DESCRIPTIVE EPIDEMIOLOG

L9

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Learning Objectives

At the end of this lecture ,the student is able to:

1. to describe the differences or variations in the occurrence of diseases or health related events regarding :

    A. Persons (individual characteristics)
    B. Time
    C. Place

2. Give explanations for these variations.

3. Understand the role of descriptive epidemiology in describing the population and helping in the exploration of variation to aid in the planning of the health services.

DESCRIPTIVE EPIDEMIOLOGY

- Includes activities related to characterizing the distribution of diseases within a population.

- A way of organizing and analyzing health data in order to understand variations in disease frequency geographically and over time, and how disease (or health) varies among people based on a host of personal characteristics (person, place, and time).

- This makes it possible to identify trends in health and disease and provides means of planning resources for populations.

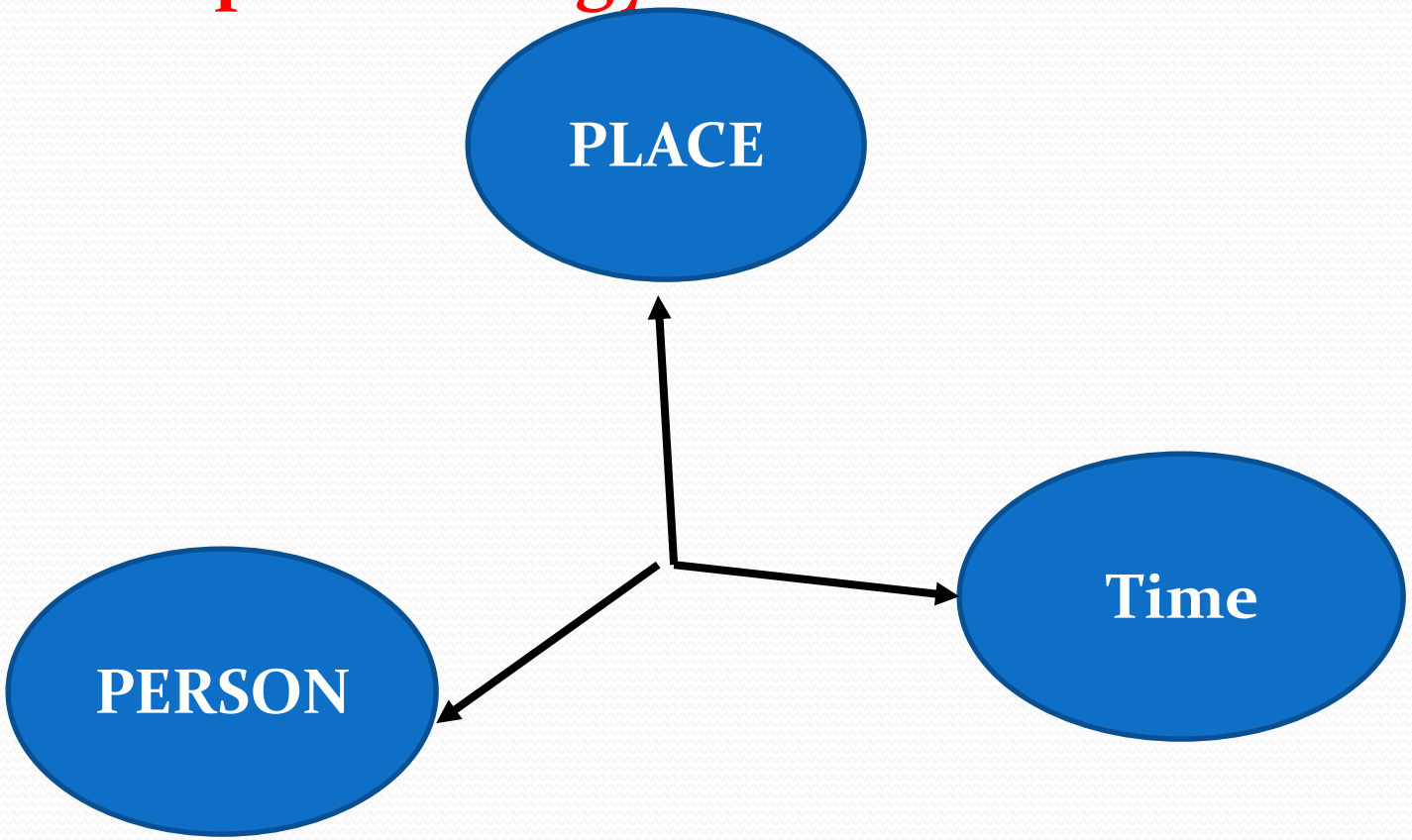
- In addition, descriptive epidemiology is important for generating hypotheses (possible explanations) about the determinants of health and disease.

