GDP_Analysis

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Imports & Pre-processing

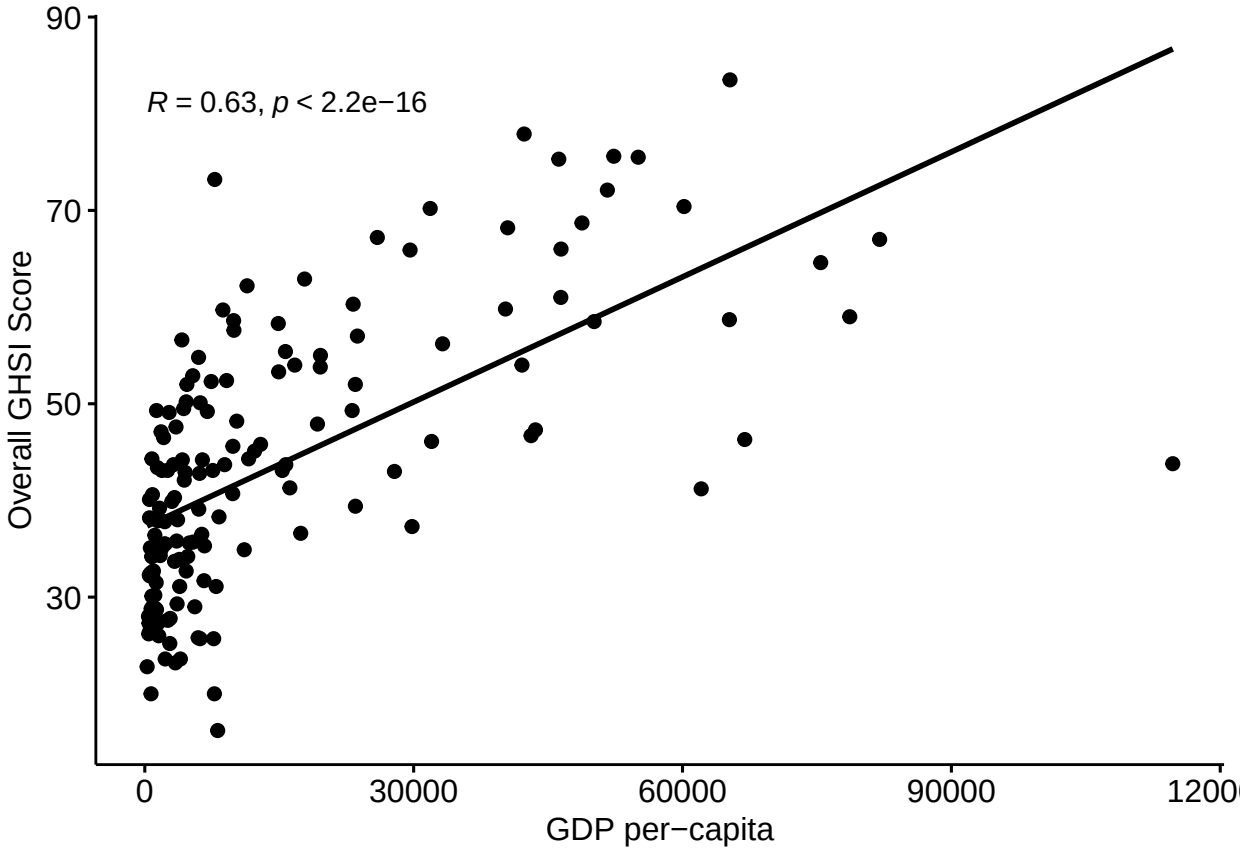
```
# import libraries
library(tidyverse)
library(lubridate)
library(ggpubr)
library(dplyr)

# load sixmonth data, omitting NA values
sixmonth_data = na.omit(read.csv(".\\prepped_data\\six_month_outlier_screened.csv", check.names = FALSE)

# add gdp_pc quartile
sixmonth_data$gdp_pc_quartile <- ntile(sixmonth_data$gdp_pc, 4)
```

Correlation between GDP per-capita and overall GHSI index

```
ggscatter(sixmonth_data,x='gdp_pc' ,y='overall',
          add='reg.line',cor.coef=TRUE,cor.method='pearson',
          xlab='GDP per-capita',ylab='Overall GHSI Score')
```



