Contents

Topic

The relationship between wind speed and influenza spread

Wind speed plays a dual role in the spread of influenza viruses: On the one hand, high wind speed helps to quickly spread droplets and reduce the concentration of the virus in a specific area. On the other hand, strong winds may dry out the environment and increase the risk of respiratory infections including flu. Furthermore, when being in places with high wind speeds, people may not be willing to stay outdoors for long periods and are more inclined to stay indoors with poor ventilation, which may also increase the chance of influenza virus transmission. Since there are different opinions on the impact of wind speed on influenza, I want to use data to illustrate the real situation.

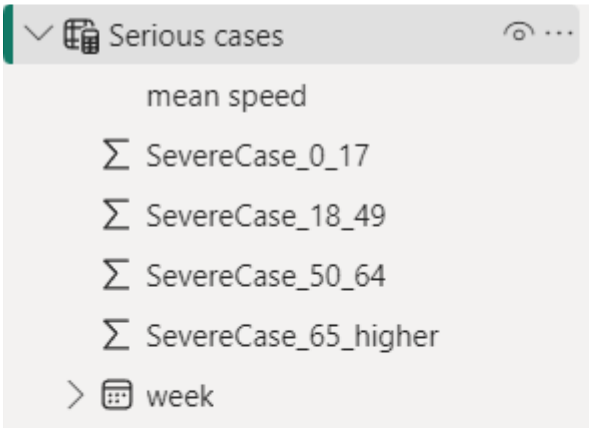
Dataset description

I used the daily data set daily_CP1_WSPD_ALL (Csv_1) for wind speed at Central Pier from CLIMATE AND WEATHER and the epidemiological data set flux_csv (Csv_2) from HEALTH for analysis. In Csv_1, the original fields include variables: Year, Month(String type) , Value, and Data Completeness, and the date format is recorded as daily. For Csv_2, it contains 31 fields. After screening, I finally selected 10 key fields for in-depth analysis, including date, number of medical consultations, and number of serious cases.

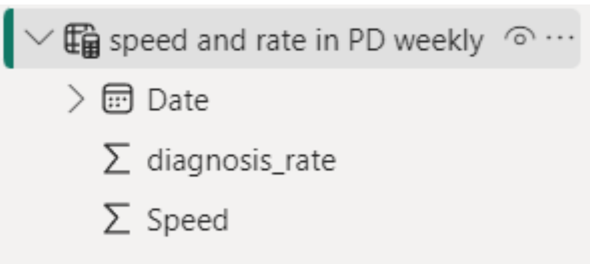
week	mean speed
Sunday, 2 February 2014	*14*
Sunday, 20 April 2014	*14*
Sunday, 6 September 2015	*14*
Sunday, 29 November 2015	*14*

To integrate the two data sets, I adjusted the time-frequency of Csv_1 to weekly and calculated its mean speed to facilitate subsequent comparison and analysis.

Table 1 & 2 description



I have adjusted the time-frequency of both data sets to weekly and put all the null and blank value into 0. For Table 1 (Severe Cases), key columns including SevereCase_0_17, SevereCase_18_49, SevereCase_50_64, SevereCase_65_higher, and mean speed of wind were imported to provide insights into the distribution of severe cases across different age groups relative to speed metrics.



In Table 2, dates are loaded along with the Diagnostic rate and Speed to facilitate temporal analysis of diagnostic rates based on speed data.

season	mean speech Season
1	*14.1266666666667*
2	*11.5034965034965*
3	*11.1319444444444*
4	*13.6142857142857*

