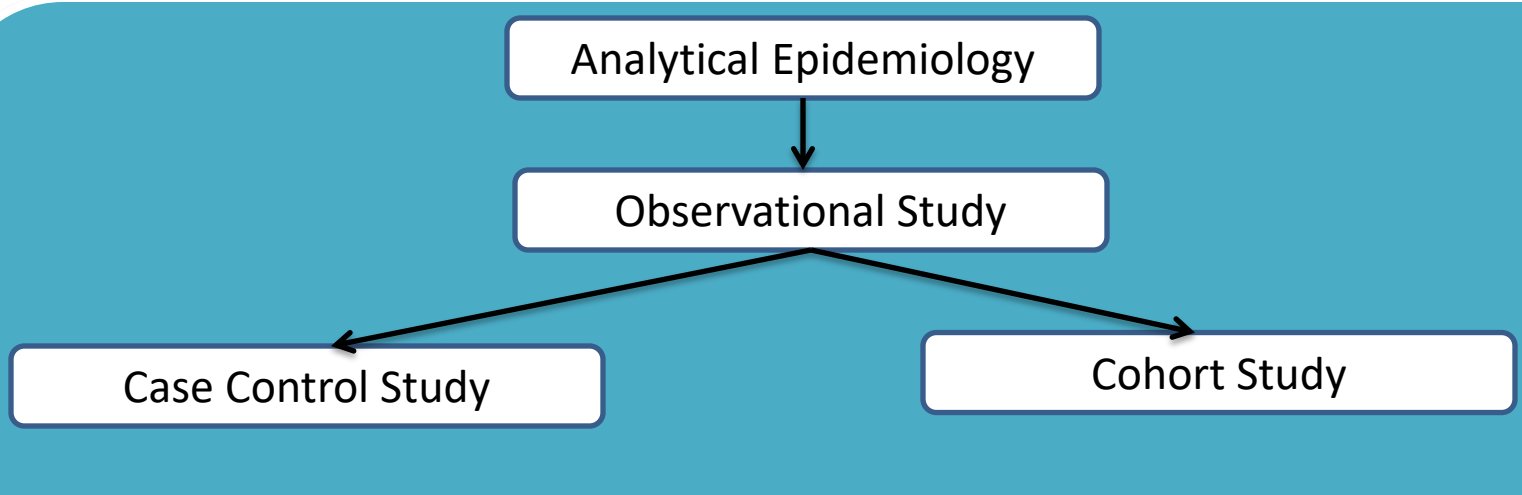
ANALYTICAL EPIDEMIOLOGY



ANALYTICAL EPIDEMIOLOGY

Case Control Study

Retrospective Study

Both exposure and outcome (disease) have occurred before the start of the study

The study proceeds backward from effect to cause

It uses control or comparison group to support or refute an inference

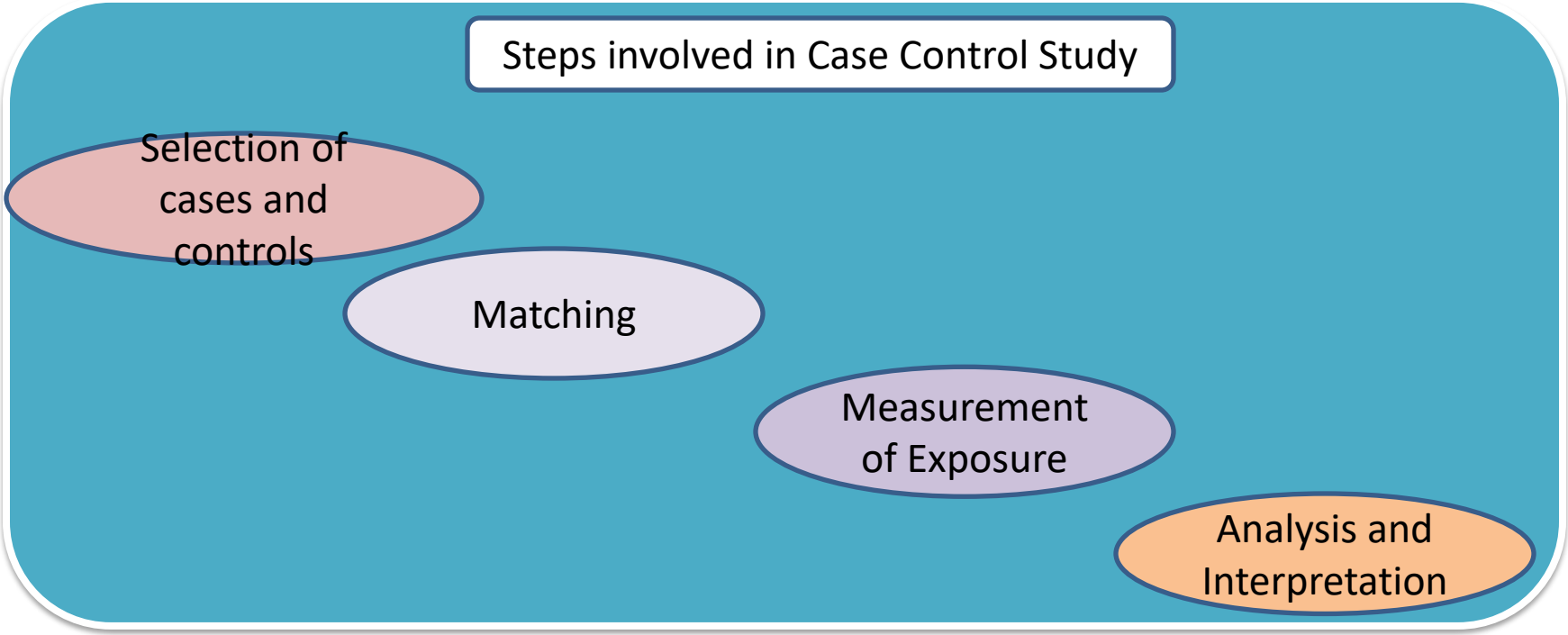
ANALYTICAL EPIDEMIOLOGY

Case Control Study

Case Control Study:

- ✓ Involves two populations- case and control
- ✓ The unit in the study is an individual rather than the group
- ✓ The focus is on disease or health related problem that has already developed

