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CHRISTIAN RELIEF & DEVELOPMENT ASSOCIATION

TRAINING PROGRAMME ON EPIDEMIOLOGY OF COMMUNICABLE DISEASE IN ETHIOPIA

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INFECTIOUS DISEASE EPIDEMIOLOGY

Introduction

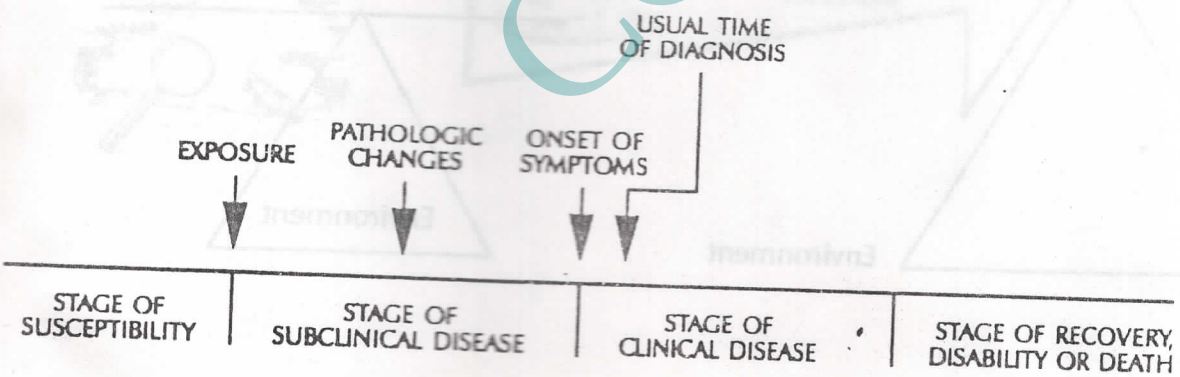
Despite the great scientific advances that have reduced morbidity and mortality from infectious diseases over the past decades, infectious diseases continue to account for a major proportion of acute illness, even in technologically advanced countries, though the types of diseases vary from place to place. The level of occurrence of infectious diseases also vary greatly, ranging from endemic(low expected levels) to pandemic(affecting several countries at a higher scale).

Natural History of Diseases

> The natural history of disease refers to the progress of a disease process in an individual over time, in the absence of intervention.

The process begins with exposure to the causative agent capable of causing disease. Without medical intervention, the process ends with recovery, disability, or death. Most disease have a characteristic natural history, although the time frame and specific manifestations of disease may vary from individual to individual. The usual course of a disease may be halted at any point in the progression by preventive and therapeutic measures, host factors, and other influences. The stages in the natural history of disease are shown in Figure 1.

Figure 1
NATURAL HISTORY OF DISEASE



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Components of infectious Disease Process

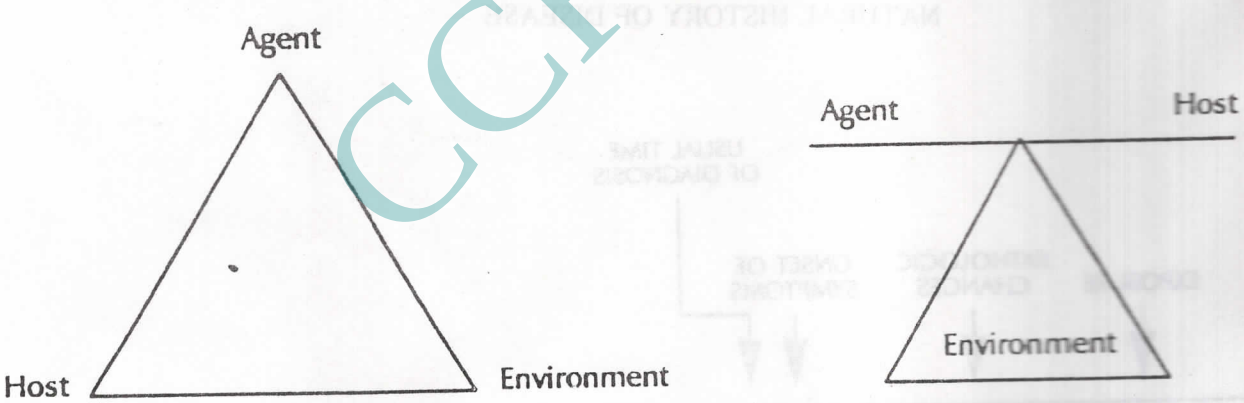
Infectious diseases result from the interaction of Infectious **agent**, susceptible **host**/reservoir and **environment** that brings the host and the agent together.

Agent: refers to an Infectious micro-organism- virus, bacteria, parasite, or other microbe.

Host: host factors influence individual's exposure, susceptibility or response to a causative agent. For example- age, sex, race, socioeconomic status, and behaviours(smoking, drug abuse, lifestyle, sexual practices and contraception, eating habits) affect exposure.

Environment: environmental factors are extrinsic factors which affect the agent and the opportunity for exposure. Physical factors such as geology, climate, and physical surrounding(e.g., maternal waiting home, hospital); biologic factors such as insects that transmit the agent; and socioeconomic factors such as crowding, sanitation, and the availability of health services.

Figure 2
EPIDEMIOLOGIC TRIANGLE AND TRIAD(VALANCE BEAM)



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Methods of Transmission of Infectious Agents

1. Direct Transmission- immediate transfer of the agent from a reservoir to a susceptible host by direct contact or droplet spread.

   Touching
   Kissing
   Sexual intercourse
   Blood transfusion
   Transplacental

2. Indirect- an agent is carried from reservoir to a susceptible host by suspended air particles or by animate(vector-mosquitoes, fleas, ticks...) or inanimate(vehicle-food, water, biologic products, fomites) intermediaries.

