The effect of pollution on women's health in the U.S., China, India, Brazil, and Russia

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/newpage

```
##
## Call:
## lm(formula = SDG_Data.short$GDP ~ SDG_Data.short$CO2)
##
## Coefficients:
##        (Intercept)  SDG_Data.short$CO2
##               3952                1964
##
## Call:
## lm(formula = SDG_Data.short$GDP ~ SDG_Data.short$CO2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -23385.1  -5850.0     18.3   9416.4  21473.5
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)          3952.0     6466.0   0.611   0.5535
## SDG_Data.short$CO2   1963.6      641.1   3.063   0.0108 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 13920 on 11 degrees of freedom
## Multiple R-squared:  0.4602, Adjusted R-squared:  0.4112
## F-statistic: 9.379 on 1 and 11 DF,  p-value: 0.0108
##
## Call:
## lm(formula = SDG_Data.short$GDP ~ SDG_Data.short$PM2.5)
```

Table 1: Summary Statistics of Variables in Countries

Variable	Mean	Median	Standard Deviation
Access to clean fuels and technologies for cooking (% of population)	79.9320	95.9900	30.600
CO2 emissions (metric tons per capita)	8.0916	7.3985	6.265
GDP per capita (current US$)	19840.0000	13574.0000	18130.000
Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70, female (%)	14.0920	13.8000	5.522
PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	34.3370	16.6400	33.200
Renewable electricity output (% of total electricity output)	27.0110	18.1950	21.290

```
## 
## Coefficients:
##          (Intercept)  SDG_Data.short$PM2.5
##             28776.8                  -260.3
## 
## Call:
## lm(formula = SDG_Data.short$GDP ~ SDG_Data.short$PM2.5)
## 
## Residuals:
##    Min     1Q Median    3Q    Max
## -21114 -11180  -5338  15701  30144
## 
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)           28776.8     6785.0   4.241  0.00139 **