- By generating hypotheses, descriptive epidemiology also provides the starting point for analytic epidemiology, which formally tests associations between potential determinants and health or disease outcomes.

Specific tasks of descriptive epidemiology are the following:

1. Monitoring and reporting on the health status and health related behaviors in populations
2. Identifying emerging health problems
3. Establishing public health priorities for a population
4. Evaluating the effectiveness of intervention programs and
5. Exploring potential associations between "risk factors" and health outcomes in order to generate hypotheses about the determinants of disease.

Descriptive Epidemiology



Think of this as the standard dimensions used to track the occurrence of a disease.

Three groups of variables are commonly used in descriptive epidemiology. These are:

A. Characteristics of **persons** affected such as:

- age,
- sex,
- marital status,
- education,
- occupation,
- habits,
- genetics and
- ethnic groups.

B. Characteristics **place**

The distribution of the disease may have:

- international,
- national (limited to one country,
- continental,
- local: only part of a country or urban-rural pattern?

C. Characteristics of **time** in which persons were found affected.

Does the distribution follows,

- secular trend (over many years and decades),
- seasonal trend (within the same year),
- recurrent pattern or the occurrence of disease after special events, e.g., raining. ?

Distribution of disease with age

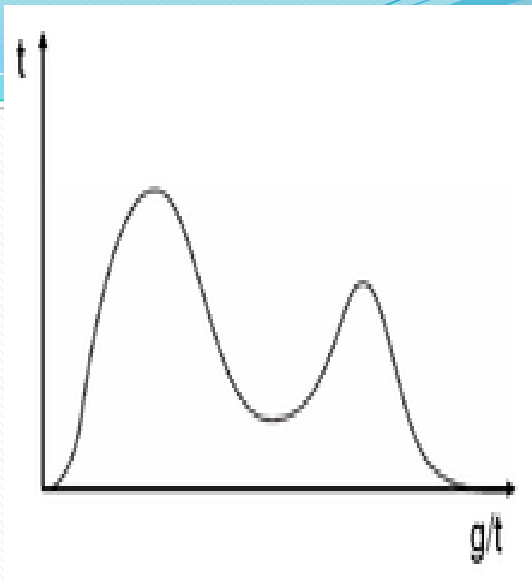
The variation of disease distribution with age may be explained as follows:

1. Accuracy of diagnosis. Disease is less likely to be ascertained in extreme age groups. This leads to under estimation of certain causes of death in the very young and the very elderly people. In some instances, basic population data are lacking on such extreme age groups.

2. Variation in intensity and duration of exposure to risk factors.

3. Variation in immunity and susceptibility. People are not constant in their immunological response and immunological status and are not necessarily similar to each other in that respect.

4. Bimodality:



In some instances, the distribution of disease frequency with age may have more than one peak (bimodal) as in case of the incidence of Hodgkin's **disease,** leukemia, testicular Cancer and tuberculosis ; with age.

This bimodality may suggest the heterogeneity of data and the possibility that we are dealing with two disease entities rather than with one disease.