   Vehicle-born: food, water, towels, ...
   Vector-borne: insect animals, ...
   Airborne: dust, droplets
   Parenteral injections

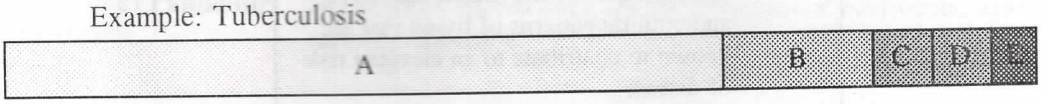
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Variation in Severity of Illness

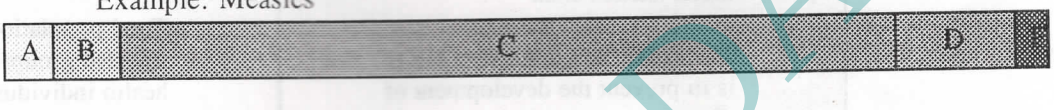
Infectious processes can result in a wide variety of clinical effects, ranging from inapparent infection to severe clinical illness or death (see figure 4).

Figure 4
Distribution of clinical severity of three classes of infections.

Class A - Inapparent Infection Frequent
Example: Tuberculosis



Class B - Clinical Disease Frequent; few deaths
Example: Measles



Class C - Infections Usually Fatal
Example: Rabies virus, HIV



Key: A = Inapparent
B = Mild
C = Moderate
D = Severe(Nonfatal)
E = Fatal

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Levels of Disease Prevention

Disease prevention means to interrupt or slow the progression of disease. Therefore, the aim is to push back the level of detection and intervention to the precursors and risk factors of disease.

Table Levels of prevention in relation to the stage of disease.

Level of Prevention	Stage of disease	Target
Primordial	Existence of underlying condition leading to causation The aim is to avoid the emergence and establishment of the social, economic, and cultural patterns of living that are known to contribute to an elevated risk of disease. Example: smoking, environmental pollution	Total population and selected groups
Primary	Specific causal factors exist The causative agent exists but the aim is to prevent the development of disease. Example: immunization Measles, polio	Total population, selected groups and health individuals
Secondary	Early stage of disease The aim is to cure patients and prevent the development of advanced disease. Example: Early detection & treatment of cases of tuberculosis & STD	Patients
Tertiary	Late stage of disease(treatment & rehabilitation) The aim is to prevent severe disability and death. Example: Leprosy	Patients

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Levels of Disease Occurrence

1. Expected levels

   a) **Endemic**: a persistent level of low to moderate occurrence
   b) Hyperendemic: a persistently high level of occurrence
   c) **Sporadic**: occasional cases occurring at irregular intervals

2. Excess of what is expected

   a) **Epidemic**: occurrence of disease in excess of what is expected in a limited period.
   b) **Outbreak**: same as epidemic, often used by public health officials because it is less provocative to the public.
   c) **Pandemic**: an epidemic spread over several countries or continents, affecting a large number of people.

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Exercised on Infectious disease Epidemiology

Exercise 1. Primary prevention is directed at preventing disease. What do the secondary and tertiary levels prevent, respectively?

Exercise 2. Secondary prevention is defined as the attempt to control which of the following?

A. disease before its biological onset
B. disease after its clinical onset but before its clinical onset
C. exposure before it cause disease
D. disease after its clinical onset but before it causes disability
E. both B and D

Exercise 3. For each of the following interventions, indicate what level (s) of prevention is (are) involved:

A. Traffic control laws
B. Special education for handicapped children
C. Use of the papanicolaou smear to detect cell abnormalities indicative of early cervical cancer
D. Treatment of people with diagnosis of active pulmonary tuberculosis
E. Testing and referral of factory workers for high blood pressure, indicative of hypertension
F. Plastic surgery on patients disfigured as a result of severe burns

Exercise 4. For each of the following components of antenatal care, indicate what level (s) of prevention is (are) involved, for child and for mother:

A. VDRL testing for syphilis
B. Immunization against tetanus
C. Monitoring of blood pressure
D. Nutritional counselling
E. Identification of high-risk pregnancies for more intensive follow-up, so as to be able to intervene early in case of complications
F. Psychological counselling after a miscarriage

Exercise 5. In the chemoprophylaxis of malaria using chloroquine, the drug does not prevent the parasite from establishing an infection in the liver cells of its human host, but prevents the subsequent dissemination of the parasite to the blood, and thus prevents the clinical onset of disease. What level of prevention would apply in this example?

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Exercise 6. For each of the following measures of AIDS prevention and control, indicate what level(s) of prevention is (are) involved:

A. Screening donated blood to exclude units contaminated by the causative agents of AIDS, hepatitis B and C, syphilis, or malaria
B. Screening apparently healthy people for the presence of the human immunodeficiency virus (HIV), followed by counselling HIV-positive individuals about ways of maintaining their health and protecting their sexual partner
C. Counselling AIDS patients and their families with the objective of helping them find ways of relieving their mental stress, and the financial burden imposed by the illness
D. Promoting awareness in high school students of self protective measures against AIDS and other sexually transmitted diseases
E. medical follow-up of HIV-positive individuals so as to enable the early detection and treatment of opportunistic infections associated with the immunosuppression caused by the virus

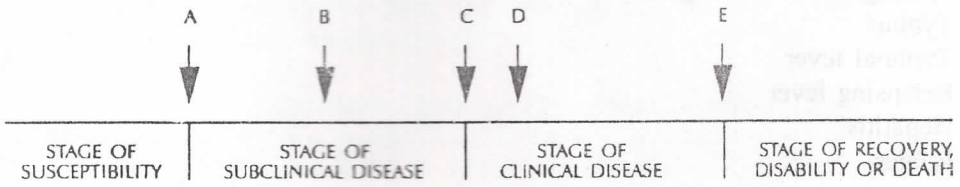
Exercise 7. Direct transmission included which of the following modes of transmission?

A. Droplet spread
B. Vehicleborne transmission
C. Vectorborne transmission
D. Airborne transmission

Exercise 8 For each of the following, identify the appropriate letter from the timeline in the figure below representing the natural history of disease.

_____Onset of symptoms
_____Usual time of diagnosis
_____Exposure

Figure: Natural history of disease timeline.



