CMED 305

Cross-Sectional Studies

Nurah Alamro, MD. MPH. DrPH.

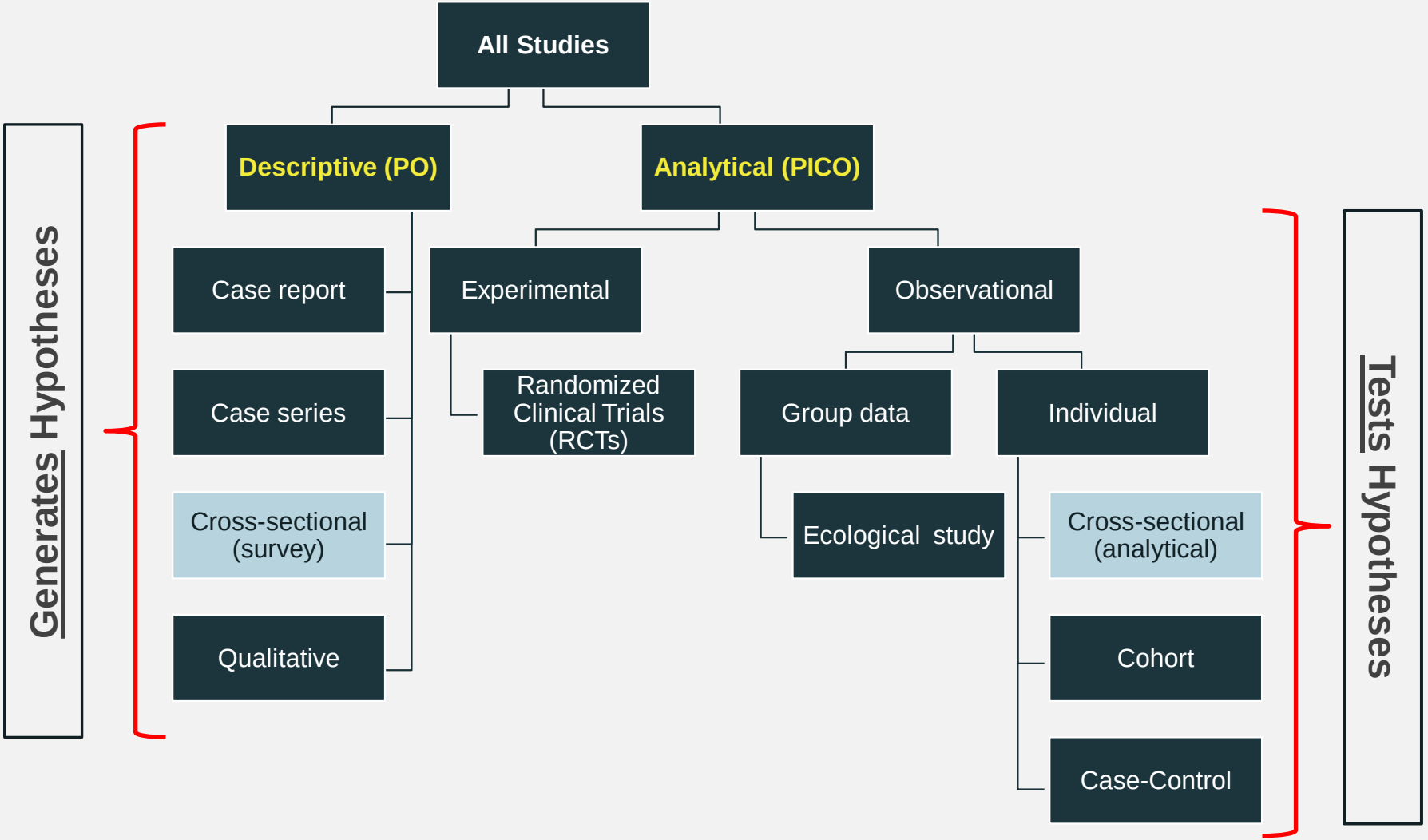
Assistant Professor - Community Medicine Unit,
Family & Community Medicine Department

nmalamro@ksu.edu.sa

Learning Objectives: By end of this session students will be able to:

1. Describe types of cross-sectional studies
2. Identify steps for conducting cross-sectional studies
3. Identify issues in the design of cross-sectional studies
4. Describe the strengths and weaknesses of cross-sectional studies

1 Types of cross-sectional studies


All Studies
Descriptive (PO)
Analytical (PICO)
Case report
Case series
Cross-sectional (survey)
Qualitative
Experimental
Randomized Clinical Trials (RCTs)
Observational
Group data
Individual
Ecological study
Cross-sectional (analytical)
Cohort
Case-Control
Generates Hypotheses
Tests Hypotheses

A cross-sectional study is a study that either quantifies an outcome of interest **AND/OR** examines the relationship between disease (or other health related state) and other variables of interest as they exist in a defined population at a single point in time or over a short period of time.