ANALYTICAL EPIDEMIOLOGY



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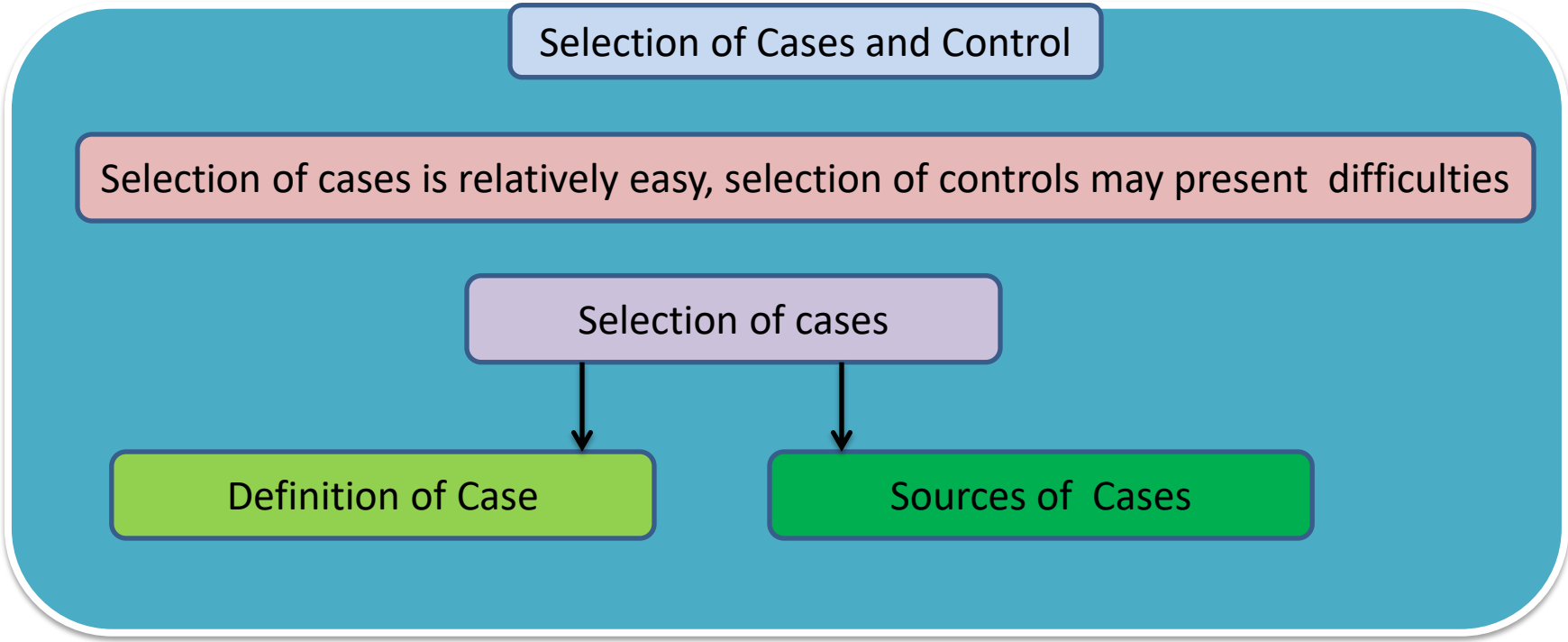

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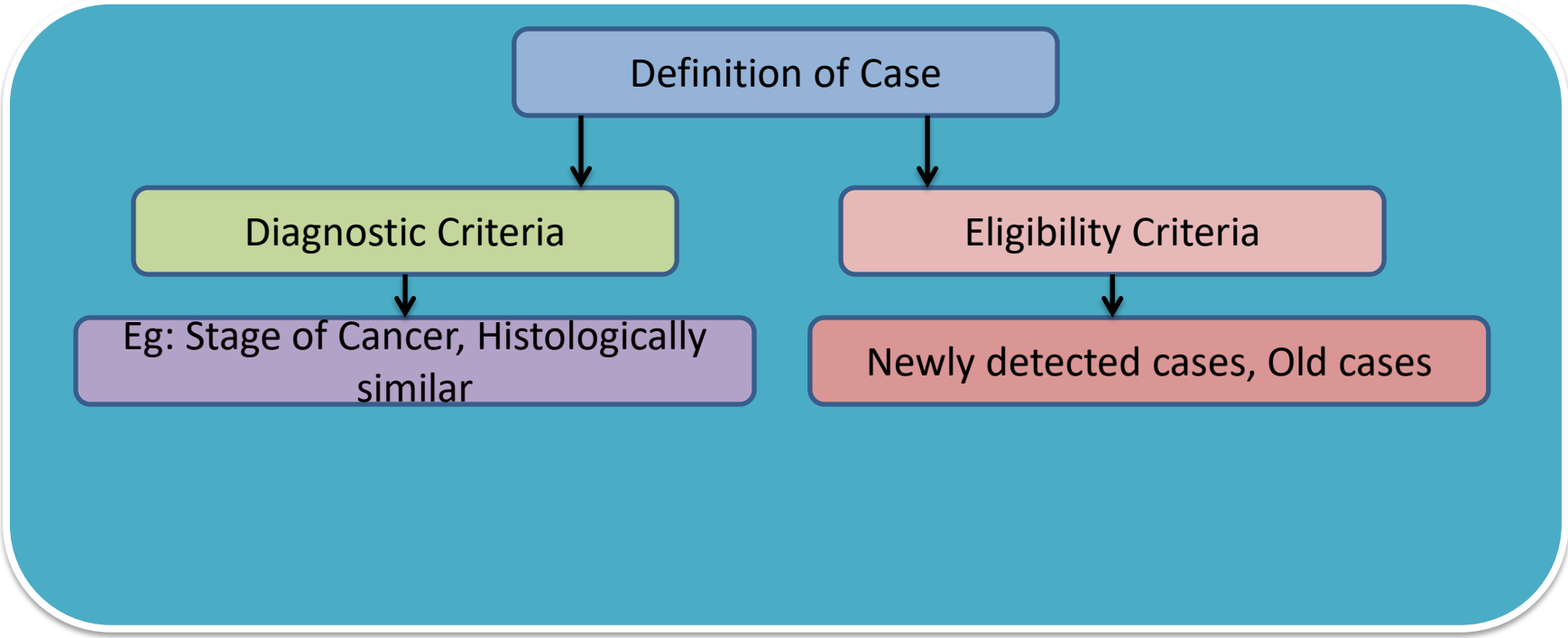

