Unit 1: Introduction to data

4. Introduction to statistical inference

GOVT 3990 - Spring 2020

Cornell University

Announcements

- Lab 1 Due today by midnight

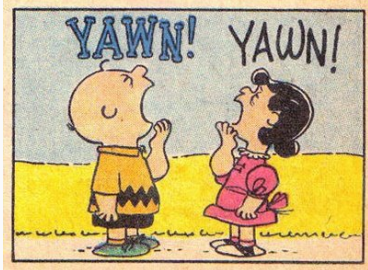▶ Lab 1 Due today by midnight - Questions?

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- ▶ Problem set (PS) 1 Due Feb 19
- ▶ Same day as lab 2 so plan accordingly

Your turn

Do you think yawning is contagious?

(a) Yes
(b) No
(c) Don't know

Is yawning contagious?

An experiment conducted by the MythBusters tested if a person can be subconsciously influenced into yawning if another person near them yawns.

50 people were randomly assigned to two groups:

- ▶ treatment: see someone yawn, $n = 34$
- ▶ control: don't see someone yawn, $n = 16$

	Treatment	Control	Total
Yawn	10	4	14
Not Yawn	24	12	36
Total	34	16	50
% Yawners			

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Based on the proportions we calculated, do you think yawning is really contagious, i.e. are seeing someone yawn and yawning dependent?

► The observed differences might suggest that yawning is contagious, i.e. seeing someone yawn and yawning are dependent

Dependence, or another possible explanation?

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- ▶ But the differences are small enough that we might wonder if they might simple be *due to chance*

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▶ So we will do just that - well, somewhat - and see what happens

▶ Instead of actually conducting the experiment many times, we will *simulate* our results

Outline

1. "There is nothing going on."
   Seeing someone yawn and yawning are *independent*, observed
   difference in proportions of yawners in the treatment and
   control is simply due to chance. → *Null hypothesis*

Two competing claims

1. "There is nothing going on."
   Seeing someone yawn and yawning are *independent*, observed difference in proportions of yawners in the treatment and control is simply due to chance. → *Null hypothesis*

2. "There is something going on."
   Seeing someone yawn and yawning are *dependent*, observed difference in proportions of yawners in the treatment and control is not due to chance. → *Alternative hypothesis*

- H_0: Defendant is innocent
- H_A: Defendant is guilty
- Present the evidence: collect data.
- Judge the evidence: "Could these data plausibly have happened by chance if the null hypothesis were true?"
- Make a decision: "How unlikely is unlikely?"

- ▶ A regular deck of cards is comprised of 52 cards: 4 aces, 4 of numbers 2-10, 4 jacks, 4 queens, and 4 kings.
- ▶ Take out two aces from the deck of cards and set them aside.
- ▶ The remaining 50 playing cards to represent each participant in the study:
  - 14 face cards (including the 2 aces) represent the people who yawn.
  - 36 non-face cards represent the people who don't yawn.

[DEMO: Watch me go through the activity before you start it in your teams.]

Activity: Running the simulation

1. Shuffle the 50 cards at least 7 times to ensure that the cards counted out are from a random process

2. Divide the cards into two decks:
   - deck 1: 16 cards $\rightarrow$ control
   - deck 2: 34 cards $\rightarrow$ treatment

3. Count the number of face cards (yawners) in each deck

4. Calculate the difference in proportions of yawners *(treatment - control)*, and submit this value (value must be between 0 and 1) - **only one submission per team per simulation**

5. Repeat steps (1) - (4) 2 times

Why shuffle 7 times: *http://www.dartmouth.edu/~chance/course/topics/winning_number.html*

Do the simulation results suggest that yawning is contagious, i.e. does seeing someone yawn and yawning appear to be dependent? (Hint: In the actual data the difference was 0.04, does this appear to be an unusual observation for the chance model?)

(a) Yes   (b) No