SUPPLEMENTARY EXERCISE SOLUTIONS, CHAPTER 3

DESIGNING STUDIES AND COLLECTING DATA

S3.26. It is believed that drinking excess quantities of alcohol can lead to terminal liver damage. A 10 year study was conducted involving 400 people. Of the 400 people, the researchers noted that 162 of them consumed more than the weekly recommended level of alcohol. Of the 162 who consumed more than the recommended level of alcohol, 85 developed some kind of liver disease during the course of the study compared with 23 of the 238 who consumed less than the recommended level of alcohol.

(a) **(10 points)** What kind of study is this? Be as explicit as possible and justify your answer.

*ANS:* It is either a prospective or retrospective observational study.

As described, it seems to be a prospective observational study. Subjects were classified as excess drinkers or not, then followed for 10 years to see if they developed liver disease or not. However, if subjects were first classified into whether they developed liver disease or not during the 10 year period, and then the groups were compared for incidence of excess alcohol consumption, it was a retrospective study.

Credit was given for either answer.

(b) **(10 points)** The results look conclusive. Can the experimenters conclude that drinking excess quantities of alcohol causes liver damage? Why or why not?

*ANS:* No, they cannot conclude that excess drinking causes liver disease, because this is an observational study and observational studies cannot determine cause. Only Controlled Experiments can determine cause.

(c) **(10 points)** If your answer to (b) was that they cannot conclude that drinking excess quantities of alcohol causes liver disease, tell how you would design a study from which such a conclusion is possible.

*ANS:* You would have to design a controlled experiment. A group of subjects (preferably with similar age, sex, lifestyle characteristics) would need to be randomly assigned treatments (excess alcohol or not) and followed to see if they developed liver disease.

S3.29. In order to determine if men get more employment opportunities than women, two trained actors, one male and one female, were given identical resumes. The first actor was sent to a large US city to apply to 20 law firms randomly chosen from the yellow pages, and the second actor did likewise with another set of 20 randomly chosen law firms. Whether the actor was granted an interview was recorded in each case.

(a) **(10 points)** Tell why this is a controlled experiment.

*ANS:* It is a controlled experiment because treatments (male/female) are imposed on experimental units (law firms) to observe a response (interview granted or not).

(b) **(10 points)** Identify the response variable, treatments, and the experimental units.

*ANS:* See (a).

(c) **(10 points)** Use blocking to improve the design of this experiment. Explain why your design is an improvement.

*ANS:* Blocking could be implemented by having both actors visit each law firm. That is, each law firm is a block. This would eliminate law firm-to-law firm variation.

S3.30. **(10 points)** Exit polls conducted by a major polling firm during the 2004 presidential election showed that the issue mentioned with greatest frequency by voters as most important was “moral values” (22% of respondents named it). For weeks after the election, commentators and pundits made a great deal of this finding as indicating a shift in the electorate's attitudes. Later, it was revealed that (1) these voters were given a list of possible responses to choose from, and (2) when, as was done in some other polls, voters were not given a list, but only asked to state the issue of most importance to them, “moral values” was not among the top choices. What kind of bias is in evidence here? Explain.

*ANS:* This is an example of response bias due to the way the question is asked.