Statistical Inference Course Project, part 2

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1 Overview

This report examines the `ToothGrowth` data in R datasets. Data will be plotted and printed and an intuitive analysis will be given at the begining. The intuituon will be tested through various confident interval tests. However, it is not obvious weather either of supplements triumphs at each dosage.

2 Data Presentation

Data is loaded in `ToothGrowth` data frame. The plot is shown in Figure 1 for supplements VC and OJ. Both supplements show a positive effect on the lenth of the teeth.

```
library(datasets);library(ggplot2)
data("ToothGrowth")
summary(ToothGrowth)

##       len        supp         dose
##  Min.   : 4.20   OJ:30   Min.   :0.500
##  1st Qu.:13.07   VC:30   1st Qu.:0.500
##  Median :19.25           Median :1.000
##  Mean   :18.81           Mean   :1.167
##  3rd Qu.:25.27           3rd Qu.:2.000
##  Max.   :33.90           Max.   :2.000

g <- ggplot(ToothGrowth, aes(x = dose, y = len))
g <- g +  geom_point(size =5, pch = 21, fill = "salmon", alpha = .5)
g <- g + stat_summary(aes(group = 1), geom = "line", fun.y = mean, size = 1, col = "black")
g <- g + facet_grid(. ~ supp)
g
```

3 Confidence Inteval Analysis

The following R code first subset the data into 5 different cathegories based on supplement and dosage levels to be analyzed.

```
ToothGrowth05 <- subset(ToothGrowth, dose==0.5)
ToothGrowth1 <- subset(ToothGrowth, dose==1)
ToothGrowth2 <- subset(ToothGrowth, dose==2)
ToothGrowthVC <- subset(ToothGrowth, supp=="VC")
ToothGrowthOJ <- subset(ToothGrowth, supp=="OJ")
```

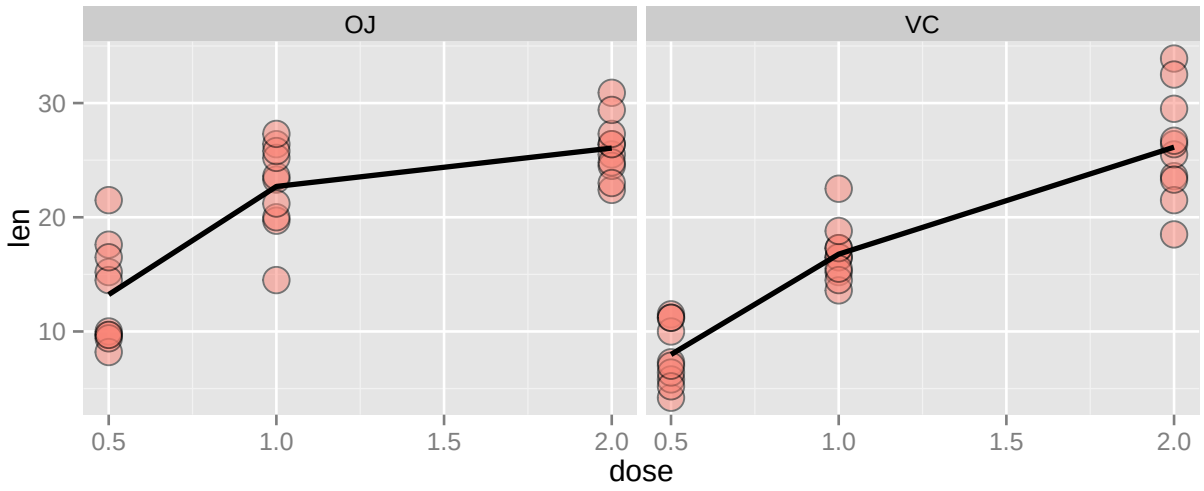

Figure 1: Tooth length variation with different dosages of suppliments.

A series of confident interval tests is performed below. if the interval contains zero, no clear conclusion can be made on the effectiveness of the supplement/dosage, an all positive or negative result shows improvement with the application of the parameter under study.

```
## confidenc interval on use of OJ vs VC at dose 0.5
t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = ToothGrowth05)$conf

## [1] 1.719057 8.780943
## attr(,"conf.level")
## [1] 0.95
```

The first test shows advantages of OJ over VC at 0.5 dosage.

```
## confidenc interval on use of OJ vs VC at dose 1
t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = ToothGrowth1)$conf

## [1] 2.802148 9.057852
## attr(,"conf.level")
## [1] 0.95
```

This test shows advantages of OJ over VC at 1 dosage.

```
## confidenc interval on use of OJ vs VC at dose 2
t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = ToothGrowth2)$conf

## [1] -3.79807  3.63807
## attr(,"conf.level")
## [1] 0.95
```

On contrary, no clear conclusion can be made at 2 dose.

Next I compare the effect of dosage for OJ and VC separately. Here I only compared dosage 2 vs dosage 0.5.

```r
## confidenc interval on dosage usage of OJ
t.test(len ~ dose, paired = FALSE, var.equal = FALSE,
       data = subset(ToothGrowthOJ,dose %in% c(0.5,2)))$conf

## [1] -16.335241  -9.324759
## attr(,"conf.level")
## [1] 0.95
```

The all negative interval shows less effct from the first parameter(0.5) which means dosage 2 is more effective for OJ as was expected from the figure.

```r
## confidenc interval on dosage usage of VC
t.test(len ~ dose, paired = FALSE, var.equal = FALSE,
       data = subset(ToothGrowthVC,dose %in% c(0.5,2)))$conf

## [1] -21.90151 -14.41849
## attr(,"conf.level")
## [1] 0.95
```

Again, the all negative interval shows less effct from the first parameter(0.5) which means dosage 2 is more effective for VC as was expected from the figure.