MATJAZ_URBAN

Urban Matjaž

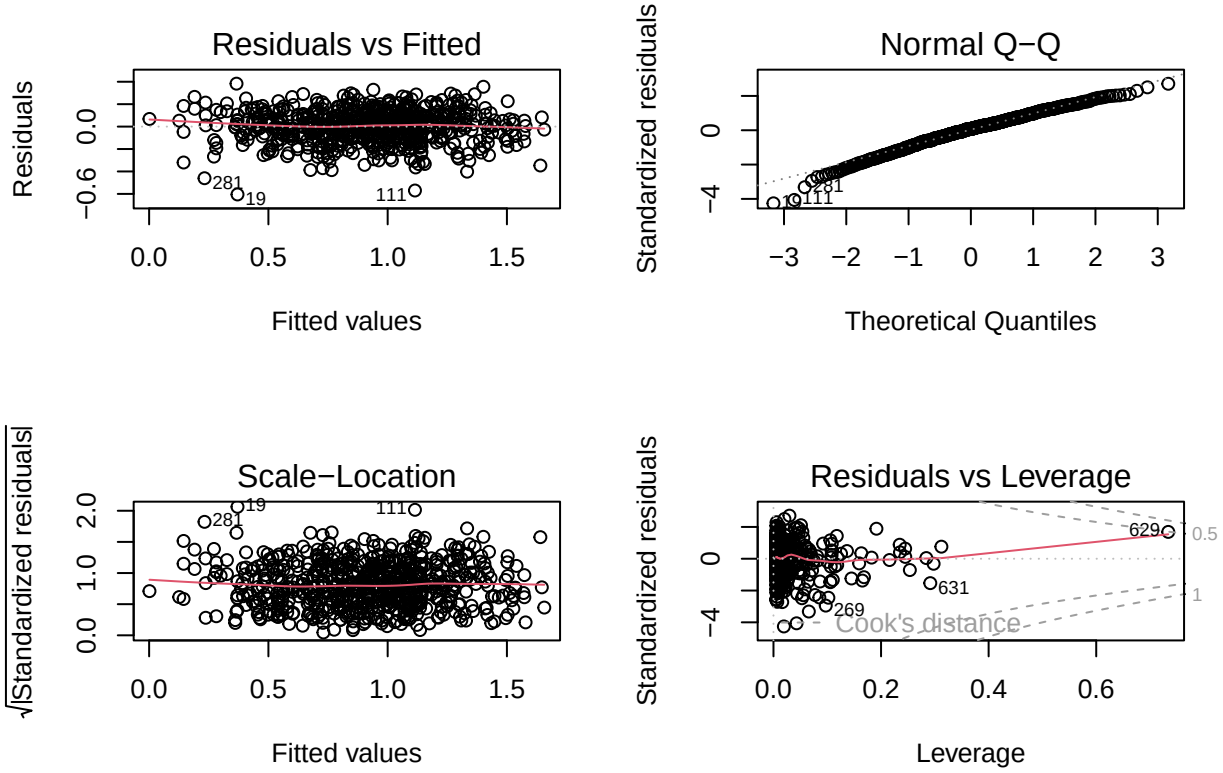
2025-01-21

```
# Ht, telesna višina v cm

lungcap$Ht <- lungcap$Ht*2.54

#  Smoke naj bo faktor z vrednostma "Ne" in "Da"

lungcap$Smoke <- factor(lungcap$Smoke, labels=c("Ne", "Da"))
levels(lungcap$Gender)
```

```
## [1] "F" "M"
```

```
# zamenjamo oznaki za spol za grafične prikaze

levels(lungcap$Gender) <- c("Ženske", "Moški")
```

```
mod2.int <- lm(log(FEV) ~ Age*Ht*Gender*Smoke, data=lungcap)
par(mfrow=c(2,2))
plot(mod2.int)
```




```
summary(mod2.int)
```

```
##
## Call:
## lm(formula = log(FEV) ~ Age * Ht * Gender * Smoke, data = lungcap)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.60494 -0.08675  0.01153  0.09379  0.38277
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                -2.546e+00  3.166e-01  -8.043 4.29e-15 ***
## Age                         1.215e-01  4.111e-02   2.954  0.00325 **
## Ht                          2.049e-02  2.153e-03   9.515  < 2e-16 ***
## GenderMoški                 9.803e-01  4.131e-01   2.373  0.01794 *
## SmokeDa                     1.205e+01  4.997e+00   2.412  0.01614 *
## Age:Ht                     -6.003e-04  2.595e-04  -2.313  0.02103 *
## Age:GenderMoški            -1.371e-01  5.095e-02  -2.692  0.00730 **
## Ht:GenderMoški             -5.876e-03  2.793e-03  -2.104  0.03579 *
## Age:SmokeDa                -8.366e-01  3.779e-01  -2.214  0.02721 *
## Ht:SmokeDa                 -7.147e-02  3.035e-02  -2.355  0.01883 *
## GenderMoški:SmokeDa        -1.388e+01  5.811e+00  -2.388  0.01722 *
## Age:Ht:GenderMoški          8.444e-04  3.158e-04   2.673  0.00770 **
## Age:Ht:SmokeDa              4.931e-03  2.297e-03   2.147  0.03219 *
```

```
## Age:GenderMoški:SmokeDa     8.748e-01  4.570e-01   1.914  0.05603 .
## Ht:GenderMoški:SmokeDa      8.236e-02  3.497e-02   2.355  0.01881 *
## Age:Ht:GenderMoški:SmokeDa -5.194e-03  2.739e-03  -1.897  0.05834 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1435 on 638 degrees of freedom
## Multiple R-squared:  0.8189, Adjusted R-squared:  0.8147
## F-statistic: 192.4 on 15 and 638 DF,  p-value: < 2.2e-16
```