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EPIDEMIC PRONE DISEASES IN ETHIOPIA

Several studies and official data from the Ministry of Health indicated that communicable diseases are the leading public health problems in Ethiopia. The majority of the communicable diseases in Ethiopia have affected and killed many people, sometimes these diseases occur at a higher rate than usual causing outbreaks. These include a wide range of vector borne and non-vector borne diseases and most could be prevented with effective public health interventions. The climate and topography of the country favour the existence of various disease vectors such as mosquitoes, flies and snails. The problem is further compounded by the low socioeconomic status of the population, poor personal and environmental hygiene and lack of adequate health services to the majority of the rural population. The following are the major epidemic prone diseases in Ethiopia:

Tropical Diseases

Malaria
Schistosomiasis
Onchocerciasis
Trypanosomiasis
leishmaniasis
Yellow fever

Non-tropical Communicable diseases

Tuberculosis
Diarrhoeal diseases
Vaccine preventable diseases
- Measles
- Poliomyelitis
- Diphtheria
- Pertussis(whooping cough)

Sexually transmitted diseases including HIV/AIDS
Trachoma
Meningococcal meningitis
Typhus
Typhoid fever
Relapsing fever
Hepatitis
Rabies

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Although the high prevalence of communicable and epidemic prone diseases is attributed to the poor nutritional status of the population and the low standard of living, the poor organization of the prevention and control activities has added to the problem.

Often the damage caused by these diseases to the community are not well recognized and documented because of the poor health information system and lack of skilled manpower.

Because of the enormity of the problems no attempt is made to describe epidemic prone diseases in Ethiopia. Readers interested in the diseases are encouraged to refer to a more elaborate description of the diseases in the reference materials provided at the end of this section.

Suggested References

Helmut Kloos and Zein Ahmed Zein(eds). The Ecology of Health and Disease in Ethiopia. Westview Press. 1993.

Melakeberhan Dagnew, Mesganaw Fantahun and Shabbir Ismail. Epidemic Prone Disease in Ethiopia. EPHA Expert Group Report. Ethiopian Journal of Health Development. 1995:118-130.

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Exercise on Epidemic Prone Diseases In Ethiopia

Select four major communicable diseases in your district which have the potential to cause outbreak. For each:

1. Indicate which age groups of the district population are most affected.

2. Is there any thing that can be done to prevent the disease?

   At primordial level:

   At primary level:

   At secondary level:

   At tertiary level:

3. Briefly describe the prevention and control activities being carried out currently in the district to prevent the disease.

4. Do you think that the prevention activities you described under 3 are adequate to achiev reasonable control of the disease? Explain you answer.

5. If an outbreak occurs, what will be the effect on the district population?

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PRINCIPLES OF OUTBREAK INVESTIGATION

Epidemic is the occurrence of excess cases of disease than expected in a given area or among a specific group of people over a particular period of time.

PATTERNS OF EPIDEMICS

Two principal types are well recognized. These are the common source and propagated/progressive. The two types can be distinguished by plotting an epidemic curve. An epidemic which shows the features of both types is referred as mixed.

1. Common source epidemics

Caused by exposure of a group of people to a common noxious influence, such as an infectious agent or a toxin.

a) Point source - exposure is brief and simultaneous. All exposed will develop the disease within one incubation period. A rapid rise and fall of an epidemic curve suggests a point source epidemic

b) Continuous common source - the source of an outbreak remains for a longer time, days, weeks or longer either continuously or intermittently, there will be multiple exposures with variable incubation period, this will make an epidemic curve with no clear peak and the duration of the outbreak will be prolonged.

c) Intermittent common source - the exposure/source is intermittent and there is no clear pattern of the course of the epidemic.

2. Propagated or progressive epidemics

Outbreak of this type can occur through direct person-to-person transmission or the transmission could pass through a vector from infected to healthy person.

The epidemic curve would have a successive series of peaks reflecting increasing numbers of cases in each generation. The epidemic usually wanes after a few generations, either because the number of susceptible falls below some critical level, or because intervention measures become effective. In reality, few propagated outbreaks provide a classic pattern.

3. Mixed Epidemics

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3. Mixed Epidemics

Epidemics having the features of both common source and propagated epidemics are referred as mixed epidemics. For example a common source outbreak may be followed by secondary person-to-person spread.

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Steps in Outbreak/Epidemic Investigation

There is no rigid step to follow while investigating an outbreak. Several activities could be accomplished simultaneously. The steps to follow are usually set by the investigator(s) depending on the suspected cause of the outbreak. However, verification of the diagnosis and establishment of the exitance of an epidemic are commonly among the first steps.

Summary of the Steps involved in Outbreak Investigation

1. Prepare for field work
2. Verify the diagnosis
3. Verify the existence of an epidemic
4. Describe the epidemic with respect to time, place, person.
5. Formulate and Test Hypotheses
6. Search for additional cases: Locate unrecognized or unreported cases.
7. Analyze the Data
8. Make a decision on the hypotheses tested.
9. Intervention and follow-up.
10. Report of the investigation

1. Prepare for field work

Before leaving for the field an investigator must be well prepared to under take the investigation. Preparations can be categorized into three:

A. Investigation related:
- supplies, and equipment to carry out the investigation
- review applicable literature and collect sample questionnaire
- consult with local experts/health workers
- consult available health information/what is known about the disease pattern?

B. Administration related:
- observe all administrative procedures
- arrange transportation and organise personal matters
- clarify your and your team role in the field
- identify local contacts and arrange where and when to meet them.

2. Verify the diagnosis

Review clinical and laboratory findings to establish diagnosis. This is to ensure that the problem has been properly diagnosed and to rule out laboratory error as the basis for the increase in

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diagnosis. If you have any doubt about the laboratory findings review the laboratory techniq being used with the qualified laboratorian or send specimen for confirmation to refere laboratory. Depending on the type of the problem under investigation establish criteria labelling persons as "cases". The criteria may be based on symptoms, laboratory results or bo

Example: Confirmed/definite: a case with laboratory verification.
Probable : a case with typical clinical features of the disease without laborat confirmation.
Possible : a case presented with fewer of the typical clinical features.

3. Verify the existence of an epidemic

Compare the current number of cases (or incidence) with the past levels of disease in community, considering the seasonal variation in the occurrence of the disease, to determ whether an excessive number of cases have occurred, i.e., compare the observed number of c (reported as outbreak) with the expected number of cases in the area.

