Diabetes

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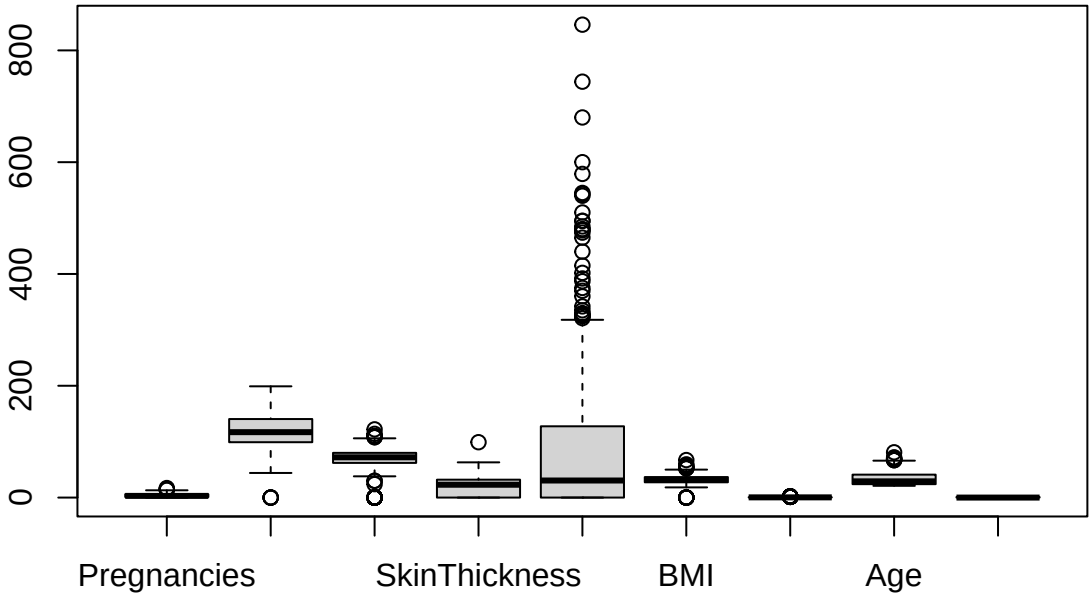
DIABETES DATASET

Data from pregnant women.

```
diabetes= read.csv("../datasets/diabetes.csv")
View(diabetes)
boxplot(diabetes)
```



Data exploration

```
str(diabetes) # we can see all the variables are int or numeric. The outcome does not make sense to be
```

```
## 'data.frame':    768 obs. of  9 variables:
##  $ Pregnancies             : int  6 1 8 1 0 5 3 10 2 8 ...
##  $ Glucose                 : int  148 85 183 89 137 116 78 115 197 125 ...
##  $ BloodPressure           : int  72 66 64 66 40 74 50 0 70 96 ...
##  $ SkinThickness           : int  35 29 0 23 35 0 32 0 45 0 ...
##  $ Insulin                 : int  0 0 0 94 168 0 88 0 543 0 ...
##  $ BMI                     : num  33.6 26.6 23.3 28.1 43.1 25.6 31 35.3 30.5 0 ...
##  $ DiabetesPedigreeFunction: num  0.627 0.351 0.672 0.167 2.288 ...
##  $ Age                     : int  50 31 32 21 33 30 26 29 53 54 ...
##  $ Outcome                 : int  1 0 1 0 1 0 1 0 1 1 ...
```

```
diabetes$Outcome= as.factor(diabetes$Outcome)

summary(diabetes) # Now summary for outcome makes sense where we can see the number of events and not t
```

```
##   Pregnancies        Glucose      BloodPressure    SkinThickness
##  Min.   : 0.000   Min.   :  0.0   Min.   :  0.00   Min.   : 0.00
##  1st Qu.: 1.000   1st Qu.: 99.0   1st Qu.: 62.00   1st Qu.: 0.00
##  Median : 3.000   Median :117.0   Median : 72.00   Median :23.00
##  Mean   : 3.845   Mean   :120.9   Mean   : 69.11   Mean   :20.54
##  3rd Qu.: 6.000   3rd Qu.:140.2   3rd Qu.: 80.00   3rd Qu.:32.00
##  Max.   :17.000   Max.   :199.0   Max.   :122.00   Max.   :99.00
##     Insulin           BMI        DiabetesPedigreeFunction      Age
##  Min.   :  0.0   Min.   : 0.00   Min.   :0.0780           Min.   :21.00
##  1st Qu.:  0.0   1st Qu.:27.30   1st Qu.:0.2437           1st Qu.:24.00
##  Median : 30.5   Median :32.00   Median :0.3725           Median :29.00
##  Mean   : 79.8   Mean   :31.99   Mean   :0.4719           Mean   :33.24
##  3rd Qu.:127.2   3rd Qu.:36.60   3rd Qu.:0.6262           3rd Qu.:41.00
##  Max.   :846.0   Max.   :67.10   Max.   :2.4200           Max.   :81.00
##  Outcome
##  0:500
##  1:268
##
##
##
##
```

```
table(is.na(diabetes))
```

```
##
## FALSE
##  6912
```

```
table(is.null(diabetes))
```

```
##
## FALSE
##     1
```