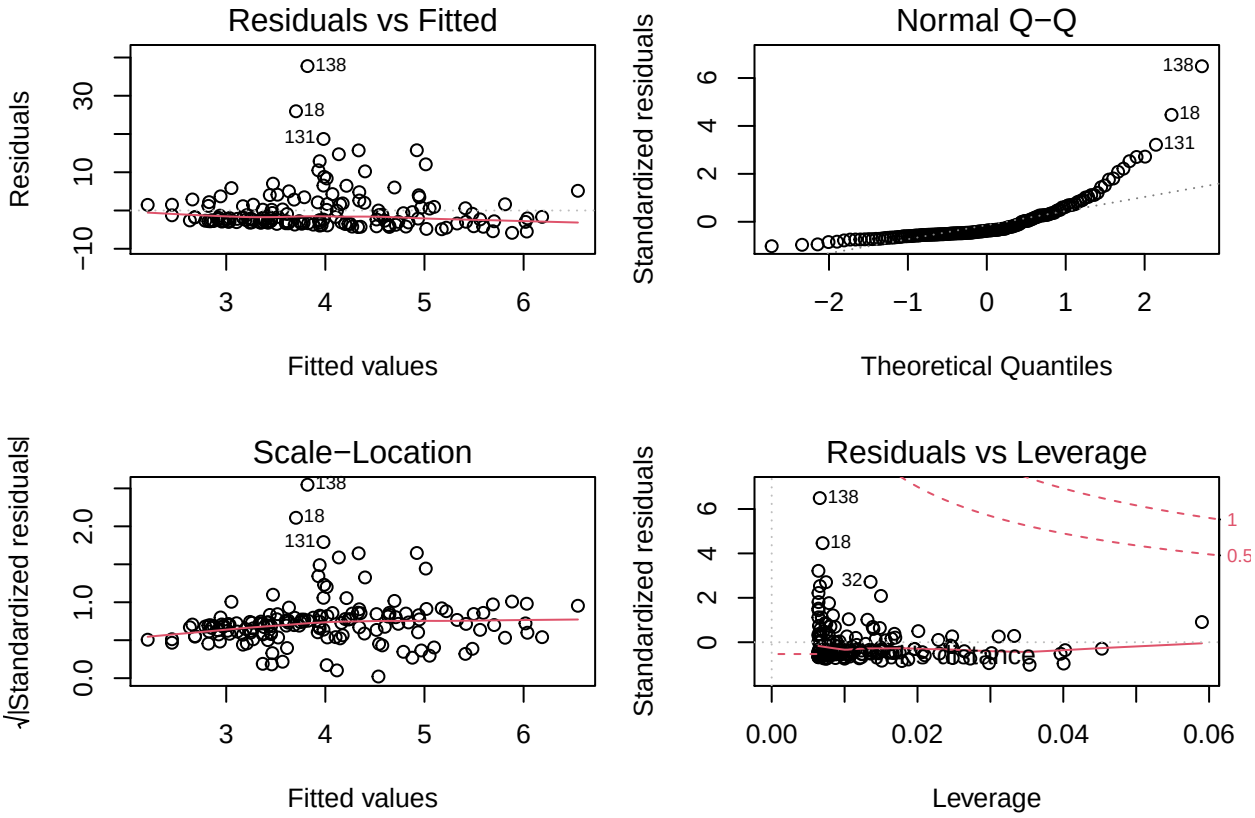
Baseline: Outcomes vs overall GHSI

Cases per-capita vs overall GHSI

```
summary(lm(casepc ~ overall, data = sixmonth_data))$coefficients
```

```
##                Estimate Std. Error   t value  Pr(>|t|)
## (Intercept) 1.16297164 1.53365725 0.7582996 0.4494306
## overall     0.06449113 0.03352208 1.9238403 0.0562191
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(casepc ~ overall, data = sixmonth_data))
```

