Biostatistics

◉ Sheet   **○ Slides**

Number

1

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Introduction to Biostatistics & Epidemiology

The details will be recalled later on in this course so no worries ☺

Q: What Is the connection between biostatistics and epidemiology?
A: The tool of epidemiology = Biostatistics

Do you have any idea about research hypothesis? Here is some background information to give you a general idea:

We start off with:
1. Figuring out the problem
2. Assessing the problem
3. Writing the significancy and the purposes
4. Writing the research questions and hypothesis
5. Biostatistics
6. Dealing with collecting the data and organizing it
7. Analyzing
8. Changing the numbers to words (which is the discussion chapter)
    a. ***What is a discussion*** *?* The first two chapters + the half of the third chapter of your project is dealing with research methods and only a small section of the methodology propose data analysis and results are the job of the biostat, then after that in the discussion you will change the numbers to words.
        • From the implications, summary, implementations, barriers, conclusions etc.

Briefly about the general introduction

1. We have to test the hypothesis
2. We have to know the introduction of research
3. Definitions of *variables*, *hypothesis*, *significancy*, *type 1* and *type 2 errors* etc....

What do the research methods mean? (He asked this question multiple times)

1. Scientific collection of data that may solve a problem
2. Steps or series
3. Dependent on *empirical data* – depends on the five senses (nothing we study goes out of these 5 senses—that would be considered supernatural and cannot be studied), therefore we must gather the data for us to <u>study</u> them, if not, we call it propaganda.

There are two types of study the phenomena (that relate to qualitative and quantitative research)

1. **Naturalistic**
   a. Related to the qualitative method of research
      * Qualitative – is word oriented
      * Example: qualitative research requires a small sample size of too many questions, because they go in depth and require interviews (of too many questions) and it depends on themes as well as stories.
      * We CANNOT generalize. (Ex: if you study a group of women, and their physical, social, psychological abuse in the US, you cannot generalize in a qualitative research in Jordan because you have to take another group of women here to study them here in depth)

2. **Positivism**
   a. Related to the quantitative methods of research
      * Quantitative – is number oriented
      * Example: So now when were dealing with population and we're taking the study sample, the quantitative requires large sample size with few questions.
      * We also translate the questions to numbers in order to enter it in mathematical software such as Excel. But in this course the doctor will orient you to the **SPSS** method. (Statistical Package for Social Science)
      * We can generalize and test hypothesis with numbers.

Main Question: why are we talking about all of this?

In biostat we work on **quantitative** research and not qualitative, because qualitative research requires stories and themes.

a. Example 1: You study 15 students medical students in 4th ,5th ,6th year and you ask them about their experience in school medicine in depth, maybe the amount of lectures, the time, the clinical part of the curriculum, the stress, the money you pay, the experience.

b. Example 2: You study the experience of women that have breast cancer, and went on chemotherapy, just experiences, but you cannot generalize their experiences here with the women who live in China for example.

(0:00-10:00)

We finished talking about quantitative research and generalization, now lets talk about designs.

Now the design, specifically the qualitative research designs in simple terms is exploring issues, understanding the phenomena, and answering questions by analyzing and making sense of unstructured data.

The designs of qualitative research are as follows:

1. *Phenomenology design:* studies the experiences of people in any phenomena
    a. Ex: someone that suffered from influenza, and they survived and you want to know about their experience for other people who may be susceptible to this disease so they can have some background information on it.

2. *Ethnography*
    a. Study the cultures, usually not in medicine.

3. *Biography*
    a. Study the story of that person.

4. *Case study*
   a. Plot is on you, 4th year you'll have a case, you have to study the case from A to Z, no numbers, however, it will be qualitative, but you can change the information to numbers so it can actually be quantitative as well. So case study is both qualitative and quantitative.

5. *Grounded theory*
   a. When you figure out a theory grounded in the data coming from the participants. This is very advanced, so you only have to be familiar with the term.

