Heart Transplant

Presented by: Alfonso F., Majorie C., & Lisa T.
http://youtube.com/watch?v=poh860kc3_Y&feature=related

3:21-4:00
(Animal) The first heart transplanted into a human occurred in 1964 at the University of Mississippi Medical Center in Jackson, Mississippi. A team led by Dr. James Hardy transplanted a chimpanzee heart into a dying patient. The heart beat for 90 minutes before stopping.

(Human) The world 1st heart transplant was done in December 3rd, 1967 by an South African surgeon named Christian Bernard. The first heart transplant patient died 18 months later.
U.S Research Statistics on Heart Transplant

- (2001) A heart transplant surgery was done 100,000 times & carried out to about 2,100 patients in 160 hospitals.
  - A 1 year success rate of 85-90% & a 5 year success rate of 75%.

United States Statistics

- (2005) 2,125 heart transplants
- (2006) 2,192 heart transplants
- 74.2 percent of heart transplant patients are male; 68.4 percent are white; 20.0 percent are ages 35–49 and 55.3 percent are ages 50–64.
- (2007) As of June 15, 2007, the one-year survival rate was 87.4 percent for males and 85.5 percent for females.
  - The three-year survival rate was about 78.7 percent for males and 75.9 percent for females.
  - The five-year survival rate was 72.3 percent for males and 67.6 percent for females.
Retrospective study:

- Data of patient deaths within 30 days of surgery in 131 U.S. hospitals.
- The 3646 transplants took place during a 27 month period from October 1987 through December 1989.

Total Observations: n=3646
Data Variables

We are analyzing 4 variables:
1. Heart Transplants
2. Deaths within 30 days
3. Success Rate = Survival rate percentage
4. Number of procedure(s) per hospital
According to [www.medterms.com](http://www.medterms.com)

- **Heart transplant**: A surgical procedure in which a diseased heart is replaced with a healthy heart from a deceased person.

- **Death**: The end of Life. The cessation of Life. (Kicking the bucket!) (Death within 30 days of transplant)

- **Percentage rate of survival**: the # of deaths per transplant

- **Number of procedures per hospital**: self explanatory
Statistical Tests

- Correlations Study
  - Scatter Plot
  - Regression line

- Independent Sample T-test
  - Hypothesis Testing
  - Confidence Intervals
Correlation Between amount of transplants performed and death rates. 
X axis - amount of surgeries; y-axis - amount of deaths

“Line of best fit”
<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>.178</td>
<td>.231</td>
<td>.771</td>
</tr>
<tr>
<td>N</td>
<td>.079</td>
<td>.006</td>
<td>.760</td>
<td>13.272</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Z
Correlation Study Conclusions

- $r = \text{correlation coefficient} = .76$ - pretty close to 1
- This suggests that there is a strong correlation between the number of heart transplants performed per hospital and death rate.
- HELLOOO!!! It’s obvious!!! $\leftarrow$ The higher the transplant rates are, the higher the death rates will be...and also survival percentage
- Example: Out of 131 transplants, 18 died = 86% survival rate VS. Out of 8 transplants, 4 died = 50% survival rate. $\leftarrow$ HELLOOOO!!!!
- Would you take your Toyota to a Kia dealer to get fixed?
Independent t-sample Test

- We are comparing different amounts of heart transplants and their success rates.

- First we divided the transplant procedures into two groups.
  - Group 0 = 1 to 75 transplants
  - Group 1 = 75 to 152 transplants

- Then we divided the transplants surgeries into 3 groups.
  - Group 0 = 1 to 25 transplants (small amount)
  - Group 1 = 75 to 152 transplants (average amount)
  - Group 2 = 26 to 75 transplants (large amount)
Hypothesis Testing I

- Ho: \( M_x \equiv M_y \)
- Hi: \( M_x \neq M_y \)

- We divided the groups in half — small amount vs. large amount
- We compared “groups 0” (1-75 transplants) to “group 1” (75-152 transplants).
- Do you think that there is a significant difference in the amount of success rates between these two groups? Let’s see....
Comparison of Groups (1-75) & (79-152)

*1st comparison

<table>
<thead>
<tr>
<th>Group Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAR00003</td>
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<tr>
<td><strong>Success</strong></td>
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<td>.00</td>
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<table>
<thead>
<tr>
<th>Independent Samples Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levene's Test for Equality of Variances</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td><strong>Success</strong></td>
</tr>
<tr>
<td>Equal variances not assumed</td>
</tr>
</tbody>
</table>

Do you see a zero?
CONCLUSION 1

• If you did NOT see a zero, then we reject the null hypothesis. There is a significant difference between groups 0 and group 1.

