By continuing with these calculations, we can make a table of use rates:

Table 4 Use rates per 10,000 population per 2-week period, by age and sex

Age (years)	Males	Females	Total .
0–4	48	65	57
5–14	97	121	109
15–44	66	121	94
45 and over	152	158	155
Total	82	117	100

Question 15 Look carefully at the use rates in Table 4. Which age group has the highest use rates? Which sex has the higher use rate?

Notice that the group with the *lowest* use rate is the 0–4 age group. This finding should be surprising and worrying, because the 0–4 age group has important needs for health services which we have already discussed. You will have to try to improve the use rate in this age group.

You can use this same method to find out which parts of your catchment population are greater users of health services. For example, you may wish to compare use rates in village A and village B, both of which have a dispensary. If you obtain age-sex distributions for the two villages and keep a record of the age and sex of all patients visiting each dispensary during a period of time, you will be able to compare the use rates.*

Question 16 Define "use rate" of a dispensary.

(Check your answer.)

Question 17 The following information is about people using two village dispensaries A and B, during a one-month period.

> *Village A: Total population   = 500*
> *Population under 5   = 100*
>
> *Persons visiting during 1-month period: Total   = 50*
> *Under-5s   = 10*
> *Village B: Total population   = 400*
> *Population under 5   = 100*
>
> *Persons visiting during 1-month period: Total   = 40*
> *Under-5s   = 20*

*Remember, you should record only *first* visits for each person during the time period.

Calculate the use rates below:

	Village A	Village B
Total		
Under-5s		
5 and over		

(Repeat your calculations and check your answers.)

You can see from these calculations that village A has the same use rate (10% during a 1-month period) among the under-5s as among the total population. However, village B has a higher use rate among its under-5s (20%, compared with 7% among the 5 and over age group). You would want to find out why the mothers in village B are bringing their young children to the dispensary more frequently than the mothers in village A. Do they live closer to the dispensary? You may need to plan mobile MCH clinics for village A to increase the use rate in the under-5s.

5.6 Birth rate and need for antenatal care

Women in the childbearing age group are important because of their needs for antenatal care. A good way of finding out the number needing antenatal care is to make an estimate of the number of births which take place each year in the catchment population. The true number of pregnancies will, of course, be greater than the number of births, as some pregnancies end in an abortion or miscarriage. It is hard to find out the number of these pregnancies which do not come to term.

The number of births can be estimated by using the *birth rate*:

> **BIRTH RATE:**
> **NUMBER OF BIRTHS PER 1,000**
> **POPULATION PER YEAR**

The birth rate is calculated by counting the number of births in a population during one year, multiplied by 1,000 and divided by the total number of people in the population.

For example: In a population of 10,000 there are 450 births each year. The birth rate is:

$$\frac{450}{10,000} \times 1,000 = 45 \text{ per 1,000 per year}$$

Question 18 There are 15 births each year in a population of 500. Calculate the birth rate.

(Check your answer.)

Question 19 There are 10 births each month *in a population of 2,000. How many births will there be in one year? Calculate the birth rate per* year.

(Check your answer.)

Question 20 The birth rate in a district of 100,000 population is 60 per 1,000 per year. How many births take place each year in the district?

(Check your answer.)

Question 21 If your catchment population of 50,000 has a birth rate of 50 per 1,000 per year, how many births take place in the catchment population:

(a) each year?

(b) each month?

(Check your answers carefully.)

You have learned how to calculate the number of births which take place in your catchment population, using the birth rate.

Question 22 The number of births per year in your catchment population tells you about (tick one):

A. Users of antenatal services

B. Non-users of antenatal services

C. Need for antenatal services

(Check your answer.)

Imagine that you have calculated that there are 2,000 births each year in your catchment population. You learn that each year in your health centre there are 500 deliveries. The percentage of births that take place in the health centre is therefore

$$\frac{500}{2,000} \times 100 = 25\%$$

You decide to find out where the mothers come from that have their deliveries at the health centre and you learn that 450 (90%) of them live *less* than 10 km from the health centre. However, you know 80% of your catchment population lives *more* than 10 km from the health centre. This means that the women who *use* the health centre for their deliveries are the women who live closest to the health centre, and not necessarily the women who are in greatest *need* of health services.

Question 23 *If your health centre is only able to manage 500 deliveries per year, or 25% of the total births in your catchment population, how would you decide which of the women are in greatest need of a health centre delivery?*

(Check your answer.)

Question 24 *The birth rate in your district is 50 per 1,000 per year. Your health centre has a catchment population of 50,000. There are 500 deliveries each year at the health centre. What percentage of the total number of births in your catchment population take place at the health centre?*

(Repeat your calculations and check your answer.)

The calculations you have just finished show how you can use the birth rate to calculate the need for antenatal services in your catchment population. The birth rate you use may be the birth rate for your country, or for your region or district, depending on what census or survey information is available to you. Find out what the birth rate is in *your* country. Then estimate the number of births taking place in *your* catchment population each year and each month.

Now find out about the number of deliveries which take place at your health centre each month (or year) and calculate the percentage of births in your catchment population which take place at the health centre.

Birth rate (in your country or district) = _____ per 1,000 per year

Number of births in your catchment population = _____ per year; _____ per month.

Deliveries at your health centre = _____ per year; _____ per month.

Percentage of births delivered at health centre = _____ %

Mothers delivered at health centres usually live near by—
they are not necessarily those whose need is greatest

5.7 Death rate and RNI

You have learned about the birth rate, and how you can use it to calculate the number of births taking place each year in your catchment population. Two other rates which are useful to know are the death rate and the population growth rate or RNI (rate of natural increase).

The *death rate* can be used to calculate the number of deaths taking place each year in your catchment population.

DEATH RATE:
NUMBER OF DEATHS PER 1,000
POPULATION PER YEAR

Question 25 Fill in the blanks:

The death rate is calculated by counting the number of...

in a population during..., multiplying by......................

and dividing by..............................

(Check your answer.)

Question 26 There are 250 deaths each year in a population of 10,000. What is the death rate?

(Check your answer.)

Question 27 The death rate for your district is 20 per 1,000 per year. How many deaths would you expect each year in your catchment population of 50,000?

(Check your answer.)

Imagine that the death rate is 20 per 1,000 per year and the birth rate is 45 per 1,000 per year. If you take a group of 1,000 people, during one year there will be 45 births and 20 deaths. Thus, at the end of the year the group of 1,000 will have increased by 45 – 20 = 25 people. The rate of population growth (natural increase) is therefore 25 per 1,000 per year, or 2.5% per year.

THE RATE OF NATURAL INCREASE (RNI)
EQUALS THE BIRTH RATE MINUS THE DEATH RATE

If the birth rate were to increase to, say, 50 per 1,000 per year, and the death rate were to stay the same, the RNI would increase to 50−20 = 30 per 1,000 per year, or 3% per year.

If the death rate were to decrease to, say, 15 per 1,000 per year, and the birth rate were to stay the same, the RNI would also increase to 45−15 = 30 per 1,000

per year, or 3% per year.

In developing countries, the death rate is likely to drop slowly as social and economic conditions improve and as health services reach a larger proportion of the population. Child-spacing programmes may eventually produce a decrease in the birth rate, but sometimes the birth rate will rise even higher before it starts to decline. From this we can assume that the RNI will continue to increase: the population will get larger and the rate of growth will increase.

We can see this more clearly if we calculate the increase in size of a health centre population over a period of 10 years, basing our calculations on RNI's of 2.5% and 3%.

For example, at a growth rate of 2.5%, a population of 50,000 will grow by

$$\frac{2.5 \times 50,000}{100} = 1,250$$

in the first year, giving a total population of 50,000 + 1,250 = 51,250.

In the second year, the population will grow by

$$\frac{2.5 \times 51,250}{100} = 1,268$$

giving a total of 51,250 + 1,281 = 52,531 at the end of the second year.

Projections of the size of catchment population of 50,000

Population size	If growth rate is 2.5%	If growth rate is 3.0%
1st year	50,000	50,000
2nd year	51,250	51,500
5th year	55,191	56,275
10th year	62,443	65,239

Thus, in 10 years' time one could expect the original population of 50,000 to have grown to somewhere between 62,443 and 65,239.

It is not wise to try to predict the size of a population too far ahead because this depends on very many factors, such as:

When will the death rate actually start to drop?

Will child-spacing programmes be effective in lowering the birth rate?

The effects of migration will also be important when we consider the total growth rates of different parts of the country. One of the most important movements of people is the movement, or migration, to urban areas, with the result that urban areas are growing at very fast rates. The people migrating to towns are mainly young adult males, so that the age-sex composition of the population in urban areas is very different from that in rural areas.

The migration of young men to the towns alters the age-sex composition of local populations

Question 28 A population of 100,000 is growing at a rate of 3% per year. How big will the population be:

(a) after one year

(b) after two years

Question 29 In a population of 50,000, the birth rate is 45 per 1,000 per year and the death rate is 20 per 1,000 per year. Calculate:

     (a) the number of births in one year

     (b) the number of deaths in one year

     (c) the RNI

(Repeat all your calculations before checking your answers.)

Question 30 Define the birth rate.

Question 31 Define the RNI (rate of natural increase).

(Check your answers.)

    You have now finished Unit 5. Look back at the objectives in 5.2. If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

5.8 Answers to practice questions

1. To know about the people who need health services so that you can organize mobile clinics and other services for them.

2. Some of the reasons might be:
    (a) He previously lived closer to health centre A and prefers to go to a place where he is known and his records are kept.
    (b) Health centre A may have better facilities or staff or be better stocked with drugs.
    (c) Health centre B may be privately run and charge for visits or drugs.
    (d) Health centre A might actually be easier to get to: there might be a convenient bus, or the patient could get a ride there more easily.
    (e) Health centre A might be closer to the patient's place of work.

    There are many other possible reasons. Discuss others you thought of with your instructor.

3. 80% (100% - 20%).

4. Because 10 km is usually the longest distance which people will walk to get health services.

5. The population which the health centre is supposed to serve.

6. The under-5s are important because they need immunization and early detection of malnutrition. Women of childbearing years are important because they need antenatal care to prevent death or illness of mother and baby.

7. Immunization is $1°$ prevention. Early detection of malnutrition is $2°$ prevention. Antenatal care includes both $1°$ prevention (tetanus immunization and delivery of high-risk mothers in hospital) and $2°$ prevention (early detection and treatment of anaemia, toxaemia, etc.).

8. (a) 8,800
    (b) 10,700 (most women bear children between the ages of 15 and 45).

9. When comparing the catchment population of one health centre with another population. For example, you might wish to know whether your catchment population had a higher percentage of under-5s than the population of the district or region in which the health centre is situated. You would need to calculate the percentage of under-5s in your population and then compare it with the percentage for the entire district, which you could obtain from the census.

10. $\dfrac{8,800}{50,000} = 17.6\%$

11. 17.6% + 25.6% = 43.2%.

12. A.

13. Children under the age of 5. Women aged 15–44 years.

14. Use rate (age 5–14) = $\dfrac{\text{visits (age 5–14)} \times 10,000}{\text{population (age 5–14)}}$ = $\dfrac{140}{12,800}$ x 10,000 = 109

15. The age group with the highest use rate is the 45 and over age group. Females have higher use rates than males.

16. The use rate of a dispensary is the number of persons using the dispensary per 100, 1,000 or 10,000 population during a specified period.

17. Use rates for the one month period:

	Village A	Village B
Total	$\dfrac{50}{500}$ = 10%	$\dfrac{40}{400}$ = 10%
Under-5s	$\dfrac{10}{100}$ = 10%	$\dfrac{20}{100}$ = 20%
5 and over	$\dfrac{40}{400}$ = 10%	$\dfrac{20}{300}$ = 7%

18. $\dfrac{15}{500}$ x 1,000 = 30 per 1,000 per year

19. 10 births per month is (10 x 12) 120 = births per year

    Birth rate = $\dfrac{120}{2,000}$ x 100 = 60 per 1,000 per year

20. Number of births = $\dfrac{60}{1,000}$ x 100,000

    = 6,000

21. (a) Number of births per year = $\dfrac{50}{1,000}$ x 50,000

    = 2,500

    (b) Number of births per month = $\dfrac{2,500}{12}$

    = 208

22. C.

23. The women in greatest need of health centre (or hospital) deliveries are the women with high-risk pregnancies because of certain risk factors, e.g., toxaemia, twins, previous caesarean, etc.

24. Number of births per year in catchment population $= \dfrac{50}{1,000} \times 50,000$

$$= 2,500$$

    Percentage of births in health centre $= \dfrac{500}{2,500} \times 100\%$

$$= 20\%$$

25. The death rate is calculated by counting the number of *deaths* in a population during *one year*, multiplying by *1,000*, and dividing by *the size of the population*.

26. Death rate $= \dfrac{250}{10,000} \times 1,000 = 25$ per 1,000 per year

27. Expected deaths $= \dfrac{20}{1,000} \times 50,000 = 1,000$

28. (a) $100,000 + \left(\dfrac{3}{100} \times 100,000\right) = 100,000 + 3,000 = 103,000$

    (b) $103,000 + \left(\dfrac{3}{100} \times 103,000\right) = 103,000 + 3,090 = 106,090$

29. (a) $\dfrac{45}{1,000} \times 50,000 = 2,250$ births per year

    (b) $\dfrac{20}{1,000} \times 50,000 = 1,000$ deaths per year

    (c) $45 - 20 = 25$ per 1,000 per year or 2.5% per year

30. Birth rate $= \dfrac{\text{number of births taking place in one year}}{\text{population size}} \times 1,000$

31. The RNI equals the birth rate minus the death rate.

SAMPLES AND SURVEYS

6.1 Introduction

In the first five units of this series you have learned to ask some important questions about your catchment population and the health services it needs. You have been given examples of the kind of information you would need to answer these questions. For example, in Unit 5 we asked whether women who had their babies at the health centre were any different from women who had their babies at home. Did the women delivering at the health centre live closer to the health centre than the women delivering at home? Which group had a larger percentage of high-risk pregnancies? In order for *you* to answer this type of question, you will need to collect information from *your* catchment population. The way you collect this information is with a *sample* or a *survey*.

When you diagnose a health problem in a patient, you use tests or examinations. For example, you listen to a patient's chest, or you look at a blood smear. These tests help you to decide what is wrong with the patient. When you are diagnosing the health problems of a catchment population, you use samples and surveys to make a *community diagnosis*. You use samples and surveys to find out about the

population in the same way that you use tests and examinations to find out about an individual patient.

HISTORY **+** EXAMINATION **+** TESTS **➡** PATIENT DIAGNOSIS

TALK WITH COMMUNITY **+** RECORDS **+** SURVEYS **➡** COMMUNITY DIAGNOSIS
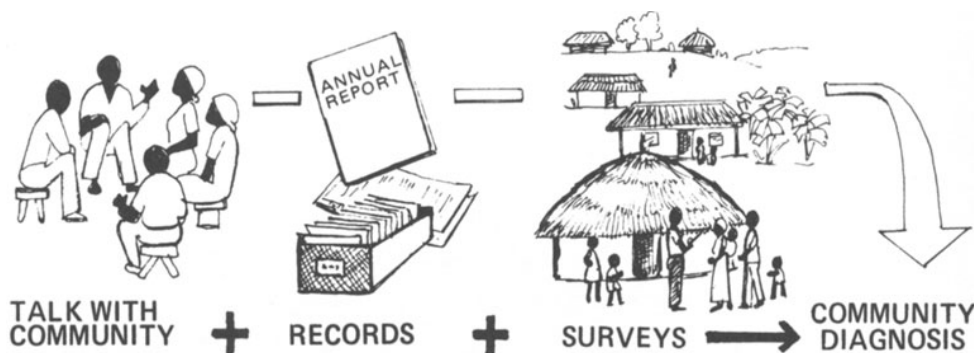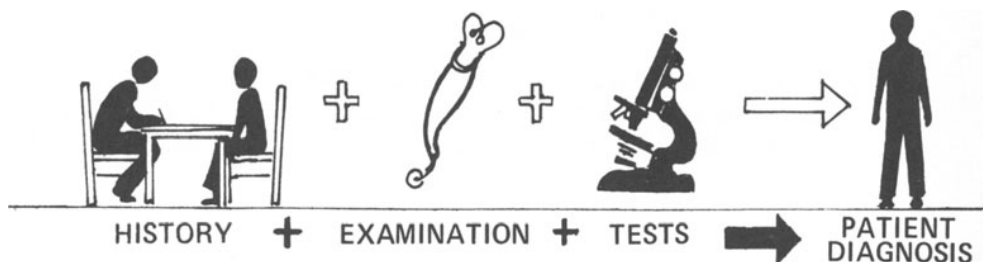
6.2 Objectives

After completing this unit, you will be able to:

1. Define the following types of survey and give examples of the types of questions each one is designed to answer:
    (a) Prevalence survey
    (b) Demographic survey (mini-census and follow-up)
    (c) KAP survey.

2. Define prevalence, calculate it when given appropriate numbers and express it appropriately (percentage, per 1,000 or per 10,000).

3. Define biased and unbiased samples and describe one method of obtaining an unbiased sample.

6.3 Surveys in the health centre population

Two types of surveys are important for the work of a health centre:

1. Surveys of the *need* for health services.

2. Surveys of *users* of health services.

For example, a survey to find out the birth rate in your population would tell you about the *need* for antenatal services. A survey of the antenatal visits in your population would tell you about the *users* of health services. If you compare the information from these two surveys, you will learn about the *non-users* of health services.

Remember:

NEED FOR HEALTH SERVICES	**=**	USERS OF HEALTH SERVICES	**+**	NON-USERS OF HEALTH SERVICES
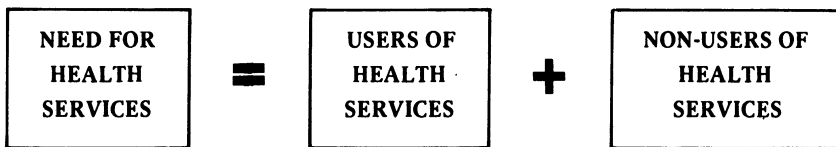
Questions 1-4 *For each of the following surveys, decide whether it is a survey of* need *or a survey of* users *of health services. Tick the correct answer.*

1. *A survey to find out the percentage of women using the health centre who give birth in the centre is:*

   A. *A survey of need for health services*

   B. *A survey of users of health services*

2. *A survey to find out the percentage of children attending MCH clinics who have moderate or severe malnutrition is:*

   A. *A survey of need for health services*

   B. *A survey of users of health services*

3. *A survey to find out the percentage of children in a village in your population who have moderate or severe malnutrition is.*

   A. *A survey of need for health services*

   B. *A survey of users of health services*

4. *A survey to find out the age-sex structure of your population is:*

   A. *A survey of need for health services*

   B. *A survey of users of health services*

(Check your answers.)

In the rest of this unit, you will learn about some special types of survey which tell you about need for health services (prevalence surveys, demographic surveys

and KAP surveys) and surveys which tell you about users of health services (health service use or utilization surveys).

6.4 Populations and samples

Before starting a survey, you must state exactly what the *aim* of the survey is to be and the specific group you wish to survey — the *survey population*. Here are two examples:

1. *A survey of need for health services*
   (a) *Aim*
      To find out the percentage of under-5-year-old children in the catchment population who have malnutrition (less than 80% of standard weight for age).
   (b) *Survey population*
      All the under-5-year-old children presently living in the catchment population.

2. *A survey of users of health services*
   (a) *Aim*
      To find out the percentage of under-5-year-old children attending MCH clinics who have malnutrition.
   (b) *Survey population*
      All the under-5-year-old children attending MCH clinics during a one-month period.

Questions 5–6 *Here are some more examples of survey aims. Select the correct survey population for each one. Tick the correct answer.*

5. *The aim is to find out the percentage of women attending antenatal clinics in the catchment population who have high-risk pregnancies. The population is (select one):*

A. *All people attending clinics during a specified period*

B. *All women attending antenatal clinics during a specified period*

C. *All women attending antenatal clinics who have high-risk pregnancies during a specified period*

D. *All women in the catchment population*

(Check your answer before trying question 6.)

6. *The aim is to find out the percentage of births at the health centre which are of high-risk pregnancies. The population is (select one):*

A. *All births taking place in the catchment population during a specified period*

B. *All high-risk births in the catchment population during a specified period*

C. *All births taking place at the health centre during a specified period*

D. *All high-risk births taking place at the health centre during a specified period*

(Check your answer.)

