Northwestern Health Unit
www.nwhu.on.ca

Pandemic H1N1 Influenza A, 2009:
An Epidemiological Summary

Prepared for the Board of Health

October 2010

Table of Contents

List of Tables

List of Figures

Background

Important Health Notices are issued by the MOHLTC in response to abnormal events that require ministry direction or instruction.[1]

On April 20, 2009, the Public Health Agency of Canada notified the Ministry of Health and Long-Term Care (MOHLTC) and the Ontario Agency for Health Protection and Promotion (OAHPP) of clusters of severe respiratory illness (SRI) in Mexico. There were 17 deaths and 134 hospitalizations in young healthy adults. Five health care workers were identified in the cluster of deaths. Symptoms included high fever, headache, eye pain, shortness of breath and extreme fatigue. By April 23, health units in Ontario received their first *Important Health Notice* (IHN) about the SRI.[2]

The National Microbiology Laboratory located in Winnipeg, Manitoba received over 50 clinical samples from Mexico. These samples were analyzed for a range of pathogens. At that time, influenza A H1N1 and influenza B had already been detected.

Healthcare providers in Ontario were advised by the MOHLTC to exercise caution, institute appropriate precaution measures, and ask patients about recent travel to Mexico.[3] Emergency departments were specifically advised of appropriate screening practices, precautions when providing direct care, necessary surveillance documentation, and notification of cases of SRI to the local Health Units. A case definition was developed and while no specific treatment was available, direction was given to follow usual influenza treatment guidelines. The Ministry Emergency Operations unit, a division of the OAHPP began work on guidance documents. Several guidance documents were developed for various sectors such as, long term care facilities, primary care, public places such as churches, summer day camps and shelters and distribution of antivirals.

Seasonal Influenza

Influenza has been a reportable disease in Ontario since 1923. A provincial surveillance program has been conducted yearly since 2004. Respiratory infection outbreaks in institutions have been reportable since 2001.[4]

Seasonal influenza (flu) is caused by influenza A and B viruses. It is an acute viral disease of the respiratory tract. Outbreaks occur yearly, usually in winter months and in temperate climates. Seasonal influenza typically results in mild to severe illness, with deaths often caused by complications (such as pneumonia). Influenza outbreaks can attack 10% to 20% of a community and easily infect more than 50% of a closed population, for example, a population that lives in confined or isolated locations, in schools, or in nursing homes.[5]

This highly contagious virus is spread from person to person through coughing and sneezing or direct contact with objects touched by someone who is already infected. The incubation period for seasonal influenza virus is approximately 1 to 3 days with a time of communicability of 3 to 5 days in most cases and up to 7 days in children.[6] Transmission of the influenza virus is during the initial days of infection when the individual has symptoms of the infection and a high concentration of the virus in the body. While the person is ill, the virus can be spread to other people. Populations with the highest risk of complications are children, the elderly, and people with chronic medical conditions, compromised immune systems, and pregnant women.

Pandemic Stages

The World Health Organization has identified 4 periods/stages in a pandemic. These periods are:

- interpandemic,
- alert pandemic,
- pandemic and
- post pandemic. [7]

Pandemic influenza is a global outbreak that occurs when a new influenza A virus emerges. The population has little immunity. The virus has the capacity to spread easily from person to person and cause serious human illness. [8]

A further description of the pandemic periods is provided in Table 1.

Table 1 Pandemic Periods

Interpandemic Period	Phase 1	No new human influenza virus circulating
	Phase 2	New animal virus circulating
Pandemic Alert Period	Phase 3	Animal to human infection
	Phase 4	Small clusters of human to human transmission
	Phase 5	Large clusters of human to human transmission
Pandemic Phase	Phase 6	Increased transmission in general population
Post Pandemic Phase		Return to interpandemic period with no circulating virus

Source: Ontario Health Plan for an Influenza Pandemic, Ontario Ministry of Health and Long-Term Care, 2007

On June 11, 2009, the World Health Organization (WHO) declared that a global pandemic was underway and not until July 1, 2009, did WHO name the novel virus as pandemic infection. Influenza A virus H1N1, 2009, or abbreviated as pH1N1. [9] A case of pH1N1 had to have laboratory confirmation of swine influenza A (H1N1) virus Only confirmed cases of influenza are reported therefore, the number of cases reported represents only a portion of the true number of influenza cases in Ontario.

On January 27th, 2010, Canada announced the end of the second pH1N1 wave. By April 14, 2010, Ontario began reducing its activities related to pH1N1.[10]

Ontario Summary of Pandemic H1N1

Background

By April 28, 2009, the first confirmed case of pH1N1 was identified in Ontario and on May 25, 2009, the first death from pH1N1 was reported. Among all of the provinces and territories, Ontario reported the highest number of deaths.[11]

Experience

Ontario experienced two distinct waves of pH1N1. The first wave took place between April 28 and August 31, 2009 and the second wave took place between September 1st and December 19, 2009. There were a total of 128 deaths in Ontario from pH1N1. Of these deaths 25 (20%) occurred in the first wave and 103 (80%) occurred in the second wave. The ages at death ranged from less than 1 year old to 95 years. Median age at death was similar in both waves (51 and 54 respectively). Females accounted for 42% of all deaths. In both waves, persons in the 45 to 64 and 65 + age groups had the highest death rates. Among the 128 deaths, 112 (88%) had underlying chronic medical conditions. [12]

According to the Ontario Influenza Bulletin Week 5, Jan. 2009 to Jan. 2010, there were a total of 1,843 hospitalizations in Ontario. Of all hospitalizations, 22% (402) were in Wave 1 and 78% (1,441) were in Wave 2. People under the age of 20 accounted for 49% of hospitalized cases in Wave 1 and 44% of hospitalized cases in Wave 2. The most commonly reported symptoms among those hospitalized were fever, cough, shortness of breath, vomiting, malaise, mylagia, sore throat and or difficulty swallowing.

In Ontario, 53.5% of all laboratory confirmed cases of pH1N1 were reported during Wave 2. Of all the northern Health Units, the NWHU reported the highest number of laboratory confirmed cases of pH1N. (See Table 2).