For example, the first peak in the incidence rate of tuberculosis in young children is definitely primary (exogenous) tuberculosis. On the other hand, the peak late in life is mainly secondary (endogenous) tuberculosis.

5. Ageing or biological clock:

Sometimes, people become very old-aging and lose the ability to carry out even simple tasks, yet they have no apparent disease.

They probably follow a pre-coded biological clock, which determines the life span.

Distribution of disease with Sex

- In general, males have higher rates of illness and death than females do for a wide range of diseases.

- For some diseases, sex-related difference is because of:

  - genetic
  - hormonal
  - anatomical
  - other inherent differences

- These inherent differences affect their susceptibility or physiologic responses.

- For example, premenopausal women have a lower risk of heart disease than men of the same age. This difference is attributed to higher estrogen levels in women.
- On the other hand, the sex-related differences in the occurrence of many diseases reflect differences in opportunity or levels of exposure. For example, hand/wrist disorders i.e., Carpal Tunnel syndrome occurs almost twice as often in females than in males.

This may be attributed to their higher level of exposure to occupational activities that require repetitive hand/wrist motion such as typing or keyboard entry or at homework.

Distribution of disease with marital status

In many studies it was reported that death rates and suicidal rates are higher among non-married people (single, widowed and divorced) than they are in married people. This is true for both males and females. Such variation might be difficult to explain but two explanations are possible:

a. Marriage stabilizes life and reduces the risk of exposure to hazardous behavior. Married people may feel more responsible not only for their lives but for the care and life of their spouses and children. They may avoid certain risky behaviours.

b. Unmarried (single) are not healthy to start with and they prefer not to marry. The higher risk of death and suicide among them is perhaps related to their poor health or due to unhealthy lifestyle or unstable life.

Socioeconomic status.

- Socioeconomic status is difficult to quantify. It is made up of many variables such as occupation, family income, educational achievement, living conditions, and social standing.
- The frequency of many adverse health conditions increases with decreasing socioeconomic status.
- For example, tuberculosis is more common among persons in lower socioeconomic status.
- Infant mortality and time lost from work due to disability are both associated with lower income.

- These patterns may reflect more harmful exposures, lower resistance, and less access to health

- Or they may in part reflect an interdependent relationship : does low socioeconomic status contribute to disability or does disability contribute to lower socioeconomic status?

- Some adverse health conditions are more frequent among persons of higher socioeconomic status. These conditions include breast cancer, gout, obesity and tennis elbow.

- Again, differences in exposure account for at least some of the differences in the frequency of these conditions.

Association of disease distribution with place

The following criteria are essential to demonstrate an association of disease distribution with place:

1. High frequency rates of the disease are observed in all ethnic groups living in that place.

2. Healthy people entering the place become affected by the disease at a rate similar to that of the indigenous population.

3. People who leave the place and move to other places do not experience high frequency rates of the disease.

4. Species other than man may show similar pattern of the disease

Characteristics Relating to Place

- **International**

For example, there was a substantial difference in the incidence of stomach cancer in Japan & the US.

There are also substantial differences in genetics , climate, culture , diet and access to health care services .

- **Variation within countries:**
- **Local**

  i.e. gastroenteritis is higher among children in areas who lacks the proper water supply.

▪Urban-rural :

Due to differences in:

• population density,

•levels of sanitation,

•deficiencies of medical care,

•education and

•environment factors,

These may result in variation in:

➢Chronic bronchitis, cardiovascular diseases, accidents are more frequent in urban than rural areas.

