

Homework 1 Solutions

Chapter 1: #9, 20

Chapter 3: #15cd, 23, 63, 98

Chapter 4: #1ab, 2ab, 5a, 13, 18ab, 20, 54

- 1.9** Statistical significance is when there is a relationship or difference that is large enough to be unlikely to have occurred in the sample if there was no relationship or difference in the population of interest. Practical significance occurs when the relationship or difference is large enough to be important or meaningful in a “real world” sense. A result can be statistically significant, but not practically significant. This may occur in studies with very large sample sizes but small effects.
- 1.20**
- a.** This is an observational study because vegetarians and non-vegetarians are compared and these groups occur naturally. People were not assigned to treatment groups.
 - b.** Because this is an observational study and not a randomized experiment, we cannot conclude that a vegetarian diet causes lower death rates from heart attacks and cancer. Other variables not accounted for may be causing this reduction.
 - c.** This answer will differ for each student. One potential confounding variable is amount of exercise. This is a confounding variable because it may be that vegetarians also exercise more on average and this led to lower death rates from heart attacks and cancer.
- 3.15**
- c.** Yes, the “Fundamental Rule for Using Data for Inference” holds. A random sample of adults in the state was taken and this should be representative of all adults in the state.
 - d.** No, the “Fundamental Rule for Using Data for Inference” does not hold. Although a random sample was taken, it was a random sample of parents of high school students, not all adults, in the state. Parents of high school students do not represent all adults for the question of interest because the law directly affects their children, and they may not want their children drinking at an earlier age.
- 3.7**
- a.** Math skills (the explanatory variable) and shoe size (the response variable) will both increase as children get older. So, age is related to the explanatory variable in that it differs for those with different math skills, and it affects the response variable, shoe size.
 - b.** Number of hours spent socializing affects the response variable, the risk of getting a cold, for reasons such as more social contacts (thus more germs) and less sleep. Whether or not the student procrastinates in an assignment (the explanatory variable) also may be related to hours spent socializing. More social people will tend to put their social life before working on an assignment.
- 3.23**
- a.** $\frac{1}{\sqrt{n}} \times 100\% = \frac{1}{\sqrt{1031}} \times 100\% = 3.1\%$.
 - b.** $66\% \pm 3.1\%$, or 62.9% to 69.1%.
- 3.63**
- a.** The margin of error is $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{1016}} = .031$, or about 3.1%.
 - b.** This can be done by focusing on the results for the first survey question and not pointing out that the question asked about teaching creationism along with evolution. The result of the

second question might be mentioned too. For example, "About two-thirds of American adults favor teaching creationism in the public schools and almost half (40%) favor teaching creationism instead of evolution."

c. The sentences would emphasize the results for the second survey question. For instance, "A majority of U.S. adults are opposed to teaching creationism instead of evolution in public schools."

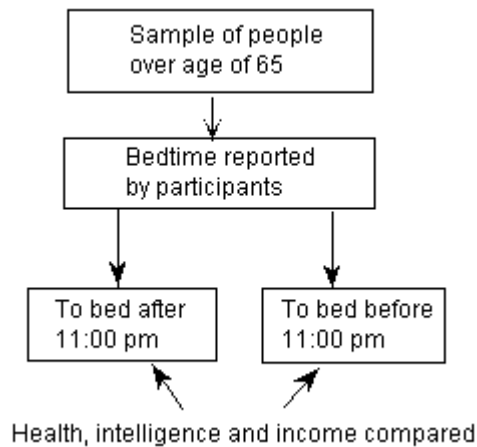
d. A simple statement of the survey percentages should be sufficient. For example, "About 68% of U.S. adults favor teaching creationism along with evolution, while 29% are opposed to doing so. About 40% favor teaching creationism instead of evolution, while 55% are opposed to that option."

e. This is an example of how deliberate bias can be used to favor one side of an issue.

- 3.98** Assume the margin of error was about 3.8% for all three polls (we aren't actually told that). In that event, approximate 95% confidence intervals for the population percentage who approved of Feinstein's performance are: June 2000, $57\% \pm 3.8\%$; February 2000, $56\% \pm 3.8\%$; October 1999, $53\% \pm 3.8\%$. There is substantial overlap among these intervals, so it's possible that the population percentage may have been nearly the same at all three times.
- 4.1**
- a.** Observational study. Female students would not be assigned to be in a sorority or not.
 - b.** Randomized experiment. The doctor could randomly assign medications, and an experiment will provide stronger evidence about any difference in the effectiveness of the two medications.
- 4.2**
- a.** Explanatory variable = sorority membership (or not); response variable = grade point average.
 - b.** Explanatory variable = medication used; response variable = extent of allergy relief for patient.
- 4.5**
- a.** Math skills and shoe size will both increase as children get older. The explanatory variable (shoe size) is related to age, and age also affects the response variable, math skills.
- 4.13**
- a.** This is an observational study. People were not assigned to be "owls" or "larks". These groups occur naturally.
 - b.** Yes, income is a possible confounding variable. People who make more money can afford better health care, better doctors, and more schooling, so may have better health overall. They may also be more likely to set their own working hours, so might be more likely to be an "owl." Income may be affecting both health and typical bedtime.
 - c.** This will differ for each student. One possibility is whether or not the person is retired. Retirement status might change sleeping habits (explanatory variable) and may also affect health (response variable).

d.

Figure for Exercise 4.13d



- 4.18**
- a. Randomly divide the overall group of forty students into two groups of twenty students. Assign each group to use a different training regimen.
 - b. One possibility is to pair individuals based on arm strength measured before the experiment begins. Members of a pair should have approximately the same beginning arm strength. Within each matched-pair, randomly assign one person to each training regimen.
- 4.20**
- a. Yes, because the sugar tablet is designed to look and taste like vitamin C.
 - b. Yes, because the participants do not know which treatment they have been assigned.
 - c. No, because the researchers know the treatment assignment for each participant.
 - d. No, participants were not paired or matched in any way.
 - e. No, participants are measured only once (at the end of the two month period).
- 4.54**
- a. Yes, confounding variables and the implication of causation is likely to be a problem since an observational study was done. A confounding variable, rather than pet ownership, could be what is causing the group without pets to have less satisfying marriages and higher stress levels. For example, couples who live in small apartments might be less likely to have pets and more likely to have added stress in their relationships due to low income, cramped space, and so on.
 - b. Placebo, Hawthorne, and experimenter effects won't be a problem because they are associated with experiments, rather than observational studies. Similar problems may be present, though. For instance, participants might rate their marriage satisfaction as higher than it really is to avoid revealing personal problems to the researcher.
 - c. Ecological validity may be a problem because couples were asked to discuss sore subjects while hooked up to blood pressure and heart monitoring equipment - not exactly a real world situation! The ability to generalize may be a problem. Volunteers were used, and they may be different from people who did not volunteer in terms of how pet ownership is related to their marriage satisfaction. Perhaps people with pets who have very satisfying marriages were more inclined to volunteer than people with pets who do not have very satisfying marriages.