Types of Cross-Sectional Studies

Descriptive

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

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

In practice, cross-sectional studies will include an element of both types of design.

When to Conduct a Cross- Sectional Study

- To estimate **prevalence** of a **health condition** or **prevalence** of a behavior or **risk factor**
- To learn about **characteristics** such as knowledge, attitude and practices of individuals in a population
- To **monitor trends over time** with serial cross-sectional studies (National example of cross-sectional studies of great importance is the National Health and Nutrition Surveys (**NHANES**)).

2 How to conduct a cross-sectional study?

Steps in conducting a cross-sectional study

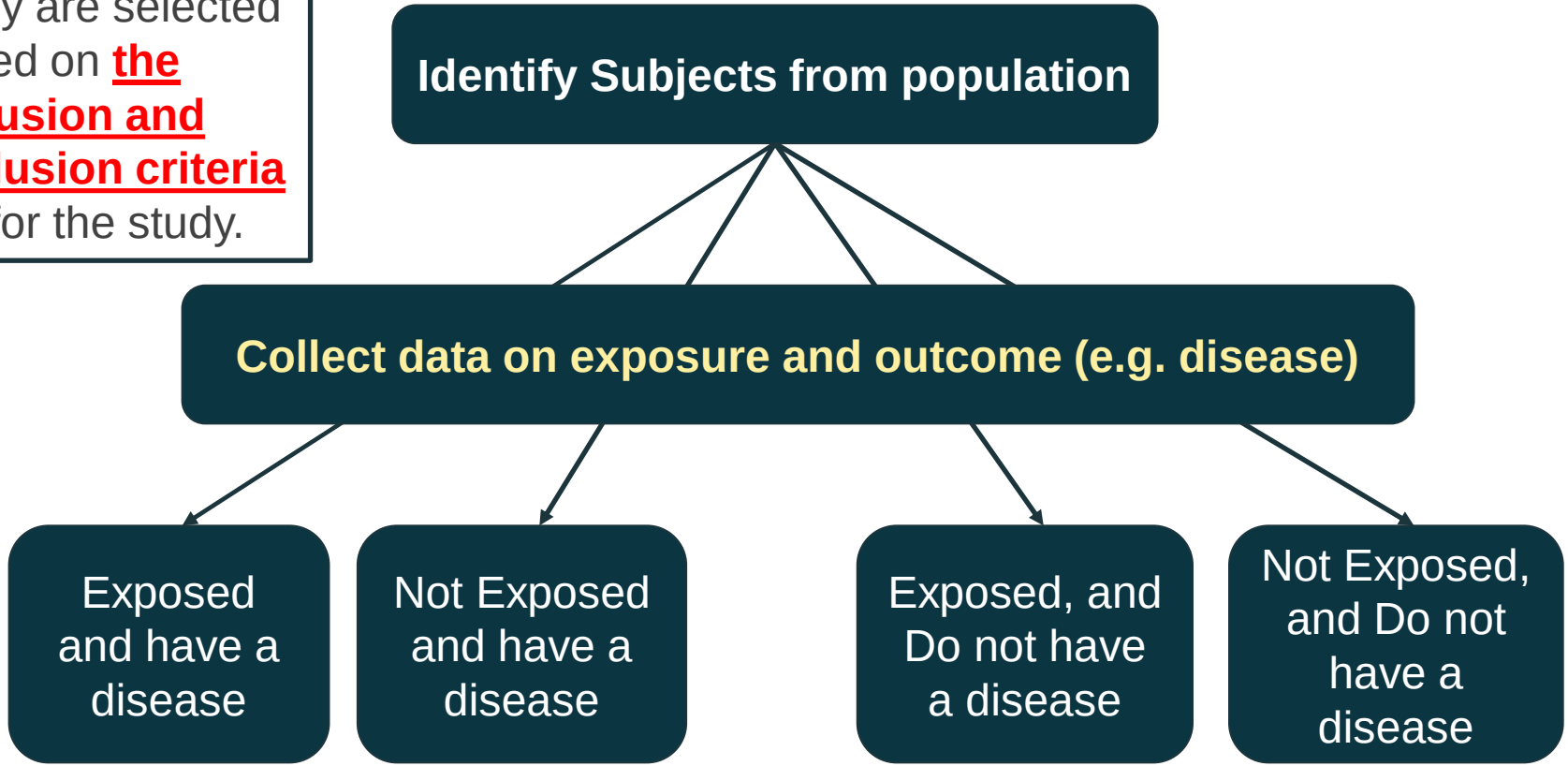
1- Define a **population** of interest (reference or source population)