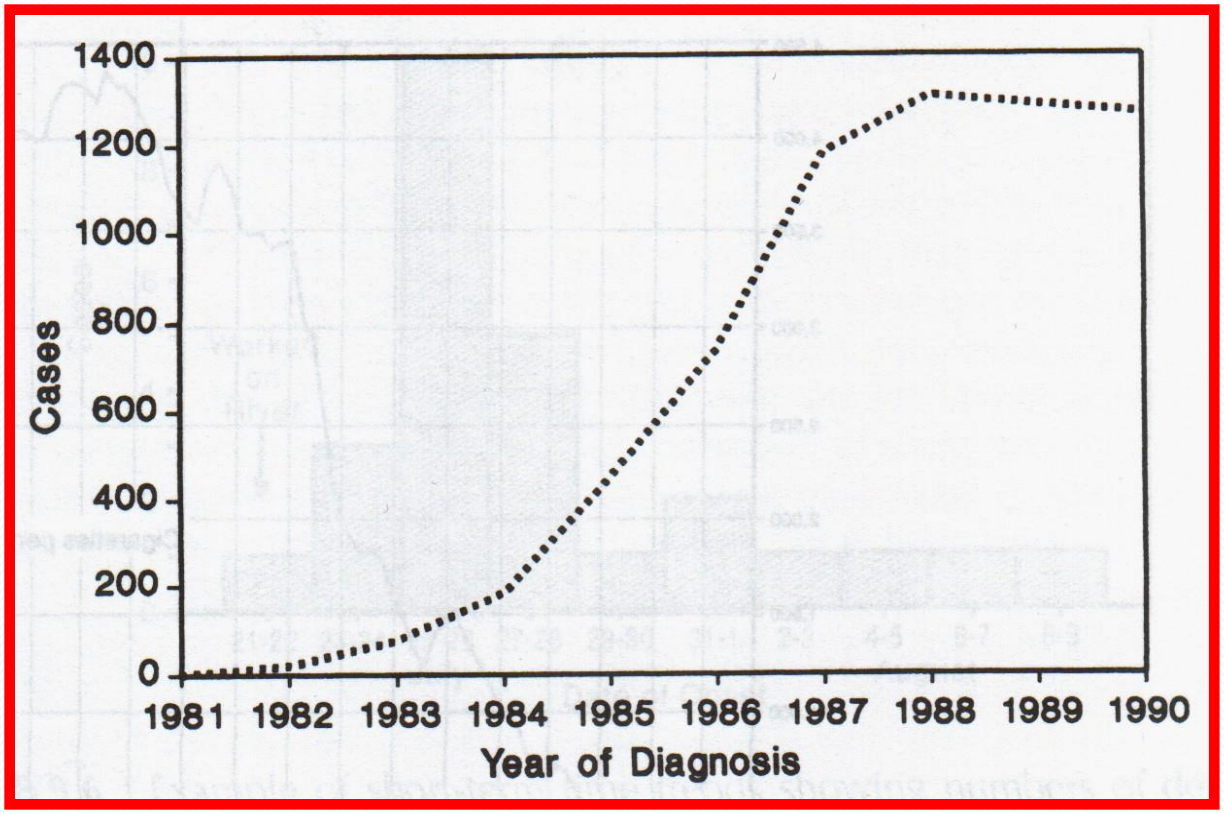
➢ Skin and zoonotic diseases and soil transmitted helminthes may be more frequent in rural than urban areas.

➢ Incidence of goiter is higher in the mountainous area and lower in other places.

➢ Incidence of schistosome is higher in the villages where they use river for swimming or other needs.

Disease variation with time

- **Secular change (long-term)**
- **Cyclic trends**
- **Seasonal variation**
- **Point epidemics**



Secular changes

•It refers to changes in the occurrence of disease over a long period of time. E.g.: Coronary disease, diabetes showing consistent upward trend and a decline in TB, polio in developed countries during the past 50 yrs.

•The changes occur over years or decades. Examples are the changes in cancer, cardiovascular disease.

•Such secular changes which show a clear rise in the disease frequency with time (years or even decades) as has been shown with the rise in mortality rate due to lung cancer in some European countries during the twentieth century could be explained as follows:

1. The rise **indicates real increase** in the incidence of the disease in response to:

a. Massive exposure to disease agents.
b. Change in lifestyle of the people and
c. Failure of adaptation to social change.

