



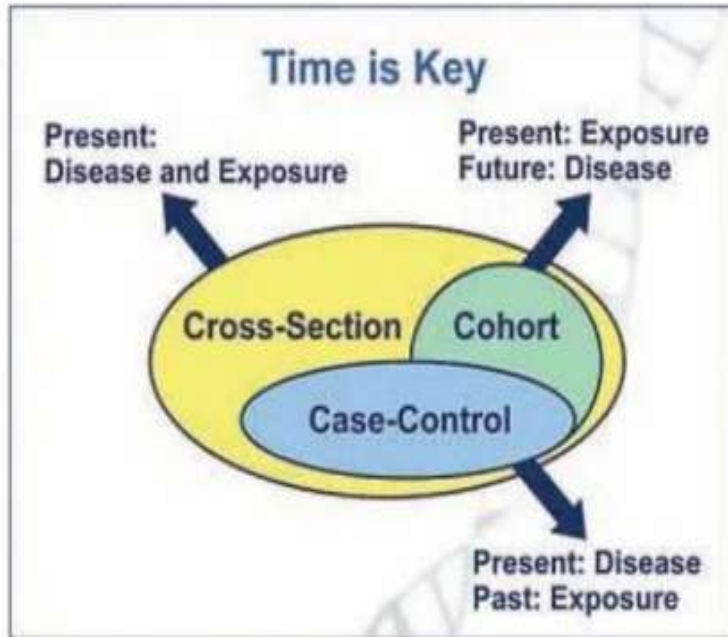
# COMMUNITY MEDICINE

## Notes

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## CROSS SECTIONAL STUDIES

### EXPOSURE AND DISEASE MEASURES SIMULTANEOUSLY



We previously took different types of studies regarding a disease's risk factor and exposure

When we're studying about a disease we look for exposure and risk factors in relation to time

Each type of study has a different way of investigations

كل نوع من الدراسات له طريقته الخاصه اللي من خلالها يعملو البحث

In cross-sectional studies we look for disease and exposure at the same time

Ya3ni if we want to make cross sectional study about diabetes we investigate the disease and exposure (risk factors) at the same time with no follow up. Cross sectional studies help us know prevalence rate of a disease, meanwhile if you remember in incidence rate studies we take a group of people exposed to a risk factor & do a follow-up to see how many people developed the disease after the exposure while in cross-sectional studies, we assume the risk factor is the cause of disease with no follow

- up, we'll discuss it in more details during the lecture

In cohort study, the investigations are performed on a group of people that share the same characteristics and we bring people who have been exposed & people who have not been exposed and continuously follow-up with them to know the outcomes

Refer to the picture above, in case-control studies we bring people who are diseased and ask them about what things they've been exposed to, based on the answers we can conclude the cause of the disease.

While in cohort studies, we bring people who share same characteristics and compare the outcomes of the ones who have been exposed to the ones who haven't been exposed

Case - control study	We ask diseased people about previous exposures and later on we make conclusions
Cohort study	We ask people who have been exposed and follow up to check for the disease (we bring people who have been exposed to a certain factor and people who haven't been exposed, and based on their answers we assume the relation of risk factor to development of disease)
Cross - sectional	We ask about exposure and disease simultaneously (no follow up and we get the results at the same time)

The whole lecture will be listing facts about cross-sectional study & its advantages/ disadvantages.

## CROSS-SECTIONAL STUDY DESIGN:

1) Sometimes called prevalence studies.

And that's because we can use the cross-sectional study results to calculate prevalence rates

2) They are studies of total populations or population groups in which information is collected about the present and past characteristics, behaviors, or experiences of individuals.

Ya3ni when we perform cross-sectional study we collect data and ask about past characteristics for example we ask the patient if he's a smoker, and if he was a smoker we ask how long he's been smoking

3) There are a number of advantages in performing a cross-sectional study. These studies involve a single data collection and, thus, are less expensive and more easy to conduct.

Now is the cross-sectional study considered observational or experimental?

A quick reminder...recall that we said we have qualitative & quantitative studies.

Qualitative studies are further divided into descriptive studies

Quantitative studies are further divided into experimental and observational.

