Statistics 101 – Homework 6

Solution

Assignment:

1. ABC News/Washington Post Poll conducted a public opinion survey between February 19th and February 22nd, 2009. 1,001 randomly selected adults from across the United States were contacted and asked the question, "Do you approve or disapprove of the way Obama is handling the economy?" 60% of the people contacted answered Approve, 34% answered Disapprove, and 6% answered Unsure.
   a) Identify the population, be specific.

      The population consists of all adults in the United States.

   b) Identify a population parameter of interest.

      A population parameter of interest would be the proportion of all adults in the United States who approve of the way Obama is handling the economy.

   c) Identify the sample, be specific.

      The sample consists of 1,001 randomly selected adults from across the U.S.

   d) Identify the sampling method, including whether or not randomization was employed.

      The 1,001 adults were selected at random so this is a simple random sample.

2. Below is a list of 10 individuals, name and gender. We wish to select 3 individuals at random from the list of 10.

0 Kaeli (F)	1 Ryan (M)	2 Lindsey (F)	3 Jon (M)	4 Matt (M)
5 Kristi (F)	6 Dawn (F)	7 Alisha (F)	8 Juan (M)	9 Amy (F)

   a) Explain how you would use the table of random numbers in the back of your text (row 21 starting from the left) to select a simple random sample of three individuals. Who are the three individuals selected?

      Starting with the left most digit and reading one digit at a time, select the individual whose number appears. If an individual has already been selected, move to the next number.

      18192
      First person selected – 1 Ryan (M)
      Second person selected – 8 Juan (M)
      Skip 1 as this has already been chosen
      Third person selected – 9 Amy (F)

b) Describe how you would randomly sample to ensure that there would be one male (M) and two females (F) chosen, regardless of where you started in the table of random numbers.

Separate males from females (stratify). Among the males select one at random. Among the females select two at random.

Males – 1 Ryan, 3 Jon, 4 Matt, 8 Juan
Females – 0 Kaeli, 2 Lindsey, 5 Kristi, 6 Dawn, 7 Alisha, 9 Amy

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First male – 1 Ryan
First female – 9 Amy
Second female – 2 Lindsey

3. The following excerpt is taken from an article that appeared in the Des Moines Register on Sunday, February 26, 2006.

Stress can lead to miscarriage.

Pregnant women who are stressed out during the first three weeks after conception are nearly three times as likely to miscarry, a new study finds. The researchers evaluated 61 women over 12 months, collecting each woman's urine three times a week to check for pregnancy status and levels of cortisol, a stress-linked hormone. Of the 61 women, 22 got pregnant. Nine carried to term and 13 miscarried. Women with increased cortisol levels during the first three weeks of pregnancy were 2.7 times more likely to miscarry, the researchers found. Miscarriages occurred in 90 percent of pregnancies in which the women had increased cortisol levels and in 33 percent of those with normal cortisol levels.

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

This is an observational study because the women are observed for 12 months. There is no intervention e.g. assignment to treatments.

b) Is it a retrospective or prospective study? Explain briefly.

The study is prospective because the women are enrolled and then evaluated (e.g. followed) over 12 months.

c) Who were the subjects studied?

The subjects of the study are women who later became pregnant.

d) What are the variables of interest? Indicate what type of variable each is.

The variables of interest are cortisol level – numerical, explanatory and whether or not the pregnant woman miscarried – categorical, response.

e) What is a parameter of interest?

A parameter of interest is the proportion of all women who miscarry.

4. The following excerpt is taken from an article that appeared in the Des Moines Register on Sunday, January 25, 2009.

New pill from Merck may help MS victims.

German drug maker Merck Serono is one step closer to releasing the first pill to treat multiple sclerosis, the company said Friday.

In a news statement, Merck said patients taking cladribine tablets had a nearly 60 percent lower relapse rate than those on placebo pills. The two-year study included 1,326 MS patients randomly divided into three groups. Two groups received different doses of cladribine and one group received fake pills.

Patients on cladribine had up to a 60 percent reduced chance of having a relapse compared to patients on placebo. The study was paid for by Merck.

a) Why is the study an experiment?

The study is an experiment because participants are randomly assigned to treatment groups. The people conducting the study are manipulating how much cladribine each participant takes.

b) Identify the subjects studied.

The subjects in the study are people with multiple sclerosis (MS).

c) Identify the factor(s) in the experiment.

The factor in the experiment is amount of cladribine.

d) Identify the treatments.

There are two dosage levels of cladribine and a control group that gets a placebo.

e) Identify the response variable measured.

The rate of relapse is the response variable.