2- Recruit a representative **sample** (adequate size, random selection)

3- Measure the **variables** of interest (exposure/outcome) at the same point in time

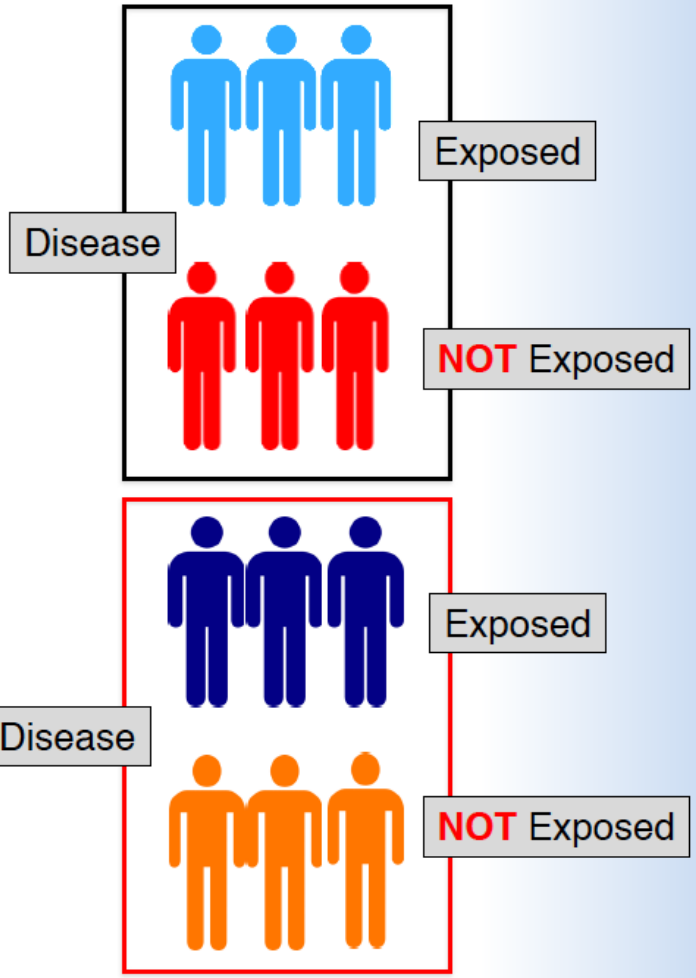
4- Analyze the **data**

The participants in a cross-sectional study are selected based on **the inclusion and exclusion criteria** set for the study.

