Testing doses and supplements in R tooth growth data

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Synopsis

Load some libraries

```r
library(dplyr)
library(ggplot2)
```

Exploratory Data Analysis

Let's first load the data and get some basic information from the data set. We also transform the dose variable to a factor, which will be easier to use later on.

```r
df <- ToothGrowth
df <- df %>%
    mutate(dose = as.factor(dose)) %>%
    rename(delivery = supp)
str(df)
```

```
## '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 ...
##  $ delivery: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose    : Factor w/ 3 levels "0.5","1","2": 1 1 1 1 1 1 1 1 1 1 ...
```

We are looking at 60 observations of tooth length where there are 2 delivery methods (orange juice (OJ) and ascorbic acid (VC)) and 3 dose levels (`r levels(df$dose)`).

Visualisation of the effect of the dose amount on tooth growth

As shown in this figure, there might be an effect of the dose amount on the tooth growth. We will explore this in more detail later.

```r
ggplot(data=df, aes(x=dose,y=len)) +
    geom_boxplot(aes(fill=dose)) +
    labs(x = "dose",
        y="Tooth length",
        title="Boxplot of tooth length versus dose");
```

Boxplot of tooth length versus dose

Visualisation of the effect of the delivery method on tooth growth

As shown in this figure, there does not seem to be much of an effect of the delivery method on tooth growth. We will explore this in more detail later.
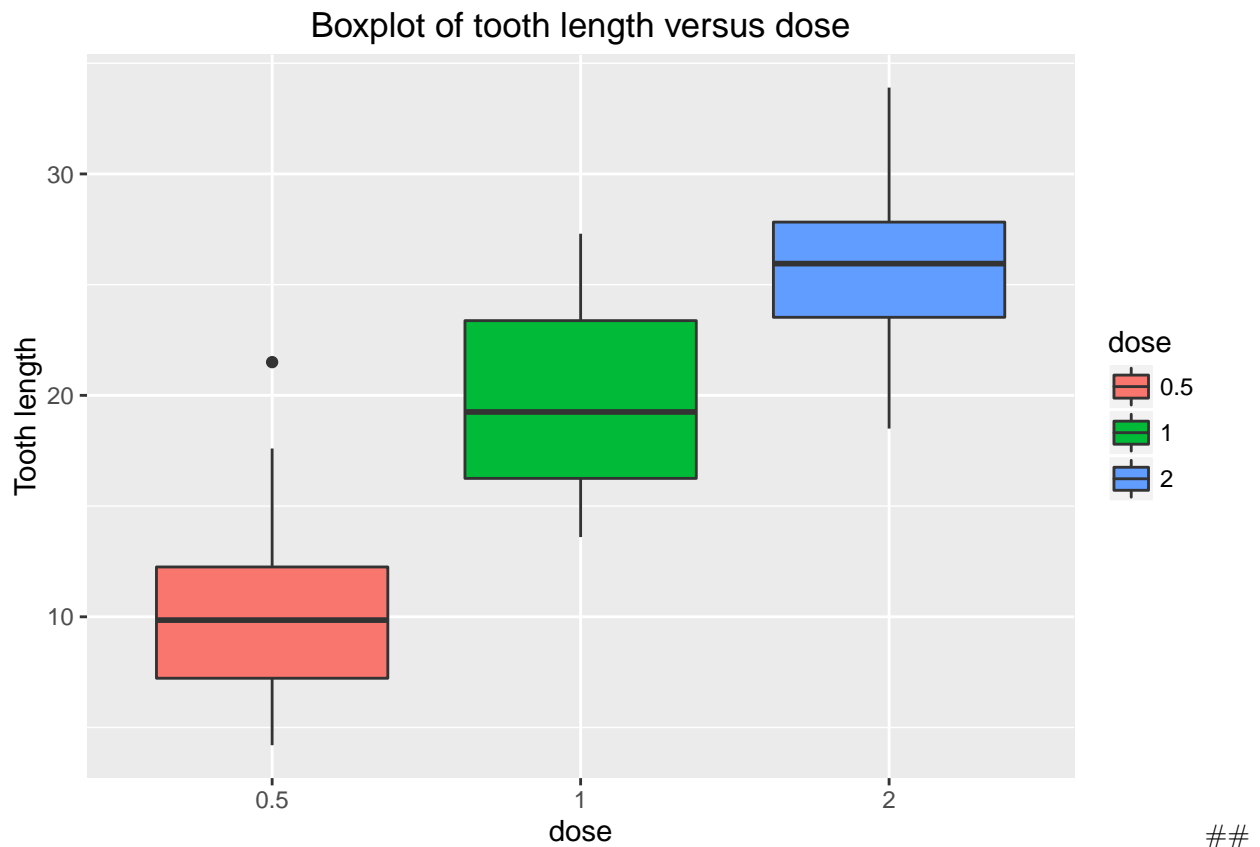
```
ggplot(data=df, aes(x=delivery,y=len)) +
    geom_boxplot(aes(fill=delivery)) +
    labs(x = "delivery",
        y="Tooth length",
        title="Boxplot of tooth length versus delivery method");
```