It is considered experimental if the study includes intervention, like trying a new drug or doing lab experiments, if there is no intervention it is considered as observational. Observational is also subdivided into analytic and descriptive depending on the presence of a comparable group or not. If there is a comparable group we consider it analytic In case-control & cohort studies we have groups of people that we compare to each other so they're quantitative analytic studies

In descriptive studies we don't compare two groups of people, an example of descriptive studies is cross-sectional studies & case fatality rates (theres more examples in previous lectures)

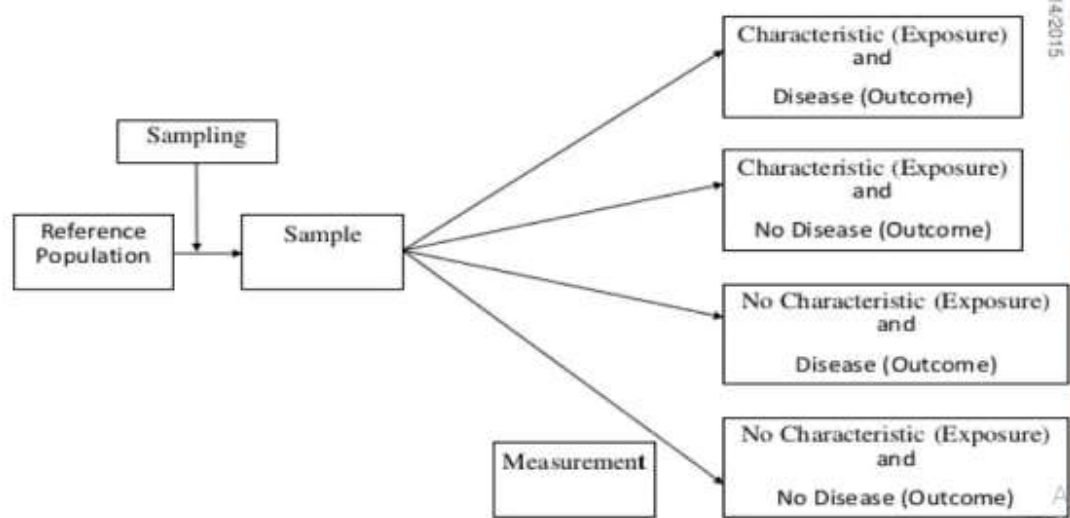
4) Cross sectional studies emphasis on differences between groups at one point in time.

Using cross-sectional study, we can study multiple groups at the same time. However, we don't compare between them, but we can study different groups simultaneously

5) They provide a one-time glimpse at the study population, showing the relative distribution of diseases, and injuries— and their attributes— in a group or population

Basically, in cross-sectional studies we can perform the study on multiple groups at the same time which helps us know the distribution of a specific disease & injuries caused by that disease in any group the study is performed on

### DESIGN OF CROSS SECTIONAL STUDY



**Explanation of the diagram above:**

Basically we take different samples from the population, the different samples will show various results.

Refer to diagram above

The first sample will show people who have been exposed to risk factor & got the disease

Second sample will show people who have been exposed but are not diseased

Third one will show people who are not exposed but somehow developed the disease

Fourth sample shows people who have not been exposed & not diseased

6) Cross sectional are studies in which a defined population is surveyed and their disease or exposure status determined at one point in time

7) The prevalence rates of disease in the whole population as well as in those with and without the exposure under investigation can be determined

Cross-sectional studies help us know the prevalence rate of a disease, once we know the prevalence rate of a disease we can know the effect of the risk factor on the development of the disease by comparing the risk of disease development between two groups of people (exposed group & and not exposed group).

Remember we said that in cross-sectional study there is no comparison, however, there is a type of cross-sectional study where we use comparison between two groups & it's called comparative cross sectional study, while in typical cross sectional study there is no comparison.

Note that in cross-sectional study, there is comparison between two groups but there is no follow-up.

For more clarification: in incidence rates we bring a group of people some are exposed to risk factors & some aren't, we follow-up for the exposed patients to see if the risk factor is associated with the outcome, however in comparative cross-sectional study we compare two groups of people with no follow-up

8) Cross-sectional studies are generally not suitable for a disease which is rare or of short duration as few people will have the disease at any one point in time

And that's because we begin the study by using both risk factor and disease, unlike other studies where we choose people exposed to risk factor and follow up for disease development, in cross-sectional there's no follow-up (the doctor keeps repeating the same thing everytime so u know how imp it is (: )

9) More effective in identifying chronic diseases and problems  
As chronic diseases the risk factor & outcome is already known

10) Less effective in identifying communicable diseases of short incubation periods and short durations.