## SDG_Data.short$PM2.5   -260.3      144.8  -1.798  0.09968 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 16650 on 11 degrees of freedom
## Multiple R-squared:  0.2271, Adjusted R-squared:  0.1568
## F-statistic: 3.232 on 1 and 11 DF,  p-value: 0.09968
## 
## Call:
## lm(formula = SDG_Data.short$PM2.5 ~ SDG_Data.short$Mortality)
## 
## Coefficients:
##          (Intercept)  SDG_Data.short$Mortality
##              -10.317                     3.169
## 
## Call:
## lm(formula = SDG_Data.short$PM2.5 ~ SDG_Data.short$Mortality)
## 
## Residuals:
##     Min     1Q Median    3Q    Max
## -45.289 -18.376  -5.692  9.667  62.120
## 
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)               -10.317     23.201  -0.445   0.6652
## SDG_Data.short$Mortality    3.169      1.541   2.057   0.0642 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 29.47 on 11 degrees of freedom
## Multiple R-squared:  0.2777, Adjusted R-squared:  0.2121
## F-statistic:  4.23 on 1 and 11 DF,  p-value: 0.06424
## 
## Call:
## lm(formula = SDG_Data.short$CO2 ~ SDG_Data.short$Renew)
## 
## Coefficients:
```

```
##          (Intercept)  SDG_Data.short$Renew
##             9.6502                -0.0577

##
## Call:
## lm(formula = SDG_Data.short$CO2 ~ SDG_Data.short$Renew)
##
## Residuals:
##    Min    1Q Median    3Q    Max
## -7.960 -3.362 -0.871  3.050 10.752
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)         9.65017    2.94801   3.273  0.00742 **
## SDG_Data.short$Renew -0.05770    0.08701  -0.663  0.52088
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.417 on 11 degrees of freedom