After deciding upon the aim of the survey and the population to be surveyed, you must next decide whether to do a population survey or a sample survey. In a *population survey*, you would count or examine all members of the survey population. In a *sample survey*, you would count or examine only part, or a sample, of the survey population.
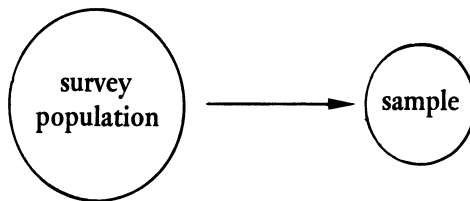
It is often not possible to survey everyone in a population, and even if it is possible, it may not be the best way to use the limited time and manpower that are available. Consider a busy health worker in a dispensary. If you ask him to check the blood pressures of *all* the patients he sees, in addition to managing their other problems, he may soon either give up or else measure the blood pressure so quickly and carelessly that he won't get accurate results. It would be far better if he were asked to check blood pressures only one day a week or on every 5th patient coming in to see him. He is likely to do it more carefully and to get more accurate results when he is asked to examine a *sample* of the population rather than the *whole population*. Although by sampling we only survey part of the population, *we expect the sample survey to give us the same answer as would a survey of the total population.* The sample must be chosen so that it truly represents the population that it is drawn from, i.e., it must be a *representative sample.*

Consider malnutrition in the under-5-year age group of a health centre population. Think of a health centre population where 3% of the under-5s have severe malnutrition. A good sample of under-5s from this health centre would *also* have 3% with severe malnutrition. Here are ways you could choose a sample:

Sample A: From under-5s attending an MCH clinic. Would this sample truly represent the population? The people who use health services, particularly preventive services, are usually better educated and more knowledgeable about health matters: they probably have less severe malnutrition than among the rest of the population. This sample is *not* representative of all the under-5s in the population.

Sample B: From an isolated rural area. This will also not be representative of the population, as a higher percentage is likely to have severe malnutrition than in the general population.

If you took a sample in either of these two ways, you would not find the true percentage with malnutrition. Both samples A and B would be BIASED. Biased means they are *different* from the population in some way.
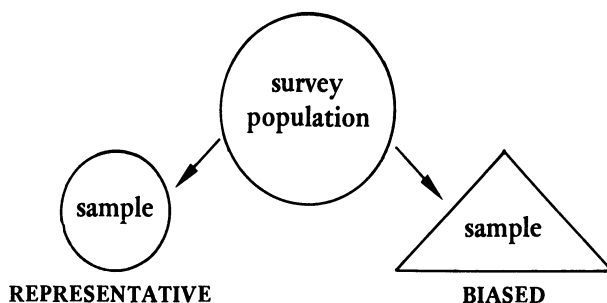
BIASED SAMPLES
ARE NOT REPRESENTATIVE
AND GIVE WRONG ANSWERS

There are several methods of choosing samples which are representative and not biased. Here is one method which you may find useful:

If you need to select a sample to answer the question, "What percentage of mothers attending antenatal clinics are anaemic?" you must first decide on a suitable time period, say one month. (If mobile MCH clinics run by your health centre visit certain places only once a month, you should not select a period of less than a month for study because you would be leaving out the mothers in the areas not visited and your sample would be biased. If mobile MCH clinics visit certain places only every two months, then your study should be extended over a two-month period.) You decide that you will have time to take blood specimens only from a sample of 50 women. Your *sample size* is 50. From previous MCH clinic records you estimate that 300 women attend these clinics each month. You will need to sample every $\frac{300}{50}$ or every 6th woman. Your *sampling interval* is 6. You next decide which woman you will start your sample with. *You* should not make this decision, but let *chance* decide. This is simply done by taking 6 small pieces of paper, numbering them 1 to 6, folding them so the numbers cannot be seen, then asking someone to pick a number. Imagine that the number 4 is picked. This means that the first woman in the sample is the 4th to attend clinic. After this first woman you continue to

select women at your sampling interval of 6. The women in your sample will be the 4th, 10th, 16th, 22nd (etc.) to attend clinic.

Question 7 *Calculate the sampling interval in the following situations:*

        (a) *You would like a sample size of 20 from a survey population of 200*

        (b) *You would like a sample size of 30 from a survey population of 90*

(Check your answers before continuing.)

To SUMMARIZE, the steps in selecting a sample are:

(1) EITHER (a) make a list of the survey population and number each member (this may be an individual, or a group such as a household)

    OR (b) arrange members of the survey population in order (such as a queue or a pile of health records)

(2) Decide on the size of your sample. Then divide this sample size into the population size to tell you your sampling interval.

(3) Pick a number randomly to start your sample, then continue to select members at the sampling interval.

Question 8 *A biased sample (tick one):*

    A. *Is too big*

    B. *Is too small*

    C. *Gives right answers*

    D. *Gives wrong answers*

    E. *Represents the population*

Question 9 *Describe how you would select an unbiased sample of 50 workers in a plantation of 400 workers.*

(Check your answers before you continue.)

    In the rest of the unit you will learn about some special kinds of surveys.

6.5 Prevalence surveys

The aim of a prevalence survey is to find out the percentage of the population which has a disease or a special characteristic. For example:

What percentage of the population has malaria?

What percentage of the under-5-year-old children in the population has malnutrition (subdivided into moderate and severe)?

What percentage of children of school age has received BCG?

All these questions ask about the percentage in the population with a certain condition. Another way of saying: "The percentage of the under-5-year-old children with severe malnutrition", is to say: "The *prevalence* of severe malnutrition among under-5-year-old children."

Question 10 Rewrite the following phrases, using the word "prevalence" instead of "percentage":

> (a) *"The percentage of the population who have malaria."*

(Check your answer to (a) before attempting (b).)

> (b) *"The percentage of children of school age who have received BCG."*
> (c) *"This survey is designed to find out the percentage of the population who have Tb."*

(Check your answers to (b) and (c) before continuing.)

Question 11 Now rewrite the following, using the word "percentage" instead of "prevalence":

> (a) *The prevalence of leprosy in the catchment population.*

> (b) *A prevalence survey of anaemia among the pregnant women in a town.*

(Check your answers to question 11.)

Imagine that you want to carry out a prevalence survey of malnutrition in two villages in your catchment population. When you plan the survey, you must answer the following questions:

1. What is the *survey population* to be surveyed? (Is there a list of the inhabitants of the two villages? Can you draw a map of each village to show all the dwellings to be included in the population? Will you include all ages, or only the under-5s?)

2. Will the total population be surveyed, or only part of the population (a sample)?

3. How will you define malnutrition and how will you measure it? You may decide, for example, to use weight and age as your two measures and use the definitions of moderate and severe malnutrition which you learned about in Units 3 and 4.

Prevalence may be expressed in different ways, depending on how large the percentage is which will be converted to prevalence. If the percentage is 1% or greater, prevalence is usually expressed as a percentage. For example, a survey of 40 school children in a village shows that 30 of them have BCG scars:

$$\text{the } percentage \text{ with BCG scars } = \frac{30}{40} \times 100 = 75\%$$

$$\text{the } prevalence \text{ of BCG scars } = 75\%$$

If the percentage is *less* than 1%, prevalence is usually expressed "per 1,000" or "per 10,000", whichever is most convenient. For example, a prevalence survey for tuberculosis and leprosy in a village may detect 10 cases of tuberculosis and 5 of leprosy. There are 5,000 people in the village and all were included in the survey:

$$\text{the } percentage \text{ with tuberculosis } = \frac{10}{5,000} \times 100 = 0.2\%$$

$$\text{the } prevalence \text{ of tuberculosis } = \frac{10}{5,000} \times 1,000 = 2 \text{ per } 1,000$$

Question 12 From the example above, calculate the percentage *with leprosy and then the* prevalence *of leprosy.*

(Repeat your calculations, then check your answers.)

Question 13 Express the proportions below as prevalence per 100 (percentage), per 1,000 and per 10,000:

Proportion	Per 100(%)	Prevalence Per 1,000	Per 10,000
(a) $\frac{6}{300}$			
(b) $\frac{8}{5,000}$			
(c) $\frac{10}{2,000}$			

(Repeat your calculations and check your answers.)

How should you choose the *best* way of expressing prevalence: per 100, per 1,000, per 10,000 or per 100,000? Usually you should choose the one which gives an answer with one or two figures before the decimal point, simply because it is easier for most people to understand whole numbers rather than fractions.

In the examples given in question 13 above, (a) would be best expressed as 2% or 20 per 1,000; (b) would be best expressed as 1.6 per 1,000 or 16 per 10,000; (c) would be best expressed as 5 per 1,000 or 50 per 10,000.

It is also important to express prevalence so that it may be compared with prevalences found in other surveys. If you find that the prevalence of severe anaemia in women is 20 per 1,000 in one village while in another village it was found to be 5%, you should express both prevalences in the same way so that they can be compared easily: *either* 20 per 1,000 and 50 per 1,000 *or* 2% and 5%.

Question 14   Prevalence surveys of disease in the catchment population measure which of the following (tick one):

> A. *Need for health services*
>
> B. *Users of health services*
>
> C. *Both A and B*

(Check your answer.)

6.6 Demographic surveys

Demographic surveys measure some aspects of the population which we considered in Unit 5, such as: age-sex structure, birth rate, death rate, and growth rate.

There are two main types of demographic survey:

1. *Mini-census:* This type of demographic survey is a small census, in which everyone in the population is counted by household (or enumerated) and information on their age, sex, occupation, etc., obtained. In addition, information may be obtained on the numbers of births and deaths which occurred in the household during the previous year, and on the age at death and perhaps the cause of death (if known) of all those who died during the previous year. (If the survey were carried out on July 15th of one year, information would be sought on births and deaths occurring from July 15th of the previous year up to the present.)

2. *Follow-up survey:* Another type of demographic survey is one which begins with the small-scale census and then continues to *follow up* the population under survey, either by revisiting the households at regular intervals (perhaps every 3

Health worker enumerating a household

months) or by asking the members of the population to report all births and
deaths to one individual, perhaps a village leader, and then visiting this individual
regularly to obtain information about all events reported since the previous visit.
Information on births and deaths obtained in this way is usually more accurate
than in the mini-census, as these events are reported closer to the times at which
they actually happen.

*Question 15 Which of the following can be measured by demographic surveys? (Tick as many as
you like.)*

  A. *The prevalence of disease*

  B. *The age-sex composition of the population*

  C. *Birth and death rates*

Question 16 Demographic surveys which follow up *the population surveyed will give more
accurate estimates than mini-censuses for which of the following? (Tick as many as
you like.)*

  A. *Age and sex composition*

  B. *Birth rate*

  C. *Death rate*

(Check your answers to questions 15 and 16.)

Question 17 Demographic surveys measure which of the following? (Tick one.)

    A. *Need for health services*

    B. *Users of health services*

    C. *Both A and B*

(Check your answer before continuing.)

6.7 KAP surveys

Prevalence surveys measure the percentage of the population with a particular disease or characteristic; demographic surveys measure the structure and growth of populations; still other surveys are concerned with people's *attitudes* to certain health problems and practices.

Let us take child-spacing problems and practices as an example. Think of some different kinds of survey that you might want to do in a health centre population to make a "community diagnosis" about child-spacing. These surveys might be done before starting *child-spacing services* in the MCH clinics of the health centre.

Here are some of the important questions that the surveys might try to answer:

A. What is the birth rate in the population?

B. What is the average number of children born to women in the population?

C. What is the average time interval between children?

D. What do the women (and the men) in the population know about methods of child-spacing?

E. What are their attitudes to the various methods?

F. What percentage of husbands and wives use child-spacing methods?

Question 18 Which of the six questions above are demographic questions, and which ask about what people in the population think *and* do *about child-spacing?*

    Demographic questions _____

    'Think and do' questions _____

(Check your answer before continuing.)

A survey which tries to answer questions like D, E, and F above is called a KAP survey:

K for Knowledge
A for Attitudes
P for Practice

You would like to learn about knowledge, attitudes and practice about child-spacing in your catchment population. You also need to know:

WHO are the women in greatest need of child-spacing services?

WHERE do they live?

WHEN are they most likely to require the services?

The WHO, WHERE, and WHEN help you to describe your *population* in need of child-spacing services. It may be that women living in villages distant from the health centre are in particular need of these services, especially after they have borne three children. This information could help you plan child-spacing services for the health centre: you might start by sending some mobile MCH units to these villages.

This type of KAP survey asks about *need* for health services in the catchment populations. Other types of KAP survey ask about knowledge, attitudes and practice among *users* of health services.

Question 19 Below are some questions. Write beside each question the type of survey that could be used to answer it from the following three types:

prevalence
demographic
KAP

(a) *What is the birth rate in the catchment population of the health centre?*

Survey:

(b) *What percentage of the under-5s have been vaccinated against smallpox?*

Survey:

(c) *What percentage of the mothers in the community know about a nutrition education programme?*

Survey:

Question 20 What do the letters KAP stand for?

K is for

A is for

P is for

Question 21 KAP surveys measure which of the following? (Tick one.)

A. *Need for health services*

B. *Users of health services*

C. *Both A and B*

(Check your answers.)

6.8 Health service use surveys

So far in this unit you have learned about some surveys which tell you about your catchment population.

Question 22 Match these types of survey with the type of information they provide:

Surveys	Information
A. Prevalence	D. Diseases and other special characteristics
B. Demographic	E. What people know, believe and actually do about their health
C. KAP	F. Age-sex distribution, birth and death rates and RNI

(Check your answer.)

These surveys usually tell you about the need for certain types of health services. For example, a prevalence survey of tuberculosis will tell you how many cases of tuberculosis live in the population and where they are located. Before planning services for these cases, you will need to know how many of them are users of health services. You can then estimate how many of the tuberculosis cases are non-users and start to plan ways of bringing the non-users for treatment (perhaps by sending health workers to visit the cases to arrange for them to be brought to the dispensary, or by providing mobile clinics to areas which are far from the dispensaries and health centre).

The best way to find out about tuberculosis cases who use health services is to have a *tuberculosis register* in which you list all the known cases in your population.

In a survey of *need* for health services the population to be surveyed is usually the catchment population, or a certain age-sex group or the population living in a certain geographic area. In a survey of *use* of health services, the population to be surveyed is the people using health services.

Question 23 Which of the following statements are true about a tuberculosis register? (tick all that apply):

A. *It surveys the population of tuberculosis patients needing health services*

B. *It surveys the population of tuberculosis patients using health services*

C. *It is a population survey*

D. *It is a sample survey*

(Check your answer.)

To find out about the population who uses health services during one year, you

ask the health workers at your dispensaries to keep a record of the age and sex of all the patients they see for four one-week periods during the year.

Question 24 Would this survey be an example of a sample survey or a population survey?

(Check your answer.)

In Unit 10 you will learn about some routine records that health centres and dispensaries can keep to survey the people using health services in their populations.

You have now finished Unit 6. Look back at the objectives in 6.2. If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

6.9 Answers to practice questions

1. B.

2. B.

3. A.

4. A.

5. B.

6. C.

7. (a) $\dfrac{200}{20} = 10$

   (b) $\dfrac{90}{30} = 3$

8. D.

9. Obtain a list of all the plantation workers and number them from 1–400. The sampling interval is $\dfrac{400}{50} = 8$. Select a number between 1 and 8 to start the sample, then select every 8th worker to be in the sample.

10. (a) The *prevalence* of malaria in the population.

    (b) The *prevalence* of BCG immunization among (or in) children of school age.

    (c) This survey is designed to find out the *prevalence* of Tb among (or in) the population.

11. (a) The *percentage* of the people in the catchment population who have leprosy.

    (b) A survey to find out the *percentage* of the pregnant women in a town who have anaemia.

12. The percentage with leprosy $= \dfrac{5}{5,000} \times 100 = 0.1\%.$

    The prevalence of leprosy $= \dfrac{5}{5,000} \times 1,000 = 1 \text{ per } 1,000$

13.

Proportion	Per 100(%)	Prevalence Per 1,000	Per 10,000
(a) $\dfrac{6}{300}$	2	20	200
(b) $\dfrac{8}{5,000}$	0.16	1.6	16
(c) $\dfrac{10}{2,000}$	0.5	5	50

14. A.

15. B and C.

16. B and C.

17. A.

18. Demographic questions: A, B, C.
    'Think and do' questions: D, E, F.

19. (a) demographic
    (b) prevalence
    (c) KAP

20. K is for Knowledge
    A is for Attitude
    P is for Practice

21. C.

22. A and D
    B and F
    C and E.

23. B and C. (It measures *all* Tb patients using health services in the population.)

24. A sample survey, because you are selecting only four weeks for the survey instead of the whole year.

Unit seven

SCREENING

7.1 Introduction

An important part of community health work is testing people who seem healthy and have no complaints, to find out if they have *risk factors* for disease, or are suffering from early subclinical disease. Measuring the height of a woman attending antenatal clinic is an example of testing for a risk factor. Weighing a child at an MCH clinic is an example of detecting early disease.

In this unit you will learn how to use and interpret the results of these tests. What you learn in this unit will also help you in your clinical work when you use tests to help you make a diagnosis.

7.2 Objectives

After completing this unit, you will be able to:

1. Define the following:
    (a) Screening for disease

   (b) Screening test
   (c) Repeatability
   (d) Patient, tester and method error
   (e) True positives and true negatives
   (f) False positives and false negatives.

2. List the six important qualities of a good screening test.

3. List three questions to ask before starting a screening programme.

4. Name at least one method for reducing each of the following: patient, tester and method error.

7.3 Why do we screen?

This unit is about screening for subclinical disease and risk factors.

   'Screening' in this sense means 'sifting out'—one meaning of the word 'Screen' is large sieve used for separating large and small stones, gravel, etc. A screening test is a test which sifts out people with one particular disease or risk factor from a large number without it.

   For example, a screening test for high blood pressure divides off people with high blood pressure from those with low blood pressure.

   A screening test for malnutrition divides off children with malnutrition from those without malnutrition.

   In the introduction, we mentioned that the two main reasons that we use screening tests are:

1. To detect people who have "risk factors" for disease.

2. To detect people who are in the early, subclinical, stages of disease.

Question 1   *Circle the correct term:*

   (a) Detecting individuals who have "risk factors" for disease is an example of primary / secondary / tertiary / prevention.

   (b) Detecting individuals who are in the early stages of disease is an example of primary / secondary / tertiary / prevention.

Question 2   *(a) What is a "risk factor"?*

(b) Give an example of a risk factor for a specific disease.

Question 3   What is the main difference between subclinical and clinical disease?

(Check your answers to questions 1–3.)

When we screen for disease, we select

1. a *population* to be screened

2. a *disease* or *risk factor* to be screened for

3. a *method of screening (screening test)*.

Here are some examples:

Example 1: When we examine pregnant women attending antenatal clinics, there are several risk factors which we would like to detect, including *maternal height.* We know that women who are unusually short are more likely to have problems at the time of labour because there may not be room for the baby to be born vaginally: these women may suffer from CPD (cephalo-pelvic disproportion) and usually require a caesarean section to deliver their babies. In some countries women who are 146 cm (4 foot 9 inches) or shorter are at especially high risk for CPD. It is therefore important to measure the height of *all* women attending antenatal clinics and to refer all women measuring 146 cm or less for hospital delivery. This can be simply done by setting up a bar which is exactly 146 cm from the ground and asking all new attenders to try and walk below the bar. All women who are able to walk under the bar (without bending their heads) would have the risk factor.

In this example:

—the *population* is all women first attending antenatal clinics

—the *risk factor* is short height (which increases the risk of CPD — the disease)

—the *screening test* is walking under the bar.

