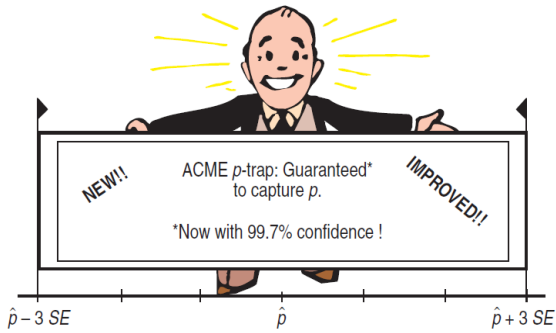


Margin of error: Certainty vs. Precision



---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

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 ( $z^*$ )



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?

$ME = z * SE(\hat{p})$   
 $ME = z * \sqrt{\frac{\hat{p}\hat{q}}{n}}$   
 $.03 = 1.96 \sqrt{\frac{\hat{p}\hat{q}}{n}}$   
 $.03 = 1.96 \sqrt{\frac{.5 * .5}{n}}$   
 $.03 = \frac{1.96 * \sqrt{.5 * .5}}{\sqrt{n}}$   
 $\sqrt{n} = \frac{1.96 * \sqrt{.5 * .5}}{.03}$   
 $n \approx 1067.1$

To find n, we need a value for p-hat. The worst case scenario is p-hat=.5. Safe value to use.

Smaller margin of error means larger sample

Round up to be safe and say we need 1068 respondents to keep the ME as small as 3% with confidence level 95%