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2024-2025

Annual Report – Summary of COVID-19, Influenza and RSV surveillance trends



Respiratory Virus Surveillance (RVS)

Surveillance, Epidemiology and Response of Respiratory and Vaccine Preventable Diseases (SERRV)

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**2024-2025 Annual Report: Summary of COVID-19,
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2024-2025 Annual Report – Summary of COVID-19, Influenza and RSV surveillance trends

Overall Summary

1. In 2024, the Public Health Agency of Canada (PHAC) expanded its long-running national influenza surveillance system, FluWatch, to include national epidemiologic surveillance for respiratory syncytial virus (RSV) and SARS-CoV-2 (the virus that causes COVID-19).
 - This expansion marked the start of a new integrated respiratory virus surveillance systems, called FluWatch+.
 - This surveillance report summarizes the results of the 2024-2025 surveillance period for all three target respiratory viruses.
2. A total of 311,706 laboratory detections of target respiratory viruses were reported to the FluWatch+ system; of these, 44% were influenza (139,839), 39% were SARS-CoV-2 (120,773), and 16% were RSV (51,094).
3. Canada experienced three distinct periods of respiratory virus activity, starting with COVID-19 activity peaking in mid-September, followed by RSV peaking at the end of December and influenza at the end of February.
4. Overall, adults 65 years were the most impacted by respiratory viruses. This age group accounted for 41% of respiratory virus detections and had the highest cumulative hospitalization rates for both COVID-19 and influenza.
5. By virus, the age patterns differed with detections and hospitalizations of RSV being observed more frequently in young children 0 to 4, while for influenza and COVID-19 detections and hospitalizations were observed more frequently in adults 65 years and older.

This report provides a broader picture of the effects of seasonal respiratory viruses on the Canadian population. These data show the combined and separate impacts of COVID-19, influenza and RSV on the Canadian population, and demonstrate the differences between populations affected by these viruses.

Introduction

Respiratory virus diseases particularly, influenza, COVID-19 and RSV, cause annual epidemics that result in significant burden on the population, especially among young children and older adults (1,2). In Canada, it's estimated that influenza and RSV result in 15,000 and 13,000 annual hospitalizations, respectively (1). Globally, given the burden associated with respiratory viruses and the recent coronavirus pandemic, national surveillance programs for influenza have expanded to target additional respiratory viruses (3).

At the beginning of the 2024-2025 respiratory virus surveillance period, PHAC expanded its national influenza surveillance system, FluWatch, to target respiratory syncytial virus (RSV) and SARS-CoV-2 (the virus that causes COVID-19) becoming the FluWatch+ system (4). This integrated approach is modelled after the WHO's Mosaic Respiratory Virus Surveillance Framework (3).

This surveillance report summarizes the results of the 2024-2025 respiratory virus surveillance period; the first of FluWatch+.

Methods

The FluWatch+ surveillance system is Canada's national multi-component surveillance system that monitors influenza, RSV and COVID-19 (4). This surveillance system consist of syndromic, laboratory, outbreak, severe outcomes and vaccine monitoring system components (4). Detailed information on data sources, population coverage, indicators, and definitions can be found in the "About this report tab" in the Canadian respiratory virus surveillance report (5).

Data received from Fluwatch+ for the 2024-2025 Canada respiratory virus surveillance period (August 25, 2024 to August 23, 2025) were analyzed descriptively using R 4.4.3 and RStudio 2024.12.1.563.

Distributions and trends over time were analyzed by virus and age group, where available. Weekly percent positivity of laboratory detections was calculated by $[(\text{number of positive tests})/(\text{total number of tests}) \times 100\%]$. Population-based hospitalization rates were calculated using StatsCan population estimates and adjusted based on available data by province or territory, as population denominators differ by virus and data source (6). Seriousness (i.e. the extent to which individuals become ill once infected with the virus) was measured calculating the percentage of hospitalizations that are admitted to intensive care unit (ICU) (7) .

Detailed case-level data such as demographic, clinical, and outcome characteristics were summarized by virus on pediatric respiratory severe outcomes from the SPRINT KIDS sentinel hospital network (8). Vaccine uptake data were sourced from analyzing responses to the Seasonal Respiratory Vaccination Coverage survey conducted between January and February 2025 (9). Vaccination coverage was measured as the percentage of people who reported receiving the vaccine in a specific surveillance period. Vaccine effectiveness estimates were provided by the Canadian Sentinel Practitioner Surveillance Network (SPSN) (10). SPSN provides vaccine effectiveness estimates for the prevention of

medically attended illness due to laboratory-confirmed influenza, with contribution from the provinces of British Columbia, Alberta, Ontario and Québec.

