Dr. Mohanad Faris Abdulhameed Department of Public Health College of Veterinary Medicine University of Basrah <u>Second Class-Statistics</u> محاضرة رقم 1

Introductory to Statistics

1-What are statistics

Let's take three examples below in our life.

- Heights vary scales among human population.
- Diversity of weights of the watermelon.

What is statistics: Statistics is the study and manipulation of data, including ways to gather, review, analyze, and draw conclusions from data. There are two major areas of statistics are <u>descriptive</u> and inf<u>erential statistics</u>

Example: a new advertisement for ice cream introduced in late May of last year resulted in a 30% increase in ice cream sales for the following three months. Thus, the advertisement was effective (because the advertisement is important to make profit from the products like ice cream).

Statistics is the discipline that concerns the collection, organization, analysis, interpretation, and presentation of <u>data</u>

Data: facts or information that needs to be collected



2-Why statistics are so important:

□ Statistics has become important aspect to our life. You can see the statistics in sport, medicine, business, and law. Statistics is important to reveal on number of the patients with a certain disease, for instance the number of the patients with Covid-19 in 2020 and the number of deaths among the patients with Covid-19 disease across the world. Any circumstances whether the patients in the hospitals with the diseases or even the veterinarians who treated animals every year that, however, needs to be explained and presents via numbers and written as tables, ratios, and illustrate graphs. After do statistics measure you need to do interpretation of the results or what the number of a percentage mean related to the subject the title or a report.

□ By the way, statistics provides tools that you need in order to react intelligently to information you hear or read. In this sense, statistics is one of the most important things that you can study.

Look take two examples to find out more about importance of the statistics below:

- Almost 85% of lung cancers in men and 45% in women are tobacco-related.
- A surprising new study shows that eating egg whites can increase one's life span.

Learn the Facts

ABOUT LUNG CANCER

LUNGevity Foundation is changing outcomes for people living with lung cancer through research, education, support, and advocacy. Share these facts to spread awareness and help make lung cancer a national health priority.

FACT: ANYONE CAN GET LUNG CANCER



1 in 16 Americans will be diagnosed with lung cancer in their lifetime. More than 235,000 will be diagnosed this year; this is more than the population of Richmond, VA. 60%-65% of all new lung cancer diagnoses are among people who have never smoked or are former smokers

> of lung cancer cases are in never-smokers

Every 2.2 minutes someone is diagnosed with lung cancer





Lung cancer can affect anyone, regardless of gender or ethnicity





361 Americans will die of lung cancer today, about the maximum who can fit on a full Airbus A340-500.



3-Descriptive statistics

What are the descriptive statistics means: <u>it refers to numbers that are used to</u> <u>summarize and describe data</u>. The word "<u>data</u>" <u>refers to the information that has been</u> <u>collected from an experiment</u>, <u>a survey</u>, an historical record, etc</u>.

If we are analysing birth certificates, for example, a descriptive statistic might be the percentage of certificates issued in Basrah, or the average age of the mother. Any other number we choose to compute also counts as a descriptive statistic for the data from which the statistic is computed.

The descriptive statistics are shown in Table 1 that illustrate the global prices of oil barrel (crude oil) from 2015 to 2020.

Year	Price per barrel \$ on average		
2016	60\$		
2017	55\$		
2018	50\$		
2019	50\$		
2020	20\$		

Based on the descriptive statistics and from the question is given that why the prices oil has been decreased since 2016 and significantly plunged down in 2020. Just will take 2020 the prices of oil become around 20\$ because of the outbreak of Covid-19. So, it is important to look to the data and interpret logically. The conclusion is that statistics can help to make reasonable answer.



<mark>4-Variables</mark>

* Independent and dependent variables

Variables are properties or characteristics of some event, object, or person that can take on different values or amounts. When conducting research, experimenters often manipulate variables. For example, an experimenter might compare the effectiveness of four types of anti-depressants. In this case, the variable is "type of antidepressant." When a variable is manipulated by an experimenter, it is called an <u>independent</u> <u>variable</u>. The experiment seeks to determine the effect of the independent variable on relief from depression. In this example, relief from depression is called <u>a dependent variable (outcome)</u>. In general, the independent variable is manipulated by the experimenter and its effects on the dependent variable are measured.



Example #1: Does beta-carotene protect against cancer? Beta-carotene supplements have been thought to protect against cancer. However, a study published in the Journal of the National Cancer Institute suggests this is false. The study was conducted with 39,000 women aged 45 and up. These women were randomly assigned to receive a beta-carotene supplement or a placebo, and their health was studied over their lifetime. Cancer rates for women taking the beta-carotene supplement did not differ systematically from the cancer rates of those women taking the placebo.

- 1. What is the independent variable? (supplements: beta-carotene or placebo)
- 2. What is the dependent variable? (occurrence of cancer)

Example #2: How bright is right? An automobile manufacturer wants to know how bright brake lights should be in order to minimize the time required for the driver of a following car to realize that the car in front is stopping and to hit the brakes.

- 1. What is the independent variable? (brightness of brake lights)
- 2. What is the dependent variable? (time to hit brakes)

Other examples can clarify what is the dependent and independent variable

Research Question	Independent variable(s)	Dependent variable(s)
Do tomatoes grow fastest under fluorescent, incandescent, or natural light?	The type of light the tomato plant is grown under	The rate of growth of the tomato plant
What is the effect of diet and regular soda on blood sugar levels?	The type of soda you drink (diet or regular)	Your blood sugar levels
How well do different plant species tolerate salt water?	The amount of salt added to the plants' water.	 Plant growth Plant wilting Plant survival rate

Examples

(Time Spent Studying) causes a change in (Test Score) and it isn't possible that (Test Score) could cause a change in (Time Spent Studying).





