

DESIGN STRATEGIES IN EPIDEMIOLOGIC RESEARCH (BASIC CONCEPTS)

COM 126

FOUAD JABRI

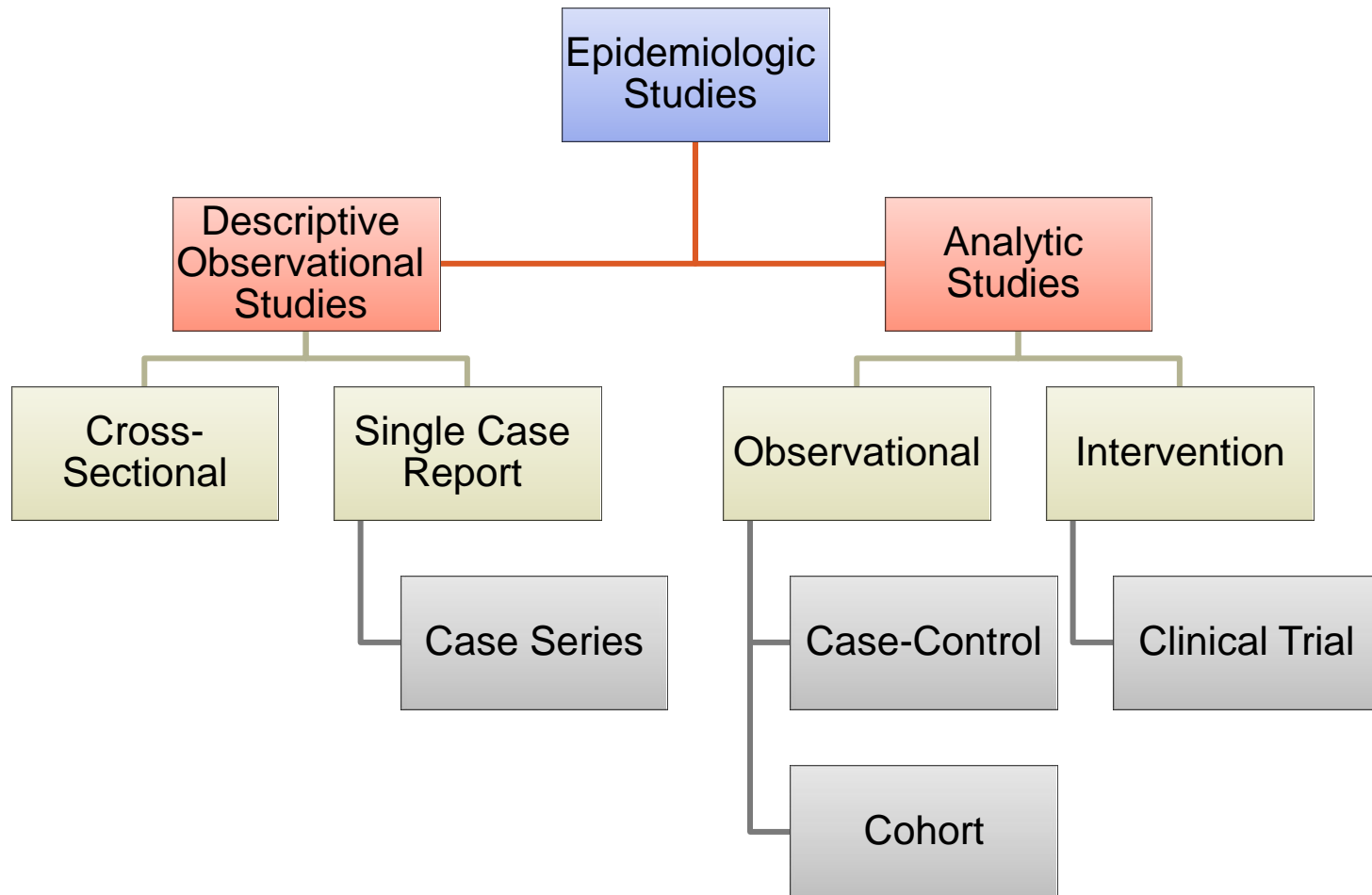
ALFAISAL COLLEGE OF MEDICINE

OBJECTIVES

- **Categorise research design into descriptive or analytical types of studies**
- **Describe the features and give examples of each of the following**
 - Case reports
 - Case series
 - Cross sectional studies
 - Case-control studies
 - **Cohort studies**
 - **Clinical trials**
- **Calculate and interpret measurement of association**
 - Odds ratio
 - **Relative risk**

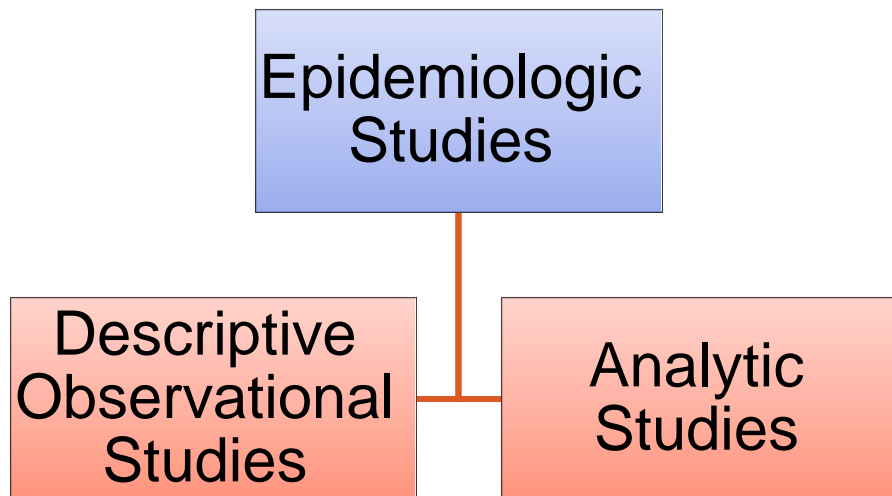
INTRODUCTION

Two categories of epidemiologic studies



TYPES OF STUDY DESIGNS

- **Epidemiology: distributions and determinants of disease frequency in human populations**
 - Epidemiologic researches use **design strategies**
 - Describing the distributions of disease
 - **Descriptive epidemiology**
 - Elucidating the determinants of disease
 - **Analytic epidemiology**



COHORT STUDIES

- Subjects are classified on the basis of the presence or absence of exposure to a particular factor and then followed for a specified period of time to determine the development of disease in each exposure group

MEASURE OF ASSOCIATION USED IN COHORT STUDIES

- **Relative risk (RR)**

- $RR = (A/(A+B)) / (C/(C+D))$

- $(A/(A+B))$ = Incidence of the disease in the exposed group
- $(C/(C+D))$ = Incidence of the disease in the non-exposed