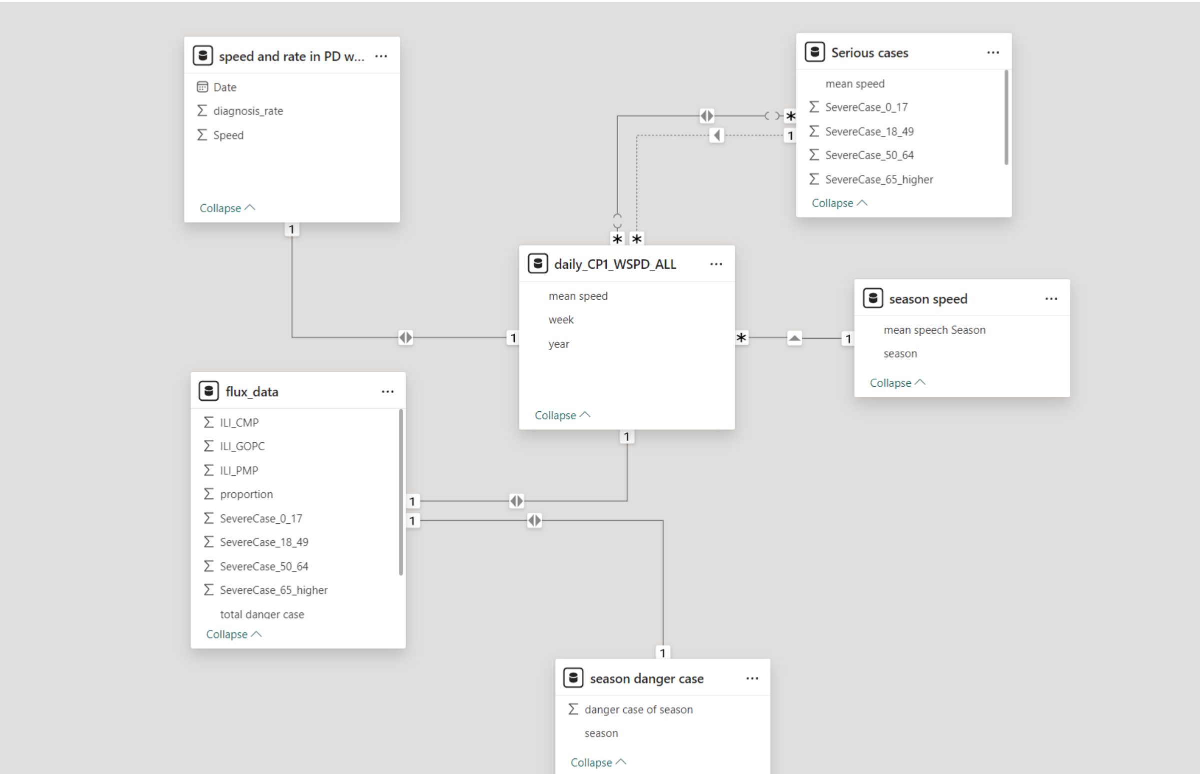
season	danger case of season
1	23.2684563758389
2	11.8601398601399
3	8.46527777777778
4	4.41780821917808

These two extras are made to help analyze the situation by season.

Data Model description

The Date column in the speed and rate in the PD weekly table serves as a key linking to the daily_CPI_WSPD_ALL dataset. Meanwhile, the week column in daily_CPI_WSPD_ALL connects with the Serious Cases table, facilitating analysis of severe cases by week. daily_CPI_WSPD_ALL are sharing a connection with season_speed via the season and week column.

The flux_data table is integrated via the danger_case and week metric to correlate with season danger Cases and daily_CPI_WSPD_ALL datasets respectively.



DAX column 1 – 3

total danger case

[SevereCase_0_17] + [SevereCase_18_49] +[SevereCase_50_64] +[SevereCase_65_higher]

This custom column aggregates the total number of serious cases across different age groups in a week, providing vital insights into the no of dangerous cases that happened. The DAX formula sums the counts of severe cases from four specified age brackets: SevereCase_0_17, SevereCase_18_49, SevereCase_50_64, and SevereCase_65_higher. This comprehensive total helps to assess the overall impact of severe cases.

total no.of case

([ILI_CMP] + [ILI_GOPC] + [ILI_PMP]) *1000

ILI_CMP: Consultation rate of suspected influenza reported by designated Chinese medicine practitioners (per 1,000 consultations)

ILI_GOPC: Consultation rate of influenza-like illness cases in designated general outpatient clinics (per 1,000 consultations)

ILI_PMP: Consultation rate of influenza-like illness cases at designated private doctors (per 1,000 consultations)

Sum three of them up and * 1000 to calculate the total no of consultations in a week. It is used to estimate the total weekly consultations related to influenza-like illnesses, providing a comprehensive view of healthcare service demand.

proportion

[total danger case] / [total no. of case]

This custom column calculates the proportion of dangerous cases relative to the total number of cases, knowing this proportion helps me understand further the impact of the wind speed.

