Primary_Analysis_A

JLee

5/23/2020

The death rate by state with the start of stay-at-home order and the end of it

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## Warning: Removed 43 rows containing missing values (geom_vline).
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## Warning: Removed 43 rows containing missing values (geom_vline).
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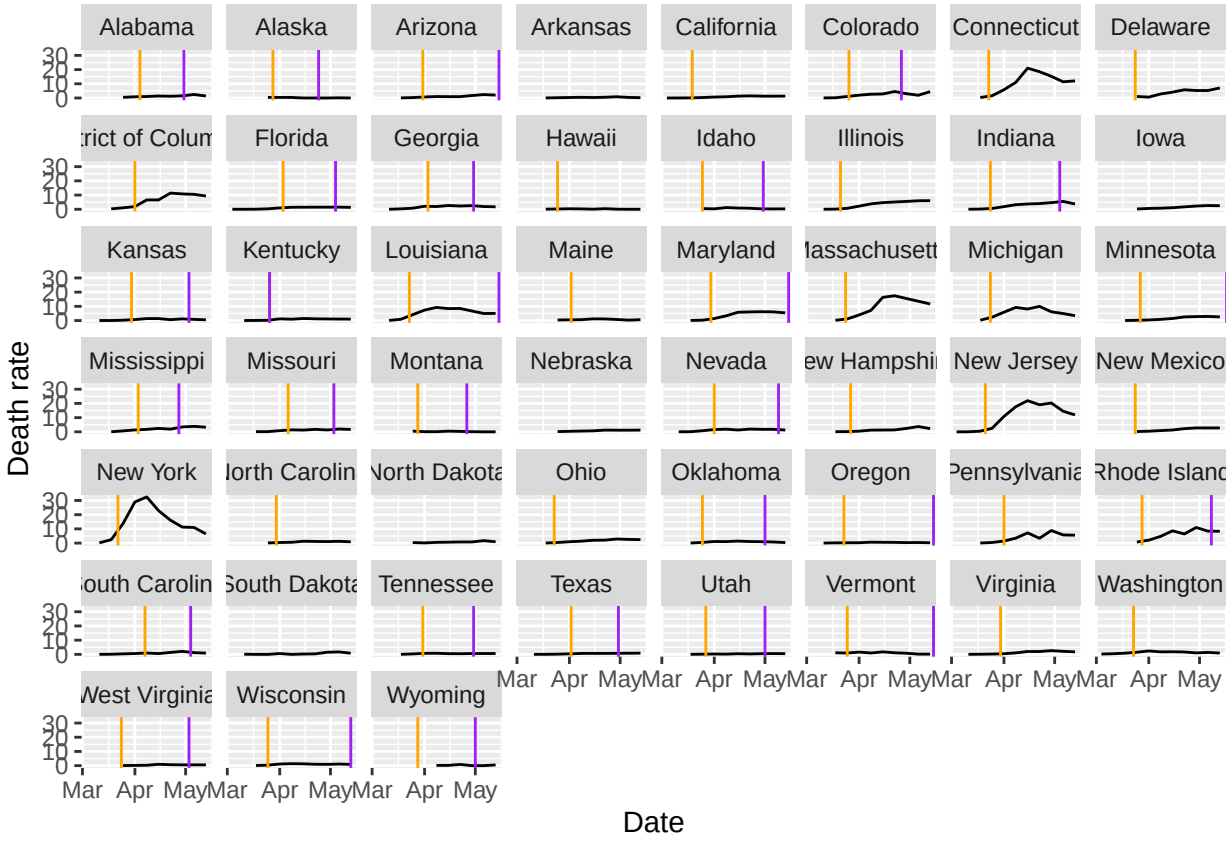

The positive test rate by state with the start of stay-at-home order and the end of it

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## Warning: Removed 43 rows containing missing values (geom_vline).
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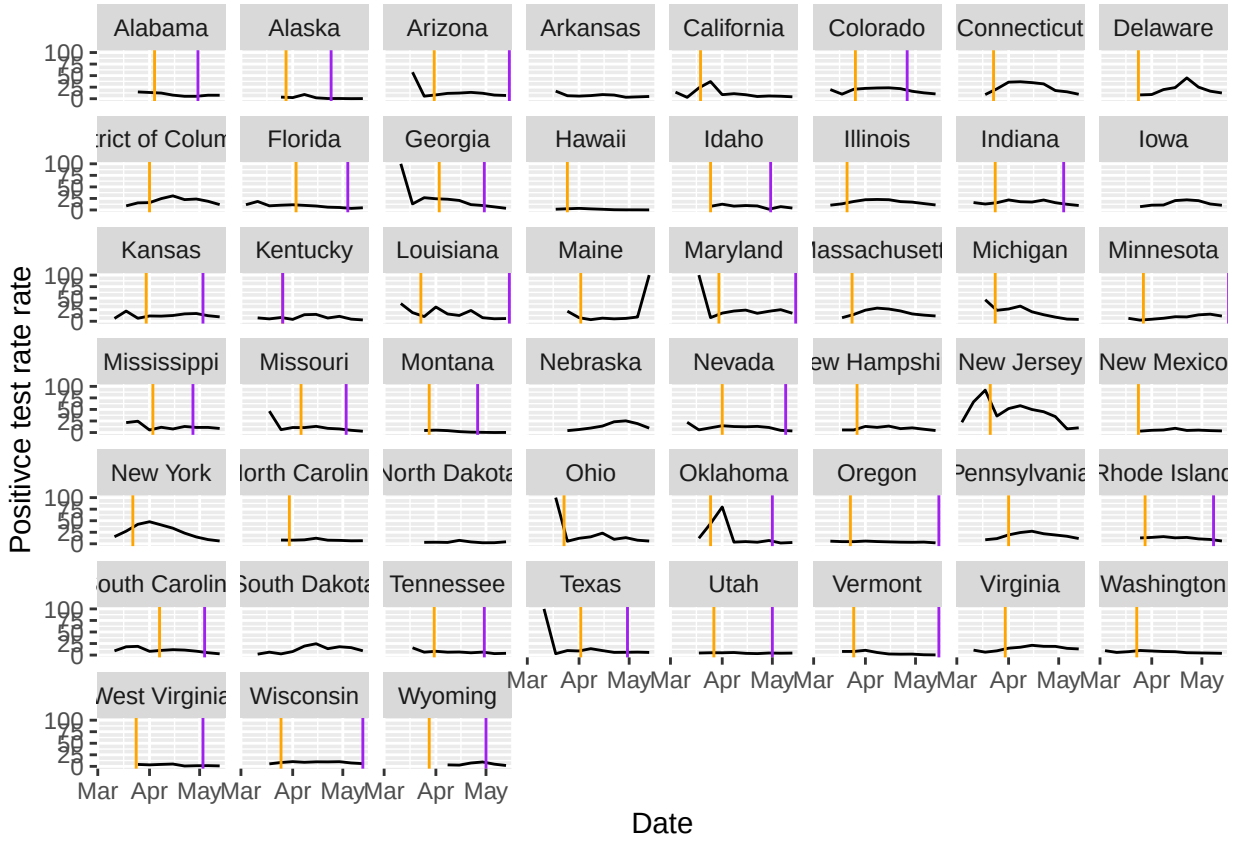

