**Atmospheric gases (NO2, SO2, NH3 and O3)**

**Model:**

**glmmPQL(data=DF2\_ss, value ~ Covid, family=quasipoisson, random= ~1|Plot)**

[1] NH3\_March\_April

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1249827 0.4877167

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 0.4394098 0.06816425 47 6.446338 0.0000

CovidB\_After -0.2652608 0.14310314 47 -1.853634 0.0701

Correlation:

(Intr)

CovidB\_After -0.338

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.2480235 -0.7296357 -0.3977232 0.2674789 2.6920081

Number of Observations: 60

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

0.4394098 -0.2652608

[1] "Quasipoisson distribution: change (%) for NH3\_March\_April ; -23"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] NH3\_May

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1583102 0.3034653

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 0.1583772 0.06241066 46 2.537663 0.0146

CovidB\_After 1.2193900 0.06094561 46 20.007838 0.0000

Correlation:

(Intr)

CovidB\_After -0.454

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-2.1856052 -0.6039028 -0.1627840 0.5662762 2.5894584

Number of Observations: 59

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

0.1583772 1.2193900

[1] "Quasipoisson distribution: change (%) for NH3\_May ; 239"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] NO2\_March\_April

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.5705178 0.2718828

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 0.6882744 0.17008629 47 4.046619 2e-04

CovidB\_After -0.5911233 0.07310101 47 -8.086391 0e+00

Correlation:

(Intr)

CovidB\_After -0.052

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-3.10208408 -0.61755576 0.02409791 0.53607397 2.41037049

Number of Observations: 60

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

0.6882744 -0.5911233

[1] "Quasipoisson distribution: change (%) for NO2\_March\_April ; -45"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] NO2\_May

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.5206241 0.548942

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 0.2989548 0.1685439 46 1.7737501 0.0827

CovidB\_After 0.1242730 0.1382163 46 0.8991196 0.3733

Correlation:

(Intr)

CovidB\_After -0.185

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.53341160 -0.76425339 -0.05804026 0.52021366 2.76116050

Number of Observations: 59

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

0.2989548 0.1242730

[1] "Quasipoisson distribution: change (%) for NO2\_May ; 13"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] SO2\_March\_April

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

iteration 4

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1748322 0.2950833

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 0.0540383 0.06644863 47 0.813234 0.4202

CovidB\_After -0.9239386 0.13961110 47 -6.617945 0.0000

Correlation:

(Intr)

CovidB\_After -0.19

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.5207282 -0.6818452 -0.1515190 0.2892669 3.2869159

Number of Observations: 60

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

0.05403831 -0.92393858

[1] "Quasipoisson distribution: change (%) for SO2\_March\_April ; -60"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] SO2\_May

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.2390187 0.2048211

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) -0.2203976 0.07801324 46 -2.8251310 0.0070

CovidB\_After -0.0215480 0.07501541 46 -0.2872477 0.7752

Correlation:

(Intr)

CovidB\_After -0.193

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.7741563 -0.7326463 0.0227700 0.6567056 2.1976166

Number of Observations: 59

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

-0.2203976 -0.0215480

[1] "Quasipoisson distribution: change (%) for SO2\_May ; -2"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] O3\_March\_April

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1539267 1.369791

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 4.189705 0.05154679 47 81.27966 0.0000

CovidB\_After -0.155950 0.05868540 47 -2.65739 0.0107

Correlation:

(Intr)

CovidB\_After -0.201

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.6718788 -0.7855977 0.1408218 0.6228416 2.0881881

Number of Observations: 60

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

4.1897052 -0.1559501

[1] "Quasipoisson distribution: change (%) for O3\_March\_April ; -14"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] O3\_May

Levels: NH3\_March\_April NH3\_May NO2\_March\_April NO2\_May SO2\_March\_April SO2\_May O3\_March\_April O3\_May

iteration 1

iteration 2

iteration 3

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1635231 1.529905

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) 4.094805 0.05631463 46 72.71298 0

CovidB\_After -0.426293 0.07714513 46 -5.52586 0

Correlation:

(Intr)