## Multiple R-squared:  0.03844,   Adjusted R-squared:  -0.04897
## F-statistic: 0.4398 on 1 and 11 DF,  p-value: 0.5209

##
## Call:
## lm(formula = SDG_Data.short$Mortality ~ SDG_Data.short$Renew)
##
## Coefficients:
##          (Intercept)  SDG_Data.short$Renew
##             16.61404                -0.09336

##
## Call:
## lm(formula = SDG_Data.short$Mortality ~ SDG_Data.short$Renew)
##
## Residuals:
##     Min    1Q Median    3Q    Max
## -9.322 -2.431 -1.587  4.091  9.085
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)         16.61404    2.47225   6.720 3.29e-05 ***
## SDG_Data.short$Renew -0.09336    0.07297  -1.279    0.227
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.381 on 11 degrees of freedom
## Multiple R-squared:  0.1295, Adjusted R-squared:  0.05041
## F-statistic: 1.637 on 1 and 11 DF,  p-value: 0.2271
```
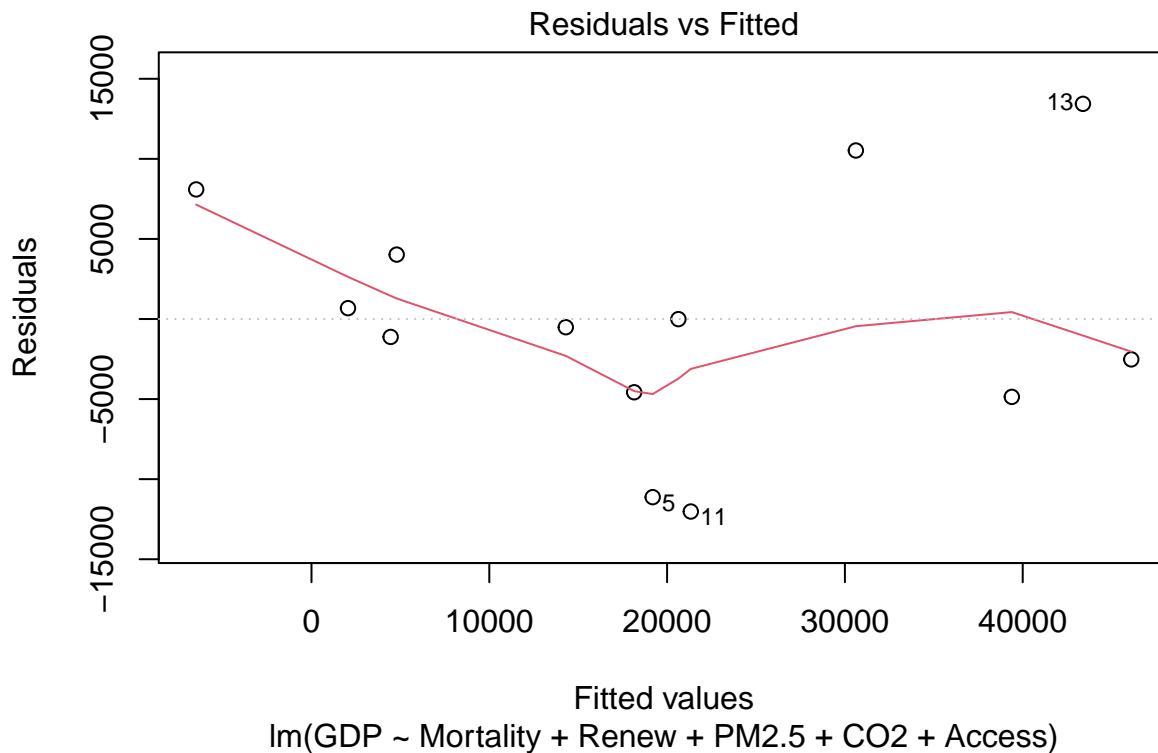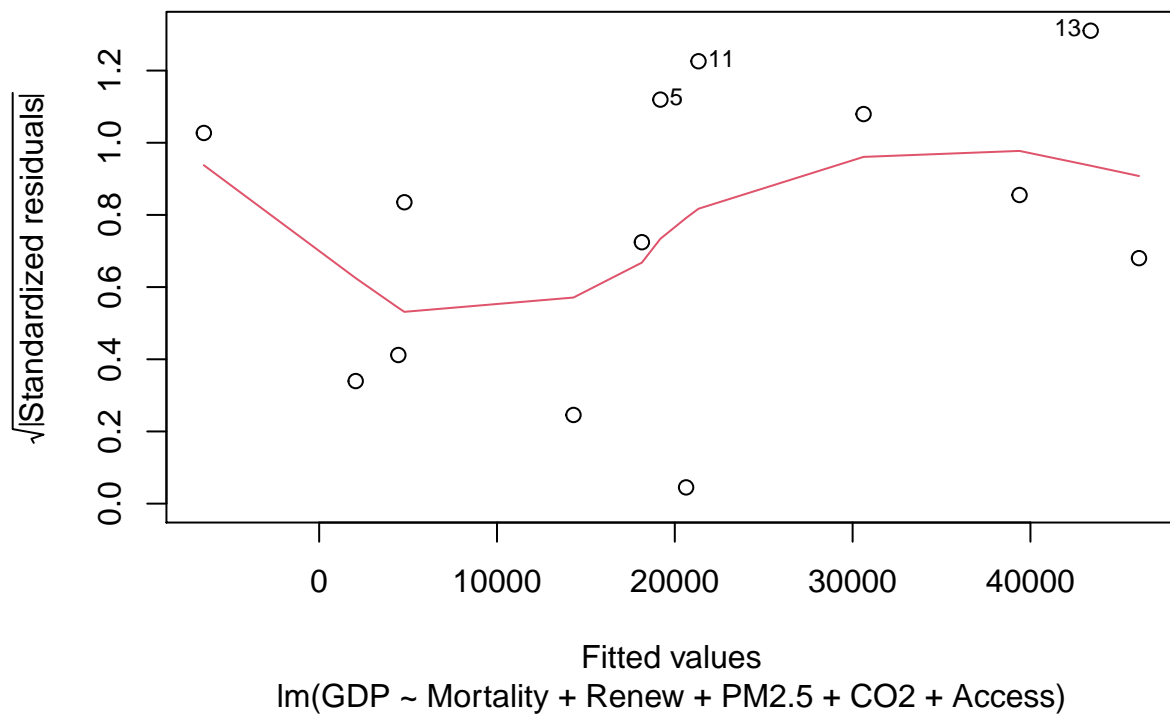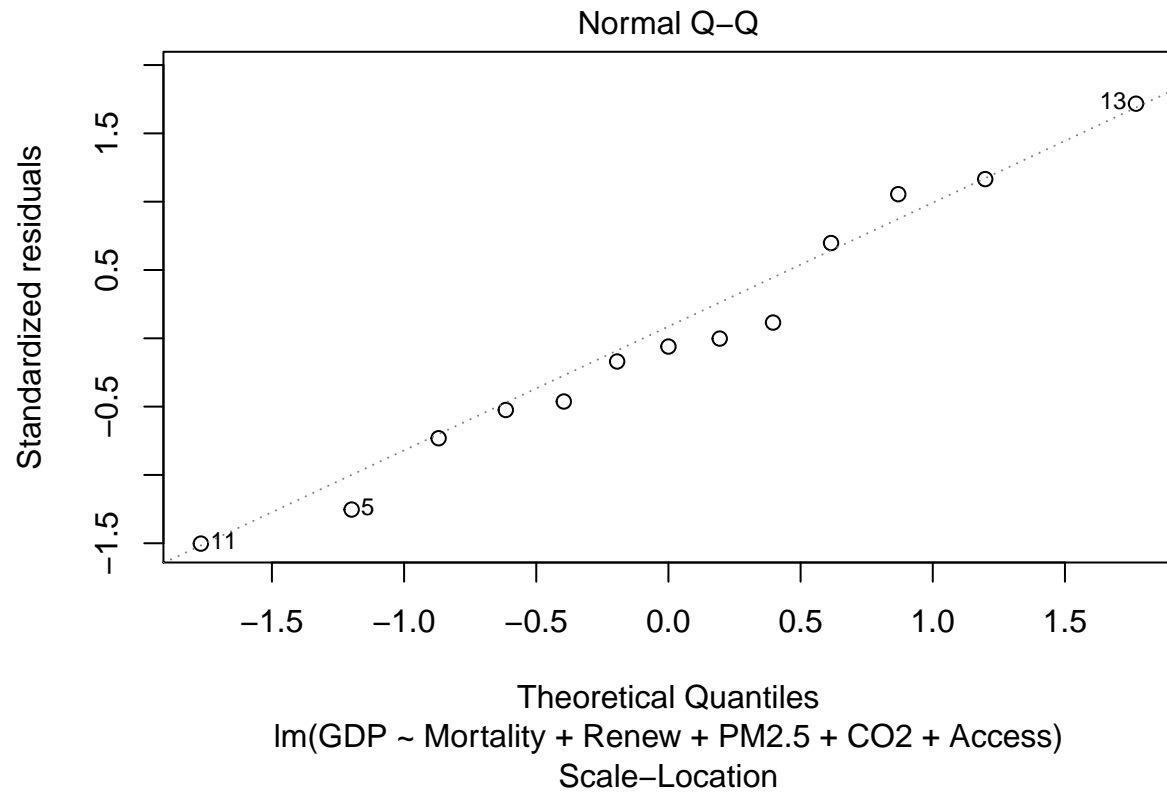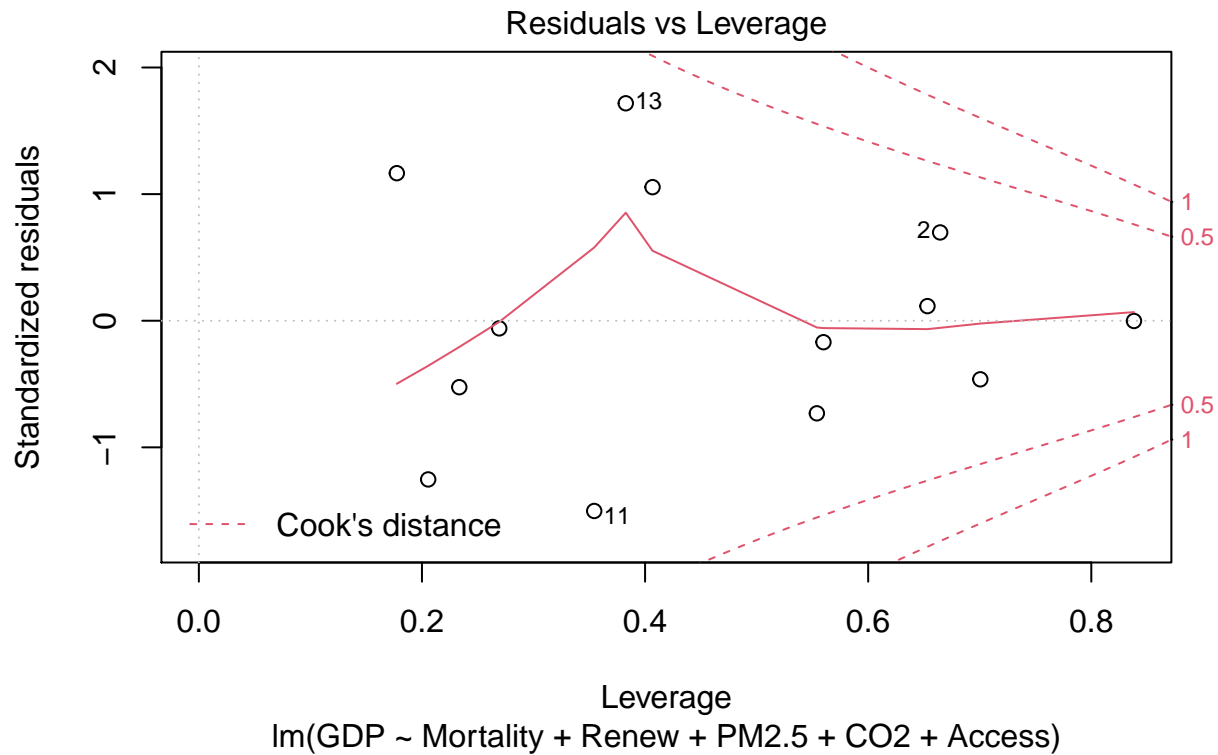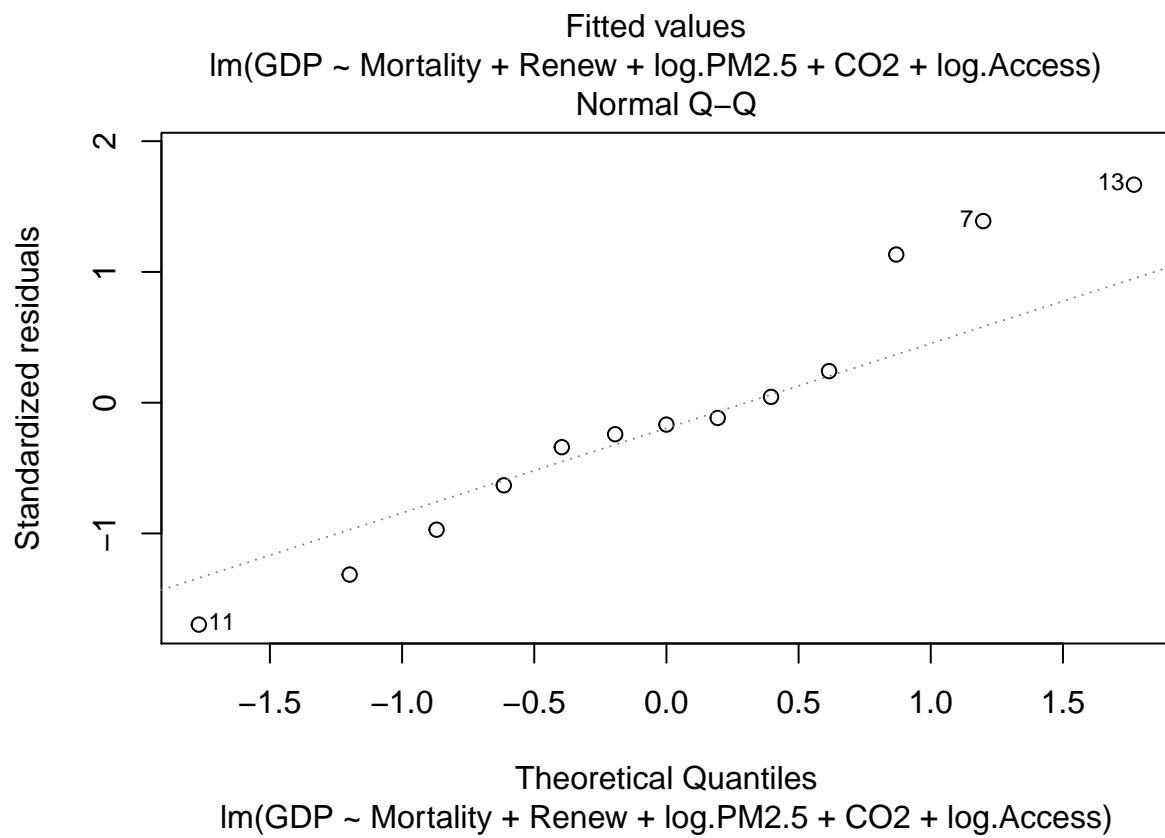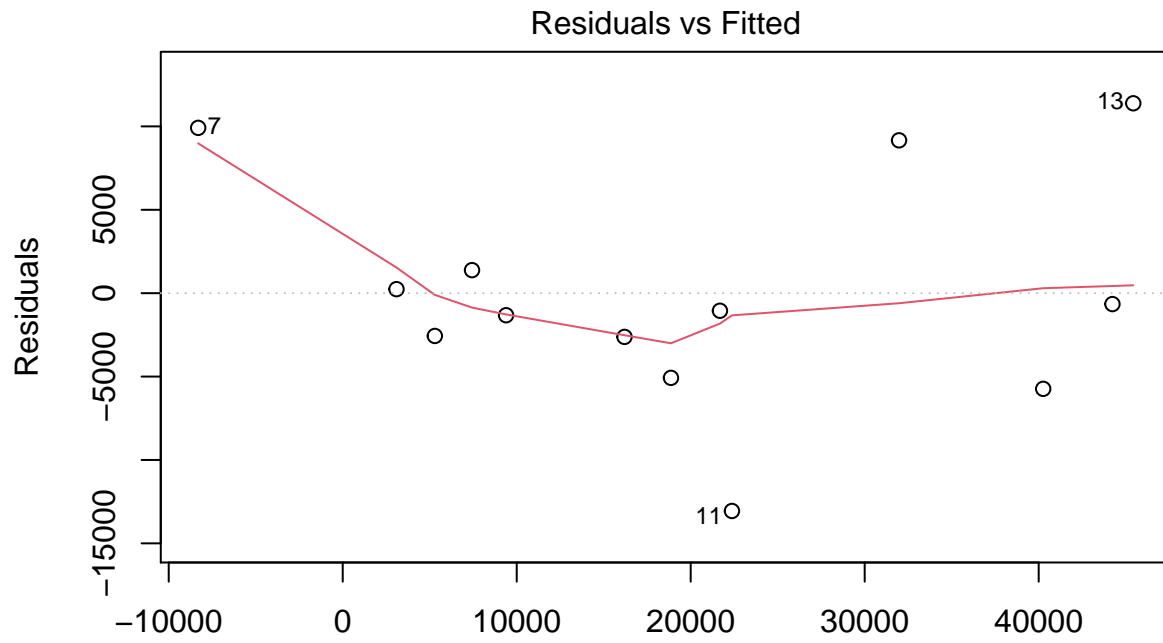
##
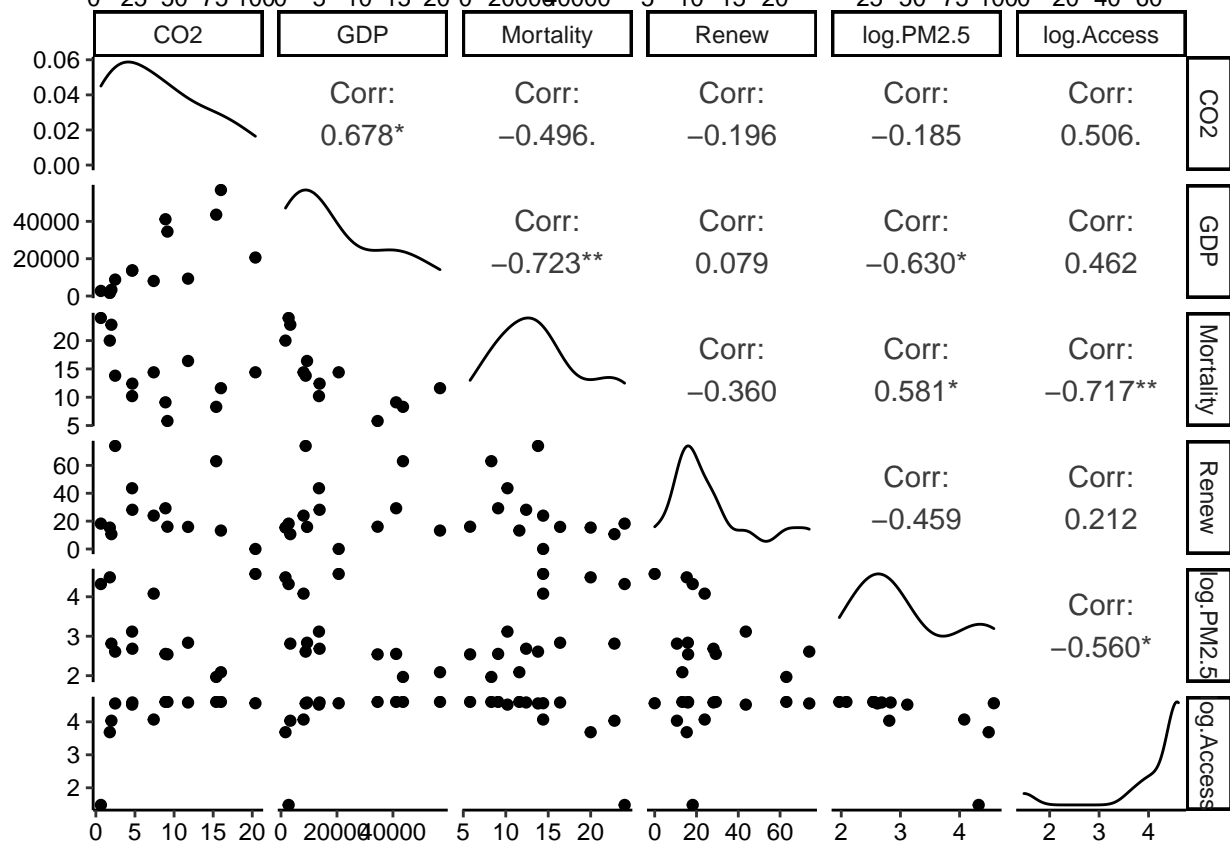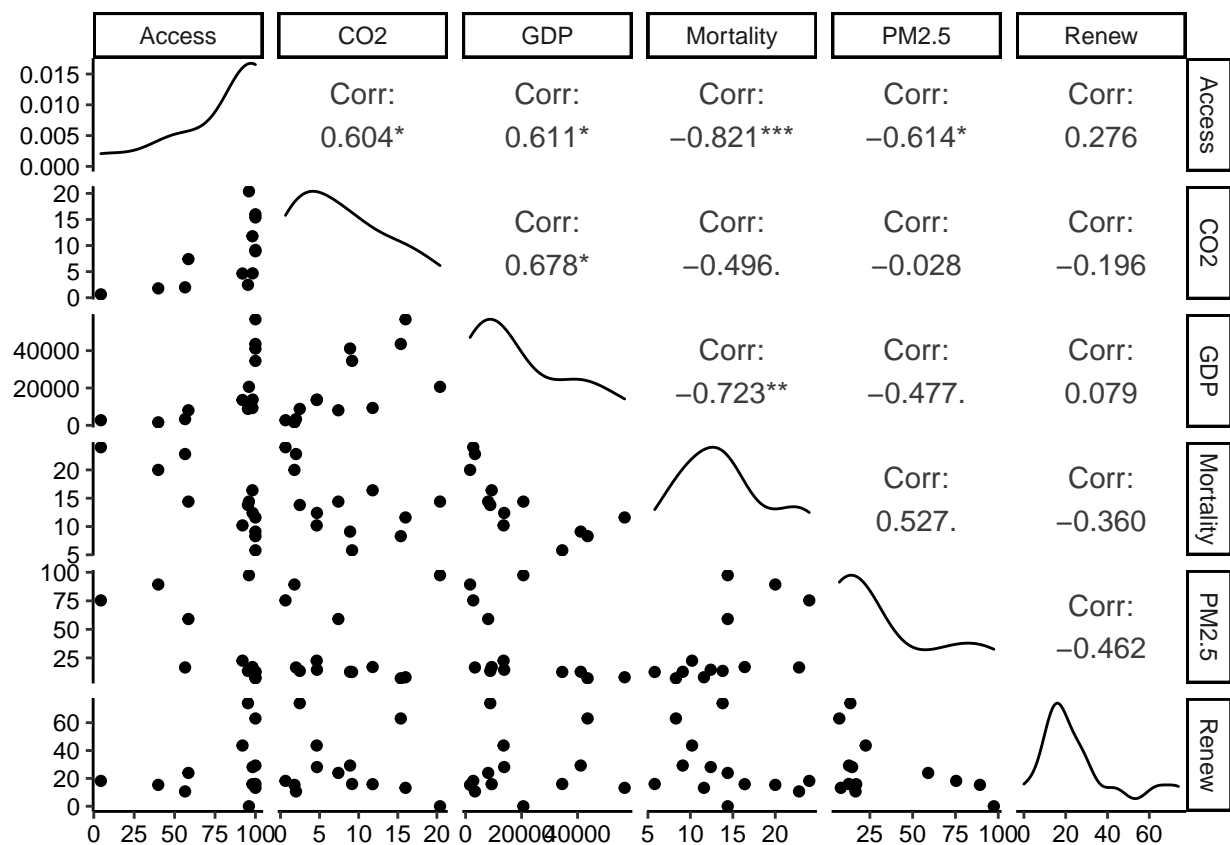
```
## Call:
## lm(formula = GDP ~ Mortality + Renew + PM2.5 + CO2 + Access,
##     data = SDG_Data.short)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12020.6  -4574.9   -513.6   4021.8  13434.4
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 80952.90   28902.36    2.801   0.0265 *
## Mortality   -2193.66     947.64   -2.315   0.0538 .
## Renew         -70.21     168.19   -0.417   0.6889
## PM2.5        -324.42     132.65   -2.446   0.0444 *
## CO2          2198.56     735.93    2.987   0.0203 *
## Access       -437.28     218.60   -2.000   0.0856 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9957 on 7 degrees of freedom
## Multiple R-squared:  0.8241, Adjusted R-squared:  0.6985
## F-statistic: 6.561 on 5 and 7 DF,  p-value: 0.0142
```


