

# Warm Up

Battery lifetime is normally distributed for large samples. The mean lifetime is 500 days and the standard deviation is 61 days. To the nearest percent, what percent of batteries have lifetimes longer than 561 days?

# Day 3: Observational Studies, Experiments and Sampling

Unit 1: Statistics



"Statistics say that religious people live longer, so I practice a different religion every day of the week to be sure I'm covered."

# Sampling and Study Design

# Main Questions

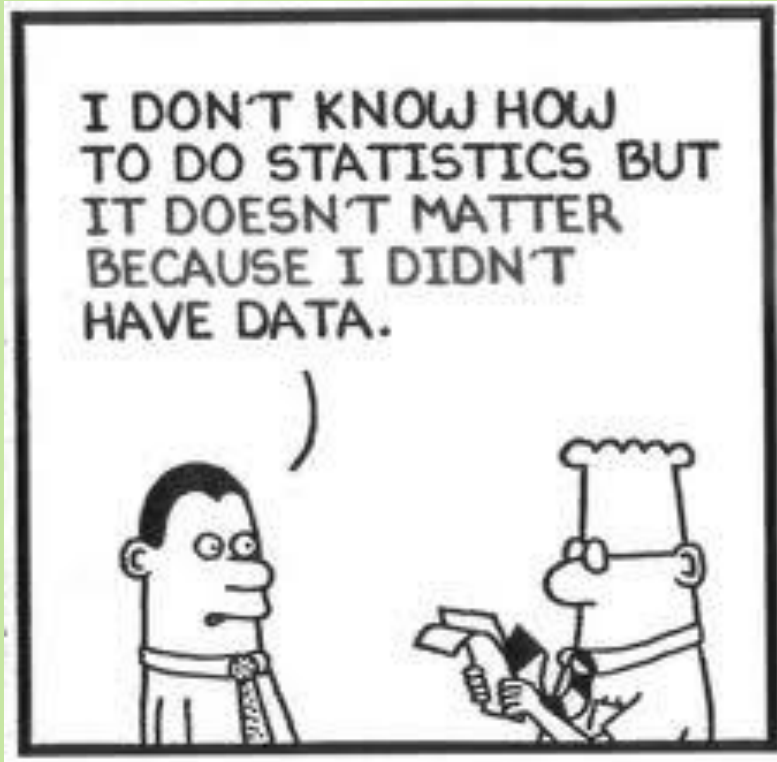
What's the difference between an experiment and an observational study?

What are the different ways that a sample can be collected?

When is a sample considered random?

What is bias and how does it affect the data you collect?

