

Influenza in Canada, 2012-2013 season

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Abstract

Objective: This report summarizes influenza activity in Canada during the 2012-13 influenza season (August 26, 2012-August 24, 2013) from data obtained through the FluWatch surveillance program.

Methods: FluWatch collected information from six primary indicators of influenza activity that describe the epidemiologic and virologic behaviour of influenza in Canada: sentinel laboratory-based influenza detections; strain characterization and antiviral resistance for circulating influenza viruses; primary care consultation rates of influenza-like illness; regional influenza activity levels; influenza-associated severe outcomes; and pharmacy surveillance.

Results: The influenza season peaked nationally between late December 2012 and early January 2013 with influenza A(H3N2) identified as the predominant circulating influenza strain until early March, when influenza B became the predominant circulating strain. The cumulative reported hospitalization rates for all age groups were 25.0 per 100,000. Influenza A most greatly affected adults ≥ 65 years of age and influenza B most greatly affected children ≤ 19 years of age.

Conclusion: The influenza season was moderately severe. When compared to the previous two seasons, which were considered relatively mild, there was a significant increase in laboratory detections for influenza, as well as hospitalizations associated with influenza in 2012-13.

Introduction

Influenza is a respiratory infection usually caused by influenza A or B viruses. In Canada, it generally occurs each year during the late fall and winter months. Influenza infection causes primary illness and can also lead to severe secondary medical complications, including viral pneumonia, secondary bacterial pneumonia and worsening of underlying medical conditions. It is estimated that in Canada, an average of 12,200 hospitalizations are related to influenza (1-3) and approximately 3,500 deaths are attributable to influenza annually (4).

National influenza surveillance is coordinated through the FluWatch program of the Centre for Immunization and Respiratory Infectious Diseases (CIRID) at the Public Health Agency of Canada. The primary objectives of this program are early detection and timely reporting of influenza activity in Canada and abroad as well as monitoring circulating strains of influenza virus such as antigenic characterization, identification of new subtypes and changes in antiviral resistance.

FluWatch collected data and information on influenza activity from a variety of sources and disseminated it weekly during the active influenza season (September to mid-May) and biweekly during the low season (mid-May to August). Information was available to health professionals and the public through e-mail and the FluWatch website www.phac-aspc.gc.ca/fluwatch/.

This report provides an epidemiologic and virologic summary of influenza activity in Canada during the 2012 - 2013 season.

Methods

This report is based on the six primary indicators of influenza activity reported by the FluWatch program on a weekly basis across Canada and between August 26, 2012 (week 35) and August 24, 2013 (week 34): (I) sentinel laboratory-based influenza and other respiratory virus detections; (II) strain characterization and antiviral resistance for circulating influenza viruses; (III) primary care consultation rates of influenza-like illness (ILI) by sentinel practitioners; (IV) regional influenza activity levels; (V) influenza-associated hospitalizations and deaths; and (VI) pharmacy surveillance.

These data sets come from ongoing public health surveillance and are exempt from research ethics board approval.

Surveillance dataset

(I) Sentinel laboratory-based influenza detections

Influenza detections were reported through the sentinel laboratory-based Respiratory Virus Detections Surveillance System (RVDSS) in aggregate and with case details. Participating laboratories reported the total number of tests performed for influenza and the total number of positive tests. Samples from the territories are tested by reference laboratories in nearby provinces and aggregated into provincial results. Samples with case-level data were attributable to a territory and reported independently from the province testing the sample.

(II) Strain characterization and antiviral resistance for circulating influenza viruses

The NML conducted national surveillance on human influenza virus strains in collaboration with provincial laboratories and other Canadian hospital- and university-based laboratories. A subset of weekly influenza detections across Canada were referred to the NML for further testing to provide strain characterization and evaluation of antigenic changes, as well as antiviral resistance in the circulating influenza virus strains.

(III) Primary care consultation rates of ILI by sentinel practitioners

CIRID recruited and managed the participation of sentinel physicians in seven provinces and three territories. In the remaining three provinces (British Columbia, Alberta and Saskatchewan), sentinel recruitment and reporting was managed by independent provincial programs. For one clinic day each week, sentinels reported the total number of patients seen for any reason (denominator) and the total number of patients meeting a standard national case definition for ILI (numerator).