Results

Laboratory detections

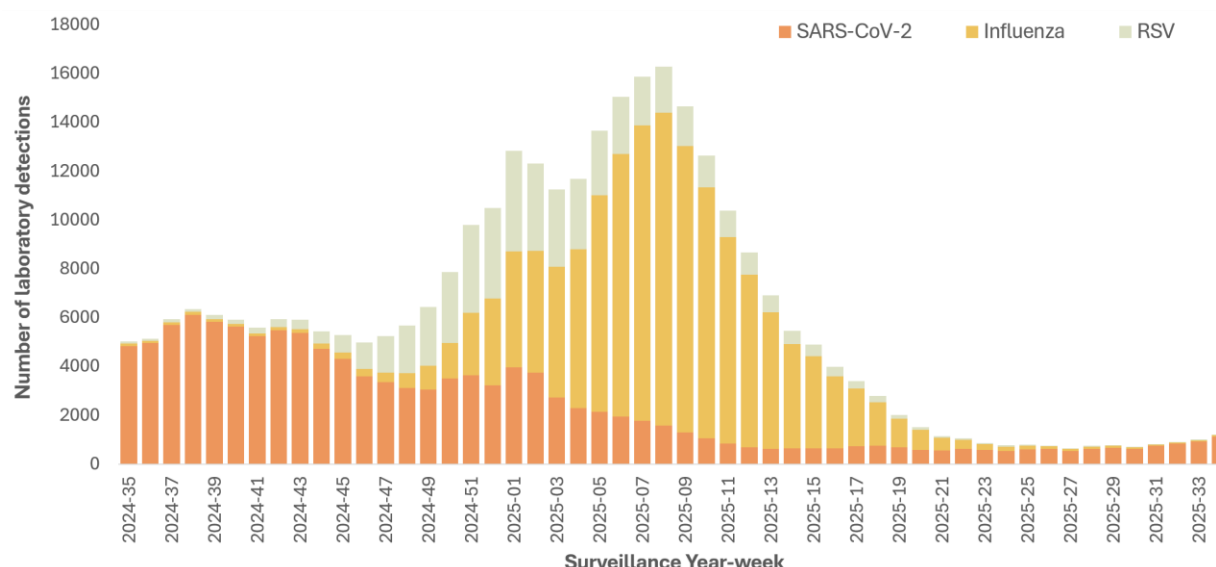
Temporal trends

The 2024-2025 surveillance period started on August 25, 2024 with COVID-19 activity in Canada being near its peak [Figure 1]. In mid-September (week 38, week ending September 21, 2024), COVID-19 percent positivity peaked at 18.9% (6,121 detections) and continued to wane throughout the fall and winter reaching the lowest percent positivity, 1.9%, by mid-March (week 12, week ending March 22, 2025). In spring 2025, COVID-19 activity slowly increased with continued acceleration observed through the summer reaching 7.3% in the final week of the surveillance period.

In late October (week 44, ending November 2, 2024), RSV percent positivity began increasing and peaked at 11.7% (3,720 detections) at the end of December (week 52, week ending December 28, 2024). The influenza epidemic began later than usual in mid-December (week 51, week ending December 28, 2024) when percent positivity exceeded the threshold of 5% (11). Influenza activity peaked at 27.6% (12,834 detections) at the end of February (week 8, week ending February 22, 2025). The influenza epidemic ended in early May (week 19, week ending May 10, 2025).

Overall, a total of 311,706 laboratory detections of target respiratory viruses were reported for the surveillance period. The highest percentage of detections were influenza, 44.9% (139,839), followed by COVID-19, 38.7% (120,773) and RSV, 16.4% (51,094).

Figure 1. Number of detections by virus and surveillance week, Canada, season 2024-2025.

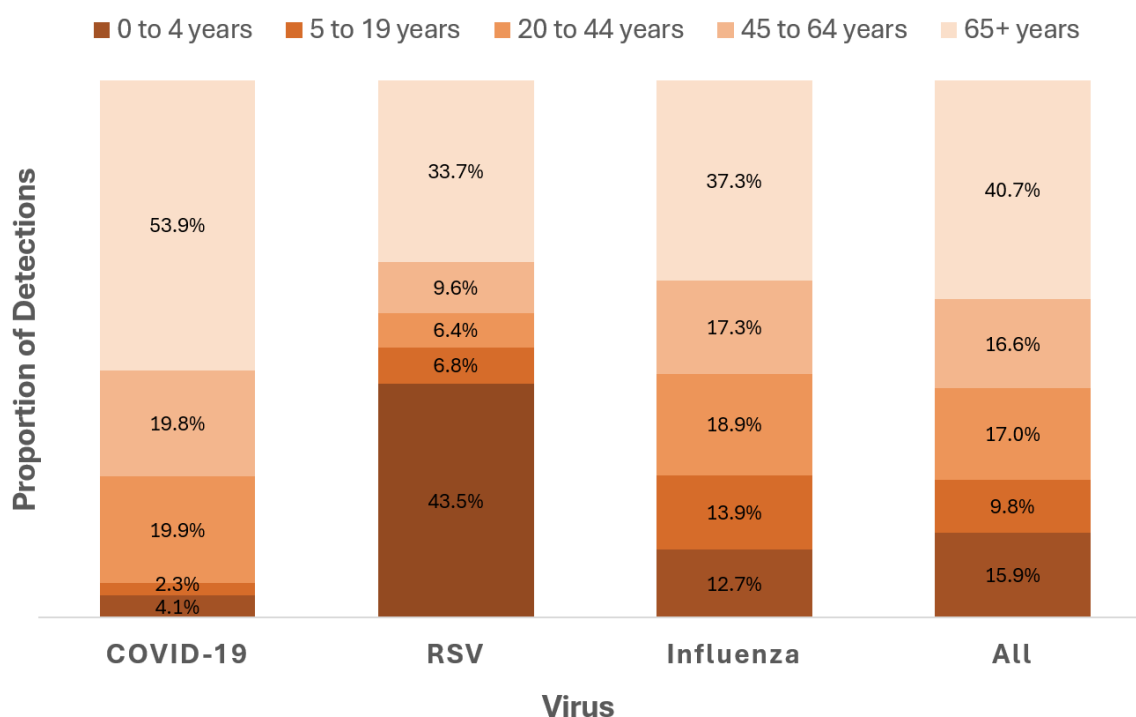


Age group trends

Age information was available for 66.5% (207,310 detections) of the reported respiratory virus detections.

Older adults aged 65 years and older accounted for the highest percentage of respiratory virus detections, 40.7%. By virus, the distribution of detections amongst age groups differed [Figure 2]. Detections of RSV occurred most frequently in children aged 0 to 4 years, 43.5%, while detections of COVID-19 and influenza occurred most frequently among those 65 years of age and older, 53.9% and 37.3%, respectively.