Residuals vs Fitted
lm(GDP ~ Mortality + Renew + PM2.5 + CO2 + Access)

Normal Q–Q

lm(GDP ~ Mortality + Renew + PM2.5 + CO2 + Access)

Scale–Location

lm(GDP ~ Mortality + Renew + PM2.5 + CO2 + Access)

6

Residuals vs Leverage

lm(GDP ~ Mortality + Renew + PM2.5 + CO2 + Access)
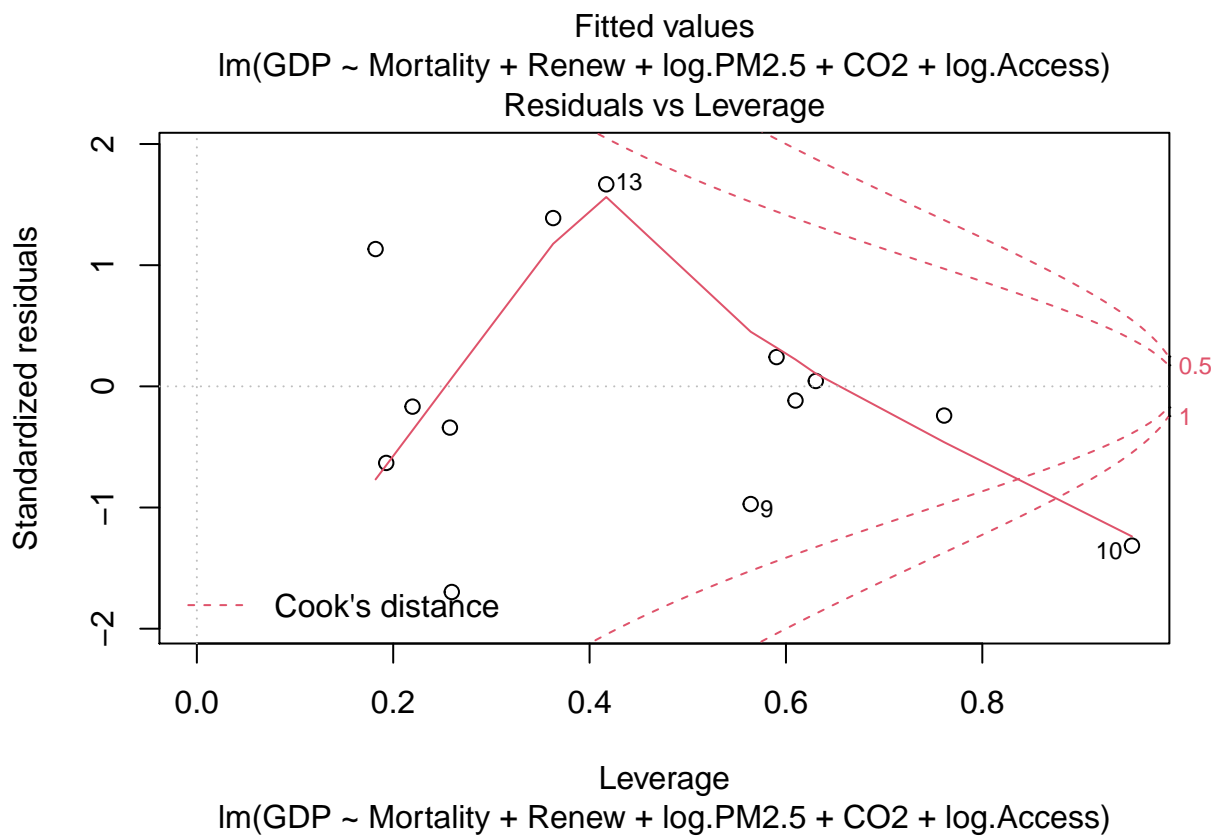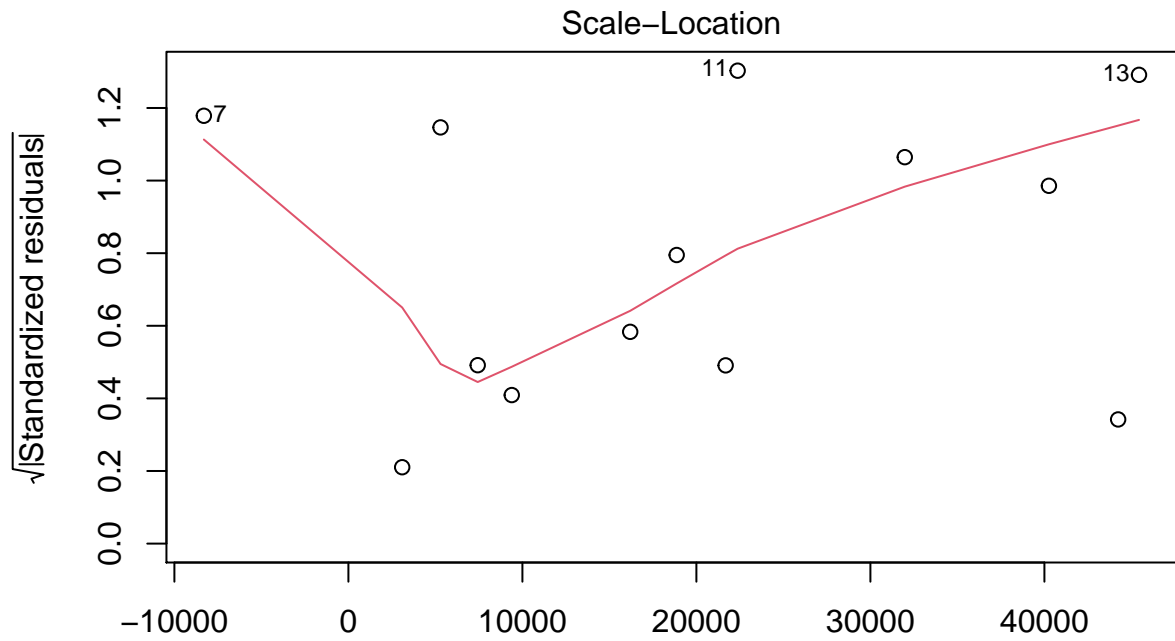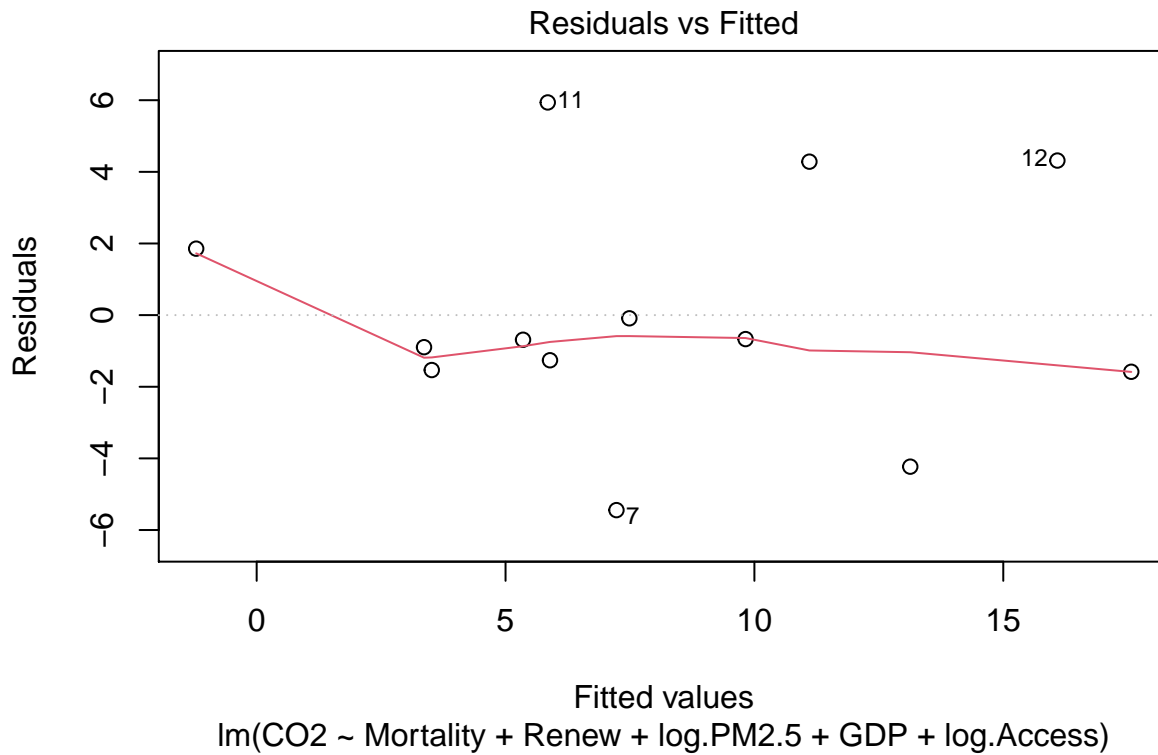
```
## 
## Call:
## lm(formula = GDP ~ Mortality + Renew + log.PM2.5 + CO2 + log.Access,
##     data = SDG_Data.short)
## 
## Residuals:
##    Min     1Q Median     3Q    Max
## -13058  -2622  -1053   1382  11385
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 111240.5    31958.5   3.481   0.0103 *
## Mortality    -1760.3      778.4  -2.261   0.0582 .
## Renew         -149.9      153.8  -0.975   0.3620
## log.PM2.5   -11084.7     3844.7  -2.883   0.0235 *
## CO2           1455.6      553.1   2.632   0.0338 *
## log.Access   -9454.0     4625.6  -2.044   0.0803 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 8942 on 7 degrees of freedom
## Multiple R-squared:  0.8582, Adjusted R-squared:  0.7568
## F-statistic:  8.47 on 5 and 7 DF,  p-value: 0.007003
```

Residuals vs Fitted

Fitted values
lm(GDP ~ Mortality + Renew + log.PM2.5 + CO2 + log.Access)

Normal Q-Q

Theoretical Quantiles
lm(GDP ~ Mortality + Renew + log.PM2.5 + CO2 + log.Access)

Scale–Location

√|Standardized residuals|

Fitted values
lm(GDP ~ Mortality + Renew + log.PM2.5 + CO2 + log.Access)

