Alberta Health

Seasonal Influenza in Alberta

2014–2015 Season

Surveillance and Assessment Branch

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Alberta Government

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Executive Summary

The 2014–2015 influenza season in Alberta was prolonged and intensive with high morbidity and mortality among seniors and the elderly resulting in over 200 outbreaks in long term care and supportive living facilities. There were 4,850 laboratory-confirmed cases of influenza reported to Alberta Health this season, 20 per cent more than last season (the last H1N1-predominant season) and 60 per cent more than the 2012–2013 season (the last H3N2-predominant season). Influenza A(H3N2) was the predominant circulating strain which has been associated with more severe influenza seasons. In addition, the circulating virus was antigenically distinct from the 2014–2015 vaccine recommended for the northern hemisphere, limiting the effectiveness of the vaccine. Vaccine effectiveness was estimated to be close to zero against the circulating influenza A(H3N2) strain.

This season featured the highest number of hospitalizations since the 2009 pandemic and the highest number of hospitalized deaths recorded since standardized reporting began during the 2009–2010 season. Seniors and the elderly had the highest rates of disease, much more than in recent years, and were more likely to experience serious outcomes such as hospitalization and death. The rate of lab-confirmed illness among the elderly age 80 and older was 17 times higher than that of working age adults and three times higher than the rate of illness among the elderly in 2012–2013. The rate of hospitalization among the elderly was 40 times that of working age adults, and three times the rate of hospitalization in 2012–2013. The rate of death among the elderly was four times higher than in 2012–2013, the last H3N2-predominant season.

Acknowledgements

The data presented in this report is from the Provincial Laboratory for Public Health (ProvLab), Alberta's influenza like illness (ILI) sentinel physician system (TARRANT), Supplemental Enhanced Service Event (SESE) physician claims data, the Pharmacy Information Network (PIN), as well as outbreak reports and hospitalized case report forms from Alberta Health's Communicable Disease Reporting System (CDRS). We would like to thank Alberta Health Services (AHS), First Nations Inuit Health Branch (FNIHB), ProvLab, the National Microbiology Laboratory (NML), and TARRANT sentinel physician system for their partnership in influenza surveillance in Alberta.

Introduction

The 2014–2015 influenza season in Canada and North America had the highest morbidity and mortality since the 2009–2010 pandemic season[1,2]. The Influenza A(H3N2) virus that was the predominant circulating strain was antigenically distinct from the 2014–2015 northern hemisphere vaccine, contributing to increased morbidity and mortality, especially among seniors and the elderly[1,3].

The components included in the 2014–2015 northern hemisphere trivalent vaccine were: Influenza A/Texas/50/2012-like virus (H3N2), Influenza A/California/07/2009(H1N1)pdm09-like virus and Influenza B/Massachusetts/2/2012-like virus (Yamagata lineage). In Canada, only three out of 1432 Influenza A(H3N2) isolates analyzed by the National Microbiology Laboratory (NML) were antigenically[4] similar to A/Texas/50/2012-like virus (H3N2)[2]. The majority of influenza A isolates were genetically or antigenically similar to A/Switzerland/9715293/2013, the component recommended for the 2015 southern hemisphere vaccine and the 2015–2016 northern hemisphere vaccine[2,3,4] . Eighty-nine per cent of influenza B isolates characterized by NML were of the Yamagata lineage and 12 per cent were of the Victoria lineage (B/Brisbane/60/2008-like).

The result of the mismatch between the predominant circulating virus and the vaccine resulted in low vaccine effectiveness. The mid-season estimate of vaccine effectiveness in Canada was –8 per cent with a confidence interval between –50 per cent and 23 per cent[5]. Vaccine effectiveness estimates were three per cent in Britain, 23 per cent in the United States, and 50 per cent in Spain, with the higher estimates in Spain and the United States likely due to an increased proportion of circulating virus antigenically similar to the vaccine[1,6].

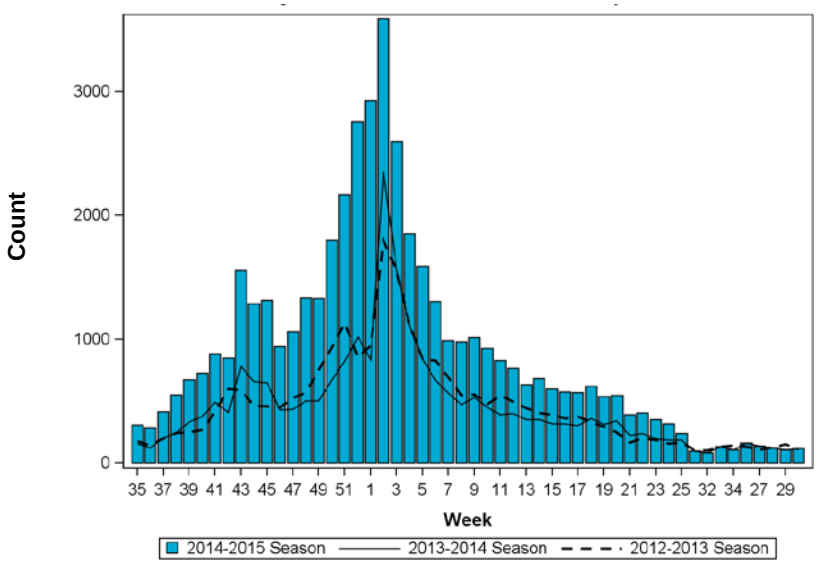
Worldwide, this season was also notable for continued avian influenza activity with links to North America. A third wave of Influenza A(H7N9) occurred in China, resulting in two British Columbia residents contracting it after travelling to China in January 2015. The cases did not have direct contact with poultry, but recalled seeing free-running chickens and chicken droppings in China during the incubation period. They were diagnosed upon their return to Canada. In addition, avian influenza A(H5N2) was found in chicken and turkey farms in British Columbia, Ontario, and in several states in the United States, resulting in quarantine and culling of flocks to prevent spread.

