stats-101a-project-markdown

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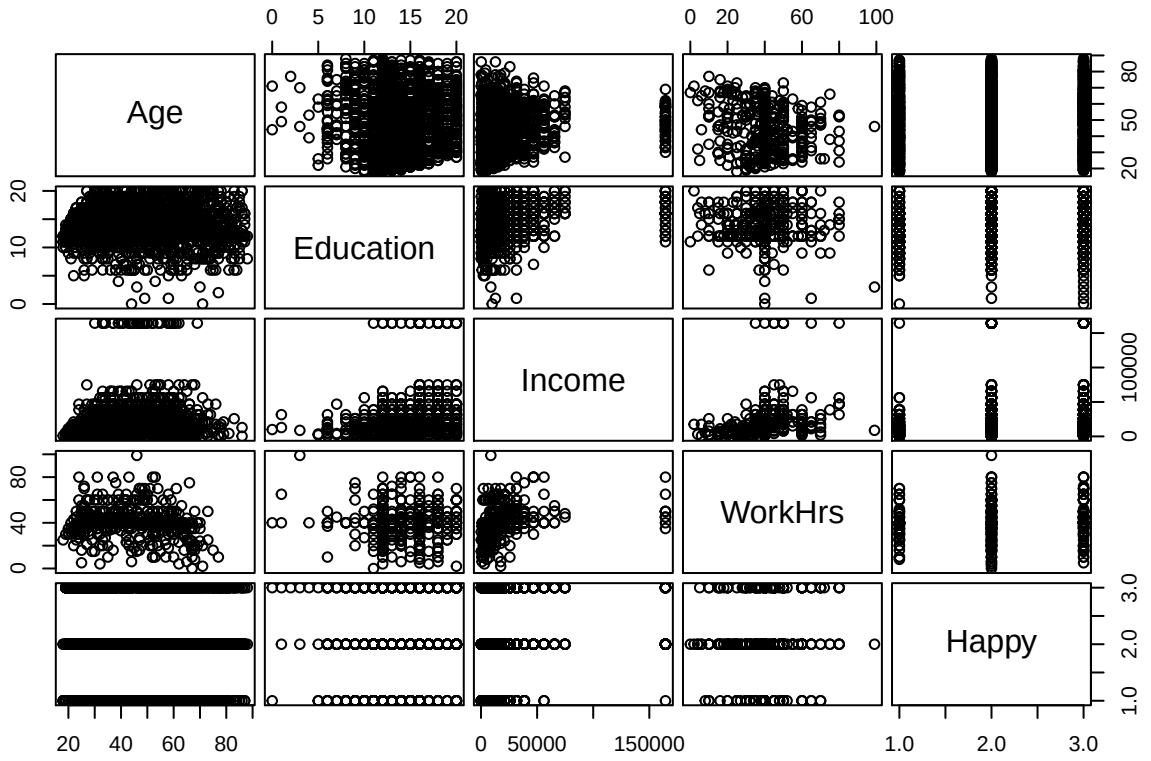
```
#data cleanup
happiness_data <- read.table("Happiness.txt", header = TRUE)
head(happiness_data)
```

```
##   Household Health OwnHome Instagram Marital Sex Age Children Education
## 3         2      2       0         2       1   1  72        2        16
## 4         4      2       1         0       1   2  43        4        12
## 5         3      1       0         1       1   2  55        2        18
## 6         2      0       1         1       1   2  53        2        14
## 7         3      4       1         0       1   1  50        2        14
## 8         2      2       0         1       1   2  23        3        11
##   JobSat Income WorkHrs Happy
## 3      0      0      -1     1
## 4      0   5265      -1     2
## 5      3    936      15     1
## 6      0      0      -1     1
## 7      0 164382      -1     2
## 8      2   7605      30     1
```

```
happiness_data$Household[happiness_data$Household == 8 | happiness_data$Household == 9] <- NA

happiness_data$Health[happiness_data$Health == 8 | happiness_data$Health == 9 |  happiness_data$Health =
happiness_data$Health[happiness_data$Health == 1] <- 400
happiness_data$Health[happiness_data$Health == 2] <- 300
happiness_data$Health[happiness_data$Health == 3] <- 2
happiness_data$Health[happiness_data$Health == 4] <- 1
happiness_data$Health[happiness_data$Health == 400] <- 4
happiness_data$Health[happiness_data$Health == 300] <- 3

happiness_data$OwnHome[happiness_data$OwnHome == 0 | happiness_data$OwnHome == 8 | happiness_data$OwnHo

