

Introduction to Biostatistics (171:161)
Breheny

Assignment 1

Due: Tuesday, February 4

1. One study on slavery in America estimated that “11.9% of slaves were skilled craftsmen.” This estimate was based on the records of thirty plantations in Plaquemines Parish, Louisiana. The study is making a generalization about a population based on a sample.
 - (a) In this study, what is the population of interest?
 - (b) In this study, what does the sample consist of?
 - (c) Could the study’s generalization be biased? If so, what type of bias would this be?
2. A Dutch study of rheumatoid arthritis found that patients who experienced more pain were more likely to respond to a health survey. In their questionnaire, 2% of respondents said that they experience no pain associated with their condition.
 - (a) Is the “2%” number an estimate or a parameter of interest?
 - (b) Is the “2%” number a biased estimate? If so, what type of bias is present?
 - (c) Is the true percentage of individuals with rheumatoid arthritis who suffer no pain likely to be less than 2%, greater than 2%, or equal to 2%?
3. The ICON site for this course contains an article by Abramowicz *et al.* (2008) on the epidemiology of ultrasound. Read the section on the second page titled “Low Birth Weight.”
 - (a) The authors discuss the use of animal studies to make inferences about humans. What sampling concept that we discussed in class does this violate?
 - (b) Are the observational studies and controlled experiments in agreement?
 - (c) Do the authors seem to place more emphasis on the observational studies or the randomized controlled experiments?
 - (d) It is not explicitly stated in the article, but were the controlled experiments randomized controlled, double-blind experiments?
4. The National Institutes of Health conducted a randomized controlled double-blind experiment to determine whether vitamin C prevents and/or cures the common cold. Subjects were assigned to one of four groups:

Group	Prevention	Therapy
1	placebo	placebo
2	vitamin C	placebo
3	placebo	vitamin C
4	vitamin C	vitamin C

All subjects were given six capsules a day for prevention, and an additional six capsules a day for therapy if they came down with a cold. In group 1, both sets of capsules just contained the placebo. In group 2, the prevention capsules had vitamin C while the therapy capsules were filled with the placebo. Group 3 was the reverse. In group 4, all the capsules were filled with vitamin C.

- (a) Groups 2 and 4 had the fewest colds, while groups 3 and 4 had the shortest colds. Does this provide evidence that vitamin C is effective at preventing and/or curing colds?
 - (b) Could the results in part (a) be affected by confounding?
 - (c) Investigators later discovered that the blinding of subjects failed in this study (vitamin C has a characteristic sour taste that the placebo lacked; this was noticed by subjects who broke the capsules). Among those subjects who remained blinded, vitamin C had no effect. Based on this new information, could the results in part (a) be affected by perception bias?
 - (d) Suppose we restrict the analysis to include only those patients who remained blinded. Could this comparison be affected by confounding?
 - (e) Based on all of the information you have been provided with in this question, does this experiment provide evidence that vitamin C is effective at preventing and/or curing colds? Or do you feel that the study is inconclusive?
5. A 1979 randomized trial was performed comparing a surgical treatment for angina pectoris (chest pains due to obstruction of the coronary arteries) to a placebo (non-surgical medical management). In the study, 6 of the patients randomized to receive surgery died before they could be operated on. There was a subsequent debate over how best to analyze the data. Some favored approach A, in which all patients were analyzed as they were randomized. Others favored approach B, in which those 6 patients were excluded on the grounds that they never actually received the surgical treatment that they were randomized to. Which approach do you think is better? Why?
6. A drug has been developed that may reduce a person's cholesterol. Investigators are interested in estimating the amount by which the drug will reduce cholesterol, and in calculating a confidence interval. For each of the following, say whether the change will cause the confidence interval to get wider or get narrower:
- (a) The investigators decide to enroll more people in the study
 - (b) More sophisticated lab techniques are invented, allowing for more accurate measurement of cholesterol
 - (c) The investigators want a 99% confidence interval instead of a 95% confidence interval