This report describes the 2014–2015 influenza season in Alberta. While influenza surveillance in Alberta occurs year round, this report includes surveillance of influenza activity from August 24, 2014 (Week 35) to July 4, 2015 (Week 26) (See Appendix 1 for weeks and date ranges for the 2014–2015 season).

Influenza Activity in Alberta

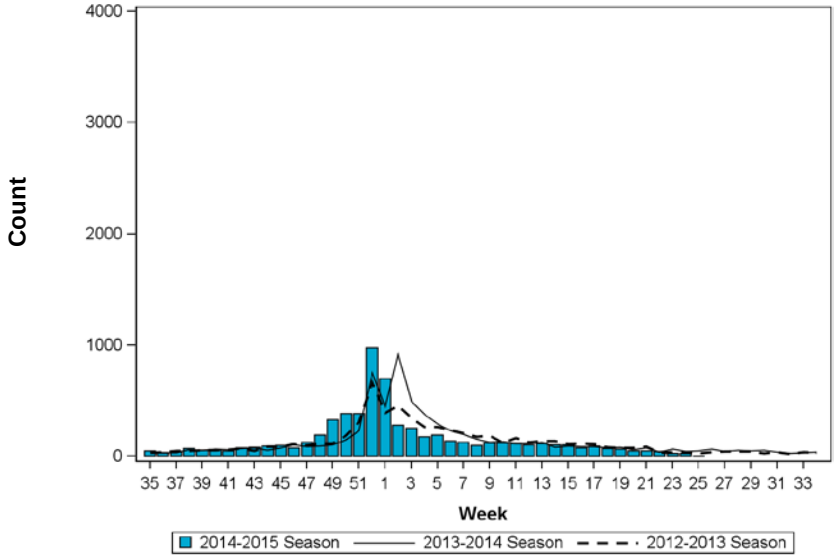
Alberta had a prolonged and intense influenza season in 2014–2015 overall, with increased levels of morbidity and mortality among the elderly. The peak occurred over the winter holidays, with multiple surveillance systems indicating high influenza activity between week 50 and week 1 (Figures 1- 5). Note that the peaks align regardless of the surveillance system used (i.e. antiviral prescriptions dispensed, percent ILI visits at sentinel physicians or the number of influenza cases diagnosed in general practitioner's offices and emergency departments). Similar to the past two seasons, approximately 30,000 Albertans were diagnosed with influenza this season: 23,332 diagnosed in general practitioner office visits and 6,649 diagnosed in emergency departments.

Figure 1: Number of individuals diagnosed with influenza in general practitioner offices, by season.



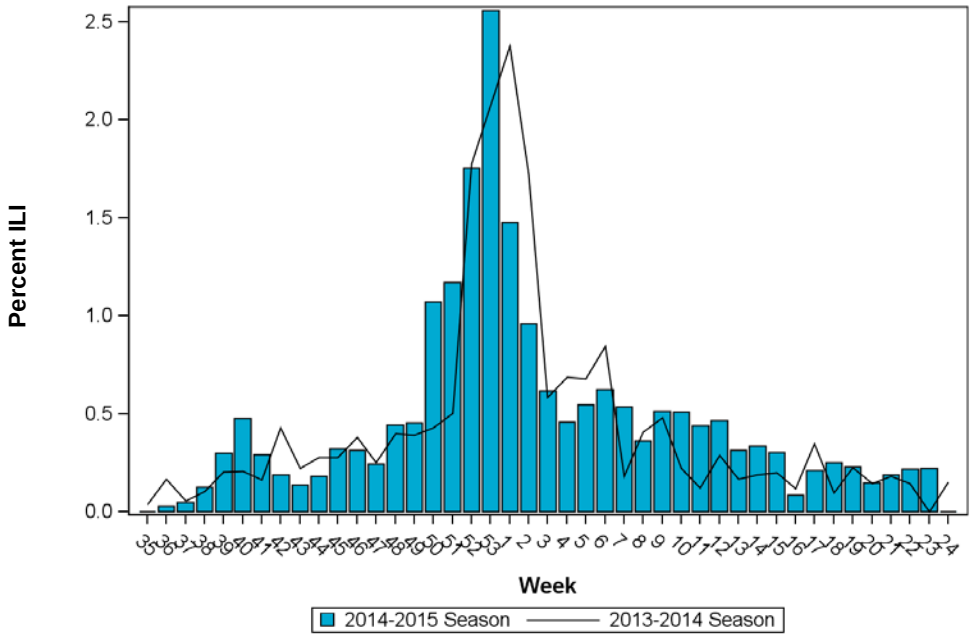
Source: Supplemental enhanced service event (Physician Claims)

Figure 2: Number of individuals diagnosed with influenza in emergency departments by season.



