

STAT 308 - Handout #19

Inference from small samples

Example

An investigation is undertaken to determine how the administration of a growth hormone affects the weight gain of pregnant rats. Weight gains during the gestation are recorded for 6 control rats and 6 rats receiving the growth hormone.

The following summary statistics are obtained:

Control Rats

$$\bar{X}_1 = 41.8$$

$$s_1 = 7.6$$

Hormone Rats

$$\bar{X}_2 = 60.8$$

$$s_2 = 16.4$$

- a. Find the 90% CI for $\mu_1 - \mu_2$.

Sample sizes?

Large Samples?

Pop'n variances known?

$$df = \quad = \quad =$$

$$t_{\alpha/2, n_1+n_2-2} =$$

Note: when $df > 30$ use normal tables.

Pooled variance s_p^2 ?

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} =$$

Hence, the pooled standard deviation is $s_p =$

Then the 90% CI is:

$$(\bar{X}_1 - \bar{X}_2) \pm \quad =$$

$$= \quad = (-32.37, -5.63)$$

The true mean difference between the control and treated group

Implication of CI?

The weight for control group is

b. What assumptions have to be made for the 90% CI to be valid?

- 1.
- 2.
- 3.

Example (Hormone example continued)

c. Is the weight gain significantly higher for the rats receiving the hormone treatment than those in the control group? Use $\alpha=0.10$.

Recall:

Control Rats

Hormone Rats

$$\bar{X}_1 = 41.8$$

$$s_1 = 7.6$$

$$n_1 = 6$$

$$\bar{X}_2 = 60.8$$

$$s_2 = 16.4$$

$$n_2 = 6$$

$$\bar{X}_1 - \bar{X}_2 = -19.0$$

$$s_p = 12.78$$

$$df = n_1 + n_2 - 2 = 10$$

→ H_0 :

H_a :

Since sample sizes are small and popul'n SD's are unknown use the test statistics

$t =$

$$= \frac{-19.0}{7.3785} = -2.5750$$

$\alpha =$



Reject H_0 if

Since