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**Lecture title:** **Statistiscs: Definitions and Notations**

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**Summary:**

- **Statistics:** it is the science of data. Statistics is a process of collecting, summarizing and analyzing of data (variables) to make conclusions and decision.
- **Statistics procedures** can be classified as:

  1- **Descriptive statistics** is used to reduce data to manageable proportions, summarizing some

  characteristics about a set of data such as the tendencies within it through graphs and numerical descriptors such as where the center lies like arithmetic mean, median and measures of data dispersion of the data like variance or range.

  2- **Inferential statistics** is concerned with drawing decision and conclusion from data. It uses a random sample of data from a population to describe and make decision about the population.

**• Definitions:**

- ➢ **Individual:** is an object described by a set of data. Individuals may be people, animals, or things.
- ➢ **Variable:** is a characteristic can take values - any one of a set values, measures ( or non-measuring) that varies from individual to individual or group to group such as height, weight, eye color, blood count, enzyme activity....etc.

  - **Categorical (qualitative) variable:** an individual belongs to one of two or more groups for example gender (male and female) and occupation.

  - **Numerical (quantitative) variable:** an individual takes numerical values which it makes sense to find an average such as height and weight.

- ➢ **Observation:** is a number expressed as a value of variable.
- ➢ **Data:** it is the set of values of observation units.

- **Population:** a complete set of possible measuring.
- **Sample:** it is a part of population.

**Nominal scale** – the distinct categories that define the variable are unordered and each can be assigned a name, e.g. coat colors.

**Ordinal scale** – the categories that constitute the variable have some intrinsic order, for example, ranking

**Discrete (discontinuous) scale**, i.e. data can take only particular integer

values, typically counts, e.g. litter size, clutch size, parity (number of pregnancies within an animal).

**Continuous scale**, for which all values are theoretically possible e.g. height, weight, speed, concentration of a chemical constituent of the blood or urine.

**• Notations:**

- X= particular variable.
- $X_i$ = it is the value of a variable.
- c,k,a = constant
- $X_1$ = value of the first observation.
- $X_5$ = value of the fifth observation.
- $X_n$ = value of the nth observation.
- ∑ sigma (summation)
- $\sum_{i=1}^{n} Xi = X_1 + X_2 + X_3 + \ldots\ldots\ldots X_n$
- $\sum_{i=1}^{n} Xi\,Yi = X_1Y_1 + X_2Y_2 + X_3Y_3 + \ldots\ldots\ldots X_nY_n$

**• Properties:**

- $\sum_{i=1}^{n} c = n*c$
- $\sum_{i=1}^{n} cXi = c\sum Xi$

- $\sum_{i=1}^{n}(Xi + Yi) = \sum Xi + \sum Yi$
- $\sum_{i=1}^{n}(Xi + c) = \sum Xi + n * c$
- $\sum_{i=1}^{n}(Xi - Yi) = \sum Xi - \sum Yi$
- $\sum_{i=1}^{n}(Xi\,Yi) \neq \sum Xi * \sum Yi$
- $\sum^{2} \neq \sum^{2}$
- $\sum Xi - 5 \neq \sum (Xi - 5)$