Public Health Ontario | Santé publique Ontario

TECHNICAL NOTES

Ontario Respiratory Virus Tool

Updated: October 25, 2024

Introduction

The Ontario Respiratory Virus Tool allows users to select, overlap and analyze multiple respiratory pathogen data sets from Ontario, as well as view highlights and reported COVID-19, influenza and respiratory syncytial virus (RSV) activity for the current week.

Data Sources

- **COVID-19 case and outbreak**: Data for COVID-19 cases with fatal outcomes and outbreaks are updated weekly in the tool with data extracted from the integrated Public Health Information System (iPHIS) by PHO for records created after June 1, 2024. Data on fatal cases and outbreaks created up to June 1, 2024 were extracted from the Public Health Case and Contact Management Solution (CCM) on June 27, 2024 and will remain accessible in the tool.
- **COVID-19 episodes**: Data for COVID-19 episodes are received from the Ministry of Health each week and calculated using data from the Ontario Laboratories Information System (OLIS). See COVID-19 case episodes section for further details.
- **Laboratory-confirmed cases of influenza**: Data for laboratory-confirmed cases of influenza are updated weekly in the tool and are obtained from iPHIS or from aggregate counts of cases reported directly to PHO by PHUs that as of October 13, 2024 have opted to report influenza cases aggregately.
- **Institutional outbreaks of influenza, RSV and other respiratory pathogens**: The data for the current surveillance period are based on information extracted weekly from iPHIS by PHO for all PHUs. Data for previous surveillance periods (2015-16 to 2023-24) were extracted on October 2, 2024.
- **Projections for SARS-CoV-2, influenza and RSV**: Projections of respiratory virus activity and severity for SARS-CoV-2, influenza and RSV are obtained from the PHO weekly surveillance report Integrated Respiratory Virus Risk Indicators for Ontario.[1] See the report for more details on these indicators, including information on data sources and methodology.
- **Laboratory testing (number of tests, percent positivity):** These data for SARS-CoV-2, influenza, RSV and other respiratory viruses are based on information received from OLIS and processed weekly. OLIS captures laboratory testing data for all of the respiratory viruses for the period starting June 23, 2024, except for SARS-CoV-2, which has data available from March 29, 2020 onwards.
- **PHO respiratory virus testing**: These data from the PHO Laboratory Information Management System are no longer a source for current laboratory testing and percent positivity in the tool as of October 13, 2024. Data for the current surveillance period were extracted on October 23, 2024. Data for previous surveillance periods were extracted on September 4, 2024. For more information about the changes in data sources, see the laboratory testing sections for COVID-19 and Influenza, RSV and other respiratory viruses, respectively.

- **Historical number of influenza and other respiratory virus tests and number of positive test results for Ontario**: These data were received from the Public Health Agency of Canada's (PHAC) Centre for Emerging and Respiratory Infections and Pandemic Preparedness (CERIPP) respiratory virus detection tables[2] with data available from the 2015-2016 respiratory season and up to October 12, 2024. OLIS has replaced this data source for weekly testing data and percent positivity for the 2024-25 season. For more information about the change in data sources, see the Influenza and RSV Laboratory Testing section.
- **Influenza strain characterization and antiviral susceptibility:** These data are received weekly from the Public Health Agency of Canada's National Microbiology Laboratory Branch (NMLB).
- **Hospital bed occupancy**: These bed census (I9) data are obtained from the Ministry of Health each week for COVID-19, influenza and RSV.
- **ICU bed occupancy**: These data are from the Critical Care Information System (CCIS), provided by CritiCALL Ontario.
- **Ontario population data**: Population estimates were received from Statistics Canada for the years 2015-2022,[3] and population projections were received from the Ontario Ministry of Finance for the years 2023-2025.[4]

Data Caveats

- Case data represent cases that get tested and/or are reported to PHUs and recorded in a provincial reporting system. COVID-19 cases and deaths were reported in CCM up to June 1, 2024 and COVID-19 deaths were reported in iPHIS after June 1, 2024. Influenza cases have been reported exclusively via iPHIS with exception for two PHUs that reported counts in aggregate. As of October 13, 2024, additional PHUs began reporting influenza counts in aggregate directly to PHO.
- All counts for influenza and COVID-19 are subject to varying degrees of underreporting and may be an underestimate of the true number of individuals with the disease due to a variety of factors, such as disease awareness and medical care seeking behaviours, which may depend on severity of illness, clinical practice, changes in laboratory testing, access to testing and reporting behaviours. As such, data should be interpreted with caution.
- Observed trends over time should be interpreted with caution for the most recent period due to reporting and/or data entry lags.
- iPHIS is a dynamic disease reporting system which allows ongoing updates to data previously entered. As a result, data extracted from iPHIS represent a snapshot at the time of extraction and may differ from previous or subsequent reports.
- COVID-19 case data were last extracted from CCM on June 27, 2024 and no further updates are expected.
- Cases of COVID-19 (up to June 1, 2024) and influenza as well as outbreaks of respiratory infection outbreaks in institutions or public hospitals are updated weekly for the current surveillance period. Data for earlier surveillance periods are updated annually.
- Due to differences in reporting timeframes, counts presented here may not align with counts presented on PHU websites. Where discrepancies exist, data presented on the PHU website should be used.

