Public Health Ontario | Santé publique Ontario

Notice to readers: Please note that Canadian influenza vaccine effectiveness estimates against the 2018/19 late-season A(H3N2) epidemic are included on page 2 of this week's Ontario Respiratory Pathogen Bulletin.

ONTARIO RESPIRATORY PATHOGEN BULLETIN

Surveillance Week 14: (March 31, 2019 - April 6, 2019)

This issue of the Ontario Respiratory Pathogen Bulletin provides information on the surveillance period from March 31, 2019 to April 6, 2019 (Week 14). It also provides information on the current influenza season to date, from a start date of September 1, 2018. Unless otherwise specified, data presented in this issue of the bulletin are for Week 14 and data extraction occurred on Wednesday, April 10 2019.

Assessment of Influenza Activity in Ontario

Measure of Activity	Assessment of Measure Compared to the Previous Week (Lower, Similar, Higher)	Reasoning Behind Assessment
Laboratory-confirmed influenza cases[1]	Similar	There were 358 influenza cases (338 influenza A, 0 influenza A & B, and 20 influenza B) reported in Week 14, which was similar to the 381 influenza cases reported in Week 13 (363 influenza A, 0 influenza A & B, and 18 influenza B).
Percent positivity for influenza[2]	Higher	Percent positivity of laboratory tests for all influenza types in Week 14 was 16.3%, which was higher than the percent positivity in Week 13 (12.8%). In Week 14, percent positivity was 15.9% for influenza A and 0.4% for influenza B.
Institutional influenza outbreaks[3]	Similar	There were 13 new influenza outbreaks reported in Week 14, which was similar to the number of influenza outbreaks reported in Week 13 (14).
Influenza activity levels reported by public health units	Similar	In Week 14, 0 public health units reported 'widespread activity,' 21 public health units reported 'localized' activity, 5 reported 'sporadic' activity, 5 reported no activity and 4 public health units did not report. In Week 13, 0 public health units reported 'widespread activity,' 21 public health units reported 'localized' activity, 8 reported 'sporadic' activity, 4 reported no activity and 2 public health units did not report.
OVERALL ASSESSMENT	**Similar**	**Overall, the indicators show that influenza activity for Week 14 was similar when compared to Week 13.**

Notes:

[1] Based on the date the case was reported to the public health unit.

[2] Positivity among viral respiratory specimens tested by Ontario laboratories that submit results to the Centre for Immunization and Respiratory Infectious Diseases (CIRID). Due to rounding, percentages presented here may not add up to the overall influenza percent positivity.

[3] The number of new outbreaks reported for the current week is based on the date the outbreak was reported to the public health unit; when reported date is unavailable, the date the outbreak was created in iPHIS is used.

Canadian influenza vaccine effectiveness estimates against the 2018-19 late-season A(H3N2) epidemic (as of April 10, 2019)

Given an atypical late-season wave of influenza A(H3N2), the community-based Canadian Sentinel Practitioner Surveillance Network (SPSN) has undertaken an additional interim analysis to assess effectiveness of the 2018-19 influenza vaccine against A(H3N2) illness. The Canadian SPSN includes participation by sentinel practitioners in the four most populous provinces of Canada: Alberta, British Columbia, Ontario and Quebec. Vaccine effectiveness (VE) monitoring methods are as described in prior publications, available at the SPSN website alongside historic and current VE findings[1].

Based on data collected as of March 30, 2019 including more than 2800 participants, the 2018-19 northern hemisphere vaccine has provided little or no protection against medically-attended outpatient A(H3N2) illness (VE of 23%; 95% CI: -9-46), including among working age adults 20-64 years old who comprise the majority of SPSN participants (VE of -16%; 95% CI: -76-23). Consistent with expected patterns[2], VE estimates for this delayed A(H3N2) wave are considerably lower than reported earlier by the SPSN for the primary A(H1N1)pmd09 epidemic based on data collected as of January 12, 2019. In that mid-season analysis, VE against A(H1N1)pdm09 was 72% (95% CI: 60-81) overall, with substantial protection observed in all age groups[3]. In the most recent analysis spanning March 30, estimates against A(H1N1)pmd09 have remained stable at approximately 70%. The SPSN continues to monitor and will further update VE estimates at end of season.

As elsewhere, sequencing of A(H3N2) viruses collected by the SPSN has revealed genetic diversity among circulating viruses. The majority (65%) of sequenced A(H3N2) viruses to date have belonged to clade 3C.2a1b, a descendant branch of clade 3C.2a1 to which the 2018-19 northern hemisphere vaccine belongs. Of note, 16% of sequenced SPSN viruses belonged to clade 3C.3a. The majority of clade 3C.3a viruses globally have been considered antigenically distinct from the current 3C.2a1 vaccine strain and have been more prevalent elsewhere, notably in the United States. A representative clade 3C.3a virus has been selected by the World Health Organization for the upcoming 2019-20 northern hemisphere vaccine[4].

[1] http://www.bccdc.ca/health-info/diseases-conditions/influenza/sentinel-network-spsn

[2] Belongia EA, Simpson MD, King JP, Sundaram ME, Kelley NS, Osterholm MT, et al. Variable influenza vaccine effectiveness by subtype: a systematic review and meta-analysis of test-negative design studies. The Lancet Infectious diseases. 2016;16(8):942-51.

[3] Skowronski DM, Leir S, Sabaiduc S, Murti M, Dickinson JA, Olsha R, et al. Interim estimates of 2018/19 vaccine effectiveness against influenza A(H1N1)pdm09, Canada, January 2019. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin. 2019;24(4). Available at: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.4.1900055

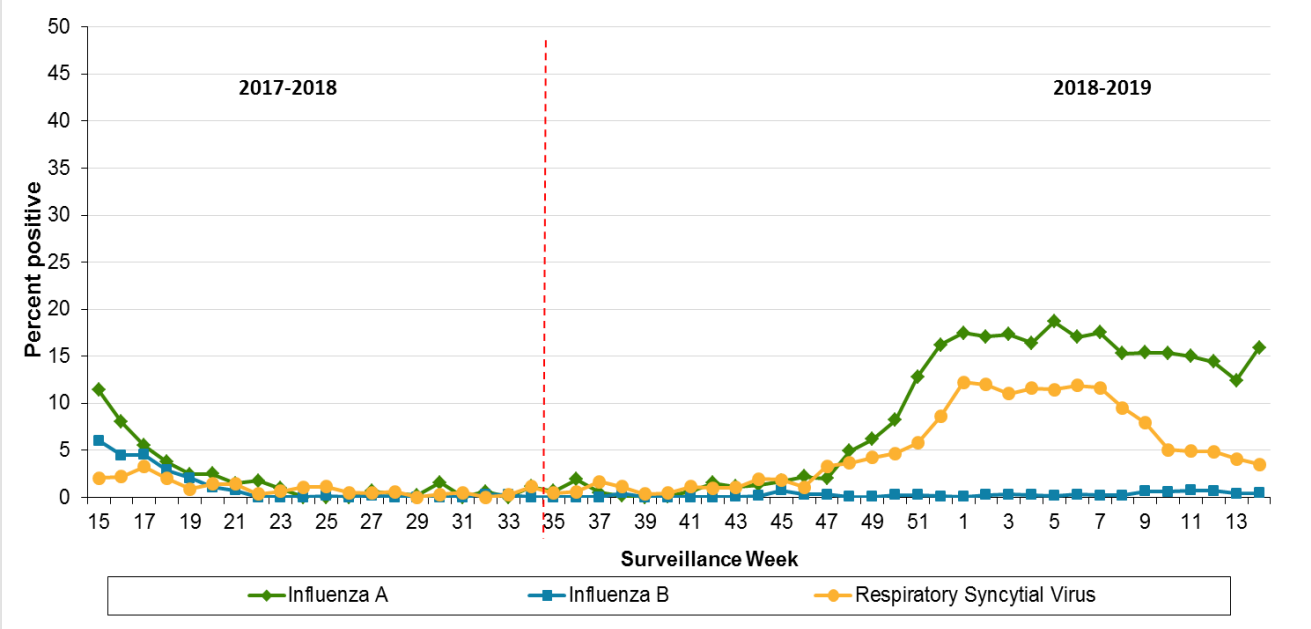
[4] World Health Organization (WHO). Addendum to the recommended composition of influenza virus vaccines for use in the 2019–2020 northern hemisphere influenza season. Geneva: WHO. Available at: https://www.who.int/influenza/vaccines/virus/recommendations/2019_20_north/en/

1. Circulating respiratory viruses in Ontario

Provincial percent positivity was moderate for influenza A and low for influenza B, at 15.9% (217/1,364) and 0.4% (6/1,364) respectively in Week 14 (Figure 1 and Figure 3). Of the 132 influenza A positive tests for which subtyping was available, 90.9% (120/132) were H3 in week 14. This continues an increasing trend in the proportion of influenza A positive tests reported as H3 compared to earlier in the season where predominately H1 was reported. For the season to date, 61.8% (2,033/3,291) of influenza A positive tests were (H1N1)pdm09. Influenza activity based on percent positivity in week 14 was moderate.