Figure 2. Proportion of detections with available age information by virus and age group, Canada, season 2024-2025.



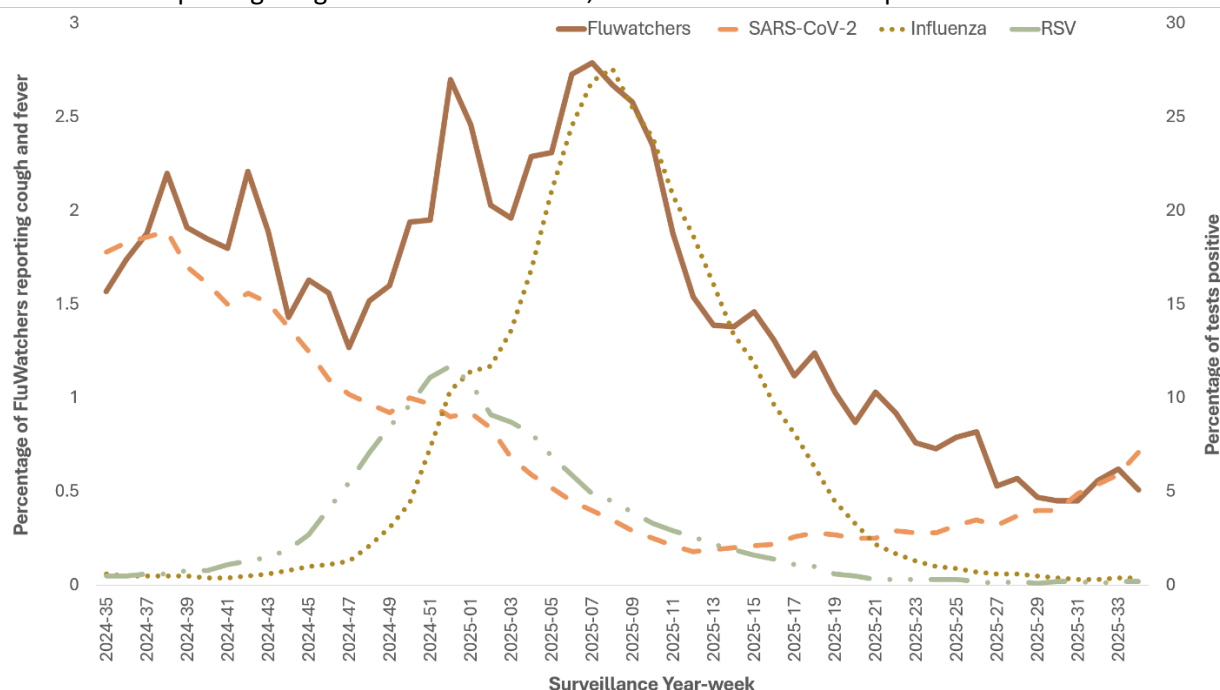
Syndromic Surveillance

A total of 14,433 participants (weekly average 8,866) submitted 461,042 questionnaires identifying whether they experienced acute onset of fever and cough (ILI symptoms) as part of FluWatchers program. Trends in the percentage of participants reporting ILI followed trends in percent positivity among laboratory-detected cases of COVID-19, influenza, and RSV [Figure 3].

There were four distinct peaks in FluWatchers data aligning with peak COVID-19, RSV and influenza percent positivity. The first two peaks in the FluWatchers data at 2.2% occurred in early fall (week 38, ending September 21, 2024 and week 42, ending October 19, 2024) where COVID-19 was at peak levels. FluWatchers data peaked again at 2.7% in late December during the same week that RSV percent

positivity peaked. Lastly, one week prior to influenza percent positivity peaking, FluWatchers peaked again at 2.8%.

Figure 3. Percentage of tests positive for COVID-19, influenza, and RSV compared to the percentage of FluWatchers reporting cough and fever in Canada, 2024-2025 surveillance period.



Outbreaks

A total of 8,890 outbreaks were reported. The majority of outbreaks were associated with COVID-19, 65% (5,816), followed by influenza, 25% (2,258), then RSV, 5% (516) [Table1]. Comparatively, this distribution differed from laboratory detections where the highest number of detections were due to influenza, followed by COVID-19 and RSV. Overall, the distribution by setting was similar across the three virus, with the highest proportion of outbreaks reported in long-term care followed by acute care, retirement homes and other settings.

The temporal distribution of outbreaks was similar to trends observed in laboratory detections [Figure 4]. At the start of the surveillance period the majority of outbreaks were associated with COVID-19. At the end of November (week 48, week ending November 30, 2024), influenza and RSV outbreaks started to increase with the majority of outbreaks being associated with influenza towards the end of January. Peak influenza outbreaks occurred during the same week as the peak influenza laboratory detections. Peak RSV outbreaks occurred one week later compared to the peak RSV laboratory detections. Peak COVID-19 outbreaks occurred three weeks earlier than the peak incidence of COVID-19 laboratory detections.

Figure 4. Number of outbreaks by virus, outbreak setting, and surveillance week, Canada, 2024-2025 surveillance period.

