Statistical Inference Course Project2

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Part 2: Basic Inferential Data Analysis.

1.Load the ToothGrowth data and perform some basic exploratory data analyses 2.Provide a basic summary of the data. 3.Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use the techniques from class, even if there's other approaches worth considering) 4.State your conclusions and the assumptions needed for your conclusions. 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).

```
library(datasets)
require(ggplot2)
data(ToothGrowth)
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 ...
```

The basic summary of the data:

```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
table(ToothGrowth$supp, ToothGrowth$dose)
```

```
##
##      0.5  1  2
##   OJ  10 10 10
##   VC  10 10 10
```

```
summary(ToothGrowth)
```

```
##       len        supp     dose
##  Min.   : 4.20   OJ:30   0.5:20
##  1st Qu.:13.07   VC:30   1  :20
##  Median :19.25           2  :20
##  Mean   :18.81
##  3rd Qu.:25.27
##  Max.   :33.90
```

```
mean(ToothGrowth$len)
```

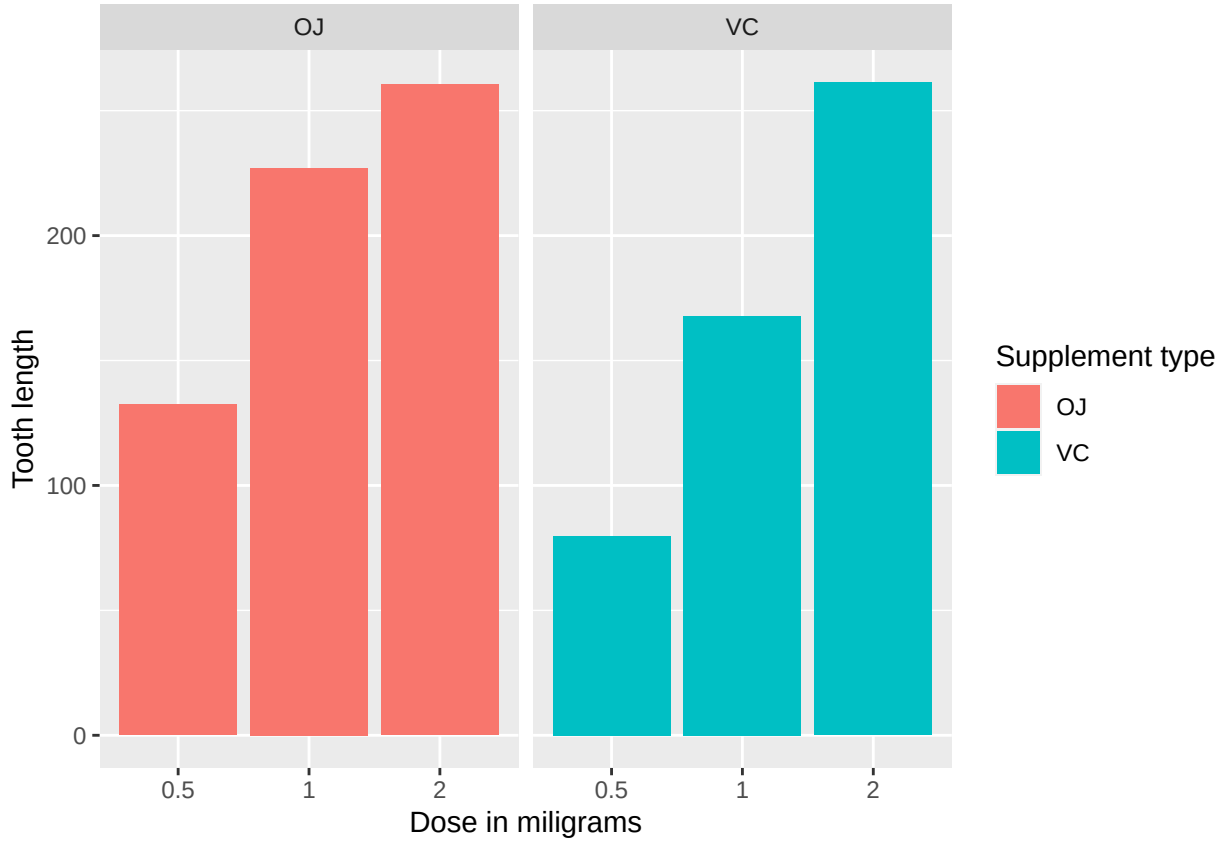
```
## [1] 18.81333
```

```
sd(ToothGrowth$len)
```

```
## [1] 7.649315
```

We compare the growth of teeth by supp and dose using graphs

```
ggplot(data=ToothGrowth, aes(x=as.factor(dose), y=len, fill=supp)) +
  geom_bar(stat="identity") +  facet_grid(. ~ supp) +
  xlab("Dose in miligrams") +  ylab("Tooth length") +
  guides(fill=guide_legend(title="Supplement type"))
```



The graph shows that orange juice and vitamin C affect tooth growth, with orange juice having a stronger effect at a dose of 0.5 and 1. A higher dose of both types of food affects the same.

```
supp.t1 <- t.test(len~supp, paired=F, var.equal=F, data=ToothGrowth)
supp.t1
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  len by supp
## t = 1.9153, df = 55.309, p-value = 0.06063
## alternative hypothesis: true difference in means between group OJ and group VC is not equal to 0
## 95 percent confidence interval:
##  -0.1710156  7.5710156
## sample estimates:
## mean in group OJ mean in group VC
##         20.66333         16.96333
```

```
supp.t2 <- t.test(len~supp, paired=F, var.equal=T, data=ToothGrowth)
supp.t2
```

```
##
##  Two Sample t-test
##
## data:  len by supp
## t = 1.9153, df = 58, p-value = 0.06039
## alternative hypothesis: true difference in means between group OJ and group VC is not equal to 0
## 95 percent confidence interval:
##  -0.1670064  7.5670064
## sample estimates:
## mean in group OJ mean in group VC
##         20.66333         16.96333
```

Conclusion: the obtained data allow us to make an assumption that vitamin C, when taken as food by guinea pigs, affects the growth of teeth, while the form of intake (orange juice or ascorbic acid) has insignificant differences. The main factor is the dose of the vitamin.