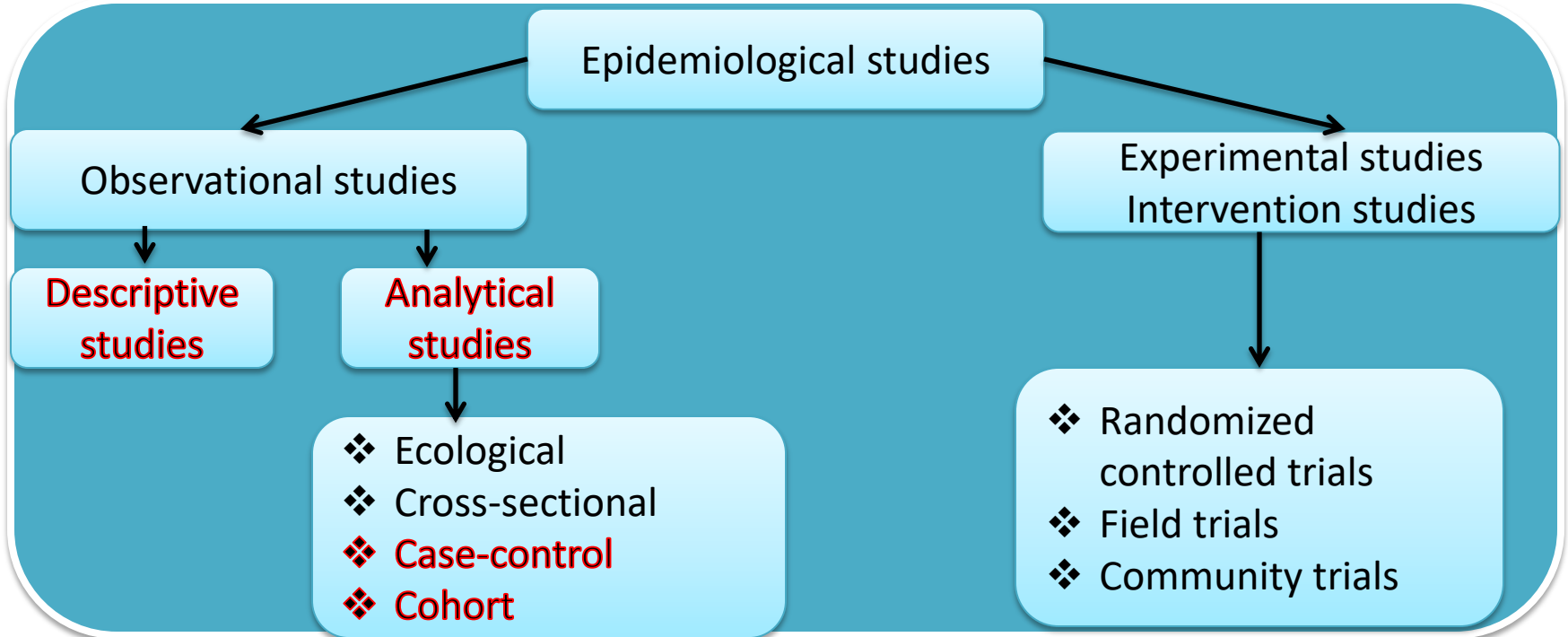


# EPIDEMIOLOGIC METHODS



# DESCRIPTIVE STUDY

**First phase** of epidemiological investigation

These studies are concerned with **observing the distribution of disease or health related characteristic in human population.**

**Identifying characteristics** with which the disease in question seems to be associated

# DESCRIPTIVE STUDY

## Steps involved in Descriptive study

1. Defining population to be studied

2. Defining the disease under study

3. Describing the disease wrt Time,  
Place and Person

4. Measurement of disease

5. Comparing with known indices

6. Formulation of an aetiological  
hypothesis



# DESCRIPTIVE STUDY

Defining population to be studied

Descriptive study is the study of the population and not the individual

# DESCRIPTIVE STUDY

Number



# DESCRIPTIVE STUDY

Age



Sex



# DESCRIPTIVE STUDY

Cultural  
characters



# DESCRIPTIVE STUDY

Occupation





# DESCRIPTIVE STUDY

Defined population can be a **whole population** from the geographical area or **representative sample** taken from

Defined population **should not be large** enough so that age sex and other specific rates are meaningful

Community chosen should be **stable** without migration in and out of the area

# DESCRIPTIVE STUDY

The concept of defined population is crucial in epidemiological studies.