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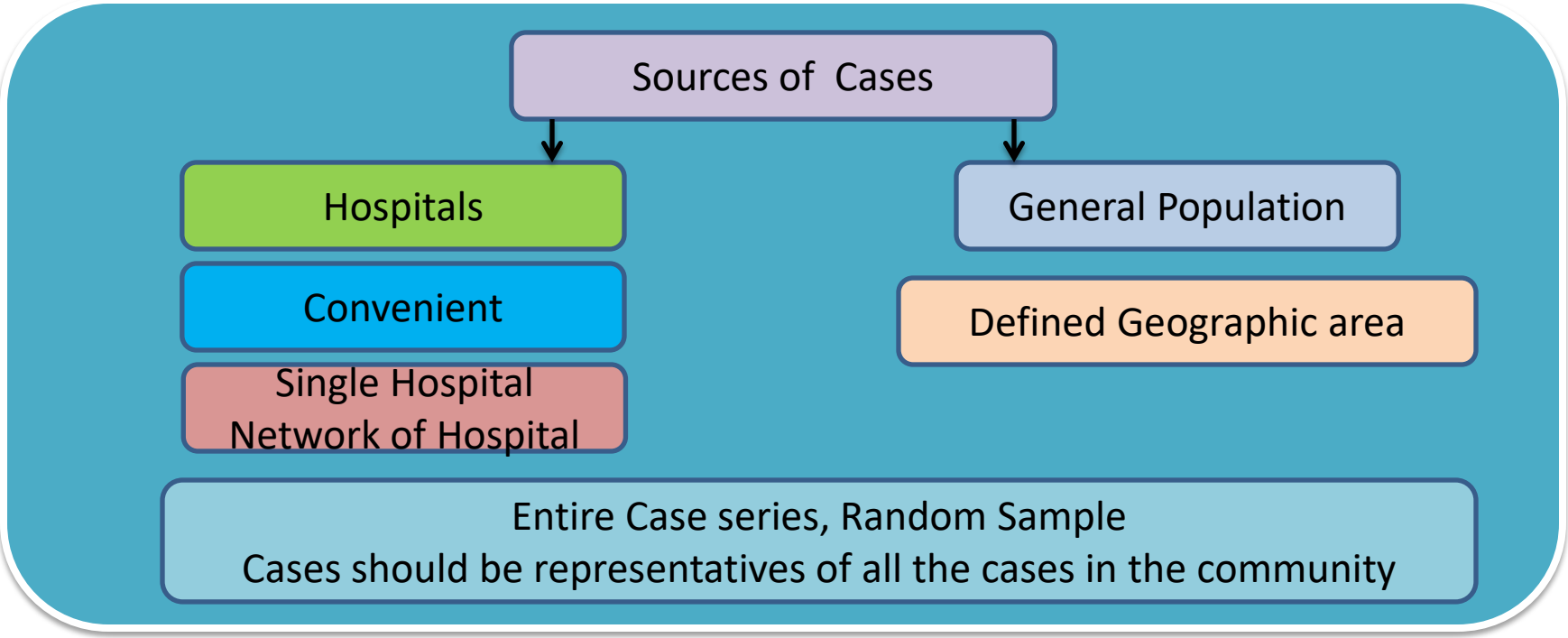
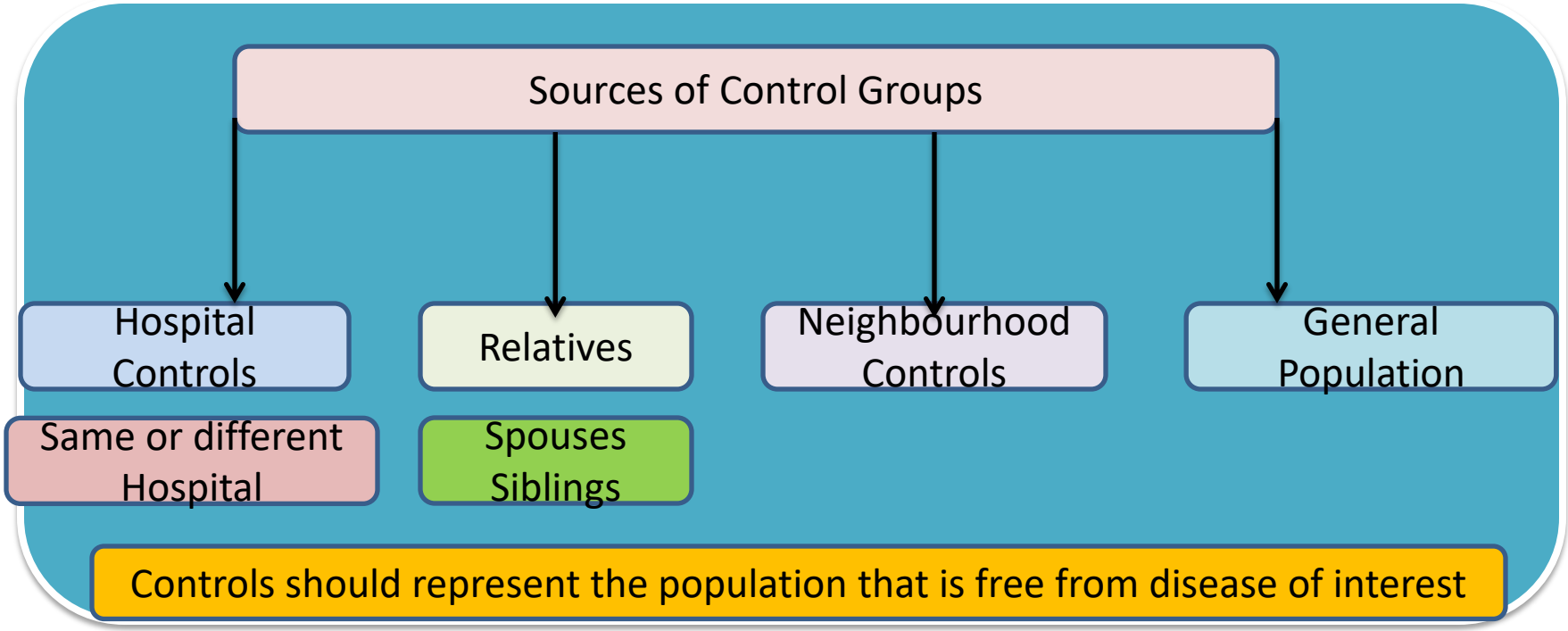


ANALYTICAL EPIDEMIOLOGY

Selection of Control

- ✓ Controls must be free from disease under study
- ✓ They must be similar to Cases in all aspects, expect for the absence of disease under study
- ✓ Difficulties may arise in the selection of controls if the disease under investigation occurs in **subclinical form** whose diagnosis is difficult
- ✓ Selection of appropriate control group is necessary as against this group we **make comparisons**, **draw inferences** ad **make judgements about the outcome of disease**

ANALYTICAL EPIDEMIOLOGY



ANALYTICAL EPIDEMIOLOGY

How many Controls are needed?

