Simple Random Sample
- Assign each person a unique number.
- Use a random number table to select 400 random numbers.
- The random numbers selected identify the persons in the sample.

Simple Random Sample
- Enter the names into a JMP data table.
- Use Tables – Subset – Random
- Enter 400 for the sample size.

Simple Random Sample
- If one were to do this more than once
  - Different random numbers will give different samples of 400 students.
  - We have introduced variability by sampling!
Margin of Error

• The variability introduced by random sampling can be quantified by the margin of error.
• Approximate margin of error

\[
\frac{1}{\sqrt{n}} \times 100\%
\]

Population – all items of interest.
Example: Adults in the U.S.

Between 39% and 45% of the population would say that the earth is getting warmer mostly because of human activity.

Sample – a few items from the population.
Example: 1,501 U.S. adults.

42% of the sample think that the earth is getting warmer mostly because of human activity.

Margin of error of +/− 3.

Types of Bias

• Sampling bias
• Non-response bias
• Response bias
Other Sampling Plans

• Systematic
  – Select in a systematic way from the sampling frame.
  – Select every 60th student on the list from the Registrar.
  – Caution the list should be in random order and the starting point should be selected at random.

Other Sampling Plans

• Stratified Random
  – Divide population into strata (subpopulations that contain similar items) and select a SRS from each strata.
  – Divide ISU students into colleges and select a SRS from each college.

Other Sampling Plans

• Cluster
  – Divide population into clusters, each cluster having a mix of items representative of the population, and select clusters at random as your sample.
  – Use classes as clusters.
Observational Studies

• Simply observing what happens
  – A sample survey is an observational study.
  – There are other observational studies that are not surveys.

Tanning and Skin Cancer

• This observational study involved 1,500 people.
• Found people who had skin cancer and other people who did not have skin cancer.
• Asked all participants whether they used tanning beds.

Diet and Blood Pressure

• Enroll 100 individuals in the study.
• Give each a diet diary. Everything eaten each day is recorded. From the diary entries the amount of sodium in the diet is calculated.
• Measure blood pressure.
Differences

- Retrospective – look at past records and historical data.
  - Tanning and Skin Cancer
- Prospective – identify subjects and collect data as events unfold.
  - Diet and Blood Pressure

Experiments

- Explanatory variable – Factor.
- Treatments.
- Response variable.
- Subjects – Participants – Experimental Units.

Experiments

- The experimenter must actively and deliberately manipulate the factor(s) to establish the method of treatment.
- Experimental units are assigned to the treatments.