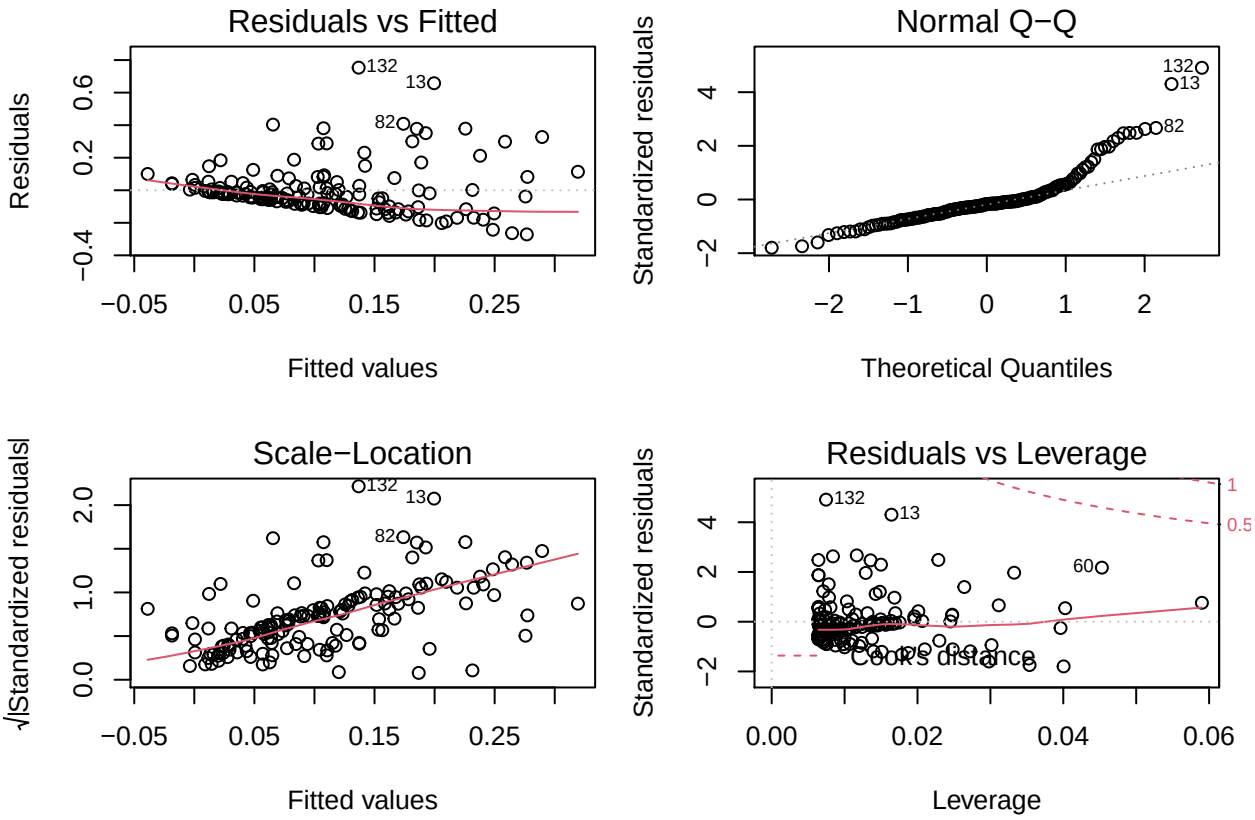


Deaths per-capita vs overall GHSI

```
summary(lm(deathpc ~ overall, data = sixmonth_data))$coefficients
```

```
##                 Estimate   Std. Error   t value     Pr(>|t|)
## (Intercept) -0.125007515 0.0404993877 -3.086652 2.401045e-03
## overall      0.005321094 0.0008852197  6.011043 1.284189e-08
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(deathpc ~ overall, data = sixmonth_data))
```

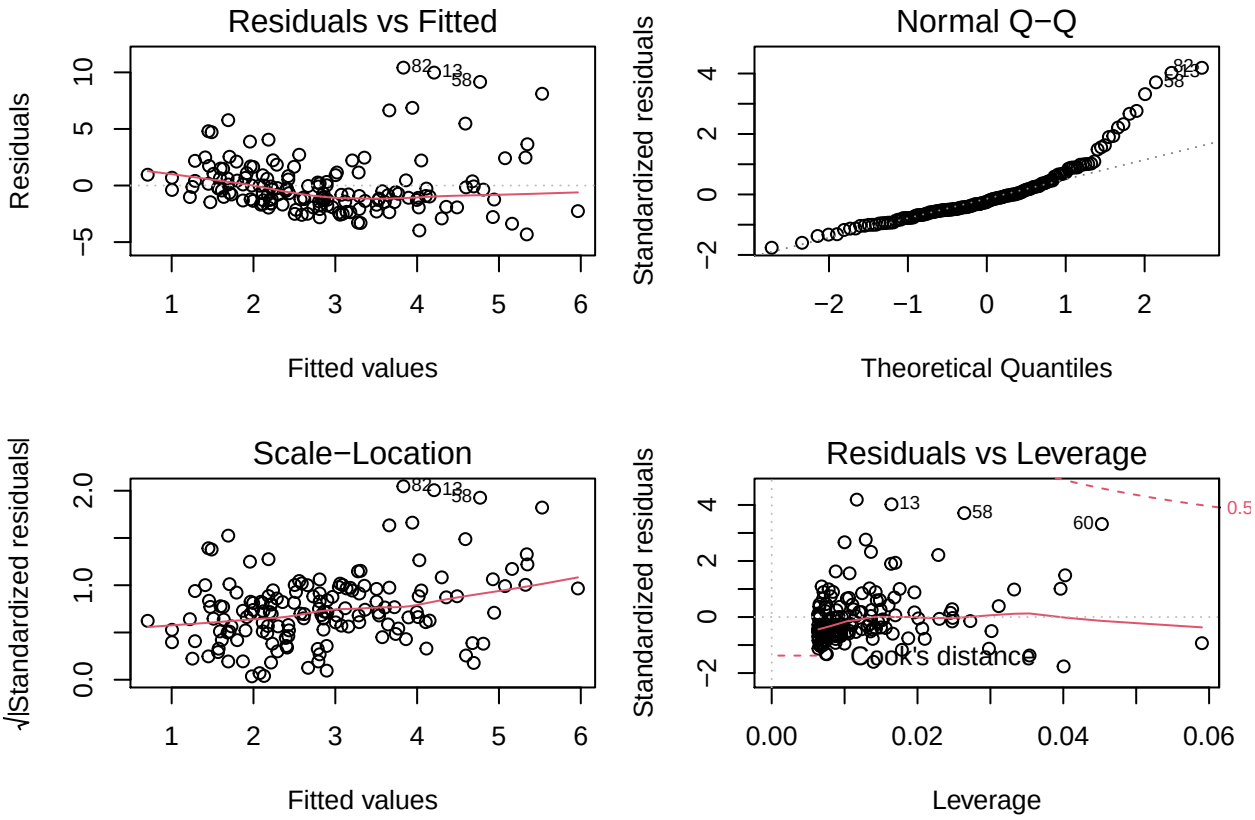


Case-fatality ratio vs overall GHSI

```
summary(lm(cfratio ~ overall, data = sixmonth_data))$coefficients
```

```
##                Estimate Std. Error    t value     Pr(>|t|)
## (Intercept) -0.55832941  0.6574143 -0.8492809 3.970433e-01
## overall      0.07812133  0.0143695  5.4366063 2.086180e-07
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(cfratio ~ overall, data = sixmonth_data))
```