The residential movement by state with the start of stay-at-home order and the end of it

```
## Warning: Removed 43 rows containing missing values (geom_vline).
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## Warning: Removed 43 rows containing missing values (geom_vline).
```
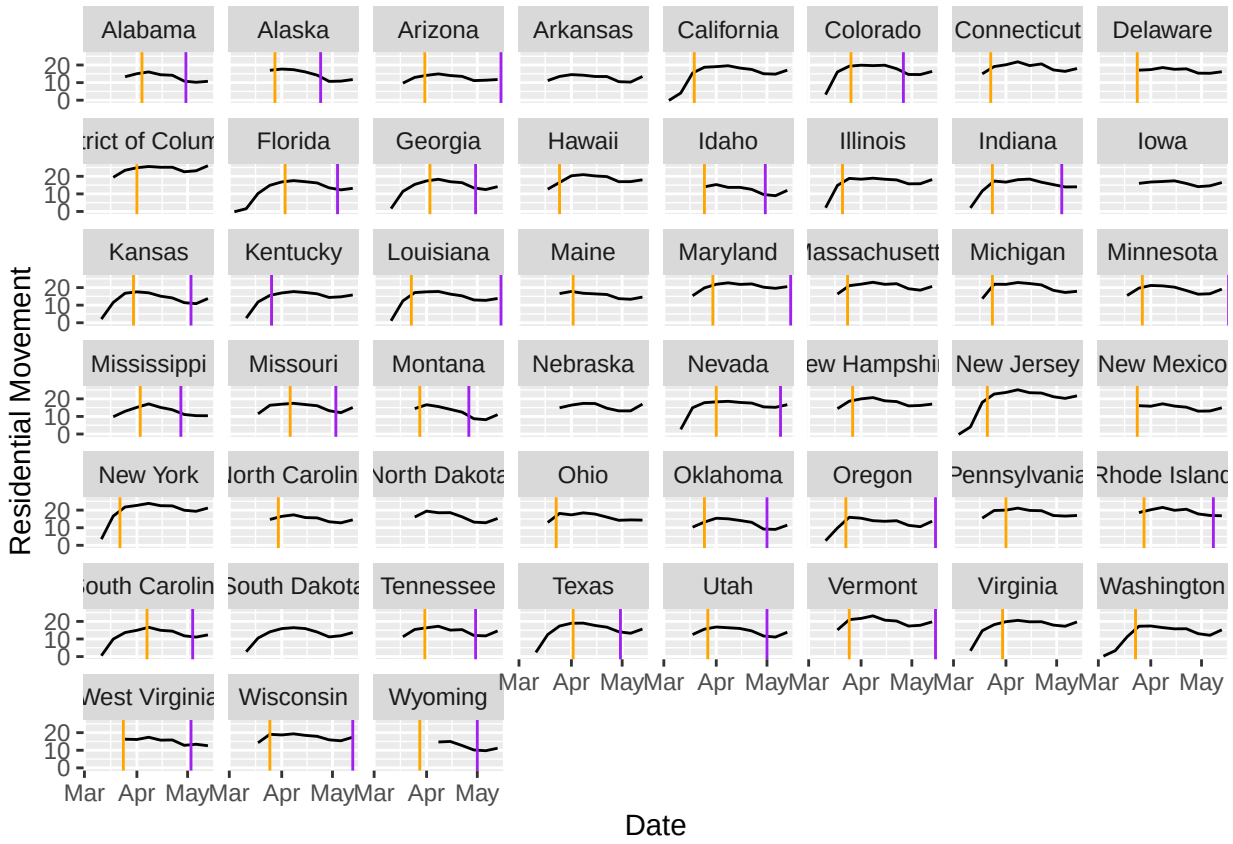



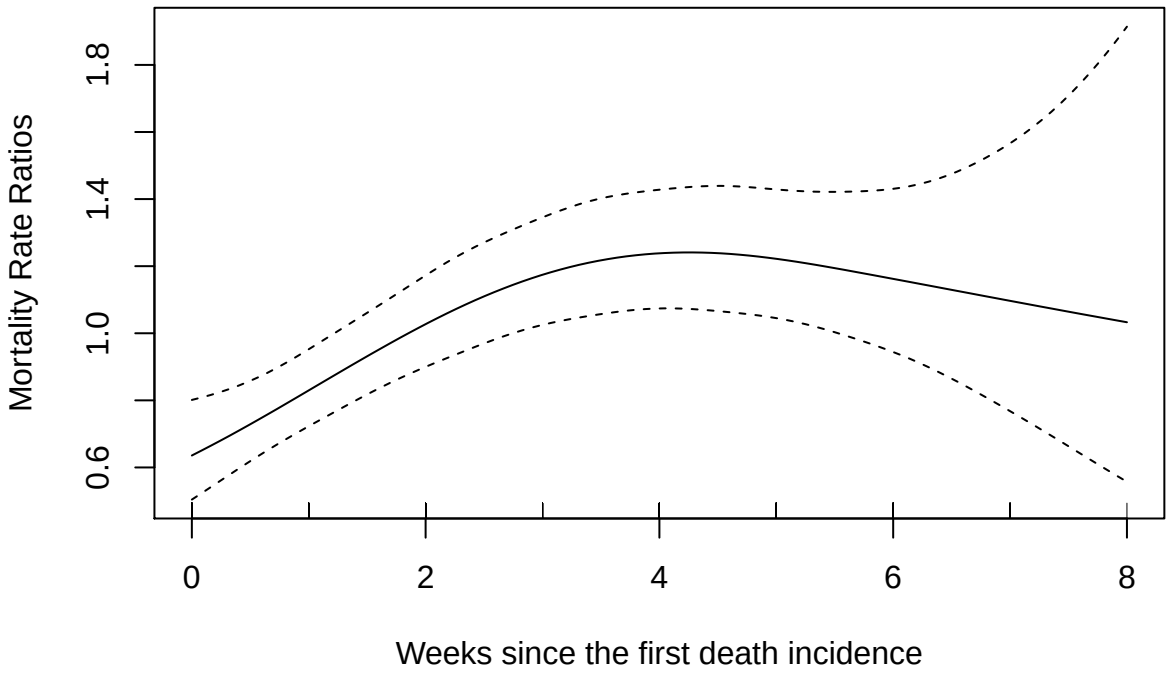
PCA

```
## Standard deviations (1, .., p=6):
## [1] 2.1397690 0.9409933 0.4452526 0.3850655 0.3548051 0.2520084
##
## Rotation (n x k) = (6 x 6):
##                            PC1         PC2        PC3        PC4        PC5
## retail_rec           0.4391116 -0.02654458 -0.3244542  0.5973402 -0.5786207
## grocery_pharmacy     0.4316070  0.05034147 -0.7272540 -0.4526782  0.2739016
## parks                0.2182351  0.93175600  0.1711175  0.1478292  0.1814841
## transit              0.4376500  0.01477681  0.4291490 -0.5906083 -0.5238385
## work                 0.4323196 -0.27865381  0.3412438  0.1565006  0.4204616
## residential         -0.4413979  0.22522338 -0.1895618 -0.2076130 -0.3256451
##                             PC6
## retail_rec          -0.09792177
## grocery_pharmacy    -0.04840649
## parks               -0.01153427
## transit              0.02916063
## work                -0.64631571
## residential         -0.75455998

## Importance of components:
##                            PC1    PC2     PC3     PC4     PC5     PC6
## Standard deviation     2.1398 0.9410 0.44525 0.38507 0.35481 0.25201
## Proportion of Variance 0.7631 0.1476 0.03304 0.02471 0.02098 0.01058
## Cumulative Proportion  0.7631 0.9107 0.94372 0.96843 0.98942 1.00000
```

