Supplementary Material: A

Excluding month variable

In the original model we include indicator variables for month to account for seasonality in the model. Here we remove these indicator variables and discuss the results, drawing comparisons between the new results and those presented in the paper. The association between average daily temperature and violent crime at various lags is shown in Figures 1A (a) – (d).

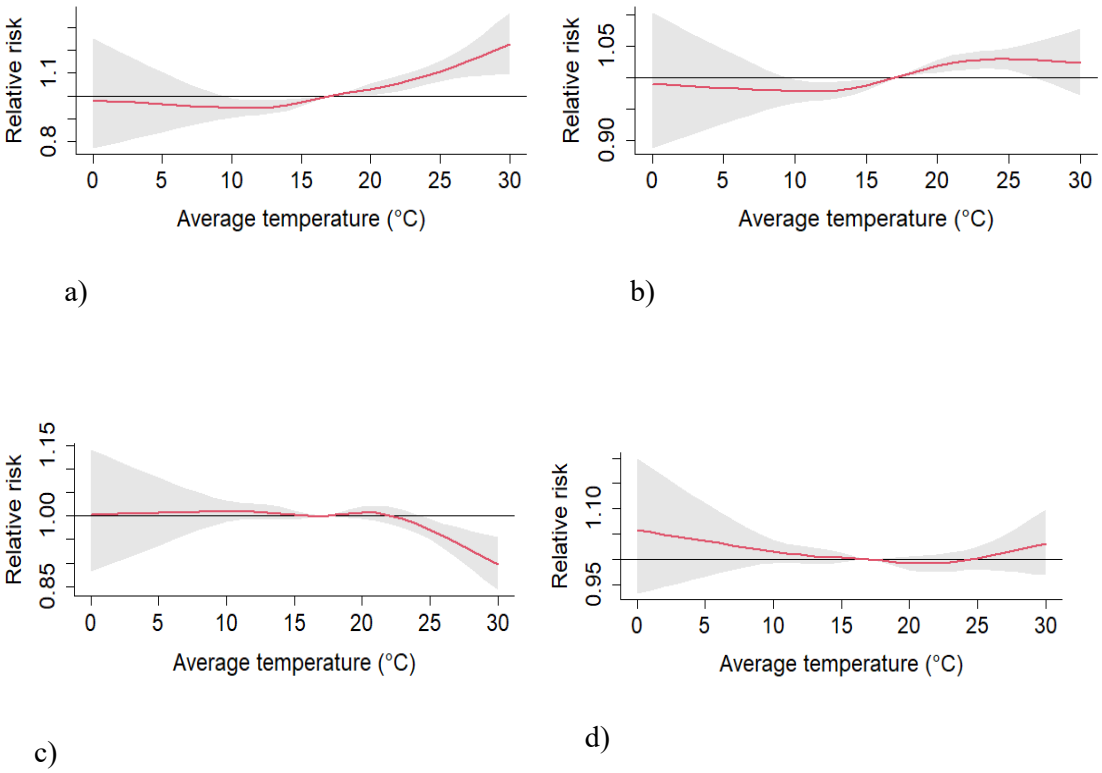


Figure A1: Association between average daily temperature and violent crime events; a) on the same day, b) after three days, c) after seven days and d) after 14 days.

In the re-analysis we observe a similar pattern as observed previously however the positive association of high temperatures and the relative risk of violent crimes decreases more rapidly.

After three days, positive associations have become non-significant. After seven days we once again observe a negative association between high temperatures and the relative risk of violent crimes. Finally, after two weeks all associations have become non-significant.

The association between various average daily temperatures and the relative risk of violent crime is shown in Figure A2. The results are similar to those observed in the manuscript (see Figure 4), with the scale of the cumulative relative risk now being significantly lower for very high temperatures (29°C). Previously, such high temperatures were associated with significantly increased cumulative relative risks of crime, however now we observe that this is only the case initially. After about 1 week these associations fade away. All other associations appear to be the same as before.