Rhinovirus was the most common circulating non-influenza respiratory virus, with provincial percent positivity at 6.3% (6/96) (Figure 2).

Figure 1. Percentage of respiratory viral pathogens (influenza A, influenza B, and respiratory syncytial virus) detected among specimens tested for that pathogen by all testing methods: Ontario, April 8, 2018 to April 6, 2019

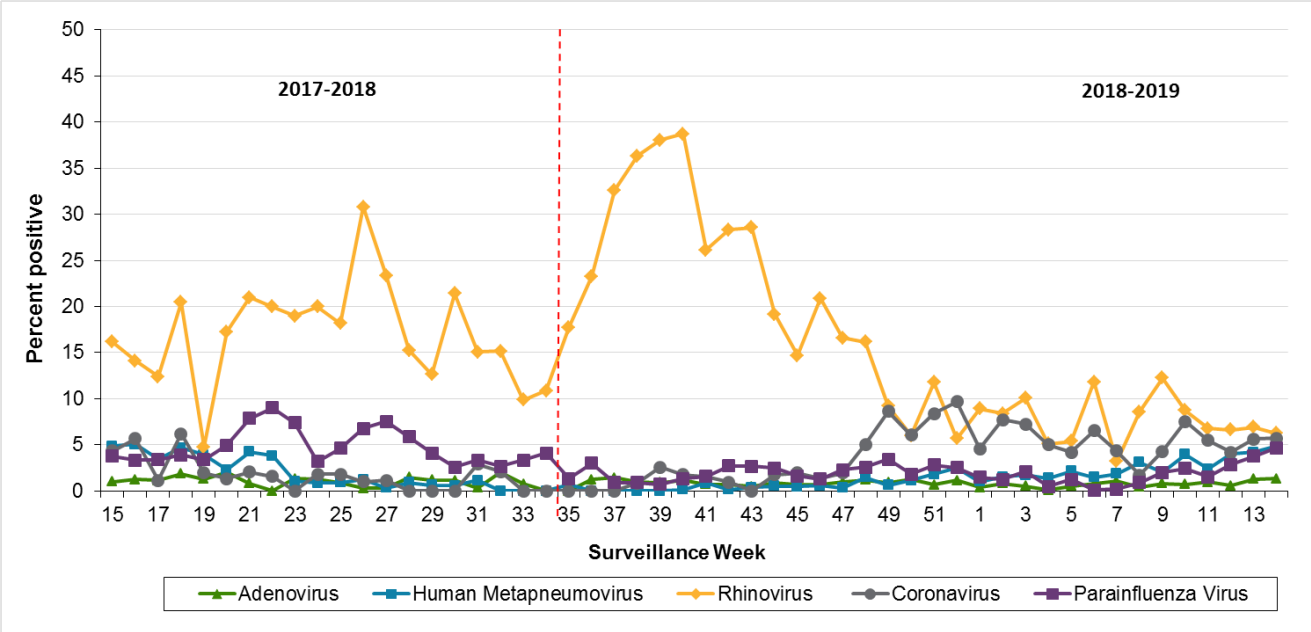


Source: Centre for Immunization and Respiratory Infectious Diseases (CIRID)

Notes:

- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

Figure 2. Percentage of respiratory viral pathogens (parainfluenza virus, adenovirus, human metapneumovirus, rhinovirus and coronavirus) detected among specimens tested for that pathogen by all testing methods: Ontario, April 8, 2018 to April 6, 2019

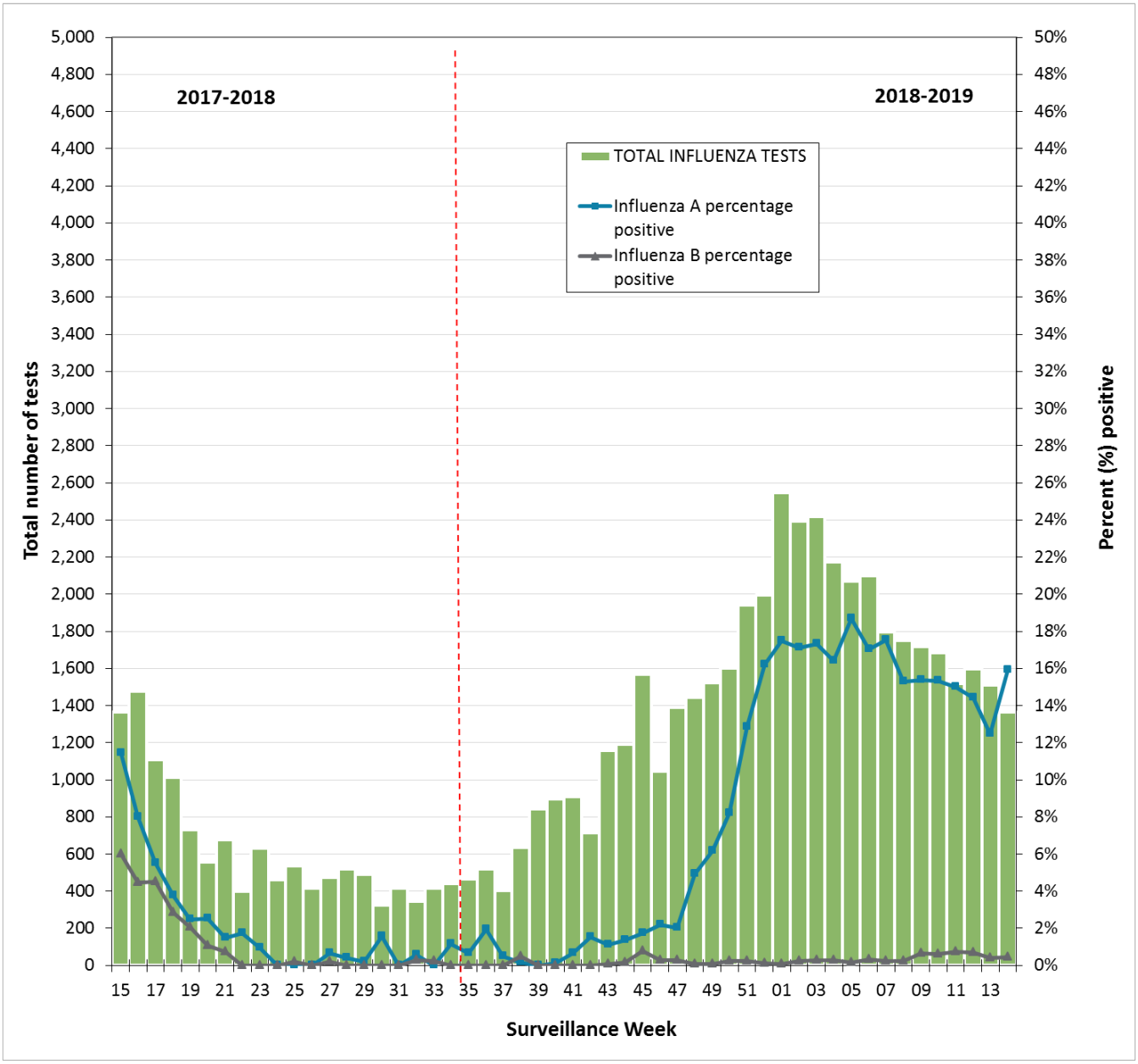


Source: Centre for Immunization and Respiratory Infectious Diseases (CIRID)

Notes:

- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

Figure 3. Total number of influenza tests performed and percent of tests positive for influenza A and B by surveillance week: Ontario, April 8, 2018 to April 6, 2019



Source: Centre for Immunization and Respiratory Infectious Diseases (CIRID)

Notes:

- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

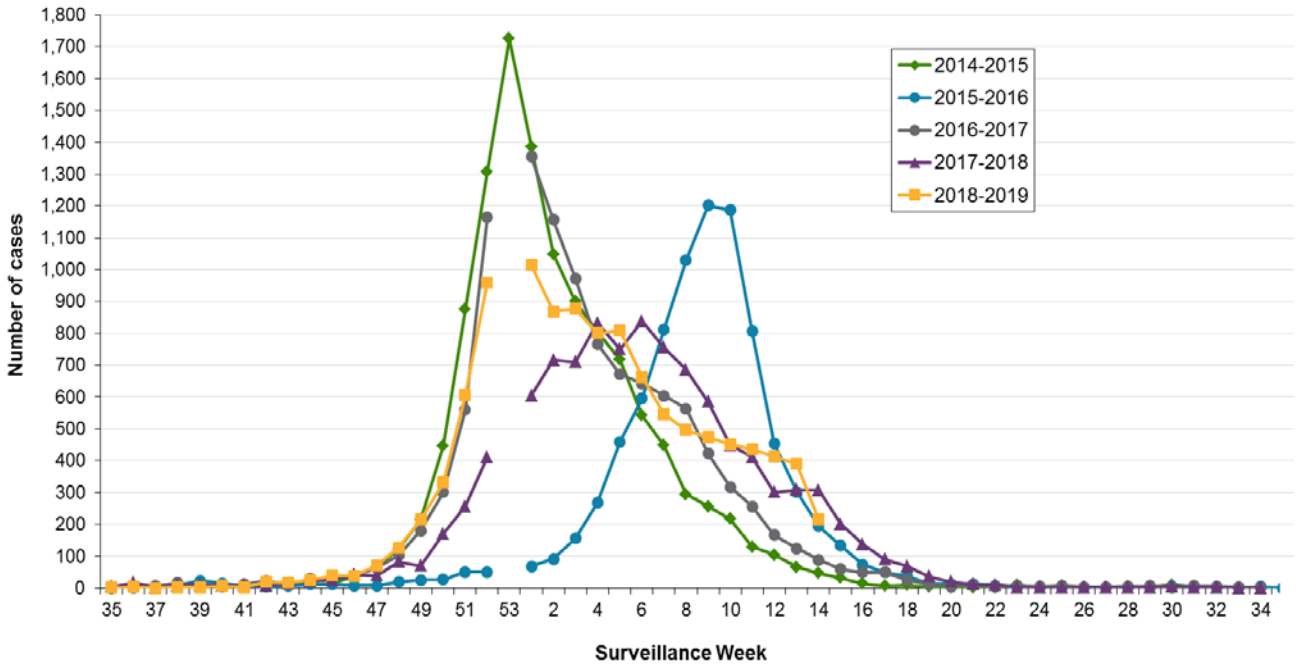
2. Laboratory-confirmed influenza cases

For the 2018-2019 surveillance season to date, 11,159 laboratory-confirmed influenza cases have been reported in Ontario. Among these cases, 97.9% (10,922/11,159) were influenza A (Table 6). Of the 2,450 reported influenza A cases with subtype information available, 40.7% (998/2,450) were H3 and 59.3% (1,452/2,450) were H1. An increase in the proportion of laboratory-confirmed influenza cases reported as H3 has been observed compared to earlier in the season, where predominantly H1 was reported.

Dominant A Subtype and B Lineage by Season

- 2014-2015: A(H3N2), B Yamagata
- 2015-2016: A(H1N1)pdm09, B Victoria
- 2016-2017: A(H3N2), B Yamagata
- 2017-2018: A(H3N2), B Yamagata
- 2018-2019: A(H1N1)pdm09, dominant B lineage to be determined

Figure 4. Number of reported confirmed cases of influenza A by surveillance week and season: Ontario, September 1, 2014 to April 6, 2019

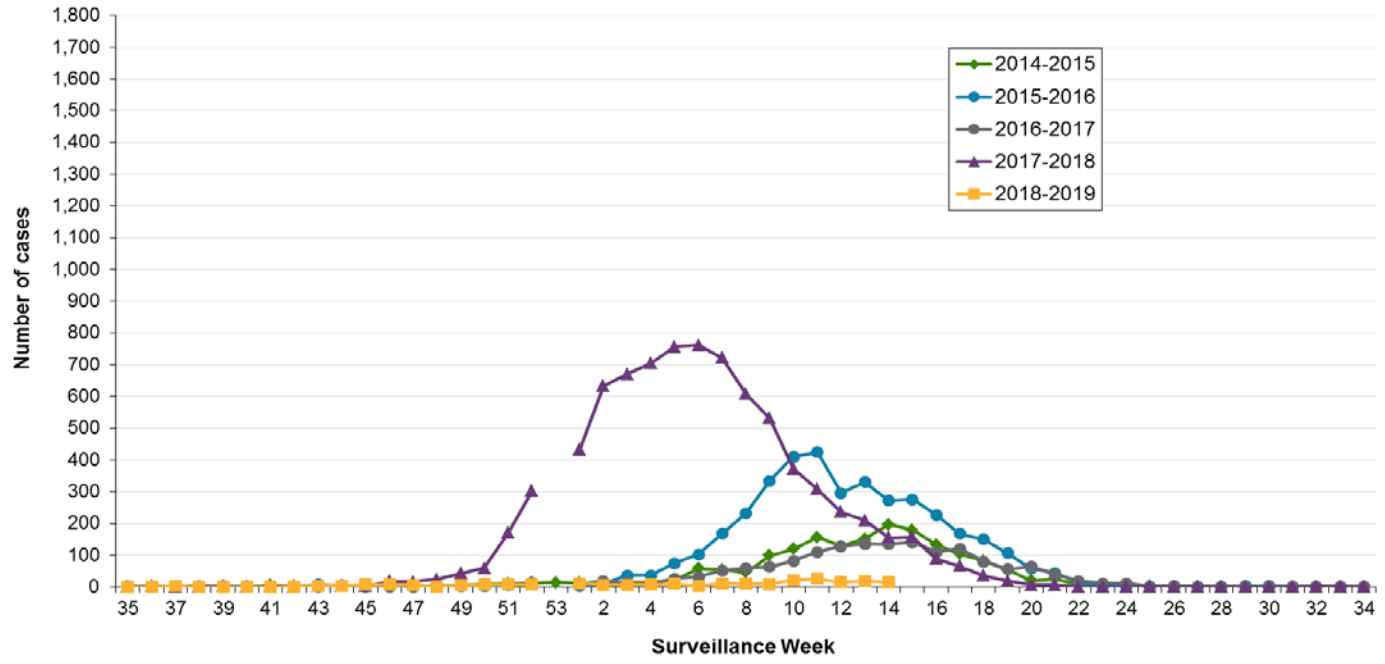


Source: integrated Public Health Information System (iPHIS)

Notes:

- Case counts are assigned to surveillance weeks based on the episode date entered in iPHIS to better reflect influenza activity. See the data sources section for details.
- Interpret most recent case counts for the current season with caution due to reporting lags.
- Unlike the other seasons presented, the 2014-2015 season included a week 53; a week 53 occurs once every five to six years. Week 53 in 2014-2015 corresponded to December 28, 2014 to January 3, 2015.
- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

Figure 5. Number of reported confirmed cases of influenza B by surveillance week and season: Ontario, September 1, 2014 to April 6, 2019



Source: integrated Public Health Information System (iPHIS)
Notes:

- Case counts are assigned to surveillance weeks based on the episode date entered in iPHIS to better reflect influenza activity. See the data sources section for details.
- Interpret most recent case counts for the current season with caution due to reporting lags.
- Unlike the other seasons presented, the 2014-2015 season included a week 53; a week 53 occurs once every five to six years. Week 53 in 2014-2015 corresponded to December 28, 2014 to January 3, 2015.
- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

3. Institutional respiratory infection outbreaks

Twelve influenza A, zero influenza A and B, and one influenza B outbreak were reported in Week 14 (Table 1). Influenza was detected in 31.8% (366/1,150) of institutional respiratory infection outbreaks reported to date in the 2018-2019 season; 16.1% (185/1,150) were reported as respiratory syncytial virus (RSV). The most institutional respiratory infection outbreaks were reported from long-term care homes (671/1,150 or 58.3% of all reported outbreaks) (Table 2).