Provides denominator



for calculating rates



measure frequency of disease



study its **distribution** and **determinants**

# DESCRIPTIVE STUDY

Defining Disease to be studied

Clinicians and Epidemiologists

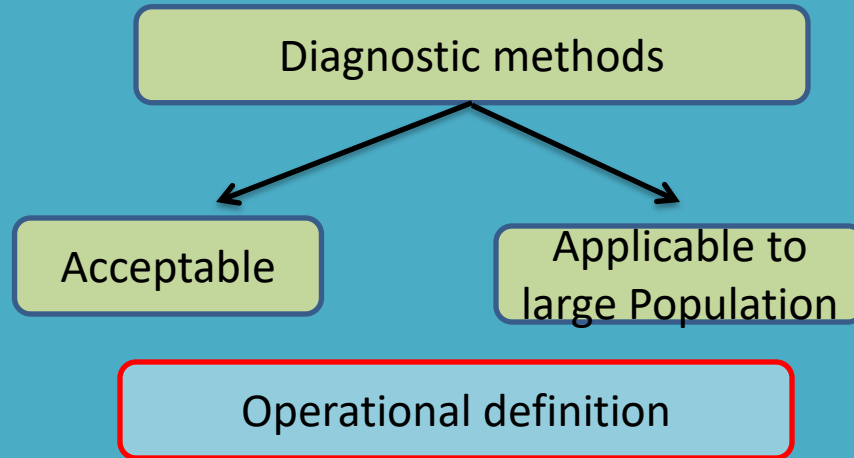
Treat the patients (individually)

Accurate estimate of disease in population

Defines disease that is precise and valid

To identify those who have disease and those who do not have

# DESCRIPTIVE STUDY



Method by which the disease or condition can be identified and measured in the defined population with a degree of accuracy

# DESCRIPTIVE STUDY

Defining Disease to be studied  
Example

Clinical definition of Tonsilitis

Inflammation of Tonsils caused by infection usually *Strptococcus pyogenes*

This definition cannot be used to measure the disease in the community

Operational definition of Tonsilitis

- ❖ Presence of enlarged red tonsils
  - ❖ With white exudate
- ❖ On throat swab culture predominantly grows *Strptococcus pyogenes*

# DESCRIPTIVE STUDY

Neurological diseases

Often do not have pathognomonic signs and symptoms

Epidemiologist may frame his own definition keeping the objectives of the study in view and aiming at degree of accuracy

If the definition is **invalid** it will be a **powerful source of error** in presentation and comparability of measurements from different sources

