Note Title 3/17/2010

STT 200 3pm 3-17-10

Ch 24 TODAY + MONDAY

CI FOR $p_1 - p_2$ or $\mu_1 - \mu_2$.

z CI for pop^N p (FRACTION OF DEMS IN VOTING POPULATION)

RECIPE: TAKE SAMPLE OF n VOTERS WITH-REPL + EQ-PROBABILITY + z-CI $\hat{p} \pm z\sqrt{\hat{p}\hat{q}}/\sqrt{n}$

eg $z = 1.96$ for 95% CI

z-CI for pop^N MEAN μ x = AMT OF BUG B IN GUT

z-CI for μ: $\bar{x} \pm 1.96\ \sigma/\sqrt{n}$

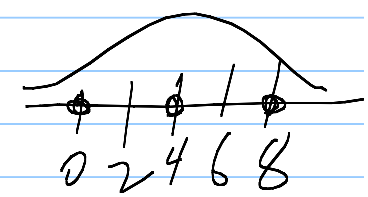
z for 95% CI

WHERE s = SAMPLE SD.

	x	$(x-\bar{x})^2$ SQ DEV FROM AVG.
SAMPLE	0	$(0-4)^2=16$
	4	$(4-4)^2=0$
	8	$(8-4)^2=16$
TOT	12	32

SO $\bar{x} = \frac{12}{3} = 4 \quad s^2 = \frac{32}{3-1} = 16, \ s = 4$

NOTE: z CI DOES NOT APPLY.



WERE THIS A SAMPLE FROM A NORMAL POPULATION BUT (JUST PLAY ALONG) WE'D HAVE RECOURSE TO t-CI: for 95% CONF $\bar{x} \pm t_{3-1}\, s/\sqrt{n}$

WORKS OUT TO $4 \pm \underline{4.303}\ 4/\sqrt{3}$

DIFFERS FROM 1.96

DF	
$3-1=2$	
CONF	95%

THESE "t-CI HAVE "EXACT" COVERAGE PROBABILITY (FOR INFINITE PRECISION CALCULATIONS)

i.e. $P\left(\mu \text{ IN } \boxed{\bar{x} \pm t_{n-1}\, s/\sqrt{n}}\right) = .95$ for t_{n-1}

TAKEN AT 95% CONF.

GOSSETT "STUDENT" ~1904

NOW MOVE THIS UP TO DIFF

SPECIAL YOGURT

$p_1 - p_2$, $(\hat{p}_1 - \hat{p}_2) \pm z \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}$ $(n \to \infty)$

PLACEBO

$\mu_1 - \mu_2$ $(\bar{x}_1 - \bar{x}_2) \pm z \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

RECALL

$\text{Var}\,\hat{p} = pq/n$

$\text{Var}(\hat{p}_1 - \hat{p}_2) = \text{Var}\,\hat{p}_1 + \text{Var}\,\hat{p}_2$

(INDEP)

EXAMPLE: SUPPOSE POP 1. p_1 = FRACTION WHO WILL HAVE BP IMPROVEMENT ON PLACEBO

p_2 = — — ON MED.

POP^N OF SUBJECTS.

SELECT EQ PR WITH-REPL n_1 PLACEBO $\hat{p}_1$

INDEP " " " " n_2 MED $\hat{p}_2$

Z-BASED 95% CI for $p_1 - p_2$:

$$\hat{p}_1 - \hat{p}_2 \pm 1.96 \text{ EST OF SD OF } \hat{p}_1 - \hat{p}_2 : \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$$

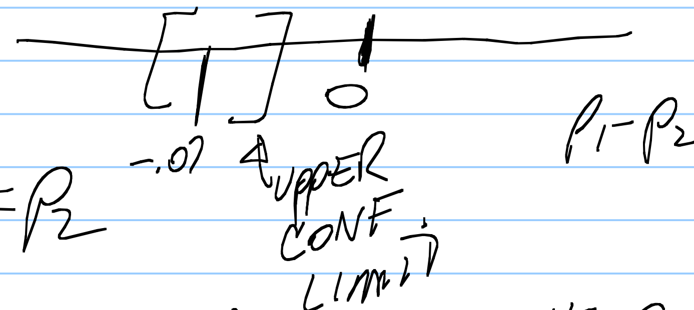
SO e.g. IF SELECT $n_1 = 100$ (PLACEBO) FINDING $\hat{p}_1 = .18$

+ IF " $n_2 = 50$ (MED) " $\hat{p}_2 = .25$

95% CI (z-BASED) $\hat{p}_1 - \hat{p}_2 \pm 1.96 \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}$

$(.18 - .25) \pm 1.96 \sqrt{\frac{.18 \cdot .82}{100} + \frac{.25 \cdot .25}{50}}$

IF THIS CI FALLS ENTIRELY LEFT OF 0 GOOD NEWS FOR THE MED



IF $p_1 = p_2$

P(CI FALLS ENTIRELY BELOW 0) IS .05 IF $p_1 = p_2$

UPPER CONF LIMIT $.18 - .25 + 1.96 \sqrt{\text{"}}$

$$-.07 \pm 1.96\sqrt{\frac{.16}{100} + \frac{3}{800}}$$

$$\sqrt{\frac{16}{800}} = \sqrt{\frac{2}{100}}$$

$$-.07 \pm 1.96\sqrt{.02}$$

$$.28$$

$$[\quad 0 \quad]$$

SO CONCLUDE THAT THE $\hat{p}_1 - \hat{p}_2$ AS SEEN COULD EASILY OCCUR JUST BY CHANCE IF $p_1 = p_2$.

SO TOO, IF x_1 = DEGREE~~S~~ OF BP REDUCTION ON PLACEBO

x_2 = " " " " " MED

SAMPLE AS BEFORE FINDING $\bar{x}_1 = 6.4$ $\quad s_1 = 8.3$

$\bar{x}_2 = 31.6$ $\quad s_2 = 56.2$

95% z-BASED CI FOR $\mu_1 - \mu_2$

IS $\quad \bar{x}_1 - \bar{x}_2 \pm 1.96\sqrt{s_1^2/n_1 + s_2^2/n_2}$

$$6.4 - 31.6 \pm 1.96\underbrace{\sqrt{\frac{8.3^2}{100} + \frac{(56.2)^2}{50}}}_{15 \text{ (SAY)}}$$

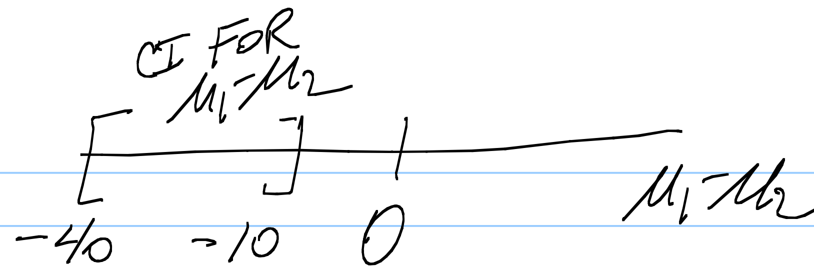
LOOKS GOOD

$.64 + 60$

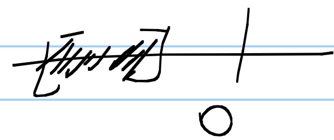
HIGHLY VARIABLE RESPONSES IN MED GROUP

-25 ± 15

-40 TO -10



IF $\mu_1 - \mu_2 = 0$ (MED HAS NO EFFECT)

THEN 

OCCURS W/ PROB $.05/2 = .025$