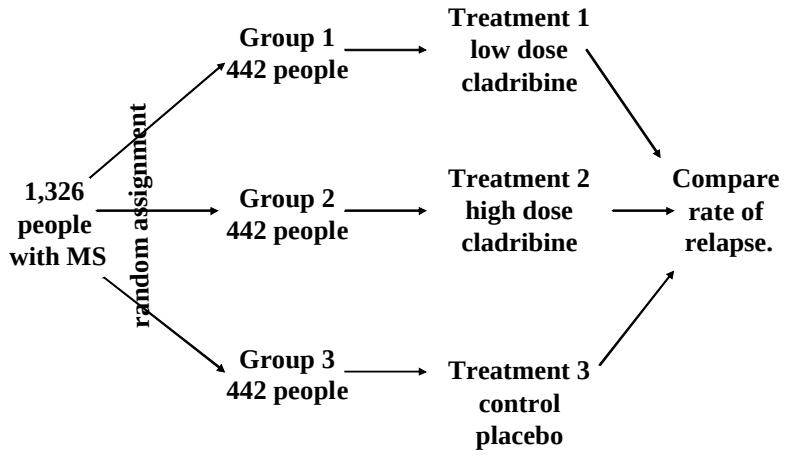
f) Explain how you know that the study was conducted using a completely randomized design and make a diagram of the study. Assume that an equal number of subjects are in each group.

The description says that the 1,326 MS patients were randomly divided into three groups.

See diagram on next page.

g) What does this experiment tell us about the relationship between dosage level of cladribine and relapse rate of MS.

Using cladribine can reduce the chance of relapse up to 60%.



5. The following is taken from an article in the Des Moines Register, January 14, 2007, page 4AA entitled "Study: Milk blunts heart benefits of tea."

   "There are a lot of studies that show that tea is protective against cardiac diseases," said lead researcher Dr. Verena Stangl, professor of cardiology at the Charite Hospital, Universitatsmedizin-Berlin, in Germany. "If you look at the studies, you see that in Asia there are less cardiac diseases, but in England that's not the case. So the question is, is the addition of milk a reason for this difference between Asia and England, where tea is often taken with milk?" she said.

   In the study, 16 healthy postmenopausal women drank either half a liter of freshly brewed black tea, black tea with 10 percent skimmed milk, or boiled water on three different occasions. The researchers then measured the function of the cells lining the brachial artery in the forearm before and two hours after beverage consumption. Stangl's team found that black tea significantly improved the ability of the arteries to relax and expand. "But when we added milk, we found the biological effect of teas was completely abolished," she said.

   a) Why is the study an experiment?

      The participants are given either tea, tea with milk or boiled water. The researcher manipulates what beverage the participants drink.

   b) What is the response variable?

      How much arteries relax and expand.

   c) What is the explanatory variable?

      The beverage the participants drink.

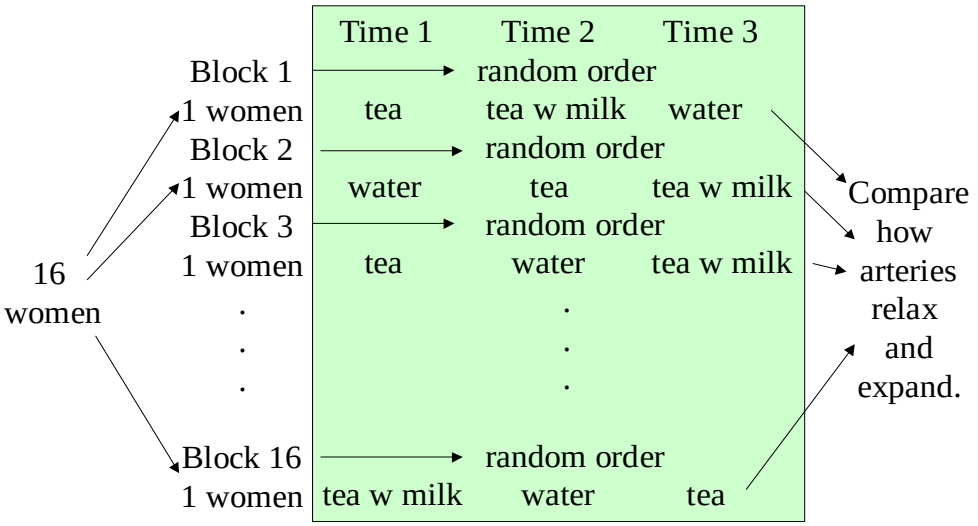
   d) What treatments are compared?

      The three treatments are black tea, black tea with milk or boiled water.

e) Is there a placebo? Explain briefly.

Yes, the boiled water would be a placebo. Boiled water is a hot beverage but does not have tea in it.

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

The description does not say but it would be hard for the participants to be unaware of what they are drinking. So this is not a "blind" study.

g) Based on a combination of the information in the article and your knowledge of sound study design, make a diagram that shows how you think the study was designed. Hint: Each woman experienced all three treatments.