Table 2 Laboratory Confirmed Cases of pH1N1 by Health Unit, 2009

Health Unit	Wave 2 (Sept.1 –Dec 19/09	Wave 1 (April – August 31/09	Total number of confirmed cases
Algoma	61	6	67
North Bay Parry Sound	48	7	55
Northwestern	73	74	147
Sudbury and District	44	24	68
Thunder Bay District	88	10	98
Porcupine	106	4	110
Timiskaming	53	0	53
Ontario	4,700	4,089	8,789

Source: Ontario Influenza Bulletin, 2009-2010, MOHLTC SURVEILLANCE WEEK 5 (January 31, 2010– February 6, 2010) accessed Jan. 16, 2010

Northwestern Health Unit Summary of Pandemic H1N1

Background

The first case of pH1N1 in the NWHU region was identified on May 19, 2009. In total, the region reported 209 cases of influenza A. Of these, 147 cases were confirmed for pH1N1. In addition to these cases, three where identified as indeterminate and five were unable to be typed. The last case of pH1N1 was reported on November 18, 2009. There were no deaths attributed to pH1N1 in the NWHU region, however, there was one death attributed to influenza A during this time period.

Generally, during an influenza year, NWHU can expect to report on average eight deaths per year attributed to influenza and pneumonia. From 2000 to 2005, there were a total of 93 deaths assigned to influenza and pneumonia. Only three deaths were specifically reported as influenza and these were in the 75 and older age group.

Often, illness may have started as influenza and then ended as pneumonia. Of those 93 deaths, 69 (74%) of them were in individuals over the age of 75 years.

Experience

In the NWHU region, confirmed cases of pH1N1 were evenly distributed in the two waves. In Wave 1, there were 74 cases of pH1N1 and in Wave 2, there were 73 cases. Ages ranged from the youngest of 2 months to the oldest of 82 years. Since the end of November 2009, no further cases of pH1N1 were diagnosed in residents in the NWHU region. (See Table 3)

Table 3 Summary of pH1N1, NWHU 2009

Waves	# Cases	Peak of Pandemic	# Hospitalized	Age groups			# Male	# Female	Median Age
				<14	<30	>60			
Wave 1	74	June 8	19	63.0%	80.0%	4.1%	42	31	13
Wave 2	73	Nov. 1	1	61.6%	84.9%	4.1%	28	42	10

Source: iPHS accessed June 2, 2010. Wave 2 gender unknown for 3 cases

In both Waves, younger age groups contracted pH1N1 at higher rates than older age groups. Almost 2/3 of the cases were in children under the age of 14 years (63% in wave 1 and 62% in wave 2). In Wave 1, the median age for pH1N1 cases was 13 years and in Wave 2, the median age was 10 years. (See Figure 1)

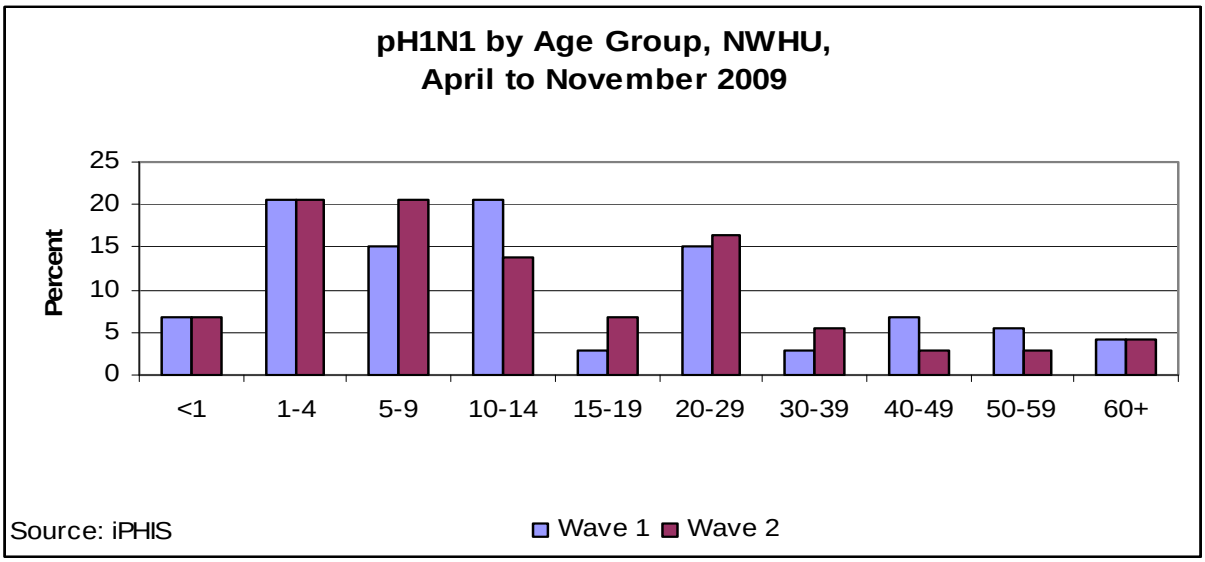


Figure 1 pH1N1 by Age Group and Wave, NWHU 2009

In Wave 1, more cases of pH1N1 were reported in males than females (57.5% versus 43.5%). In Wave 2 however, females reported more cases of pH1N1 than males (60% versus 40%). (See Figure 2)

