## 蕁麻疹就診人數資料

資料來自高雄榮民總醫院 (皮膚科)，為 2017 年 1 月 1 日至 2017 年 12 月 31 日診斷 ICD-9 代碼為 995.3(過敏) 每日就診人數資料，此篇為蕁麻疹的結果。

# univariate gam

Generalized additive Poisson model

$$\ln(patient) = Intercept + \beta \times Airpollution + s(temperature) + s(humidity) + s(time)$$

s= a cyclic cubic regression splines
下列依不同的空汙指標分別做單變數 Generalized additive Poisson model，並以時間趨勢、當天的溫度與濕度作為共變量做平滑函數的擬合，下列各空汙列出了不同的滯後天數 (row, 當天 前七天) 與不同的移動平均天數 (colum, 當天平均 七天平均) 的模型結果 (p-value 與空汙估計係數)

# CO

Table 1: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.089 | 0.188 | 0.355 | 0.266 | 0.060 | 0.099 | 0.136 |
| 2 | 0.890 | 0.436 | 0.419 | 0.578 | 0.420 | 0.149 | 0.241 |
| 3 | 0.149 | 0.231 | 0.137 | 0.169 | 0.282 | 0.151 | 0.034 |
| 4 | 0.126 | 0.066 | 0.106 | 0.066 | 0.082 | 0.121 | 0.052 |
| 5 | 0.004 | 0.032 | 0.028 | 0.051 | 0.034 | 0.055 | 0.109 |
| 6 | 0.586 | 0.163 | 0.162 | 0.113 | 0.137 | 0.068 | 0.072 |
| 7 | 0.211 | 0.467 | 0.046 | 0.040 | 0.025 | 0.037 | 0.017 |
| 8 | 0.166 | 0.762 | 0.660 | 0.476 | 0.387 | 0.251 | 0.298 |

row:lag days,col:moving average for the n days

Table 2: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.575 | 0.562 | 0.461 | 0.627 | 1.184 | 1.156 | 1.140 |
| 2 | 0.049 | 0.332 | 0.403 | 0.315 | 0.509 | 1.008 | 0.892 |
| 3 | 0.495 | 0.513 | 0.737 | 0.776 | 0.678 | 1.005 | 1.615 |
| 4 | 0.525 | 0.783 | 0.802 | 1.033 | 1.095 | 1.085 | 1.480 |
| 5 | 0.936 | 0.907 | 1.087 | 1.097 | 1.329 | 1.340 | 1.218 |
| 6 | -0.198 | 0.599 | 0.696 | 0.892 | 0.938 | 1.276 | 1.369 |
| 7 | 0.433 | 0.315 | 0.988 | 1.157 | 1.409 | 1.461 | 1.823 |
| 8 | -0.513 | -0.133 | -0.222 | 0.403 | 0.544 | 0.799 | 0.791 |

## SO2

Table 3: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.597 | 0.019 | 0.026 | 0.009 | 0.001 | 0.019 | 0.022 |
| 2 | 0.303 | 0.871 | 0.124 | 0.075 | 0.024 | 0.002 | 0.035 |
| 3 | 0.011 | 0.358 | 0.252 | 0.025 | 0.020 | 0.005 | 0.000 |
| 4 | 0.769 | 0.086 | 0.434 | 0.336 | 0.053 | 0.038 | 0.011 |
| 5 | 0.143 | 0.282 | 0.044 | 0.204 | 0.167 | 0.031 | 0.026 |
| 6 | 0.029 | 0.703 | 0.967 | 0.378 | 0.657 | 0.461 | 0.116 |
| 7 | 0.702 | 0.287 | 0.938 | 0.732 | 0.256 | 0.487 | 0.343 |
| 8 | 0.016 | 0.114 | 0.815 | 0.473 | 0.400 | 0.144 | 0.314 |

row:lag days,col:moving average for the n days

Table 4: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.022 | 0.122 | 0.133 | 0.173 | 0.253 | 0.182 | 0.187 |
| 2 | -0.044 | -0.008 | 0.092 | 0.118 | 0.165 | 0.236 | 0.172 |
| 3 | 0.108 | 0.048 | 0.068 | 0.149 | 0.170 | 0.218 | 0.290 |
| 4 | 0.012 | 0.089 | 0.047 | 0.064 | 0.141 | 0.161 | 0.208 |
| 5 | 0.062 | 0.056 | 0.121 | 0.085 | 0.100 | 0.167 | 0.182 |
| 6 | -0.092 | -0.020 | -0.002 | 0.058 | 0.032 | 0.056 | 0.128 |
| 7 | 0.016 | -0.055 | -0.005 | 0.023 | 0.082 | 0.053 | 0.077 |
| 8 | 0.102 | 0.082 | 0.014 | 0.048 | 0.061 | 0.113 | 0.082 |