(explained later)

11) It is often difficult to separate cause and effect as the measurement of exposure and disease at any one point in time.

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ض لعوامل ممكن انها تكون سبب في المرض هل بقدر احكي انها السب  
ب الاكيد لحدوث

المرض؟ الجواب لا طبعاً. وهذا واحد من عيوب هالدراسه

So one of the disadvantages of cross-sectional studies is that we can't establish a cause-effect relationship in a population because we investigate the cause & effect at the same time without follow-ups, while in studies where we perform a follow-up we can establish a cause-effect relationship, for example when we want to do a study on the effect of radiation on the development of cancer, if we do cross-sectional study we'll see cancer patients & check for history of radiation exposure, but we can't precisely detect if radiation was the exact cause of cancer, while when performing a study that includes a follow-up of radiation effect on cancer development, we bring people who have been exposed to radiation & do a follow-up to check for cancer development in any of the people the study has been performed on, and if cancer was detected, we can ensure the cause is radiation & thus a cause-effect relationship will be established

Eg from slides: if milk drinking is associated with peptic ulcer, is that because milk causes the disease, or because ulcer sufferers drink milk to relieve their symptoms?

12) Cross sectional studies are best suited to diseases that produce little disability and to the pre-symptomatic phases of more serious disorders.

13) Cross-sectional studies are often used as an initial exploration of a hypothesis prior to conducting a case-control

or follow-up study (prompts further study).

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ض معين  
في المجتمع يعني بتوجهك لتعرف انو في مشكله معينه بالمجتمع.. يعن  
ي ببساطه  
بتعطي فكره عن المرض اللي رح ندرس عنه والعوامل المؤثره عليه

So one of the advantages of cross-sectional studies is that they provide initial information that helps in further researches of the disease

14) Cross-sectional studies provide information & data useful for planning of health services & medical programs

Cross-sectional studies help us know the danger of a certain disease which helps us in planning of health services & medical programs to lessen the burden of the disease in the community

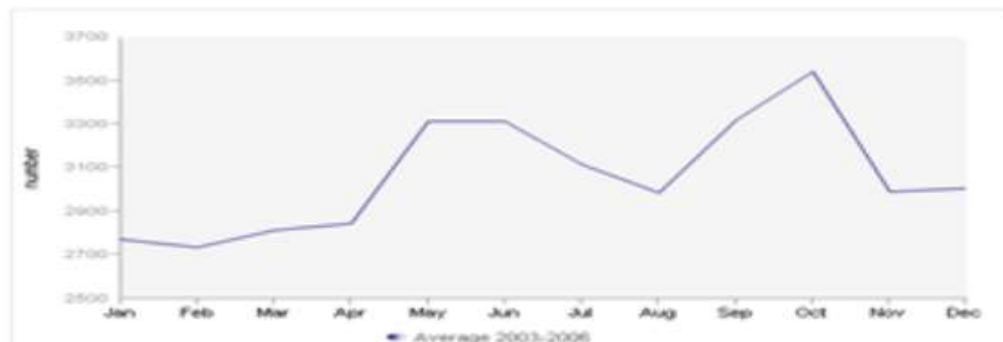
15) They are based on a sample of whole population & don't rely on individuals presenting themselves for medical treatment

When we start a cross-sectional study, we take a sample of the whole population & not a sample from a specific group, so the results will represent the whole population, ya3ni we don't take samples from people who have a specific disease like DM , we take from the whole population



# Cross-sectional studies

- **Seasonal variations of disease are not well represented in cross-sectional studies except if the duration of the study allows such comparison**
- In the example below, studying RTA in October would not provide a valid result for incidence of RTA in whole year and does not allow identifying seasonal variations in the RTA
- Road traffic accidents by month of accident, Slovenia, average 2003-2006



Cross-sectional studies don't properly represent seasonal variations of a disease (seasonal variation of disease means that the disease happens more commonly in some seasons than others)