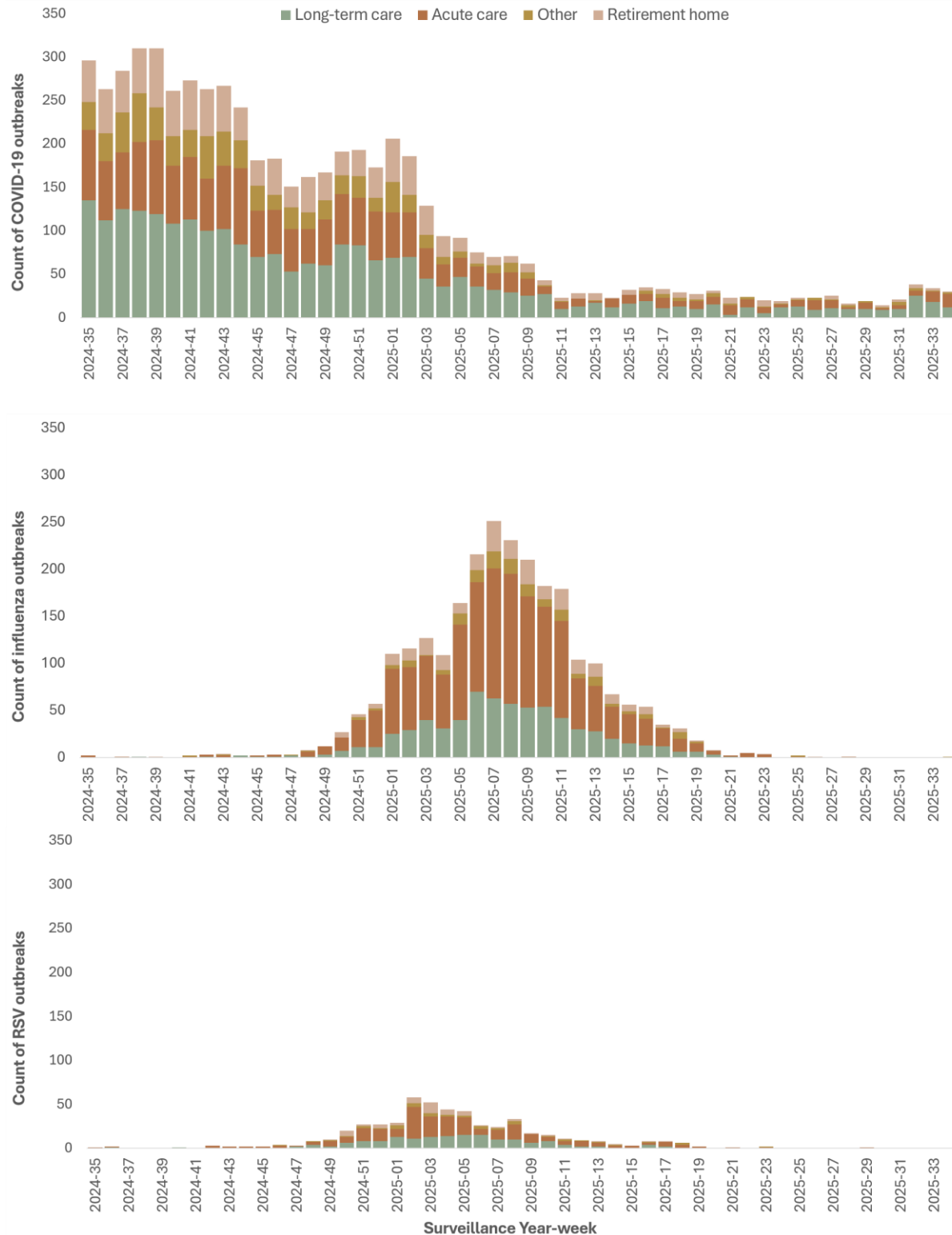


Table 1. Count and proportion of outbreaks by outbreak setting for COVID-19, influenza and RSV, Canada, 2024-2025 surveillance period.

Outbreak setting	COVID-19		Influenza		RSV	
	Count	%	Count	%	Count	%
Retirement home	1085	18.7%	283	11.1%	57	11.0%
Long-term care home	2383	41.0%	1440	56.3%	256	49.6%
Acute care setting	1620	27.9%	679	26.5%	161	31.2%
Other	728	12.5%	156	6.1%	42	8.1%
Total	5,816	100	2,258	100	516	100

