LECTURE NOTES

For Environmental and Occupational Health Students

Epidemiology



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In collaboration with the Ethiopia Public Health Training Initiative, The Carter Center, the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education

2004



Funded under USAID Cooperative Agreement No. 663-A-00-00-0358-00.

Produced in collaboration with the Ethiopia Public Health Training Initiative, The Carter Center, the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education.

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Acknowledgements

The development of this lecture note for training Health Extension workers is an arduous assignment for Dr. Yigzaw Kebede at Gondar University.

Essentially, it required the consolidation and merging of existing in depth training materials, examination of Health Extension Package manuals and the Curriculum.

Recognizing the importance of and the need for the preparation of the lecture note for the Training of Health Extension workers THE CARTER CENTER (TCC) ETHIOPIA PUBLIC HEALTH TRAINING INITIATIVE (EPHTI) facilitated the task for Gondar University to write the lecture note in consultation with the Health Extension Coordinating Office of the Federal Ministry of Health.

Finally the Federal Ministry of Health would like to express special words of gratitude for those who contributed and endeavored to the development of this lecture note and to TCC/USAID for the technical and financial support.

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Introduction

This lecture note will familiarize the students about the definition of words which are commonly used in Epidemiology, levels of prevention; Infectious diseases Epidemiology; measuring morbidity and mortality; sources and method of data collection; Epidemic investigation and management; and Surveillance.

The examples and exercises given in this lecture note will enable the health extension worker to better understand the concepts of Epidemiology.

The lecture note is not intended to replace standard textbooks. Hence, the reader is advised to read textbook when the need arises.

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UNIT ONE

Introduction to Epidemiology

Learning Objectives:

At the end of this unit the student is expected to:

- Define Epidemiology
- Identify the main issues in the definition
- Discuss the uses of Epidemiology

1.1. Definition

Epidemiology is the study of the ***frequency, distribution*** and ***determinants*** of diseases and other health related conditions in human populations, and the application of this study to the promotion of health, and to the prevention and control of health problems.

Major components of the definition

1. Population. *T*he main focus of epidemiology is on the effect of disease on the population rather than individuals. For example malaria affects many people in Ethiopia but lung cancer is rare. If an individual develops lung cancer, it is more likely that he/she will die. Even though lung cancer is more killer, epidemiology gives more emphasis to malaria since it affects many people.

2. Frequency. This shows that epidemiology is mainly a quantitative science. Epidemiology is concerned with the frequency (occurrence) of diseases and other health related conditions. Frequency of diseases is measured by morbidity and mortality rates.

3. Health related conditions. Epidemiology is concerned not only with disease but also with other health related conditions because every thing around us and what we do also affects our health. Health related conditions are conditions which directly or indirectly affect or influence health. These may be injuries, births, health related behaviors like smoking, unemployment, poverty etc.

4. ***Distribution.*** Distribution refers to the geographical distribution of diseases, the distribution in time, and distribution by type of persons affected.

5. Determinants. Determinants are factors which determine whether or not a person will get a disease.

6. Application of the studies to the promotion of health and to the prevention and control of health problems. This means the whole aim in studying the frequency, distribution, and determinants of disease is to identify effective disease prevention and control strategies.

1.2 History of Epidemiology

Although epidemiological thinking has been traced to the time of Hippocrates, who lived around 5th century B.C., the discipline did not flourish until 1940s.

Hippocrates displayed an extraordinary awareness of the impact of environment and behavior on personal well–being. Hippocrates therefore identified forces that epidemiologists today recognize as major determinants of human health.

There were many other scientists who contributed to the development of epidemiology. One of them was John Snow. In 1849, ***John Snow***, an English physician, formulated and tested a hypothesis concerning the origin of an epidemic of cholera in London. On the basis of the available data snow postulated that cholera was transmitted by contaminated water through a then unknown mechanism. He observed that death rates from cholera were particularly high in areas of London that were supplied with water by the Lambeth Company or the Southwark and Vauxhall Company, both of which drew their water from the Thames River at a point heavily polluted with sewage. Between 1849 and 1854, the Lambeth Company changed its source to an area of the Thames where the water was "quite free from the sewage of London." The rates of cholera declined in those areas of the city supplied by the Lambeth Company, while there was no change in those areas receiving water from the Southwark and Vauxhall Company. Finally, Snow concluded that the source of cholera outbreak was contaminated water.

1.3 Uses of Epidemiology

- To make a community diagnosis. Epidemiology helps to identify and describe health problems in a community (for example, the prevalence of anaemia, or the nutrition status of children).

- To monitor continuously over a period of time the change of health in a community. (for example, the effect of a vaccination programme, health education, nutritional supplementation).

- To practice surveillance for a specific disease in order to be able to act quickly and so cut short any outbreak (example cholera).

- To investigate an outbreak of a communicable disease, analyse the reasons for it, plan a feasible remedy and carry it out, and monitor the effects of the remedy on the outbreak.

- To plan effective health services. Effective services, interventions and remedies all depend on accurate community data.

Exercise

1. What is epidemiology?

2. "Fifty percent of malaria cases in North Gondar Zone occurred in Metema Woreda." This statement shows, please choose the best

   a. the distribution of malaria

   b. the causes of malaria

   c. the time of the year when malaria is prevalent

3. Is epidemiology important to know the causes of malaria epidemic in your area?

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UNIT TWO

Disease Causation

Learning Objectives

At the end of this unit the student is expected to:

- Define cause of disease
- Discuss the different risk factors for disease

Definition

Cause of disease: is an event, condition, characteristic or a combination of these factors which plays an important role in producing the disease.

The causes of disease can be classified in to two:

1. **Primary causes –** these are the factors which are necessary for a disease to occur, in whose absence the disease will not occur. The term ***"etiologic agent"*** can be used instead of primary cause for Infectious causes of diseases. For example "Mycobacterium tuberculosis" is the primary cause (etiologic agent) of pulmonary tuberculosis.

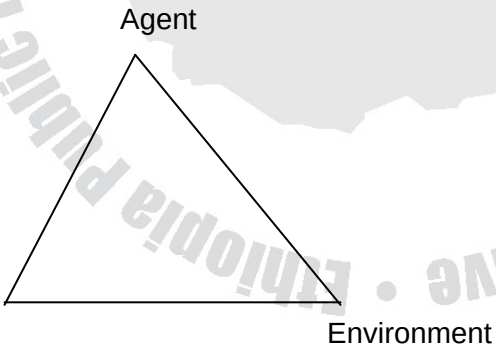
2. Risk factors (contributing, predisposing, or aggravating factors).

These are not the necessary causes of disease but they are important for a disease to occur. A factor associated with an increased occurrence of a disease is risk factor for the exposed group; and a factor associated with a decreased occurrence of a disease is a risk factor for the non exposed group. Risk factors could be related to the agent, the host and the environment.

The etiology of a disease is the sum total of all the factors (primary causes and risk factors) which contribute to the occurrence of the disease.

It is the interaction of the agent, the host, and the environment which determines whether or not a disease develops, and this can be illustrated using the epidemiologic triangle.

The epidemiologic triangle



The epidemiologic triangle, depicts the relationship among three key factors in the occurrence of disease or injury: ***agent, environment*****,** and ***host.***

An ***agent*** is a factor whose presence or absence, excess or deficit is necessary for a particular disease or injury to occur.