- Surveillance periods start from approximately September 1 of one year and end August 31 of the following year. In online tools and graphs depicting respiratory virus data by surveillance week, the surveillance week typically containing September 1 (week 35) is used as the first week of the surveillance period.
    - Unlike influenza and other respiratory viruses, COVID-19 is not recognized as a seasonal respiratory virus. However, data for COVID-19 are reported according to surveillance periods within parts of this tool.
- Surveillance weeks correspond to the FluWatch Public Health Agency of Canada (PHAC) influenza surveillance weeks.[5]
- The 2020-21 surveillance period included a week 53, which occurs once every five to six years. In 2020-21 week 53 corresponded to the period from December 27, 2020 to January 2, 2021.
- Cases with unknown or missing ages were excluded from age-specific analyses.
- For indicators for which cumulative rates were calculated, the start year for the surveillance period was matched to the year for the population count used as the denominator for the calculation. For example, for the 2024-25 surveillance period, the cumulative case rate is calculated using the 2024 population projections as the denominator.

COVID-19, Influenza and RSV Activity

Percent Positivity Level and Weekly Indicator Change Data Sources

- COVID-19 and influenza are diseases of public health significance in Ontario and are therefore reportable to the province per Ontario Regulation (O. Reg.) 135/18 (Designation of Diseases) and amendments under the Health Protection and Promotion Act (HPPA).[6,7] As of July 1, 2024, PHUs are only required to report COVID-19 cases with fatal outcomes in iPHIS. Other respiratory viruses, including RSV, are only reportable in summary outbreak counts if they are the aetiologic agent responsible for respiratory infection outbreaks in institutions and public hospitals.
- Respiratory virus percent positivity level and thresholds for determining weekly indicator changes are based on case, outbreak and laboratory data, where applicable. Currently, percent positivity level and thresholds for weekly indicator changes are determined as follows:
    - For influenza – iPHIS for outbreak data, both iPHIS and aggregate reports for case data and OLIS for percent positivity data
    - For SARS-CoV-2 – iPHIS for outbreak data and OLIS for percent positivity data
    - For RSV – iPHIS for outbreak data and OLIS for percent positivity data
- Indicators and data sources for respiratory virus percent positivity level thresholds and weekly indicator changes have changed over time. Previously, percent positivity levels were assessed for SARS-CoV-2 using the PD-NOC data up to June 1, 2024 and for influenza and RSV using PHAC's CERIPP's Respiratory Virus Detection Surveillance System data up to October 12, 2024. For more information about the switch to the use of OLIS data in this tool, see the COVID-19 Laboratory Testing and Influenza and RSV Laboratory Testing sections, as well as Appendix E.
- The number of positive tests for SARS-CoV-2 and influenza from OLIS may not align with the number of COVID-19 and influenza cases, respectively. Additionally, the number of COVID-19 episodes calculated from OLIS may not match the number of reported cases. This may be due to factors such as:

- Differences in the dates used to place the data in time (specimen collection date for OLIS versus reported date for CCM/iPHIS).
- The number of tests performed may not necessarily correspond with the number of persons tested, as more than one specimen may have been submitted per person. More than one test may also be performed per specimen. Where specific case counts are not available in Ontario, but testing data are available, refer to these as positive tests which may not be unique to each person.
- Application of the provincial case definition for COVID-19 cases, and by design, not for COVID-19 episodes.

Percent Positivity Levels

- Respiratory percent positivity levels for COVID-19, influenza and RSV are developed by PHO and are used to monitor respiratory virus activity. For simplicity, percent positivity as a single measure was selected instead of a composite indicator using multiple measures, as this metric generally trends closely with case counts and outbreaks. These levels are reviewed annually and updated as needed.
- For surveillance purposes, COVID-19, influenza and RSV are assigned to a percent positivity level of low, moderate, high, very high to provide a snapshot of the extent to which these respiratory viruses are circulating. These may differ from levels that PHAC uses at the national level.
- Percent positivity is calculated from the number of positive tests divided by the total number of tests performed in a given time period. Testing eligibility for COVID-19, influenza and RSV differ along with the number of tests performed.
- For the most up to date information on testing eligibility in Ontario, refer to the provincial testing guidance for COVID-19 and the PHO Laboratory's guidance for influenza and RSV.[8,9] For the most up to date information on seasonal respiratory viruses tested at PHO, refer to PHO's laboratory respiratory testing algorithm.[9]
- Provincial COVID-19 percent positivity levels were last reviewed September 2024 and are defined as follows:
  - Low: <10.0% positivity
  - Moderate: 10.0% - 16.9% positivity
  - High: 17.0% - 24.9% positivity
  - Very high: ≥25.0% positivity
- Provincial influenza (i.e., influenza A and B combined) percent positivity levels were last reviewed September 2024 and are defined as follows:
  - Low: <10.0% positivity
  - Moderate: 10.0% - 16.9% positivity
  - High: 17.0% - 24.9% positivity
  - Very high: ≥25.0% positivity
- Provincial RSV percent positivity levels were developed September 2024 and are defined as follows:
  - Low: <5.0% positivity
  - Moderate: 5.0% - 9.9% positivity