Table 1. Institutional respiratory infection outbreaks: Ontario, Week 14 and total for the 2018-2019 season to date[1]

Virus reported in outbreak	Current week: Number of new outbreaks[2]	Percentage of total for current week	Cumulative: Number of outbreaks	Percentage of cumulative total
Influenza A[3]	12	38.7%	358	31.1%
Influenza B[3]	1	3.2%	6	0.5%
Both influenza A and B[3]	0	0.0%	2	0.2%
Entero/rhinovirus	1	3.2%	15	1.3%
Parainfluenza (all types)	0	0.0%	28	2.4%
Respiratory syncytial virus (RSV)	2	6.5%	185	16.1%
Human metapneumovirus, adenovirus, coronavirus or other viruses	1	3.2%	38	3.3%
Two or more non-influenza viruses	0	0.0%	4	0.3%
No organism reported	14	45.2%	514	44.7%
TOTAL	***31***	***100.0%***	***1150***	***100.0%***

Source: integrated Public Health Information System (iPHIS)

Notes:

[1] Season to date includes all outbreaks in which the date the outbreak was reported to the public health unit (or if unavailable, the date the outbreak was created in iPHIS) occurred between September 1, 2018 (Week 35, 2018) and the current reporting week, as well as outbreaks in which the reported date is missing but the outbreaks were entered into iPHIS during the current season.

[2] New outbreaks are defined as those in which the date the outbreak was reported to the public health unit was in the current surveillance period, i.e. March 31, 2019 – April 6, 2019 (Week 14), and was recorded in iPHIS.

[3] Any outbreak where influenza was identified is reported under the appropriate influenza category ("Influenza A", "Influenza B", or "Both influenza A and B") regardless of what other virus was also identified in the outbreak.

Table 2. Institutional respiratory infection outbreaks by setting type: Ontario, total for the 2018-2019 season to date[1]

Setting type reported	Number of influenza outbreaks (% of total)	Number of other respiratory virus outbreaks (% of total)
Long-Term Care Home	169 (46.2%)	502 (64.0%)
Hospital	70 (19.1%)	38 (4.8%)
Retirement Home	94 (25.7%)	139 (17.7%)
Other[2]	9 (2.5%)	9 (1.1%)
Unknown	24 (6.6%)	96 (12.2%)
TOTAL	***366 (100.0%)***	***784 (100.0%)***

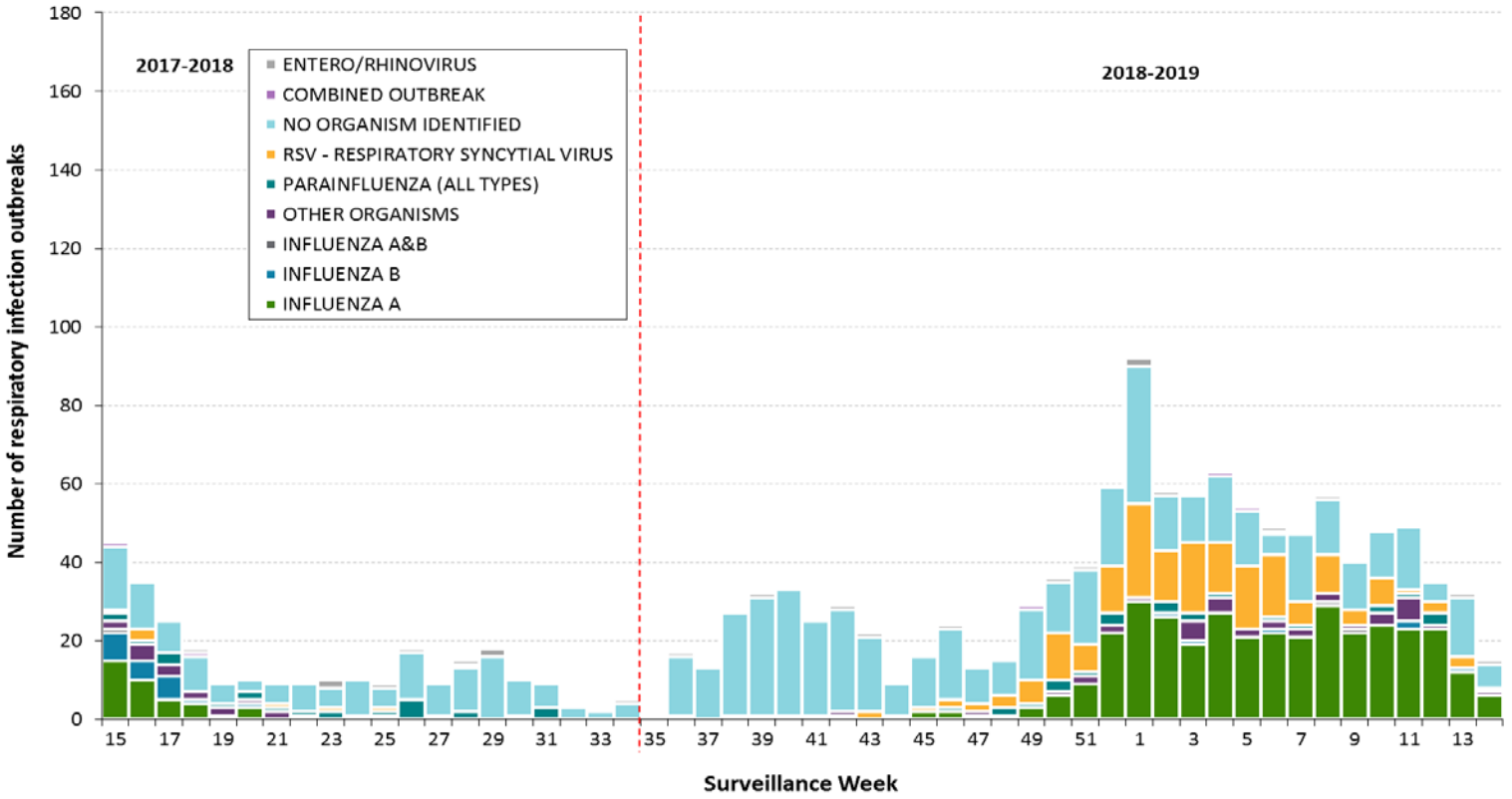
Source: integrated Public Health Information System (iPHIS)

Notes:

[1] Season to date includes all outbreaks in which the date the outbreak was reported to the public health unit (or if unavailable, the date the outbreak was created in iPHIS) occurred between September 1, 2018 (Week 35, 2018) and the current reporting week, as well as outbreaks in which the reported date is missing but the outbreaks were entered into iPHIS during the current season.

[2] Other types of institutions include: correctional facilities, group homes, shelters, and facilities operating under the Developmental Services Act. Note that school and child care centre respiratory outbreaks are not captured in this table.

Figure 6. Institutional respiratory infection outbreaks by week of illness onset in the first case: April 8, 2018 to April 6, 2019



Source: integrated Public Health Information System (iPHIS)

Notes:

- Interpret most recent outbreak counts for the current season with caution due to reporting lags
- Institutional respiratory infection outbreaks for which the date of onset of illness for the first case is missing are excluded in this figure. However, these outbreaks are counted in the cumulative outbreaks section of Table 1.
- Any outbreak where influenza was identified is reported under the appropriate influenza category ("Influenza A", "Influenza B", or "Both influenza A & B") regardless of what other virus is also identified in the outbreak.
- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.

4. Respiratory viruses by setting and age

Based on Public Health Ontario Laboratory (PHOL) data, influenza A positivity was 14.2% (85/600) for week 14 compared to 15.3% (101/658) for week 13. Influenza B positivity was 0.8% (5/600) for week 14 compared to 0.8% (5/658) for the previous week (Table 3). Of the influenza A specimens that had subtyping completed for the 2018-2019 season (n=2,566), the most predominant subtype was influenza A(H1N1)pdm09 (n=1,587), with the remainder being comprised of influenza A(H3N2) subtype (n=979). The age group with most influenza A detections for this season was the 65+ years age group (Table 4).

