Summary

- Interval estimation is a process of obtaining an interval in which the parameter value is expected to lie.
- A confidence interval gives an estimated range of values which is likely to include an unknown population parameter, the estimated range being calculated from a given set of sample data.
- The width of the confidence interval gives us some idea about how uncertain we are about the unknown parameter
- The three desirable properties of the interval may be described as validity, optimality and invariance.
- Confidence limits are the lower and upper boundaries / values of a confidence interval. That is, the values which define the range of a confidence interval.
- The confidence level is the probability value $(1-\alpha)$ associated with a confidence interval which is often expressed as a percentage
- 95% Confidence Interval for the population mean $\bar{Y}$ under SRSWR for the known population variance is

  $$\left[\bar{y} - 1.96\sqrt{\sigma^2/n}\ ,\ \bar{y} + 1.96\sqrt{\sigma^2/n}\right]$$

- 95% Confidence Interval for the population mean $\bar{Y}$ under SRSWOR for the known population variance is

  $$\left[\bar{y} - 1.96\sqrt{\frac{N-n}{N} * \frac{S^2}{n}}\ ,\ \bar{y} + 1.96\sqrt{\frac{N-n}{N} * \frac{S^2}{n}}\right]$$

- 95% Confidence Interval for the population mean $\bar{Y}$ under SRSWR for an unknown population variance is

  $$\left[\bar{y} - t_{\alpha}(n-1)\sqrt{s/n}\ ,\ \bar{y} + t_{\alpha}(n-1)\sqrt{s/n}\right]$$

- 95% Confidence Interval for the population mean $\overline{Y}$ under SRSWOR for the unknown population variance is

$$\left[\acute{y} - t_{\alpha}(n-1)\sqrt{\frac{N-n}{N} * \frac{S^2}{n}}, \quad \acute{y} + t_{\alpha}(n-1)\sqrt{\frac{N-n}{N} * \frac{S^2}{n}}\right]$$

- 95% Confidence Interval for the population total Y under SRSWR for the unknown population variance is

$$\left[N\bar{y} - 1.96\sqrt{N^2\sigma^2/n}, \; N\bar{y} + 1.96\sqrt{N^2\sigma^2/n}\right]$$

- 95% Confidence Interval for the population total Y under SRSWOR for the unknown population variance is

$$\left[N\bar{y} - 1.96\sqrt{N^2 \times \frac{(N-n)}{N} \times \frac{S^2}{n}}, \; N\bar{y} + 1.96\sqrt{N^2 \times \frac{(N-n)}{N} \times \frac{S^2}{n}}\right]$$

- The sample size under SRSWR for estimating population mean with the confidence coefficient 95% and margin of error 'e' is given by $n = (1.96)^2 \sigma^2 / e^2$
- The sample size under SRSWR for estimating population mean with the confidence coefficient 95% and margin of error 'e' can be estimated as

$$n = \frac{N S^2 (1.96)^2}{N e^2 + (1.96)^2 S^2}$$