

Introduction and History of Epidemiology Summary.

Some definitions:

Public Health:

(previously called community health)
The science and art of preventing disease, prolonging life, and promoting health & efficient through organized community effort. (Winslow, 1920).

Health:

A state of complete physical, mental and social well being and not merely the absence of disease or infirmity (WHO, 1948).

Disease: (DIS – EASE)

A physiological and psychological dysfunction.

Illness:

A subjective (felt by the person) state of not being well.

Sickness:

A state of social dysfunction (noticed by the people around that person).

Epidemiology:

Epi= upon, among. Demos=people. Ology=science, study of...

-Generally, it is the science or study of **diseases** in populations.

It is the scientific method of disease investigation.

-Typically, it involves the disciplines of **biostatistics** and **medicine**.

Note: we study biostatistics to investigate the relationship between risk factors and diseases.

We have THREE definitions of epidemiology:

A) The science of the *mass phenomena* of **infectious diseases** or the *natural history* of **infectious diseases**. (Frost 1927)

B) The science of infective diseases, their prime causes, propagation and prevention. (Stallbrass 1931.)

C) the study, of the distribution and determinants of health-related states or events in specified populations, and the application of the study to the control (prevention) of health problems. (J.M Last 1988).

Now we will discuss the components (underlined words) of epidemiology one by one 😊

Components of epidemiology: (6)

1.Study:

Systemic collection, analysis and interpretation of data. (Health related data in the case of epidemiology).

2.Distribution:

The study of the pattern of health event by person, place and time.

TIME Distribution:

Answers the question (WHEN does a disease occur more (TIME)?)

Epidemiologists have identified **three** kinds of time trends or fluctuations in disease occurrence:

1.Short term fluctuation:

-**single** (one incubation period and one peak) (e.g. food poisoning).

or multiple and continuous exposure (e.g. well of contaminated water-cholera, Minamata disease in Japan).

2.Periodic fluctuation: (related to specific time).

-**Seasonal**: (occur in the same season each year)

GI infection in summer, influenza (winter) and west Nile virus infection (August-September).

or Cyclic (not related to a season) (e.g. influenza every 7-10 years... genetic variations happens in viruses-> Like COVID-19 and other SARS viruses).

3.Long-term fluctuation or Secular trend

Chronic and take years to develop (e.g. CVD and lung cancer).

NOTES: ->Occurrence of diseases change over time either regularly or in an unpredictable manner.

->Examples of diseases that can occur any time are hepatitis B and salmonellosis.

->Some diseases occur at a specific **day** of the week or **time** of the day may be important in describing the health problem.

Epidemiology is concerned with the **frequency** and **pattern** of health events in a population (it studies the distribution of diseases among subgroups of the population in certain areas and any increase or decrease (change) in rate.

Disease frequency: The core characteristics of epidemiology are to measure the frequency (number of cases) of diseases, disability, death or any health-related issue in a specified population.

We first count the number then convert it to a **rate, ratio and proportion**.

This falls in the domain of biostatistics, which is a basic tool of epidemiology.

An example is calculating the prevalence (total number of people who have a disease right now), incidence rates (the rate of new disease cases in the population), death rates...

Rates are ESSENTIAL for comparing the disease frequency in different populations (certain geographic areas) or subgroups of the same population.

Introduction and History of Epidemiology Summary.

PERSON Distribution:

Answers the question (WHO gets a disease (PERSON)?)

->In **descriptive** studies disease is further characterized by defining the patient who develop the disease by age, gender, ethnicity, religion, occupation, material status, habits (like smoking), social class and other host factors.

->These host factors help us understand the natural history of the disease.

PLACE Distribution:

Answers the question (WHERE does a disease happen more (PLACE)?)

-> **Geographical pathology** (study of the geography of the disease) is one of the important *dimensions* of epidemiology. Here we learn the differences in disease patterns between two geographical areas. Examples: international (between countries), national (in the same country), urban/rural differences. These variations may be due to variations in: population density, social classes, deficiencies in health services, level of sanitation, education and environmental factors..

