# Chapter Four

Measures of Central Tendency

**Summary**

• The mode, the median, and the mean are measures of central tendency—numbers that describe what is average or typical about the distribution.

• The mode is the category or score with the largest frequency (or percentage) in the distribution. It is often used to describe the most commonly occurring category of a nominal level variable.

• The median is a measure of central tendency that represents the exact middle of the distribution. It is calculated for variables measured on at least an ordinal level of measurement.

• The mean is typically used to describe central tendency in interval-ratio variables, such as income, age, or education. We obtain the mean by summing all the scores and dividing by the total (N) number of scores.

• In a symmetrical distribution, the frequencies at the right and left tails of the distribution are identical. In skewed distributions, there are either a few extremely high (positive skew) or a few extremely low (negative skew) values.

**Outline**

* Measures of Central Tendency
  + - Numbers that describe what is average or typical of the distribution
    - The choice of an appropriate measure of central tendency for representing a distribution depends on three factors
      * The way the variables are measured (their level of measurement)
      * The shape of the distribution
      * The purpose of the research
* The Mode
* The category or score with the largest frequency or percentage in the distribution
* Usually the easiest to identify
* The mode is always a category or score, not a frequency
* The mode is used to describe nominal variables
* In some distributions, there are two scores or categories with the highest frequency
  + Bimodal
* The Median
  + - The median is a measure of central tendency that can be calculated for variables that are at least at an ordinal level of measurement
    - The median represents the exact middle of a distribution; it is the score that divides the distribution into two equal parts so that half the cases are above it and half below it
    - Finding the median in sorted data
      * Odd number of cases
      * Even number of cases
    - Finding the median in frequency distributions
      * To find the median, we need to identify the category associated with the observation located at the middle of the distribution
      * A second approach to locating the median in a frequency distribution is to use the cumulative percentages column
* Statistics in Practice
  + - Gendered income inequality
* Locating Percentiles in a Frequency Distribution
  + - A percentile is a score at or below which a specific percentage of the distribution falls
    - Percentiles are widely used to evaluate relative performance on standardized achievement tests
    - Another widely used measure of location is the quartile
* The Mean
* The best known and most widely used measure of central tendency
* The mean is typically used to describe central tendency in interval-ratio variables
* Calculating the mean
  + Formulas
* A Closer Look 4.1 Finding the Mean in a Frequency Distribution
* Understanding some important properties of the arithmetic mean
  + Because it requires the mathematical operations of addition and division, the mean can be calculated only for variables measured at the interval-ratio level
  + Because the mean (unlike the mode and the median) incorporates all the scores in the distribution, we can think of it as the center of gravity of the distribution
  + Because every score enters into the calculation of the mean, the mean is sensitive to extreme scores in the distribution
* The Shape of the Distribution: Television, Education, and Siblings
  + - A distribution is symmetrical if the frequencies at the right and left tails of the distribution are identical, so that if it is divided into two halves, each will be the mirror image of the other
    - In a unimodal, symmetrical distribution, the mean, median, and mode are identical
    - A skewed distribution has a few extreme values on one side of the distribution
    - A negatively skewed distribution has a few extremely low values
    - A positively skewed distribution has a few extremely high values
    - Guidelines for identifying the shape of a distribution
      * In unimodal distributions, when the mode, the median, and the mean coincide or are almost identical, the distribution is symmetrical
      * When the mean is higher than the median (or is positioned to the right of the median), the distribution is positively skewed
      * When the mean is lower than the median (or is positioned to the left of the median), the distribution is negatively skewed
* Considerations for Choosing a Measure of Central Tendency
  + - Level of measurement
      * Nominal variables are restricted to the mode
      * Ordinal data offers two choices: the mode or the median (or sometimes both)
      * Our choice depends on what we want to know about the distribution
      * When the data are measured on an interval-ratio level, the choice between the appropriate measures is a bit more complex and is restricted by the shape of the distribution
    - When the distribution is skewed, the mean may give misleading information on the central tendency because its value is affected by extreme scores in the distribution
    - When the distribution we want to analyze is symmetrical, we can use any of the three averages
    - A Closer Look 4.2 A Cautionary Note: Representing Income