**HOMEWORK 2**

*Inference for One Mean and Paired Data*

For this reading and assignment, use the free online textbook, *OpenIntro Statistics, 4th Edition*. To see the textbook, go to <https://www.openintro.org/book/os/>. Click on *Free – OpenIntro Statistics PDF*, and then click on *Read Free Sample* on the right. A pdf version of the textbook should open.

Reading: This assignment focuses on content from Chapters 5.1 and 7.1-7.2. Read Chapters 5.1 and 7.1-7.2.

Notes:

* For questions requiring you to use JMP, you must provide a copy of your output at the end of your assignment or embedded within your assignment. No credit will be given if you do not include your output, even if your answer is correct.
* Recall that you can download JMP to your personal computer for free. See the JMP information posted on Canvas. Problems due to not getting JMP working will not allow you to submit your assignment late. Please plan to work ahead and email your instructor questions if needed.
* See the JMP information posted on Canvas on how to copy JMP output into files.
* Round all numbers to 2 decimal places unless otherwise specified.

Complete the following questions from the textbook. Note that the questions start on page 300. Also, the answers to the odd numbered questions are at the end starting on page 398.

1. 7.17 – Paired or not, Part I? (no explanations needed) (page 265)
   1. paired
   2. Not paired
   3. paired
   4. paired
2. 7.51 – Hen eggs. (page 300)
   1. sampling distribution.
   2. Symmetric, right skewed, or left skewed?

Explain.

Given the information that there are random samples and a sample size of 35 eggs, which is greater than 30, according to the central limit theorem, the distribution would be approximately normal and thus symmetric.

* 1. Hint: This measure of variability was simulated in the sampling distribution lab and the formula was used when computing a confidence interval by hand in lecture.

Value of measure of variability = 18.2/sqrt(45)=2.713

Term (name of this measure of variability): Standard error

* 1. Will the variability in the new distribution (n=10) have the same variability, smaller variability, or larger variability than the previous distribution (n=45)?

It would have a larger variability than the previous distribution because it has a smaller sample size, so they are likely to vary more.

1. 7.57 – Online communication. (page 302)

Answer questions 4-16 based on the following scenario and dataset posted on Canvas.

Students were surveyed in an introductory statistics course.[[1]](#footnote-1) The variable we will look at first is *Pulse* which refers to pulse rate in beats per minute of the student.

Research Question 1: What is the population mean number pulse rate for students at the university where the data was collected?

1. Why would it be appropriate to use a confidence interval to answer Research Question 1?

A confidence interval would be more appropriate because we want to find the estimate of the population mean, which would likely be between a range of values, for the number of hours of television is watched by students at the university.

1. Are the conditions met to create a 95% confidence interval for the *Pulse* variable? Explain.

No, the conditions are to have random samples and an approximately normal distribution. Even though there is a sample size greater than 30 and the distribution is approximately normal, the students were surveyed in an introductory stats course which means the samples were not randomly sampled.

1. Use JMP to create a 95% confidence interval for the *Pulse* variable. Note that you will likely use the *Analyze, Distribution* analysis in JMP, however there are other ways to get the same results.

Confidence interval = 95% CI [68.31, 70.84]

Application

Description automatically generated with low confidence

1. Interpret the 95% confidence interval for the *Pulse* variable.

We are 95% confident that the true mean number of beats per minute of students at the university is between 68.31 and 70.84 beats per minute.

Now we will look at the *Piercings* variable.

Research Question 2: Is the population mean number of piercings for students at the university where the data was collected more than 1?

1. Why would it be appropriate to use a hypothesis test to answer Research Question 2?

It is appropriate to use a hypothesis test because we are investigating whether or not the evidence to the hypothesis of which population mean piercings for students at the university where the data was collected was more than 1 is plausible.

1. Are the conditions met to conduct a hypothesis test for the *Piercings* variable? Explain.

No, the conditions are to have random samples and an approximately normal distribution. Although there is a sample size greater than 30 and the distribution is approximately normal, the students were surveyed in an intro stats course which means the samples were not randomly sampled.

1. What are the appropriate hypothesis statements to answer Research Question 2?

Ho: μ = 1

Ha: μ > 1

1. Use JMP to compute the test statistic and *p*-value to answer Research Question 2. Note that you will likely use the *Analyze, Distribution* analysis in JMP, however there are other ways to get the same results. Keep 4 decimal places in your answers.

Test statistic = 5.8864

*p*-value = < 0.0001

Graphical user interface, text, application

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1. Interpret the p-value by stating what the probability represents in context.

The probability of having a sample mean Piercings number as extreme or more than 1 if the null hypothesis were true was <0.0001.

1. Write out your conclusion to answer Research Question 2.

There is overwhelming evidence that the population mean number of piercings for students at the university where the data was collected is more than 1.

Research Question 3: Is the population mean number of piercings for students at the university where the data was collected more than 1.5?

1. What are the appropriate hypothesis statements to answer Research Question 3?

Ho: μ = 1.5

Ha: μ > 1.5

1. Use JMP to compute the test statistic and *p*-value to answer Research Question 3. Keep 4 decimal places in your answers.

Test statistic = 1.514

*p*-value = 0.0655

Graphical user interface, application

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1. Write out your conclusion to answer Research Question 3.

There is borderline/weak evidence that the population mean number of piercings for students at the university where the data was collected is more than 1.5.

Answer questions 17-23 based on the following scenario and dataset posted on Canvas.

199 married couples were randomly selected from a list of couples who were married at a particular church in the past year.[[2]](#footnote-2) The husbands and wives reported their ages and heights.

1. Explain why the data is paired.

The husbands and wives each reported their ages and heights which are dependent. The husbands and wives have been married for the past year and they are the same married couple throughout the scenario so there is pairing.

Research Question 1: Is there of a evidence of a difference in husbands and wives average heights?

1. What are the appropriate hypothesis statements to answer Research Question 1?

Ho: μ=0

Ha: μ≠0

1. Are the conditions met to conduct a hypothesis test? Explain.

Yes, the couples were randomly sampled, there is a sample size of at least 30 and the population difference is approximately normally distributed.

1. Use JMP to compute the test statistic and *p*-value to answer Research Question 1. Keep 4 decimal places in your answers.

Test statistic = 24.8399

*p*-value = < 0.0001

Graphical user interface, text, application

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1. Write out your conclusion to answer Research Question 1.

There is overwhelming evidence that the population mean difference in husbands and wives average heights is not 0.

Research Question 2: What is the population mean difference in average ages for husbands and wives?

1. Use JMP to create a 95% confidence interval to answer Research Question 2. Keep 2 decimal places in your answers.

Confidence interval = [1.62, 2.85]

Graphical user interface, application

Description automatically generated

1. Interpret the 95% confidence interval. In your interpretation make sure to specify whether husbands or wives are older on average.

We are 95% confident that the population mean difference between husbands and wives age in years between husbands and wives (HusbandsAge-WivesAge) is between 1.62 and 2.85.

1. http://www.lock5stat.com/datapage.html [↑](#footnote-ref-1)
2. Data from <https://dasl.datadescription.com/datafile/couples/?_sfm_methods=Paired+Data&_sfm_cases=4+59943> [↑](#footnote-ref-2)