Cross Sectional Study

Objectives:

- Recognize the concepts & uses of cross sectional studies.

-Understand the basic features of cross-sectional studies.

-List the advantages and disadvantages of cross-sectional study design

Team Members:

Hatem Alnddah - Doaa Walid - Wejdan Alzaid - Lama Alfawzan

Team Leaders: Rawan Alwadee & Mohammed ALYousef

Revised By: Maha Alghamdi

Resources:

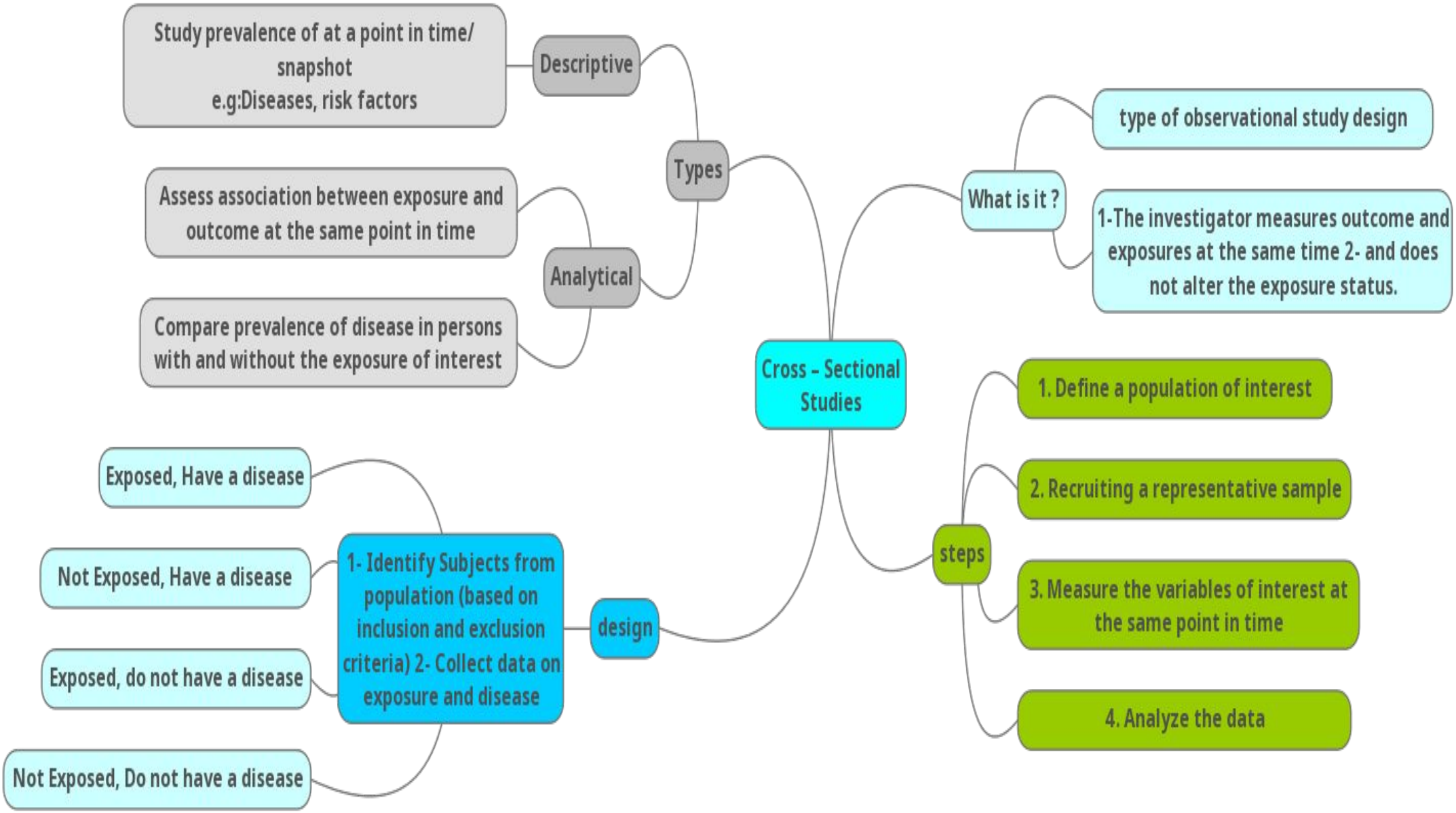
• 436 Lecture Slides + Notes

Important – Notes

436researchteam@gmail.com

Editing file

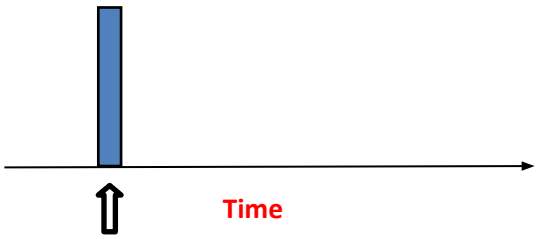
Feedback link


Cross – Sectional Studies
What is it ?
type of observational study design
1-The investigator measures outcome and exposures at the same time 2- and does not alter the exposure status.
steps
1. Define a population of interest
2. Recruiting a representative sample
3. Measure the variables of interest at the same point in time
4. Analyze the data
Types
Descriptive
Study prevalence of at a point in time/ snapshot
e.g:Diseases, risk factors
Analytical
Assess association between exposure and outcome at the same point in time
Compare prevalence of disease in persons with and without the exposure of interest
design
1- Identify Subjects from population (based on inclusion and exclusion criteria) 2- Collect data on exposure and disease
Exposed, Have a disease
Not Exposed, Have a disease
Exposed, do not have a disease
Not Exposed, Do not have a disease

What is Cross-Sectional Studies/ surveys? (prevalence study)?

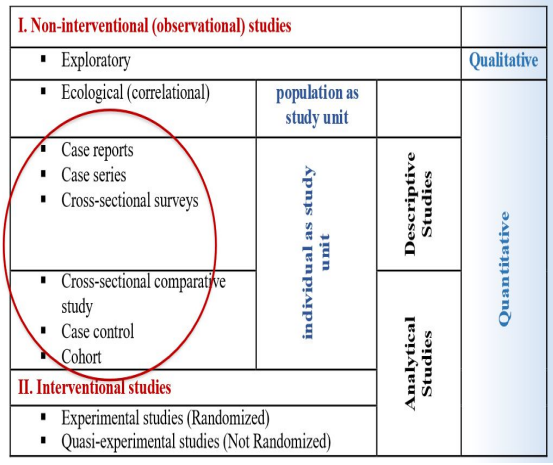
- An "**observational**" design that measures existing disease (D) and current exposure levels (E) **at a single point in time** (a cross-section of the population) .
- Exposure and disease status are assessed simultaneously among individuals in a well defined population
- The investigator does not alter the exposure status.

that's way one of the limitations is lack of temporality, that's mean we don't know what come first whether the exposure or the outcome of interest.



Study only exists at this point in time

Classification of Research Study Designs



Types of Cross-Sectional Studies

Descriptive cross-sectional studies

Study prevalence of health related events at a point in time/snapshot.

