Heart Disease UCI

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2020-Nov-14

Heart Disease UCI Dataset analysis

A. Short summary of data

```
## 'data.frame':    303 obs. of  14 variables:
##  $ age     : int  63 37 41 56 57 57 56 44 52 57 ...
##  $ sex     : int  1 1 0 1 0 1 0 1 1 1 ...
##  $ cp      : int  3 2 1 1 0 0 1 1 2 2 ...
##  $ trestbps: int  145 130 130 120 120 140 140 120 172 150 ...
##  $ chol    : int  233 250 204 236 354 192 294 263 199 168 ...
##  $ fbs     : int  1 0 0 0 0 0 0 0 1 0 ...
##  $ restecg : int  0 1 0 1 1 1 0 1 1 1 ...
##  $ thalach : int  150 187 172 178 163 148 153 173 162 174 ...
##  $ exang   : int  0 0 0 0 1 0 0 0 0 0 ...
##  $ oldpeak : num  2.3 3.5 1.4 0.8 0.6 0.4 1.3 0 0.5 1.6 ...
##  $ slope   : int  0 0 2 2 2 1 1 2 2 2 ...
##  $ ca      : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ thal    : int  1 2 2 2 2 1 2 3 3 2 ...
##  $ target  : int  1 1 1 1 1 1 1 1 1 1 ...
```

```
##       age             sex               cp           trestbps    
##  Min.   :29.00   Min.   :0.0000   Min.   :0.000   Min.   : 94.0  
##  1st Qu.:47.50   1st Qu.:0.0000   1st Qu.:0.000   1st Qu.:120.0  
##  Median :55.00   Median :1.0000   Median :1.000   Median :130.0  
##  Mean   :54.37   Mean   :0.6832   Mean   :0.967   Mean   :131.6  
##  3rd Qu.:61.00   3rd Qu.:1.0000   3rd Qu.:2.000   3rd Qu.:140.0  
##  Max.   :77.00   Max.   :1.0000   Max.   :3.000   Max.   :200.0  
##       chol            fbs            restecg          thalach     
##  Min.   :126.0   Min.   :0.0000   Min.   :0.0000   Min.   : 71.0  
##  1st Qu.:211.0   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:133.5  
##  Median :240.0   Median :0.0000   Median :1.0000   Median :153.0  
##  Mean   :246.3   Mean   :0.1485   Mean   :0.5281   Mean   :149.6  
##  3rd Qu.:274.5   3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:166.0  
##  Max.   :564.0   Max.   :1.0000   Max.   :2.0000   Max.   :202.0  
##      exang           oldpeak         slope             ca        
##  Min.   :0.0000   Min.   :0.00   Min.   :0.000   Min.   :0.0000  
##  1st Qu.:0.0000   1st Qu.:0.00   1st Qu.:1.000   1st Qu.:0.0000  
##  Median :0.0000   Median :0.80   Median :1.000   Median :0.0000  
##  Mean   :0.3267   Mean   :1.04   Mean   :1.399   Mean   :0.7294  
##  3rd Qu.:1.0000   3rd Qu.:1.60   3rd Qu.:2.000   3rd Qu.:1.0000  
##  Max.   :1.0000   Max.   :6.20   Max.   :2.000   Max.   :4.0000
```

```
##       thal           target
##  Min.   :0.000   Min.   :0.0000
##  1st Qu.:2.000   1st Qu.:0.0000
##  Median :2.000   Median :1.0000
##  Mean   :2.314   Mean   :0.5446
##  3rd Qu.:3.000   3rd Qu.:1.0000
##  Max.   :3.000   Max.   :1.0000
```

We have 303 observation with 14 variables:

- age: age
- sex: sex
- cp: chest pain type (4 values)
- trestbps: resting blood pressure
- chol: serum cholesterol in mg/dl
- fbs: fasting blood sugar > 120 mg/dl
- restecg: resting electrocardiograph results (values 0,1,2)
- thalach: maximum heart rate achieved
- exang: exercise induced angina
- oldpeak: ST depression induced by exercise relative to rest
- slope: the slope of the peak exercise ST segment
- ca: number of major vessels (0-3) colored by flourosopy
- thal: 3 = normal; 6 = fixed defect; 7 = reversable defect
- target: Target Groups

B. Find the correleation between all veriables

```
##                 age         sex          cp    trestbps         chol
## age       1.00000000 -0.09844660 -0.06865302  0.27935091  0.213677957
## sex      -0.09844660  1.00000000 -0.04935288 -0.05676882 -0.197912174
## cp       -0.06865302 -0.04935288  1.00000000  0.04760776 -0.076904391
## trestbps  0.27935091 -0.05676882  0.04760776  1.00000000  0.123174207
## chol      0.21367796 -0.19791217 -0.07690439  0.12317421  1.000000000
## fbs       0.12130765  0.04503179  0.09444403  0.17753054  0.013293602
## restecg  -0.11621090 -0.05819627  0.04442059 -0.11410279 -0.151040078
## thalach  -0.39852194 -0.04401991  0.29576212 -0.04669773 -0.009939839
## exang     0.09680083  0.14166381 -0.39428027  0.06761612  0.067022783
## oldpeak   0.21001257  0.09609288 -0.14923016  0.19321647  0.053951920
## slope    -0.16881424 -0.03071057  0.11971659 -0.12147458 -0.004037770
## ca        0.27632624  0.11826141 -0.18105303  0.10138899  0.070510925
## thal      0.06800138  0.21004110 -0.16173557  0.06220989  0.098802993
## target   -0.22543872 -0.28093658  0.43379826 -0.14493113 -0.085239105
##                  fbs     restecg      thalach       exang      oldpeak
## age       0.121307648 -0.11621090 -0.398521938  0.09680083  0.210012567
## sex       0.045031789 -0.05819627 -0.044019908  0.14166381  0.096092877
## cp        0.094444035  0.04442059  0.295762125 -0.39428027 -0.149230158
## trestbps  0.177530542 -0.11410279 -0.046697728  0.06761612  0.193216472
## chol      0.013293602 -0.15104008 -0.009939839  0.06702278  0.053951920
## fbs       1.000000000 -0.08418905 -0.008567107  0.02566515  0.005747223
## restecg  -0.084189054  1.00000000  0.044123444 -0.07073286 -0.058770226
## thalach  -0.008567107  0.04412344  1.000000000 -0.37881209 -0.344186948
## exang     0.025665147 -0.07073286 -0.378812094  1.00000000  0.288222808
## oldpeak   0.005747223 -0.05877023 -0.344186948  0.28822281  1.000000000
```

```
## slope    -0.059894178  0.09304482  0.386784410 -0.25774837 -0.577536817
## ca        0.137979327 -0.07204243 -0.213176928  0.11573938  0.222682322
## thal     -0.032019339 -0.01198140 -0.096439132  0.20675379  0.210244126
## target   -0.028045760  0.13722950  0.421740934 -0.43675708 -0.430696002
##                slope          ca        thal      target
## age      -0.16881424  0.27632624  0.06800138 -0.22543872
## sex      -0.03071057  0.11826141  0.21004110 -0.28093658
## cp        0.11971659 -0.18105303 -0.16173557  0.43379826
## trestbps -0.12147458  0.10138899  0.06220989 -0.14493113
## chol     -0.00403777  0.07051093  0.09880299 -0.08523911
## fbs      -0.05989418  0.13797933 -0.03201934 -0.02804576
## restecg   0.09304482 -0.07204243 -0.01198140  0.13722950
## thalach   0.38678441 -0.21317693 -0.09643913  0.42174093
## exang    -0.25774837  0.11573938  0.20675379 -0.43675708
## oldpeak  -0.57753682  0.22268232  0.21024413 -0.43069600
## slope     1.00000000 -0.08015521 -0.10476379  0.34587708
## ca       -0.08015521  1.00000000  0.15183213 -0.39172399
## thal     -0.10476379  0.15183213  1.00000000 -0.34402927
## target    0.34587708 -0.39172399 -0.34402927  1.00000000
```