The ***environment*** includes all external factors, other than the agent, that can influence health. These factors are further categorized according to whether they belong in the ***social***, ***physical***, or ***biological*** environments.

The **social environment** encompasses a broad range of factors, including education, unemployment, culture regarding diet; and many other factors pertaining to political, legal, economic, communications, transportation, and health care systems.

Physical environmental factors are factors like climate, terrain, and pollution.

Biological environmental influences include vectors, humans and plants serving as reservoirs of infection.

From the perspective of epidemiologic triangle, the host, agent, and environment can coexist harmoniously. Disease and injury occur only when there is altered equilibrium between them.

Exercise

Identify the primary causes and risk factors for the following diseases

Disease	**Primary cause**	**Environmental risk factors**	**Host risk factors**
Malaria			
Tuberculosis			
HIV/AIDS			
Amoebiasis			
Measles			
Common cold			

UNIT THREE

Levels of Prevention

Learning Objectives

At the end of this unit the student is expected to:

- Define the natural history of disease and its different stages
- Describe the levels of disease prevention

3.1 Natural history of disease

The “natural history of disease” refers to the progression of disease process in an individual over time, in the absence of intervention.

There are four stages in the natural history of a disease. These are:

1. Stage of susceptibility
2. Stage of pre-symptomatic (sub-clinical) disease
3. Stage of clinical disease
4. Stage of disability or death

1. **Stage of susceptibility**

In this stage, disease has not yet developed, but the groundwork has been laid by the presence of factors that favor its occurrence.

Example: unvaccinated child is susceptible to measles.

2. **Stage of Pre-symptomatic (sub-clinical) disease**

In this stage there are no manifestations of the disease but pathologic changes (damages) have started to occur in the body. The disease can only be detected through special tests since the signs and symptoms of the disease are not present.

Examples:

- Detection of antibodies against HIV in an apparently healthy person.
- Ova of intestinal parasite in the stool of apparently healthy children.

The pre-symptomatic (sub-clinical) stage may lead to the clinical stage, or may sometimes end in recovery without development of any signs or symptoms.

3. **The Clinical stage**

At this stage the person has developed signs and symptoms of the disease. The clinical stage of different diseases differs in duration,

severity and outcome. The outcomes of this stage may be recovery, disability or death.

Examples:

- Common cold has a *short* and *mild* clinical stage and almost everyone ***recovers*** quickly.
- Polio has a *severe* clinical stage and many patients develop paralysis becoming ***disabled*** for the rest of their lives.
- Rabies has a *relatively short* but *severe* clinical stage and almost always results in ***death.***
- Diabetes Mellitus has a *relatively longer* clinical stage and eventually results in ***death*** if the patient is not properly treated.

4. Stage of disability or death

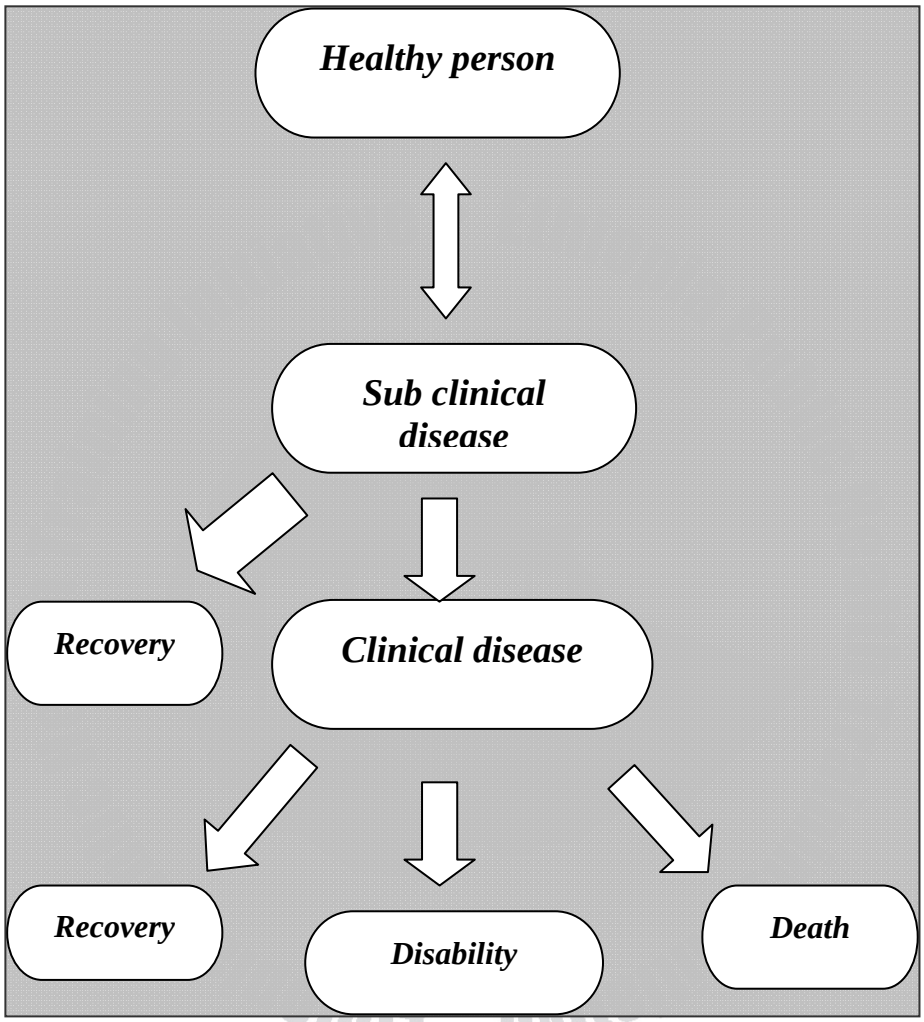
Some diseases run their course and then resolve completely either spontaneously or by treatment. In others the disease may result in a residual defect, leaving the person disabled for a short or longer duration. Still, other diseases will end in death.

Disability is limitation of a person's activities including his role as a parent, wage earner, etc

Examples:

- Trachoma may cause blindness
- Meningitis may result in blindness or deafness. Meningitis may also result in death.

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A schematic diagram of the natural history of diseases and their expected outcomes.

3.2 Levels of Disease Prevention

The major purpose in investigating the epidemiology of diseases is to learn how to prevent and control them. Disease prevention means to interrupt or slow the progression of disease. Epidemiology plays a central role in disease prevention by identifying those modifiable causes.

There are three levels of prevention

1) **Primary prevention:-**The main objectives of primary prevention are promoting health, preventing exposure and preventing disease. Primary prevention keeps the disease process from becoming established by eliminating causes of disease or increasing resistance to disease.

   Primary prevention has 3 components. These are health promotion, prevention of exposure, and prevention of disease.

   A. Health promotion:- consists of general non-specific interventions that enhance health and the body's ability to resist disease. Improvement of socioeconomic status, provision of adequate food, housing, clothing, and education are examples of health promotion.

   B. Prevention of exposure:- is the avoidance of factors which may cause disease if an individual is exposed to them.

Examples can be provision of safe and adequate water, proper excreta disposal, and vector control.

