

## STAT 221 Introduction to Probability and Statistics Winter 2012

### Quiz 16

Assigned on Wed Feb 8; due on Mon Feb 13. You may work with a group of as many as 4 students, submitting one quiz with all names, provided that you all contribute to the work. You may use your notes. Also, please include your section number (8am: section 2, 9am: section 3) and “quiz 16” along with your name(s).

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  $2 \times 2$  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    |

1. Is this an observational study or an experiment? Explain how you know.
2. For each treatment group, calculate the conditional proportion of subjects who yawned. Also calculate the difference in these proportions.

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

3. Go to the Yawning Study applet (in the lower left corner of: <http://www.rossmanchance.com/applets/>). 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.
4. Interpret what the p-value means: This is the probability of \_\_\_\_, assuming \_\_\_\_.

5. The *MythBusters* folks concluded that these data provide strong evidence that yawning is contagious. Do you agree with this conclusion? Explain your answer, based on your simulation results.