- High: 10.0% - 14.9% positivity
- Very high: ≥15.0% positivity

- The threshold for the start of seasonal influenza activity is a provincial percent positivity level ≥5%. The threshold for inter-seasonal activity is when the provincial percent positivity level is <5%. This aligns with PHAC seasonal thresholds.[10]
- Percent positivity levels for influenza were updated for the 2024-25 surveillance period because the review of the 2023-24 levels identified strong rationale for aligning with levels for COVID-19 for 2024-25. Specifically, the influenza percent positivity levels used in 2023-24 were found to be too high given changes in testing (e.g., greater testing volumes, co-testing of specimen for both influenza and COVID-19) that made influenza testing volumes more similar to those of COVID-19. Prior to this, the 2022-23 influenza percent positivity levels (unchanged for 2023-24 surveillance period) were determined using percent positivity data for influenza from pre-pandemic surveillance periods (2015-16 to 2019-20) and 2022-23; the 2020-21 and 2021-22 surveillance periods were excluded due to percent positivity being <5% most of the time.
- RSV percent positivity levels were developed for the first time for the 2024-25 surveillance period using RSV percent positivity values reported in the previous five seasons (2019-20 to 2023-24). RSV-specific percent positivity levels were deemed necessary as weekly percent positivity for RSV is generally lower than those for COVID-19 and influenza, particularly in post-pandemic seasons. Percent positivity levels for RSV will be reviewed annually and updated as needed.
- COVID-19 percent positivity levels were developed using the following approach:
  - COVID-19 percent positivity levels were developed initially for the 2022-23 surveillance period. COVID-19 percent positivity values reported in 2022 were evaluated against the PHO-developed percent positivity levels for pre-pandemic influenza and other respiratory viruses. It was determined that COVID-19-specific percent positivity levels should be developed because percent positivity for COVID-19 was lower than the percent positivity values that had been used for setting the levels for influenza.
  - The percent positivity levels have been adjusted and narrowed based on observed COVID-19 percent positivity levels throughout the pandemic. For example, during the Omicron surge (wave 5), the Ontario health system experienced an overwhelming number of cases and higher than usual hospital occupancy; the weekly percent positivity at this time reached an all-time high of over 29.4%, which provided the additional context for setting the very high range as ≥25%. After reviewing the minimum, maximum and median percent positivity values, percent positivity levels were selected and these were reviewed by the Ministry of Health and local public health unit partners prior to being finalized.
  - Levels were reviewed ahead of the 2024-25 surveillance period and no updates were required.
- Percent positivity levels were developed for surveillance and situational awareness purposes. Decisions regarding public health action and/or infection prevention and control should not solely rely on percent positivity level thresholds as context specific indicators (e.g., the group at risk, current trajectory of trends, immunization coverage, transmissibility, severity, risk tolerance, as well as local factors such as health care capacity and access to care, current measures in place, etc.) should be considered.
- Provincial percent positivity may not reflect the higher levels of activity that may be occurring disproportionately in select sub-populations at a given time.

Activity Levels and Weekly Indicator Change

- Influenza public health unit activity levels are calculated weekly for each PHU by PHO using case data (individually reported in iPHIS by all PHUs with the exception of two health units up to October 12, 2024; either individually reported in iPHIS or reported in aggregate directly to PHO after October 13, 2024) and outbreak data from iPHIS. Currently, COVID-19 and RSV activity levels are not calculated at the health unit level.
- Weekly indicator change assessment was determined by considering a combination of indicators as detailed in Appendix A for COVID-19, Appendix B for influenza and Appendix C for RSV.

COVID-19, Influenza and RSV Projections

- Projections activity and risk of severe viral respiratory disease (i.e., requiring hospitalization) pertaining to SARS-CoV-2, influenza and RSV are highlighted in the ORVT. Both indicators are determined using laboratory testing and hospitalization data to make predictions on how activity and the risk of severe illness occurring in the pediatric and adult populations might change over the next two weeks.
- Projections shown in the ORVT are intended to provide situational awareness of potential near-term changes in respiratory virus activity in the province. These projections should be used in combination with context-specific indicators (e.g., the group at risk, current trajectory of trends, immunization coverage), consideration of local factors (e.g., health care capacity and access to care), and other measures for assessing respiratory virus activity (e.g., wastewater concentration for SARS-CoV-2, hospital admissions).
- For further details on the projections of respiratory virus activity and severity, the methodology used to create these indicators, and how changes are assessed, refer to the Integrated Respiratory Virus Risk Indicators report.[1]

COVID-19

Case Counts

- Case data from CCM are no longer being updated. However, data up to June 1, 2024 will remain available in the tool and the data considerations below apply.
  - Only cases meeting the confirmed case classification as listed in the MOH Case Definition – Coronavirus Disease 2019 (COVID-19) document are included.[11]
  - Cases of confirmed reinfection, as defined in the provincial case definitions, are counted as unique cases.
  - Reported Date is the date the COVID-19 case was reported to public health.
  - COVID-19 cases from CCM for which the Classification and/or Disposition was reported as ENTERED IN ERROR, DOES NOT MEET DEFINITION, IGNORE, DUPLICATE, or any variation on these values have been excluded. The provincial case count for COVID-19 may include some duplicate records, if these records were not identified and resolved.
  - Male/Female information are sourced from the Sex field in CCM and are intended to represent sex assigned at birth. On October 14, 2021, changes were made in CCM to enable reporting on the Sex field where this data field is supplemented by archived Male/Female information previously entered in the Gender field.

- Orientation of case counts by geography is based on the permanent health unit (also referred to as diagnosing health unit or DHU). DHU refers to the case's public health unit of residence at the time of illness onset and not necessarily the location of exposure. Cases for which the DHU was reported as MOH-PHO (to signify a case is not a resident of Ontario) have been excluded from the analysis.

