

A wooden board with a blue border holds several awards and a compass. At the top left is a red ribbon with a circular emblem. Below it is a silver star-shaped medal with a central emblem. To the left is a blue ribbon with a circular emblem. Below that is another silver star-shaped medal. At the bottom left is a circular compass with a needle and degree markings. A pair of glasses with thin frames and a red-tipped pen are also visible on the board.

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DESCRIPTIVE EPIDEMIOLOGY

- ◆ The best study of **mankind is man**.
- ◆ Descriptive studies are usually the **first phase** of an epidemiological investigation.
- ◆ These studies are concerned with **observing the distribution** of disease or health-related characteristics in human populations
- ◆ and **identifying the characteristics** with which the disease in question seems to be associated.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ Such studies basically ask **the questions**.
- ◆ A. When is the disease occurring ?
 - ◆ - **Time** distribution
- ◆ B. Where is it occurring ?
 - ◆ - **Place** distribution
- ◆ C. Who is getting the disease?
 - ◆ - **Person** distribution



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **Procedures** in descriptive studies
 1. Defining the **population** to be studied
 2. Defining the **disease** under study
 3. **Describing** the disease by
 - a. time
 - b. place
 - c. person
 4. **Measurement** of disease
 5. **Comparing** with known indices
 6. Formulation of an **aetiological hypothesis**



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **1. Defining the population**
- ◆ Descriptive studies are investigations of **populations**, not individuals
- ◆ The first step is, therefore, to define the **"population base"** not only in terms of the total number, but also **its composition** in terms of age, sex, occupation, cultural characters and similar information needed for the study.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ The "defined population" can be the **whole population** in a geographic area, or more often a **representative sample** taken from it.
- ◆ The defined population **needs to be large** enough so that age, sex and other specific rates are meaningful.
- ◆ The community chosen should be **stable, without migration** or out of the area.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ Perhaps the most essential ingredient is **community participation**
- ◆ In the famous **Framingham Heart Study** in US, all the above criteria were taken into consideration in choosing the study population



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **2 . Defining the disease under study**
- ◆ The needs of the clinician and epidemiologist may diverge
- ◆ **The clinician** may not need a precise definition of disease (e.g. , migraine) for immediate patient care



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **The epidemiologist**, whose main concern is to obtain an accurate estimate of disease in a population, needs **a definition that is both precise and valid** to enable him (or observers working in field conditions)
- ◆ To identify those who have the disease from those who do not