Be careful, excess may not always indicate an outbreak. The excess may be due to change local reporting procedures, change in case definition, increased interest because of loca national awareness, or improvements in diagnostic procedures. In areas with sudden change population size such as resort areas, college towns, and migrant farming areas, changes in numerator (number of reported cases) may simply reflect changes in the denominator (size o population) - absolute numbers (without proportion or rates) should be carefully analyzed.

4. Describe the epidemic with respect to time, place, person.

Collect relevant information related to the investigation. Information could be obtained from already existing records or you can obtain using a case investigation form specifically desig for a particular situation under investigation.

By using a well established descriptive epidemiological tools, like epidemic curve and mapping, an outbreak can be characterized by time, place and person.

Epidemic curve: a graph showing the cases by the time of onset.
Spot map: a plot of the cases by location.
Attack rate: calculate rates of illness in population at risk by exposure to spe suspected items and other relevant attributes. The identificatio "relevant" attributes may be a crucial step in the solution of the prob

5. Formulate and Test Hypotheses

Formulate the hypotheses based on your characterization of the epidemic by time, place, person. The hypotheses should address:

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* the source of the agent,
* the mode of transmission, and
* the exposures that caused the disease
* the type of epidemic- common source Vs propagated
* the population at the highest risk
* the possible source(s) of the disease (infection)

Methods of Evaluation of Hypothesis:

1. Compare the hypotheses with the established fact.

2. Use analytic epidemiology to quantify relationships and explore the role of chance.

Cohort approach - Calculate attack rates and relative risk for exposed and nonexposed persons.

Attack rate = Number of cases/population at risk

Relative risk = attack rate in exposed/ attack rate in nonexposed

Case-control approach- Compare ill population(cases) with well population(controls) with regard to the suspected exposure.

6. Search for additional cases: Locate unrecognized or unreported cases.

Passive: inquire physicians or hospitals or both whether they have seen similar cases.

Active : do intensive investigation in the community on asymptomatic persons or contacts of the cases. For example, doing liver function test in an investigation of hepatitis A outbreak.

7. Analyze the Data

Assemble all the findings so far and try to make a sense out of it- interpret finding in totality.

8. Make a decision on the hypotheses tested.

Try to see that all the findings are consistent and that they all support one, and only one, hypotheses.

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9. Intervention and follow-up.

Although it is discussed late, intervention must start as soon as possible depending on the specific circumstances. Aim control measures at the weak link or links in the chain of infection. One might aim control measures at the specific agent, source, or reservoir. For example, an outbreak might be controlled by destroying contaminated foods, sterilizing contaminated water, or destroying mosquito breeding sites. or an infectious food handler could be removed from the job and treated. (see discussion on epidemic management).

10. Report of the investigation

At the end prepare a comprehensive report and submit to the appropriate/concerned agency (or agencies). The report should follow the usual scientific format: introduction, background, methods, results, discussion, and recommendations.

The report should discuss in detail:
- factors leading to the epidemic.
- evaluation of measures used for the control of the epidemic.
- recommendations for the prevention of similar episodes in the future.

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Epidemic Management

1. 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 disease with varies reservoir :

Domestic animals as reservoir:

* Immunization
* Destruction of infected animals

Example : brucellosis and bovine tuberculosis.

Wild animals as reservoir:

* Post-exposure prophylaxis

Example : rabies

Humans as reservoir

♣ Eradication of an infected host is not a viable option.

* Removal of the focus of infection- e.g., cholecystectomy in a chronic typhoid carrier.
* Isolation of infected persons. This is separation of infected persons from non-infected for the period of communicability. Not suitable in the control of diseases in which a large proportion are inapparent infection or in which maximal infectivity precedes overt illness.
* Treatment to make them noninfectious- e.g., tuberculosis.
* Disinfection of contaminated objects.

♦ 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, Plaque, and yellow fever are the three internationally quarantable 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.

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2. Measures that interrupt the transmission of organisms

* Action to prevent transmission of disease by ingestion:
  - purification of water
  - pasteurization of milk
  - inspection procedures designed to ensure safe food supply.
  - improve housing conditions.

* Attempts to reduce transmission of respiratory infections
  - chemical disinfection of air and use of ultraviolet light.
  - work on ventilation patterns, like unidirectional ("laminar") air flow to reduce the transmission of organisms in hospitals.

* Action to interrupt transmission of diseases whose cycles involve an intermediate host
  - clearing irrigation farms from snails to control schistosomiasis.

3. Measures that reduce host susceptibility

* Active immunization, when either the altered organism or its product is given to a person to induce production of antibodies - EPI.

* Passive immunization, has lesser role in he control of communicable diseases than active immunization:
  . Transfer of maternal antibodies to the fetus through the placenta.
  . Prophylaxis administration of immune serum globulin(ISG) - TAT, rabies

* Chemoprophylaxis:
  . use of antibiotics for known contacts of cases- for example, in tuberculosis, gonorrhoea, and syphilis.
  . use of chloroquine to persons travelling to malaria endemic areas.
  . use of rifampicin for epidemic meningitis.

Detecting Outbreaks/Epidemics

Outbreaks are detected in one of the following ways:

1. Through timely analysis of routine surveillance data, this may reveal an increase in reported cases or unusual clustering of cases.

2. Report from clinician.

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

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Why do we Investigate Possible Outbreaks

1. To institute control and prevention measures - to reduce disease spread.

2. Opportunity for research

   Outbreaks are natural experiment waiting to be analyzed and exploited. It gives a unique opportunity to study the natural history of diseases. May also help to assess the impact of control measures and the usefulness of new epidemiology and laboratory techniques.

   E.g. Outbreaks of measles in highly immunized community provides a setting for investigators to study vaccine efficacy, the effect of age at vaccination, and the duration of vaccine-induced protection.

3. Training opportunity

   Investigating an outbreak requires a combination of diplomacy, logical thinking, problem-solving ability, quantitative skills, epidemiologic know-how, and judgement. These skills improve with practice and experience. Therefore, an outbreak may provide a good opportunity for an epidemiologist in-training to learn these skills by working with experienced epidemiologist.