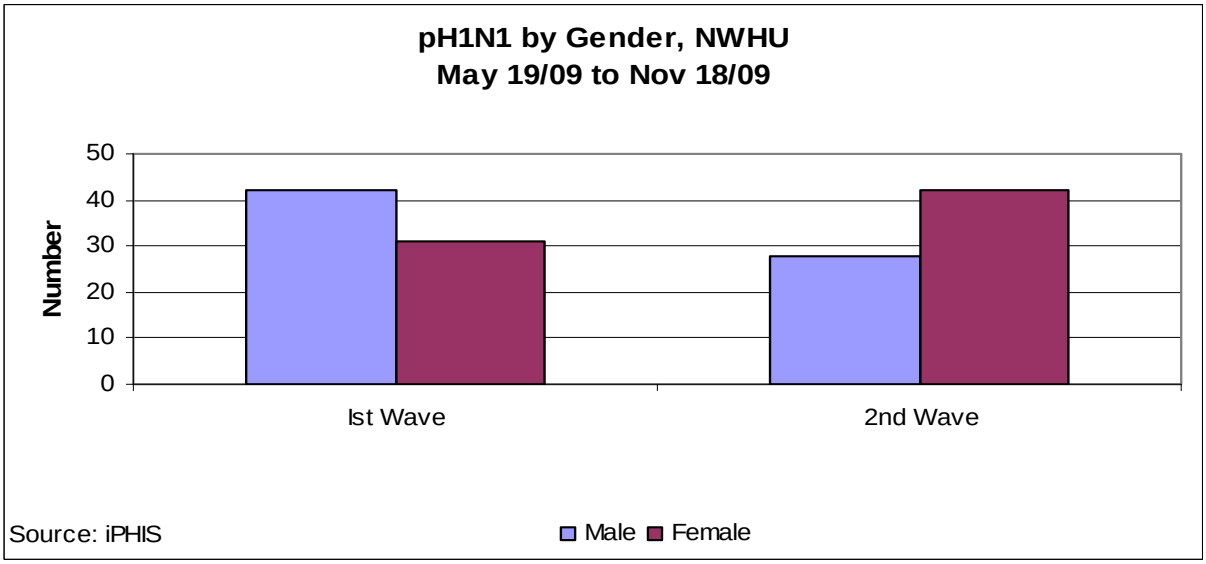


Figure 2 pH1N1 by Gender, NWHU 2009

An epi curve is a graphic illustration of the number of cases of illness by the date of the illness.[13]

In the NWHU region, the first confirmed case of pH1N1 in Wave 2 was on October 14, 2009. The peak of the epidemic (epi) curve was reached on November 1st, 2009 with seven confirmed pH1N1 cases. The epi curves for pH1N1 cases were different. Wave 1 showed a faster rise to the peak number of cases of pH1N1 on June 8, 2009 with seven confirmed cases followed by a slower tapered decline. Wave 2 showed a gradual increase in the number of cases of pH1N1 to its peak number on November 1st followed by a faster and shorter decline in cases. (See Figure 3)

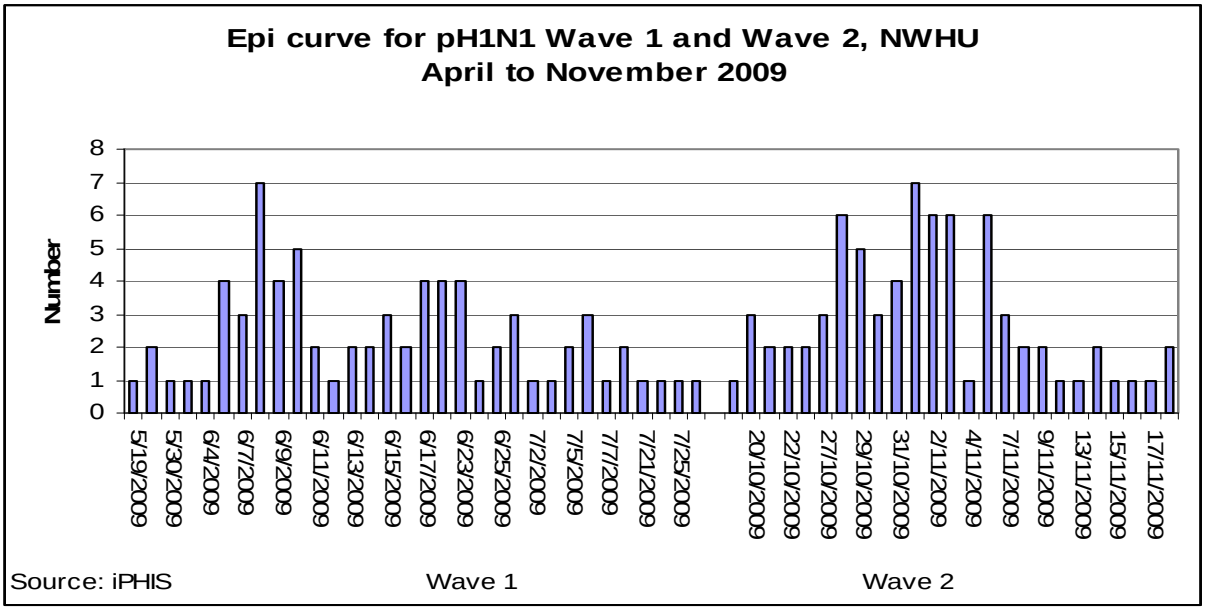


Figure 3 Epi Curve for pH1N1, NWHU 2009

In a usual influenza season, NWHU would experience on average 38 positive influenza cases. In 2009, there were a total of 219 reported influenza cases. This includes both influenza A and influenza B. It is acknowledged that there was a heightened surveillance of influenza in 2009 and this may have contributed to the increase in the number of positive reports. In addition, not all individuals who experienced flu like symptoms were tested for the virus, therefore making the assumption that there could have been more positive cases reported.

Hospitalizations

In Wave 1, NWHU region experienced moderate illness in most people while the more serious/severe illnesses were in young people, pregnant women and others with chronic diseases. In Wave 1, there were 19 hospitalizations compared to one hospitalization in Wave 2. Very little information was provided regarding the risk factors of persons diagnosed with pH1N1. In the little information available it was noted that the risk factors included asthma, cancer, pregnancy and diabetes. The absence of more hospitalizations in Wave 2 may have been attributed to the various precautionary measures that were instituted in all sectors.