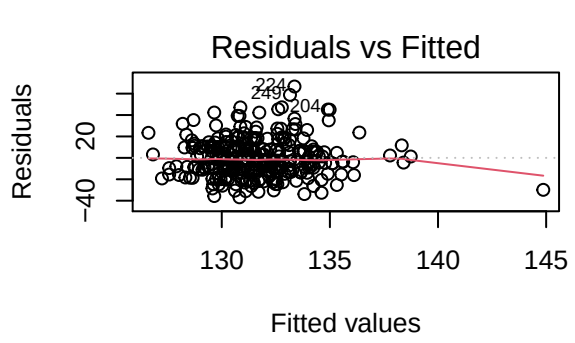
```
##           age trestbps
## age      1.00     0.28
## trestbps 0.28     1.00
##
## n= 303
##
##
## P
##          age trestbps
## age           0
## trestbps  0
```

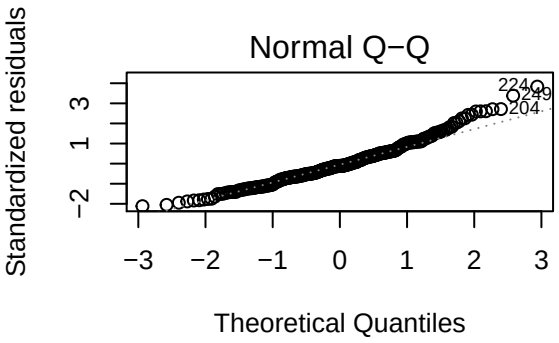
```
##
##  Pearson's product-moment correlation
##
## data:  heartDF$age and heartDF$trestbps
## t = 5.0475, df = 301, p-value = 7.762e-07
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1720897 0.3800657
## sample estimates:
##       cor
## 0.2793509
```

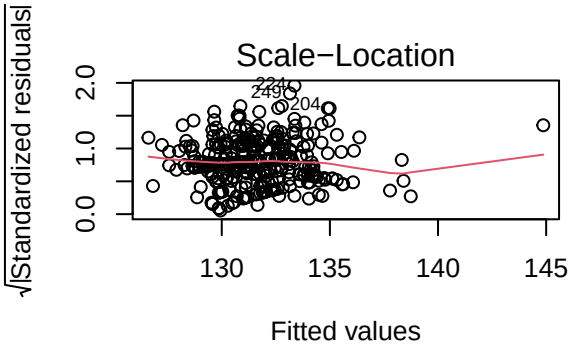
From correlation result below are my observations on heart disease data * The trestbps has 27% affecting to the heart. * cp has 27% affecting to the heart. * Cholesterol has 21% affecting to the heart. * oldpeakhas 21% affecting to the heart. * fbs has 12% affecting to the heart. * exang has 9% affecting to the heart. * thal has 6% affecting to the heart. * All other variables has a -ve correlation values(Means they are not impacting or not related to heart disease). We are going to ignore it for further analysis * For Further analysis lets use only age, trestbps , chol, fbs, exang, oldpeak, ca, thal for main analysis

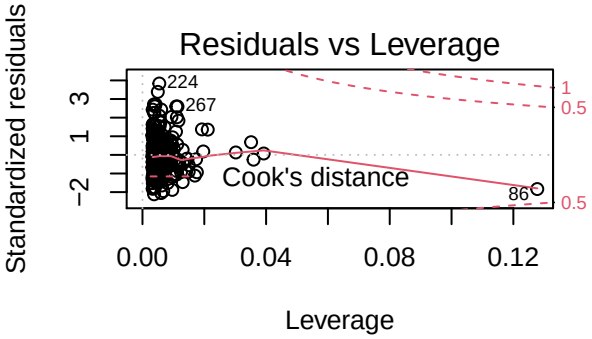
```
##
## Call:
```

```
## lm(formula = trestbps ~ chol, data = heartDF)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -36.821 -11.259  -1.946   9.513  66.637
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 121.35976    4.87052  24.917   <2e-16 ***
## chol          0.04168    0.01935   2.153   0.0321 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 17.43 on 301 degrees of freedom
## Multiple R-squared:  0.01517,    Adjusted R-squared:  0.0119
## F-statistic: 4.637 on 1 and 301 DF,  p-value: 0.03208
```