Model 1

(1) Weekly_death ~ s(days_since_first) + scaled independent variables

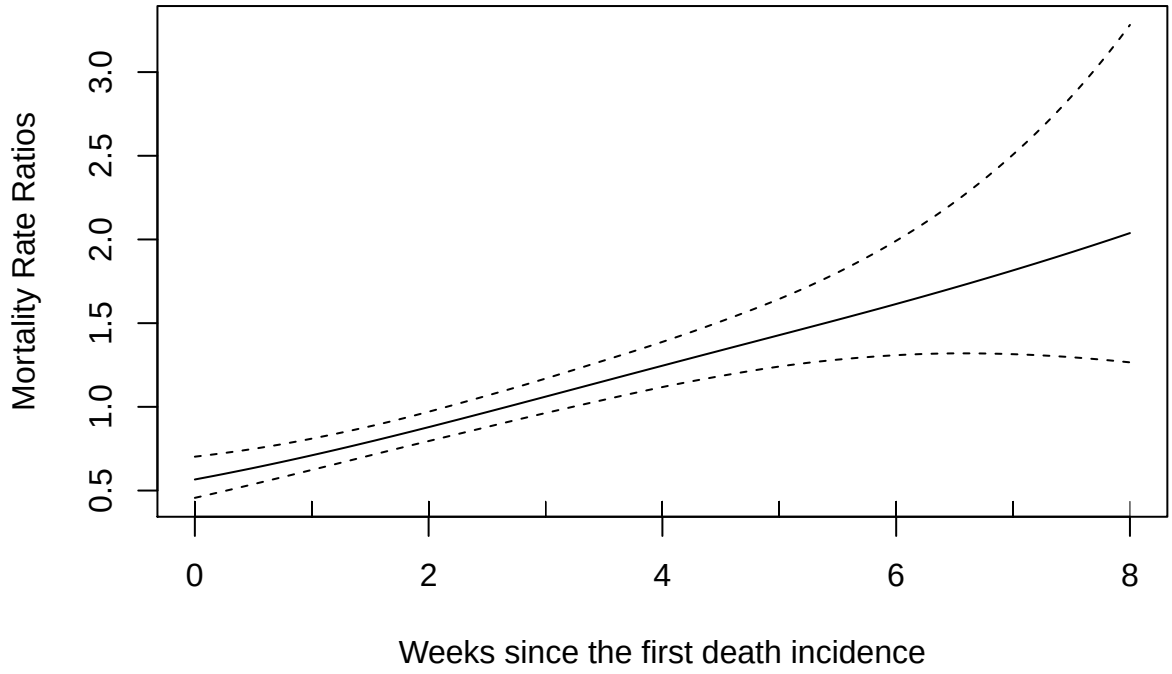
```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + offset(log(population))
##
## Parametric coefficients:
##                               Estimate Std. Error z value Pr(>|z|)
## (Intercept)                  -11.30712    0.36111 -31.312  < 2e-16 ***
## factor(q_popdensity)2          0.25958    0.34661   0.749  0.45391
## factor(q_popdensity)3          0.38991    0.41869   0.931  0.35173
## factor(q_popdensity)4          0.29330    0.43728   0.671  0.50238
## factor(q_popdensity)5          1.66642    0.54029   3.084  0.00204 **
## scale(Age_gp1)                 0.45158    0.23368   1.933  0.05330 .
## scale(Age_gp3)                 0.46880    0.18500   2.534  0.01128 *
## scale(Age_gp4)                -0.03124    0.21949  -0.142  0.88681
## scale(poverty_perc)            0.26982    0.20376   1.324  0.18543
## scale(Black.perc)              0.45558    0.20368   2.237  0.02531 *
## scale(Hispanic.or.Latino.perc) 0.15425    0.22194   0.695  0.48707
## scale(temp)                   -0.55591    0.20858  -2.665  0.00769 **
## scale(precipitation)          -0.06359    0.23372  -0.272  0.78555
## scale(Bachelor_orhigher_perc)  0.19260    0.25623   0.752  0.45225
## scale(bed_rate)                0.07728    0.11663   0.663  0.50759
## scale(smoke_perc)             -0.22206    0.21019  -1.056  0.29074
## scale(obese_perc)              0.20154    0.18782   1.073  0.28327
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                         edf Ref.df Chi.sq  p-value
## s(weeks_since_first) 2.297  2.297   16.8 0.000568 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.663
## glmer.ML = 64.432  Scale est. = 1         n = 287
```



(2) Weekly_death ~ s(days_since_first) + scaled independent variables + positive_test_ratio with 3 weeks lag + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + rptest + ptest_weeks_ago1 +
##     ptest_weeks_ago2 + ptest_weeks_ago3 + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -1.136e+01  2.943e-01 -38.603  < 2e-16 ***
## factor(q_popdensity)2         -1.688e-01  2.888e-01  -0.584 0.559012
## factor(q_popdensity)3         -7.695e-02  3.466e-01  -0.222 0.824322
## factor(q_popdensity)4         -2.895e-01  3.614e-01  -0.801 0.423207
## factor(q_popdensity)5          4.340e-01  4.834e-01   0.898 0.369295
## scale(Age_gp1)                 1.541e-01  1.943e-01   0.793 0.427630
## scale(Age_gp3)                 2.337e-01  1.565e-01   1.494 0.135297
## scale(Age_gp4)                -4.245e-03  1.741e-01  -0.024 0.980549
## scale(poverty_perc)            3.253e-01  1.623e-01   2.005 0.045011 *
## scale(Black.perc)              2.906e-01  1.636e-01   1.776 0.075803 .
## scale(Hispanic.or.Latino.perc) -2.560e-02  1.778e-01  -0.144 0.885555
## scale(temp)                   -3.856e-01  1.662e-01  -2.320 0.020360 *
## scale(precipitation)           1.572e-01  1.903e-01   0.826 0.408685
## scale(Bachelor_orhigher_perc)  -3.731e-02  2.095e-01  -0.178 0.858683
## scale(bed_rate)               -4.084e-02  9.470e-02  -0.431 0.666276
## scale(smoke_perc)             -3.774e-01  1.699e-01  -2.221 0.026334 *
```

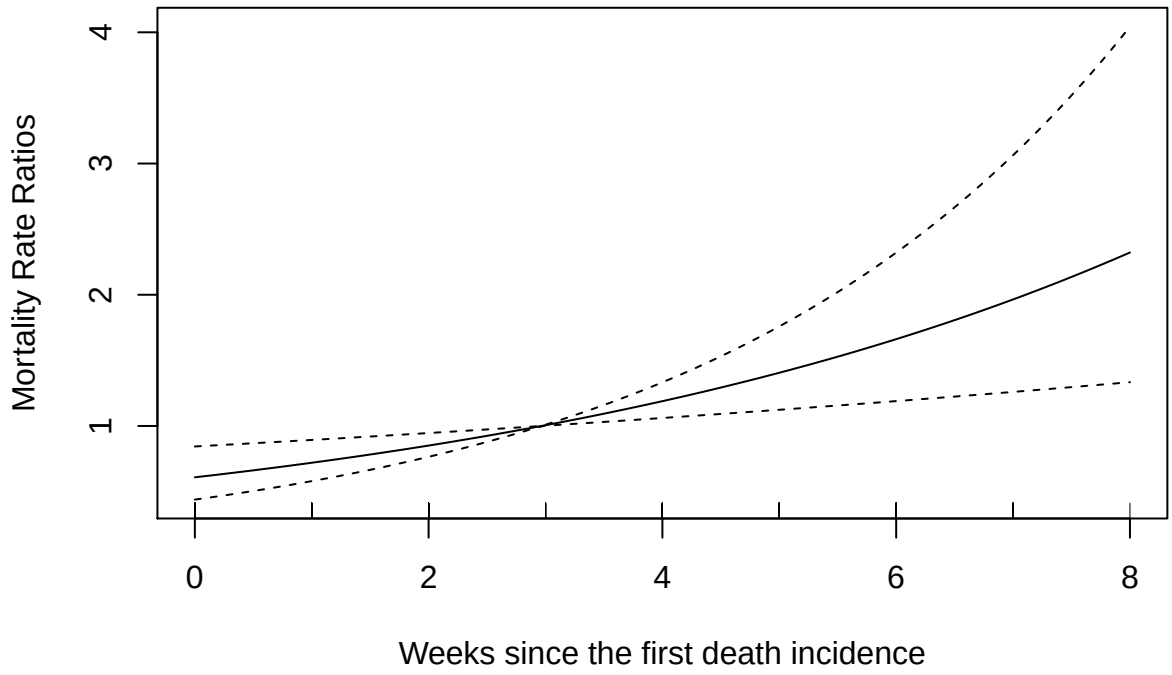
```
## scale(obese_perc)               2.569e-02  1.508e-01   0.170 0.864705
## rptest                          3.324e-02  8.563e-03   3.882 0.000104 ***
## ptest_weeks_ago1                1.297e-02  6.533e-03   1.985 0.047092 *
## ptest_weeks_ago2                3.312e-03  4.697e-03   0.705 0.480713
## ptest_weeks_ago3                9.089e-04  3.841e-03   0.237 0.812950
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                          edf Ref.df Chi.sq  p-value
## s(weeks_since_first) 1.576  1.576  23.98 3.46e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.868
## glmer.ML = 80.774  Scale est. = 1         n = 287
```



(3) Weekly_death ~ s(days_since_first) + scaled independent variables + the curent positive test ratio + the PCA of movement + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + rptest + PC1 + PC2 +
##     factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
```