# DESCRIPTIVE STUDY

## Steps involved in Descriptive study

1. Defining population to be studied

2. Defining the disease under study

3. Describing the disease wrt Time,  
Place and Person

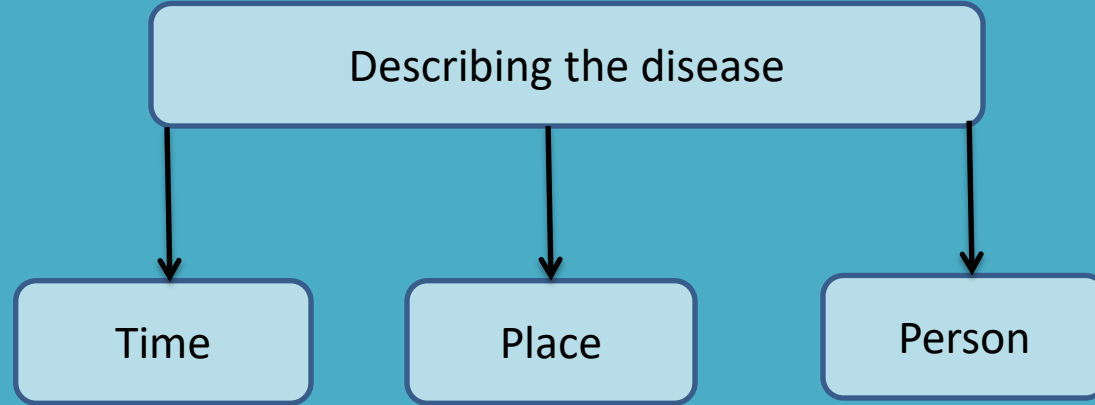
4. Measurement of disease

5. Comparing with known indices

6. Formulation of an aetiological  
hypothesis



# DESCRIPTIVE STUDY





# DESCRIPTIVE STUDY

Describing the disease with respect to time

Yield important clues about the source or aetiology of the disease, thereby suggesting potential preventive measures

Time trends or Fluctuations in Disease occurrence

Short term  
fluctuation

Periodic  
fluctuation

Long term/  
Secular trends

# DESCRIPTIVE STUDY

Short Term Fluctuation

Epidemic

Occurrence in the community or region of cases of illness or other health related events clearly in **excess of normal expectancy**

# DESCRIPTIVE STUDY

Types of Epidemics

```
graph TD; A[Types of Epidemics] --> B[Common Source Epidemics]; A --> C[Propagated Epidemics]; B --> D[Single exposure]; B --> E[Continuous exposure];
```

Common Source  
Epidemics

Propagated Epidemics

Single  
exposure

Continuous  
exposure

# DESCRIPTIVE STUDY

## Common Source Epidemics

Frequently but not always occurs due to exposure of infectious agents

Contamination of Environment

Air, water, food, soil

Industrial pollutants /chemicals

Bhopal gas tragedy  
Minamata disease

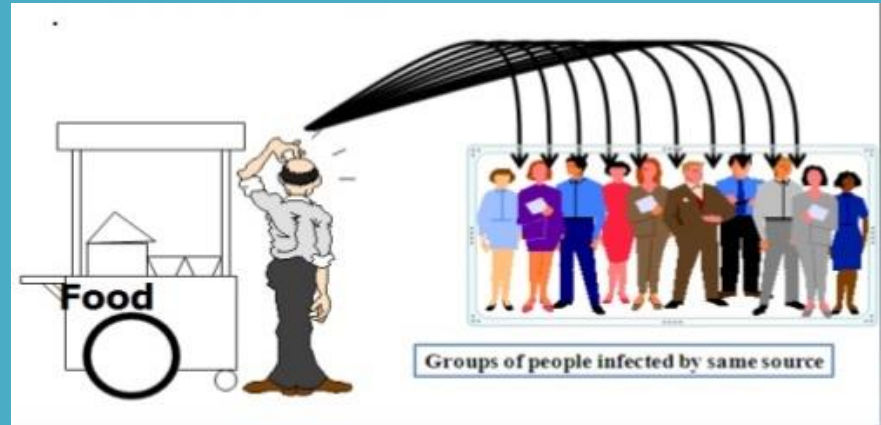
# DESCRIPTIVE STUDY

Single exposure Epidemics

Point source epidemics

Exposure of disease agent is brief and simultaneous, the resultant cases all develop within one incubation period

# DESCRIPTIVE STUDY



Point source epidemics

Continuous source epidemics

# DESCRIPTIVE STUDY

Continuous Exposure Epidemic

Multiple Exposure Epidemic

Exposure from same source but prolonged, continuous, repeated or intermittent  
not necessarily at the same time or place

Resultant epidemic tend to be more extended and irregular

# DESCRIPTIVE STUDY



**'Typhoid Mary'  
Dead at 70; Gave  
Fever to Many**



# DESCRIPTIVE STUDY

Propagated epidemics

Infectious origin

Person to person transmission

Epidemic shows gradual rise and tails off over a much longer period of time

Transmission continues until the number of susceptibles are depleted  
Or susceptible individuals are no longer exposed to infected persons

# DESCRIPTIVE STUDY

## Propagated epidemics

The speed of spread depends upon the herd immunity, opportunities for contact and secondary attack rate.

