Primary Health Care Initiatives (PHCI) Project
Contract No. 278-C-00-99-00059-00
Abt. Associates Inc.

BASIC EPIDEMIOLOGY

LEARNING OBJECTIVES

- Define epidemiology and its scope and importance
- Know some of the major contributions of epidemiology to the health field.
- Calculate measures of disease frequency, incidence and prevalence, and understand the uses and differences between them.

TEACHING STRATEGIES

- Informal lectures/discussions
- Encourage questions and input from trainees
- Use examples from Jordan as much as possible, including examples from the work places of the participants

MATERIALS AND EQUIPMENT NEEDED

- Flipcharts & markers
- Manual
- References for future studies
- Overhead projector and transparencies

LEARNING POINTS

- Definition of epidemiology
  The study of the distribution and those things that determine health status or disease, in specific populations. This also involves the application of these studies to the control of health problems.

- Types of epidemiology:
  - Descriptive: Describing disease by person, time and place.
  - Analytic: looking for associations and testing hypotheses
  - Operational/Experimental: testing the effect of interventions or services on disease

- Scope of epidemiology
  - Concern with communicable diseases.(etiology)
  - Non-communicable diseases.
  - Nutritional problems.
  - Health status of the human population.
  - Environmental aspects of health.

- Importance of epidemiology

- Allows greater knowledge of community and its problems
- To search for causes
- Assist in putting priorities for action
- For planning and evaluation of the effectiveness and efficiency of health services e.g. The value of treating high blood pressure, the efficiency of sanitation measures to control diarrheal diseases etc.)

Applied epidemiology

- Community diagnosis
  - To find magnitude of health problems in the community
  - To find out what are the prevalent diseases in the community and their causes
  - To find the susceptible groups (groups that are vulnerable to certain problems)
  - To evaluate what is being done
  - To calculate some measures of disease frequency by using epidemiological tools such as prevalence and incidence calculations

- Prevalence of the disease - the number of cases in a given population at a specified point in time.
  - Prevalence rate = $\frac{\text{Number of people with the disease at a specified time}}{\text{Total population at risk at the specified time}} \times 100$
  - Uses of prevalence rates
    - Understand magnitude of current health problems in a population
    - Compare magnitude of various health problems to set priorities
    - Assessing the need for health care and the planning of health services.
    - It's often used to measure the occurrence of conditions for which the onset of disease may be gradual, such as Type II diabetes or rheumatoid arthritis.
  - Factors influencing observed prevalence rate
    - The severity of illness (if many people who develop a disease die its prevalence rate is depressed)
    - The duration of illness (if a disease lasts a short time its prevalence rate is lower than if it lasts a long time)
    - The number of new cases (if many people develop a disease its prevalence rate is higher than if few people do so)
  - PREVALENCE best used for:
    - Chronic, long-term illness
    - Monitoring of changes in chronic diseases

- Incidence of the disease - The number of new cases arising in a given period in a specified population.
  - Cum. Incidence = $\frac{\text{Number of NEW CASES in defined period of time}}{\text{Total Population during defined period of time}} X100$
  - Uses of incidence
    - Specialized incidence measures:-
      - Morbidity rate which is defined as the incidence of a disease in a particular population over a specified time period
      - Attack rate: - When the duration of a disease is short (e.g., an acute infectious disease such as measles) and the observation period covers an entire epidemic, the incidence of the disease is called the attack rate.
      - Mortality rate
      - Case-fatality rate

    - Monitor progression of new cases over time
    - Compare incidence of various health problems to set priorities
  - INCIDENCE best used for:
    - Short-term, acute illness
    - Monitoring of epidemic illness
- Ratios or Health Indices – used to understand the effect of health activities, for example – the vaccination ratio

  - Vaccination ratio = $\frac{\text{Total number of children } \mathbf{receiving} \text{ vaccine X 100}}{\text{Total number of children } \mathbf{eligible} \text{ to receive vaccine}}$

  - Uses of ratios such as vaccination ration
    - Compare local vaccination rates with national standards or rates
    - Compare national vaccination rates with other countries
    - Compare improvements in vaccination rates with new policies or vaccination strategies

Epidemiological surveillance

- Definition of epidemiologic surveillance
  - The on-going systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice
  - This should be closely integrated with timely dissemination of this data to those who need to know, both at the central and local levels
  - The final link in the surveillance chain is the application of this data to prevention and control.
  - Local PHC staff can be very important in identifying a new epidemic or cluster of cases
    - Requires awareness of grouping of unusual or new type of illness
    - May be only 3 or 4 cases, but could be beginning of a new epidemic
  - Information for surveillance is taken primarily from clinic records, especially patient records
    - Accurate record is very important for followup of suspected cases of reportable disease
    - May require referral to specialist or hospital for confirmation of suspected case of reportable disease
  - Must use standard MOH forms for recording and reporting
  - Notifiable diseases in Jordan
    - Diseases to be notified urgently (attachment 1)
    - Diseases to be notified urgently on weekly & monthly basis (attachment 2)