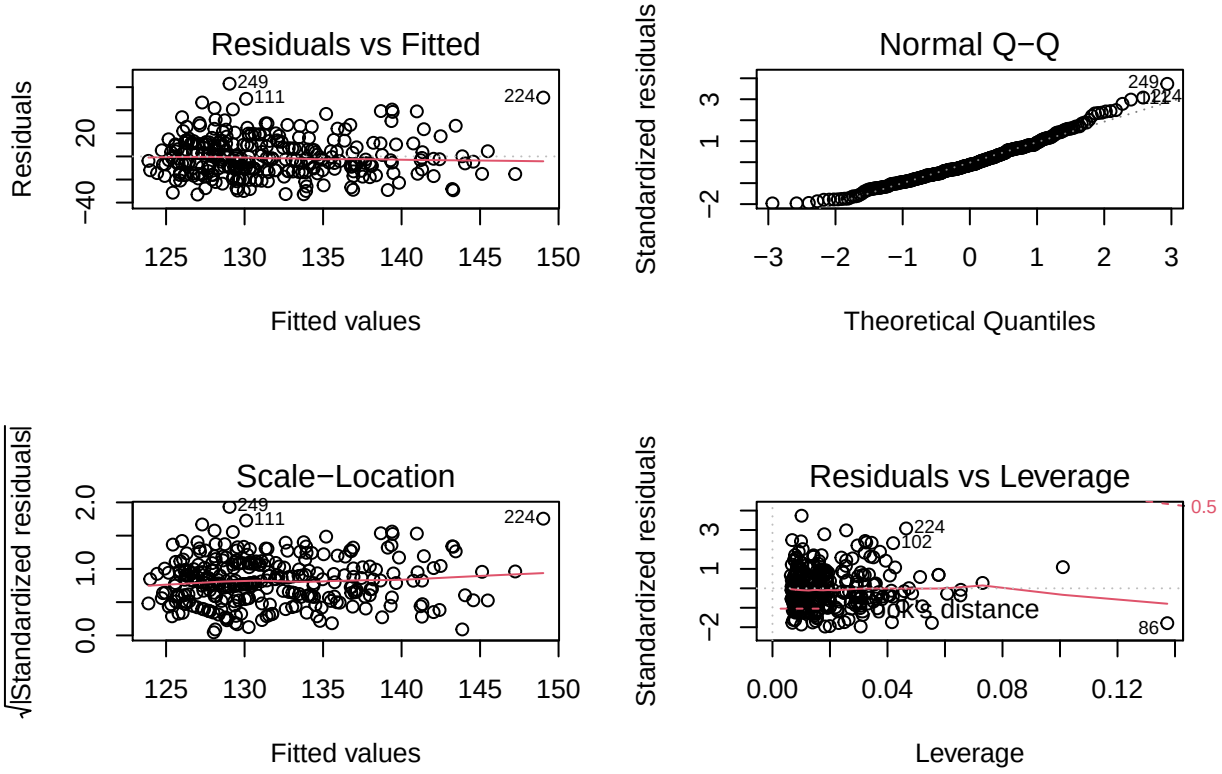


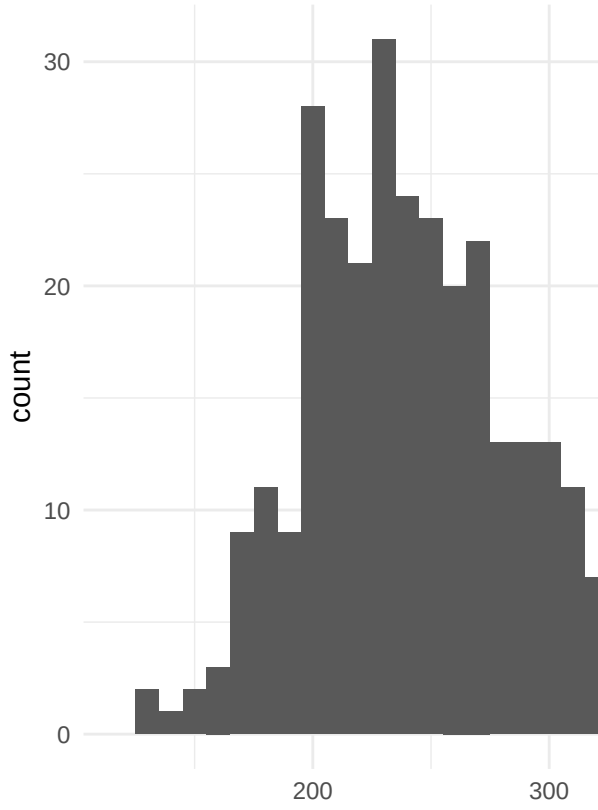





```
##
## Call:
## lm(formula = trestbps ~ chol + oldpeak + exang + fbs + ca, data = heartDF)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -33.003 -11.418  -2.039  10.695  62.957
##
```

```
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 118.08407    4.79559  24.623  < 2e-16 ***
## chol          0.03690    0.01890   1.952  0.05187 .
## oldpeak       2.71054    0.89579   3.026  0.00270 **
## exang         0.02688    2.17444   0.012  0.99015
## fbs           8.41367    2.76588   3.042  0.00256 **
## ca            0.51587    0.99098   0.521  0.60306
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 16.95 on 297 degrees of freedom
## Multiple R-squared:  0.08154,    Adjusted R-squared:  0.06608
## F-statistic: 5.273 on 5 and 297 DF,  p-value: 0.0001172
```



