

ERRORS IN MEDICAL STUDIES

BACHELOR THESIS
VITH YEAR, 2019-2020

Errors

- 1. Types of errors in data collection**
- 2. Measurement errors**
- 3. Errors in hypothesis testing**

Types of errors in data collection

SELECTION ERRORS

Vary depending on **data collection method**

- Cohort collection:
 - ☐ Non-response error
 - ☐ Surveillance error
- Control group collection:
 - ☐ Non-response error
 - ☐ Diagnostic error
 - ☐ Administration error
 - ☐ Survival error

TO AVOID this type of error:

- Select patients and witnesses **without knowing their status** related to the exposing factors or to the disease taken into study
- All cases should be selected from the same area
- Use objective criteria in disease diagnosis

Types of errors in data collection

INFORMATIONAL ERRORS

Generally determined by an incorrect measurement or defect measuring tool:

- ☐ **Memory errors**
- ☐ **Investigation errors**
- ☐ **Omission errors**
- ☐ **Data quality errors**

TO REDUCE this type of errors:

- Special training of people that perform the interview
- Use of blind or double blind studies
- Use of specific measurement criteria
- Record of great number of data by using large samples

Types of errors in data collection

CONFUSION ERRORS

Factors that may independently influence the risk of disease, altering the results

EG.:

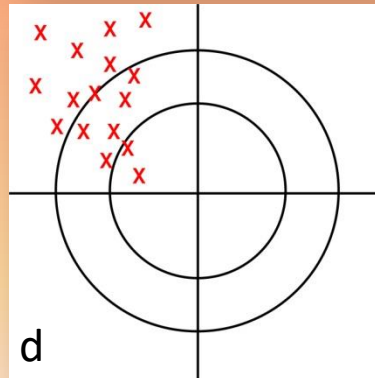
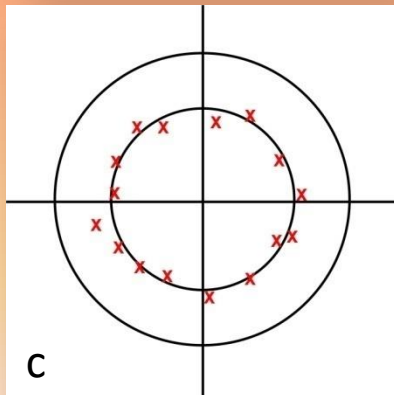
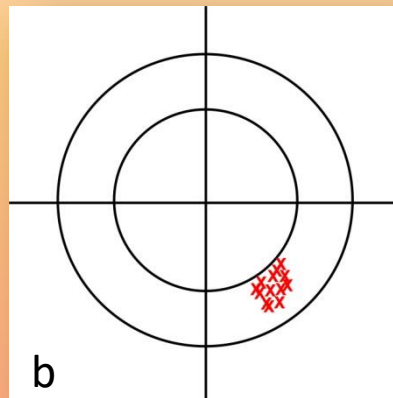
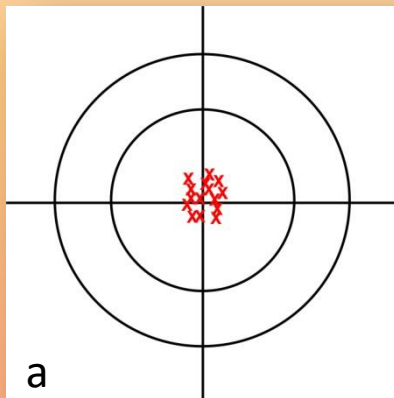
- Association between smoking and increased risk of periodontal disease
- Association between diabetes and increased risk of periodontal disease

!!! INFORMATION and SELECTION ERRORS may be eliminated **only at the beginning** of the research

The control of the **CONFUSION FACTORS** may be realized **even after** data collection and **during the analysis** of data

Measurement errors

Depending on precision, presence/absence of errors, measurements may be:



- a - precise, without errors
- b - precise, with errors
- c - imprecise, without errors
- d - imprecise, with errors

Measurement errors

They **OVER-/UNDERESTIMATE** the real value even if it is precise

Causes:

- Due to investigator
- Due to subject
- Due to equipment

Errors in hypothesis testing

Two types of errors:

- Type I
- Type II

Null Hypothesis (H_0) – there are NO significant differences between the two groups

Alternative Hypothesis (H_1) – opposing the first, THERE ARE significant differences between the two groups

Errors in hypothesis testing

Type I error

- When null hypothesis H_0 is **rejected**, but it is **true**
- Generates a **false-positive** result
- The possibility to have this error is noted with α

Type II error

- When null hypothesis H_0 is **accepted**, but it is **false**
- Generates a **false-negative** result
- The possibility to have this error is noted with β

Errors in hypothesis testing

	Accept H_0	Reject H_0
H_0 true	Correct decision	Type I error (false-positive) α Probability
H_0 false	Type II error (false-negative) β Probability	Correct decision

Exercise no.1

Please indicate possible errors which could appear in your research (data collection errors, selection errors, measurement errors).