DESCRIPTIVE EPIDEMIOLOGY

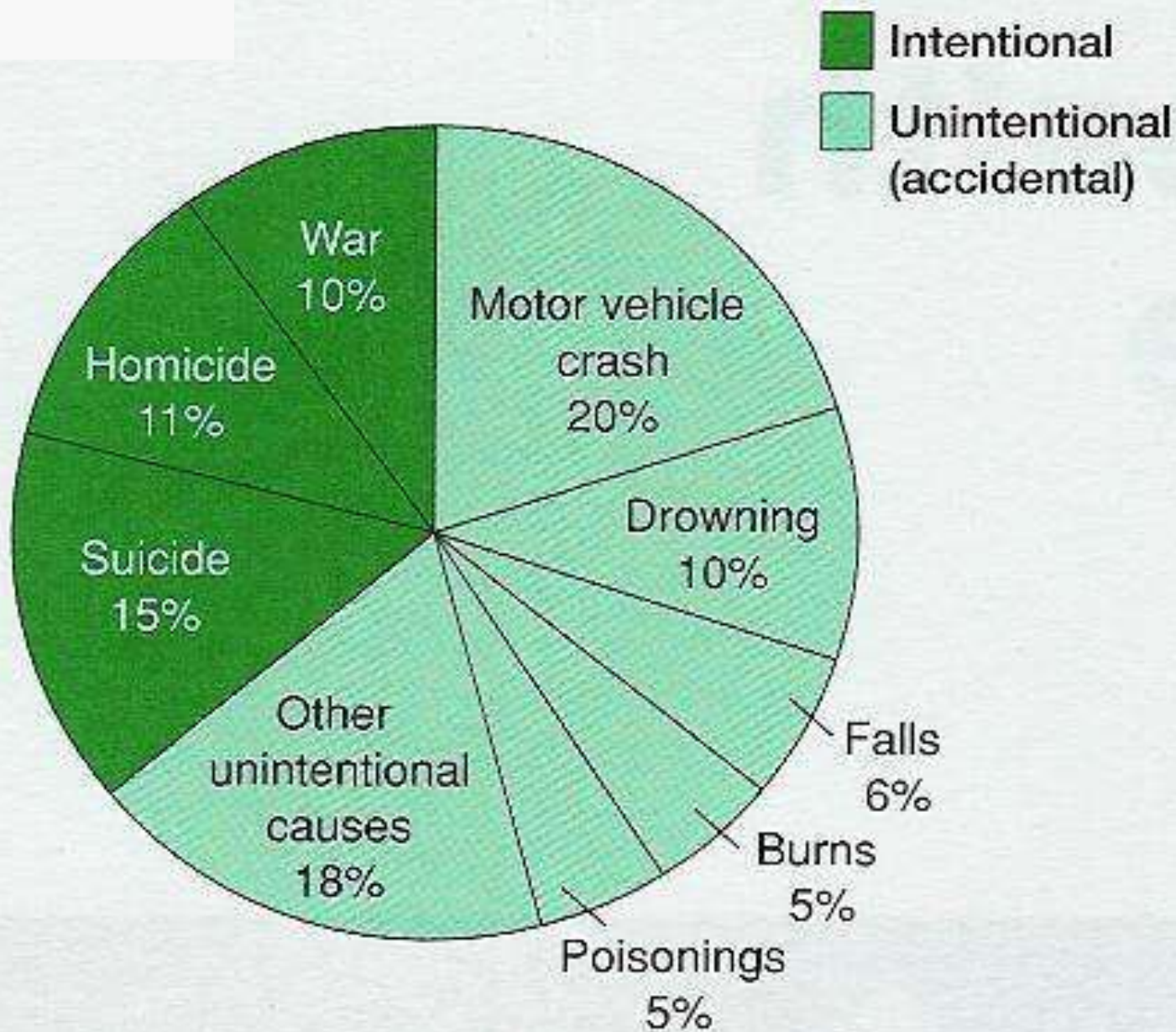
- ◆ In other words, the epidemiologist looks out for an "operational definition"
- ◆ A definition by which the disease or condition can be identified and measured in the defined population with a degree of accuracy
- ◆ For example, tonsillitis might be defined clinically as an inflammation of the tonsils caused by infection, usually with *streptococcus pyogenes*



DESCRIPTIVE EPIDEMIOLOGY

- ◆ On the other hand, an "operational definition" spells out clearly **the criteria** by which the disease can be measured. Such criteria in the case of tonsillitis would include
 - ◆ The presence of **enlarged,**
 - ◆ **Red tonsils** with white **exudates,**
 - ◆ Which on throat **swab culture** grow predominantly *S. Pyogenes*.
 - ◆ If the definition is **not valid**, it would be a powerful **source of error**

Injury Deaths Worldwide by Leading Causes and Intention, 1990



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **3 . Describing the disease**
- ◆ The primary objective of descriptive epidemiology is to describe the **occurrence and distribution** of disease

Time	Place	Person	
Year, season	Climatic zones	Age	Birth order
Month, week	Country, region	Sex	Family size
Day, hour of onset,	Urban/rural Local community	Marital state	Height Weight
Duration	Towns Cities Institutions	Occupation Social status Education	Blood pressure Blood cholesterol Personal habits



DESCRIPTIVE EPIDEMIOLOGY

- ◆ Epidemiologists have identified three kinds of time trends or fluctuations in disease occurrence.
- ◆ I. Short-term fluctuations
- ◆ II. Periodic fluctuations, and
- ◆ III. Long-term or secular trends



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **I. Short-term fluctuations**
- ◆ The best known short-term fluctuation in the occurrence of a disease is **an epidemic**
- ◆ an **epidemic** is defined as "the occurrence in a community or region of cases of an illness or other health-related events **clearly in excess of normal expectancy**".