	Disease status		
Exposure status	Yes	No	Total
Yes	A	B	B + A
No	C	D	C + D

RELATIVE RISK

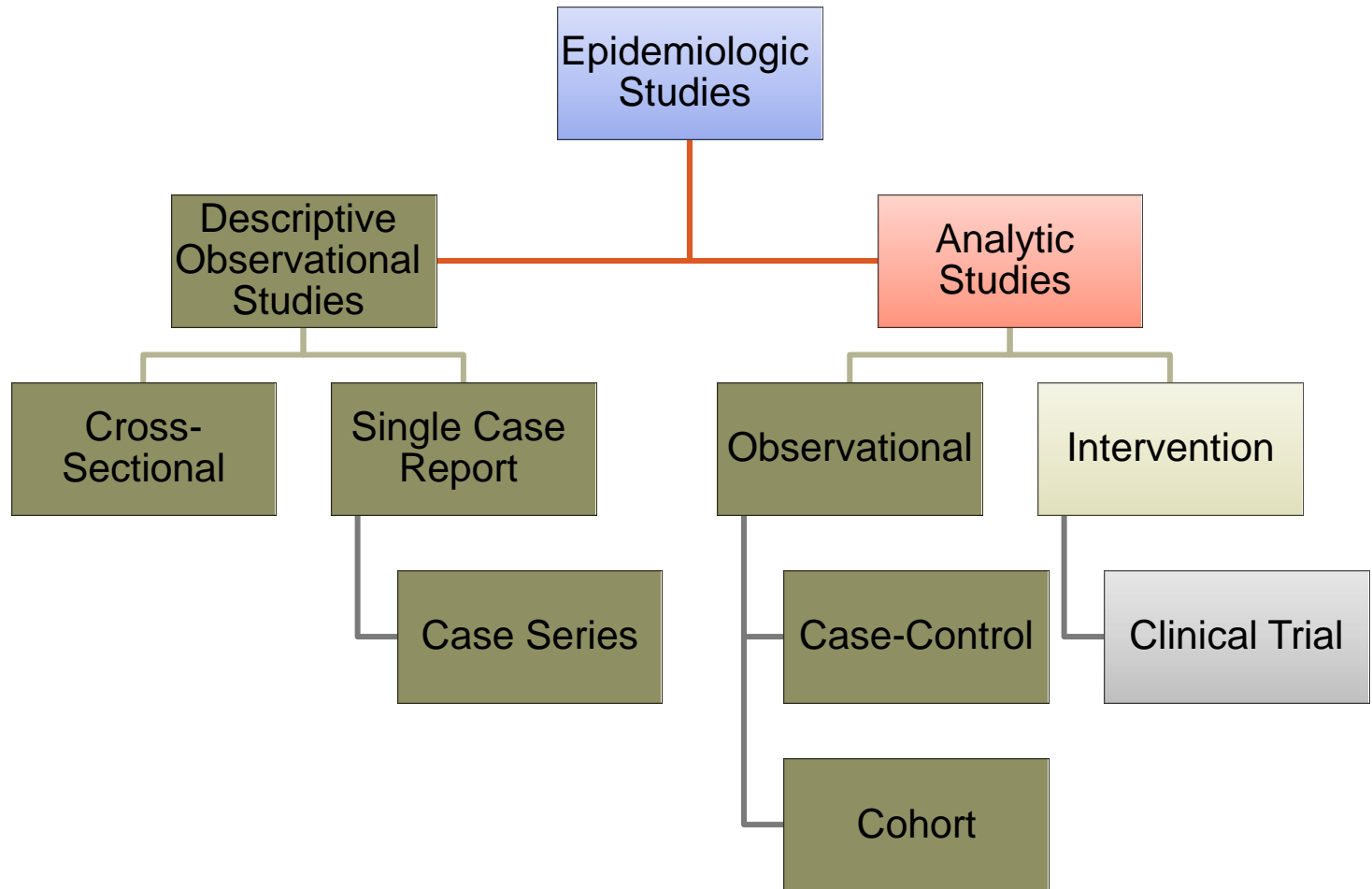
RR	Interpretation
> 1	Implies that the risk is more among the exposed than among the non-exposed + association between exposure and the) (outcome
$= 1$	The risk of disease among exposed is not different from the risk of disease among non-exposed
< 1	Indicates a protective effect

RELATIVE RISK

Example:

	Liver cancer		
Solvent exposure	Yes	No	Total
Yes	3	104	107
No	2	601	603

- Incidence rate in the exposed group = $3/107 = 0.02804$
- Incidence rate in the non-exposed group = $2/603 = 0.003317$
- $RR = 0.02804/0.003317 = 8.43$
- Interpretation: the risk of developing liver cancer is 8 times greater among workers who were exposed to solvents than among those who were not exposed to solvents