***C. Prevention of disease*:-** is the prevention of disease development after the individual has become exposed to the disease causing factors. Immunization is an example of prevention of disease. Immunization acts after exposure has taken place. Immunization does not prevent an infectious organism from invading the immunized host, but does prevent it from establishing an infection. If we take measles vaccine, it will not prevent the virus from entering to the body but it prevents the development of infection/disease.

2) Secondary prevention:- The objective of secondary prevention is to ***stop or slow the progression of disease*** so as to prevent or limit permanent damage. Secondary prevention can be achieved through detecting people who already have the disease as early as possible and treat them. It is carried out before the person is permanently damaged.

Examples:

- Prevention of blindness from Trachoma
- Early detection and treatment of breast cancer to prevent its progression to the invasive stage, which is the severe form of the disease.

3) **Tertiary prevention:**– is targeted towards people with permanent damage or disability. Tertiary prevention is needed in some diseases because primary and secondary preventions have failed, and in others because primary and secondary prevention are not effective. It has two objectives:

- Treatment to ***prevent further disability or death*** and
- To ***limit the physical, psychological, social, and financial impact of disability,*** thereby improving the quality of life. This can be done through ***rehabilitation,*** which is the retraining of the remaining functions for maximal effectiveness.

Example: When a person becomes blind due to vitamin A deficiency, tertiary prevention (*rehabilitation*) can help the blind or partly blind person learn to do gainful work and be economically self supporting.

Exercise:

1. A patient with tuberculosis is treated with drugs. Is it possible to learn (know) the natural history of tuberculosis on this patient? Why?

2. Write the primary, secondary, and tertiary prevention strategies for the diseases or conditions listed in the table below?

Disease	**Primary prevention**	**Secondary prevention**	**Tertiary Prevention**
Measles			
Pulmonary tuberculosis			
A person lost his leg by car accident			
Poliomyelitis			

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UNIT FOUR

Infectious Diseases Epidemiology

Learning Objectives

At the end of this unit the student is expected to:

- Define communicable/infectious disease
- Discuss the components of infectious process
- Describe different modes of disease transmission

4.1 Definition

Communicable disease (infectious disease) – is an illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or the inanimate environment.

4.2 Components of the infectious process

The infectious process of a specific disease can be described by the following components, which constitute of the **chain of disease transmission**.

1. The Agent
2. Its reservoirs
3. Its portal of exits
4. Its mode of transmission
5. Its portals of entry
6. The human host

I. The Agents

The agents in the infectious process range from viral particles to complex multi-cellular organisms

II. Reservoirs

A reservoir is an organism or habitat, in which an infectious agent normally lives, transforms, develops and/or multiplies. Reservoirs for infectious agents may be humans, animals, plants or other inanimate objects.

Some diseases with human reservoirs are:

- Most bacterial and viral respiratory diseases

- HIV/AIDS/Sexually Transmitted Infections (STIs), measles, typhoid etc.

All infected humans, whether showing signs and symptoms of the disease or not, are potential sources of infection to others. A person who does not have apparent clinical disease, but is a potential source of infection to other people is called a *Carrier.* An example of carrier is a person infected with HIV. A person infected with HIV might not have the signs and symptoms but he/she is capable of transmitting the infection to others

Some diseases are transmitted to human beings from animals. These diseases are called ***zoonoses***.

Examples: Rabies, anthrax, etc.

III. Portal of Exit

Portal of exit is the way the infectious agent leaves the reservoir. Possible portals of exit include all body secretions and discharges: Mucus, saliva, tears, breast milk, vaginal and cervical discharges, excretions (feces and urine), blood, and tissues. For example feces is the portal of exit for the eggs of hook worm.

IV. Mode of Transmission

Modes of transmission include the various mechanisms by which agents are conveyed to other susceptible hosts. Transmission may be direct or indirect.

1. **Direct Transmission**

***1.1 Direct contact*:** Occurs when there is contact of skin, mucosa, or conjunctiva with infectious agents directly from person or vertebrate animal, via touching, kissing, biting, passage through the birth canal, or during sexual intercourse.

Example: HIV/AIDS/STIs, rabies

***1.2 Direct Projection*:** is transmission by projection of saliva droplets during coughing, sneezing, singing, spitting or talking.

Example: common cold

1.3 Transplacental: *is t*ransmission from mother to fetus through the placenta.

Example: syphilis, HIV/AIDS

2. **Indirect transmission**

The following are the different types of indirect transmission.

***2.1 Vehicle-borne*:** Transmission occurs through indirect contact with inanimate objects fomites: bed sheets, towels,

toys, or surgical instruments; as well as through contaminated food, water, IV fluids etc.

2.2 Vector-borne: The infectious agent is conveyed by an arthropod to a host. Vectors may be biological or mechanical.

***Biological vector*:** A vector is called biological vector if the agent multiplies in the vector before transmission.

- Example: anopheles mosquito is a biological vector for malaria.

Mechanical vector*:* A vector is called mechanical vector if the agent is directly infective to other hosts, without having to go through a period of multiplication or development in the vector. The vector simply carries the agent by its body parts(leg, proboscis etc) to convey it to susceptible hosts.

Example: Flies are mechanical vectors for the transmission of trachoma.

2.3 Airborne: which may occur by dust or droplet nuclei (dried residue of aerosols)

Example: Tuberculosis. When pulmonary tuberculosis patients cough, they emit many aerosols which consists the agents of tuberculosis. When these aerosols dry droplet nuclei will be formed. These droplet nuclei will remain suspended in the air

for some time. When another healthy susceptible individual breaths he/she will inhale the droplet nuclei and become infected with tuberculosis.

V. **Portal of entry** - is the site where an infectious agent enters a susceptible host.

Examples:

-Nasal mucosa is portal of entry for common cold

-Conjunctiva is the portal of entry for trachoma

-Injury site is portal of entry for tetanus

VI. **Susceptible human host:** The susceptible human host is the final link in the infectious process. Host susceptibility or resistance can be seen at the *individual* and at the *community* level.

Host resistance at the community (population) level is called ***herd immunity***. Herd immunity can be defined as *the resistance of a population to the introduction and spread of an infectious agent, based on the immunity of a high proportion of individual members of the population, thereby lessening the likelihood of a person with a disease coming into contact with susceptibles*.

Example - If 90 % of the children are vaccinated for measles, the remaining 10 % of the children who are not vaccinated might

not become infected with measles because most of the children (90 %) are vaccinated. That means transmission from infected person to other susceptible children will not be easier.

Exercise:

Identify the components of the chain of transmission for the following diseases.

Chain of transmission	***Malaria***	***Amoebiasis***	***Tuberculosis***
i. Infectious agent			
ii. Reservoir			
iii. Portal of exit			
iv. Mode of transmission			
v. Portal of entry			
vi. Susceptible host			

UNIT FIVE

Descriptive Epidemiology

Learning Objectives

At the end of this unit the student is expected to:

- Define descriptive Epidemiology
- Identify the most important Time, Place and personal variables in Descriptive Epidemiology
- Describe cross sectional study (survey)

5.1 Definition

Descriptive epidemiology is one of the basic types of epidemiology, which is concerned with describing the frequency and distribution of diseases and other health related conditions by time, place, and person. The other branch of epidemiology which deals with the causes or determinants of diseases is called ***Analytical Epidemiology.*** It asks the questions: how? Why?