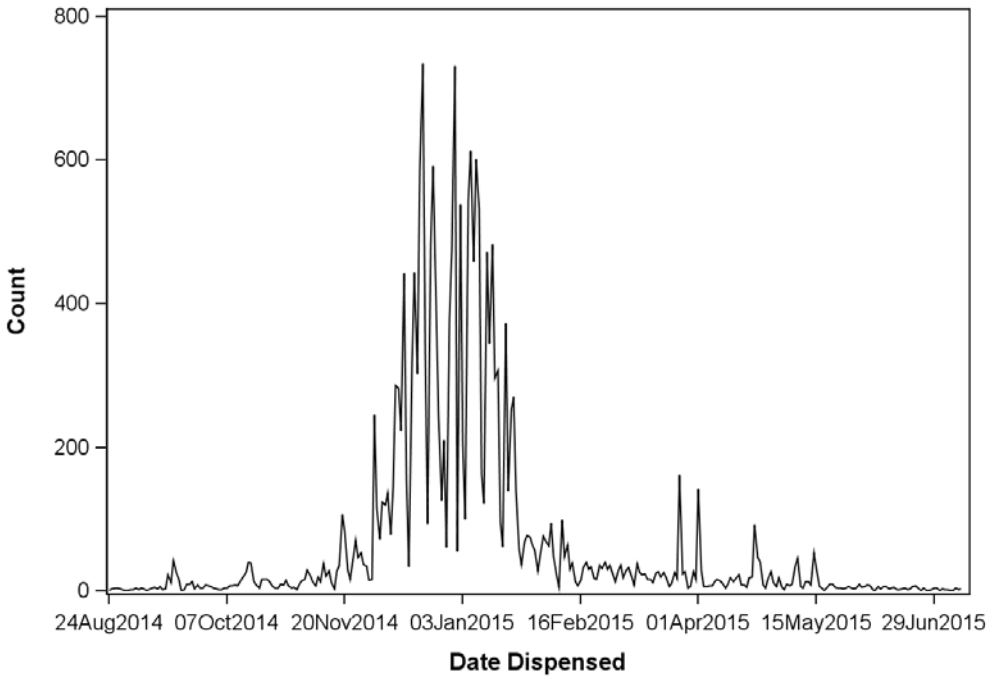
Source: Supplemental enhanced service event (Physician Claims)

Figure 3: Per cent of patient visits due to influenza-like illness as reported by sentinel physicians, by week and season.



Source: TARRANT

Figure 4: Number of antiviral prescriptions dispensed by pharmacists, by week.

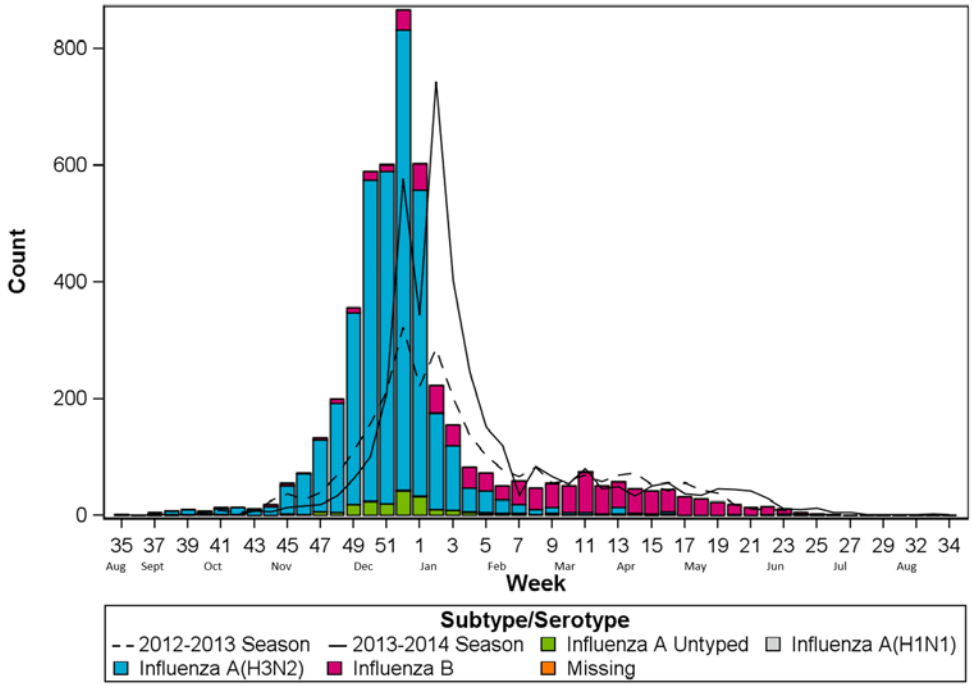


Source: Pharmaceutical Information Network

There were 4,850 laboratory-confirmed cases in 2014–2015, for a rate of 117.7 per 100,000 (Figure 5). This is the highest number of laboratory-confirmed cases reported since the 2009 pandemic season; 20 per cent higher than 2013–2014 (97.7 per 100,000) and 60 per cent higher than 2012–2013 (74.3 per 100,000). Similar to 2012–2013, the majority of cases were due to Influenza A(H3N2) (77 per cent). Of the remaining cases, 19 per cent were Influenza B, 0.2 per cent were Influenza A(H1N1), and four per cent were influenza A isolates with low viral load or were unable to be further subtyped by nucleic acid amplification test (NAAT) (Figure 5). This is in contrast to the 2013–2014 season where 76 per cent of isolates were due to influenza A(H1N1)pdm09.