INTERVENTION STUDIES

- **Experimental studies**
- “an investigation involving intentional change in some aspect of the status of the subjects, e.g., introduction of a preventive or therapeutic regimen”
- **Randomized Controlled Trials (RCT)**
 - Participants are identified on the basis of their exposure status
 - Participants are followed to determine whether they develop the disease
 - Prospective cohort study!
 - The exposure factor is assigned by the investigator
 - Example
 - 500 diabetic patients
 - Assigned at random by the investigators
 - Group A: New treatment
 - Group B: Current therapy
 - >>> 5 years
 - 17% fewer complications in the new treatment group

RCT

- **Often considered as the most reliable evidence from epidemiologic research**
 - Judge whether an exposure causes or prevents a disease
- **Randomization**
 - Control of all other factors
 - (Known influences)
 - (Unknown influences)
 - Equal distribution of confounders
 - Each subject will have same probability of taking the intervention
 - Done by hand or computer
 - Randomized clinical trial are superior

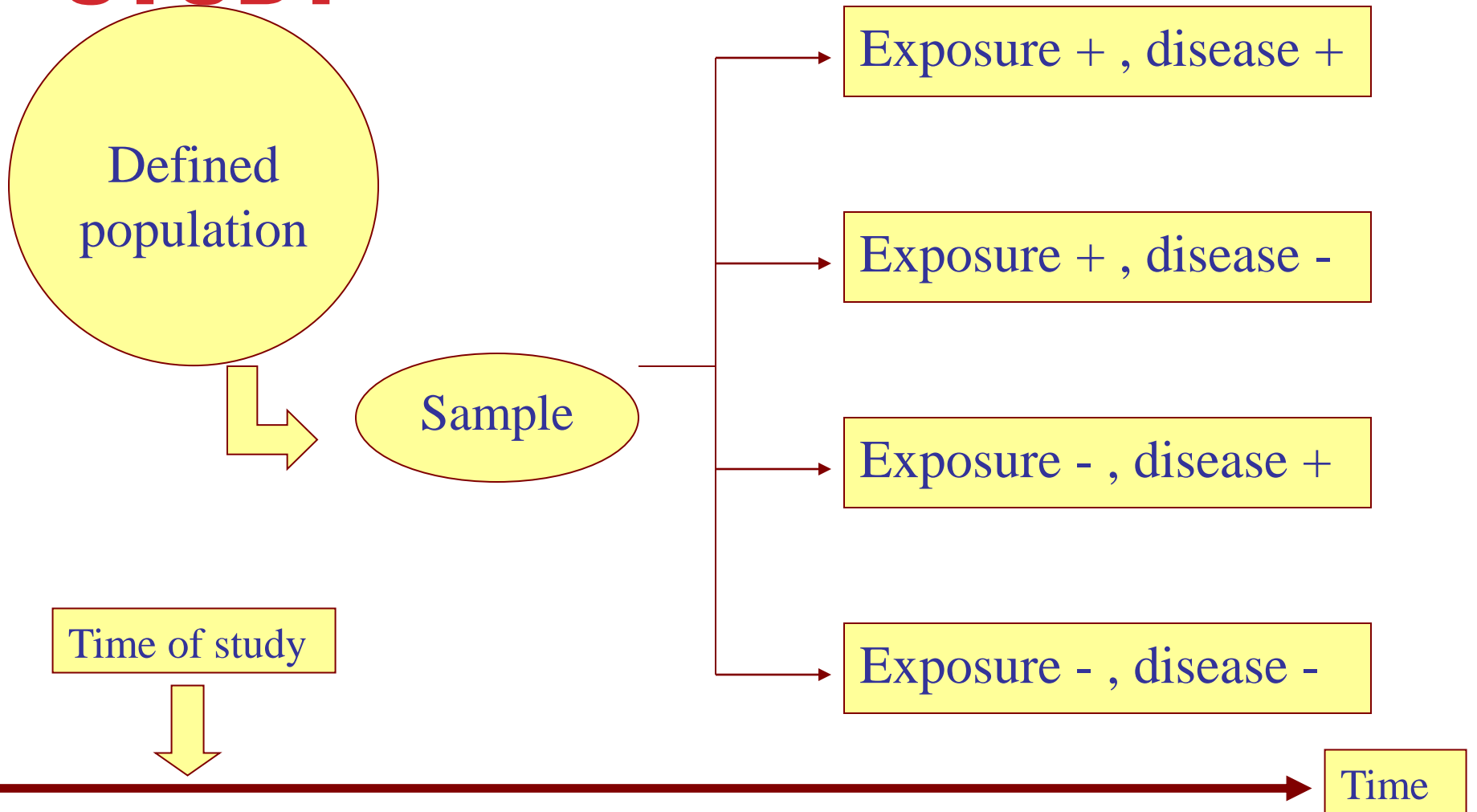
RCT

- **Control group**
 - Placebo or other standard exposure
- **Blinding**
 - Open labeled, single, double, triple
- **Ethical concern**
- **Costs**
- **Feasibility**

SUMMARY

- **General overview of the various design strategies**
 - Formulate or test epidemiologic hypotheses
- **Descriptive studies**
 - Describing patterns of disease occurrence
 - Allowing the formulation of etiologic hypotheses
- **Analytic studies**
 - Generate additional research questions
 - Test epidemiologic hypotheses
- **Particular research question may be addressed using different approaches**
- **The choice of study design is influenced by**
 - Particular features of the exposure and disease
 - Logistic considerations (time and resources)
 - Results from previous studies
 - Gaps in knowledge to be filled
- **Employ both descriptive and analytic design strategies**