Case Episodes

- Individuals with a positive PCR/NAAT test result in OLIS are considered to have had a COVID-19 episode, provided that the result is not within 90 days of another positive result. These data are available from August 27, 2023 (2023-week 35) onwards.
- The specimen date is used to place COVID-19 episodes in time.
- Orientation of COVID-19 episodes by geography is based on the public health unit of residence at the time of specimen collection provided the patient's address information was available.
- COVID-19 episodes are not the same as COVID-19 cases since they do not include all laboratory tested individuals that met the provincial case definition. The measure is calculated using laboratory testing data obtained from OLIS, as opposed to case data from a disease reporting system where a case would have been assessed against the provincial case definition by the PHU. Individuals that could not be matched with the Registered Persons Database (RPDB) are also excluded.

Laboratory Testing

OLIS Laboratory Data

- As of June 2, 2024, PD-NOC was replaced by OLIS as the data source for COVID-19 (SARS-CoV-2) testing. OLIS is a more comprehensive data source, which covers virtually all testing laboratories in the province and allows for breakdowns by PHU and age group that were previously not available from PD-NOC.
- The specimen collection date is used to place OLIS data in time.
- The number of tests performed does not reflect the number of specimens or persons tested. More than one test may be performed per person. Duplicate tests for the same person on the same day are removed. The percentage of tests that were positive does not necessarily translate to the number of specimens or persons testing positive.
- OLIS data are assigned to a PHU using patient postal code. Where patient postal code is missing, submitter postal code is used to assign the public health unit. This could lead to test results being assigned to a different PHU from where the tested individual resides.
- PHO Laboratory data are used in the projections. See the COVID-19, Influenza and RSV Projections section for further details.

Severity Indicators

Hospital Bed Occupancy

- Hospital bed occupancy data presents the average daily occupancy count per week of people in hospital (including intensive care unit (ICU)) with active COVID-19 (i.e., tested positive). People may be counted in bed occupancy data for multiple days.

    - The ‘COVID-19 Hospital Bed Occupancy (total)’ indicator accounts for hospital bed occupancy among people in hospital with active COVID-19 (regardless of whether the reason for admission was COVID-19 or a non-COVID-19 related illness with a subsequent positive test for COVID-19).
    - The ‘COVID-19 Hospital Bed Occupancy (due to infection)’ indicator accounts for hospital bed occupancy among people in hospital for active COVID-19 (i.e., admitted, COVID-19 positive and primarily being treated for COVID-19).
- Hospital bed occupancy data are not available by sex.
- Hospital bed occupancy data by public health unit is determined based on the location of the hospital, not the patient’s home address or health unit of residence.
- Hospital bed occupancy data are available by age group, however the age groups presented for these indicators differ from those elsewhere in the tool such as cases from CCM by age group.

Hospital ICU Bed Occupancy

- Hospital ICU bed occupancy (total) represents the average total daily occupancy count per week of people in intensive care unit with laboratory confirmation of SARS-CoV-2 (i.e., tested positive).
- Laboratory confirmation of SARS-CoV-2 may be from any date during the patient’s current ICU admission until ICU discharge or death occurs.
- The data source for this indicator has been updated as of October 25, 2024 and includes ‘total’ people in ICU testing positive for COVID-19. Previously, this indicator accounted for people in ICU ‘because’ of COVID-19 which included people who are currently negative for COVID-19, but admitted or re-admitted to the ICU as a result of their prior COVID-19 illness.
- Start dates for bed occupancy indicators vary. Refer to Appendix D: Table D1 for details.

Deaths (CCM)

- Data on deaths from CCM (up to June 1, 2024) and iPHIS (after June 1, 2024) are likely under-reported as this event may occur after the completion of public health follow up of cases. Cases that died after follow-up was completed may not be captured in CCM or iPHIS.
- For surveillance purposes, a COVID-19 death is defined as a death resulting from a clinically compatible illness in a confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 (e.g., trauma). There should be no period of complete recovery between the illness and the reported death.
- Deaths are determined by using the Outcome and Type of Death fields in CCM or iPHIS. COVID-19 deaths are counted where the Outcome value is ‘Fatal’ and the Type of Death value is not ‘DOPHS was unrelated to cause of death’, ‘Reportable disease was unrelated to cause of death’ or ‘Under PHU Review’.
- COVID-19 deaths are placed in time using the ‘Date of Death’ field in CCM or the ‘Outcome Date’ field in iPHIS.
    - If the date of death is missing in CCM, the outcome date field in CCM is used as a proxy. When there is no outcome date in either CCM or iPHIS, then the case reported date is used.
- COVID-19 deaths in cases 0 to 19 years of age are not stratified by public health unit due to concerns regarding small counts of this sub-population, particularly in smaller health units.

- Historical COVID-19 outcome data between January 15, 2020 to March 31, 2023 were updated as part of a provincial data quality initiative. As a result, changes to historical COVID-19 cases and deaths were included in this tool as of December 1, 2023.