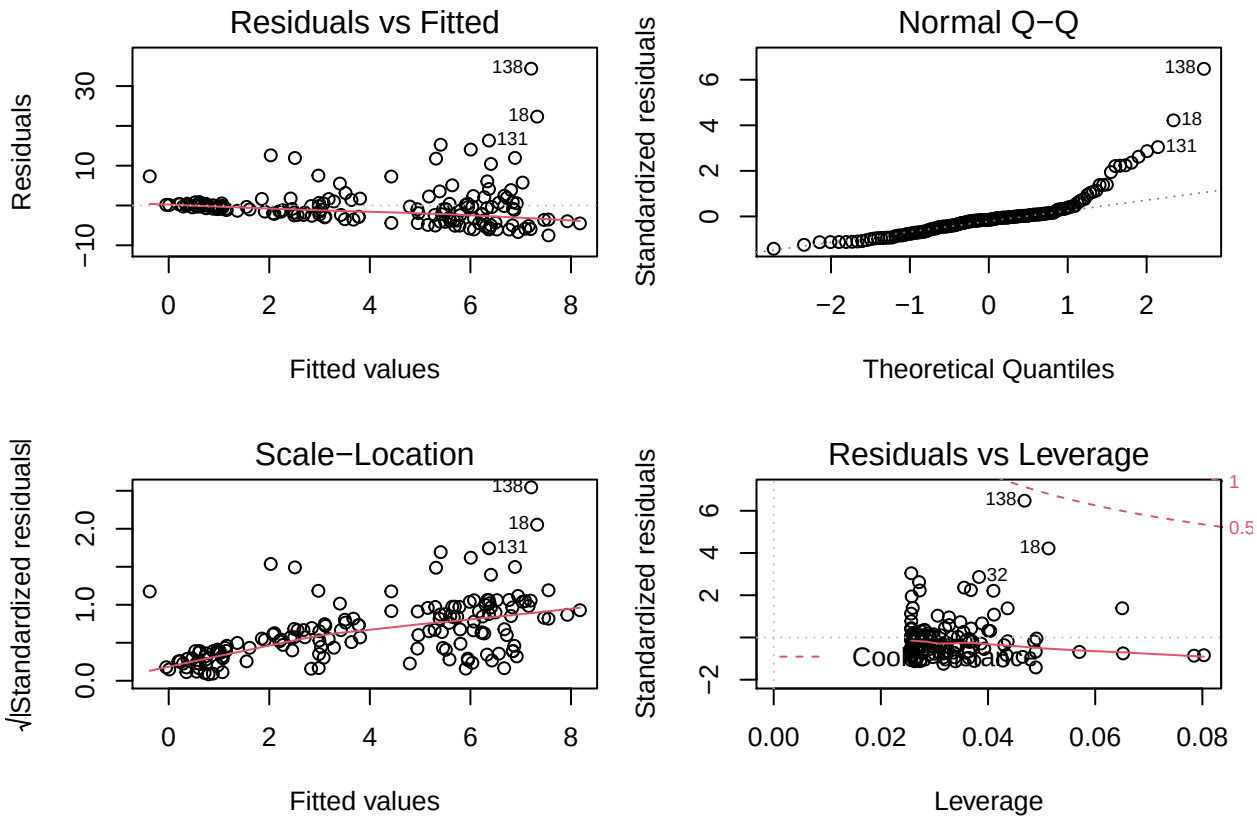
Confounding GDP per-capita (quartiles): Outcomes vs overall GHSI

Cases per-capita vs overall GHSI & GDP per-capita quartiles

```
summary(lm(casepc ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))$coefficients
```

```
##                                Estimate Std. Error   t value     Pr(>|t|)
## (Intercept)                 2.86466999 1.69037182  1.694698 9.219403e-02
## overall                    -0.06577676 0.04418861 -1.488545 1.386926e-01
## factor(gdp_pc_quartile)2    2.46697531 1.25137905  1.971405 5.050516e-02
## factor(gdp_pc_quartile)3    6.37846805 1.33392399  4.781733 4.091891e-06
## factor(gdp_pc_quartile)4    7.05412304 1.69234122  4.168263 5.151332e-05
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(casepc ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))
```

