

Additional file 4 – GAM model

$$Y_{itd} \sim \text{Poisson}(\mu_{itd})$$

1. Single Pollutant Model (Model 1):

$$\begin{aligned} \text{Log}(\mu_{itd}) = & \beta_0 + \beta_1 X_{\text{weekend}} + \beta_2 X_{\text{holiday}} + \beta_3 X_{\text{population}} + S1(X_{\text{temperature}}) + S2(X_{\text{dewpoint}}) + \\ & S3(X_{\text{weekday}}) + S4(X_{\text{timeseries}}) + S5(X_{\text{onepollutant}}) \end{aligned}$$

2. Four pollutants Model (Model 2):

$$\begin{aligned} \text{Log}(\mu_{itd}) = & \beta_0 + \beta_1 X_{\text{weekend}} + \beta_2 X_{\text{holiday}} + \beta_3 X_{\text{population}} + S1(X_{\text{temperature}}) + S2(X_{\text{dewpoint}}) + \\ & S3(X_{\text{weekday}}) + S4(X_{\text{timeseries}}) + S5(X_{\text{PM10}}) + S6(X_{\text{SO2}}) + S7(X_{\text{O3}}) \\ & + S8(X_{\text{NO2}}) \end{aligned}$$

Where $i=1,2,\dots,12$ (12 districts), $t=2000,2001,2002$ (year), $d=1,2,\dots,1096$ (day).

Y_{itd} : Daily asthma outpatient or emergency visits in each district.

μ_{itd} : Daily average asthma outpatient or emergency visits in each district.

X_{weekend} : weekend/Non-Weekend

X_{holiday} : Chinese New Year (5 days)

$X_{\text{population}}$: Population in four age groups in each district

$X_{\text{temperature}}$: Daily average temperature in Taipei City

X_{dewpoint} : Daily average dewpoint in Taipei City

X_{weekday} : Weekly cycle, from Monday to Sunday (1,2,...,7)

$X_{\text{timeseries}}$: Daily cycle, from first day to the last day in the study period.(1,2,...,1096)

$X_{\text{onepollutant}}$: Only one estimated daily average concentration of pollutant in each district

$X_{\text{PM10}}, X_{\text{SO2}}, X_{\text{O3}}, X_{\text{NO2}}$: Four estimated daily average concentration of pollutants in each district

S1-S8: Smoothing function (Cubic smoothing Spline) will get approximate linear coefficient by SAS.