Precaution measures included: hand hygiene, respiratory cough etiquette, social distancing (i.e. minimizing contact with family members, not going out in public), not going to work until symptoms have resolved [14]

In 2009, in the NWHU region, there were a total of 61 hospitalizations for influenza. The influenza was not identified as A or B but classified between J09 to J11 according to the *International Statistical Classification of Diseases and Related Health Problems 10th Revision.* (See Appendix 2). Of these hospitalizations, 70.5% were under the age of 44 years. In a usual influenza A and B season, on a 5 year average, the NWHU region would experience eight hospitalizations for influenza and 59% would be under the age of 44 years.

The chart below identifies that during the pandemic, there was a total of 19 pH1N1 cases who required hospitalizations attributed specifically to influenza A subtype H1N1. Of these hospitalizations, 18 were in Wave 1 and one was in Wave 2. (See Figure 4)

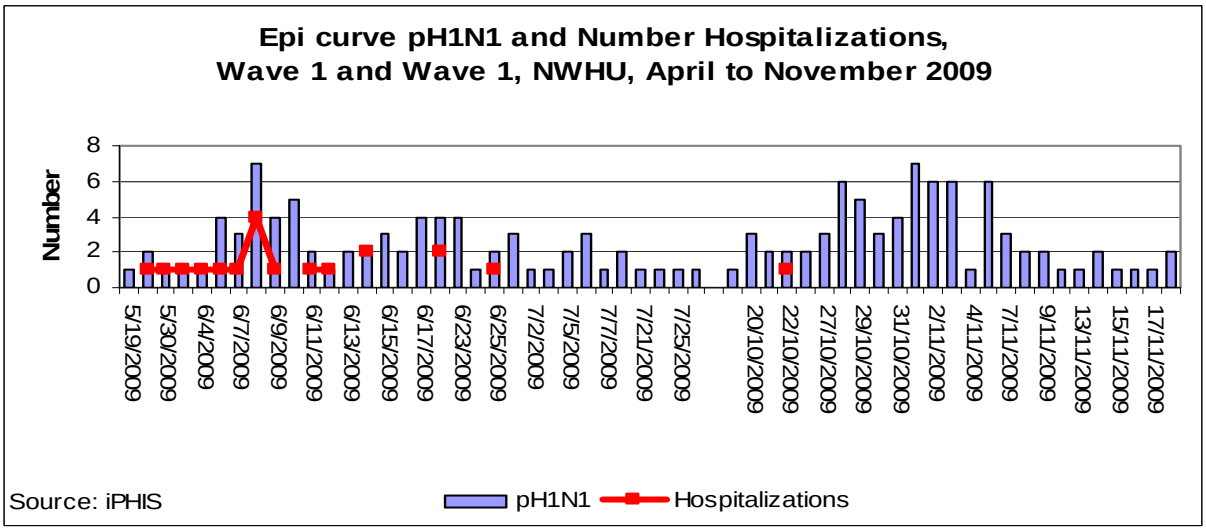


Figure 4 Epi Curve by pH1N1 Cases and Hospitalizations, NWHU 2009

pH1N1 Influenza Vaccine

The government of Canada purchased 50.4 million doses of pH1N1 vaccine from one supplier. That supplier had difficulty meeting the demand and within the required time frame. Responsibility for contracting with the maker of the vaccine, GlaxoSmithKline (GSK), rested with the federal government. Provinces advised the federal government as to how much vaccine was required. As the vaccine was produced by GSK and required approval from Health Canada, only after that approval was it shipped to the provinces and territories.[15] The immunization campaign began across the country on October 26th, 2009. NWHU received its first shipment of vaccine on October 23, 2009.

Vaccine Supply

Vaccines produce immunity to specific diseases by stimulating the production of antibodies. Vaccines are the primary means of preventing the spread of influenza.[16]

Vaccines targeted specific people. There were two types of vaccine available for immunization, adjuvanted and unadjuvanted. Adjuvanted vaccines contain an additive which helps to boost an individual's immune response and offers additional protection should the virus increase in strength. Unadjvanted vaccines do not contain additives, requires more of the virus material to be effective and does not provide any other protection should the virus increase in strength. Unadjuvanted vaccines are recommended for pregnant women for safety precautions.[17] (See Appendix 1 for the flow chart regarding the administration of pH1N1 vaccine to specific populations).

Between October 23, 2009 and December 8, 2009, a total of 56, 230 doses of vaccine were received from the government pharmacy. As a vaccine depot for the MOHLTC, the NWHU supplied and shipped pH1N1 vaccines to doctors' offices, hospitals, and clinics in the region. According to OAHPP, 31,051 vaccinations were administered to residents of NWHU region. Since documentation of vaccinations was problematic in Ontario, it is believed that at least 37% of the population in NWHU region was vaccinated against pH1N1. Vaccinations were administered by the Pubic Health Unit staff (52.2%), staff from First Nations and Inuit Health Branch staff (24.2%), family health teams/doctor's offices (16.6%) and other health care facilities such as hospitals and long term care (5.6%).

Children under the age of 19 years accounted for 29.7% of all vaccines given. Adults between the ages of 20-49 accounted for 34.1% and adults over the age of 50

accounted for 36.2% of all vaccines given. (See Figure 5) More females (53 4%) received the pH1N1 vaccine than males.