Independent Variable: Amount of direct sunlight a plant receives

Dependent Variable: Plant health

POUR

5- Qualitative and Quantitative Variables

An important distinction between variables is between qualitative variables and quantitative variables. <u>Qualitative variables</u> are those that express a qualitative attribute such as hair colour, eye colour, religion, favourite movie, gender, and so on. The values of a qualitative variable do not imply a numerical ordering. Qualitative variables are sometimes referred to as categorical variables. <u>Quantitative variables</u> are those variables that are measured in terms of numbers. Some examples of quantitative variables are height, weight, and shoe size.

Numeric

Non-Numeric

Example#. In the study on the effect of diet, <u>the independent variable</u> was type of <u>supplement</u>: none, strawberry, blueberry, and spinach. The variable "type of <u>supplement</u>" is a qualitative variable; there is nothing quantitative about it. In contrast, the dependent variable "memory test" is a quantitative variable variable since memory performance was measured on a quantitative scale (number correct).

6-Discrete and Continuous Variables

 Variables such as number of children in a household are called <u>discrete variables</u> since the possible scores are discrete points on the scale.

For example, a household could have three children or six children, but not 4.53 children. Other variables such as "time to respond to a question" are <u>continuous</u> <u>variables</u> since the scale is continuous and not made up of discrete steps. The response time could be 1.64 seconds, or it could be 1.64237123922121 seconds.

Quantitative Variables	Qualitative Variables
Take on numeric values	Take on names or labels
Number of students in a class	Eye color
Number of square feet in a house	Gender
Population size of a city	Breed of dog
Age of an individual	Level of Education
Height of an individual	Marital status

Quantitative		2		
Year	MPG 40 Hwy	MPG 50+ Hwy	Most Fuel Efficient Car	MPG
1985	34	0	Honda Civic Coupe	49
1986	14	2	Chevrolet Sprint	54
1987	8	2	Chevrolet Sprint	53
1988	6	2	Chevrolet Sprint Metro	53
1989	13	2	Geo Metro	53
1990	9	1	Geo Metro	53
1991	9	1	Geo Metro	53
1992	11	2	Geo Metro	53
1993	9	2	Geo Metro	53
1994	9	2	Geo Metro	53
1995	6	1	Honda Civic HB	51
1996	6	0	Geo Metro	45
1997	6	0	Geo Metro	45
1998	8	0	Chevrolet Metro	45
1999	8	0	VW Jetta (Diesel)	45
2000	7	1	Honda Insight	63
2001	9	1	Honda Insight	62
2002	12	2	Honda Insight	62
2003	14	2	Honda Insight	62
2004	12	2	Honda Insight	60
2005	12	2	Honda Insight	60
2006	7	2	Honda Insight	60
2007	2	0	Toyota Prius (Hybrid)	46
2008	2	0	Toyota Prius (Hybrid)	45
2009	4	0	Voyota Prius (Hybrid)	45
2010	7	0	Toyota Prius (Hybrid)	48

This table was found at http://www.pioneerplanning.com/wpcontent/uploads/2009/10/MPG-Table.jpg on June 2, 2011.

7-Levels of Measurement

Four types of Scales

• Nominal scales

When measuring using a nominal scale, one simply names or categorizes responses (no calculation). Examples: Gender, yes or no, handedness, favourite colour, and religion are examples of variables measured on a nominal scale.

• Ordinal scales

A researcher wishing to measure consumers' satisfaction with their microwave ovens might ask them to specify their feelings as either "very dissatisfied," "somewhat dissatisfied," "somewhat satisfied," or "very satisfied." The items in this scale are ordered, ranging from least to most satisfied. This is what distinguishes ordinal from nominal scales.

1) Interval scales

Interval scales are numerical scales in which intervals have the same interpretation throughout. As an example, consider the Fahrenheit scale of temperature. The difference between 30 degrees and 40 degrees represents the same temperature difference as the difference between 80 degrees and 90 degrees. This is because each 10-degree interval has the same physical meaning (in terms of the kinetic energy of molecules).

1) Ratio scales

The ratio scale of measurement is the most informative scale. It is an interval scale with the additional property that its <u>zero position</u> indicates the absence of the quantity being measured. You can think of a ratio scale as the three earlier scales rolled up in one. Like a nominal scale, it provides a name or category for each object (the numbers serve as labels). Like an ordinal scale, the objects are ordered (in terms of the ordering of the numbers). Like an interval scale, the same difference at two places on the scale has the same meaning. And in addition, the same ratio at two places on the scale also carries the same meaning.

Typical example age and weight both has zero point. We can say also that 2 meters is twice as long as 1 meter, and at a 40 age-years old is twice as old as 20-years old.

Levels of Measurement

Nominal	Ordinal	Interval	Ratio
"Eye color"	"Level of satisfaction"	"Temperature"	"Height"
Named	Named	Named	Named
	Natural order	Natural order	Natural order
		Equal interval between variables	Equal interval betweer variables
			Has a "true zero" value thus ratio between values can be calculate





مع تمنياتي لكم بالتوفيق والنجاح الدائم