this time: comparing 2 samples

read: FPP ch. 8, 9 (?)

19 ① May

AMS5

next time: correlation

big picture: p. 22 VI A, VII A

(hwk 5 due 1 week from today)

tribe 1

pop: all tribe 1 adult ~~females at~~ relevant time

sample: the observed ~~skeletons~~

imag. ~~data~~ possible $\bar{y}_1$, s

height

N_1 = big

like SRS ≐ like IID

height

$n_1 = 25$

mean $\bar{y}_1 = 59.4$ in

SD $s_1 = 1.8$ in

59.4 in ← $\bar{y}_1$
59.9
⋮

∞

mean $\mu_1 = ?$

SD $\sigma_1 = ?$

?

pop hist.

hyp IID

$n_1 = 25$

mean $\bar{y}_1 = ?$
(ex. 59.9 in)

⋮

long run mean	$E_{IID}(\bar{y}_1) = \mu_1$
(est.) long run SD	$\hat{SE}_{IID}(\bar{y}_1) = 0.36$ in
long run hist	CLT μ_1

inferential summary (tribe 1)

quantity of interest	μ_1 = mean height of all adult females in tribe 1
estimate	$\bar{y}_1 = 59.4$ in

give or take	$\hat{SE}_{IID}(\bar{y}_1) = \frac{\cancel{\sigma_1}\, s_1}{\sqrt{n_1}} = \frac{1.8\text{ in}}{\sqrt{25}} = 0.36\text{ in}$

pop: ditto tribe 2 | tribe 2 | sample: ditto | imag. data: possible $\bar{y}_2$'s

ht. N_2 = big — like IID → ht. $n_2 = 27$

mean $\bar{y}_2 = 61.3$ in

SD $s_2 = 2.4$ in

→ 61.3 in ↑ ∞ ↓

mean $\mu_2 = ?$

SD $\sigma_2 = ?$

pop hist.

ditto → $n_2 = 27$

mean $\bar{y}_2 = ?$

long run mean: $E_{IID}(\bar{y}_2) = \mu_2$

long run SD (est.): $\hat{SE}_{IID}(\bar{y}_2) = 0.46$ in

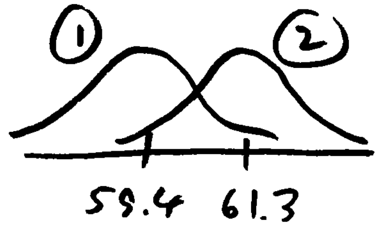
l.r. h.

CLT μ_2

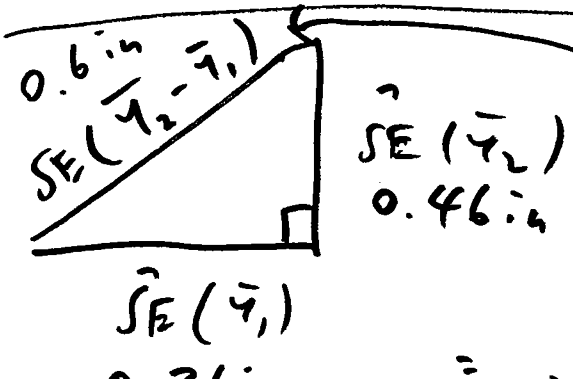
inferential summary (tribe 2)

quantity of interest	μ_2 = ditto tribe 2
estimate	$\bar{y}_2 = 61.3$ in
give or take	$\hat{SE}_{IID}(\bar{y}_2) = \frac{\cancel{\sigma_2}\, s_2}{\sqrt{n_2}} = \frac{2.4\text{ in}}{\sqrt{27}} = 0.46$ in

(real) inferential summary

quantity of interest	$(\mu_2 - \mu_1)$ = mean difference between adult (F) height in tribe 2 vs. 1
estimate	$(\bar{y}_2 - \bar{y}_1) = (61.3\text{ in} - 59.4\text{ in}) = 1.9\text{ in}$
is this diff. practically significant?	 most of (2) women would be taller than most of (1) women, so yes
give or take for estimate	$\hat{SE}(\bar{y}_2 - \bar{y}_1) = 0.6\text{ in}$
95% CI for $(\mu_2 - \mu_1)$	$(\bar{y}_2 - \bar{y}_1) \pm 2\,\hat{SE}(\bar{y}_2 - \bar{y}_1)$ $= 1.9\text{ in} \pm 2(0.6\text{ in}) = 1.9\text{ in} \pm 1.2\text{ in}$

math fact: uncertainty combines with 2 <u>indep.</u> samples like legs of a right Δ



$$= \hat{SE}(\bar{y}_1 - \bar{y}_2) = \sqrt{\left(\hat{SE}(\bar{y}_1)\right)^2 + \left[\hat{SE}(\bar{y}_2)\right]^2}$$

$$= \sqrt{(0.36\text{ in})^2 + (0.46\text{ in})^2} = 0.58\text{ in} \doteq 0.6\text{ in}$$