CROSS-SECTIONAL STUDY



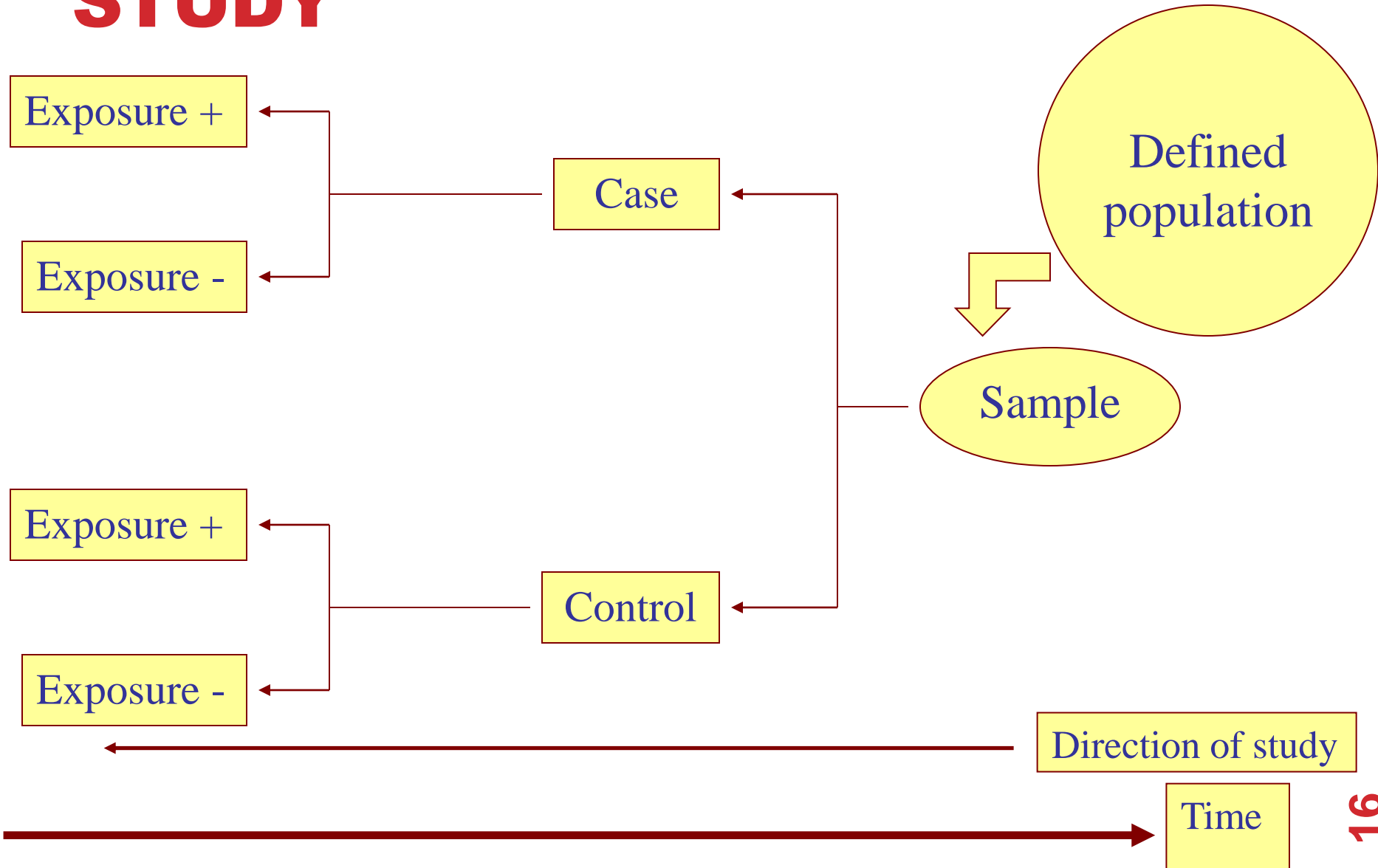
CROSS-SECTIONAL STUDY

What is the prevalence of the following event in this population?

	Event		Total
	Yes	No	
Gender			
Male	280	100	380
Female	30	2067	2097
Total	310	2167	2477

- **Prevalence** = $\frac{\text{number of existing cases of a disease}}{\text{total population}}$ *at a given point in time*
- **P = 310 / 2477**
- **P = 12.5 %**