Table 3. Number (percentage) of specimens with respiratory pathogens detected by patient setting, Public Health Ontario Laboratory, week 14 and cumulative for the 2018-2019 season to date

Respiratory Pathogen Detected	ICU Current	ICU Cumulative	Hospitalized non-ICU Current	Hospitalized non-ICU Cumulative	Emergency Department Current	Emergency Department Cumulative	Ambulatory/ No Setting Current	Ambulatory/ No Setting Cumulative	Institution Current	Institution Cumulative
Influenza A (all)	5 (9.6)	224 (10.2)	32 (10.2)	1,226 (9.4)	1 (8.3)	65 (13.9)	18 (15.9)	863 (17.6)	29 (26.9)	438 (16.1)
Influenza A (H3N2)	4	51	27	383	1	24	16	234	26	287
Influenza A (H1N1)pdm09	0	156	0	719	0	40	2	579	1	93
Influenza B	0 (0.0)	1 (0.0)	1 (0.3)	42 (0.3)	0 (0.0)	2 (0.4)	2 (1.8)	26 (0.5)	2 (1.9)	7 (0.3)
Adenovirus	1 (3.0)	6 (0.3)	2 (1.1)	67 (0.6)	0 (0.0)	3 (0.8)	1 (1.8)	10 (0.3)	1 (1.9)	1 (0.1)
Entero/rhinovirus	0 (NA)	0 (0.0)	0 (NA)	0 (0.0)	0 (NA)	0 (0.0)	0 (0.0)	2 (0.3)	0 (NA)	0 (0.0)
Human metapneumovirus	1 (3.0)	7 (0.4)	8 (4.3)	133 (1.2)	0 (0.0)	1 (0.3)	1 (1.8)	30 (1.2)	4 (7.4)	45 (2.6)
Parainfluenza (all types)	0 (0.0)	11 (0.6)	5 (2.7)	173 (1.6)	0 (0.0)	10 (2.7)	1 (1.8)	40 (1.4)	2 (3.7)	48 (2.8)
Respiratory syncytial virus	0 (0.0)	65 (3.0)	11 (3.6)	882 (6.8)	0 (0.0)	25 (5.8)	6 (5.7)	270 (5.6)	4 (3.7)	372 (13.8)
Total positives	**7 (13.5)**	**313 (14.3)**	**59 (18.7)**	**2,505 (19.2)**	**1 (8.3)**	**106 (22.7)**	**30 (26.5)**	**1,225 (25.0)**	**40 (37.0)**	**905 (33.3)**

Source: Public Health Ontario Laboratory

Please see below Table 4 for additional notes.

Table 4. Number (percentage) of specimens with respiratory pathogens detected by age group (years), Public Health Ontario Laboratory, week 14 and cumulative for the 2018-2019 season to date

Respiratory Pathogen Detected	<1 Current	<1 Cumulative	1-4 Current	1-4 Cumulative	5-19 Current	5-19 Cumulative	20-64 Current	20-64 Cumulative	65+ Current	65+ Cumulative
Influenza A (all)	0 (0.0)	55 (4.5)	3 (10.7)	249 (18.1)	5 (33.3)	207 (25.0)	18 (11.5)	994 (14.9)	59 (15.8)	1,299 (9.8)
Influenza A (H3N2)	0	7	3	38	5	51	13	189	53	689
Influenza A (H1N1)pdm09	0	45	0	201	0	152	2	720	1	463
Influenza B	0 (0.0)	3 (0.2)	0 (0.0)	6 (0.4)	1 (6.7)	13 (1.6)	2 (1.3)	32 (0.5)	2 (0.5)	24 (0.2)
Adenovirus	0 (0.0)	21 (2.3)	3 (21.4)	42 (5.0)	0 (0.0)	5 (1.0)	1 (1.1)	13 (0.3)	1 (0.5)	6 (0.1)
Entero/rhinovirus	0 (NA)	0 (0.0)	0 (NA)	0 (0.0)	0 (NA)	0 (0.0)	0 (NA)	2 (0.4)	0 (0.0)	0 (0.0)
Human metapneumovirus	2 (14.3)	15 (1.7)	0 (0.0)	18 (2.2)	0 (0.0)	2 (0.5)	3 (3.3)	30 (0.7)	9 (4.2)	151 (1.4)
Parainfluenza (all types)	2 (14.3)	44 (4.9)	1 (7.1)	47 (5.6)	0 (0.0)	10 (2.1)	1 (1.1)	43 (0.9)	4 (1.9)	138 (1.3)
Respiratory syncytial virus	3 (12.5)	304 (25.1)	3 (10.7)	249 (18.5)	0 (0.0)	35 (4.4)	2 (1.3)	195 (3.0)	13 (3.6)	823 (6.3)
Total positives	**7 (28.0)**	**440 (35.9)**	**10 (35.7)**	**597 (43.4)**	**6 (40.0)**	**266 (32.1)**	**28 (17.8)**	**1,299 (19.5)**	**86 (23.0)**	**2,432 (18.4)**

Source: Public Health Ontario Laboratory (PHOL)

Notes for Table 3 and Table 4:

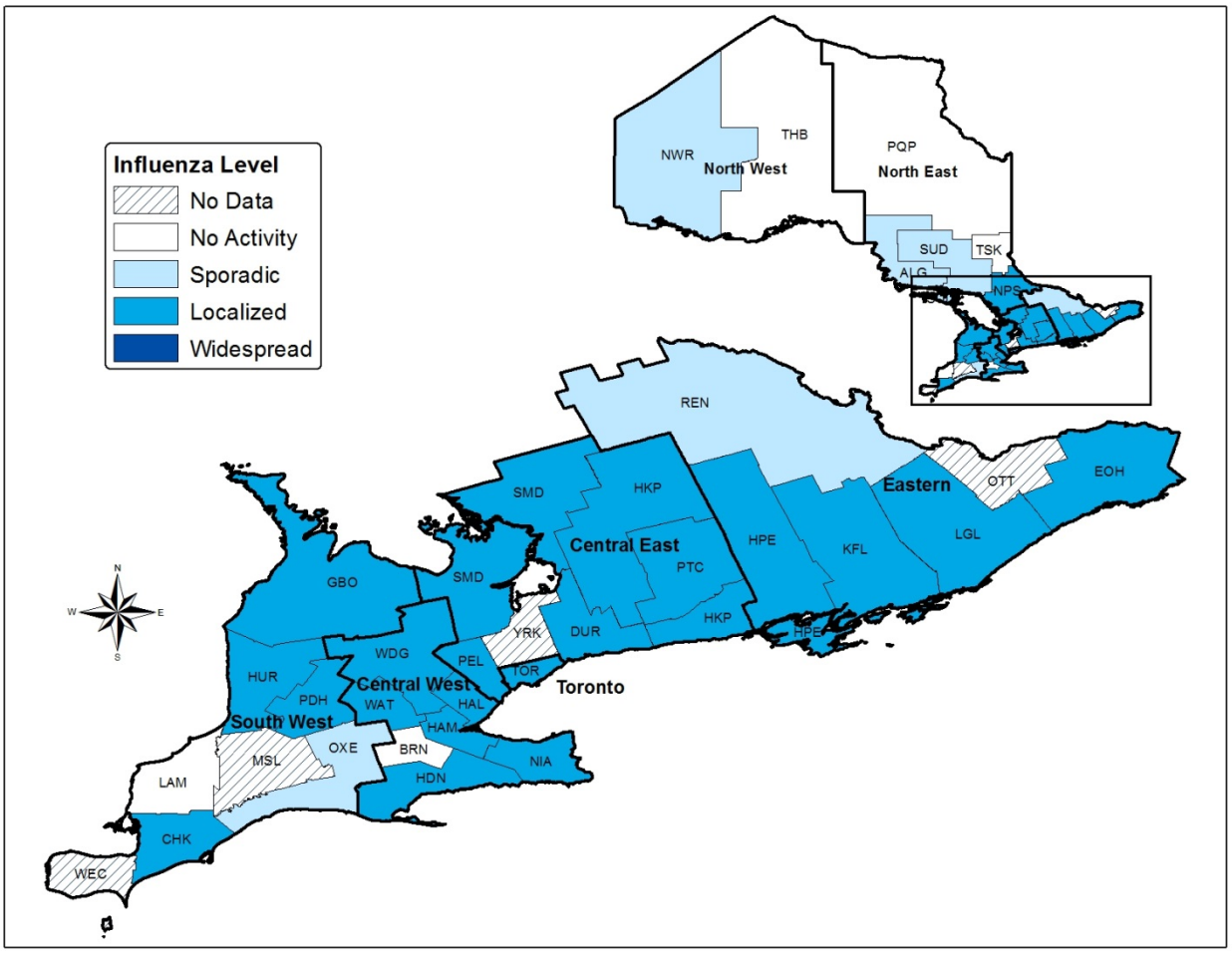
- The percentages in Table 3 and Table 4 are calculated as number of specimens with the respiratory pathogen detected divided by total number of specimens tested for that particular pathogen within the patient setting/same age category. Following the implementation of the new respiratory virus testing algorithm on September 20, 2017, no routine respiratory virus testing is offered to ambulatory and emergency department patients.
- Institution includes retirement homes, long term care facilities, correctional facilities, and undefined institutions. Excludes hospitals.
- Ambulatory/No Setting includes specimens where setting was missing, as well as specimens from sentinels in the Sentinel Practitioner Surveillance Network or specimens with special approval.
- Current respiratory testing does not test for coronavirus and parainfluenza virus 4.
- The "Influenza A (all)" row includes the numbers in the "Influenza A(H3N2)" and "Influenza A (H1N1)pdm09" rows as well as Influenza A positives that were not subtyped.
- Percent positivity is not calculated for Influenza A(H3N2) and Influenza A(H1N1)pdm09 because subtyping is only done on select influenza A samples, precluding an accurate calculation.

