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:

<table>
<thead>
<tr>
<th>Control Rats</th>
<th>Hormone Rats</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{X}_1 = 41.8$</td>
<td>$\bar{X}_2 = 60.8$</td>
</tr>
<tr>
<td>$s_1 = 7.6$</td>
<td>$s_2 = 16.4$</td>
</tr>
</tbody>
</table>

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

Sample sizes?
Large Samples?
Pop’n variances known?

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

$$t_{\alpha/2} \cdot s_{p} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

Note: when df > 30 use normal tables.

Pooled variance $s_p^2$?

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

Hence, the pooled standard deviation is $s_p = \quad$

Then the 90% CI is:

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

$$(2.45)$$

$$(2.45) \quad = \quad \quad = \quad (-32.37, -5.63)$$

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:

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<tr>
<td>$s_1=7.6$</td>
<td>$s_2=16.4$</td>
</tr>
<tr>
<td>$n_1=6$</td>
<td>$n_2=6$</td>
</tr>
</tbody>
</table>

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

$$s_p = 12.78$$

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

- $H_0$
- $H_a$

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