Chapter 4: Designing Studies

Key Vocabulary:

- sample
- population
- sample survey
- voluntary response sample
- confounded
- design
- convenience sampling
- biased
- simple random sample
- table of random digits
- probability sample
- stratified random sample
- cluster sampling
- inference
- margin of error
- strata
- undercoverage
- nonresponse
- response bias
- sampling frame
- systematic random sample
- observational study
- experimental
- confounding
- ~~lurking~~ **extraneous variable**
- experimental units
- subjects
- random assignment
- treatment
- factor
- level
- placebo effect
- single blind experiment
- control group
- completely randomized experiment
- randomize design
- matched p
- statistically significant
- replication
- hidden bia
- double-blin experimen
- block desi
- data ethics

4.1 Sampling and Surveys (pp.206-224)

1. Explain the difference between a *population* and a *sample*.

2. What is involved in planning a *sample survey*?

3. Why might *convenience sampling* be unreliable?

4. What is a *biased* study?

5. Why are *voluntary response samples* unreliable?

6. Define *simple random sample (SRS)*.

7. What two properties of a *table of random digits* make it a good choice for creating a simple random sample?

8. State the two steps in *choosing an SRS*:

9. What is the difference between sampling *with* replacement and sampling *without* replacement?

10. How can you account for this difference *with and without replacement* when using a table of random digits or other random number generator?

11. How do you select a *stratified random sample*?

12. What is *cluster sampling*?

13. What is *inference*?

14. What is a *margin of error*?

15. What is the benefit of a *larger* sample size?

16. A *sampling frame* is…

17. Give an example of *undercoverage* in a sample.

18. Give an example of *nonresponse bias* in a sample.

19. Give an example of *response bias* in a sample.

20. How can the wording of questions cause *bias* in a sample?

21. Answer the two questions for the *Check Your Understanding* on page 224.

4.2 Experiments (pp.231-251)

1. Explain the differences between *observational study* and *experiment.*

2. A *lurking variable* is…

3. What problems can lurking variables cause?

4. *Confounding* occurs when…

5. Answer the four questions for the *Check Your Understanding* on page 233.

6. Explain the difference between *experimental units* and *subjects*.

7. Define *treatment*.

8. By studying the TV Advertising example on page 235, identify the *factors* and *levels* in the experiment.

9. Explain why the example, *Which Works Better: Online or In-Class SAT Preparation,* is a bad experiment.

10. What is *random assignment*?

11. What is a *comparative* experimental design?

12. In a *completely randomized design*…

13. Does using chance to assign treatments in an experiment guarantee a completely randomized design? Explain.

14. What is the significance of using a *control group*?

15. The basic *principles of statistical design* experiments are:

16. Define *control*, *random assignment* and *replication* in experimental design.

17. Describe the *placebo effect*.

18. What are the differences between a *double-blind* and *single-blind* experiement?

19. Define *statistically significant*.

20. What is a *block*?

21. What is a *randomized block design*?

22. When does *randomization* take place in a block design, and how does this differ to a completely randomized design?

23. What is the goal of a *matched pairs design*?

24. When is it beneficial to use a blocked/paired design? How should we choose which variables to block for?

4.3 Using Studies Wisely (pp.261-267)

1. Name the two *types of inferences* that can be identified based on the design of a study.

2. Name the *challenges* of establishing causation.

3. What are the four criteria for *establishing causation* when we can't do an experiment?

4. Briefly describe the basics of *data ethics*.