4. Opportunity for program evaluation

   An outbreak of a disease targeted by a public health program, such as EPI, tuberculosis or STDs, may reveal a weak point in that program and provide the opportunity to change or strengthen the program's effort.

5. Public, political, or legal concerns

   Public, political, or legal concerns sometimes override scientific concerns in the decision to conduct an investigation. The call from these parties usually have no scientific basis and such investigations mostly do not identify a causal link between exposure and disease. Nevertheless, health departments have to be responsive to public concerns, because it at least provides an opportunity to educate the public.

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Exercises on Disease Outbreak

Exercise 1. An epidemic curve shows the distribution of cases of disease (on the vertical axis) in relation to (on the vertical axis):

A. the dates on which people were exposed
B. the dates in which people become ill
C. the duration of the epidemic
D. the duration of the incubation period
E. time

Exercise 2. The following statement(s) apply(ies) to a propagated epidemic:

A. its duration fits approximately within one incubation period of the disease
B. the epidemic curve is characterized by a sharp rise and a slow fall
C. the mode of transmission can be direct contact
D. the mode of transmission can be through a vector
E. it is a type of common source epidemic

Exercise 3. Contrast the following pairs of groups of terms:

A. Pandemic, epidemic, outbreak, and cluster of disease
B. epidemic, endemic, and sporadic disease

Exercise 4. An epidemic due to known infectious agent which lasts much longer than one incubation period of the disease agent is most probably not a:

A. common source epidemic
B. propagated epidemic
C. point source epidemic
D. progressive epidemic
E. A and C above

Exercise 5. An investigation of an outbreak of diarrhea revealed that the proportion of cases eating in Restaurant A was 85%, Restaurant B, 15%, Restaurant C, 55%, and the proportion consuming public water was 95%. Which of the following statements is correct?

A. the source is Restaurant A because the proportion of cases eating there is highest among the restaurants
B. the source is not Restaurant B because the proportion of cases eating there is the lowest
C. the source is the water supply because it has the highest proportions of cases
D. the source could be either Restaurant A, Restaurant C, or the water supply
E. similar data on a healthy group must be collected to reach a valid conclusion

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Exercise 6. In an outbreak of food poisoning associated with a party, the analysis of food histories taken from all who attended the party revealed an attack rate of 80% for those who ate cake. This finding suggests that:

A. cake is implicated in the causation of the outbreak
B. if the finding is statistically significant, there is an association between eating cake and becoming ill
C. the chance is 80% that cake is implicated in the causation of the outbreak
D. 80% of those who attended the party ate cake
E. none of the above

Exercise 7. On June 20, 1983, the Health Officer of Zway, a city with a population of approximately 60, 000, received case reports of 5 cases of typhoid fever in residents of the city. On the same day he had received notification of a case typhoid fever in resident of another city who had been a visitor in his city during approximately three of the four weeks preceding the onset of the illness. Typhoid fever had not occurred in this city during that year prior to the report of these cases reported in this city during the preceding five years was 2 cases per year. A survey of the health institutions of the city and inquires made to all physicians revealed a total of 13 known or suspected cases of typhoid fever (including the case reported from a nearby city). The dates of the onset of disease for each of the 13 reported cases were June 5, 7 (5 cases), 9(2 cases) 11, 16, 18, 25, and 28.

7.1. A. What was the incidence rate of typhoid fever in Zway from January to June 1939?

B. What was the average annual incidence rate of typhoid fever in Zway in the five year preceding the outbreak?

7.2. Do the 13 cases of typhoid fever reported from Zway in June 1939 constitute an epidemic? Explain your answer.

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Exercise 8. The Table below shows the dates of the onset of illness obtained for 98 people wh contracted viral hepatitis A during an outbreak of the disease.

Table. Dates of onset of illness for 98 cases of viral hepatitis A in an outbreak in Addis Ababa Ethiopia. 1971.

Dates of onset (1971)		Number of cases
August	21	1
	23	1
	27	2
	28	4
	30	2
	31	7
September	1	7
	2	13
	3	13
	4	12
	5	11
	6	11
	7	3
	8	1
	9	3
	10	3
	11	2
	13	2

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8.1. Construct the epidemic curve in the form of a histogram.

8.2. The incubation period in viral hepatitis A averages 28 to 30 days (range 15 to 50 days, dependin on dose).

A. Assuming no further cases occurred after September 13. can you say anything about th type of outbreak ? Explain your answer.

B. What additional information would enable you to confirm your answer to 8.2.A?

Exercise 9 In the course of your investigation of a disease outbreak in a certain area, a spot map which you have prepared shows that although case are found throughout the area, there is a particularly high concentration of cases in one specific location. What additional information do you need to consider before concluding that the risk of contracting the disease is highest in that location?

Exercise 10 (Based on the data presented in the Table below)

Table. Age distribution of reported measles cases and estimated age specific incidence rates of measles, Gondar, 1988.

Age group (years)	Number of cases	Relative frequency (% of total cases)	Incidence rate (per 100,000)
<1	288	8.4	7.5
1 - 4	690	20.2	4.7
5 - 9	312	9.1	1.7
10-14	576	16.9	3.5
15-19	1,054	30.9	5.8
20-24	252	7.4	1.3
25-29	116	3.4	0.5
30+	123	3.6	0.1
Total	3,411	100.0	1.4

10.1. In which age group did most cases of measles occur in 1988 in Gondar?

10.2. In which age group was the risk of contracting measles highest in 1988 in Gondar?

10.3. If your answers were different for 4.1 and 4.2, how do you explain the difference?

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Exercise 11. An outbreak of food poisoning occurred among a group of people who had attended picnic.

11.1. From the data given in the Table below, calculate the food-specific attack rates, i.e. the attac rates for people eating a specific food item, and for item, and for people not eating the specifi food item.

Table. Food histories given by persons attending a picnic (adapted from Reference 1.5)

Food items	Persons who ate food		Persons who did not eat food	
	Sick	Well	Sick	Well
Bread	20	80	10	90
Wot	20	80	50	50
Kitfo	65	35	10	90
Ayib	30	70	40	60
Gomen	60	40	45	55

11.2. On the basis of the attack rates you calculated, determine which was the food item most like to have been the source of disease.

