**Lab Activity 4**

# Part I. (5 pt) One-sample z-test

The weights of packages of a certain type of cookie follow a normal distribution with a mean of 16.2 oz and a standard deviation of 0.5 oz. Suppose you buy a large box of these cookies, and the box includes 25 packages. Then, you measure the weight for each package. You find that the average weight of all packages in this box is 15.9 oz. Your gut says there is something wrong, and you start believing that the manufacturer is lying. You hypothesize that the manufacturer is producing packages with significantly lower weights than the weight they claim.

How would you test your hypothesis? Respond to the following questions as instructed.

1. State the null and alternative hypotheses in words.

Null hypothesis:

Alternative hypothesis:

1. State the null and alternative hypotheses in symbols.

H0:

HA:

1. Conduct a test to test your hypothesis at the significance level of 0.01 (*α* = .01). What is your conclusion? Is the manufacturer lying? Explain all your reasoning and include your computations as you make your conclusions about your hypothesis.

# Part II. (5 pt) One-sample t-test

You decide to try another box of cookies that also follows a normal distribution with a mean of 16.2 oz and an unknown standard deviation. Suppose you buy a large box of these cookies, and the box includes 25 packages. Then, you measure the weight for each package. You find that the average weight of all packages in this box is 15.9 oz with a standard deviation of 0.45 oz. You become suspicious again and start believing that this manufacturer is also lying. You hypothesize that the manufacturer is producing packages with significantly lower weights than the weight they claim.

How would you test your hypothesis? Respond to the following questions as instructed.

1. State the null and alternative hypotheses in words.

Null hypothesis:

Alternative hypothesis:

1. State the null and alternative hypotheses in symbols.

H0:

HA:

1. Conduct a test to test your hypothesis at the significance level of 0.01 (*α* = .01). What is your conclusion? Is the manufacturer lying? Explain all your reasoning and include your computations as you make your conclusions about your hypothesis.
2. Consider the differences between Part I and Part II. Now that you’ve tested two separate hypotheses, describe the differences you observed between using a t-test and a z-test.

# Part III. (5 pt) One-sample t-test - HEIGHT

For Part III, you will use another subset of the ECLS-K dataset (<https://nces.ed.gov/ecls/>). The dataset is available on Canvas in CSV format (ecls-k-sub.csv). Please refer to the appendix in Lab 2 and the corresponding tutorial for more information about the dataset, its variables, and how to recode missing values before conducting the following analyses.

One of your friends claims that the average height in the U.S. for kids starting kindergarten is 44 inches. Assuming that the ECLS-K sample dataset is a representative sample of the U.S. population of kids starting kindergarten, you will test this hypothesis.

The variable of interest in the dataset is X1HEIGHT.

1. State the null and alternative hypotheses in words.

Null hypothesis:

Alternative hypothesis:

1. State the null and alternative hypotheses in symbols.

H0:

HA:

1. Run a one-sample t-test to test your friend’s claim. Copy/Paste the R output below.
2. Fill in the blanks in the following summary write-up according to your analysis results (round the numbers to the second decimal).

The average height for \_\_\_\_\_\_ children in this particular sample was \_\_\_\_\_\_ with a standard deviation of \_\_\_\_\_. A one-sample *t*-test was conducted to test whether the average height in the population was equal to 44 inches. Based on the results of a one-sample *t*-test, we *reject*/*do not reject (choose one of the options)* the null hypothesis that the average height in the population is equal to 44 inches, *t* (\_\_\_\_\_) = \_\_\_\_\_, *p* = \_\_\_\_\_, *Cohen’s d* = \_\_\_\_\_.

# Part IV. (5 pt) One-sample t-test - WEIGHT

For Part IV, you will again use a subset of the ECLS-K dataset (<https://nces.ed.gov/ecls/>). The same friend claims that the average weight in the U.S. for kids starting kindergarten is 47 pounds. Assuming that the ECLS-K sample dataset is a representative sample of the U.S. population of kids starting kindergarten, you will again test this hypothesis.

The variable of interest in the dataset is X1WEIGHT.

1. State the null and alternative hypotheses in words.

Null hypothesis:

Alternative hypothesis:

1. State the null and alternative hypotheses in symbols.

H0:

HA:

1. Provide a summary write-up for your results from this analysis.