

Stat 101L: Lecture 35

Inference for $\mu_1 - \mu_2$

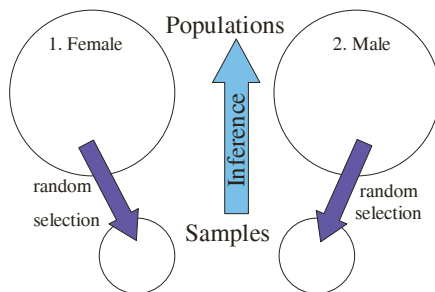
- * Who? Students at I.S.U.
- * What? Time (minutes).
- * When? Fall 2000.
- * Where? Lied Recreation Athletic Center.
- * How? Measure time from when student arrives on 2nd floor until she/he leaves.
- * Why? Part of a Stat 101 data collection project.

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Inference for $\mu_1 - \mu_2$

- * Do males and females at I.S.U. spend the same amount of time, on average, at the Lied Recreation Athletic Center?

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Time (minutes)

1. Females	2. Males
63, 32, 86, 53, 49	52, 75, 74, 68, 93
73, 39, 56, 45, 67	77, 41, 87, 72, 53
49, 51, 65, 54, 56	84, 65, 66, 69, 62

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Time (minutes)

Sex=F		Sex=M	
Mean	55.87	Mean	69.20
Std Dev	13.527	Std Dev	13.790
Std Err Mean	3.4927	Std Err Mean	3.5606
N	15	N	15

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Comment

* This sample of I.S.U. females spends, on average, 13.33 minutes less time at the Lied Recreation Athletic Center than this sample of I.S.U. males.

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Conditions & Assumptions

- * Randomization Condition
- * 10% Condition
- * Nearly Normal Condition
- * Independent Groups Assumption
 - How were the data collected?

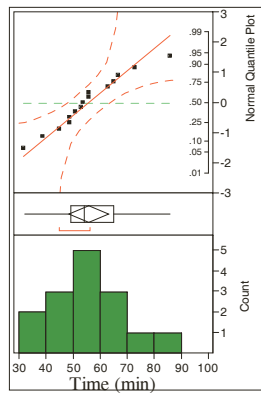
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Conditions & Assumptions

- * Randomization Condition
 - Random sample of males.
 - Random sample of females.
- * Independence Assumption
 - Two separate random samples.
- * 10% Condition

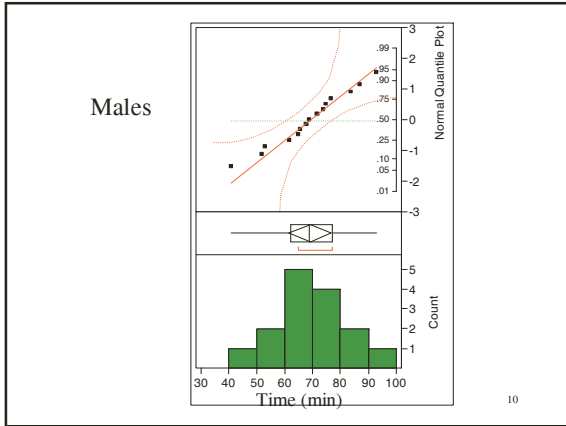
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Females



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Nearly Normal Condition

- * The female sample data could have come from a population with a normal model.
- * The male sample data could have come from a population with a normal model.

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Confidence Interval for $\mu_1 - \mu_2$

$$(\bar{y}_1 - \bar{y}_2) \pm t^* \text{SE}(\bar{y}_1 - \bar{y}_2)$$

$$\text{SE}(\bar{y}_1 - \bar{y}_2) = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

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

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$$\begin{aligned} SE(\bar{y}_1 - \bar{y}_2) &= \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \\ &= \sqrt{\frac{(13.527)^2}{15} + \frac{(13.792)^2}{15}} \\ &= \sqrt{24.88} = 4.988 \end{aligned}$$

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$$\begin{aligned} SE(\bar{y}_1 - \bar{y}_2) &= \sqrt{[SE(\bar{y}_1)]^2 + [SE(\bar{y}_2)]^2} \\ &= \sqrt{[3.4927]^2 + [3.5606]^2} \\ &= \sqrt{24.88} = 4.988 \end{aligned}$$

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Finding t^*

- *Use Table T.
- *Confidence Level in last row.
- *df = a really nasty formula (so the value will be given to you).
-df = 28 for our example.

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Table T

df					
1					
2					
3					
4					
⋮					
28			2.048		
Confidence Levels	80%	90%	95%	98%	99%

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Confidence Interval for $\mu_1 - \mu_2$

$$(\bar{y}_1 - \bar{y}_2) \pm t^* SE(\bar{y}_1 - \bar{y}_2)$$

$$(55.87 - 69.2) \pm 2.048(4.988)$$

$$-13.33 \pm 10.22$$

$$-23.55 \text{ to } -3.11$$

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Interpretation

* We are 95% confident that I.S.U. females spend, on average, from 3.11 to 23.55 minutes less time at the Lied Recreation Athletic Center than I.S.U. males do.

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