11.3. Assuming that particular food item was confirmed as the source of disease, what are possi explanations for the fact that the attack rate was not 100% among those who ate the contamina food item?

11.4. What are possible explanations for the fact that the attack rate was not 0% among those who not eat the contaminated food item?

11.5. Why was the attack rate not 0% among those who ate non-contaminated food items?

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Exercise 12 A spot map of the cases of measles occurring in 1990 in a certain primary school was prepared. There were 6 cases in the first grade class, 8 cases in the second grade, 9 cases in the third grade, and no cases in the fourth and fifth grade classes. Based on the above information only (i.e. not considering any knowledge you may have about the epidemiology of measles), your conclusion is:

A. measles is an age-relates disease
B. measles is related to the level of education
C. the risk of catching measles was in the third grade class
D. there was an epidemic of measles in 1990 in that primary school
E. no conclusions can be reached with the available data

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SURVEILLANCE

The aim of surveillance is to provide quick information for action.

What is Surveillance?

Continuous monitoring of diseases and other health related events relevant to prevention and control of diseases within a population.

Surveillance = "To watch over"

Characteristics of Surveillance

* Dynamic/Continuous
* Current/Timely
* Purposeful/Action oriented

Main Uses of a Surveillance System

1. To assist early recognition and control of outbreaks.

2. To provide information on the distribution of health related events.

   Who is most affected by the disease?
   When does the disease affect the community most?
   Where does the disease exist in abundant?

3. To assist in priority setting and resource allocation.

4. To monitor the implementation and effectiveness of control programs.

Note: We do not limit surveillance to diseases for which we have effective control measure Surveillance can be justified for two additional purposes: 1) to learn more about th natural history, clinical spectrum, and epidemiology of a disease, and 2) to obta baseline data which we can use to assess the effectiveness of prevention and contr measures when they are developed and implemented.

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Sources of Data for Surveillance

* Census
* Vital registration system(birth and death certificates, autopsy reports)
* Health institutions report(discharge diagnoses, surgical logs, hospital infection reports)
* Absenteeism records (school, workplace, compensation claims)
* Epidemic notification and investigation reports
* Special surveys (e.g., research data, serologic surveys)
* Police records (especially for injury, alcohol-related crime)
* Information on animal reservoirs and vectors (e.g., for rabies, plague, Lyme disease)
* Special surveillance systems (e.g., for HIV/AIDS, injury and occupational illnesses)

Types of Surveillance

1. **Passive surveillance:** is that in which health care providers sends reports based on a known set of rules and regulations.

2. **Active surveillance:** is that in which public health officials contact providers to solicit reports of events or diseases. Such active surveillance is usually limited to specific diseases over a limited period of time.

3. **Sentinel surveillance:** uses a pre-arranged **sample** of reporting sources to report all cases of one or more conditions. Usually the sample sources are selected to be those most likely to see cases. Particularly in developing countries, sentinel surveillance provides a practical alternative to population-based surveillance.

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Conditions in which active surveillance is appropriate:

- For periodic evaluation of ongoing programs
  E.g. HIV/AIDS, EPI...
- For programs which have time limit of operation
  E.g. Small pox
- With the occurrence of unusual situations:
  - when a new disease/event discovered
  - when investigating a new mode of transmission
  - when a high-risk period is recognized
  - when a disease appears in a new geographic area or found to affect a new subgroup of the population
  - when previously eradicated disease reappear or low incidence disease occur at a higher level of endemicity

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Activities in Surveillance

1. Data collection and recording
   You need to collect information on each case in order to get adequate explanation for the occurrence of the disease under surveillance.

2. Reporting and notification.

3. Compilation, data analysis, and interpretation
   This activity must be performed at each level and timely if the aim is to make decisions at the right time before serious damage occurs to the community under surveillance.

4. Dissemination of findings for action.

Factors related with the selection of disease for surveillance:

1. Magnitude of the disease
2. Feasibility of control measures
3. Need for monitoring and evaluating the performance of a control program
4. Resource availability

Features of good surveillance system

1. Uses a combination of passive and active mechanisms to collect data.

   . Emphasizes the collection of minimum data in a simplest possible way.
   . Ensures quality and enhance compliance by making sure that the data collected is useful for the workers who actually collect the data.

2. Timely reporting.

3. Timely and comprehensive action.

   Action must be targeted towards both case detection and treatment and as well as to the control of the disease.

4. Provides strong laboratory services for accurate diagnosis.

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Common Deficiency in Routine Surveillance System

1. Data collection
   * Depends on passive case detection
   * Lack completeness
   * Lack representativeness

2. Reporting/Notification
   * Low compliance from the people collecting the data
   * Lack of timeliness

3. Data analysis
   * Done at a central level
   * Usually ended up by making an aggregate indicator of health, rather than locally applicable indicators
   * Doubtful reliability
   * Outdated

4. Dissemination
   * Aggregate information - not applicable at the local level.
   * No feedback system
   * Lack follow-up action

Note: Incomplete data are better than no data at all, provided that the problems and defects in the data are understood.

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Exercise on Surveillance

Exercise 1. How would you classify the following method of identifying cases, in terms of passive of active case detection:

In the course of investigations of a malaria outbreak in a certain town, the leaders of each of the administrative subunits of the town (kebeles) were requested to publicized an announcement inviting all people with fever to present themselves to the local health centre, where diagnosis and treatment would be conducted, with the assistance of a team of health workers sent to investigate the outbreak.

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Exercise 2.

In health care services, epidemiology has been used to develop surveillance systems geared almost solely to the detection of abnormal situations, so that control measures can be activated promptly, particularly against some communicable diseases. In many countries these systems have become passive case-reporting mechanisms that typically collect data at the local level and compile them at the central level. In general, these data cover only a segment of the population (usually that dealt with by public services; and they are not analysed at the levels at which services are provided. The situation is aggravated by the multiplicity of case reporting forms, which are controlled, standardized, and supervised by distinct, mutually disconnected programs. Even in the few instances where these data are analysed locally, the information obtained does not produce immediate action due to limitations in local administrative capacity.

