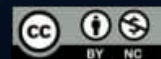




Conservative Approach & Sample Size Consideration

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Statistics Course Developer



95% Confidence Intervals for p

Best Estimate \pm Margin of Error

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Best Estimate \pm “a few” (estimated) standard errors

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$$\hat{p} \pm 1.96 \cdot \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

Motts Car Seat Example

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(0.823, 0.877)

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$n=659$

Closer Look at estimated SE

$$\text{estimated standard error} = \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

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What if \hat{p} is
not accurate?

which is maximized when $\hat{p}=0.5$

$$\text{conservative standard error} = \frac{1}{2\sqrt{n}}$$

Back to Motts Car Seat Example

$$\hat{p} \pm 2 \cdot \frac{1}{2\sqrt{n}}$$

$\hat{p}=0.85$
 $n=659$

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95% Margin of Error is only dependent on sample size

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$$n=659$$

Back to Motts Car Seat Example

95% Margin of Error is only dependent on sample size

$$\hat{p} \pm 2 \cdot \frac{1}{2\sqrt{n}}$$

$$\hat{p} \pm \frac{1}{\sqrt{n}}$$

(0.81, 0.89)

$$\hat{p}=0.85$$

$$n=659$$

**Conservative 95% Confidence Interval,
4% Margin of Error**

Sample Size Determination

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What sample size would we need to have a 95% *(conservative)* confidence interval with a Margin of Error of only 3% (0.03)?

Sample Size Determination

$$\text{MoE} = \frac{1}{\sqrt{n}}$$

For 95% Confidence

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$$\text{MoE} = \frac{1}{\sqrt{n}}$$

MoE = 0.03

$$n = (1/\text{MoE})^2$$

Sample Size Determination

For 95% Confidence

$$\text{MoE} = \frac{1}{\sqrt{n}}$$

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$$n = (1/0.03)^2$$

$$n = 1,111.11$$

Sample Size Determination

For 95% Confidence

$$\text{MoE} = \frac{1}{\sqrt{n}}$$

MoE = 0.03

$$n = (1/\text{MoE})^2$$

$$n = (1/0.03)^2$$

$$n = 1,111.11$$

$$n \geq 1,112$$

What if 3% MoE @ 99% Confidence?

$$\hat{p} \pm Z^* \cdot \frac{1}{2\sqrt{n}}$$

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What if 3% MoE @ 99% Confidence?

$$\hat{p} \pm Z^* \cdot \frac{1}{2\sqrt{n}}$$

$$\text{MoE} = Z^* \cdot \frac{1}{2\sqrt{n}}$$

$$n = \left(\frac{Z^*}{2 \cdot \text{MoE}} \right)^2$$



IVQ HERE

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$Z^* = 2.576$ (99%)
 $MoE = 0.03$

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$$Z^* = 2.576 \text{ (99\%)} \\ MoE = 0.03$$

$$n = 1843.27$$

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$$n = \left(\frac{Z^*}{2 \cdot MoE} \right)^2$$

$$Z^* = 2.576 \text{ (99\%)} \\ MoE = 0.03$$

$$n = 1843.27$$

$$n \geq 1844$$

Summary

- Estimated standard error may be too small, or inaccurate based off sample so can employ conservative approach.

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- Estimated standard error may be too small, or inaccurate based off sample so can employ conservative approach.
- Conservative approach → determine sample size needed based on a confidence level and desired margin of error.