



UNIVARIATE STATISTICAL ANALYSIS

TUTORIAL SESSION 8

HYPOTHESIS TESTING (ONE TAILED)

Chapter 10

Question 10.52 (page.539) – Salary

Question 10.53 (page.539) – Big Mac Price

Extra Question 1.

Given that $\bar{x} = 150$, $\sigma = 100$ and $n = 200$, test the following hypotheses with $\alpha = 0.05$

$$H_0: \mu = 160$$

$$H_a: \mu < 160$$

Extra Question 2.

From a normal population whose standard deviation is 82.09. Test with $\alpha = 0.05$, sample of 100 and sample mean of 682. Can we conclude that the population mean is greater than 626.4?

- c. Do you think that asking customers before they order to provide a receipt when they leave could have introduced a potential bias? Explain.

10.52 The report “2016 Salary Survey Executive Summary” (National Association of Colleges and Employers, naceweb.org/uploadedfiles/files/2016/publications/executive-summary/2016-nace-salary-survey-fall-executive-summary.pdf, retrieved December 24, 2016) states that the mean yearly salary offer for students graduating with mathematics and statistics degrees in 2016 is \$62,985. Suppose that a random sample of 50 mathematics and statistics graduates at a large university who received job offers resulted in a mean offer of \$63,500 and a standard deviation of \$3300. Do the sample data provide strong support for the claim that the mean salary offer for mathematics and statistics graduates of this university is greater than the 2016 national average of \$62,985? Test the relevant hypotheses using $\alpha = 0.05$.

10.53 ● *The Economist* collects data each year on the price of a Big Mac in various countries around the world. The price of a Big Mac for a sample of McDonald’s restaurants in Europe in July 2016 resulted in the following Big Mac prices (after conversion to U.S. dollars):

4.44 3.15 2.42 3.96 4.35 4.51
4.17 3.69 4.62 3.80 3.36 3.85

The mean price of a Big Mac in the U.S. in July 2016 was \$5.04. For purposes of this exercise, assume it is reasonable to regard the sample as representative of European McDonald’s restaurants. Does the sample provide convincing evidence that the mean July 2016 price of a Big Mac in Europe is less than the reported U.S. price? Test the relevant hypotheses using $\alpha = 0.05$.

10.54 The report “Majoring in Money: How American College Students Manage Their Finances” (Sallie Mae, 2016, news/salliemae.com, retrieved December 24, 2016) includes data from a survey of college students. Each person in a representative sample of 793 college students was asked if they had one or more credit cards and if so, whether they paid their balance in full each month. There were 500 who paid in full each month. For this sample of 500 students, the sample mean credit card balance was reported to be \$825. The sample standard deviation of the credit card balances for these 500 students was not reported, but for purposes of this exercise, suppose that it was \$200. Is there convincing evidence that college students who pay their credit card balance in full each month have mean balance that is lower than \$906, the value reported for all college students with credit cards? Carry out a hypothesis test using a significance level of 0.01.

10.55 The authors of the paper “Changes in Quantity, Spending, and Nutritional Characteristics of Adult,

Adolescent and Child Urban Corner Store Purchases After an Environmental Intervention” (*Preventative Medicine* [2015]: 81–85) wondered if increasing the availability of healthy food options would also increase the amount people spend at the corner store. They collected data from a representative sample of 5949 purchases at corner stores in Philadelphia after the stores increased their healthy food options. The sample mean amount spent for this sample of purchases was \$2.86 and the sample standard deviation was \$5.40.

- a. Notice that for this sample, the sample standard deviation is greater than the sample mean. What does this tell you about the distribution of purchase amounts?
- b. Before the stores increased the availability of healthy foods, the population mean total amount spent per purchase was thought to be about \$2.80. Do the data from this study provide convincing evidence that the population mean amount spent per purchase is greater after the change to increase healthy food options? Carry out a hypothesis test with a significance level of 0.05.

10.56 ● Medical research has shown that repeated wrist extension beyond 20 degrees increases the risk of wrist and hand injuries. Each of 24 students at Cornell University used a proposed new computer mouse design. While using the mouse, each student’s wrist extension was recorded. Data consistent with summary values given in the paper “Comparative Study of Two Computer Mouse Designs” (Cornell Human Factors Laboratory Technical Report RP7992) are given. Use these data to test the hypothesis that the mean wrist extension for people using this new mouse design is greater than 20 degrees. Are any assumptions required in order for it to be appropriate to generalize the results of your test to the population of Cornell students? To the population of all university students? (Hint: See Example 10.13.)

27 28 24 26 27 25 25 24 24 24 25 28
22 25 24 28 27 26 31 25 28 27 27 25

10.57 A comprehensive study conducted by the National Institute of Child Health and Human Development tracked more than 1000 children from an early age through elementary school (*The New York Times*, November 1, 2005). The study concluded that children who spent more than 30 hours a week in child care before entering school tended to score higher in math and reading when they were in the third grade. The researchers cautioned that the findings should not be a cause for alarm because the effects of child care were found to be small.

Explain how the difference between the sample mean math score for third graders who spent long hours in child care and the known overall mean for third graders could be small but the researchers