Biostatistics

Lecture 5

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Descriptive Statistics
Measures of Dispersion

The measures of central tendency, such as the mean, median, and mode, do not reveal the whole picture of the distribution of a data set.

Two data sets with the same mean may have completely different spreads.

Descriptive Statistics
Measures of Dispersion

- Mean for Group 1 = 728 / 10 = 72.8

- Mean for Group 2 = 728 / 10 = 72.8

100	90	88	85	80	75	70	55	45	40	Group 1
78	77	76	75	74	73	72	70	68	65	Group 2

Descriptive Statistics
Measures of Dispersion
(Range)

- Range for Group 1 = 100 – 40 = 60

  Group 1 has large variation

- Range for Group 2 = 78 – 65 = 13

  Group 2 has small variation

Range = Largest value - Smallest value

100	90	88	85	80	75	70	55	45	40	Group 1
78	77	76	75	74	73	72	70	68	65	Group 2

Descriptive Statistics
Measures of Dispersion
(Variance & Standard Deviation)

- The standard deviation is the most-used measure of dispersion. The value of the standard deviation tells how closely the values of a data set are spread around the mean.
- Lower value of the standard deviation = Smaller range around the mean.
- Larger value of the standard deviation = Larger range around the mean.

Descriptive Statistics
Measures of Dispersion
(Variance & Standard Deviation)

- How to calculate variance and standard deviation ??

- Variance = $$s^2 = \frac{\sum(x_i - \bar{X})^2}{n-1}$$

- Standard Deviation = $$s = \sqrt{\frac{\sum(x - \bar{x})^2}{N - 1}}$$

Descriptive Statistics
Measures of Dispersion
(Variance & Standard Deviation)

- Example / Calculate variance and standard deviation for the following data
- 1, 2, 3, 4, 5
- Answer /
- Mean = 1 + 2 + 3 + 4 + 5 = 15 / 5 = 3

Descriptive Statistics Measures of Dispersion (Variance & Standard Deviation)

- Mean = 3

X	$x_i - \bar{X}$	$(x_i - \bar{X})^2$
1	1 – 3 = -2	4
2	2 – 3 = -1	1
3	3 – 3 = 0	0
4	4 – 3 = 1	1
5	5 – 3 = 2	4
Total	**= 0**	**10**

Variance = 10 / 5 – 1

Variance = 10 / 4 = 2.5

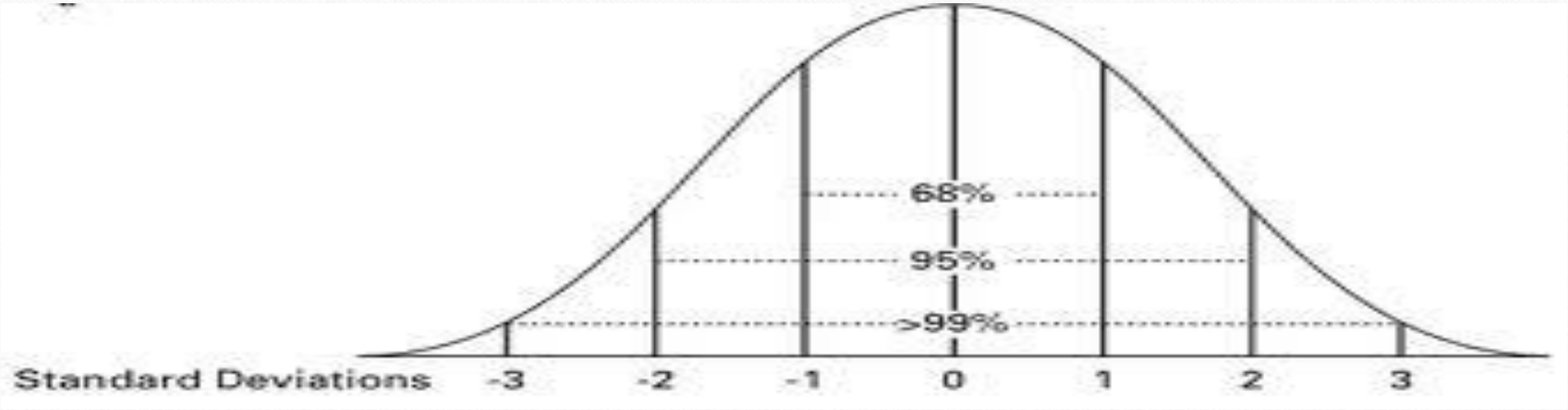
Standard deviation = Square root of variance

$\sqrt{}$ 2.5 = 1.58

Descriptive Statistics
Measures of Dispersion
(Variance & Standard Deviation)

Advantages and disadvantages of using standard deviation
The most common measure of dispersion
Easy to use
It is effected by outlier or exterem values
It takes into account the whole values to be calculated

Descriptive Statistics
Measures of Dispersion
(Variance & Standard Deviation)



Descriptive Statistics Measures of Dispersion (Variance & Standard Deviation)

- If we have a group of students had a normal distribution for weight. The mean weight was 70kg and the SD was 5kg.

1 SD above the mean weight is 70 + 5 = 75kg

1 SD below the mean weight is 70 - 5 = 65kg

2 SD above the mean weight is 70 + 10 = 80kg

2 SD below the mean weight is 70 - 10 = 60kg

3 SD above the mean weight is 70 + 15 = 85kg

3 SD below the mean weight is 70 - 15 = 55kg

1 SD will include 68.2% of students weigh between (75 and 65 kg)

2 SD will include 95.4% of students weigh between (80 and 60 kg)

3 SD will include 99.7% of students weigh between (85 and 55 kg)

Reference

- **Prem S. Mann 1998, Introductory Statistics, 7th edn, New York, USA.**

Good Luck for All Students

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