Propagated epidemics are more likely to occur where large number of susceptible are aggregated or where there is regular supply of new susceptible individuals

# DESCRIPTIVE STUDY

## Periodic fluctuations

```
graph TD; A[Periodic fluctuations] --> B[Seasonal trend]; A --> C[Cyclic trend];
```

### Seasonal trend

- ❖ Environmental condition:  
Temperature, Humidity, Rainfall  
Overcrowding, Life cycle of vector
- ❖ Infectious diseases
- ❖ Non-infectious diseases

### Cyclic trend

- ❖ Some diseases occur in cycles spread over short period of time— days, weeks, months or years  
Measles---2-3 years  
Rubella—6-9 years
- ❖ Naturally occurring variations in herd immunity
- ❖ Non infectious diseases

# DESCRIPTIVE STUDY

## Long-term or Secular trends

Changes in the occurrence of the disease (progressive increase or decrease) over a long period of time, generally several years or decades.

### Example:

- ❖ Coronary heart disease, Lung cancer and Diabetes consistent upward trend in last 50 years.
- ❖ Tuberculosis, Typhoid, Diphtheria, Polio ---- decline

# DESCRIPTIVE STUDY

## Interpretation of Time trends

By surveillance or monitoring of time trends the epidemiologists finds out:

- ✓ Which diseases are increasing?
- ✓ Which diseases are decreasing?
- ✓ Which are the emerging health problems?
- ✓ Tries to formulate aetiological hypotheses

# DESCRIPTIVE STUDY

Place Distribution  
(Geographical comparisons)

International  
variations

National variations

Rural urban  
differences

Local distribution

# DESCRIPTIVE STUDY

## Person Distribution

Age

Social  
class

Sex

Behaviour

Ethnicity

Stress

Marital  
status

Migration

Occupation

# DESCRIPTIVE STUDY

Age

Strongly related to disease

Childhood  
Measels, Chicken  
pox

Middle age  
Cancer

Old age  
Atherosclerosis  
Arthritis

- ❖ Attack rate of communicable diseases are same in all age groups
  - ❖ All age groups are equally susceptible
  - ❖ No previous immunity



# DESCRIPTIVE STUDY

Sex

Sex Ratio

Sex specific morbidity

Mortality rates

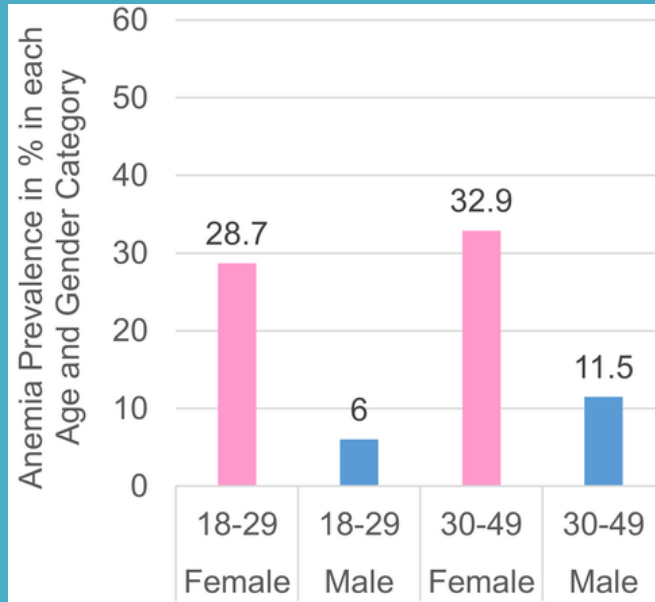
Variations in disease frequency between sexes  
have been attributed to:

Basic biological differences  
between sexes

Cultural and Behavioural  
differences

# DESCRIPTIVE STUDY

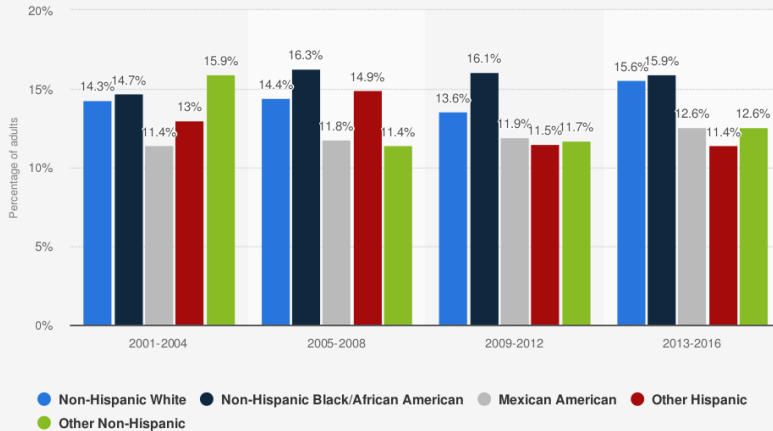
## Person Distribution



# DESCRIPTIVE STUDY

## Person Distribution

Percentage of adults in the U.S. who had chronic kidney disease from 2001 to 2016, by ethnicity

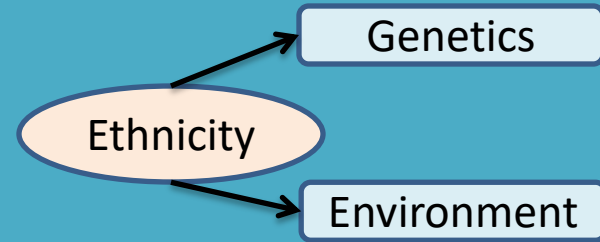


### Sources

CDC (National Health and Nutrition Examination Survey); USRDS  
© Statista 2020

### Additional Information:

United States; CDC (National Health and Nutrition Examination Survey); base: 5,000; 20 years and older



# DESCRIPTIVE STUDY

Person Distribution

Marital  
status

Mortality rates are lower for married males and females in comparison to unmarried males and females of same age group