Boxplot of tooth length versus delivery method
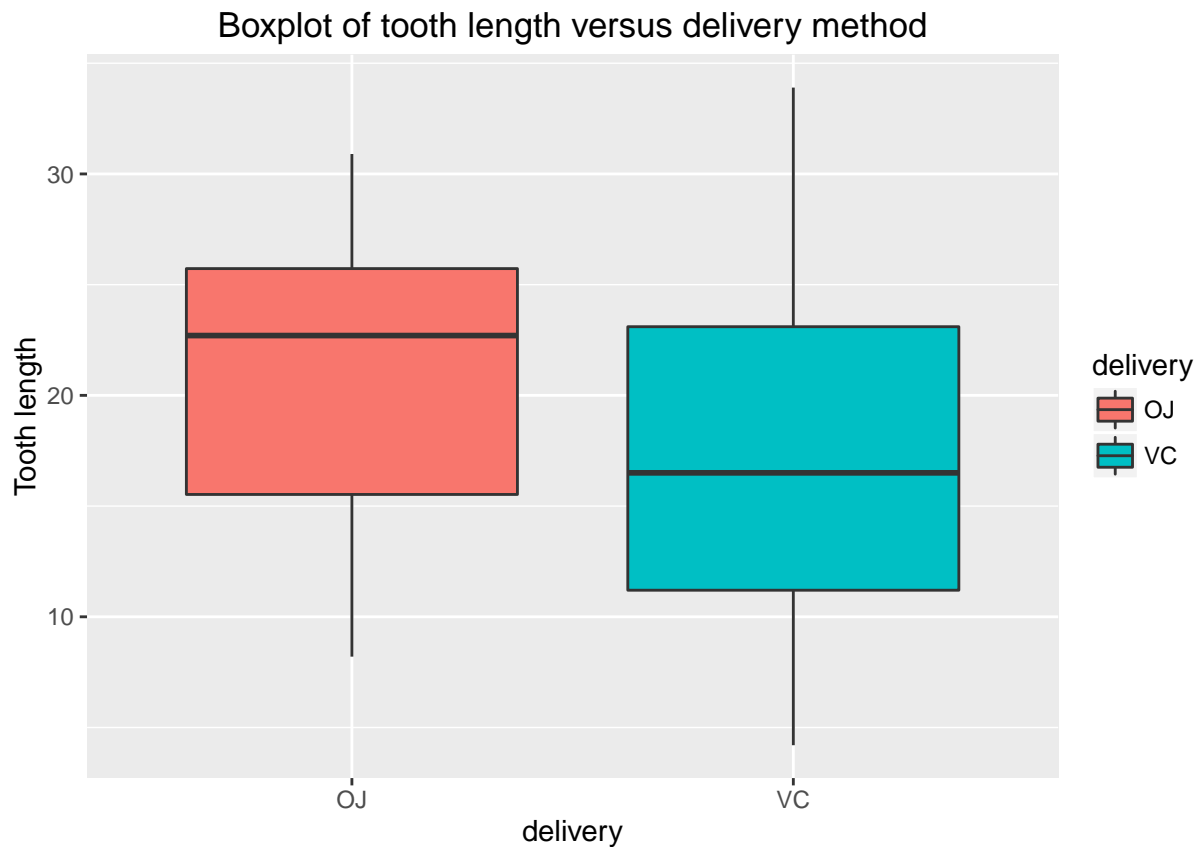
Questions and Key Assumptions

Our analysis will seek to answer two questions:

1. Does the dose amount change the tooth growth?
2. Does the delivery method change the tooth growth?

For our analysis to hold, we make the following key assumptions about the data:

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Hypothesis Tests

Conclusions

Appendix