happiness_data$Instagram[happiness_data$Instagram == 0 | happiness_data$Instagram == 8 | happiness_data

happiness_data$Marital[happiness_data$Marital == 9] <- NA

happiness_data$Age[happiness_data$Age == 89 | happiness_data$Age == 98 | happiness_data$Age == 99] <- N

happiness_data$Children[happiness_data$Children == 8 | happiness_data$Children == 9] <- NA

happiness_data$Education[happiness_data$Education == 97 | happiness_data$Education == 98 | happiness_da

happiness_data$JobSat[happiness_data$JobSat == 0 | happiness_data$JobSat == 8 | happiness_data$JobSat =

happiness_data$Income[happiness_data$Income == 0 | happiness_data$Income == 999998 | happiness_data$Inc

happiness_data$WorkHrs[happiness_data$WorkHrs == -1 | happiness_data$WorkHrs == 998 | happiness_data$Wo

happiness_data$Happy[happiness_data$Happy == 0 | happiness_data$Happy == 8 | happiness_data$Happy == 9]
```

```r
happiness_data$Happy[happiness_data$Happy == 1] <- 100
happiness_data$Happy[happiness_data$Happy == 3] <- 1
happiness_data$Happy[happiness_data$Happy == 100] <- 3

#exploring data
pairs(happiness_data[, -c(1,2,3,4,5,6,8,10)], gap=0.4,cex.labels=1.5)
```

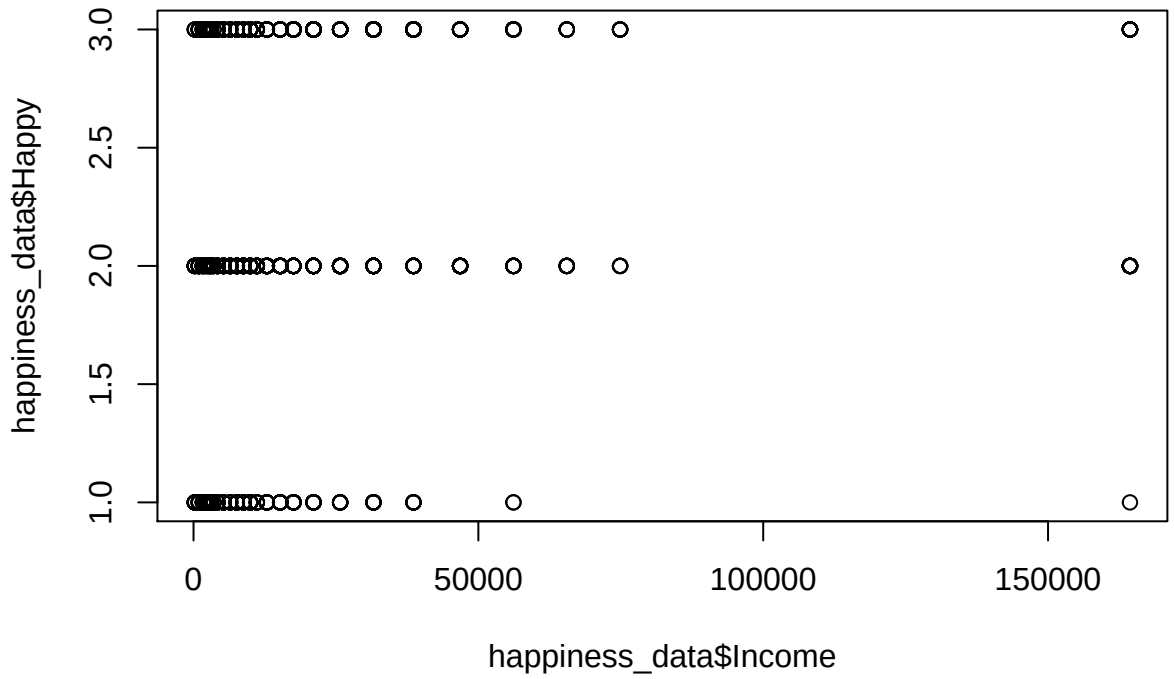



```r
m1 <- lm(happiness_data$Happy ~ happiness_data$Age + happiness_data$Education + happiness_data$Income +

summary(m1)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ happiness_data$Age + happiness_data$Education +
##     happiness_data$Income + happiness_data$WorkHrs)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.5164 -0.2267 -0.1453  0.7486  0.9651
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 1.915e+00  2.240e-01   8.546 3.04e-16 ***