Note that we answered **THREE** questions here, **WHO** gets the disease, **WHERE** does a disease happen more and **WHEN** does the disease occur more.

This is **descriptive epidemiology**.

An important outcome of this step is formulation of **etiological hypothesis**, to have an idea about new hypothesis about what may cause this disease.

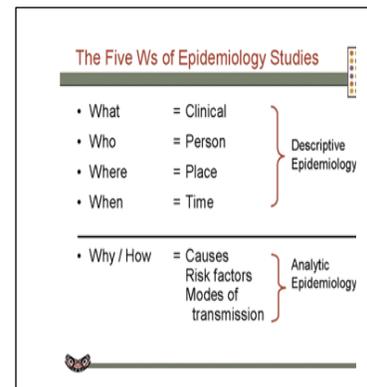
3.Determinants:

Factors, the influence (presence or absence) of which **affects** the occurrence of a **disease** and level of a **health event**.

Epidemiology studies what determines or influences health events:

It answers **TWO** questions here: **HOW** does the disease happen and **WHY** does it happen.

This is called **analytical epidemiology** which is more advanced than descriptive epidemiology.



4.Health-related states and events:

->Here we study anything that may affect an individual's health (physiological, social and psychological) and well-being in any way.

->It studies all health related conditions.

->Not only pathological conditions are studied here, examples are road accidents, fire-arm training people...

5.Specified population:

->Epidemiology diagnoses and treats communities/populations.

Unit of study: population/group of people (e.g. students in a specific university).

->Clinical medicine diagnoses and treats patients after they get sick and go seek physician's help.

6.Application:

->Epidemiological studies have direct and practical applications for prevention of diseases & promotion of health

->Epidemiology is an applied science and it's a practice.

Epidemiology provides data essential to the planning, implementation & evaluation of services for the prevention, control & treatment of disease.

Questions in epidemiology related to the **health event:**

What is the event? What is the magnitude? Where did it happen? When did it happen? Who is affected? Why did it happen?

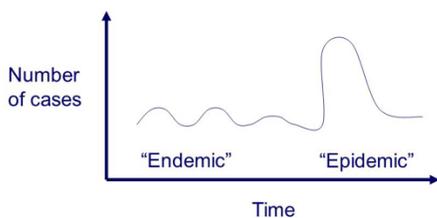
Questions in epidemiology related to the **health action:**

What can be done to reduce this problem and its consequences? What action should be taken by the community? By whom should these activities be carried out? How can it be prevented in future?

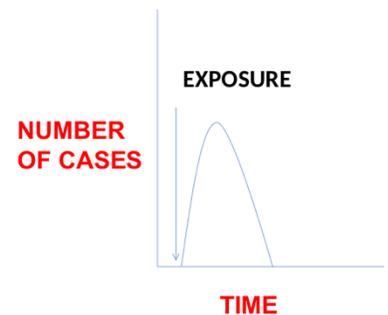
Introduction and History of Epidemiology Summary.

Endemic (normal curve)	-The habitual (usual) presence of a disease within a <u>geographic area</u> . -May also refer to the usual prevalence of a given disease within an area (American public health association). e.g. Malaria in some African countries.
Epidemic	-The occurrence in a community or region of <u>a group of illnesses of similar nature, clearly in excess of normal expectancy</u> (APHA) -Outbreak. (ONE case of polio in Jordan is considered an epidemic as it's been zero for decades).
Pandemic (Sudden severe rising cases)	-A <u>worldwide</u> epidemic. (e.g. COVID-19)

"Endemic" vs "Epidemic"



Epidemic Curve



Examples of Epidemic studies done previously: (most numbers are not mentioned here, refer to the slides)