For example if a disease most commonly happens during winter season & cross-sectional study was performed on a season other than winter, then it won't give accurate results & so we won't be able to detect seasonal variation of the disease

For example (refer to diagram above) a study concerning trauma from RTA was done in Slovenia & they found that RTA cases increase in certain times of the year than other times

So if cross-sectional study wasn't done in the season where RTA are the highest we won't be able to detect the seasonal variation unless the study was done for a longer time, long enough to include the seasons where RTA are the highest  
So basically, cross-sectional studies help us in knowing

prevalence rate of disease which helps us know how dangerous the disease is & its impact on our society, it helps in studying chronic diseases as they're more stable & have longer duration.

Recall that cross-sectional studies aren't suitable for communicable diseases, diseases of short duration & serious diseases that cause disability

However, it could be suitable for seasonal variation studies depending on the duration of the study. If the cross-sectional study was long enough to include the seasonal variation then it is useful, if it wasn't long enough then its of no help.

### Cross-sectional survey of CHD among male by physical activity

(Chronic heart dz)

	Number examined	Number with CHD	prevalence
Not physically active	89	14	157.2/1000
Physically active	90	3	33.3/1000

A cross-sectional study of CHD (chronic heart disease) was done on male population according to their physical activity, so basically an investigation of risk factor (physical inactivity) & disease occurrence was done simultaneously

Number of males not physically active was 89 and 14 of them had CHD

Recall that prevalence rate equation is number of diseased patients (in this case patients with CHD) divided by the

population examined (89+90) multiplied by a constant, so the result was 157.2/1000 of not physically active males have CHD  
Same thing applies to physically active males, 3 divided by (89+90) multiplied by a constant and the result was 33.3/1000

- Cross-sectional study is a study in which all the measurements are taken at a particular point in time
- When a study only measures health outcome, it is known as descriptive cross-sectional study
- When a study only measures both exposure and health outcome at the same time, it is known as analytic (comparative) cross-sectional study

In the example above, the CHD study compares between exposed & non exposed patients, so it is analytic cross-sectional study, however in the absence of comparison between exposed & non exposed it is considered as descriptive cross-sectional study

# Descriptive Cross-Sectional Study

- They provide a prevalence rate of a disease at a point in time (**point prevalence**) or over a period of time (**period prevalence**)
- The **total population** is the **denominator** for these prevalence rates
- The study describes prevalence rate by personal characteristics (e.g., age & sex), geographical areas and time frame
- If cross-sectional studies are done **serially** over a certain period, they can provide time **trend of disease prevalence**

Basically if we perform cross-sectional study at the start of the year, then we do it again after 6 months, then again after 4 months, we can know the trend of the disease  
بنعرف اتجاه المرض لو بزيد او يقل

## Analytic (Comparative) Cross-Sectional Study

- A cross-sectional study is an observational study in which **exposure and disease are determined at the same point in time in a given population**
- Often deal with exposures that can not change, such as blood type or other invariable personal characteristics
- Cases in a cross-sectional study will **over represent** cases with a **long duration of illness** and **under represent** those with a **short duration of illness**