CASE-CONTROL STUDY



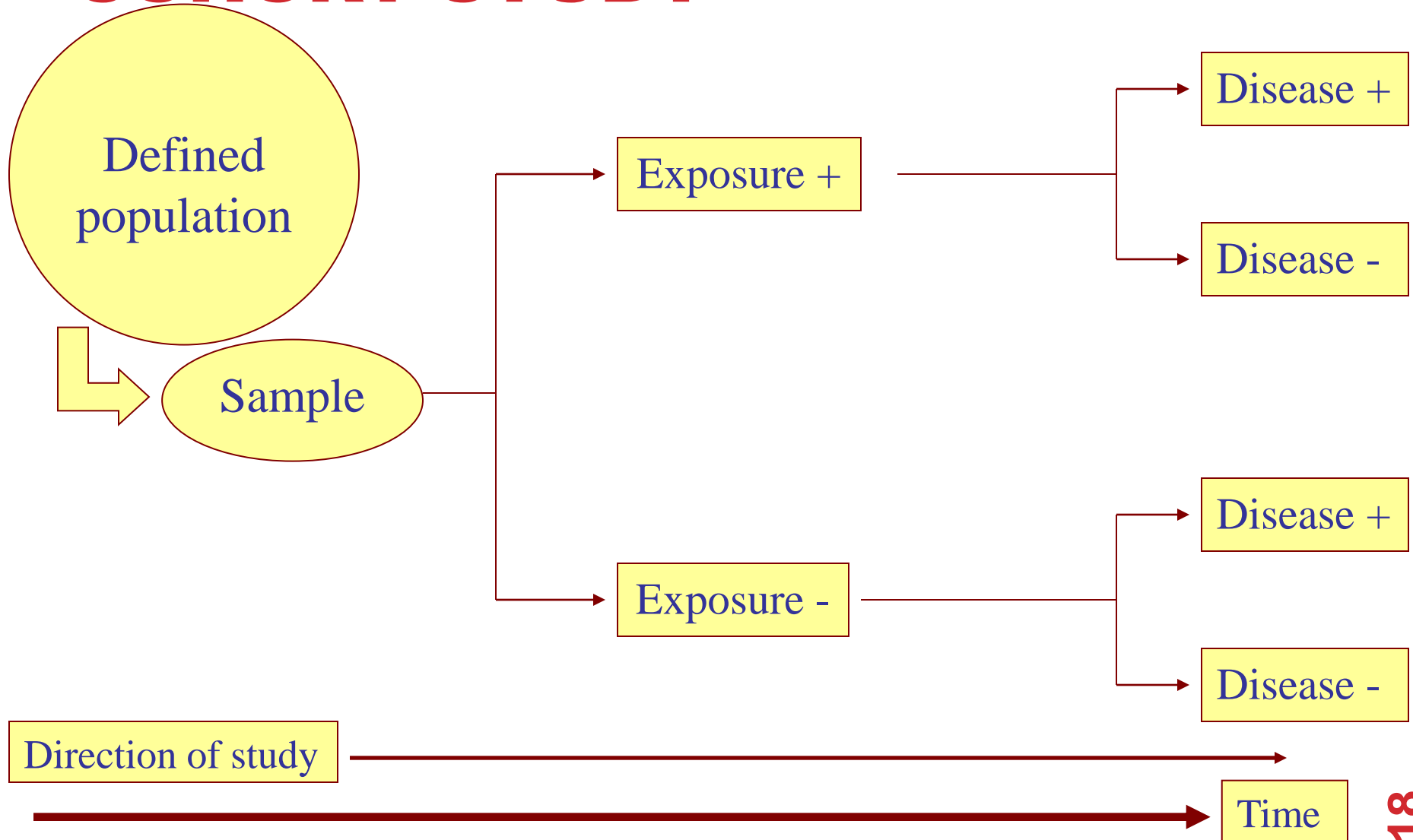
CASE-CONTROL STUDY

Assess the risk of CBD injury in association with laparoscopic cholecystectomy

LAP	CBD Injury		Total
	Yes	No	
Yes	121	334	455
No	2973	11525	14498
Total	3094	11859	14953

- the odds in favor of exposure among the cases = $121 / 2973$
- the odds in favor of exposure among the controls = $334 / 11525$
- OR = 1.4

