بسم الله الرحمن الرحيم

COHORT STUDIES

Cohort (follow-up) studies **are observational analytic studies, where**

group (s) of individuals are defined on the basis of presence or absence of

the exposure to a suspected risk factor of a disease, then followed for

a period of time to assess the occurrence of the disease provided that

they should be FREE from the disease at the start of the exposure .

Two main types:

1.Follow-up studies (the prospective form)

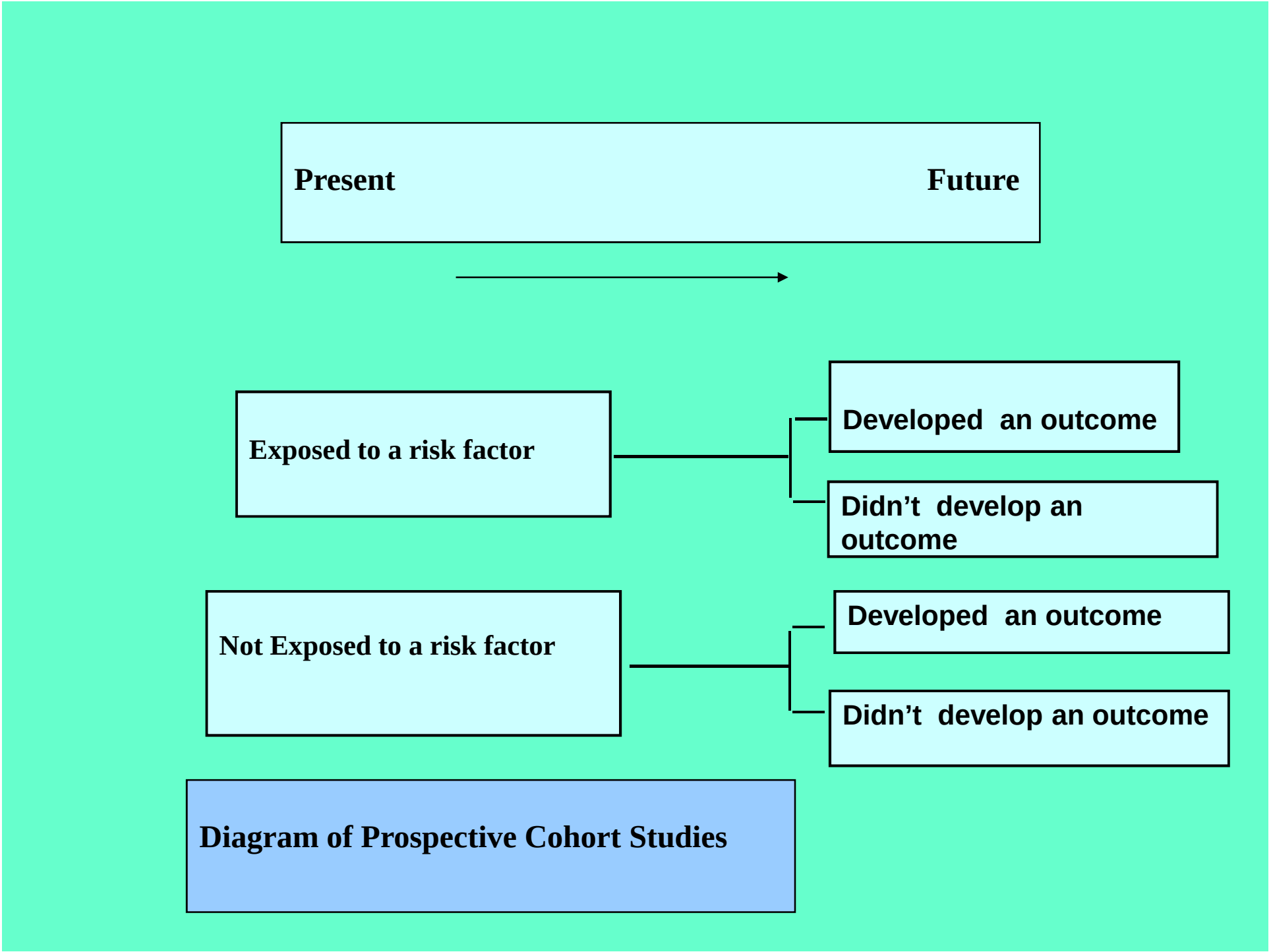
2.Retrospective cohort study :

1. Follow-up studies (the prospective form)

Constitutes the basic observational strategy for testing hypotheses.