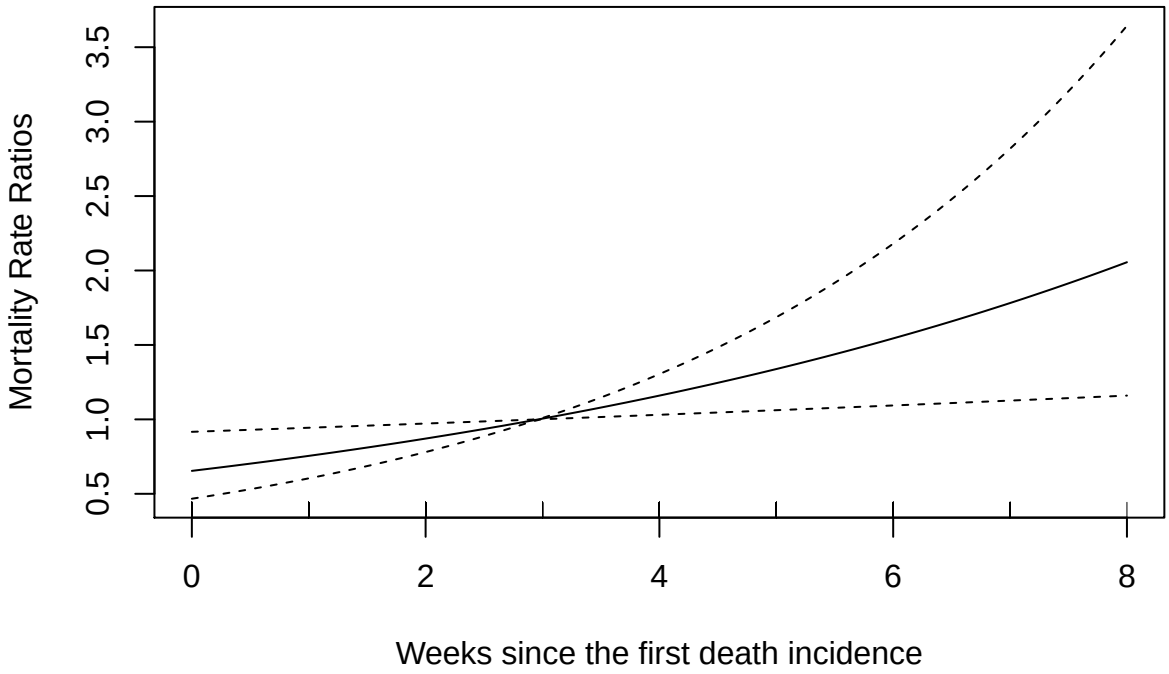
```
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.581223   0.445102 -26.019  < 2e-16 ***
## factor(q_popdensity)2          -0.073777   0.296873  -0.249   0.8037
## factor(q_popdensity)3          -0.024213   0.374916  -0.065   0.9485
## factor(q_popdensity)4          -0.214361   0.378711  -0.566   0.5714
## factor(q_popdensity)5           0.524144   0.503449   1.041   0.2978
## scale(Age_gp1)                  0.240276   0.219778   1.093   0.2743
## scale(Age_gp3)                  0.260869   0.153823   1.696   0.0899 .
## scale(Age_gp4)                  0.010680   0.186461   0.057   0.9543
## scale(poverty_perc)             0.350630   0.163330   2.147   0.0318 *
## scale(Black.perc)               0.249855   0.173507   1.440   0.1499
## scale(Hispanic.or.Latino.perc) -0.037898   0.184239  -0.206   0.8370
## scale(temp)                    -0.359467   0.202202  -1.778   0.0754 .
## scale(precipitation)            0.161387   0.191253   0.844   0.3988
## scale(Bachelor_orhigher_perc)  -0.035008   0.215717  -0.162   0.8711
## scale(bed_rate)                -0.036817   0.096289  -0.382   0.7022
## scale(smoke_perc)              -0.336394   0.174635  -1.926   0.0541 .
## scale(obese_perc)               0.012420   0.155257   0.080   0.9362
## rptest                          0.042229   0.007952   5.310 1.09e-07 ***
## PC1                            -0.080678   0.077542  -1.040   0.2981
## PC2                             0.006845   0.137803   0.050   0.9604
## factor(f_mask)1                 0.339215   0.215733   1.572   0.1159
## factor(f_mask)2                 0.358878   0.318554   1.127   0.2599
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                       edf Ref.df Chi.sq p-value
## s(weeks_since_first)   1      1  9.233 0.00238 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.855
## glmer.ML = 81.603  Scale est. = 1         n = 287
```



(4) Weekly_death ~ s(days_since_first) + scaled independent variables + the positive test ratio with 1 week lag + the PCA of movement + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + ptest_weeks_ago1 +
##     PC1 + PC2 + factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.404284   0.459141 -24.838  < 2e-16 ***
## factor(q_popdensity)2          -0.007075   0.314177  -0.023   0.9820
## factor(q_popdensity)3           0.061507   0.397094   0.155   0.8769
## factor(q_popdensity)4          -0.107536   0.402837  -0.267   0.7895
## factor(q_popdensity)5           0.781383   0.528454   1.479   0.1392
## scale(Age_gp1)                  0.292274   0.230864   1.266   0.2055
## scale(Age_gp3)                  0.289634   0.163671   1.770   0.0768 .
## scale(Age_gp4)                  0.023617   0.198436   0.119   0.9053
## scale(poverty_perc)             0.293388   0.174350   1.683   0.0924 .
## scale(Black.perc)               0.347246   0.183891   1.888   0.0590 .
## scale(Hispanic.or.Latino.perc)  0.041476   0.195663   0.212   0.8321
## scale(temp)                    -0.426778   0.212528  -2.008   0.0446 *
## scale(precipitation)            0.109312   0.204536   0.534   0.5930
## scale(Bachelor_orhigher_perc)   0.034884   0.227344   0.153   0.8781
## scale(bed_rate)                -0.014173   0.103192  -0.137   0.8908
## scale(smoke_perc)              -0.315193   0.185411  -1.700   0.0891 .
```

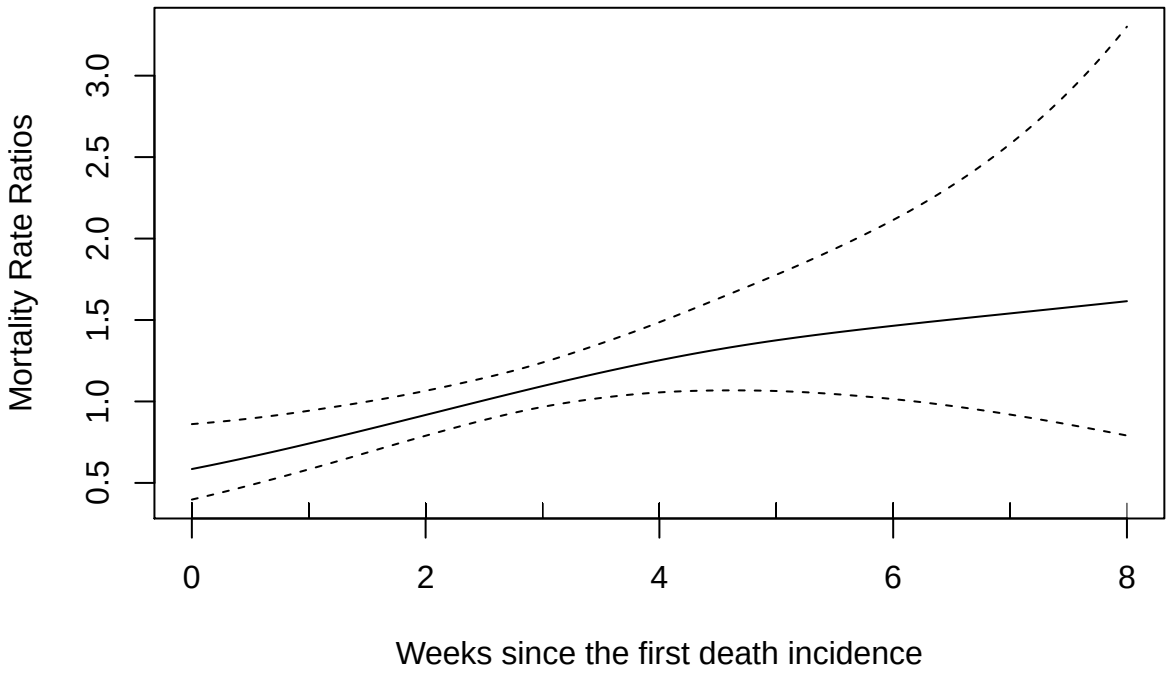
```
## scale(obese_perc)                0.087696   0.164837   0.532   0.5947
## ptest_weeks_ago1                 0.028993   0.005972   4.855  1.2e-06 ***
## PC1                             -0.049486   0.080753  -0.613   0.5400
## PC2                              0.029115   0.140365   0.207   0.8357
## factor(f_mask)1                  0.221699   0.218396   1.015   0.3100
## factor(f_mask)2                  0.093127   0.323326   0.288   0.7733
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                       edf Ref.df Chi.sq p-value
## s(weeks_since_first)   1      1   6.34  0.0118 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =   0.73
## glmer.ML = 78.309  Scale est. = 1         n = 287
```



(5) Weekly_death ~ s(days_since_first) + scaled independent variables + the positive test ratio with 2 week lag + the PCA of movement + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + ptest_weeks_ago2 +
##     PC1 + PC2 + factor(f_mask) + offset(log(population))
##
```