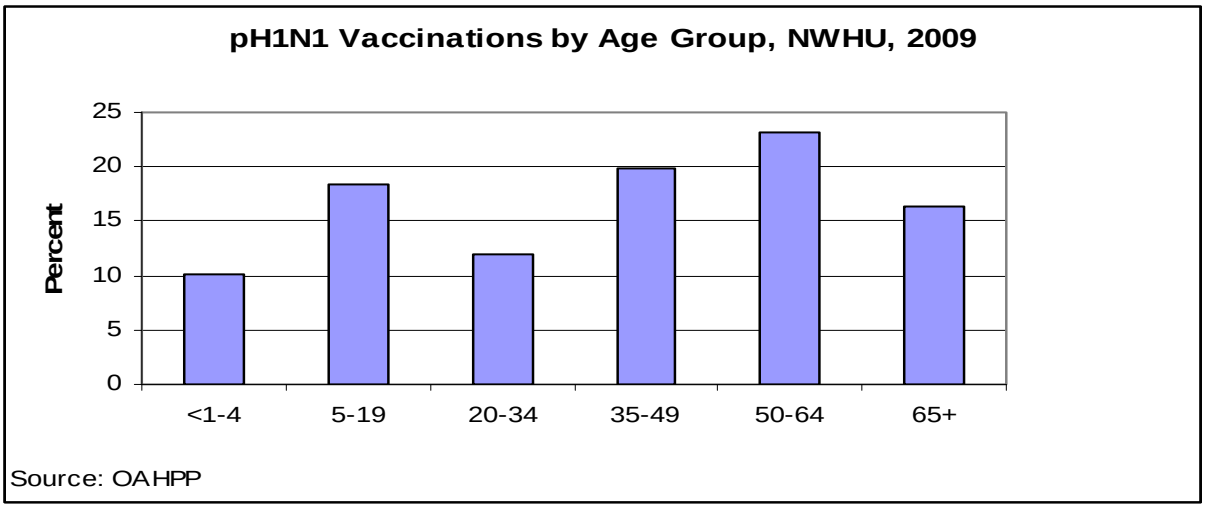


Figure 5 Vaccinations by Age Group, NWHU, 2009

Immunization clinics for residents of NWHU began on Oct. 26/09. During the first 3 weeks of the vaccine campaign, immunization was geared for risk/priority groups as directed by the Chief Medical Officer of Health, Dr Arlene King, MOHLTC. All vaccines and supplies were distributed free of charge.

Priority populations included: pregnant women; children between the ages of six months to five years;(later extended to 13 yrs),people living in remote and isolated communities; people under 65 with chronic conditions; health care workers, and household contacts, care providers and people who are immunocompromised.[18]

The main priority groups receiving the vaccine were to those with chronic conditions, and household members or care givers of persons in priority groups and pregnant women. Specific and detailed documentation of vaccine delivery was required in the first three weeks of the immunization campaign. Documentation of immunization by health care providers changed afterwards. Therefore information on the number of people in priority groups who received the vaccine was incomplete, never-the-less,

according to the data that was available during the first three weeks of the immunization campaign,

- 53% of vaccinations were administered to people who reported having chronic health conditions
- 29% of the vaccines were administered to household members and care givers of priority groups household members/care givers and
- 12% of the vaccines were administered to health care workers. (See Figure 6)

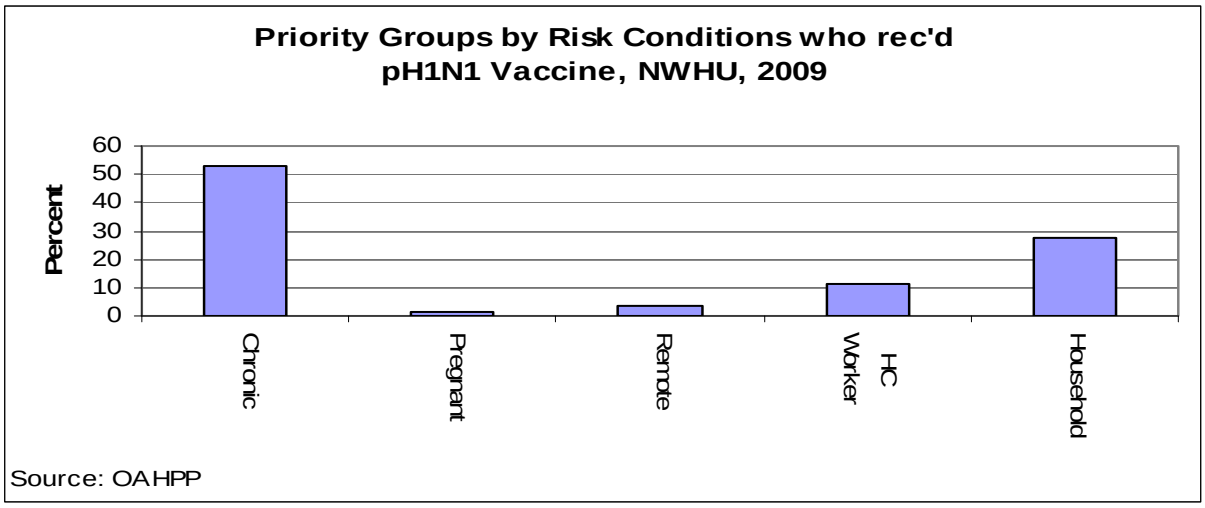


Figure 6 Priority Groups by Risk Conditions and Vaccine, NWHU, 2009

In Wave 2, as vaccine clinics were established, the number of confirmed cases of pH1N1 began to decline. (See Figure 7) Since the pH1N1vaccine required 10-14 days to develop immunity [19] it appeared that immunization may not have been a factor in reducing the circulating virus from the population. Earlier reduction of the virus in the population may have been attributable to people developing immunity from exposure to the virus in Wave 1, previous exposure of the adult population to the H1N1 virus and/or the seasonal activity of the virus (8 to 10 weeks) simply died off.

During the immunization campaign, a total of 19 adverse vaccine reactions were reported and of these, 12 adverse vaccine reactions were reported for the adjuvanted pH1N1 vaccine. (See Figure 7)

