Introduction to Epidemiology:

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Objectives

- Provide a definition of epidemiology
- Briefly describe the history of epidemiology
- Know the Unique Contribution of Epidemiology
- Differentiate between clinical medicine and Public health

What is Epidemiology?

- **The word epidemiology comes from the Greek words**

- **epi, meaning "on or upon,"**
- **demos, meaning "people," and**
- **logos, meaning "the study of."**

Epidemiology: Definition

"The study of distribution and determinants of health-related states or events in specified populations, and the application of this study to control health problems" Last, 2001

" The branch of medical science which treats of epidemics" The Oxford English Dictionary (OED)- Parkin 1873

London Society of Epidemiology 1850s

Epidemioligia appears in the title of a spanish history of epidemics, Epidemiologia espanola, Madrid, 1802

Epidemic: Johnson's dictionary (1775)

Citation by the OED dated 1603

The world was used by Hippocrates (c 460-377 BCE): "airs, waters, and places"

Epidemiology: Definition

The term epidemiology was originally

- **Associated with epidemics of infectious diseases. Infectious diseases have relatively short incubation period between exposure and onset of illness.**

- **Now much broader and more complex and deals with non-infectious chronic diseases and health related states.**

Components of the definition by Last,2001

- Study: includes surveillance, observation, hypothesis testing, analytic research, and experiments.
- Distribution: Refers to analysis by time, place, and classes of persons affected.
- Determinants: All the physical, biological, social, cultural, and behavioral factors that influence health.

Components of the definition by Last,2001

- Health related states and events: include diseases, causes of death, behaviours such as use of tobacco, reaction to preventive regimens, and provision and use of health services
- Specified populations: are those with identifiable characteristics such as precisely defined number
- Application to control….: makes explicit the aim of epidemiology: to promote, protect and restore health

Main goal of epidemiology:

- **Obtain, interpret and use health information to:**

promote health and reduce disease

What is epidemiology

- Epidemiology is
- Distribution: Who gets what, and where, and when
- Determinants: and why, and how

Components of the Definition of Epidemiology

The study of the distribution and determinants of disease frequency in human population

Frequency

-quantify existence or occurrence of disease
-prerequisite for any systematic investigation of pattern of disease occurrence.

Distribution

-who, where, when (descriptive epidemiology)
-formulate hypotheses for causal and preventive factors

Determinants

-derived from the above two
-test epidemiologic hypotheses

Changing Patterns of Mortality

1. Control of infectious diseases due to improved living conditions, better nutrition and water supply, antibiotics, and immunization programs resulted in increased average life expectancy.

2. Paralleled by the emergence of chronic diseases with long latency periods.

The change in mortality pattern implications

A dramatic shift in the subgroup of population to whom public health intervention are primarily directed:

- **Increase in life expectancy was first due to improvement in infant and childhood mortality rates**
- **recently increase is due to prevention of premature death among middle aged people (decline in deaths from coronary heart disease)**

Cont: The change in mortality pattern implications:-

-Broadening the definition of epidemic

any disease occurring at a greater frequency than usually expected.

-Development of new methodology to suit chronic diseases due to difficulty in precise ascertainment of exposure (long latency period) and small to moderate magnitude of effect

Epidemiological contributions to medical science and humanity

- 1854 John Snow, The control of Cholera

(principles of disease mapping)

1952 London fog- Clean Air Act 1956

1950s epidemiologists observed increased mortality from Lung cancer

Epidemiological contributions to medical science and humanity

Doll & Bradford-Hill smoking and carcinoma of the lung: preliminary report, BMJ 1950;II:739-48

Patients with lung cancer more likely to have smoked

85-90% of cases are due to tobacco

Epidemiological contributions to medical science and humanity

- RCTs of new treatments
- Health service related research
- Need for health care
- Planning service provision
- Implementing, monitoring and evaluation of screening programmes

Objectives of Epidemiology

- Investigate the etiology of disease and modes of transmission
- Determine the extent of disease problems in the community
- Study the natural history and prognosis of disease
- Evaluate both existing and new preventive and therapeutic measures and modes of health care delivery
- Provide a foundation for developing public policy and regulatory decisions

Epidemiologic Reasoning

Hypothesis is tested in epidemiologic studies using:

- **-systematic collection & analysis of data**
- **-appropriate comparisons**
- **-calculate probability of developing a particular outcome in presence versus absence of a certain exposure**
- **-necessary to assess the validity of observed statistical associations by excluding other explanations:**
  - **i-chance: luck of the draw**
  - **ii-bias: systematic error in collecting and interpreting data**
  - **iii-confounding: effect of extraneous variables**
- **-judgment: causal-effect association (causal inference)**