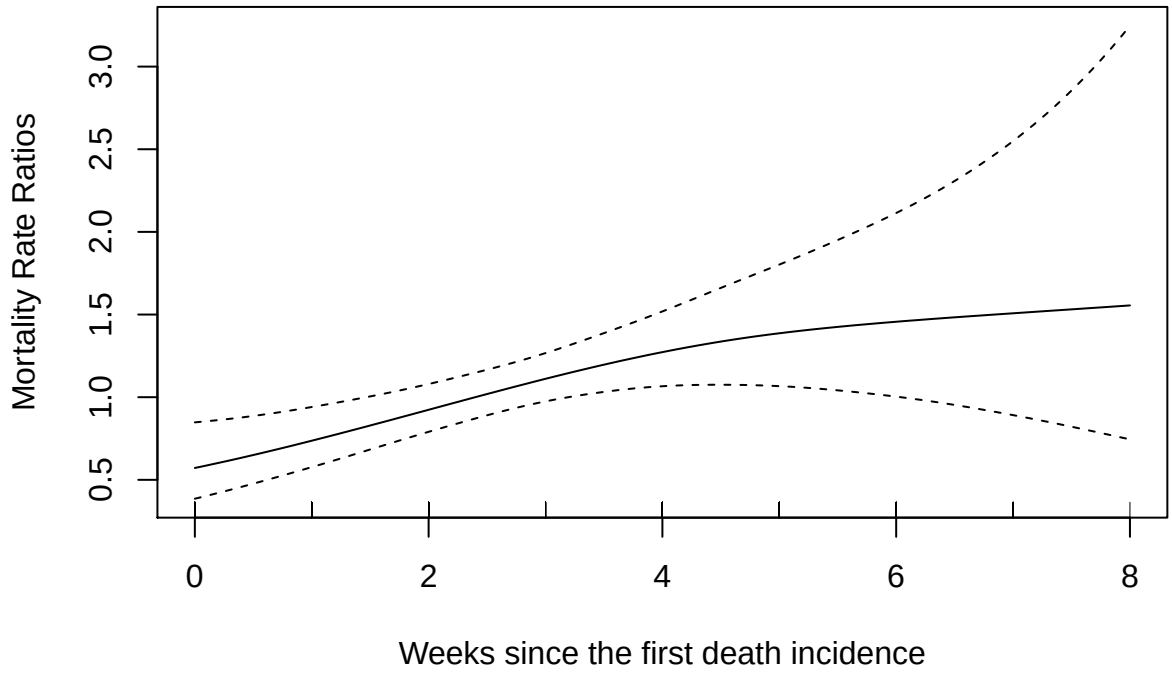
```
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.179423   0.491172 -22.761   <2e-16 ***
## factor(q_popdensity)2           0.071526   0.340189   0.210   0.8335
## factor(q_popdensity)3           0.070914   0.429768   0.165   0.8689
## factor(q_popdensity)4          -0.004681   0.436556  -0.011   0.9914
## factor(q_popdensity)5           1.090279   0.570867   1.910   0.0562 .
## scale(Age_gp1)                  0.441400   0.245518   1.798   0.0722 .
## scale(Age_gp3)                  0.354050   0.178710   1.981   0.0476 *
## scale(Age_gp4)                  0.046184   0.214717   0.215   0.8297
## scale(poverty_perc)             0.283181   0.189787   1.492   0.1357
## scale(Black.perc)               0.371770   0.199232   1.866   0.0620 .
## scale(Hispanic.or.Latino.perc)  0.090816   0.212002   0.428   0.6684
## scale(temp)                    -0.531590   0.228025  -2.331   0.0197 *
## scale(precipitation)            0.085563   0.224358   0.381   0.7029
## scale(Bachelor_orhigher_perc)   0.119514   0.245670   0.486   0.6266
## scale(bed_rate)                 0.038393   0.110763   0.347   0.7289
## scale(smoke_perc)              -0.227268   0.200279  -1.135   0.2565
## scale(obese_perc)               0.113362   0.179803   0.630   0.5284
## ptest_weeks_ago2                0.007219   0.004481   1.611   0.1072
## PC1                            -0.094464   0.082690  -1.142   0.2533
## PC2                            -0.012934   0.144256  -0.090   0.9286
## factor(f_mask)1                 0.169650   0.241696   0.702   0.4827
## factor(f_mask)2                 0.041028   0.343087   0.120   0.9048
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                         edf Ref.df Chi.sq p-value
## s(weeks_since_first) 1.767  1.767  5.614  0.0278 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.673
## glmer.ML = 71.438  Scale est. = 1         n = 287
```



(6) Weekly_death ~ s(days_since_first) + scaled independent variables + the positive test ratio with 3 week lag + the PCA of movement + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + ptest_weeks_ago3 +
##     PC1 + PC2 + factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.136211   0.497738 -22.374   <2e-16 ***
## factor(q_popdensity)2           0.111368   0.348289   0.320   0.7492
## factor(q_popdensity)3           0.100662   0.440816   0.228   0.8194
## factor(q_popdensity)4           0.044453   0.447806   0.099   0.9209
## factor(q_popdensity)5           1.183779   0.585561   2.022   0.0432 *
## scale(Age_gp1)                  0.478189   0.250311   1.910   0.0561 .
## scale(Age_gp3)                  0.376422   0.183045   2.056   0.0397 *
## scale(Age_gp4)                  0.056732   0.220310   0.258   0.7968
## scale(poverty_perc)             0.280834   0.195325   1.438   0.1505
## scale(Black.perc)               0.380828   0.204124   1.866   0.0621 .
## scale(Hispanic.or.Latino.perc)  0.096176   0.217579   0.442   0.6585
## scale(temp)                    -0.540046   0.233476  -2.313   0.0207 *
## scale(precipitation)            0.062758   0.230777   0.272   0.7857
## scale(Bachelor_orhigher_perc)   0.143925   0.251429   0.572   0.5670
## scale(bed_rate)                 0.058166   0.113113   0.514   0.6071
## scale(smoke_perc)              -0.223959   0.206160  -1.086   0.2773
```

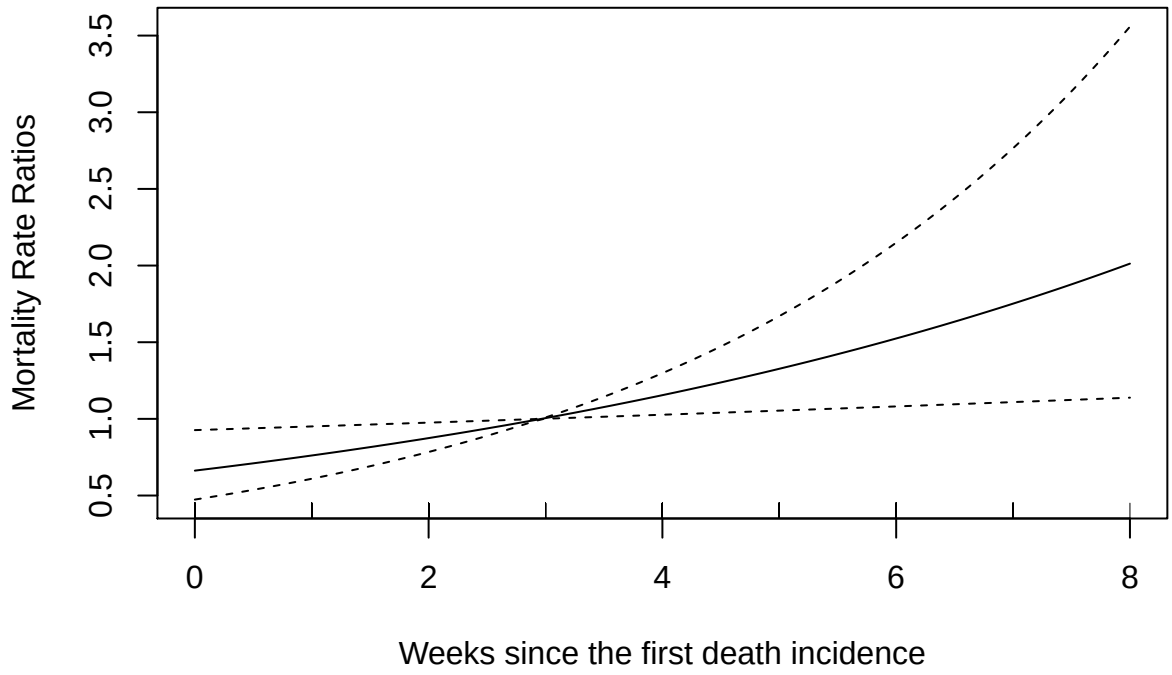
```
## scale(obese_perc)                0.126383   0.184544   0.685   0.4934
## ptest_weeks_ago3                 0.003124   0.003763   0.830   0.4063
## PC1                             -0.095896   0.084175  -1.139   0.2546
## PC2                             -0.013978   0.145496  -0.096   0.9235
## factor(f_mask)1                  0.134388   0.242279   0.555   0.5791
## factor(f_mask)2                 -0.001543   0.344259  -0.004   0.9964
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                         edf Ref.df Chi.sq p-value
## s(weeks_since_first) 1.875  1.875  6.487  0.0206 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.646
## glmer.ML = 68.269  Scale est. = 1         n = 287
```



(7) Weekly_death ~ s(days_since_first) + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + the PCA of movement + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 8, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + ptest_weeks_ago1 +
##     ptest_weeks_ago2 + ptest_weeks_ago3 + PC1 + PC2 + factor(f_mask) +
```

