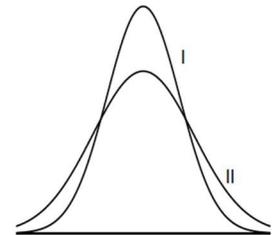


Problem 1

1. Suppose that 65% of all college women have been on a diet within the last 6 months. A survey is planned to interview a simple random sample of 100 college women if they were on a diet within the last 6 months. What is the probability that 70% or more of the women in the sample have been on a diet in the last 6 months? ⁴ **Solution: 0.1469**

Problem 2

2. The following graph shows two sampling distributions of two sample proportions (Distribution I is taller.) The population from which we sample is the same in both cases. What can we conclude? Hint: Think in terms of the spread.
 - a) The sample proportion in I comes from a larger sample from that of II.
 - b) The sample proportion in II comes from a larger sample from that of I.
 - c) The sample sizes for both sample proportions are equal to each other.
 - d) The sample sizes are different, but it cannot be determined which is larger.
 - e) Something is wrong. If the population is the same in both cases, the sampling distributions should look the same.



Answer: a

Problem 3

3. Historically, 51% voters in a certain state voted for a Republican candidate as state governor. A new governor election is coming up and a survey of randomly selected 100 voters from this state will be conducted, what is the probability that more than 55% will vote for the Republican candidate? Find the closest answer.
 - a) 0.83
 - b) 0.04
 - c) 0.79
 - d) 0.96
 - e) 0.21

Answer: e

Problem 4

A hospital administrator hoping to improve wait times decides to estimate the average emergency room waiting time at her hospital. The population standard deviation is provided. She collects a simple random sample of 64 patients and determines the time (in minutes) between when they checked in to the ER until they were first seen by a doctor. A 95% confidence interval based on this sample is (128 minutes, 147 minutes), which is based on the normal model for the mean.

Determine whether the following statements are true or false, and explain your reasoning. ⁴

1. This confidence interval is not valid since we do not know if the population distribution of the ER wait times is nearly Normal.
False, because $n \geq 30$
2. We are 95% confident that the average waiting time of these 64 emergency room patients is between 128 and 147 minutes.
False, because inference is made on parameter

¹ Math-UOttawa ² UVermont ³ Utts ⁴ OpenIntro



3. We are 95% confident that the average waiting time of all patients at this hospital's emergency room is between 128 and 147 minutes.

True

4. 95% of random samples have a sample mean between 128 and 147 minutes.

False, the CI is not about a sample mean.

5. A 99% confidence interval would be narrower than the 95% confidence interval since we need to be surer of our estimate.

False, it will be wider

6. The margin of error is 9.5 and the sample mean is 137.5.

True

7. In order to decrease the margin of error of a 95% confidence interval to half of what it is now, we would need to double the sample size.

False, To cut the SE (or margin of error) in half, we would need a sample of 256 that is four times the original sample size.

Problem 5⁴.

In 2013, the Pew Research Foundation reported that 45% of U.S. adults report that they live with one or more chronic conditions". However, this value was based on a sample, so it may not be a perfect estimate for the population parameter of interest on its own. The standard deviation of about 1.2%, and a normal model may reasonably be used in this setting.

1. Which conditions were checked in order to use the normal model?

$n\hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$

2. Create a 95% confidence interval for the proportion of U.S. adults who live with one or more chronic conditions. Also interpret the confidence interval in the context of the study.

Answer: Recall that the general formula is $\text{point estimate} \pm$

First, identify the three different values. The point estimate is 45%, $Z^* = 1.96$ for a 95% confidence level, and $Sd = 1.2\%$. Then, plug the values into the formula:

$$45\% \pm 1.96 \times 1.2\% \rightarrow (42.6\%, 47.4\%)$$

We are 95% confident that the proportion of US adults who live with one or more chronic conditions is between 42.6% and 47.4%.

Problem 6⁴ (Part ii)

In 2013, the Pew Research Foundation reported that "45% of U.S. adults report that they live with one or more chronic conditions", and the standard deviation is 1.2%. Identify each of the following statements as true or false. Provide an explanation to justify each of your answers.

3. We can say with certainty that the confidence interval from Problem 1 contains the true percentage of U.S. adults who suffer from a chronic illness.

False. Confidence intervals provide a range of plausible values, and sometimes the truth is missed. A 95% confidence interval "misses" about 5% of the time.

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4. If we repeated this study 1,000 times and constructed a 95% confidence interval for each study, then approximately 950 of those confidence intervals would contain the true fraction of U.S. adults who suffer from chronic illnesses.

True. Notice that the description focuses on the true population value.

5. Since the standard deviation is 1.2%, only 1.2% of people in the study communicated uncertainty about their answer.

False. The standard deviation describes the uncertainty in the overall estimate from natural fluctuations due to randomness, not the uncertainty corresponding to individuals' responses.