Community Screening for Disease

- Definition of screening
  - The presumptive identification of unrecognized disease or defect by the application of tests, examination or other procedure which can be easily and rapidly applied
  - Purpose of screening is to sort out apparently well persons who probably have a disease from those who probably do not, such as screening for hypertension with blood pressure measurements
  - Ideal of screening is to identify persons with a disease or risk of disease

        - Example: Identification of hypertension by several high blood pressure readings, and control of blood pressure with exercise and daily medication
        - This will significantly decrease the risk of heart attack, heart failure, and stroke later in life
    - Screening is not diagnosis – it is only identification of those who are at higher risk for having a specific disease
    - Cannot base treatment on results of a screening test – must be based on results of more accurate diagnosis and testing

- Criteria for disease or problem suitable for community screening
    - Is highly prevalent
    - Serious consequences of disease
    - No symptoms or signs at early stages
    - Can be detected at relatively low cost before the clinical stage starts
    - Early treatment is available and accessible that has been shown to reduce morbidity and mortality

- Screening will result in false positives and negatives, as well as identify those with true disease
    - Those with false positives must be distinguished from those with true disease by further diagnostic testing.

- Types of screening
    - Mass screening involves the screening of a whole population.
    - Multiple or multiphasic screening involves the use of a variety of screening tests on the same occasion (such as school health exams)
    - Targeted screening of groups with specific exposures, (e.g. workers in high noise environments), is often used in environmental and occupational health
    - Case-finding or opportunistic screening is restricted to patients who consult a health practitioner for some other purpose, (example: screening for cancer of breast in women who come for respiratory infection, screening for diabetes in patients coming for painful feet)

GROUP EXERCISE

Apply the above criteria for suitable screening to the following problems. Is there an effective and efficient way to screen for these problems?

a. Diabetes
b. Cancer of the breast
c. Cancer of the uterus
d. Anemia in children

CASE STUDIES

1. You are working in a Health Center which serves a population of 14,500 people. In the period from January to March you treat a total of 126 new cases of upper respiratory infection, and from April to June you treat a total of 70 new cases of respiratory infection.

a. Calculate the incidence of upper respiratory infection in January-March. and April-June.
b. What may be some of the reasons that there is a change in the incidence?
c. Why are we measuring incidence rather than prevalence in this example?

2. In this same health center that serves a population of 14,500 people, you treat a number of people with asthma and with diabetes (Type II). Since they all come to the center for their medicines at least once in two months, you count all the persons with asthma and all those with diabetes in the months of June and July. You find that during this time, you have treated 45 people with asthma and 165 people with Type II diabetes.
   a. Calculate the prevalence of asthma and of diabetes in this population.
   b. Why are we measuring prevalence rather than incidence in this example?

3. During an entire year approximately 4,000 people, both adults and children, come to your PHC to receive care. During that entire year, the diagnosis of diarrhea was made in 500 people who came in to be seen for that problem.
   a. What was the annual incidence of diarrhea in your PHC clinic population that year?
   b. Can you say that was the incidence of diarrhea in the whole village? Why or why not?

4. Among the 4,000 people who come to your PHC for care, one-half of them are adults. Among the adults, 50 of them have chronic arthritis.
   a. What is the prevalence of arthritis among the adults who come to your PHC?

5. In the most recent vaccination campaign in your Health Center, a total of 450 children less than 2 years of age received their 4^{th} dose of oral polio vaccine, and 375 children less than 2 year of ages received their 4^{th} dose of DPT vaccine. The total number of children less than the age of 2 in the catchment area of your health center is 600.
   a. What is the vaccination ratio for the completed primary series of oral polio vaccine?
   b. What is the vaccination ration for the completed primary series of DPT vaccine?
   c. Are these ratios good, or can anything be done to improve these ratios?

6. In a particular community, 115 persons in a population of 4400 became ill with food poisoning. These 115 ill persons were from 75 households, and the total number of persons living in these 75 households was 425.
      a. What is the ratio of ill people in the community?
      b. What is the ratio of ill people in the 75 affected households?

CRITICAL ELEMENTS FOR EVALUATION OF COMPETENCE

- Understand the meaning of epidemiology
- Understand the use of epidemiological tools such as surveillance at the health facility level
- Able to do simple epidemiological calculations

- Understand the role and limitation of screening for disease