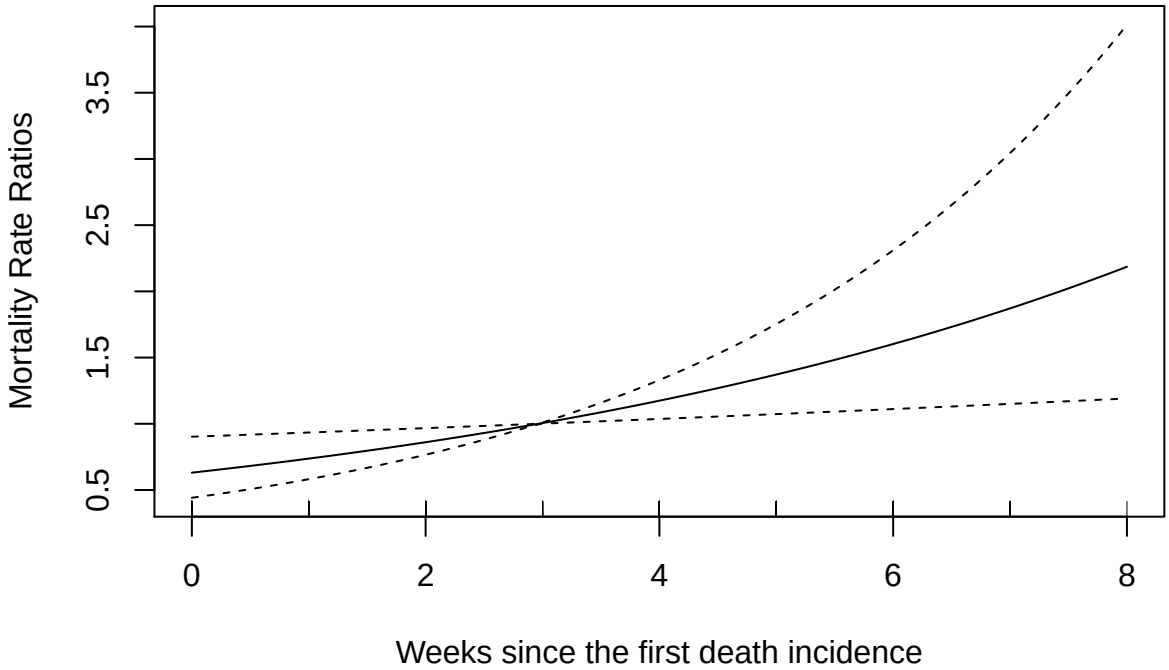
```
##     offset(log(population))
##
## Parametric coefficients:
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.465294   0.460243 -24.911  < 2e-16 ***
## factor(q_popdensity)2          -0.055102   0.313477  -0.176   0.8605
## factor(q_popdensity)3           0.010575   0.396312   0.027   0.9787
## factor(q_popdensity)4          -0.168557   0.401891  -0.419   0.6749
## factor(q_popdensity)5           0.661932   0.535784   1.235   0.2167
## scale(Age_gp1)                  0.244386   0.233631   1.046   0.2955
## scale(Age_gp3)                  0.247090   0.166139   1.487   0.1369
## scale(Age_gp4)                  0.023422   0.196525   0.119   0.9051
## scale(poverty_perc)             0.280676   0.173163   1.621   0.1050
## scale(Black.perc)               0.343670   0.182355   1.885   0.0595 .
## scale(Hispanic.or.Latino.perc)  0.050393   0.193828   0.260   0.7949
## scale(temp)                    -0.441526   0.210745  -2.095   0.0362 *
## scale(precipitation)            0.153875   0.205776   0.748   0.4546
## scale(Bachelor_orhigher_perc)   0.007083   0.226851   0.031   0.9751
## scale(bed_rate)                -0.029808   0.102522  -0.291   0.7712
## scale(smoke_perc)              -0.326565   0.184558  -1.769   0.0768 .
## scale(obese_perc)               0.077206   0.163534   0.472   0.6368
## ptest_weeks_ago1                0.027466   0.006138   4.475 7.64e-06 ***
## ptest_weeks_ago2                0.003487   0.004776   0.730   0.4652
## ptest_weeks_ago3                0.002413   0.003912   0.617   0.5374
## PC1                            -0.040540   0.081166  -0.499   0.6175
## PC2                             0.023443   0.139972   0.167   0.8670
## factor(f_mask)1                 0.276770   0.225001   1.230   0.2187
## factor(f_mask)2                 0.146891   0.325473   0.451   0.6518
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                       edf Ref.df Chi.sq p-value
## s(weeks_since_first)   1      1  6.025  0.0141 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.726
## glmer.ML = 78.946  Scale est. = 1         n = 287
```



(8) Weekly_death ~ s(days_since_first) + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + the residential movement with 3 weeks lag + the time since the mask policy with 3 levels + random intercept

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ s(weeks_since_first, k = 4, bs = "cr") + factor(q_popdensity) +
##     scale(Age_gp1) + scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) +
##     scale(Black.perc) + scale(Hispanic.or.Latino.perc) + scale(temp) +
##     scale(precipitation) + scale(Bachelor_orhigher_perc) + scale(bed_rate) +
##     scale(smoke_perc) + scale(obese_perc) + ptest_weeks_ago1 +
##     ptest_weeks_ago2 + ptest_weeks_ago3 + resident_weeks_ago1 +
##     resident_weeks_ago2 + resident_weeks_ago3 + resident_weeks_ago4 +
##     resident_weeks_ago5 + factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -12.247205   0.745572 -16.427  < 2e-16 ***
## factor(q_popdensity)2          -0.117957   0.317600  -0.371   0.7103
## factor(q_popdensity)3          -0.130506   0.401355  -0.325   0.7451
## factor(q_popdensity)4          -0.310279   0.408841  -0.759   0.4479
## factor(q_popdensity)5           0.375871   0.549033   0.685   0.4936
## scale(Age_gp1)                  0.198765   0.203926   0.975   0.3297
## scale(Age_gp3)                  0.130756   0.173090   0.755   0.4500
## scale(Age_gp4)                  0.084890   0.188871   0.449   0.6531
## scale(poverty_perc)             0.296337   0.171448   1.728   0.0839 .
## scale(Black.perc)               0.292621   0.177798   1.646   0.0998 .
## scale(Hispanic.or.Latino.perc)  0.008242   0.193963   0.042   0.9661
## scale(temp)                    -0.390276   0.184474  -2.116   0.0344 *
## scale(precipitation)            0.234471   0.203990   1.149   0.2504
```