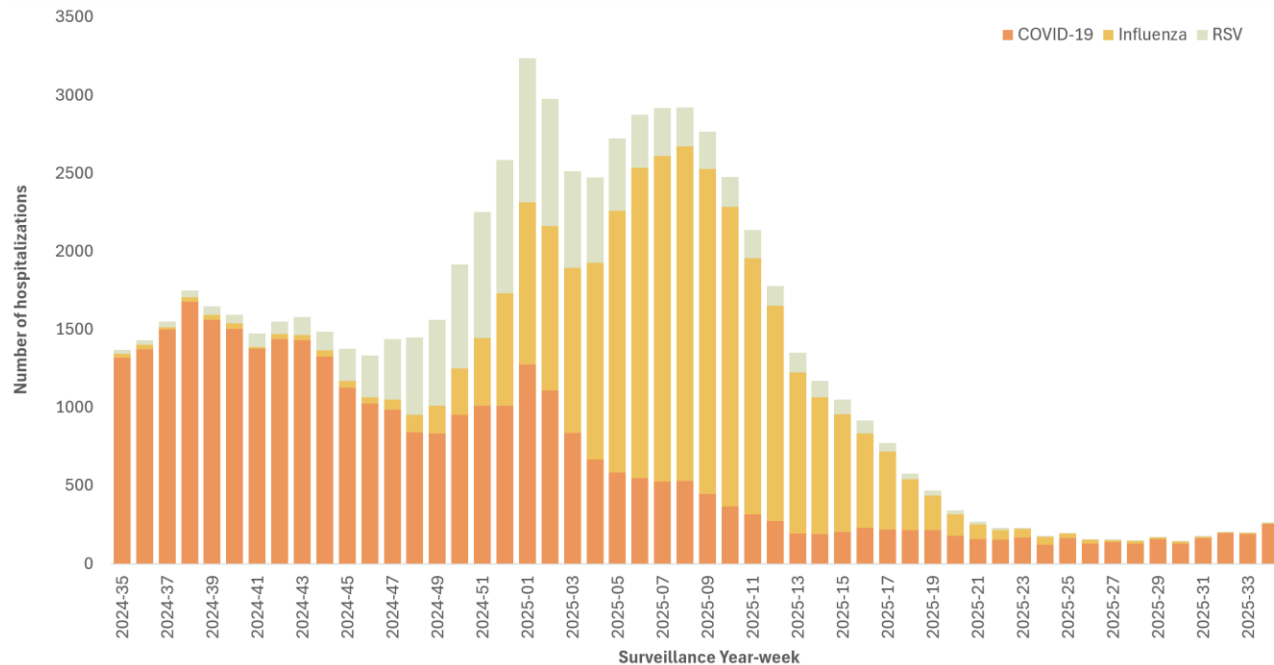
Severe Outcomes

Temporal trends

A total of 70,579 hospitalizations (33,755 COVID-19, 26,309 influenza and 10,515 RSV) were reported by participating provinces and territories. The cumulative rate was 211 hospitalizations per 100,000 population. The cumulative hospitalization rates were 101.3, 76.7, and 32.6 per 100,000 population for COVID-19, influenza and RSV, respectively.

The temporal distribution of respiratory virus associated hospitalizations aligned with trends observed in laboratory detections; there were three distinct peaks in the data. The first peak occurred in the same week as peak COVID-19 detections (week 38, ending September 21, 2024) where 1,750 hospitalizations were reported of which 96% (1,679) were associated to COVID-19. The second peak occurred in week 1 (week ending January 4, 2025) and was the week with the highest total number respiratory viral hospitalizations reported for the season. It coincided with peak RSV laboratory detections and increasing influenza and COVID-19 laboratory detections. A total 3,237 hospitalizations were reported in week 1: 39% (1,278) were associated with COVID-19, 32% (1,038) with influenza and 28% (921) with RSV. The final peak occurred during the same week as peak influenza detections (week 8): 2,923 hospitalizations were reported of which 73% (2,139) were associated with influenza.

Figure 5. Number of respiratory virus-associated hospitalizations by virus and surveillance week, Canada, 2024-2025 surveillance period



Age group trends

Similar to trends observed in laboratory detections, the age-specific hospitalization rates varied by virus [Table 2]. COVID-19 hospitalizations were skewed towards older adults. Adults 65 years and older had the highest cumulative hospitalization rate of 506.5 per 100,000 population which was 6 to 61 times higher than any other age group. RSV hospitalizations were skewed towards young children. Children 0-4 years had a cumulative hospitalization rate of 430.4 per 100,000 population which was 5 to 113 times higher than any other age group. Influenza hospitalizations were highest among adults 65 years and older but was less distinct compared to other age groups. The cumulative hospitalization rate of 324.4 per 100,000 population which was only 2 to 10 times higher than any other age group.

Table 2. Number and cumulative rate per 100,000 population of respiratory virus-associated hospitalizations, by age group* and virus, Canada, 2024-2025 respiratory surveillance period

Age group (years)	COVID-19		Influenza		RSV	
	Count (%)	Rate per 100,000 pop.	Count (%)	Rate per 100,000 pop.	Count (%)	Rate per 100,000 pop.
0 to 4	722 (3.3)	82.6	1,345 (7.3%)	155.2	3,300 (45.9%)	430.4
5 to 19	248 (1.1)	8.3	977 (5.3%)	32.1	280 (3.9%)	10.4
20 to 44	1,144 (5.2)	19.2	1,496 (8.1%)	24.2	208 (2.9%)	3.8
45 to 64	2,514 (11.5)	55.9	3,144 (17.1%)	69.4	563 (7.8%)	14.0
65+	17,233 (78.8)	506.5	11,422 (62.1%)	324.4	2,844 (39.5%)	90.7
All	33,755	101.3	26,309	76.7	10,515	32.6

*Note: The "All" row includes hospitalizations with and without age information

Seriousness

The percentage of hospitalizations admitted to ICU was the same for influenza and RSV (9%) but differed for COVID-19 (7%).

Sentinel pediatric severe outcomes

Demographic and clinical characteristics

A total of 5,499 pediatric respiratory viral-associated hospitalizations were reported from the SPRINT-KIDS pediatric surveillance network. Overall, RSV contributed to the highest percentage of reported hospitalizations, accounting for 55% (n=3,036), followed by influenza, 30% (n=1,629) [Table 3]. COVID-19 accounted for only 12% (n=679) of hospitalizations and the remainder of the hospitalizations 3% (n=155) were co-infections.

The age distribution of pediatric respiratory viral-associated hospitalizations differed across the three viruses. RSV and COVID-19 hospitalizations were concentrated in infants aged <6 months (RSV: 48%; COVID-19: 45%). In contrast, influenza hospitalizations were more common among children aged 2-4 years (27%) and 5-9 years (27%).

Symptom profiles showed overlap across pediatric COVID-19, influenza, and RSV-associated hospitalizations [Table 4]. Fever and cough were most common across all three viruses (COVID-19: fever 57%, cough 43%; influenza: fever 82%, cough 57%; RSV: fever 52%, cough 83%). RSV cases showed a higher frequency of lower respiratory involvement, with shortness of breath (47%), and wheezing (22%) occurring more often than COVID-19 (shortness of breath 20%, wheezing 8%) or influenza (shortness of breath 19%, wheezing 6%) cases.

Across pediatric respiratory viral-associated hospitalizations, 55% of RSV cases, 48% of COVID-19 cases, and 42% of influenza cases occurred in children without pre-existing comorbidities [Table 5]. Among children with pre-existing comorbidities, RSV, COVID-19, and influenza cases all demonstrated a broad and diverse comorbidity profile.

