

Using Simulation to Develop the Logic of Inference

Activity 1: Hiring Discrimination

Adapted from The Practice of Statistics 6e

An airline has just finished training 25 pilots—15 male and 10 female—to become captains. Unfortunately, only eight captain positions are available right now. Airline managers announce that they will use a lottery to determine which pilots will fill the available positions. The names of all 25 pilots will be written on identical slips of paper, placed in a hat, mixed thoroughly, and drawn out one at a time until all eight captains have been identified. A day later, managers announce the results of the lottery. Of the 8 captains chosen, 5 are female and 3 are male. Some of the male pilots who weren't selected suspect that the lottery was not carried out fairly. Do these results provide *convincing* evidence of discrimination?

What is the evidence of discrimination?

What are the two explanations for this evidence?

How can we determine if the evidence of discrimination is convincing?

Activity 2: Is Steph Curry a Streaky Shooter?

Adapted from Statistical Reasoning in Sports 2e

Steph Curry is an NBA Most Valuable Player and three-time NBA champion. He is most famous for his ability to shoot, often having streaks of several made shots in a row. Does being a good shooter mean he is a streaky shooter as well? Or, are the outcomes of his shots independent, meaning that his ability to make a shot isn't affected by the outcome of his previous shot?

Here are the outcomes—in order—of each of Curry's 23 shots in a recent game, where Y represents a made shot and N represents a missed shot. Do these data provide *convincing* evidence that Curry was a streaky shooter in this game?

YYY N YYY NN Y NNN Y N YY NN YYY

What is the evidence of streakiness? How can we measure streakiness?

What are the two explanations for this evidence?

How can we determine if the evidence is convincing?

Activity 3: Is there a Home-Field Advantage in the NFL? *Adapted from Statistical Reasoning in Sports 2e*

Unfortunately for football fans outside of the Northeast, the New England Patriots are regularly one of the best teams in the league. But do they have a greater *ABILITY* to win at home than on the road? Here is a two-way table summarizing the *PERFORMANCES* of the Patriots in a recent season. Do these data provide *convincing* evidence that the Patriots had a greater *ABILITY* at home?

		Location		
		Home	Away	Total
Outcome	Win	7	5	12
	Loss	1	3	4
	Total	8	8	16

What is the evidence for a home-field advantage?

What are the two explanations for this evidence?

How can we determine if the evidence is convincing?

The Logic of Inference

In plain language...	In statistical language...
1. Identify the claim being made	1. State the null and alternative hypotheses
2. Identify evidence for the claim	2. Identify evidence for the alternative hypothesis
3. Consider the two explanations for the evidence: nothing special is happening (the claim isn't true) and the observed result was due to chance alone OR something special is happening (the claim is true)	3. Consider the two explanations for the evidence: the null hypothesis is true and the observed result was due to chance alone OR the alternative hypothesis is true
4. Perform a simulation to determine which outcomes are likely to happen by chance alone	4. Identify a probability distribution that models the possible outcomes to determine which outcomes are likely to happen by chance alone
5. Compare the observed result with what is likely to happen by chance alone	5. Calculate a p -value
6. If the observed result would rarely happen by chance alone, there is convincing evidence that something special is happening (the claim is true)	6. If the p -value is small, we reject the null hypothesis and find convincing evidence for the alternative hypothesis (in context, of course!)

See my post on StatsMedic.com: www.statsmedic.com/blog/tell-the-whole-story-evidence-for-ha-by-josh-tabor

Applets can be found at www.stapplet.com