<p>1)Fatalities Associated with Farm Tractors</p> <p>(1982), number of farm tractor-associated deaths in Georgia. Described in terms of <u>time, place and person</u>. Study took place between 1971 and 1981. Number of cases= 166. -> In general, the older the age group the higher the risk. ->Deaths are more common in the northern region.</p> <p>Refer to slides if you want.. there are some numbers associated with the study.(don't think they're imp.)</p>	<p>2)London Smog Disaster (1952)</p> <p>When fog and soot from coal burning created a dense smog in <u>Winter, 1952</u>, in London, the smog was around for <u>five days</u> from <u>December 5–10</u>. -Substantial increase in mortality. Death rate increased from 2,062 -> to 4,703. (sudden sharp increase in the number of deaths). Clearly associated with sudden increase in smog that resulted from <u>sulfur dioxide and smoke interaction</u> during that week.</p>
<p>3)Legionnaire's Disease Outbreak.</p> <p>Members of the American Legion gathered for the annual American Legion Convention held July 21 through 24, 1976, in Philadelphia. After it began a substantial number of attendees developed acute onset of <u>fever, chills, headache, malaise, dry cough and muscle pain</u>. In January 1977, the <u>Legionella bacterium</u> was finally identified and isolated and was found to be breeding in the <u>cooling tower</u> of the hotel's air-conditioning system; the bacteria then spread through the building whenever the system was used.</p>	<p>Similar bacteria grew in warm waters in nature, such as hot springs, and also had been identified in air-conditioning cooling towers.</p> <div data-bbox="885 1486 1507 1743"> <p>Legionnaire's disease outbreak</p> </div>
<p>4)Epidemiology and Polio Vaccine</p>	
<p>In April, <u>1955</u>, Dr. Thomas Francis, director of Poliomyelitis Vaccine Evaluation Center at the University of Michigan, announced that the two-year field trial of the Salk vaccine against polio was up to <u>90%</u> effective</p>	

Introduction and History of Epidemiology Summary.

Scope of epidemiology:

->**Originally**, Epidemiology was concerned with **investigation & management of epidemics of communicable diseases** (Infectious diseases).

->**Lately**, epidemiology was extended to **endemic communicable diseases and non-communicable diseases** (chronic diseases).

->**Recently**, Epidemiology can be applied to **all diseases and other health related events**.

History of Epidemiology

Seven landmarks in the history of Epidemiology:

- 1) **Hippocrates (460BC)**: he concluded that **Environment & human behaviors affects health**
- 2) **John Graunt (1662)**: **Quantified** -Making lists and counting- **births, deaths and diseases**.
- 3) **Lind (1747)**: **Scurvy** - deficiency of vitamin C - **could be treated with fresh fruit** →

ما كانت هاي المعلومة قبل.. لكن ليند اجى و عمل
Very critical observation for people who got scurvy & who not
و كيف ممكن تكون طرق العلاج و اكتشف انه ممكن يكون عن طريق
التواكه
- 4) **William Farr (1839)**: Established application of **vital statistics** -For birth, deaths and diseases - **for the evaluation of health problems**.
- 5) **John Snow (1854)**: tested a hypothesis on the origin of an epidemic of **cholera** in London. **قصته مهمة و حثيكي عنها بعد قليل**
- 6) **Alexander Louis (1872)**: **Systematized application of numerical thinking (quantitative reasoning)** +Doing more analysis to statistics related to health
- 7) **Bradford Hill (1937)**: **Suggested criteria for establishing causation**. A new era of Epidemiology started with him

Criteria that may apply to relationship between **risk factor** and a **disease** can **establish the connection** between the factors and diseases and may indicate causality

41

So, epidemiology emerged in **460 BC** and flourished as a scientific discipline in **1940s**.

John Snow :

->An english physician and modern-day **father of epidemiology**.

->He used scientific methods to identify the cause of the **epidemic of cholera**. in London **1854**.

->He believed that it was the water pump that was responsible for the disease (cholera transmitted in contaminated water) .

and the removal of the pump handle **ended the outbreak**.

->This was before or during the development of microscopes.

Farr had a different idea about the cause of cholera. He adhered to what was called the **miasmatic theory** of diseases, according to this theory, which was commonly held at that time, diseases were transmitted by contacting a miasma or a cloud with bad smell that clung low on the earth surface.

Done By: Lubna Alnatour.

Corrected By: Ghazal Al-Attiyat.

