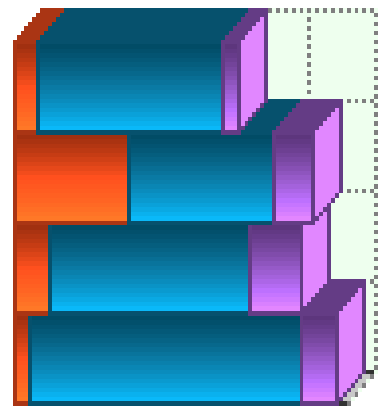
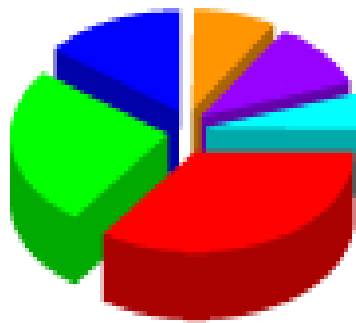
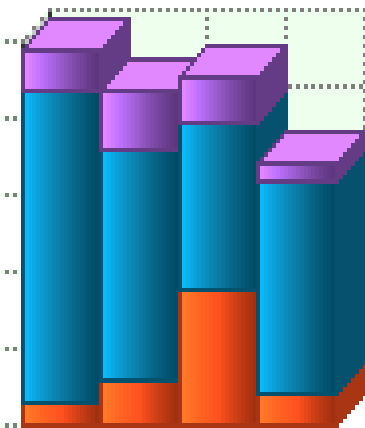
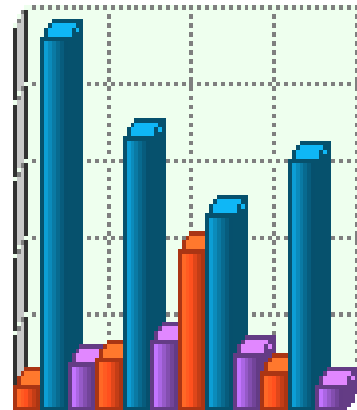
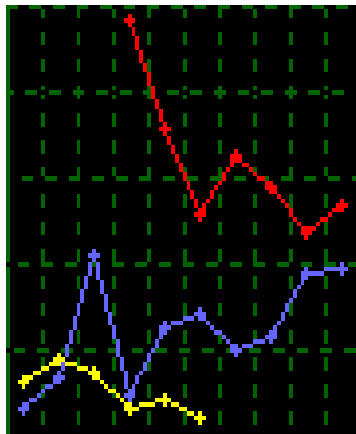
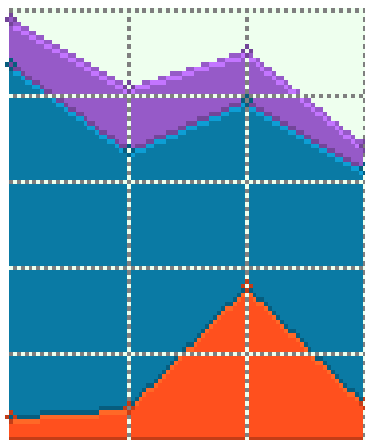


King Saud University

Epidemiology Course (CHS 334)

# Epidemiology



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## **Chapter One**

### **Introduction to the Epidemiology**

#### **❖Chapter Objectives**

**After completing this chapter, the students will be able to:**

- Define epidemiology
- List at least five types of clinical inquiry that epidemiologic studies can address
- Summarize the epidemiologic method
- Understand the basic vocabulary used in the epidemiology
- Identify the terms related to the epidemiology
- Identify the principles of epidemiology
- Identify the core epidemiology functions

#### **Introduction:**

In recent years, the important role of epidemiology has become increasingly recognized. Epidemiology is a core subject required in public health and health education programs; it is a study that provides information about public health problems and the causes of those problems. This information is then used to improve the health and social conditions of people. Epidemiology has a population focus in that epidemiologic investigations are concerned with the collective health of the people in a community or population under study. In contrast, a clinician is concerned for the health of an individual. The clinician focuses on treating and caring for the patient, whereas the epidemiologist focuses on identifying the source or exposure of disease, disability or death, the number of persons exposed, and the potential for further spread. The clinician treats the patient based on scientific knowledge, experience, and clinical judgment, whereas the epidemiologist uses descriptive and analytical epidemiologic methods to provide information that will ultimately help determine the appropriate public health action to control and prevent the health problem.