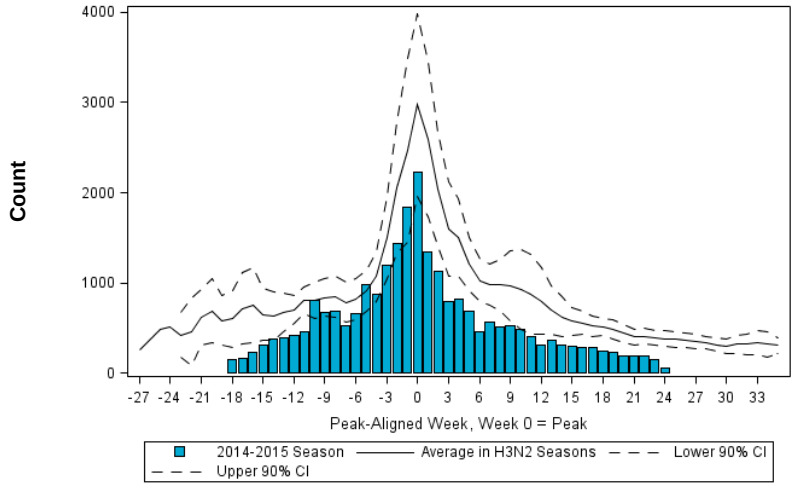
H3N2-predominant influenza seasons have been linked to more severe illness[7]. As routine reporting of lab-confirmed influenza began in 2009 and there have been only two H3N2-predominant seasons since, it is difficult to determine if the increased laboratory activity this season is higher than would be expected in an Influenza A(H3N2)-predominant season. However, if the number of influenza cases diagnosed by a general practitioner is compared between this season and all of the H3N2-predominant seasons since 1993-1994, it is likely influenza activity was average for an H3N2-predominant season (Figure 6).

Figure 5: Laboratory-confirmed cases of influenza, by subtype and week of diagnosis*.



* See Appendix 2 for data notes.
Source: CDRS, Alberta Health

Figure 6: Number of individuals diagnosed with influenza in general practitioner offices in 2014–2015 compared to the average number of cases diagnosed in general practitioner offices in H3N2-predominant seasons* since 1993-1994.



Source: Supplemental enhanced service event (Physician Claims)
* See Appendix 2 for data notes.

Alberta Health Service Zone

This season, Calgary Zone had the highest number of reported cases (1,604) and Central Zone had the most cases per capita with a rate of 140.7 reported cases per 100,000 (Table 1). Most zones experienced an increase in the rate of influenza this season compared to the previous two seasons. North Zone, however, experienced a slight decrease in the rate of disease over 2013–2014 (the most recent Influenza A(H1N1)-predominant season). The epidemic curves and relative proportions of subtypes by zone were similar to the overall pattern for Alberta.

Table 1: Rate of laboratory-confirmed influenza by Zone (per 100,000 population)

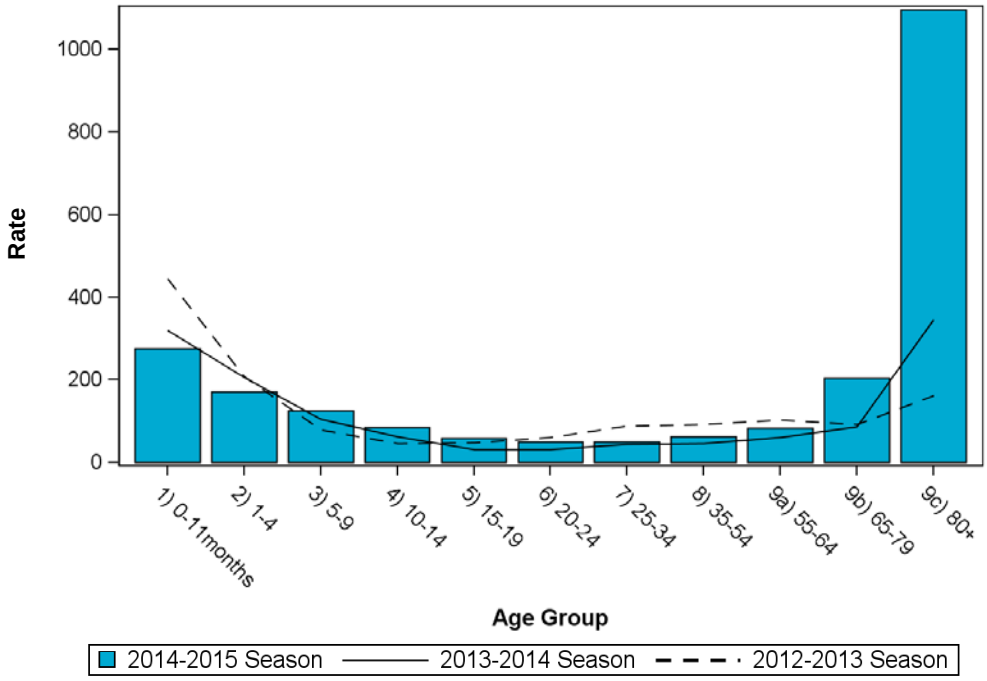
	2014–2015		2013–2014		2012–2013	
Zone	**Count**	**Rate**	**Count**	**Rate**	**Count**	**Rate**
North Zone	661	136.1	693	146.0	327	71.2
Edmonton Zone	1,562	119.6	1,366	108.2	1,093	89.3
Central Zone	667	140.7	621	132.9	373	81.3
Calgary Zone	1,604	103.1	997	66.2	781	53.6
South Zone	354	117.9	238	80.4	316	108.0
Alberta Overall	4,850	117.7	3,915	97.7	2,888	74.3

Source: Communicable Disease reporting System (CDRS), Alberta Health

Age

While the rate of illness in children under the age of five decreased this season, the rate of illness increased significantly among seniors and the elderly compared to the previous season (Figure 7). The elderly over the age of 80 compose three per cent of the Alberta population; however, they made up 27 per cent (n=1315) of the lab-confirmed influenza cases reported to Alberta Health, for a rate of 1,096 cases per 100,000 population. The rate among those 80 and older was 17 times higher than the rate among working age adults age 20–64, and nine times higher than the rate of illness in the Alberta population as a whole. The rate of influenza among the elderly is the highest since lab-confirmed influenza surveillance began in 2009 and three times higher than the last H3N2-predominant influenza season (2012–2013) when the rate was 346.7 per 100,000.