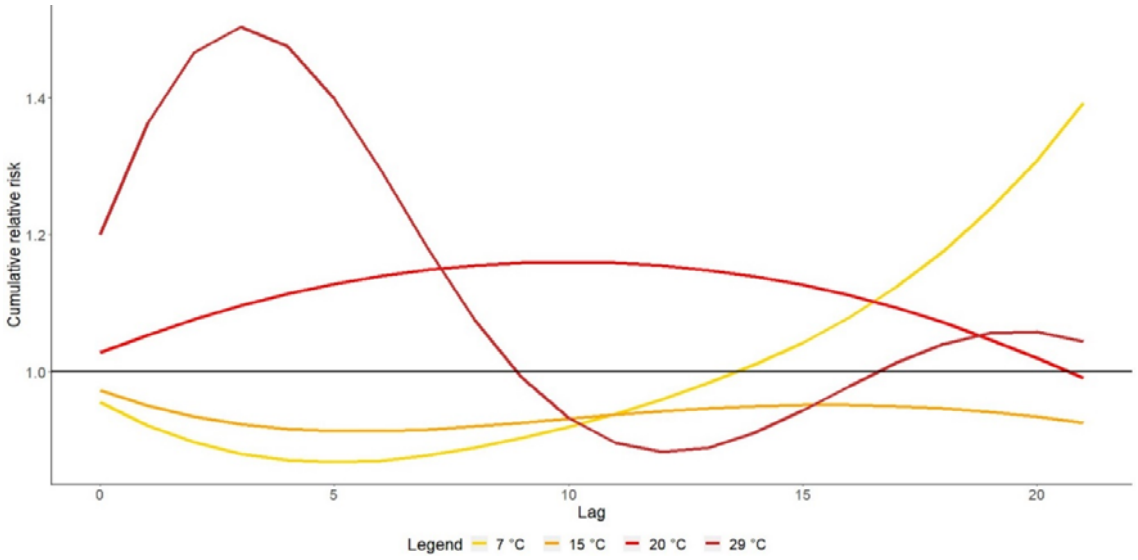


Figure A2: Association between various average daily temperature measurements and the cumulative relative risk of violent crime events.

Now we discuss other crime-weather pairs. Recall that in the original analysis an association was identified between total rainfall and relative humidity with property crime and sexual crime respectively. The association between total rainfall and the cumulative relative risk of property crime is shown in Figure A3; note that this association remains unchanged.

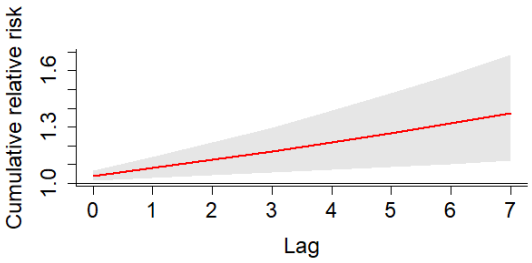
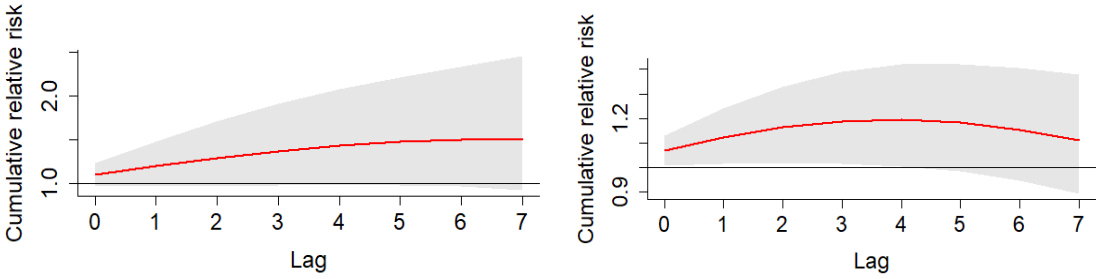


Figure A3: Association between total rainfall of 20mm with the cumulative relative risk of property crime events over the course of one week.

The association between average daily relative humidity and the cumulative association of sexual crime events is shown in Figure A4 for measurements of 48% and 80%.



a) b)

Figure A4: Association between average daily relative humidity and the cumulative relative risk of sexual crime events over one week for; a) relative humidity of 48% and b) relative humidity of 80%.

