ToothGrowth Analysis

HPSUN

2017 年 12 月 3 日

Overview

This dataset is "The Effect of Vitamin C on Tooth Growth in Guinea Pigs" It has three variable [,1] len numeric Tooth length [,2] supp factor Supplement type (VC or OJ). [,3] dose numeric Dose in milligrams/day details can be found here: https://stat.ethz.ch/R-manual/R-devel/library/datasets/html/ToothGrowth.html

Data Summary

```
library(ggplot2)
g <- ggplot(ToothGrowth,aes(dose,len))
g + geom_jitter(aes(color=supp)) + labs(title="Summary of ToothGrowth data")
```
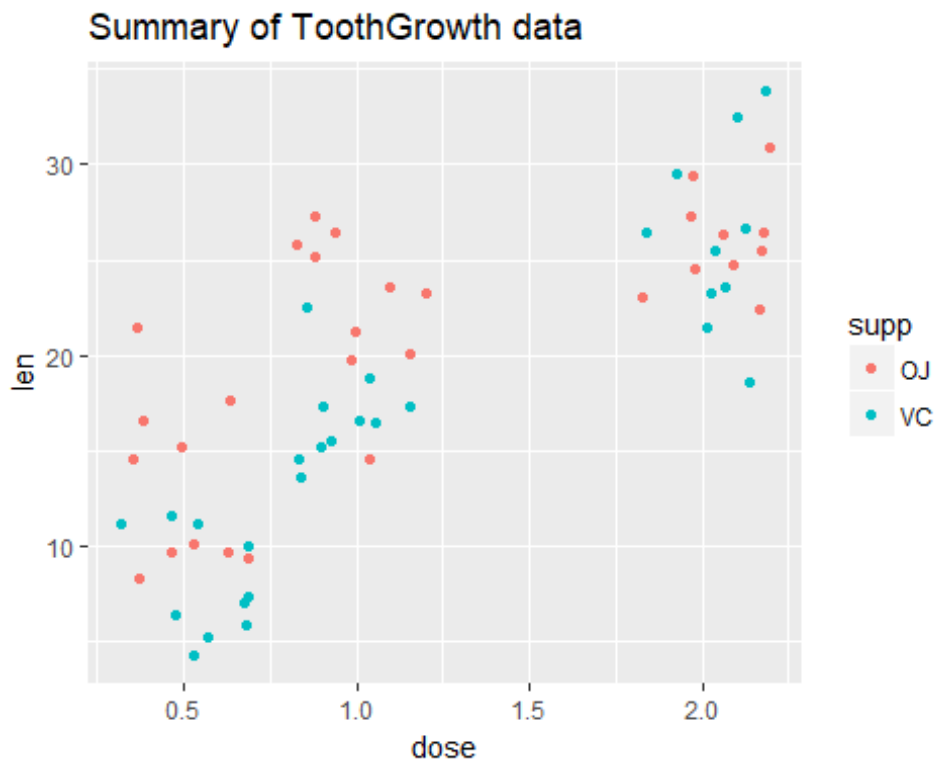
Growth Effect Comparision

Same dose, different supplyment

0.5mg

```r
OJ <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==0.
5)]
VC <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==0.
5)]
h <- t.test(x=OJ,y=VC,alternative = "two.sided")
c(mean(OJ),mean(VC))
```

```
## [1] 13.23  7.98
```

```r
paste("confidence interval:",round(h$conf.int[1],3),"-",round(h$conf.in
t[2],3))
```

```
## [1] "confidence interval: 1.719 - 8.781"
```

```r
paste("Pvalue:",round(h$p.value,5))
```

```
## [1] "Pvalue: 0.00636"
```

1.0 mg

```r
OJ <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==1)]
VC <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==1)]
h <- t.test(x=OJ,y=VC,alternative = "two.sided")
c(mean(OJ),mean(VC))
```

```
## [1] 22.70 16.77
```

```r
paste("confidence interval:",round(h$conf.int[1],3),"-",round(h$conf.in
t[2],3))
```

```
## [1] "confidence interval: 2.802 - 9.058"
```

```r
paste("Pvalue:",round(h$p.value,5))
```

```
## [1] "Pvalue: 0.00104"
```

2.0 mg

```r
OJ <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==2)]
VC <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==2)]
h <- t.test(x=OJ,y=VC,alternative = "two.sided")
c(mean(OJ),mean(VC))
```

```
## [1] 26.06 26.14
```

```r
paste("confidence interval:",round(h$conf.int[1],3),"-",round(h$conf.in
t[2],3))
```

```
## [1] "confidence interval: -3.798 - 3.638"
```

```r
paste("Pvalue:",round(h$p.value,5))
```

```
## [1] "Pvalue: 0.96385"
```

Same supplyment,different dose

OJ
```r
OJ.5 <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==
0.5)]
OJ1 <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==
1)]
OJ2 <- ToothGrowth$len[which(ToothGrowth$supp=="OJ"&ToothGrowth$dose==
2)]
c(mean(OJ.5),mean(OJ1),mean(OJ2))
```

```
## [1] 13.23 22.70 26.06
```

```r
h <- t.test(x=OJ.5,y=OJ1,alternative = "less")
paste("Pvalue of length under dose 0.5 less than dose 1.0 mg is:",round
(h$p.value,5))
```

```
## [1] "Pvalue of length under dose 0.5 less than dose 1.0 mg is: 4e-05
"
```

```r
h <- t.test(x=OJ.5,y=OJ2,alternative = "less")
paste("Pvalue of length under dose 0.5 less than dose 2.0 mg is:",round
(h$p.value,5))
```

```
## [1] "Pvalue of length under dose 0.5 less than dose 2.0 mg is: 0"
```

```r
h <- t.test(x=OJ1,y=OJ2,alternative = "less")
paste("Pvalue of length under dose 1.0 less than dose 2.0 mg is:",round
(h$p.value,5))
```

```
## [1] "Pvalue of length under dose 1.0 less than dose 2.0 mg is: 0.019
6"
```

VC
```r
VC.5 <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==
0.5)]
VC1 <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==
1)]
VC2 <- ToothGrowth$len[which(ToothGrowth$supp=="VC"&ToothGrowth$dose==
2)]
c(mean(VC.5),mean(VC1),mean(VC2))
```

```
## [1]  7.98 16.77 26.14
```

```r
h <- t.test(x=VC.5,y=VC1,alternative = "less")
paste("Pvalue of length under dose 0.5 less than dose 1.0 mg is:",round
(h$p.value,5))
```

```
## [1] "Pvalue of length under dose 0.5 less than dose 1.0 mg is: 0"

h <- t.test(x=VC.5,y=VC2,alternative = "less")
paste("Pvalue of length under dose 0.5 less than dose 2.0 mg is:",round
(h$p.value,5))

## [1] "Pvalue of length under dose 0.5 less than dose 2.0 mg is: 0"

h <- t.test(x=VC1,y=VC2,alternative = "less")
paste("Pvalue of length under dose 1.0 less than dose 2.0 mg is:",round
(h$p.value,5))

## [1] "Pvalue of length under dose 1.0 less than dose 2.0 mg is: 5e-05
"
```

Conclusions

From results above, we can tell that length of tooth is significantly related with the dose of supplyments (both OJ and VC). The higher dose of supplyments, the longer tooth length. And the effect of supplyments are different. At low dose (0.5 and 1.0 mg),the OJ supply has a better effect of tooth length at 95% confidence, but this differnce no longer significant at 2.0 mg dose.