Figure 7: Rate of laboratory-confirmed influenza infections by age and season (per 100,000).

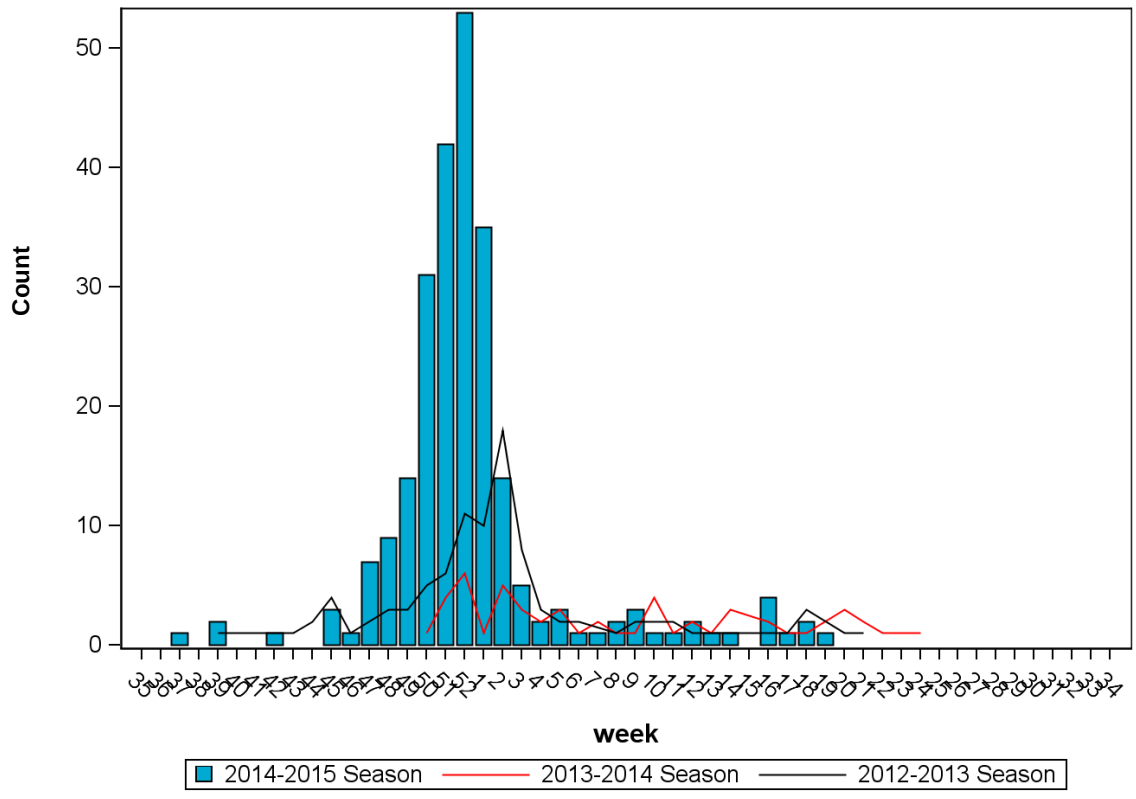


Source: CDRS, Alberta Health

Outbreaks

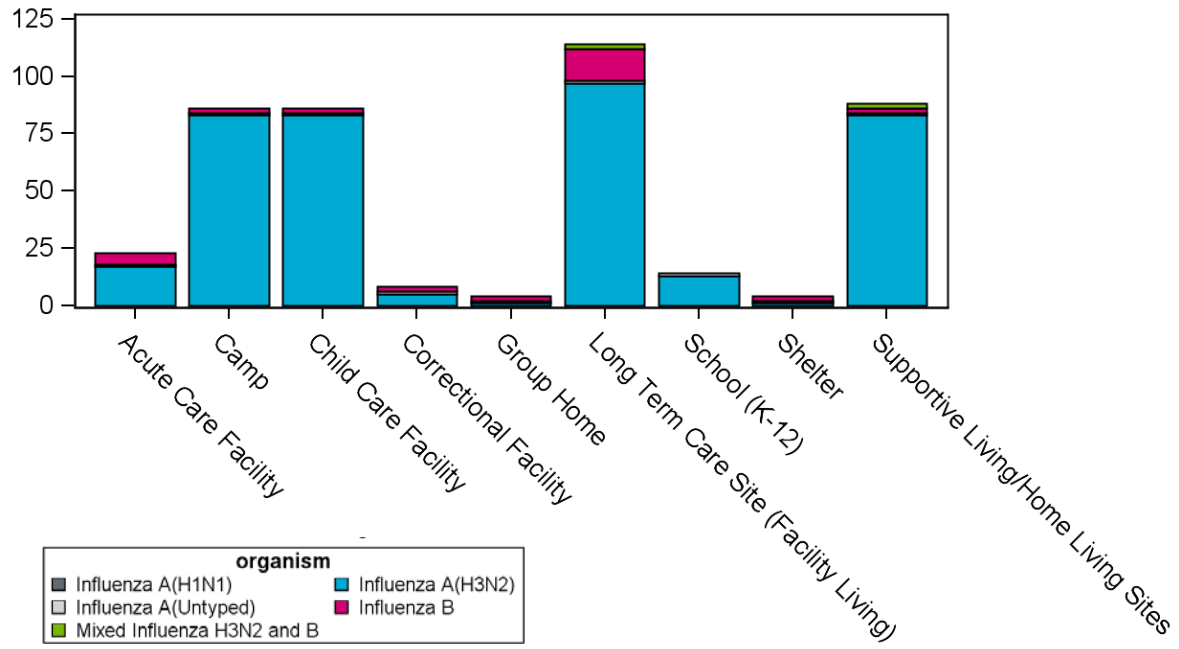
Influenza outbreaks that occur in group settings such as hospitals, residential institutions, schools, and child care facilities are reported to Alberta Health. There were 244 influenza outbreaks reported to Alberta Health this season, more than double the 100 influenza outbreaks reported in the previous H3N2-predominant 2012–2013 season and more than four times as many as the H1N1-predominant 2013–2014 season (Figure 8). Long term care facilities and supportive-living facilities were most affected this season; there were 114 outbreaks in long term care facilities and 90 outbreaks in supportive living/home living sites (Table 2, Figure 9). Supportive living sites had the highest increase in outbreaks compared to previous years: there were three times as many outbreaks reported this season as 2012–2013 and 12 times as many as 2013–2014. The high number of outbreaks reported in long term care facilities is likely due in part to the lack of an effective vaccine against influenza A(H3N2) this season.

