§8.6 ESTIMATING DIFFERENCE BETWEEN 2 POP. MEANS

e.g. PLANTS GIVEN FERTILIZER HAVE AVERAGE HEIGHT 5 INCHES TALLER THAN PLANTS NOT GIVEN FERTILIZER.

... LOST 5 LBS MORE WEIGHT THAN ...

CITY DWELLERS WATCH 5 HOURS LESS TV PER WEEK THAN NON-CITY DWELLERS.

MORE?

	POPULATION 1	POPULATION 2	SAMPLE 1	SAMPLE 2
MEAN	μ_1	μ_2	$\bar{x}_1$	$\bar{x}_2$
S.D.	σ_1	σ_2	s_1	s_2
SIZE	N_1	N_2	n_1	n_2

WHEN INDEPENDENT RANDOM SAMPLES OF n_1 & n_2 OBSERVATIONS ARE TAKEN FROM POPULATIONS WITH MEANS μ_1 & μ_2 AND S.D.'S σ_1 & σ_2 RESPECTIVELY, THE SAMPLING DISTRIBUTION OF THE DIFFERENCE $(\bar{x}_1 - \bar{x}_2)$ HAS

- MEAN $= (\mu_1 - \mu_2)$
- S.E. $= \sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}} \approx \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$ ⟶

THE SAMPLING DISTRIBUTION FOR $(\bar{x}_1 - \bar{x}_2)$ IS EXACTLY NORMAL IF THE POPULATIONS ARE NORMALLY DISTRIBUTED.

THE SAMPLING DISTRIBUTION FOR $(\bar{x}_1 - \bar{x}_2)$ IS APPROXIMATELY NORMAL IF BOTH $n_1, n_2 \geq 30$ (BY C.L.T.)

THE STATISTIC $$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$ HAS (APPROX.) STANDARD NORMAL DISTRIBUTION

POINT ESTIMATION: $(\mu_1 - \mu_2) \approx (\bar{x}_1 - \bar{x}_2)$

95% MARGIN OF ERROR : ± 1.96 S.E. $= \pm 1.96 \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

$(1-\alpha)$ CONFIDENCE INTERVAL :

$$(\bar{x}_1 - \bar{x}_2) \pm z_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

WE CONCLUDE THERE IS LIKELY A DIFFERENCE BETWEEN THE POPULATION MEANS IF 0 IS NOT IN THIS INTERVAL.

ex. #42, #46, 52,