Splošna enačba modela

$$\hat{y}_i = \beta_0 + \beta_1 \cdot \text{Age}_i + \beta_2 \cdot \text{Ht}_i + \beta_3 \cdot \text{Gender}_i + \beta_4 \cdot \text{Smoke}_i + \beta_5 \cdot (\text{Age}_i \cdot \text{Ht}_i) + \beta_6 \cdot (\text{Age}_i \cdot \text{Gender}_i) + \beta_7 \cdot (\text{Age}_i \cdot \text{Smoke}_i)$$
$$+ \beta_8 \cdot (\text{Ht}_i \cdot \text{Gender}_i) + \beta_9 \cdot (\text{Ht}_i \cdot \text{Smoke}_i) + \beta_{10} \cdot (\text{Gender}_i \cdot \text{Smoke}_i) + \beta_{11} \cdot (\text{Age}_i \cdot \text{Ht}_i \cdot \text{Gender}_i) + \beta_{12} \cdot (\text{Age}_i \cdot \text{Ht}_i \cdot \text{Smoke}_i)$$
$$+ \beta_{13} \cdot (\text{Age}_i \cdot \text{Gender}_i \cdot \text{Smoke}_i) + \beta_{14} \cdot (\text{Ht}_i \cdot \text{Gender}_i \cdot \text{Smoke}_i) + \beta_{15} \cdot (\text{Age}_i \cdot \text{Ht}_i \cdot \text{Gender}_i \cdot \text{Smoke}_i) + \epsilon_i$$

Ženske nekadilke

$Gender = 0$

$Smoke = 0$

$$\log(\text{FEV}) = -2.55 + 0.12 \cdot \text{Age} + 0.02 \cdot \text{Ht} - 0.0006 \cdot (\text{Age} \cdot \text{Ht})$$

Ženske kadilke

$Gender = 0$

$Smoke = 1$

$$\log(\text{FEV}) = (-2.55 + 12.05) + (0.12 - 0.84) \cdot \text{Age} + (0.02 - 0.07) \cdot \text{Ht}$$
$$+ (0.005 - 0.0006) \cdot (\text{Age} \cdot \text{Ht})$$

