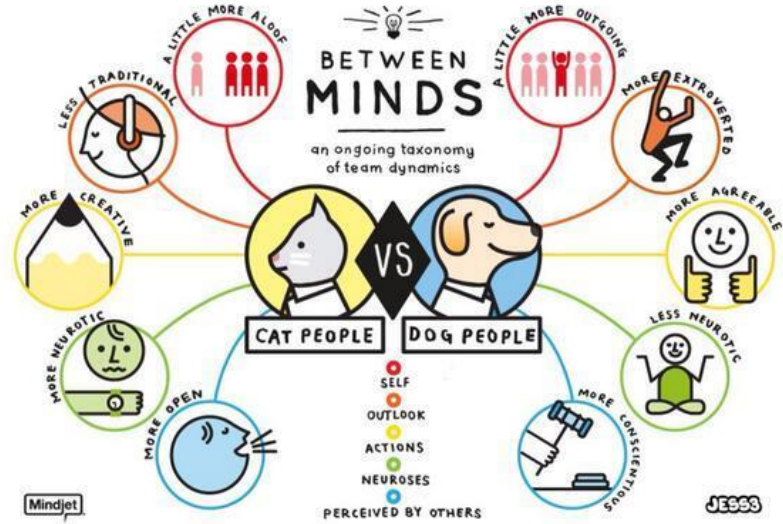


Monday, April 13: Cats and Dogs



Opening Question: Sometimes, it's said that everyone is either a cat person or a dog person. Which do you think you are?

Group Members: List the names of your group mates below.

1. The following population has seven people in it, two of which are cat people and the rest dog people.



a) What's the parameter? What percentage of the population are cat people?

$p =$

b) Suppose we randomly select a sample of four people. What percentage(s) of the sample could be cat people? Is it possible for 25% of the sample to be cat people? What about 100%

c) Describe one sample of size 4 that has an estimator of $\hat{p} = 50\%$. Which people are in this sample?

2. Your professor is coming around with a cup full of all possible samples of cats and dogs people.

- Randomly select one sample,
- Calculate the estimator for this sample,
- Write the estimator and the people in the sample on a post-it note, and
- Place this post-it note on the board above the appropriate space in the graph.

3. The graph we've created on the board is the **sampling distribution**. It shows the probability of randomly selecting a sample that's 0% cat people, 25% cat people, or 50% cat people.

a) What's the probability that we select a random sample that has no cat people?

b) What's the probability that we select a random sample that's 25% cat people?

c) On average, what percentage of a randomly selected sample are cat people?

d) How does your answer to part c compare to the parameter p ?

- e) You can estimate the amount of variation (the standard deviation) between samples using the formula

$$\text{standard error} = SE = \sqrt{\frac{p(1-p)}{n}}$$

What is the **standard error** for our sampling method?

4. Now, we're going to repeat problem 2 using a different sampling method. This time, we will reject any sample that has both people 1 and 2 in it.

- a) **Make a prediction:** How will this change affect the mean of the sampling distribution?
How will it affect the standard error?
- b) This time, what's the probability that we select a random sample that's 25% cat people?
- c) This time, on average, what percentage of a randomly selected sample are cat people?
- d) How does your answer to part c compare to the parameter p ?
- e) This time, what's the standard error?

5. We have two sampling methods, the one in problem 2 and the one in problem 4.

a) Which one has more error (and is thus less precise)? **Explain** your answer.

b) Which one has more bias (and is thus less accurate)? **Explain** your answer.

Challenge Question: Think you've got the hang of things? Let's try a third sampling method. This time, we will reject any sample that has both people 1 and 4 in it.

a) What are the mean and standard error of the resulting sampling distribution?

b) Is this technique more or less precise than the other two sampling methods? **Explain** your answer.

c) Is this technique more or less biased? **Explain** your answer.