EPIDEMIOLOGY

Dr Kalyani Addya

WHAT IS EPIDEMIOLOGY?

Epi = Upon (among)
Demos = People
Ology = Science
Epidemiology = The science which deals with what falls upon people…..

- Definition of Epidemiology
- "The study of the distribution and determinants of health-related states in specified populations, and the application of this study to control health problems".

DISTRIBUTION

- **Includes Frequency and Pattern**

- **Frequency**
  - ✓ **The number of health events (e.g. number of cases of diabetes in a population), the relationship of that number to the size of the population**

- **Pattern: Occurrence of health-related events by time, place, and person**
  - ✓ **Time patterns : Annual, seasonal, weekly, daily, hourly, weekday versus weekend,**
  - ✓ **Place patterns: Geographic variation, urban/rural differences, and location of work sites or schools**
  - ✓ **Personal characteristics: Demographic factors (age, sex, marital status, and socioeconomic status), as well as behaviors and environmental exposures**

TIME DISTRIBUTION

- **Short-term Fluctuations.**
  - **Common Source Epidemics**
    - ✓ **Single exposure / point source: Bhopal Gas Tragedy**
  - **Propagated / Infectious: Hepatitis A**
- **Periodic Fluctuations;**
  - **Seasonal: Measles (early spring)**
  - **Cyclic: Measles in pre-vaccinated era (peak 2-3 yr)**
- **Long-term or Secular Trends :**
  - **Occurrence of health-related events by time, place and person**
  - **Secular trend of Tetanus declined due to Tetanus Vaccine**

PLACE DISTRIBUTION

- **International Variations**
  - Cancer of stomach very common in Japan, less common in US
  - Oral cancer- India
  - Breast cancer- Low in Japan, high in Western Countries
- **National variations**
  - Distribution of Fluorosis, Tuberculosis
- **Rural-urban differences**
  - Cardio vascular & Resp disorders , Mental illness more common in urban areas.
  - Skin diseases, worm infestations more common in rural areas
- **Local Distributions**
  - Spot maps- John Snow in London to incriminate water supply as cause of cholera transmission in London.

DETERMINANTS

- **Determinant:**
  - **Any factor, whether event, characteristic, or other definable entity, that brings about a change in a health condition or other defined characteristic**

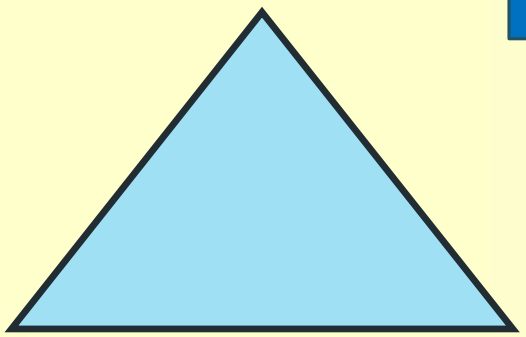
PERSON DISTRIBUTION

- **Age**
  - Measles common in children
  - Lifestyle disease like diabetes, hypertension in middle age
  - Degenerative diseases ,arthritis in old age.
- **Sex**
  - Women- Lung cancer-less and Hyperthyroidism more
- **Social Class**
  - Diabetes, Hypertension more prevalent in upper class

CAUSE OF DISEASE

- **Three essential characteristics examined to study the cause(s) for disease in analytic epidemiology are...**
  - **Host**
  - **Agent**
  - **Environment**

CAUSE OF DISEASE: EPIDEMILOGY TRIAD



Host

- Demographic Characteristics
- Biological Characteristics
- Socioeconomic Characteristics
- Lifestyle Characteristics

Agent

- Biological agents
- Physical agents
- Chemical agents
- Nutrient agents
- Mechanical agents
- Social agents

Environment

- Physical environment;
- Biological environment;
- Psychosocial environment.