At the central level, data thus collected besides being of dubious reliability are outdated as wee. Much of the information is presented in statistical tables accompanied by little or no analysis. The extent of analysis of the health situation is generally limited to reporting national rates of indicators that do not disclose existing or potential geographic and social variations within the country.

To improve surveillance within this type of system, collected data must be analysed and utilised at the local level so that decision can be taken in good time. Moreover, analyses must be made at progressively higher levels to contribute to the understanding of health problems, support decision-making at each level, and provide feedback to the central regulatory and planning processes. As an aid to local programming and the evaluation of health services, data analysis must be based on the smallest geographical units and consider the structural characteristics of the health services and the distribution of population groups by living conditions.

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2.1. Summarize the common deficiencies in the national surveillance identified in the article cited above. List the deficiencies according to the specific surveillance activity to which they relate (data collection/recording, reporting/notification, compilation/data analysis, dissemination).

2.2. In your view, how do the surveillance systems described in the article compare with your experience of the surveillance system in Ethiopia?

2.3. What are the suggestions for improving surveillance system made by the article?

Exercise 3 - Case Study(two cases given.

Case study 1: "Cuba's Campaign against deadly dengue".

On the morning of June 1, 1981, 12 year -old Octavio Veliz was rushed to the Hermonos Almedia Hospital in Havana. His mother told the admissions nurse her son had awakened with fever nausea, and vomiting. The boy complained of abdominal pains and his face and legs were covered with a rash.

The doctor in charge of the outpatient clinic ordered a series of tests. Five hours later the diagnosis come back: dengue fever, a viral infection transmitted by the Aedes aegypti mosquito.

The hospital notified the pedro Kouri Institute of Tropical Medicine and within hours the well-developed Cuban health care system went into action. A public appeal, through radio and TV, advised that anyone suffering from the symptoms observed in Octavio Veliz should immediately report to the nearest hospital or medical center. Twenty-four hours later over 1,000 adults and children were hospitalized and the Public Health Ministry announced that Cuba had been hit by a dengue epidemic.

Of the several clinical syndromes caused by arboviruses (viruses transmitted by insects), the haemorrhagic fevers are among the most feared because of the significant number of deaths they cause. The Cuban medical authorities did not believe that the dengue epidemic affecting their people was sometimes fatal dengue haemorrhagic fever/dengue shock syndrome (DHF/DSS). But June 5, Octavio Veliz died and the Public Health Ministry declared a national state emergency.

The civil defence system and the Revolutionary Neighbourhood Committees were mobilized. With massive public participation, an anti-dengue campaign went into effect and already infected were isolated in specially selected hospitals. Unfortunately the medical teams were not prepared to deal with the disease since DHF/DSS had never before been seen in the western Hemisphere.

To diagnose cases of DHF at an early stage among the epidemic's victims, doctors applied tourniquets to patients' arms for a short period. Those suffering from DHF experienced a great accentuation of haemorrhaging under the skin even at point away from the tourniquet. The skin become dark violet in colour. Other evidence included the vomiting of black material similar in appearance to coffee grounds, a drop in body temperature, cold and clammy skin, and conspicuous sweating.

Later in June the medical authorities decided that the epidemic had to be attacked at its source. So three weeks after the first case of dengue was reported, 10,000 volunteers, organised into mini-bridges of two or three people, spread out over the country in an attempt to wipe out the Aedes aegypti mosquito. A major breeding site for the insect was water storage containers used in homes without running water. Because the volunteers were operating in their own neighbourhoods, they had no problem gaining access to people's homes to check for mosquitoes.

Through massive public participation and cooperation, the Cubans managed to stop the epidemic and eradicate the Aedes aegypti mosquito in six months. During the epidemic 350,000 adults and children were infected with dengue and 116,000 of them were hospitalized. There were 10,000 cases of DHF/DSS, with 158 deaths, 1101 of them children. According to Cuban medical experts, it was the all-out public participation that made medical control of the epidemic possible.

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Case study 2: Henoch-Schonlein Purpura

Between August 13 and December 15, 1987, a cluster of twenty cases of Henoch-Schonlein Purpura (HSP) involving children under ten years of age was identified in Connecticut. In construct, eight cases had been identified in the state during the first seven month of the year.

HSP is an inflammation of blood vessels involving the skin and other organ systems, primarily affecting children. HSP is identified by a characteristic rash most prominent on the buttocks and legs and is often associated with arthritis of the knee or ankle, abdominal cramping, or haematuria. HSP leads to renal failure in a small percentage of children. In Europe, HSP is the cause of renal failure for an estimated 15% of children on dialysis. The etiology of HSP is known; however, it is believed to be caused by an immunological response to variety of different stimuli, such as foods, medicines, toxins, insect bites, and various infectious agents.

The cluster was initially noted by a Hartford paediatric nephologist who was consulted regarding eight children, four of whom became ill over a two-week period. The Connecticut Department of Health Services then identified other cases by calling approximately 100 practising paediatricians an members of all nine hospital paediatric departments in Hartford Country. In addition, selected paediatric group practices and teaching programs throughout the state were contacted.

Increase case finding, a letter requesting reports of all cases seen since January 1, 1987, has been sent to all paediatricians and all family practitioners in the state. A state wide case-control study to identify risk factors for acquiring the illness is underway.

Because HSP is not a generally a reportable disease, the incidence of the disease in the United States is known. State health departments are requested to notify the Epidemiology office, Division of Viral Diseases, Center for Infectious Diseases, Centers for Disease Control, of any clusters of HSP. Investigations of clusters may identify agents responsible for causing HSP and may ultimately help in formulating strategies for prevention.

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Exercise 3.

3.1. What is the difference between active and passive surveillance?

3.2. What are various possible methods of active surveillance illustrated by the two cases studies?

3.3. In your view, what are important features of a good surveillance system, as illustrated by the two case studies?

3.4. What are the advantages of involving the community in both surveillance and control activities, as illustrated by the first case study?

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Community Participation in Health Programs

Community participation should promote empowerment rather than exploitation.