## **❖ Definition of terms related to epidemiology:**

1. **Health:** it is a state of complete physical, mental, and social well-being and merely the absence of disease or infirmity (WHO).
2. **Disease:** Any departure, subjective or objective, from a state of physiological or psychological well-being.
3. **Environment :** Internal and external factors that constitute the context for agent-host interactions; the aspect of existence perceived outside the self; this perception changes with alterations in awareness and expansion of consciousness; one of the concepts of nursing metaparadigm.
4. **Agent:** A causative factor, such as a biological or chemical agent that must be present (or absent) in the environment for disease occurrence in a susceptible host.
5. **Host:** A person or living species capable of being infected.
6. **Endemic disease:** The constant presence of a disease or infectious agent within **a given geographic area or population group**; may also refer to the usual prevalence of a given disease within such area or group.
7. **Epidemic:** The occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time.
8. **Epidemic period:** A time period when the number of cases of disease reported is greater than expected.
9. **Pandemic:** An epidemic occurring over a **very wide area** (several countries or continents) and usually affecting **a large proportion of the population**.
10. **Outbreak:** A more or less localized epidemic affecting large number of a group, in the community e.g., outbreak of food poisoning.
11. **Sporadic:** A disease that occurs infrequently and irregularly. Cases are few and **separated widely in space and time showing no connection to each other**.

12. **Elimination of disease:** disease incidence is reduced to a minimal level at which the disease is no longer considered a public health problem, while infection may still occur

**For example:**

- Elimination of neonatal tetanus is reduction of its incidence to less than one case\1000live births.

-Also in early 1997, WHO listed leprosy, onchocerciasis, and Chagas disease as being candidates for elimination "as public health problems within ten years".

13. **Eradication:** Eradication has been defined in various ways

- as elimination of the occurrence of a given disease

- as reduction of **the worldwide incidence** of a disease to zero level (permanent ) with complete destruction of the agent.

- the organism can be presented only in laboratories and no need for interventions

E. g. Smallpox eradication from the world since 1979.

14. Disease frequency : Occurrence of disease as measured by various rates such as morbidity rate.

15. **Ecology:** the study of relations and interactions among all organisms within the total environment; in community health, the individual's interaction with his or her social, cultural, and physical environments.

16. **Morbidity rate:** A disease rate, specifically prevalence and incidence rates of diseases in a population in a specified time period.

17. **Mortality rate:** The number of deaths from all causes divided by the total population at a particular time and place.

18. **Incidence rate:** The rate of new cases of a condition or disease in a population in a specified time period; provides an estimate of the condition/disease risk in that population.

19. **Hypothesis:** A supposition arrived at from observation or reflection that leads to refutable predictions. Any conjecture cast in a form that will allow it to be tested and refuted.

20. **Rate:** An expression of the frequency with which an event occurs in a defined population.

21. **Natural history of a disease:** The course that a disease would take from onset to resolution without intervention by humans.

- describes the course of the disease in an individual starting from the moment of exposure to the causal agents till one of the four major possible outcomes occurs.

22. **Risk factors:** it is a condition that is associated with the increased probability of a health related state or events.

### **❖ Definition of epidemiology:**

The Word of Epidemiology, literally meaning "the study of what is upon the people", is derived from Greek words **epi**, meaning "upon, among", **demos**, meaning "people, district", and **logos**, meaning "study of".

The term epidemiology is now widely applied to cover the description and causation of not only epidemic disease, but of disease in general, and even many non-disease health-related conditions, such as high blood pressure and obesity. Infectious\non-infectious disease, communicable\non-communicable disease as well. It consider as the cornerstone method of [public health](#) research, and helps inform policy decisions and [evidence-based medicine](#) by identifying [risk factors](#) for [disease](#) and targets for [preventive medicine](#). Epidemiologists are involved in the design of studies, collection and [statistical analysis](#) of data, and interpretation and dissemination of results (including [peer review](#) and occasional [systematic review](#)).

**Epidemiology** :The study of the distribution of disease and determinants of **health-related states or events** in specified human populations and the application of this study to the control of human health problems.