Depends upon the study that is undertaken

If study group is large → number of Controls can be equal to Cases

If study group is small → Cases are less than 50 then 2-4 control can be selected

ANALYTICAL EPIDEMIOLOGY

Selection of proper cases and controls in crucial for the **interpretation of results** of Case- Control study

Avoid influence of **selection bias**---- Cases can be selected from one source and Controls can be selected from more than one source

Desirable to **conduct more than one** Case Control study in **different geographical areas.** Consistent findings -→Increases the validity of the inference

Failure to select comparable control groups can introduce bias into results and decrease the confidence of the findings

ANALYTICAL EPIDEMIOLOGY

Step 2: Matching

Controls may differ from Cases in number of factors – Age, sex, Occupation, Social status… etc

Ensure Comparability between Cases and Controls---Matching

Selection of control groups in such a way that they are similar to cases with respect to other variables (age) which may influence the outcome of the disease

If adequate matching is not done results obtained will be distorted or confounded

ANALYTICAL EPIDEMIOLOGY

Confounding Factor: Factor which is associated with both exposure and disease and it is distributed unequally in control and study group

In the study of Role of Alcohol in aetiology of Oesophageal cancer, **Smoking is a confounding factor.**

Smoking is associated with consumption of alcohol

Smoking is independent risk factor for oesophageal cancer

Effect of Alcohol consumption can be determined only if influence of smoking is neutralized by matching

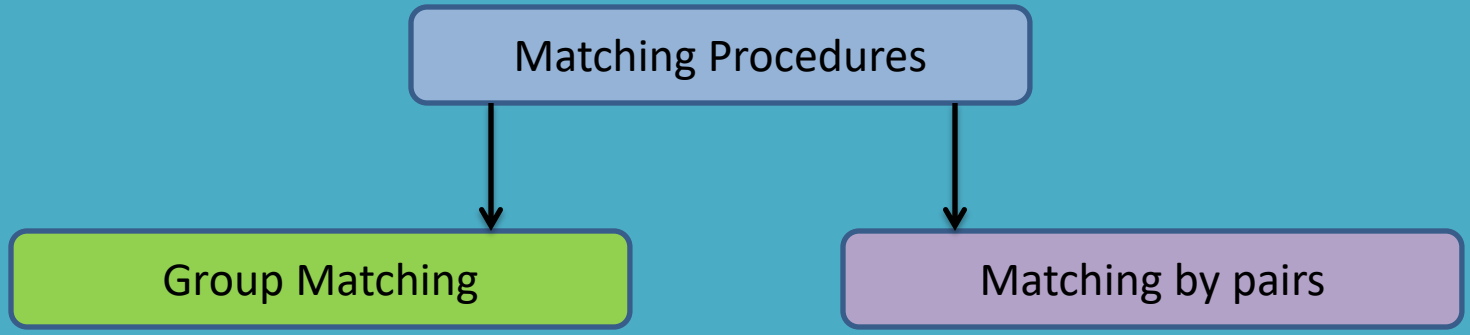
ANALYTICAL EPIDEMIOLOGY

Age can be a confounding factor

Investigation of relationship between steroid contraceptive and breast cancer.

If women taking oral contraceptives were younger than those in the comparison group,
they would necessarily be at lower risk of breast cancer
Because prevalence of Brest cancer increases with that of age

ANALYTICAL EPIDEMIOLOGY



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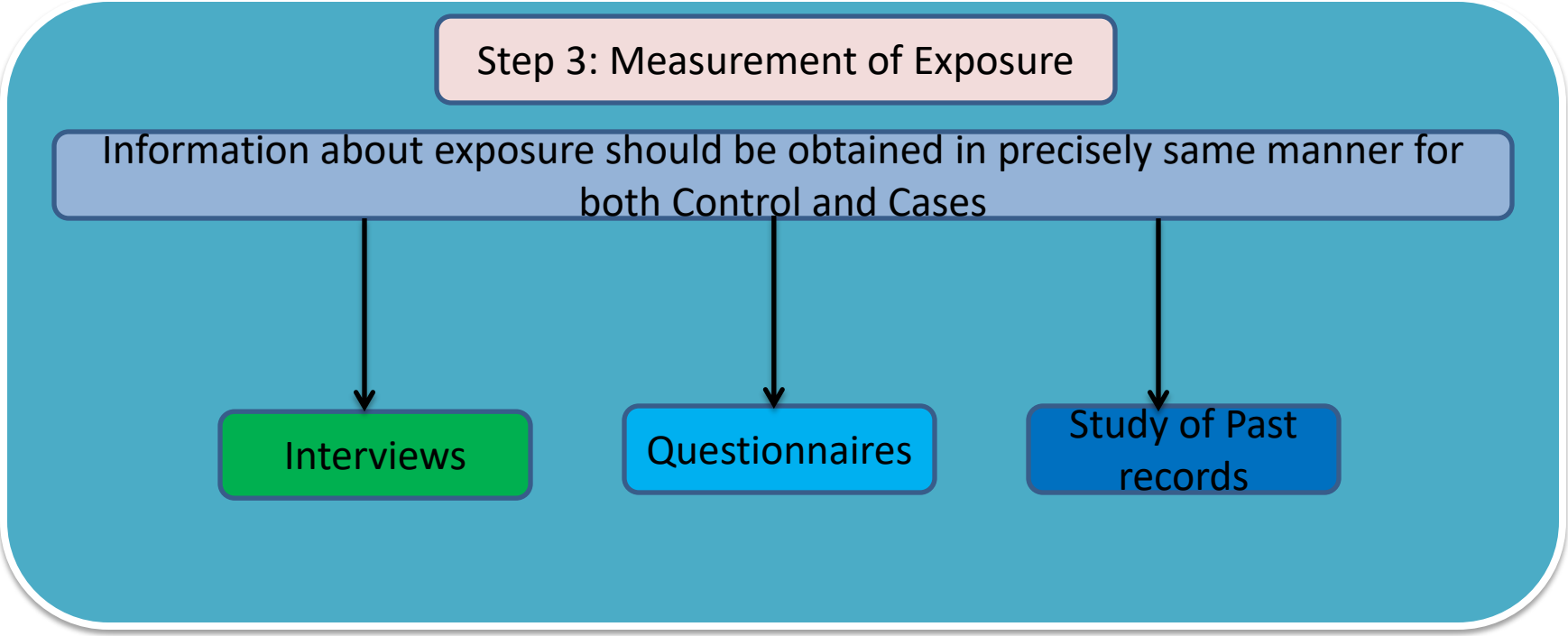


ANALYTICAL EPIDEMIOLOGY

Step 4: Analysis

To find out:

- ✓ Exposure rates among cases and controls to suspected factor
- ✓ Estimation of disease risk associated with exposure

ANALYTICAL EPIDEMIOLOGY

A Case Control Study of Smoking and Lung Cancer (calculating Exposure rate)

	Cases (With Lung Cancer)	Controls (Without Lung Cancer)
Smokers (less than 5 Cigarettes per day)	33 (a)	55 (b)
Non Smokers	2(c)	27 (d)
Total	35 (a +c)	82 (b +d)