## happiness_data$Age          2.136e-03  2.470e-03   0.865    0.388
## happiness_data$Education -2.974e-03  1.052e-02  -0.283    0.778
## happiness_data$Income       1.950e-06  1.412e-06   1.381    0.168
## happiness_data$WorkHrs      4.098e-03  2.552e-03   1.606    0.109
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.6347 on 384 degrees of freedom
##   (1978 observations deleted due to missingness)
## Multiple R-squared:  0.01724,    Adjusted R-squared:  0.007001
## F-statistic: 1.684 on 4 and 384 DF,  p-value: 0.1529
```

```
m2 <- lm(happiness_data$Happy ~ happiness_data$Income)
plot(happiness_data$Happy ~ happiness_data$Income)
```




```
summary(m2)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ happiness_data$Income)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.6110 -0.1944 -0.1302  0.7579  0.9039
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)            2.095e+00  2.170e-02   96.57  < 2e-16 ***
## happiness_data$Income 3.137e-06  5.852e-07    5.36 9.78e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6137 on 1326 degrees of freedom
##   (1039 observations deleted due to missingness)
## Multiple R-squared:  0.02121,    Adjusted R-squared:  0.02047
## F-statistic: 28.73 on 1 and 1326 DF,  p-value: 9.783e-08
```

```
#adding factors/levels
HappyCat <- factor(happiness_data$Happy)
levels(HappyCat)
```

```
## [1] "1" "2" "3"
```

```
#m4 <- lm(HappyCat ~ happiness_data$Income)
#summary(m4)
#plot(HappyCat ~ happiness_data$Income)

#m5 <- lm(happiness_data$Income ~ HappyCat)
#summary(m5)
#plot(happiness_data$Income ~ HappyCat)

#transforming linear income
mean_income <- mean(happiness_data$Income, na.rm=TRUE)
tIncome <- happiness_data$Income/mean_income