# O3

Table 5: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.323 | 0.388 | 0.562 | 0.448 | 0.269 | 0.412 | 0.257 |
| 2 | 0.129 | 0.123 | 0.154 | 0.237 | 0.176 | 0.095 | 0.137 |
| 3 | 0.368 | 0.134 | 0.107 | 0.155 | 0.241 | 0.194 | 0.126 |
| 4 | 0.004 | 0.020 | 0.020 | 0.027 | 0.050 | 0.099 | 0.084 |
| 5 | 0.649 | 0.102 | 0.120 | 0.080 | 0.071 | 0.090 | 0.128 |
| 6 | 0.124 | 0.622 | 0.505 | 0.415 | 0.269 | 0.210 | 0.216 |
| 7 | 0.940 | 0.716 | 0.809 | 0.269 | 0.218 | 0.134 | 0.097 |
| 8 | 0.394 | 0.450 | 0.340 | 0.629 | 0.755 | 0.598 | 0.405 |

row:lag days,col:moving average for the n days

Table 6: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.003 | 0.003 | 0.002 | 0.003 | 0.005 | 0.004 | 0.005 |
| 2 | 0.005 | 0.006 | 0.006 | 0.005 | 0.006 | 0.007 | 0.007 |
| 3 | 0.003 | 0.005 | 0.006 | 0.006 | 0.005 | 0.006 | 0.007 |
| 4 | 0.009 | 0.008 | 0.009 | 0.009 | 0.008 | 0.007 | 0.008 |
| 5 | 0.002 | 0.006 | 0.006 | 0.007 | 0.008 | 0.007 | 0.007 |
| 6 | -0.005 | -0.002 | 0.003 | 0.003 | 0.005 | 0.006 | 0.006 |
| 7 | 0.000 | -0.001 | 0.001 | 0.005 | 0.005 | 0.007 | 0.008 |
| 8 | -0.003 | -0.003 | -0.004 | -0.002 | 0.001 | 0.002 | 0.004 |

## PM2.5

Table 7: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.017 | 0.300 | 0.626 | 0.201 | 0.289 | 0.466 | 0.595 |
| 2 | 0.266 | 0.572 | 0.949 | 0.797 | 0.568 | 0.687 | 0.894 |
| 3 | 0.000 | 0.034 | 0.006 | 0.048 | 0.132 | 0.030 | 0.055 |
| 4 | 0.003 | 0.000 | 0.002 | 0.000 | 0.005 | 0.017 | 0.003 |
| 5 | 0.608 | 0.097 | 0.002 | 0.028 | 0.009 | 0.045 | 0.103 |
| 6 | 0.818 | 0.714 | 0.152 | 0.007 | 0.035 | 0.010 | 0.037 |
| 7 | 0.947 | 0.889 | 0.506 | 0.101 | 0.005 | 0.018 | 0.004 |
| 8 | 0.574 | 0.905 | 0.984 | 0.791 | 0.296 | 0.038 | 0.088 |

row:lag days,col:moving average for the n days

Table 8: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.009 | 0.005 | 0.003 | 0.008 | 0.007 | 0.005 | 0.004 |
| 2 | -0.004 | 0.003 | 0.000 | -0.002 | 0.004 | 0.003 | 0.001 |
| 3 | 0.016 | 0.010 | 0.015 | 0.012 | 0.010 | 0.016 | 0.015 |
| 4 | 0.011 | 0.021 | 0.017 | 0.022 | 0.019 | 0.018 | 0.024 |
| 5 | 0.002 | 0.008 | 0.017 | 0.014 | 0.018 | 0.015 | 0.013 |
| 6 | -0.001 | 0.002 | 0.008 | 0.017 | 0.014 | 0.019 | 0.016 |
| 7 | 0.000 | 0.001 | 0.004 | 0.010 | 0.019 | 0.018 | 0.022 |
| 8 | 0.002 | 0.001 | -0.000 | 0.002 | 0.007 | 0.015 | 0.013 |

## PM10

Table 9: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.447 | 0.882 | 0.599 | 0.867 | 0.943 | 0.604 | 0.922 |
| 2 | 0.282 | 0.815 | 0.637 | 0.382 | 0.926 | 0.769 | 0.524 |
| 3 | 0.050 | 0.486 | 0.326 | 0.613 | 0.987 | 0.513 | 0.698 |
| 4 | 0.365 | 0.058 | 0.293 | 0.223 | 0.437 | 0.763 | 0.347 |
| 5 | 0.491 | 0.881 | 0.467 | 0.851 | 0.657 | 0.939 | 0.740 |
| 6 | 0.131 | 0.199 | 0.467 | 0.945 | 0.745 | 0.999 | 0.785 |
| 7 | 0.169 | 0.120 | 0.205 | 0.504 | 0.897 | 0.865 | 0.825 |
| 8 | 0.303 | 0.571 | 0.270 | 0.263 | 0.466 | 0.974 | 0.733 |