Residuals vs Leverage

Standardized residuals

Cook's distance

Leverage
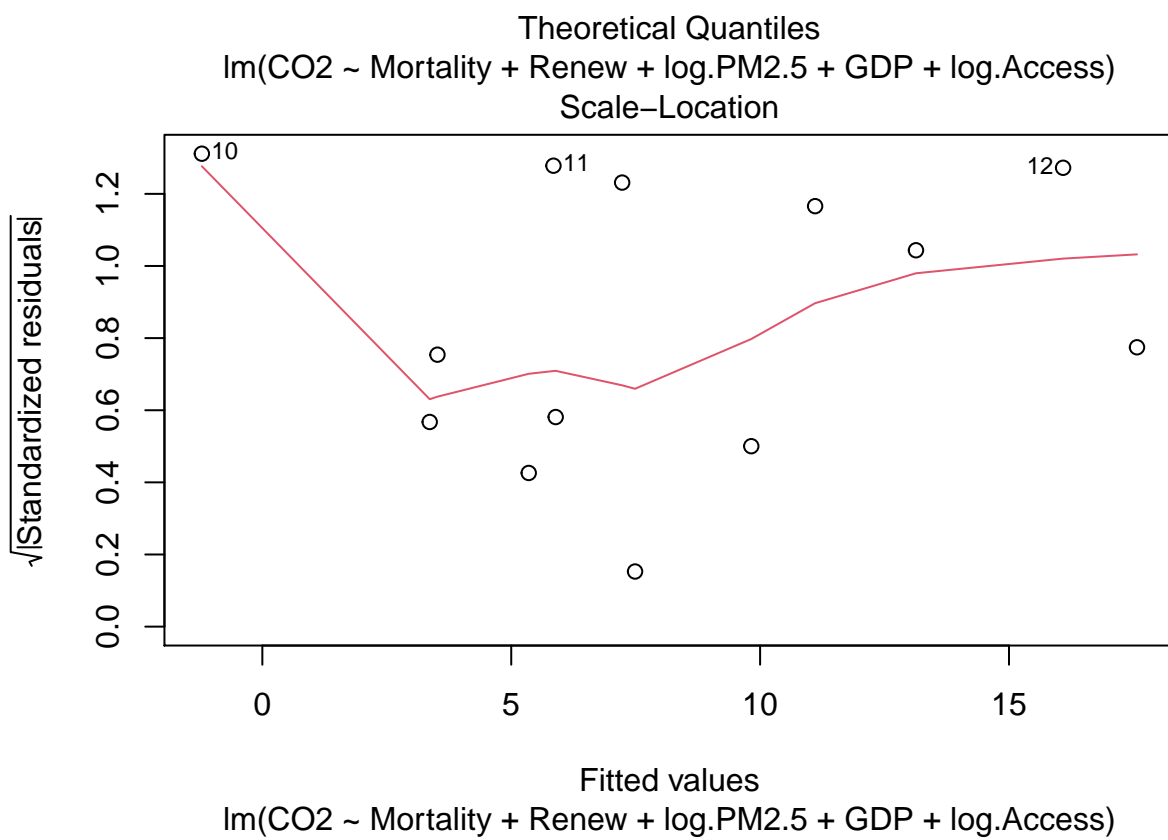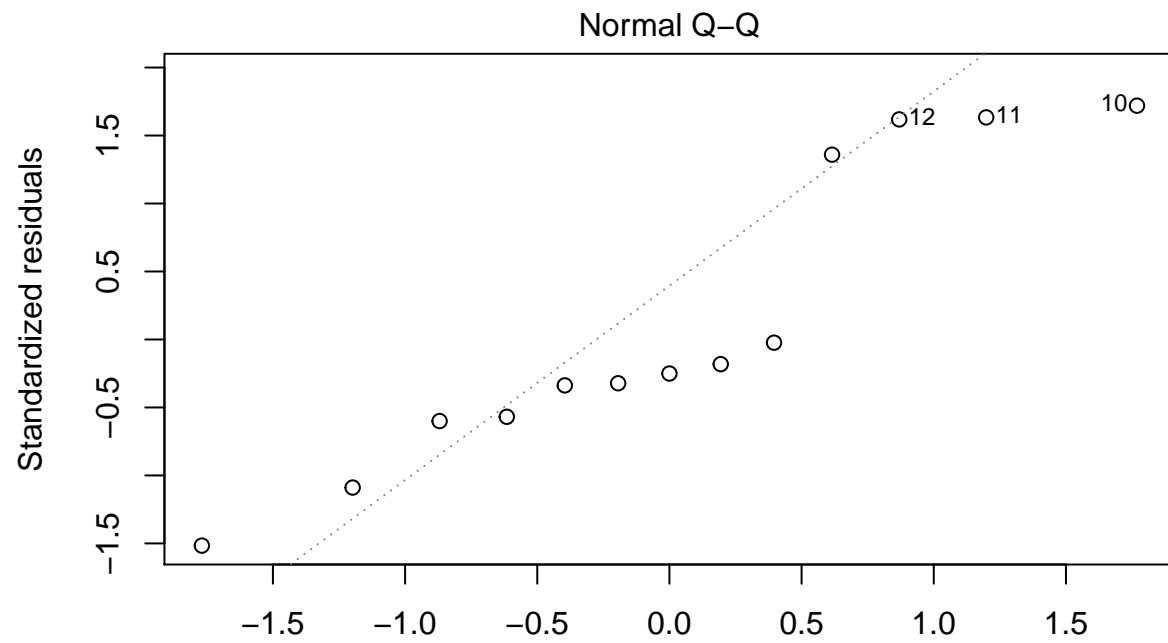lm(GDP ~ Mortality + Renew + log.PM2.5 + CO2 + log.Access)
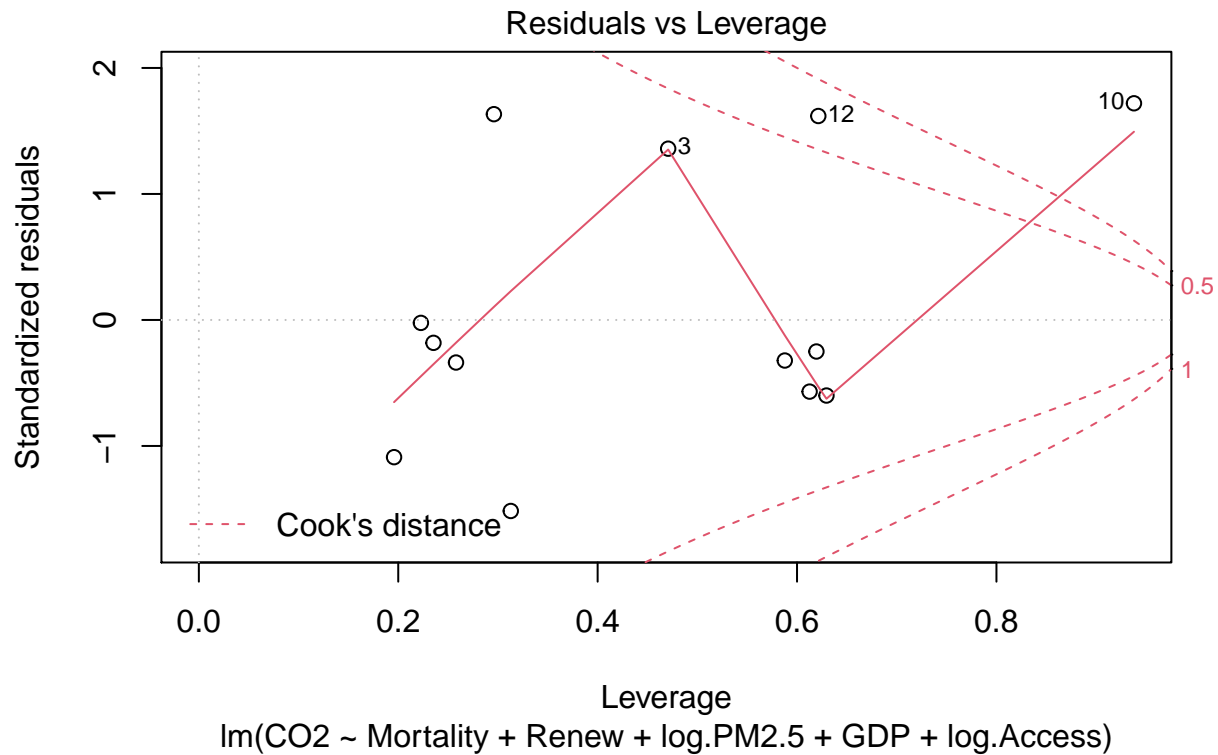
```
##
## Call:
## lm(formula = CO2 ~ Mortality + Renew + log.PM2.5 + GDP + log.Access,
##     data = SDG_Data.short)
##
## Residuals:
```
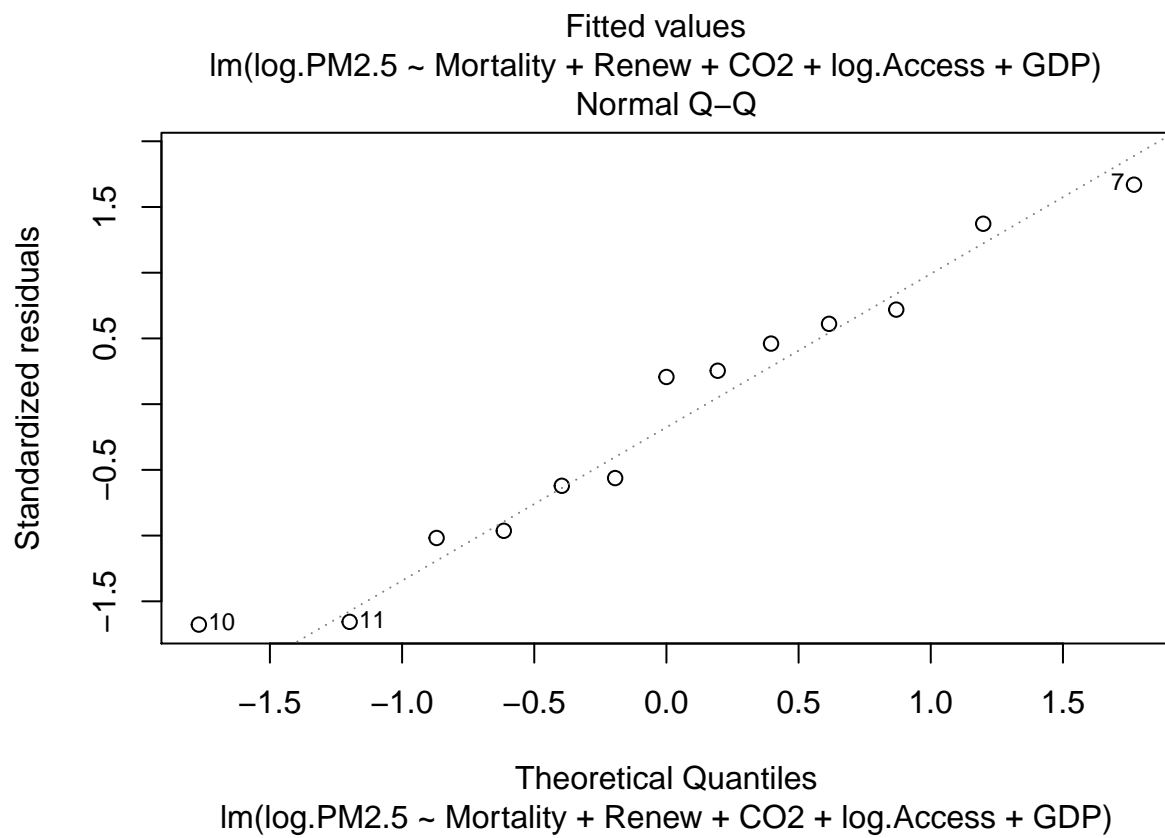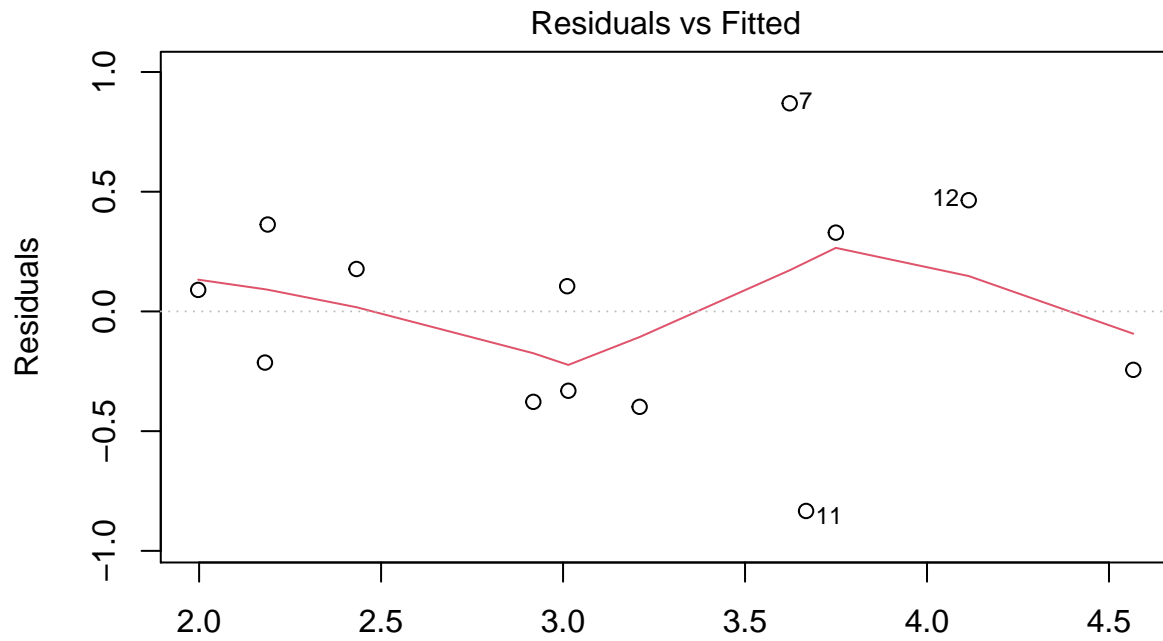
```
##     Min     1Q  Median     3Q     Max
## -5.4440 -1.5334 -0.6877  1.8555  5.9373
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.376e+01  2.218e+01  -1.522   0.1717
## Mortality    3.336e-01  4.798e-01   0.695   0.5093
## Renew       -7.241e-03  7.934e-02  -0.091   0.9298
## log.PM2.5    4.024e+00  2.297e+00   1.752   0.1233
## GDP          3.417e-04  1.298e-04   2.632   0.0338 *
## log.Access   4.288e+00  2.322e+00   1.846   0.1073
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.332 on 7 degrees of freedom
## Multiple R-squared:  0.7211, Adjusted R-squared:  0.5219
## F-statistic:  3.62 on 5 and 7 DF,  p-value: 0.06171
```