We can see max.age is 81. That is probably a mistake.Consider.

Also variables as Insulin, Blood pressure, Glucose have several 0 values. That does not make sense.

Questions

```
# What is the average number of pregnancies for the diabetic women? And for the non diabetic?

mean(diabetes$Pregnancies[diabetes$Outcome == 1])
```

```
## [1] 4.865672
```

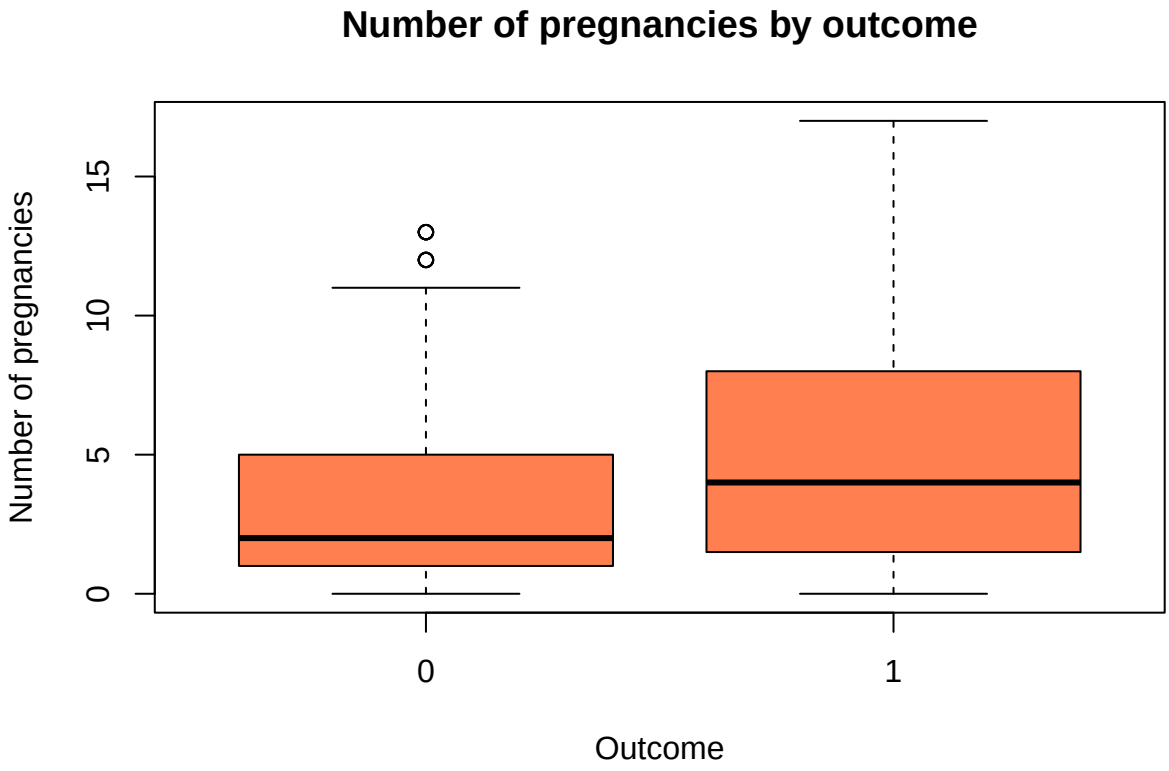
```
mean(diabetes$Pregnancies[diabetes$Outcome == 0])
```

```
## [1] 3.298
```