In a follow-up study, people without the disease are followed up to see who develop it, and disease incidence in persons with a characteristic is compared with incidence in persons without the characteristic.

A "cohort" is a defined group of people who share a common characteristic. e.g. born in certain year, have same exposure to a hazard.


Present
Future
Exposed to a risk factor
Developed an outcome
Didn't develop an outcome
Not Exposed to a risk factor
Developed an outcome
Didn't develop an outcome
Diagram of Prospective Cohort Studies

1. Retrospective cohort study :

The observer looks backward to the disease & exposure because both of them have happened when the study had started"

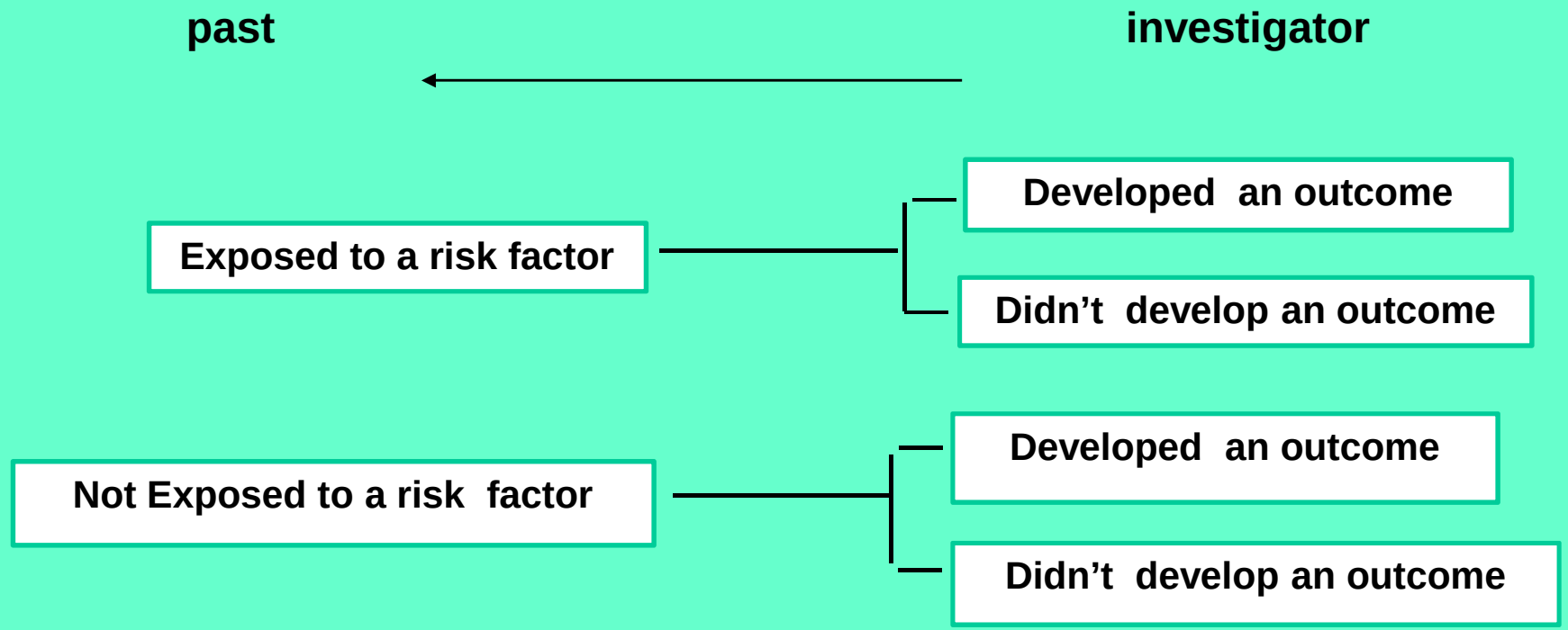


Diagram of Retrospective Cohort Studies

The two by two table :