5.2 The major variables in Descriptive Epidemiology

The major variables in descriptive epidemiology can be classified under the headings: person, place and time. To describe the occurrence of a disease fully, the following questions must be answered. **Who** is affected? **Where** and **When** do the cases occur?

5.2.1 Person

People can be categorized with respect to many variables. In Epidemiologic study it is common to specify three characteristics of a person – age, sex and ethnic group or race.

Age: Age is the most important determinant among the personal variables. Example: Measles affects children.

Sex: There are some diseases which are common among females. For example breast cancer is a disease of females.

Ethnic group and Race: Many diseases differ markedly in frequency, severity, or both in different racial or ethnic groups.

Other personal variables: There are also other personal variables that should be considered during epidemiologic studies. This includes social class, religion, occupation, marital status, environmental exposure etc.

5.2.2 Place

The frequency of disease is different in different places. These differences can occur because of the natural boundaries (e.g. mountain range, rivers, deserts). An area defined by natural boundaries may have a high or low frequency of certain diseases because it is characterized by some particular environmental or climatic conditions, such as temperature, humidity, rainfall, altitude, mineral content of soil, or water supply. For example - Malaria is common in low lands but relapsing fever is common in highlands.

5.2.3 Time

Study of disease occurrence by time is a basic aspect of epidemiologic analysis. Occurrence is usually expressed on a monthly or annual basis.

Some diseases occur **periodically or cycles.** Cycles may be annual or have some other periodicity. The most common types of periodicity are in relation to seasonal changes, or in relation to changes in the number of susceptible persons in a population. Malaria is one of the example of diseases with seasonal periodicity, where high peaks occur in relation to the rainy season. Epidemic of malaria are common in October and November, when stagnant water bodies are convenient for the breeding of mosquitoes.

5.3 Cross sectional study design (Survey)

Cross sectional study is the major type of descriptive study designs. It is mainly concerned with the distribution of diseases with respect to time, place and person. By conducting survey, the magnitude of diseases or other health related condition will be known. They are useful for priority setting, resource allocation etc.

In cross sectional studies, information about the status of an individual with respect to the presence or absence of exposure and disease is assessed at a point in time. The point in time may be as short as few minutes or as long as two or three months. The time frame of "point in time" is based on the speed of data collection.

If somebody wants to conduct a survey, he/she can follow the following procedures:

- Write the objectives of the survey
- Identify the methods of data collection. Data can be collected by using questionnaire, interview, self-administered questionnaire, observation, applying laboratory tests etc.
- Recruit and train data collectors
- Calculate (determine) the number of people needed for the survey
- Collect the data
- Analyse the data
- Disseminate the findings

Advantages of cross sectional studies:

- are a one-stop, one-time collection of data
- are less expensive & easier to conduct
- provide much information useful for planning health services and medical programs
- show relative distribution of conditions, disease, injury and disability in groups and populations. For example by conducting survey in different towns, it is possible to know which towns are highly affected by HIV/AIDS.

Exercises

1. Suppose you want to determine the prevalence of hypertension among adult population in your kebele. How do you conduct cross sectional studies for this purpose?

Choose the best answer for questions 2,3, and 4.

2. Malaria mainly affects children.

   This is:

   a. Distribution by person
   b. Distribution by place
   c. Distribution by time

3. Pregnant women are highly affected by malaria.

   This is:

   a. Distribution by person
   b. Distribution by place
   c. Distribution by time

4. Epidemic of malaria occurs in October, November and April.

   This is:

   a. Distribution by person
   b. Distribution by place
   c. Distribution by time

UNIT SIX

Measurements of Morbidity and Mortality

Learning Objectives

At the end of this unit the student is expected to:

- Describe the differences between ratio, proportion and rate
- Calculate the most important morbidity and mortality measures

6.1 Measurement of health

Epidemiology is mainly a quantitative science. Measures of disease frequency are the basic tools of the epidemiological approach. Health status of a community is assessed by the collection, compilation, analysis and interpretation of data on **illness** (morbidity), **death** (mortality), **disability** and **utilization of health services**.

The most basic measure of disease frequency is a simple count of affected individuals. Such information is useful for public health planners and administrators for proper allocation of health care resources in a particular community. However, to investigate distributions and determinants of disease, it is also necessary to know the size of the source population from which affected individuals were counted. One of the central concerns of epidemiology is to find and enumerate appropriate denominators in order to describe and compare groups in a meaningful and useful way. Such measures allow direct comparisons of disease frequencies in two or more groups of individuals.

6.2 Ratios, proportions, and rates

Ratio

A ratio quantifies the magnitude of one occurrence or condition to another. It expresses the relationship between two numbers in the form of *x: y* or *x/y* X *k*

Example:

-The ratio of males to females (M:F) in Ethiopia.

-The ratio of male malaria patients to female malaria patients

Proportion

A proportion quantifies occurrences in relation to the populations in which these occurrences take place. It is a specific type of ratio in which the numerator is included in the denominator and the result is expressed as a percentage.

Example: The proportion of all births that was male

$$\frac{\text{Male births}}{\text{Male + Female births}} \times 100$$

Rate

Rate is the most important epidemiological tool used for measuring diseases. Rate is a special form of proportion that includes time. It is

the measure that most clearly expresses probability or risk of disease in a defined population over a specified period of time, hence, it is considered to be a basic measure of disease occurrence. Accurate count of all events of interest that occur in a defined population during a specified period is essential for the calculation of rate.

$$\text{Rate} = \frac{\text{Number of events in a specific period}}{\text{Population at risk of these events in a specified Period}} \times k$$

Example: The number of newly diagnosed pneumonia cases in 1999 per 1000 under five children.

6.3 Measurements of morbidity

Morbidity rates are rates used to quantify the occurrence of disease. Measures of morbidity include incidence, period prevalence, and point prevalence rates.

Incidence rate

The incidence of a disease is defined as the number of new cases of a disease that occur during a specified period of time in a population at risk for developing the disease.

Incidence rate = $\frac{\text{Number of new cases of a disease over a period of time}}{} \times K$

Total Population during the given period of time

The critical element in the definition of incidence is new cases of disease. Because incidence is a measure of new events (i.e. transition from a non-diseased to a diseased state), incidence is a measure of risk. The appropriate denominator for incidence rate is **population at risk** but knowing the population at risk is difficult at this level. Hence, total population can be used as a denominator. Another important issue in incidence is the issue of time. For incidence to be a measure of risk we must specify a period of time and we must know that all of the individuals in the group represented by the denominator have been followed up for that entire period. The choice of time period is arbitrary: We could calculate incidence rate in one week, one month, one year, 5 years, and so on. Incidence rates can be used to make statements about the risk of disease. If the incidence rate of a certain disease is high in one area, then the risk of acquiring that disease by other healthy individuals will be high.

Example. In Ginbot 1995 there were 50 new cases of relapsing fever in “Kebele X”. The average total population of “Kebele X” was 5000. Calculate the incidence rate of relapsing fever in “Kebele X” in Ginbot 1995.

