Stat 104 – Homework 1
Solution

Assignment:

1. Complete the following problems from the text: 1.25, 1.28, 1.32, 1.36, 1.44, and 1.50.

   If you have questions about these problems please contact me.

2. CBS News conducted a public opinion survey from July 31st through August 5th, 2008. 906 randomly selected registered voters from across the United States were contacted by telephone and asked the question, "Would you favor allowing increased drilling for oil and natural gas off the U.S. coast, or do you think the costs and risks are too great?" 64% of the people contacted answered that they were in favor, 28% answered that they thought the costs and risks were too great, and 8% were unsure.

   a) Identify the population.

      The population consists of all registered voters in the United States.

   b) Identify a population parameter of interest.

      A population parameter is the proportion of all registered voters who favor allowing increased drilling for oil and natural gas off the U.S. coast.

   c) Identify the sample.

      The sample consists of 906 randomly selected registered voters contacted by CBS News.

   d) Identify a sample statistic that tells you something about the parameter you identified in b) and give its value.

      A sample statistics is the proportion of the sample that favors allowing increased drilling for oil and natural gas off the U.S. coast. Its value is 0.64 or 64%.

   e) Identify any potential sources of bias you can detect and any problems you see in generalizing to the population identified in a).

      Only registered voters with telephones will be contacted. This can create a bias because those without telephones are excluded from the sampling frame. We can make a generalization to all registered voters with telephones but not to all registered voters.

      If the population of interest is all adults (18 years and older) in the U.S. then contacting only registered voters could create a bias because not all adults may be eligible to vote or registered to vote.

3. The following is taken from an article on the Des Moines Register website, August 11, 2008, entitled "Balancing brain time-out in concussion recovery."

   "Your brain needs more of a time-out than just missing the next game to recover from a concussion. New research suggests student athletes who are too active – not just on the field, but at home and school – may hinder their recovery.

   … researchers at the University of Pittsburgh … tracked 95 high school athletes evaluated in a university-based program that gave a battery of memory, reaction time and other cognitive tests up to a month after the concussion. The researchers grouped patients by activities recorded in their medical records: No school; some schoolwork but no other activity; moderate activity described as schoolwork and some routine home chores; that plus sports practice; or schoolwork and playing some sports.

   Those with moderate activity showed the best recovery, scoring better on brain tests than even the less active patients, researchers reported in the Journal of Athletic Training. The more active patients scored much worse – and although their allowed activity suggested they were thought to have a mild concussion, they ultimately performed as poorly as athletes initially diagnosed with a more serious concussion.

   a) Why is this study an observational study and not an experiment?

      No factor was manipulated by the researchers. Activity was observed from medical records and brain test scores were observed for all patients.

   b) What is the response variable? Is it categorical or numerical?

      The response variable is the score on the brain test. This is most likely a numerical variable.

   c) What is the explanatory variable? Is it categorical or numerical?

      The explanatory variable is the activity of the patient. This is a categorical variable e.g. no school, schoolwork but no other activity, etc.

   d) Activities recorded in the athletes' medical records are most likely linked to another variable concerning the athletes. What is this variable? Is it categorical or numerical?

      Activities are most likely prescribed based on the severity of the concussion, e.g. milder concussions might allow for more activity while more severe concussions would limit activity more. Concussion severity is often reported as Grade 1 (mild), Grade 2 (moderate), or Grade 3 (severe). This is an ordered categorical variable.

4. *Science Daily* ("Frankincense Provides Relief to Arthritis Sufferers," July 31, 2008) reported on a study that found that an enriched extract of the Indian Frankincense herb *Boswellia serrata*, trade-name 5-Loxin®, reduced symptoms of osteoarthritis in the knee. The research study, published in *Arthritis Research and Therapy*, involved 75 osteoarthritis patients. Patients were randomly

assigned to treatment groups, with 25 patients in each group. The groups were; High dose (250 mg/day of 5-Loxin®), Low dose 100 mg/day of 5-Loxin®), and Control (capsules of similar color, taste and appearance but with no 5-Loxin®). Neither patients nor researchers knew which group patients were in until after the study was completed. The researchers assessed the functional disability reported by patients at the beginning of the study and at days 7, 30, 60 and 90. Pain, stiffness and physical function were assessed using a standard questionnaire (the Western Ontario and McMaster Universities Osteoarthritis Index). At the end of 90 days, the patients treated with 5-Loxin® had significantly lower pain than those in the Control group.

a) Why is this study an experiment?

This is an experiment because the researchers manipulate the amount of 5-Loxin® that patients receive.

b) What is the response variable?

The response variables are pain, stiffness and physical function as reported by the patient through a questionnaire. There are several questions relating to pain on the questionnaire where the patient indicates the amount of pain from 0 = no pain to 100 = severe pain. These scores are added up to produce an overall pain score, a numerical variable.

c) What is the explanatory variable?

The explanatory variable is the amount of 5-Loxin® taken each day. This is numerical variable ranging from 0 to 250 mg/day.

d) What treatments are compared?

The treatments compared are 0 mg/day (Control), 100 mg/day (Low dose) and 250 mg/day (High dose).

e) Is there a placebo, e.g. a treatment with no intended effect? Explain briefly.

Yes, the Control group gets a placebo, capsules of similar color, taste and appearance but with no 5-Loxin®.

f) Is this a "blind" study, e.g. are participants not aware of which treatment they are receiving? Explain briefly?

Yes, neither patients nor researchers know which group patients are in until after the study is completed.