Outbreaks

- Outbreak reported week is based on the outbreak reported date, and if unavailable, the date the public health unit created the outbreak.
- Outbreaks are declared by the local medical officer of health or their designate in accordance with the Health Protection and Promotion Act and criteria outlined in Ministry guidance documents.[7]
- Confirmed outbreaks are defined in Ministry of Health's Appendix 1: Case Definitions and Disease Specific Information for COVID-19.[11] Guidance for specific settings includes: Recommendations for Outbreak Prevention and Control in Institutions and Congregate Living Settings.[12]
    - Note: Prior to May 5, 2021, a confirmed COVID-19 outbreak in a long-term care home or retirement home setting was defined as a single, laboratory-confirmed case of COVID-19 in a resident or staff member.
    - Outbreak definitions have changed over the course of the pandemic and outbreaks were declared based on the definitions in place at the time.
- Data on outbreak settings are based on information entered in CCM up to June 1, 2024 and in iPHIS from June 2, 2024 onwards. Outbreaks with missing setting information and in settings other than long-term care homes (LTCH), retirement homes (RH), and hospitals were excluded from the outbreak severity analyses.
- Public health units indicate the outbreak setting in CCM using the location fields and the exposure setting field in iPHIS. When there is no setting information, the outbreak is reported as having an unknown/missing setting regardless of the information captured in the text field for the outbreak name.
- All data relating to COVID-19 outbreak-associated cases, hospitalizations and deaths in LTCH, RH or public hospitals are based on summary counts reported in CCM up to June 1, 2024 and in iPHIS from June 2, 2024 onwards. The summary counts include cases that are symptomatic or test positive by rapid antigen test (RAT) or by PCR/nucleic acid amplification test. Previously reported counts of COVID-19 cases, hospitalizations and deaths in LTCHs and RHs were based on individual reports of PCR-confirmed cases, which were identified in CCM through linkage to a risk factor and/or outbreak associated with a LTCH, RH or hospital. Due to this difference in ascertainment of outbreak status, summary outbreak counts in this tool should not be compared directly to outbreak indicators in other reports that are based on individually reported laboratory confirmed cases.
- Summary case counts for COVID-19 outbreaks for the 2022-23 surveillance period may be less complete compared to subsequent time periods. Even though PHUs were required to enter summary outbreak case counts, more emphasis was placed on individual case data entry until April 1, 2023 when the reporting requirement was changed to allow PHUs to focus on entry of summary case counts for outbreaks in LTCH, RH, and hospital instead of individual linking of cases to outbreaks in these facilities.
- COVID-19 outbreaks are reported separately and outbreak summary count of cases are all attributed to SARS-CoV-2 when multiple viruses are listed in the outbreak record in iPHIS.

- All outbreaks reported as confirmed are counted even if no summary case counts have been entered in the summary section in iPHIS, with the exception of the Outbreaks > Severity tab where only outbreaks with summary case counts entered are included in the analyses.
- Further data caveats and methods relating to outbreak-associated cases and outbreak severity are outlined in the Outbreak Severity Measures section.

Influenza, RSV and Other Respiratory Viruses

Case Counts – Influenza

- Dates used for laboratory-confirmed influenza cases are based on the date the case was reported to the public health unit (PHU) as recorded in iPHIS (up to October 12, 2024) or directly to PHO in aggregate format by some public health units (as of October 13, 2024).
- Cases of influenza A&B are included in the influenza A counts. In the surveillance periods before the COVID-19 pandemic, cases of influenza A&B made up less than 0.4% of all influenza cases.
- Influenza A cases may be further categorized into a subtype (H3 and H1). Not all laboratory-confirmed influenza A cases have testing completed to determine the subtype. Influenza A case subtype details (e.g., H1N1, H3N2) are available in the Summary> Influenza Strain Details tab of the tool.
- Age and sex data are not available for influenza cases as these data are not required to be reported by PHUs that have opted to report laboratory confirmed cases of influenza in aggregate directly to PHO.
- Severity indicators are not available for influenza cases as data on hospitalization and deaths are not routinely collected and recorded in iPHIS nor required to be reported by PHUs that have opted to report laboratory confirmed cases of influenza in aggregate directly to PHO.

Laboratory Testing

OLIS Laboratory Data

- As of October 13, 2024, use of laboratory testing data from PHAC CERIPP was discontinued and replaced by OLIS as the data source for influenza, RSV and other respiratory viruses. OLIS is more comprehensive; it covers virtually all testing laboratories in the province and allows for breakdowns (i.e., by PHU and age group) that are not available in the testing data from PHAC CERIPP.
- The specimen collection date in the OLIS data is used to place data in time.
- The number of tests performed does not reflect the number of specimens or persons tested. More than one test may be performed per person. Duplicate tests for the same person on the same day are removed. The percentage of tests that were positive does not necessarily translate to the number of specimens or persons testing positive.
- OLIS data are assigned to a PHU using a hierarchy where postal code of the tested individual > practitioner postal code > reporting lab postal code. This could lead to test results being assigned to a different PHU from where an individual resides.

PHAC CERIPP laboratory data

- PHAC CERIPP data are no longer being updated in the tool. However, data up to October 12, 2024 remain available in the tool and the data considerations below apply.

- As of October 13, 2024, OLIS has replaced PHAC CERIPP as the data source for weekly laboratory testing data for influenza, RSV and other respiratory viruses with OLIS data available from June 23, 2024 onwards.
- Percent positivity for influenza and other circulating non-influenza respiratory viruses represents viral respiratory specimens tested by 18 Ontario laboratories, including 11 PHO laboratory locations and seven hospital-based laboratories, that submit results to the PHAC's CERIPP. Therefore these data represent a subset of laboratory tests conducted for each respiratory virus in the province.
- As of the 2022-23 surveillance period, the Shared Hospital Laboratory and the Sault Area Hospital began reporting testing data to CERIPP, resulting in an increase in the weekly number of tests reported.
- Testing data were assigned to a surveillance week based on when test results were reported to PHAC.
- These data represent the number of tests performed and may not necessarily correspond to the number of patients tested as more than one specimen may have been submitted per patient.

