Unit 1: Introduction to data

4. Introduction to statistical inference

LBJ - SDA - Spring 2024

University of Texas

Outline

1. Housekeeping

2. Case study: Is yawning contagious?
    1. Competing claims
    2. Testing via simulation
    3. Checking for independence

Announcements

- Lab 1 Due today by midnight

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- Problem set (PS) 1 Due Feb 19

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- Same day as lab 2 so plan accordingly

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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.

http://www.discovery.com/tv-shows/mythbusters/videos/is-yawning-contagious-minimyth.htm

Experiment summary

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
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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?

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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

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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. $\rightarrow$ *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. $\rightarrow$ *Alternative hypothesis*

A trial as a hypothesis test

- 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?"

Outline

Simulation setup

- 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*

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Your turn

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