Lesson 47: Selecting sample size

How Confidence Intervals Behave:

1) When designing confidence intervals, a researcher wants to accomplish 2 things:

   a) Have a high confidence level

   > This is relatively subjective; the researcher decides what confidence level they wish. This confidence level, however, can drive other factors about the experiment.

   b) Have a narrow confidence interval

In order to attain a narrow confidence interval the **margin of error** $(Z \cdot \frac{\sigma}{\sqrt{n}})$ must be reduced.

Method 1: lower the confidence level which creates a smaller Z value.

Method 2: increase the sample size which causes division by a larger √n value.

Method 2 is a better option because it allows you to reduce the margin of error while maintaining your desired level of confidence. The drawback is that collecting a larger sample size might be too costly or time consuming.

Reminder – the **central limit theorem** tells us that the distribution of $\bar{x}$ will be close to normal as long as the sample size is greater than 30. When in doubt of the shape of the population, use a sample size of at least 30.

Example 1:   The confidence interval at the 95% level is 4 to 6.

What happens if the confidence level is changed to 80%

How would we change the confidence level so that the confidence interval is smaller?

What else could we do to shrink the confidence interval?

Example 2: A 95% confidence interval for a random sample of 50 homes sold in Springfield for the average value was found to be ($58,000 to $91,000). Find the sample mean and standard deviation.

Example 3:
The average price of 40 recently purchased LA homes (taken via an SRS) was $730,000. Assume that the true standard deviation of LA home prices (of homes recently purchased) is σ = $60,000.

   a. Construct a 95% confidence interval for the true average price of all recently purchased homes in LA.

   b. Construct a 90% confidence interval for the same data. What do you notice about this interval compared to the 95% confidence interval?

   c. What confidence level would reduce the margin of error to $12,000 or less?

   d. Construct a 95% confidence interval for the true average price in LA, but change the sample size to 100.

   e. What sample size is needed to reduce the margin of error to $12,000 or less?

   f. If a confidence interval is listed as $720,000 to $740,000, then what is the level of confidence?

Example 4
To assess the accuracy of a scale, a standard weight known to weigh 10 grams is weighed repeatedly. The scale readings are normally distributed about the average weight from the scale. Based on previous tests, the scale has standard deviation of 0.0002 grams. How many measurements must be averaged to get a MOE of 0.0001 with 98% confidence?

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Study for Quiz 14 over Lessons 45-47, review 44