Table 3. Demographic and clinical characteristics of pediatric respiratory-viral associated hospitalizations, by virus, SPRINT-KIDS hospital network, 2024-2025 respiratory surveillance period

Characteristic	COVID-19	Influenza	RSV
Severe Outcomes			
Hospitalizations	679	1629	3036
ICU Admissions	109	248	482
Deaths	3	14	6
Median Length of Stay in days (IQR)	3 (1-6)	3 (2-5)	3 (2-5)
Demographics			
Median Age (IQR)	1 (0-5)	4 (1-8)	1 (0-2)
<6 months (%)	213 (31.4)	129 (7.9)	1056 (34.8)
6 to 12 months (%)	115 (16.9)	119 (7.3)	457 (15.1)
13 to 24 months (%)	83 (12.2)	188 (11.5)	565 (18.6)
2 to 4 years (%)	94 (13.8)	424 (26.0)	654 (21.5)
5 to 9 years (%)	74 (10.9)	445 (27.3)	217 (7.1)
10 to 14 years (%)	64 (9.4)	237 (14.5)	55 (1.8)
15 to ≤18 years (%)	36 (5.3)	87 (5.3)	32 (1.1)
Symptoms			
Median number of symptoms (IQR)	3 (2-4)	3 (2-4)	3 (3-4)
Asymptomatic (%)	34 (5.0)	8 (0.6)	44 (1.4)
Pre-existing Comorbidities			
Median number of pre-existing comorbidities (IQR)	1 (0-2)	1 (0-2)	0 (0-1)
None (%)	325 (47.9)	535 (41.5)	1742 (55.0)
Vaccination status*			
Eligible records with status available (%)	403 (86.5)	1227 (81.8)	1984 (95.5)
Vaccinated (%)	4(1.0) [‡]	169 (13.8) [‡]	51 (2.6) [‡]

*Eligible records for influenza and COVID-19 vaccines is limited to children older than 6 months; for RSV its limited to individuals under 2 years of age

[‡]COVID-19 vaccination status denotes reception of COVID-19 vaccination during 2024-25;

[‡]Influenza vaccination status denotes reception of the current season's (2024-25) influenza vaccines

[‡]RSV vaccination status denotes reception of RSV-directed monoclonal antibodies among children under 2 years of age

Table 4. Number and percentage of the most frequently reported symptoms among pediatric respiratory-viral associated hospitalizations, by virus, Canada, 2024-2025 respiratory surveillance period.

Symptom	COVID-19 (%)	Influenza (%)	RSV (%)
Fever	370 (57.4)	1,051 (82.0)	1,543 (51.6)
Cough	282 (43.7)	735 (57.4)	2,474 (82.7)
Rhinorrhea/congestion	276 (42.8)	453 (35.4)	1,876 (62.7)
Other*	292 (45.3)	549 (42.9)	1,207 (40.3)
Shortness of breath	127 (19.7)	245 (19.1)	1,415 (47.3)
Vomiting	133 (20.6)	366 (28.6)	687 (23.0)
Lethargy	78 (12.1)	230 (18.0)	323 (10.8)
Wheezing	43 (6.7)	71 (5.5)	664 (22.2)
Diarrhea	49 (7.6)	141 (11.1)	241 (8.1)
Abdominal pain	38 (5.9)	108 (8.4)	45 (1.5)

Notes: Percentages are calculated using virus-specific denominators (number of cases with symptoms). Symptoms are not mutually exclusive, cases may report more than one symptom.

Top 10 symptoms are ranked by the sum of percentage across viruses to highlight symptoms commonly reported across all the viruses.

*"Other" includes symptoms not individually categorized.

Table 5. Number and percentage of the most frequently reported pre-existing comorbidities among pediatric respiratory-viral associated hospitalizations, by virus, Canada, 2024-2025 respiratory surveillance period.

Pre-existing comorbidity	COVID-19 (%)	Influenza (%)	RSV (%)
Other disease*	48 (13.6)	159 (21.1)	218 (16.1)
Previous pneumonia	73 (20.6)	152 (20.2)	399 (29.4)
Genetic condition/trisomy	59 (16.7)	151 (20.0)	158 (11.6)
Prematurity	52 (14.7)	90 (11.9)	324 (23.9)
Asthma	40 (11.3)	148 (19.6)	309 (22.8)
Neurologic/neurodevelopmental condition	51 (14.4)	148 (19.6)	119 (8.8)
Technology dependence – enteral feeding	56 (15.8)	103 (13.7)	122 (9.0)
Epilepsy/seizure disorder	53 (15.0)	116 (15.4)	89 (6.6)
Immunocompromised	53 (15.0)	73 (9.7)	72 (5.3)
Developmental delay	27 (7.6)	84 (11.1)	80 (5.9)

Notes: Percentages are calculated using virus-specific denominators (number of cases with a comorbidity).

Comorbidities are not mutually exclusive; cases may report more than one pre-existing comorbidity. Top 10 comorbidities are ranked by the sum of percentage across viruses to highlight comorbidities commonly reported across all the viruses.

*"Other disease" includes comorbidities not individually categorized.

Seriousness

A total of 871 ICU admissions were reported (109 associated with COVID-19, 248 influenza, 482 RSV, and 32 co-infections). The percentage of hospitalizations resulting in ICU admission was relatively similar across all three viruses (influenza: 15%; COVID-19: 16%; RSV: 16%).

A total of 23 pediatric respiratory viral-attributed deaths were reported (COVID-19: 3, influenza: 14, RSV: 6) [Table 6]. The median age at death was 8 years, with deaths distributed across age groups. Among respiratory viral-attributed deaths (n=23), 76.2% (16) had pre-existing comorbidities (median: 4, range 1-7).

