



# Epidemiological and Research Studies

## Part 2

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It begins with group of people **free of disease** and **classified into subgroups**  
**a group** of **individuals exposed to a risk factor**  
**a group** who are **unexposed to the risk factor**  
**are followed over time** (often years)



# Cohort Study

Issues in the design of cohort studies understand the differences from a CCS,

- \*Analysis of cohort studies

- \*calculate the basic measures (RR,AR

- \*appreciate its strengths and weaknesses.



# Cohort Study

Analytical studies

Cross-sectional

Case-control

Cohort



Also called : **follow up study or incidence studies**,

## Definition:

Study in which persons,

- based on **their exposure** to a determinant
- and **free of the disease** outcome at the start of the study
- **are followed in time** to assess the **occurrence of the disease outcome**

➤ It begins with a **group of people who are free of disease** and who are  
➤ **classified into subgroups according to exposure** to a **potential cause** of disease or outcome .

- Cases are **excluded** at the beginning
- **Variables of interest** are specified and measured and
  - the whole cohort is **followed up** to see how the subsequent development **of new cases** of the disease (or other outcome
  - differs between the groups **with** and **without exposure**.





# cohort studies

Cohort studies are a **form of longitudinal study** design that **flows from the exposure to outcome**.

## In a cohort study,

- a group of individuals **exposed to a putative risk factor** and
- a group who are **unexposed to the risk factor**
- are followed over time (often years)
- to **determine the occurrence of disease**.

□ The **incidence of disease**

✓ in the **exposed group** is **compared**

✓ **with** the **incidence** of disease in the **unexposed group**.

The **relative risk** is used

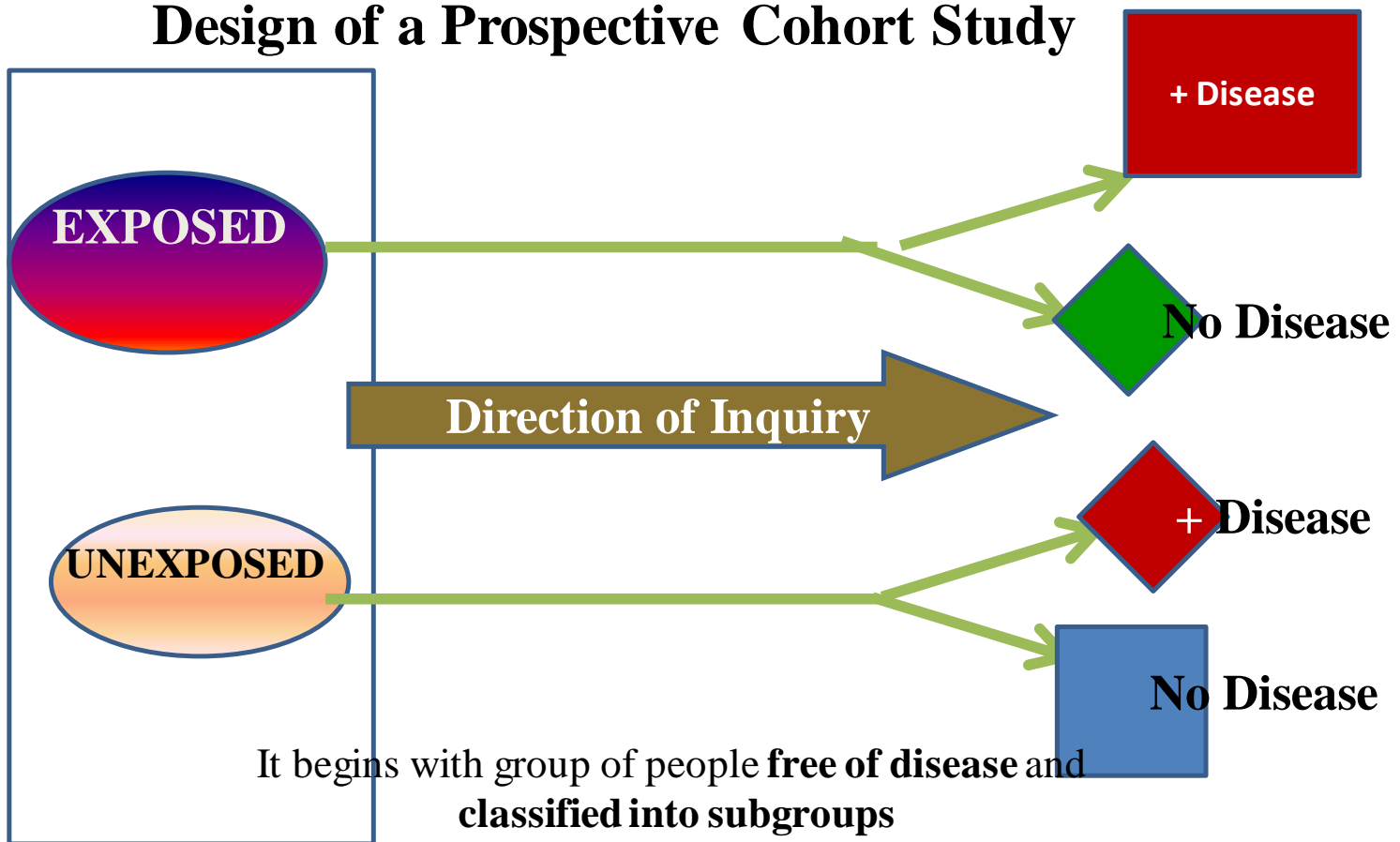
**to assess whether the exposure and disease are causally linked.**

Cohort studies be **prospective**

**A prospective cohort** study is also called a **concurrent cohort study**, where the **subjects have been followed up for a period and the outcomes of interest are recorded.**



# Design of a Prospective Cohort Study



a group of individuals **exposed to a risk factor**

a group who are **unexposed to the risk factor**

**are followed over time** (often years)



## Cont.....cohort studies

### 1. Issues in the design of cohort studies

- Selection of study groups
- Measuring exposure
- Measuring outcome
- Methods of follow-up

- Issues in the design of cohort studies
- Analysis of cohort studies
- calculate the basic measures (relative risk, attributable risk etc
- appreciate its strengths and weaknesses.