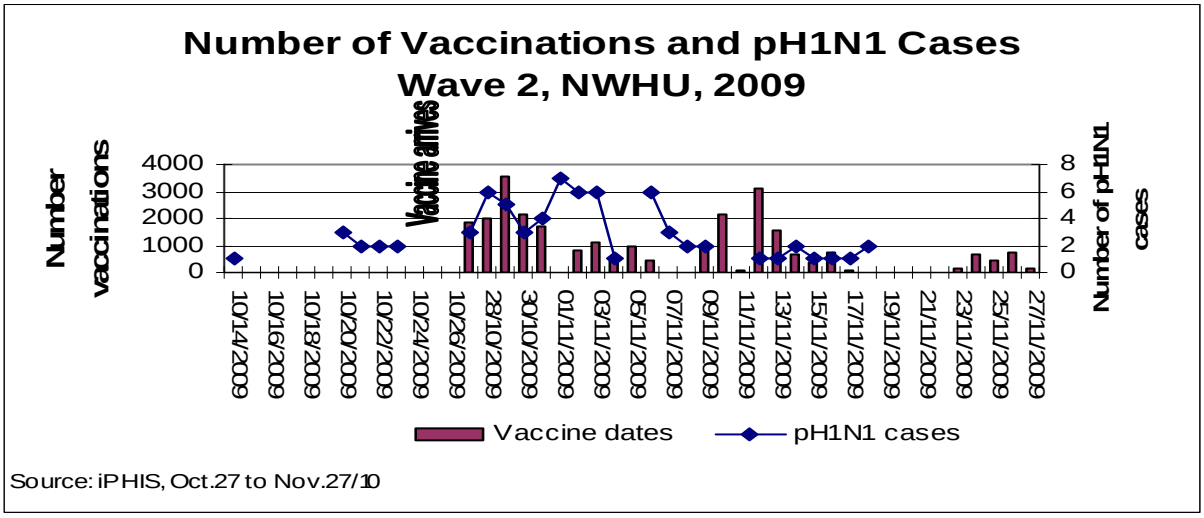


Figure 7 Vaccination Dates and pH1N1 Cases, NWHU, 2009

Antivirals

In Ontario, antivirals have been used for the prophylaxis and treatment of influenza A since 1988.[20] Antivirals (such as Tamiflu or Relenza) are drugs used for the early treatment of viral infections such as influenza. They do not provide immunity to the virus, but if given early after symptoms begin, these drugs can reduce severity of symptoms, shorten the length of the illness and reduce the risk of complications of influenza.[21] Treatment with antivirals is only recommended within 48 hours from the start of symptoms for the following groups:

- persons with flu-like illness who are at risk of developing complications and
- persons with flu-like illness who have complications requiring hospitalization.

Antivirals were provided by the MOHLTC and made available and distributed free to pharmacies and hospitals through the NWHU. Antivirals were only requested in Wave 1.

Surveillance

K.E. Nelson, author of Infectious Disease Methodology, defines the surveillance of infectious diseases as, "the continuous systematic collection of data on illness or infections in a defined population to monitor, the incidence or prevalence of a disease or a behaviour that is placing people at risk of disease or ill health."[22] It includes the collection, analysis and interpretation of data that is needed for planning, implementing and evaluating public health programs. The information is reported and shared with the people who need to know so that action can be taken.[24]

Influenza-like illness is a term used to describe respiratory symptoms with fever and cough and one or more of the following symptoms: sore throat, muscles aches, joint pain or weakness. In children under age 5, gastrointestinal symptoms may also be present. In children under 5, gastrointestinal symptoms may also be present. In patients under 5 or 65 and older, fever may not be prominent. [23]

Surveillance is an important part of influenza pandemic planning. Activities used in surveillance help to detect strains of viruses that may cause widespread illness and death. Estimates of influenza attack rates and monitoring the severity and progress of a disease such as influenza can be done with surveillance activities. There were a variety of surveillance strategies used to determine the extent of pH1N1 activity in the NWHU region.

Emergency Departments:

Some hospitals participated in providing influenza-like illness (ILI) counts to Health Unit staff on a daily basis. These counts provided a picture of how many people with symptoms of influenza were being seen in the emergency departments of local hospitals. This important information suggested an indication of the presence of the pH1N1 virus in the community.

School Absenteeism Rates:

Surveillance: Schools and work sites with greater than 10% absenteeism on any day, with symptoms similar to ILI report this information to the health unit. 10% is an arbitrary upper limit used to identify health related concerns early.[25]

Absence of students from school provided an indication of influenza activity in the community. Since, NWHU Public Health nurses maintain relationships with their schools throughout the school year; schools contacted them when absenteeism rates were over 10%. During each wave of the pandemic, some schools in the NWHU region reported absenteeism rates of over 10%. Educational information relating to the prevention and spread of influenza was made available to school officials and parents.

Residential/Long Term Care Facilities:

Residential or long term care facilities are on the alert for communicable disease in a highly susceptible population. Usually two or more cases of ILI within a seven-day period, including at least one laboratory confirmed case is reported to the health unit.[26] During the influenza experience of 2009, no facilities were identified with an outbreak of influenza.

Sentinel physicians:

During the influenza season, there are physicians in the NWHU region who perform duties as 'sentinel physicians'. In the national surveillance program (Flu Watch), sentinel physicians report on the number of patients they saw during a particular day of the week who exhibited symptoms of ILI. Weekly results are sent out to the provinces. During the weeks of October 18 and November 14th, 2009 when pH1N1 cases were the highest in the NWHU region, sentinel physicians identified 13 cases with ILI symptoms out of 177 patients they had seen during the reporting period.[27] In Ontario, the Sentinel Vaccine Effectiveness Study has sentinel physicians who take swabs from patients and forwards the swabs to the provincial laboratory. This

laboratory based surveillance system examines the swabs for the presence of influenza viruses. In addition to this, the effectiveness of the influenza vaccine is evaluated. Between the weeks of October 19 and November 16, 2009, there were 62 laboratory specimens positive for pH1N1 in the NWHU region.[28]

Laboratory confirmation:

Swabs from the throats or nasal areas of individuals with symptoms of ILI were used to confirm the presence of influenza in the community. The swabs/samples were transported to laboratories in Thunder Bay and Timmins for analysis. It took about 4 days for the results from the samples to be communicated back to the Health Unit. Not everyone with symptoms of ILI required laboratory confirmation of the pH1N1 virus. As the number of people with ILI increased, laboratory confirmation was only required if an individual was admitted to hospital.[29] In the NWHU region, 218 samples were positive for influenza A. Of these, 147 were positive for pH1N1.

Telehealth Ontario:

Telehealth is a toll free nursing helpline available 24/7.[30] The OAHPP monitors this service and tracks three syndromes from the data in Telehealth Ontario. These syndromes are fever and ILI, respiratory conditions and gastro-intestinal conditions? During the pandemic, data from telehealth was analyzed weekly by OAHPP. Health units were made aware of results that were considered above what was normally expected in their area. Health Unit staff investigated the suspected increase in symptoms against other surveillance activities in their local area. The NWHU region was alerted through telehealth about clusters of respiratory symptoms in the week of October 19 to 25, 2009.

