

# OBSERVATIONAL STUDIES

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## INTRODUCT ION

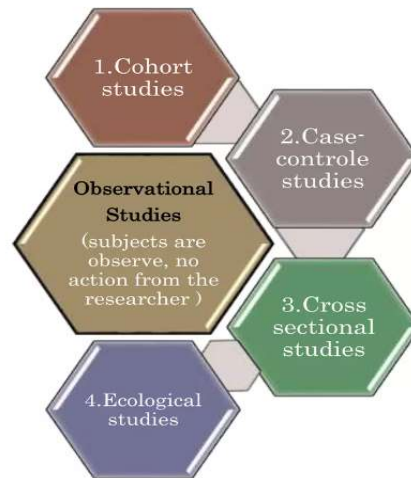
- **Definition:** The population is observed without any interference by the investigator.
- A type of study in which individuals are observed or certain outcomes are measured. No attempt is made to affect the outcome (for example, no treatment is given).



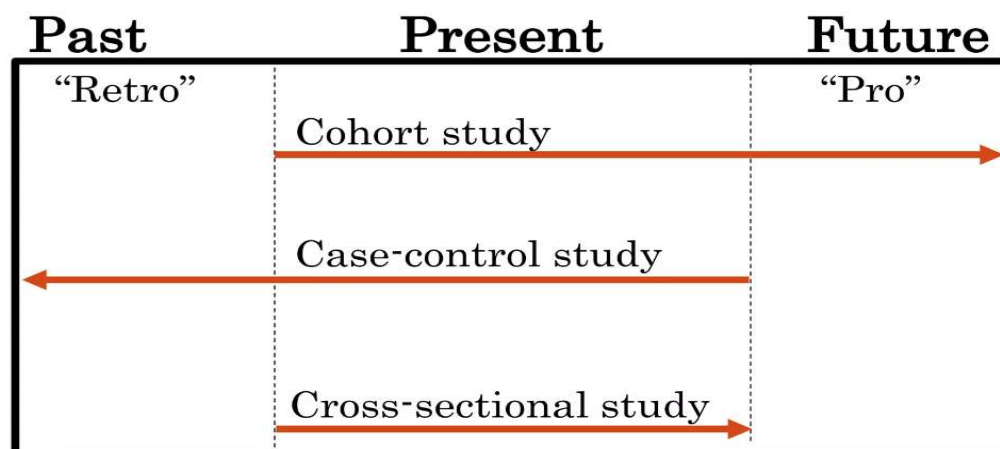
## WHY OBSERVATIO NAL STUDIES


- Cheaper
- Can examine long term effect
- Hypothesis generation
- Sometime, experimental study are not ethical

# TYPES OF OBSERVATIONAL STUDIES



## Types of observational studies





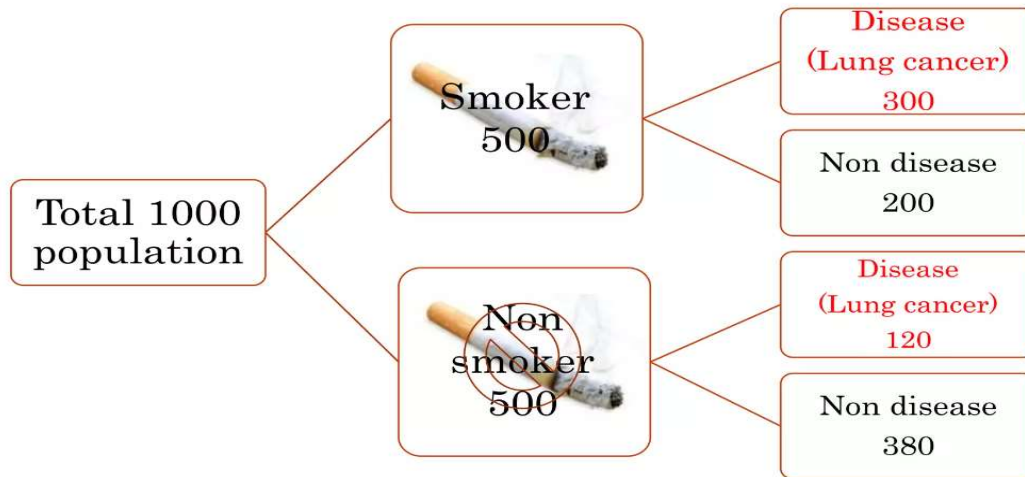
## 1. COHORT STUDIES

- A cohort study is an observational study in which participants are selected and followed forward in time, to see how likely disease is to develop within the group.
- Other name of cohort study are longitudinal study, incidence study and forward-looking study.