Looks like the more pregnancies you have, the more chances to have diabetes.Is that significant?

```
# Is the number of pregnancies on every diabetes outcome significantly different?
```

```
boxplot(diabetes$Pregnancies~ diabetes$Outcome, main="Number of pregnancies by outcome", font.main =2,
```




```
diabetes$Outcome= factor(diabetes$Outcome, levels = c(0,1),
labels = c("Diabetic", "No Diabetic"))
str(diabetes)
```

```
## 'data.frame':    768 obs. of  9 variables:
##  $ Pregnancies             : int  6 1 8 1 0 5 3 10 2 8 ...
##  $ Glucose                 : int  148 85 183 89 137 116 78 115 197 125 ...
##  $ BloodPressure           : int  72 66 64 66 40 74 50 0 70 96 ...
##  $ SkinThickness           : int  35 29 0 23 35 0 32 0 45 0 ...
##  $ Insulin                 : int  0 0 0 94 168 0 88 0 543 0 ...
##  $ BMI                     : num  33.6 26.6 23.3 28.1 43.1 25.6 31 35.3 30.5 0 ...
##  $ DiabetesPedigreeFunction: num  0.627 0.351 0.672 0.167 2.288 ...
##  $ Age                     : int  50 31 32 21 33 30 26 29 53 54 ...
##  $ Outcome                 : Factor w/ 2 levels "Diabetic","No Diabetic": 2 1 2 1 2 1 2 1 2 2 ...
```

```
t.test(diabetes$Pregnancies~ diabetes$Outcome, data = diabetes) # perform t test
```

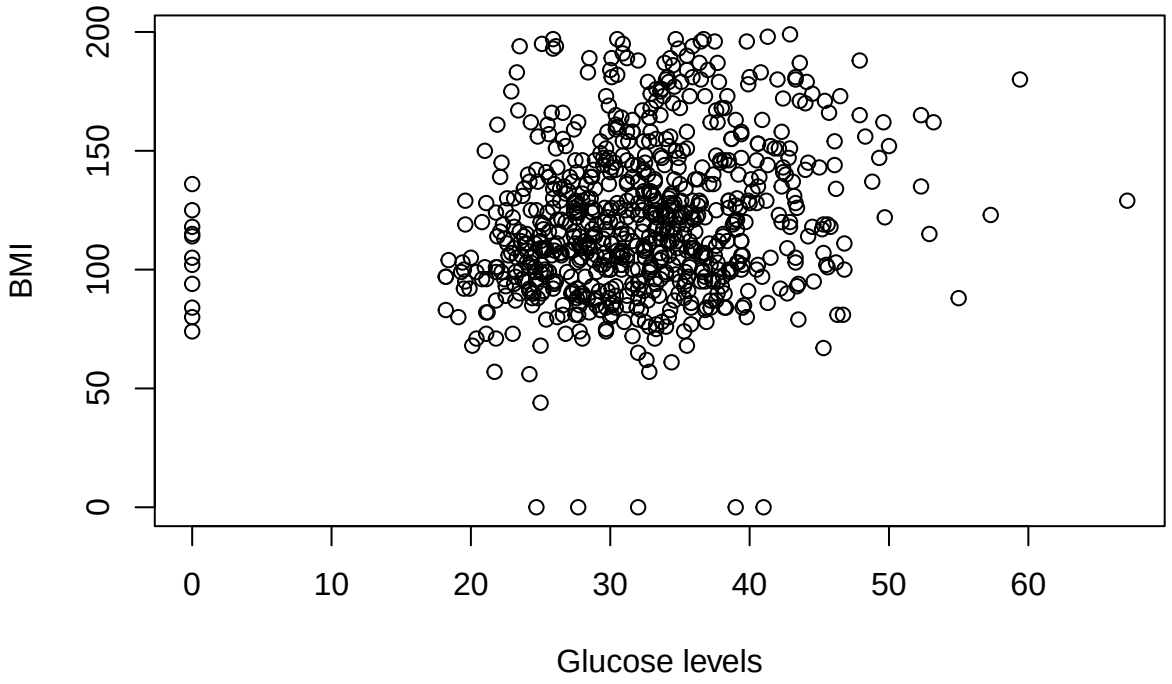
```
##
##  Welch Two Sample t-test
##
## data:  diabetes$Pregnancies by diabetes$Outcome
## t = -5.907, df = 455.96, p-value = 6.822e-09
## alternative hypothesis: true difference in means between group Diabetic and group No Diabetic is not
## 95 percent confidence interval:
##  -2.089219 -1.046125
## sample estimates:
##    mean in group Diabetic mean in group No Diabetic
##                  3.298000                  4.865672
```

```r
t.test(diabetes$Pregnancies~ diabetes$Outcome, data = diabetes)$p.value # get p value
```

```
## [1] 6.821926e-09
```

```r
# ¿Is BMI correlated with glucose levels?

# Correlation plot
plot(diabetes$BMI, diabetes$Glucose,xlab="Glucose levels", ylab="BMI")
```