(IV) Regional influenza activity levels and outbreaks

Provinces and territories were subdivided into surveillance regions. Provincial and territorial epidemiologists assessed the weekly influenza activity level in their respective jurisdictions based on laboratory reports of influenza detections, presence of ILI and reports of outbreaks of influenza or ILI. There were four standard categories of activity: no activity, sporadic activity, localized activity and widespread activity. Outbreaks in hospitals and long-term care facilities (LTCF) were reported weekly, where an outbreak was defined as two or more cases of ILI within a seven-day period and included at least one laboratory-confirmed case of influenza.

(V) Influenza-associated hospitalizations and deaths

Hospitalizations and deaths associated with laboratory-confirmed influenza virus infections were reported by participating provinces and territories and two hospital surveillance networks. In 2012 - 13, eight provinces and territories (AB, MB, SK, ON, PE, NL, NT, YK) reported influenza-associated hospitalizations and deaths in their jurisdictions. The Canadian Immunization Monitoring Program ACTive (IMPACT) is a network of paediatric tertiary

care hospitals with 12 centres in eight provinces representing approximately 90% of all tertiary care paediatric beds in the country. The PHAC-CIHR Influenza Research Network-Severe Outcomes Surveillance (PCIRN-SOS) network comprises of 40 adult hospitals in six provinces, representing more than 17,000 adult acute-care beds in Canada. Hospitalizations and deaths reported from IMPACT or PCIRN also may be included in provincial/territorial reporting.

(VI) Pharmacy surveillance – prescription sales

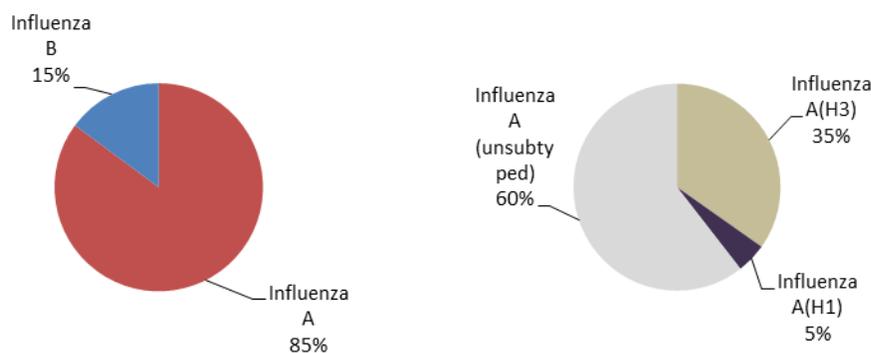
The pharmacy surveillance system is coordinated by the Centre for Foodborne, Environmental and Zoonotic Infectious Diseases (CFEZID) using data provided by participating pharmacies to RxCanada. In 2012 - 13, approximately 2,500 stores from 15 major pharmacy chains contributed over-the-counter and prescription data. Participating pharmacies were present in all provinces and territories except Nunavut and 85% of health regions in Canada. Data was collected on new and refill prescription medications purchased, which are categorized as “antiviral” (including oseltamivir, zanamivir and amantadine) and “other” (all other prescriptions).

Results

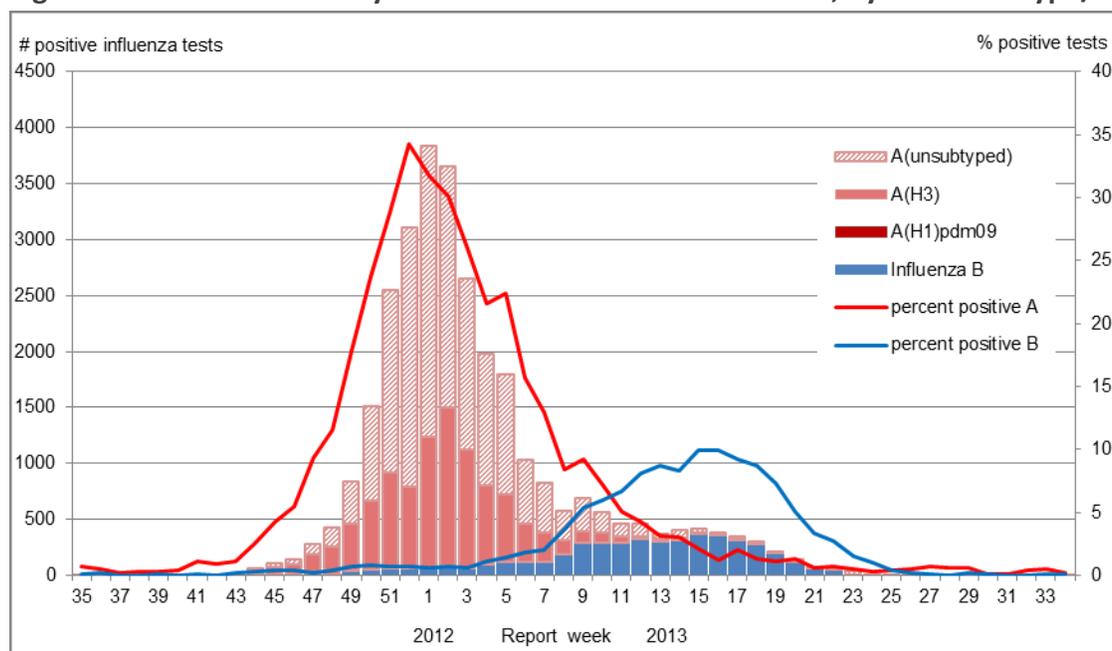
Sentinel laboratory-based influenza and other respiratory virus detections

