Surveillance and epidemiology of 2009 pandemic H1N1

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Outline

• Where did we start and what did we learn?
• Where are we now?
• Lessons learned nationally and internationally
How did it start? – Not where we expected!
Influenza-like illness in the United States and Mexico

24 April 2009 -- The United States Government has reported seven confirmed human cases of Swine Influenza A/H1N1 in the USA (five in California and two in Texas) and nine suspect cases. All seven confirmed cases had mild Influenza-Like Illness (ILI), with only one requiring brief hospitalization. No deaths have been reported.

The Government of Mexico has reported three separate events. In the Federal District of Mexico, surveillance began picking up cases of ILI starting 18 March. The number of cases has risen steadily through April and as of 23 April there are now more than 854 cases of pneumonia from the capital. Of those, 59 have died. In San Luis Potosi, in central Mexico, 24 cases of ILI, with three deaths, have been reported. And from Mexicali, near the border with the United States, four cases of ILI, with no deaths, have been reported.

Of the Mexican cases, 18 have been laboratory confirmed in Canada as Swine Influenza A/H1N1, while 12 of those are genetically identical to the Swine Influenza A/H1N1 viruses from California.
Fecha de inicio de síntomas en casos sospechosos y confirmados

Todo el país (reporte del 17 de septiembre)

Garske T et al BMJ. 2009
Adjusted estimate obtained by dividing the number of deaths by the number of cases adjusted for the delay from symptom onset to death.
Post-SARS Ontario better prepared for new flu outbreak

OTTAWA -- An outbreak of swine flu in Ontario, Canada’s most populous province, would not be as serious as the 2003 SARS epidemic, in part because authorities have been preparing for decades to fight widespread influenza, a senior provincial medical official said Friday.

More On This Story

WHO confirms 60 dead, 800 sick with flu-like illness

Related Topics
Important Health Notices IHN 26th April

- 6 cases in Canada, none in Ontario
- Clinicians are advised to screen patients for febrile respiratory illness (FRI) and influenza like illness (ILI), and continue to practice meticulous infection prevention and control in the office setting.
- Individual cases of ILI with a history of travel to an affected area or clusters of ILI should be reported to the local public health unit. Treatment of ILI at this time should be no different than usual practices.
- Further updates will occur as more is known about the virus characteristics and level of activity in Ontario.
Ontario has first swine flu cases

By ANTONELLA ARTUSO, QUEEN’S PARK BUREAU CHIEF

Last Updated: 28th April 2009, 3:36pm

Ontario has four confirmed cases of swine flu.

Three cases are in Durham and one is in York Region.

"These are mild cases," said Dr. David Williams, Ontario's Associate chief medical officer of health.

In all four cases, travel to Mexico was involved.

The individuals, who were not immediately identified, are recovering at home.
Travel to Mexico

![Bar chart showing the number of confirmed cases of Novel H1N1 Influenza A Virus, with bars indicating the number of cases per day from 15-Apr to 29-May. The chart includes two categories: Acquired in Ontario and Travel to Mexico.]
Figure 1. Destination Cities and Corresponding Volumes of International Passengers Arriving from Mexico between March 1 and April 30, 2008.

Khan K et al NEJM 2009
Different approach to control in Europe

• Containment considered feasible
• Widespread prophylaxis – households and in schools
• School closures
Markel et al JAMA 2007 Weekly Excess Death Rates From September 8, 1918, Through February 22, 1919
Influenza-like illness consultation rate in Hong Kong in 2007 and 2008. In 2007 (blue line) schools remained open after the peak and in 2008 (red line) they were closed just after the peak (blue rectangle).
Confirmed pandemic H1N1 virus cases in Ontario by age group and gender, April 13th to June 15th

Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (IPHIS) database, extracted at 8:30 am [15/06/2009]
Institutional influenza outbreaks in Ontario by onset of illness in the first case: Total Outbreaks up to and including Week 36 by subtype

Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS) database, extracted [16/09/2009]
IHN 11th June

- Testing for novel H1N1 Influenza A is not recommended for patients with mild illness. Specimens should only be submitted for testing where lab results are required for clinical management of hospitalized cases of ILI or where patients are at high risk for complications from influenza.
Influenza and the iceberg of disease

- **Deaths**
- **Hospitalised cases**
  - Stage 2: Follow up of confirmed hospitalised cases
- **Symptomatic cases**
  - Only severe or hospitalised cases may be confirmed
- **Mild or asymptomatic cases**
  - Will not seek medical attention

Stage 1: Follow up of first cases
5 Day rolling averages of the number of pH1N1 cases and number of patients tested, by specimen collection dates April 23 - September 15, 2009
Age – specific rates of pH1N1 per 1,000,000 persons (1), by specimen collection week, April 19- September 12, 2009
Total number of influenza tests performed and percent of positive tests in Ontario conducted by the Ontario Agency for Health Protection and Promotion Laboratory – Toronto, by specimen collection week April 12 – September 12, 2009

Source: Adapted from Table 1 in the "OAHPP Laboratory Pandemic H1N1 Surveillance Report" Tuesday September 15, 2009
Average influenza-like illness (ILI) consultation rate (per 1,000 patient visits) reported by sentinel physicians* in Ontario up to the 2009-10 surveillance season, by report week, compared to Ontario average† (1999/2000 to 2007/08 seasons).