		Disease		Total
		Present	Absent	
Exposure to a risk factor	(+)ve	a	b	a+b Exposed
	(-)ve	c	d	c+d Non Exposed
Total		a+c (cases)	b+d (controls)	a+b+c+d

We start with 2 groups , one exposed to the factors & the other group not exposed but both groups do not have the disease , then follow them up in time.

Group 1 Exposed : (a+b)
Group 2 Non Exposed : (c+d)

Analysis :

The measure of association between the exposure & the development of the disease is calculated by :

$$\text{1. Relative risk (RR)} = \frac{\text{Incidence of disease among exposed}}{\text{Incidence of disease among non exposed}} \text{ no unit}$$

$$\text{Relative risk (RR)} = \frac{a \ / \ (a+b)}{c \ / \ (c+d)}$$

RR = 1 : No association bet exp. & risk of disease

RR > 1 : +ve association (increased risk among exposed) (risk factor).

RR< 1 : -ve association (decreased risk among exposed) (protective factor).

. RR estimates the magnitude (strength) of association between exposure & disease.

. it indicates the probability of developing the disease in the exposed related to those unexposed

The exposure : risk factor ⟶ The outcome : disease or death

e.g. 1

In a Cohort study for association between usage of oral contraceptive use (OCP) & bacteruria, the following table was formed:

		Bacteruria		Total
		Yes	No	
OCP	Yes	27	455	482
	No	77	1831	1908
Total		104	2286	2390

$$\text{1- Relative risk (RR)} = \frac{a \,/\, (a+b)}{c \,/\, (c+d)} = \frac{27/482}{77/1908} = 1.4$$

This means that those who are OCP users have risk a 1.4 times the risk to develop the outcome than those no exposed.

e.g.2 suppose the incidence of Hepatitis B sero (+)ve among those having previous blood transfusion is 5/1000 / year & those with no blood transfusion is 1/1000/y so:

$$RR = \frac{5/1000/year}{1/1000/year} =$$ **5 times of developing an outcome among exposed compared to the non- exposed)**

2. Attributable Risk (AR) :

AR= I exposed minus I non exposed

AR = {a / (a+b)} - {c / (c+d)} ……. unit

•Also called the risk difference .

•provides information about the absolute effect of the exposure

•i.e. the excess risk of dis. among the exposed compared to the non exposed . Now look at the bacteruria –OC table

AR = Ie - Ie^{-} = 56.02/1000 per year - 40.36/1000 per year
=15.66/1000 per year

Note :

"AR is only calculated from cohort studies " & cannot be calculated from case-control studies .

Back to hepatitis example so :

AR = 5/1000 hepatitis per year -1/1000 hepatitis per year

= 4/1000 hepatitis per year (absolute measure , effect of the exposure).

. It quantifies the excess of risk of disease in the exposed group which

is attributable to the exposure.

. AR is useful as a measure of public health impact of a particular

exposure assuming a causal effect f the exposure on the outcome .

Annual Mortality Rate per 100,000

	Lung Ca	CHD (coronary H. disease)
Cig. Smokers	140	669
Non-smokers	10	413
RR	14.0	1.6
AR	$130/10^5/y$	$256/10^5/y$

$$\text{RR (lung Ca)} = \frac{140}{10} = 14 \text{ times}$$

$$\text{RR (CHD)} = \frac{669}{413} = 1.6 \text{ times}$$

So 14.0 : A person who smokes will have a 14.0 times chance to die from lung Ca than a non- smoker . And :

1.6 : 1.6 times chance to die from CHD than a non- smoker

3. Attributable Risk Percent (AR%) :

$$\text{Attributable Risk \%} = \frac{\text{Attributable Risk}}{\text{Incidence among exposed}} \times 100$$

Estimates % of gain, if the factor is removed from population.