m6 <- lm(happiness_data$Happy ~ tIncome)
summary(m6)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ tIncome)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.6110 -0.1944 -0.1302  0.7579  0.9039
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.09534    0.02170   96.57  < 2e-16 ***
## tIncome      0.07334    0.01368    5.36 9.78e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6137 on 1326 degrees of freedom
##   (1039 observations deleted due to missingness)
## Multiple R-squared:  0.02121,    Adjusted R-squared:  0.02047
## F-statistic: 28.73 on 1 and 1326 DF,  p-value: 9.783e-08
```

```
#transforming inverse income
inverse_income <- 1/(happiness_data$Income)
m7 <- lm(happiness_data$Happy ~ inverse_income)
summary(m7)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ inverse_income)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.1918 -0.1889 -0.1821  0.8099  1.3017
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)       2.19252    0.01796 122.051  < 2e-16 ***
## inverse_income -115.64146   29.23653  -3.955 8.05e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.6167 on 1326 degrees of freedom
##   (1039 observations deleted due to missingness)
## Multiple R-squared:  0.01166,    Adjusted R-squared:  0.01092
## F-statistic: 15.64 on 1 and 1326 DF,  p-value: 8.046e-05
```

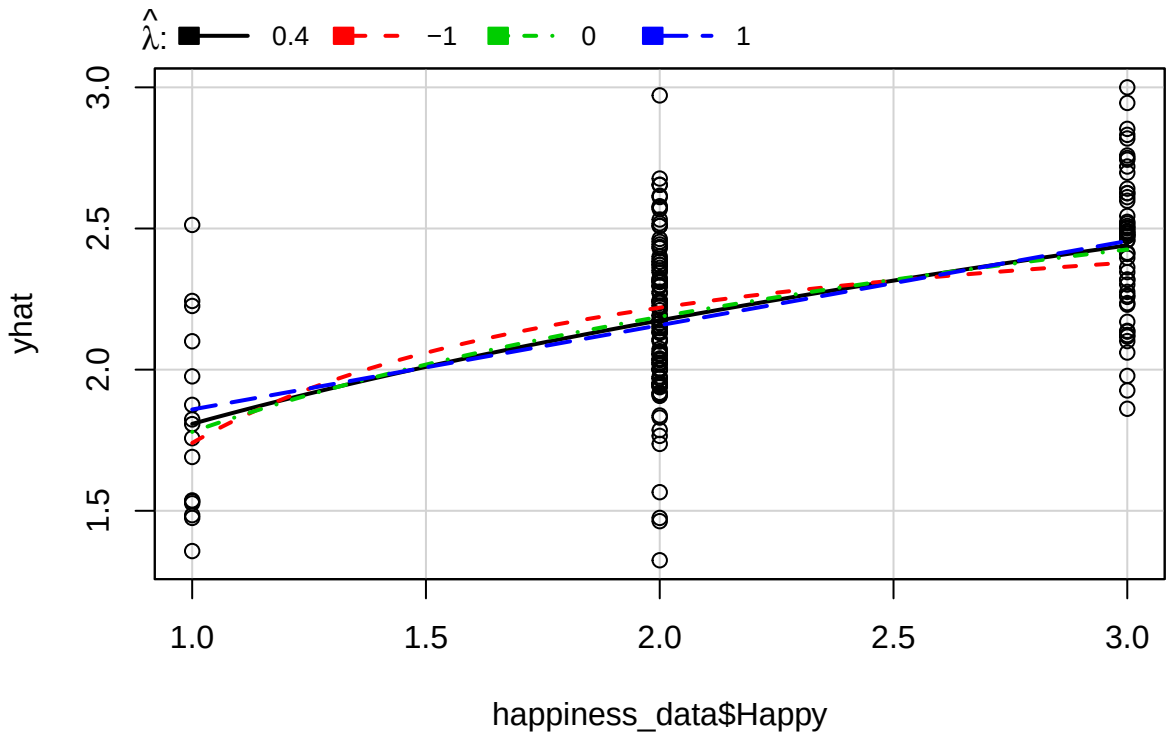
```
library(alr3)
```

```
## Loading required package: car
```

```
## Warning: package 'car' was built under R version 3.4.3
```

```
m1 <- lm(happiness_data$Happy ~ factor(happiness_data$Household) + factor(happiness_data$OwnHome) + happ
inverse.response.plot(m1,key=TRUE)
```

