Sampling Distributions 7

7.3 How Can We Make Inferences About a Population?

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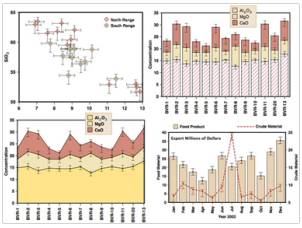
Learning Objectives

- Using the CLT to Make Inferences
- Standard Errors in Practice
- Sampling Distribution for a Proportion



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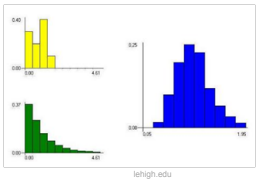
Using the CLT to Make Inferences



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Implications of the CLT:

- For large *n*, sampling distribution of $\bar{x}$ is approximately normal despite population shape
- When approximately normal, is within 2 standard errors of μ 95% of the $\bar{x}$ time and almost certainly within 3

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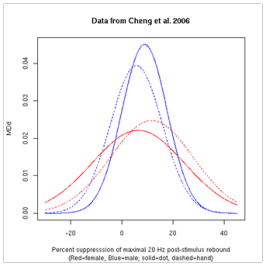
Standard Errors in Practice

Standard error have exact values depend on parameters:

- $\sqrt{p(1-p)/n}$
- $\sigma/\sqrt{n}$

In practice, parameters are unknown so we approximate with p-hat and s



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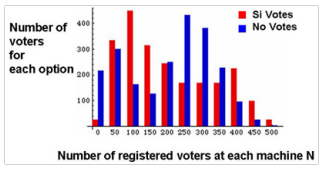
Sampling Distribution for a Proportion



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- Binomial probability distribution with x as # of successes and y as probability
- Sample *proportion* (not #) of successes is usually reported

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Sampling Distribution for a Proportion

Mean and Standard Deviation of Sampling Distribution of a Proportion

For a binomial random variable with *n* trials and probability *p* of success for each, the sampling distribution of the *proportion* of successes has

$$\text{Mean} = p \quad \text{standard error} = \sqrt{\frac{p(1-p)}{n}}.$$

To obtain these values, take the mean *np* and standard deviation $\sqrt{np(1-p)}$ for the binomial distribution of the *number* of successes and divide by *n*.

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7.32 Global warming: A poll of a random sample of 1002 adult Americans in April 2007 asked, "Do you think the federal government should do more than it's doing now to try to deal with global warming, should do less than it's doing now, or is it doing about the right amount?" In this sample, 70% said more, 7% said less, 21% said about right, and 2% were unsure. Can you conclude that a majority of Americans would say more? Justify your answer by showing what you would expect for the sample proportion if the population proportion saying more equals 0.50, based on the standard error of the sample proportion for this poll.

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Image Sources

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The Drunkard's Walk, Mlodinow
Elementary Statistics, 7th Edition, Neil Weiss
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