Statistican Inference Project2

Oliver Ledesma

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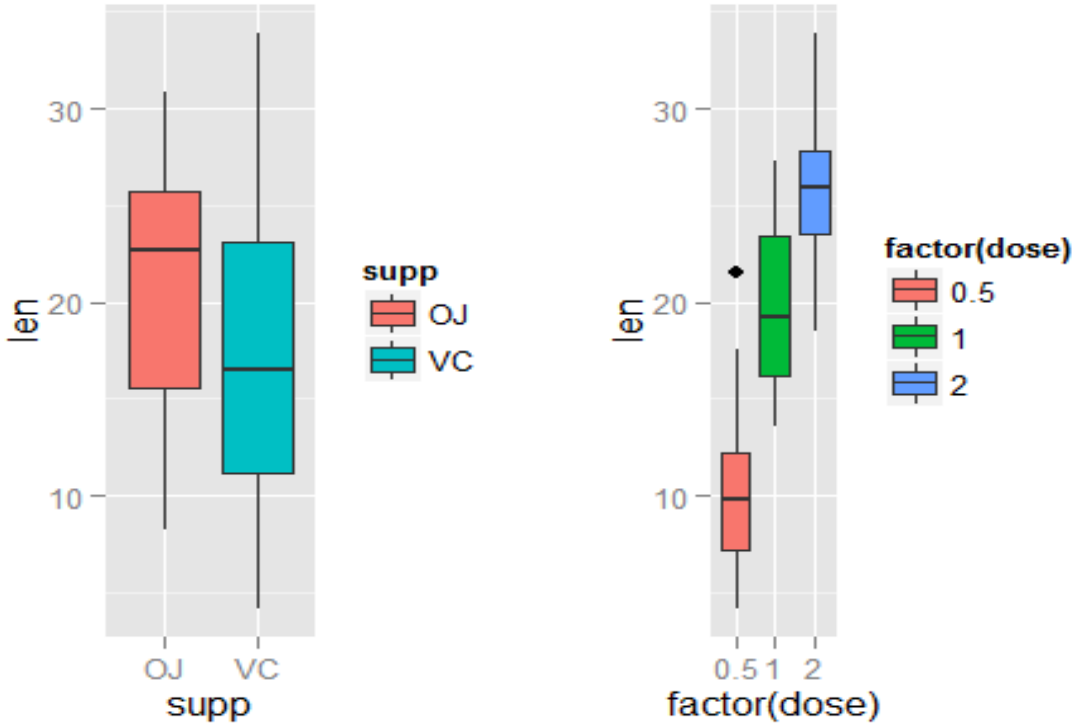
1. Load the ToothGrowth data and perform some basic exploratory data analyses.

Loading Data.

```
library(psych)

## Warning: package 'psych' was built under R version 3.1.1

library(ggplot2)

## Warning: package 'ggplot2' was built under R version 3.1.1

##
## Attaching package: 'ggplot2'
##
## The following object is masked from 'package:psych':
##
##     %+%

library(gridExtra)

## Warning: package 'gridExtra' was built under R version 3.1.1

## Loading required package: grid

library(datasets)
data(ToothGrowth)
attach(ToothGrowth)
```

Perform some basic exploratory data analyses

```
suppplot<-ggplot(aes(x=supp, y=len), data=ToothGrowth)+geom_boxplot(aes(fill
= supp))
doseplot<-ggplot(aes(x=factor(dose), y=len),
data=ToothGrowth)+geom_boxplot(aes(fill=factor(dose)))
grid.arrange(suppplot, doseplot, ncol = 2)
```



2. Provide a basic summary of the data.

```
x <- ToothGrowth
summary(x)
```

```
##       len        supp         dose
##  Min.   : 4.2   OJ:30   Min.   :0.50
##  1st Qu.:13.1   VC:30   1st Qu.:0.50
##  Median :19.2           Median :1.00
##  Mean   :18.8           Mean   :1.17
##  3rd Qu.:25.3           3rd Qu.:2.00
##  Max.   :33.9           Max.   :2.00
```

3. Use confidence intervals and hypothesis tests to compare tooth growth by supp and dose. (Use the techniques from class even if there's other approaches worth considering)

```
alpha <- 0.05  # 95% confidence interval for 2 tail z values
z.half.alpha <- qnorm(1 - alpha/2)
c(-z.half.alpha, z.half.alpha)
```

```
## [1] -1.96  1.96
```

```
t.test(x$len[x$supp == "OJ"], x$len[x$supp == "VC"], paired = TRUE)  #
Hypothesis 1 that OJ does not improve growth more than VC
```

```
##
##  Paired t-test
```

```
##
## data:  x$len[x$supp == "OJ"] and x$len[x$supp == "VC"]
## t = 3.303, df = 29, p-value = 0.00255
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.409 5.991
## sample estimates:
## mean of the differences
##                     3.7
```

```
t.test(x$len, x$dose)  # Hypothesis 2 that dosage improves growth
```

```
##
##  Welch Two Sample t-test
##
## data:  x$len and x$dose
## t = 17.81, df = 59.8, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  15.66 19.63
## sample estimates:
## mean of x mean of y
##    18.813     1.167
```

4. State your conclusions and the assumptions needed for your conclusions.

With Hypothesis 1 - The Paired Test: the 95% confidence interval contains the sample mean of the differences between -1.96 to 1.96, the hypothesis cannot be rejected. Therefore, there is insufficient evidence to conclude that supplement OJ will works any better than supplement VC.**

With Hypothesis 2 - The Welch 2 Sample T-Test: the 95% confidence interval contains the sample mean of the differences between -1.96 to 1.96, the hypothesis cannot be rejected. Therefore, there is sufficient evidence to conclude that increased dosages will effect tooth Growth. **

Due to the values obtained it can be assumed that there is a difference in the growth of the tooth while the doses are larger. By looking at the boxplot and the assumptions from the hypothesis, the delivery methods are independent of the dose size.