```
## scale(Bachelor_orhigher_perc)   -0.051087   0.222233  -0.230   0.8182
## scale(bed_rate)                 -0.089724   0.104030  -0.862   0.3884
## scale(smoke_perc)               -0.315904   0.179805  -1.757   0.0789 .
## scale(obese_perc)                0.002403   0.164599   0.015   0.9884
## ptest_weeks_ago1                 0.024556   0.006094   4.029  5.6e-05 ***
## ptest_weeks_ago2                 0.002779   0.004803   0.579   0.5629
## ptest_weeks_ago3                 0.003526   0.003908   0.902   0.3670
## resident_weeks_ago1              0.046259   0.059108   0.783   0.4339
## resident_weeks_ago2              0.028723   0.042543   0.675   0.4996
## resident_weeks_ago3              0.019048   0.077171   0.247   0.8050
## resident_weeks_ago4              0.001243   0.040402   0.031   0.9755
## resident_weeks_ago5             -0.011340   0.028595  -0.397   0.6917
## factor(f_mask)1                 -0.343028   0.716193  -0.479   0.6320
## factor(f_mask)2                 -0.329130   0.789262  -0.417   0.6767
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                       edf Ref.df Chi.sq p-value
## s(weeks_since_first)   1      1  6.633    0.01 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.758
## glmer.ML = 72.907  Scale est. = 1         n = 287
```



(9) Weekly_death ~ linear days_since_first + scaled independent variables + positive test ratio with 3 weeks lag + random intercept + random slope for days_since_first

```
##
## Family: Negative Binomial(1)
## Link function: log
##
```

```
## Formula:
## weekly_death ~ weeks_since_first + factor(q_popdensity) + scale(Age_gp1) +
##     scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) + scale(Black.perc) +
##     scale(Hispanic.or.Latino.perc) + scale(temp) + scale(precipitation) +
##     scale(Bachelor_orhigher_perc) + scale(bed_rate) + scale(smoke_perc) +
##     scale(obese_perc) + rptest + ptest_weeks_ago1 + ptest_weeks_ago2 +
##     ptest_weeks_ago3 + offset(log(population))
##
## Parametric coefficients:
##                                  Estimate Std. Error z value Pr(>|z|)
## (Intercept)                    -1.188e+01  3.047e-01 -39.003  < 2e-16 ***
## weeks_since_first               1.729e-01  3.180e-02   5.438 5.38e-08 ***
## factor(q_popdensity)2          -1.718e-01  2.890e-01  -0.594   0.5523
## factor(q_popdensity)3          -8.944e-02  3.467e-01  -0.258   0.7964
## factor(q_popdensity)4          -2.989e-01  3.616e-01  -0.827   0.4084
## factor(q_popdensity)5           4.086e-01  4.833e-01   0.845   0.3979
## scale(Age_gp1)                  1.403e-01  1.944e-01   0.722   0.4705
## scale(Age_gp3)                  2.296e-01  1.566e-01   1.466   0.1426
## scale(Age_gp4)                 -6.859e-03  1.743e-01  -0.039   0.9686
## scale(poverty_perc)             3.273e-01  1.625e-01   2.015   0.0439 *
## scale(Black.perc)               2.830e-01  1.638e-01   1.728   0.0841 .
## scale(Hispanic.or.Latino.perc) -3.164e-02  1.780e-01  -0.178   0.8589
## scale(temp)                    -3.764e-01  1.664e-01  -2.262   0.0237 *
## scale(precipitation)            1.564e-01  1.905e-01   0.821   0.4116
## scale(Bachelor_orhigher_perc)  -4.322e-02  2.098e-01  -0.206   0.8367
## scale(bed_rate)                -4.159e-02  9.480e-02  -0.439   0.6609
## scale(smoke_perc)              -3.735e-01  1.701e-01  -2.196   0.0281 *
## scale(obese_perc)               1.671e-02  1.510e-01   0.111   0.9119
## rptest                          3.405e-02  8.539e-03   3.988 6.66e-05 ***
## ptest_weeks_ago1                1.403e-02  6.523e-03   2.151   0.0315 *
## ptest_weeks_ago2                3.292e-03  4.695e-03   0.701   0.4832
## ptest_weeks_ago3                8.046e-04  3.841e-03   0.209   0.8341
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## R-sq.(adj) =  0.863
## glmer.ML = 82.584  Scale est. = 1         n = 287
```

(10) Weekly_death ~ linear days_since_first + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + random intercept + random slope for days_since_first

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ weeks_since_first + factor(q_popdensity) + scale(Age_gp1) +
##     scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) + scale(Black.perc) +
##     scale(Hispanic.or.Latino.perc) + scale(temp) + scale(precipitation) +
##     scale(Bachelor_orhigher_perc) + scale(bed_rate) + scale(smoke_perc) +
##     scale(obese_perc) + ptest_weeks_ago1 + ptest_weeks_ago2 +
##     ptest_weeks_ago3 + offset(log(population))
##
```

```
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.751986   0.314707 -37.343  < 2e-16 ***
## weeks_since_first               0.127281   0.030089   4.230 2.34e-05 ***
## factor(q_popdensity)2          -0.032501   0.303378  -0.107  0.91469
## factor(q_popdensity)3           0.075524   0.365437   0.207  0.83627
## factor(q_popdensity)4          -0.106361   0.381425  -0.279  0.78036
## factor(q_popdensity)5           0.771615   0.499613   1.544  0.12249
## scale(Age_gp1)                  0.235948   0.204316   1.155  0.24817
## scale(Age_gp3)                  0.272453   0.164440   1.657  0.09755 .
## scale(Age_gp4)                  0.006315   0.184988   0.034  0.97277
## scale(poverty_perc)             0.281538   0.172162   1.635  0.10199
## scale(Black.perc)               0.361257   0.173131   2.087  0.03692 *
## scale(Hispanic.or.Latino.perc)  0.049544   0.187924   0.264  0.79206
## scale(temp)                    -0.453838   0.175994  -2.579  0.00992 **
## scale(precipitation)            0.108503   0.201793   0.538  0.59079
## scale(Bachelor_orhigher_perc)   0.030736   0.220781   0.139  0.88928
## scale(bed_rate)                -0.014177   0.100379  -0.141  0.88769
## scale(smoke_perc)              -0.330011   0.179661  -1.837  0.06623 .
## scale(obese_perc)               0.090426   0.159085   0.568  0.56976
## ptest_weeks_ago1                0.030860   0.005967   5.171 2.32e-07 ***
## ptest_weeks_ago2                0.002627   0.004710   0.558  0.57702
## ptest_weeks_ago3                0.002061   0.003855   0.535  0.59296
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## R-sq.(adj) =  0.656
## glmer.ML = 82.138  Scale est. = 1         n = 287
```

(11) Weekly_death ~ linear days_since_first + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + the PCA of movement + the time since the mask policy with 3 levels + random intercept + random slope for days_since_first

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ weeks_since_first + factor(q_popdensity) + scale(Age_gp1) +
##     scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) + scale(Black.perc) +
##     scale(Hispanic.or.Latino.perc) + scale(temp) + scale(precipitation) +
##     scale(Bachelor_orhigher_perc) + scale(bed_rate) + scale(smoke_perc) +
##     scale(obese_perc) + ptest_weeks_ago1 + ptest_weeks_ago2 +
##     ptest_weeks_ago3 + PC1 + PC2 + factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -11.887747   0.383669 -30.984  < 2e-16 ***
## weeks_since_first               0.139469   0.056634   2.463   0.0138 *
## factor(q_popdensity)2          -0.050014   0.314427  -0.159   0.8736
## factor(q_popdensity)3           0.015948   0.397275   0.040   0.9680
## factor(q_popdensity)4          -0.159718   0.402683  -0.397   0.6916
## factor(q_popdensity)5           0.667382   0.536667   1.244   0.2137
## scale(Age_gp1)                  0.247915   0.234273   1.058   0.2899
```

