Observation Studies, Sampling Strategies, and Experiments

Professor Bradley Warner

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Exercises

1. **Propose a sampling strategy**. A large college class has 160 students. All 160 students attend the lectures together, but the students are divided into 4 groups, each of 40 students, for lab sections administered by different teaching assistants. The professor wants to conduct a survey about how satisfied the students are with the course, and he believes that the lab section a student is in might affect the student's overall satisfaction with the course.

a. What type of study is this?

b. Suggest a sampling strategy for carrying out this study.

2. **Flawed reasoning**. Identify the flaw in reasoning in the following scenarios. Explain what the individuals in the study should have done differently if they wanted to make such strong conclusions.

a. Students at an elementary school are given a questionnaire that they are required to return after their parents have completed it. One of the questions asked is, *Do you find that your work schedule makes it difficult for you to spend time with your kids after school?* Of the parents who replied, 85% said *no*. Based on these results, the school officials conclude that a great majority of the parents have no difficulty spending time with their kids after school.

b. A survey is conducted on a simple random sample of 1,000 women who recently gave birth, asking them about whether or not they smoked during pregnancy. A follow-up survey asking if the children have respiratory problems is conducted 3 years later, however, only 567 of these women are reached at the same address. The researcher reports that these 567 women are representative of all mothers.

3. **Sampling strategies**. A Math 377 student who is curious about the relationship between the amount of time students spend on social networking sites and their performance at school decides to conduct a survey. Four research strategies for collecting data are described below. In each, name the sampling method proposed and any bias you might expect.

a. He randomly samples 40 students from the study's population, gives them the survey, asks them to fill it out and bring it back the next day.

b. He gives out the survey only to his friends, and makes sure each one of them fills out the survey.

c. He posts a link to an online survey on his Facebook wall and asks his friends to fill out the survey.

d. He stands outside the student center and asks every third person that walks out the door to fill out the survey.

4. **Vitamin supplements**. In order to assess the effectiveness of taking large doses of vitamin C in reducing the duration of the common cold, researchers recruited 400 healthy volunteers from staff and students at a university. A quarter of the patients were assigned a placebo, and the rest were evenly divided between 1g Vitamin C, 3g Vitamin C, or 3g Vitamin C plus additives to be taken at onset of a cold for the following two days. All tablets had identical appearance and packaging. The nurses who handed the prescribed pills to the patients knew which patient received which treatment, but the researchers assessing the patients when they were sick did not. No significant differences were observed in any measure of cold duration or severity between the four medication groups, and the placebo group had the shortest duration of symptoms.

a. Was this an experiment or an observational study? Why?

b. What are the explanatory and response variables in this study?

c. Were the patients blinded to their treatment?

d. Was this study double-blind?

e. Participants are ultimately able to choose whether or not to use the pills prescribed to them. We might expect that not all of them will adhere and take their pills. Does this introduce a confounding variable to the study? Explain your reasoning.

5. **Exercise and mental health**. A researcher is interested in the effects of exercise on mental health and she proposes the following study: Use stratified random sampling to ensure representative proportions of 18-30, 31-40 and 41-55 year olds from the population. Next, randomly assign half the subjects from each age group to exercise twice a week, and instruct the rest not to exercise. Conduct a mental health exam at the beginning and at the end of the study, and compare the results.

a. What type of study is this?

b. What are the treatment and control groups in this study?

c. Does this study make use of blocking? If so, what is the blocking variable?

d. Does this study make use of blinding?

e. Comment on whether or not the results of the study can be used to establish a causal relationship between exercise and mental health, and indicate whether or not the conclusions can be generalized to the population at large.

f. Suppose you are given the task of determining if this proposed study should get funding. Would you have any reservations about the study proposal?