Statistical Inference - Part 2: Basic inferential data analysis - tooth growth

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Synopsis

Analyze ToothGrowth data in R datasets package.

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

Simulation Section

1. Load ToothGrowth data and perform some basic exploratory data analyses

```
#install.packages("datasets ")
library(datasets)
```

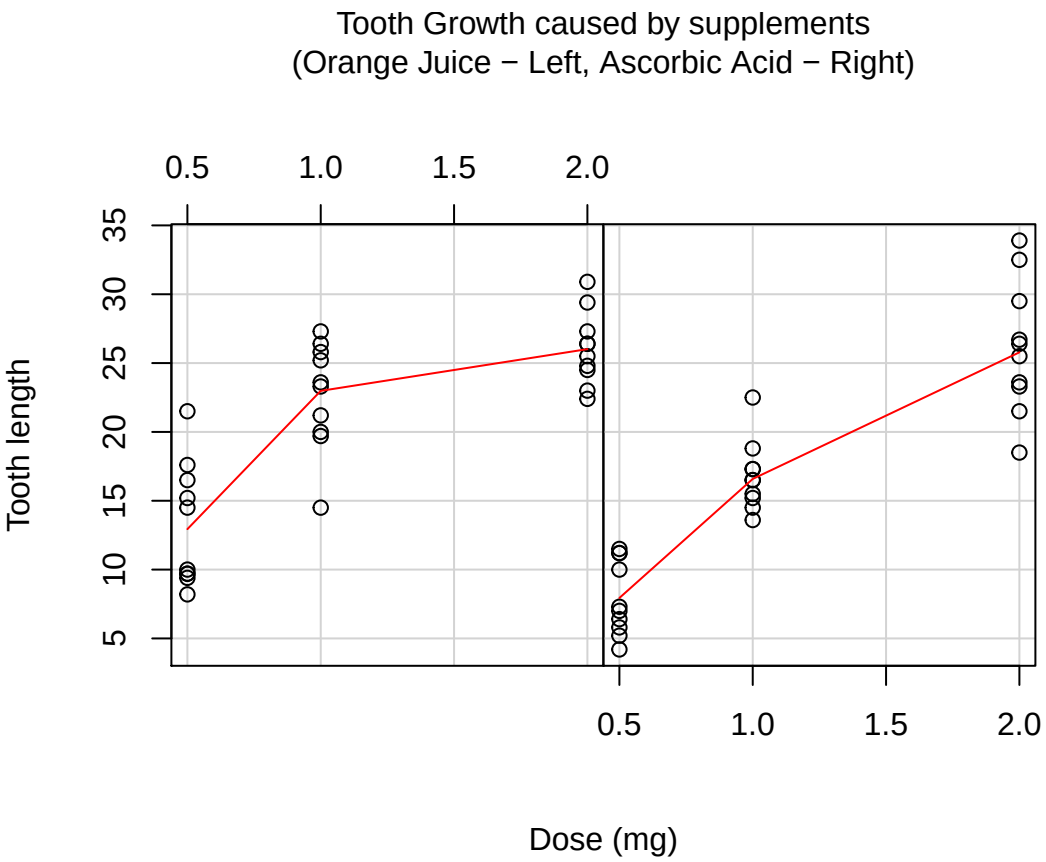
2. Provide a basic summary of data.

Effect of Vitamin C on Tooth Growth in Guinea Pigs.

Description

Response is length of odontoblasts (teeth) in each of 10 guinea pigs at each of three dose levels of Vitamin C (0.5, 1, and 2 mg) with each of two delivery methods (orange juice or ascorbic acid).

```
library(graphics)
coplot(len ~ dose | supp, ToothGrowth, panel = panel.smooth, show.given = FALSE,
ylab = "Tooth length", xlab = c("Dose (mg)", "Tooth Growth caused by supplements
(Orange Juice - Left, Ascorbic Acid - Right)"))
```



3. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use techniques from class, even if there's other approaches worth considering)

Running T-test at 0.5 mg:

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose == .5, ])
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## 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 in group OJ mean in group VC
##            13.23             7.98
```

Running T-test at 1 mg:

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose == 1, ])
```

```
##
```

```
##  Welch Two Sample t-test
##
## data:  len by supp
## 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 in group OJ mean in group VC
##            22.70            16.77
```

Running T-test at 2 mg:

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose == 2, ])
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## 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 in group OJ mean in group VC
##            26.06            26.14
```

4. State your conclusions and assumptions needed for your conclusions

Assumptions:

- Data is paired
- Guinea pigs are repesentative for population of guinea pigs
- Dosage and supplement are randomly assigned
- Normal distribution for mean

It was observed from analysis that increased vitamin C dosages (regardless whether orange juice or ascorbic acid) leads to tooth growth in guinea pigs.

Based on T-test analysis performed, we conclude that:

- Orange juice is more effective than ascorbic acid for tooth growth for dosages of either 0.5 mg or 1 mg
- No significant proof derived for dosage at 2 mg to conclude whether orange juice or ascorbic acid has greater effects on teeth growth.