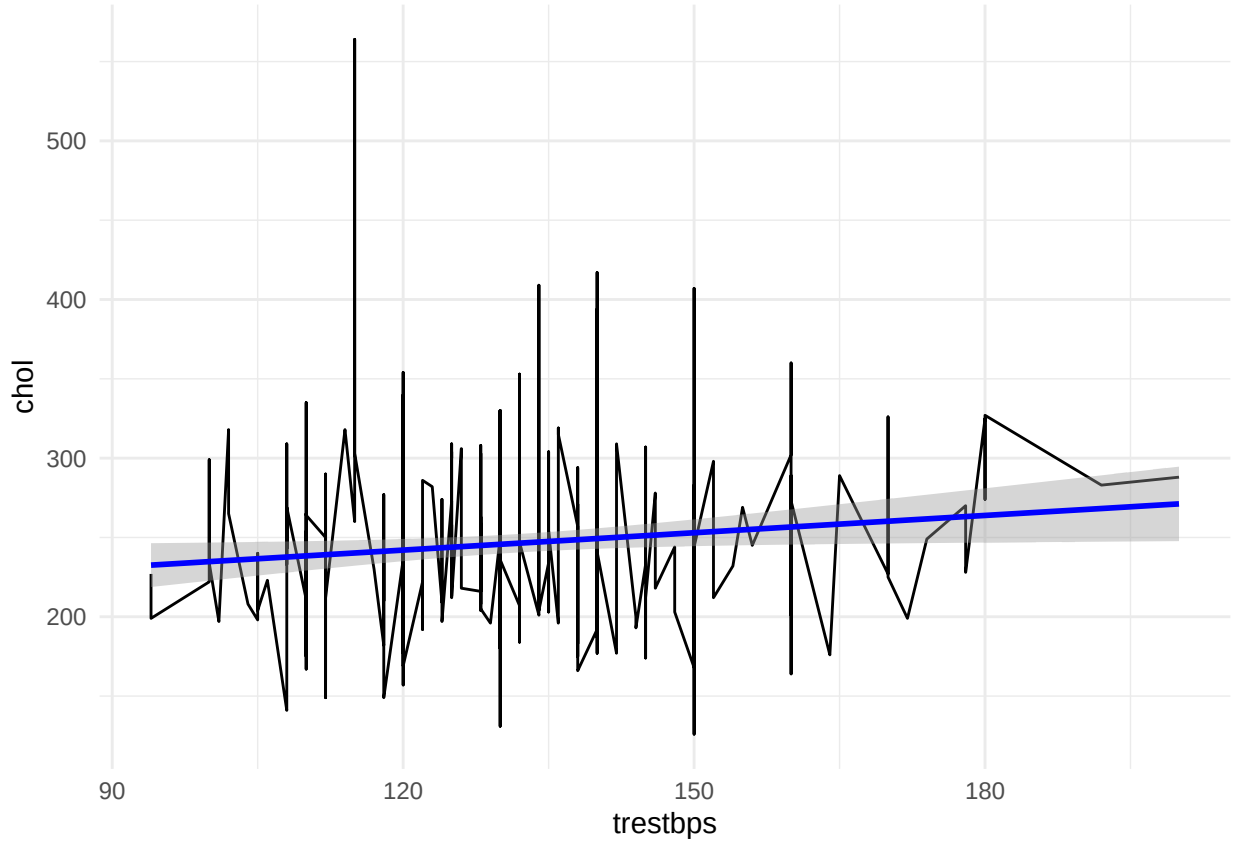


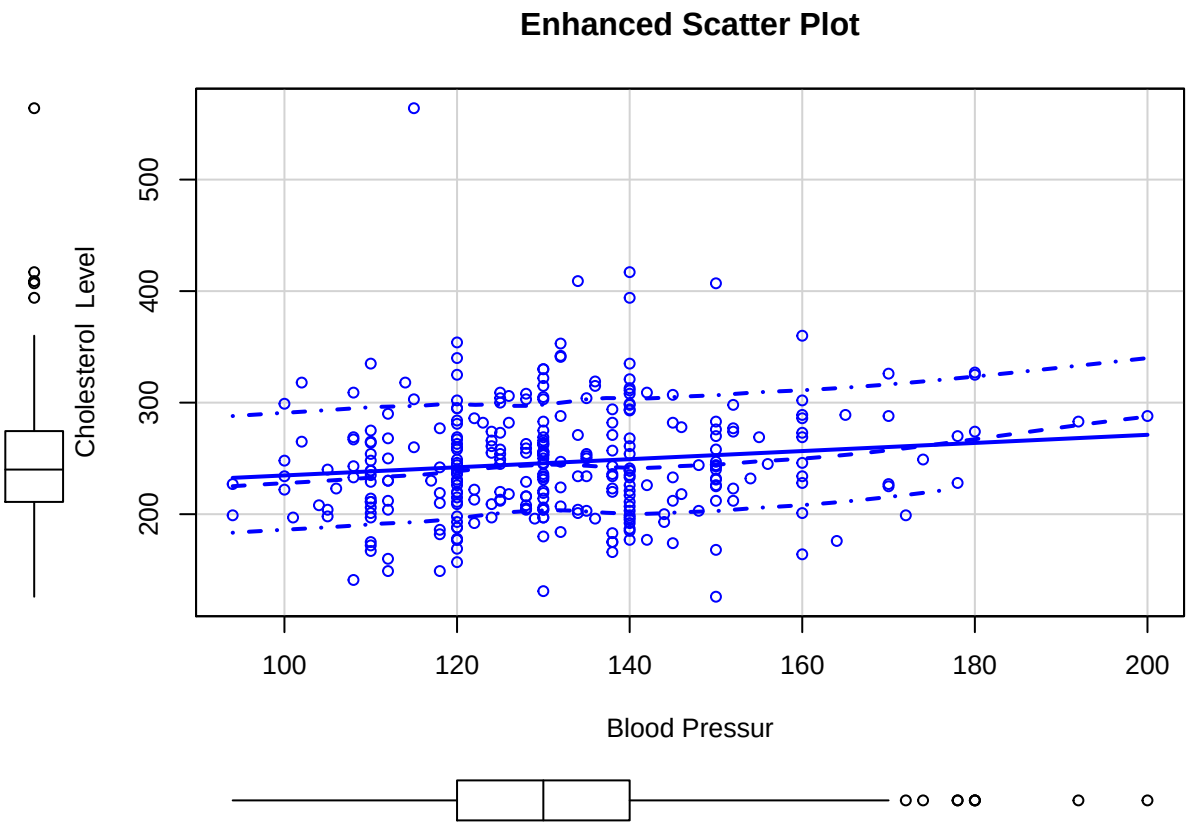
C. What is most common age when heart disease gets started?