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **Types of epidemics**
- ◆ Three major types of epidemics may be distinguished.
- ◆ **A. Common-source epidemics**
- ◆ (a) Single exposure or "point-source" epidemics.
- ◆ (b) Continuous or multiple exposure epidemics
- ◆ **B. Propagated epidemics**
- ◆ (a) Person-to-person
- ◆ (b) Arthropod vector
- ◆ (c) Animal reservoir
- ◆ **C. Slow (modern) epidemics.**



DESCRIPTIVE EPIDEMIOLOGY

- ◆ A graph of the time distribution of epidemic cases is called the "epidemic curve"
- ◆ It suggest :
- ◆ (1) a time relationship with exposure to a suspected source,
- ◆ (2) a cyclical or seasonal pattern



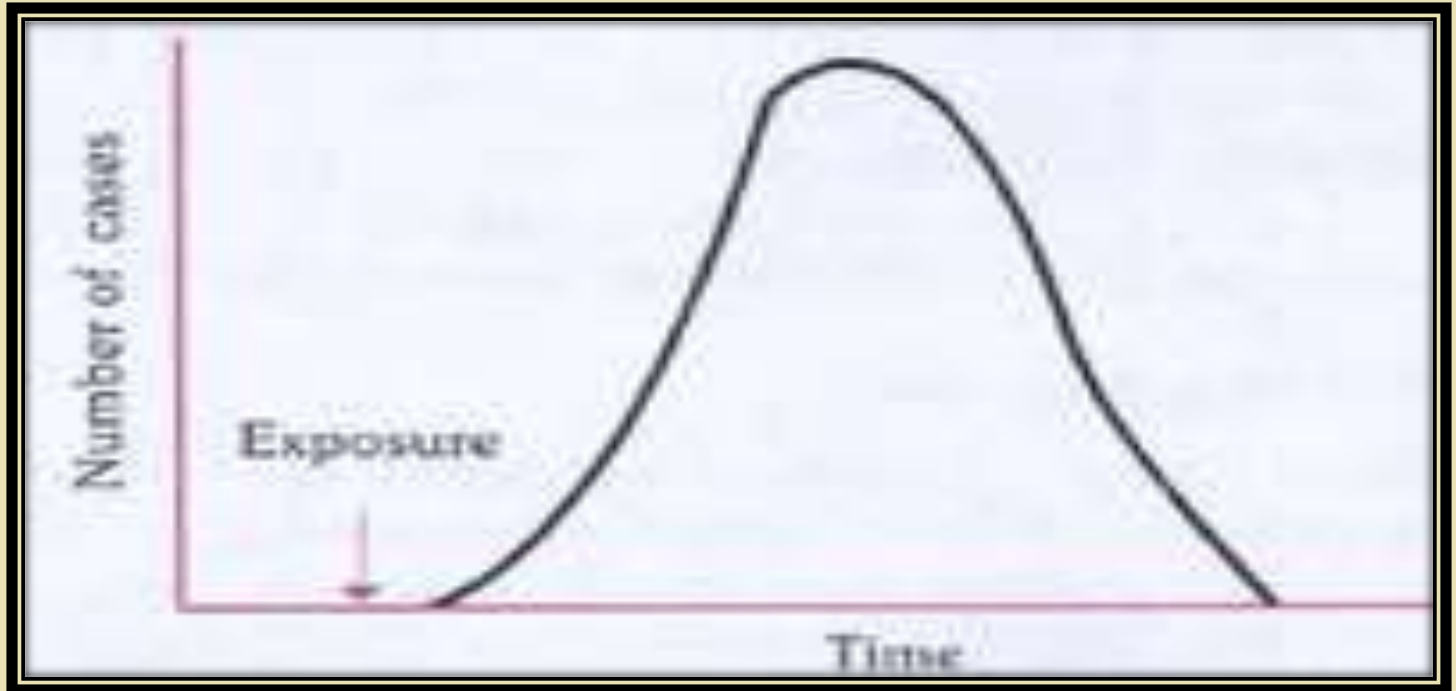
DESCRIPTIVE EPIDEMIOLOGY

A. Common-source epidemics

(a) Common-source, single exposure epidemics

- ◆ The main features of a "point-source" epidemic are :
 - ◆ (i) the epidemic curve rises and falls rapidly, with no secondary waves
 - ◆ (ii) the epidemic tends to be explosive, there is clustering of cases within a narrow interval of time,
 - ◆ (iii) more importantly, all the cases develop within one incubation period of disease.