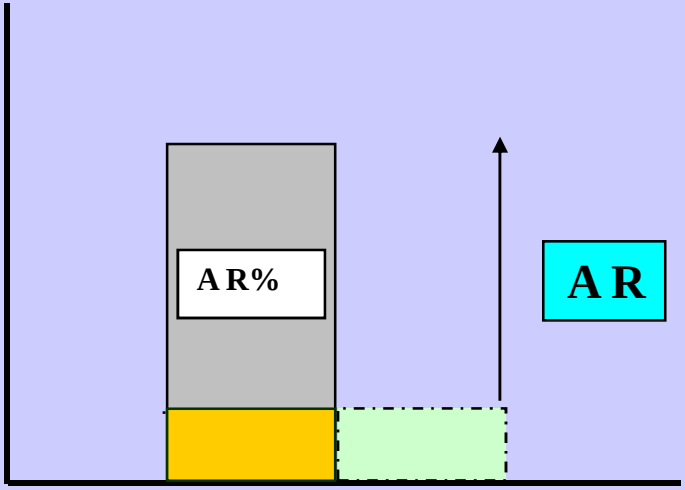
Gives an idea about the proportion of the disease in the exposed that could be prevented by eliminating the exposure .

e.g. of cohort the bacteruria –OC

$$\text{AR\%} = \frac{15.66/1000/\text{year}}{56.02/1000/\text{year}} \times 100 = 27.95\%$$

It estimates the proportion of the disease among the exposed that is attributed to the exposure.

Incidence



I among exposed **I among non exposed**

Strengths -Advantages-of cohort studies:

1. Establish the temporal relationship between disease. i.e. the time sequence between the exposure & the outcome & it is important in determining the causal outcome .

2. determines the risk of getting the disease through the exposure to a factor.

3. Useful for rare exposure. E.g. : Chemical & Radio active exposure is best studied through Cohort.

4. Examines multiple effects of a single exposure. E.g. People exposed to Asbestos & follow them up to develop Lung Ca, pulmonary fibrosis & other effects of the exposure

5. Allows direct measurement of the incidence of the disease among exposed & non- exposed groups.

Limitations:

1.Expensive : Personnel & Finance.

2. Time Consuming : due to the follow up e.g. Framingham Study

which started in the 50s studying the exposure of certain factors to

development of various heart disease.

3. Problems to follow up : die, run away, disappear ,.etc.

4. Of limited use in rare disease.

Sources of Exposure Data

1. Pre-existing records.
2. Information from the study subjects -interview.
3. Direct Physical examination or an investigation.
4. Direct measurement of the environment.

e.g. detection of the exact level of a certain thing in the environment as noise by a sound level meter.

Selection of Comparison Group

They should be similar to the study group in all the factors related to the disease, except the factor under study.

Sources of Outcome Data

Fatal Outcome : - death certificates.

Non-Fatal Outcome :

- **Medical Records.**
- **Direct from the participants.**
- **Data from periodic M Exam.**

The method of assessment of outcome should be the same for both groups.

e.g. "A" a hypothetical cohort study of cigarette Smoking & lung Ca (100exposed, 100nonexposed)

		lung Ca		Total
		Case	Control	
Cigarette Smoking	Yes	70	30	100
	No	30	70	100
Total		100	100	200

$$RR = \frac{a / (a+b)}{c / (c+d)} = \frac{70 / 100}{30 / 100} = 2.3$$

Now : same e.g. "B“370 exposed 730 non exposed

		lung Ca		Total
		Case	Control	
Cigarette Smoking	Yes	70	300	370
	No	30	700	730
Total		100	1000	1100

$$RR = \frac{a / (a+b)}{c / (c+d)} = \frac{23 \times 2816}{304 \times 133} = 4.6 \text{ changed}$$