# There are three ways to collect data:

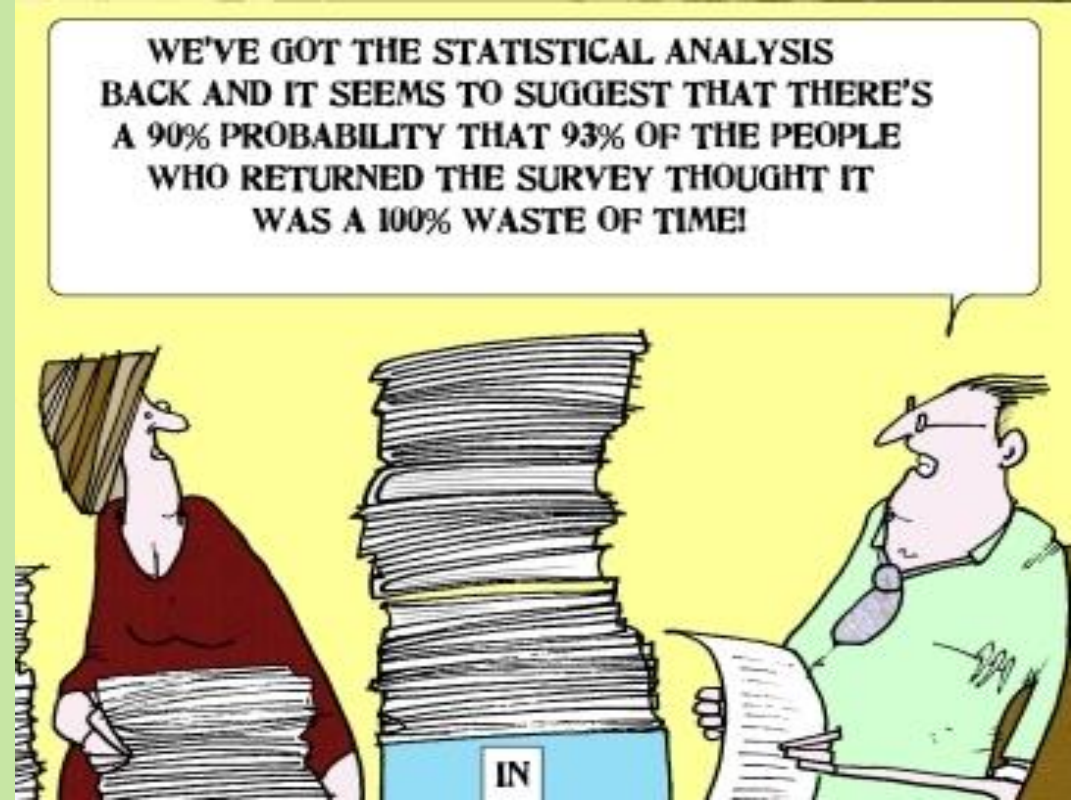


1. Surveys
2. Observational Studies
3. Experiments

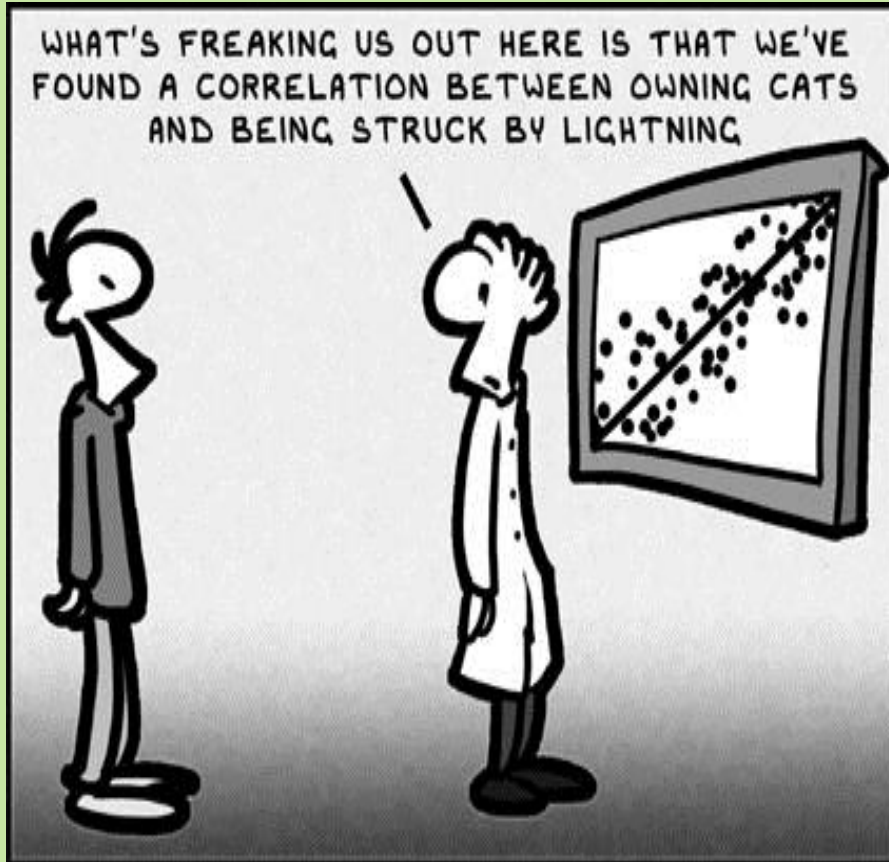
# Surveys

Surveys most often involve the use of a questionnaire to measure the characteristics and/or attitudes of people.

ex. asking students their opinion about extending the school day



# Observational Studies



Individuals are observed and certain outcomes are measured, but no attempt is made to affect the outcome.



# Experiments

Treatments are imposed  
prior to observation.  
Experiments are the  
only way to show a  
cause-and-effect  
relationship.