Conclusion

This report provided an epidemiologic summary of the pH1N1 activity in the NWHU region. From December 2009 to April 2010, low levels of influenza activity continued in the province and within the NWHU region.

Almost a year from the start of the influenza pandemic, on April 14, 2010, the Ministry of Health and Long Term Care announced that the steps that were put into place to respond to the pandemic were being deactivated.[31] The Ministry Emergency Operations unit was in '*recovery'* status, vaccine was being retrieved, a second vaccine dose for some child age groups was not needed; the provincial stock pile for supplies was closed; and guidance documents were no longer in effect. In addition, health care providers could return to their routine practices and precautions.

On August 10, 2010, the World Health Organization Director-General Dr Margaret Chan announced that the H1N1 influenza virus pandemic had moved into the post-pandemic period. However, she reiterated that localized outbreaks of various sizes of H1N1 was likely to continue and that the prevailing influenza for 2010 was H1N1. [32]

Post Pandemic Period means the evidence is strong that the recent influenza pandemic patterns are transitioning towards seasonal patterns of influenza.[30]

Recommendations:

Even though the World Health Organization has identified that H1N1 will be the primary circulating virus in this years' influenza season for which many people may have developed natural immunity because of exposure to the virus, it is important that public health continues to:

- Promote influenza immunization;
- Be vigilant
- Continue proper coughing technique;
- Stay home when sick;

Hand washing, when done correctly, is the single most effective way to prevent the spread of communicable diseases. Good hand washing can significantly reduce the spread of infectious diseases among children and adults. (MOHLTC)

References

1. MOHLTC, Important Health Notice, Volume 6 Issue 1 April 23, 2009
2. MOHLTC, Important Health Notice, Volume 6 Issue 1 April 23, 2009
3. MOHLTC, Important Health Notice, Volume 6 Issue 1 April 23, 2009
4. 2006/07 Influenza and Respiratory Infection Outbreak Surveillance Report Report on the 2006/07 Influenza and Respiratory Infection Outbreak Surveillance Season in Ontario MOHLTC Public Health Division Jan 2009 Accessed September 7, 2009
5. Control of Communicable Diseases Manual 19th Edition, David L. Heyman Editor, 2008, American Public Health Association Washington DC
6. Control of Communicable Diseases Manual 19th Edition, David L. Heyman Editor, 2008, American Public Health Association Washington DC
7. 1N1 Frequently asked questions 3#513,
8. Ontario Health Plan for an Influenza Pandemic, Ontario Ministry of Health and Long-Term Care, 2007
9. CHICA Canada Pandemic (H1N1) 2009 Virus http://www.chica.org/links_swineflu.html Accessed Sept 7, 2009
10. CHICA Canada Pandemic (H1N1) 2009 Virus http://www.chica.org/links_swineflu.html. Accessed Sept 7, 2009
11. The H1N1 Pandemic How Ontario Fared, A Report of Ontario's Chief Medical Officerof Health August, 2010. http://www.health.gov.on.ca/en/public/publications/ministry_reports/cmoh_h1n1/cmoh_h1n1_20100602.pdf . Accessed September 7, 2009
12. Ontario Influenza Bulletin, 2009-2010 Surveillance Week 4 (January 24, 2010 –January 30, 2010, http://www.health.gov.on.ca/english/providers/program/pubhealth/flu/flu_09/bulletins/flu_bul_01_20100205.pdf. Accessed Sept 9, 2010
13. Nelson, K. E. Williams C.M. Infectious Disease Methodology, Theory and Practice, 2nd Edition, Jones and Bartlett Publishers, Massachusetts, 2007

14. MOHLTC, Important Health Notice, Volume 6, Issue 2 accessed Sept 7, 2010 Ontario Influenza Bulletin, 2009-2010, Surveillance week 6 Feb 7-13, Accessed August 16, 2009
15. PHAC Government of Canada announces intention to order 50.4 million doses of H1N1 vaccine August 6, 2009, http://www.phac-aspc.gc.ca/media/nr-rp/2009/2009_0806-eng.php. Accessed August 16, 2009
16. Ontario Health Unit, H1N1 Frequently asked questions http://www.eohu.ca/segments/vocabulary_e.php?segmentID=23&topicID=283#513 . Accessed September 7, 2010
17. Difference Between Adjuvanted and Unadjuvanted H1N1 vaccines http://www.differencebetween.net/science/health/difference-between-adjuvanted-and-unadjuvanted-h1n1-vaccines/#ixzz13OkPdF6j Accessed Oct 22, 2010
18. MOHLTC, Ontario Sends First Shipment Of 700,000 Doses of H1N1 Vaccine To Health Units Oct. 23, 2009 http://www.health.gov.on.ca/en/news/release/2009/oct/nr_20091023.aspx Accessed September 7, 2009
19. Eastern Ontario Health Unit, H1N1 Frequently asked questions http://www.eohu.ca/segments/vocabulary_e.php?segmentID=23&topicID=283#513, Accessed September 7, 2010
20. 2006/07 Influenza and Respiratory Infection Outbreak Surveillance Report Report on the 2006/07 Influenza and Respiratory Infection Outbreak Surveillance Season Ontario http://www.health.gov.on.ca/english/providers/program/pubhealth/flu/reports/flu_surveillance_rp_01_20090209.pdf Accessed Oct 23,2010
21. Eastern Ontario Health Unit, H1N1 Frequently asked questions http://www.eohu.ca/segments/vocabulary_e.php?segmentID=23&topicID=283#513, Accessed September 7, 2010
22. Nelson, K. E. Williams C.M. Infectious Disease Methodology, Theory and Practice, 2nd Edition, Jones and Bartlett Publishers, Massachusetts, 2007

23. Eastern Ontario Health Unit, H1N1 Frequently asked questions http://www.eohu.ca/segments/vocabulary_e.php?segmentID=23&topicID=283#513, Accessed September 7, 2010

