



# MEASURES OF DISPERSION OR VARIATION

By

DR. MUHAMMAD SHOAIB

MBBS, MPH

Senior Lecturer

Department of Community Medicine

MBBS MC

# Dispersion

- Dispersion means deviation of certain values from the central value.
- Quantitative indices that describe the spread of a dataset are called measures of dispersion.

# Types Of Dispersion

Measures Of dispersion have of two types:

1. Absolute measures of dispersion
2. Relative measures of dispersion

# Absolute Measures Of Dispersion

These measures give us an idea about the amount of dispersion in a dataset in the same unit in which original data was collected.

They are unsuitable for comparability if:

1. Unit of measurement are different for different samples. One sample's measurement is in kg and others is in lbs.
2. Two different variables measured in different units are to be compared for a single subject. As we want to compare the variability of serum cholestrole with blood pressure of a person, one is measured in mg /dl and other in mm Hg.

# Types Of Absolute Measures Of Dispersion

Following are absolute measures of dispersion:

1. Range
2. Mean deviation
3. Variance
4. Standard deviation
5. Quartile deviation

# Relative measures of dispersion.

These are in ratio or % and best for comparison when two datasets in different units are to be compared. These measures are free of units in which the original data was measured.

# Types Of Relative Measures Of Dispersion

Following are relative measures of dispersion:

1. Coefficient of range
2. Coefficient of mean deviation
3. Coefficient of variation
4. Coefficient of standard deviation
5. Coefficient of quartile deviation

# Range

Range is the difference between the highest and the lowest values in a given data series.

$$\text{Range} = x_{\max} - x_{\min}$$

**Example**: The ages (in years) of 10 children are recorded as following:

7, 6, 8, 10, 4, 14, 15, 6, 9, 11

The range of age will be:

$$\begin{aligned}\text{Range} &= x_{\max} - x_{\min} \\ &= 15 - 4 = 11 \text{ years}\end{aligned}$$



# Advantages Of Range

1. It is easy to compute and easy to understand.
2. It is the simplest measure of dispersion.
3. Its unit is same as the unit of variable measured.
4. It is used to calculate class interval (by dividing range by number of classes required).
5. It is used in descriptive statistics.
6. It shows us the boundaries of the scatteredness of the data.
7. It is insensitive to the distribution and magnitude of values within the two extremes.

# Example

For the data set 1, 4, 5, 2, 6, 7, 2, the range is:

$$\text{Range} = x_{max} - x_{min} = 7 - 1 = 6$$

For other data, set 1,1,1,7,1,1,1, the range is also:

$$\text{Range} = x_{max} - x_{min} = 7 - 1 = 6$$

# Disadvantages

1. It does not enjoy any prominent place in statistical theory. It has no role in inferential statistics.
2. It is a poor measure of dispersion and it provides no knowledge about the spread of values within the data series. (It is silent on the scatterdness of the individual values in a data series).
3. As range is based on two extreme values therefore range can mislead about the data spread.
4. It is subjected to sampling fluctuation more than variance and standard deviation. Larger the  $n$  (sample size), the larger the range tends to be, thus making difficulty in comparing different sized data sets. (Influenced by sample size)
5. The most important disadvantage is that range of a sample can not give an idea about the range of the population.