Residuals vs Fitted

Fitted values
lm(CO2 ~ Mortality + Renew + log.PM2.5 + GDP + log.Access)

10

Normal Q–Q

Standardized residuals

Theoretical Quantiles
lm(CO2 ~ Mortality + Renew + log.PM2.5 + GDP + log.Access)

Scale–Location

$\sqrt{|\text{Standardized residuals}|}$

Fitted values
lm(CO2 ~ Mortality + Renew + log.PM2.5 + GDP + log.Access)

Residuals vs Leverage

lm(CO2 ~ Mortality + Renew + log.PM2.5 + GDP + log.Access)
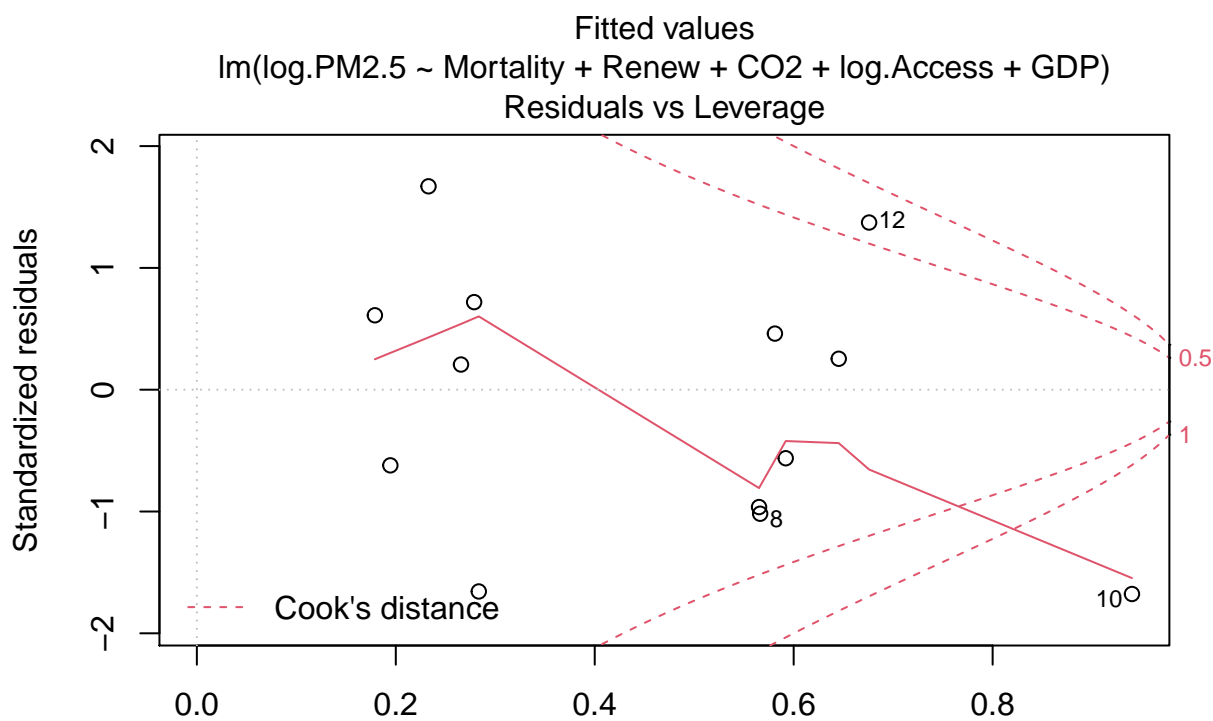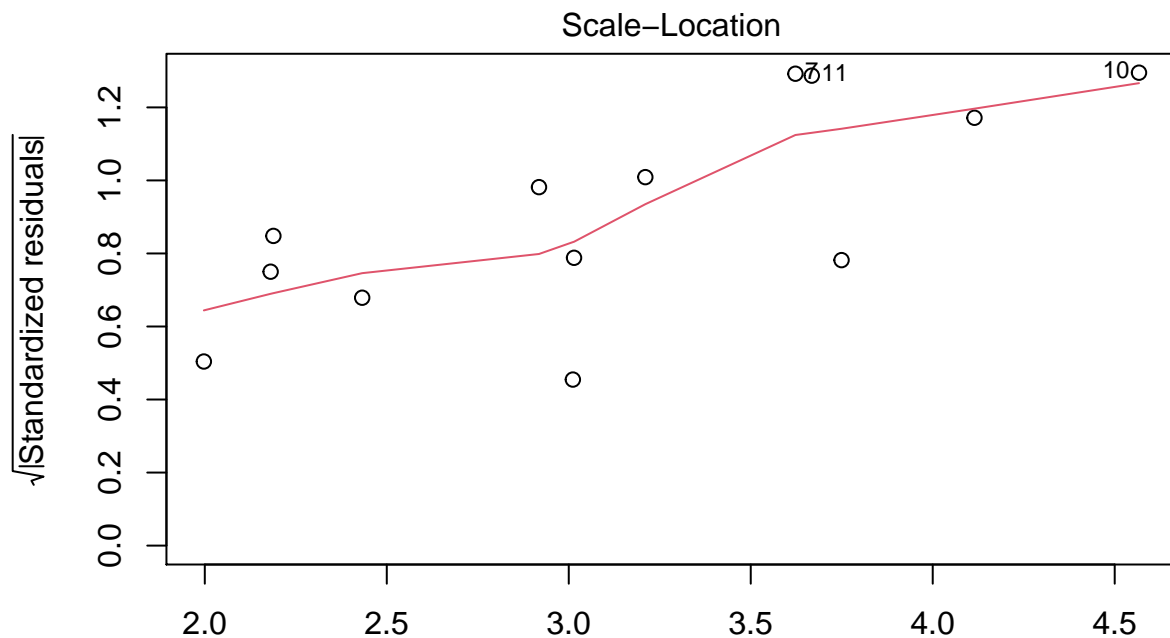
```
## 
## Call:
## lm(formula = log.PM2.5 ~ Mortality + Renew + CO2 + log.Access +
##     GDP, data = SDG_Data.short)
## 
## Residuals:
##      Min      1Q   Median      3Q      Max
## -0.83337 -0.33133  0.08997  0.32913  0.86930
## 
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.394e+00  2.124e+00   3.481   0.0103 *
## Mortality   -6.584e-02  6.335e-02  -1.039   0.3332
## Renew       -1.279e-02  9.761e-03  -1.310   0.2316
## CO2          7.575e-02  4.324e-02   1.752   0.1233
## log.Access  -6.280e-01  3.076e-01  -2.042   0.0805 .
## GDP         -4.897e-05  1.699e-05  -2.883   0.0235 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.5944 on 7 degrees of freedom
## Multiple R-squared:  0.7541, Adjusted R-squared:  0.5785
## F-statistic: 4.294 on 5 and 7 DF,  p-value: 0.04165
```

