

Investigation 3: Contagious Yawns? (assigned Wed Feb 1; due Tues Feb 7)

You may work with a group of as many as three students on this assignment, handing in one report with all names, provided that you all contribute to the work. Word-processed reports are preferred to hand-written ones. Please copy/paste relevant, well-labeled computer output into a Word file as appropriate.

Are yawns contagious? Conventional wisdom says yes: when you see someone else yawn, you're prone to feel sleepy and let out a yawn yourself. How many times have you caught yourself in this situation, or noticed it in someone else? But will this hypothesis withstand a scientific test? Will data support this claim?

The folks at *MythBusters*, a popular television program on the Discovery Channel, investigated this issue by using a two-way mirror and a hidden camera. Fifty subjects sat in a booth, accompanied only by an experimental attendee. For some of the subjects, the attendee yawned (planting a yawn "seed"), while for other subjects the attendee did not yawn. The researchers decided in advance, with a random mechanism, which subjects would receive the yawn seed and which would not. As time passed, the researchers watched to see which subjects yawned. They found that 10 of 34 subjects who had been given a yawn seed actually yawned themselves, compared with 4 of 16 subjects who had not been given a yawn seed. These data are summarized in the following 2×2 table:

	Yawn seed planted	Yawn seed not planted	Total
Subject yawned	10	4	14
Subject did not yawn	24	12	36
Total	34	16	50

- Identify the explanatory and response variables.
- Is this an observational study or an experiment? Explain how you know.
- For each treatment group, calculate the conditional proportion of subjects who yawned.
- Produce a segmented bar graph to compare the proportions who yawned between the two groups.

Next you will conduct a simulation analysis, as you did with the dolphin study, to investigate whether these data provide strong evidence to support the belief that yawning is contagious.

- Follow the "applets" link on our course webpage and then click on the Yawning Study applet (lower left corner of the page). Click Randomize to perform one repetition of the random assignment under the assumption that yawning is not contagious. Then use the applet to perform a total of 1000 repetitions of the random assignment to the yawn seed and the control groups. Finally, determine an approximate p-value from this simulation. Report this approximate p-value, and also submit a print-out of the simulation results (you can use the "print screen" key or the "snipping" tool).

f) Calculate the (exact) probability that random assignment alone (assuming no effect of planting the yawn seed) would have put 10 yawners and 24 non-yawners in the “yawn seed” group. Show how to calculate this probability in terms of combinations, and also report the probability rounded to four decimal places.

g) Calculate the other probabilities necessary to calculate the exact p-value. (Feel free to use Excel.) Again show how to calculate these probabilities in terms of combinations, and also report the p-value rounded to four decimal places.

h) Summarize the conclusion that you would draw, based on your simulation analysis and exact p-value calculation, with regard to whether the observed data provide strong evidence that yawning is contagious. Also be sure to explain the reasoning process by which your conclusion follows from your simulation analysis and p-value.