Table 6. Characteristics of pediatric respiratory viral-attributed deaths (N=23)

Characteristic	Counts and values
Virus	
COVID-19	3
Influenza	14
RSV	6
Sex, n (%)	
Male	9 (39.1)
Female	14 (60.9)
Age, years	
Median (range)	8 (0–16)
Age group, n (%)	
<5 years	9 (39.1)
5-9 years	5 (21.7)
10-18 years	9 (39.1)
Pre-existing comorbidities	
≥1 comorbidity, n (%)	18 (78.3)
Number of comorbidities, median (range)	2 (0–7)
Vaccination Status*	
Eligible records with status available (%)	9 (52.9%)
Vaccinated (%)	1 (11.1%)

*Eligible records for influenza and COVID-19 vaccines is limited to children older than 6 months; for RSV its limited to individuals under 2 years of age

Vaccine coverage

This surveillance period, 26% and 33% of adults aged 18 years and older received the COVID-19 and influenza vaccine, respectively [Table 7-8]. These vaccination rates were lower compared to previous surveillance periods for COVID-19 (39% in 2023-24) and influenza (range 39% to 43% during 2021-2022 to 2023-2024). Vaccination rates for RSV are not available for this surveillance period.

Table 7. Seasonal influenza vaccination coverage, by risk group and influenza season, Seasonal Respiratory Vaccination Coverage Survey, Canada, 2021-2022 to 2024-2025.

Demographic	2024-2025		2023-2024		2022-2023		2021-2022	
	n	% (95% CI)*	n	% (95% CI)*	n	% (95% CI)*	n	% (95% CI)*
Adults (18+ years)	4,125	33.4 (31.7-35.2)	5,344	42.4 (40.5-44.0)	3,535	43.5 (41.6-45.3)	3,487	38.7 (36.9-40.6)
Adults 18 to 64 years, no chronic medical conditions	2,049	22.2 (20.1-24.3)	2,264	28.5 (26.1-30.8)	1,715	31.0 (28.6-33.4)	1,658	26.8 (24.4-29.2)
Adults 18 to 64 years, with chronic medical condition	524	32.3 (27.7-36.9)	987	44.1 (40.1-48.1)	583	43.1 (38.6-47.6)	713	37.6 (33.6-41.7)
Seniors (65+ years)	1,552	63.2 (60.4-66.1)	2,072	72.7 (70.3-75.1)	1,198	73.7 (71.0-76.5)	1,098	71.0 (68.1-74.0)

*Note: % denotes vaccine coverage estimates and CI means confidence interval

Table 8. COVID-19 vaccination coverage, by risk group and surveillance period, Seasonal Respiratory Vaccination Coverage Survey, Canada, 2023-2024 to 2024-2025.

Demographic	2024-2025		2023-2024	
	n	% (95% CI)*	n	% (95% CI)*
Adults (18+ years)	4,116	26.1 (24.6-27.7)	5,307	38.6 (36.9-40.3)
Adults 18 to 64 years, no chronic medical conditions	1,737	16.5 (14.5-18.5)	2,254	26.3 (24.0-28.6)
Adults 18 to 64 years, with chronic medical condition	844	20.6 (17.5-23.6)	989	39.3 (35.4-43.2)
Seniors (65+ years)	1,535	53.3 (50.6-56.4)	2,038	66.5 (63.9-69.0)

*Note: % denotes vaccine coverage estimates and CI means confidence interval.

Vaccine effectiveness

Between November 2024 and April 2025, SPSN calculated the vaccine effectiveness (VE) of the Pfizer and Moderna mRNA KP.2 vaccines when the main circulating viruses were Omicron KP.3.1.1, XEC, and their descendants. Among individuals aged 12 years and older, the VE against acute respiratory illness was 54% (95% CI: 36-68) and protection was lower in older adults aged 65 years and older at 40% (95% CI: 7-62)(12).

For the 2024-2025 influenza season, the VE among individuals aged one year and older against any influenza was 43% (95% CI: 36-49). Specifically, against influenza A(H1N1), the VE was 37% (95% CI: 27-45), against influenza A(H3N2), the VE was 40% (95% CI: 27-51) and against influenza B the VE was 66% (95% CI: 54-75)(13).

Discussion

PHAC's long-running national influenza surveillance system evolved into FluWatch+, expanding its scope to incorporate COVID-19 and RSV surveillance for the 2024-25 surveillance period. This integrated approach allowed for a more fulsome analysis of all three viruses in the Canadian population which was not possible prior to integration.

Analysis of FluWatch+ surveillance indicators, all characterized this period as one with three distinct and sequential periods of increased respiratory virus activity. Age-group specific analysis from laboratory and severe outcome data demonstrated that these three viruses have distinct population-level impacts. COVID-19 detections and hospitalization rates were highest in adults 65 years of age and older. In contrast, RSV detections and hospitalization rates were highest in children 0-4 years. Both these age trends are consistent with the known epidemiology of COVID-19 and RSV (14-16). In contrast, influenza detections and hospitalization rates showed less pronounced differences across age groups, consistent with historical trends observed in Canada (2,11,17). In the Canadian healthcare system, care and delivery of services are often separated for adults and children. Continuous monitoring of these age-specific differences is critical because of the role age plays in the susceptibility to infection to these different viruses and the likelihood of severe outcomes.