PHO Laboratory Data

- PHO Laboratory data are no longer being updated in the tool. However, data up to October 12, 2024 remain available in the tool and the data considerations below apply.
  - Trends over time should be interpreted with caution as PHO's respiratory testing algorithm changed yearly. For current information on testing eligibility, refer to the PHO respiratory viruses (including influenza) Test Information Sheet.[9]
  - Date was assigned using sample collection date if provided or login date (date the sample was received at PHO) otherwise.
  - Public health unit was assigned using patient's postal code if provided and submitter's postal code otherwise.
  - Percent positivity for populations with a small number of individuals tested may be unstable and should be interpreted with caution.
  - Testing data may not be representative of Ontario overall as testing for influenza and other respiratory viruses is also performed by other microbiology laboratories.
  - For further details regarding routine testing of select population groups, refer to PHO's Test information index.[9]
- PHO Laboratory Sentinel Surveillance Network data has been removed from the tool as of October 13, 2024.

Key Changes in PHO's Testing Algorithm

- As of September 20, 2017, routine testing was no longer provided for individuals seen in ambulatory and ED (not admitted) settings.
- From November 2018 to October 2019, PHO did not routinely test for human coronavirus and entero/rhinovirus. Counts for these two viruses should be interpreted with caution for this period.

- As of November 2, 2020, a new laboratory-developed multiplex respiratory virus PCR panel, “FLUVID”, was implemented which includes influenza A, influenza B, SARS-CoV-2, and respiratory syncytial virus.
- As of November 1, 2022, the Ministry of Health and Long-Term Care approved an expanded influenza testing program for long-term care and retirement homes to other laboratories. As such, the volume of specimens tested by PHO for these institutions decreased.
- As of January 2, 2024, symptomatic individuals from Emergency Department or Ambulatory Clinic, who are at risk of severe disease and in whom care or treatment may be impacted by respiratory test results, will be eligible for FLUVID.
- As of October 1, 2024, asymptomatic patients are no longer eligible for COVID-19 testing at PHO.

Influenza Strain Characterization and Antiviral Susceptibility

- Influenza strain characterization is completed for influenza positive isolates received by the National Microbiology Laboratory (NML) from laboratories across Canada, with data available in the tool for Ontario and nationally. The data are cumulative and includes isolates from September 1 of the current season to date.
- Changes in circulating influenza viruses are monitored by antigenic characterization. Antigenic characterization results show how similar the circulating viruses are to reference viruses. Reference viruses represent strains included in the current seasonal influenza vaccine.
- Antiviral susceptibility testing is also completed for isolates received by the NML, with data available in the tool for Ontario and nationally. Oseltamivir and Zanamavir are the two antiviral drugs monitored, with susceptibility categorized as either resistant or susceptible.

PHU Activity Levels

- PHO calculates influenza activity levels weekly for each PHU using case data reported in iPHIS by or aggregate counts reported directly to PHO by other PHUs, and laboratory-confirmed influenza outbreaks in institutions and public hospitals. Influenza public health unit activity levels are not updated once they have been assigned.
    - Due to lags in data entry in iPHIS, the influenza public health unit activity level reported may, in some instances, not align with a PHU’s true activity level.
- Influenza public health unit activity levels calculated for a particular surveillance week may not necessarily correspond to the number of new outbreaks reported in the same week because of ongoing outbreaks from previous weeks.
- Activity level data for Huron Perth Public Health prior to the 2020-21 surveillance period is not available in the map view as this health unit was formerly two separate health units and is unable to be displayed. Similarly, Southwestern Health Unit was formerly two separate health units prior to the 2018-19 surveillance period and therefore data is not available for the periods prior.
- Influenza public health unit activity levels are defined as follows and based on data reported from iPHIS or reported in aggregate directly to PHO:
    - **No activity:** No laboratory-confirmed cases of influenza reported and no ongoing laboratory-confirmed influenza outbreaks in an institution or public hospital.

- **Sporadic**: At least one laboratory-confirmed case of influenza within the surveillance area at any time within the surveillance week based on the date the health unit received the laboratory report, with no ongoing laboratory-confirmed influenza outbreaks in an institution or public hospital.
- **Localized**: At least one ongoing laboratory-confirmed influenza outbreak in an institution or public hospital during the surveillance week even if the outbreak was declared over on the first day of the surveillance week.
- **Widespread:** Multiple ongoing laboratory-confirmed influenza outbreaks in long-term care homes, retirement homes or public hospitals. For PHUs with 30 or more of these institutions or public hospitals, at least 10% must be experiencing an ongoing influenza outbreak to be assessed as having "widespread" activity. For PHUs with fewer than 30 of these institutions or public hospitals, at least 15% must be in an active influenza outbreak. Denominator information is based on the number of long-term care homes, retirement homes and hospitals in each PHU.

Severity Indicators

Hospital Bed Occupancy

- Influenza hospital bed occupancy data presents the average daily occupancy count per week of people in hospital (including intensive care unit (ICU)) with influenza (i.e., tested positive). People may be counted in bed occupancy data for multiple days.
  - The 'Influenza Hospital Bed Occupancy (total)' indicator accounts for hospital bed occupancy among people in hospital with active influenza (regardless of whether the reason for admission was influenza or a non-influenza related illness with a subsequent positive test for influenza).
  - The 'Influenza Hospital Bed Occupancy (due to infection)' indicator accounts for hospital bed occupancy among people in hospital for active influenza (i.e., admitted, influenza positive and primarily treated for influenza).
- RSV hospital bed occupancy data presents the average daily occupancy count per week of people in hospital (including intensive care unit (ICU)) with RSV (i.e., testing positive). People may be counted in bed occupancy data for multiple days.
- Bed occupancy data by public health unit is determined based on the location of the hospital, not the patient's home address or health unit of residence.
- Hospital bed occupancy data are not available by sex.
- Bed occupancy data are available by age group, however the age groups presented for these indicators differ from those elsewhere in the tool such as influenza cases by age group and RSV laboratory tests by age group.
- Start dates for bed occupancy indicators vary. Refer to Appendix D: Table D1 for details.