Example 2: When we examine young children at MCH clinics it is important to
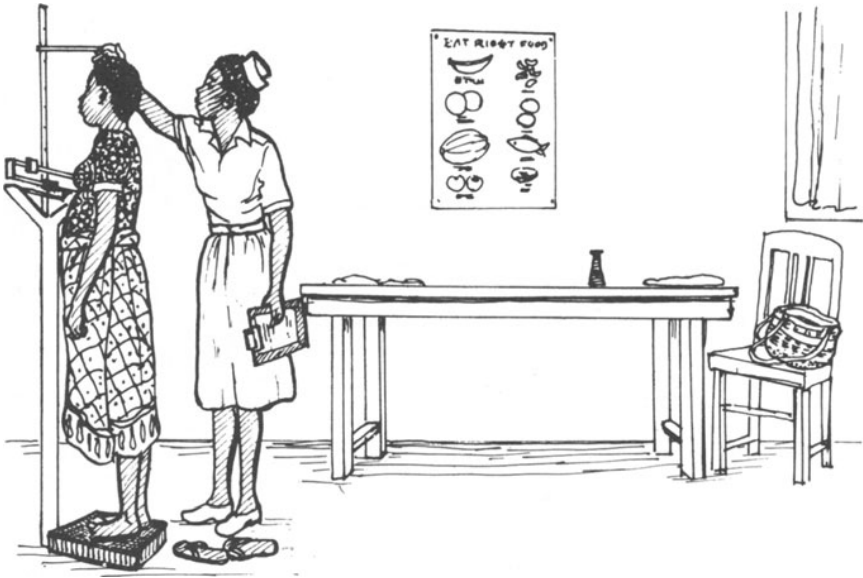
Measuring the height of women at antenatal clinics detects one important risk factor

detect children in the *early* stages of malnutrition before they develop the signs and symptoms of clinical malnutrition: oedema, apathy, reddening of the hair, and so on. The best way to do this is to weigh the children at each visit and compare their weight with the "standard weight" for a child of that age (as you learned in Units 3 and 4). If the child's weight falls below 80% of the standard, or if the child fails to gain weight over a 3-month period, then that child may be in the early stages of malnutrition: the child should be watched carefully and his mother should be instructed about proper nutrition.

In this example:

—the *population* is young children attending MCH clinics

—the *disease* is malnutrition

—the *screening test* is weighing the child.

Example 3: When we see people in the clinic with respiratory symptoms, particularly coughs, we are worried because the cough may be due to tuberculosis. If the diagnosis is missed, the patient may become severely ill and it will be hard to treat him. If the disease is detected in the early stages and the patient is treated, he

has a good chance of being completely cured. Any person who has had a cough for more than 4 weeks should be investigated further to find out if he has tuberculosis or not.

In this example:

—the *population* is patients attending clinics with respiratory symptoms

—the *disease* is tuberculosis

—the *screening test* is a history of cough of more than 4 weeks' duration.

**SCREENING IS NOT THE SAME
AS MAKING A DIAGNOSIS**

When a patient comes to you with symptoms of disease, you examine and test the patient carefully to make a diagnosis. When a patient comes to you without symptoms, or when you visit patients in their homes or other places to detect risk factors or early subclinical disease, you don't have time to make a careful diagnosis on each person. You want a test that will quickly tell you whether a person *probably has* the risk factor or disease you are looking for. The screening test sieves or separates those people who *probably have* the risk factor or disease (the positives) from those who probably *do not have* it (the negatives). You can then spend more time examining the positives to find out whether they *really do have* the risk factor or disease.

For example, you could *screen* for hypertension by doing a single blood pressure measurement on a population. People with high blood pressures (say, higher than 140/90) we call *positive* on the screen — they probably have hypertension. To *diagnose* the hypertension, you would probably want to repeat the blood pressure measurement several times on the positives with the patient at rest. Some of your positives would have follow-up blood pressures over 140/90, we call these people *true positives*, while other positives would have follow-up blood pressures in the normal range, we call these the *false positives*.
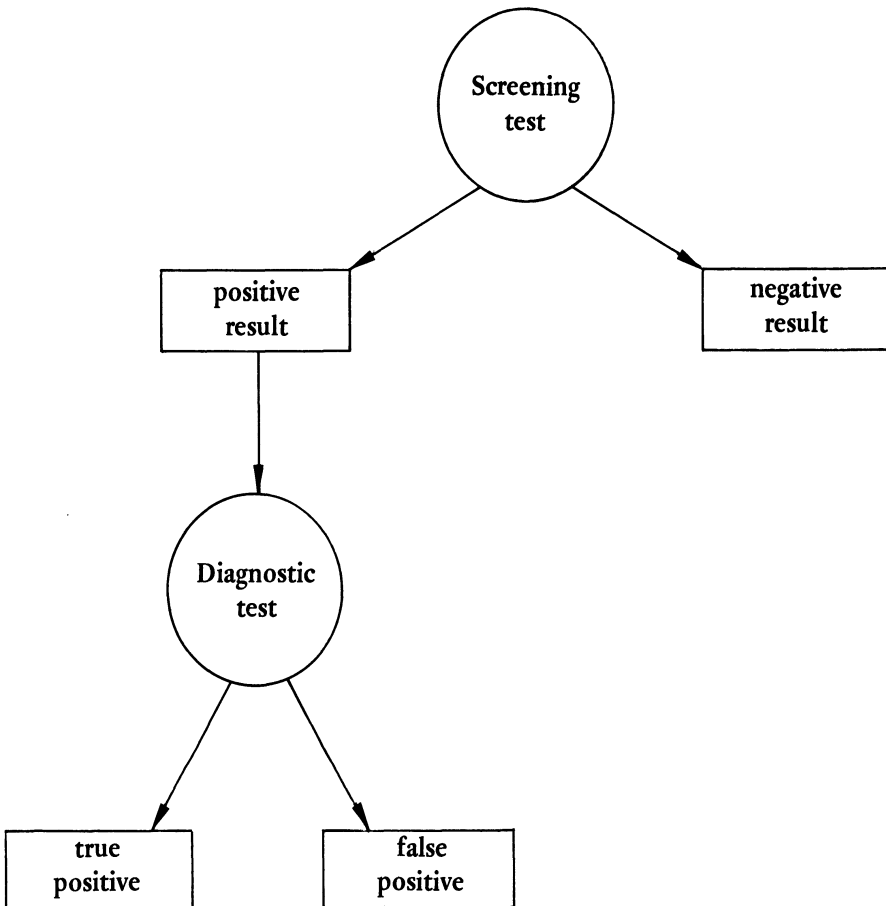
The steps in screening are:

1. Give *screening test* to your population and divide them into positives and negatives.

2. Give *diagnostic tests* to the positives only and divide them into true positives and false positives.

A SCREENING TEST IS A SIMPLE, CHEAP, QUICK
WAY OF DETECTING PEOPLE WITH
RISK FACTORS OR SUBCLINICAL DISEASE

Results of a screening test are usually referred to as positive or negative. A "positive" test means the person is at high risk. Positive results from the three examples considered would be:

> the pregnant woman who is 146 cm or less in height

> the child whose weight is less than 80% of the standard

> the patient with a cough of more than 4 weeks' duration.

Question 4   *When pregnant women are routinely examined at antenatal clinics, their blood pressures are checked. Women with blood pressures greater than 140/90 may be pre-eclamptic and should be referred to a doctor. In this example (fill in the blanks):*

(a)   *the* population *is*

(b)   *the* risk factor *is*

(c)   *the* disease *is*

(d)   *the* screening test *is*

(e)   *a* positive result *would be*

(Check your answers before trying question 5.)

Question 5   *Children entering school should be checked to see whether they have been fully immunized. They are usually examined to see whether they have scars in the proper places (on the shoulders or forearms, according to national policy). In this example (fill in the blanks):*

(a)   *the* population *is*

(b)   *the* risk factor *is*

(c)   *the* diseases *are*

> *and*

(d)   *the* screening tests *are*

(e)   positive results *would be*

Question 6   Measuring the height of pregnant women is a method of...

...........................prevention against...

(Fill in the blanks.)

Question 7   What are the advantages of using a screening test rather than making a diagnosis?

(Check your answers to questions 5-7.)

7.4 Accuracy of screening tests

Before using a screening test, we need to know how *accurate* the test is and how well it can tell us whether a person with a positive test actually has or will develop the disease or risk factor we are concerned with. There are several errors that can be made.

Using the example of screening for CPD by measuring the height of pregnant women, we can ask the following questions about the screening test:

1. If the height of a woman is measured by the same health worker on several different occasions, will she always get the same result?

2. If the height of a woman is measured by two different health workers, will they both get the same result?

3. If the height of a woman is measured using two different measuring rods, will they both give the same result?

4. What percentage of women who are 146 cm or under in height would normally end up with CPD?

5. What percentage of women who are over 146 cm in height would normally end up with CPD?

Questions 1, 2, and 3 are concerned with how accurately the woman's height is measured, and whether there are differences according to who measures the height and how well the measuring rod is calibrated. They are concerned with whether the same result is obtained when the measurement is *repeated* several times: this is called *REPEATABILITY.*

Questions 4 and 5 are concerned with what the woman's height tells us about her chances of developing obstructed labour. How well does the risk factor *predict* whether the woman will get the disease or not? In order to answer these questions, we shall need to understand something about *false positives* and *false negatives.*

7.5 Repeatability

One of the qualities that we expect of a good screening test is that it will be repeat-able.

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A REPEATABLE TEST WILL GIVE THE SAME RESULT
IF IT IS REPEATED MANY TIMES

</div>

If a woman's true height is 152 cm, we would hope that no matter who makes the measurement, using whatever different measuring rods, the height will always be measured at 152 cm.

Question 8 *What are some of the reasons why on some occasions this woman's height might be measured as 151 cm or 153 cm? One reason might be that the woman was not stand-ing straight when she was measured. Can you think of three other reasons?*

(a)

(b)

(c)

(Check your answers.)

From this example we can see that there are *three* main reasons why a test may not be repeatable. These reasons have to do with:

1. the person being tested, or the *patient*
2. the person performing the test, or the *tester*
3. the instrument, or the *method.*

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REASONS FOR ERROR OR POOR REPEATABILITY
IN A SCREENING TEST ARE:

1. PATIENT ERROR
2. TESTER ERROR
3. METHOD ERROR

</div>

Let us consider screening for hookworm disease by examining stool specimens under the microscope. There are many possible reasons why this test may not be repeatable. Some of these reasons are listed below under patient, tester and method error.

Patient error—hookworm ova are not equally present in different stool samples *or* if patient couldn't produce a stool specimen himself, he might substitute someone else's (this is a frequent problem in school surveys when children are asked to bring stool specimens with them).

Tester error—tester may not be experienced in reading slides and may miss hookworm ova or identify ova of other parasites as hookworm ova.

Method error—microscope may be old and not focus well enough to identify ova easily. There might be poor light or missing lenses.

PATIENT ERROR   TESTER ERROR   METHOD ERROR
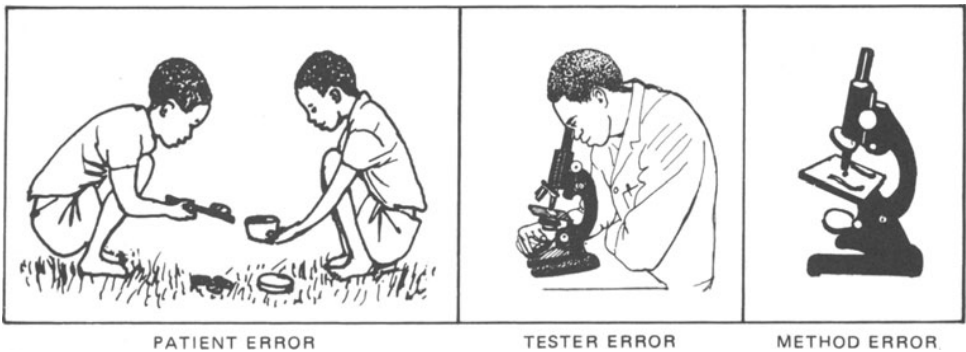
Question 9   Write down some possible reasons for error (lack of repeatability) in blood pressure measurements, under patient, tester and method error:

Patient error:

Tester error:

Method error:

(Check your answers before continuing.)

You can check for yourself these various errors in blood pressure measurement by carrying out the following exercise with a group of students and a sphygmomanometer.

Step 1
Measure the blood pressure of one person after 5 minutes of vigorous exercise (running, jumping, etc.). Then make him lie down and rest for 15 minutes and repeat the blood pressure measurement.

Step 2
Select another person to be the "patient" and fasten the sphygmomanometer cuff to his arm. The rest of the group takes it in turns to measure the blood pressure and each person writes their result on a piece of paper without telling the others. When everyone has finished, compare your results. Calculate the *average* systolic and the *average* diastolic pressure obtained by your group as well as the *range* for each of these measurements.

Step 3
Use another sphygmomanometer to measure the blood pressure of the same "patient" and have all members of the group make the measurement as before. Calculate the average systolic and diastolic pressures as before and compare with the averages obtained with the previous sphygmomanometer.

Discuss the results with your class and with your instructor.

Question 10 Circle the correct terms below. (The statements refer to the exercise described above.)

Step 1 measures patient / tester / method / error.

Step 2 measures patient / tester / method / error.

Step 3 measures patient / tester / method / error.

Question 11 Complete the following sentence:

"A repeatable test will give the same result if.."

(Check your answers to questions 10 and 11.)

If you understand the reason for error in screening test results, then you can take the appropriate action to *reduce* the errors and to *improve the repeatability* of the test.

Some useful methods of improving the repeatability of tests are:

Method 1: Make sure that patients are tested under standard conditions, e.g.:

    (a) Heights should be measured with patients standing upright, without shoes.

    (b) Blood pressures should be measured after the patient has been resting for about 15 minutes.

Method 2: The number of people doing the testing should be as few as possible, preferably only one person. If two or more must be used then they should compare results frequently.

Method 3: Testers should be carefully trained and supervised and their results should be checked from time to time by someone more experienced.

Method 4: The same instrument should be used for all tests, e.g., the same measuring rod, the same sphygmomanometer, etc. If this is not possible, the different instruments should be compared with one another by using the same patient or the same specimen. If it is found, for example, that measuring rod A always measures half a centimetre taller than rod B, then rod A should either be adjusted or all patients measured on rod A should have half a centimetre subtracted from their height.

Question 12 Considering the four methods of improving the repeatability of tests listed above:

    Method 1 reduces...error

    Method 2 reduces...error

    Method 3 reduces...error

    Method 4 reduces...error

(Fill in the blanks and check your answers.)

7.6 False positives and false negatives

The results of screening tests are either positive or negative. If the test can predict perfectly, then *all* the positives actually have or will develop the disease we are trying to detect, and *all* of the negatives are free of the disease (or will not develop it). None of the screening tests we use are perfect: they are quick, cheap, simple

methods of finding out whether a person *probably* has or will develop the disease we are concerned about. Although screening tests are not perfect, we would like them to be as good as possible and we are therefore concerned about false positives and false negatives.

Let us use the example of maternal height as a screening test for CPD. The cut-off point for the screening test is 146 cm:

A *"positive"* result means that the woman is 146 cm or less in height.

A *"negative"* result means the woman is over 146 cm in height.

A *"false positive"* result means the woman is 146 cm or less in height but *will not* develop CPD.

A *"true negative"* result means the woman is over 146 cm in height and *will not* develop CPD.

A *"false negative"* result means the woman is over 146 cm in height but *will* develop CPD.

We can show these results in the table below where every woman whose height is measured in the screening programme fits into *one and only one* of the four categories:

	Will develop CPD	Will not develop CPD
Height 146 cm or less	true positive	false positive
Height over 146 cm	false negative	true negative

In a study which was carried out at a hospital in East Africa, information was collected on the heights of 622 women who did or did not require caesarean section (CS) for CPD. The results are shown below:

Study of 622 pregnancies

	Women requiring CS for CPD	Women not requiring CS for CPD
Height 146 cm or less	19	182
Height over 146 cm	2	419

Question 13 From the preceding table, calculate the following:

    (a) The total number of women in the study whose height was 146 cm or less (positives on the screening test).

    (b) The total number of women in the study who had a caesarean section for CPD.

(Repeat your calculations and check your answers. If your answers are correct, you may omit question 14.)

Question 14 Now calculate the following from the table:

    (a) The total number of women in the study whose height was over 146 cm (negatives on the screening test).

    (b) The total number of women in the study who did not require a caesarean section.

(Repeat your calculations and check your answers.)

Question 15 Now answer the following from the table:

    (a) How many "true positives" were there?

    (b) How many "false positives" were there?

(Check your answers carefully to (a) and (b) before answering (c) and (d).)

    (c) How many "true negatives" were there?

    (d) How many "false negatives" were there?

(Check your answers before continuing.)

You have now worked out the numbers of false positives and false negatives that might be obtained by using this screening test. What are the actual disadvantages of false positives and false negatives?

Question 16 Imagine that you are an antenatal patient whose height is less than 146 cm. The clinic where you are screened informs you that you are "high risk" and you will need to be delivered in a hospital. When you begin to go into labour (or even before) you arrange to be taken to a hospital, but it turns out that you have a normal labour and delivery—there is no CPD.

    (a) You would be classified as a false..

(b) What are the possible disadvantages to you?

(c) What are the possible disadvantages to the people providing health services?

(Check your answers before continuing.)

Question 17 Imagine that you are an antenatal patient who is screened and found to be taller than 146 cm. You are told that everything seems to be all right and you prepare for home delivery. At the time of labour, it turns out that you do have CPD.

(a) You would be classified as a false...

(b) What are the possible disadvantages to you?

(c) What are the possible disadvantages to the people providing health services?

(Check your answers before continuing.)

There are clearly disadvantages both to false positives and to false negatives.

If there are too many false positives:
—treatment facilities will be overloaded and resources wasted
—many people will be unnecessarily worried.

If there are too many false negatives:
—true cases of disease will be missed
—many people will be falsely reassured and may lose their faith in the people providing health services.

7.7 Qualities of a good screening test

We can now summarize some of the important qualities that we expect from a good

screening test.

It must be *simple, cheap, quick,* and *repeatable* (minimal patient, tester, or method error).

It must have *few* false positives or false negatives.

In addition, it must be *acceptable* to the population in which it is to be used. (For example, a screening test involving blood sampling may not be acceptable in a population where blood-letting is associated with witchcraft.)

Here are some other important questions to ask yourself before you start a screening programme:

1. Is the disease or risk factor I am screening for *important* in my population?

2. How many positives do I expect from the screening test and can I manage to give diagnostic tests or examinations to all of them?

3. Is there an *effective treatment* for the disease, and if so, can my health centre and dispensaries take care of all the new cases of disease that are found?

Question 18 Name two disadvantages of false positives.

Question 19 Name two disadvantages of false negatives.

(Check your answers to questions 18 and 19.)

Question 20 Low cost is an important quality of a good screening test. Name five other qualities.

Question 21 Name three questions that you would ask yourself before starting a screening pro-gramme.

(Check your answers to questions 20 and 21.)

We should try to make the best use of our available facilities and health workers by:

1. Making sure that the three requirements for screening are met.

2. Making sure that we are using the best screening test available, according to the six important qualities.

3. Trying to predict the total number of positives that will be detected by the test (true and false positives).

4. Making sure that there are adequate resources to treat or to investigate all the expected positives.

You have now finished Unit 7. Look back at the objectives in 7.2. If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

7.8 Answers to practice questions

1. (a) primary
   (b) secondary.
   (If you made a mistake in this question read Unit 2.4 and 2.5 again.)

2. (a) A "risk factor" is a factor which may cause a person to get a disease.
   (b) Some examples are:
   "Not wearing shoes" is a risk factor for hookworm disease.
   "Not having measles immunization" is a risk factor for measles.
   "Weaning before age 2" is a risk factor for malnutrition.

   (Some other examples were given in Unit 1. Discuss any other examples you thought of with your instructor.)

3. In subclinical disease there are no signs or symptoms of the disease, and the patient does not know that he has the disease.

4. (a) pregnant women attending antenatal clinics
   (b) blood pressure greater than 140/90
   (c) pre-eclampsia
   (d) taking the blood pressure
   (e) a blood pressure greater than 140/90.

5. (a) children entering school
   (b) no immunization
   (c) smallpox and tuberculosis
   (d) presence of scars in the proper places
   (e) no scars.

6. Measuring the height of pregnant women is a method of *primary* prevention against *CPD (because the test detects a risk factor for CPD)*.

7. A screening test is simpler, cheaper and quicker than making a diagnosis.

8. (a) The patient might have a hairstyle that made her seem taller.
   (b) The person making the measurement might not be doing it carefully or accurately.
   (c) The measuring rod might not be properly calibrated.

9. Patient error—blood pressures may be higher than usual if the patient has been exercising or is excited.
   Tester error—people may interpret the "sounds" they hear differently or read them off less accurately.
   Method error—different sphygmomanometers may be calibrated differently and produce different results.
   (You probably thought of even more reasons: please discuss them with your instructor.)

10. Step 1 measures patient error.
    Step 2 measures tester error.
    Step 3 measures method error.

11. A repeatable test will give the same result if *it is repeated many times*.

12. Method 1 reduces patient error.
    Method 2 reduces tester error.
    Method 3 reduces tester error.
    Method 4 reduces method error.