- Total number of positives represents unique specimens that have at least one virus detected. Therefore, it may not correspond to the sum of viruses detected per each setting as some specimens may have more than one organism detected. When calculating the “Total Positives”, the “Influenza A(H3N2)” and “Influenza A(H1N1)pdm09” rows are not counted as these numbers are already included in the “Influenza A (all)” row.
- Changes in the testing algorithm used by the Public Health Ontario Laboratory will impact the interpretation of respiratory virus reports over time. Please see the data sources section with regard to the changes to the Public Health Ontario Laboratory testing algorithm.
- NA-Not applicable- Indicates no specimens were tested in that setting; therefore percent positivity was not calculated.

5. By Jurisdiction – Influenza activity

In Week 14, 0 public health units reported 'widespread activity,' 21 public health units reported 'localized' activity, 5 reported 'sporadic' activity, 5 reported no activity and 4 public health units did not report.

Figure 7: Influenza activity levels reported by public health units: Ontario, March 31, 2019 to April 6, 2019 (Week 14)



Source: Public Health Ontario from public health units

Table 5. Specimens submitted to Public Health Ontario Laboratory for influenza testing and positive results by public health unit; number for week 14 and (cumulative total) for the 2018-2019 season to date

Public Health Unit and Region	Number of specimens submitted	Number of specimens tested	Number of influenza A positive specimens	% positivity influenza A	Influenza A(H1N1)pdm09	Influenza A H3N2	Number of influenza B positive specimens	% positivity influenza B
Northwestern	18 (279)	7 (244)	3 (53)	42.9 (21.7)	0 (25)	3 (27)	0 (0)	0.0 (0.0)
Thunder Bay District	11 (159)	6 (129)	1 (14)	16.7 (10.9)	0 (4)	1 (6)	0 (0)	0.0 (0.0)
TOTAL NORTH WEST	**29 (438)**	**13 (373)**	**4 (67)**	**30.8 (18.0)**	**0 (29)**	**4 (33)**	**0 (0)**	**0.0 (0.0)**
Algoma	7 (420)	9 (409)	3 (87)	33.3 (21.3)	0 (48)	2 (35)	0 (0)	0.0 (0.0)
North Bay Parry Sound District	28 (615)	18 (593)	2 (39)	11.1 (6.6)	0 (29)	1 (9)	0 (1)	0.0 (0.2)
Porcupine	10 (254)	8 (211)	0 (30)	0.0 (14.2)	0 (28)	0 (0)	0 (0)	0.0 (0.0)
Sudbury & Districts	5 (223)	2 (204)	0 (20)	0.0 (9.8)	0 (16)	0 (4)	0 (0)	0.0 (0.0)
Timiskaming	4 (156)	6 (144)	0 (19)	0.0 (13.2)	0 (16)	0 (3)	0 (0)	0.0 (0.0)
TOTAL NORTH EAST	**54 (1,668)**	**43 (1,561)**	**5 (195)**	**11.6 (12.5)**	**0 (137)**	**3 (51)**	**0 (1)**	**0.0 (0.1)**
City of Ottawa	9 (366)	9 (336)	5 (64)	55.6 (19.0)	0 (26)	5 (27)	0 (1)	0.0 (0.3)
Eastern Ontario	7 (309)	4 (284)	1 (55)	25.0 (19.4)	0 (31)	1 (17)	0 (1)	0.0 (0.4)
Hastings & Prince Edward Counties	17 (449)	14 (422)	5 (72)	35.7 (17.1)	0 (33)	5 (32)	0 (2)	0.0 (0.5)
Kingston, Frontenac, Lennox & Addington	4 (264)	3 (238)	1 (20)	33.3 (8.4)	0 (10)	1 (8)	0 (1)	0.0 (0.4)
Leeds, Grenville And Lanark District	3 (205)	3 (189)	0 (49)	0.0 (25.9)	0 (31)	0 (18)	0 (4)	0.0 (2.1)
Renfrew County And District	4 (211)	0 (193)	0 (41)	NA (21.2)	0 (20)	0 (18)	0 (0)	NA (0.0)
TOTAL EASTERN	**44 (1,804)**	**33 (1,662)**	**12 (301)**	**36.4 (18.1)**	**0 (151)**	**12 (120)**	**0 (9)**	**0.0 (0.5)**
Durham Region	19 (823)	16 (723)	1 (75)	6.3 (10.4)	0 (43)	1 (22)	0 (4)	0.0 (0.6)
Haliburton, Kawartha, Pine Ridge	18 (438)	16 (379)	7 (66)	43.8 (17.4)	0 (26)	7 (34)	0 (1)	0.0 (0.3)
Peel Region	52 (2,876)	54 (2,773)	4 (174)	7.4 (6.3)	0 (110)	0 (36)	0 (22)	0.0 (0.8)
Peterborough County-City	7 (161)	6 (151)	0 (20)	0.0 (13.2)	0 (3)	0 (9)	0 (0)	0.0 (0.0)
Simcoe Muskoka District	47 (1,326)	44 (1,209)	2 (150)	4.5 (12.4)	0 (82)	2 (45)	0 (0)	0.0 (0.0)
York Region	68 (2,588)	65 (2,440)	8 (352)	12.3 (14.4)	0 (198)	8 (139)	1 (10)	1.5 (0.4)
TOTAL CENTRAL EAST	**211 (8,212)**	**201 (7,675)**	**22 (837)**	**10.9 (10.9)**	**0 (462)**	**18 (285)**	**1 (37)**	**0.5 (0.5)**
Toronto	140 (5,686)	129 (5,209)	14 (526)	10.9 (10.1)	3 (265)	12 (222)	1 (12)	0.8 (0.2)
TOTAL TORONTO	**140 (5,686)**	**129 (5,209)**	**14 (526)**	**10.9 (10.1)**	**3 (265)**	**12 (222)**	**1 (12)**	**0.8 (0.2)**
Chatham-Kent	15 (285)	12 (259)	5 (33)	41.7 (12.7)	0 (23)	3 (6)	0 (0)	0.0 (0.0)
Grey Bruce	8 (244)	8 (203)	3 (30)	37.5 (14.8)	0 (13)	3 (16)	0 (2)	0.0 (1.0)

Public Health Unit and Region	Number of specimens submitted	Number of specimens tested	Number of influenza A positive specimens	% positivity influenza A	Influenza A(H1N1)pdm09	Influenza A H3N2	Number of influenza B positive specimens	% positivity influenza B
Huron County	6 (179)	4 (171)	0 (14)	0.0 (8.2)	0 (6)	0 (4)	0 (0)	0.0 (0.0)
Lambton County	9 (264)	3 (255)	0 (29)	0.0 (11.4)	0 (22)	0 (3)	0 (0)	0.0 (0.0)
Middlesex-London	16 (458)	15 (413)	2 (92)	13.3 (22.3)	0 (52)	1 (31)	2 (3)	13.3 (0.7)
Perth District	13 (265)	12 (254)	5 (17)	41.7 (6.7)	0 (4)	5 (12)	0 (0)	0.0 (0.0)
Southwestern Public Health	22 (575)	21 (556)	4 (105)	19.0 (18.9)	0 (49)	4 (46)	0 (3)	0.0 (0.5)
Windsor-Essex County	11 (1,005)	9 (952)	1 (141)	11.1 (14.8)	0 (110)	1 (18)	0 (1)	0.0 (0.1)
TOTAL SOUTH WEST	**100 (3,275)**	**84 (3,063)**	**20 (461)**	**23.8 (15.1)**	**0 (279)**	**17 (136)**	**2 (9)**	**2.4 (0.3)**
Brant County	5 (260)	3 (243)	0 (21)	0.0 (8.6)	0 (9)	0 (9)	0 (0)	0.0 (0.0)
City Of Hamilton	10 (282)	10 (257)	3 (49)	30.0 (19.1)	0 (35)	3 (13)	0 (1)	0.0 (0.4)
Haldimand-Norfolk	3 (236)	2 (220)	0 (42)	0.0 (19.1)	0 (16)	0 (22)	0 (0)	0.0 (0.0)
Halton Region	38 (1,322)	41 (1,282)	3 (85)	7.3 (6.6)	0 (56)	3 (20)	0 (3)	0.0 (0.2)
Niagara Region	4 (513)	4 (457)	1 (114)	25.0 (24.9)	0 (77)	1 (33)	1 (2)	25.0 (0.4)
Waterloo Region	7 (386)	4 (352)	1 (46)	25.0 (13.1)	0 (20)	1 (18)	0 (2)	0.0 (0.6)
Wellington-Dufferin-Guelph	33 (1,053)	33 (1,003)	0 (72)	0.0 (7.2)	0 (51)	0 (17)	0 (2)	0.0 (0.2)
TOTAL CENTRAL WEST	**100 (4,052)**	**97 (3,814)**	**8 (429)**	**8.2 (11.2)**	**0 (264)**	**8 (132)**	**1 (10)**	**1.0 (0.3)**
OUT OF PROVINCE	**0 (0)**	**0 (0)**	**0 (0)**	**NA (NA)**	**0 (0)**	**0 (0)**	**0 (0)**	**NA (NA)**
TOTAL ONTARIO	**678 (25,135)**	**600 (23,357)**	**85 (2,816)**	**14.2 (12.1)**	**3 (1,587)**	**74 (979)**	**5 (78)**	**0.8 (0.3)**