Outbreaks

- The number of new institutional influenza outbreaks reported for the current week is based on the date/week the outbreak was reported to the PHU; when reported date/week is unavailable, the date/week the outbreak was created in iPHIS is used.
- Outbreaks that do not meet the provincial outbreak definition are excluded from analyses. Refer to Appendix 1: Respiratory Infection Outbreaks in Institutions and Public Hospitals document for current outbreak definitions.[13]

- Outbreaks where influenza is identified are counted under the appropriate influenza category ("Influenza A" or "Influenza B") even if other viruses (other than SARS-CoV-2) are also identified in the outbreak. Outbreaks of "influenza A and B" are included in the counts for outbreaks of influenza A.
- For outbreak severity analyses, all influenza types are grouped under the single category "Influenza (all types)".
- Outbreaks with co-circulation of respiratory viruses other than SARS-CoV-2 and influenza are reported as having been caused by 'more than one pathogen'.
- Public health units use the exposure setting field in iPHIS to indicate the outbreak setting. Outbreaks are reported as having an unknown/missing setting if the exposure setting field is empty.
- Confirmed outbreaks in institutions (as defined in the HPPA) and public hospitals are reported in four groupings in this tool: Long-Term Care Homes (LTCH), Retirement Homes (RH), Hospitals and Other.[7]
- Outbreaks with no exposure setting information and in settings other than LTCHs, RHs and hospitals (e.g., community settings, daycares, schools and childcare facilities) are excluded from the outbreak severity analyses.

Outbreak Severity Measures – All Respiratory Viruses

- All data relating to outbreak-associated cases, hospitalizations and deaths are based on summary case counts reported in the outbreak summary section of iPHIS or CCM (for COVID-19 up to June 1, 2024).
- Outbreak-associated cases are individuals that were line listed for the outbreak (i.e., related to the outbreak) and may include cases that are symptomatic with or without an epidemiologic link, and/or test positive by rapid antigen test (COVID-19 only) or an approved laboratory method (e.g., PCR/nucleic acid amplification test). As summary counts are ascertained differently from individually reported laboratory confirmed cases, direct comparisons are more likely to be inaccurate.
- Hospitalized outbreak-associated cases are individuals who were line listed and met the outbreak case definition and subsequently admitted to hospital because of their infection.
- Deaths are counted as outbreak-related deaths (i.e. excluding deaths where the disease was unrelated to the cause of death) that occurred in individuals who were line listed and met the outbreak case definition.
- Attack rates are calculated as:

$$\frac{\text{(Cases in residents/staff)}}{\text{(Number of residents/staff in the affected area)}}$$

  - If the number of cases or the number of residents/staff in the affected area was not available, then the attack rate for that outbreak was not calculated and not included in the summary of attack rates.
  - Attack rates calculated to be over 100% were set to 100% for the purposes of this tool.

- Case hospitalization rates are calculated as:

$$\frac{\text{Hospitalizations among resident/staff cases occurring as a result of their infection}}{\text{Number of Cases in residents/staff}}$$

  - If the number of hospitalizations is missing, then the hospitalization rate was not calculated and not included in the summary of hospitalization rates.
  - Hospitalization rates calculated to be over 100% were set to 100% for the purposes of this tool.
- Case fatality rate are calculated as:

$$\frac{\text{Deaths among resident/staff cases occurring as a result of their infection}}{\text{Number of Cases in residents/staff}}$$

  - If the number of deaths was missing, then the case fatality rate was not calculated and not included in the summary of case fatality rates.
  - Case fatality rates calculated to be over 100% were set to 100% for the purposes of this tool.
- Duration is measured in days and is calculated as '*Date of onset of illness in last case - Date onset of illness in first case'*. It is not calculated for outbreaks missing either of these dates. If an outbreak had a calculated duration less than 0 days, then the outbreak was excluded from calculations of summary duration measures. Duration is not calculated for ongoing outbreaks.
- The interquartile range (IQR) used for attack, hospitalization and fatality rates as well as outbreak duration is between the 25^{th} and 75^{th} percentiles of the data.