Answer- Incidence rate = $\frac{50}{5000}$ X 1000 = 10 new cases per 1000 population

That means out of every 1000 people living in “Kebele X”, 10 of them acquired relapsing fever in Ginbot 1995.

Another commonly used measure of morbidity is attack rate. Attack rate is a type of incidence rate which is mainly used during epidemics.

Attack rate = No. of new cases of a specific disease reported during an epidemic X k

Total population at risk during the same time

On Tir 7, 1995, 100 people were invited by Ato Alemitegnaw for dinner. All of them ate the food that was served for dinner. The next day (Tir 8, 1995) 90 of the 100 people who ate that food developed diarrhea. Calculate the attack rate of diarrhea which occurred on Tir 8, 1995.

Attack rate = $\frac{90}{100}$ X 100 = 90 cases of diarrhea per 100 people

That means out of 100 people who ate the food served by Ato Alemitegnaw, 90 of them developed diarrhea on Tir 8, 1995.

Uses incidence rate

Incidence rate is important as a fundamental tool for etiologic studies of diseases since it is a direct measure of risk. If the incidence rate is

significantly higher in one area, then the cause of that disease can be systematically searched.

Prevalence rate

Prevalence rate measures the number of people in a population who have a disease at a given time. It includes both new and old cases. The major type of prevalence is point prevalence rate.

Point Prevalence rate: measures the proportion of a population with a certain condition at a given point in time. Point prevalence rate can be determined by conducting cross-sectional study.

$$\textbf{Point Prevalence rate} = \frac{\text{All persons with a specific Condition at one point in time}}{\text{Total population}} \times K$$

Example: One health extension worker conducted a survey in one of the nearby elementary schools on Hidar 10, 1996 to know the prevalence of trachoma in that school. The total number of students in that school was 200. The health extension worker examined all the 200 students for trachoma. Hundred students were found to have trachoma.

Calculate the point prevalence rate of trachoma for that school.

Point prevalence rate= $\frac{100}{200}$ X 100 = 50 trachoma patients per 100 students on Hidar10,1996

That means 50 % of the students in that elementary school were affected by trachoma on Hidar 10, 1996.

Uses of prevalence rate

- Planning health facilities and human resource
- Monitoring chronic disease control programs like tuberculosis control program

6.4 Measurements of Mortality

Mortality rates and ratios measure the occurrence of deaths in a population using different ways. Rates whose denominators are the total population are commonly calculated using either the mid - interval population or the average population. This is done because population size fluctuates over time due to births, deaths and migration.

$$\text{Average population} = \frac{\text{Population count at the beginning + Population count at the end of the time interval considered}}{2}$$

Below are given some formulas for the commonly used mortality rates and ratios.

1. Crude Death rate (CDR)

$$CDR = \frac{\text{Total no. of deaths reported during a given time interval}}{\text{Estimated mid interval population}} \times 1000$$

The Crude Death Rate measures the proportion of the population dying every year, or the number of deaths in the community, per 1000 population. It reflects the risk of death in that community or country. Currently the Crude Death Rate in Ethiopia is 12.6 per 1000 population (1995 health & health related indicators, MOH). That means out of 1000 total population about 13 people die each year.

2. Age- specific mortality rate $= \frac{\text{No. of deaths in a specific age group during a given time}}{\text{Estimated mid interval population of specific age group}} \times 1000$

One example of age specific mortality rate is Infant Mortality Rate.

3. Sex- specific mortality rate $= \frac{\text{No. of deaths in a specific sex during a given time}}{\text{Estimated mid interval population of same sex}} \times 1000$

Example: The average total population of “Kebele Y” in 1996 was 6000 (3500 female & 2500 male). In the same year 300 people died (100 female & 200 male). Calculate the mortality rate (Crude death rate) for females.

CDR for females = $\frac{100}{3500}$ X 1000 = 29 per 1000 female population

That means out of 1000 female population living in “Kebele Y”, 29 females died in 1996.

4. Proportionate mortality ratio = $\frac{\text{No. of deaths from a specific cause during a given time}}{\text{Total no. of deaths from all causes in the same time}}$ x 100

The proportionate mortality ratio asks the question: What proportion of deaths are due to a certain cause? For example when we say the proportionate mortality ratio for HIV/AIDS is 30 %, this means out of 100 total (of all) deaths 30 of them died from HIV/AIDS.

4. Case Fatality Rate (CFR) = $\frac{\text{No. of deaths from a specific disease during a given time}}{\text{No. of cases of that disease during the same time}}$ x 100

Case fatality rate represents the probability of death among diagnosed cases or the killing power of a disease.

Example: In 1996 there were 1000 tuberculosis patients in one region. Out of the 1000 patients 100 died in the same year. Calculate the case fatality rate of tuberculosis.

$$CFR = \frac{100}{1000} \times 100 = 10\ \%$$

That means 10% of tuberculosis patients will die once they develop the disease

5. Neonatal Mortality Rate = No. of deaths under 28 days of age reported during a given time X 1000

No. of live births reported during the same time

Example: In 1996 there were a total of 5000 live births in “Zone B”. Two hundred of them died before 28 days after birth. Calculate the Neonatal Mortality Rate (NMR).

$$NMR = \frac{200}{5000} \times 1000 = 40 \text{ per } 1000 \text{ live births}$$

That means out of 1000 live births in 1996, 40 of them died before 28 days after birth.

Death during the neonatal period is largely due to prematurity, malformations, accidents or injuries at birth, and lack of cleanliness and sterility during or after delivery. In addition, it reflects the inadequacy of antenatal care.

6. Infant Mortality Rate (IMR) = No. of deaths under 1 year of age during a given time / No. of live births reported during the same time interval X 1000

Infant mortality rate reflects the health of the community in which the child is being brought up. Thus, it is high among people who have little health care, chiefly because infections, such as pneumonia, diarrhea and malaria, are common among their infants. Malnutrition is also one of the killer of infants in developing countries. The infant mortality rate in Ethiopia is one of the highest in the world (96.8 per 1000 live births). That means out of 1000 live births about 97 die before they celebrate their first birth day.

7. Under- five mortality rate = No. of deaths of 0-4 years of age during a given time / Average (mid-year) population of the same age at the same time X 1000

NB: The numerator says 0-4 years. 0-4 years in this formula means children from birth to less than five years of age i.e the upper age limit is not 4.

Example: In 1996 the total number of children under 5 years of age was 10,000 in "Zone C". In the same year 200 children under five years of age died. Calculate the under five-mortality rate (U5MR).

$$U5MR = \frac{200}{10{,}000} \times 1000 = 20 \text{ per } 1000 \text{ under five children}$$

That means in "Zone C", out of 1000 under five children, 20 died in 1996.

8. Maternal Mortality Rate = $\frac{\text{No. of pregnancy associated deaths of mothers in a given time}}{\text{No. of live births in the same time}} \times 100{,}000$

Maternal Mortality Rate reflects the standards of all aspects of maternal care (antenatal, delivery and postnatal). The Maternal Mortality Rate in Ethiopia is estimated to be 871 per 100,000 live births. That means in 100,000 live births, around 871 mothers die each year due to pregnancy related causes.

