

Chapter 16

1. Lying about age Pew Research, in November 2011, polled a random sample of 799 U.S. teens about Internet use. 49% of those teens reported that they had misrepresented their age online to gain access to websites and online services.

- Explain the meaning of $\hat{p} = 0.49$ in the context of this situation.
- Calculate the standard error of \hat{p} .
- Explain what this standard error means in the context of this situation.

3. Lying about age again The 95% confidence interval for the number of teens in Exercise 1 who reported that they had misrepresented their age is from 45.6% to 52.5%.

- Interpret the interval in this context.
- Explain the meaning of “95% confident” in this context.

5. Wrong direction St. Norbert’s College in Green Bay, Wisconsin, and Wisconsin Public Radio conduct an annual poll of Wisconsinites about political opinions. The Fall 2011 survey asked a random sample of 402 adult Wisconsin residents whether they think things in the country are going in the right direction or in the wrong direction. 66% said that things were going in the wrong direction.

- Calculate the margin of error for the proportion of all adult Wisconsin residents who think things are going in the wrong direction for 90% confidence.
- Would the margin of error be larger or smaller for 95% confidence? Explain.

7. Wrong direction again Consider the St. Norbert’s College poll of Exercise 5.

- Are the assumptions and conditions met?
- How many people would need to be surveyed for a 90% confidence interval to ensure the margin of error would be less than 2%?

11. Conditions For each situation described below, identify the population and the sample, explain what p and \hat{p} represent, and tell whether the methods of this chapter can be used to create a confidence interval.

- a) Police set up an auto checkpoint at which drivers are stopped and their cars inspected for safety problems. They find that 14 of the 134 cars stopped have at least one safety violation. They want to estimate the percentage of all cars that may be unsafe.
- b) A TV talk show asks viewers to register their opinions on prayer in schools by logging on to a website. Of the 602 people who voted, 488 favored prayer in schools. We want to estimate the level of support among the general public.
- c) A school is considering requiring students to wear uniforms. The PTA surveys parent opinion by sending a questionnaire home with all 1245 students; 380 surveys are returned, with 228 families in favor of the change.
- d) A college admits 1632 freshmen one year, and four years later, 1388 of them graduate on time. The college wants to estimate the percentage of all their freshman enrollees who graduate on time.

15. Confidence intervals Several factors are involved in the creation of a confidence interval. Among them are the sample size, the level of confidence, and the margin of error. Which statements are true?

- a) For a given sample size, higher confidence means a smaller margin of error.
- b) For a specified confidence level, larger samples provide smaller margins of error.
- c) For a fixed margin of error, larger samples provide greater confidence.
- d) For a given confidence level, halving the margin of error requires a sample twice as large.

19. Misabeled seafood In December 2011, *Consumer Reports* published their study of labeling of seafood sold in New York, New Jersey, and Connecticut. They purchased 190 pieces of seafood from various kinds of food stores and restaurants in the three states and genetically compared the pieces to standard gene fragments that can identify the species. Laboratory results indicated that 22% of these packages of seafood were mislabeled, incompletely labeled, or misidentified by store or restaurant employees.

- a) Construct a 95% confidence interval for the proportion of all seafood packages in those three states that are mislabeled or misidentified.
- b) Explain what your confidence interval says about seafood sold in these three states.
- c) A 2009 report by the Government Accountability Board says that the Food and Drug Administration has spent very little time recently looking for seafood fraud. Suppose an official said, "That's only 190 packages out of the billions of pieces of seafood sold in a year. With the small number tested, I don't know that one would want to change one's buying habits." (An official was quoted similarly in a different but similar context). Is this argument valid? Explain.

35. Deer ticks Wildlife biologists inspect 153 deer taken by hunters and find 32 of them carrying ticks that test positive for Lyme disease.

- a) Create a 90% confidence interval for the percentage of deer that may carry such ticks.
- b) If the scientists want to cut the margin of error in half, how many deer must they inspect?
- c) What concerns do you have about this sample?

31. Rickets Vitamin D, whether ingested as a dietary supplement or produced naturally when sunlight falls on the skin, is essential for strong, healthy bones. The bone disease rickets was largely eliminated in England during the 1950s, but now there is concern that a generation of children more likely to watch TV or play computer games than spend time outdoors is at increased risk. A recent study of 2700 children randomly selected from all parts of England found 20% of them deficient in vitamin D.

- a) Find a 98% confidence interval.
- b) Explain carefully what your interval means.
- c) Explain what “98% confidence” means.

43. Approval rating A newspaper reports that the governor’s approval rating stands at 65%. The article adds that the poll is based on a random sample of 972 adults and has a margin of error of 2.5%. What level of confidence did the pollsters use?