Graduate Statistics

Measures of Central Tendency

What We Will Cover in This Section

- Introduction
- Mean
- Median
- Mode

Question

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

Mean

- Sum the scores and divide by the number of scores.
- Symbols
  - Sample: M or $\overline{X}$
  - Population: μ

Defining Formula

$$M(or\,\overline{X}) = \frac{\sum x}{N}$$

Properties of the Mean

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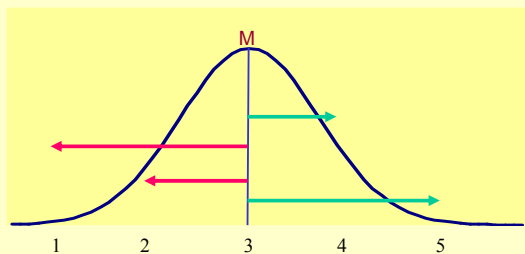5. Used in some form or other in almost all other statistical procedures.

Algebraic Center

Strange Property of the Mean

$$\sum (X - M_X) = 0$$

Demonstration: $\overline{X} = 7.5$

Score	X - M_X
4	-3.5
5	-2.5
6	-1.5
7	-.5
8	.5
9	1.5
10	2.5
11	3.5
60	?

Deviation Score

Difference between the mean
and a raw score.

$$X - M_X$$

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.

Median

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

Example

8	9	10	11	12	13	14	15	16

8	9	10	11	12	13	16	16	46

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. Only choice when there are open-ended distributions.
6. Not much use in higher level statistics.

Assumptions

1. Data are measured on an ordinal scale or higher.

Mode

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

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.