13. (a) 19 + 182 = 201 women
    (b) 19 + 2 = 21 women

14. (a) 2 + 419 = 421 women
    (b) 182 + 419 = 601 women

15. (a) 19 women were positive on the screening test and did require CS for CPD.
    (b) 182 women were positive on the screening test but did not require CS for CPD.
    (c) 419 women were negative on the test and did not require CS for CPD.
    (d) 2 women were negative on the test but did require CS for CPD.

16. (a) False positive.
    (b) You are anxious about the situation and worried that you may have to have a caesarean section. You must go to the trouble of arranging for transport to the hospital and making sure that your other children are cared for while you are away.
    (c) Hospital delivery is more expensive than home delivery because more highly qualified persons and special facilities are required. This "false positive" patient is using a bed that could have been used for some other purpose.

17. (a) False negative.
    (b) Your life and your baby's life are in danger, depending on how quickly you or those attending the labour realize that things are not proceeding normally and on how long it takes to arrange for you to be transported to the hospital.
    (c) The health services have failed in their goal of primary prevention: they have not detected a person in need of health services.

18. (a) Treatment facilities will be overloaded.
    (b) People will be unnecessarily worried.

19. (a) True cases of disease will be missed.
    (b) People will be falsely reassured.

20. (a) It should be quick.
    (b) It should be simple.
    (c) It should be acceptable to the community.
    (d) It should be repeatable.
    (e) It should have few false positives and false negatives.

21. (a) Is the disease important in the community?
    (b) Are there adequate diagnostic facilities?
    (c) Is there an effective treatment and are there adequate treatment facilities?

Unit eight

EVALUATING COMMUNITY HEALTH SERVICES

8.1 Introduction

In the first seven units of this series you learned many ideas and skills which you will need for community health work. In these last three units you will learn how to use these ideas and skills to find out how the health services for your catchment population are working. You will learn how to set goals and how to find out whether you have been successful in reaching these goals.

8.2 Objectives

After completing this unit, you will be able to:

1. Describe the four stages of the community health cycle, and the questions each stage tries to answer:
    (a) Community diagnosis/choosing priorities
    (b) Goals
    (c) Organization
    (d) Evaluation.

2. Write goals for antenatal services or immunization programmes.

3. Identify the resources which can be used to organize a community health pro-
    gramme.

4. Describe some ways in which antenatal services or immunization programmes
    could be evaluated.

5. Calculate an incidence rate and list four differences between incidence and pre-
    valence.

8.3 The community health cycle

Imagine you have been assigned to a new health centre. After spending some time
getting to know your catchment population and the staff and services of your health
centre and its satellite dispensaries, you decide to take a look at the community
health problems of your population. Which are the most *frequent* community health
problems? Which are the most *serious* community health problems? Which problems
is the community itself most *concerned* about?

Question 1   Describing the health problems of a community is called

(Check your answer before continuing.)

When you know what the most common and serious community health problems
are in your population and which problems the community is most concerned about,
you decide on *priorities*. Which problem will you attack first? In many communities
antenatal care will be a high-priority problem because:

1. The community is *concerned* about good antenatal services.

2. It is a *common* problem. (As you saw in Unit 5, in a catchment population of
    50,000 with a birth rate of 50 per 1,000 per year, there are 2,500 births each
    year.)

3. It is a *serious* problem. (If good antenatal services are not provided, many
    mothers and babies will die or have severe complications because of problems
    with the pregnancy or childbirth.)

4. Antenatal services can *reduce illness and deaths.*

When you choose priorities among the different community health problems in
your population, you should always ask these four questions:

1. Is the community concerned about the problem?

2. Is it a common problem?

3. Is it a serious problem?
4. Can health services prevent illness or deaths arising from this problem?

Question 2   *How would you decide which of two diseases, schistosomiasis or hookworm disease, was more* common *in your population?*

(Check your answer.)

   Making a community diagnosis and choosing priorities is the first stage in the community health cycle.
   The next stage is to *set goals*, or decide what your services will aim to do. For example, a goal for antenatal services might be to get 90% of the pregnant women in your population to visit an MCH clinic at least once during their pregnancies. You will learn more about setting goals in the next section.
   The third stage in the cycle is to decide how you will *organize* the services with the resources (staff, equipment and money) you have available.
   The fourth and last stage is to find out how successful or *effective* you have been in reaching your goals. This is the stage of *evaluation*. The evaluation of antenatal services will tell you whether antenatal care is still a problem in your population or whether it is being taken care of. This will help you decide whether antenatal services are still a high priority and bring you back to the first stage of the cycle again.
   The diagram below shows these four stages in the community health cycle:

*Which problem should
I attack first?*

COMMUNITY DIAGNOSIS/
CHOOSING PRIORITIES

*How will I know if it
has been done effectively?*

EVALUATION

*What will I
try to do?*

GOALS

*How can I organize a
programme with the resources available?*

ORGANIZATION
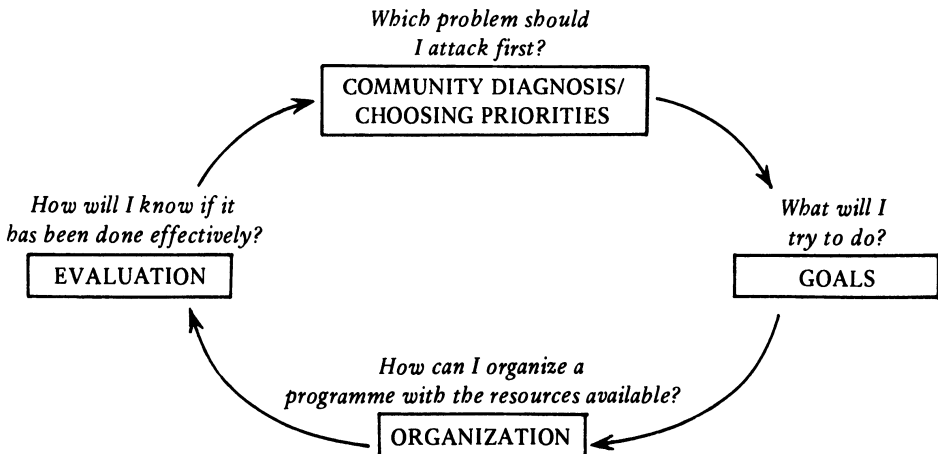
Question 5   How would you calculate the number of women in your catchment population who became pregnant during one year?

(Check your answer before continuing.)
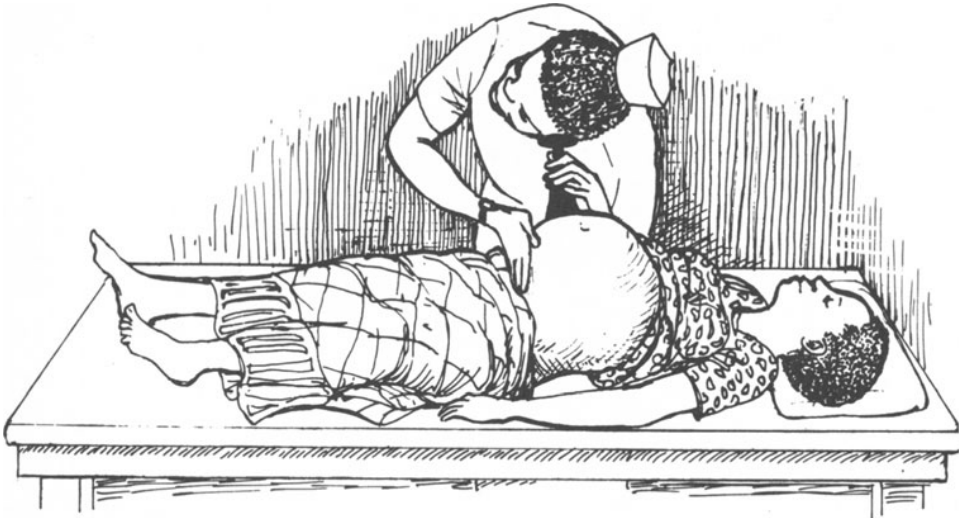
What percentage of pregnant women are receiving this care?

Questions 6–8   The following are some goals for antenatal services. Read each one carefully and decide whether it tells you WHAT, HOW MUCH, and WHEN.

Question 6   At least 50% of the pregnant women in the catchment population will visit MCH clinics.

Question 7   Pregnant women visiting MCH clinics during the next 3 months will be divided into high-risk and low-risk pregnancies.

Question 8   At least 80% of high-risk pregnancies during the next 6 months will be delivered at the health centre or hospital.

(Check your answers carefully.)

Question 3   What four questions about a health problem should you ask to help you choose priorities?

(Check your answer.)

8.4 Setting goals

We have seen that health services have three general goals: primary, secondary and tertiary prevention.

Question 4   (Fill in the blanks.)

> *In general, primary prevention aims to*

> *secondary prevention aims to*

> *and tertiary prevention aims to*

(Check your answers carefully.)

These goals are general. They don't tell you *how successful* you expect to be with your goal. It would be very difficult, for example, for a BCG vaccination programme to prevent all cases of tuberculosis in a population because it would be hard to reach all the unvaccinated people. But it might be possible to prevent, say, 80% of the tuberculosis cases in a population.

When you set goals for health services, you must decide the following:

1. WHAT you hope will happen.

2. HOW MANY people it will happen to.

3. WHEN it will happen.

For example, a goal fcr antenatal services might be: to have at least 90% of pregnant women in the catchment population visit an MCH clinic at least once during their pregnancies during the following year.

What will happen? Pregnant women in the catchment population will visit an MCH clinic at least once during their pregnancies.

How many? At least 90% of the pregnant women.

When? During the following year.

Why do you need to set goals? Goals are needed so that you can tell how success-ful or effective your services are; i.e., goals are necessary for evaluation. If you don't know what you are trying to do, then you will never know whether you have done it! Also, it is important to tell other members of the health care team what the goals of the service are so that they can work together to make the service effective.

Question 9 Write the correct words in the boxes in the community health cycle below:

*Which problem should
I attack first?*

*How will I know if it
has been done effectively?*

*What will I
try to do?*

*How can I organize a
programme with the resources available?*

(Check your answers before continuing.)

8.5 Organization

Imagine that you have chosen as a goal for antenatal services *to have at least 80% of the pregnant women in the catchment population visit MCH clinics at least once dur-ing their pregnancies during the next year.*

Question 10 Is this goal a good one? Does it contain all the information that you need?

(Check your answer.)

Now you must decide how you will work towards this goal. In your community diagnosis you have already estimated the *number* of pregnant women in your popu-lation (in one year) and *where* they live. You must now consider:

How many MCH clinics need to be provided?

Should they be at the health centre or dispensary or should they be mobile?

Where should mobile clinics be held so that they can be reached easily by the pregnant women?

How often should they be held?

What education should be used to tell the community about the clinics?

These are some of the questions that you must ask so that you can decide how to *organize* the programme.

The *resources* that you can use include the three M's:

Money   (budget)
Manpower   (staff)
Materials   (buildings, transportation, drugs and equipment).

There are many different ways that you could use these resources, and many different ways of organizing antenatal services. In planning how you will organize the services, you should consider the COST of the services (what resources do they use?) and how EFFECTIVE they are likely to be (how successful will they be in reaching your goal).

You will need to balance costs against effectiveness in your planning.
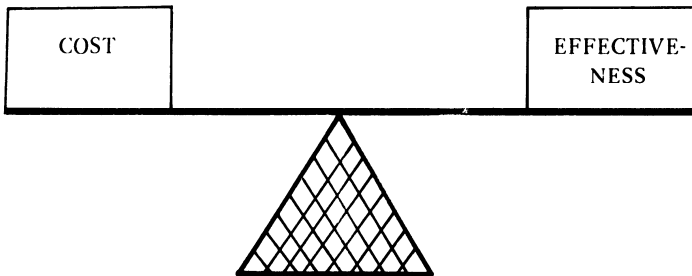
Question 11 What is included under costs, or resources, used by health services?

(Check your answer before continuing.)

8.6 Evaluation

Question 12 Evaluation is the last stage in the community health cycle. What question about health services does it answer?

(Check your answer.)

In order to evaluate health services, you must have GOALS. Evaluation then measures how effective or successful you have been in reaching those goals. Imagine that your goal is to have at least 80% of the pregnant women in the catchment population visit MCH clinics 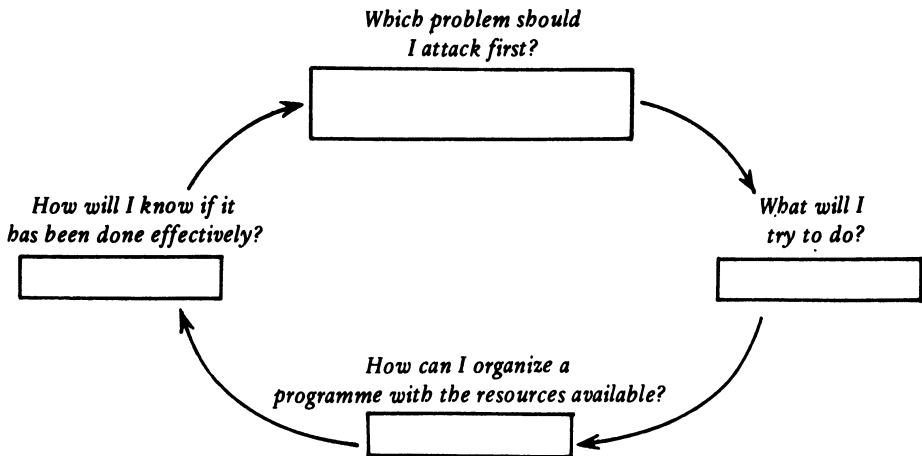at least once during their pregnancies during the next year. You will need to carry out a survey during the next year to find out the number of *first visits* for that pregnancy made at MCH clinics. You would then divide this by the total number of pregnancies to find the *percentage* who have made visits. For example:

Size of catchment population = 50,000
Estimated birth rate = 50 per 1,000 per year

MCH clinic visits for antenatal care during year:

First visits	2,000
Second visits	800
Third or more visits	200
TOTAL	3,000

Question 13 Calculate the total births in the catchment population during one year. What percentage of these births had one or more visits to MCH clinics for antenatal care?

(Check your answer before continuing.)

Question 14 How effective was the programme of antenatal services?

(Check your answer.)

Question 15 Imagine that your goal is, during the next year, to have at least 50% of the pregnant women in your population visit MCH clinics for antenatal care before the third trimester. What information would you need for evaluation?

(Check your answer carefully.)

In Section 8.4 you learned about the importance of sharing the goals of community health services with other members of your staff so that you can all work towards the same goals. You should also keep your staff informed of the progress you are making towards meeting your goals, according to your evaluation. For example, you could make graphs which show the number of pregnant women visiting MCH clinics each week or month, and graphs showing the number or percentage of pregnant women visiting clinics before the third trimester.

The graph below shows total first visits during pregnancy by month in a health centre population. These rise from 100 in January to 150 in October.
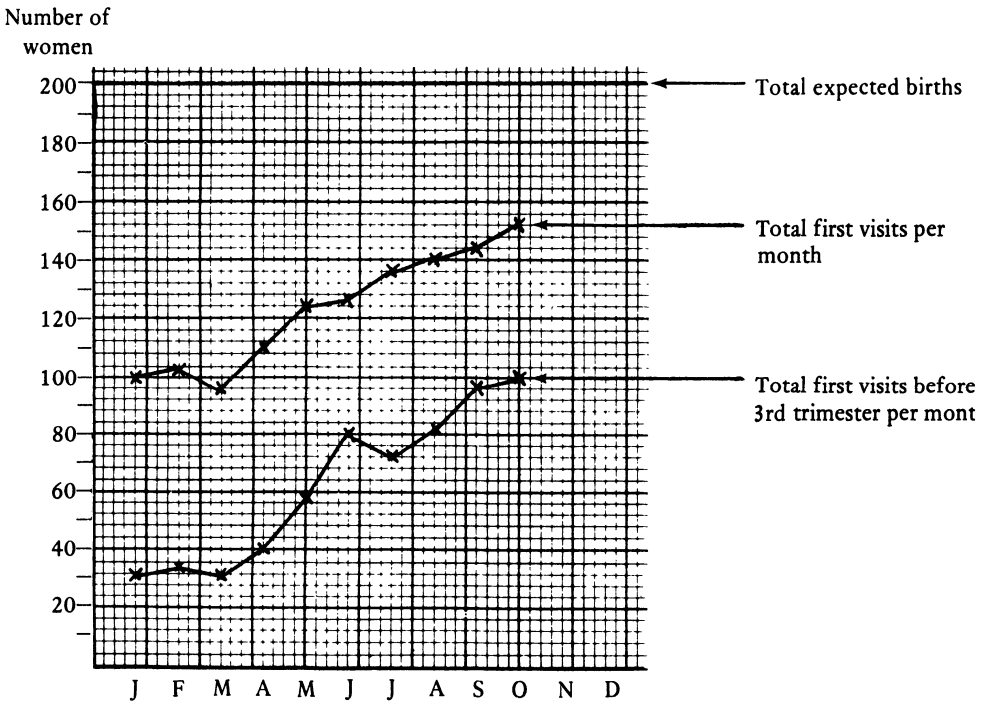
Total expected births and first visits for antenatal care by month in a health centre population.

First visits before the third trimester are also plotted and rise from 30 in January to 100 in October. The straight line at the top shows the expected total births per month in the population (200 per month). The graph shows that both total first visits and first visits before the third trimester have increased over the 10-month period, but that first visits before the third trimester have increased more rapidly. This is shown if you calculate the percentage of first visits which are before

the third trimester. In January, the percentage is:

$$\frac{30}{100} \times 100 = 30\%$$

In October, the percentage has risen to :

$$\frac{100}{150} \times 100 = 67\%$$

Graphs like this one show your staff quickly how well the programme is meeting its goals. You could even mark in the actual goals on the graph. For example, 180 first visits per month and 150 first visits before the third trimester.

8.7 Evaluation of immunization programmes

In this second example of evaluating community health services, consider an immunization programme against measles.

Question 16 Measles immunization is a method of...
              prevention of measles. (Fill in the blank.)

Question 17 What could be some goals for a programme of measles immunization?

(Check your answers to questions 17 and 18.)

There are many problems in planning measles immunization programmes. These include:

—cost: the vaccine is relatively expensive

—unstable vaccine: it must be properly refrigerated to remain active.

Imagine that money is available to buy adequate quantities of vaccine and refrigerators, and that health workers have been trained in the proper storage and administration of the vaccine. Your health centre is asked to introduce measles immunization at your under-5s clinics.

Question 18 In this example, measles immunization has been made a priority. This is the first
              stage of the community health cycle. Name the next three stages.

(Check your answer before continuing.)

The children who are at risk of measles and who should be immunized are aged between 6 months and about 2 years. Children younger than 6 months are protected by their mothers' antibodies; children older than 2 years will probably have had the disease already, in areas where measles is common.

You decide to set your goal: to immunize 90% of the children aged between 6 months and 2 years in your population during the next year.

Question 19 How would you find out how many children there are in that age group?

Question 20 What will you need to know before you organize the programme?

Question 21 How will you evaluate the programme?

(Check your answers to questions 19–21.)

Another goal that you might have for the programme might be to reduce the number of measles cases in the catchment population by a certain amount. To evaluate this goal, you would need to know the number of measles cases *before* the programme to compare with the number of measles cases *after* the programme.

You look over the outpatient records of your health centre and its satellite dispensaries for the past year to find out how many measles cases have been seen in your catchment population. The results are as follows:

	Cases		*Cases*
January	20	July	10
February	40	August	70
March	50	September	60
April	70	October	50
May	40	November	40
June	20	December	30

Total cases for the year = 500.

Question 22 Are these 500 cases the total number of measles cases which have occurred in your catchment population over the previous year? (Give reasons for your answer.)

(Check your answer before continuing.)

Question 23 How could you find out what the true *total number of measles cases was during a given time period in your population?*

(Check your answer.)

Health workers visiting houses for measles survey.

Question 24 Would you miss any cases in a survey like this?

(Check your answer before continuing.)

You now need to convert the number of measles cases into an INCIDENCE RATE.

