

Chapter 11. Please do Activity 5 on the Chapter 11 handout as a review. This was a follow-up on the question: What are unusual values for the sample mean?

Chapter 14: Estimating a population mean

Do you remember the questions in the Ch. 11 discussion: What are typical values? What are unusual values? This chapter is following up on the question “What are typical values?”

Activity 1. (I don’t expect you to use any exact method. Just guess here. Think about what you know or just use your instincts. You can re-visit this at the end of the handout.)

We want to estimate the mean percentage tip that patrons leave in a restaurant when their server gives them an upbeat message “Tomorrow’s weather should be good. The data we collected to estimate this is the tips from 20 randomly selected patrons who received that message and that sample mean is 22.21%. We have prior information that the standard deviation of the tips is 2.00%. We’d like to be about 95% sure that we capture the true population mean tip in our interval. Which of these intervals looks best and why?

$$\begin{array}{lll}
 \text{a.} & 22.21 \pm 2 \cdot 2.00 & \\
 & 22.21 \pm 4.00 & \\
 & & \text{b.} \quad 22.21 \pm 2 \cdot \frac{2.00}{\sqrt{20}} \\
 & & 22.21 \pm 0.89 \\
 & & \text{c.} \quad 22.21 \pm 3 \cdot \frac{2.00}{\sqrt{20}} \\
 & & 22.21 \pm 1.34
 \end{array}$$

It is important to understand the interpretations, the meaning, and why the formulas are what they are. The basis upon which they are founded is our Chapter 11 Sampling Distribution of the Sample Mean.

Tour of Chapter 14.

The reasoning of statistical inference.

Activity 3. Read the discussion 1-4. Read exercise 14.1a. In the margin here, draw pictures like we did in Chapter 11 to illustrate the population distribution and the sampling distribution of the sample mean. (Note that the population mean is unknown here. Call it μ . The mean of the sampling distribution of the sample means is also μ . What is the standard deviation of the population? What is the sample size?) Use your pictures to answer exercise 14.1.

Margin of error and confidence level.

Activity 3. Notice that all the computations in this chapter are in the picture of the sampling distribution of the sample mean. Explain what the pictures in Figures 14.1 and 14.2 tell you. Notice that the confidence level tells you how much of the middle of the picture to use, so that tells you how large the margin of error is.

Write the formula for the margin of error.

Write the formula for the confidence interval for the population mean.

Confidence Intervals for the Population Mean

In this section, we give a more precise value for how many standard deviations it takes to get 95% in the center. We learned in the 68-95-99.7 rule that it is about 2 standard deviations. If we write that number correct to the nearest thousandth, it is 1.960 standard deviations away from the mean. The values for 90% and 99% intervals are also given. You may write those in your notes. (They can also be found from the normal table.)

Activity 4.

- a. Do Exercise 14.7b – just the calculations and not the entire four-step process. Be sure to use software to find the mean. Of course, you could do it by hand with a calculator, but we don't want to take the time to do that in class.

- b. Re-do exercise 14.7b, but now find a 95% confidence interval for the mean. Is it wider or narrower than the 99% interval. Is that what you would have expected? Explain.

- c. Suppose that, in exercise 14.7b, you had the same sample mean, but it was from a sample size of 64 instead of 31. Find the 99% confidence interval for the population mean.

- d. Say whether this 99% interval for $n = 64$ is wider or narrower than the 99% confidence interval from the original sample where $n = 31$. Is that what you would have expected? Explain.

Simple conditions for inference.

Discussion / lecture. These are (1) SRS from pop'n of interest. (2) Pop'n is normally distributed. (3) Pop'n standard deviation is known.

In the Solve step of the Four-Step process, start by checking the conditions. This is probably the most complex part of an inference problem, and, in fact, **I don't expect you to be able to do this well until you get into Chs. 18 and on.** But to learn to do it well, you have to see it discussed in quite a few situations. So we're starting to do that.

Activity 5. Read Example 14.3 (Confidence Intervals for a Population Mean). Skim over the solution. What does this tell you about the question you answered today in Activity 1 about the population mean tip? Do you understand why? Discuss.

Skim over the discussion of checking the conditions (after the example.) While you are not expected to write things like that yet, you are expected to read these and discuss them on the Disc. Board (and in class.)

Activity 6. For Exercise 14.7 – you did part b already. Now do part a and write something reasonable for each of the four steps of the solution to b. (Use the computations you did earlier instead of re-doing them.)

Activity 7: Do Exercise 14.23.

(Hint. Think of sketching the two pictures – one for the population and the other for the distribution of the sample mean. A confidence interval is formed in which picture? The conclusion stated in this question is in which picture?)