DESCRIPTIVE EPIDEMIOLOGY



e.g. , Bhopal gas tragedy in India and Minamata disease in Japan resulting from consumption of fish containing high concentration of methyl mercury.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **(b) Common-source, continuous or repeated exposure**
- ◆ The exposure from the same source may be
- ◆ **prolonged - continuous, repeated or intermittent** –
- ◆ not necessarily at the same time or place



DESCRIPTIVE EPIDEMIOLOGY

- ◆ e.g. A prostitute may be a common source in a gonorrhoea outbreak, but since she will infect her clients over a period of time.
- ◆ A well of contaminated water, or a nationally distributed brand of vaccine (e.g. polio vaccine) , or food



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **2. Propagated epidemics**
- ◆ (a) Person-to-person
- ◆ (b) Arthropod vector
- ◆ (c) Animal reservoir
- ◆ A propagated epidemic is most often of **infectious origin** and results from **person-to-person transmission** of an infectious agent (e.g., epidemics of hepatitis A and polio).
- ◆ The epidemic usually shows a gradual rise and tails off over a much longer period of time .
- ◆ **Transmission continues**
- ◆ If the number of susceptible exist
- ◆ Development of herd immunity
- ◆ Secondary attack rate



DESCRIPTIVE EPIDEMIOLOGY

II. Periodic fluctuations

(i) *Seasonal trend*

Measles & varicella- Early spring

URTI-Winter

Bacterial GIT infections-Summer

Non-infectious - Sunstroke, hay fever

Dengue-July to Nov

Seasonal variations may be related to environmental conditions like

Temperature , humidity ,rainfall, overcrowding, life cycle of vectors etc

which directly or indirectly favor disease transmission.



DESCRIPTIVE EPIDEMIOLOGY

(ii) Cyclic trends -

Some diseases occur in cycles spread over short periods of time, which may be days, weeks, months or years.

e.g.

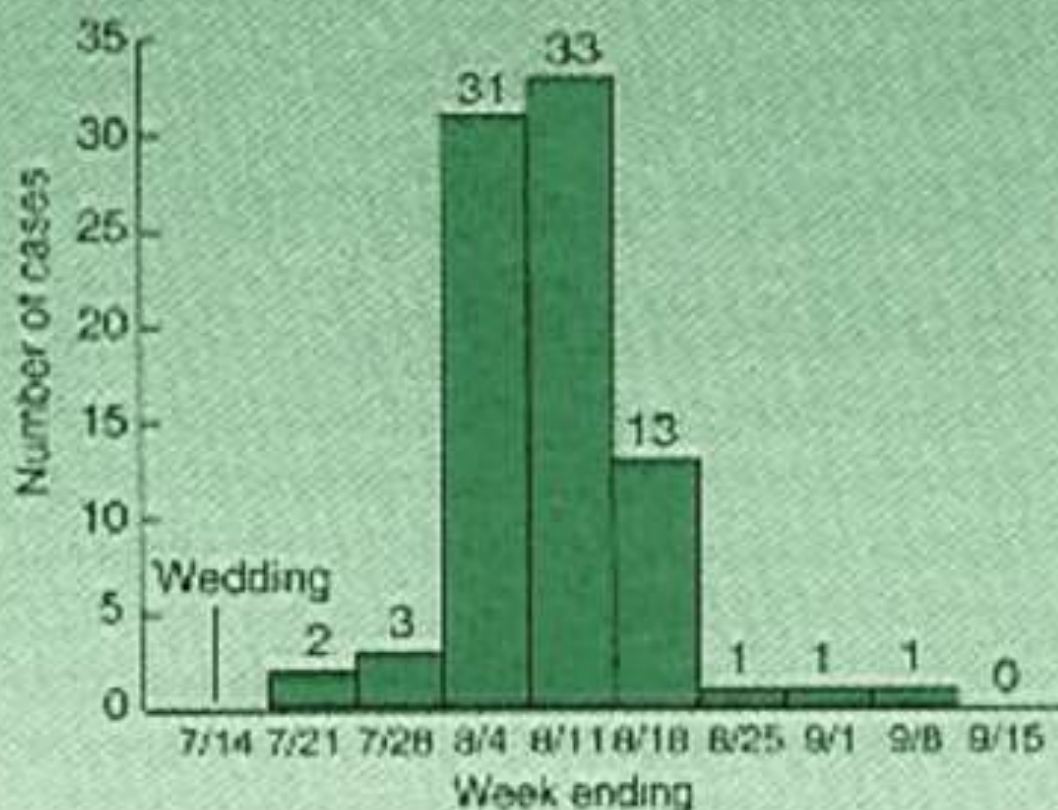
Measles in pre-vaccine era-every 2-3 years