The outbreak trends highlight important differences in the epidemiology and impact of COVID-19, influenza, and RSV in congregate living facilities. Although influenza had the highest reported number of laboratory detections overall for this surveillance period, COVID-19 associated outbreaks accounted for most reported outbreaks. Reported COVID-19 associated outbreaks were more than doubled that of influenza (5,816 vs 2,258 respectively); however, the number of laboratory detections were slightly higher for influenza 139,839 vs 120,773 COVID-19 detections. Although this suggests that transmission dynamics of these viruses, especially COVID-19, within group living facilities may differ from the general population, differences in outbreak declaration and reporting by virus within and between provinces and territories also contributes to the observed distribution (18,19). This is particularly evident for RSV outbreaks, where fewer provinces and territories report data outbreak data. Regardless, the predominance of outbreaks in long-term care and retirement homes in general highlights the continued vulnerability of the population in these facilities (2,17,20-22). In terms of timing, outbreak activity by virus closely mirrored laboratory trends which reinforces that outbreak surveillance is a sensitive indicator of broader seasonal activity and may offer additional insights in understanding the timing, intensity, and spread of seasonal respiratory viruses within a vulnerable population (21,22).

Hospitalization data provided by participating provinces and territories enables the identification of who in the population are experiencing more severe outcomes by virus and

when these hospitalizations were occurring. Hospitalizations peaked three times during this surveillance period. The first and last peak occurred when COVID-19 and influenza percent positivity peaked respectively and the respective virus made up the vast majority of hospitalizations during that peak week. The second hospitalization peak occurred one week prior to RSV percent positivity peaking and RSV did not account for the majority of hospitalizations. Rather, this second peak was strongly driven by concurrently increasing COVID-19 and influenza hospitalizations and to a lesser extent increasing RSV hospitalizations. Similar to outbreak surveillance data, differences in hospitalization reporting by virus, especially RSV within provinces and territories may contribute to the observed distribution; however, it is documented in the literature that RSV in general is responsible for less infections in the population compared to influenza (1). These results highlight the potential misalignment between laboratory activity and hospitalization burden and underscore the importance of monitoring COVID-19, influenza, and RSV concurrently rather than in isolation and the need for comprehensive, multi-component surveillance. Additionally, this is the first surveillance period in which a national cumulative hospitalization rate for respiratory viruses was reported which can inform estimates of healthcare demand and guide resource planning for respiratory viruses in general.

Detailed case-level hospitalization data complements high-level provincial and territorial hospitalization data and allow for a deeper understanding of disease characteristics: who is being hospitalized (i.e. individual ages, comorbidities profile, gender and vaccination status) and why they were hospitalized (i.e. positive test result, coinfections and symptom presentation) and with what outcomes (i.e. ICU admission, death and length of stay). The SPRINT-KIDS pediatric surveillance network reported these data for the pediatric population across all three viruses this season. An additional value of a sentinel network is the consistent application of standardized methodologies across time and place, allowing for direct comparison of disease-specific trends.

Vaccination rates were lower compared to previous surveillance periods for influenza and COVID-19 (9,23). Declining vaccination rates for respiratory viruses in recent years highlight an important opportunity to re-engage the public about the risks of severe outcomes from vaccine-preventable respiratory diseases regardless of health status. The SPRINT-KIDS data highlighted how a large percentage of pediatric hospitalizations (range 42-52%) had no comorbidities and among those that did have comorbidities, there was a broad distribution of health conditions. Using these surveillance findings while also emphasizing demonstrated vaccine effectiveness in reducing severe outcomes can help communicate the importance of vaccination and motivate uptake.

Limitations

FluWatch+ is a national surveillance system with national case and indicator definitions; however, individual jurisdictions determine whether to apply national or provincial/territorial surveillance definitions. While we encourage standardization, we know there is variability. The assumption is that with consistent application of a definition over time within jurisdictions, our national assessment of trends is relatively accurate but the accuracy of absolute values may be limited.

The availability of data for RSV detections and severe outcomes in the FluWatch+ surveillance system is more limited compared to influenza and COVID-19 and reduces the comparability across the three target viruses. In general there were fewer laboratory detections, lower rates of hospitalizations, and less outbreaks of RSV than those observed for COVID-19 and influenza. While it is difficult to determine whether these are true epidemiologic differences or the result of RSV being notifiable in less jurisdictions; there is evidence that have indicated that burden of RSV in general is consistently lower than that of influenza (1).

Furthermore, overall geographic coverage for provincial and territorial severe outcome surveillance varies by virus and indicator, and is generally lower for ICU admissions and age information (4,5). Despite these limitations, previous analyses and comparisons with other national data sources, which may be less timely than FluWatch+ surveillance data, have provided similar epidemiologic trends (1,24,25). Despite the incompleteness in total numbers, the data from the FluWatch+ surveillance program remain appropriate for monitoring trends over time of severe outcome activity in Canada.

This report summarizes the national efforts of a harmonized surveillance approach to three priority respiratory pathogens modelled after long-standing influenza surveillance. However, it is important to continue to acknowledge and recognize the differences between these viruses for future surveillance periods. Surveillance approaches to RSV will require continued review as recommendations and uptake of RSV therapeutics continue to evolve in Canada and COVID-19 continues to resist establishing a consistent epidemic seasonal pattern in Canada, requiring continued year-round surveillance and active monitoring of variants.

Conclusions

As the first integrated surveillance report issued under FluWatch+, Canada's national respiratory virus surveillance system, this report provides a comprehensive picture of the effects of seasonal respiratory viruses on the Canadian population. The analysis of data reported to this system, show the combined and separate impacts of COVID-19, influenza and RSV on the Canadian population. By using consistent surveillance methods to monitor these three viruses, Canadians, public health professionals and policymakers can better understand

the overall impact and holistic burden of respiratory illnesses in Canada, while still allowing detailed tracking of each virus. Similar to previous surveillance periods, this reports reinforces that circulating respiratory viruses, specifically influenza, COVID-19 and RSV, have an annual burden on the Canadian population and subsequently its health care system. As data continue to be collected in future surveillance seasons, comparisons across multiple seasons from this surveillance system will be possible.

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