INCIDENCE RATE =
NUMBER OF NEW CASES OCCURRING
DURING 1 YEAR x 1,000 (or 100 or 10,000 or 100,000)
TOTAL POPULATION

In this case, the measles incidence rate for your population would be:

$$\frac{1,500}{50,000} \times 1,000 = 30 \text{ cases per 1,000 population per year}$$

Incidence rates must always be stated with the population size and time period included. Some other ways of stating this incidence rate might be:

3 cases per 100 population per year
300 cases per 10,000 population per year
150 cases per 10,000 population per 6 months.

Question 25 Why is it better to use this incidence rate rather than simply the number of cases?

(Check your answer.)

Question 26 How is the incidence rate different from the prevalence of a disease (discussed in Unit 6)?

(Check your answer before continuing.)

The table below shows some of the important differences between incidence and prevalence.

Incidence	Prevalence
New cases only included	New and old cases included
Measured over period of time	Measured at point in time
Harder to measure	Easier to measure
Used to evaluate effectiveness of primary prevention	Should not be used for evaluation

In order to use the incidence rate of measles to evaluate a programme of measles immunization, the incidence rate must be measured *before* the programme has started as well as during and/or after the programme. If, for example, the incidence rate of measles is 30 cases per 1,000 per year before the programme, but by one year after the programme has started it has dropped to 10 per 1,000 per year, the programme would seem to be effective.

Question 27 *Write "incidence" or "prevalence" beside each of the statements below:*

(a) *Easier to measure* ....

(b) *Measured over a period of time*...

(c) *Best way to evaluate a programme of primary prevention*.....................................

(d) *Includes new and old cases of disease*..

Question 28 *There are 150 new cases of tuberculosis in a population of 5,000 in a year. What is the incidence rate of tuberculosis?*

(Repeat your calculations.)

Question 29 *How do you calculate the incidence rate of a disease?*

(Check your answers to questions 27–29.)

Question 30 *The incidence rate of schistosomiasis in a community of 100,000 is estimated to be 10 per 10,000 per year. How many new cases of schistosomiasis are diagnosed each year?*

(**Check your answer.**)

Questions 31-32 *In a population there are 10,000 children under 5 years old. At the time of a special nutritional survey 50 of these children are found to have severe malnutrition. Every year 15 new cases of severe malnutrition are diagnosed.*

Question 31 *What is the incidence rate of severe malnutrition?*

Question 32 *What is the prevalence of severe malnutrition?*

(Check your answers before continuing.)

You have learned two methods of evaluating immunization programmes:

1. By finding out the percentage of the population who were immunized.
2. By finding out whether the incidence rate of the disease was reduced.

Question 33 *(a) Which of the two methods is easier to do?*

(b) Which of the two methods will give better information about whether the immunization programme was effective?

(Check your answers before continuing.)

Although the second method is the better method in theory, it will usually not be possible for the staff of a health centre to do the surveys to estimate the incidence rates before and after the programme. The first method is the more useful for you to know about and be able to do.

Question 34 Write in the correct words in the community health cycle below. Also write the questions you are trying to answer.

Question . . . .
. . . .

Question . . . .   **Question** . . . .
. . . .

Question . . . .
. . . .
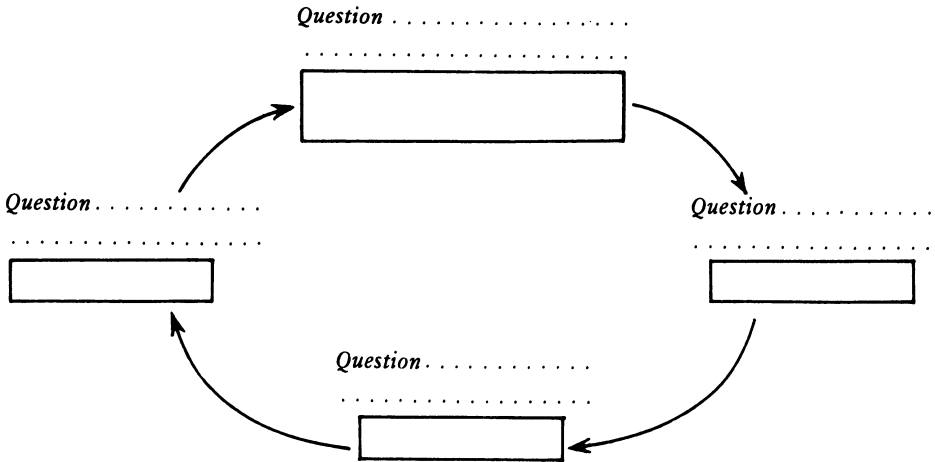
You have now finished Unit 8. Look back at the objectives in 8.2 If there are any parts you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

8.8 Answers to practice questions

1. Making a community diagnosis. (Look back to Unit 1 [1.6] if you do not remember this.)

2. By calculating prevalence rates from a prevalence survey.

3. Is the community concerned about it?
    Is it a common problem?
    Is it a serious problem?
    Can services prevent illness or deaths?

4. In general, primary prevention aims to *prevent disease from occurring;* secondary prevention aims to *detect individuals who already have disease as early in the course of their disease as possible in order to start treatment while it is most likely to be effective;* and tertiary prevention aims to *prevent disability and death in patients whose disease cannot be cured.*

5. You could use the birth rate to calculate the number of births per year in the catchment population. This is somewhat less than the number of pregnancies, but is probably your best estimate.

6. This goal tells you WHAT and HOW MANY, but doesn't tell you WHEN.

7. This goal tells you WHAT and WHEN, but doesn't tell you HOW MANY.

8. This goal answers all three questions.

9. (a) Community Diagnosis/Choosing Priorities
    (b) Goals
    (c) Organization
    (d) Evaluation.

10. Yes. This goal tells you WHAT, HOW MANY, and WHEN.

11. The 3 Ms: Money, Manpower and Materials.

12. How do I know it has been done effectively? *or* How successful have the services been in reaching their goals?

13. Total births = $\dfrac{50}{1,000}$ x 50,000
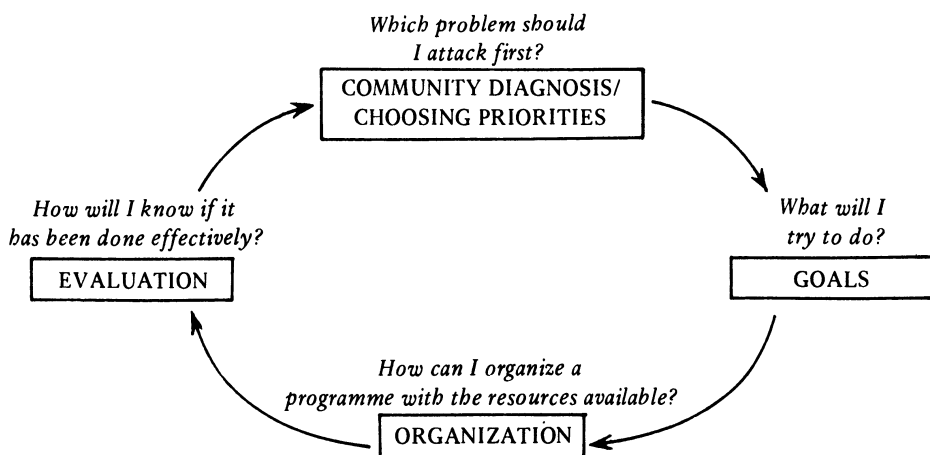
    = 2,500

    Total first visits = 2,000

    % of births to have one or more visits = $\dfrac{2,000}{2,500}$ x 100%

    = 80%

14. The programme was effective because it met its goal of having 80% of the pregnant women visit MCH clinics for at least one visit.

15. You would need the following information:

    Total pregnancies in the population (calculated from birth rate applied to catchment population).

    Total first visits before third trimester (calculated by dividing first visits into "before third trimester" and "in third trimester").

16. Primary.

17. Some possible goals might be:

    (a) To immunize a certain percentage of children in the population (e.g., 80%, 90%) during a certain period of time.

    (b) To immunize a certain percentage of children brought to MCH clinics during a certain period of time.

    (c) To reduce the number of cases of measles (the incidence of measles) by a certain percentage during a certain period of time.

18. Setting goals; organization; evaluation.

19. From the age-sex distribution of your population. If, for example, there are 5,000 children under the age of 5, you could estimate that 1,500 of them were aged between 6 months and 2 years.

20. What resources are available:

    Money
    Manpower   (staff)
    Materials   (clinics, transport, vaccine, refrigerators, etc.).

21. By finding out whether the programme has met its goal. You will need to find out the number of children aged between 6 months and 2 years who were immunized and divide by the total number of children in that age group (see answer to question 20). If this percentage is more than 90%, you have met your goal.

22. No. These 500 cases are only those which were brought to the clinic. They were probably brought because they were severe cases. The true total number of cases would have been greater than 500.

23. You would have to do a survey. This could be done by visiting a sample of households in the population and asking whether any household members had had measles during the previous 12 months. If, for example, you visited a sample of 50 households (a total of 500 individuals) and they reported a total of 15 measles cases during the previous 12 months, then you could estimate that in the total population of 50,000 there had been $\frac{15}{500}$ x 50,000 = 1,500 measles cases in the past year.

24. You might have missed some cases which had been forgotten or not recognized as being measles.

25. With a rate (as with a percentage) you can compare measles in your population with other populations.

26. The prevalence is the percentage of the population with a disease at one *point* in time. The incidence rate measures the number of new cases which occur in the population over a *period* of time.

27. (a) Prevalence
    (b) Incidence
    (c) Incidence
    (d) Prevalence

28. $\dfrac{150}{5,000}$ x 1,000 = 30 per 1,000 per year *or* 3 per 100 per year (3% per year).

29. $\dfrac{\text{Number of new cases of a disease in one year}}{\text{Total population}}$ x 100 (or 1,000 or 10,000 or 100,000)

30. New cases each year = 10 x $\dfrac{100,000}{10,000}$ = 100

31. Incidence rate = 15 per 10,000 per year or 1.5 per 1,000 per year.

32. Prevalence = 50 per 10,000 or 5 per 1,000 (at the time of the nutrition survey).

33. (a) Method 1 is easier to do.
    (b) Method 2 will give better information about the effectiveness of your programme. For example, you might have immunized a large percentage of your population with measles vaccine that was inactive because it had not been refrigerated properly. Only Method 2 would show you that your programme was not effective in preventing measles.

34.

*Which problem should
I attack first?*

COMMUNITY DIAGNOSIS/
CHOOSING PRIORITIES

*How will I know if it
has been done effectively?*

EVALUATION

*What will I
try to do?*

GOALS

*How can I organize a
programme with the resources available?*

ORGANIZATION

IMPROVING THE QUALITY OF SERVICES

9.1 Introduction

Evaluation is important both for your clinical medical work and your community health work. One of your goals is to provide health services to all who need them in your catchment population. The material in the previous units has taught you some ways of planning, organizing and evaluating services to meet this goal. A second goal, also very important, is to provide services of the highest possible quality. It will not do much good to carefully plan and organize a measles immunization programme to reach 90% of the population if you do not also take time to teach your staff the proper way to give the vaccine and supervise them to be sure it is given correctly. This unit is about improving the quality of health services for your catchment population.

9.2 Objectives

After completing this unit, you will be able to:

1. Separate questions which ask about quality of health services from those which ask about quantity of health services.

2. List five methods of improving the quality of services given in clinics and dispensaries. Describe what is meant by standardization of records and action-oriented patient records, and show how they can improve the quality of services, giving examples from antenatal records.

3. Describe the direct observation method of evaluating quality of services.

4. Describe some criteria for evaluation of quality of services.

9.3 Quality of health services

When we talk about health services, it is useful to talk about two different aspects: quantity and quality of services.

If we ask about the *quantity* of services, we want to know how many services are provided; e.g., how many MCH clinics are held each month? When and where are they held and how many mothers and children attend? How many children are immunized against measles each month?

If we ask about the *quality* of services, we want to know how good those services are. Are the methods of diagnosis and treatment used correct? Are the measles immunizations being given the correct way? Is the vaccine being properly refrigerated? Are the pregnant women at antenatal clinics being examined correctly? Are they all examined for diseases and risk factors? This type of question asks about the *quality* of the services, not about the quantity.

What are some of the ways in which we can improve the quality of services given in clinics and dispensaries?

1. By *providing guidelines on correct treatment* (dose, schedule, etc.) for different diseases. A National Formulary and Therapeutic Index, if it exists, contains this type of information.

2. By *providing refresher courses* to help the staff keep up with new developments in prevention and treatment.

3. By *providing adequate supervision*. It is important for you to visit your dispensary and clinic workers regularly to provide "on-the-spot" advice on problem cases which may arise. You also have the chance to observe the treatments given and the various procedures used and to correct improper practices.

In the rest of this unit, you will learn some other ways of improving the quality of services and learn some methods of evaluating quality.

Question 1   Which of the following questions ask about the quality of health services (tick all that apply):

   A.   How many mobile MCH clinics are held each month?

   B.   Are sterile needles used for immunizations?

   C.   How many patients attended the outpatient clinic last month?

   D.   Is the correct treatment for malaria given?

   E.   Are children with malnutrition being diagnosed correctly?

(Check your answers before continuing.)

9.4 Improving quality through patient records

Often when patients see doctors and other health workers, there is very little record-keeping. The health worker may simply make a note on a slip of paper of the treatment he is prescribing for the patient (a prescription slip) which the patient takes to the pharmacy. In other situations, the clinic or dispensary may try to keep records, filed perhaps by the patient's name or by clinic number. The information in these records varies with how busy the health worker is and how sick the patient is. One may find recorded *symptoms* (such as fever, diarrhoea, etc.) or a *diagnosis* (malaria, hookworm, etc), or simply the *treatment* prescribed. In some cases the writing is so bad that it is almost impossible to understand what was written! Why do we try to keep patient records?

Patient collecting clinic record card from registration desk

Question 2   *Try to write down two or more reasons why you think it is important to keep patient records.*

(Check your answers before continuing.)

Now that you have started to think about patient records and why we need them, it will be useful to think of patient records as a way to help you carry out primary, secondary and tertiary prevention.

Question 3   *Write down definitions of primary, secondary and tertiary prevention. List two examples of each type of prevention (e.g., immunization is one example of primary prevention).*

     (a) Primary prevention means

     Two examples are:

     (b) Secondary prevention means

     Two examples are:

     (c) Tertiary prevention means

     Two examples are:

(Check your answers.)

Here are some examples of how patient records can help you with primary, secondary and tertiary prevention.

Patient records and primary prevention
When you see a child attending an under-5s clinic, you must find out whether that child is at risk for malnutrition by recording the child's pattern of weight gain on the Road to Health Chart and by finding out about certain events, such as: weaning, recent measles or whooping cough, absence of either parent. The presence of any risk factors requires special care: careful supervision and health education. In addition, every child attending under-5s clinics must receive a full course of immunizations (unless there are certain contraindications). Each child must have a record of what immunizations have already been given so that you can decide what is still required.

     To carry out primary prevention for individual patients, you need to:

1. Identify and record the patient's risk factors.

2. Take appropriate action (health education, immunization, etc.).

Patient records and secondary prevention
A woman attending antenatal clinics who is short (146 cm or under) must be scheduled for hospital delivery. A woman who has bleeding during her pregnancy must be referred to a doctor immediately.
　　To carry out secondary prevention for individual patients, you need to:

1. Identify and record the patient's risk factors or disease.

2. Take appropriate action (treatment, referral, etc.).

Patient records and tertiary prevention
A patient with leprosy needs to be followed over a long period of time, usually for many years, to be maintained on treatment and to assess whether his disease is progressing or improving.
　　To carry out tertiary prevention for individual patients, you need to:

1. Identify and record changes in the course of the disease and in the patient's general condition.

2. Take appropriate action (adjust drugs and dosage, give health education, etc.).

To summarize
Patient records can help you to carry out primary, secondary, and tertiary prevention in individual patients by:

1. Recording information of the patient's risk factors, disease(s) and change in the course of disease.

2. Indicating when *action* should be taken.

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PATIENT RECORDS SHOULD:
1. RECORD PROBLEMS
2. INDICATE ACTION
```

　　If we rely on health workers to record information on risk factors, disease and change in the course of disease, we will probably not get complete and accurate information. Individuals are different in their skills, knowledge, memory, experience and judgement about, for example, what risk factors should be examined for and recorded. In antenatal clinics, we need to be sure that every patient is asked certain questions (e.g., how many previous pregnancies has she had? Has she had a previous caesarean section or previous stillbirths?) and receives certain tests and examinations

(e.g., height and blood pressure measurements). Making sure that, for example, all antenatal patients receive the same standard history, physical examination and laboratory tests, and that this information is recorded in the same way, is called STANDARDIZATION.

> **STANDARDIZED PATIENT RECORDS**
> **IMPROVE THE QUALITY OF SERVICES**

Question 4 *What are the two ways that patient records can help to carry out primary, secondary and tertiary prevention?*

(Check your answers before proceeding.)

Standardization helps to improve patient records by making sure that information is collected and recorded in a standard fashion.

Question 5 *Here are sections of two antenatal records, A and B:*

Antenatal Record A

Date of visit	Findings

Antenatal Record B
(selected parts only)

History since LMP	Date of visit				
	Bleeding				
	Other symptoms				
Examination	Severe anaemia				
	Oedema				
	BP				
Treatment	Iron				
	Health education about diet				

Which of these two records attempts to standardize the collection and recording of information?

(Check your answers.)

You have probably seen records of the same type as Antenatal Record A. The B type of record is gaining acceptance as it is realized how much more useful information is collected and recorded and how easy it is to quickly review the patient's progress. Standardized patient records will become more widespread in the future. You can help by seeing that your health centre uses standardized records wherever possible.

The second major requirement of records is that they *indicate the appropriate action to be taken.* So often we see health workers routinely collecting and recording information but not *doing* anything about any abnormal findings. We must be sure that, for example, all women 146 cm and under in height are scheduled for hospital delivery, and that *all* women with antenatal bleeding are immediately referred to a doctor. If the records tell what action must be taken, then we make it easier for health workers to make the correct decision. Records which tell what action must be taken are called ACTION-ORIENTED RECORDS.

> **ACTION-ORIENTED RECORDS**
> **IMPROVE THE QUALITY OF SERVICES**

A good way of making sure our records are "action-oriented" is to mark each part of the history or examination where action is required. For example, in one antenatal card, asterisks are used to indicate action:

* means hospital delivery
** means immediate referral to a doctor.

It was decided that a patient with one or more of the following risk factors should be *delivered in hospital*. These risk factors are marked with an asterisk on the record:

* age below 16
* age above 35
* more than 10 years since last pregnancy
* previous caesarean
* previous vacuum extraction or other assisted delivery
* previous PPH (post-partum haemorrhage)
* height below 146 cm
* limp or polio leg
* breech presentation or transverse lie
* twins suspected.

A patient with one or more of the following risk factors should be *immediately referred to a doctor*. These risk factors are marked with two asterisks on the record.

** BP above 140/90 or oedema, and proteinuria
** positive sputum for Tb
** bleeding
** severe anaemia (clinically).

Question 6   *Which of the following is/are methods of improving the quality of health services (tick all that apply):*

    A.   *Providing refresher courses.*

    B.   *Providing adequate supervision.*

    C.   *Providing guidelines on correct treatment.*

    D.   *Standardization of records.*

    E.   *Use of action-oriented records.*

Question 7 A standardized record is (tick one):

    A. A record which is filled out every time the patient visits the clinic.

    B. A record in which information is always collected and recorded in the same way.

    C. A record which tells what should be done for the patient.

(Check your answers to questions 6 and 7.)

9.5 Evaluating quality of services

In Unit 8, you learned about some ways of evaluating community health pro-grammes.

Question 8 What must you have for any health services before you can evaluate them?

(Check your answer before continuing.)

In order to set goals for clinical services which will improve their quality, you must decide what you mean by good-quality services.

For example, what is the best way to diagnose malnutrition? How should needles be sterilized?

The answers to these questions need to be decided upon by all the staff respons-ible for the services. They must define some standards which can be measured and will tell them if the services are of good quality or of poor quality. Standards by which things are judged are called *criteria.*

For example, some of the criteria for good quality antenatal services might include:

(a) Accurate detection of women with pre-eclampsia.

(b) Correct technique in measuring blood pressure.

(c) Hospital delivery for all women with certain risk factors (see list in Section 9.4).

(d) Referral to doctor for all women with certain risk factors (see list in Sec-tion 9.4).

(e) All women to be immunized against tetanus.

(f) Iron tablets to be in stock at all times.

The principles which apply to antenatal records also apply to all patient records.

Question 9 Name two ways of improving patient records which will improve the quality of ser-vices.

(Check your answer.)

Example 1: *Malnutrition in children*

Criteria: (a) Clinically obvious cases of kwashiorkor (with red hair, apathy, oedema, anaemia) to be recognized by the person in charge of the dispensary.

(b) Health education to be given to mothers of malnourished children.

(c) Children with kwashiorkor to be referred to doctor.

Method of Evaluation: The medical students sat beside the person in charge of the dispensary and saw all his patients with him. They observed but did not comment. They recorded:

(a) All the clinically obvious cases of kwashiorkor that they recognized.

(b) The number of cases also diagnosed by the person in charge of the dispensary.

(c) The time spent on health education for each case.

(d) The number of cases referred to a doctor.

Here is a record form which could be used to record this information:

Kwashiorkor Cases			
Dispensary _____ Date _____			
Case	Case diagnosed by dispensary health worker	Time spent on health education (mins)	Referred to doctor
1			
2			
3			
4			

Example 2: *Gastroenteritis in children*

Criteria: (a) All cases of gastroenteritis seen should be assessed for severity of dehydration (by pinching skin, looking for sunken eyes, etc.).

(b) Mothers of cases to be given saline mixture and instructed how to give it to the child.

(c) Moderate and severe cases should be referred.

Question 10 What is meant by "criteria" for evaluating the quality of services?

(Check your answer.)

Question 11 Give some examples of criteria for good quality antenatal services.

(Check your answer.)

Now we shall talk about some methods of evaluating the quality of some different services. The examples which follow are taken from a study carried out by medical students in dispensaries. As you read through these examples, be sure to discuss any disease or treatments that you don't understand with your instructor.

Medical student observing and recording work in a dispensary

Method of Evaluation: Using the same method of observation used for malnutrition, the students recorded:

(a) The total number of cases of gastroenteritis in children seen.

(b) The total number assessed for severity.

(c) The number of dispensaries where saline mixture was available and, if available, the number of cases in which its use was explained to the mother.

(d) The number of moderate or severe cases that were referred.

Example 3: *Scabies*

Criteria: (a) BBE should be applied correctly (all over the body rather than just on the affected area).

(b) Penicillin should not be given to uninfected cases.

(c) Patients should be told to reattend for another application.

(d) Mothers should be instructed to bring any other infected children in the family for treatment.

(e) The mothers should be instructed to treat all non-infected members of the family.

Method of Evaluation: Using the observation method, the students recorded:

(a) The total number of cases seen.

(b) The number in which BBE was correctly applied.

(c) The number of uninfected cases given penicillin.

(d) The number of cases instructed to reattend.

(e) The number of mothers told to bring other infected children and to treat uninfected family members.

Example 4: *General procedures*

Criteria: (a) Correct sterilization of instruments and needles.

(b) Correct injection techniques for PPF.

Method of Evaluation: Using the same method of observation, the students recorded the following general observations for each dispensary:

(a) Whether instruments and needles were boiled for the full 20 minutes.

(b) Whether forceps were correctly used.

(c) Whether items were added and not reboiled.

(d) Whether the correct site was selected for PPF injection.

(e) Whether the correct dose was given.

(f) Whether the correct injection technique was used.

Example 5: *Supplies*

Criteria: Each dispensary should be supplied with the following equipment and drugs:

(a) Equipment	(b) Drugs
torch (flashlight)	BBE
thermometer	adrenaline
tongue depressor	ergometrine
examination couch	oral chloroquine
urine-testing equipment	IM chloroquine
blood pressure machine	thiazina
stethoscope	saline mixture
sutures	dapsone
artery forceps	PPF
airway	Triplopen
schedule for drug doses.	PAM.

Method of Evaluation: Using these two checklists, the students went through the dispensary supplies and noted which were and were not present. If a drug was out of stock, they asked *how long* it had been out of stock.

As you have been reading through these examples, you may have disagreed in some cases with the criteria that were used: this is not the point! The criteria must be decided upon by the people responsible for the services given: the method of evaluation will then tell them whether these criteria are being met. You will have noticed that in all these examples the *direct observation* method was used. It is important that when you use this method for evaluation you do not make any comments during the period of observation on whether the correct treatment or procedure is being used. You should explain this to the person in charge of the dispensary so that you are not asked, "Am I doing this right?" "Is this the right treatment?" —and so on. At the *end* of the period of observation, it is perfectly all right to make some general observations on the quality of services you have observed and use this time to educate the staff.

Question 12 The following criteria are to be used to evaluate the quality of services for patients
with fever:
(a)   temperature to be taken with thermometer

(b) throat must be examined using tongue depressor

(c) chest to be listened to with stethoscope

(d) all cases to be questioned about history of diarrhoea and vomiting

(e) all children below age 5 must have their ears examined.

What method of evaluation will you use to see whether these criteria are used for patients with fever attending the dispensary? How will you measure each of these criteria?

(Check your answer before proceeding.)

Question 13 *Now you will construct your record form to carry out the evaluation described in question 12. Below is one line for each fever patient seen. Decide on the columns and headings you will need to collect the information listed in question 12, and write them onto the record form.*

Fever Study Record Form

Fever Patient	
1	
2	
3	
4	
5	

(Check your answer carefully before continuing.)

Question 14 *Now imagine you have carried out the study on 100 patients, 80 of whom were under 5 years old. The results were:*

Temperature taken = 50

Throat examined = 10

Chest examined = 0

Asked about D & V = 45
Ears examined: adults = 0, children = 8.

Make the necessary calculations to present the results of your study so that they can be compared easily with the results of a similar study at another dispensary.

(Check your calculations and your answers.)

Question 15 *How would you now go about improving the quality of services for fever patients in the dispensary you have studied?*

(Check your answer before continuing.)
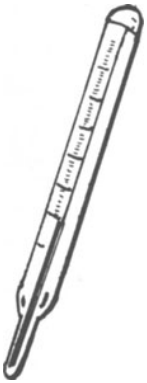
THERMOMETER   STETHOSCOPE   TONGUE DEPRESSOR   AURISCOPE

Equipment required for examining a child with fever

The methods you use to improve quality will differ in different situations. In the example above, refresher courses providing guidelines were helpful.

Question 16 Name some other methods of improving quality of care.

(Check your answers before continuing.)

The method of *direct observation* for evaluating the quality of services is often the best to use, but in some situations you may be able to use existing records. This will be described in more detail in Unit 10: Records and Registers.

The methods described in this unit should be useful to you in your supervision of staff at dispensaries and clinics. Evaluation of quality by direct observation and use of the five ways of improving quality should help you to improve the clinical and community health services for your catchment population.

You have now finished Unit 9. Look back at the objectives in 9.1. If there are any objectives you are not sure about, read through that part of the unit again. Discuss any parts that are not clear with your instructor. When you think you are ready, take the Post Test.

9.6 Answers to practice questions

1. B, D, and E are correct.

2. You may have thought of some of the following reasons for keeping patient records:

    (a) If the patient must return several times for treatment for his illness (e.g., a course of intramuscular iron treatment), it is important to record the total doses given to decide whether the patient has received an adequate total course of treatment.

    (b) If a patient attends many times for treatment of a given condition without much improvement, it may be time to consider another form of treatment (e.g., the patient with tropical ulcer who has not responded to dressings and penicillin therapy).

    (c) In some diseases, a sudden change in the patient's condition can only be detected if a "baseline" of measurements has already been made (e.g., sudden weight loss or failure to gain weight in a young child can only be detected if the child's previous pattern of weight gain is known).

    (d) To carry out certain types of primary prevention of disease—health education and immunization—we need to be sure that everyone "at risk" receives the health education message or dose of vaccine that is required. A record is required of what the patient has already received so that the health worker knows what is still required.

    (e) Often information on a patient's past history of illnesses, treatments and results of screening tests is useful in identifying the patient's "risk factors" which can be used to plan appropriate care for the patient (e.g., the pregnant woman with a history of repeated stillbirths is at risk for another stillbirth and should be referred for hospital delivery).

    This list is only partial; you probably thought of other reasons for keeping patient records which you should talk about with your instructor.

3. (a) Primary prevention means preventing healthy people from becoming sick.

    Some examples include: immunization, health education, nutrition, provision of safe water and adequate housing, safe disposal of human excreta, vector control.

    (b) Secondary prevention means detecting and treating people who already have the disease as early as possible to cure the patient.

    Some examples include: early case finding, screening, e.g., in MCH clinics.

    (c) Tertiary prevention means prevention of more disability and death in a patient who cannot be cured.

    Some examples include: regular examination of patients with chronic disease, rehabilitation, physical therapy.

4. (a) By recording information on the patient's risk factors, disease(s) and change in the course of the disease.

    (b) By indicating where action should be taken.

5. Only Record B attempts to standardize the collection and recording of information, by listing for each visit the various questions, examinations and treatments that may be required. In Record A, it is up to the individual health worker what he may examine and treat and how he records it.

6. All are correct.

7. B.

8. Goals.

9. By using standardized and action-oriented patient records.

10. These are standards by which things are judged. They should be defined by the people responsible for the health services. Measurement of these criteria will tell you whether the services are of good quality or of poor quality.

11. Any of the following, which were already mentioned in the text:
    (a) accurate detection of women with pre-eclampsia
    (b) correct technique in measuring blood pressure
    (c) hospital delivery or referral to doctor for women with certain risk factors
    (d) all women to be immunized against tetanus
    (e) iron tablets in stock at all clinics.

    You may have thought of several other examples. Discuss these with your instructor before continuing.

12. The method of evaluation would be direct observation. You would observe the management of fever cases according to the criteria and measure:
    (a) total number of fever cases seen
    (b) number of cases where temperature was taken
    (c) number of cases where throat was examined
    (d) number of cases where chest was listened to
    (e) number of cases asked about diarrhoea and vomiting
    (f) number of cases aged under 5
    (g) number of under-5s where ears were examined.

13. The following layout will work well. Results have been recorded for two patients.

Fever patient	Age A—adult C—children	Temperature taken	Throat examined	Chest examined	History of D&V	Ears examined
1	A	0	+	+	+	0
2	C	+	+	+	+	0
3						

The age of the patient is simply recorded for purposes of this study as C (child under 5 years old) or A (adult or anyone 5 years of age or older). Under all other categories you simply put + if the examination was performed and 0 if it was not performed.

14. Results of study:

    Total cases seen: 100
    % cases where temperature taken = 50%
    % cases where throat examined = 10%
    % cases where chest examined = 0%
    % cases asked about D & V = 45%
    % children under 5 where ears examined = 10% $\left(\dfrac{8}{80}\right)$

    (It is important to present your results in percentages so that they can be compared with other results.)

15. First you should find out why some of the examinations were not being performed. For example, the chests may not have been examined because there was no stethoscope in the dispensary. When you have made sure that the equipment is present, then you should hold a refresher session with the person in charge of the dispensary on "diagnosis" of fever cases. It would probably be helpful if you demonstrated the correct procedure on a few patients, showing how you reach a diagnosis. It would also be helpful if you left at the dispensary a list of guidelines on the steps to be carried out in diagnosing cases of fever. Most important, you should revisit the dispensary after a period of, say, one to three months, to see whether the quality of services has improved.

16. (a) use of patient records (standardized and action-oriented)
    (b) supervision.

Unit ten

RECORDS AND REGISTERS

10.1 Introduction

As part of your job, you will need to keep patient records, send in periodic reports to your supervisors and maintain registers for certain groups of patients in your catchment population that you need to follow carefully, such as patients with tuberculosis and leprosy. You may wonder what is the purpose of all these pieces of paper and why it is important to complete them carefully and accurately. In this unit, you will learn about some of the reasons that we are concerned about records, and about some ways that you can make your records help you to be more effective in managing your patients and the health problems of your catchment population.

10.2 Objectives

After completing this unit, you will be able to:

1. Name at least one advantage and one disadvantage of patients keeping their own records.

2. Define epidemic, endemic and sporadic disease patterns and give one example of each.

3. Describe a method of record-keeping or design a record form for use at dispensaries and outpatient clinics which allows you to:
   (a) describe users of health services
   (b) detect epidemics in their early stages.

4. Describe a method of record-keeping for antenatal clinics which allows you to evaluate the effectiveness of services.

5. Design a record form which allows you to evaluate the quality of services given at dispensaries.

6. List the principles of designing survey records.