Rubella-every 6-9 years

Influenza Pandemics -every 7-10 yrs

Non-infectious like accidents- weekends
esp. Sundays

Onset of Illness in Des Moines, Iowa, Trichinosis Outbreak, July to September 1990



Source: McAuley, J. et al. A Trichinosis Outbreak Among Southeast Asian Refugees (1992). *American Journal of Epidemiology* 135(12):1404-1410. Reproduced in Rockett, I.R.H. *Population and Health: An Introduction to Epidemiology* (1999). *Population Bulletin* 54(4):23.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **Place distribution-**
- ◆ By studying the distribution of disease in different populations we gain perspective on the fascinating differences (or variations) in disease patterns not only between countries, but also within countries
- ◆ Variations may be
 - ◆ International variations
 - ◆ National variations
 - ◆ Rural-Urban differences
 - ◆ Local distributions



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **International variations**
- ◆ We know that **cancer** exists all over the world. There is, however, **a marked difference between the incidence** of each cancer in different parts of the world.
- ◆ Thus **cancer of the stomach** is very common in Japan, but unusual in US.
- ◆ Cancers of **the oral cavity and uterine cervix** are exceedingly common in India as compared to industrialized countries. ■



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **National variations**
- ◆ It is obvious that variations in disease occurrence must also exist **within countries or national boundaries**
- ◆ For example the distribution of endemic goitre, lathyrism, fluorosis, leprosy, malaria, nutritional deficiency diseases have all shown variations in their distribution in India



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **Rural-urban variations**
- ◆ Chronic bronchitis, accidents, lung cancer, cardiovascular diseases, mental illness and drug dependence are usually more frequent in **urban** than in rural areas . On the other hand, skin and zoonotic diseases and soil-transmitted helminthes may be more frequent in **rural** areas than in urban areas.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **Person distribution**
- ◆ Some of the host factors are
 - ◆ Age
 - ◆ Sex
 - ◆ Ethnicity
 - ◆ Marital status
 - ◆ Occupation
 - ◆ Social class, Behaviour
 - ◆ Stress & Migration.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **(a) Age-**

- ◆ e.g. measles in childhood,
- ◆ cancer in middle age
- ◆ and atherosclerosis in old age

- ◆ **Bimodality :**

Sometimes there may be two separate peaks instead of one in the **age incidence** curve of a disease as in the case of Hodgkin's disease, leukaemia, and female breast cancer.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **(b) Sex-** It has been found that certain chronic diseases such as diabetes, hyperthyroidism and obesity are strikingly more common in women than in men,
- ◆ and diseases such as lung cancer and coronary heart disease are less frequent in women



DESCRIPTIVE EPIDEMIOLOGY

- ◆ *(c) Ethnicity –*
- ◆ Coronary heart disease, cancer, and sickle cell anaemia.
- ◆ They are related to genetic or environmental factors,