Visualization 1 - 5

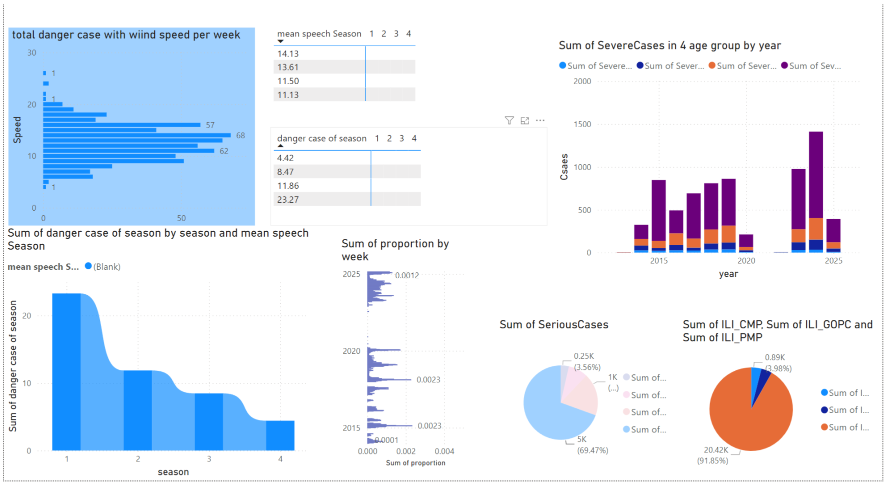
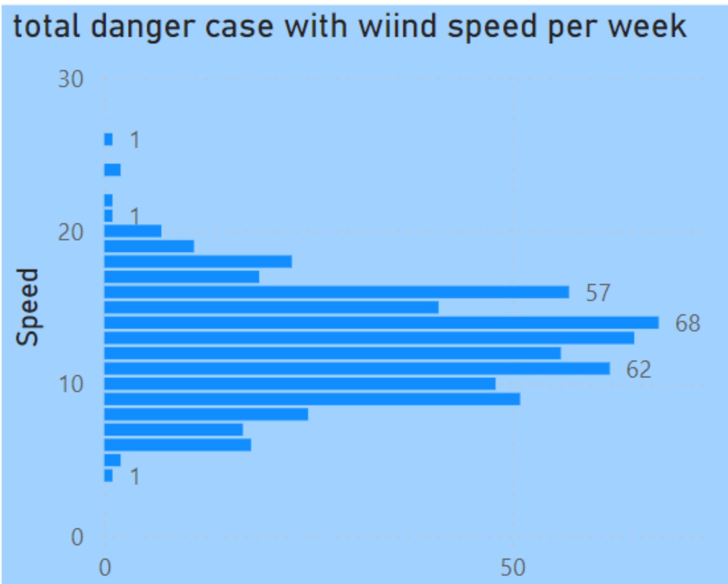
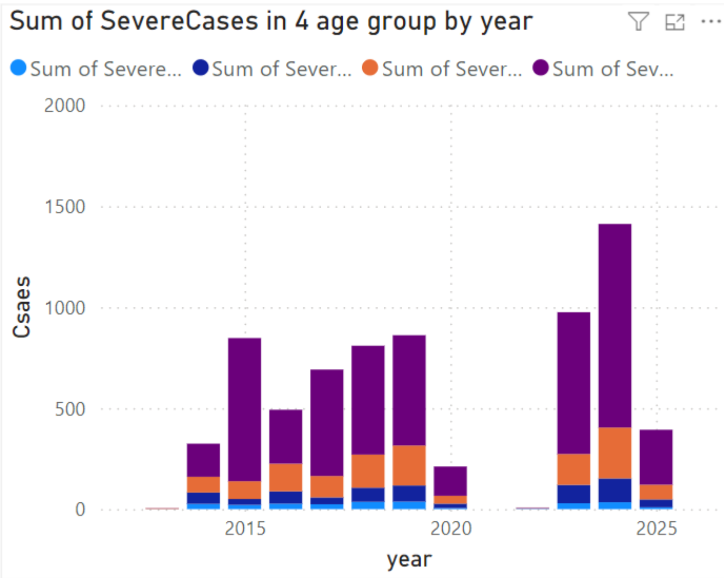


