Regression Analysis

Analysis of Variance

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Basics Concepts

About This Lesson

ANOVA: Analysis of Variance

Population 1: (μ_1, σ_1^2) → Sample 1:$(Y_{1,1},\ldots,Y_{1,n_1})$ → $(\bar{Y}_1, s_1^2)$

Population 2: (μ_2, σ_2^2) → Sample 2: $(Y_{2,1},\ldots,Y_{2,n_2})$ → $(\bar{Y}_2, s_2^2)$

.....

Population k: (μ_k, σ_k^2) → Sample k: $(Y_{k,1},\ldots,Y_{k,n_k})$ → $(\bar{Y}_k, s_k^2)$

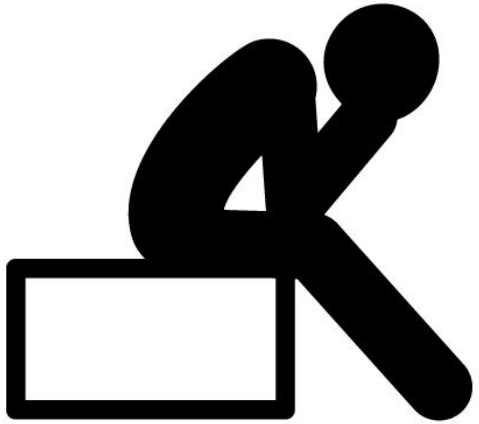
ANOVA: Comparing the means of multiple samples

ANOVA Example 1: Global Suicide

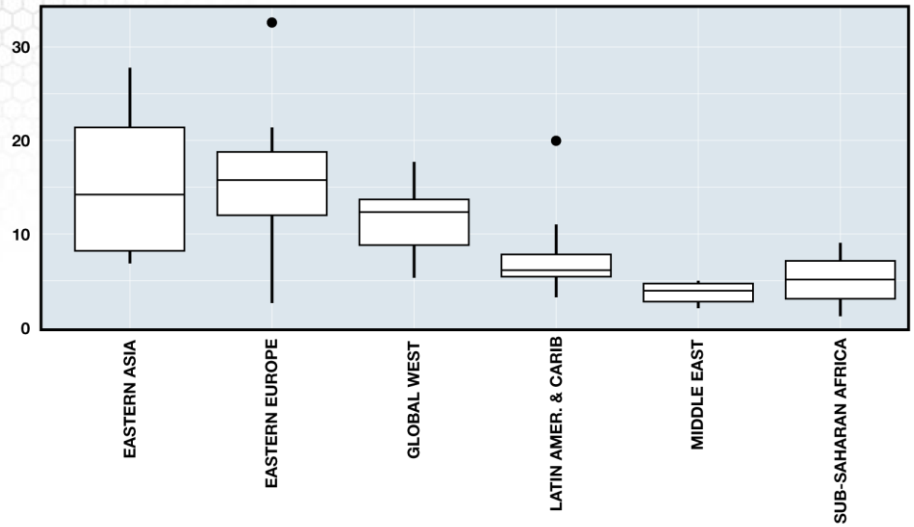
Data Source:

Suicide Rate: Kaggle

https://www.kaggle.com/russellyates88/suicide-rates-overview-1985-to-2016



ANOVA Example 1: Suicide Rate & Region



1. Is there a difference in the suicide rate by region?

2. Which region has higher suicide rate?

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ANOVA Example 2: Keyboard Layout

Three different keyboard layouts are being compared in terms of typing speed.

Layout 1	Layout 2	Layout 3
23.8	30.2	27.0
25.6	29.9	25.4
24.0	29.1	25.6
25.1	28.8	24.2
25.5	29.1	24.8
26.1	28.6	24.0
23.8	28.3	25.5
25.7	28.7	23.9
24.3	27.9	22.6
26.0	30.5	26.0
24.6	*	23.4
27.0	*	*

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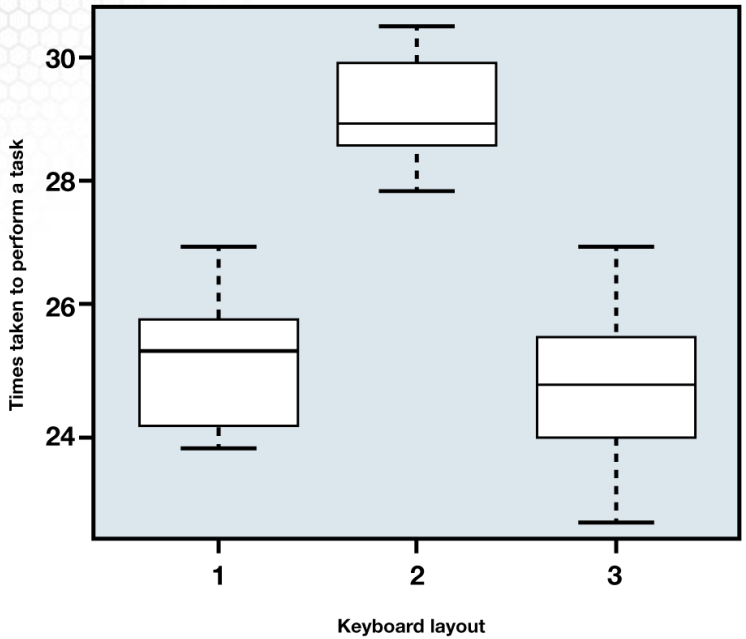
Operation Time by Keyboard Layout



1. Is there a difference in the time taken to perform a task?

2. Which layout is more effective?

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ANOVA: Objectives

Primary objectives in ANOVA:

1. Analysis of the variability in the data – the ANOVA table
2. Testing for equal means

$$H_o : \mu_1 = \mu_2 = ... = \mu_k$$

3. Estimation of simultaneous confidence intervals for the mean differences

$$\mu_i - \mu_j \quad \textit{for } i \textit{ and } j = 1, \ldots, k$$

Summary