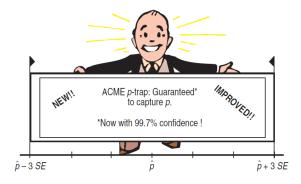
Margin of error: Certainty vs. Precision



Our confidence intervals have the form

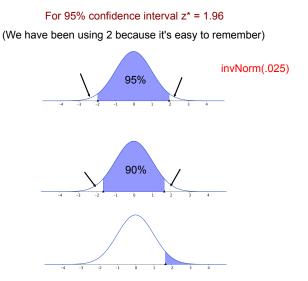
 $\hat{p} \pm 2SE(\hat{p})$ Estimate  $\pm ME$ 

Margin of error

$$\hat{p} \pm 2SE(\hat{p})$$

to change confidence level we change the number of standard errors.

\*\* This # of SE's is called a critical value (z\*)



Based on the Central Limit Theorem

#### Assumptions and Conditions:

Confidence intervals are built on Normal models for the sampling distributions, therefore the assumptions and conditions are the same.

Independence assumption: Is there any reason to believe that the data values affect each other? (Can only check with deep knowledge of the situation.)

→ Randomization Condition

→10% condition

→ Sample size condition success/failure

### **ONE-PROPORTION** *z***-INTERVAL**

When the conditions are met, we are ready to find the confidence interval for the population proportion, *p*. The confidence interval is  $\hat{p} \pm z^* \times SE(\hat{p})$  where the standard deviation of the proportion is estimated by  $SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$ .

## Confidence Intervals (CIs)

STATE	State the parameter you want to estimate and the confidence level.
PLAN	Identify the appropriate inference method and check conditions.
DO	If the conditions are met, perform calculations.
CONCLUDE	Interpret your interval in the context of the problem.

Confidence interval: point estimate ± margin of error

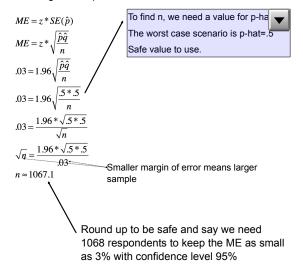
Example on page 447

## Choosing the sample size

How large a sample to take when planning a study?

**Scenario**: A candidate is planning a poll and wants to estimate voter support within 3% with 95% confidence.

How large a sample does she need?



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