2. The rise is artificial due to:
a. Improved diagnosis of disease which lead the identification of cases which were previously missed.

b. Change in classification of disease.

c. Improved recording of cases.

d. Ageing of the population/ change in population at risk .

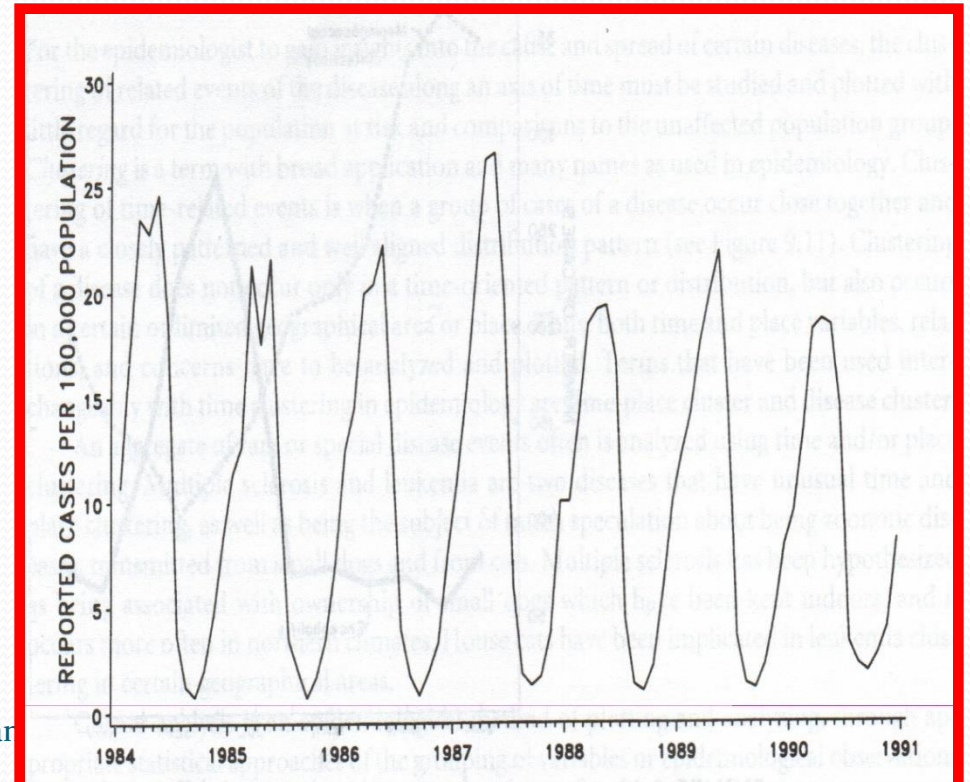
Cyclical trends:

- Cyclic trends: recurrent alterations in occurrence , interval or frequency of disease.
- Some diseases occur in cycles spread over short periods of time (days, weeks, months or years) . Eg: Influenza pandemics are known to occur at intervals of 7-10 yrs due to antigenic variations.
- Non-infectious conditions

may also occur in this trend.

E.g: Automobile accidents are more frequent on weekends.

