Statistical Reasoning Thurs., March 5

Please have out both sheets from yesterday!

Chapter 6 Vocabulary

Word	Definition
Experiments	*a study which deliberately imposes some treatment on individuals in order to observe their responses*
Explanatory Variable	*a variable that we think explains or causes changes in the response variables*
Response Variable	*a variable that measures an outcome or result of a study*
Subjects	*the individuals studied in an experiment*
Treatment	*any specific experimental condition applied to the subjects*
Confounding	*the influence of the explanatory variable cannot be distinguished from the influence of a lurking variable*
Lurking Variable	*a variable that has an important effect on the relationship among the variables in a study but is not one of the variables being studied*
Clinical Trials	*experiment which studies the effectiveness of medical treatments on actual patients*
Placebo	*a dummy treatment with no active ingredients*
Placebo Effect	*favorable response to a dummy treatment*

Randomized Comparative Experiment	*a study comparing two or more treatments, using chance to decide which subjects get each treatment, and using enough subjects so that the effects of chance variations between the groups are small*
Control Group	*the group in an experiment which receives the placebo treatment or a treatment which is already on the market*
Statistically Significant	*an observed effect so large that it would rarely occur by chance*
Double-Blind Experiment	*an experiment in which neither the subjects nor the people who work with them know which treatment each subject is receiving*
Nonadherers	*subjects who not follow the experimental treatment*
Completely Randomized Experiment	*experiment in which all subjects are randomly assigned to treatments*
Matched Pairs Design	*experimental technique comparing pairs of subjects that are alike as much as possible when each receives a different treatment* (twins)
Block Design	*subjects are first grouped into similar traits and then randomization is carried out separately within each group*
Confidentiality	*policy of keeping all collected data about the individual subjects private*
Anonymity	*when the names of the subjects are not known to even the director of a study*

Statistical Reasoning Name:

6.1 – Guided Notes

Read pages 257-265. Using your textbook, define the words in section 6.1 on your green vocabulary sheet (begin with experiment and end with control group).

Randomized Comparative Experiment

design of experiment

Subjects: *300 drunk drivers*

Treatments: *control, alcoholism clinic, alcoholics anonymous*

Principles of Experimental Design:

1) ***control*** *the effects of lurking variables on the response; use a comparative design and ensure that the only systematic difference between the groups is the treatment administered*

2) ***randomize*** *– use impersonal chance to assign subjects to treatments*

3) ***use enough subjects*** *in each group to reduce chance variation in the results*

Exercises:

6.1 a) *it is an experiment ; the researches are imposing a treatment – a subject sees one of two possible price histories*

b) Explanatory Variable: *the price history shown to the subjects*

Response Variable: *the price the subject says they would expect to pay*

Subjects: *the students in the economics course*

Treatments: *the two price histories*

explanatory variable → independent variable

response variable → dependent variable

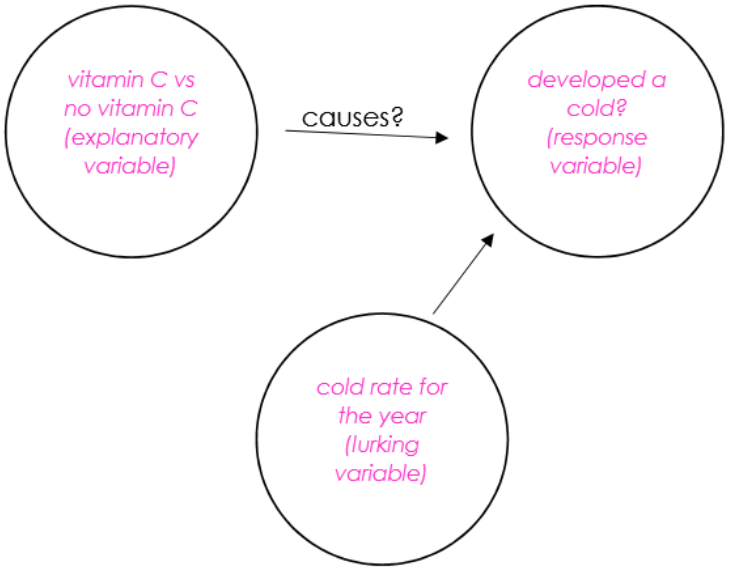
6.2 a) *it is not an experiment because no treatment was imposed*

b) Explanatory Variable: *whether or not a family had been accepted for public housing*

Response Variable: *family stability*

c) *Yes – it is likely that the group of people accepted for public housing differs from the group of people rejected. These differences may account for differences in family stability and cannot be separated from the effects of living in public housing. Lurking variables could include job status, family size, overall economic climate, etc.*

6.4 *The differences in general rates of colds between the two years was not taken into account. The difference in rates of colds is a lurking variable – the difference in cold rates for the general population is confounded with the possible effects of taking vitamin C.*