Residuals vs Fitted

Fitted values
lm(log.PM2.5 ~ Mortality + Renew + CO2 + log.Access + GDP)

Normal Q–Q

Theoretical Quantiles
lm(log.PM2.5 ~ Mortality + Renew + CO2 + log.Access + GDP)

Scale–Location

Fitted values
lm(log.PM2.5 ~ Mortality + Renew + CO2 + log.Access + GDP)
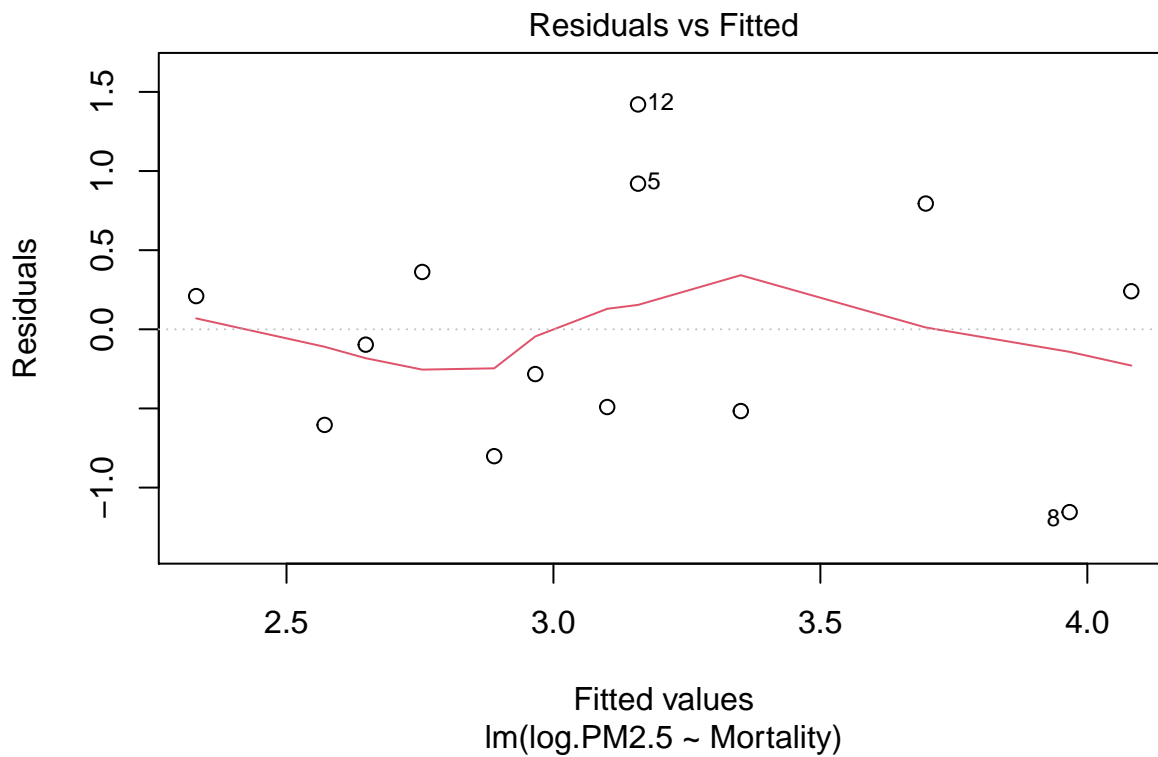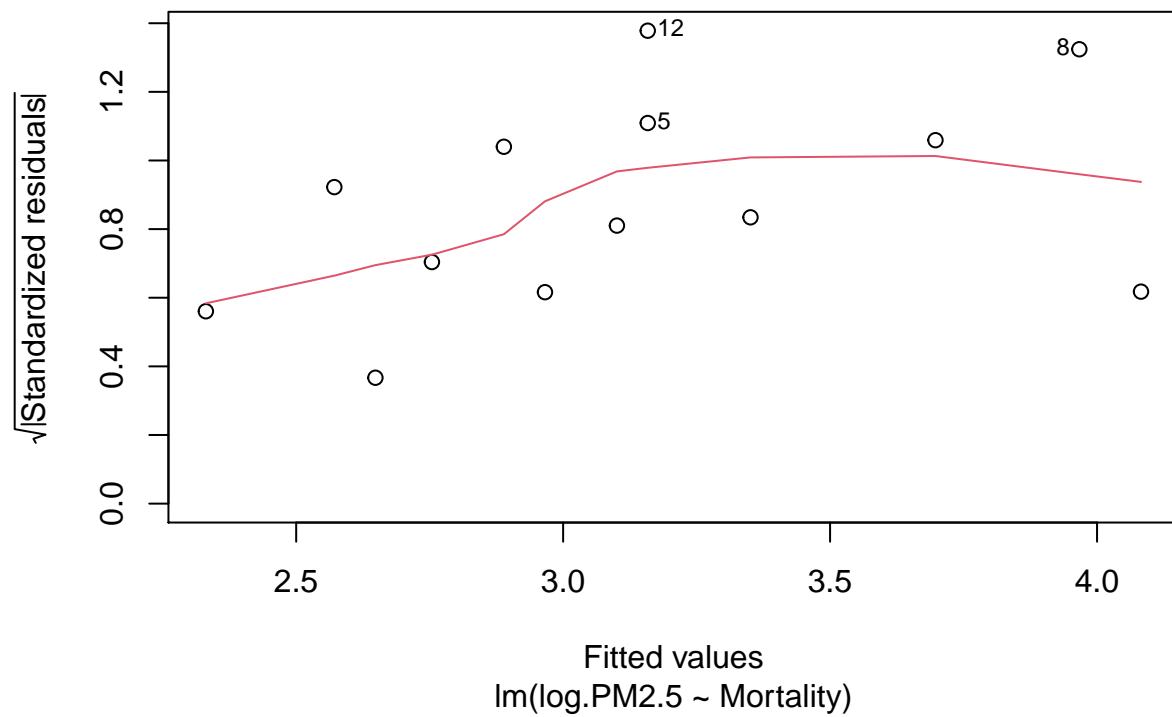
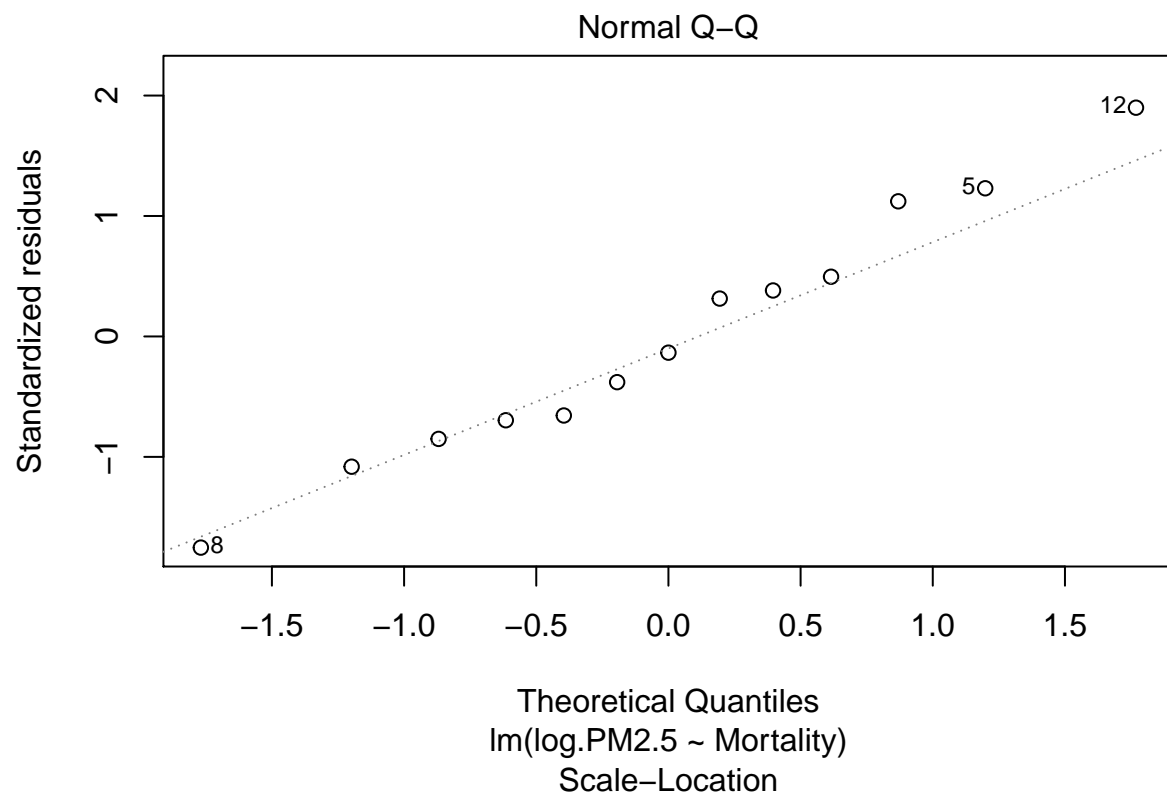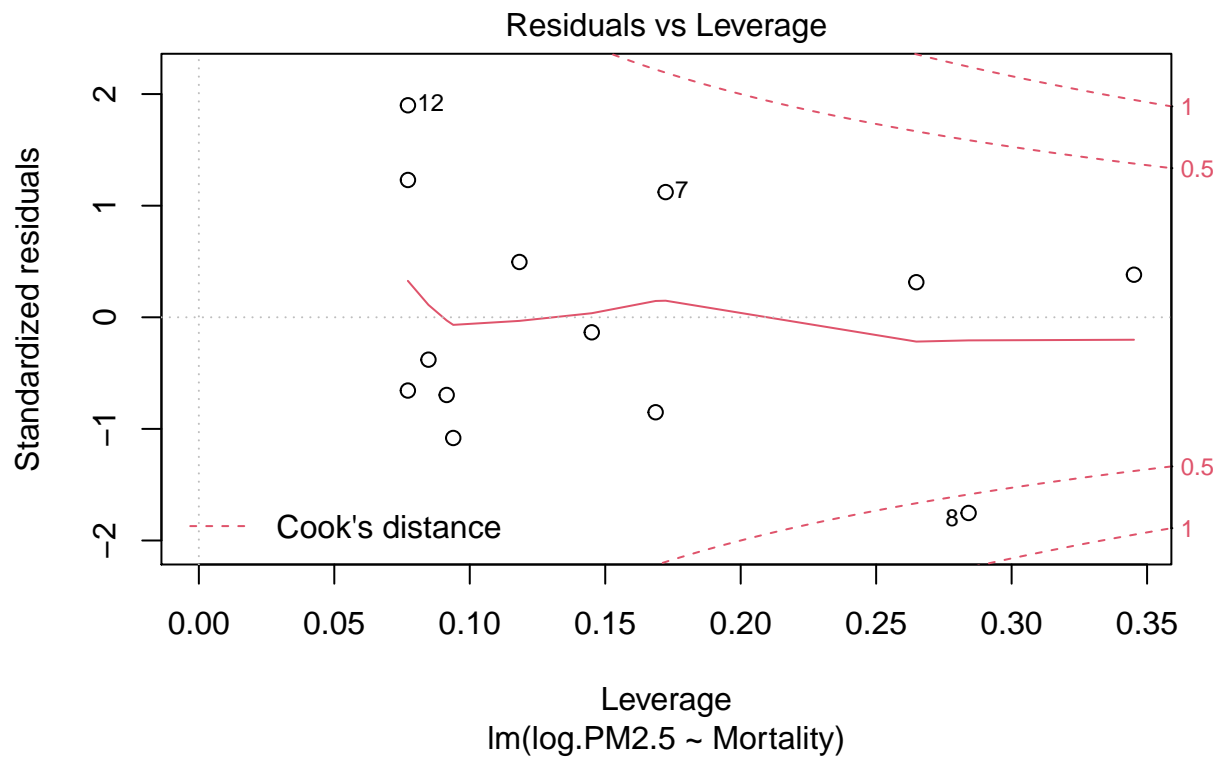Residuals vs Leverage

