

Simulating a null distribution

From Lock5Data package: BodyTemp50

$$\bar{x} = 98.26 \quad (\text{sample mean})$$

↑
value that \bar{X} can take on d.d w/ this sample data

$$s = 0.765$$

Know sampling dist. for $\bar{X} \sim \text{Norm}\left(\mu, \frac{\sigma}{\sqrt{50}}\right)$
↑ approx. ↑ unknown ↑ unknown

If we want to test hypotheses

$$H_0: \mu = 98.6^\circ\text{F} \quad H_a: \mu \neq 98.6$$

Test statistic

$$t = \frac{\bar{x} - \mu_0}{SE_{\bar{x}}} = \frac{98.26 - 98.6}{\underbrace{0.765/\sqrt{50}}_{\approx 0.1}} \\ = -3.14$$

Get P-value: $pt(-3.14, df=49) * 2$
 $= 0.003$

By resampling (always w/ $n=50$, w/ replacement) from our orig. sample and generating an \bar{x} from each "resample", shifting as appropriate, we have obtained an approximate null distribution

- has roughly the right spread
 - centered at right place
 - roughly correct shape.
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$$\bar{x}_F = 9.4, \quad \bar{x}_M = 12.4$$

Want to test: $H_0: \mu_M - \mu_F = 0$ $H_a: \mu_M - \mu_F \neq 0$