We note that in this case the previously identified association between relative humidity and sexual crime events is no longer present, with estimates being largely non-significant. Last, we note that in the original analysis only certain month variables resulted in significant parameter estimates. The month variables that were significant varied by crime type. For violent and sexual crimes, only months with higher average temperature (i.e., October – March) resulted

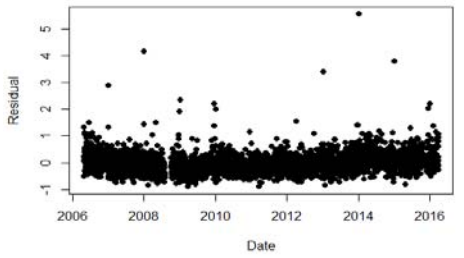
in significant parameters. For property crime, only months with lower average temperature (specifically, May – August) resulted in significant parameters. This reflects our prior findings, that increased relative risk of violent and sexual crimes are associated with increased temperature and mild humidity, as will often be the case in summer months. The significance of winter months with regards to the relative risk of property crime is most likely due to the study region experiencing most of its rainfall during the winter.

Supplementary Material: B

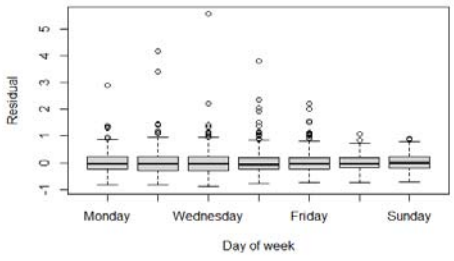
Model validation

We study the model residuals for each category of crime individually (see Figures B1 – B8). There does not appear to be any evidence of long-term trends in the model residuals (see Figures B1, B3, B5 and B7 (a)). Please note that the 'gap' at around 2009 is due to observations that had to be removed due to missing observations (either in the observed data or the basis functions). There is also no apparent relationship between residuals and any of the meteorological predictors (see Figures B2, B4, B6 and B8) or with day of the week or month (see Figures B1, B3, B5 and B7 (b) and (c)). Finally, we show the partial autocorrelation function for the residuals for each category of crime (see Figure B1, B3, B5 and B7 (d)). While the partial autocorrelation at certain lags is statistically significant, these associations are still relatively small.

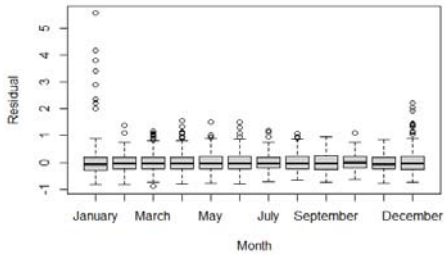
All crimes

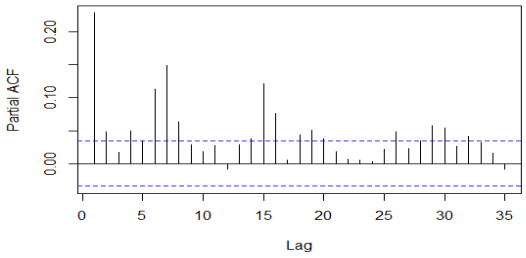


(a)



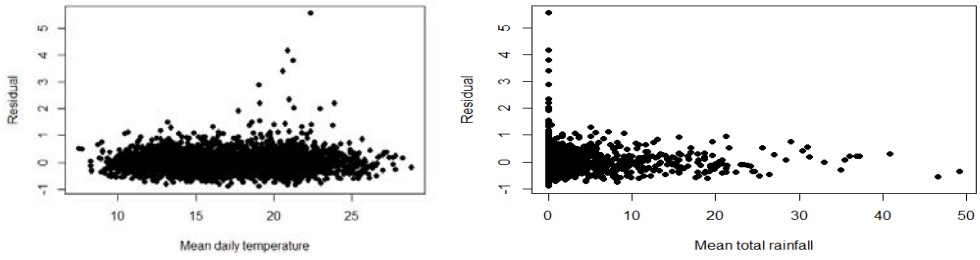
(b)



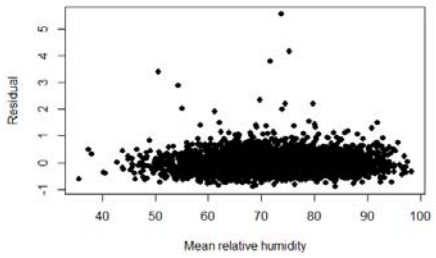


(c) (d)

Figure B1: Residuals by date (a), day of the week (b), month (c) as well as partial autocorrelation function (d) for residuals of predicted counts for all crime categories.