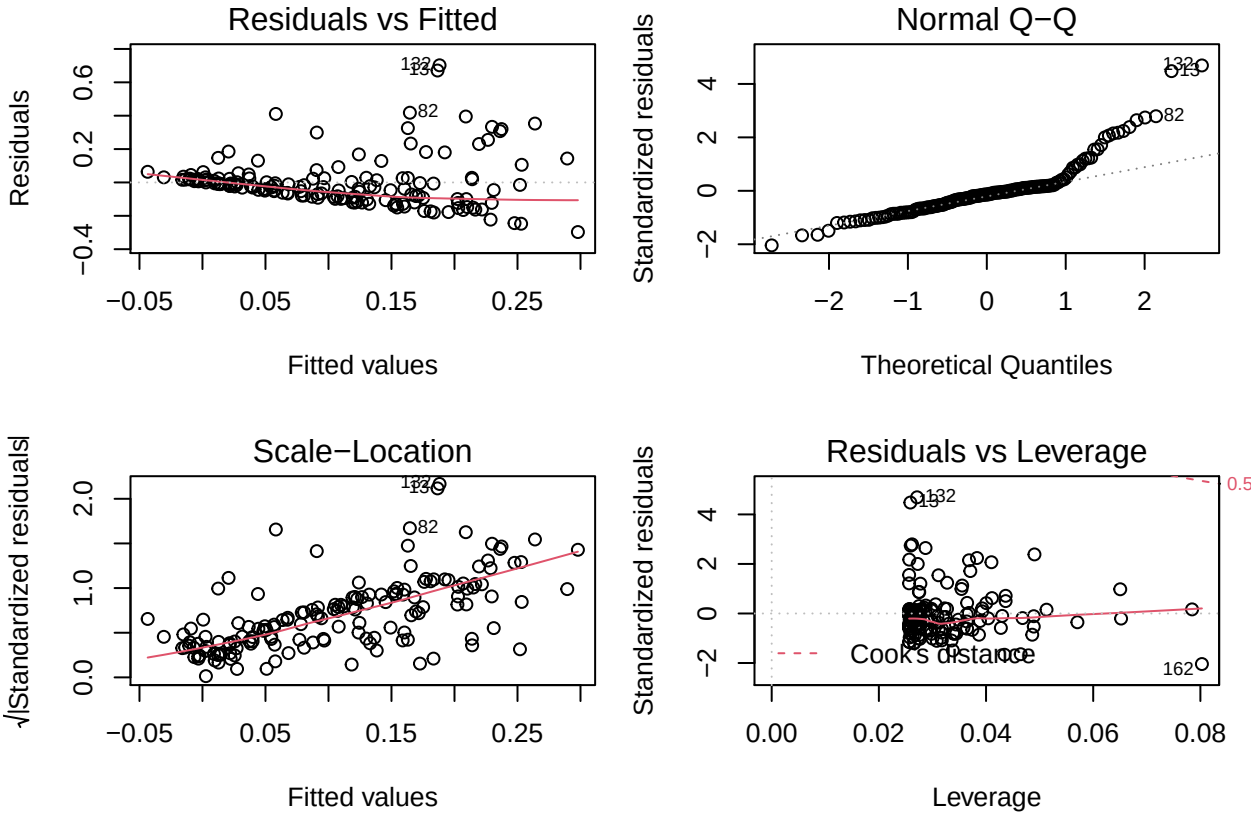


Deaths per-capita vs overall GHSI & GDP per-capita quartiles

```
summary(lm(deathpc ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))$coefficients
```

```
##                                Estimate Std. Error    t value     Pr(>|t|)
## (Intercept)                -0.134963389 0.04720183 -2.8592827 0.0048470196
## overall                     0.004574669 0.00123392  3.7074277 0.0002934393
## factor(gdp_pc_quartile)2    0.029417619 0.03494343  0.8418641 0.4011953508
## factor(gdp_pc_quartile)3    0.098047871 0.03724841  2.6322701 0.0093628685
## factor(gdp_pc_quartile)4    0.042463671 0.04725683  0.8985722 0.3703111901
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(deathpc ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))
```