```
## Warning: 'inverse.response.plot' is deprecated.
## Use 'inverseResponsePlot' instead.
## See help("Deprecated") and help("alr3-deprecated").
```




```
##      lambda      RSS
## 1  0.396029 12.62671
## 2 -1.000000 13.09307
## 3  0.000000 12.66673
## 4  1.000000 12.70891
```

```
m2 <- lm((happiness_data$Happy)^0.396 ~ factor(happiness_data$Household) + factor(happiness_data$OwnHome
summary(m2)
```

```
##
## Call:
## lm(formula = (happiness_data$Happy)^0.396 ~ factor(happiness_data$Household) +
##     factor(happiness_data$OwnHome) + happiness_data$Instagram +
##     factor(happiness_data$Marital) + happiness_data$Children +
##     happiness_data$Education + factor(happiness_data$JobSat) +
```

```
##     happiness_data$Income)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.42922 -0.07632 -0.00066  0.10275  0.28342
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        1.437e+00  1.015e-01  14.154  < 2e-16
## factor(happiness_data$Household)2 -4.743e-02  3.287e-02  -1.443 0.151175
## factor(happiness_data$Household)3 -1.058e-02  4.249e-02  -0.249 0.803668
## factor(happiness_data$Household)4 -1.954e-01  8.817e-02  -2.216 0.028286
## factor(happiness_data$Household)5 -8.682e-02  1.472e-01  -0.590 0.556135
## factor(happiness_data$Household)6 -1.814e-01  1.059e-01  -1.712 0.088974
## factor(happiness_data$OwnHome)2    3.689e-02  2.654e-02   1.390 0.166594
## factor(happiness_data$OwnHome)3    8.115e-02  1.483e-01   0.547 0.585169
## happiness_data$Instagram          -2.169e-02  2.714e-02  -0.799 