E**xercise:**

The following information is about kebele X which was collected for the year 1999:

- Total average population = 40,000
- Total number of live births = 4000
- Total number of deaths = 400
- Total number of deaths before the age of 28 days = 50
- Total number of infant deaths = 200
- Number of women who died from pregnancy related causes = 160
- New cases of tuberculosis = 100
- All cases of tuberculosis = 300
- Deaths from tuberculosis = 60

Based on the above information calculate the following.

1. The incidence rate of tuberculosis.
2. The period prevalence rate of tuberculosis.
3. The case fatality rate of tuberculosis.

4. The Neonatal mortality rate.

5. The infant mortality rate.

6. The maternal mortality ratio

UNIT SEVEN

Sources of Data and Methods of Data Collection

Learning Objectives:

At the end of this unit the student is expected to:

- Identify the sources for health information
- Describe the advantages and disadvantages of each source
- Describe the methods of data collection

I. Sources of Data

There are different sources of data on health and health related conditions in the community. Each source has advantages and limitations. The information obtained from these sources is used for health planning, programming and evaluation of health services. The major sources are the following.

1. Census:

Census is defined as a periodic count or enumeration of a population. Census data are necessary for accurate description of population's health status and are principal source of denominator for rates of disease & death.

It provides information on:

- Size and composition of a population
- The trends anticipated in the future.

In Ethiopia census was conducted twice, i.e., in 1984 and 1994 (G.C). Data was collected on:

- Age, sex and size of the population
- Mortality, fertility
- Language, ethnicity
- Housing

From these data different health indices could be calculated. Crude birth rate, crude death rate, age specific mortality rate and sex specific mortality rate are some of the examples of the indicators that could be calculated.

Limitation

- Conducting nationwide census is very expensive and it generates a large amount of data which takes a very long time to compile and analyze. .
- It is carried in intervals of many years. Therefore it can't assess yearly changes.

2. Vital statistics:

This is a system by which all births and deaths occurring nationnwide are registered, reported and compiled centrally. Certificate is issued for each birth and death. It is the source of information for the calculation of birth and death rates. There is no nationwide birth and death registration system in Ethiopia but the system should be established in the future.

The main characteristics of vital statistics are:

- Comprehensive – all births and deaths should be registered.
- Compulsory by law – should be enforced by law.
- Compiled centrally so that it can serve as a source of information.
- Continuous – it should be an ongoing process.

3. Health Service Records

All health institutions report their activities to the Ministry of Health through the regional health bureaus. The Ministry compiles, analyzes and publishes it in the health service directory. It is therefore the major source of health information in Ethiopia.

Advantages:

- Easily obtainable
- Available at low cost
- Continuous system of reporting
- Causes of illness and death available.

Limitations:

- Lack of completeness – health service coverage is low.
- Lack of representativeness – a small proportion of diseased population seeks medical advice. Those patients who remained at home are not reported.

- Lack of denominator – catchment area is not known in the majority of cases.
- Lack of uniformity in quality.
- Diagnosis varies across the level of health institutions.
- Lack of compliance with reporting.
- Irregularity and incompleteness of published compilations.

Notification of Infectious Diseases

There are some internationally notifiable diseases. WHO member states report on **Plague**, **Cholera**, and **Yellow fever**. Moreover, every country has its own list of notifiable diseases.

The major problems related to this source (health service records) are low compliance and delays in reporting.

4. Health Surveys

Health surveys are studies conducted on a representative sample population to obtain more comprehensive data for monitoring the health status of a population. There are two types of health surveys:

1. Surveys of specific diseases: These are studies conducted on each specific disease. Examples are:

- EPI target diseases
- Diarrheal Diseases
- HIV/AIDS
- Trachoma
- Tuberculosis / Leprosy

2. Surveys of general health status: These are studies on general health status of the population. They are based on interview, physical examination and laboratory tests. They are expensive.

Advantages of surveys based on interview:

- They are more representative of the health condition of the community.
- The denominator is known.
- Data are more uniform in quality.

Limitations:

- Data accuracy is dependent on the memory and cooperation of the interviewee.
- Surveys are expensive.

II. Methods of data collection

The main methods of collecting information are:

1. **Observation**
2. **Interview and questionniares**
3. **Documentary sources -** Clinical records and other personal records, death certificates, publications etc.

Exercise

1. State the different sources of health information.
2. What is the major source of health information in Ethiopia?
3. Discuss the problems related to health service records as source of health data.
4. If you want to know the number of people in your kebele who are properly using latrines, which method of data collection would be appropriate?

UNIT EIGHT

Epidemic Investigation and Management

Learning Objectives

At the end of this unit the student is expected to:

- Define epidemic
- Identify types of epidemic
- Describe the different steps in the investigation of epidemic
- Discuss the management of epidemic

8.1 Levels of Disease Occurrence

Diseases occur in a community at different levels at a particular point in time. Some diseases are usually present at a predictable level. This is called the **expected level**. But sometimes they occur in **excess of what is expected**. The examples of expected level are endemic and hyper endemic. When the disease occur as epidemic, outbreak, and pandemic it is considered as excess of what is expected.

Definition of terms related to the level of occurrence of disease

1. **Endemic:** Presence of a disease at more or less stable level. Malaria is endemic in the lowland areas of Ethiopia.

2. **Hyper endemic:** Persistently high level of disease occurrence.

3. **Sporadic:** Occasional or irregular occurrence of a disease. When diseases occur sporadically they may occur as epidemic.

4. **Epidemic**: The occurrence of disease or other health related condition in excess of the usual frequency in a given area or among a specific group of people over a particular period of time.

5. **Outbreak**: Epidemics of shorter duration covering a more limited area.

6. **Pandemic:** An epidemic involving several countries or continents affecting a large number of people. For example the worldwide occurrence of HIV/AIDS is a pandemic.

The definition of epidemic indicates that the term can have a broad meaning. It may include any kind of disease or injury including non – infectious diseases. There is no general rule about the number of cases that must exist for a disease to be considered an epidemic. If the number of cases exceeds the expected level on the basis of the past experience of the particular population, then it is an epidemic. It

is important to note that this level varies for different diseases and different circumstances. An epidemic may cover a small area within a city, or an entire nation or may have a worldwide distribution. It may encompass any time period ranging from few hours (chemical intoxication, bacterial food poisoning), a few weeks (influenza, hepatitis) to several years (AIDS). A disease that remains epidemic over many years eventually may be considered endemic.

8.2 Types of epidemics

Epidemics (outbreaks) can be classified according to the method of spread or propagation, nature and length of exposure to the infectious agent, and duration.

1. Common Source Epidemics:- Disease occurs as a result of exposure of a group of susceptible persons to a common source of a pathogen, often at the same time or within a brief time period. When the exposure is simultaneous, the resulting cases develop within one incubation period of the disease and this is called a **point source epidemic**. The epidemic curve in a point source epidemic will commonly show a sharp rise and fall. Food borne epidemic following an event where the food was served to many people is a good example of point source epidemic. If the exposure to a common source continues over time it will result in a **continuous common source epidemic**. A waterborne outbreak that spreads through a contaminated community water supply is an example of a common source epidemic with continuous exposure. The epidemic curve may

have a wide peak because of the range of exposures and the range of incubation periods.

