Surveys, Experiments, Observations, & Evaluation of Reports Notes

There are three main techniques for gathering a sample: *sample surveys, experiments,* and *observational studies*. Each of these methods has a purpose, advantages, and limitations. Randomization should occur in each of these methods.

VOCABULARY
When conducting a **survey** every member in the sample answers a set of questions.

Experiments require at least two groups. One group receives the trial treatment, while the other, sometimes called the control group, does not receive the treatment. At the end of an allotted period of time, the two groups are compared to determine if the treatment had an effect.

Observational studies require you to observe outcomes without interacting with any members of the sample.

Sample Surveys

The purpose of a sample survey is to gather information about the sample by means of a survey. There are several advantages to using a survey. Surveys are inexpensive and can collect a large amount of data representative of the population. They can be done in a variety of forms and about a variety of topics. Surveys also have the ability to focus only on the necessary information. However, surveys are flawed by non-responders since a survey is generally voluntary; people have the option not to participate. Additionally, people in a survey know that they are being studied and they may not be as honest in their responses as they would be if they were not being studies. Surveys are also open to interpretation and bias. Surveys can be written in a way that biases the responders. Also, questions can be interpreted differently than intended by those responding to the survey.

Surveys can be administered with randomization methods, such as simple random sampling, multistage sampling, stratified sampling, or systematic sampling, all of which would ensure that the sample is random and representative of the overall population.

Experiments

The purpose of an experiment is to assign a treatment, using control over some of the conditions in order to gather data about the treatment's effectiveness. An experiment is the only way to establish causation. When an experiment is designed, all of the variables are controlled. This allows the experimenter to demonstrate that a change in one variable causes the change in another variable. There are drawbacks to experiments. They can be very expensive and time consuming. Ethics may be question especially if animals or people are used in the experiment. Experiments must not intentionally harm any of the subjects. The attitude and behavior of those conducting the experiment can also affect the results.

It is imperative that randomization is used when assigning subjects to their treatment groups. Each group needs to be representative of the overall population.

Observational Studies

The purpose of an observational study is to observe subjects in their natural environment without their knowledge and without assigning treatments to the subjects. There are some advantages to using an observational study. It is simple and inexpensive to conduct. It provides deeper and richer information than a survey because the observer is seeing behavior firsthand and is able to observe the process not just the result. There are also some disadvantages. The results cannot prove causation nor can they be applied to the general population. It is only representative of those being studied. The results are subjective and open to interpretation by the observer. There may also be a question of ethics, especially if people are involved. People have a right to privacy and the observational study must not infringe upon the rights and expectations of people. If you are doing the study in the present, you can randomize the individuals involved. If you are gathering data from past records, there is no chance for randomization.

Evaluate Reports

Statistics are reported everywhere. It is important to look at any statistical reporting critically and evaluate the content for its validity in regards to the general population. Here are some things to consider when evaluating any report containing statistical information.

- Sampling method
- Study type
- Population of interest
- Bias
- Sample size
- Study duration

Example 1:

Which type of study method is described in each situation? Should the sample statistics be used to make a general conclusion about the population?

a. Researchers randomly choose two groups from 20 volunteers. Over a period of 6 weeks, one group works on a computer for an hour right before going to sleep, and the other does not. Volunteers wear monitoring devices while sleeping, and researchers record their quality of sleep.

b. Students in an elementary class observe the growth of some newly hatched chickens.

c. Market researchers want to know if people like the new store at the local mall. They ask every fourth person who enters the mall if they like the new store.