Inferences Based on a Single Sample: Estimation

I. Introduction

The objective of statistics is to make inferences about a population based on information contained in a sample. One way of making inference is to estimate a population parameter using a sample.

Example:

II. Point Estimation

a. A point estimator of a parameter is a statistic used to estimate that parameter.

Examples:

b. Properties of a “good” estimator are:

1. Unbiasedness: An estimator of a parameter is unbiased if its expected value is equal to the parameter.

Example:

2. Minimum Variance:

3. Consistency:
III. Interval Estimation

a. **Confidence Interval:** A random interval which covers the true value of a parameter with a given probability.

b. **Confidence Interval for \( \mu \) when \( \sigma \) is known:**

   Recall the *Central Limit Theorem*, which states that for large \( n \) (\( n \geq 30 \)), the sample mean is approximately normal with mean \( \mu \) and standard deviation \( \sigma / \sqrt{n} \).

   **95% confidence interval:**

   **90% confidence interval:**
The general form of a confidence interval:

Example: Suppose, for a sample of 100 children randomly selected from the offspring of fathers with high cholesterol the sample mean is 207 mg/ml. Suppose for this group of children it is known that the standard deviation is 30 mg/ml. With 95% confidence, can we say that the average cholesterol level for this group is higher than the normal value 175 mg/ml?