Cases = a/ a+c
=33/35
= 94.2 %

Controls = b/ b+d
= 55/82
= 67%

Frequency of rate of lung cancer is definitely higher among smokers than in non smokers

ANALYTICAL EPIDEMIOLOGY

Estimation of Risk

Odds Ratio (OR) --- Measures the strength of association between risk factor and outcome

Odds ratio = ad/bc
= 33 X 27/ 55 X 2
= 8.1

Smokers of less than 5 cigarettes per day showed a risk of having lung cancer 8.1 times more than that of non smokers

ANALYTICAL EPIDEMIOLOGY

Advantages of Case-Control Study

- Relatively easy to carry out
- Requires comparatively few subjects
- Rapid and inexpensive (in comparison to cohort study)
- Ethical Problems are minimal

ANALYTICAL EPIDEMIOLOGY

Advantages of Case-Control Study

- ✓ Suitable to investigate rare diseases or disease about which very little information is available.
- ✓ Disease which is rare in general population may not be rare in special exposure group

Risk factors can be identified. Prevention and control programmes can be established

ANALYTICAL EPIDEMIOLOGY

Disadvantages of Case-Control Study

Selection of an appropriate control group may be difficult

- Problems of bias.
- Study relies on memory or past records, the accuracy of which may be uncertain.
- Validation of information obtained is difficult or sometimes impossible

Cannot measure incidence and can only estimate the relative risk

Another major concern is the representativeness of cases and controls

COHORT STUDY

Analytical Study

Study is undertaken to obtain additional evidence to refute or support the existence of an association between suspected cause and disease.

Prospective study

Longitudinal study

Incidence study

Forward Looking study

COHORT STUDY

Distinguishing Features of Cohort Studies

Cohorts are identified prior to the appearance of disease under investigation

The study groups, so identified are observed over a period of time to determine the frequency of disease among them

The study proceeds forward from cause to effect

COHORT STUDY

Concept of Cohort

Group of people who share a common characteristic or experience within a defined time period

Age, Occupation, Exposure to a drug or vaccine, Pregnancy

COHORT STUDY

Indications for Cohort Study

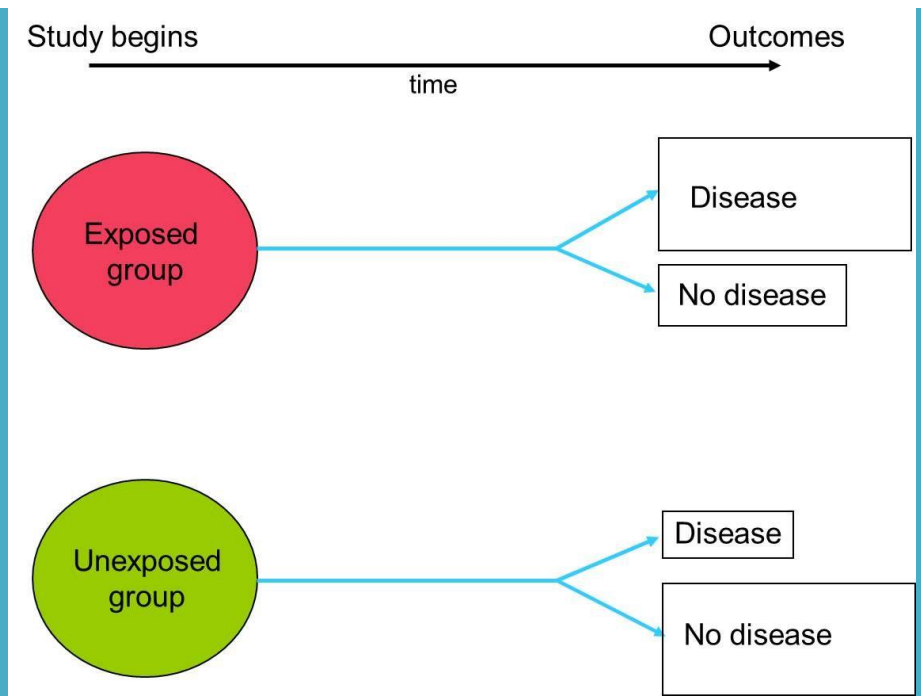
When there is good evidence of an association between exposure and disease, as derived from clinical observations and supported by descriptive and case control study

When exposure is rare, but incidence of disease high among exposed

When attrition of study population can be minimised eg, follow up is easy, cohort is stable, cooperative and easily accessible

