Basic Inferential Data Analysis

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Data description

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, orange juice or ascorbic acid (a form of vitamin C and coded as VC).

```
str(ToothGrowth)
```

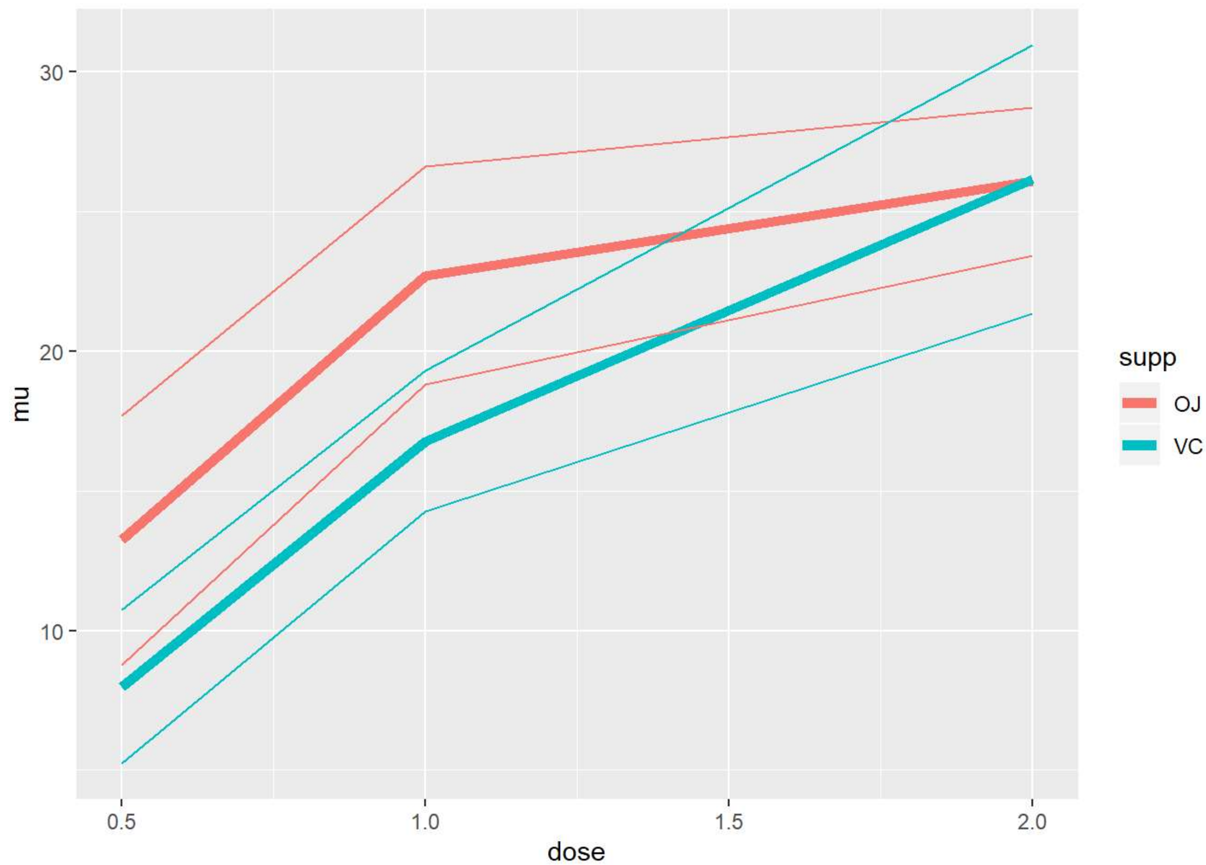
```
## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

```
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
```

It looks like there are two dimensions (supplement and dosage) and one meassurement (length). Let’s take a look at the groups combinations:

```
## # A tibble: 6 x 5
## # Groups:   supp [2]
##   supp   dose subj_count    mu    sd
##   <fct> <dbl>      <int> <dbl> <dbl>
## 1 OJ      0.5         10 13.2   4.46
## 2 OJ      1           10 22.7   3.91
## 3 OJ      2           10 26.1   2.66
## 4 VC      0.5         10  7.98  2.75
## 5 VC      1           10 16.8   2.52
## 6 VC      2           10 26.1   4.80
```



Null Hypotesis - The supplement is more irrelevant the bigger dosage is.

```
OJ05 <- filter(ToothGrowth, supp == "OJ" & dose == 0.5)
OJ10 <- filter(ToothGrowth, supp == "OJ" & dose == 1.0)
OJ20 <- filter(ToothGrowth, supp == "OJ" & dose == 2.0)
VC05 <- filter(ToothGrowth, supp == "VC" & dose == 0.5)
VC10 <- filter(ToothGrowth, supp == "VC" & dose == 1.0)
VC20 <- filter(ToothGrowth, supp == "VC" & dose == 2.0)
```

Dose 0.5

```
t.test(OJ05$len, VC05$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  OJ05$len and VC05$len
## t = 3.1697, df = 14.969, p-value = 0.006359
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.719057 8.780943
## sample estimates:
## mean of x mean of y
##     13.23      7.98
```

Dose 1.0

```
t.test(OJ10$len, VC10$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  OJ10$len and VC10$len
## t = 4.0328, df = 15.358, p-value = 0.001038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  2.802148 9.057852
## sample estimates:
## mean of x mean of y
##     22.70     16.77
```

Dose 2.0

```
t.test(OJ20$len, VC20$len)
```

```
##
##  Welch Two Sample t-test
##
## data:  OJ20$len and VC20$len
## t = -0.046136, df = 14.04, p-value = 0.9639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.79807  3.63807
## sample estimates:
## mean of x mean of y
##     26.06     26.14
```

Conclustion

As we can see Dose 0.5 and Dose 1.0 have significant difference in teeth growth with p_values 0.0064 and 0.001 respectively. But picture totally changes for Dose 2.0 where it’s doesn’t matter what supplements we are using the progress is pretty similar with p-value 0.934. The supplement used for the teeth grows is less relevant the bigger dosage. OJ gives more precise result with less variance then VC.