Leverage
lm(log.PM2.5 ~ Mortality + Renew + CO2 + log.Access + GDP)

```
##             Df Sum Sq Mean Sq F value Pr(>F)
## Mortality    1  3.389   3.389   5.591 0.0375 *
## Residuals   11  6.669   0.606
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
```
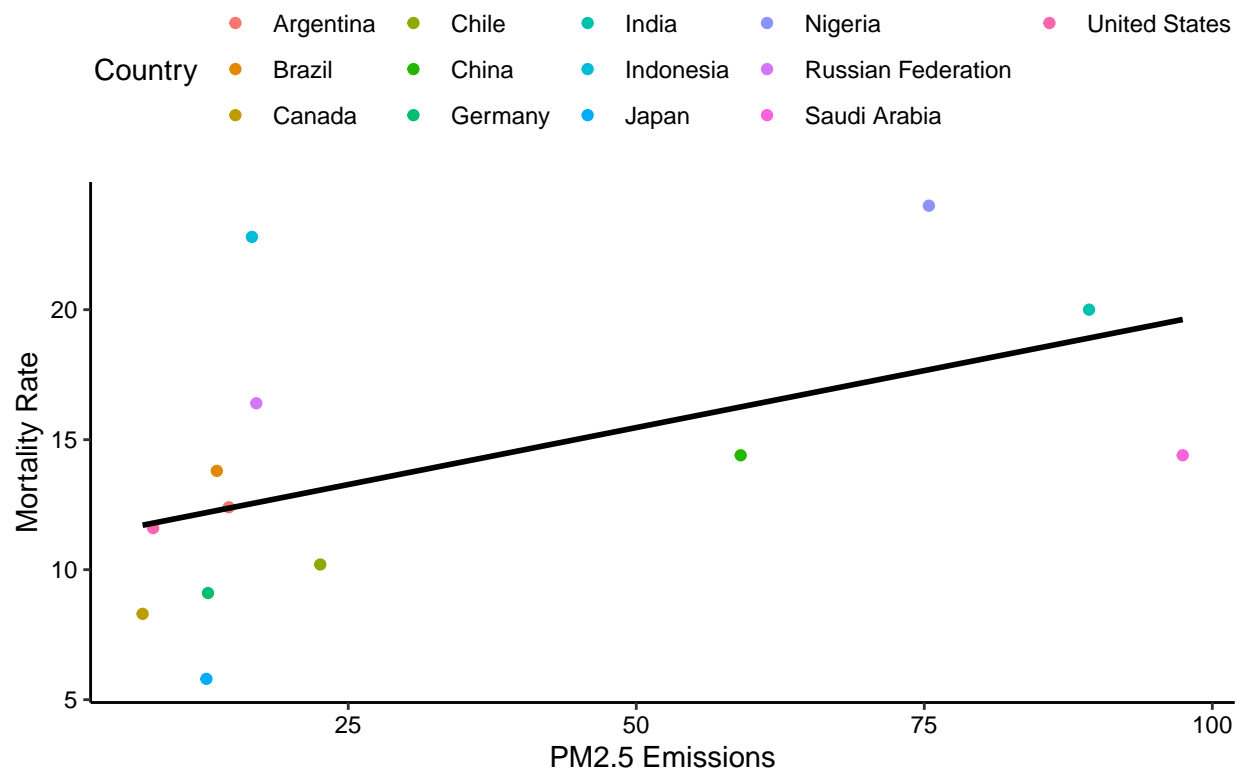
```
## Call:
## lm(formula = log.PM2.5 ~ Mortality, data = SDG_Data.short)
##
## Residuals:
##      Min      1Q   Median       3Q      Max
## -1.15503 -0.51660 -0.09692  0.36235  1.42069
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.77264    0.61288   2.892   0.0146 *
## Mortality    0.09624    0.04070   2.364   0.0375 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7786 on 11 degrees of freedom
## Multiple R-squared:  0.337,  Adjusted R-squared:  0.2767
## F-statistic: 5.591 on 1 and 11 DF,  p-value: 0.03752
```

Residuals vs Fitted

lm(log.PM2.5 ~ Mortality)

Normal Q–Q

lm(log.PM2.5 ~ Mortality)

Scale–Location

Fitted values
lm(log.PM2.5 ~ Mortality)

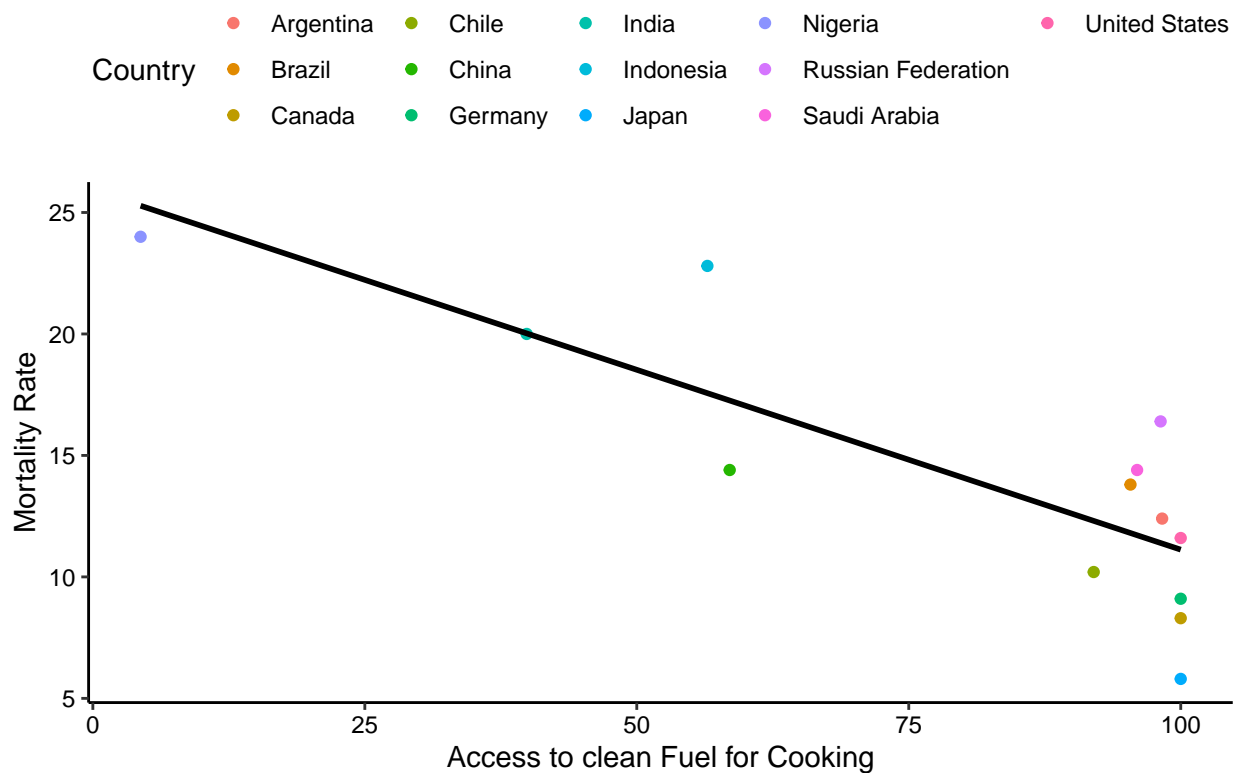Residuals vs Leverage

lm(log.PM2.5 ~ Mortality)

PM2.5 and Mortality

Access to Clean Cooking Fuels and Mortality

Access to Clean Cooking Fuels and GDP