Diseases, risk factors, coverage of interventions, health service utilization, knowledge, attitude and practice.

Analytical cross-sectional studies

Assess association between exposure and outcome.

- Exposure and disease status are assessed simultaneously among individuals at the same point in time.
- Compare prevalence of disease in persons with and without the exposure of interest

If I want to compare between two prevalence at different area or different point of time > it become analytical

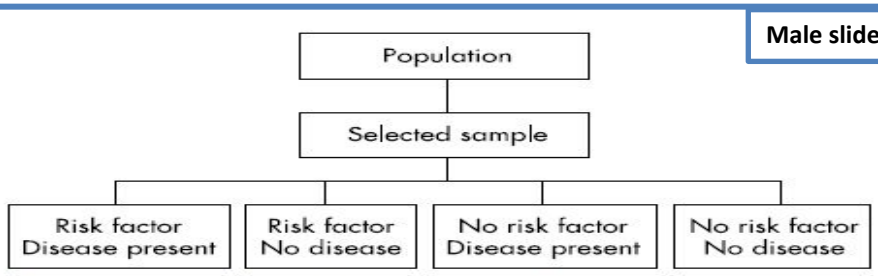
Male slides

Cross sectional studies:

- These are primarily used to determine prevalence, e.g. the number of cases in a population at a given point in time.
- All the measurements on each person are made once at one point in time.
- At one point in time the subjects are assessed to determine whether they were exposed to the relevant agent and whether they have the outcome of interest.
- If the study made at multiple points in time it will be called cohort design neither than cross sectional design.
- Associated factors are not a primary objective when using cross sectional design specially if we study a rare disease, better to use case control design.

Study design for cross sectional studies:

Male slides



You don't categorize the subjects in your sample to people with the disease and health people like in case control design, in cross sectional design you will take a random sample and may all of them fall in one category of above figure. For example " No disease, risk factors " or may the sample will distributed

Male slides

Sample of Population:

Physically active life style

Prevalence of IHD

Sedentary life style

- Prevalence of IHD

Time Frame: Present

Male slides

How to run a cross sectional study:

- Formulate the research question(s) and choose the sample population.
- Then decide what variables of the study population are relevant to the research question.
- A method for contacting sample subjects must be devised and then implemented.
- Many cross sectional studies are done using self administered questionnaires or alternatively each of the subjects may be interviewed.
- In this way the data are collected, summarized in a 2X2 table and can then be analyzed.
- The principal summary statistic of cross sectional studies is the odds ratio.