0.425376
## factor(happiness_data$Marital)2   -2.232e-01  5.854e-02  -3.812 0.000204
## factor(happiness_data$Marital)3   -9.841e-02  3.802e-02  -2.588 0.010638
## factor(happiness_data$Marital)4   -1.541e-01  8.703e-02  -1.771 0.078747
## factor(happiness_data$Marital)5   -9.380e-02  3.764e-02  -2.492 0.013842
## happiness_data$Children           -2.539e-03  9.523e-03  -0.267 0.790147
## happiness_data$Education           5.854e-03  4.913e-03   1.191 0.235436
## factor(happiness_data$JobSat)2    -2.026e-02  3.402e-02  -0.596 0.552445
## factor(happiness_data$JobSat)3    -7.703e-02  3.610e-02  -2.134 0.034568
## factor(happiness_data$JobSat)4    -6.828e-02  6.801e-02  -1.004 0.317088
## factor(happiness_data$JobSat)5    -1.423e-01  5.366e-02  -2.652 0.008917
## factor(happiness_data$JobSat)6    -2.960e-01  7.744e-02  -3.822 0.000197
## factor(happiness_data$JobSat)7    -7.765e-02  1.470e-01  -0.528 0.598234
## happiness_data$Income              6.106e-07  4.021e-07   1.519 0.131076
##
## (Intercept)                       ***
## factor(happiness_data$Household)2
## factor(happiness_data$Household)3
## factor(happiness_data$Household)4 *
## factor(happiness_data$Household)5
## factor(happiness_data$Household)6 .
## factor(happiness_data$OwnHome)2
## factor(happiness_data$OwnHome)3
## happiness_data$Instagram
## factor(happiness_data$Marital)2   ***
## factor(happiness_data$Marital)3   *
## factor(happiness_data$Marital)4   .