Source: Public Health Agency of Canada
* Sentinel physician information is reported to Public Health Agency of Canada, 104 sentinel reported this week.
† No data available for mean rate in previous years for weeks 21 to 29 (1999-2000 through 2004-2005 seasons). During weeks 20-39, 2002-2003/2004-2005 seasons, ILI is reported once every two weeks, on even weeks only. Since Week 23, 2005, the number of sentinel physicians has increased, which might affect ILI rate starting from week 23.
Incidence of hospitalization and death due to pandemic H1N1 2009 in Ontario, April 13 – September 16, 2009

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Hospitalizations</th>
<th>Rate/100,000</th>
<th>Deaths</th>
<th>Rate/100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>20</td>
<td>14.93</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>1-4</td>
<td>50</td>
<td>9.15</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>5-19</td>
<td>108</td>
<td>4.47</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>20-49</td>
<td>107</td>
<td>1.88</td>
<td>4</td>
<td>0.07</td>
</tr>
<tr>
<td>50-64</td>
<td>51</td>
<td>2.12</td>
<td>9</td>
<td>0.37</td>
</tr>
<tr>
<td>65+</td>
<td>34</td>
<td>1.97</td>
<td>7</td>
<td>0.41</td>
</tr>
<tr>
<td>TOTAL</td>
<td>370</td>
<td>2.86</td>
<td>23</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Source (Incidence): Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (IPHIS) database, extracted at 8:30 am [16/09/2009]


## Bi-weekly and cumulative number of deaths due to Pandemic (H1N1) 2009, by province/territory, Canada, as of 17 September, 2009, 11h00 EDT

<table>
<thead>
<tr>
<th>Province / Territory</th>
<th>New Deaths reported (from September 15, 2009 to September 17, 2009, 11h00 EDT)</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Alberta</td>
<td>0</td>
<td>8&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Manitoba</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Ontario</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Quebec</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Yukon</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nunavut</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>76</td>
</tr>
</tbody>
</table>

<sup>1</sup> Out-of-country resident.
## Global mortality

<table>
<thead>
<tr>
<th>Region</th>
<th>Cumulative total as of 13 September 2009</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cases*</td>
</tr>
<tr>
<td>WHO Regional Office for Africa (AFRO)</td>
<td></td>
<td>8125</td>
</tr>
<tr>
<td>WHO Regional Office for the Americas (AMRO)</td>
<td></td>
<td>124126</td>
</tr>
<tr>
<td>WHO Regional Office for the Eastern Mediterranean (EMRO)</td>
<td></td>
<td>10533</td>
</tr>
<tr>
<td>WHO Regional Office for Europe (EURO)</td>
<td></td>
<td>over 52000</td>
</tr>
<tr>
<td>WHO Regional Office for South-East Asia (SEARO)</td>
<td></td>
<td>25339</td>
</tr>
<tr>
<td>WHO Regional Office for the Western Pacific (WPRO)</td>
<td></td>
<td>76348</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>over 296471</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO Regional Office for Africa (AFRO)</td>
<td>40</td>
</tr>
<tr>
<td>WHO Regional Office for the Americas (AMRO)</td>
<td>2625</td>
</tr>
<tr>
<td>WHO Regional Office for the Eastern Mediterranean (EMRO)</td>
<td>61</td>
</tr>
<tr>
<td>WHO Regional Office for Europe (EURO)</td>
<td>at least 140</td>
</tr>
<tr>
<td>WHO Regional Office for South-East Asia (SEARO)</td>
<td>283</td>
</tr>
<tr>
<td>WHO Regional Office for the Western Pacific (WPRO)</td>
<td>337</td>
</tr>
<tr>
<td>Total</td>
<td>at least 3486</td>
</tr>
</tbody>
</table>

**Estimated excess deaths from 1918 pandemic:** 1.1% of European population (2.64 million deaths) *Ansart S et al 2009*
Research studies

- Seroprevalence study
- Case control study of risk factors using test negative controls
- Contact pattern study for household secondary attack rates (with UK)
- Rapid Risk Factor Surveillance System, RRFSS - behavioural

https://h1n1study.oahpp.ca/Pages/home.aspx
RRFSS - Perceived risk of becoming infected with Novel H1N1 among adults aware of nH1N1 outbreak in May 2009

- Don't know: 5.1% (C.I. 30.0%-34.1%)
- Very likely: 1.5% (C.I. 1.1%-2.2%)
- Somewhat likely: 8.7% (C.I. 7.5%-10.0%)
- Not at all likely: 32.0% (C.I. 30.0%-34.1%)
- Not very likely: 52.7% (C.I. 50.5%-54.9%)

n= 2238
RRFSS – Novel H1N1 Vaccination Likelihood among adults aware of pandemic H1N1 outbreak in May 2009