- From the above histogram I would say heart disease are getting started from thirties of the age

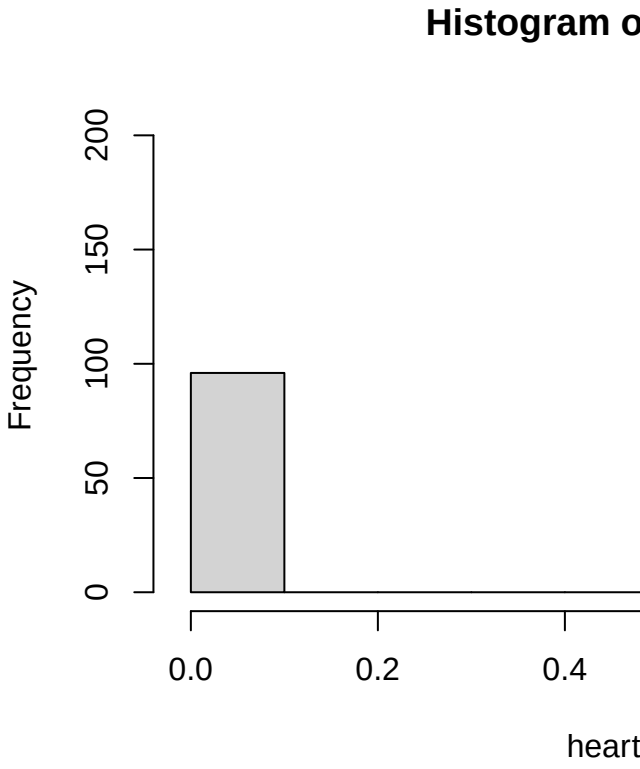
D. How much is the effect of cholesterol on heart? From the correlation found that the Cholesterol has 21% affecting to the heart. Initially before starting the analysis I thought that the Cholesterol is the most important factor which cause the heart disease. But blood pressure and stress has 27% of effect on heart disease.

```
## `geom_smooth()` using formula 'y ~ x'
```

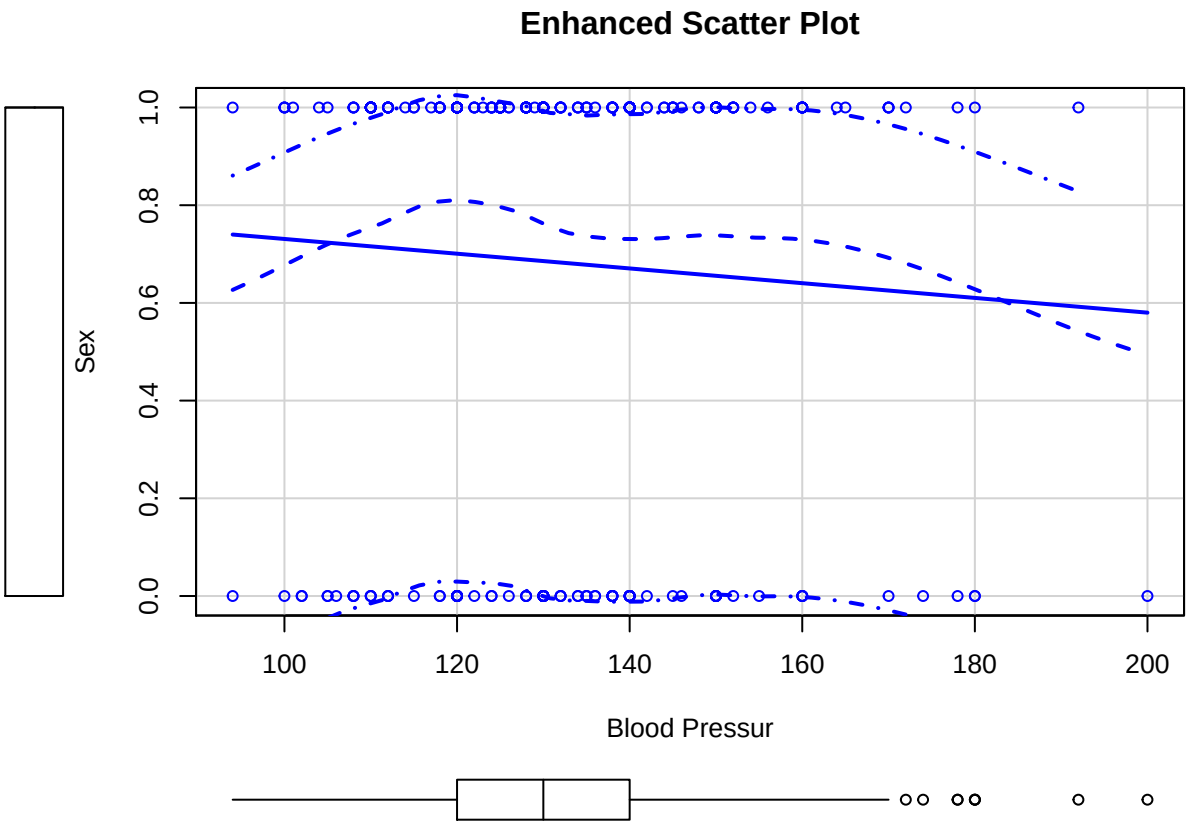

500
400
300
200
chol
90
120
150
180
trestbps



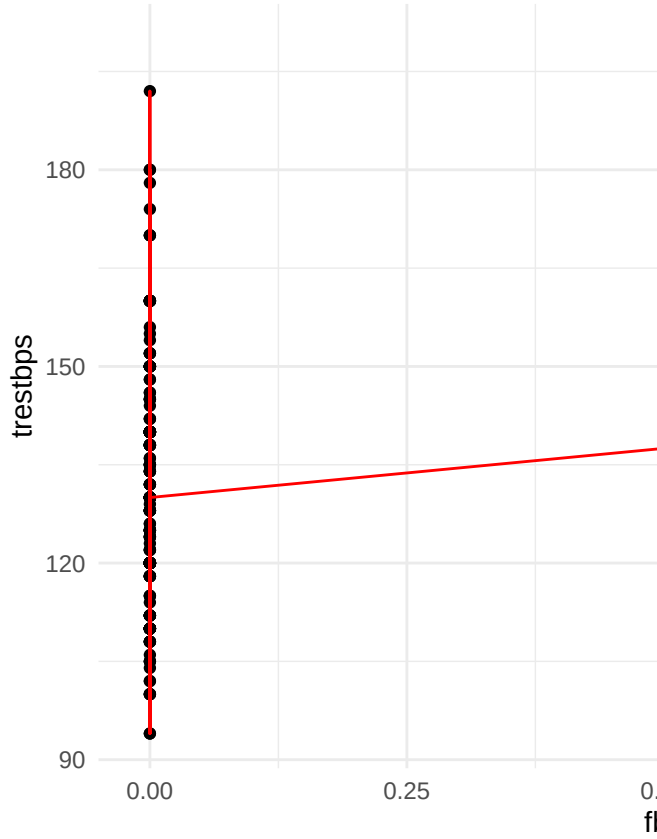
- The major factor of heart disease is blood pressure and Cholesterol. If you observe above plot, the increase in Cholesterol increases the blood pressure level.