## factor(happiness_data$Marital)5   *
## happiness_data$Children
## happiness_data$Education
## factor(happiness_data$JobSat)2
## factor(happiness_data$JobSat)3    *
## factor(happiness_data$JobSat)4
## factor(happiness_data$JobSat)5    **
## factor(happiness_data$JobSat)6    ***
## factor(happiness_data$JobSat)7
## happiness_data$Income
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1406 on 143 degrees of freedom
##   (2202 observations deleted due to missingness)
## Multiple R-squared:  0.3064, Adjusted R-squared:  0.2045
## F-statistic: 3.008 on 21 and 143 DF,  p-value: 5.709e-05
```

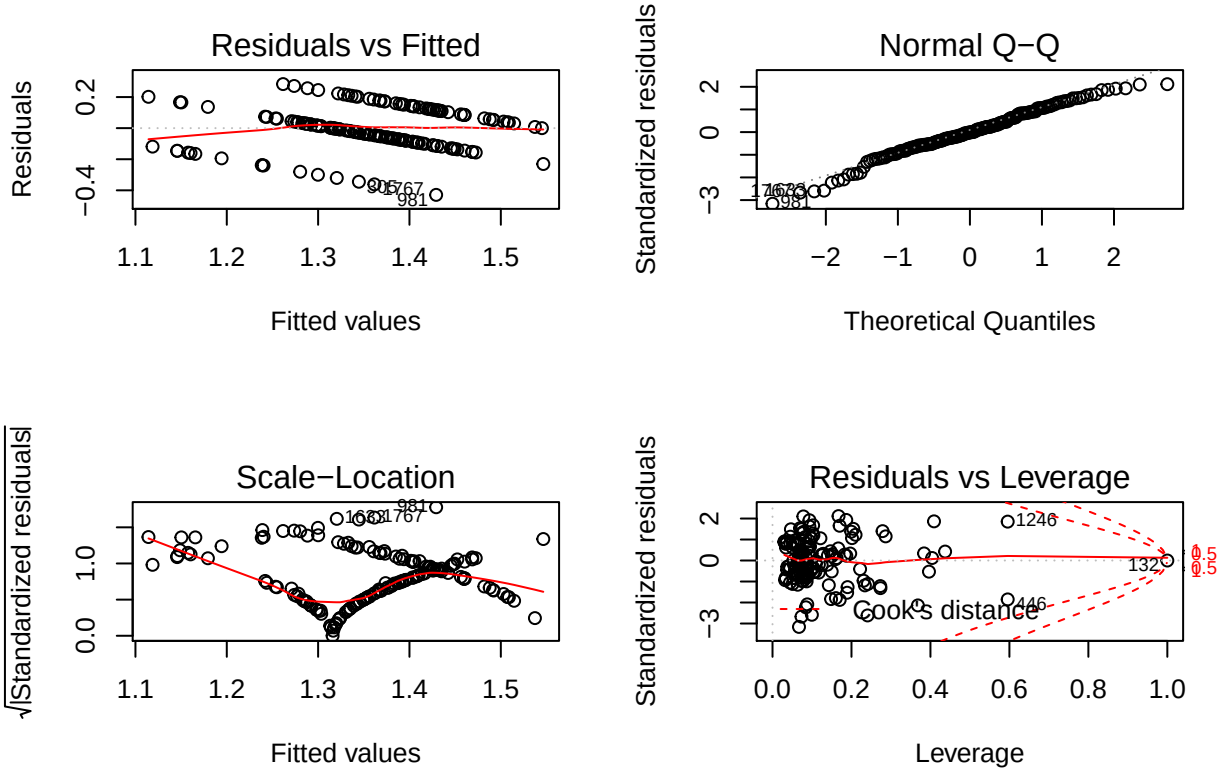
```
par(mfrow=c(2,2))
plot(m2)
```

```
## Warning: not plotting observations with leverage one:
##   31, 74
```

```
## Warning: not plotting observations with leverage one:
##   31, 74
```

```
## Warning in sqrt(crit * p * (1 - hh)/hh): NaNs produced
```

```
## Warning in sqrt(crit * p * (1 - hh)/hh): NaNs produced
```

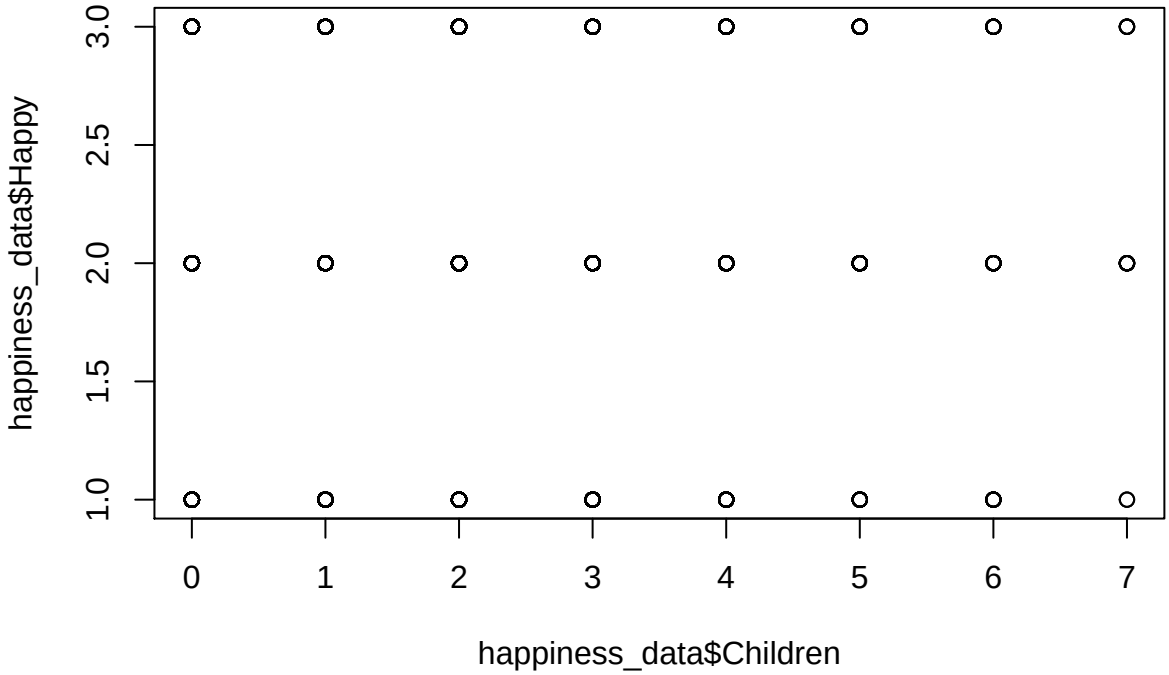



```
anova(m2)
```

```
## Analysis of Variance Table
##
## Response: (happiness_data$Happy)^0.396
##                                  Df  Sum Sq  Mean Sq F value    Pr(>F)
## factor(happiness_data$Household)  5 0.21752 0.043503  2.2008 0.0574183
## factor(happiness_data$OwnHome)    2 0.04163 0.020814  1.0530 0.3515920
## happiness_data$Instagram          1 0.00023 0.000226  0.0114 0.9149618
## factor(happiness_data$Marital)    4 0.39408 0.098520  4.9840 0.0008635
## happiness_data$Children           1 0.00501 0.005008  0.2534 0.6154957
## happiness_data$Education          1 0.01888 0.018883  0.9552 0.3300382
```

