# Study relation between Asthma And Air Pollution, Climate In Taiwan From 2002-2010

PHAN DINH VAN, Hsiu Chen Hsu

Yuan Ze University, Department of Information Management

## 1. Introduction

Asthma is a disease of the respiratory system was defined by WHO: Asthma attacks all age groups but often starts in childhood. It is a disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. In an individual, they may occur from hour to hour and day to day.

This condition is due to inflammation of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs (Definition of WHO).

From definition of WHO and as we know that weather and climate directly and greatly affects to asthma disease. Therefore, in this study, we use asthma disease data from the 2002-2010 of NHIRD to find out the effect of weather and climate to Asthma.

## 2. Methodology

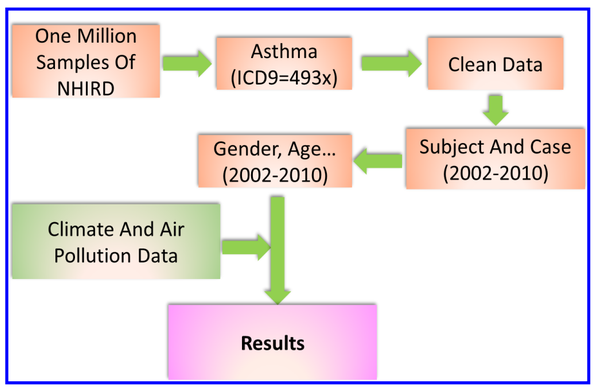


*Figure 1: Data handling model*

We use one million samples data in 2010 to study the cases of outpatient Asthma (ICD9 = 493x) data combined with weather and air pollution data. However, after the extracted Asthma data, we need to clean the data, because some records of exactly one patient but those have different birth date values or different gender values. We also combined the position (area) of the patients were visited hospital (HOSP_ID, Area_No), longitude and latitude to locate the number asthma patient in over Taiwan. Finally, we use the statistics theory, correlation, regression and RStudio to show descriptive analyze by gender, age group, monthly, Seasonally; correlation coefficient, relation between asthma and weather & climate and show asthma of each area on the google maps.

## 3. Characteristic of Asthma

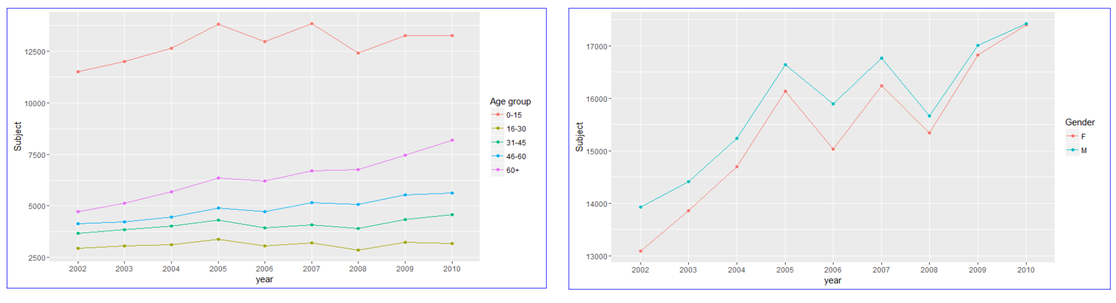


*Figure 2: Age stratum of asthma*

Generally, almost groups have increasing trend in subject and case number from 2002 to 2010. Among them, subject and case number of childhood group (0-15) always higher than others, but elderly group was the fastest increasing trend. Asthma in male group always higher than female group. (fig. 2)

## 4. Distribution in Seasonally

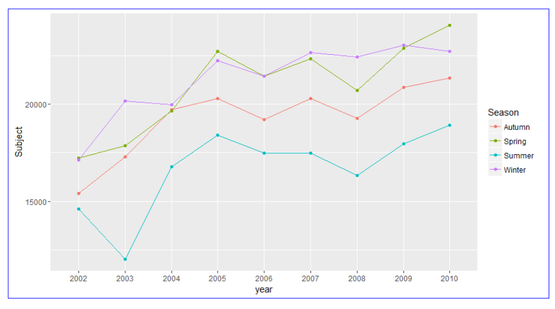


*Figure 4: Distribution Seasonally*

As in introduction, we have know asthma was effected by weather. Indeed, fig. 4 shows Winter and Spring have the highest number. Conversely, in Winter has the lowest.