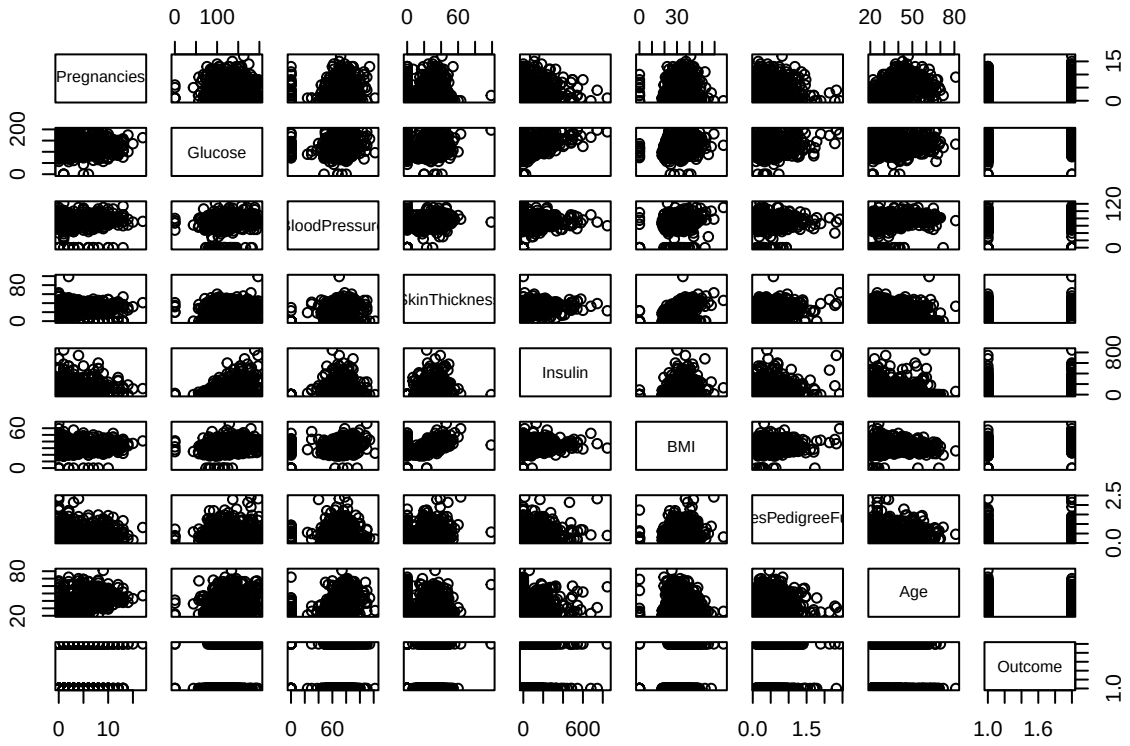

```r
# Correlation test
cor(diabetes$BMI, diabetes$Glucose)
```

```
## [1] 0.2210711
```

```r
cor.test(diabetes$BMI, diabetes$Glucose, method="pearson") # there is significant positive correlation
```

