protected file and only allowing authorized people to see the data; however, it is likely that the educator will know which student is associated with what data. Therefore, although the data are kept confidential, they are not collected anonymously.

Definition

An **Institutional Review Board (IRB)** is a group of people who review the design of a study to make sure that it is appropriate and that no unnecessary harm will come to the subjects involved.

Informed consent involves completely disclosing to participants the goals and procedures involved in a study and obtaining their agreement to participate.

Summary

In summary, a statistical study begins with a question to be answered. This question determines the population of the study and the variables of interest. Data are then collected by means of an observational study or an experiment, depending on whether the study hopes to determine a cause-and-effect relationship as established in Step 1. Once data are collected, they are organized through the use of tables, graphs, or numerical summaries. Lastly, the results are analyzed to answer the original question. The remainder of the book, beginning with Chapter 2, will be devoted to these last two steps of a study: organizing and analyzing data.

1.3 Section Exercises

Vocabulary

Determine if each statement is true or false. Explain why.

1. The first step in any statistical study is to state the question to be answered.
2. Data collection must be complete before variables are chosen so that the researcher can be sure he has the data needed to answer the question.
3. If a researcher wishes to determine a cause-and-effect relationship, she should use an observational study.
4. A random sample is the same thing as a simple random sample.
5. An Institutional Review Board will require that a researcher disclose to participants the goals and procedures involved in her study and obtain their agreement to participate.
6. The question in a statistical study dictates the population and variables.
7. Participants in an experiment should always be allowed to choose which group they are placed in so that they feel as comfortable as possible for the duration of the experiment.

Complete each statement.

8. An experiment in which both the participant and the person administering the treatment are unaware of whether the participant is in the treatment group or the control group is referred to as a _____ experiment.
9. A member of the population that is being studied in an experiment is called a _____.
10. The group in an experiment that receives a placebo is called the _____ group.
11. An experiment is a type of statistical study in which a _____ is applied to a group of the population.
12. A pill that looks like the treatment pill but has no active ingredient is called a _____.

13. An experiment in which only the participant is unaware of whether they are in the treatment group or the control group is referred to as a _____ experiment.

14. When a subject believes that he has recovered from an illness because he is taking a treatment drug, when in reality he is in the control group of an experiment, it is referred to as the _____.

15. A human subject in an experiment is referred to as a _____.

16. A researcher gives an active drug to the _____ group in an experiment.

Observational Studies vs. Experiments

Determine which type of study should be conducted: an observational study or an experiment.

17. A football coach wants to know the average weight of his offensive linemen.

18. A doctor wants to study the effect of ginseng on patients' memories.

19. A city planner wants to know the average number of vehicles parked in downtown parking lots on any given business day.

20. A cell phone company wants to know the average total length of time teenagers spend on the phone each day.

21. A dentist wants to look at the effects of a new dental material used for fillings.

22. A financial institution wants to know if customer behavior will change significantly when interacting with a new mobile app feature.

Sampling Methods

Identify the sampling method used in each observational study.

23. The FDA chooses 15 hospitals around the country at random. Every doctor in the chosen hospitals is asked to participate in the study.

24. Every 4^{th} dorm room is selected for a survey regarding study hours and campus security.

25. A state politician wants to gauge public opinion in his area before deciding to run for reelection. For the study, 200 registered voters are chosen at random from each county in his district.

26. A computer program is used to randomly generate a list of student ID numbers in order to gather a group to give feedback about the Greek system on campus.

27. In order to complete a psychology project, you pass out surveys to the first 25 people you find in the student union.

28. A student asks all the people living on the 1^{st}, 5^{th}, and 8^{th} floors of his dorm to answer a survey about dorm life on your campus.

29. A local church wanted to know the average age of its morning congregation, so they asked every 10^{th} person leaving the service to put their age in a box.

30. Ten students from each of the 15 sections of College Algebra were asked about the quality of the textbook used in the course.

31. One thousand phone numbers were selected by a computer to be called for a telephone survey.

32. A local politician asks 20 people in his neighborhood what they think about the new school board proposal.

Cross-Sectional vs. Longitudinal Studies

Classify each scenario as either a cross-sectional study or a longitudinal study.

33. A social worker wants to determine the number of current foster children in her district who were placed in foster care due to neglect.

34. A budget-conscious person wishes to find which gas station in his area has the cheapest gas on his way to work one morning.

35. A local teachers' group creates charts to demonstrate that pay raises over the last five years have not kept up with inflation.

36. The child welfare office keeps track of how many reports of child abuse are received each month over a two-year period to determine if there are certain times of the year that generally have a higher report rate.

37. A human rights group gathers data from each state regarding the number of reported cases of human trafficking.

38. A patient with HIV gets her blood tested every three months to check her viral load to make sure that it is not increasing.

Meta-Analysis vs. Case Studies

Classify each scenario as either a meta-analysis or a case study.

39. A child prodigy's home life is examined in order to determine environmental factors that may have shaped him intellectually.

40. Studies performed on four different airlines are compared in order to determine which provides the best customer care.

41. For the purpose of studying sibling rivalry as affected by birth order, a typical American family is selected.

42. A medical researcher looks at multiple studies performed on a new drug in order to determine whether or not the drug is safe to put on the market.

Answer each question thoughtfully.

43. In the text we considered the research question: "Does taking 80 mg of aspirin each morning reduce the risk of heart attacks?" If we wanted to narrow our question to "Does taking 80 mg of aspirin each morning reduce the risk of heart attacks in African-American women over the age of 50?" how would this change the population of the study? If the results of the study showed that aspirin did indeed reduce the risk of heart attacks in this new population, would you be justified in recommending that your 52-year-old uncle begin taking aspirin daily? Does your answer change based on the ethnicity of your uncle? Explain.

44. Why not let a human choose the random sample? In reality, it is against our human nature to choose members of the population truly at random. To understand this phenomenon, take a moment to choose five random numbers between 1 and 100. Try to make sure they are truly random. Now, consider these questions. Are the numbers spaced out or grouped closely together? Are they all even, odd, or some of both? Did you have a reason for choosing any of the numbers? Did you alter any of your original responses and if so why? Did you repeat any of the numbers? In summary, would you say you were able to truly generate a set of random numbers?

45. In the text we considered an assembly line that has a mechanism with a defect so that it causes an error in every 4th label. If we sample every 4th label, we will get either a sample of labels that have no errors or a sample of labels that all have errors. Explain how to get a sample with no errors. Is it possible to get an unbiased sample by choosing every 5^{th} label from the assembly line? What about every 16^{th} part? Why or label not?

46. One type of convenience sampling is a **self-selected sample**. A self-selected sample is one in which the survey participants volunteer to be a part of the study rather than having been chosen by the researcher. The problem with a self-selected sample is that usually, only people with strong opinions will take the time to volunteer their time or information for the study. For instance, a popular American women's magazine wants to do research for a story regarding hospital care. The magazine lists a website in its June issue, inviting readers to log on and share stories about the care they received in the hospital. Describe the types of responses you could expect from people willing to log on and answer this survey. What would be the true population for the study described in this scenario? Can the results of this self-selected sample be generalized to describe hospital care for all patients in American hospitals?