



Epidemiology

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Outline

- History.
- Definition.
- Objectives.
- Source of epidemiological data.
- Measurements in epidemiology.
- Tools of measurements (count , rate , ratio , proportion)
- References



Objectives

- To identify different sources of epidemiological data.
- To understand epidemiological measurement & different tools of measurement.



History of epidemiology

- **Hippocrates**, considered the father of modern medicine, first suggested in the 5th century B.C that the development of human disease might be related to the external as well as personal environment of an individual.
- In 1662, in London, **John Graunt** published the nature and political observations made upon the bills of mortality.



History of epidemiology(Cont.)

- William far, in the 19th century, was interested in vital statistics.
- In 1854, John Snow, formulated and tested a hypothesis concerning the origin of an epidemic of cholera in London. He was perhaps the first investigator to draw together all 3 components of the definition of epidemiology.



Definition

- epi=upon, demos=people, logos=study
- The study of the distribution and determinants of health –related states or events in specified populations , and the application of this study to the control of health problems .



Epidemiology key words: Study

- Epidemiology is the basic science of public health.
- It's a highly based on principles of statistics and research methodologies.



Epidemiology key words: Distribution

- Epidemiologists study the distribution of frequencies and patterns of health events within groups in a population.
- They use descriptive epidemiology, which characterizes health events in terms of time, place, and person.
 - Questions: who, where, when



Epidemiology key words: Determinants

- Epidemiologists also attempt to search for causes or factors that are associated with increased risk or probability of disease.
- What factors cause the problem or are associated with the problem
- Questions: how and why



Epidemiology key words:

Health-related states

- Epidemiology is applied to the whole spectrum of health-related events:
 - Chronic diseases,
 - Environmental problems,
 - Behavioral problems,
 - Injuries,
 - Infectious diseases.



Epidemiology key words: Population

- One of the most important distinguishing characteristics of epidemiology is that it deals with groups of people rather than with individual patients.



Epidemiology key words: Application

- Epidemiological data aids in developing and evaluating interventions to control and prevent health problems.



Objectives of epidemiology :

- To identify the etiology or the cause of a disease and the risk factor.
- To determine the extent of disease found in the community.
- To study the natural history and prognosis of disease.



Objectives (Cont.)

- To evaluate new preventive and therapeutic measures and new modes of health care delivery.
- To provide the foundation for developing public policy and regulatory decisions relating to environmental problems.



Source of epidemiological data

- Hospital , health centers and clinical records.
- Disease reporting – Communicable disease & Cancer registries.
- Absentism records (Industry & schools).
- Pre employment and periodic physical examination in industry and schools.
- Case finding program.
- Morbidity surveys on population samples e.g national cancer survey.
- Research



Measurements in Epidemiology

- Measurement of mortality
- Measurements of morbidity
- Measurement of the presence ,absence , or distribution of the characteristics or attributes of the diseases.
- Measurement of medical needs , health care facilities , utilization of health services and other health related events.



Measurement in epidemiology(Cont.)

- Measurement of the presence , absence or distribution of the environmental and other factors suspected of causing diseases.
- Measurement of demographic variables.



Tools of measurement

- Count
- Ratio
- Proportion
- Rate



Count

- Simple counting
- No. of affected individuals.
- It is limited use.



Count(Cont.)

Why is a simple count not enough?

- 3 cases of cancer per year from a city of 1,000 people is very different than 3 cases per year from a city of 100,000 people



Count(Cont.)

So, in epidemiology we must know:

- The size of the population from which the affected individuals come, and the time period the information was collected.



Ratio

- Obtained by simply dividing one quantity by another without implying any specific relationship between them.
- Expressed as $X : Y$
 - Ex: male: female ratio in this class?
 - Faculty: student



Proportion

- Relation of a part of the whole.
- The numerator is **always** included in the denominator (part to all).
- Usually expressed as %.
 - Ex: proportion of males and female in this class?

Example of proportion:

$$= \frac{\textit{Number of white blood cells at a certain time}}{\textit{Total number of blood cells at the same time}} \times 100$$



Rate

- Measure the occurrence of some particular event (development of disease or the occurrence of death) in a population during a given time period.
- It indicate the change in some event that takes place in a population over a period of time.
 - Example of typical rate is the death rate

Rate elements

- Numerator (number of deaths)
- Denominator (total population at risk)
- Time period (one year)
- Multiplier : the rate expressed per 1000 or some other round figure (10,000 or 100,000)selected according to convenience to avoid fraction.

$$= \frac{\text{Number of deaths in one year}}{\text{Mid - year population}} \times 1000$$



Exercise 1

In a health center, there were 341 total attendees recorded in one day, if the number of females attendees was 179,

1. Calculate proportion of female attendees.
2. Calculate male: female ratio.



Exercise (Cont.)

In a health center, there were 341 total attendees recorded in one day, if the number of females attendees was 179,

1. Calculate proportion of female attendees.
2. Calculate male: female ratio.

Answer:

1. $179/341 * 100 = 52\%$.
2. Male attendees = $(341 - 179) = 162$.
3. $M/F = 162/179 = 0.9$
male: female ratio is 0.9:1



References

- **Control of communicable diseases manual**, by Heymann DL, American Public Health Association, 19th edition, 2008.
- **Park's textbook of preventive and social medicine**, by Park K, Banarsidas Bhanot Publishers, 21st edition, 2011.