Statistical Inference

Project 1

Part2

In this second part of the project we are going to investigate some of properties of the ToothGrowth data set. The data comes from a study on 10 guinea pigs which recorded the response in growth of teeth, in each of 10 guinea pigs, for each of three dose levels of Vitamin C (0.5,1 and 2 mg), by two different delivery methods, orange juice(OJ) and ascorbic acid (VC).

```
data(ToothGrowth)
tg <- ToothGrowth
```

Some initial exploratory analysis

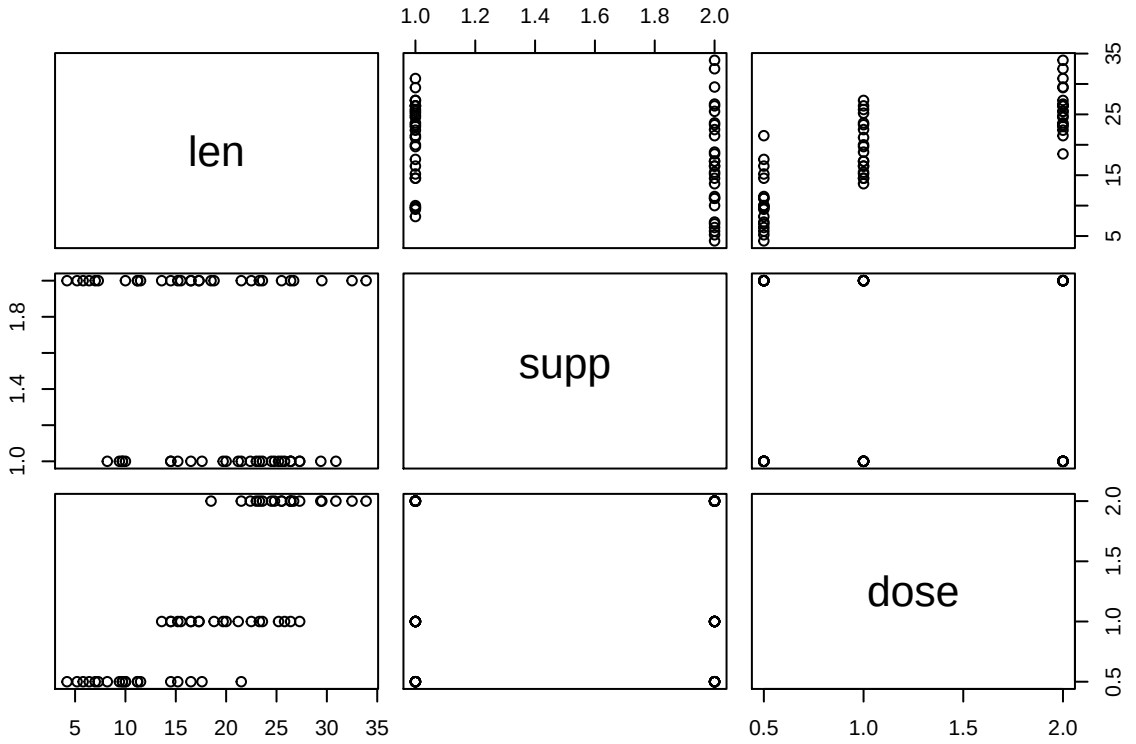
```
summary(tg)
```

```
##       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
```

```
str(tg)
```

```
## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

```
plot(tg)
```




```
dose0.5 <- tg[tg$dose==0.5,]
dose1 <- tg[tg$dose==1,]
dose2 <- tg[tg$dose==2,]
suppvc <- tg[tg$supp=='VC',]
suppoj <- tg[tg$supp=='OJ',]
```

Assumptions

Because this is a study with small sample sizes and I don't know if the measurements are paired the Welch T test will be used for the analysis.

This is a test for the hypothesis that the mean growth caused by the dosage of 0.5mg is the same as for a dosage of 1mg

```
t.test(dose0.5$len,dose1$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  dose0.5$len and dose1$len
## t = -6.4766, df = 37.986, p-value = 1.268e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.983781  -6.276219
```

```
## sample estimates:
## mean of x mean of y
##    10.605    19.735
```

The conclusion is no, since the 0 is not included in the confidence interval. Hence we can say that a dosage of 0.5mg causes smaller mean growth then the dosage of 1mg. This we can say with a 95% probability of being true.

This is a test for the hypothesis that, the mean growth of a dosage of 1mg, is equal to the growth caused by a dosage of 2mg

```
t.test(dose1$len,dose2$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  dose1$len and dose2$len
## t = -4.9005, df = 37.101, p-value = 1.906e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.996481 -3.733519
## sample estimates:
## mean of x mean of y
##    19.735    26.100
```

The conclusion is no, since the 0 is not included in the confidence interval. Hence we can say that dosage of 1mg causes smaller mean growth then the dosage of 2mg. This we can say with a 95% probability of being true.

And finaly a test for the hypothesis that, the mean growth caused by using ascorbic acid = (VC), is equal to the mean growth of using orange juice = (OJ).

```
t.test(suppvc$len,suppoj$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  suppvc$len and suppoj$len
## 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:
##  -7.5710156  0.1710156
## sample estimates:
## mean of x mean of y
##  16.96333  20.66333
```

Since the 0 is inside the interval. We can say that using ascorbic acid causes the same growth as using orange juice. With a probability of 95% of being true.