(a) (b)



(c)

Figure B2: Model residuals plotted against mean daily temperature (a), mean total rainfall (b) and mean relative humidity (c) for all crime categories.

Violent crimes

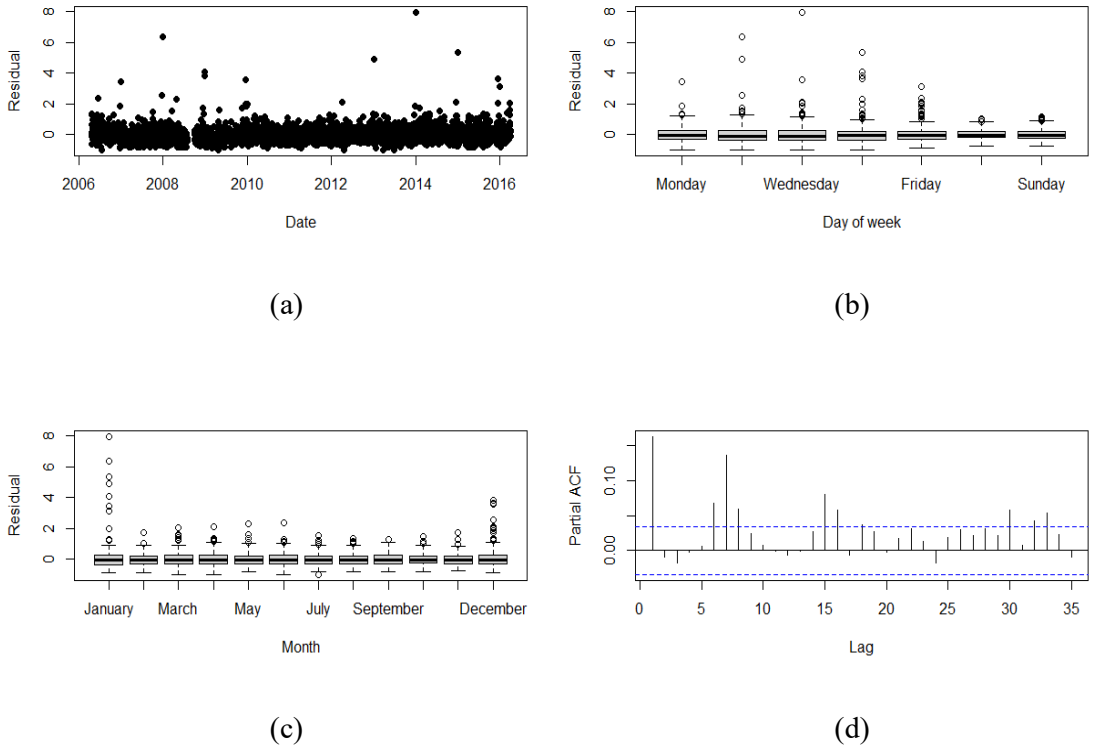


Figure B3: Residuals by date (a), day of the week (b), month (c) as well as partial autocorrelation function (d) for residuals of predicted counts for violent crimes.