## STEPS OF COHORT STUDY

- 1 • Selection of study population
- 2 • Obtaining data on exposure
- 3 • Selection of comparison grp
- 4 • Follow up
- 5 • Analysis

## EXAMPLE



## CALCULATION

Risk factor	Disease		
	Present	Absent	Total
Present (smoker)	300(a)	200(b)	500 (a+b)
Absent (nonsmoker)	120(c)	380(d)	500 (c+d)

$$\text{Incident rate among smoker} = \frac{a}{a+b} \quad x = \frac{a(300)}{a+b(500)} * 100 = 60\%$$

$$\text{Incident rate among nonsmoker} = \frac{c}{c+d} \quad x = \frac{c(120)}{c+d(500)} * 100 = 24\%$$

# CALCULATION

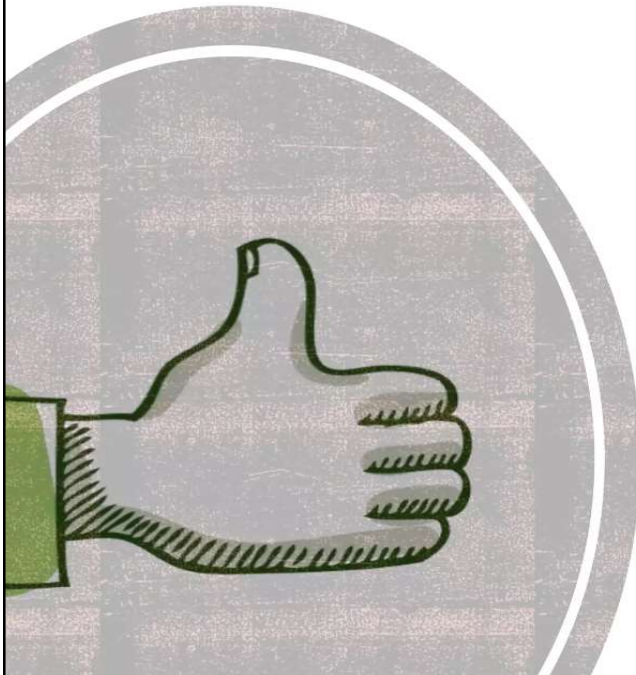
$$\begin{aligned} \text{Relative risk or Risk ratio} &= \frac{\text{Incident rate among smoker}}{\text{Incident rate among nonsmoker}} \\ &= \frac{60}{24} = 2.5 \end{aligned}$$

*Means smoker having 2.5 times more chances of developing lungs carcinoma than nonsmoker.*

