Alternative Hypothesis

Statistics and Big Data

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UCSC

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Course: Statistics and Big Data

Overview

What is the Alternative Hypothesis?

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What happens when we want to determine if there is a significant difference between these two drugs?
This leads us to the concept of the alternative hypothesis.

Understanding the Null Hypothesis

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For instance, if we observe that patients taking drug C recover faster than those taking drug D, we need to determine if this difference is statistically significant or merely due to random variation.

The Role of Statistical Tests

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A statistical test requires three essential components:

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2. **Null Hypothesis (H_0)**: The hypothesis stating no effect or difference.
3. **Alternative Hypothesis (H_a)**: The hypothesis that contradicts the null hypothesis.

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This framework allows us to make informed decisions based on our data.

Example of Recovery Times

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How do we analyze this data to test our hypotheses?

Analyzing the Data

To test the null hypothesis, we can calculate the mean recovery time for each drug:

$$\bar{X_C} = \frac{5+6+7+5+6}{5} = 5.8$$
$$\bar{X_D} = \frac{8+9+7+8+9}{5} = 8.2$$

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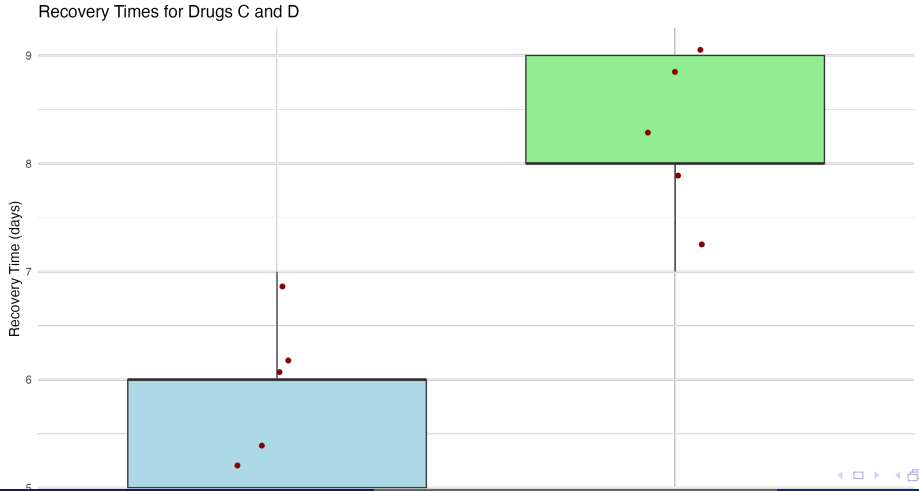
Next, we assess the distances of each observation from the respective means.
This analysis helps us determine if the differences in means are statistically significant.

Visualizing the Means

Here is a visual representation of the means and the distances from each observation to the mean for both drugs.



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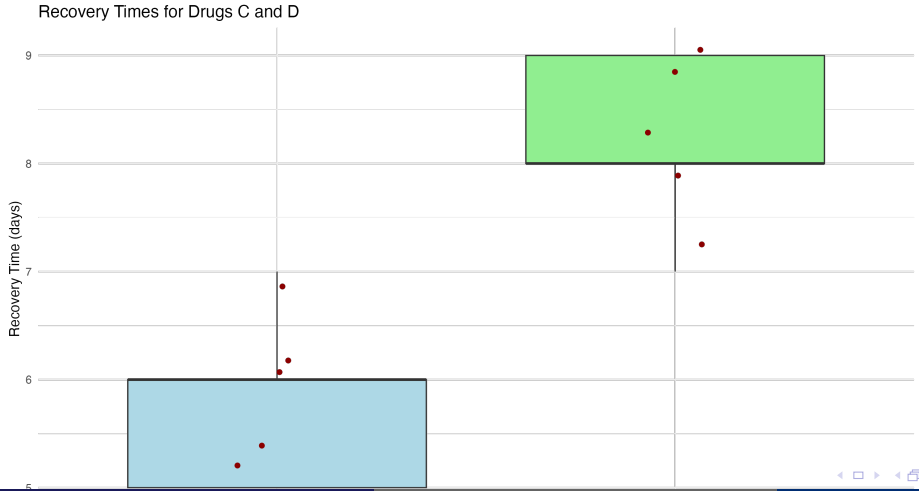

Interpreting the Results

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Conversely, if the distances are similar, we fail to reject the null hypothesis, indicating that any observed difference may be due to random variation.

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How do we choose which alternative hypothesis to test?

Importance of Specifying Hypotheses

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This highlights the importance of clearly stating our hypotheses before conducting tests.

Summary of Key Concepts

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When dealing with two groups, the alternative hypothesis is straightforward. However, with three or more groups, the complexity increases, necessitating careful consideration of the hypotheses we choose to test.

Exercises

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Exercise 4

Reflect on a real-world scenario where failing to reject the null hypothesis could lead to