During the 2012 - 13 season, sentinel laboratories tested 190,376 specimens for influenza and 31,737 (16.7%) were positive. Of the positive specimens, 27,020 (85.1%) were influenza A and 4,717 (14.9%) were influenza B. Among the seasonal influenza A viruses, 10,669 (39.5%) were subtyped and 9,395 (88.1%) were influenza A (H3N2) and 1,274 (11.9%) were influenza A (H1N1) pdm09 (**Figure 1**).

Figure 1: Percentage of laboratory detections of influenza in Canada, by type and subtype, 2012-13



Based on laboratory reporting, the season peaked nationally between week 52 and week 1 (December 23, 2012 to January 5, 2013) with 35.0% of respiratory specimens testing positive for influenza. Influenza A(H3N2) was the predominant influenza strain during the 2012-13 season. Influenza A(H3N2) was predominant until between week 10 and 11 (March 3 to 16, 2013), when influenza B became the predominant circulating strain (**Figure 2**).

Figure 2: Sentinel laboratory detections of influenza in Canada, by week and type/subtype, 2012-13

The relative proportion of each type and subtype circulating and the time that influenza activity peaked varied by geographic region. The percentage of positive specimens was highest in week 52 for parts of western and central Canada (British Columbia, Alberta, Ontario, Quebec) and Newfoundland. The proportion of positive tests was highest in Saskatchewan in week 2, Manitoba in week 3 and in the remaining Atlantic provinces in week 5 for New Brunswick and week 6 for PEI and Nova Scotia. Influenza A was the predominant strain in all the provinces for the season, with the proportion of laboratory tests positive for Influenza A ranging from 72.2% in Saskatchewan to 99.2% in PEI. From case-based data, for which laboratory data for the territories can be identified, influenza activity appears to have peaked in Nunavut in week 5 (January 27-February 2, 2013) and in Northwest Territories in week 17 (April 21 - 27, 2013). No data is available for Yukon Territory.

Among the 26,546 cases for which information on age and type/subtype was received this season, adults ≥ 65 years of age comprised 41.1% of the influenza cases (**Table 1**). Approximately 45% of the influenza A cases occurred in adults ≥ 65 years of age and 45.9% of the influenza B cases occurred in children ≤ 19 years of age.

Table 1: Cumulative case-based laboratory detections in Canada, by age, type/subtype, August 26, 2012 to August 24, 2013

Age groups (years)	Cumulative (August 26, 2012 to August 24, 2013)						
	Influenza A				B	Influenza A and B	
	A Total	A(H1) pdm09	A(H3)	A (UnS)	Total	#	%
<5	3040	224	847	1969	853	3893	14.7%
5-19	1672	72	633	967	1081	2753	10.4%
20-44	3568	359	1236	1973	731	4299	16.2%
45-64	3766	331	1239	2196	703	4469	16.8%
65+	10068	138	3767	6163	842	10910	41.1%

Unknown	219	30	183	6	3	222	0.8%
Total	22333	1154	7905	13274	4213	26546	100.0%
Percentage²	84.1%	5.2%	35.4%	59.4%	15.9%		

Antigenic characterization and antiviral resistance

The NML antigenically characterized 1,514 influenza viruses during the 2012 - 13 influenza season. The 662 influenza A (H3N2) viruses were antigenically similar to the vaccine strain A/Victoria/361/2011 and the 250 A(H1N1)pdm09 viruses were antigenically similar to the vaccine strain A/California/07/09. Among the influenza B viruses, 464 were antigenically similar to the vaccine strain B/Wisconsin/01/2010 (Yamagata lineage) and 138 were similar to B/Brisbane/60/2008 (Victoria lineage; component of the 2011 - 2012 seasonal influenza vaccine).