E. Who is most affected by heart disease (Male or Female)?



- Mail has more heart disease that women.



F. Is fasting blood sugar has a relation with heart disease?

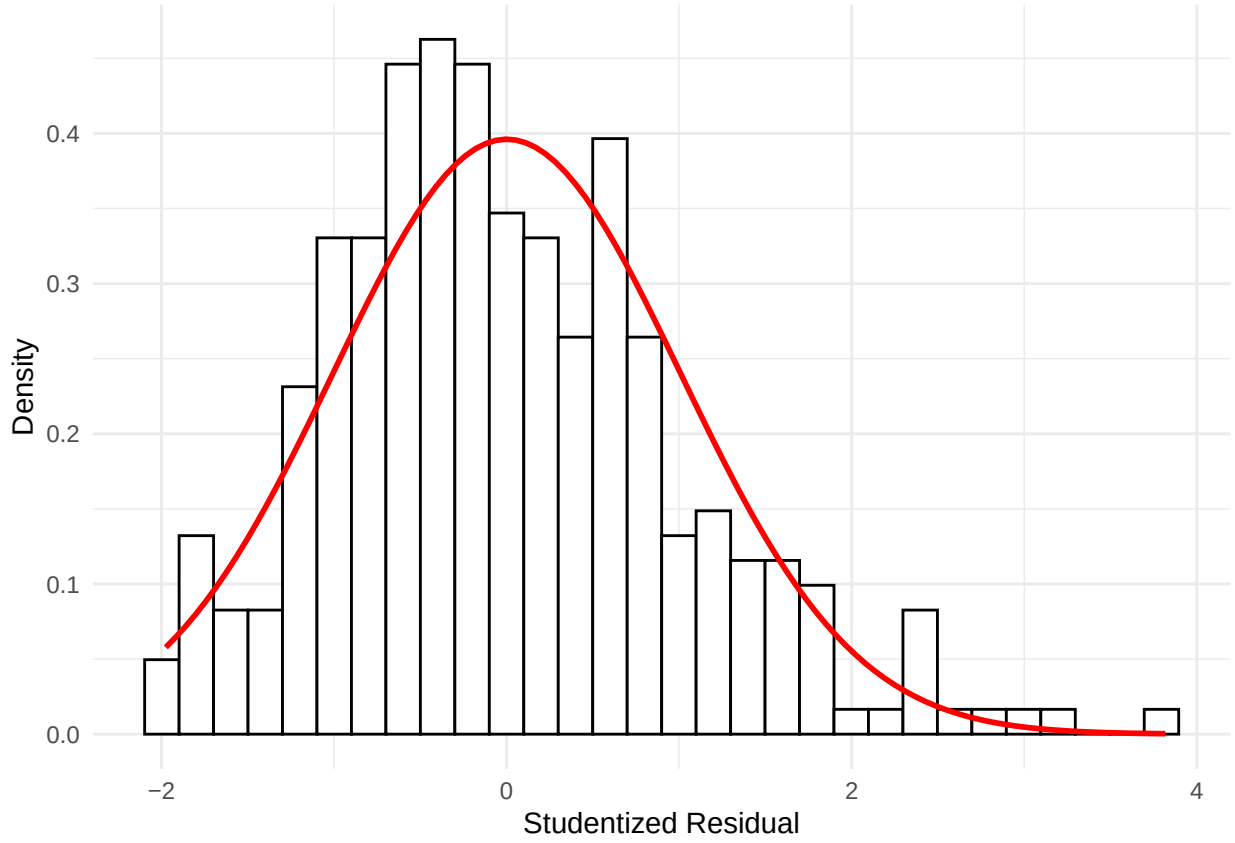
- With fasting the blood pressure increases so the patient with heart disease should not do long fasting.

