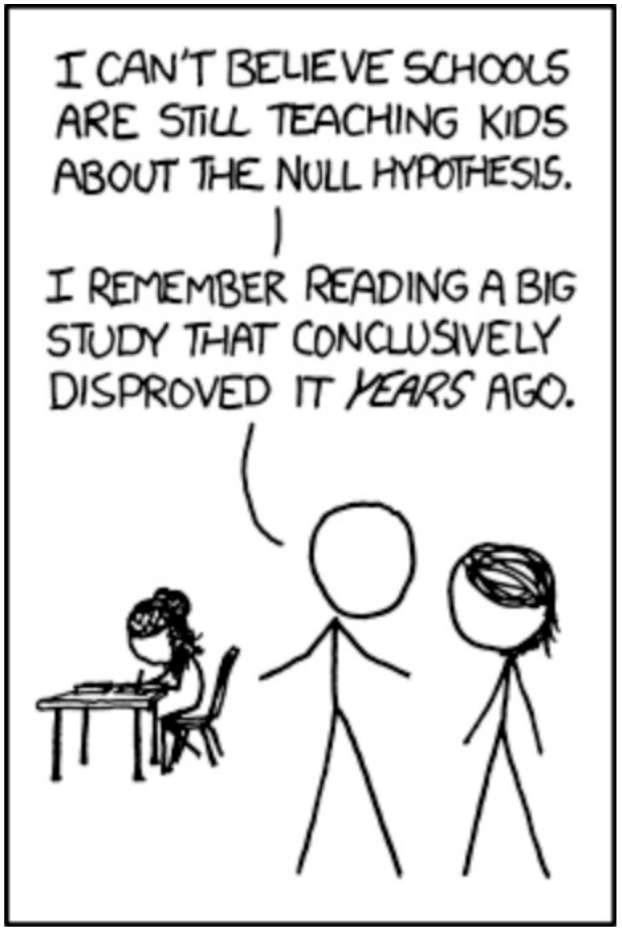
Stat 88: Probability & Mathematical Statistics in Data Science



Lecture 29 : 4/5/2021

Section 9.2

A/B Testing

A/B testing

- Data 8, section 12.3, randomized controlled trial to see if botulinum toxin could help manage chronic pain
- 31 patients → 15 in treatment group, 16 in control group. 2 patients in the control group reported pain relief and 9 in the treatment group.

- A/B testing is a (relatively recent) term used to describe hypothesis tests which involve comparing the distributions of two random samples. (Earlier we had *one* sample and made a hypothesis about its distribution.)
- In particular, we can conduct an A/B test for hypothesis tests involving results of randomized controlled trials.

Fisher's exact test

- Control group: 16 patients, 2 reported relief
- Treatment group: 15 patients, 9 reported relief

- H_0: The treatment has no effect (there would have been 11 patients reporting pain relief no matter what, and it just so happens that 9 of them were in the treatment group)
- H_1: The treatment has an effect

Example continued

Example:The Lady Tasting Tea

- The first person to describe this sort of hypothesis test was the famous British statistician Ronald Fisher. In his book *The Design of Experiments,* he describes a tea party in which a lady of his acquaintance claimed that she could tell from tasting a cup of tea if the milk had been poured first or the tea.
- Fisher immediately set up an experiment in which she was given multiple cups of tea and asked to identify which of them had had the tea poured first. She tasted 8 cups of tea, of which 4 had the tea poured first, and identified 3 of them correctly. Does this data support her claim?

Example: Gender bias?

- Rosen and Jerdee conducted several experiments using male bank supervisors (this was in 1974) who were given a personnel file and asked to decide whether to promote or hold the file. 24 were randomly assigned to a file labeled as that of a male employee and 24 to a female.
- 21 of the 24 males were promoted, and 14 of the females. Is there evidence of gender bias?