What is Community Participation

Community participation has been given different meanings, some are quoted below:

- a means of resolving problems in service delivery and a means of mobilizing resources for health programs.
- a social process in which specific groups with shared needs living in a defined geographical area actively pursue identification of their needs and take decisions and establish mechanisms to meet them
- a process by which community members take part in programmes or activities that are being conducted in the community's interest.
- a social process of taking part, voluntarily, in either formal or informal activities, programmes and/or discussions to bring about a planned change or improvement in community life, service and/or resources.
- a means of shifting government responsibilities to communities or to cover inequities in health status and social or political power that exist at regional, national, and international levels.

WHO study group suggested that participation may be interpreted in three ways:

1. Contribution (of cash, labour or material),
2. Organization (through selection of community health workers and formation of social structures to facilitate participation), and
3. Empowerment (through management decision making).

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Why do we need to promote community participation in health programs:

1. To improve cost effective of the programs
2. To enhance success and sustainability of efforts
3. To ensure equity
4. To encourage self-reliance

Prerequisites for Effective community participation

Resourcing communities (with power, knowledge and skills) in order to make CP feasible.

Political support from governments to successfully promote CP through "grass roots" organizations through which people can influence decisions.

Decentralize power and resources to local people to make CP relevant.

Effective Community Participation requires:

- a mechanism for continuous participation which is recognized as legitimate by the community and appropriate to local conditions.
- the attitude and the managerial capacity of the provider influenced by their training, and the commitment of health authorities to PHC.
- the understanding of CP objectives by the health committee.
- the availability of adequate personnel and resources.
- the community's recognition of its rights and responsibilities.
- the presence of dynamic leadership.
- intersectional coordination

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Factors obstructing Community Participation

1. Block within the community.

   Most communities will be used to charity and donation approach. They will expect us to do things for them and give things to them. If we are don't they may lost interest.

2. Blocks from professionals.

   Some doctors and nurses will want to hold on to their knowledge and skills. They may dislike or even oppose any system in which patients and people start learning about health or running a programme.

3. Blocks from Government

   Although almost all governments support the 1978 Alma Ata declaration which calls for participation, some will be less keen in practice.

The kind of attitude required of professionals

1. Really committed to the idea of participation.
2. Ready to share knowledge and skills at every opportunity.
3. Flexible, being prepared for mistakes, delays and experiments.
4. Ready to trust others.
5. Ready to give respect and credit to others.
6. Prepared for a long-term commitment as facilitator.
7. Willing to give up to control, and stop being the boss.

> The biggest block to participation is not the unwillingness of the community. It is the possessive attitude of the health worker wanting to gain credit and keep control.

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Factors influencing participation

Several factors are known to influence participation of the community and it is the responsibility of those involved in the organization of community participation to identify them and take the necessary actions to over come them. Some of the common strategies to enhance participation are discussed below.

1. Start with the a problem with strong needs by the community.

   There is no point in 'scratching where their is no itch", in choosing a subject in which the people have no interest.

2. Assess feasibility of tackling the problem.

   The activity must be easily within the abilities of the community. If it is too long or too difficult all will lose interest.

3. Use strategies/solutions which are able to bring an early, obvious benefit.

   It is important to realise that many changes in community health are real but not obvious. The community may fail to notice any change unless they are helped to look back and see how much things have improved since they started. Whatever activity is chosen, it must work and it must be enjoyable.

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What can the community do in Disease Control?

**Take part in prevention activities:
Immunisation campaigns

Environmental health activities

Health education related to priority areas.

Agricultural education: encourage and teach their members to start kitchen gardens.

Establish Village Health Committees(VHCs) with the following functions:
Organise and support community health workers(CHW)
Organise the construction of a health post and be responsible for maintaining it.
VHC members can assist in the clinic.

Assist in community survey

Members can visit homes before hand to explain why the survey is being done. They can work with project members in carrying out the survey. They can explain results to community after the survey is finished.

** Take part in control activities:
Assist in identifying infectious cases of disease
Encourages those who are sick to comply with their treatment
Assist in surveillance

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Steps in Seeking Community Partnership in Disease prevention and control

1. Discuss needs with the community.
2. Explore solutions to the problems together with the community.
3. Make plans together with the community.
4. Obtain the commitment of the community members.

> In all our contacts with community members our aim is to help them to discover their needs, identify their solutions and carry out their plans. In this way they will begin to understand it is their programme.

Practical guidelines when dealing with a new community

1. Before going to the community find out first about any custom expected from a visitor.
2. On arrival meet the leaders and explain the purpose of the visit.
3. Be friendly and open.
4. Dress appropriately and modestly wearing local-style clothes if possible.
5. Make the differences between visitors/yourselves and the people as small as possible, being careful not to show off expensive equipment.
6. Accept hospitality, eating and drinking with the people where possible.
7. Play and joke with the children.
8. Listen and learn, being slow to ask too many questions at the start.
9. Don't make plans or promises which may not be able to keep.
10. Praise and encourage good customs and practices.
11. Avoid argument or criticism both through words and through manner.
12. Don't take sides in any family or village dispute.

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Suggested mechanisms to increase enthusiasm of the community members

- be friendly,
- create an atmosphere people enjoy working together,
- give the people the freedom to share their own ideas and do things own way
- give support when things are difficult,
- celebrate success,
- give training and teaching so people feel they are making personal progress,
- be fair in making decisions and solving disputes,
- don't blame people or become easily angered.

Guiding principles in keeping partnership with a community

- Hand over tasks to other as soon as possible.
- Identify interest and abilities in community members.
- Lead from the middle, not from the front.
- Keep outside money, resources and equipment to the minimum.
- Be faithful and straightforward.
- Never make promises which cannot be kept, or raise expectations that can't be met.
- Show respect to every one even those it may seem difficult to trust.
- Teach generosity and kindness.
- Stop an activity if it is obviously not going to work.

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Exercise On Community Participation

Suppose you want to establish a trachoma control activities in a rural village of Sidamo.

Question 1. What are the important components of the trachoma control activities?

Question 2. What actions do you take to solicit the support of the community?

Question 3. What are the potential barriers to establishing the control activity and partnership with the community in the village?

Question 4. What are your suggestions to overcome the barriers?

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