

Statistical Inference Course Project - Part 2

Jose Arturo Mora Soto

May 10, 2016

Overview

In this project we are going to analyze the **ToothGrowth** data in the R datasets package. The data in this dataset corresponds to the effect of Vitamin C on tooth growth in guinea pigs. The response is the length of odontoblasts (cells responsible for tooth growth) in 60 guinea pigs. Each animal received one of three dose levels of vitamin C (0.5, 1, and 2 mg/day) by one of two delivery methods, (1) orange juice (coded as **OJ**) or (2) ascorbic acid (a form of vitamin C and coded as **VC**).

Data Format

A data frame with 60 observations on 3 variables. 1. **len** numeric Tooth length 2. **supp** factor Supplement type (VC or OJ). 3. **dose** numeric Dose in milligrams/day

Load the ToothGrowth Dataset

In order to use the **ToothGrowth** dataset it is necessary to use the **datasets** library.

```
library(datasets)

# Load ToothGrowth dataset
data <- ToothGrowth
```

Basic Exploratory Data Analyses on the ToothGrowth Dataset

Now we will perform some exploratory data analyses using the **dose** data.

```
# Convert dose to factor
data$dose <- as.factor(data$dose)

# Contingency table with doses per supplement type
library(pander)
panderOptions("digits", 2)
set.caption("Doses per Supplement Type")
pander(table(data$dose, data$supp))
```

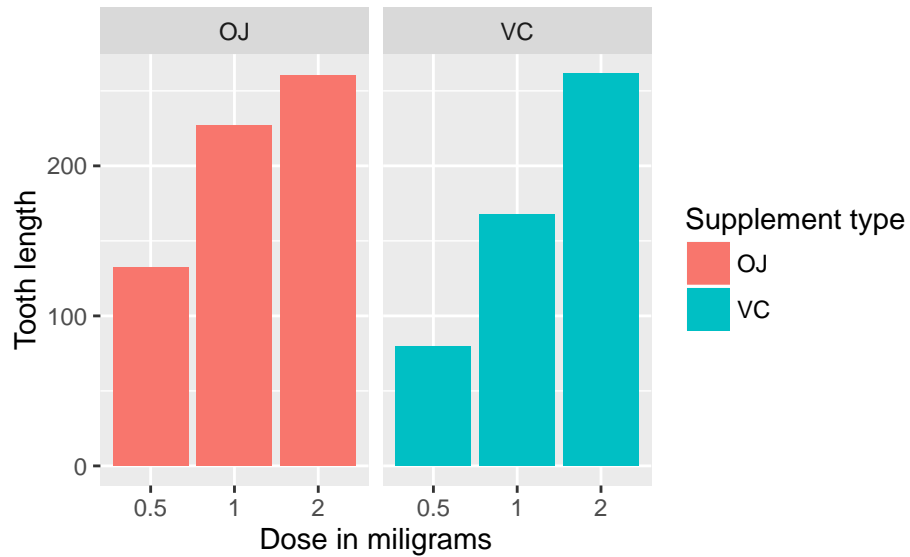
Table 1: Doses per Supplement Type

	OJ	VC
0.5	10	10
1	10	10
2	10	10

Analysis of toot lenth according to the supplement type given to the guinea pigs.

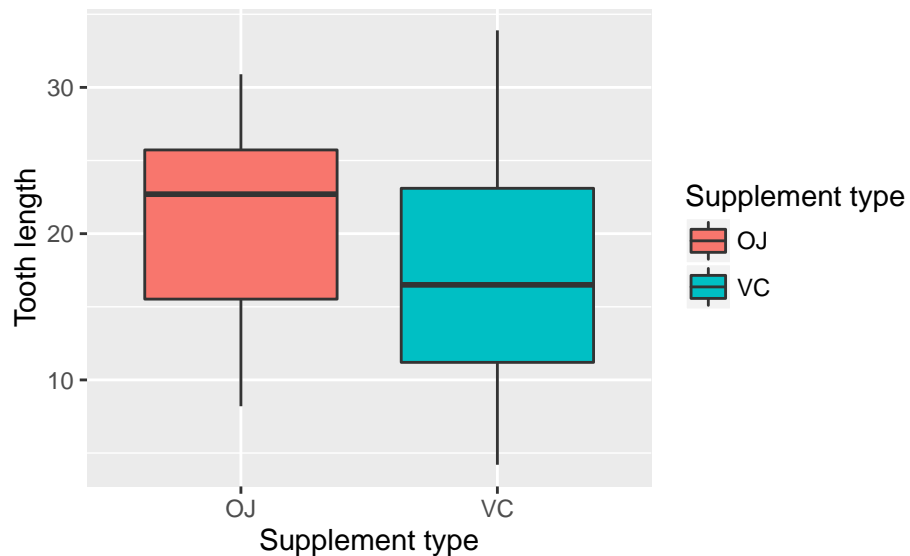
```
library(ggplot2)

ggplot(data=data, aes(x=dose, y=len, fill=supp)) + geom_bar(stat="identity",) +
  facet_grid(. ~ supp) + xlab("Dose in miligrams") + ylab("Tooth length") +
  guides(fill=guide_legend(title="Supplement type"))
```



Toot length Mean analyses of the the two supplement types

```
ggplot(aes(x=supp, y=len), data=data) + geom_boxplot(aes(fill=supp)) +
  xlab("Supplement type") + ylab("Tooth length") +
  guides(fill=guide_legend(title="Supplement type"))
```



Basic Summary of the Data

```
set.caption("Summary Statistics of the Tooth Growth Dataset")
pander(summary(data))
```

Table 2: Summary Statistics of the Tooth Growth Dataset

len	supp	dose
Min. : 4.20	OJ:30	0.5:20
1st Qu.:13.07	VC:30	1 :20
Median :19.25	NA	2 :20
Mean :18.81	NA	NA
3rd Qu.:25.27	NA	NA
Max. :33.90	NA	NA

Confidence Intervals and/or Hypothesis Tests to Compare Tooth Growth by Supplement Type and Dose

```
t.test(len ~ supp, data=data)

##
## Welch Two Sample t-test
##
## data: len by supp
## t = 1.9153, df = 55.309, p-value = 0.06063
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.1710156 7.5710156
## sample estimates:
## mean in group OJ mean in group VC
## 20.66333 16.96333
```

Conclusions

Null hypothesis can not be rejected as confidence intervals contain zero and p-value is 0.06.

Supplement types seems to have no impact on Tooth growth.