### Selection of study groups

- ❖ The aim of a cohort study is to **select study participants who are identical with the exception of their exposure status.**
- ❖ All study participants must be
  - **Free of the outcome under investigation and**
    - **have the potential to develop the outcome** under investigation.



## Measuring outcome

Outcome measures

Method used to ascertain outcome

- ✓ **must be identical for both exposed and unexposed groups.**

Issues in the design of cohort

Selection of study groups

Measuring exposure

**Measuring outcome**

**Methods of follow-up**



## Methods of follow-up

The follow-up of study participants in a cohort study

**is a major challenge.**

- A great deal of **cost and time** is required to ensure follow-up of cohort members



## Cont.....cohort studies

### Analysis of cohort studies

1 Issues in the design of cohort studies  
understand the differences from a CCS,  
2 Potential bias in cohort studies  
3 Analysis of cohort studies  
4 calculate the basic measures (relative  
risk, attributable risk etc  
5 appreciate its strengths and  
weaknesses.

Analysis of a cohort study **uses either**

- the **rate** of disease  
in the **exposed** cohort
- **compared** with the
- **rate in** the **unexposed** cohort.



Example



## Risk estimates

To estimate risk of event to occur when exposed to a risk factor.

□ Relative risk (RR)

### Relative risk

□  $RR = \frac{a/(a+b)}{c/(c+d)}$

□ Used in cohort study

□ The risk is the relative incidence in the exposed and non exposed group

$$RR = \frac{\text{proportion of disease in exposed group}}{\text{proportion of disease in unexposed group}}$$

$$RR = \frac{\text{incidence of disease in exposed group}}{\text{incidence of disease in unexposed group}}$$

**Example:** Calculation of the risk ratio from a hypothetical cohort study of smoking and cancer of the pancreas followed for 1 year



### Analysis of cohort studies

**Example:** Calculation of the Relative Risk from a hypothetical cohort study of smoking and cancer of the pancreas followed for 1 year

	Cancer of the pancreas	No disease	Total	Incidence rate
Smokers	42	27,000	27,042	1.5/1000/yr
Non-smokers	7	63,000	63,007	0.1/1000/yr
Total	49	90,000	90,049	

the data, taken from a hypothetical cohort study to investigate the relation between smoking and cancer of the pancreas, the **relative and attributable risk** can be calculated as follows:

Example



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**Relative Risk = Incidence rate of **disease** in exposed group (r1)**  
**Incidence rate **disease** in unexposed group (r0)**

$$RR = 1.5/0.1 = 15$$

**The RR of 15 indicates that**  
**the risk of cancer of the pancreas is 15 times higher**  
**among smokers than non-smokers.**

**attributable risk can be calculated ???**





## Example

To study the relation of small birth weigh and smoking during pregnancy . A sample of 460 women were chosen, consist of 150 women, delivered small birth weight babies , and 310 delivered normal weight babies . History of Smoking was detected in 100 women having low birth babies, and 60 having babies with normal birth weight. is smoking during pregnancy act as a risk factor for small birth weight babies?

A sample of 460 pregnant women were chosen, categorized into two groups, 160 smokers and 300 non smokers . Both groups were followed until labour .from the smokers, 100 babies with a low birth weigh were borne , while non smoker women, delivered 50 babies with a low birth weight

smoking during pregnancy	birth weight babies		total
	small	normal	
positive	100	60	160
Negative	50	250	300
total	150	310	460

$$\frac{100/160}{50/300} = \frac{62.5}{16.6} = 3.77$$



## Cont.....cohort studies

### 4. Strengths and weaknesses of cohort studies

#### Weaknesses

- Costly and time consuming.
- Prone to bias due to loss to follow-up.
- Prone to confounding.
- Participants may move between one exposure category
- Knowledge of exposure status may **bias classification** of the outcome.
- Being in the study may alter participant's behaviour.
- Poor choice for the study of a rare disease.
- Classification of individuals (exposure or outcome status) can be affected by changes in diagnostic procedures.

#### Strengths

- ✓ **Multiple outcomes** can be measured for any one exposure.
- ✓ **Can look at multiple exposures.**
- ✓ Exposure is measured before the onset of disease
- ✓ **Good for measuring rare exposures**, for example among different occupations.
- ✓ Demonstrate direction of causality.
- ✓ Can measure **incidence**



**Al-Karak hospital conducted a study on 7000 subjects who were smokers over a ten-year period & found 70 subjects developed lung cancer. Concurrent evaluation of general population in the catchment area of hospital, out of 7000 non-smoker subjects only 7 developed lung cancer.**



# Thank you for attention



Qs ?????