Epidemiology is a highly quantitative discipline based on the principles of statistics and research methodology. Study includes surveillance, observation, hypothesis testing, analytic research, and experiments.

### **❖Principles' of epidemiology**

The main objectives of epidemiology are to

- Describe the occurrence of disease , and
- Explain the possible causes of disease

**Describing a disease requires the gathering of information on the distribution of disease in human based on age, gender, race, and geographical area.**

### **Study**

Epidemiology is a scientific discipline with sound methods of scientific foundation. Epidemiology is data-driven and relies on a systematic and unbiased approach to the collection, analysis, and interpretation of data.

### **Distribution**

Epidemiology is concerned with the **frequency** and **pattern** of health events in a population:

### **Frequency**

Refers not only to the number of health events such as the number of cases of meningitis or diabetes in a population, but also to the relationship of that number to the size of the population. The resulting rate allows epidemiologists to compare disease occurrence across different populations.

## Pattern

Refers to the occurrence of health-related events by

**Time,**

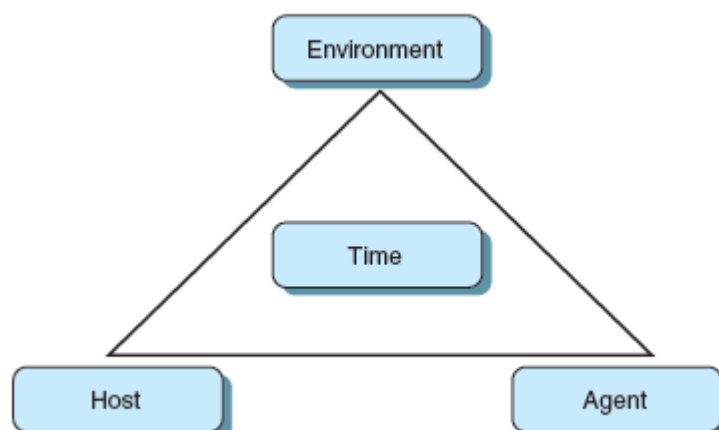
**Place,**

**person.**

**Time patterns** may be (annual, seasonal, weekly, daily, hourly, weekday versus weekend, or any other breakdown of time that may influence disease or injury occurrence. **Place patterns** include geographic variation, urban/rural differences, and location of work sites or schools. **Personal characteristics** include demographic factors which may be related to risk of illness, injury, or disability such as age, sex, marital status, and socioeconomic status, as well as behaviors and environmental exposures. Characterizing health events by time, place, and person are activities of **descriptive epidemiology**, discussed in more detail later

## **Determinants**

Epidemiology is also used to search for **determinants**, which are the **causes and other factors** that influence the occurrence of disease and other health-related events. Epidemiologists assume that illness does not occur randomly in a population, but happens only when the right accumulation of risk factors or determinants exists in an individual. **To search for these determinants, epidemiologists use analytic epidemiology or epidemiologic studies to provide the “Why” and “How” of such event.**



- **Agent factor:** its refer to the cause of the disease, it may include the infectious disease (bacteria, virus, parasite, or other microbes), in non-infectious disease like (chemical from food, radiation, insufficient food)

**NOTE: they are necessary but not always sufficient to cause disease.**

- **Host factors:** is an organism, usually human, animal that harbors the disease. Also indicate for intrinsic factors that influence individual 's exposure, susceptibility, or response to a causative agent ( age, immunity level, race, nutrition , genetic makeup, and level of exposure )
- **Environment:** including the surrounding and condition external to human, or animal that cause or allow the disease to transmission.
- **Time :** it's refer to the incubation period , life expectancy of the host or pathogen , the duration or severity of illness in relation on how long a person infected or till recovery or condition causes of death.

### **Health-related states or events**

Epidemiology was originally focused exclusively on epidemics of communicable diseases<sup>3</sup> but was subsequently expanded to address endemic communicable diseases and non-communicable infectious diseases. Chronic diseases, injuries, birth defects, maternal-child health, occupational health, and environmental health. Then epidemiologists began to look at behaviors related to health and well-being, such as amount of exercise and seat belt use. Now, with the recent explosion in molecular methods, epidemiologists can make important strides in Examining genetic markers of disease risk

### **Specified populations**

Although epidemiologists and direct health-care providers(clinicians) **are both** concerned with occurrence and control of disease, they differ greatly in how they **view “the patient.”** The clinician is concerned about the health of an individual; the



epidemiologist is concerned about the collective health of the people in a community or population. In other words, the clinician's "patient" is the individual; the epidemiologist's "patient" is the community. Therefore, the clinician and the epidemiologist have different responsibilities when faced with a person with illness.