DESCRIPTIVE EPIDEMIOLOGY

- ◆ (d) *Marital status*
- ◆ It was found that **mortality rates were always lower for married males and females** than for the unmarried
- ◆ Reason may be that those who are healthy are more likely to get married, so risk of dying is also less.
- ◆ Married persons are also more secure and protected and lead a more stable life than unmarried.■



DESCRIPTIVE EPIDEMIOLOGY

- ◆ *(e) Occupation*
- ◆ *Altered habits and exposure during occupation plays vital role*
- ◆ sleep, alcohol, smoking, drug addiction, night shifts
- ◆ e.g. Workers in coal mines – Silicosis
Sedentary workers – CHD



DESCRIPTIVE EPIDEMIOLOGY

- ◆ (f) *Social class*
- ◆ Certain diseases (e.g., coronary heart disease, hypertension, diabetes) have shown a higher prevalence in upper classes than in the lower classes.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ *(g) Behaviour*
- ◆ Behavioural patterns like smoking, sedentary life style, over-eating and drug abuse are risk factors I in modern day diseases like CHD, cancer, obesity, accidents etc.
- ◆ Mass movement of people e.g. Pilgrimages can lead to transmission of infectious diseases like cholera & diarrhoeas, Insect-borne and STD.

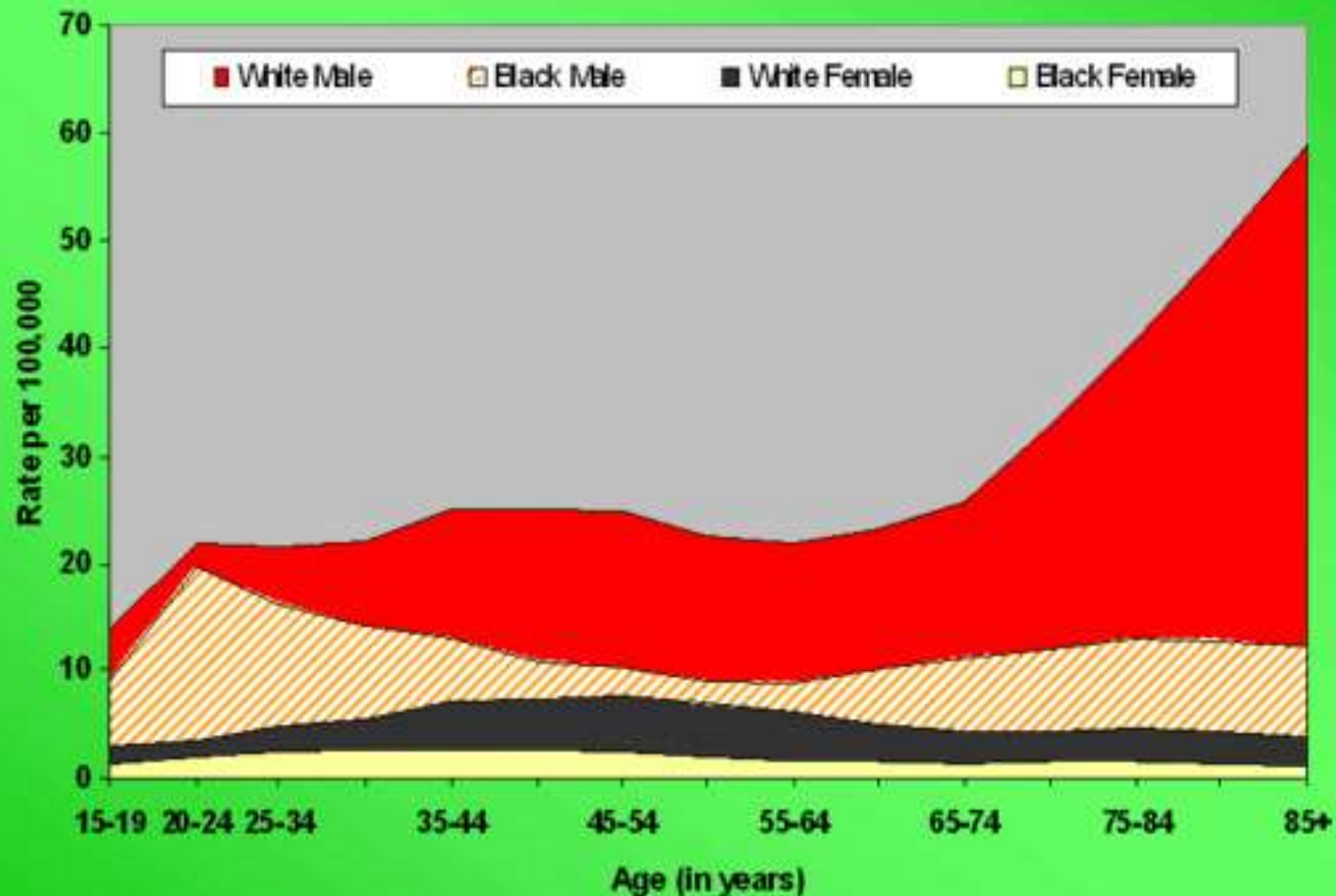


DESCRIPTIVE EPIDEMIOLOGY

◆ (h) Stress

- Increases susceptibility to disease, exacerbation of symptoms,
- e.g. Stress-related hyperacidity, anxiety, hypertension

United States Suicide Rates by Age, Sex, and Racial Group, 1999-2001





DESCRIPTIVE EPIDEMIOLOGY

- ◆ **4 Measurement of disease**
- ◆ We need to have a clear picture of the amount of disease in the population (disease load) in terms of mortality, morbidity, disability etc.
- ◆ Mortality data can be directly obtained while morbidity data can be obtained as incidence and prevalence. Incidence can be obtained from longitudinal studies and prevalence can be obtained from cross-sectional studies



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **5 Comparing with known indices**
- ◆ By making comparisons between different populations and sub-groups of the same population, it is possible to arrive at clues related to disease etiology.
- ◆ Can also identify or define groups which are at increased risk for certain diseases.



DESCRIPTIVE EPIDEMIOLOGY

- ◆ **6 Formulation of a hypothesis**