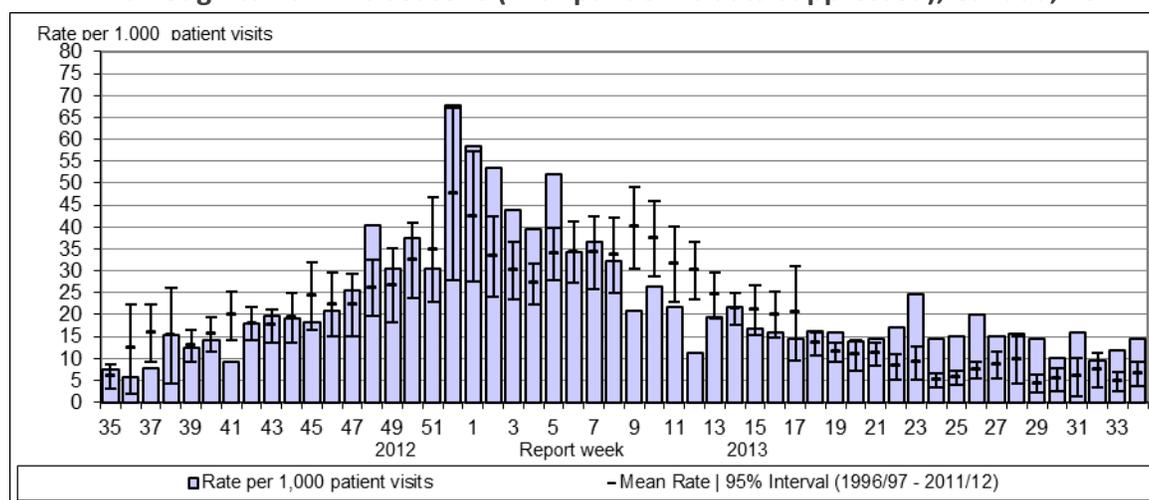
The NML tested 1,508 influenza viruses for resistance to oseltamivir, 1,505 viruses for resistance to zanamivir and 1,344 influenza A viruses for resistance to amantadine. Of 653 A (H3N2) viruses tested, 1 (0.2%) was resistant to oseltamivir and zanamivir. Of 254 A (H1N1) viruses tested, one (0.4%) were resistant to oseltamivir and all were susceptible to zanamivir. Of 601 B viruses tested, three (0.5%) were resistant to oseltamivir and zanamivir. All but one A (H3N2) virus was resistant to amantadine.

Primary care consultation rates of influenza-like illness (ILI)

Of the 450 sentinels submitting at least one ILI report during the season, 97% reported during the active influenza season (October to May / weeks 40 to 20), with 46% reporting for at least 15 of the 33 weeks during the active period.

The peak ILI consultation rate was 67.7 per 1,000 patient visits and occurred during the week ending December 29, 2012 (week 52), similar to the peak percentage of laboratory tests positive for influenza (**Figure 3**). The weekly ILI consultation rates exceeded the expected range, based on mean observations rates for the previous seasons since 1996 - 97 (excluding rates from the pandemic period), in week 48 and between weeks 52 (2012) and week 5 (2013). Weekly ILI consultations rates remained within or below the expected range for the rest of the season.

Figure 3: Influenza-like illness (ILI) consultation rates by report week, compared to the 1996-97 through to 2012-13 seasons (with pandemic data suppressed), Canada, 2012-2013



The highest ILI consultation rates were reported in children with an average of 44.3 visits for ILI per 1,000 patient visits in those 0 to 4 years of age and 46.2 per 1,000 patient visits in those 5 to 19 years of age during the active influenza period (week 40 - week 20) in the 2012 - 13 season.

Regional influenza activity levels and outbreaks

Provincial and territorial epidemiologists report the geographic distribution of influenza in their jurisdiction. The geographic distribution of influenza was most extensive during the week ending January 12, 2013 (week 2) with 14 regions reporting widespread activity and 26 regions reporting localized activity. The week ending June 15, 2013 (week 24) was the first week none of the regions reported widespread or localized influenza activity following the active influenza season. There were 53 hospital outbreaks and 676 LTCF outbreaks reported during the season, with the number of outbreaks peaking during the week ending January 12, 2013 (week 2).