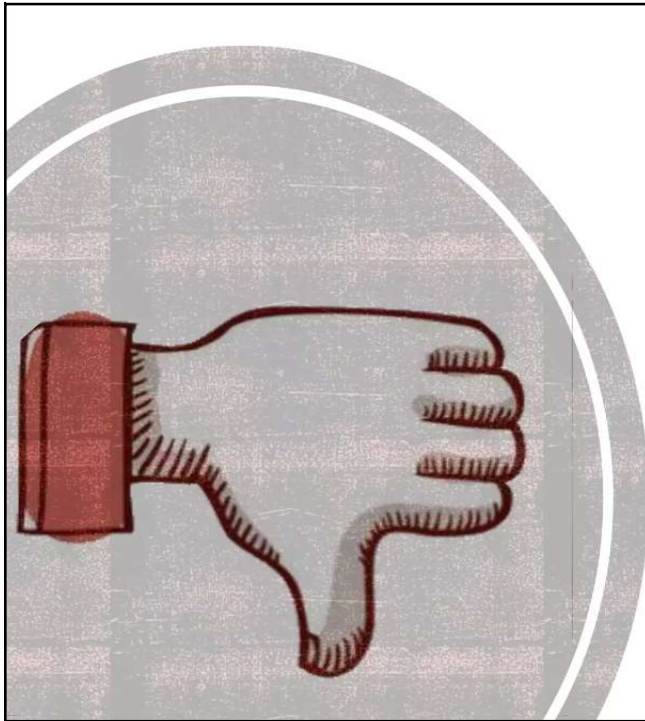


## ADVANTAGES

- Incidence rate, relative risk, attributable risk can be calculated.
- Provide direct estimate of risk.
- Multifactor can be studied simultaneously.
- Minimizes recall bias.







## DISADVANTAGES

- Large population is needed.
- Not suitable for rare disease.
- It is time consuming
- Expensive.
- Certain administrative problem like loss of staff, loss of funding.
- Ethical problem.

## 2. CASE CONTROL STUDY

- A case control study is defined as a research that starts by picking up cases who have already developed a particular disease and who have not developed the disease but are similar to the group.
- The study proceeds backward from effect to cause.



## 2. CASE CONTROL STUDY

- A case control study involves two population case and control.
- **Case:** A person in the population or study group identified having the particular disease, health disorder or condition under investigator.
- **Control:** It use a control or comparison group to support inference.
- Control must be ideally matching with the cases by age, sex and other characteristics except the control must not be suffering from disease.

## ELEMENT OF A CASE CONTROL STUDY

- 1. Selection of case
- 2. Selection of controls
- 3. Information on exposure
- 4. Analysis



## ELEMENT OF A CASE CONTROL STUDY

### 1. Selection of cases

- Preferably new cases or incidence case.
- Random selection, Convenient selection.

### 2. Selection of control

- Control must be ideally matching with the cases by age, sex and other characteristics except the control must not be suffering from disease.
- Hospital control, Random selection, Friend and relative.
- Control from general population.

## ELEMENT OF A CASE CONTROL STUDY

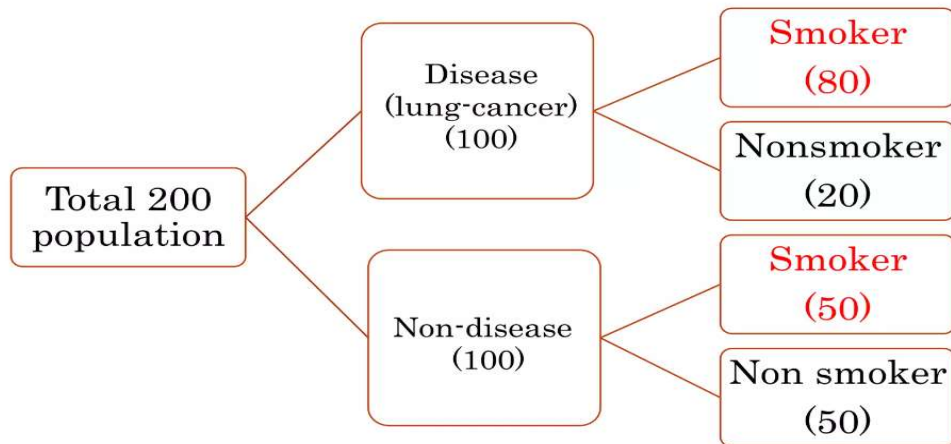
### 3. Information on exposure

- Observation
- Interviews
- Examination of records

### 4. Analysis

- Exposure rates among the disease(case)
- Exposure rates among the non disease
- Odds ratio

## EXAMPLE



## CALCULATION

Disease condition	smoking		
	Present	Absent	Total
Present Lung cancer	80(a)	20(b)	100 (a+b)
Absent Non cancer	50(c)	50(d)	100 (c+d)

$$\text{Exposure ratio among disease (case)} = \frac{a}{a+b} \quad x = \frac{a(80)}{a+b(100)} * 100 = 80\%$$

$$\text{Exposure ratio among non disease (control)} = \frac{c}{c+d} \quad x = \frac{a(50)}{a+b(50)} * 100 = 50\%$$