Female slides

Steps in Conducting Cross Sectional Studies:

1. Define a population of interest (reference or source population) > according to my inclusion and exclusion criteria.
2. Recruiting a representative sample (adequate size, random selection)
3. Measure the variables* of interest (disease/exposure) at the same point in time
4. Analyze the data

*E.g. If it prevalence we will measure the Prevalence
If it association we will measure the Odds Ratio

The following table lists the advantages and disadvantages of each:

Male slides

QUESTIONNAIRE	INTERVEIW
Cheap	Expensive
Low response rate	High response rate
Large sample size	Smaller sample size

Male slides

Uses of cross sectional studies (Health survey):

1. Describe the state of health
2. Burden of illness: Prevalence &Disability.
3. Burden of mortality: Death
4. Describe the distribution of risk factors & other attributes.
5. Factors associated with diseases e.g. smoking, physical activity.
6. Factors associated with use of health services e.g. awareness of services, health insurance.
7. Determine the association of various factors and diseases.
8. Make comparisons within and among various communities to determine if services are allocated according to needs.

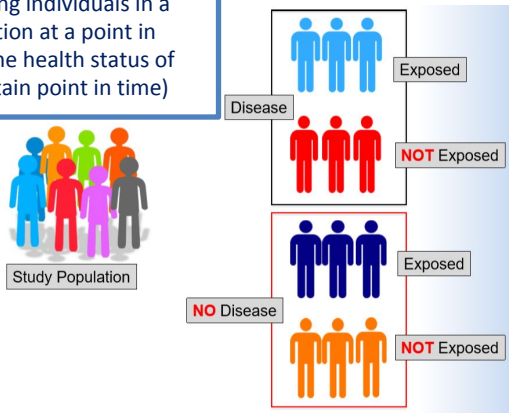
Examples of Cross-sectional Studies:

- National Surveys; National Health and Nutrition Exam Survey (NHANES) in USA
- Patient satisfaction in primary care clinics
- CHD in relation to physical exercises.
- Obesity in relation to diabetes mellitus.
- Knowledge, Attitude and Practice (KAP) about mammogram, vaccination programs,….
- A census is another example of a cross sectional study.

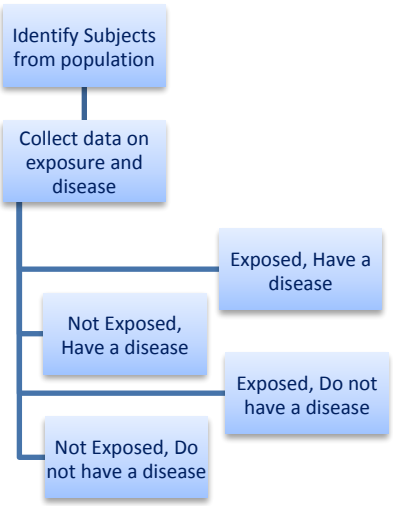
Designing Cross-Sectional Studies

- The participants in a cross-sectional study are selected based on the inclusion and exclusion criteria set for the study.
- Once the participants have been selected for the study, the investigator follows the study to assess the exposure and the outcomes

Measure disease and exposure status simultaneously among individuals in a well-defined population at a point in time. (Snapshot of the health status of populations at a certain point in time)



When I have prevalence I just calculate the date and stop, I don't care about dividing the groups. But if I have association (analytical) I care and I will divide them.



Example:

Usually survey study considered cross sectional.


Original Investigation

Electronic Cigarettes and Conventional Cigarette Use Among US Adolescents

A Cross-sectional Study

Lauren M. Dutra, ScD; Stanton A. Glantz, PhD

IMPORTANCE Electronic cigarette (e-cigarette) use is increasing rapidly among adolescents, and e-cigarettes are currently unregulated.

OBJECTIVE To examine e-cigarette use and conventional cigarette smoking.

DESIGN, SETTING, AND PARTICIPANTS Cross-sectional analyses of survey data from a representative sample of US middle and high school students in 2011 (n = 17 353) and 2012 (n = 22 529) who completed the 2011 and 2012 National Youth Tobacco Survey.

EXPOSURES Ever and current e-cigarette use.

MAIN OUTCOMES AND MEASURES Experimentation with, ever, and current smoking, and smoking abstinence.