Figure 8: Number of lab-confirmed influenza outbreaks reported by week.



Source: CDRS, Alberta Health

Figure 9: Count of lab-confirmed influenza outbreaks by organism and outbreak setting.



Source: CDRS, Alberta Health

Table 2: Count of outbreaks by outbreak setting and season.

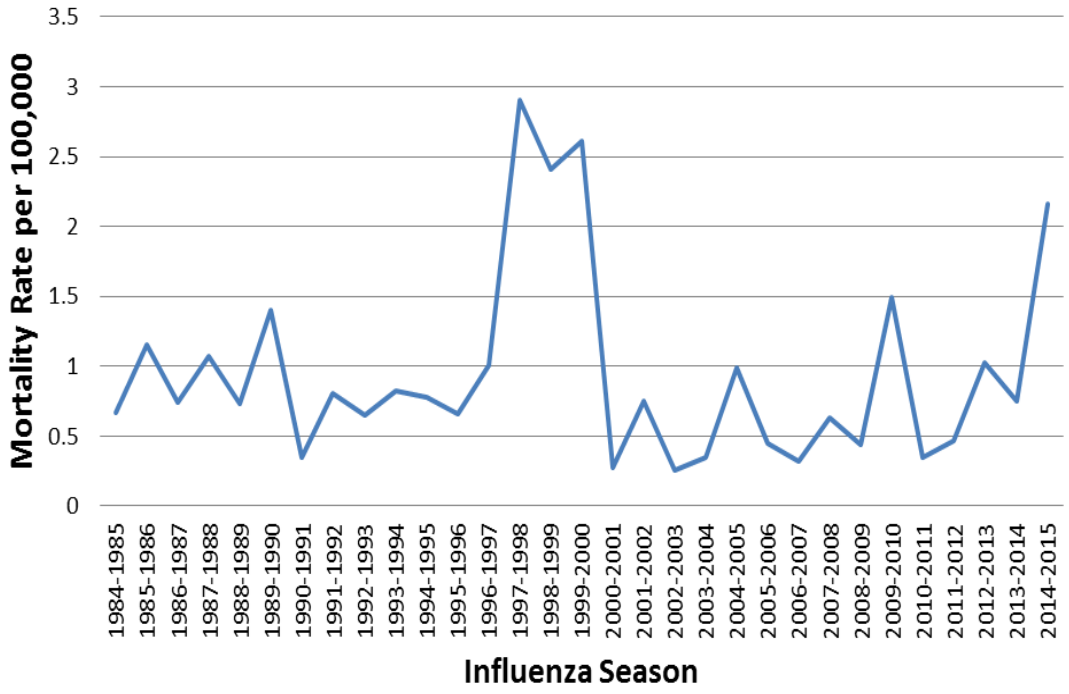
	2012–2013		2013–2014		2014–2015	
	Count	**Per cent**	**Count**	**Per cent**	**Count**	**Per cent**
Long term Care Facility	42	42%	20	38%	114	47%
Supportive Living/Home Living	29	29%	7	14%	90	37%
Correctional Facility	1	1%	6	12%	5	2%
Shelter	.		.		1	1%
Acute Care Facility	14	14%	11	22%	20	8%
Child Care Facility	4	4%	5	10%	.	
Schools (K-12)	10	10%	2	4%	13	5%
Group Home	.		.		1	1%
Camp	.		1	2%	.	
Total	98		50		244	

Source: CDRS, Alberta Health

Hospitalized Cases

This season featured the highest number of hospitalizations and deaths among hospitalized patients since the 2009–2010 pandemic. This season there were 1,931 individuals hospitalized with influenza, for a rate of 46.8 per 100,000, 50 per cent more hospitalizations than last season and twice as many as the last H3N2-predominant season (2012–2013) (Tables 3 and 4). Nine per cent (168) of hospitalized influenza patients were admitted to the intensive care unit (ICU), statistically significantly lower than the H1N1-predominant 2013–2014 season. There were 90 fatalities in hospitalized patients this season, three times as many as last season and 2.4 times as many as 2012–2013. The last time a similar fatality rate was experienced in Alberta was the 1997-1998, 1998-1999 and 1999–2000 seasons with the introduction of a new variant of Influenza A(H3N2) (Figure 10)[8].