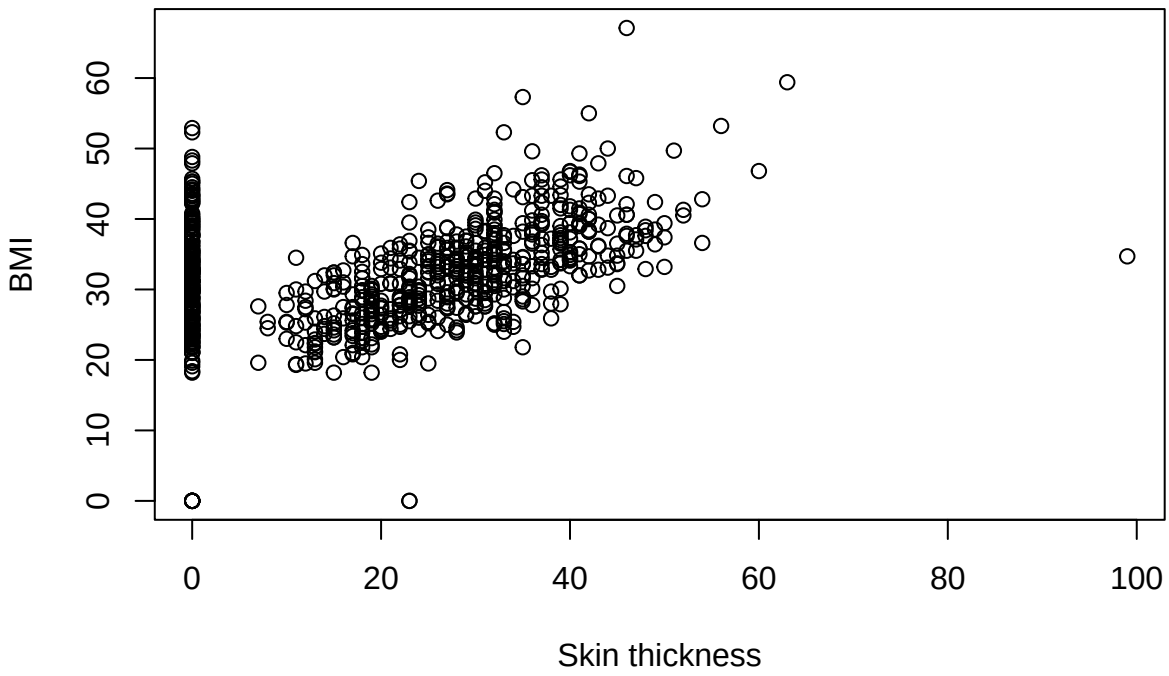
```
##
##  Pearson's product-moment correlation
##
## data:  diabetes$BMI and diabetes$Glucose
## t = 6.2737, df = 766, p-value = 5.891e-10
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1527152 0.2873218
## sample estimates:
##       cor
## 0.2210711
```

```r
# We can perform correlation plots for all the columns as an overview
pairs(diabetes)
```



We can see skin thikness and BMI looks like they correlate too. Let us have a look.

```
plot(diabetes$SkinThickness, diabetes$BMI,xlab="Skin thickness", ylab="BMI") # A few 0 values that can'
```




```
# Convert 0s to NA
diabetes[diabetes==0]= NA

# Subset dataset to skin thikness and BMI
diabetes2= diabetes[,c(4,6)]
diabetes2= diabetes2[complete.cases(diabetes2),]
```

