

(21) total.

Name: _____ Section: (day/time) _____

AMS5 - Quiz 4
Thursday, 25th February, 2016

1. An agency of the federal government plans to take a simple random sample (SRS) of residents in each state to estimate the proportion of owners of real estate in each state's population. The populations of the states range from about 584,000 people in Wyoming to about 38.8 million in California. (Both figures for 2014.)

(a) Will the variability of the sample proportion change from state to state if an SRS of size 2,000 is taken in each state? Explain your answer.

(1) + (1)

No. The variability depends on sample size, not the population size (assuming sample is small compared to the population)

(b) Will the variability of the sample proportion change from state to state if an SRS of 1/10 of 1% (0.001) of the state's population is taken in each state? Explain your answer.

(1) + (1)

Yes. The size of the sample changes from state - to - state.

2. The *New York Times* and CBS News conducted a nationwide poll of 1,044 randomly selected 13- to 17-year olds. Of these teenagers, 694 had a television in their room. Also, of the 1,044 teens surveyed, 198 named Fox as their favorite television network. We can consider the sample to be an SRS.

(a) Give 95% confidence intervals for the proportion of all people in this age group who had a TV in their room at the time of the poll, and the proportion who would choose Fox as their favorite network.

(2) + (2)

TV. $SE = \sqrt{1044 \times (1-0) \times \frac{694}{1044} \times \frac{350}{1044}} = 15.3$

95% CI $\frac{694}{1044} \pm 2 \times \frac{15.3}{1044} = 66.5\% \pm 2.9\%$

Fox $SE = \sqrt{1044 \times (1-0) \times \frac{198}{1044} \times \frac{846}{1044}} = 12.7$

95% CI $\frac{198}{1044} \pm 2 \times \frac{12.7}{1044} = 19.0\% \pm 2.4\%$

(b) The news article says, "In theory, in 19 cases out of 20, the poll results will differ by no more than 3 percentage points in either direction from what would have been obtained by seeking out all American teenagers." Explain how your results agree with this statement.

(1)

95% CI says that for 95% of samples (as 19 out of 20) the CI covers the population proportion. [TURN OVER]

The width of the CI is approximately 3 percentage points in each direction, confirming the statement in the news article.

3. 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. $SE_{\text{ave}} = \frac{SE_{\text{sum}}}{\# \text{ draws}} = \frac{SD_{\text{box}}}{\sqrt{\# \text{ draws}}}$

(1) + (1)

or sample SD as $SD_{\text{box}} = \frac{\sqrt{625} \times 1.75}{625} = 0.07$ TRUE

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

FALSE CI's apply to the population not the sample.

(1) + (1)

We know the ave. household size in the sample exactly

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

95% CI is sample mean $\pm 2 SE_{\text{mean}}$

(1) + (1)

$2.3 \pm 2 \times 0.07 \approx 2.16 \rightarrow 2.44$

TRUE

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

FALSE - don't confuse SD of the population with SE of average

(1) + (1)

(also - households have integer # of people - no households have

(e) The 95% confidence level is about right because household size follows the normal curve. $2.16 - 2.44$ people)

FALSE - household size does not follow the normal curve.

(1) + (1)

(big right tail)

(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.

(1) + (1)

TRUE - From the Central Limit Theorem, the sum and average of draws will follow the normal curve

The 95% CI is based on the normal approximation, that 95% of the area under the curve lies within ± 2 (in standard units)