Influenza-associated severe outcomes (hospitalizations and deaths)

During the 2012 - 13 influenza season 5,110 influenza-associated hospitalizations were reported from eight provinces and territories. Cumulative reported rates (per 100,000 population) for hospitalizations by age groups were calculated based on the population of participating provinces and territories. The cumulative hospitalization rate for all age groups was 25.0 per 100,000. By age group, the hospitalization rates were 66.4 (0-4 years), 8.6 (5-19 years), 6.5 (20-44 years), 15.4 (45-64 years) and 94.1 (≥65 years). The cumulative death rate was 1.7 per 100,000.

In addition to provincial/territorial reports, Cases were also reported by two hospital surveillance networks. IMPACT reported 889 paediatric hospitalizations and PCIRN-SOS reported 1,812 adult hospitalizations. ICU admission was required for 13% of the paediatric hospitalizations and 12% of the adult hospitalizations (**Figure 4**). Influenza A was the predominant strain identified in hospitalized cases.

Figure 4. Percentage of hospitalizations, ICU admissions and deaths with influenza reported by age group, Canada, 2012-13

a) Paediatric hospitalizations (≤16 years of age, IMPACT)



b) Adult hospitalizations (≥16 year of age, PCIRN-SOS)



Of the 889 children hospitalized, 70% (n=624) were younger than five years of age and 47% (n=419) were healthy prior to infection. A total of 329 hospitalized children had underlying health conditions for which influenza

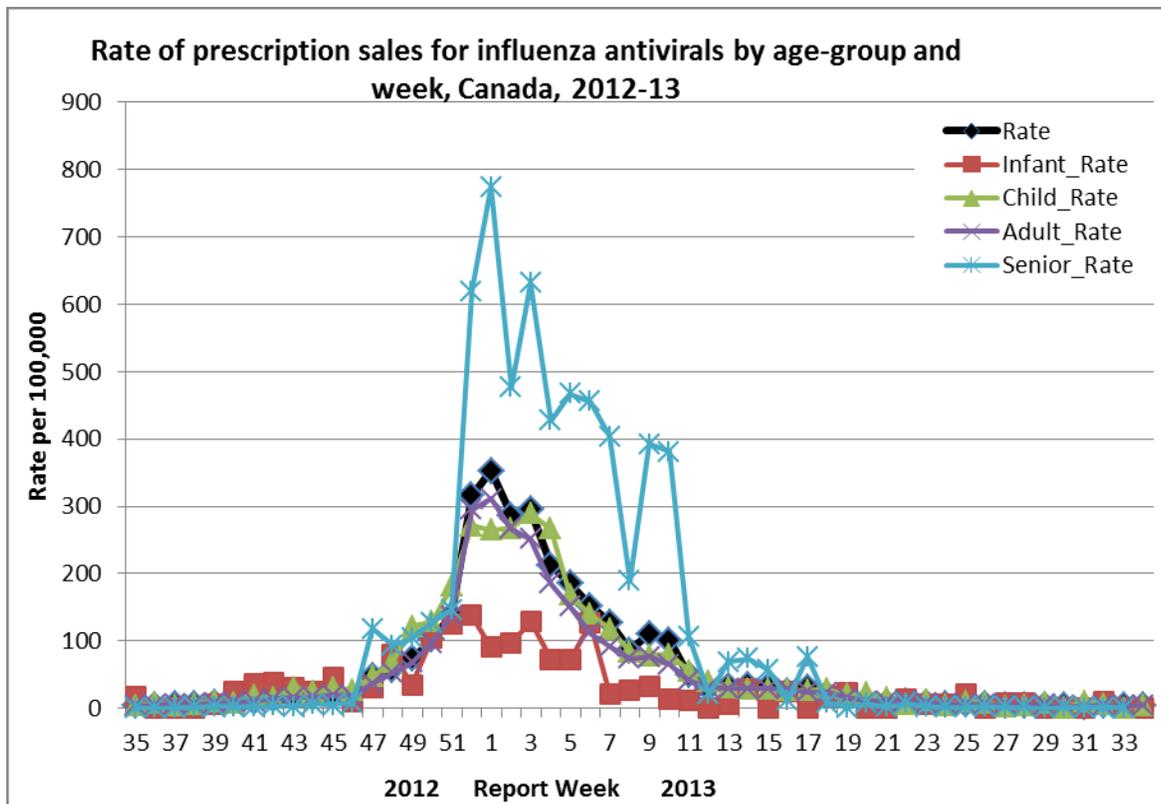
immunization is recommended by the National Advisory Committee on Immunization (5). Only one paediatric death was reported.

