Chapter 13 Experiments and Observational Studies

Observational Study - A study based on data that is observed (no manipulation of factors has been employed) - valuable for discovering trends and possible relationships.

Retrospective Study - a study in which subjects are selected and then their previous conditions or behaviors are determined. These studies are not based on random samples. They focus on estimating differences between groups or associations between variables.

Prospective Study - A study in which subjects are followed to observe future outcomes. Because no treatments are deliberately applied, this type of study is not an experiment. Prospective studies usually focus on estimating differences among groups.
Experiment

1. Requires random assignment

2. Must identify at least one explanatory variable, called a factor, to manipulate and at least one response variable to measure.

3. The experimenter actively and deliberately manipulates the factors to control the details of the possible treatments and assigns subjects to the treatments at random.

4. Subjects or participants - humans who are experimented on
   Experimental units - more generic term for other individuals (rats, days, petri dishes of bacteria) who are experimented on

5. Levels - specific values that the experimenter chooses for a factor
   *Example: Sleep deprivation Levels: 4hr, 6hr, 8hr*

6. Treatment - combination of specific levels from all the factors that an experimental unit receives.
1. An examination of the medical records of more than 360,000 Swedish men showed that those who were overweight or who had high blood pressure had a higher risk of kidney cancer.

a. observational study or experiment?

If observational study, identify (if possible):
   b. retrospective or prospective?
   c. subjects studied and how selected
   d. parameters of interest
   e. nature and scope of the conclusion the study can reach

If experiment,
   b. subjects identified
   c. factors in the experiment and the number of levels for each
   d. number of treatments
   e. response variable to be measured
2. Some gardeners prefer to use non-chemical methods to control insect pests in their gardens. Researchers have designed two kinds of traps and want to know which design will be more effective. They randomly choose 10 locations in a large garden and place one of each kind of trap at each location. After a week they count the number of bugs in each trap.

a. observational study or experiment?

If observational study, identify (if possible):
   b. retrospective or prospective?
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Samples WS ANS

27. Phone surveys.
   a) A simple random sample is difficult in this case because there is a problem with
      undercoverage. People with unlisted phone numbers and those without phones are not in
      the sampling frame. People who are at work, or otherwise away from home, are included
      in the sampling frame. These people could never be in the sample itself.
   b) One possibility is to generate random phone numbers and call at random times, although
      obviously not in the middle of the night! This would take care of the undercoverage of
      people at work during the day, as well as people with unlisted phone numbers, although
      there is still a problem avoiding undercoverage of people without phones.
   c) Under the original plan, those families in which one person stays home are more likely to
      be included. Under the second plan, many more are included. People without phones are
      still excluded.
   d) Follow-up of this type greatly improves the chance that a selected household is included,
      increasing the reliability of the survey.
   e) Random dialers allow people with unlisted phone numbers to be selected, although they
      may not be the most willing participants. There is a reason that the phone number is
      unlisted. Time of day will still be an issue, as will people without phones.

32. Happy workers?

   b) Assign a number from 001 to 439 to each employee. Use a random number table or
      software to select the sample.
   c) The simple random sample might not give a good cross section of the different types of
      employees. There are relatively few supervisors and project managers, and we want to
      make sure their opinions are noted, as well as the opinions of the laborers.
   d) A better strategy would be to stratify the sample by job type. Sample a certain percentage
      of each job type.
   e) Answers will vary. Assign each person a number from 01-14, and generate 2 usable
      random numbers from a random number table or software.

33. Quality control.
   a) Select three cases at random, then select one jar randomly from each case.

   b) Generate three random numbers between 61-80, with no repeats, to select three cases.
      Then assign each of the jars in the case a number 01-12, and generate one random number
      for each case to select the three jars, one from each case.
   c) This is not a simple random sample, since there are groups of three jars that cannot be the
      sample. For example, it is impossible for three jars in the same case to be the sample. This
      would be possible if the sample were a simple random sample.

35. Sampling methods.
   a) This method would probably result in undercoverage of those doctors that are not listed in
      the Yellow Pages. Using the “line listings” seems fair, as long as all doctors are listed, but
      using the advertisements would not be a typical list of doctors.
   b) This method is not appropriate. This cluster sample will probably contain listings for only
      one or two types of businesses, not a representative cross-section of businesses.