CovidB\_After -0.196

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.97723322 -0.51838534 0.03458569 0.44995777 2.62697701

Number of Observations: 59

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

4.0948046 -0.4262935

[1] "Quasipoisson distribution: change (%) for O3\_May ; -35"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

**Bulk Deposition concentration (NO3- and SO42-)**

[1] N\_NO3..VWM.\_april

Levels: quantity\_april Cl..VWM.\_april N\_NO3..VWM.\_april S\_SO4..VWM.\_april quantity\_may Cl..VWM.\_may N\_NO3..VWM.\_may S\_SO4..VWM.\_may

iteration 1

iteration 2

iteration 3

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.1539505 0.27166

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) -1.3386529 0.09169208 45 -14.599439 0.0000

CovidB\_After -0.4316731 0.20893924 45 -2.066022 0.0446

Correlation:

(Intr)

CovidB\_After -0.332

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.4945583 -0.7287058 -0.2434018 0.4290156 3.2795692

Number of Observations: 58

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

-1.3386529 -0.4316731

[1] "Quasipoisson distribution: change (%) for N\_NO3..VWM.\_april ; -35"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] S\_SO4..VWM.\_april

Levels: quantity\_april Cl..VWM.\_april N\_NO3..VWM.\_april S\_SO4..VWM.\_april quantity\_may Cl..VWM.\_may N\_NO3..VWM.\_may S\_SO4..VWM.\_may

iteration 1

iteration 2

iteration 3

iteration 4

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.3665683 0.4038921

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) -1.0636702 0.1492915 45 -7.124786 0.0000

CovidB\_After -0.4003995 0.2625417 45 -1.525089 0.1342

Correlation:

(Intr)

CovidB\_After -0.265

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.0013465 -0.6738176 -0.2535281 0.3165813 4.7998327

Number of Observations: 58

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

-1.0636702 -0.4003995

[1] "Quasipoisson distribution: change (%) for S\_SO4..VWM.\_april ; -33"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] N\_NO3..VWM.\_may

Levels: quantity\_april Cl..VWM.\_april N\_NO3..VWM.\_april S\_SO4..VWM.\_april quantity\_may Cl..VWM.\_may N\_NO3..VWM.\_may S\_SO4..VWM.\_may

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.7753005 0.5143131

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) -1.1796203 0.2698645 44 -4.371157 0.0001

CovidB\_After -0.6772097 0.3622723 44 -1.869339 0.0682

Correlation:

(Intr)

CovidB\_After -0.164

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.5958231 -0.6022287 -0.1706041 0.1252465 4.3501926

Number of Observations: 57

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

-1.1796203 -0.6772097

[1] "Quasipoisson distribution: change (%) for N\_NO3..VWM.\_may ; -49"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] S\_SO4..VWM.\_may

Levels: quantity\_april Cl..VWM.\_april N\_NO3..VWM.\_april S\_SO4..VWM.\_april quantity\_may Cl..VWM.\_may N\_NO3..VWM.\_may S\_SO4..VWM.\_may

iteration 1

iteration 2

iteration 3

iteration 4

iteration 5

iteration 6

Linear mixed-effects model fit by maximum likelihood

Data: DF2\_ss

AIC BIC logLik

NA NA NA

Random effects:

Formula: ~1 | Plot

(Intercept) Residual

StdDev: 0.6791267 0.5022864

Variance function:

Structure: fixed weights

Formula: ~invwt

Fixed effects: value ~ Covid

Value Std.Error DF t-value p-value

(Intercept) -0.8007260 0.2308838 44 -3.468091 0.0012

CovidB\_After -0.4906245 0.2723248 44 -1.801615 0.0785

Correlation:

(Intr)

CovidB\_After -0.169

Standardized Within-Group Residuals:

Min Q1 Med Q3 Max

-1.03727524 -0.60006235 -0.24101446 0.05353171 3.88335577

Number of Observations: 57

Number of Groups: 12

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

[1] "% of change using quasipoisson distribution"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"

(Intercept) CovidB\_After

-0.8007260 -0.4906245

[1] "Quasipoisson distribution: change (%) for S\_SO4..VWM.\_may ; -39"

[1] "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"