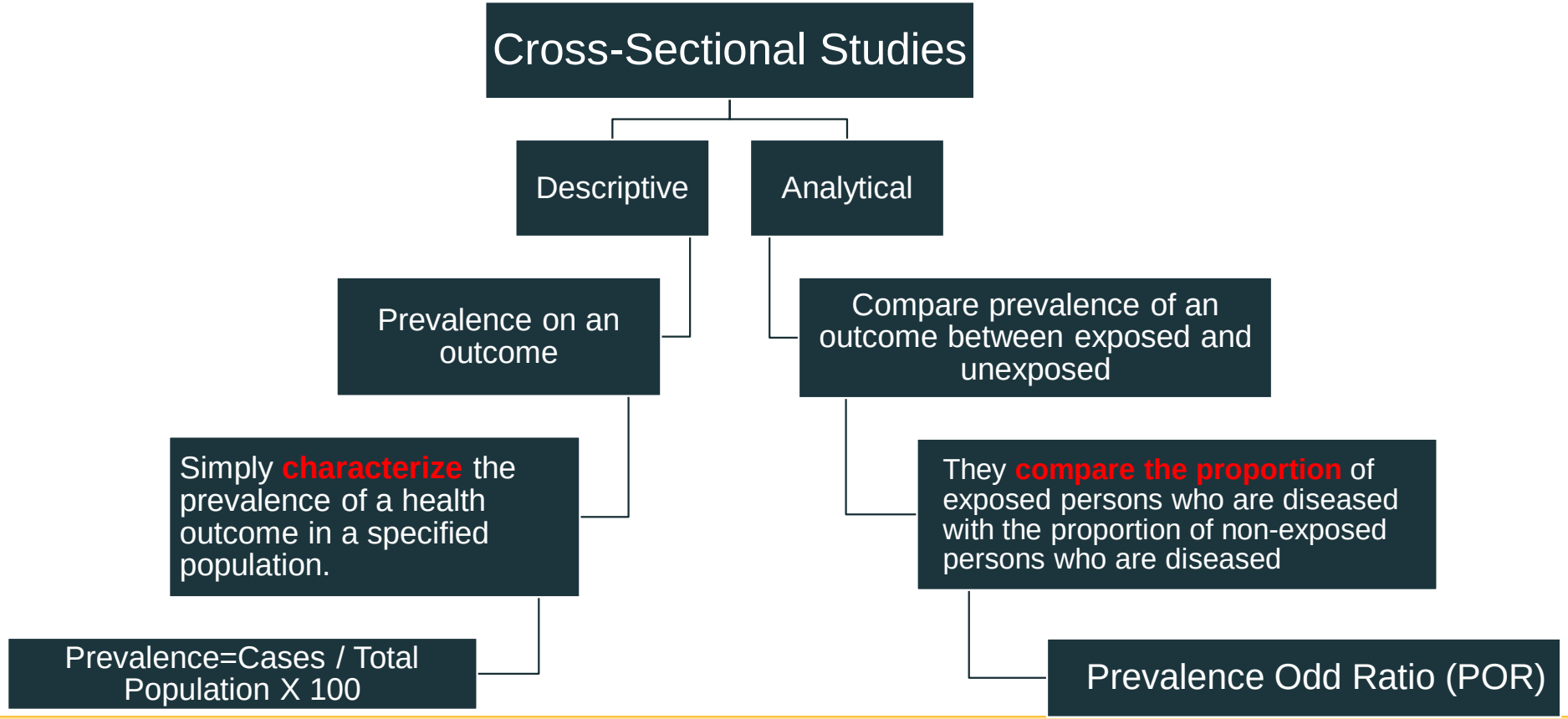


Measure disease and exposure status simultaneously among individuals in a well-defined population at a point in time.
(Snapshot of the health status of populations at a certain point in time)

Study Population



Measurement & Analysis in Cross-Sectional studies



Vaping and Advertisement

You identify a random sample of young adults aged 18 – 25 at city of Riyadh.

Exposure: Ads about vaping **Outcome:** Vaping

	Vaping	Not Vaping	Total
Ads	50	200	250
No Ads	50	700	750
Total	100	900	1000

	Vaping	Not Vaping	Total
Ads	50	200	250
No Ads	50	700	750
Total	100	900	1000

Descriptive Cross-Sectional:

What is the prevalence of vaping?

=Number of people who vape/ Total population X 100

= 100 /1000 X 100

= 10%

Analytical Cross-Sectional:

Does the prevalence of vaping vary by the status of exposure to advertisement?

I.e. What are the odds of vaping given exposure to advertisement versus not exposed to advertisement?

	Vaping		Not Vaping		Total
Ads	50	**a**	200	**b**	250
No Ads	50	**c**	700	**d**	750
Total	100		900		1000

Analytical Cross-Sectional:

Does the prevalence of vaping vary by the status of exposure to advertisement?

i.e. What are the odds of vaping given exposure to advertisement versus not exposed to advertisement?

OR = odds an exposed person develop the outcome (a/b)
odds an unexposed person develop the outcome (c/d)

= **ad / bc**

= (50X700) / (200X50) = 3.5

What does 3.5 mean??

The odds of vaping is 3.5 times higher after seeing a vaping advertisement as opposed to not seeing one.

{3 Issues in the design of cross-sectional studies}

Choosing a representative sample

- A cross-sectional study should be representative of the population if generalizations from the findings are to have any validity.
- For example, a study of the prevalence of diabetes among women aged 40-60 years in Town A should comprise a random sample of all women aged 40-60 years in that town.

