

Psy 331 Inferential Statistics

Measures of Central Tendency



What We Will Cover in This Section

- Introduction
- Statistical notation review
- Mean
- Median
- Mode



Summation (Σ), Part 1

- The Greek letter sigma (Σ) means 'add up'.
 - Σx means add all of the scores for variable x .
 - Σy means add all of the scores for variable y .



Summation, Part 2

- Σx^2 means add all of the x scores after squaring them.
- $(\Sigma x)^2$ means add all of the x scores first, then square them.
- $\Sigma(x - y)^2$ means subtract the y score from each x score then square the difference.

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Example

x	y	x^2	$(x-y)$	$(x-y)^2$
2	4	4	-2	4
3	3	9	0	0
5	2	25	3	9
6	1	36	5	25
16	10	74	6	38
Σx	Σy	Σx^2	$\Sigma(x - y)$	$\Sigma(x - y)^2$

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Question

What number would you use to describe the typical GPA of people in this class?



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Mean

- Sum the scores and divide by the number of scores.
- Symbols
 - Sample statistic: M_x or \bar{X}
 - Population parameter: μ

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Defining Formula

$$M_x \text{ (or } \bar{X}) = \frac{\sum x}{N}$$

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What is the mean of this distribution?

1, 2, 3, 4, 5

$$\bar{X} = 3.00$$



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Properties of the Mean

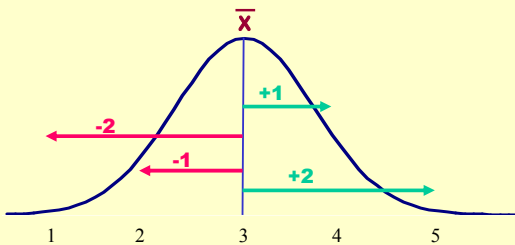
1. Sensitive to each score in the distribution.
2. Sensitive to extreme scores.
3. Most stable measure, resists sampling fluctuation.
4. Unbiased **estimate of μ** .
5. Used in some form or other in almost all other statistical procedures.
6. **Algebraic center** of the distribution.

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Algebraic Center



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Deviation Score

Difference between the mean and a raw score.

$$X - \bar{X}$$

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Strange Property of the Mean

$$\sum (X - \bar{X}) = 0$$

Demonstration: $\bar{X} = 7.5$

Score	$X - \bar{X}$
4	-3.5
5	-2.5
6	-1.5
7	-.5
8	.5
9	1.5
10	2.5
11	3.5
60	?

Assumptions

1. Measurement on **interval** or **ratio** scale.
2. Best used when the **distribution is normal.**

Key Learning Points

- The *mean* is the best estimator of any score in a distribution.
- The *deviation score* indicates the amount of error in this prediction.
- The sum of the *deviation scores* always equals zero.
- The sample mean, M , is used to estimate the population parameter, μ .

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Median

- The score below which 50% of the scores fall.
- Represents P_{50} .
- Divides the distribution in half.
- Symbol.
 - Sample: Mdn

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Example

8 9 10 11 12 13 14 15 16

8 9 10 11 12 13 16 16 46

8 9 10 11 15 19 26 29
↑
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Properties

1. Sensitive to the number of scores that fall above it and below it but not their values.
2. Relatively insensitive to extreme scores in skewed distributions.
3. Next best in resisting sampling fluctuations.
4. Best used when there are **skewed distributions**.
5. Not much use in higher level statistics.

Assumptions

1. Data are measured on an ordinal scale or higher.
2. The Median represents the 50th percentile (P_{50}).

Mode

- The score that occurs **most frequently** in a distribution.
- Used for nominal scales or higher.
- Symbol.
 - Sample: M_o

Properties

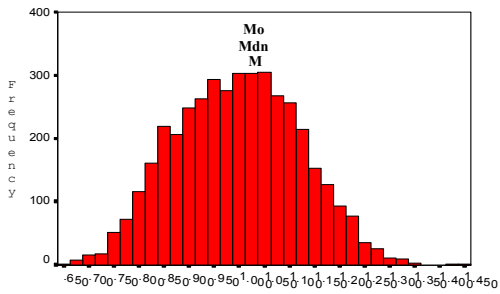
1. Easy to compute.
2. OK for rough approximations of the 'typical' score.
3. Least stable score, highly sensitive to sampling error.
4. May be more than one mode.
5. Ignores much numerical information.
6. Little use beyond descriptive level.

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Normal Distribution
Leptokurtic

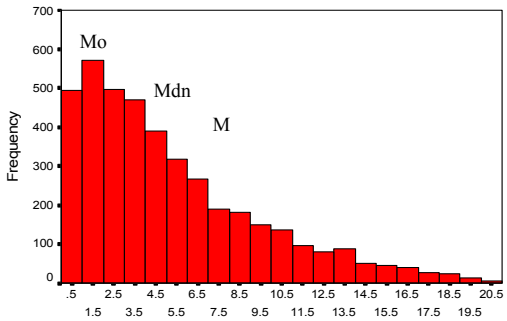


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Positively Skewed Distribution



Conformity Raw Score

Assignment

Homework
#3 and #4



The End