When ample funds are available

COHORT STUDY



COHORT STUDY

Elements of Cohort Study

Selection of study group

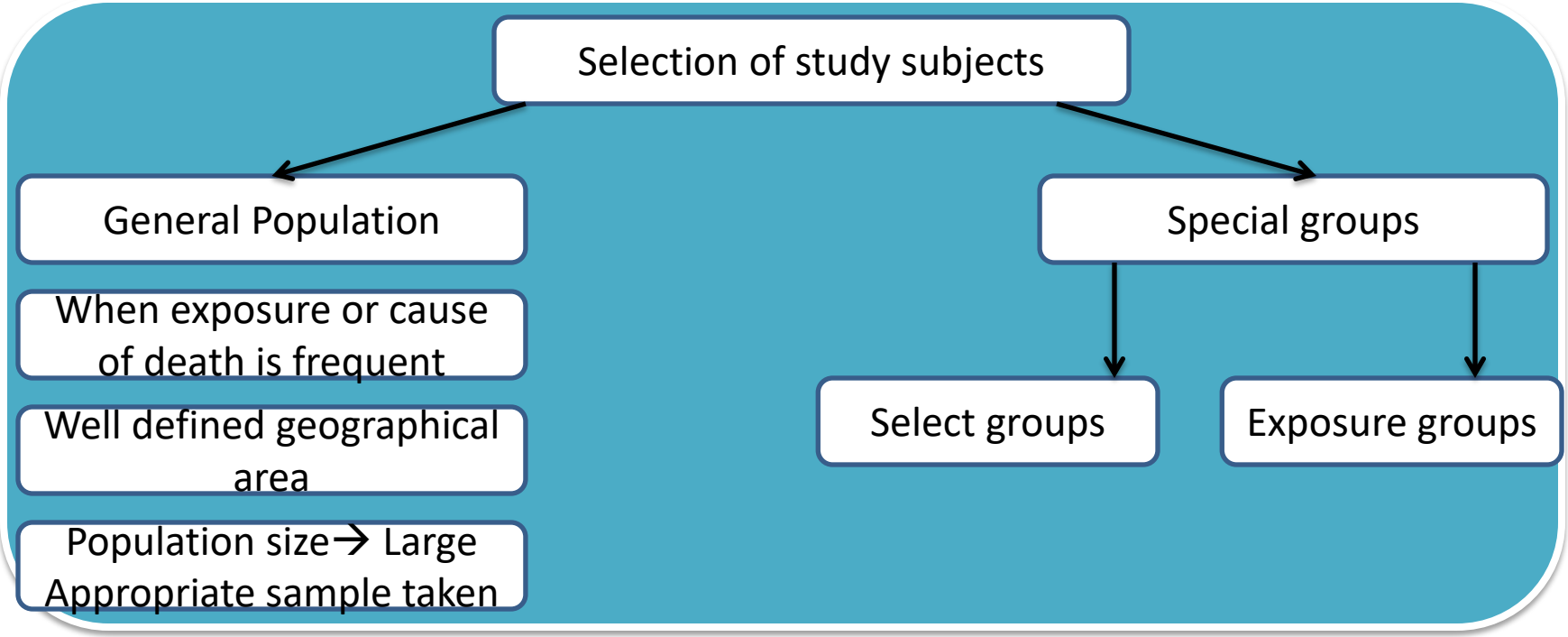
Obtaining data on exposure

Selection of Comparison groups

Follow-up

Analysis

COHORT STUDY



COHORT STUDY

Select groups

Professional groups

Homogeneous population

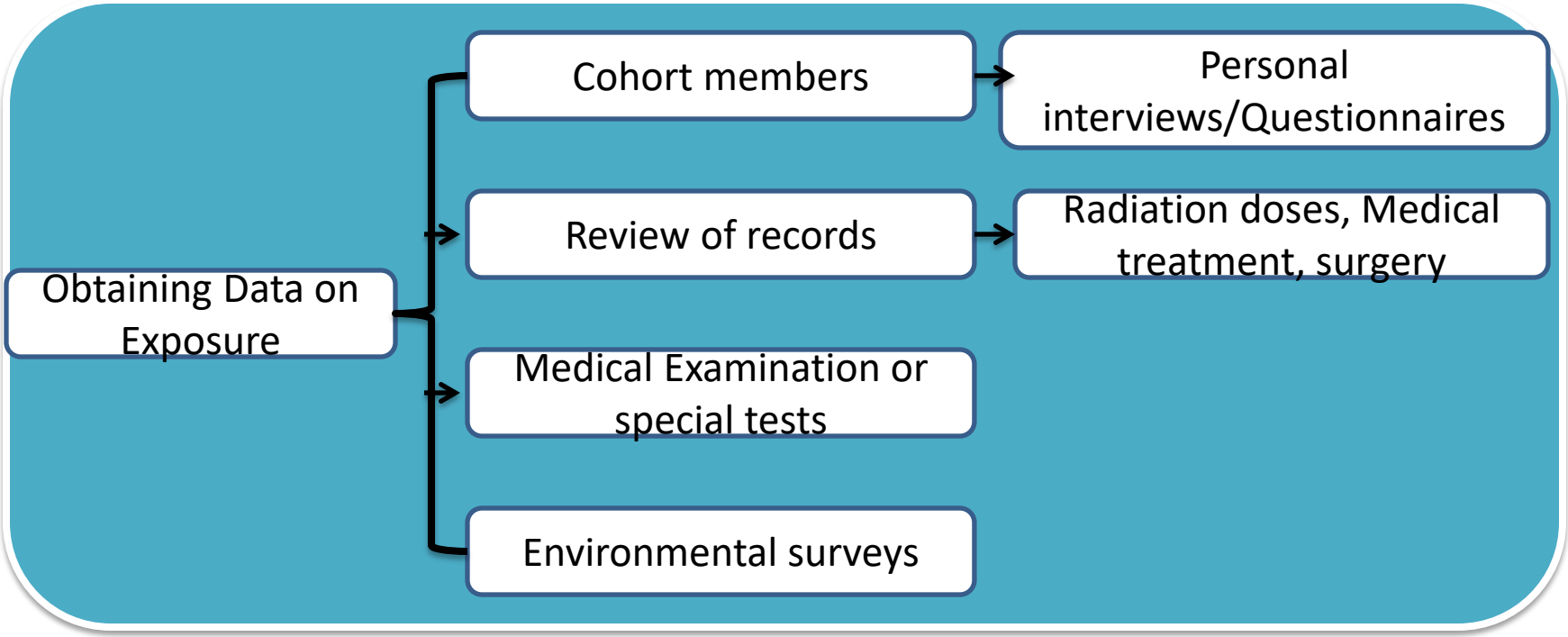
Advantage of:

- ❖ Accessibility
- ❖ Easy follow ups

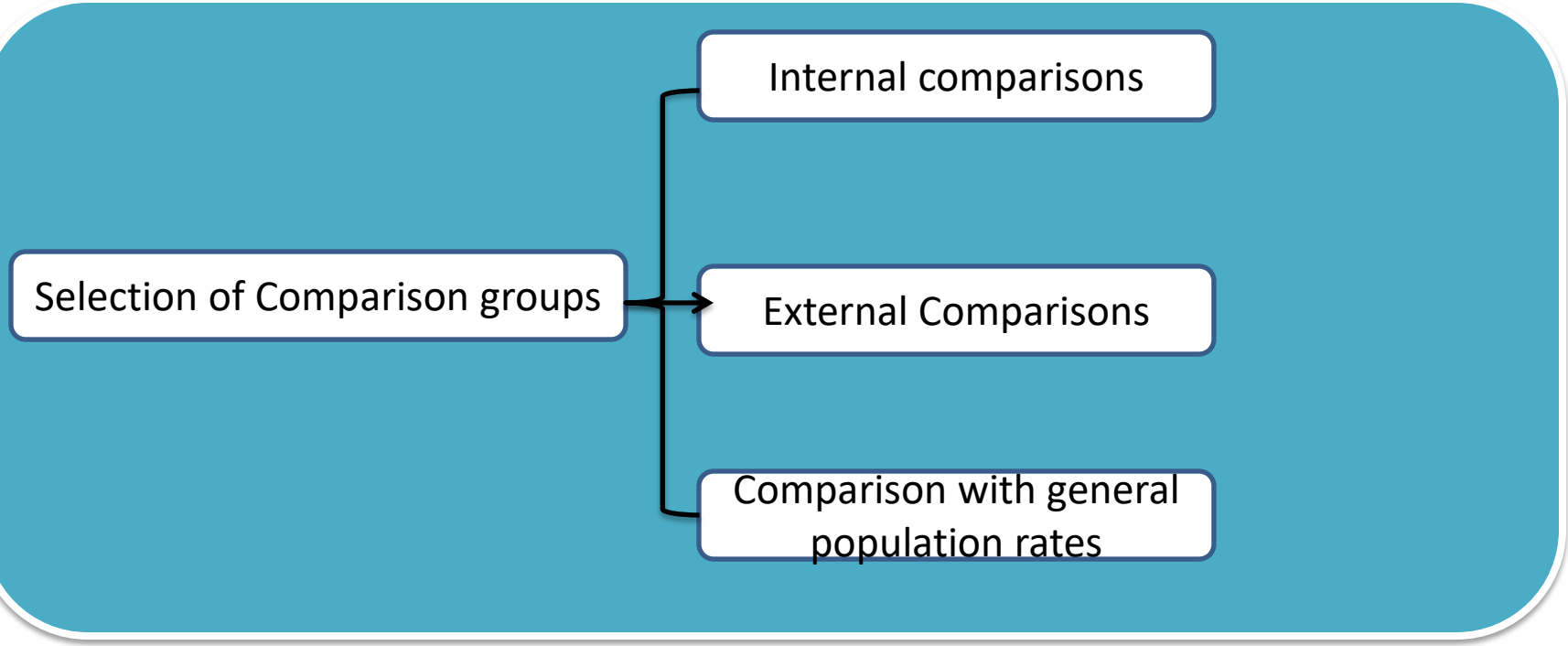
COHORT STUDY

- Exposure groups
- When exposure is rare
- Economical procedure
- Workers in industries and those employed in high risk situations

COHORT STUDY



COHORT STUDY



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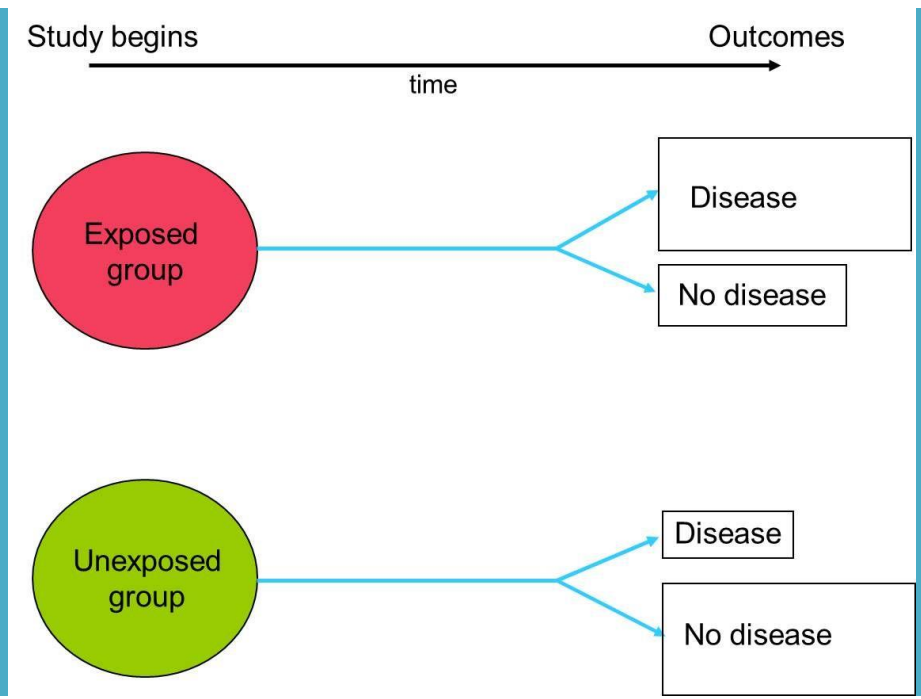


COHORT STUDY

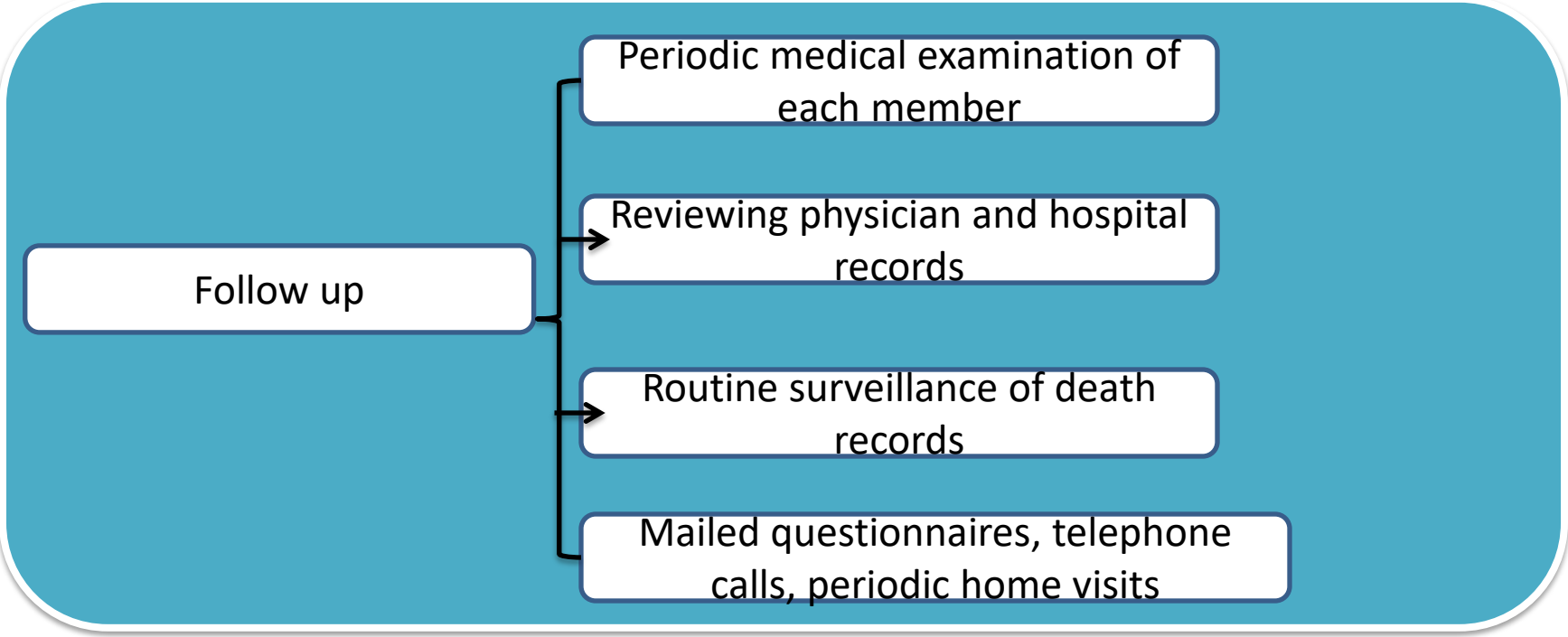
Internal Comparison Groups

Classification of Exposure	No. of deaths
1/2pack	24
1/2-1pack	84
1-2 packs	90
More than 2 packs	97

Mortality rate of Lung cancer increases with increasing number of cigarettes smoked

