Seasonality of influenza activity in Hong Kong and its association with meteorological variations

Prof. Paul Chan
Department of Microbiology
The Chinese University of Hong Kong

Mr. HY Mok
Senior Scientific Officer
The Hong Kong Observatory
Background:

- Influenza carries an important health burden
- In 2008, 504 influenza cases admitted to Prince of Wales Hospital
- Better understanding on infection pattern is essential to achieve cost-effective control
Background:

- Temperate regions have a consistent annual peak in winter
- Tropical & subtropical regions are more variable, and less information available
- Hong Kong known to have “some” influenza activity in summer
- Better understanding on seasonality helps immunization and healthcare resource planning
Study Objective 1:

- Characterize the seasonality of influenza activity in Hong Kong
Study population:

• 10 years: 1997-2006
• Confirmed influenza A & B
• Admitted to Prince of Wales Hospital
Influenza admissions 1997-2006

• 10 year study period:
  Total = 7538 patients
  Flu A: 6076 (81%)
  Flu B: 1462 (19%)

• Flu admission per year:
  Flu A: 244 – 1183 patients
  Flu B: 51 – 268 patients
No. of Influenza A admissions per week, 1997-2006

- 2 peaks for influenza A
- Winter/spring peak - Feb / Mar
- Summer peak – Jun / July
No. of Influenza B admissions per week, 1997-2006

- 1 (2 in some yrs) peak for influenza B
- Major: Winter/spring peak - Feb / Mar
- Minor, less consistent: Summer peak – 4 out of 10 yr
Study Objective 2:

• Correlation between influenza activity and weather conditions in Hong Kong
Concept of correlation analysis:

- 1997-2006 influenza admissions in PWH
- Daily temperature & relative humidity recorded at Shatin
- Account for delay in weather change and influenza admission
Influenza A and temperature

Average occurrence ($N_T$) of influenza A

Higher activity: $<21^\circ C$, $>24^\circ C$
Lower activity: 21-24$^\circ C$
Influenza B and temperature

Higher activity: <20°C
Decrease activity: ≥20°C
Activity increased with higher relative humidity, but association was weak.

Average occurrence ($N_H$) of influenza A.
Activity increased with higher relative humidity, but association was weak.

Influenza B and relative humidity

\[ y = 0.0486x - 1.3062 \]

\[ R^2 = 0.121 \]
Favourable climatic zone for influenza A

Temperature and relative humidity zone with occurrence of peak activity of FluA in winter and spring

Unfavourable zone
Temperature and relative humidity zone with trough activity of FluA
Favourable climatic zone for influenza B

- **Favourable zone**: Temperature and relative humidity zone with occurrence of peak activity of FluB in winter and spring.
- **Intermediate zone**: Temperature and relative humidity zone with occurrence of peak activity of FluB and trough activity of FluB in summer.
- **Unfavourable zone**: Temperature and relative humidity zone with trough activity of FluB.
Projection with 2°C rise in temperature on influenza A favourable days:

Flu A favourable days:  
- Dec-Apr: decrease – 78% > 57%  
- May-Nov: increase – 58% > 71% 

![Graph showing the percentage of days favourable for influenza A with and without a 2°C rise in temperature over the months from December to November.]
Projection with 2° C rise in temperature on influenza B favourable days

Flu A favourable days: Dec-Apr: decrease – 83% > 62%
May-Nov: no major change – 17% > 18%
Key findings:

• Influenza A carried a higher health impact than influenza B

• Two seasonal peaks were observed in Hong Kong, but with different patterns for influenza A and B

• Correlation between influenza activity and temperature and relative humidity was observed, further application on this aspect will be explored
Interpretation & hypothesis:

Our observation represents the overall effects of a complex interaction involving human health and susceptibility to influenza. Indirect effects include social behaviour, ventilation, etc., which influence virus transmission and survival.
Immediate key message for public:

- Best time for vaccination in Hong Kong??
- Does it matter if you vaccinate earlier or later??
Trend of change in relative magnitude of winter/spring and summer peak for influenza A
Immediate key message for public:

- November –December is the best time for vaccination in Hong Kong
- Two seasonal peaks in Hong Kong
- Vaccine takes 1-3 weeks to effect, maximum protection for a few months
- Receiving vaccine too early may not protect summer peak which is getting more severe in Hong Kong
- Receiving vaccine too late miss protection for winter/spring peak
Immediate key message for public:

• Weather of this summer in Hong Kong is expected to be normal

• Public is advised to pay attention to personal and public hygiene in the coming months