**Confidence Intervals**

**(1) The mean income of the entire population in the state of Massachusetts is $60,000, with a population standard deviation of $5,000. You sample 100 BC alumni. Based on the population parameters, calculate the 95% confidence interval, and make a conclusion statement.**

$$µ= 60000$$

$σ=5000$

N = 100

Z-Critical Value = 1.96 (based on 95% confidence)

Ssm **=** $\frac{θ}{\sqrt{N}}$ : Standard Deviation of Sample Mean = $\frac{Population Standard Deviation}{\sqrt{\# of Sample}}$

Ssm = $\frac{5000}{\sqrt{100}}$ = 500

$$C.I. = Mean + (z\_{critical})(Standard Deviation of the Sample Mean)$$

$$C.I. for Upper Limit = 60,000 + \left(+1.96\right)\left(500\right) C.I. for Lower Limit=60,000 + (-1.96)(500)$$

$$ C.I. for Upper Limit=60,980 C.I. for Lower Limit=59,020$$

Conclusion:

We are 95% confident that the true population proportion value for BC alumni falls between $59,020 and $60,980.

**(2) Which dining hall do BC students prefer, Hillside or McElroy? You survey 100 students at random and find that 63% prefer Hillside and 37% prefer McElroy. Based on the known proportions of this sample, calculate the 95% confidence interval.**

$µ= .63$

Z-critical value = 1.96 (based on 95% confidence)

Ssm = $\sqrt{\frac{\left(Proportion favoring Hillside\right)\*\left(Proportion favoring McElroy\right)}{N}}$ : $\sqrt{\frac{(p)\*\left(q\right)}{N}}$

Ssm = $\sqrt{\frac{\left(.63\right)\*\left(.37\right)}{100}}$ = .04828

 $C.I. = Mean + (z\\_score)(Standard Deviation of the Sample Mean)$

$$C.I. for Upper Limit = .63 + \left(+1.96\right)\left(.04828\right) C.I. for Lower Limit=.63 + (-1.96)(.04828)$$

$ C.I. for Upper Limit=.7246 C.I. for Lower Limit=.53$54

Conclusion:

We are 95% confident that the true population proportion value for Hillside falls between 53.54% and 72.46%.

Thus, we conclude that we are 95% confident that BC students prefer Hillside over McElroy.

-this is because the confidence interval does not include 50%, which would indicate that the “race is too close to call”