## CALCULATION

Disease condition	smoking		
	Present	Absent	Total
Present Lung cancer	80(a)	20(b)	100 (a+b)
Absent Non cancer	50(c)	50(d)	100 (c+d)

$$\text{Odds ratio} = \frac{ad}{bc} = \frac{80 * 50}{20 * 50} * 100 = 4\%$$

**Interpretation** those who are smoking having 4 times higher chances of developing lung cancer than non smoker.

## ADVANTAGES

- Minimal ethical problem
- Efficient for the study of chronic disease
- Less expensive than alternative designs
- Multiple risk factor can be examine
- Easy to carry out
- Rapid and inexpensive
- Rare disease investigation
- No risk to subjects



## DISADVANTAGES

- Selection of an appropriate comparison group may be difficult.
- Control selection is difficult.
- Susceptible to recall bias.



## APPLICATION

- Evaluating vaccine effectiveness
- Evaluation of treatment and program
- Evaluation of screening
- Outbreak investigation
- Occupation health research

## 3.CROSS SECTIONAL STUDY

- **Introduction:**
- In cross sectional study both exposure and disease outcome are determine simultaneously for each subject.
- Cross sectional study is a study in which all the measurement are taken particular point in time.
- We identify prevalent cases of disease.
- When study only measure health outcome it is known as descriptive cross sectional study.

## INTRODUCTION

- When a study measure both exposure and health outcome at same time it is known as analytical cross sectional study.
- Snapshot studies
- Observational at a single hypothetical point in time.



# WHERE CAN WE DO CROSS SECTIONAL STUDY



Worksite



Community

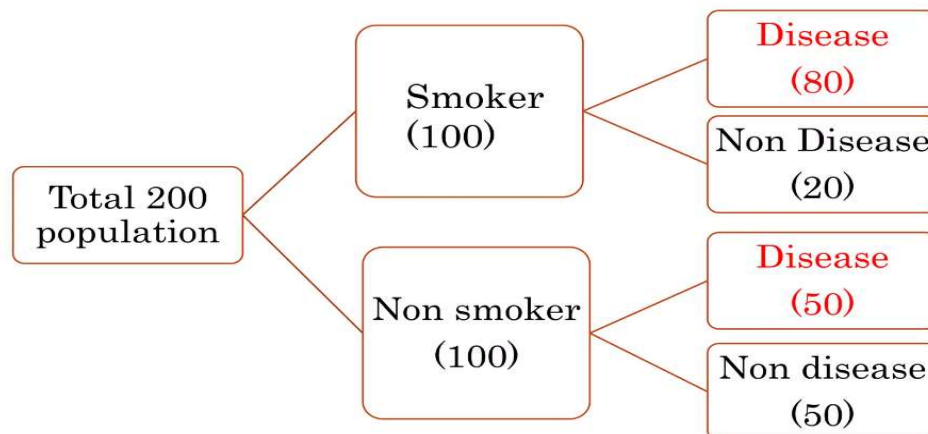


School



Hospital

## EXAMPLE



## EXAMPLE

$$\text{Prevalence rate} = \frac{\text{Number of prevailing cases of disease (old and new) existing at given point of time}}{\text{Estimated population at the same point of time (multiloading factor can be chosen as appropriate)}} * 1000$$

## EXAMPLE

Disease condition	smoking		
	Present	Absent	Total
Present Lung cancer	80(a)	20(b)	100 (a+b)
Absent Non cancer	50(c)	50(d)	100 (c+d)

$$\text{Prevalence in expose} = \frac{80}{100} = 0.8$$

$$\text{Prevalence in non expose} = \frac{50}{100} = 0.5$$

$$\text{Prevalence ratio} = \frac{0.8}{0.5} = 1.6$$

## ADVANTAGES

- Useful in hypothesis formation
- Easy to obtain prevalence (outcome and exposure )
- Provide estimate of disease burden
- Relative short duration
- Easy and quick
- Less costly



## DISADVANTAGES

- With no comparison group, no formal assessment of relationship between exposure and outcome
- Not suitable for rare disease
- Recall bias