DISRUPTION OF EPIDEMILOGY TRIAD

- **Epidemics arise when host, agent, and environmental factors are not in balance due to:-**
  - **New agent**
  - **Changes in existing agent (infectivity, pathogenicity, virulence)**
  - **Change in number of susceptibles in the population**
  - **Environmental changes that affect transmission of the agent or growth of the agent**

HEALTH RELATED STATES AND EVENTS

- Epidemics of communicable diseases
- Endemic communicable diseases
- Non-communicable infectious diseases
- Chronic diseases, injuries, birth defects, maternal-child health, occupational health, and environmental health
- Health-related behaviors: exercise, seat belt use,

SPECIFIED POPULATION

- Population may be defined as the whole population or a representative sample.
- Can also be a specially selected group such as age and sex groups, occupational groups, hospital patients, school children, small community, etc.

APPLICATION

- **Epidemiology involves:-**
  - ✓ **Applying the knowledge gained for epidemiologic judgement**
  - ✓ **Diagnosing the health of the community**
  - ✓ **Taking appropriate prophylactic and preventive steps**

AIM: EPIDEMIOLOGY

- To eliminate or reduce health problem or its consequences
- To promote health and well-being of society

LEARNING OBJECTIVES

- Define epidemiology
- Describe basic terminology and concepts of epidemiology
- Identify types of data sources essential for data collection and interpretation
- Identify the key components of a descriptive epidemiology outbreak investigation
- Describe the distribution and magnitude of health and disease problems in the population
- Identify the etiological factors – risk factors in the population.
- Provide data essential to planning, implementation and evaluation of services
- Prevention, control and treatment of disease and establish priorities for these services

PURPOSE: EPIDEMIOLOGY

- To investigate nature / extent of health-related phenomena in the community / identify priorities
- To study natural history and prognosis of health-related problems
- To identify causes and risk factors
- To recommend / assist in application of / evaluate best interventions (preventive and therapeutic measures)
- To provide foundation for public policy

CASE STUDY: CHOLERA OUTBREAK IN LONDON, 1854

TYPES OF EPIDEMIOLOGY

- Descriptive Epidemiology
- Analytic Epidemiology

DESCRIPTIVE EPIDEMIOLOGY

- What - Health Issue of Concern
- Who - Person
- Where - Place
- When - Time
- Why / How - Causes, Risk Factors, Modes of Transmission

ANALYTIC EPIDEMIOLOGY

- Tests hypotheses about:
  - Why
  - How
  - To identify causes and risk factors
  - To recommend / assist in application of / evaluate best interventions (preventive and therapeutic measures)
  - To provide foundation for public policy

BROAD TYPES OF EPIDEMIOLOGY

Descriptive Epidemiology

- Examining distribution of a disease in a population
- Observing basic features of its distribution in terms of time, place, and person
- Typical study design: Cross-sectional Study & Descriptive Study

Analytic Epidemiology

- Testing specific hypothesis about relationship of a disease to a cause
- Conducting an epidemiologic study that relates the exposure and disease of interest
- Typical study designs: Cohort & Case-control

USES OF EPIDEMIOLOGY

- Assessing the Community's Health
- Making Individual Decisions
- Completing the Clinical Picture
- Searching for Causes

REFERENCES

- *Principles of Epidemiology in Public Health Practice, 3rd Edition, May 2012: An Introduction to Applied Epidemiology and Biostatistics - Centers for Disease Control and Prevention (CDC), USA*
- *National Human Genome Research Institute, Division of Intramural Research, USA*
- *Last JM: A Dictionary of Epidemiology 4th Ed. 2001*

DISCUSSION

TOPICS TO BE COVERED

- ✓ Introduction to Epidemiology – Definition & 0bjectives of epidemiology, principles and methods of epidemiology to investigate disease distribution
- ✓ Using epidemiology methods to study the cause, extent and prevention of various infectious and non-infectious diseases
- ✓ Dynamics of disease transmission: modes of transmission, attack rate, disease outbreak investigation
- ✓ Disease surveillance and measures of morbidity and mortality: Active and passive surveillance, emergency warning systems
- ✓ Stages of a disease, incidence and prevalence of disease, mortality rates, case fatality
- ✓ Assessing screening tests: Validity of tests, Tests with binary and continuous outcomes, sequential testing, sensitivity and specificity measures
- ✓ Different types of study design, including randomized trials, case-control and cohort studies, risk estimation and causal inferences