G. How much help or improvement we can achieve with the help of exercise and diet?

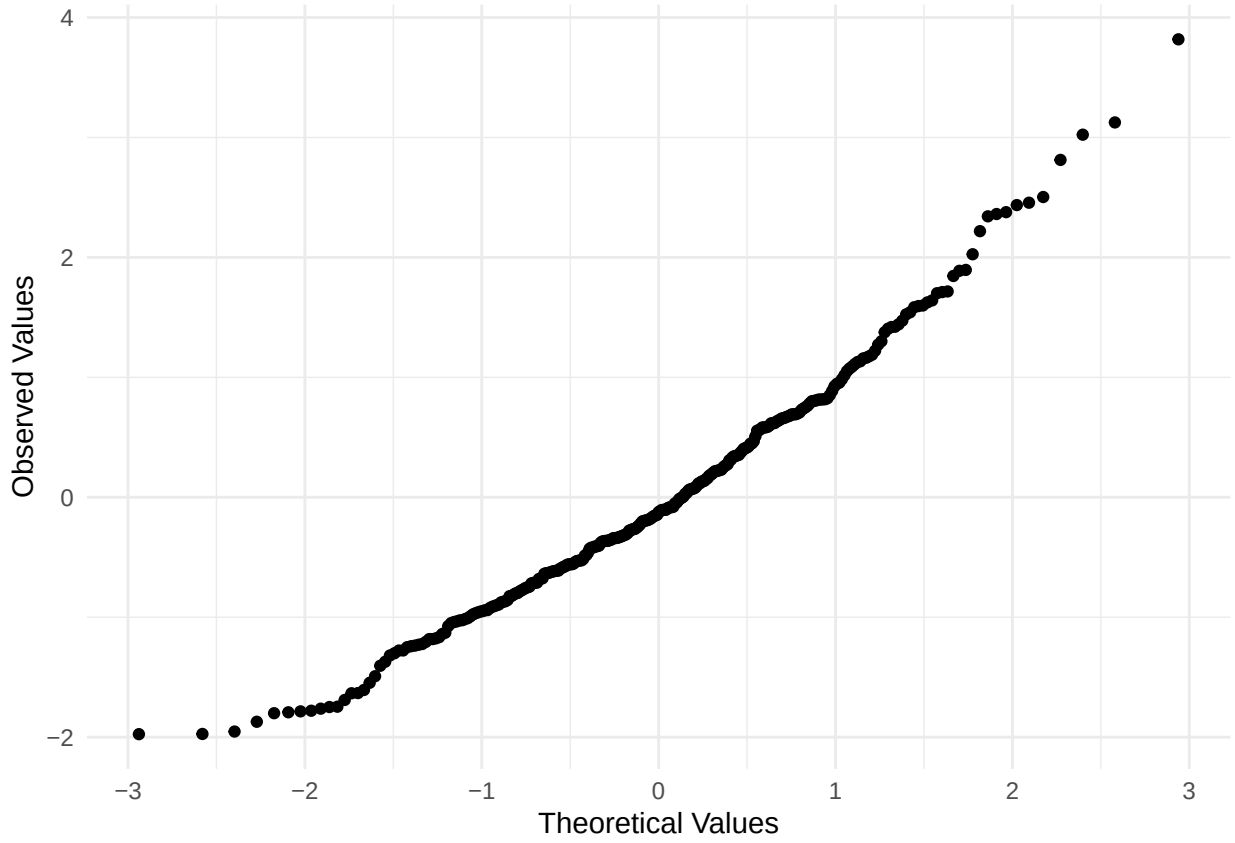
- I couldn't find the exact answer of this question.

H. Will create a multi linear model find the appropriate results.

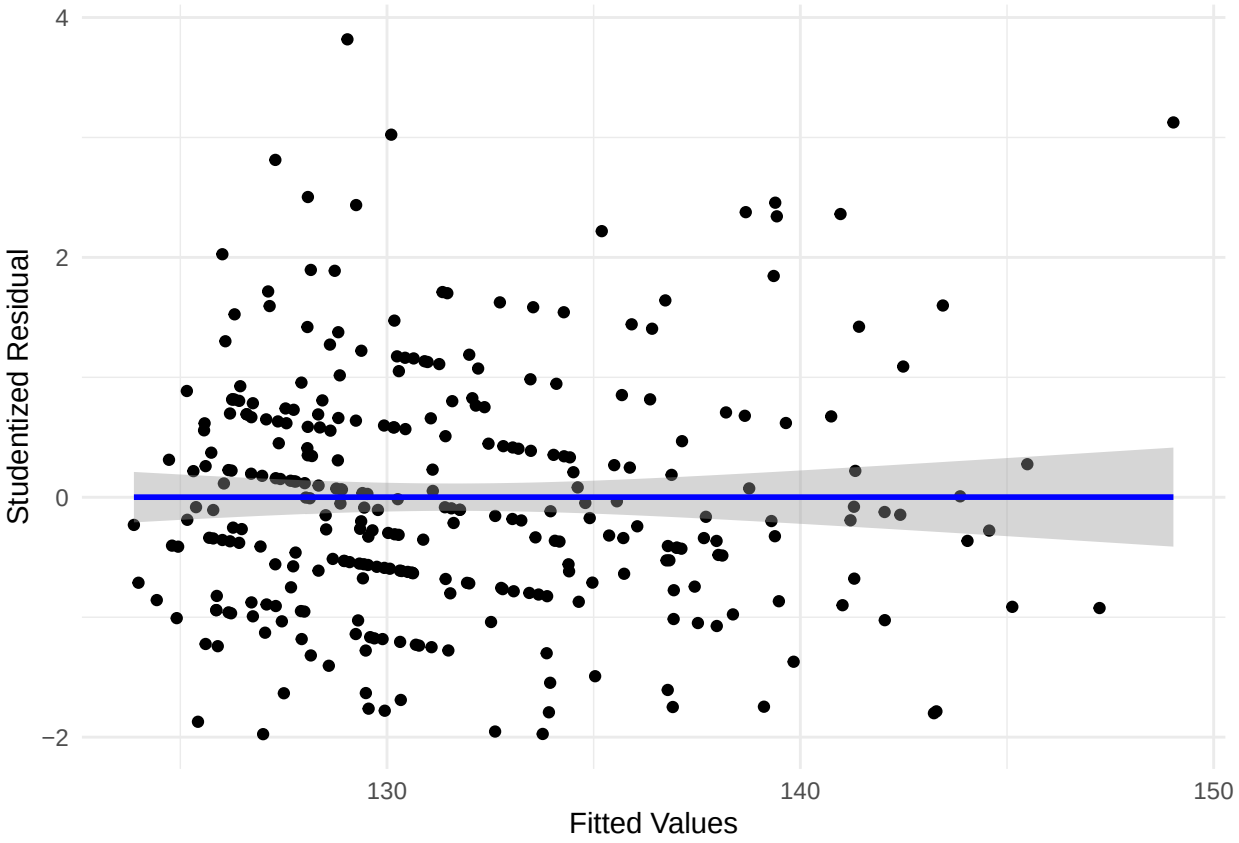
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