Of the 1,812 adults hospitalized, 68% (n=1,230) were ≥ 65 years of age and 107 resulted in death. Of the 286 individuals who were admitted to ICU or died, 122 had underlying medical conditions, two had no underlying medical conditions and medical history was unknown for the remaining individuals.

Antiviral drugs - pharmacy surveillance

The overall Canadian antiviral prescription rate peaked in week 1 at 349 antiviral prescriptions per 100,000 new prescriptions dispensed. The antiviral prescription rate was highest in those ≥ 65 years of age and peaked at 750 prescriptions per 100,000 prescriptions dispensed and was lowest in infants (0-2 years of age) and peaked at 138 prescriptions per 100,000 prescriptions dispensed (**Figure 5**).

Figure 5: Rate of prescription sales for influenza antivirals by age group and week, Canada, 2012-2013



Discussion

The various indicators of influenza surveillance during the 2012 - 13 season peaked in late December 2012 to early January 2013, which is in keeping with the expected pattern of the seasonal influenza epidemic. Influenza A (H3N2) was the predominant circulating influenza strain for the season and constituted the majority of influenza illness until early March 2013 when influenza B became the predominant circulating strain.

The 2012 - 13 season was moderately severe compared to the previous two seasons (9, 10). An increase in the impact of influenza was seen in the number of positive laboratory tests for influenza reported, with almost twice as many positive detections compared to 2010 - 11 and almost three times the detections in 2011 - 12. The same

trend was seen in the cumulative rate of hospitalizations and deaths reported by participating provinces and territories. The cumulative hospitalization and death rate per 100,000 was 14.6 and 1.1 respectively in 2010 - 11 and 8.5 and 0.5 for 2011 - 12 (data not published). The number of outbreaks reported this season in hospitals and LTCFs was the highest since 2004 - 05.

Characterization and antiviral resistance testing from the NML suggests that the circulating influenza viruses demonstrated little antigenic drift and remained closely related to the WHO-recommended strains for the 2012 - 13 trivalent influenza vaccine. Despite this antigenic concordance, some studies reported low to moderate vaccine effectiveness during the 2012 -13 season (6-8). All but a small percentage of viruses tested remained sensitive to neuraminidase inhibitors.

There are a number of limitations that need to be considered when interpreting results from the FluWatch surveillance program. Laboratory testing, surveillance and reporting protocols have varied prior to, during and post-pandemic and vary between provinces and territories. Therefore comparisons of laboratory findings (e.g. percentage of positive tests and number of positive laboratory-confirmed cases) over time as well as differences between jurisdictions need to be interpreted in light of these differences. Several factors affect the number of isolates sent to the NML such as limitations to culture isolates in provincial laboratories and samples of clinical interest. A greater proportion of the early isolates may also be analyzed to get a better understanding of the circulating strains for the coming season. Because only a subset of influenza viruses is characterized by the NML, the distribution of strain information is not representative of influenza detections reported by all laboratories contributing to RVDSS. Age-specific data for ILI consultation rates as well as laboratory testing for influenza may be affected by biases in health care utilization and physician testing behaviour. ILI consultation rates across time and between jurisdictions may vary with sentinel participation, differences in coverage rates as well as the co-circulation of other respiratory viruses. The true number of individuals affected by influenza in the population is not reflected in the data as FluWatch relies on sentinel data sources.

Duplicate reporting of hospitalizations and deaths is possible where a reporting jurisdiction has one or more hospitals participating in IMPACT or PCIRN-SOS. The reason for hospitalization or cause of death reported by provinces and territories does not have to be attributable to influenza for reporting purposes. Not all provinces/territories report aggregate hospitalizations or deaths, which makes these data incomplete at the national level.

There are a number of limitations associated with the data sources used in the FluWatch program, however, these data sources collectively inform influenza epidemiology in Canada over the season and allow for comparison between seasons. The FluWatch program continues to strengthen influenza surveillance in Canada in collaboration with national and international surveillance partners.

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Conflict of interest

There are no conflicts of interests to declare.

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