Inferential Statistics:

1. **Parametric techniques**
   *Examples: (Z-tests, t-tests, ANOVA, Pearson's)
   (Discussed in details later in the course.)
2. **Nonparametric techniques**
   a) Nominal Data: data in the first level (ex. Chi-Square)
   b) Ordinal Data
      *Example: Mann Whitney U test
      *Example: Kruskal Wallis Test

Quantitative (2 types) – experimental and non-experimental

1. *Experimental* (called clinical trials when talking about medicine/in hospitals. It is called experimental in the lab.)
   It is divided into 3 types:

   a. **True experimental design** (Most famous)
   - 3 requirements:
   - Control group (1)
   - Randomized (2)
   - Ex: take the entire group (400 students) and split everyone up equally depending on your abilities, some sort of matching.

➢ _Online definition_: **Randomization** refers to the practice of using chance methods (random number tables, flipping a coin, etc.) to assign subjects to treatments. In this way, the potential effects of lurking variables are distributed at chance levels (hopefully roughly evenly) across treatment conditions.

- Manipulation (3)

b. **Quasi:**
- Control
- Manipulation
- Example: If I want to study a particulator issue of 2ⁿᵈ year medical students, to compare the 4 different sections we use this technique since it's already divided and the researcher has no power over the divisions. —_So no randomization._

c. **Pre-experimental:**
- Manipulation

2. _Non- experimental_
a. Prospective – cohorts—we _can_ use clinical trials
b. Retrospective—we _cannot_ use clinical trials—we cannot manipulate independent variables
- Example: We cannot force someone to smoke (**_manipulation_**) because it is not ethical
- _What do we mean by manipulation_? It is the treatment we give, which is the independent variable. Ex: Chemotherapy, Antibiotics, procedures…

(10:00-20:00)

ABOUT THE PROJECT:

***In our project, the doctor discusses the different sources we can choose our topic from, including newspapers, the university website has some interesting articles, and the most recommended: ISI journals worldwide. You read about it and look at the questionnaire published online along with the

measurements especially. (Don't go for something that will ask you to get blood tests, be practical). Look for something like a cross sectional- survey (which is a point of time that can manipulate the independent variable.) Also make sure the measurements that are published online are allowed in this country. Then in the measurements you have to check the psychometric properties—the *validity* and *reliability*, if the Cronbach's alpha is over .6 it is a reliable questionnaire that you can use (you will never see a value of 0 or 1)… Example: reliable car takes you from A to B; as a result you can rely on it. It must be consistent, and measure the same concept even after some time. Example: The value is still the same after ten days. It should also be valid. What does valid mean? Example: if you have a biostat exam, you shouldn't see any other material like physics included, it would be considered invalid. So for the project, just mention a brief paragraph from the questionnaire about the reliability and validity. ***

(20:00-30:00)

Last thing: Now, the research hypothesis and research questions (this is also for the project) → IMPORTANT:

Definition: It is an assumption in the head of the researcher or a question that you think about which you eventually want to answer. A bond between at least two variables that is not tested yet, which is known as an assumption.
  ➢ How to test a hypothesis? Example: stress vs. grades and the relationship between the two ways

There are two types of hypothesis:

ATTENTION! ***(He said this will come on the exam) ***

1. *Alternative* (research) hypothesis—a relationship between the two, if it's:
    • General, it is non-directional
    • One sided, it is one directional
2. *Statistical (*Null) hypothesis

Type of Research	Research Hypothesis
Qualitative description	No
Quantitative Experimental	Yes
Quantitative Co-relational	Yes

LAST QUESTION: *why do we need research methods?*

1. Decision makers, to provide some data for the policy makers
2. Uses of the statistics in medicine
3. To test hypothesis
4. Generalization
5. Predictions---different types of risk factors for a specific disease
6. For biostat—ex: allowance
7. Promotions
8. Everyday life ---ex: allowance

(30:00- 40:00)

~SUCCESS IS NO ACCIDENT~
It is hard work, perseverance, learning, studying, sacrifice, and most of all,
love *of what you are doing.*