Figure 10: Crude mortality rate per 100,000 where influenza named as the cause of death in vital statistics* by season.



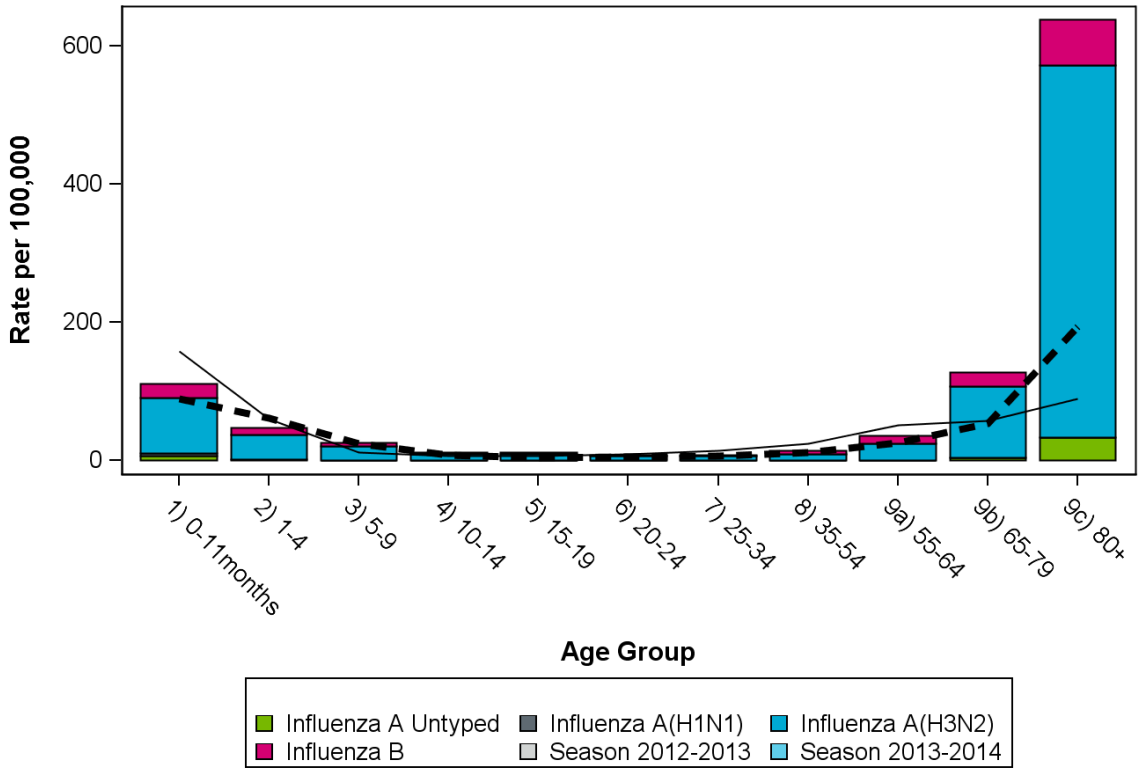
*Note: Vital statistics data not yet received for 2014 and 2015. Hospitalized influenza fatalities from CDRS have been utitlized for 2013–2014 and 2014–2015.

Source: Vital statistics and CDRS

Similar to lab-confirmed cases, age was a significant factor linked to severity of disease and season. The median age of hospitalized cases, cases admitted to the ICU and fatalities was statistically significantly higher this year than in previous years. The rate of hospitalization in children under the age of five was lower this season than last season, but similar to the H3N2-predominant 2012–2013 influenza season (Figure 11). The rate of hospitalization among the elderly was much higher this season than in previous seasons. While the rate of hospitalization in the elderly was 194.6 per 100,000 in 2012–2013 and 89.9 per 100,000 in 2013–2014, the rate this season was 638.4 per 100,000, 40 times that of adults age 20–64. The rate of hospitalized fatalities among the elderly was 55.0 per 100,000, 3.7 times higher than 2012–2013 and 16 times higher than 2013–2014.

The increased rate of hospitalization and death among the elderly as compared to 2012–2013 is not surprising given the known increased severity of disease among the elderly, the high number of outbreaks in long term care facilities and the poor vaccine effectiveness this season[7]. The increases this season over last season is likely because the predominant circulating strain last season was influenza A(H1N1)pdm09 and the elderly are thought to have residual immunity as H1N1 influenza viruses were the predominant circulating strains between 1918 and the mid-1950s[8].

Figure 11: Rate of hospitalized influenza cases by age group and season (per 100,000).



Source: CDRS, Alberta Health

Table 3: Rate of lab-confirmed influenza hospitalizations, ICU admissions, and hospitalized deaths by season (per 100,000)

	2014–2015	2013–2014	2012–2013
Hospitalizations	46.8 (44.8–49.0)	30.4 (28.7–32.1)*	25.0 (23.4–25.6)*
ICU admissions	4.1 (3.5–4.7)	5.5 (4.8–6.3)*	3.9 (3.3–4.5)
Hospitalized deaths	2.2 (1.8–2.7)	0.7 (0.5-1.1)*	1.0 (0.7-1.3)*