Sample Size

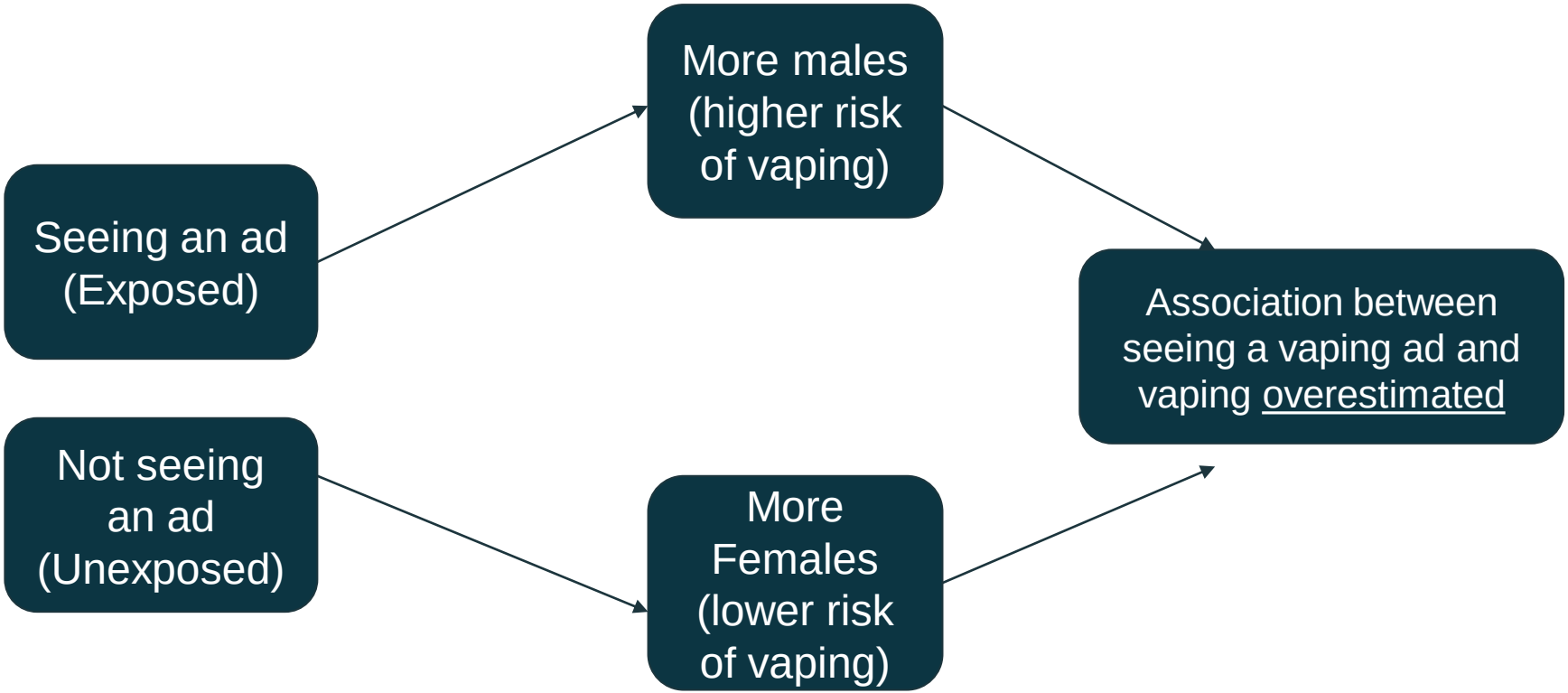
- The sample size should be sufficiently large enough to estimate the prevalence of the conditions of interest with adequate precision.
- Sample size calculations can be carried out using sample size tables or statistical packages such as Epi Info.

Biases in Cross-Sectional Studies

1. **Selection Bias:** when the study participants are systematically different in their characteristics compared with eligible participants who were not selected for the study. **Common type:** Non-response bias.

2. **Recall bias**

3. **Confounding!**


More males (higher risk of vaping)
Seeing an ad (Exposed)
Association between seeing a vaping ad and vaping overestimated
Not seeing an ad (Unexposed)
More Females (lower risk of vaping)
Confounding

{4 Strengths & Weaknesses }

Strengths

- Relatively quick and easy to conduct
- Data on all variables is only collected once.
- Able to measure prevalence for all factors under investigation.
- Multiple outcomes and exposures can be studied.
- Good for descriptive analyses and for generating hypotheses.

Weakness

- Difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome.
- Difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome.
- Associations identified may be difficult to interpret.
- Susceptible to bias due to low response and misclassification due to recall bias.

Thank you!

Office Hours (by appointment via email):

Mondays & Wednesdays
11 AM – 1 PM
College of Medicine West Building
Level 1 - Office 4011034

---

nmalamro@ksu.edu.sa

References:

- Celentano, David D., and Scd Mhs. Gordis Epidemiology. Elsevier, 2018.
- Hulley, Stephen B., ed. Designing clinical research. Lippincott Williams & Wilkins, 2007.
- Haynes, R. Brian. Clinical epidemiology: how to do clinical practice research. Lippincott williams & wilkins, 2012.
- Carlson, Melissa DA, and R. Sean Morrison. "Study design, precision, and validity in observational studies." Journal of palliative medicine 12.1 (2009): 77-82.
- The Centre for Evidence-Based Medicine develops, promotes and disseminates better evidence for healthcare. Study Design. NA. Accessed September 13, 2019: https://www.cebm.net/2014/04/study-designs/