Moški nekadilci

$Gender = 1$

$Smoke = 0$

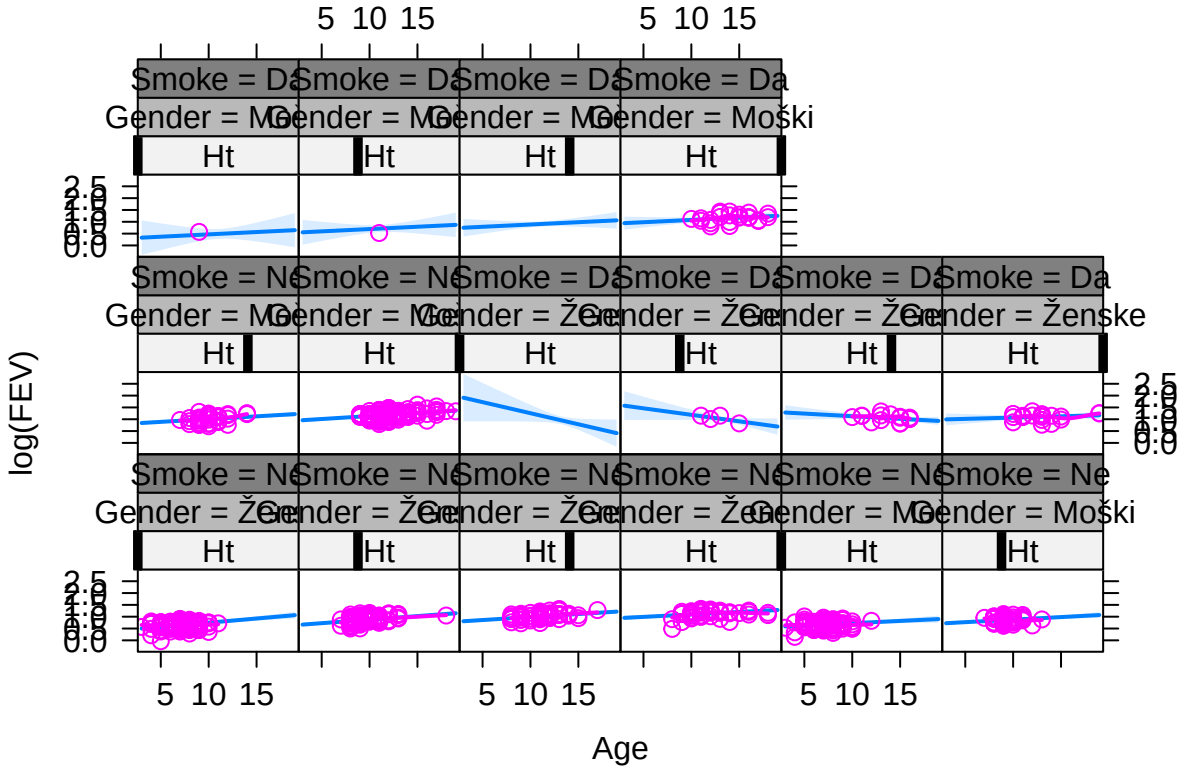
$$\log(\text{FEV}) = (-2.55 + 0.98) + (0.12 - 0.14) \cdot \text{Age} + (0.02 - 0.006) \cdot \text{Ht}$$
$$+ (0.0008 - 0.0006) \cdot (\text{Age} \cdot \text{Ht})$$

Moški kadilci

$Gender = 1$

$Smoke = 1$

$$\log(\text{FEV}) = (-2.55 + 0.98 + 12.05 - 13.88) + (-0.14 - 0.84 + 0.87) \cdot \text{Age}$$
$$+(-0.006 - 0.07 + 0.08) \cdot \text{Ht} + (0.0008 + 0.005 - 0.005 - 0.0006) \cdot (\text{Age} \cdot \text{Ht})$$



Iz zgornjega grafa lahko razberemo, da so nekatere skupine povsem nezastopane (Najnižji starostni skupini, med kadilci tako pri moških kot tudi pri ženskah) Vidimo tudi da ima tako pri moških nekadilcih kot tudi ženskah nekadilkah premica vočji naklon kot pri moških kadilcih oz. ženskih kadilkah. Prav tako lahko opazimo, da se log(FEV) pri moških nekadilcih z leti bolj povečuje kot pri ženskah nekadilkah.