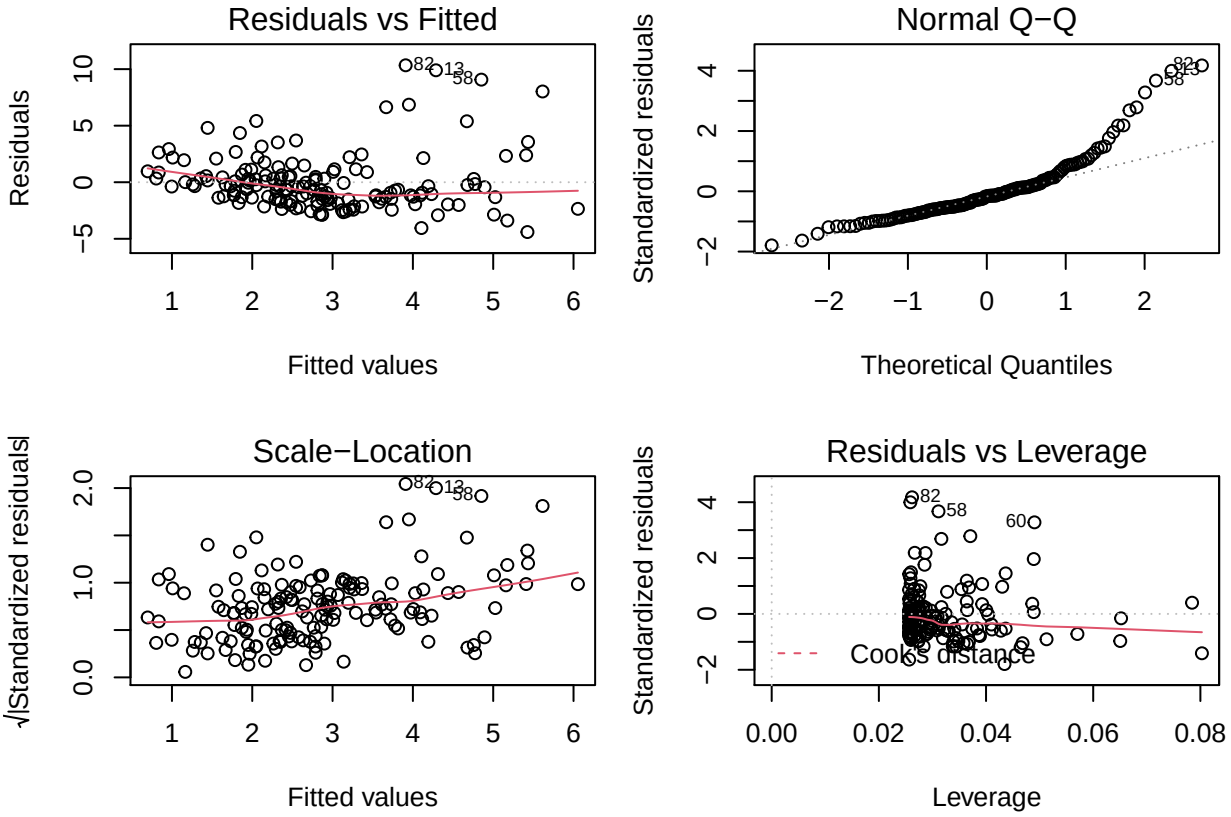


Case-fatality ratio vs overall GHSI & GDP per-capita quartiles

```
round(summary(lm(cfratio ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))$coefficients,6)
```

```
##                              Estimate Std. Error   t value Pr(>|t|)
## (Intercept)                -0.211825   0.780550 -0.271379 0.786470
## overall                     0.078559   0.020405  3.850031 0.000174
## factor(gdp_pc_quartile)2 -0.806239   0.577840 -1.395264 0.164985
## factor(gdp_pc_quartile)3 -0.362782   0.615956 -0.588974 0.556759
## factor(gdp_pc_quartile)4 -0.293196   0.781460 -0.375191 0.708045
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(cfratio ~ overall + factor(gdp_pc_quartile), data = sixmonth_data))
```



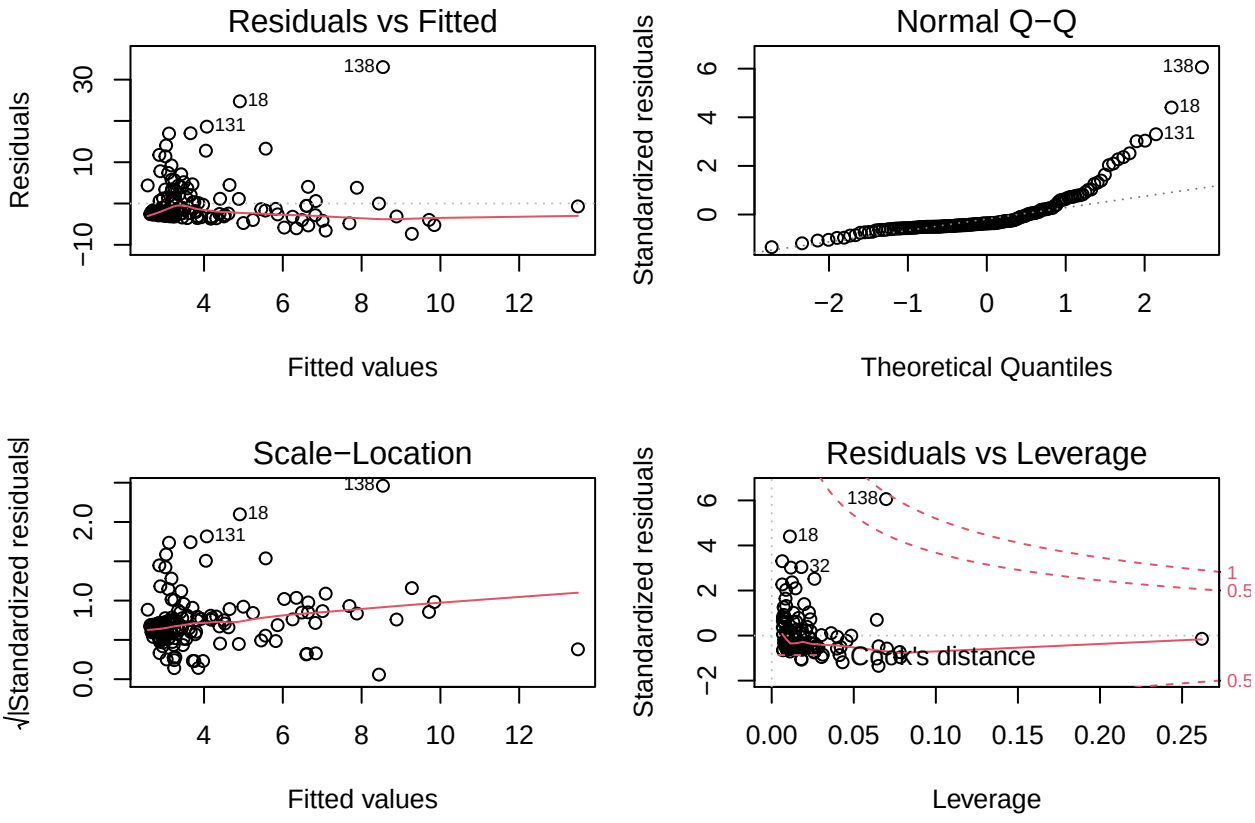
Confounding GDP per-capita (raw): Outcomes vs overall GHSI