6.6 a) *the placebo was the harmless leaf*

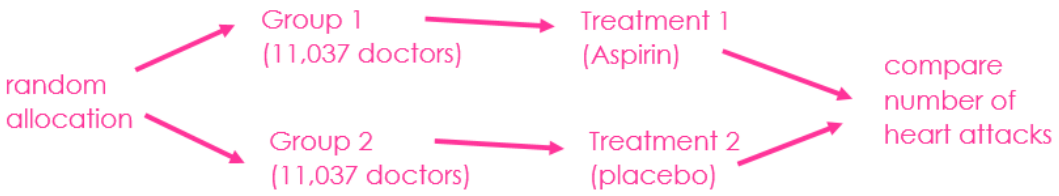
b) *the results support the idea of a placebo effect because the subjects developed rashes on the arm exposed to the placebo (harmless leaf) simply because they thought they were being exposed to the active treatment (poison ivy leaf)*

6.7 a) Subjects: *the subjects were 22,071 male physicians*

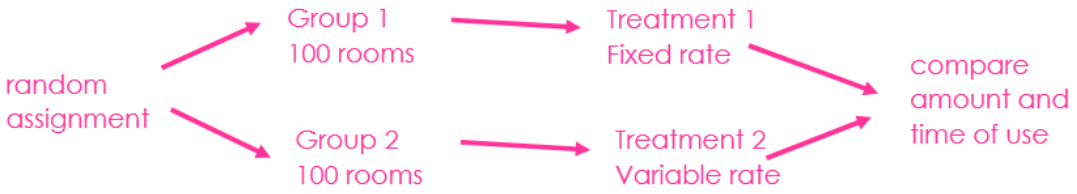
Explanatory Variable: *medication (aspirin or placebo)*

Response Variable: *whether or not the subject had a heart attack*

b)



6.9 a) *Randomly divide the 200 rooms into two groups of 100 rooms; one of the two groups will pay the flat rate and the other group will pay the variable rate. After a set amount of time, measure and compare the two groups in terms of how much time they spend using the computer to make telephone calls over the internet as well as what time of day they use the internet to make the calls.*



b) *Assigning three-digit numbers 001-200 rooms, and starting on line 125, we find the first five rooms to be assigned to the flat-rate group are 119. 033. 199, 192, and 148.*

6.10 a) *Divide the 30 turkeys randomly into three groups of 10 each. Randomly select which of the three groups are to receive the three different levels of Vitamin E. At the end of the study, compare the pancreas damage in each of the three groups.*

b) *Number the turkeys from 1-30. Beginning on line 125, assign the first 10 turkeys to group 1 and the next to group 2. The remaining 10 turkeys will be assigned to group 3*

Group 1: 21, 18, 23, 10, 19, 3, 25, 6, 8, 11

Group 2: 15, 13, 24, 28, 9, 29, 27, 5, 16, 17

Group 3: 1, 2, 4, 7, 12, 14, 20, 22, 26, 30

Statistical Reasoning Name: answer key
Explanatory and Response Variables

1) The National Student Loan Survey provides data on the amount of debt for recent college graduates, their current income, and how stressed they feel about college debt. A sociologist looks at the data with the goal of using amount of debt and income to explain the stress caused be college debt. Identify the explanatory and response variables.

explanatory: amount of debt and income

response: stress caused by college debt

2) How does drinking beer affect the level of alcohol in our blood? The legal limit for driving in all states is 0.08%. In a study, adult volunteers drank different numbers of cans of beer. Thirty minutes later, a police officer measured their blood alcohol levels. Identify the explanatory and response variables.

explanatory: amount of cans of beer

response: blood alcohol levels

3) A study published in the New England Journal of Medicine (March 11, 2010) compared two medicines to treat head lice: an oral medication called Ivermectin and a topical lotion containing malathion. Researchers studied 812 people in 376 households in seven areas around the world. Of the 185 randomly assigned to Ivermectin, 171 were free from head lice after two weeks compared to only 151 of the 191 households randomly assigned to malathion. Identify the explanatory and response variables, and the treatments in this experiment.

explanatory: medicine given to treat lice

response: whether or not lice free

treatments: Ivermectin, topical lotion containing malathion

4) A pediatrician wants to know whether watching TV causes girls to be overweight. She interviews 173 11-year-old girls and records the number of hours of TV each girl watches per day and whether each girl is overweight. She finds that girls in the sample who watch more than 2 hours of TV per day are over twice as likely to be overweight than girls in the sample who watch fewer than 2 hours of TV per day. Identify the explanatory and response variables.

explanatory: amount of TV watched

response: whether the girls are overweight

5) A team of veterinarians wants to compare the effectiveness of two fertility treatments for pandas in captivity. The two treatments are in-vitro fertilization and male fertility medications. Identify the explanatory and response variables as well as the treatments.

explanatory: fertility treatments

response: fertility rate

treatments: in-vitro fertilization, male fertility medication

6) A public speaking teacher has developed a new lesson that she believes decreases student anxiety in public speaking situations more than the old lesson. She designs an experiment to test if her new lesson works better than the old lesson. Public speaking students are randomly assigned to receive either the new or old lesson; their anxiety levels during a variety of public speaking experiences are measured. Identify the explanatory and response variables as well as the treatments.

explanatory: lesson received

response: anxiety levels

treatments: new lesson, old lesson