

Stat 130 - Day 2
Chapter 1: Where Do Data Come From? (cont.)

Types of Studies

- **Observational Study**- observes individuals and measures variables of interest but does not attempt to influence responses; goal is to *describe* situation.
 - **Sample Survey**
 - **Population**- the entire group of individuals about which we want information
 - **Sample**- part of the population from which we actually collect information, in order to draw conclusions about the population
- **Experiment**- deliberately imposes some treatment on individuals to observe their responses; goal is to study whether treatment *causes* a change in the response.

Example 1: “An Apple A Day”

Suppose that you want to collect data to study whether the expression “an apple a day keeps the doctor away” has any merit. In other words, you want to investigate whether eating apples has any health benefit. Consider three different designs of such a study:

- You take a group of individuals, identify which do and do not eat apples regularly, and then monitor their health for the next six months.
 - You find a group of physicians and ask them whether they have noticed any health benefits of eating apples.
 - You take a group of individuals, assign half to eat an apple a day for the next six months and the other half not to, and then monitor their health over those six months.
- (a) Which of these are observational studies, and which is an experiment? Which is a survey?

(b) Which is the only study that has a chance to establish a cause/effect relationship?

Now consider a fourth “study” of this issue:

- You recall that your Uncle Joe loved apples and was never sick a day in his life, while your Uncle Tom despised apples and was often ill.
- (c) Do you find this an effective argument that eating apples has a health benefit?

An *anecdote* is a striking story that sticks in our minds. Data beat anecdotes!

Example 2: Pet Therapy

Suppose that you study patients recovering from a heart attack and record for each patient whether he/she has a pet. Then you follow the patients for five years and see which survive.

(a) Is this an observational study or an experiment?

(b) If you find that pet owners survive more often than non-owners, would you conclude that pet ownership has therapeutic benefits for heart attack patients?

Example 3: Foreign Language Study

Studies often show that high school students who study a foreign language in high school tend to perform better on the SAT-Verbal than students who do not study a foreign language.

- (a) Is this an observational study or an experiment?

- (b) Should you conclude that foreign language study causes an improvement in students' verbal abilities?

- (c) Is it feasible to conduct an experiment on this issue? What would that entail?

Example 4: Studies from *Blink* (cont.)

The following studies are all described in the popular book *Blink*, by Malcom Gladwell. For each one, identify whether the study is observational or experimental. For those that are surveys, also identify the population and sample.

- (a) An economist suspected that chief executive officers (CEO's) of American companies tend to be taller than the national average height of 69 inches, so she took a random sample of 100 CEO's and recorded their heights.

- (b) A psychologist showed a videotaped interview of a married couple to a sample of 150 marriage counselors. Each counselor was asked to predict whether the couple would still be married five years later. The psychologist wanted to test whether marriage counselors make the correct prediction more than half the time.

- (c) A psychologist gave an SAT-like exam to 200 African-American college students. Half of the students were randomly assigned to use a form that asked them to indicate their race, and the other half were randomly assigned to use a form that did not ask them to indicate their race. The psychologist suspected that those not asked to indicate their race would score significantly higher on the exam than those who were asked to indicate their race.

- (d) An economist randomly assigned four actors to go to ten car dealerships each and negotiate the best price they could for a particular model of car. The four people were all the same age, dressed similarly, and all told the car salesmen that they had the same occupation and neighborhood of residence. One of the actors was a white male, one was a black male, one was a white female, and one was a black female. The economist wanted to test whether the average prices would differ significantly among these four types of customers.