Statistics, Day 8

Objectives: To compute a confidence interval
To use confidence intervals to make conclusions

Statistical inference is the process of drawing conclusions about the population from sample data. One type of inference is called a confidence interval which provides a range of values which most likely contains the true population parameter. A confidence interval has the form:

Sample Statistic ± Margin of Error

Example: Two weeks before an election, a polling organization asks a random sample of 1000 registered voters whether they intend to vote for H or D in the upcoming election. They report that 52% of the sample of voters intend to vote for H, and they give a margin of error of 3% for a 95% confidence interval.

What was the sample statistic from this poll? .52

If the organization had asked a different random sample of 1000 voters, do you think they would have gotten the same sample statistic? SURE, BUT NOT FAR OFF IF TAKING GOOD SAMPLES

Give a confidence interval for the true (population) percentage of voters who are likely to vote for H.

.52 ± .03 (.49, .55)

Is it possible H will not win the election?

Yes

To calculate the Margin of Error, the data must be approximately Normally distributed (69-95-99.7 rule)

Margin of Error = multiplier * Standard Error

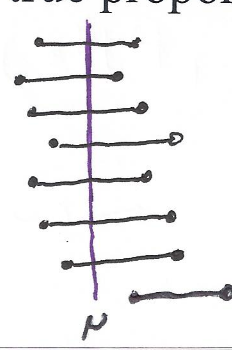
The multiplier for a 95% confidence interval is 2 because 95% of the data in a normal distribution are within $\pm$ 2 standard deviations from the mean. The Standard Error, like a standard deviation, measures how much variation we can expect in repeated samples of the same size. Because larger samples will have less variation,

$$\text{Standard Error} = \frac{\text{Standard Deviation}}{\sqrt{n}}, \text{ where n is the sample size}$$

Example: In the election poll described above, the standard deviation was about 0.5. Show how this leads to a margin of error for a 95% confidence interval of about 3%.

$$\frac{.5}{\sqrt{1000}} \approx .015 \quad 1.5\%$$

The 95% confidence interval tells us that if we were to calculate a CI from many, many different samples of 1000 randomly selected voters, then we expect about 95% of those intervals to actually contain the true proportion of voters who will vote for H.



MOST SAMPLES WILL INCLUDE THE TRUE MEAN OF THE POPULATION

Example: The heights of teenage boys are Normally distributed with a standard deviation of 2.5”. A random sample of 25 boys at WHS had a mean of 62”.

Would a different random sample of 30 boys be likely to give the same mean height? NO, NOT EXACTLY.

Find the Margin of Error for a 95% confidence interval.

$$\frac{2.5}{\sqrt{25}} = .5$$

Find the 95% confidence interval for the mean height of WHS boys.

$62 \pm 2(.5)$ $(61, 63)$

$\bar{x}$

Explain what it means to be 95% confident.

I AM 95% SURE THE TRUE MEAN HEIGHT OF WHS BOYS IS BETWEEN 61 AND 63 INCHES.

$$\text{Sample Mean} \pm 2\left(\frac{\text{STANDARD DEVIATION}}{\sqrt{n}}\right)$$