Course : Research statistics **Lecturer : Pr. Saliha CHELLI**

Level : Master 1

Part two : Basics of research

Lecture : 3

Introduction of Statistics

Lecture objectives : introducing the types of statistics in addition to the nature of data and levels of measurement.

Introduction

The study of statistics has become more popular than ever over the past four decades or so. The increasing availablility of computers and statistical packages has enlarged the role of statistics as a tool of empirical research. Like almost all fields of study, statistics has two aspects: **Theoretical and applied**. The former, also called mathematical statistics, deals with the development of theorems, formulas, rules, and laws. The latter involves the application of those theorems, formulas, rules and laws. The main aim of this lecture is to introduce statistics including the nature of data as well as the levels of measuement that can be used.

1. Definition of statistics

The word statistics has two meanings. In the most common usage, statistics refers to **numerical facts**. The second meaning of statistics refers to the **field or discipline of study**. In this sense, statistics is a group of methods used to collect, analyze, present and interprete data and make decisions (Mann & Lacke, 2010).

2. Function of statistics

Statistics provides methods for:1/**Design:** Planning and carrying out research studies.
2 /**Description**:Summarizing and exploring data. 3/**Inference**: Making predictions and generalizations about phenomena represented by data*

3. Types of statistics

Broadly speaking, statistics can be divided into two areas: descriptive statistics and inferential statistics.**Descriptive statistics** consists of methods for organizing, displaying and descibing data by using tables, graphs and summary methods.while **Inferential statistics** consists of methods that use sample results to help make decisions or prediction about a population (Mann & Lacke, 2010)

In statistics, we commonly use these key terms

Population and sample.

* Population is the complete collection of elements to be studied.

* Sample is a sub collection of elements drawn from a population.

Variables: numerical or categorical.

Data are the actual values of the variable. They may be numbers or words.

3.Nature of data

Two types of data can be identified as **qualitatitve** and **quantitative data**.

1. Qualitative data deal with characteristics and descriptors that cannot be easilty measured.

It can be separated into different categories that are distinguished by some non- numerical characteristics.

Qualitative data are the result of categorizing or describing attributes of a population. Ethnic group, hair colour, blood type are all types of qualitative data. They are generally described by words or letters

a. Quantitative data consist of numbers representing counts and measurements.

Discrete data (counts) have finite values such as sex and race and can be grouped into mutually exclusive categories. For example, the number of students in class or the number of children in a family (you can't have 2.5 children.

Continuous data (measurements) such as age, height, weight are infinitely divisible.

* The statistical test to apply to data depends on whether the variables are discrete or continuous. A judgement error will lead to flawed conclusions

5.Levels of measurement

The way a set of data is measured is called its level of measurement. Data can classified into four levels of measurement.They are :Nomimal scale level, ordinal scale level, interval scale level, ratio scale level.

Nominal scale level: Data that is measured using a nomimal scale is qualitative (Chu, Dean, Illowsky, 2013, p.5). It is characterized by data that consists of names, labels or categories. Nominal data commonly identifies groups of two members, eg., male or female, left or right, young or old, yes or no, etc. Nominal data are not ordered and cannot be used in calculations.

The ordinal scale level is similar to nominal scale but it is different as data can be ordered. For example, when responses are ordered from the desired responses to the least desired one: excellent, good, satisfactory, unsatisfactory. Like the nominal scale, ordinal scale data cannot be used in calculations.

The interval scale level is like the ordinal, with the additional property that meaningful ammounts of differences between data can be determined. However, there is no natural zero starting point.

Zero is not the absolute lowest temperature.

* A degree represent the same underlying amount of heat.

* This kind of data can be used in calculations. In other words, the interval scale has a definte ordering, the difference between interval scale data can be measured, but there is no starting point.

Example: Temperature scales like Celcius (C) are measured by using the interval scale.In both temperatures, 40 degree is equal to 100 degrees minus 60 degrees. Differences make sense. tZero is not the absolute lowest temperature.

* A degree represent the same underlying amount of heat.

* This kind of data can be used in calculations.

The Ratio scale level is like the interval level but, in addition, it has a 0 point and ratios can be calculated. For example, the final exam scores are 18, 15, 10 and 9 (out of 20).

* The data can be put in order: 9, 10, 15 an 18

*The difference between data has meaning: the difference between score 18 and 9 is 9 points.

- Ratios can be calculated: The smallest ratio score is 0.
- So, 9 is twice 18. The score of 18 is better than the score of 9.

Interval and ratio measurement levels are the most desirable as we can use the more powerful statistical procedures available for means and standard deviations.

Exercise: What type of measurement scale is being used?

A satisfaction survey of a social website by number:

1= Very satisfied, 2= somewhat satisfied, 3= not satisfied

2. Common letters A,B,C,D, F

3. . Incomes measured in dollars

4.. The dates: 1866, 1920, 2010

5. The sex of students

6. Baking temperatures for different dishes: 350, 200, 400, 250, 300

Mann. P.S, Lacke, C.J. (2010). Introductory statistics. 7th ed. Rowan University: John Wiley &Sons.INC.

ftp.cats.com.jo/Stat/Statistics/Introductory%20Statistics%20(7th%20Ed).pdf

2. Weiss. N. A**.** (2012). Introductory statistics. 9th ed. Arizona State University: School of Mathematics and Statistical Sciences.

kczx.whu.edu.cn/G2S/Utility/download2.aspx?type=2&fileID=76261

3. Chu, K, Dea,,S & Illowsky,B. (2013). Elementary statistics. Rice University, Houston, Texas.http://cnx.org/content/col10966/1.4