7. Given one item of information on a survey record, design an appropriate method of recording the response, using precoding if appropriate.

10.3 Purposes of records

We can divide records into three broad groups:

1. Patient care records, for management of individual patients.

2. Health facility records, for the planning, organization and evaluation of services.

3. Special survey records.

In this unit, we shall consider some examples from each group.

10.4 Patient care records

In Unit 9 you learned how patient records can improve the quality of health services.

Question 1   What are two ways that patient records can improve the quality of health services?

(Check your answers before continuing.)

   In addition to improving the quality of care, patient records are important to help patients to understand their own health problems and to begin to take some responsibility for solving them. For example, the Growth Chart gives mothers a picture of their child's progress that they can take pride in. It can help them to see when their child strays from correct development and reminds them that they must help to bring him back again. This is one good reason why patients should keep their own records.

Question 2 *Can you think of any other reasons why it is important for patients to keep their own records?*

Question 3 *What are some possible disadvantages of patients keeping their own records?*

(Check your answers to questions 2 and 3.)

Although there is a small chance that some patients may lose their records, it has been demonstrated that very few, in fact, do. Even if the records are kept centrally at a clinic or health facility, it is still possible that they will not be found when they are needed because they have been filed in the wrong place. To avoid the possibility of tearing or spoiling the record, it is a good idea to provide a plastic envelope for the patient to keep the record in.

Mother going home with Growth Chart in plastic bag

10.5 Detection of epidemics

Another important function of records is the early detection of *epidemics* of disease. Before continuing, we should think of what we mean by "epidemic".

Question 4   *You have probably heard and used the word "epidemic" before. Try to write down a definition for it.*

(Check your answer.)

Question 5   *Decide in each case below whether you think an epidemic has occurred:*

     (a) *In one village, normally between 5 and 10 measles cases occur each month, with an average of 7 per month. During a particular month 20 cases occur, followed by 45 cases the following month.*

          Tick one: *Epidemic*

                    Not an epidemic

     (b) *Smallpox has been eradicated from a country for 4 years, i.e., no cases of smallpox have been reported for that period of time. Then two smallpox cases are reported within a 2-week period.*

          Tick one: *Epidemic*

                    Not an epidemic

(Check your answers.)

**EPIDEMIC = UNUSUAL INCREASE
IN THE INCIDENCE OF A DISEASE**

In deciding whether an epidemic is occurring, you need to know the *usual* incidence of the disease that you can compare your 'epidemic' information with.

Question 6   *Which rate would be most helpful to you in deciding whether there was an epidemic of malaria in your community?   A. Incidence rate.*

                 B. Prevalence rate.

(Check your answer before proceeding.)

Several patterns of occurrence can be defined:

1. Diseases that are always present in the population at roughly a constant level (endemic diseases). The prevalence and the incidence of the disease are fairly constant over time. Examples are tuberculosis, malnutrition and malaria (in the coastal regions).

2. Diseases that show unusual increases in frequency over time (epidemic diseases). Diseases like poliomyelitis and measles are epidemic diseases because, although they are always present in the community, the incidence of either disease may suddenly increase rapidly, giving rise to an epidemic. The reason for an increased

incidence of diseases which spread from person to person may be due to con-
ditions which keep people indoors and close to one another so that the virus or
other disease agent has a better chance to spread from one person to another.
Thus, we may see epidemics of such diseases following a period of cold or rainy
weather. Other diseases which depend on vectors for transmission may produce
epidemics following conditions favourable to vector breeding. Thus, epidemics
of malaria occur every year immediately following the rainy season in some parts
of the world where the disease is not endemic. (Even in endemic areas there may be
an increased incidence of malaria following the rains.)

3. Diseases which are not normally present in the population, but give rise occasion-
ally and irregularly to epidemics, are called *sporadic diseases*. An example would
be plague.

You need to know how to keep records in your health centre and dispensaries
that will help you to detect early epidemics of these important and dangerous diseases.

*Question 7   Why would it be important to try to detect an epidemic of measles as early as
possible?*

(Check your answer.)

Diseases which are normally not present in the population so that even one case
can be an epidemic, such as *smallpox*, are not a problem as long as you are able to
recognize a clinical case. While this may be an easy job for an older health worker
who had experience with smallpox, it is not so easy for a younger person who has
never seen a case of the disease. It may be useful to ask these people to record any
adult case of chickenpox they see, as chickenpox is extremely rare in adults and may
be confused clinically with smallpox.

Cholera is another disease where there may be problems with recognizing the dis-
ease. Asking health workers to record any cases they see of profuse, watery diar-
rhoea in adults may be more satisfactory than asking them to record cholera cases.
Although sporadic cases of profuse watery diarrhoea in adults may not be cholera
cases, a sharp increase in the incidence of cases with these symptoms should immedi-
ately alert you to the possibility of a cholera epidemic.

An epidemic of *measles* may be hard to detect in the early stages if records are
not kept. It is surprising how inaccurate the answers are when you ask a health
worker how many cases of measles he sees at his dispensary each week. Our mem-
ories are not as good as we would like them to be. A health worker who sees an aver-
age of 5 cases of measles a week would probably miss an increase to 10 or 15 cases in
one week unless he had been keeping routine records.

Question 8 Choose one name and one disease for each of the following definitions:

(a) *A disease which is not normally present in the population which may give rise to occasional epidemics:*

Name *(Tick one)*	Disease *(Tick one)*
A. *Epidemic*	D. *Tuberculosis*
B. *Endemic*	E. *Plague*
C. *Sporadic*	F. *Measles*

(b) *A disease which is always present in the population at about the same level:*

Name *(Tick one)*	Disease *(Tick one)*
A. *Epidemic*	D. *Tuberculosis*
B. *Endemic*	E. *Plague*
C. *Sporadic*	F. *Measles*

(c) *A disease which shows unusual increases in frequency over time:*

Name *(Tick one)*	Disease *(Tick one)*
A. *Epidemic*	D. *Tuberculosis*
B. *Endemic*	E. *Plague*
C. *Sporadic*	F. *Measles*

(Check your answers before continuing.)

One way of keeping track of the important epidemic diseases we have been discussing is for dispensary and health centre workers to keep daily records of certain conditions seen at outpatient clinics. The form below is one way this information can be recorded, and it seems to work well in practice. *Remember*, you are not asking the health worker to keep a record of every patient he sees, but only of certain selected diseases or symptoms.

Disease or symptom(s)	Mon	Tues	Wed	Thurs	Fri	Sat	Weekly total
Measles							
Severe watery diarrhoea in adults							
Fever, lymph gland swelling in groin							
Paralytic polio							
Chickenpox in adults							
Smallpox							

You can plot the information that you collect in this way onto a graph to show time trends in the incidence of that condition. For example, your weekly measles total could be plotted as follows:
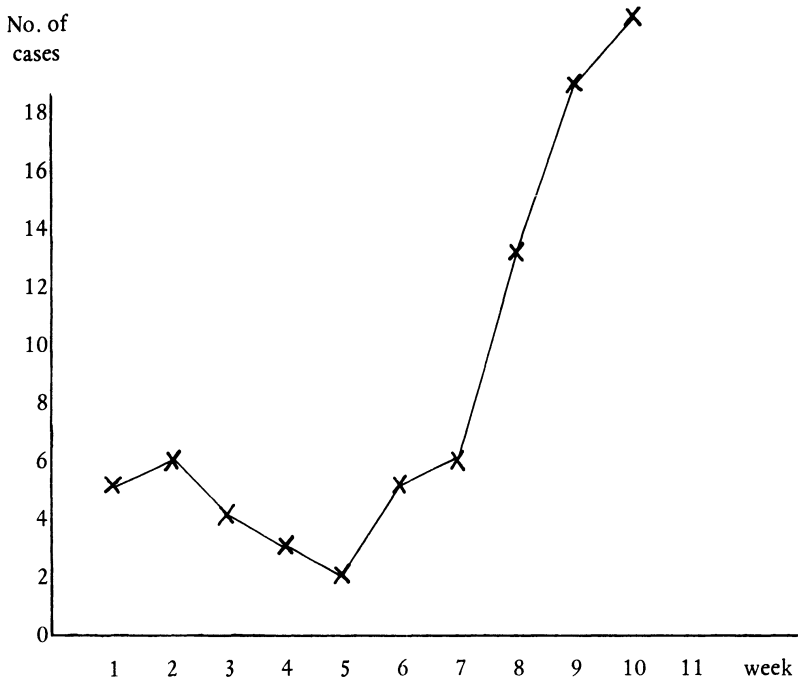
Weekly totals of measles cases at a dispensary.

Up to week 7, the weekly total cases are between 2 and 7. Beginning at week 8, there is a sudden rise in the incidence of cases, which continues over the following weeks. An epidemic of measles is obviously occurring. By plotting the cases in this way, you should suspect an epidemic in week 8 and be sure by week 9. You should report this epidemic immediately to your District Medical Office. Similarly, if you suspect an epidemic of any of the other diseases you are keeping records on, you should report it immediately. Even a few cases of severe watery diarrhoea or of paralytic polio can signal an epidemic, if this is an *increase over the usual level of cases.*

REPORT A SUSPECTED
EPIDEMIC IMMEDIATELY

10.6 Planning and organizing health services

Keeping regular but simple records may be useful to you in ways other than in the early detection of epidemics. If you know which are the most frequent types of disease and symptoms seen at your health centre or dispensaries, this will help you to plan the services which are required. This may help to save you time also. For example, if you find that you are seeing a lot of school children with minor cuts and ulcers requiring dressings, it may be worthwhile talking to the school teachers at your local school and planning special school health clinics where many children can be quickly examined and treated. If you find that scabies is a problem that you see frequently, you may try to bring back all your scabies patients and their families on a certain day when you hold a health education programme on the prevention and proper method of treatment of scabies. Another use for this information would be in planning refresher courses for your staff, by selecting conditions that they see more frequently.

Question 9 *When you record symptoms and diagnoses of patients seen at outpatient clinics, what are you measuring? (Tick one.)*

    A. *Need for health services*

    B. *User of health services*

    C. *Both A and B above*

    D. *Neither A nor B.*

(Check your answer before attempting question 10.)

Question 10 *In order to measure users of health services at a dispensary, would it be necessary to record* all *diagnoses and symptoms seen* every *day?*

(Check your answer before attempting question 11.)

Question 11 *If you tried to get a dispensary worker to co-operate in such a project, what do you think his reaction would be?*

(Check your answer.)

You could use the record below to obtain this type of information:

Date of clinic			
Patient No	Sex	Age	Symptom/Diagnosis
1			
2			
3			
4			
5			
6			

The sex of each patient would be recorded as M or F. The age of each patient could be coded into the following categories:

$$C = Child (under 5)$$
$$S = School-age child$$
$$A = Adult.$$

The other way, which is quicker but leaves out age and sex of each patient, is to simply make a count of certain conditions of interest, as shown below:

Disease/ Symptom	Mon	Tues	Wed	Thurs	Fri	Sat	Weekly Summary
Scabies							
Gastro-enteritis							
PCM							

Other diseases/symptoms could be added to this list. This record could be used if you wanted to investigate time trends in certain conditions, e.g., you would like to know whether you are seeing a larger or smaller number or percentage of cases of childhood malnutrition than in previous weeks and months.

Question 12 Look carefully at the record above. What additional information would you need to calculate the percentage of certain diseases seen each day or each week?

(Check your answer before attempting **question 13.**)

Question 13 Why would it be important to use percentages instead of the actual numbers of cases?

(Check your answer.)

Another type of record using a counting system which you may come across is shown below:

Disease or Symptom	Day					Weekly Total
	Mon	Tues	Wed	Thurs	Fri	
	00000 00000	00000 00000	00000 00000	00000 00000	00000 00000	

Instead of marking a count of seven cases seen on one day like this:

you would mark seven of the 0's like this:

<div align="center">

00000

00000

</div>

Question 14 Name two reasons for keeping a count of the types of symptoms or diseases which are seen each day at dispensaries and outpatient clinics.

(Check your answers before continuing.)

10.7 Evaluating health services

In Unit 8, you learned about some ways of evaluating the effectiveness of antenatal services. Below is shown a possible layout for part of an antenatal clinic record which would allow you to evaluate antenatal services.

Antenatal Clinic Record

Place   VILLAGE A   Date   7/9/75

Attendance	1st 12 weeks	13–28 weeks	29–40 weeks	Trim 1	Total 6
1st	ϕϕϕϕϕ 00000 ϕ0000 00000	ϕϕϕϕϕ ϕϕ000 ϕϕϕϕϕ 00000	ϕϕϕϕϕ ϕϕϕϕϕ ϕϕϕϕϕ 00000	2 3	12 15 ___ 33
2nd	ϕϕϕϕϕ ϕ0000 ϕϕϕϕϕ 00000	00000 00000 00000 00000	00000 00000 00000 00000		11
3rd	ϕϕϕϕ0 00000	00000 00000	00000 00000		4
More	00000 00000	00000 00000	00000 00000		0
Total					48

Question 15 Give some examples of how you could use this antenatal clinic record to evaluate the effectiveness of the services. (Use the numbers provided to make any necessary calculations.)

(Check your answer.)

Question 16 How would you evaluate the quality of services given in a dispensary?

(Check your answer.)

As you saw in Unit 9, the criteria for good quality care may include criteria for correct diagnosis, for correct treatment, for correct referral and follow-up or for necessary supplies. Whichever criteria you choose, you will need a record form on which to record the results of your observations.

Question 17 Design a record form on which details of treatment are to be recorded for all patients seen at a dispensary on a certain day.

(Compare the form you have designed with the specimen in the answer section.)

Question 18 For which of the following could you use the information collected on this form? (Tick as many as you like.)

  A. *Evaluating quality of treatment*

  B. *Measuring use of health services*

  C. *Determining the age-sex distribution of users of the dispensary*

  D. *Measuring need for health services.*

(Check your answers before continuing.)

10.8 Survey records

In Unit 6, you learned about some of the types of survey or special investigation which you may decide to undertake or which you may be asked to participate in. These may include prevalence surveys, demographic surveys and KAP surveys, as well as surveys of users of health services.

  In each of these types of survey, you may need to design a record form. If the information collected is fairly simple, then you may use one piece of paper or a book to record the required information on all the individuals in the survey. For example, in a school survey where you are estimating the prevalence of BCG and smallpox vaccination scars, the form below may be quite adequate:

No.	Name	Present or absent	BCG scar	Smallpox scar
1				
2				
3				
4				

School_____ Class_____ Date_____

Question 19 Why is it important to write in the names of children who were absent as well as those present for the survey?

(Check your answer.)
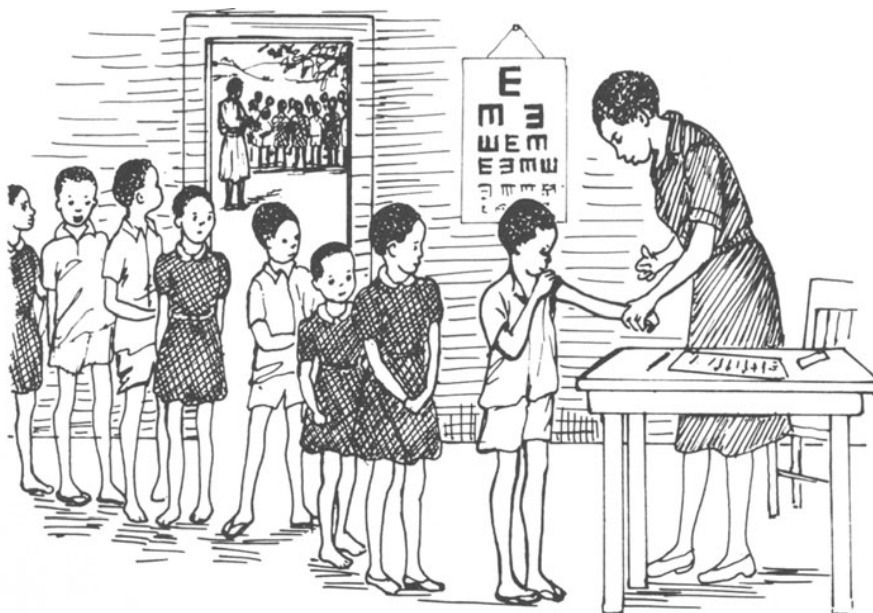
Nurse looking for BCG scars on children's forearms

If the survey information is more complicated than this or if you need to do any special analysis, e.g., if you are examining the children for the presence of various parasites and if you want to relate this information to method of excreta disposal used at the child's home, then you should keep a separate record form for each individual in the survey. Use the sturdiest paper or card that you can, as you may be handling and sorting these records quite a lot.

The important principles in designing records are:

> **RECORDS SHOULD BE**
> **SIMPLE**
> **CLEAR**
> **AND STANDARDIZED**

Question 20 What is meant by a standardized record?

(Check your answer.)

You must clearly indicate on the record *what* information is to be collected and *how* it should be recorded.

Wherever possible, responses to a given item should be listed so that the person filling out the record form has only to tick the appropriate box.

Question 21 Which of the following methods of recording marital status would be better? (Tick A. or B.)

> A. *Marital status* _____
>
> B. *Marital status (Tick one):*
>
> | | |
> |---|---|
> | ☐ | *Married* |
> | ☐ | *Single* |
> | ☐ | *Divorced* |
> | ☐ | *Separated* |
> | ☐ | *Widowed* |
> | ☐ | *Unknown* |

It is usually helpful to number the boxes for each possible response. This makes sorting the cards easier. Also, if the information is to be later transferred to punched cards, the numbering will already have been done. Example:

Marital status (Tick one):

1		Married
2		Single
3		Divorced
4		Separated
5		Widowed
6		Unknown

Another example, using age divided into convenient groups:

Age in years (Tick one):

1		0–4
2		5–14
3		15–44
4		45 and over
5		Unknown

This type of procedure is known as *precoding*. All the responses or results of interest to the items in the survey are given a code. It is easier to *precode* the information *before* the survey is carried out than to try to code the information afterwards. For example, if you had not precoded the age item in your form, it would have appeared as follows:

Age in years

and the people filling in the forms might have written in responses such as,

"about 45" or "in the 40's"

which would be hard to code, as you wouldn't know whether to assign them to the 15–44 or to the 45 and over age group.

Question 22 One of the items on your survey record is sex of the patient. How would you make sure this information is recorded in a standardized way? Show how you would write out this item on the survey record and try to precode the answers.

(Compare your answer with the suggested format.)

Question 23 *Fill in the blanks:*

> *Records should be...,*

> *.., and*

> *...*

(Check your answer.)

Question 24 *(a)* *What is meant by precoding?*

(b) *What are the advantages of precoding?*

(Check your answers.)

Congratulations! You have now completed Unit 10: Records and Registers, and have reached the end of this series of Self-Instructional Units in Community Health. Look back at 10.2 and make sure that you understand all the objectives. Read through any sections again that you are still confused about, and discuss them with your instructor. When you are ready, take the Post Test.

We hope you have enjoyed this self-instructional course and that the knowledge and skills you have acquired will make you a more effective health worker.

Good luck!

10.9 Answers to practice questions

1. By being (a) standardized
                (b) action-oriented.

2. So that when they move or become sick in another place or are visited at home by health workers, they can produce their own records.

3. The records may become lost or torn or dirty.

4. An epidemic is an unusual increase in the incidence of new cases of a disease.

5. (a) Yes, this is an epidemic, as there has been a marked increase in the incidence of measles cases over a 2-month period.

    (b) Yes, this is also an epidemic, as there has been a marked increase in the incidence of cases from none over a period of 4 years to two in a period of 2 weeks. This is clearly an unusual incidence.

6. A. Incidence.

7. So that efforts could be made to control, or to halt, the epidemic by administering measles vaccine to the non-immunized young children in the population.

8. (a) C and E.
    (b) B and D.
    (c) A and F.

9. B.

10. Not necessarily. You could record this information on a sample of patients; for example: every 10th patient, or patients seen on certain days only.

11. He would be more likely to co-operate if he were asked to record this information on a sample of patients.

12. The total number of patients seen each day.

13. So that you could *compare* results obtained at different times of the year or compare two or more dispensaries.

14. Any two of the following:
    (a) Detection of epidemics.
    (b) Measuring users of health services.
    (c) Planning health services.

15. You could calculate the following directly from the record:
    (a) Total first visits. (In order to calculate the percentage of pregnant women who use the antenatal clinic, you need to estimate total births from the birth rate.)
    (b) Percentage of first visits which are in the first trimester $\dfrac{6}{33}$ x 100 = 18%

Discuss some other ways of using this form for evaluation with your instructor.

16. By selecting criteria for quality, and then directly observing whether the criteria are met.

17. The form below would be suitable for collecting details of treatment:

Date of clinic				
Patient No.	Sex	Age	Symptoms/diseases	Treatment
1				
2				
3				
4				
5				

18. A, B, and C are correct.

19. This is important for two reasons:
    (a) If a large percentage of the children are absent for the survey, then the results are likely to be biased and you may have to return to re-examine the missing children.
    (b) When you revisit, then you will need the names of the children to be examined.

20. A record in which the same information is collected on all patients and is recorded in the same way.

21. B would be better, as the information-recording is standardized.

22. Sex (Tick one):

    1 [ ] Male

    2 [ ] Female

    3 [ ] Unknown/not recorded

    (You may think that the "unknown" category is not necessary, but it may be if you are doing a survey from records or if the interviewer forgets to record the information and it is not clear from the person's name.)

23. Records should be *simple, clear,* and *standardized.*