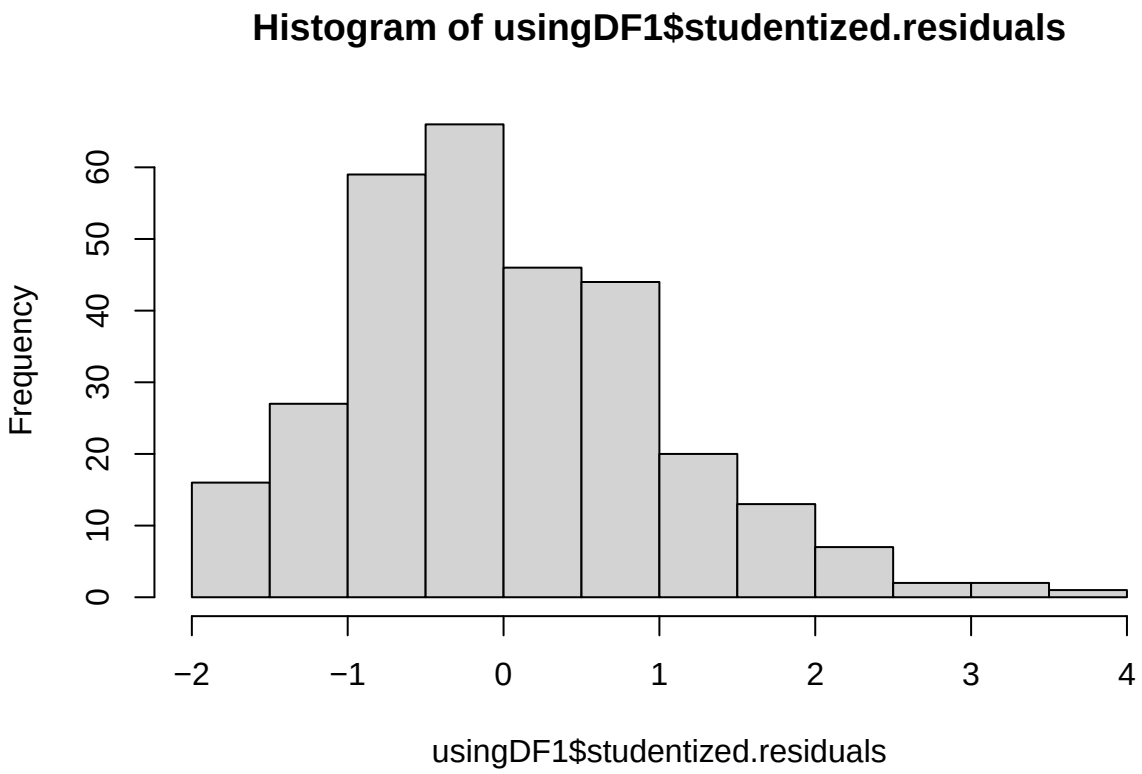


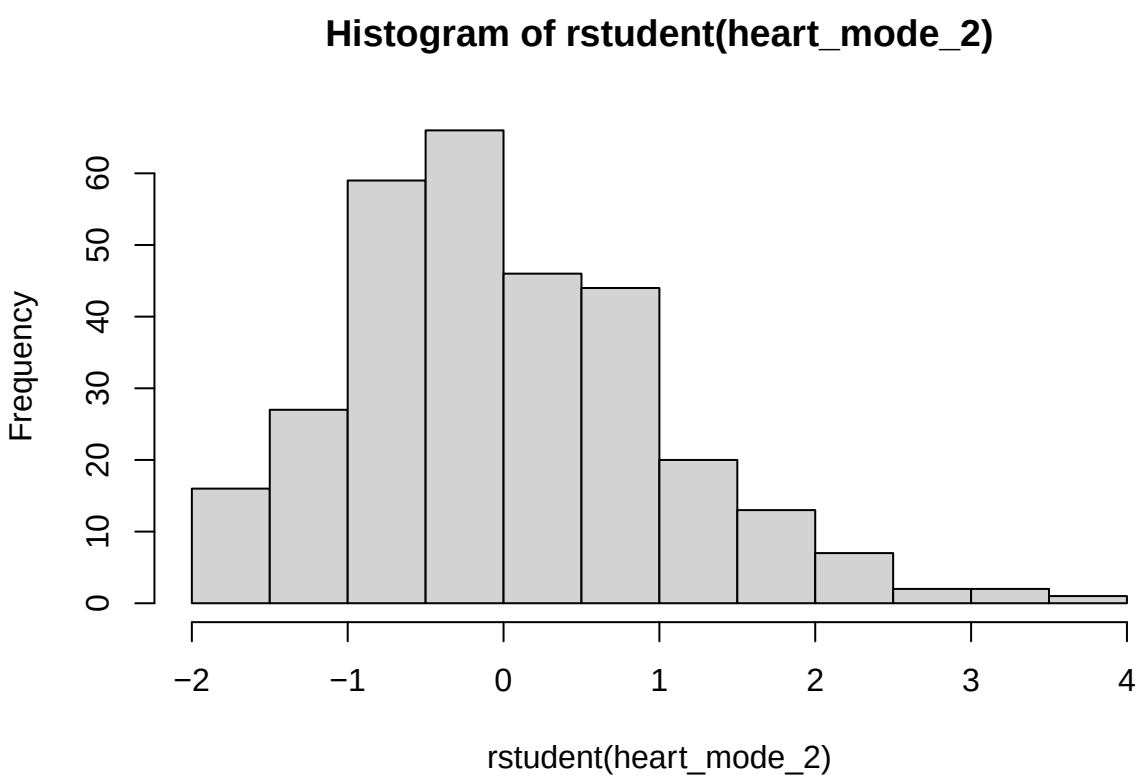

```
## Warning: `stat` is deprecated
```




```
## `geom_smooth()` using formula 'y ~ x'
```


4
2
0
−2
Studentized Residual
130
140
150
Fitted Values


Histogram of usingDF1$studentized.residuals
Frequency
0
10
20
30
40
50
60
−2
−1
0
1
2
3
4
usingDF1$studentized.residuals



- Overall regression model is unbiased. We could summarize saying that the model appears, in most senses, to be both accurate for the sample and generalizable to the population.

I. How much is confidence level of the model?

```
##                    2.5 %       97.5 %
## (Intercept)  1.086464e+02 127.52170683
## chol        -3.002895e-04   0.07410088
## oldpeak      9.476387e-01   4.47343480
## exang       -4.252385e+00   4.30613667
## fbs          2.970462e+00  13.85687880
## ca          -1.434361e+00   2.46609683
```

- What I observed from the outcome of confident interval. A good model will have a small confidence interval, indicating that the value of b is of the b-values tells us about the direction of the relationship between the predictors and outcome. If you observe outcome of my model is very small, means this model is good.

Add Citations

- Discovering Statistics Using R(Field, Miles, and Field 2012)

References

Field, A., J. Miles, and Z. Field. 2012. *Discovering Statistics Using R*. SAGE Publications. https://books.google.com/books?id=wd2K2zC3swIC.