Cases per-capita vs overall GHSI & GDP per-capita

```
round(summary(lm(casepc ~ overall + gdp_pc, data = sixmonth_data))$coefficients,6)
```

```
##              Estimate Std. Error   t value Pr(>|t|)
## (Intercept)  3.572180   1.653234  2.160723 0.032273
## overall     -0.022861   0.041777 -0.547210 0.585032
## gdp_pc       0.000095   0.000029  3.324406 0.001109
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(casepc ~ overall + gdp_pc, data = sixmonth_data))
```

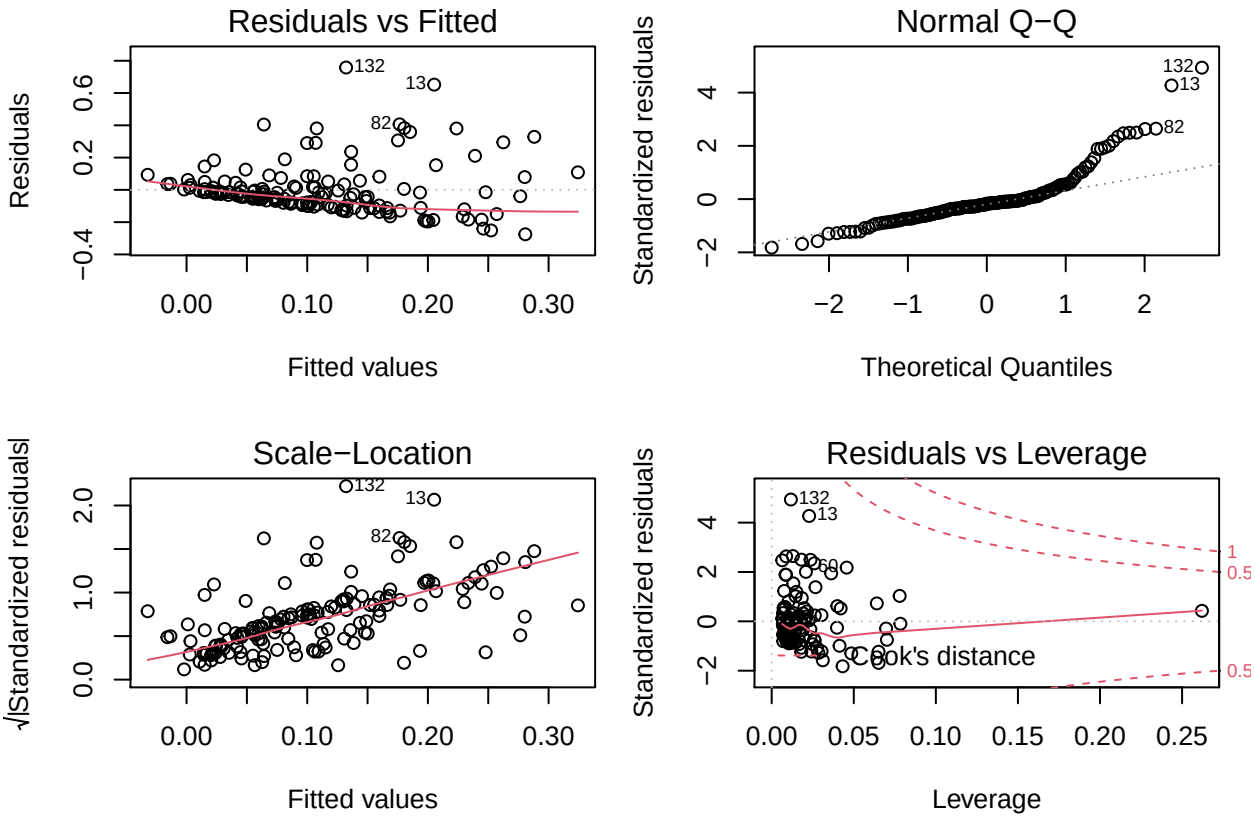


Deaths per-capita vs overall GHSI & GDP per-capita

```
round(summary(lm(deathpc ~ overall + gdp_pc, data = sixmonth_data))$coefficients,6)
```

```
##              Estimate Std. Error   t value Pr(>|t|)
## (Intercept) -0.115986   0.045176 -2.567445 0.011204
## overall      0.004994   0.001142  4.374646 0.000022
## gdp_pc       0.000000   0.000001  0.455557 0.649354
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(deathpc ~ overall + gdp_pc, data = sixmonth_data))
```