```
## factor(happiness_data$JobSat)      6 0.52554 0.087591  4.4311 0.0003849
## happiness_data$Income              1 0.04559 0.045585  2.3061 0.1310760
## Residuals                        143 2.82673 0.019767
##
## factor(happiness_data$Household) .
## factor(happiness_data$OwnHome)
## happiness_data$Instagram
## factor(happiness_data$Marital)   ***
## happiness_data$Children
## happiness_data$Education
## factor(happiness_data$JobSat)    ***
## happiness_data$Income
## Residuals
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
#testing the significance of Children predictor variable
plot(happiness_data$Happy ~ happiness_data$Children)
```

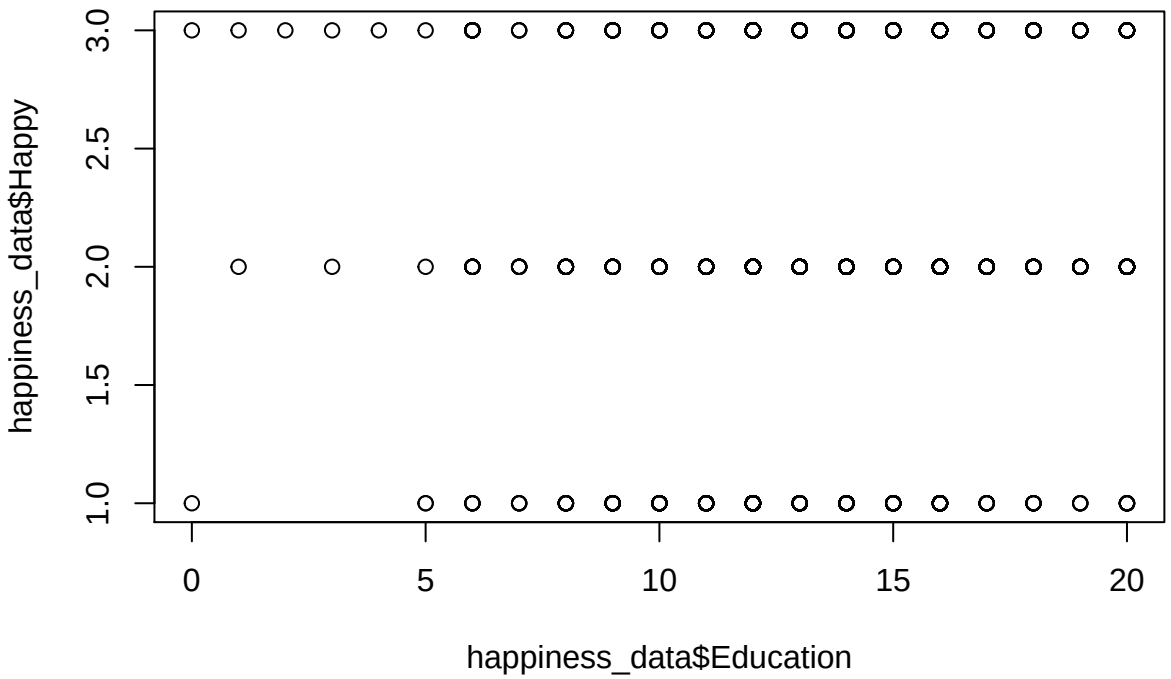



```r
m8 <- lm(happiness_data$Happy ~ happiness_data$Children)
summary(m8)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ happiness_data$Children)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.1282 -0.1191 -0.1146  0.8786  0.8877
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)              2.112312   0.020326 103.922   <2e-16 ***
```

```
## happiness_data$Children 0.002274   0.008496   0.268    0.789
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6506 on 2335 degrees of freedom
##   (30 observations deleted due to missingness)
## Multiple R-squared:  3.067e-05,  Adjusted R-squared:  -0.0003976
## F-statistic: 0.07162 on 1 and 2335 DF,  p-value: 0.789
```

```
#it seems children and happiness have almost no correlation

#testing the significance of Education predictor variable
plot(happiness_data$Happy ~ happiness_data$Education)
```




```
m9 <- lm(happiness_data$Happy ~ happiness_data$Education)
summary(m9)
```

```
##
## Call:
## lm(formula = happiness_data$Happy ~ happiness_data$Education)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.25203 -0.18569 -0.09725  0.79219  1.19021
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)               1.809793   0.063607  28.453  < 2e-16 ***
## happiness_data$Education 0.022112   0.004523   4.889 1.08e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6498 on 2353 degrees of freedom
```

```
##   (12 observations deleted due to missingness)
## Multiple R-squared:  0.01006,    Adjusted R-squared:  0.009635
## F-statistic:  23.9 on 1 and 2353 DF,  p-value: 1.082e-06
```

```
# logEducation <- log(happiness_data$Education)
# m10 <- lm(happiness_data$Happy ~ logEducation)
# summary(m10)
```