HOMEWORK 15 Due: next class 4/12

1. Adverse drug reactions to legally prescribed medicines are among the leading causes of drug-related death in the U.S. Suppose in a random sample of 60 drug-related deaths 53 were caused by legally prescribed drugs and the rest were result of illicit drug use. Based on these results, the reported 95% confidence interval was 86% ± 8.5%

   a. Did the investigators calculate the confidence interval by using the "old" formula with the sample proportion or with the adjusted sample proportion? Show your work.

      In the "old" formula we use $\hat{p} = \frac{x}{n} = \frac{53}{60} \approx 0.88$
      In the adjusted formula we use $\hat{p} = \frac{x+2}{n+4} = \frac{53+2}{60+4} \approx 0.86$

      Since the form of the CI is: $\hat{p} \pm m$, and as we see, in the given interval we have 86% ± 8.5%, that is 0.86 ± 0.085. So $\hat{p}$ is 0.86. Then they used the adjusted formula.

   b. Their interpretation is as follows: "We are 95% confident that the true percent of all drug-related deaths caused by legally prescribed drugs in this sample is between 77.5% and 94.5%."
      Is this interpretation correct? If not, correct it.

      No, it's not correct. It should say: We are 95% confident that the true percent of all drug-related deaths caused by legally prescribed drugs in **the U.S**. is between 77.5% and 94.5%.

2. The 95% confidence interval for the mean number of latex gloves used per week by all health-care workers in a certain hospital is (15.86, 22.74).

   a. Write the correct interpretation of this confidence interval.

      We are 95% confident that the true mean number of latex gloves used per week by ALL health-care workers in that hospital is somewhere between 15.86 and 22.74.

   b. What is in the exact middle of the interval? Circle all the correct answers.

Sample mean	*Population mean*	*19.3*	*Margin of error*
Sample statistic	*Population parameter*	*3.44*	*95%*

3. 38% of a simple random sample of 100 Columbia, South Carolina residents said that they had attended a USC (University of South Carolina) football game last year. Which value is the closest to the margin of error for a 95 percent confidence interval for the proportion of Columbia residents who have attended a game this year?
   (a) 0.01
   (b) 0.09
   (c) 0.38
   (d) 0.62

4. Using data from the n = 100 Columbia residents in Question 3, a 99 percent confidence interval for the mean age (in years) of Columbia residents was computed to be (29.8; 38.5).
   What is the correct interpretation attached to this interval?
   (a) We are 99% confident that the mean age of all Columbia residents is between 29.8 and 38.5.
   (b) 99% of the residents in our sample had ages between 29.8 and 38.5.
   (c) We are 99 % confident that the mean age of the residents in our sample is between 29.8 and 38.5.
   (d) All of the above are valid interpretations.

5. In Question 4, what is one way to decrease the length of the confidence interval?
   (a) Increase the sample size
   (b) Use a smaller confidence level
   (c) Both (a) and (b) are correct
   (d) Neither (a) nor (b) are correct

6. In a clinical trial, the researchers guess that the proportion of patients responding to a certain drug is around 0.6. To engage in a larger trial, the researchers would like to know how many patients they should recruit into the study. Their resulting 90 percent confidence interval for p, the true population proportion of patients responding to the drug, should have a margin of error no greater than m = 0.05. What is the smallest sample size they would need for the trial?

$$n = \left(\frac{z^*}{m}\right)^2 \hat{p}(1-\hat{p}) = \left(\frac{1.645}{0.05}\right)^2 0.6(1-0.6) = 259.778$$

But we need to round it up, so they need at least 260 patients.