Types of Epidemiological Studies

Experimental: Epidemiologist *controls exposure* of subjects to an intervention and observes the outcome

Observational: Epidemiologist observes exposure and outcome *without controlling either*

- **Descriptive**: Epidemiologist collects information to characterize and summarize health event
- **Analytical**: Epidemiologist compares groups to identify causes or risk factors

Clinical preventive medicine provides scientific overlap between them

	CLINICAL MEDICINE	COMMUNITY MEDICINE
Observes	Individual	Community
History by	Medical history (interview and case record)	National/local records, surveillance
Investigate by	Physical examination, clinical tests	Observational studies, surveys
Diagnosis	Defines condition of individual	Analytic studies
Treatment	Individual therapy, advice	Plan health programmes, services
Assessment	Individual progress	Evaluation
Follow-up	Change/continue/ Stop therapy	Adjust planned programmes
Outcome	Individual effect	Community effect

Measuring health and disease

- **Definitions**
- **Health indicators**
- **Sources of health related data**

Definitions

"health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" WHO 1948

" the ability of the individual to function in manner acceptable to himself and to the group of which he is part" Dubos 1959

A state of equilibrium between humans and the physical biologic and social environment, compatible with full functional activity (Last 1997)

Definitions

Disease: Literally, dis-ease, the opposite of ease, when something is wrong with a bodily function.

Susser has suggested the following terms to be used as follows:

Disease: is a physiological/psychological dysfunction

Illness: subjective state of a person who feels aware of not being well

Sickness: state of social dysfunction, i.e., a role that the individual assumes when ill.

Risk factor

- ***A risk factor is a characteristic to which***

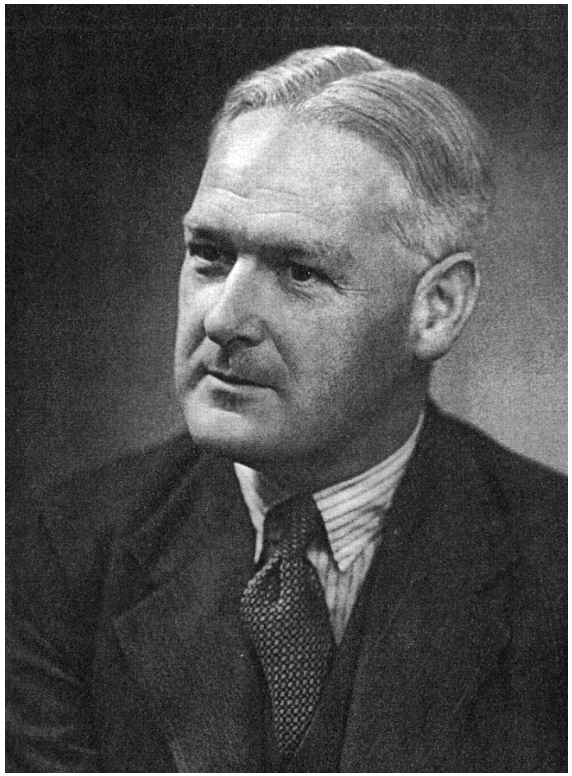
people are exposed and is associated with changes in the frequency of a disease.

Associations Vs. Causation

- Epidemiological research is aimed to uncovering the causes of disease.
- Epidemiology is studying the association between a potential component cause (risk factor) and a specific disease.
- How do we go about determining whether a given association is causal?

Sir Austin Bradford Hill(1897-1991)

- The Environment and Disease: Association or Causation
  - Strength
  - Consistency
  - Specificity
  - Temporality
  - Dose-response relationship
  - Biological plausibility
  - Coherence
  - Reversibility



Terms

- Impairment: any loss or abnormality of psychological, physiological or anatomical structure of function

Structural or functional

loss of a limb, loss of vision or memory loss.

- Disability: any restriction or lack (resulting from impairment) of ability to perform an activity in the manner or within the range considered normal
- Handicap: a disadvantage for a given individual, resulting from an impairment or disability that limits or prevents the fulfilment of a role that is normal

Health indicators

Indicators are a measure that can be used to help describe a situation that exists and to measure changes or trends over a period of time

They are necessary in order to:

- **Analyze the present situation**
- **Make comparisons**
- **Measure changes over time**

Sources of information for calculation of indicators

- Registration of births, deaths and diseases
- Population censuses
- Routine health information systems
- Surveillance
- Investigation of epidemics
- Sample surveys