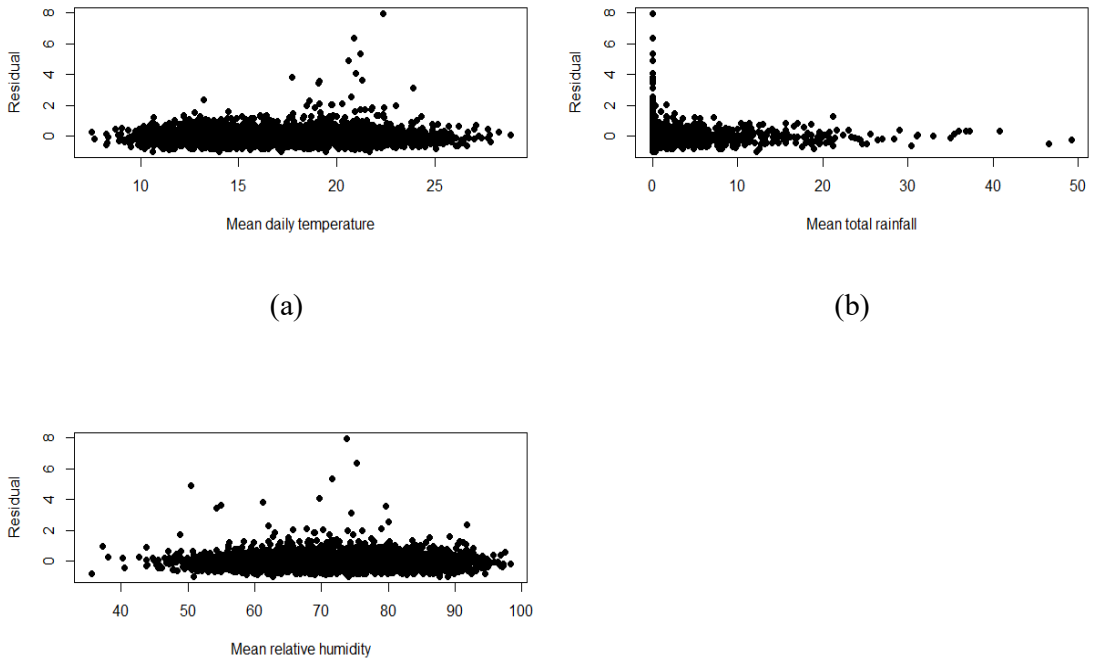


Figure B4: Model residuals plotted against mean daily temperature (a), mean total rainfall (b) and mean relative humidity (c) for violent crimes.

Property crimes

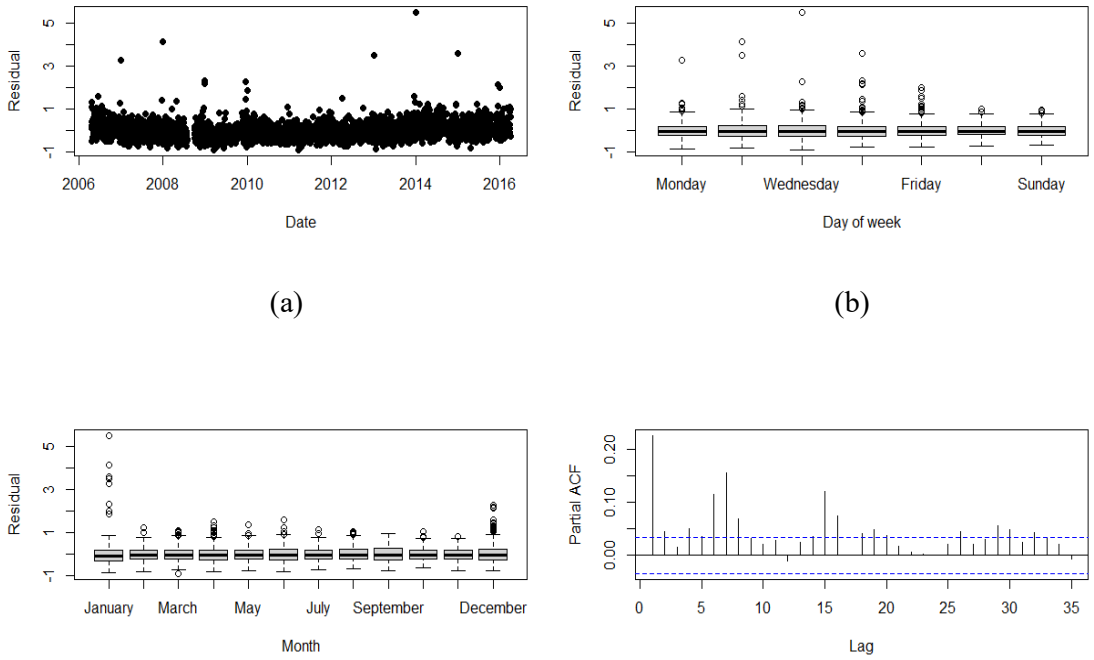


Figure B5: Residuals by date (a), day of the week (b), month (c) as well as partial autocorrelation function (d) for residuals of predicted counts for property crimes.