COHORT STUDY



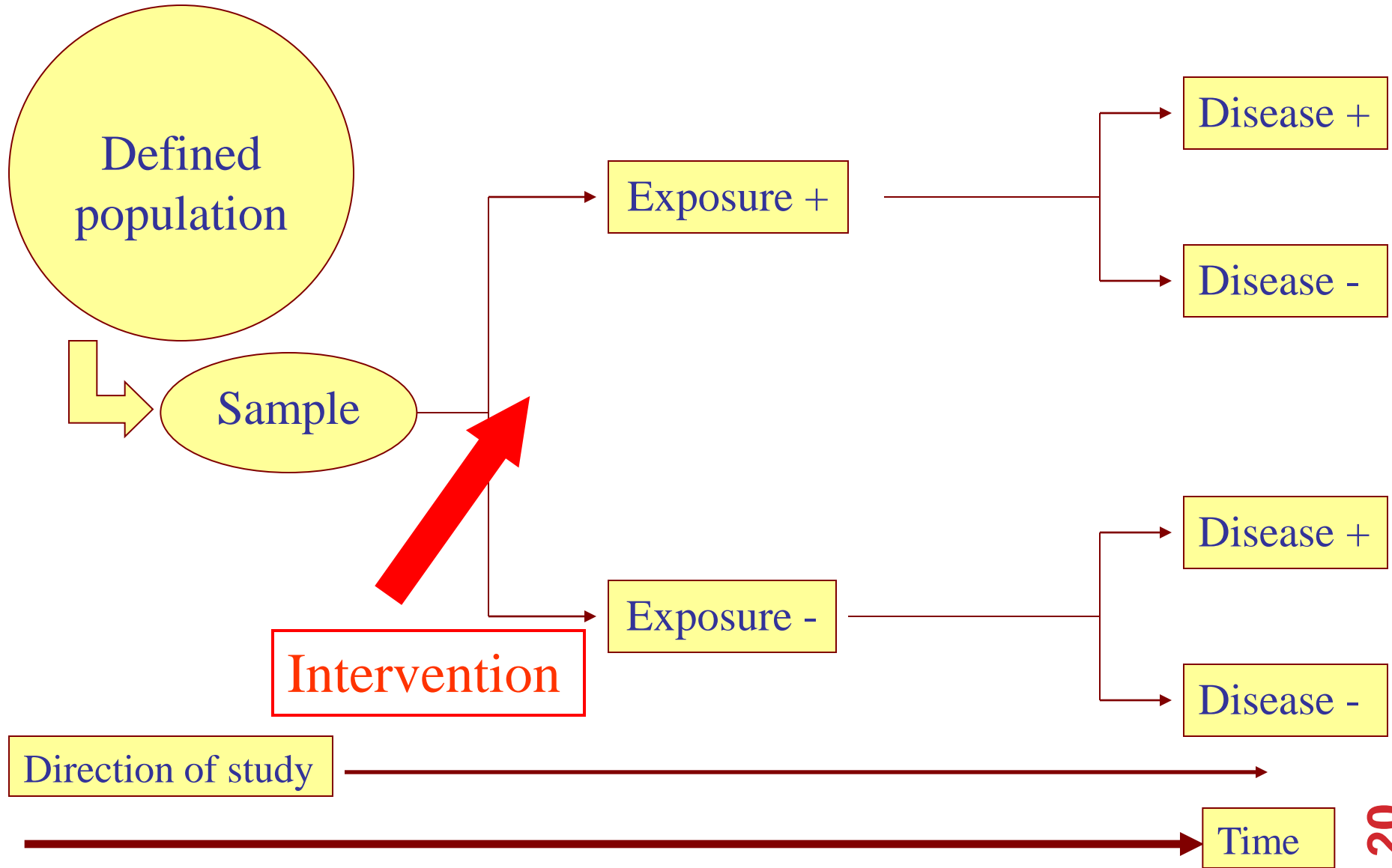
COHORT STUDY

Assess the efficacy of laparoscopic vs. open cholecystectomy with regard to developing incisional hernias

Choly	Incisional Hernia		Total
	Yes	No	
OPEN	5	103	108
LAP	3	138	141
Total	8	241	249

- Risk of outcome in exposed = $5 / 108 = 4.6\%$
- Risk of outcome in non-exposed = $3 / 141 = 2.1\%$
- Relative risk = 2.18

RCT



RCT

Assess the association between early vs. late laparoscopic cholecystectomy in Acute cholecystitis and the occurrence of CBD injuries

Choly	CBD Injury		Total
	Yes	No	
Early	344	1828	2172
Delayed	307	1893	2200
Total	651	3721	4372

- Risk of outcome in exposed = $344 / 2172 = 16\%$
- Risk of outcome in non-exposed = $307 / 2200 = 14\%$
- Relative risk = 1.14

END OF PART 2

REFERENCES

- Friis, R. H. (2010). *Epidemiology 101.* : Jones & Bartlett Learning.
- Hennekens, C. H. & Burnig, J. E., *Epidemiology in medicine.* : Lippincott Williams & Wilkins.

Any questions?