Source: Public Health Ontario Laboratory (PHOL)

***Notes*:**

- Cumulative numbers are from September 1, 2018 to the current week and are displayed in brackets.
- The difference between submissions and testing is due to lags in testing time. In addition, number of specimens submitted is determined based on the date specimens were received at lab for testing, while number of specimens tested is determined based on the date specimens were collected from the patient.
- "Public Health Unit" reflects the jurisdiction where the patient resides. In the event this is not available, the public health unit of the specimen submitter is used.
- NA-Not applicable- Indicates public health units with no specimens tested; therefore percent positivity was not calculated.
- The calculation of percent positivity is possible because PHOL tests the samples and knows the numbers of positive and negative resutls. Percent positivity for health units that had less than 40 respiratory specimens tested for the current week may not be reliable due to small numbers.
- Public Health Ontario Laboratory performs testing for influenza and other respiratory viruses, but other microbiology laboratories also perform these tests. Therefore, it is important to note that the numbers reported here do not represent the total number of influenza viruses identified in Ontario.
- The public health units Elgin-St. Thomas and Oxford County have merged into Southwestern Public Health Unit.

Table 6. Number of reported confirmed influenza cases by public health unit and geographic region for week 14 and (cumulative total) for the 2018-2019 influenza season

Public Health Unit and Region	Influenza A H1	Influenza A H3	Influenza A All subtypes[1]	Influenza A & B	Influenza B	TOTAL
Northwestern	0 (26)	9 (25)	9 (68)	0 (0)	0 (0)	9 (68)
Thunder Bay District	5 (68)	11 (44)	18 (145)	0 (0)	0 (1)	18 (146)
TOTAL NORTH WEST	**5 (94)**	**20 (69)**	**27 (213)**	**0 (0)**	**0 (1)**	**27 (214)**
Algoma	0 (40)	4 (30)	7 (82)	0 (0)	0 (0)	7 (82)
North Bay Parry Sound District	0 (32)	2 (12)	6 (110)	0 (0)	0 (2)	6 (112)
Porcupine	1 (36)	0 (0)	1 (47)	0 (0)	0 (0)	1 (47)
Sudbury & Districts	1 (13)	2 (4)	4 (99)	0 (0)	0 (1)	4 (100)
Timiskaming	0 (13)	0 (3)	0 (17)	0 (0)	0 (0)	0 (17)
TOTAL NORTH EAST	**2 (134)**	**8 (49)**	**18 (355)**	**0 (0)**	**0 (3)**	**18 (358)**
Eastern Ontario	0 (27)	1 (17)	3 (131)	0 (0)	0 (3)	3 (134)
Hastings & Prince Edward Counties	0 (19)	5 (28)	8 (85)	0 (0)	0 (4)	8 (89)
Kingston, Frontenac, Lennox & Addington	0 (6)	0 (6)	4 (94)	0 (0)	0 (6)	4 (100)
Leeds, Grenville And Lanark District	0 (27)	0 (20)	1 (106)	0 (0)	1 (5)	2 (111)
Ottawa	0 (19)	0 (14)	23 (545)	0 (3)	0 (6)	23 (554)
Renfrew County And District	0 (17)	1 (16)	1 (47)	0 (0)	0 (0)	1 (47)
TOTAL EASTERN	**0 (115)**	**7 (101)**	**40 (1,008)**	**0 (3)**	**1 (24)**	**41 (1,035)**
Durham Region	0 (41)	1 (19)	13 (373)	0 (1)	0 (12)	13 (386)
Haliburton, Kawartha, Pine Ridge	0 (26)	6 (33)	10 (177)	0 (0)	1 (1)	11 (178)
Peel	0 (110)	5 (44)	36 (1234)	0 (0)	3 (44)	39 (1278)
Peterborough	0 (3)	0 (4)	0 (109)	0 (0)	0 (0)	0 (109)
Simcoe Muskoka District	0 (73)	2 (41)	11 (617)	0 (0)	0 (7)	11 (624)
York Region	3 (220)	9 (145)	30 (861)	0 (0)	0 (18)	30 (879)
TOTAL CENTRAL EAST	**3 (473)**	**23 (286)**	**100 (3,371)**	**0 (1)**	**4 (82)**	**104 (3,454)**
Toronto	1 (144)	6 (269)	23 (2217)	0 (1)	1 (50)	24 (2268)
TOTAL TORONTO	**1 (144)**	**6 (269)**	**23 (2,217)**	**0 (1)**	**1 (50)**	**24 (2,268)**
Chatham-Kent	0 (18)	0 (3)	1 (36)	0 (0)	0 (0)	1 (36)
Grey Bruce	0 (11)	2 (12)	6 (170)	0 (0)	0 (2)	6 (172)
Huron County	0 (5)	0 (2)	1 (71)	0 (0)	0 (0)	1 (71)
Lambton	0 (21)	0 (3)	0 (40)	0 (0)	0 (1)	0 (41)
Middlesex-London	0 (53)	1 (28)	17 (454)	0 (0)	0 (4)	17 (458)
Perth District	0 (6)	4 (11)	4 (50)	0 (0)	0 (0)	4 (50)
Southwestern	0 (38)	6 (34)	8 (127)	0 (2)	0 (1)	8 (130)
Windsor-Essex County	0 (99)	0 (5)	1 (140)	0 (0)	0 (1)	1 (141)
TOTAL SOUTH WEST	**0 (251)**	**13 (98)**	**38 (1,088)**	**0 (2)**	**0 (9)**	**38 (1,099)**
Brant County	0 (6)	1 (4)	13 (182)	0 (0)	0 (1)	13 (183)
City Of Hamilton	0 (30)	3 (12)	33 (725)	0 (0)	8 (28)	41 (753)
Haldimand-Norfolk	0 (13)	0 (11)	0 (69)	0 (0)	0 (0)	0 (69)
Halton Region	1 (50)	2 (17)	13 (479)	0 (0)	5 (12)	18 (491)
Niagara Region	0 (61)	1 (34)	18 (759)	0 (1)	1 (12)	19 (772)
Region of Waterloo	0 (13)	0 (19)	11 (280)	0 (0)	0 (4)	11 (284)
Wellington-Dufferin-Guelph	0 (68)	1 (29)	4 (176)	0 (0)	0 (3)	4 (179)
TOTAL CENTRAL WEST	**1 (241)**	**8 (126)**	**92 (2,670)**	**0 (1)**	**14 (60)**	**106 (2,731)**
TOTAL ONTARIO	**12 (1,452)**	**85 (998)**	**338 (10,922)**	**0 (8)**	**20 (229)**	**358 (11,159)**

Source: integrated Public Health Information System (iPHIS)

Note:[1] Includes influenza A positive cases for whom no subtype was reported. This table presents laboratory-confirmed influenza cases reported to the public health units from multiple laboratories. Percent positivity cannot be calculated because negative tests are not reported

6. Strain comparison – circulating influenza strains and vaccine strains

Since September 1, 2018, the National Microbiology Laboratory (NML) has characterized 1,904 influenza viruses (314 H3N2, 1,523 H1N1 and 67 B) that were received from Canadian laboratories.

Genetic Characterization of Influenza A (H3N2):

155 influenza A(H3N2) viruses did not grow to sufficient hemagglutination titer for antigenic characterization by hemagglutination inhibition (HI) assay. Therefore, NML has performed genetic characterization to determine the genetic group identity of these viruses.