Figure 1



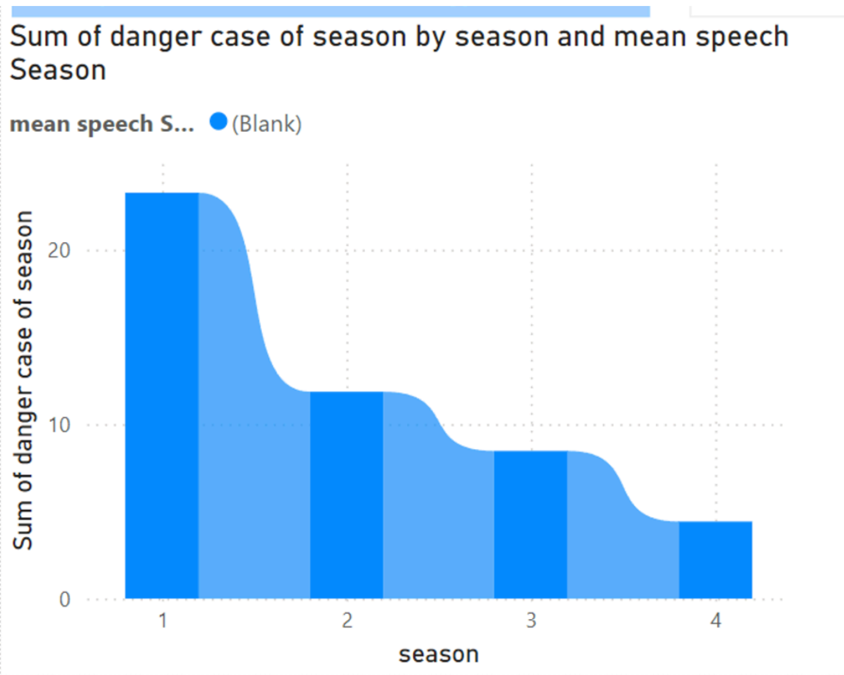
This histogram visualizes the relationship between total danger cases and wind speed on a weekly basis. And we can see that the number of dangerous cases occurs most often when the wind speed is between 9-16.

Figure 2



Here we can see the the sum of severe cases categorized by four age groups over the years. Notably, it reveals that the majority of severe cases are concentrated in the 65+ age group.

Figure 3



This chart compares the sum of danger cases throughout the seasons alongside mean speech data. It is clear that most cases occur in season one and the wind speed in season one is the highest among all 4 seasons as well.

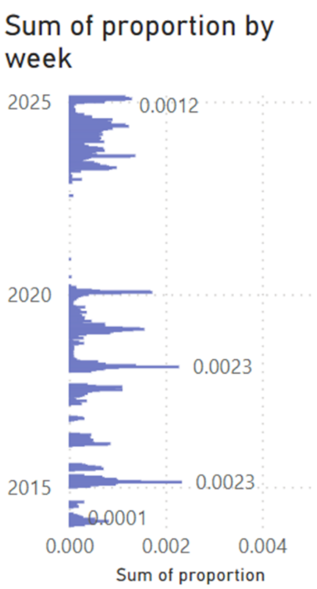
Figure 4

mean speech	Season	1	2	3	4
14.13					
13.61					
11.50					
11.13					

danger case of season	1	2	3	4
4.42				
8.47				
11.86				
23.27				

These figures allow me to control the displayed data by selecting a specific season. When a season is selected, the other seasons' data will be hidden, enhancing clarity and focus on the chosen period.

Figure 5



This graph showcases the proportion of cases by week, allowing analysis of fluctuations over time.

We can find that the situation is most serious in 2015 and 2018.

Insight

The graphics offer a thorough examination of the relationship between wind speed and influenza threat cases for people of different ages. The graph indicates a critical threshold where wind may both help spread the virus through respiratory droplets and contribute to environmental changes that facilitate respiratory infections. The highest incidence of dangerous cases occurs when wind speeds are between 9 and 16 mph, while the number of cases is significantly lower when wind speeds are below 9.

Furthermore, the data on severe instances show that people 65 and older are significantly concentrated. This demographic insight highlights how susceptible older persons are to influenza, indicating that at times of increased risk, healthcare measures should pay special attention to this population when the weather changes.

The seasonal comparison chart shows that the first quarter has the highest number of dangerous events, and the season must be the period that has the highest average wind speeds, this correlation may indicate that strong winds promote the spread of the virus.

In conclusion, wind speed does affect the prevalence of influenza. The prevalence of influenza is highest when the wind speed is concentrated between 9 and 16. At the same time, the prevalence of influenza will be higher in season one, even if the average wind speed is the highest. Severely ill patients tend to be those over the age of 65. However, according to the figure, a vast majority of patients—more than 91.85%—see private physicians as opposed to hospitals for treatment. This pattern would suggest that most people do not consider influenza to be a major health risk. A desire for convenience or the conviction that symptoms may be controlled without significant medical intervention may be the reasons for this dependence on private treatment. There, it may be hard for the government to provide more strategies for promoting awareness of preventing flu during the season.

Reference

https://data.gov.hk/tc-data/dataset/hk-hko-rss-daily-mean-wind-speed