2. Propagated/ Progressive Epidemics:- The infectious agent is transferred from one host to another. It can occur through direct person to person transmission or it can involve more complex cycles in which the agent must pass through a vector as in malaria. Propagated spread usually results in an epidemic curve with a relatively gentle upslope and somewhat steeper tail. An outbreak of malaria is a good example of propagated epidemic.

When it is difficult to differentiate the two types of epidemics by the epidemic curve, spot map (studying the geographic distribution) can help.

3. Mixed Epidemics:- The epidemic begins with a single, common source of an infectious agent with subsequent propagated spread. Many food borne pathogens result in mixed epidemics.

8.3 Investigation of an Epidemic

The purpose is to determine the specific cause or causes of the outbreak at the earliest time and to take appropriate measure directed at controlling the epidemic and preventing future occurrence. The following questions should be answered when investigating an epidemic.

- What is the etiological agent responsible for the epidemic?

- What is/are the predominant modes of transmission?

- What specific source/s of disease can be identified?

E.g. human carriers, breeding sites for vectors, etc.

- What specific practices or environmental deficiencies have contributed to the outbreak? E.g. improper food handling, human made breeding sites for mosquitoes.

- What is the chain of events that led to the outbreak?

E.g. accumulation of susceptible hosts in an area.

Uncovering outbreaks

Outbreaks are detected in one of the following ways:

a. Through timely analysis of routine surveillance data

b. Report from clinician.

c. Report from the community, either from the affected group or concerned citizen.

Steps in Epidemic Investigation

There is no fixed step in the investigation of epidemics but the following step can be considered as one option.

1. **Prepare for fieldwork.**

Before leaving for the field you should be well prepared to under take the investigation. Preparations can include:

- Investigator must have the appropriate scientific knowledge, supplies, and equipment to carry out the investigation. It might be difficult for the health extension worker to fully investigate the epidemic, hence, he/she should inform and involve other high level health professionals from the outset.
- collect sample questionnaire.
- arrange transportation and organize personnel matters.
- clarify your and your team role in the field. Arrange where and when to meet them.

2. Verify (confirm) the existence of an epidemic

This initial determination is often made on the basis of available data. Compare the number of cases with the past levels to identify whether the present occurrence is in excess of its usual frequency. Instead of comparing absolute numbers it is advisable to compare rates like incidence rate

3. Verify (confirm the diagnosis).

Always consider whether initial reports are correct. Carry out clinical and laboratory investigations on the reported cases. For example the already collected blood film slides can be seen by laboratory experts to check whether the initial report was correct. It is important to investigate the index case (the first case that comes to the attention of health authorities) and other early cases. The importance of the index case and other early cases for diseases that are known to occur in epidemic form, such as relapsing fever, is as an indication to health authorities of the possible start of an outbreak. The sooner the index case and other early cases are investigated, the greater the opportunity to arrest the outbreak at earliest stage possible. The health extension worker requests support from the Woreda Health Office or the nearest Health Center for confirming the diagnosis.

4. Identify and count cases

Prepare "case definition" before starting identification of cases.

Case definition is defined as a standard set of criteria to differentiate between cases and non cases. Cases can be one of the following:

Confirmed / definite: A case with laboratory verification.

Probable: A case with typical clinical features but without laboratory confirmation.

Possible: A case with fewer of typical clinical features.

Cases can better be identified by active case detection using all available means including house to house visits. They can also be identified by stimulated passive case detection, for example by alerting the public about the epidemic and requesting them to report to the nearest health institution when they have signs and symptoms of that disease. The health extension worker can identify and count cases based on the sign and symptoms of the disease.

If there is effective drug for the treatment of that disease, cases can be treated while identifying them. Additionally other control measures can be taken side by side to arrest the epidemic before many people are affected.

5. Describe the epidemic with respect to person, place and time

Each case must be defined according to standard epidemiologic parameters: the date of onset of the illness, the place where the person lives or became ill, and the sociodemographic characteristics (age, sex, education level, occupation).

The tools to be used when characterizing the epidemic are epidemic curve, spot map and attack rates.

Epidemic curve is an important tool for the investigation of disease outbreaks. In epidemic curve the distribution of cases is plotted over time, usually in the form of histogram, with the date of onset of cases on the horizontal axis, and the number of cases corresponding to each date of onset on the vertical axis.

Spot map is a map of locality where the outbreak has occurred, on which the location of cases is plotted. The spot map is often helpful in detecting the source of an outbreak. Mapping disease can be done at kebele, woreda, regional, and national level. One limitation of spot map is that it does not take into account underlying geographic differences in population density. Thus the spot map needs to be supplemented by calculation of place specific attack rates.

Person specific attack rates: The tool that is important for the analysis of disease outbreaks by personal characteristics is person specific attack rates like attack rates by age, sex, occupation, income, religion etc.

6. Identify the causes of the epidemic

All factors that can contribute to the occurrence of the epidemic should be assessed. The epidemic investigating team should try to answer questions like:

Why did this epidemic occur?

Are there many susceptible individuals?

Is the temperature favorable for the transmission of the diseases?

Are there breeding sites for the breeding of vectors? Etc

Confirmation of the diagnosis can be done by using additional tests which are more accurate. In addition to knowing the etiologic agent, more emphasis should be given to identify the risk factors. Investigate the environmental conditions such as food sanitation, suspected breeding sites, animal reservoirs, according to the type of disease outbreak being investigated.

7. Management of epidemic and follow up

Although it is discussed late, intervention must start as soon as possible depending on the specific circumstances. One might aim control measures at the specific agent, source, or reservoir. For example, an outbreak might be controlled by destroying contaminated foods, disinfecting contaminated water, or destroying mosquito breeding sites or an infectious food handler could be suspended from the job and treated.

General principles in the management of epidemics

Management of epidemics requires an urgent and intelligent use of appropriate measures against the spread of the disease. Action to be taken is dependent on the type of the disease as well as the source of the outbreak. However, the actions can be generally categorized as presented below to facilitate easy understanding of the strategies.

A. Measures Directed Against the Reservoir

Understanding the nature of the reservoir is necessary in the selection of an appropriate control methods and their likelihood of success. The following are examples of control measures against diseases with various reservoirs:

Domestic animals as reservoir:

- Immunization. Example – giving anti-rabies vaccine for dogs
- Destruction of infected animals e.g anthrax

Wild animals as reservoir:

post-exposure prophylaxis for human beings- Example: rabies

Humans as reservoir

a. Isolation of infected persons. This is separation of infected persons from non-infected for the period of communicability. This is not suitable in the control of diseases in which a large proportion are inapparent infection (without signs and symptoms) or in which maximal infectivity precedes overt illness.

b. Treatment to make them noninfectious- e.g., tuberculosis.

c. Quarantine- is the limitation of freedom of movement of apparently healthy persons or animals who have been exposed to a case of infectious disease. Usually imposed

for the duration of the usual maximal incubation period of the disease. Cholera, Plague, and yellow fever are the three internationally quarantinable diseases by international agreement.

Now quarantine is replaced in some countries by active surveillance of the individuals; maintaining close supervision over possible contacts of ill persons to detect infection or illness promptly; their freedom of movement is not restricted.