* Statistically significantly different than 2014–2015

Table 4: Characteristics of Hospitalized Influenza Cases, by Season

	2014–2015	2013–2014	2012–2013
Hospitalizations	1931	1219	971
Median age (IQR)	74.0 (49.0–85.0)	51.7 (25.6–64.5)*	57.1 (13.4–77.8)*
No. cases with one or more chronic conditions (per cent)	1537 (80%)	912 (75%)*	724 (75%)*
ICU Admissions in Hospitalized Cases (per cent)	168 (9%)	222 (17%)*	150 (15%)*
Median age (IQR)	65.0 (44.5–76.0)	52.1 (37.3–61.6)*	59.4 (41.9–67.9)*
No. cases with one or more chronic conditions (per cent)	144 (86%)	197 (88%)	128 (85%)
Deaths in Hospitalized Cases (per cent)	90 (4.7%)	30 (2.5%)*	37 (3.8%)
Median age (IQR)	86.0 (78.0-92.0)	59.4 (51.7–66.2)*	74.2 (63.3–86.9)*
No. cases with one or more chronic conditions (per cent)	76 (84%)	25 (83%)	33 (89%)

*Statistically significant different than 2014–2015 (P value < 0.05). Fisher's exact test utilized where appropriate.

Source: CDRS, Alberta Health

Antiviral Resistance

As of July 16, 2015, the NML had tested 1131 influenza viruses (249 from Alberta) for resistance to the antiviral drugs oseltamivir, zanamivir, and amantadine[9,10,11]. Similar to last season, all influenza isolates were sensitive to zanamivir, the majority (99 per cent) of isolates were sensitive to oseltamivir, and all influenza A isolates were resistant to amantadine, except one isolate from Ontario. The only influenza A(H3N2) isolate resistant to oseltamivir in Canada was collected from Alberta.

Conclusion

The 2014–2015 influenza season was prolonged and intense with high morbidity and mortality among seniors and the elderly. The influenza A(H3N2) predominant circulating strain was antigenically distinct from the 2014–2015 vaccine recommended for the northern hemisphere, severely limiting the effectiveness of the vaccine and leading to the highest number of outbreaks recorded in recent years.

Appendix: 2014–2015 Influenza Season Reporting Weeks

Week	Start	End
35	24-Aug-14	30-Aug-14
36	31-Aug-14	6-Sep-14
37	7-Sep-14	13-Sep-14
38	14-Sep-14	20-Sep-14
39	21-Sep-14	27-Sep-14
40	28-Sep-14	4-Oct-14
41	5-Oct-14	11-Oct-14
42	12-Oct-14	18-Oct-14
43	19-Oct-14	25-Oct-14
44	26-Oct-14	1-Nov-14
45	2-Nov-14	8-Nov-14
46	9-Nov-14	15-Nov-14
47	16-Nov-14	22-Nov-14
48	23-Nov-14	29-Nov-14
49	30-Nov-14	6-Dec-14
50	7-Dec-14	13-Dec-14
51	14-Dec-14	20-Dec-14
52	21-Dec-14	27-Dec-14
53	28-Dec-14	3-Jan-15
1	4-Jan-15	10-Jan-15
2	11-Jan-15	17-Jan-15
3	18-Jan-15	24-Jan-15
4	25-Jan-15	31-Jan-15
5	1-Feb-15	7-Feb-15
6	8-Feb-15	14-Feb-15
7	15-Feb-15	21-Feb-15
8	22-Feb-15	28-Feb-15
9	1-Mar-15	7-Mar-15
10	8-Mar-15	14-Mar-15
11	15-Mar-15	21-Mar-15
12	22-Mar-15	28-Mar-15
13	29-Mar-15	4-Apr-15
14	5-Apr-15	11-Apr-15
15	12-Apr-15	18-Apr-15
16	19-Apr-15	25-Apr-15
17	26-Apr-15	2-May-15
18	3-May-15	9-May-15
19	10-May-15	16-May-15
20	17-May-15	23-May-15
21	24-May-15	30-May-15
22	31-May-15	6-Jun-15
23	7-Jun-15	13-Jun-15
24	14-Jun-15	20-Jun-15
25	21-Jun-15	27-Jun-15
26	28-Jun-15	4-Jul-15
27	5-Jul-15	11-Jul-15
28	12-Jul-15	18-Jul-15
29	19-Jul-15	25-Jul-15
30	26-Jul-15	1-Aug-15
31	2-Aug-15	8-Aug-15
32	9-Aug-15	15-Aug-15
33	16-Aug-15	22-Aug-15
34	23-Aug-15	29-Aug-15

*Note: To facilitate comparison of graphs between seasons in this report, Week 53 was divided into Week 52 and Week 1.

Appendix 2 – Data Notes

Figure 5: Laboratory-confirmed cases of influenza, by subtype and week of diagnosis

To ensure consistency in graphing between seasons, cases diagnosed in week 53 (December 28, 2014 – January 3, 2015) were placed into week 52 or week 1. This makes the peak of the influenza season appear to be week 52, although the number of lab-confirmed cases was slightly higher in week 51 than week 52.

Figure 6: Number of individuals diagnosed with influenza in general practitioner offices in 2014–2015 compared to the average number of cases diagnosed in general practitioner offices in H3N2-predominant seasons* since 1993-1994

H3N2-predominant seasons in Canada – 1993/94, 1996/97, 1997/98, 1998/99, 1999/00, 2002/03, 2003/04, 2004/05, 2005/06, 2011/12, 2012/13[12,13,14]. The graph aligned the epidemic curves for each season at their peak, calculating the average number of cases at each of the aligned weeks (as well as the upper and lower limits of the confidence intervals). The peak was defined as the week with the largest number of diagnoses and labelled "0". Subsequent weeks were labelled with positive or negative integers depending on position to the peak. Thus week -1 is the week prior to the peak and week +1 the week after the peak.

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