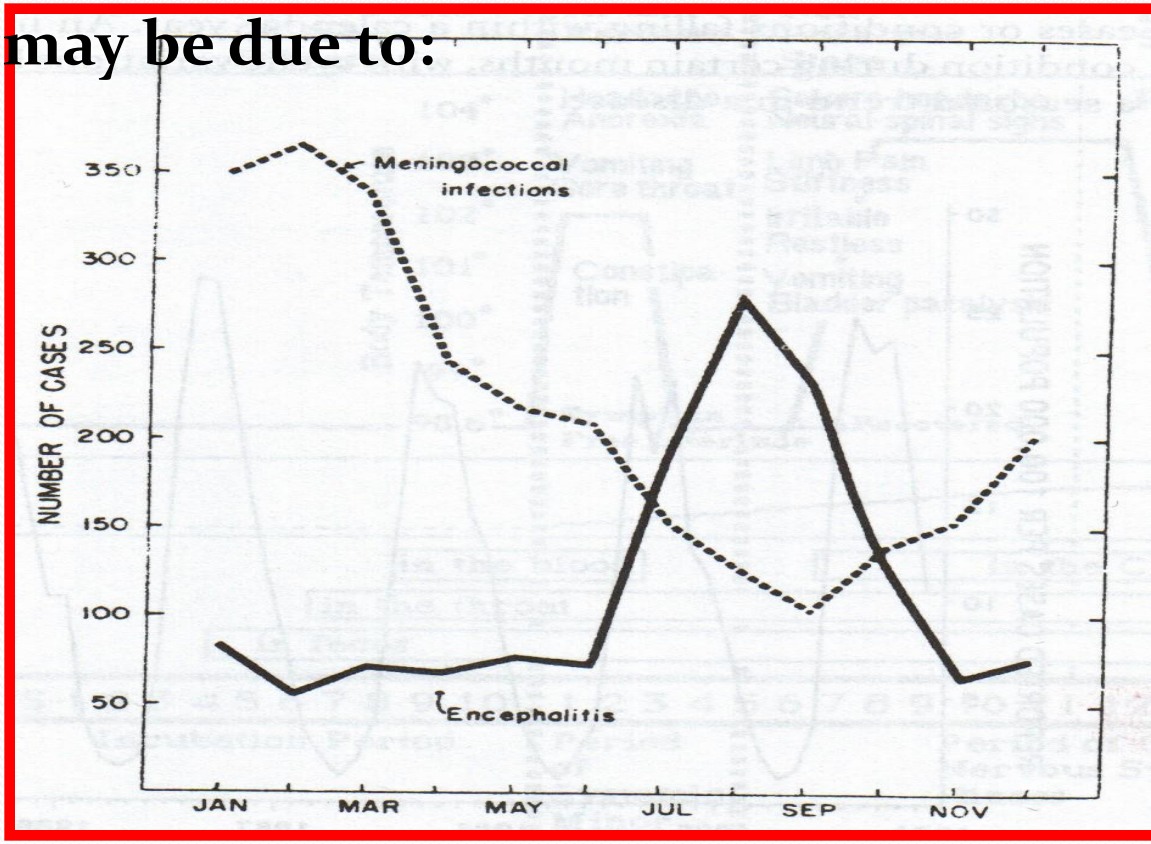
- cyclic trends due to factors:
  - ✓ Immigration
  - ✓ School year
  - ✓ Military deployment



Seasonal changes

A change of disease frequency within the year reflects a change in population immunity (susceptibility), change in the environmental situation in favor of disease agent development or multiplication, and its transmission to new host or both.

- **Seasonal fluctuations may be due to:**
  - *Environmental factors*
  - *Occupational activities*
  - *Recreational activities.*



- Seasonal variation can be used to suggest possible etiology .i.e. malaria, influenza, meningococcal menininingitis, asthma.

- Non-infectious diseases and conditions may sometimes exhibit seasonal variation.

E.g: Sunstroke, hay fever.

Time clustering

Time Place Cluster/disease cluster

A group of cases occur close together & have a well aligned distribution pattern {*in terms of time and place*}

Cluster analysis-used for rare or special disease events.

- Time clustering data can sometimes be used to trace the "beginning" to the introduction of a specific causal agent
  - ✓ Thalidomide & birth defects

    First marketed in Europe in 1950's as sleeping pill and to treat morning sickness in pregnant women

In the late 1950s and early 1960s, more than 10,000 children in 46 countries were born with deformities, such as phocomelia, as a consequence of thalidomide use.

Thank You