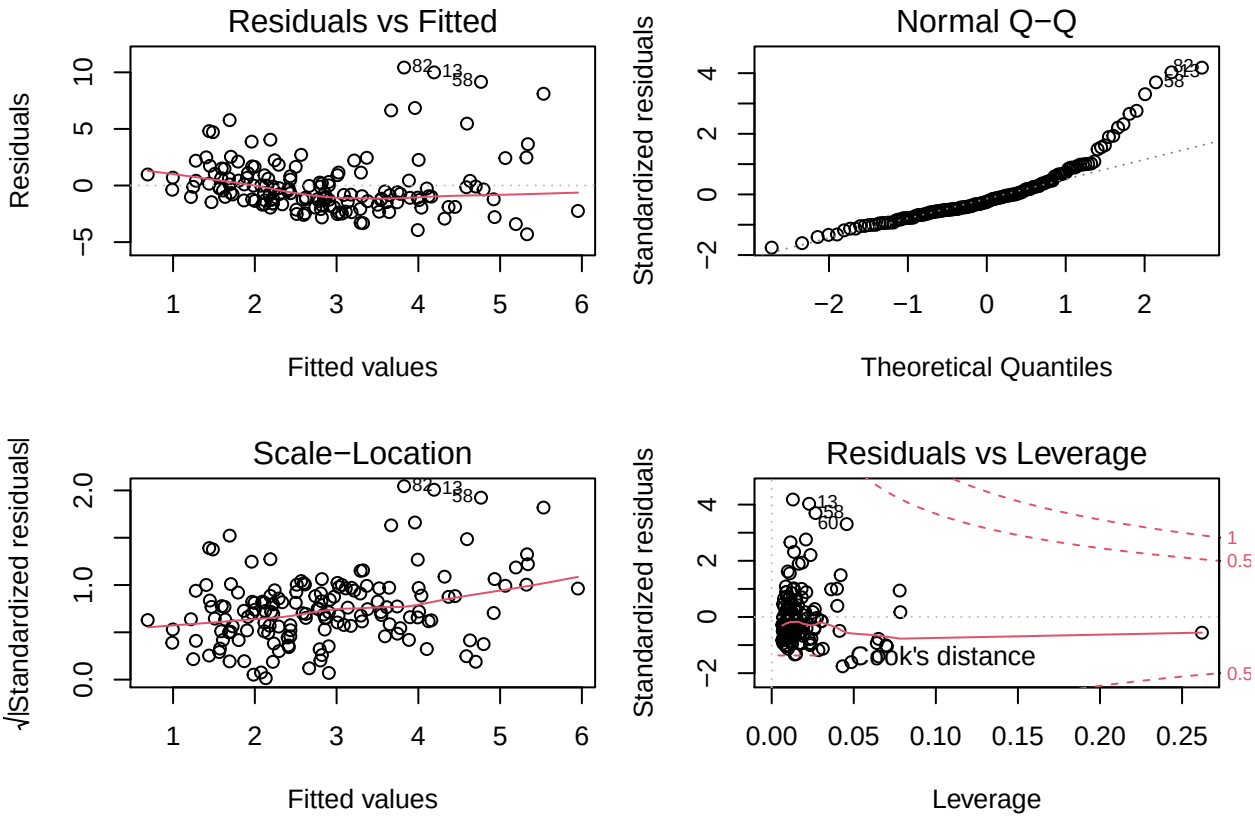


Case-fatality ratio vs overall GHSI & GDP per-capita

```
round(summary(lm(cfratio ~ overall + gdp_pc, data = sixmonth_data))$coefficients,6)
```

```
##              Estimate Std. Error   t value Pr(>|t|)
## (Intercept) -0.582471   0.733807 -0.793765 0.428561
## overall      0.078997   0.018543  4.260160 0.000036
## gdp_pc      -0.000001   0.000013 -0.075050 0.940273
```

```
par(mfrow=c(2,2),mar=c(5,4,2,1))
plot(lm(cfratio ~ overall + gdp_pc, data = sixmonth_data))
```



```r
summary(lm(cfratio ~ gdp_pc, data = sixmonth_data))
```

```
##
## Call:
## lm(formula = cfratio ~ gdp_pc, data = sixmonth_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.5932 -1.5059 -0.5090  0.5818 10.7893
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2.360e+00  2.612e-01   9.034 6.47e-16 ***
## gdp_pc      3.310e-05  1.042e-05   3.178  0.00179 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.645 on 154 degrees of freedom
## Multiple R-squared:  0.06154,    Adjusted R-squared:  0.05544
## F-statistic:  10.1 on 1 and 154 DF,  p-value: 0.001794
```

```r
summary(lm(cfratio ~ factor(gdp_pc_quartile), data = sixmonth_data))
```

```
##
## Call:
## lm(formula = cfratio ~ factor(gdp_pc_quartile), data = sixmonth_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.0810 -1.5061 -0.4689  0.7772 10.1122
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 2.3647     0.4196   5.635 8.25e-08 ***
## factor(gdp_pc_quartile)2   -0.4008     0.5934  -0.675  0.50050
## factor(gdp_pc_quartile)3    0.5531     0.5934   0.932  0.35277
## factor(gdp_pc_quartile)4    1.7725     0.5934   2.987  0.00329 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.621 on 152 degrees of freedom
## Multiple R-squared:  0.09108,    Adjusted R-squared:  0.07314
## F-statistic: 5.077 on 3 and 152 DF,  p-value: 0.002231
```

```r
summary(lm(cfratio ~ gdp_pc_quartile, data = sixmonth_data))
```

```
##
## Call:
## lm(formula = cfratio ~ gdp_pc_quartile, data = sixmonth_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.7304 -1.5291 -0.5592  0.6660 10.4628
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)       1.2781     0.5174    2.47  0.01459 *
## gdp_pc_quartile   0.6271     0.1889    3.32  0.00112 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.638 on 154 degrees of freedom
## Multiple R-squared:  0.06678,    Adjusted R-squared:  0.06072
## F-statistic: 11.02 on 1 and 154 DF,  p-value: 0.001125
```