Editorial page 601

Related articles pages 684 and 688

Supplemental content at jamapediatrics.com

Measurements in CrossSectional Studies Prevalence :

Prevalence: Number of cases in a defined population at one point in tn time / Number of persons in a defined populations at the same point in time

Prevalence, Example

Research Topic: prevalence of vitiligo in a village.

Design: population-based survey was designed to assess the prevalence of this condition.

We go to all the houses that were supposed to be included in the study and examine the population. The total sample surveyed is 5686. Of these, we found that 98 individuals have vitiligo.

The prevalence of vitiligo in this community is:

Prevalence = 98\5686 or 17.23

We can't calculate the incidence in cross sectional study. So what is the best design for incidence? Cohort study

Because in cohort I choose them free of the disease from the beginning so I can determine the incidence or the new cases.

Odd ratio (OR):

The OR is AD/BC 50*90 \ 10*150 OR is 3.0

ضرب اكس

Interpretation: the odd of having HIV positive is three time greater in female compare to male.

Total	HIV negative	HIV positive	
200	150	50	Males
100	90	10	Females
300	240	60	

Example Cross-sectional Study:

* A cross-sectional study of maternal smoking as a risk factor for infant colic. The results of the study are shown below

	Infant colic	No infant colic	Total
Mother smoking	15	167	182
Mother not smoking	111	2477	2588
	126	2644	2770

- Prevalence of colic with smoking mothers = a/(a + b) = 15/182 = 8.2%.
- Prevalence of colic with nonsmoking mothers = c/(c+ d) = 111/2,588 = 4.3%.
- Prevalence of colic overall = (a + c)/(a + b + c + d) = 126/2,770 = 4.5%.

Advantages of Cross-sectional Studies:

- Cross sectional studies are the best way to determine prevalence rates;
  - Can estimate overall and specific disease prevalence rates
  - Can estimate exposure proportions/prevalence in the population.
- They are useful at identifying associations and generating hypotheses about the cause of disease
- They are useful to study conditions that are relatively frequent with long duration (chronic conditions)
- Relatively easy, quick and inexpensive. Because
  - Only one group is used, data are collected only once and multiple outcomes can be studied
  - As there is no follow up, less time and resources are required to run the study.
- Minimal ethical problems because no intervention is applied.
- Can be used to estimate the risk by calculating the odds ratio.

Disadvantages of Cross-sectional Studies:

1. The most important problem with cross sectional study is that they do not differentiate between cause and effect or the sequence of events;
   - Thus temporal sequence of exposure and effect may be difficult to determine; Chicken-egg dilemma)
   - For example, a study finding an association between low CD4 counts and HIV infection does not demonstrate whether HIV infection lowers CD4 levels or low CD4 levels predispose to HIV infection.
   - To differentiate between cause and effect do an Experimental study.
2. Rare conditions cannot efficiently be studied using cross sectional studies because even in large samples there may be no one with the disease. In this situation it is better to study a cross sectional sample of patients who already have the disease (a case series).
3. It deals with survivors so, Not appropriate for studying highly fatal diseases or a disease with short duration of expression
4. Not useful for establishing causal relationships
5. Confounding is difficult to control.

Bias in Cross-Sectional studies:

Selection bias:

- Occurs in the design phase of studies. It may also occur during the execution of study when some subjects are included and not others.
- Errors in the estimation of effect happens when characteristics of the subjects selected for the study are systematically different from those in the target population.
- Non-response bias. What is the methods to improve the response rate? Send reminder – electronic survey

Confounding bias: most common confounding factors : Age and Sex

- Occurs when the exposure effect is mixed with the effect of extraneous variables.
- To be confounding, and extraneous variable must have the following characteristics:
  - ✓ It must be a risk factor for disease.
  - ✓ It must be associated with the exposure under study in the population studied.
  - ✓ It must not be an intermediate steps in the casual path between the exposures and the disease.

Confounding criteria: related to exposure, related to the outcomes and not in the bath way.

Cross-sectional strengths and weakness:

Weakness	Strengths
• Temporal sequence between exposure and disease can not be established. E.g. We want to assess the relationships between the inactivity and developing diabetes; we don't know whether those patient are inactive because they are obese or they are obese because they are inactive • Can not determine causality. • More vulnerable to bias. . Specially selection bias	• Less time consuming. A lot of information in short time • Less expensive. • No loss to follow up. • Provides more information. From one questionnaire I can get a lot of information • Helps to determine prevalence (disease burden) • Multiple factors and outcomes at same point in time can be studied. • Useful for public health planning, monitoring, and evaluation.