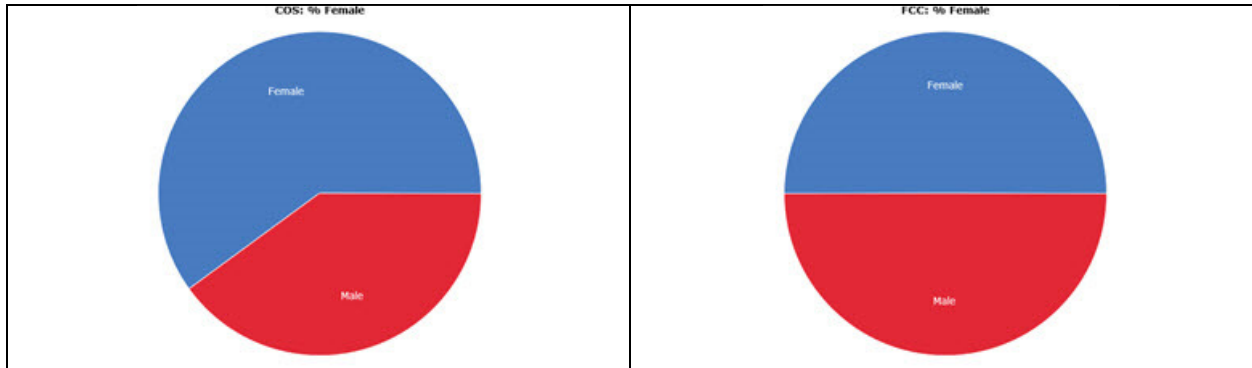# Project 2: Comparing Two Population Proportions Using Resampling

Introduction

One random sample of 15 COS students had 9 female students (60%).
Another random sample of 8 Fresno City students had 4 female students (50%).

Is this sample evidence (difference of 10%) strong enough to convince you that the percentage of all students at COS who are female is greater than the percentage of Fresno City students who are female?

We can use a simulation to investigate this. There are 13 females between the two samples and 10 males. We will draw samples of 15 of these students randomly to represent the 15 COS students, and determine how often at least 9 of them are female. (This means that the percentage difference will be at least 10%.)

Simulation Using 13 White Poker Chips (Female) and 10 Red Poker Chips (Male)

Based on the results of the poker chip simulation, would it be unusual for a sample of 15 COS students to have at least 9 females in it? (An ***unusual outcome*** occurs less than 5% of the time.)

- _____

StatCrunch Simulation Using 13 Green Balls (Female) and 10 Red Balls (Male)

Based on the results of the StatCrunch simulation, would it be unusual for a sample of 15 COS students to have at least 9 females in it?

- _____

Approximately what percentage of the time will a sample of 15 COS students have at least 9 females in it?

- _____

Investigation 1

One random sample of 100 COS students had 60 female students (60%).
Another random sample of 80 Fresno City students had 40 female students (50%).

Is this sample evidence (difference of 10%) strong enough to convince you that the percentage of all students at COS who are female is greater than the percentage of Fresno City students who are female?

StatCrunch Resampling

We can use StatCrunch to randomize these 180 students and assign 100 to COS and 80 to Fresno City. StatCrunch can repeat this simulation thousands of times and keep track how often the percentage of female students at COS is at least 10% higher than it is at Fresno City.

Directions to Applet in StatCrunch
Applets > Resampling > Randomization Test for Two Proportions

- *Use the Radio Button for "From Summary."*
- *Fill in the boxes as shown.*

⦿ **From summary:**
Sample 1:
# of successes: 60
# of observations: 100
Label: COS

Sample 2:
# of successes: 40
# of observations: 80
Label: Fresno City

- *Press Compute to create the applet.*
- *Press the button labeled "1000 times" to run the simulation 1000 times.*

What percentage of your 1000 simulations produced a sample difference above 0.1 (10%)?

- _____

Click "Reset" and "1000 times" repeatedly to make sure that your first percentage does not change by a lot.

Would it be unusual for the COS percentage to be at least 10% higher than the Fresno City percentage if the two population proportions are the same?

- _____

Investigation 2

One random sample of 300 COS students had 180 female students (60%).
Another random sample of 250 Fresno City students had 125 female students (50%).

Set up a new applet based on these two samples.

What percentage of your 1000 simulations produced a sample difference above 0.1 (10%)?

- _____

Click "Reset" and "1000 times" repeatedly to make sure that your first percentage does not change by a lot.

Would it be unusual for the COS percentage to be at least 10% higher than the Fresno City percentage if the two population proportions are the same?

- _____

Investigation 3

A college dean believes that there is no difference between the success rates in Math 230 for students who take Math 200 and for students who place into Math 230 based on their high school transcripts.

A random sample of 250 students who had taken Math 200 revealed that 105 passed Math 230 (42%). A random sample of 200 students who placed into Math 230 based on their high school transcripts revealed that 96 passed Math 230 (48%).

> *There is a 6% difference in success rates between the two samples. Because the dean believes there is no difference, rather than claiming one pass rate will be higher than the other, we must consider those samples which produce a difference below -0.06 or above 0.06 in this case.*

What percentage of your 1000 simulations produced a sample difference below -0.06 or above 0.06?

- _____

Click "Reset" and "1000 times" repeatedly to make sure that your first percentage does not change by a lot.

Would it be unusual for the two pass rates to be different by 6% or more if the two true pass rates for each population are the same?

- _____

Investigation 4 – Using Your Research

In your sample of female students how many plan to vote in the next election?

- _____/_____

In your sample of male students how many plan to vote in the next election?

- _____/_____

Set up a new applet based on these two samples.

What percentage of your 1000 simulations produced a sample difference that is as extreme (or more extreme) than your observed sample difference?

- _____

Would your samples be considered an unusual observation if the percentage of all females who plan to vote is the same as the percentage of all males who plan to vote?

- _____

Based on your results, are you able to conclude that there is a difference between the percentage of all females who plan to vote and the percentage of all males who plan to vote?

- _____

Investigation 5 – Using Your Research

What was your second research question?

-
- Results for females: _____/_____   Results for males: _____/_____

Set up a new applet based on these two samples.

What percentage of your 1000 simulations produced a sample difference that is as extreme (or more extreme) than your observed sample difference?

- _____

Would your samples be considered an unusual observation if the two population percentages are equal?

- _____

Based on your results, are you able to conclude that there is a difference between the two population percentages?

- _____