• We can conclude that hospitals that perform more transplants have a greater success rate than hospitals that perform less transplants.

• The significant level is .001.
Hypothesis Testing 2

- Ho: Mx = My
- Hi: Mx ≠ My

We compared “groups 0” (1-25 transplants-smallest amount) to “group 1” (75-152 transplants-largest amt). We left out the middle group (26-74).

- Do you think that there is a significant difference in the amount of success rates between the two groups?
- Let’s see……..
### Comparison of Groups (1-25) & (75-152)

*Comparison 2*

#### Group Statistics

<table>
<thead>
<tr>
<th></th>
<th>VAR00004</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
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<td>8</td>
<td>.9155</td>
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<td>.01272</td>
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<td>.00</td>
<td>79</td>
<td>.8563</td>
<td>.18391</td>
<td>.02069</td>
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#### Independent Samples Test

<table>
<thead>
<tr>
<th>Levene's Test for equality of Variance</th>
<th>t-test for Equality of Means</th>
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<tbody>
<tr>
<td>F</td>
<td>Sig.</td>
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<tr>
<td>Success</td>
<td>Equal variance assumed</td>
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<tr>
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</tbody>
</table>

Do YOU see a zero?
Conclusion 2

- If you did see a zero, then we accept the null hypothesis. There is no difference between the smallest amounts and the largest amounts.
- This finding is **remarkable**!!!!!! WHY, you Ask?
- We can conclude that hospitals that perform **few** transplants and hospitals that perform **a lot of** transplants have the **same success rate**.
- Some factors that influenced this finding are inexperience on the hospitals that do few transplants and perhaps sloppiness on hospitals that do many transplants.
Hypothesis Testing 3

Ho: $M_x = M_y$
Hi: $M_x \neq M_y$

- We compared “group 2” (26-75 transplants [middle group]) to “group 1” (79-152 [group with a lot of transplants]).

- Do you think that there is a significant difference in the amount of success rates between these two groups? Let’s see….
Comparison of Groups (26-75) & (79-152)

*Comparison 3

<table>
<thead>
<tr>
<th>VAR00004</th>
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<tbody>
<tr>
<td>Success 2.00</td>
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<td>.9286</td>
<td>.04729</td>
<td>.00697</td>
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<tr>
<td>Success 1.00</td>
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**Independent Samples Test**

<table>
<thead>
<tr>
<th>Levene's Test for Equality of Variance</th>
<th>f-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
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<td>f</td>
<td>df</td>
</tr>
<tr>
<td>Success Equal variance assumed</td>
<td>.158</td>
<td>.693</td>
</tr>
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<td>Success Equal variance not assumed</td>
<td>.442</td>
<td>6.880</td>
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</table>
CONCLUSION 3

• If you did see a zero, then we accept the null hypothesis. There is not a significant difference between group 2 and group 1.

• We can conclude that hospitals that perform an average amount of transplants (26-75) and hospitals that perform a lot of transplants (75-152) have the same success rate.
We compared “group 2” (26-75 transplants [middle group]) to “group 0” (1-25 [group with few transplants]).

Do you think that there is a significant difference in the amount of success rates between these two groups?

Let’s SEE>>>
Comparison of Groups (26-75) & (1-25)

*Comparison 4

### Group Statistics

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<tr>
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<td>Sig.</td>
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<tr>
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<td>.001</td>
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</table>

Do YOU see a ZERO?
CONCLUSION 4

• If you did not see a zero, then we reject the null hypothesis. There is a significant difference between group 2 and group 0.

• We can conclude that hospitals that perform an average amount of transplants (26-75) have a higher success rate than hospitals that perform few transplants (1-25).
MISSING INFORMATION

- Where were the hospitals located? (Location, Location, Location!!!)
- Age of patients (Does being young or old make a difference?)
- Where and whom did the hearts come from?
- How much experience do the surgeons have?
- How long were each surgery?
- What were the health reasons of each patient who needed a transplant?
- Can you think of any others?
FINAL QUESTIONS & THOUGHTS

- Would you have a heart transplant knowing what the survival and death rates are?
- Where would you get a heart transplant?
  - A) Hospitals that perform few transplants?
  - B) Hospitals that perform an average amount of transplant?
  - C) Hospitals that perform many transplants?
- What are the survival rates in other countries? **Look up the information & statistics- yourself :]**

Thank you for listening to our presentation!