B. Measures that interrupt the transmission of organisms

Action to prevent transmission of disease by ingestion:

i. Purification of water

ii. Pasteurization of milk

iii. Inspection procedures to ensure safe food supply.

iv. Improve housing conditions.

Actions to reduce transmission of respiratory infections

- include ventilation of rooms.

In the case of diseases that involve an intermediate host for transmission, for example schistosomiasis, clearing irrigation farms from snails is an appropriate measure.

C. Measures that reduce host susceptibility

- immunization (vaccination). Example vaccination for meningitis
- Chemoprophylaxis: for example, use of chloroquine to persons traveling to malaria endemic areas.

After the epidemic is controlled, strict follow up mechanisms should be designed so as to prevent similar epidemics in the future.

8. Report of the investigation

At the end prepare a comprehensive report and submit to the appropriate/concerned bodies like the Woreda Health Office. The report should follow the usual scientific format: introduction, methods, results, discussion, and recommendations.

The report should discuss in detail:

- Factors leading to the epidemic.
- Measures used for the control of the epidemic.

- Recommendations for the prevention of similar episodes in the future.

Exercise

1. Hundred cases of malaria were seen in the health post which is found in your kebele in October 2000. Can you say there was epidemic of malaria in October 2000? Why?

2. Suppose epidemic of common cold occur in your area. What type of epidemic is this one?

   a. Point source epidemic

   b. Common source epidemic with continued exposure

   c. Propagated epidemic

   d. Mixed epidemic

3. Suppose epidemic of relapsing fever occur in your area. What type of epidemic is this one?

   a. Point source epidemic

b. Common source epidemic with continued exposure

c. Propagated epidemic

d. Mixed epidemic

4. Ten patients come to you to seek treatment because they have fever and severe headache. They also informed you that there are many other similar cases in their village. How do you investigate this epidemic?.

5. Suppose malaria epidemic occur in your kebele. How do you control it?

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UNIT NINE

Epidemiological Surveillance

Learning Objectives

At the end of this unit the student is expected to:

- Define surveillance
- Describe the types of surveillance
- Discuss the activities of surveillance
- Identify public health important diseases that are under surveillance in Ethiopia

9.1 Definition

Surveillance is defined as the *continuous (ongoing)* scrutiny of the factors that determine the occurrence and distribution of diseases and other health related events through a systematic collection of data.

9.2 Purpose of surveillance

- To be able to identify diseases, injuries, hazards and other health related factors as early as possible, i.e. prediction and early detection of outbreaks.

- To provide scientific baseline data and information for priority setting, planning, implementing and evaluating disease control program for both communicable and non-communicable health problems.

- To define the magnitude and distribution of diseases by time, person and place dimension.

9.3 Types of surveillance

The two common types of surveillance are passive and active surveillance.

Passive surveillance

Passive surveillance may be defined as a mechanism for routine surveillance based on passive case detection and on the routine recording and reporting system. The information provider comes to the health institutions for help, be it medical or other preventive and promotive health services. It involves collection of data as part of routine provision of health services.

Advantages of passive surveillance

- covers a wide range of problems

- does not require special *arrangement*

- it is relatively cheap

- covers a wider area

The disadvantages of passive surveillance

- The information generated is to a large extent unreliable, incomplete and inaccurate
- Most of the time, data from passive surveillance is not available on time
- Most of the time, you may not get the kind of information you desire
- It lacks representativeness of the whole population since passive surveillance is mainly based on health institution reports

Active surveillance

Active surveillance is defined as a method of data collection usually on a specific disease, for relatively limited period of time. It involves collection of data from communities such as in house-to-house surveys or mobilizing communities to some central point where data can be collected. This can be arranged by assigning health personnel to collect information on presence or absence of new cases of a particular disease at regular intervals.

Example: investigation of out-breaks

The advantages of active surveillance

- the collected data is complete and accurate
- information collected is timely.

The disadvantages of active surveillance

- it requires good organization,
- it is expensive
- it requires skilled human power
- it is for short period of time(not a continuous process)
- it is directed towards specific disease conditions

Conditions in which active surveillance is appropriate

Active surveillance has limited scope. Unlike passive surveillance, it cannot be used for routine purposes. There are certain conditions where active surveillance is appropriate. These conditions are:

- For periodic evaluation of an ongoing program
- For programs with limited time of operation such as eradication program

- In unusual situations such as:
    - New disease discovery
    - New mode of transmission
    - When a disease is found to affect a new subgroup of the population.
    - When a previously eradicated disease reappears.

9.4 Activities in Surveillance

The different activities carried out under surveillance are:

1. Data collection and recording
2. Data compilation, analysis and interpretation
3. Reporting and notification
4. Dissemination of information

9.5 Features of a good surveillance system

- Using a combination of both active and passive surveillance techniques
- Timely notification
- Timely and comprehensive action taken in response to notification

- Availability of a strong laboratory service for accurate diagnoses of cases

9.6 The integrated disease surveillance system

The integrated disease surveillance system is a relatively new strategy, which is being implemented in Ethiopia. In this strategy several activities from the different vertical programs are coordinated and streamlined in order to make best use of scarce resources. The activities are combined taking advantage of similar surveillance functions, skills, resources, and target population.

Integrated disease surveillance strategy recommends coordination and integration of surveillance activities for diseases of public health importance.

Diseases included in the integrated disease surveillance system

Among the most prevalent health problems 21 (twenty one) communicable diseases and conditions are selected for integrated disease surveillance to be implemented in Ethiopia. The diseases are recommended because they fall into one or more of the following categories:

- Are top causes of high morbidity and mortality in Ethiopia (for example, malaria, pneumonia, diarrheal diseases, tuberculosis, and HIV/AIDS)
- Have epidemic potential (for example yellow fever and cholera)
- Surveillance required internationally (for example plague, yellow fever and cholera)
- Have available effective control and prevention interventions for addressing the public health problem they pose (for example schistosomiasis, onchocerciasis, trypanosomiasis)
- Can easily be identified using simple case definition; and
- Have intervention programs for prevention, control, eradication or elimination of the diseases (for example EPI and Integrated Management of Childhood Illness Strategy (IMCI)

List of Priority Disease in Ethiopia

A. Epidemic-Prone Diseases

- Cholera
- Diarrhea with blood (Shigella)
- Yellow fever
- Measles
- Meningitis
- Plague
- Viral hemorrhagic fevers***
- Typhoid fever
- Relapsing fever
- Epidemic typhus
- Malaria

B. **Diseases Targeted for Eradication and Elimination**

- Acute flaccid paralysis (AFP)/ polio
- Dracunculiasis (Guinea worm)
- Leprosy
- Neonatal tetanus

C. Other Diseases of Public Health Importance

- Pneumonia in children less than 5 years of age
- Diarrhea in children less than 5 years of age
- New AIDS cases
- Onchocerciasis
- Sexually Transmitted Infections (STIs)
- Tuberculosis

*** Viral Hemorrhagic Fever (VHF) is not in the National priority diseases list, but every health worker should be aware of its epidemic proneness and high fatality

Exercise

1. What is the purpose of surveillance?
2. What is the difference between active and passive surveillance?
3. What is the most important use of active surveillance?
4. What are the activities in surveillance?
5. What is the advantage of integrated disease surveillance strategy?

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