Homework №13

Math 107, Spring 2016 Due: May 27 by 4:00 pm

Problem 1

A market researcher wants to evaluate car insurance savings at a competing company. Based on past studies he is assuming that the standard deviation of savings is $100. He wants to collect data such that he can get a margin of error of no more than $8 at a 90% confidence level. How large of a sample should he collect?

Problem 2

A major medical center in the Northeastern U.S. conducted a study looking at blood cholesterol levels and incidence of heart attack. Below are data from 16 people who had a heart attack and 20 people who did not have a heart attack. The data are displayed below and a tidy form of the data set is available online (`cholesterol.csv`).

Heart Attack					**No Heart Attack**				
242	186	266	206		182	222	198	192	238
318	294	282	234		198	188	166	204	182
224	276	262	360		178	202	164	230	186
310	280	248	258		162	182	218	170	200

(a) Is this an experiment or an observational study? Briefly justify your answer.

(b) Use R to compute the sample mean and sample standard deviation for each group.

(c) Use R to create side-by-side boxplots for each group. Include this plot in your submission and compare the two groups in terms of center and spread.

(d) Describe how individuals in this study need to be selected for the randomization assumption to be satisfied.

(e) Is there sufficient evidence to indicate that the mean cholesterol level for people who have had a heart attack is greater than that for people who have not had a heart attack? Perform the appropriate hypothesis test (be sure to complete all five steps).

(f) Construct and interpret a 95% confidence interval for the difference in population mean cholesterol levels.

Problem 3

A group of researchers are interested in the possible effects of distracting stimuli during eating, such as an increase or decrease in the amount of food consumption. To test this hypothesis, they monitored food intake for a group of 44 patients who were randomized into two equal groups. The treatment group ate lunch while playing solitaire, and the control group ate lunch without any added distractions. Patients in the treatment group ate 52.1 grams of biscuits, with a standard deviation of 45.1 grams, and patients in the control group ate 27.1 grams of biscuits, with a standard deviation of 26.4 grams. Do these data provide convincing evidence that the average food intake (measured in amount of biscuits consumed) is different for the patients in the treatment group? Assume that conditions for inference are satisfied.[1]

[1] R.E. Oldham-Cooper et al. "Playing a computer game during lunch affects fullness, memory for lunch, and later snack intake." In: *The American Journal of Clinical Nutrition* 93.2 (2011), p. 308.

Problem 4

Air quality measurements were collected in a random sample of 25 country capitals in 2013, and then again in the same cities in 2014. We would like to use these data to compare average air quality between the two years.

(a) Should we use a one-sided or a two-sided test? Explain your reasoning.

(b) Can we justify the independent group assumption? Explain your reasoning.