```
## scale(Age_gp3)                   0.247917   0.166349   1.490   0.1361
## scale(Age_gp4)                   0.026685   0.196977   0.135   0.8922
## scale(poverty_perc)              0.281472   0.173591   1.621   0.1049
## scale(Black.perc)                0.346223   0.182845   1.894   0.0583 .
## scale(Hispanic.or.Latino.perc)   0.049305   0.194386   0.254   0.7998
## scale(temp)                     -0.441620   0.211266  -2.090   0.0366 *
## scale(precipitation)             0.151438   0.205817   0.736   0.4619
## scale(Bachelor_orhigher_perc)    0.008221   0.227638   0.036   0.9712
## scale(bed_rate)                 -0.029255   0.102750  -0.285   0.7759
## scale(smoke_perc)               -0.330419   0.184938  -1.787   0.0740 .
## scale(obese_perc)                0.077818   0.163862   0.475   0.6349
## ptest_weeks_ago1                 0.027396   0.006154   4.452 8.51e-06 ***
## ptest_weeks_ago2                 0.003490   0.004779   0.730   0.4652
## ptest_weeks_ago3                 0.002453   0.003916   0.626   0.5310
## PC1                             -0.039948   0.081279  -0.491   0.6231
## PC2                              0.023683   0.140078   0.169   0.8657
## factor(f_mask)1                  0.280151   0.225443   1.243   0.2140
## factor(f_mask)2                  0.149318   0.326103   0.458   0.6470
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## R-sq.(adj) =  0.726
## glmer.ML = 78.352  Scale est. = 1         n = 287
```

(12) Weekly_death ~ linear days_since_first + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + the residential movement with 3 weeks lag + the time since the mask policy with 3 levels + random intercept + random slope for days_since_first

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ weeks_since_first + factor(q_popdensity) + scale(Age_gp1) +
##     scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) + scale(Black.perc) +
##     scale(Hispanic.or.Latino.perc) + scale(temp) + scale(precipitation) +
##     scale(Bachelor_orhigher_perc) + scale(bed_rate) + scale(smoke_perc) +
##     scale(obese_perc) + ptest_weeks_ago1 + ptest_weeks_ago2 +
##     ptest_weeks_ago3 + resident_weeks_ago1 + resident_weeks_ago2 +
##     resident_weeks_ago3 + resident_weeks_ago4 + resident_weeks_ago5 +
##     factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -12.733441   0.736552 -17.288  < 2e-16 ***
## weeks_since_first               0.157108   0.060627   2.591  0.00956 **
## factor(q_popdensity)2          -0.107985   0.320779  -0.337  0.73639
## factor(q_popdensity)3          -0.122707   0.404874  -0.303  0.76183
## factor(q_popdensity)4          -0.293210   0.412023  -0.712  0.47669
## factor(q_popdensity)5           0.386514   0.552749   0.699  0.48439
## scale(Age_gp1)                  0.208901   0.205669   1.016  0.30976
## scale(Age_gp3)                  0.135078   0.174163   0.776  0.43799
## scale(Age_gp4)                  0.092053   0.190463   0.483  0.62888
## scale(poverty_perc)             0.297820   0.173060   1.721  0.08527 .
```

```
## scale(Black.perc)                0.297278   0.179628   1.655  0.09793 .
## scale(Hispanic.or.Latino.perc)   0.004633   0.195818   0.024  0.98112
## scale(temp)                     -0.388756   0.186208  -2.088  0.03682 *
## scale(precipitation)             0.226505   0.205086   1.104  0.26940
## scale(Bachelor_orhigher_perc)   -0.047425   0.224691  -0.211  0.83283
## scale(bed_rate)                 -0.086208   0.104876  -0.822  0.41108
## scale(smoke_perc)               -0.323207   0.181487  -1.781  0.07493 .
## scale(obese_perc)                0.003597   0.165975   0.022  0.98271
## ptest_weeks_ago1                 0.024207   0.006130   3.949 7.85e-05 ***
## ptest_weeks_ago2                 0.002789   0.004811   0.580  0.56207
## ptest_weeks_ago3                 0.003597   0.003919   0.918  0.35872
## resident_weeks_ago1              0.045604   0.059282   0.769  0.44173
## resident_weeks_ago2              0.030374   0.042608   0.713  0.47593
## resident_weeks_ago3              0.018244   0.077271   0.236  0.81335
## resident_weeks_ago4              0.001467   0.040433   0.036  0.97106
## resident_weeks_ago5             -0.011762   0.028607  -0.411  0.68095
## factor(f_mask)1                 -0.335868   0.717262  -0.468  0.63960
## factor(f_mask)2                 -0.318928   0.790685  -0.403  0.68669
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## R-sq.(adj) =  0.757
## glmer.ML = 70.748  Scale est. = 1         n = 287
```

(13) Only after the staty-at-home order: Weekly_death ~ linear days_since_first + scaled independent variables + positive test ratio with only 1-3 weeks lag without the current postive test ratio + the PCA of movement + the time since the mask policy with 3 levels + random intercept + random slope for days_since_first

```
##
## Family: Negative Binomial(1)
## Link function: log
##
## Formula:
## weekly_death ~ weeks_since_first + factor(q_popdensity) + scale(Age_gp1) +
##     scale(Age_gp3) + scale(Age_gp4) + scale(poverty_perc) + scale(Black.perc) +
##     scale(Hispanic.or.Latino.perc) + scale(temp) + scale(precipitation) +
##     scale(Bachelor_orhigher_perc) + scale(bed_rate) + scale(smoke_perc) +
##     scale(obese_perc) + ptest_weeks_ago1 + ptest_weeks_ago2 +
##     ptest_weeks_ago3 + PC1 + PC2 + factor(f_mask) + offset(log(population))
##
## Parametric coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -1.166e+01  3.954e-01 -29.486  < 2e-16 ***
## weeks_since_first              1.637e-01  5.785e-02   2.830  0.00465 **
## factor(q_popdensity)2         -1.054e-01  3.213e-01  -0.328  0.74281
## factor(q_popdensity)3         -5.826e-04  3.802e-01  -0.002  0.99878
## factor(q_popdensity)4         -2.121e-01  3.886e-01  -0.546  0.58524
## factor(q_popdensity)5          7.692e-01  5.218e-01   1.474  0.14046
## scale(Age_gp1)                 3.273e-01  2.368e-01   1.382  0.16692
## scale(Age_gp3)                 3.090e-01  1.794e-01   1.723  0.08497 .
## scale(Age_gp4)                -2.004e-03  1.908e-01  -0.011  0.99162
## scale(poverty_perc)            3.314e-01  1.840e-01   1.801  0.07170 .
## scale(Black.perc)              3.335e-01  1.793e-01   1.860  0.06289 .
```

```
## scale(Hispanic.or.Latino.perc)  1.373e-02  2.059e-01   0.067  0.94683
## scale(temp)                    -4.099e-01  2.029e-01  -2.020  0.04340 *
## scale(precipitation)            1.867e-01  2.176e-01   0.858  0.39080
## scale(Bachelor_orhigher_perc)   8.151e-02  2.328e-01   0.350  0.72627
## scale(bed_rate)                -1.169e-01  1.103e-01  -1.060  0.28905
## scale(smoke_perc)              -4.012e-01  1.851e-01  -2.168  0.03018 *
## scale(obese_perc)               1.748e-01  1.633e-01   1.071  0.28424
## ptest_weeks_ago1                2.007e-02  6.496e-03   3.089  0.00201 **
## ptest_weeks_ago2                3.501e-03  5.669e-03   0.618  0.53684
## ptest_weeks_ago3                6.128e-03  4.878e-03   1.256  0.20900
## PC1                            -3.720e-02  8.441e-02  -0.441  0.65947
## PC2                            -6.368e-02  1.499e-01  -0.425  0.67102
## factor(f_mask)1                 1.360e-01  2.445e-01   0.556  0.57804
## factor(f_mask)2                -7.251e-02  3.501e-01  -0.207  0.83593
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## R-sq.(adj) =  0.719
## glmer.ML = 71.949  Scale est. = 1         n = 260
```