MODULE 3

Sampling is useful because:

- requires less time than collecting data on every item in a population
- saves money and resources
- analyzing a sample is more practical than analyzing an entire population.

Collecting a sample is faster, more practical and less expensive than collecting data on every member of the population.

The Sampling Process steps:

1. Identify the target population
2. Select the sampling frame (list of all items in the target population)
3. Choose the sampling method
    a. **Probability sampling**
       Uses random selection to generate a sample (best chance to get representative sample)
    b. **Non-probability sampling**
       Based on convenience or personal preferences of the researcher
4. Determine the sample size
5. Collect the sample data

Four Types of probability sampling method:

1. **Simple random sampling**
   Every member of a population is selected randomly and has an equal chance of being chosen
2. **Stratified random sampling**
   Divide a population into groups and randomly select some members from each group
3. **Cluster random sampling**
   Divide a population into clusters and randomly select certain clusters and include all members from the chosen clusters in the sample.
4. **Systematic random sampling**
   Put every member of a population into ordered sequence, then choose a random starting point in the sequence an select members for your sample at regular intervals.

Sampling bias occurs when a sample is not representative of the population as a whole.

Non-probability sampling useful to develop initial understanding, not draw conclusions or make predictions.

Four types of non-probability sampling method:

1. **Convenient sampling**
   Choose members of a population that are easy to contact or reach
2. **Voluntary response sampling**
   Members of a population who volunteer to participate in a study
3. **Snowball sampling**
   Researcher recruits initial participants to be in a study and ask them to recruit other people to participate in the study

4. **Purposive sampling**
   The researcher often intentionally exclude certain groups from the sample to focus on a specific group who they think is the most relevant to their study

Point estimate uses a single value to estimate a population parameter.

Sampling distribution is a probability distribution of a sample statistic. The sample is taken and measured repeatedly to get an estimate of the population mean.

Standard error is the standard deviation of a sample statistic (in statistic). Less standard error that the sample mean is accurate estimate of the population mean.

$$Standard\ error\ of\ the\ mean = \frac{s}{\sqrt{n}}$$

Where: s = sample standard deviation, n = sample size

Central Limit Theorem
- States that the sampling distribution of the mean approaches a normal distribution as the sample size increases.
- The pattern is true even the population has skewed distribution,
- Used to estimate population parameters for data in economics, science, business, and other field.
- In general, sample size of 30 or more is considered sufficient.

Conditions to apply central limit theorem:

- **Randomization**
  Sample data must be selected randomly
- **Independence**
  Sample values must be independent of each other
- **Sample size**
  Sample size needs to be sufficiently large
- **Requirements for precision**
  The larger the sample size, the more closely the sampling distribution resembles normal distribution
- **The shape of the population**
  If the distribution is roughly bell-shaped and resembles normal distribution, the sampling distribution will close to normal distribution even with small sample size

Population proportion is the percentage of elements in a population that share a certain characteristic.

Standard error measures the variability of sample statistic. It shows how much is the sample statistic is likely to differ from the actual population proportion.

$$Standard\ error\ of\ the\ proportion, SE(\hat{p}) = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Where: $\hat{p}$ = population proportion, n = sample size