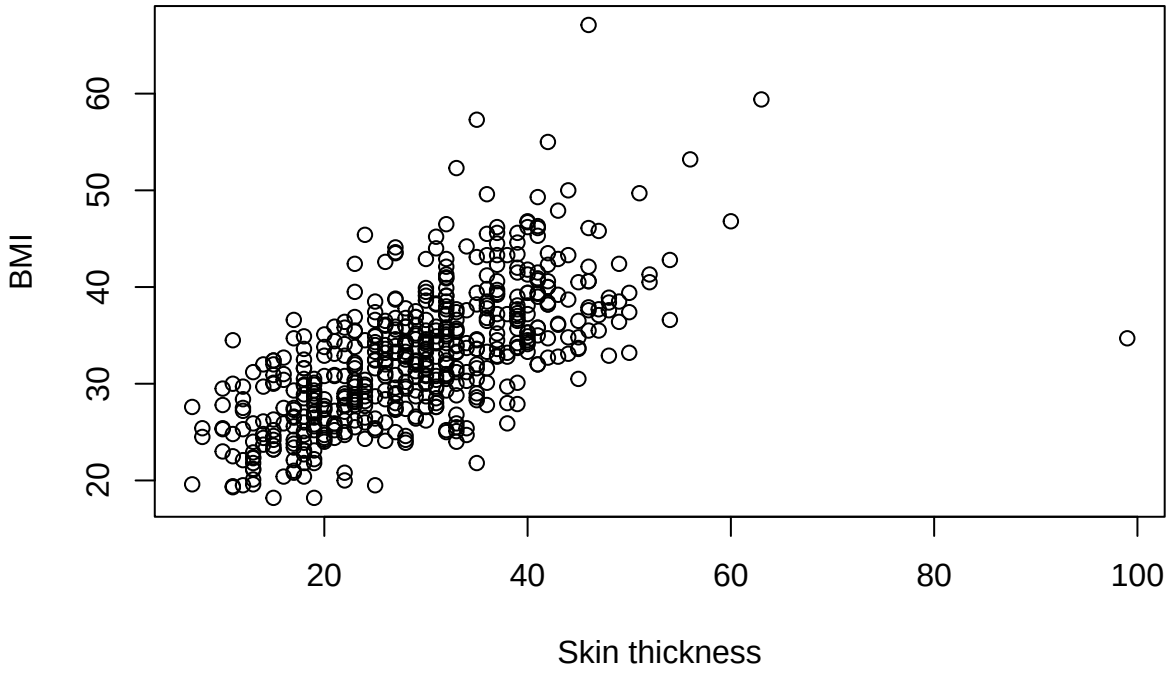
```r
dim(diabetes)
```

```
## [1] 768   9
```

```r
dim(diabetes2) # We go from 768 patients to 539
```

```
## [1] 539   2
```

```r
# Let us plot again
plot(diabetes$SkinThickness, diabetes$BMI,xlab="Skin thickness", ylab="BMI") # A few 0 values that can
```




```r
# Correlation test
cor(diabetes2$SkinThickness, diabetes2$BMI)
```

```
## [1] 0.6482139
```

```r
cor.test(diabetes2$SkinThickness, diabetes2$BMI, method="pearson") # there is significant positive corr
```

```
##
##  Pearson's product-moment correlation
##
## data:  diabetes2$SkinThickness and diabetes2$BMI
## t = 19.727, df = 537, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.5964087 0.6946414
## sample estimates:
##       cor
## 0.6482139
```

```r
# Do woman with just one pregnancy have higher incidence of Diabetes compared to more than one pregnanc

# We can just do:
summary(diabetes$Outcome[diabetes$Pregnancies ==1])
```

```
##    Diabetic No Diabetic        NA's
```

```
##         106          29         111
```

```r
summary(diabetes$Outcome[diabetes$Pregnancies != 1])
```

```
##    Diabetic No Diabetic        NA's
##         321         201         111
```

```r
# Are these ratio significantly different?
# it looks like there are more diabetic cases among women with just one pregnancy.
```