- ◆ A hypothesis is a supposition, arrived at from observation or reflection. It can be accepted or rejected, using analytical epidemiology.
- ◆ Hypothesis should specify the following :
 - a) The **population**- the characteristics of the persons to whom the hypothesis applies
 - b) The **specific cause** being considered
 - c) The expected outcome- **the disease**
 - d) The **dose-response relationship**- the amount of the cause needed to lead to a stated effect
 - e) The **time-response relationship**- time period elapsing between exposure to the cause and observation of effect.
 - f) Eg of cigarette smoking



Uses of Descriptive Epidemiology

- ◆ Provide data regarding **magnitude of disease** load and types of disease problems in the community .
- ◆ Provided clue to **disease etiology** and helps to formulate an **etiologial hypothesis**
- ◆ Provide **background data** for planning, organizing and evaluating preventive and curative services.
- ◆ Contribute to **research** by describing variations in disease occurrence by time, place & person.



Examples of early leads from descriptive studies

- ◆ Clinical observation Underlying association
Hepatocellular adenoma in young Exposure to high-dose women oral contraceptives.
- ◆ Blindness in newborn infants High ambient oxygen concentrations in incubators.
- ◆ Kaposi's sarcoma in young men Infection with HIV-1
- ◆ Angiosarcoma of the liver in Industrial exposure to employees vinyl chloride
- ◆ Cataracts, heart defects, Maternal infection with and deafness in newborns rubella during pregnancy



TYPES OF DESCRIPTIVE STUDIES

◆ **Case report**

- ◆ The case report is the least publishable unit in the medical literature. Often, an observant clinician reports an unusual disease or association, which prompts further investigations with more rigorous study designs
- ◆ A clinician, among others, reported benign hepatocellular adenomas, a rare tumour, in women who had taken oral contraceptives.



- ◆ **Case-series report**
- ◆ A case-series aggregates individual cases in one report Sometimes, the appearance of several similar cases in a short period
- ◆ For example, a cluster of homosexual men in Los Angeles with a similar clinical syndrome alerted the medical community to the AIDS epidemic in North America.