Sequence analysis of the HA gene of the viruses showed that 20 viruses belonged to genetic group 3C.2a, 131 viruses belonged to subclade 3C.2a1, and three viruses belonged to 3C.3a. One isolate could not be sequenced. A/Singapore/INFIMH-16-0019/2016-like virus belongs to genetic group 3C.2a1 and is the influenza A/H3N2 component of the 2018-19 Northern Hemisphere influenza vaccine.

Antigenic Characterization:

Influenza A (H3N2):

103 influenza A (H3N2) viruses were antigenically characterized as A/Singapore/INFIMH-16-0019/2016-like by HI testing using antiserum raised against egg-propagated A/Singapore/INFIMH-16-0019/2016. A/Singapore/INFIMH-16-0019/2016 is the influenza A/H3N2 component of the 2018-19 Northern Hemisphere influenza vaccine. 53 viruses showed reduced titer with ferret antisera raised against egg-propagated A/Singapore/INFIMH-16-0019/2016. 67 influenza A (H3N2) viruses characterized belonged to genetic group 3C.2a1. 17 viruses belonged to genetic group 3C.2a and 32 to 3C.3a. Sequencing is pending for the remaining isolate.

Influenza A (H1N1):

1,480 H1N1 viruses characterized were antigenically similar to A/Michigan/45/2015, which is the influenza A/H1N1 component of the 2018-19 Northern Hemisphere influenza vaccine. 43 viruses showed reduced titer with ferret antisera raised against cell culture-propagated A/Michigan/45/2015.

Influenza B:

Influenza B viruses can be divided into two antigenically distinct lineages represented by B/Yamagata/16/88 and B/Victoria/2/87 viruses. The recommended influenza B components for the 2018-19 Northern Hemisphere influenza vaccine are B/Colorado/06/2017 (Victoria lineage) and B/Phuket/3073/2013 (Yamagata lineage).

16 influenza B viruses were characterized as B/Colorado/06/2017, which belongs to the Victoria lineage and is included as an influenza B component of the 2018-19 Northern Hemisphere influenza vaccine. 28 viruses showed reduced titer with ferret antisera raised against cell culture-propagated B/Colorado/06/2017. 23 influenza B viruses were characterized as B/Phuket/3073/2013-like, which belongs to the Yamagata lineage and is included as an influenza B component of the 2018-19 Northern Hemisphere quadrivalent influenza vaccine.

Table 7. Strain characterization completed on influenza isolates at the National Microbiology Laboratory: Ontario and Canada, September 1, 2018 to April 11, 2019

Influenza strains	Ontario	Canada
Influenza A (H3N2) A/Singapore/INFIMH-16-0019/2016-like	97	156
Influenza A (H1N1) A/Michigan/45/2015-like	644	1,523
Influenza B B/Colorado/06/2017-like	12	44
Influenza B B/Phuket/3073/13-like	17	23

Source: National Microbiology Laboratory (NML)

7. Antiviral resistance/ sensitivity for influenza

All influenza A viruses in Canada tested by NML for antiviral resistance in the 2018-19 season were resistant to amantadine, but sensitive to zanamivir. Four influenza A (H1N1)pdm09 positive isolates from Ontario tested by NML were resistant to oseltamivir. All influenza B viruses in Canada tested by NML for antiviral resistance were sensitive to both oseltamivir and zanamivir.

Table 8. Amantadine susceptibility assays completed on influenza isolates at the National Microbiology Laboratory: Ontario and Canada, September 1, 2018 to April 11, 2019

Influenza strains	Ontario: Resistant	Ontario: Susceptible	Canada: Resistant	Canada: Susceptible
Influenza A (H3N2)	35	0	73	0
Influenza A (H1N1)pdm09	86	0	343	0
Influenza B	NA	NA	NA	NA

Source: National Microbiology Laboratory (NML)
NA = Not Applicable

Table 9. Oseltamivir susceptibility assays completed on influenza isolates at the National Microbiology Laboratory: Ontario and Canada, September 1, 2018 to April 11, 2019

Influenza strains	Ontario: Resistant	Ontario: Susceptible	Canada: Resistant	Canada: Susceptible
Influenza A (H3N2)	0	71	0	112
Influenza A (H1N1)pdm09	4	333	4	929
Influenza B	0	27	0	51

Source: National Microbiology Laboratory (NML)
NA = Not Applicable

Table 10. Zanamavir susceptibility assays completed on influenza isolates at the National Microbiology Laboratory: Ontario and Canada, September 1, 2018 to April 11, 2019

Influenza strains	Ontario: Resistant	Ontario: Susceptible	Canada: Resistant	Canada: Susceptible
Influenza A (H3N2)	0	71	0	112
Influenza A (H1N1)pdm09	0	336	0	932
Influenza B	0	27	0	51

Source: National Microbiology Laboratory (NML)
NA = Not Applicable

8. Data sources for this report

- **Integrated Public Health Information System (iPHIS):** provides information on laboratory-confirmed cases of influenza reported to local public health units, and institutional outbreaks of influenza and other respiratory pathogens reported to local public health units. iPHIS is administered by the Ontario Ministry of Health and Long-Term Care; data for this issue was extracted by Public Health Ontario on April 10, 2019.

  Cases of influenza A and B are included in the report based on the 'Reported Date', which was the date the public health unit was notified of the case. For Figure 4 and Figure 5, cases are assigned to a particular surveillance week based on the episode date entered in iPHIS to better reflect influenza activity. Episode date for a case corresponds to the earliest date on record for the case according to the iPHIS hierarchy (Symptom Onset Date > Specimen Collection Date > Lab Test Date > Reported Date). Cases are excluded from these counts if the episode date is based on reported date, and the reported date occurs after the latest surveillance week.

- **Centre for Immunization and Respiratory Infectious Diseases (CIRID) of the Public Health Agency of Canada (PHAC):** provides information on the number of influenza tests and number that are positive based on submissions from 16 participating laboratories in Ontario including 11 Public Health Ontario Laboratories (PHOLs) and five hospital-based laboratories. The results are assigned to a particular surveillance week based on when test results are reported to PHAC; these data are not updated when results are submitted late for previous surveillance weeks. These data represent the number of specimens tested, which may not necessarily correspond with the number of patients as more than one specimen may have been submitted per patient. Cumulative numbers for the season to date are also available through FluWatch.

- **Public Health Ontario's laboratory:** provides specimen level information from the 11 PHO laboratory sites located in Ontario; data for this issue was extracted from the Laboratory Information Management System by PHO on April 11, 2019. A detailed summary of PHO laboratory data is available on the PHO website here. More details about the new testing algorithm can be found here.

- **National Microbiology Laboratory (NML), Influenza and Respiratory Viruses Section:** provides testing results for influenza strain identification and influenza antiviral resistance / susceptibility.

- **Public Health Ontario from public health units:** Public health units provide Public Health Ontario with weekly reports of influenza activity levels in their areas [Provincial Influenza Activity Report (Appendix C) Database]. Influenza activity levels are assigned by local public health units and reported to Public Health Ontario by 4:00 pm on the Tuesday following the end of each surveillance week. Activity levels are assigned based on laboratory confirmations, ILI reports from various sources, and laboratory-confirmed institutional respiratory infection outbreaks. Please refer to the detailed definitions for the 2018-2019 season for more information. Activity levels reported for a particular surveillance week may not necessarily correspond to the number of new outbreaks reported in the same week in Table 1 because ongoing outbreaks from previous weeks, as well as laboratory confirmed outbreaks in schools, may be included in the assessment of the activity level.

Disclaimer

This document was developed by Public Health Ontario (PHO). PHO provides scientific and technical advice to Ontario's government, public health organizations and health care providers. PHO's work is guided by the current best available evidence at the time of publication.

The application and use of this document is the responsibility of the user. PHO assumes no liability resulting from any such application or use.

Public Health Ontario

Public Health Ontario is a Crown corporation dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, front-line health workers and researchers to the best scientific intelligence and knowledge from around the world.

Public Health Ontario provides expert scientific and technical support to government, local public health units and health care providers relating to the following:

- communicable and infectious diseases
- infection prevention and control
- environmental and occupational health
- emergency preparedness
- health promotion, chronic disease and injury prevention
- public health laboratory services

Public Health Ontario's work also includes surveillance, epidemiology, research, professional development and knowledge services. For more information about PHO, visit: publichealthontario.ca.

Public Health Ontario acknowledges the financial support of the Ontario Government.

Ontario
Agency for Health Protection and Promotion
Agence de protection et de promotion de la santé