### **Application**

Epidemiology is not just "the study of" health in a population; it also involves applying the knowledge gained by the studies to community-based practice. Like the practice of medicine, the practice of epidemiology is both a science and an art. To make the proper diagnosis and prescribe appropriate treatment for a patient, the clinician combines medical (scientific) knowledge with experience, clinical judgment, and understanding of the patient. Similarly, the epidemiologist uses the scientific methods of study to help in prevention and control of disease and health related problems.

### **❖The objectives of epidemiology include the following:**

- To identify the etiology or cause of disease
- To determine the extent of disease
- To study the progression of disease
- To evaluate preventive and therapeutic measures for a disease or condition
- To develop public health policy

Key terms in this definition reflect some of the important Principles of epidemiology.

### **❖Uses (Aims) of Epidemiology**

**Epidemiology and the information generated by epidemiological methods have been used in many ways.**

1. Assessing the community's health:

To assess the health of a population or community, relevant sources of data must be identified and analyzed by person, place, and time (descriptive epidemiology).

- **What are the actual and potential health problems in the community?**
- **Where are they occurring more common?**
- **Which populations are at increased risk?**
- **Which problems have declined over time?**
- **Which ones are increasing or have the potential to increase?**
- **How do these patterns related to the level and distribution of public health services available?**
- **When the diseases occur most frequently?**
- **What the public health programs might be most effective?**

2. Identification of magnitude of the problem

3. Observation and description of the natural history of diseases.

4. Definition and classification of diseases.

5. Identification of determinants of disease.

6. Provision of the data necessary for the planning and evaluation of health programs.

7. Supply the essential data related to availability, accessibility and utilization of health services.

8. Take suitable administrative measures in assessing needs, utilizing and effectiveness.

9. Communicating public health information

10. Assisting in carrying out public health program

11. Identification the individuals and population at greatest risk for disease.

12. Making individual decisions

13. Searching for causes

## **❖Core epidemiologic functions**

The major takes of epidemiology in public health practice are:

- **Public health surveillance**
- **Field investigation**
- **Analytic studies**
- **Evaluation**
- **Policy development**

## **CONCLUSION**

Epidemiology is the process of describing and understanding public health problems and the application of this knowledge to the promotion of physical, mental, and social well-being in the population. Epidemiology involves applying scientific models to the description of the frequency and pattern of health-related states or events, the identification of the causes of health-related states or events and modes of transmission, and the guidance of public health planning and decision making. Epidemiologic information is intended to guide health officials and assist individuals in making informed health behavior changes.

**TABLE 1-1** Types of Epidemiologic Information Useful for Influencing Public Health Policy and Planning and Individual Health Decisions

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1. Public health assessment
    - Surveillance
    - Identifying who is at greatest risk for experiencing the public health problem
    - Identifying where the public health problem is greatest
    - Identifying when the public health problem is greatest
    - Monitoring potential exposures over time
    - Monitoring intervention-related health outcomes over time
  2. Finding causes of disease
    - Identifying the primary agents associated with disease, disorders, or conditions
    - Identifying the mode of transmission
    - Combining laboratory evidence with epidemiologic findings
  3. Completing the clinical picture
    - Identifying who is susceptible to disease
    - Identifying the types of exposures capable of causing disease
    - Describing the pathologic changes that occur, the stage of subclinical disease, and the expected length of this subclinical phase of the disease
    - Identifying the types of symptoms that characterize the disease
    - Identifying probable outcomes (recovery, disability, or death) associated with different levels of the disease
  4. Evaluating the program
    - Identifying the efficacy of the public health program
    - Measuring the effectiveness of the public health program
- 

### ***Summary***

Epidemiology is the study (scientific, systematic, data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (patient is community, individuals viewed collectively), and the application of (since epidemiology is a discipline within public health) this study to the control of health problems