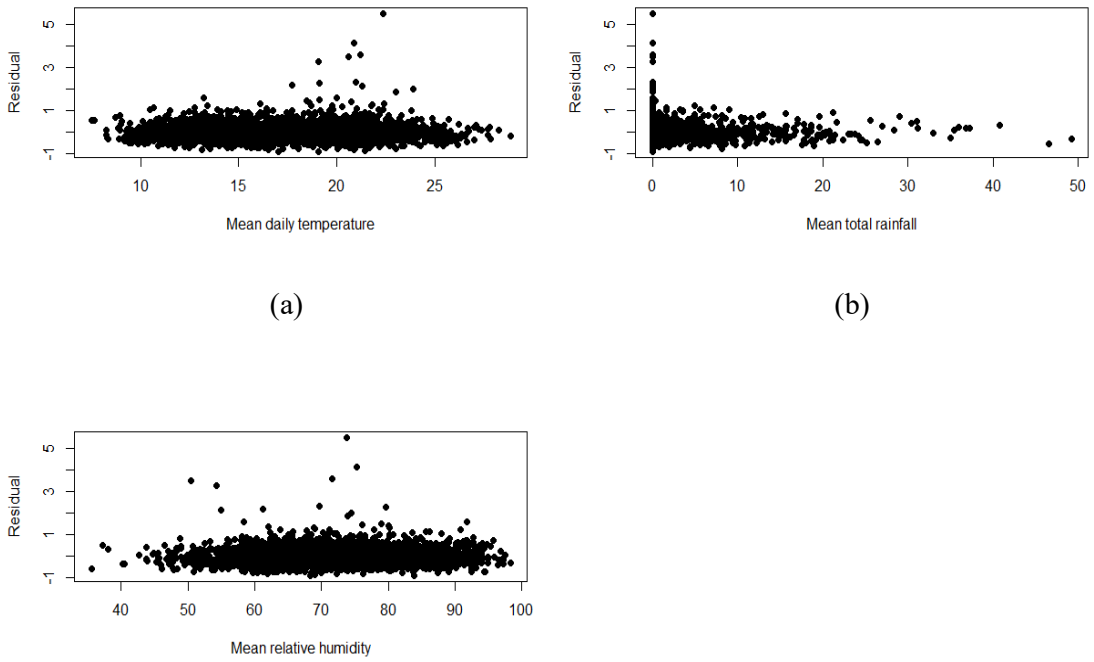


Figure B6: Model residuals plotted against mean daily temperature (a), mean total rainfall (b) and mean relative humidity (c) for property crimes.

