

## chapter 1 lab

**Due Monday, August 26th at the beginning of class****True/False**

Indicate whether the statement is true or false.

- \_\_\_ 1. The entire collection of individuals or objects about which information is desired is called a sample.
- \_\_\_ 2. A study is an observational study if the investigator observes the behavior of a response variable when one or more factors are manipulated.
- \_\_\_ 3. By definition, a simple random sample of size  $n$  is any sample that is selected in a manner to guarantee every individual in the population has an equal chance of selection.
- \_\_\_ 4. Response bias can occur when responses are not actually obtained from all individuals selected for inclusion in the sample.
- \_\_\_ 5. Selection bias can occur if volunteers only are used in a study.
- \_\_\_ 6. Increasing sample size will generally eliminate bias in a sample.
- \_\_\_ 7. As long as the sample size is small relative to the population, there is little practical difference between sampling with replacement and sampling without replacement.
- \_\_\_ 8. Blocking is a technique that can be used to filter out the effects of extraneous factors.
- \_\_\_ 9. A placebo is identical in appearance to the treatment of interest, but contains no active ingredients.
- \_\_\_ 10. In a well-designed experiment, the factors are confounded whenever possible.
- \_\_\_ 11. A treatment is any particular combination of values for the explanatory variables.
- \_\_\_ 12. Random assignment to treatments will guarantee groups that are exactly alike for experimental purposes.
- \_\_\_ 13. A control group provides a baseline for comparison to a treatment group.
- \_\_\_ 14. Random assignment of volunteers should result in comparable experimental groups.
- \_\_\_ 15. If the subjects as well as the person measuring the response are aware of the treatment assigned to the subject, only single-blinding is being used.

**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 16. Which of the following statistical studies is an observational study?
- A group of students is surveyed to determine the percentage who believe in reincarnation.
  - A random sample of students is shown a documentary on the evolution of reincarnation beliefs throughout human history. A second random sample is not shown the documentary. The object of the study is to determine whether viewing the documentary affects belief in reincarnation.
  - To determine whether Vitamin C has any effectiveness at lessening the duration of the common cold, one set of cold sufferers is given no Vitamin C, a second set is given 2 grams per day, and a third set is given 5 grams of Vitamin C per day.
  - All of these studies are observational.
  - None of these studies is observational.

- \_\_\_\_\_ 17. Which of the following statistical studies is an experimental study?
- A researcher observes the effect of alcohol consumption on reaction time by administering various quantities of alcohol to randomly-selected subjects.
  - A study is conducted to see if exposure to increased carbon dioxide levels increases tomato yields. Tomato plants are selected at random and are then exposed to various doses of carbon dioxide.
  - Two random samples of senior adults are selected. The first group watches a 30-minute presentation on medicare fraud, while the other group does not watch the presentation. A survey is then administered to measure the level of confidence the subjects have in their health care providers.
  - All of these are experimental studies.
  - None of these are experimental studies.

- \_\_\_\_\_ 18. Select the correct sampling method for the following situation.

To analyze the level of employee satisfaction at stores in a certain large city, a grocery store chain selects eight store locations at random and surveys all employees at these locations.

- Simple random sampling
  - Stratified random sampling
  - Cluster sampling
  - Systematic sampling
  - Convenience sampling
- \_\_\_\_\_ 19. Which of the following best describes the meaning of “variable confounding”?
- A variable is confounding if it complicates the researcher’s analysis .
  - A variable is confounding if it influences the data.
  - Two variables are confounded if their effects on the response variable cannot be distinguished.
  - A variable is confounding if it influences other variables.
  - A variable is confounding when it has no influence over the data.

- \_\_\_\_\_ 20. Which of the following statements is false?
- The explanatory variables are those variables that have values that are controlled by the experimenter.
  - The response variable is the variable that the experimenter thinks may be affected by the explanatory variables.
  - An experimental unit is the smallest entity to which a treatment is applied.
  - Two variables are confounded if their effects on the response variable can be distinguished.
  - An experiment in which experimental units are randomly assigned to treatments is called a completely randomized experiment.
- \_\_\_\_\_ 21. Which of the following best summarizes “nonresponse bias”?
- a tendency for samples to differ from the corresponding population as a result of systematic exclusion of some part of the population
  - a tendency for samples to differ from the corresponding population because data are not obtained from all individuals selected for inclusion in the sample
  - a tendency for samples to differ from the corresponding population because the method of observation tends to produce values that differ from the true value
  - a bias on the part of the researcher towards those who chose not to participate in a survey
  - None of these describes nonresponse bias.
- \_\_\_\_\_ 22. A researcher wishes to study the relationship between the level of background noise and mental concentration. The treatment (noise level) will have three levels: no noise, low-intensity noise, and high-intensity noise. The subjects are to be divided into three groups, and each group is to receive one of the treatments. He has available to him a set of 60 female volunteers and a set of 90 male volunteers. What experimental design strategy would help him eliminate the introduction of gender as a confounding variable?
- stratified sampling
  - replication
  - blocking
  - systematic sampling
  - double-blind trials
- \_\_\_\_\_ 23. For which of the following types of studies is it *impossible* to draw cause-and effect conclusions?
- Completely randomized experiments
  - Randomized block experiments
  - Observational studies
- I only
  - III only
  - III only
  - It is never possible to draw cause-and-effect conclusions.
  - It is always possible to draw cause-and-effect conclusions.

- \_\_\_\_\_ 24. To estimate the proportion of students who plan to purchase tickets to an upcoming school fundraiser, a high school decides to sample 100 students as they register for the spring semester. There are 2000 students at the school. Which of the following sampling plans would result in a simple random sample?
- Number the students from 1 to 2000 and then use random numbers to select 100 students.
  - Survey the first 100 students to register.
  - Randomly select 100 students from a list of the 950 female students at the school.
  - Divide the students into early registrants (the first 1000 to register) and late registrants (the last 1000 to register). Use random numbers to identify 50 of the early registrants and 50 of the late registrants to survey.
  - Select one of the first 20 students to register using a random number table and then select every 20th student to register thereafter.

**Short Answer**

25. The two paragraphs below discuss aspects of two studies, each of which exhibit a bias. For each study, decide whether the problem is selection bias, response bias, or nonresponse bias, and in a few sentences explain why you chose your answer.
- One part of the Nurses' Health Study is concerned with possible causes of skin cancer. Nurses were asked about different behaviors and aspects of their health when they entered the study. Then, the nurses were given the questionnaire again if they were diagnosed with cancer. When the questionnaires were analyzed, the investigators discovered that after the nurses were diagnosed with cancer they tended to report a reduced ability to tan. It is thought that the shift in reporting might be caused by an awareness of their diagnosis.
  - One part of the Demographic and Health Surveys Program is concerned with measures of malnutrition. Investigators measure physical aspects of growing children, and attempt to document the physical characteristics of a population at different ages. Sadly, in some countries many children die early, and thus a bias is introduced in the study when the investigators can not collect the data from the deceased children.