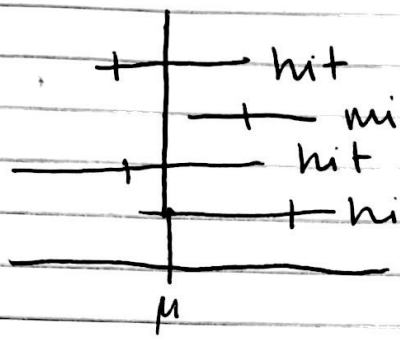
Stat 7 11-12

L-145 Q Is it true that $P_F(24.47°C < \mu < 25.58°C) = 95\%$

A. No; μ is a fixed unknown constant



hit = (includes μ)

about 95% of all possible 95% CIs will be hits

fact: 95% conf. level not high enough for useful scientific work

you declare a statsig diff: this is a positive result;

If you're wrong & μ_0 belongs in CI, you have just created a false positive; want false positive rate low; 95% conf. level ↔ (100 − 95 = 5)% false positive rate

Hallmark of good science: replicability of findings

better practice $\frac{5\%}{10}$ → @ .5% false$_+$ (99.5%)

related: 99.7% (part 3 of empirical rule)

99.7% CI stat sig ≠ practical significance

$$\left(\begin{matrix}\text{expected value}\\ \text{of } \hat{p}\end{matrix}\right) = \left(\begin{matrix}\text{EV of}\\ \hat{p}\end{matrix}\right) = E_{IID}(\hat{p}) = p$$

$$= E_{IID}(\bar{y}) = \mu$$

2 (Estimated standard error of $\hat{p}$) = ($\widehat{SE}$ if $\hat{p}$) = $\widehat{SE}_{IID}(\hat{p})$

$$\widehat{SE}_{IID}(\bar{y}) = \frac{\hat{\sigma}}{\sqrt{n}} = \frac{\sqrt{\hat{p}(1-\hat{p})}}{\sqrt{n}}$$

$$= \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{(.83)(.17)}{12}} = 11\% = .11$$

math fact: if pop. has only 2 possible values in it,

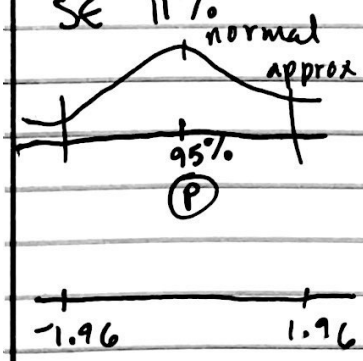
$$\left(\begin{matrix}\text{pop}\\ \text{SD}\end{matrix}\right) = \sigma = \left[\left(\begin{matrix}\text{larger}\\ \text{value}\end{matrix}\right) - \left(\begin{matrix}\text{smaller}\\ \text{value}\end{matrix}\right)\right]\sqrt{\left(\begin{matrix}\text{fraction of}\\ \text{larger value}\end{matrix}\right)\left(\begin{matrix}\text{fraction of}\\ \text{smaller value}\end{matrix}\right)}$$

$$1 \quad - \quad 0 \qquad\qquad p \qquad\qquad (1-p)$$

math fact with a 0/1 pop, with 100p% 1s,

$$\sigma = \sqrt{p(1-p)}$$

the diff between 50% (p_0 & 83%) ($\hat{p}$ is statistically significant) because p_0 is not in 95% CI for p) $\leftrightarrow$ diff is probably real

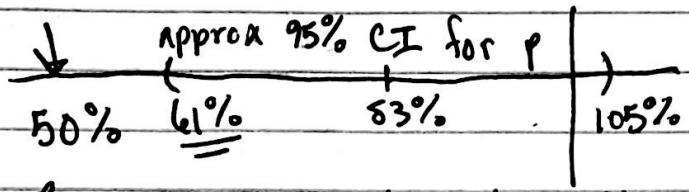


long run hist of $\hat{p}$

approx. 95% CI for p in this class:

$$\hat{p} \pm 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

83% ≠ 2 (11%)



devil's advocate theory ($p = 50\%$, p_0) | DA's theory probably wrong