Research is divided mainly into :

1.**qualitative research**: concerned with taking history from patients ; narration about patients.

2.**quantitative research**: contains information about patients collected by questionnaire, for example asking about age category.

 2.a experimental research : what we are mostly concerned about in the medical field, because we base our decisions on its results.

 2.a.1 true experimental research

 2.a.2 pre- experimental research

 2.b non-experimental research: could be surveys or retrospective studies

*Extra: what is the difference between Qualitative Research and Quantitative Research?*

*Qualitative Research is primarily exploratory research. It is used to gain an understanding of underlying reasons, opinions, and motivations.. Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews, and participation/observations. The sample size is typically small, and respondents are selected to fulfill a given quota.*

*Quantitative Research is used to quantify the problem by way of generating numerical data or data that can be transformed into useable statistics. It is used to quantify attitudes, opinions, behaviors, and other defined variables – and generalize results from a larger sample population. Quantitative data collection methods are much more structured than Qualitative data collection methods. Quantitative data collection methods include various forms of surveys, face-to-face interviews,*[*telephone interviews*](https://www.snapsurveys.com/phone-surveys/)*, longitudinal studies, website interceptors, online polls, and systematic observations.*

There is no room for trial and error in the medical field, so we depend on randomized clinical trials and most importantly on the statistical inference .

Statistical evidence is very important part of the true experimental research provided that the design of the study is of high quality. so a good statistical evidence that came from a weak study is not of any importance.

For the design to be of a good quality it must have 3 factors :

1.having **intervention**; manipulation

2. the sample must be **randomized**, There are 2 conditions for having a good sample: Being Adequate and representative

Adequacy is measured by an accessible software called G\*power which calculates the estimated sample size .

If the sample was selected based on the **scientific** randomization then it's definitely representative of the population . for a sample to be representative it has to be about 10% of the population . if a study was made on the JU students for example, we need 10% which is about 4000 student and these 4000 have to be representative of each faculty and it would be even better if it represented the students of each year equally.

3.**control** . having a group that takes placebo which doesn’t contain the active ingredient that is being researched about . so placebo could be another medication that the patient already takes for that disease but he thinks that he is taking the new one or it could be simply sugar.

 Statistics summaries a lot about the evidence related to a specific topic.

Systematic review : reviewing a significant amount of literature about a specific topic, one very important indicator is the analysis of the statistical procedures.

To be able to describe a population based on the results of a study we have to generalize the results, because we study only a sample not the whole population.

Target population : the group that the researcher targets with his study.

From the target population we get what is called the accessible population : people that can be accessed by time, effort and money.

So we have target 🡪 accessible 🡪 sample

And the statistical parameters always express the sample.

* Statistics : A branch of applied math. that deals with collecting, organizing and interpreting data using well-defined procedures.

We start to think about statistical analysis at the time we start to think about the research idea, we don’t wait until we finish collecting data. So we first organize the data then analyze it then we do interpretation.

Due to the lack of time we are going to jump immediately to interpretation of the statistical data .

We have 2 types of statistical data :

Descriptive and inferential

1.Descriptive : includes mean, median, standard deviation

2.Inferential : more advanced

Variable: anything that is changeable during the study time.

Taking for example smoking and lung cancer : We have 2 variables, smoking and lung cancer. The independent variable is smoking and the dependent is lung cancer.

Ex.2 in the relationship between the salary and the turnover.The salary is the independent variable.

Ex.3 CVD and cholesterol ( HDL and LDL ),CVD is the dependent.

The statistical analysis depends on being able to identify and know the DEPENDENT variable.

The type of dependent variable is what determines the type of statics that is going to be used. Failure to identify the dependent variable results in using the wrong type of statics, giving errors at the end.

OUTCOMES of a study express the DEPENDENT variable.

When asking about age in a survey we could ask for

1.years only

2.years/months/days

3.a range (20-39..40-59..)

It is best to ask for a specific data(specific age for ex.) as it is easy to go down the scale and simplify the data than to start with the basic and try to upgrade it.-if we asked for a range we can't know the exact age later on-.

**Levels of measurement :**

We have 3 basic (originally 4) levels:

1.**nominal** :giving arbitrary numbers only as a coding system but they don't mean anything.

nominal dichotomous : 2 categories M=1 F=2 , yes/no, 0/1

Nominal categorical : when more than 2

2. **ordinal** : to some extend the numbers mean something but it's not that accurate. For example: survey that asks to give :4 for strongly agreeing, 3for agreeing, 2 for neutral, 1 for disagreeing and 0 for strongly disagreeing. So these numbers indicate the difference but because they don’t have a measuring unit they aren’t that accurate.

3.**scale** (also called cont. level of measurement):

Basically it is 2 levels of measurement :ratio and interval.

For example saying that a pt has a HR of 120 means that he has tachycardia or saying that his temperature is 39.1 means that he has low grade fever .So the number means itself here, and it can be handled mathematically ( added , subtracted..)

**Difference between interval and ratio:**

Interval: there is no absolute zero

Ratio: there is absolute zero

Otherwise they are the same

In slide 19: the ratio is the highest level of measurement so we can convert it to the lower levels( interval, ordinal, nominal) but the opposite isn’t true, the ratio here is the weight of these participants.

Converting ratio to interval :

 we took the lowest weight ratio and subtracted it from the ratio of others.

 so for subject 1=180-110=70 kg

converting interval to ordinal:

we put them in order; lowest 🡪 highest

Ordinal to nominal:

we created a cut-off point which was 130 kg ; lower 🡪1 , higher 🡪2

This helps in the decision making for these pts. category 1 -according to the nominal- needs plastic surgery, while category 2 needs gastric surgery.

The ratio is the highest level of measurement but according to statics it is treated the same as interval level.

To make it clear, if we asked the students in the classroom to give their age and it ranged from 17-25 each number is a ratio (17 is a ratio, 18 is a ratio.. ) then we can make intervals to categorize these students according to their age but these intervals must me equal 17-19 is category 1 or interval 1 then 20-22 is interval 2 and so on

Usually intervals are used for biophysiological measurements ( BP,HR, )

The difference between the ordinal and the interval measurements is that the ordinal doesn’t have to be in equal categories unlike intervals.

Important thing to understand is that there is 2 types of sciences 1.medical sciences 2. Other sciences

In the medical one we arbitrarily say that any physiological measurement is a ratio although it can't be absolutely zero, for ex no one has a HR of zero or weighs zero kg, but in physical science this can be true if he was an astronaut .