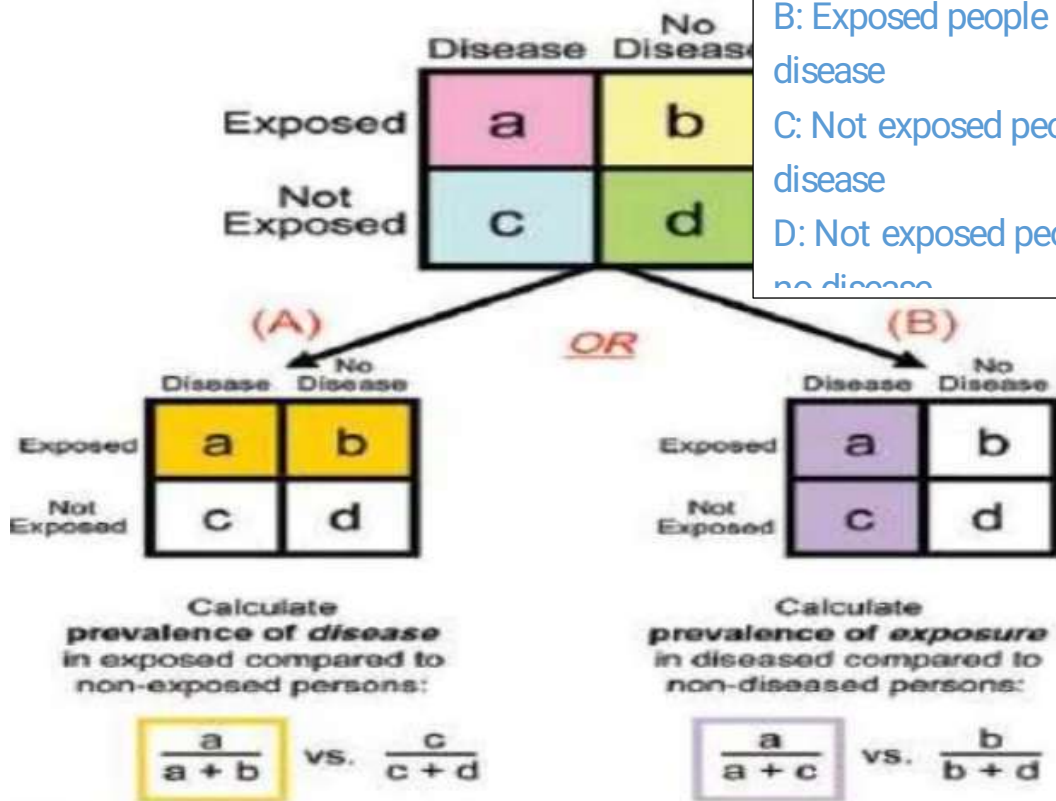
Explanation of each point in the slide above:

1) We said that in cross-sectional study there is no comparison, however when there is comparison it is called analytic study, but we still didn't break the rules of cross-sectional study, basically we chose people who are exposed & people who aren't exposed to risk factors & then we compared them to each other without a follow up

2) In cross-sectional study we look for disease & risk factors, and so the risk factors should be things that are unchangeable, like gender & age because we won't do a follow-up so the risk factors should be things that remain stable

3) We said there are 2 types of cross-sectional study. In descriptive cross-sectional study we will look for disease factor only, no comparison or analysis is done, while in analytic we will look for disease & risk factors, so risk factors should be unchangeable to avoid any errors in the study

A: Exposed people with disease  
 B: Exposed people with no disease  
 C: Not exposed people with disease  
 D: Not exposed people with no disease



The doctor read all the equations here so memorize them :3

# Uses of Cross-sectional Studies

Summary of everything we mentioned

- Assessment of **Health Status of a Population**
- **Trend Analysis** (by serial cross-sectional surveys)
  - Secular trend, Cyclic changes, Seasonal variation, Epidemics
- **Health Care Planning**
  - prioritization, target population & resource allocation
- **Clues** about Disease Causation & Prevention
  - Hypothesis generation

## Advantages of cross-sectional study:

- Quick, feasible and not time consuming (no follow up)
- Data on all variables is only collected once.
- Prevalence estimated
- The prevalence of disease or other health related characteristics are important in public health for assessing the burden of disease in a

specified population and in planning and allocating health resources.

لما اعرف حجم خطوره المرض و ضرره عالمجتمع بقدر اني اشتغل على تطوير المنظمه الصحيه بحيث انها تقلل من حدوث المرض

For example at one point of time in Egypt there was high prevalence rate of hepatitis C because of bilharzia infection causing complete liver cirrhosis at 45 & there is no cure but liver transplantation

- Good for descriptive analyses and for generating hypotheses
- We can study several diseases and or exposures

### **Cross-sectional studies disadvantages :**

- Fairly expensive
- No interpretation given by results  
Explanation of this: if a patient with cancer comes to your clinic with previous exposure to radiation, radiation is a risk factor and cancer is the disease, but we can't surely say radiation is the cause of cancer and so we can't do any conclusions or interpretations given by the results
- Recall of past events poor  
When you ask patients about previous exposure to a risk factor that caused the disease they may not remember
- No absolute risk estimates (no follow up)  
Absolute risks are measured by incidence rates  
Cross-sectional studies measure prevalence rates & not incidence rates.  
Absolute, attributable & relative risks cant be measured using cross-sectional study

- Potential temporal ambiguity

No time sequence as there is no followup

When we do cross-sectional study we look for risk factor & disease at the same time so there is no time sequence

- Inefficient for rare or highly fatal diseases or short duration diseases

- If the sample is not representative, results are representative only of the individuals who participate in the study

Example prevalence of sickle cell anaemia in the Eastern region of the KSA does not represent the whole country.