“Do a double-blind test. Give the new drug to rich patients and a placebo to the poor. No sense getting their hopes up. They couldn’t afford it even if it works.”

Remember:  
Correlation is not causation!



# Observational Study or Experiment?

Fifty people with clinical depression were divided into two groups. Over a 6 month period, one group was given a traditional treatment for depression while the other group was given a new drug. The people were evaluated at the end of the period to determine whether their depression had improved.

Experiment

# Observational Study or Experiment?

To determine whether or not apples really do keep the doctor away, forty patients at a doctor's office were asked to report how often they came to the doctor and the number of apples they had eaten recently.

Observational Study

# Observational Study or Experiment?

To determine whether music really helped students' scores on a test, a teacher who taught two U. S. History classes played classical music during testing for one class and played no music during testing for the other class.

Experiment

Classwork- In your groups work on page 7 in your packet.

# Types of Sampling

In order to collect data, we must choose a **sample**, or a group that represents the population.

The goal of a study will determine the type of sampling that will take place.

# Simple Random Sample (SRS)

All individuals in the population have the same probability of being selected, and all groups in the sample size have the same probability of being selected.

# Simple Random Sample?

100 names are put in a hat and 10 are picked

**SRS**

3 red marbles and 2 green marbles are put in a bag. One marble is picked

**Not SRS**





# Stratified Random Sample

If a researcher wants to highlight specific subgroups within the population, they divide the entire population into different subgroups, or strata, and then randomly selects the final subjects proportionally from the different strata.



# Systematic Random Sample

The researcher selects a number at random,  $n$ , and then selects every  $n$ th individual for the study.



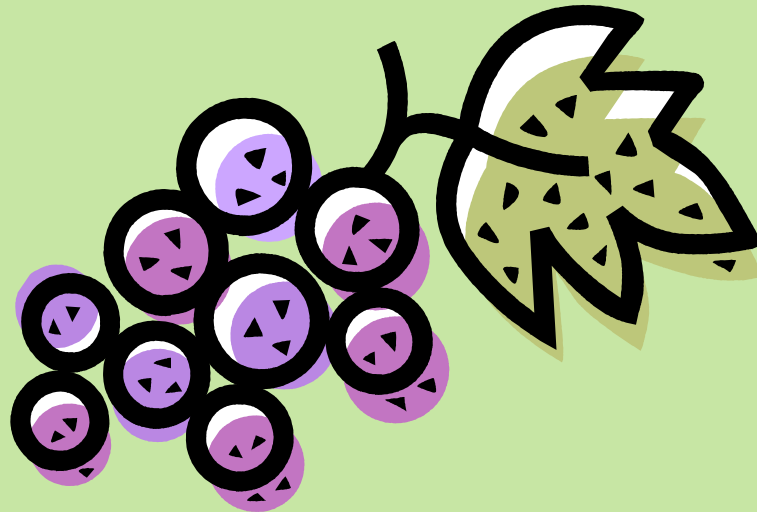
# Convenience Sample

Subjects are taken from a group that is conveniently accessible to a researcher, for example, picking the first 100 people to enter the movies on Friday night.



# Cluster Sample

The entire population is divided into groups, or clusters, and a random sample of these clusters are selected. All individuals in the selected clusters are included in the sample.



# Name that sample!

The names of 70 contestants are written on 70 cards, the cards are placed in a bag, the bag is shaken, and three names are picked from the bag.

Simple random sample

Stratified sample

Convenience sample

Cluster sample

Systematic sample

# Name that sample!

To avoid working late, the quality control manager inspects the last 10 items produced that day.

Simple random sample

Stratified sample

Convenience sample

Cluster sample

Systematic sample

# Name that sample!

A researcher for an airline interviews all of the passengers on five randomly selected flights.

Simple random sample

Stratified sample

Convenience sample

Cluster sample

Systematic sample



# Name that sample!

A researcher randomly selects and interviews fifty male and fifty female teachers.

Simple random sample

Stratified sample

Convenience sample

Cluster sample

Systematic sample

# Name that sample!

Every fifth person boarding a plane is searched thoroughly.

Simple random sample

Stratified sample

Convenience sample

Cluster sample

Systematic sample