Selective process

Secured and protected

Marriage can be a risk factor in some diseases– cervical cancer

# DESCRIPTIVE STUDY

Person Distribution

Occupation

Alters the habit of the employees

Sleep

Smoking

Alcoholism

Drug abuse

Work environment and exposure

# DESCRIPTIVE STUDY

Person Distribution

Social class

Upper class

Lower class

Life expectancy

Nutritional status

Better health facility

# DESCRIPTIVE STUDY

## Behaviour

50%-70%  
sit at least 6 hours a day

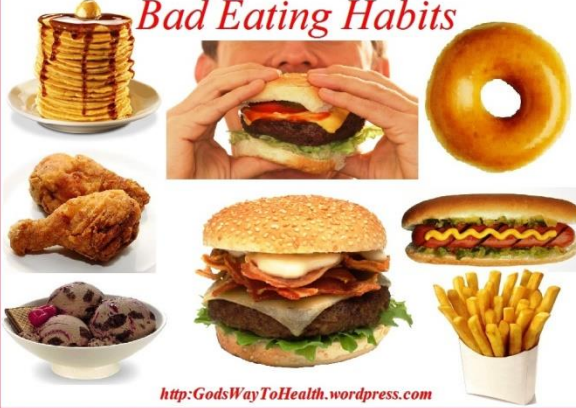


Mayo Clinic

20%-35%  
spend more than 4 hours  
watching TV



### Bad Eating Habits



PHYSICAL  
ACTIVITY

HIGH  
level



AVERAGE  
level



LOW  
level



# DESCRIPTIVE STUDY

Person Distribution

Migration

Short term &  
Long term

Age, Occupation,  
Education

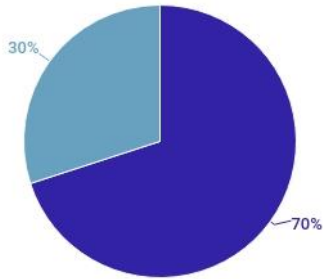
Internal &  
External

Rural & Urban



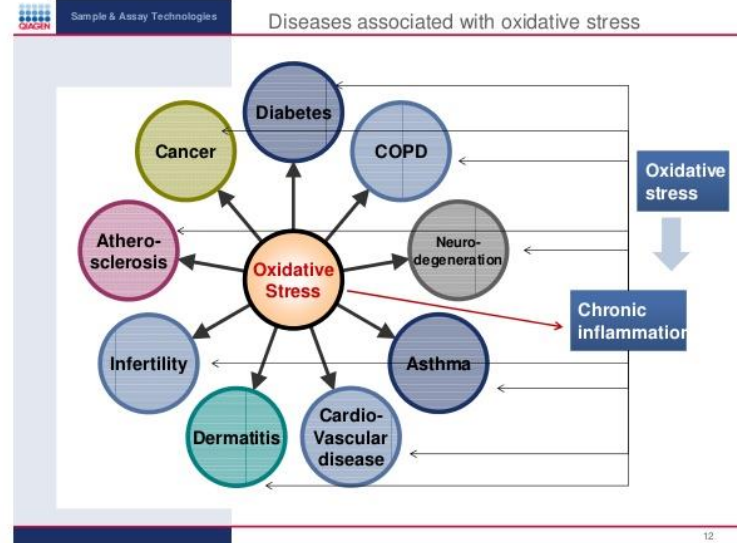
# DESCRIPTIVE STUDY

## Stress



70% OF ALL DISEASE IS  
RELATED TO STRESS

- World Health Organisation



# DESCRIPTIVE STUDY



# DESCRIPTIVE STUDY

Cross sectional studies

Prevalence study

Single examination of a cross section of population

At one point

Results of which can be projected on the whole population



# DESCRIPTIVE STUDY

## Longitudinal studies

Observations are repeated in the same population over a prolonged period of time by means of follow up examinations

Longitudinal studies are useful:

- ❖ To study the natural history of the disease and its further outcome
  - ❖ Identifying risk factors of disease
- ❖ For finding out incidence rate or rate of occurrence of new cases of disease in the community

Difficult to organise and More time consuming

# DESCRIPTIVE STUDY

Comparing with known indices

```
graph TD; A[Comparing with known indices] --> B[Between different populations]; A --> C[Subgroups of the same population]; B --- D[It is possible to arrive at clues to disease aetiology]; C --- D;
```

Between different populations

Subgroups of the same population

It is possible to arrive at clues to disease aetiology

# DESCRIPTIVE STUDY

Formulation of hypothesis

Hypothesis is a supposition arrived at from observation

An epidemiological hypothesis should specify:

Population

Specific cause  
being considered

Expected  
outcome

Dose  
response  
relationship

Time  
response  
relationship

# DESCRIPTIVE STUDY

Formulation of hypothesis

Example: Cigarette smoking causes lung cancer



Example: Smoking 30-40 cigarettes per day causes lung cancer in 10 percent of smokers after 20 years of exposure



# DESCRIPTIVE STUDY

## Uses of descriptive epidemiology

Magnitude of  
disease load

Types of disease problems  
in the community

Clues to disease  
aetiology

Formulation of an  
aetiological 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 and person