24. (a) Precoding means listing all the answers to a given item and giving a number code to each response.

    (b) The information is easier to interpret. The records are more easily stored and analyzed. The information may be readily transferred to punched cards.

DEFINITIONS OF TECHNICAL TERMS AND CONCEPTS

The most important definitions used in the units are listed here. The numbers in brackets refer to the unit section where the term is first discussed.

Action oriented records (9.4)
    Records which show what actions should be taken.
Average (4.4)
    The sum of a group of measurements divided by the number of measurements.
Biased sample (6.4)
    Sample which is not representative and gives wrong answers.
Birth rate (5.6)
    Number of births per 1,000 population per year.
Catchment population (5.3)
    The population served by a health facility.
Clinical stage of disease (1.5)
    The stage where there are signs and symptoms.
Community diagnosis (1.6)
    Describing the health problems of the community.
Criteria for evaluating quality of services (9.5)
    Standards which are used to judge whether services are of good or poor quality.
Death rate (5.7)
    Number of deaths per 1,000 population per year.
Demographic survey (6.6)
    Survey which measures the population e.g. by age and sex, birth and death rates.
Endemic disease (10.5)
    Disease which is always present in the population at a roughly constant level.
Epidemic (10.5)
    Unusual increase in the incidence of a disease.
Evaluation of community health services (8.6)
    Methods of knowing whether the services have met their goals.
False negative (7.6)
    A screening test result which is negative but the patient *does* have the disease or risk factor.
False positive (7.6)
    A screening test result which is positive but the patient *does not* have the disease or risk factor.
Frequency distribution (3.5)
    A method of presenting a series of measurements, by dividing them into groups and counting the number in each group.
Goals for community health services (8.4)
    Statements of what the services will try to do.
Histogram (3.6)
    A graph made from a frequency distribution.

Incidence rate (8.7)
Number of new cases of disease occurring during one year x 1,000 (or 100 or 10,000 or 100,000) divided by the total population.

KAP survey (6.7)
Survey which measures *K*nowledge, *A*ttitudes and *P*ractice about a disease or health problem.

Line graph (4.6, 4.7)
Graph drawn by connecting points on a graph with straight lines.

Mean (see Average)

Method error (7.5)
Test result is not repeatable because of changes in the instrument or method used.

Need for health services (1.7)
People in the community who need health services because of a health problem, including users and non-users of health services.

Patient error (7.5)
Test result is not repeatable because of changes in the patient being tested.

Percentage (3.3)
The number of people in a group with a characteristic, divided by the total number of people in the group, and multiplied by 100.

Population pyramid (3.7)
Histograms of the population showing age groups for each sex.

Precoded records (10.8)
Survey records in which all responses or results of interest are given a code before the survey.

Prevalence (6.5)
The percentage (or rate per 1,000 or 10,000) of the population with a disease or special characteristic.

Prevalence survey (6.5)
Survey to find out the percentage of the population with a disease or special characteristic.

Primary prevention (2.4)
Preventing healthy people from becoming sick.

Priorities in community health services (8.3)
Choosing which problem to attack first.

Quality of health services (9.3)
The quality of health services tell us how good those services are.

Range (3.4)
The difference between the highest and lowest measurement in a group of measurements.

Rate of natural increase (RNI) (5.7)
The birth rate minus the death rate.

Repeatable test (7.5)
A repeatable test will give the same result if it is repeated many times.

Representative sample (6.4)
A sample which is chosen in a random way so that it truly represents the population it comes from.

Risk factor (1.4)
A risk factor for a disease is a factor which may cause a person to get the disease.

Sample (6.4)
A sample of the population is any part of that population.

Sample survey (6.4)
Survey of a sample of a population.

Screening test (7.3)
A simple, cheap, quick way of detecting people with risk factors or subclinical disease.

Secondary prevention (2.5)
Detecting people who already have disease as early as possible to cure the patient and prevent chronic disease and disability.

Sporadic disease (10.5)
Disease which is not normally present in the population but gives rise occasionally and irregularly to epidemics.

Standard weight for age (4.5)
The average weight of children from a standard population in a given age-group (Harvard students are in common use).

Standardized records (9.4, 10.8)
A record in which the same information is collected on all patients and is recorded in the same way.

Subclinical stage of disease (1.5)
The stage where a disease has started but there are no signs or symptoms and the patient does not know that he has any disease.

Tertiary prevention (2.6)
Prevention of more disability and death in a patient who cannot be cured.

Tester error (7.5)
Test result is not repeatable because of changes in the way the test is measured.

Use rate of health services (5.5)
Number of persons using health services per 100, 1,000 or 10,000 population during a specif: time period.

POST TESTS

Do *not* look back at the units while you answer these questions. Do all the questions *before* you look up the answers.

POST TEST TO UNIT ONE

Tick the *one* correct answer to each of these questions.

1. *Which of the following tasks are community health tasks?*

   A. *Detecting a measles epidemic in a community.*

   B. *Treating malaria patients.*

   C. *Planning a BCG immunization programme.*

   D. *Diagnosing a patient with heart disease.*

   E. *A and C.*

2. *Which of the following is the definition of a risk factor?*

   A. *A person who has an infectious disease.*

   B. *A dangerous job.*

   C. *A factor which is present in people with disease.*

   D. *A factor which may cause a person to get a disease.*

   E. *None of the above is the correct definition.*

3. *Which of these statements is/are correct about clinical and subclinical disease?*

   A. *People with subclinical disease have signs and symptoms.*

   B. *People with subclinical disease do not have signs and symptoms.*

   C. *People with clinical disease do not have signs and symptoms.*

   D. *A and C are correct.*

   E. *B and C are correct.*

4. *Which of these are outcomes of clinical disease?*

   A. *Recovery.*

   B. *Disability.*

   C. *Death.*

   D. *All of the above are outcomes.*

   E. *None of the above are outcomes.*

5. Which of the following is the best way to make a community diagnosis?

    A. Look at existing medical records.

    B. Attend village gatherings.

    C. Visit people in their homes.

    D. Talk to village leaders and health workers.

6. Which of the following could be reason(s) that sick people are non-users of health services?

    A. They do not have severe symptoms.

    B. They use traditional treatment.

    C. They live far from the health services.

    D. A and C.

    E. A, B, and C.

7. How would you count the users of health services in a community?

    A. By surveying people in their homes.

    B. By looking at records at the health centres.

    C. By counting the health services.

    D. A and C.

    E. A, B, and C.

POST TEST TO UNIT TWO

Tick the *one* correct answer to each of the following questions. Do *not* look back at the unit while you are doing the post test.

1. *Detecting and treating people who already have disease as early as possible is called:*
   A. Primary prevention
   B. Secondary prevention
   C. Tertiary prevention
   D. None of the above

2. *Immunization is a method of:*
   A. Primary prevention
   B. Secondary prevention
   C. Tertiary prevention
   D. None of the above

3. *Which of the following diseases can be prevented by immunization?*
   A. Tuberculosis
   B. Diabetes
   C. Whooping cough
   D. Schistosomiasis
   E. A and C above

4. *Primary prevention of malaria could include all of the following <u>except</u>:*
   A. Use of mosquito nets
   B. Prophylactic chloroquine for people visiting endemic areas
   C. Treatment of malaria cases with chloroquine
   D. Clearing of areas with stagnant water
   E. Use of insecticides

5. *Tertiary prevention of diabetes could include all of the following <u>except</u>:*
   A. Drugs to control the blood sugar
   B. Special diet
   C. Treatment of secondary infections
   D. Rehabilitation for diabetic patients who have become blind
   E. Complete cure of diabetes

POST TEST FOR UNIT THREE

The number of patients attending a dispensary is counted on five consecutive days. The results are as follows:

Day	Number of patients
Monday	50
Tuesday	28
Wednesday	37
Thursday	42
Friday	43

1. *What is the* range *of patients attending on each day?*

   Answer:

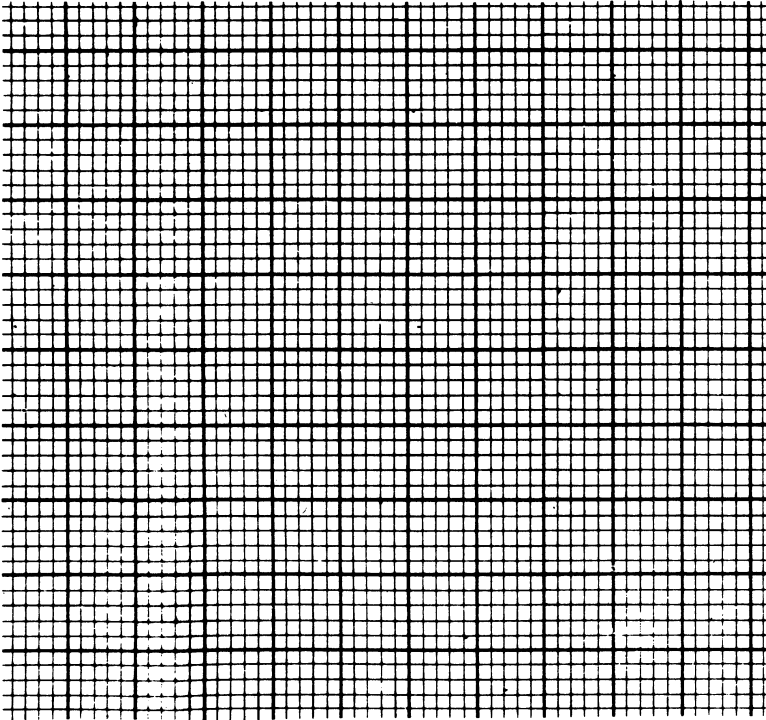2. *What* percentage *of all the patients attended on Tuesday?*

   Answer:

3. *The following are the ages of the patients attending on Tuesday. Make a frequency distribution of these ages below using 5-year age groups.*

   (Ages in years)

5,	19,	7,	21,	2,	9,	25,	3,	43	
8,	31;	3,	22,	14,	29,	2,	11,	20	32
12,	47,	1,	18,	10,	33,	4,	9,	2	

4. *Now make a graph of the frequency distribution. Label your graph carefully.*

5. *Which of the following statements are correct about the population pyramid of a developing country (tick each correct statement)?*

   A. *It is shaped more like a rectangle than a triangle.*

   B. *Males appear on the left and females on the right.*

   C. *Age is on the horizontal axis and percentage of the total population on the vertical axis.*

   D. *A larger proportion of the population is under 5 than over 70.*

POST TEST FOR UNIT FOUR

1. *Calculate the average age of these 7 children (ages given in months):*

   6, 9, 3, 15, 10, 7, 6

2. *A child aged 11 months weighs 7.2 kg. The standard weight for 11 months is 9.6 kg. What is the child's percentage of standard weight for age?*

3. *A child whose weight is 70% of the standard is (tick one answer):*

   A. *Normal, healthy*

   B. *Mildly malnourished*

   C. *Severely malnourished*

4. *A child whose weight on the Growth Chart is on the green-shaded area (or between the top two lines) is: (tick one answer)*

   A. *Normal, healthy*

   B. *Mildly malnourished*

   C. *Severely malnourished*

5. *Children who are severel malnourished usually have weights which are (tick one answer):*

   A. *Below 80% of the standard weight for age*

   B. *Below 70% of the standard weight for age*

   C. *Below 60% of the standard weight for age*

   D. *Below 50% of the standard weight for age*

6. *Make a line graph below of the number of malnourished children attending an MCH clinic each month:*

Month	Number of malnourished children
January	7
February	12
March	5
April	6
May	10
June	8
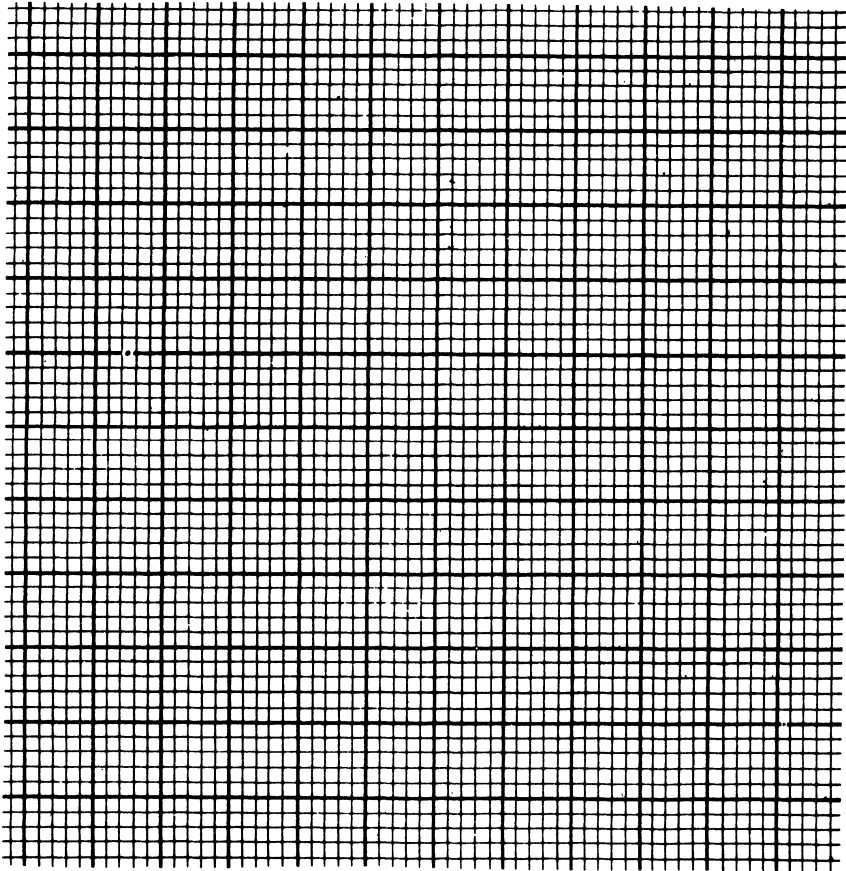
POST TEST FOR UNIT FIVE

Your health centre has a catchment population of 50,000. The birth rate for your district is 50 per 1,000 per year and the death rate is 25 per 1,000 per year.
Calculate the following for your catchment population:

1. *The number of births per year.*

2. *The number of deaths per year.*

3. *The rate of natural increase (RNI).*

20% of your population is aged under 5. During one year you estimate that 6,000 children under 5 visit the health centre and dispensaries at least once.

4. *How many under-5s are there in your catchment population?*

5. *What is the use-rate for the under-5s (per year).*

6. *On average, there are 100 deliveries per month in the health centre. What percentage of births in the catchment population are delivered at the health centre?*

POST TEST FOR UNIT SIX

Tick the *one* correct answer to each of these questions.

1. *A survey which finds out about peoples attitudes to child-spacing services is a:*
   A. *Prevalence survey*
   B. *Demographic survey*
   C. *KAP survey*

2. *A survey which finds out the percentage of the population with schistosomiasis is a:*
   A. *Prevalence survey*
   B. *Demographic survey*
   C. *KAP survey*

3. *A survey for leprosy found 70 cases in a population of 10,000. What is the prevalence of leprosy?*

Questions 4-7 You want to find out the percentage of women attending antenatal clinics at your health centre who have high-risk pregnancies.

4. *This survey would be of:*
   A. *Need for health services*
   B. *Users of health services*
   C. *Non-users of health services*

5. *The population to be surveyed would be:*
   A. *Pregnant women in the catchment population*
   B. *Pregnant women attending antenatal clinics*
   C. *High-risk pregnancies in the catchment population*
   D. *High-risk pregnancies at antenatal clinics*

6. *If you selected a sample from only the first 10 women who attended each clinic, your sample would be:*
   A. *Representative*
   B. *Biased*

7. *If you selected a sample from every 10th woman attending each clinic, your sample would be:*
   A. *Representative*
   B. *Biased*

POST TEST FOR UNIT SEVEN

Tick the *one* correct answer to each of these questions.

1. *A good screening test should:*
   A. *Be quick and simple to perform.*
   B. *Be acceptable to the community.*
   C. *Be repeatable.*
   D. *Have few false positives and false negatives.*
   E. *All of the above.*

2. *Which of the following questions is the* least *important to ask about a new screening programme for a disease?*
   A. *Are there adequate diagnostic facilities?*
   B. *Is there an effective treatment for the disease?*
   C. *Is the disease important in the community?*
   D. *How is the disease diagnosed?*
   E. *Are there adequate treatment facilities?*

3. *Which of the following are disadvantages of too many false positives?*
   A. *Treatment facilities will be overloaded.*
   B. *People will be unnecessarily worried.*
   C. *True cases of disease will be missed.*
   D. *A and B are correct.*
   E. *A and C are correct.*

4. *Making the patient rest 15 minutes before taking the blood pressure will reduce:*
   A. *Patient error.*
   B. *Tester error.*
   C. *Method error.*

5. *Which of the following is caused by weighing children with poorly calibrated scales?*
   A. *Patient error.*
   B. *Tester error.*
   C. *Method error.*

6. *If a woman is taller than 146 cm but she develops CPD, what do we call her with regard to the screening test?*
   A. *True positive.*
   B. *True negative.*
   C. *False positive.*
   D. *False negative.*

POST TEST FOR UNIT EIGHT

Tick the *one* correct answer to each of these questions.

1. Which of the following questions about a disease or health problem is least *useful in setting priorities?*

    A. Is it a serious problem?

    B. Is it a common problem?

    C. Is the community concerned about the problem?

    D. What are the risk factors involved?

    E. Can health services for the problem prevent illness or deaths?

2. One stage in the community health cycle asks the question "How do I know if it has been done effectively? This stage is called:

    A. Organization

    B. Community diagnosis

    C. Evaluation

    D. Goals

    E. Choosing priorities

3. The following is a goal for an immunization programme:

    "At least 80% of the under-1-year-old children in the population will be fully immunized against DPT within the following 6 months."

    Which of the following is correct about this goal?

    A. It tells what, how much *and* when.

    B. It does not tell what *will be done.*

    C. It does not tell how much *will be done.*

    D. It does not tell when *it will be done.*

    E. It cannot be evaluated.

4. In general, the resources which can be used to organize a community health programme include:

    A. Transportation

    B. Staff

    C. Drugs and equipment

    D. Money

    E. All of the above

5. In a health centre population of 50,000 there are 50 cases of leprosy. 5 new cases of leprosy

are diagnosed each year. The incidence rate of leprosy is:

A. *1 per 1,000*

B. *1 per 1,000 per year*

C. *1 per 10,000*

D. *1 per 10,000 per year*

E. *None of the above*

6. *Which of the following is true about the incidence rate of a disease:*

A. *It is easier to measure than the prevalence.*

B. *It includes old as well as newly diagnosed cases of disease.*

C. *It is measured at a point in time.*

D. *It can be used to evaluate the effectiveness of a programme of primary prevention.*

7. *Which of the following methods could be used to evaluate the effectiveness of a BCG immunization programme:*

A. *The percentage of the population immunized with BCG.*

B. *The incidence rate of tuberculosis.*

C. *The prevalence of tuberculosis.*

D. *A and B above.*

E. *A, B, and C above.*

POST TEST FOR UNIT NINE

Tick the *one* correct answer to each of these questions.

1. *Which of the following questions asks about the* quality *of health services?*
   A. *How many cases of measles are diagnosed each month?*
   B. *Are cases of measles being diagnosed correctly?*
   C. *What is the incidence rate of measles?*
   D. *How many under-5s have been immunized against measles?*

2. *Which of the following statements is/are correct about action-oriented patient records?*
   A. *They contain information which is always collected and recorded in the same way.*
   B. *They tell what should be done for the patient.*
   C. *They help to improve the quality of care.*
   D. *A B and C are correct*
   E. *B and C are correct.*

3. *Which of the following might be criteria for good quality antenatal services:*
   A. *All women should be immunized against tetanus.*
   B. *All women with risk factors should be delivered in hospital.*
   C. *Correct technique to be used for measuring blood pressure.*
   D. *All of the above.*
   E. *None of the above.*

4. *Some methods to evaluate the quality of care of patients with fever could include:*
   A. *Setting criteria for good quality care.*
   B. *Looking at medical records.*
   C. *Direct observation.*
   D. *All of the above.*
   E. *None of the above.*

5. *Which of the following methods may improve the quality of care in a leprosy control programme?*
   A. *Use of standardized patient records.*
   B. *Use of action-oriented patient records.*
   C. *Supervision of dispensary workers giving care to leprosy patients.*
   D. *B and C*
   E. *A B and C*

POST TEST FOR UNIT TEN

Tick the *one* correct answer to each of these questions.

1. *A disease which shows unusual increases in frequency over time is called:*
   A. *An endemic disease*
   B. *An epidemic disease*
   C. *A sporadic disease.*

2. *Plague usually occurs as:*
   A. *An endemic disease*
   B. *An epidemic disease*
   C. *A sporadic disease.*

3. *Keeping a count of the types of symptoms and diseases seen at dispensaries and health centre clinics can be useful for:*
   A. *Detecting epidemics of disease*
   B. *Measuring users of health services*
   C. *Planning health services*
   D. *All of the above*
   E. *None of the above.*

4. *Which of the following is the least important for survey records:*
   A. *They should be simple*
   B. *They should be clear*
   C. *They should be standardized*
   D. *They should be action-oriented.*

5. *Which of the following are some advantages of precoding?*
   A. *Easier to interpret*
   B. *Easier to analyze*
   C. *Both A and B*
   D. *Neither A nor B,*

6. *Show how you could record sex on a precoded format.*

ANSWERS TO POST TESTS

If you have worked through the units carefully you should have got all the answers right. If you find you have got one or more wrong you should check back carefully in the unit and find out why.

ANSWERS TO POST TEST FOR UNIT ONE

1. E.
2. D.
3. B.
4. D.
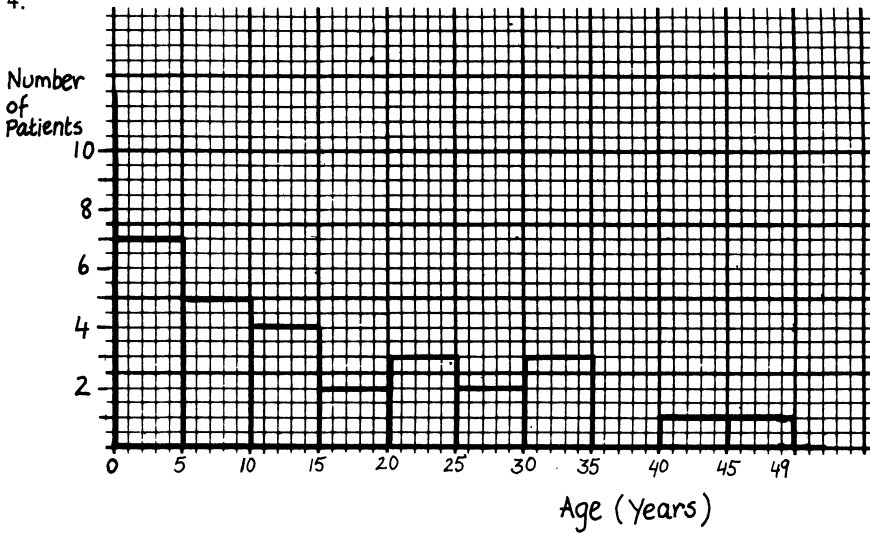5. C.
6. E.
7. B.

ANSWERS TO POST TEST TO UNIT TWO

1. B.
2. A.
3. E.
4. C.
5. E.

ANSWERS TO POST TEST FOR UNIT THREE

1. Range = 50 - 28 = 22 patients.

2. The total number of patients is (50 + 28 + 37 + 42 + 43) = 200. Percentage on Tuesday =
   $\frac{28}{200}$ x 400 = 14%

3. Ages of 28 patients attending on Tuesday.

Age groups (yrs)	Count	Number
0–4	ЖНТ 11	7
5–9	ЖНТ	5
10–14	1111	4
15–19	11	2
20–24	111	3
25–29	11	2
30–34	111	3
35–39		0
40–44	1	1
45–49	1	1
Total		28

4.

5. B and D are correct.

(Note. If you used different age groups in questions 3–4 check your answers with an instructor.)

ANSWERS TO POST TEST FOR UNIT FOUR

1. $\dfrac{6 + 9 + 3 + 15 + 10 + 7 + 6}{7} = \dfrac{56}{7} = 8$ months

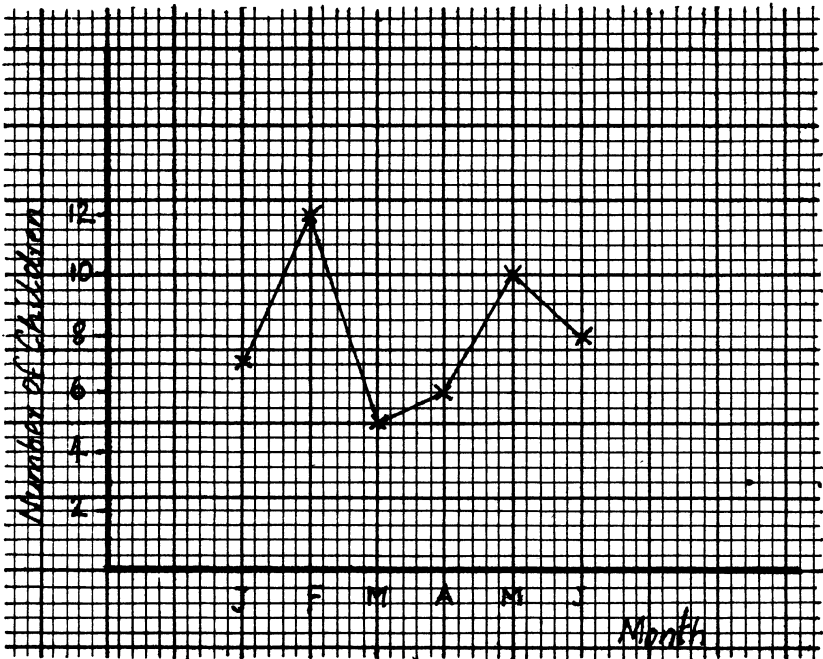2. $\dfrac{7.2 \times 100}{9.6} = \dfrac{3 \times 100}{4} = 75\%$

3. B

4. A

5. C

6.

Malnourished children attending MCH clinic each month

Make sure you have labelled both axes and given the graph a title.

ANSWERS TO POST TEST FOR UNIT FIVE

1. 2,500

2. 1,250

3. 2.5% per year

4. 10,000

5. 60% per year.

6. 100 deliveries per month = 1200 per year. Deliveries at health centre = $\underline{1200} \times 100\% = 48\%$.
   $\phantom{100 \text{ deliveries per month} = 1200 \text{ per year. Deliveries at health centre} = }2500$

ANSWERS TO POST TEST FOR UNIT SIX

1. C.

2. A.

3. 7 per 1,000; 70 per 10,000.

4. B.

5. B.

6. B. (These women may be different from those that come later.)

7. A.

ANSWERS TO POST TEST FOR UNIT SEVEN

1. E.

2. D.

3. D.

4. A.

5. C.

6. D.

ANSWERS TO POST TEST FOR UNIT EIGHT

1. D.

2. C.

3. A.

4. E.

5. D.

6. D.

7. D.

ANSWERS TO POST TEST FOR UNIT NINE

1. B.

2. E.

3. D.

4. D.

5. E.

ANSWERS TO POST TEST FOR UNIT TEN

1. B.

2. C.

3. D.

4. D.

5. C.

6.

1	Male
2	Female
3	Unknown/not recorded