- Very likely: 39.0% (C.I. 36.9%-41.0%)
- Somewhat likely: 22.3% (C.I. 20.6%-24.1%)
- Not very likely: 18.5% (C.I. 16.9%-20.1%)
- Not at all likely: 17.2% (C.I. 15.7%-18.8%)
- Don’t know: 3.1% (C.I. 2.4%-3.9%)

Over 1/3 unlikely to get vaccine: n = 2236
Where are we now?
Northern hemisphere (week 17-36)

Number of specimens positive for influenza by subtypes (from 19 April to 5 September)

Virological data reported to FluNet by GISP NICs from countries in the northern hemisphere (week 17-36). Bars represent the number of specimens reported positive for influenza viruses during the reporting week represented in the X-axis. The X-axis also shows the number of countries that reported to FluNet during the respective week. Example: 17 (38) means that in week 17, 38 countries reported. The right side Y-axis shows the proportion (%) and the left Y-axis shows the absolute number of specimens reported positive for influenza viruses (influenza A subtypes, pandemic H1N1 and influenza B).
Southern hemisphere (week 17-36)

Number of specimens positive for influenza by subtypes (from 19 April to 5 September)

Virological data reported to FluNet by GISN NICs from countries in the southern hemisphere (week 17-36). Bars represent the number of specimens reported positive for influenza viruses during the reporting week represented in the X-axis. The X-axis also shows the number of countries that reported to FluNet during the respective week. Example: 17 (7) means that in week 17, 7 countries reported. The right side Y-axis shows the proportion (%) and the left Y-axis shows the absolute number of specimens reported positive for influenza viruses (influenza A subtypes, pandemic H1N1 and influenza B).
Australia

- Data for September 18th bulletin
- Most cases mild
  - 36,237 confirmed cases of pandemic (H1N1) 2009
  - 4,698 Hospitalized
  - 56 /303 (18%) currently hospitalized are in ICU
  - 172 Deaths (8 per million)
- Aboriginal population at 8 fold increased risk

Laboratory confirmed cases of pandemic (H1N1) 2009 in Australia, to 4 September 2009 by jurisdiction

Source: NetEPI database
Influenza activity in Australia, by reporting week, years 2007, 2008 and 2009*

Data on pandemic (H1N1) 2009 cases is extracted from NetEPI; data on seasonal influenza is extracted from the NNDSS.

Sources: NNDSS and NetEPI databases
Rate of ILI reported from GP ILI surveillance systems from 2007 to 30 August 2009 by week

*Delays in the reporting of data may cause data to change retrospectively. As data from the NT and the VIDRL surveillance systems are combined with ASPREN data, rates may not be directly comparable across 2007, 2008 and 2009.*
Rates of absenteeism of greater than 3 days absent, National employer, 1 January 2007 to 26 August 2009, by week
“The apparent decline cannot be fully explained. New Zealand remains in the middle of its traditional influenza season… we estimate that only about 11% of the population have been infected….”
Global summary – what do we know?

• 2009 Pandemic H1N1 has established itself as the dominant influenza strain globally
• Strains have remained identical, and resistance is also rare
• Most cases of infection are mild
• Large numbers of people remain susceptible
• Age distribution is much younger than seasonal influenza
• Risk groups globally include those with obesity, asthma, diabetes, pregnant women and indigenous peoples,
• Severe respiratory disease (direct lung infection) including in young healthy people requires highly specialized and prolonged intensive care
  – Impact on ICU in the coming season is likely to be significant
Epidemiological uncertainties and risk communication – what don’t we know?

• Many uncertainties, little time, and difficult messages to balance
• Benefits of seasonal vaccination uncertain this year
  – How much seasonal influenza will circulate, how much additional benefit from vaccine?
• Risk of pH1N1 for healthy people is low and safety of pH1N1 vaccine unknown – e.g. Guillain-Barré syndrome
  – *Safranek et al Am J Epidemiol. 1991*
    • 1976 swine influenza vaccine: Relative risk during the 6 weeks following vaccination 7.10 ; 9-10 per million vaccinees
    • Relative risk within 90 days of seasonal **vaccination** 0.76 (0.41, 1.40)
    • Relative risk within 90 days of **an influenza-like illness** 7.35 (4.36, 12.38)
What are we planning for?

• Predictable surprises:
  – “Influenza A viruses: sloppy, capricious, and promiscuous” *Avian influenza: assessing the pandemic threat*

• Public and public health professionals’ confidence need to be supported
  – Trust is good for health
Map of the laboratory confirmed pH1N1 cases by PHU. Weekly cases are represented in the ring map, and the total number of positive pH1N1 cases is represented in brackets in the map of Ontario.
We’re waiting for a different flu season.....

Ian McKellen and Patrick Stewart in Samuel Beckett’s Waiting for Godot
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