## 5. Incidence of Asthma

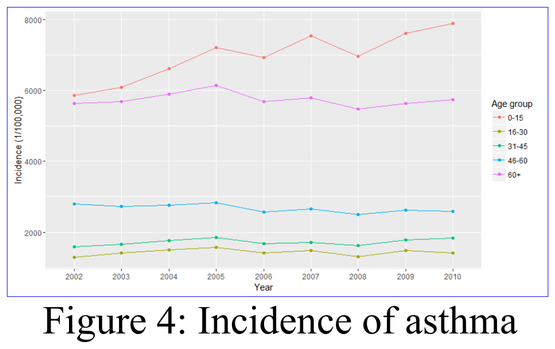


Figure 4: Incidence of asthma

From 2002 to 2010 incidence of childhood is great increase (5,861-7,892), but 46-60 group has decreasing trend (2,802 - 2,591).

## 6. Affection of climate and Air Pollution

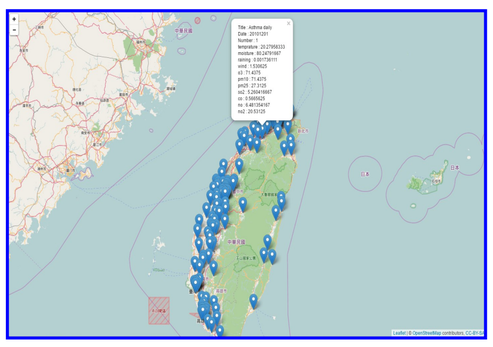

Figure 5: Asthma distribution

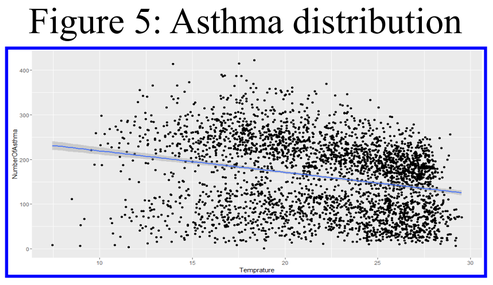


Figure 6: Asthma - Temperature

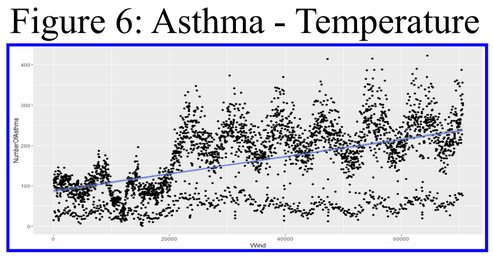


Figure 7: Asthma - Wind

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Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.149e+01  1.415e+01   4.344 1.44e-05 ***
x$Temprature -1.760e+00  3.477e-01  -5.062 4.38e-07 ***
x$Wind        2.382e-03  7.618e-05  31.265  < 2e-16 ***
x$O3         -3.024e-01  1.865e-01  -1.621 0.105076
x$PM10        8.433e-01  9.181e-02   9.185  < 2e-16 ***
x$PM2.5      -1.640e+00  1.433e-01 -11.444  < 2e-16 ***
x$SO2        -2.664e+00  7.850e-01  -3.393 0.000699 ***
x$CO         -6.086e+00  1.573e+01  -0.387 0.698938
x$NO         -1.162e+00  5.107e-01  -2.276 0.022913 *
x$NO2         5.318e+00  5.032e-01  10.569  < 2e-16 ***
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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 66.05 on 3277 degrees of freedom
Multiple R-squared:  0.3786,    Adjusted R-squared:  0.3769
F-statistic: 221.8 on 9 and 3277 DF,  p-value: < 2.2e-16
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Figure 8: Asthma - Regression

Asthma, climate and air pollution ware be presented Taiwan area in google maps to know the distribution and more detail information together. From the map, we see fewer patients in the East, but concentrated in the western region. It may be the number of people who are not balance or the air pollution in the East is higher than the West.

The regression model (fig. 8) shows relation between asthma and climate (with 10 independence variable) & air pollution with estimate: $\beta = 2.38$ ($p<0.001$) of wind and $\beta=8.43$ ($p<0.001$) of PM10.

## 7. Conclusions

This study has find out some characteristic of asthma in Taiwan from 2002 to 2010 of Male always was higher than Female; in the group, childhood is the highest and next is elderly. Asthma also was be effected from climate and air pollution.