row:lag days,col:moving average for the n days

Table 10: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.001 | 0.000 | -0.002 | 0.000 | -0.000 | -0.002 | 0.000 |
| 2 | -0.002 | -0.001 | -0.001 | -0.003 | -0.000 | -0.001 | -0.003 |
| 3 | 0.003 | 0.002 | 0.003 | 0.002 | -0.000 | 0.002 | 0.002 |
| 4 | 0.002 | 0.004 | 0.003 | 0.004 | 0.003 | 0.001 | 0.004 |
| 5 | -0.001 | -0.000 | 0.002 | 0.001 | 0.002 | 0.000 | -0.001 |
| 6 | -0.003 | -0.003 | -0.002 | 0.000 | -0.001 | 0.000 | -0.001 |
| 7 | -0.003 | -0.004 | -0.004 | -0.002 | 0.000 | -0.001 | 0.001 |
| 8 | 0.002 | -0.001 | -0.003 | -0.004 | -0.003 | -0.000 | -0.001 |

**NO**

Table 11: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.551 | 0.384 | 0.616 | 0.771 | 0.715 | 0.693 | 0.772 |
| 2 | 0.222 | 0.455 | 0.774 | 0.686 | 0.565 | 0.610 | 0.548 |
| 3 | 0.786 | 0.577 | 0.664 | 0.927 | 0.882 | 0.805 | 0.922 |
| 4 | 0.066 | 0.239 | 0.141 | 0.216 | 0.397 | 0.439 | 0.437 |
| 5 | 0.260 | 0.631 | 0.671 | 0.436 | 0.483 | 0.658 | 0.605 |
| 6 | 0.783 | 0.638 | 0.631 | 0.669 | 0.487 | 0.574 | 0.771 |
| 7 | 0.795 | 0.634 | 0.881 | 0.340 | 0.312 | 0.166 | 0.177 |
| 8 | 0.504 | 0.497 | 0.895 | 0.710 | 0.754 | 0.700 | 0.457 |

row:lag days,col:moving average for the n days

Table 12: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.017 | 0.029 | 0.018 | 0.012 | 0.016 | 0.018 | -0.014 |
| 2 | -0.036 | -0.025 | -0.011 | -0.017 | -0.025 | -0.024 | -0.029 |
| 3 | 0.008 | -0.019 | -0.016 | -0.004 | -0.006 | -0.011 | -0.005 |
| 4 | -0.054 | -0.040 | -0.055 | -0.051 | -0.037 | -0.036 | -0.038 |
| 5 | 0.032 | -0.016 | -0.016 | -0.032 | -0.031 | -0.021 | -0.025 |
| 6 | -0.008 | 0.015 | -0.018 | -0.017 | -0.030 | -0.026 | -0.014 |
| 7 | 0.007 | -0.016 | -0.006 | -0.039 | -0.045 | -0.065 | -0.067 |
| 8 | 0.019 | 0.022 | 0.005 | 0.015 | -0.014 | -0.018 | -0.037 |

## NO2

Table 13: linear term p-value with lag and moving average data

| | p.pv | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.539 | 0.937 | 0.862 | 0.449 | 0.453 | 0.682 | 0.936 |
| 2 | 0.021 | 0.124 | 0.105 | 0.221 | 0.571 | 0.611 | 0.409 |
| 3 | 0.005 | 0.557 | 0.721 | 0.918 | 0.996 | 0.603 | 0.586 |
| 4 | 0.750 | 0.059 | 0.575 | 0.681 | 0.966 | 0.835 | 0.460 |
| 5 | 0.170 | 0.717 | 0.183 | 0.782 | 0.908 | 0.794 | 0.818 |
| 6 | 0.869 | 0.394 | 0.715 | 0.260 | 0.789 | 0.847 | 0.906 |
| 7 | 0.763 | 0.609 | 0.314 | 0.460 | 0.156 | 0.535 | 0.580 |
| 8 | 0.092 | 0.334 | 0.461 | 0.310 | 0.510 | 0.222 | 0.646 |

row:lag days,col:moving average for the n days

Table 14: Parametric coefficients with lag and moving average data

| | beta | mv2 | mv3 | mv4 | mv5 | mv6 | mv7 |
|---|---|---|---|---|---|---|---|
| 1 | 0.007 | -0.001 | 0.003 | 0.012 | 0.013 | 0.008 | -0.002 |
| 2 | -0.026 | -0.020 | -0.024 | -0.020 | -0.010 | -0.010 | -0.017 |
| 3 | 0.030 | 0.008 | 0.005 | -0.002 | -0.000 | 0.010 | 0.011 |
| 4 | 0.004 | 0.024 | 0.008 | 0.007 | 0.001 | 0.004 | 0.015 |
| 5 | 0.015 | 0.005 | 0.019 | 0.004 | 0.002 | -0.005 | -0.005 |
| 6 | 0.002 | 0.011 | 0.005 | 0.018 | 0.005 | 0.004 | -0.002 |
| 7 | 0.003 | 0.007 | 0.015 | 0.012 | 0.025 | 0.012 | 0.011 |
| 8 | 0.018 | 0.012 | 0.011 | 0.016 | 0.012 | 0.023 | 0.009 |