Sexual crimes

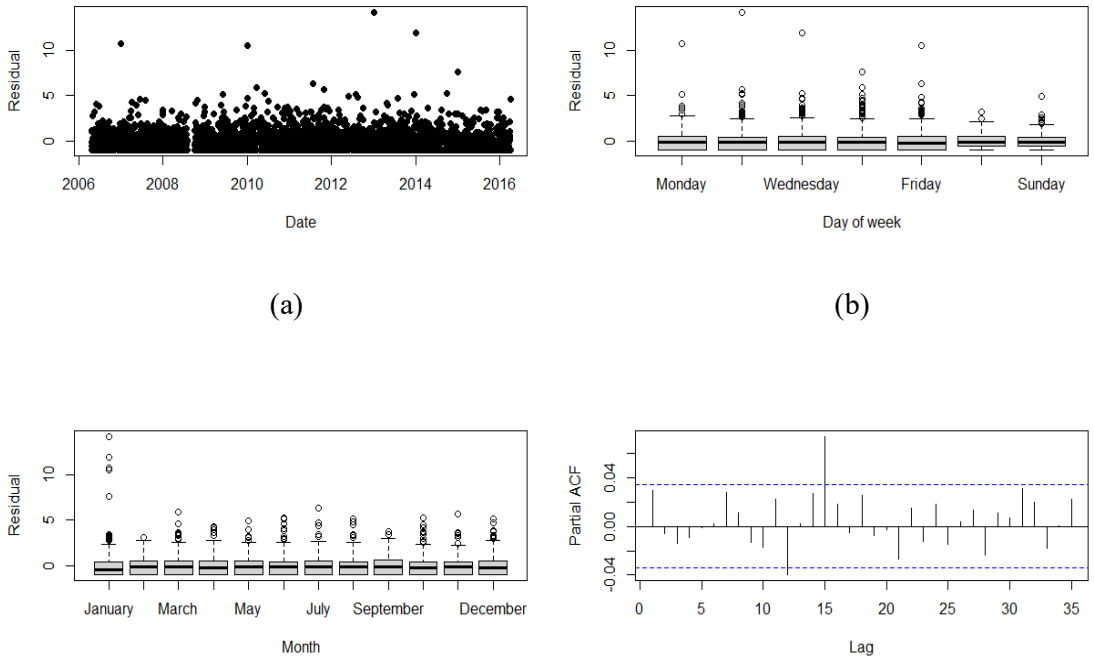


Figure B7: Residuals by date (a), day of the week (b), month (c) as well as partial autocorrelation function (d) for residuals of predicted counts for sexual crimes.

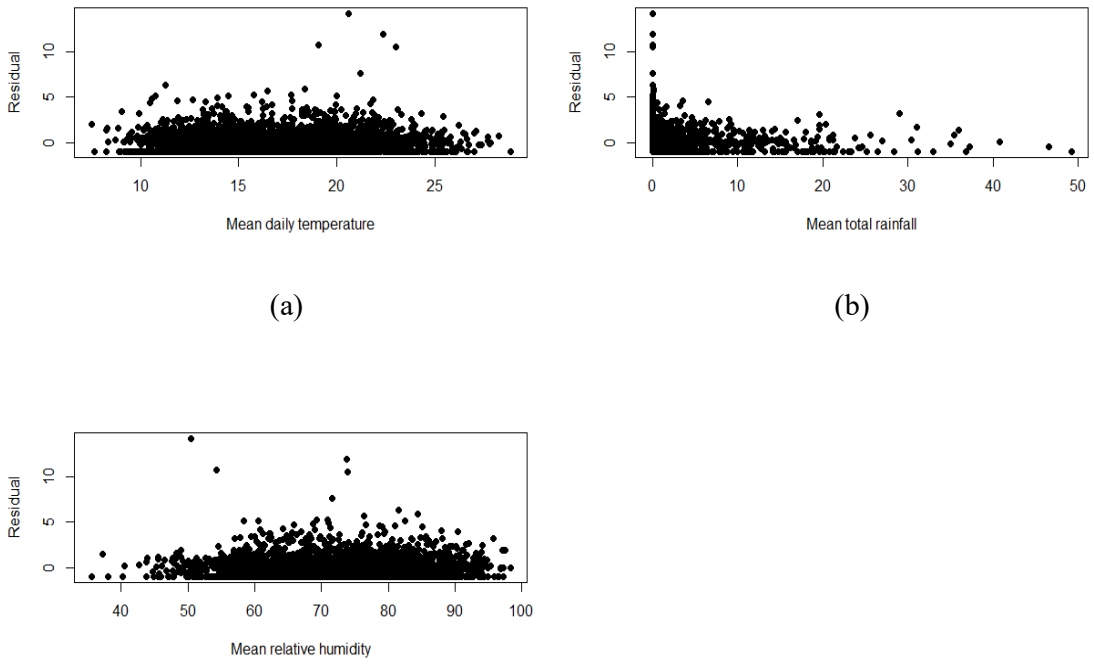


Figure B8: Model residuals plotted against mean daily temperature (a), mean total rainfall (b) and mean relative humidity (c) for sexual crimes.

Increasing the degrees of freedom of the natural cubic splines used to model the association between the various crime categories and the meteorological predictors resulted in models with non-significant estimates that overfitted to the data. Increasing the lag dimension of rainfall and relative humidity (which in the final model are set at a maximum of 7 days) resulted in no significant changes to the results.