Stat 145, Mon 8-Mar-2021 -- Mon 8-Mar-2021
Biostatistics
Spring 2021

Monday, March 8th 2021

Wk 6, Mo
Topic:: Hypothesis test intro
Read:: Lock5 4.1
HW:: PS06
HW:: PS07 Ellenberg

Hypothesis test
- another inference procedure
- idea cultivated using single proportion
  multiple choice test, 5 answers available
  let p = proportion you would get correct over full population of questions

  If you were guessing, you'd expect p = 1/5

  You hope your performance provides evidence against this conclusion
    State corresponding null and alternative hypotheses

  Say, in 50 questions, you get 18 correct.
    this provides sample data
    identify possible sample statistics

- construction of approximate null distribution
  similar to bootstrapping
  slips in bag are given proportion equal to value in null hypothesis

- look at appropriate sampling distribution
  Lock's call this the randomization distribution
  Also goes by the name null distribution

- repeat this example using R
  manyRuns <- do(5000) * rflip(50, prob=.2)

Statistical significance

SAT: $n = 50$ questions (sample size)

Let p = proportion (among all questions in population) you would get correct.

Want to show $p \neq 0.2$ $(\frac{1}{5})$

Two rival hypotheses

$H_0: p = 0.2$ (null hypothesis)

$H_a: p \neq 0.2$ (alternative hypothesis)

Other scenarios

1. Suppose a coin is to be tested for "fairness".
   Consider p = proportion (over all possible flips) of "Heads"

   $H_0: p = 0.5$

   $H_a: p \neq 0.5$

2. Looking at p = proportion of "Rock" chosen in Rock-Paper-Scissors. Test whether "Rock" comes up one third of time for a particular child.

   Let p = proportion of Rock

   $H_0: p = \frac{1}{3}$

   $H_a: p \neq \frac{1}{3}$

Bivariate data

one (categorical) variable identifies group (F or M)

on (quantitative) variable has means for the 2 populations we wish to compare

μ_F = mean # of hours exercised per week amongst females

μ_M = " " " " " " " " males

$H_0: \mu_M - \mu_F = 0$

$H_a: \mu_M - \mu_F \neq 0$

Have sample data: $\bar{x}_F = 9.4$, $\bar{x}_M = 12.4$ $\Rightarrow$ $\bar{x}_M - \bar{x}_F = 3$