24, Control of Communicable Diseases Manual 19th Edition, David L. Heyman Editor,2008, American Public Health Association Washington DC

25. School Absenteeism Surveillance Report North Bay Parry Sound Health Unit http://www.healthunit.biz/Surveillance%20-%20School%20Absenteeism%20Report/School%20Absenteeism%20Surveillance%20Report%20EN.pdf Accessed Oct 22, 2010

26. Important Health Notice volume 6 Issue 14 June 11, 2009, Accessed August 16th, 2009, http://www.health.gov.on.ca/english/providers/program/emu/health_notices/ihn_200906 11.pdf

27. Public Health Ontario.CA https://www.publichealthontario.ca/portal/server.pt/gateway/PTARGS_0_13139_530_239_825_43/do/document/overview?projID=126 Accessed Nov 6, 2010

28. Ontario Agency for Health Protection and Promotion. Public health laboratories surveillance updates. Oct. 19, 26, and Nov. 2, 9, 16., 2009, Accessed Nov.9,2010 http://www.oahpp.ca/resources/documents/reports/labratorysurveillancereports/091116%20OAHPP%20Weekly%20Laboratory%20Surveillance%20Update.pdf

29. Important Health Notice volume 6 Issue 14 June 11, 2009, Accessed August 16th, 2009, http://www.health.gov.on.ca/english/providers/program/emu/health_notices/ihn_200906 11.pdf

30. MOHLTC Public Information, Ministry Program Telehealth Ontario http://www.health.gov.on.ca/en/public/programs/telehealth/

31. Important Health Notice, MOHLTC. April 14, 2010 Information for Health Care Professionals Pandemic (H1N1) 2009 Update Volume 7, Issue 2. Accessed Sept 7, 2009

32. World Health Organization H1N1 in Post-Pandemic Period http://www.who.int/mediacentre/news/statements/2010/h1n1_vpc_20100810/en/index.h tml Accessed August 16th, 2010

31. World Health Organization, What is Post Pandemic? http://www.who.int/csr/disease/swineflu/frequently_asked_questions/post_pandemic/en /print.html. Accessed August 16, 2010

Sources of data:

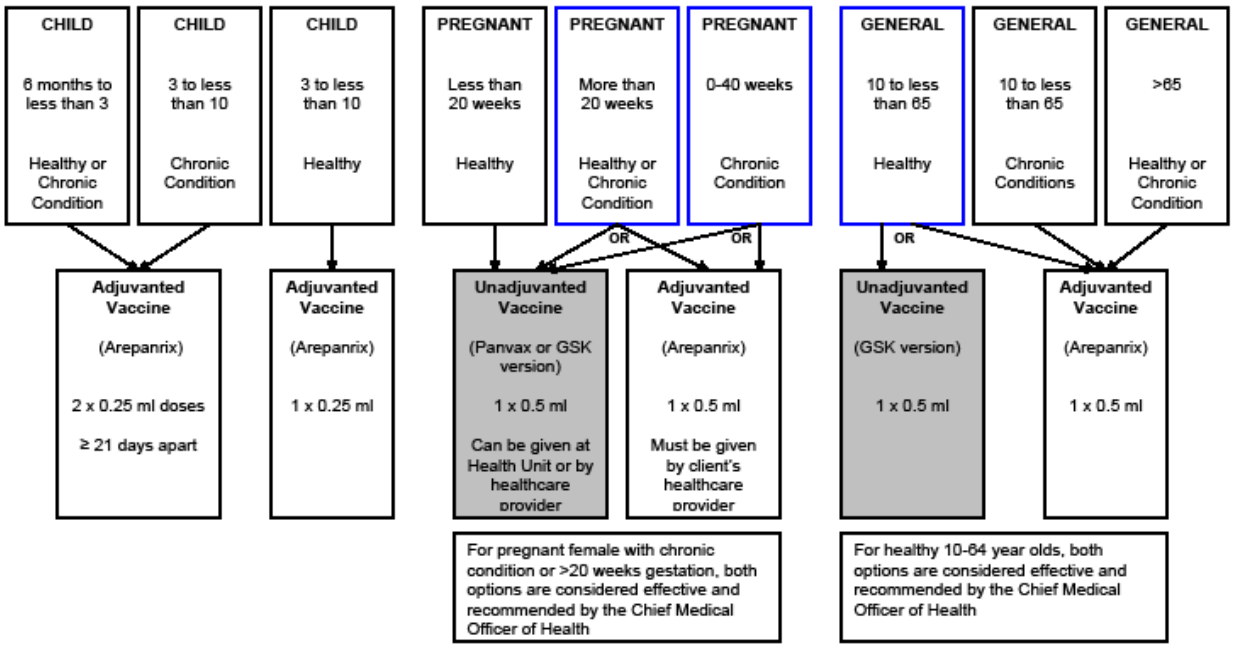
1. Mortality and Morbidity data was accessed from the Ministry of Health and Long Term Care, Provincial Health Planning Data base, intelliHealth
2. Counts of influenza cases were accessed from the Ministry of Health and Long Term Care iPHIS program.

Appendix 1 Pandemic H1N1Vaccine Options

Northwestern Health Unit

November 24, 2009

H1N1 VACCINE OPTIONS



Note: use unadjuvanted vaccine where possible to ensure sufficient stock is available of the adjuvanted vaccine for children and adults with chronic conditions

Appendix 2 International Statistical Classification of Diseases and Related Health Problems 10th Revision

Chapter X Diseases if the Respiratory System

J09 Influenza due to identified avian influenza virus

J10 Influenza due to other identified influenza virus

J10.0 Influenza with pneumonia, other influenza virus identified

J10.1 Influenza with other respiratory manifestations, other influenza virus identified

J10.8 Influenza with other manifestations, other influenza virus identified

J11 Influenza, virus not identified

J11.0 Influenza with pneumonia, virus not identified

J11.1 Influenza with other respiratory manifestations, virus not identified

J11.8 Influenza with other manifestations, virus not identified