HW11 - Confidence Intervals

Stat 131A, Fall 2018

Due Nov-07

1) In a simiple random sample of 100 graduates from a certain college, 48 were earning $50,000 a year or more. Estimate a 90% confidence interval for the proportions of all graduates of that college earning $50,000 a year or more.

2) A box contains 10,000 marbles, of which some are red and the others blue. To estimate the percentage of red marbles in the box, 100 are drawn at random without replacement. Among the draws, 1 turns out to be red. The percentage of red marbles in the box is estimated as 1%, with an SE of 1%. True or false: a 95%-confidence interval for the percentage of red marbles in the box is 1% ± 2%. Explain.

3) A box contains a large number of red and blue tickets; th eproportion of red tickets is known to be 50%. A simple random sample of 100 tickets is drawn from the box. Say whether each of the following statements is true or false, and explain briefly.

a. The percentage of red tickets in the sample has an expected value of 50%, and an SE of 5%.

b. The 5% measures the likely size of the chance error in the 50%.

c. The proportion of reds in the sample will be around 50%, give or take 5% or so.

d. An approximate 95%-confidence interval for the proportion of reds in the sample is 40% to 60%.

e. There is about a 95% chance that the proportion of reds in the sample will be in the range from 40% to 60%.

4) At a large university, 54.3% of the students are female and 45.7% are male. A simple random sample of 1000 persons is drawn from this population. The SE for the sample proportion of females is figured as 1.6%. True or False: There is about a 95% chance for the proportion of females in the sample to be in the range 54.3% ± 3.2%. Explain.

5) The Residential Energy Consumption Survey found in 2001 that 47% of American households had internet access. A market survey organization repeated this study in a certain

town with 25,000 households, using a simple random sample of 500 households: 239 of the samples households had internet access.

a. The proportion of households in the town with internet access is esstimataed as _____; this estimated is likely to be off by _____ or so.

b. If possible, find a 95%-confidence interval for the proportion of all 25,000 households with internet access. If this is not possible, explain why not.

6) A simple random sample of 400 persons is taken to estimate the percentage of Republicans in a large population. It turns out that 214 of the people in the sample are Republicans. True or False and explain. $_{1.5pts}$

a. The sample percentage is 54.3%; the SE for the sample percentage is 1.6%.

b. The sample percentage is 53.5%; the SE for the sample percentage is 2.5%.

c. 53.5% $\pm$ 4.12% is a 90%-confidence interval for the population percentage.

d. 53.5% $\pm$ 5% is a 95%-confidence interval for the population percentage.

e. 53.5% $\pm$ 5% is a 95%-confidence interval for the sample percentage.

f. There is about a 95% probability for the percentage of Republicans in the population to be in the range 53.5% $\pm$ 5%.

7) A real estate office wants to make a survey in a certain town, which has 50,000 households, to determine average commute distance to work. A simple random sample of 1,000 households is chosen. The real state office interviewed all persons age 16 and over in the sample of households; there were 2,500 such persons. On the average, these 2,500 people commuted 7.1 miles to work, and the SD of the distances was 10.2 miles. If possible, find a 95%-confidence interval for the average commute distance for all people age 16 and over in this town. If this isn't possible, explain why not.

8) A survey organization takes a simple random sample of 625 households from a city of 80,000 households. On the average, there are 2.30 persons per sample household, and the SD is 1.75. Say whether each of the following statements is true or false, and explain.

a. The SE for the sample average is 0.07.

b. A 95%-confidence interval for the average household size in the sample is 2.16 to 2.44.

c. A 95%-confidence interval for the average household size in the city is 2.16 to 2.44.

d. 95% of the households in the city contain between 2.16 and 2.44 persons.

e. The 95%-confidence level is about right because household size follows the normal curve.

f. The 95%-confidence level is about right because, with 625 draws from the box, the probability histogram for the average of the draws follows the normal curve.

9) One term at the University of California, Berkeley, 400 students took the final in a Statistics course. Their scores averaged 65.3 out of 100, and the SD was 25. Now

$$\sqrt{400} \times 25 = 500, \qquad \frac{500}{400} = 1.25$$

Is 65.3 ± 2.5 a 95%-confidence interval? If so, for what? If not, why not?

10) According to Ben & Jerry's they are "always on the lookout for the next best way to experience our ice cream." One of their creations is the *BRRR-ito*. Suppose that B&J wants to estimate the average number of BRRR-itos sold across all U.S. locations.

a. What is the parameter of interest?

b. A SRS is used to sample 1000 locations, finding that these locations sell a combined total of 47,000 BRRR-itos. The SD for number of BRRR-itos sold at each location was calculated as 100. Calculate an estimate for the parameter along with a 95% confidence interval.

c. Would you expect a 99% confidence interval to be larger or smaller.? Explain.

d. Provide the interpretation for your confidence interval from part **b**.

e. Suppose that B&J included only samples from stores in California. Would the confidence interval calculated previously have the same interpretation? Explain.