- This design is not effective if the level of disease rate is very small.

Ya3ni it can't be used for rare disease because we can't perform the study unless the disease rate is very high, so if it was rare & rate was low we can't perform it

- Not suitable for studying rare diseases or diseases with a short duration.

- Unable to measure incidence unless the duration of study allows.

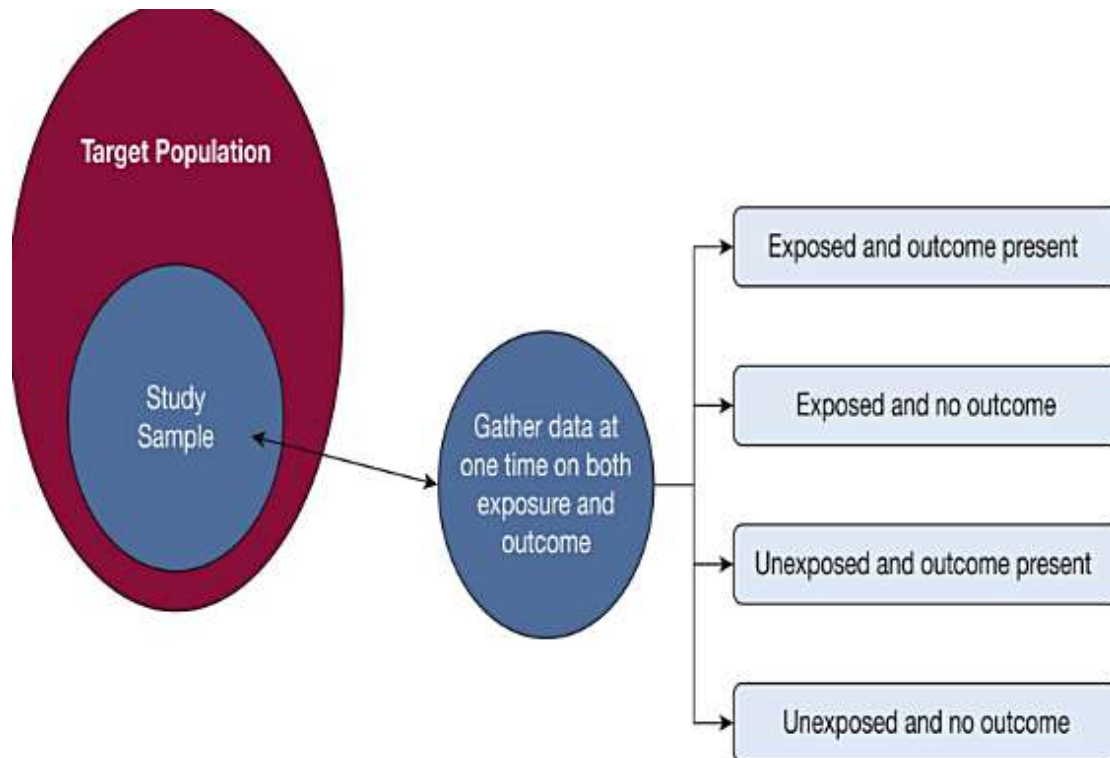
Incidence rates are new cases of the disease, so in cross-sectional study we can't measure incidence rate unless duration of study was long enough for new cases to develop

- Associations identified may be difficult to interpret.

We can't establish a cause-effect relationship

- Susceptible to bias due to low response as some people may not be interested in answering, recall bias (misclassification) when you ask some people if they had the disease and they accidentally say yes, and report bias يكون في اخطاء بالتقرير





- A sample is taken from the target population.  
The data of risk factor & outcome is gathered all at once.  
The result will be 4 of the following:
- 1) Exposed & outcome present
  - 2) Exposed & no outcome
  - 3) Unexposed and outcome present
  - 4) Unexposed & no outcome