Association between smoking and lung cancer

COHORT STUDY



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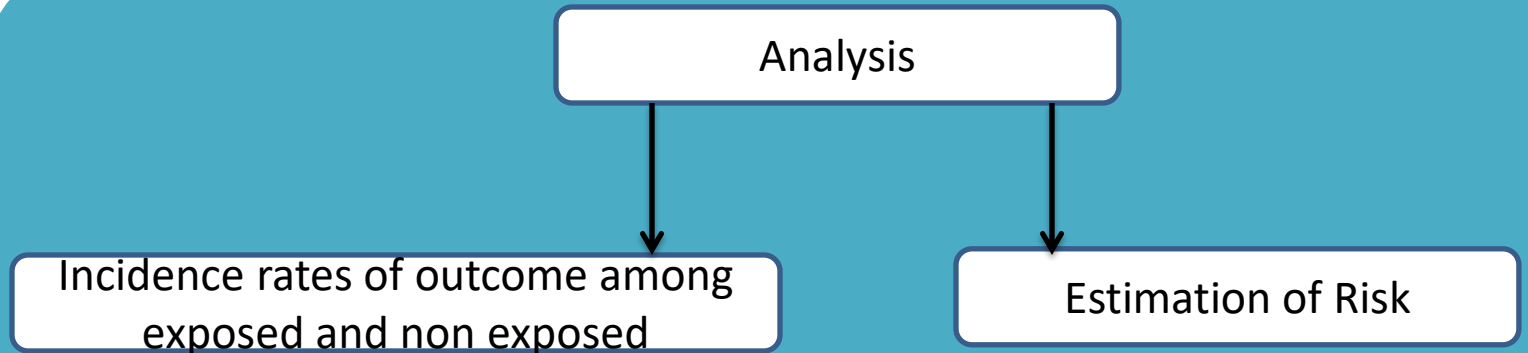


COHORT STUDY

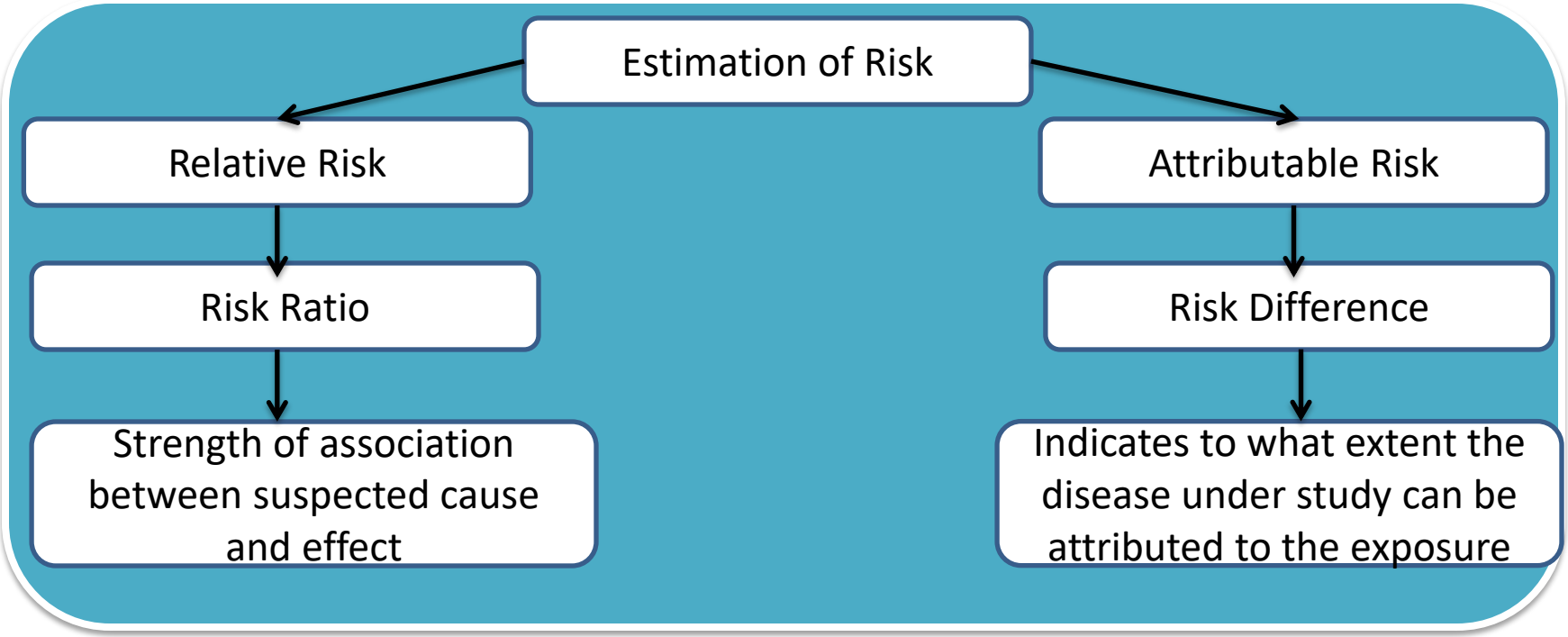
Incidence Rates

Cigarette smoking	Developed Lung Cancer	Did not develop Lung Cancer	Total
Yes	70 (a)	6930 (b)	7000 (a+b)
No	3 (c)	2997 (d)	3000 (c+d+

Incidence rates among Smokers= 70/7000 = **10 per 1000**
Incidence rates among Non-smokers= 3/3000 = **1 per 1000**

P<0.001

COHORT STUDY



COHORT STUDY

Risk Ratio= Incidence of Disease among exposed / Incidence of Disease among non exposed

=10/1 =**10**

It implies that smokers are 10 times at greater risk of developing lung cancer than non smoker

Attributable Risk =

Difference of Incidence rate of Disease among exposed and un exposed X 100 / Incidence of Disease among exposed

= 10-1 / 10 X 100 = **90%**

Association between smoking and lung cancer is causal, 90% of lung cancer among smoker was due to their smoking

COHORT STUDY

Advantages of Cohort Study

- Incidence can be calculated
- Several possible outcomes related to exposure can be simultaneously
- Provide direct estimate of Relative risk
- Dose response relation can be calculated
- Bias can be minimised

COHORT STUDY

Disadvantages of Cohort Study

- Involve large number of people
  Not suitable for investigating uncommon diseases or diseases with low incidence in the population
- Long time to complete the study and obtain the results (20-30 years or more)
- Administrative problems: Loss of experienced staff, loss of funding, Extensive record keeping
- Selection of comparison group is a limiting factor

COHORT STUDY

Disadvantages of Cohort Study

There may be changes in standard methods or diagnostic criteria of the disease over prolonged follow up

Cohort studies are expensive

The study itself may alter people's behaviour