

HOMEWORK 7

STA 321, Basic Statistical Theory
Spring Semester, 2015

Due: April 16th, 2015

More data analysis. This time, descriptive and inferential. Wherever possible, display the data using an appropriate graphical method. Carefully choose the correct inference method (and appropriate hypotheses), analyze the data set, and formulate an interpretation/conclusion. You may analyze “by hand” (using a calculator), using the online tools, or using statistical software such as SAS. Check the assumptions that you can check. Otherwise, assume that they are sufficiently satisfied.

1. Egyptian Skulls. Archeologists think that ancient Egyptians interbred with several different neighboring and immigrant populations for thousands of years. This claim would be supported by any indication of changes in body structure between 4000 B.C. and 200 B.C. [Thomson and Randall-Maciver (1905), *Ancient Races of the Thebaid*, Oxford University Press.] The following data contain the maximum skull breadth [mm] for 30 skulls of male Egyptians from each of these two time periods.

4000 B.C.: 131 131 125 135 131 132 119 139 136 132 138 126 139 135 125 134 131 128 134 130 129 138 134 128 126 127 132 131 141 124

200 B.C.: 141 131 141 129 135 136 133 131 131 139 140 144 139 141 140 130 138 133 132 138 134 131 135 136 133 132 136 135 134 141

2. Shape of Glass. Researchers randomly assigned participants either a tall and thin “highball” or a short and wide “tumbler” glass, each of which held 355ml. Subjects were asked to pour a shot (44.3ml) into the glass. Does the shape of the glass make a difference in how much alcohol they poured?

[Warsink and van Ittersum (2005), *Shape of Glass and Amount of Alcohol Poured*, *British Medical Journal* 331, 15121514.] The summary statistics from this experiment were as follows.

“Highball” glasses: sample size $n = 99$, sample mean $\bar{Y} = 42.2\text{ml}$, sample standard deviation $s = 16.2\text{ml}$

“Tumbler” glasses: $n = 99$, $\bar{Y} = 60.9\text{ml}$, $s = 17.9\text{ml}$

3. Vitality of Treetops. The effects of acid rain on treetops were investigated by comparing the vitality of trees under a “de-acidification roof” to those exposed to normal rain. The vitality of the tree is rated on a grading scale from 1 (vital) to 10 (dead).

[Bredemeier et al. (1998), *The Solling Roof Project Site Characteristics, Experiments and Results, Forest Ecology and Management* 101, 281293.]

De-acidification: 1 5 2 1 2 3 5 2 2 5 3 2 2 4 7 3 2 2 4 3 4 2 1 4 2 1 4

Normal: 2 1 2 3 4 2 4 4 3 2 3 4 2 2 3 1 5 1 3 2 4 1

4. Watching TV and Aggressive Behavior. Various studies have investigated whether there is a link between television violence and aggressive behavior by those who watch a lot of TV. Researchers have randomly sampled 707 families in northern New York State. They asked how much TV the sampled teenagers watched. Then, they made follow-up observations over a period of 17 years to see whether the same teenager conducted any aggressive act against another person, as reported by the teenager or by their mother.

[Johnson et al. (2002), *Science* 295, March 29, 2002.]

Out of 88 teenagers who watched less than one hour per day, 5 committed an aggressive act. Out of 619 teenagers who watched at least one hour per day, 154 conducted an aggressive act.

5. Cell Phones and Driving. Most scientists think that using cell phones while driving poses potential harm. An experiment investigated whether cell phone use impairs drivers’ reaction times. 64 students from the University of Utah were randomly assigned to a cell phone group ($n_1 = 32$) or a control group ($n_2 = 32$). On a machine that simulated driving situations, at irregular periods a target flashed red or green. Participants were instructed to press a “brake button” as soon as possible when they noticed a red light. The control group listened to a radio broadcast or to a book on tape, while the cell phone group carried out a conversation about a political issue on the cell phone with someone in a separate room.

[Strayer and Johnston (2001), Psychological Science 21.]

The response times in the cell phone group had a mean of 585.2 milliseconds and a standard deviation of 89.6 milliseconds. In the control group, the mean was 533.7 milliseconds, and the standard deviation was 65.3 milliseconds.