References

1. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Integrated respiratory virus risk indicators for Ontario [Internet]. Toronto, ON: King's Printer for Ontario; 2024 [updated 2024 Oct 18; cited 2024 Oct 24]. Available from: https://www.publichealthontario.ca/-/media/Documents/I/2023/integrated-respiratory-virus-risk-indicators-ontario.pdf
2. Public Health Agency of Canada. Respiratory virus detections in Canada [Internet]. Ottawa, ON: Government of Canada; 2024 [modified 2024 Jul 7; cited 2024 Sep 10]. Available from: https://www.canada.ca/en/public-health/services/surveillance/respiratory-virus-detections-canada.html
3. Statistics Canada. Table 17-10-0134-01: estimates of population (2016 census and administrative data), by age group and sex for July 1st, Canada, provinces, territories, health regions (2018 boundaries) and peer groups [Internet]. Ottawa, ON: Government of Canada; 2023 Mar 2 [extracted 2023 Mar 13]. Available from: https://doi.org/10.25318/1710013401-eng
4. Population Reporting. Population projections public health unit, 2023-2046 [data file]. Toronto ON: Ministry of Finance [producer]; Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor]; [data extracted 2024 Jun 10].
5. Government of Canada. FluWatch week's calendar: 2024-2025 [Internet]. Ottawa, ON: Government of Canada; 2024 [modified 2024 Sep 9; cited 2024 Sep 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/weekly-influenza-reports.html
6. *Designation of Diseases*, O Reg 135/18. Available from: https://www.ontario.ca/laws/regulation/180135
7. *Health Protection and Promotion Act*, RSO 1990, c H-7. Available from: https://www.ontario.ca/laws/statute/90h07
8. Ontario. Ministry of Health; Ministry of Long-term Care. COVID-19 testing and treatment [Internet]. Toronto, ON: King's Printer for Ontario; 2024 [modified 2024 Oct 1; cited 2024 Oct 4]. Available from: https://www.ontario.ca/page/covid-19-testing-and-treatment
9. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Test information index: respiratory viruses (including influenza) [Internet]. Toronto, ON: King's Printer for Ontario; 2023 [updated 2024 Oct 2; cited 2024 Oct 4]. Available from: https://www.publichealthontario.ca/en/Laboratory-Services/Test-Information-Index/Virus-Respiratory
10. Public Health Agency of Canada. Weekly influenza reports [Internet]. Ottawa, ON: Government of Canada; 2024 [modified 2024 Aug 30; cited 2024 Sep 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/weekly-influenza-reports.html
11. Ontario. Ministry of Health. Ontario public health standards: requirements for programs, services, and accountability. Infectious disease protocol. Appendix 1: case definitions and disease-specific information. Disease: coronavirus disease 2019 (COVID-19). Effective: October 2024 [Internet]. Toronto, ON: King's Printer for Ontario; 2024 [cited 2024 Oct 4]. Available from: https://www.ontario.ca/files/2024-10/moh-ophs-coronavirus-disease-2019-en-2024-10-24.pdf

12. Ontario. Ministry of Health. Recommendations for outbreak prevention and control in institutions and congregate living settings. Effective: April 2024 [Internet]. Toronto, ON: King's Printer for Ontario; 2024 [cited 2024 Oct 4]. Available from: https://www.ontario.ca/files/2024-04/moh-recommendations-for-outbreak-prevention-and-control-in-institutions-and-cls-en-2024-04-09.pdf
13. Ontario. Ministry of Health. Ontario public health standards: requirements for programs, services, and accountability. Infectious disease protocol. Appendix 1: case definitions and disease-specific information. Disease: respiratory infection outbreaks in institutions and public hospitals. Effective: September 2024 [Internet]. Toronto, ON: King's Printer for Ontario; 2024 [cited 2024 Oct 4]. Available from: https://www.ontario.ca/files/2024-10/moh-ophs-respiratory-infection-outbreaks-en-2024-10-01.pdf

Appendix A: COVID-19 Indicators

Indicator: Percent Positivity

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If percent positivity in the previous week was under 10%:
  - an increase of 0.5 percentage point or more → **Higher**
  - a change less than 0.5 percentage point → **Similar**
  - a decrease of 0.5 percentage point or more → **Lower**
- If percent positivity in the previous week was 10% or over:
  - an increase of 5% or more → **Higher**
  - a change less than 5% → **Similar**
  - a decrease of 5% or more → **Lower**

Indicator: Outbreaks

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If the number of new outbreaks in the previous week was under 50:
  - an increase of 5 or more outbreaks → **Higher**
  - a change less than 5 outbreaks → **Similar**
  - a decrease of 5 or more outbreaks → **Lower**
- If the number of new outbreaks in the previous week was over 50:
  - an increase of 10% or more → **Higher**
  - a change less than 10% → **Similar**
  - a decrease of 10% or more → **Lower**

Overall Weekly Indicator Change

The interpretation of the weekly indicator change is compared against the current epidemiologic context. When a percent positivity level is crossed (e.g., from low to moderate) this may be considered as well. If there is discordance between the indicator assessments, the magnitude of the change in each indicator is considered.

Appendix B: Influenza Indicators

Indicator: Cases

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If case counts in the previous week were under 50:
  - an increase of 5 or more cases → **Higher**
  - a change less than 5 cases → **Similar**
  - a decrease of 5 or more cases → **Lower**
- If case counts in the previous week were over 50:
  - an increase of 10% or more cases → **Higher**
  - a change less than 10% of cases → **Similar**
  - a decrease of 10% or more cases → **Lower**

Indicator: Percent Positivity

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If percent positivity in the previous week was under 10%:
  - an increase of 0.5 percentage point or more → **Higher**
  - a change less than 0.5 percentage point → **Similar**
  - a decrease of 0.5 percentage point or more → **Lower**
- If percent positivity in the previous week was 10% or over:
  - an increase of 5% or more → **Higher**
  - a change less than 5% → **Similar**
  - a decrease of 5% or more → **Lower**

Indicator: Influenza Outbreaks

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If the number of new outbreaks in the previous week was under 50:
  - an increase of 5 or more outbreaks → **Higher**
  - a change less than 5 outbreaks → **Similar**
  - a decrease of 5 or more outbreaks → **Lower**

- If the number of new outbreaks in the previous week was over 50:
  - an increase of 10% or more → **Higher**
  - a change less than 10% → **Similar**
  - a decrease of 10% or more → **Lower**

Indicator: Public Health Unit Activity Levels

- If average of activity levels is > than in previous week → **Higher**
- If average of activity levels is equal to that of the previous week → **Similar**
- If average of activity levels is < than in previous week → **Lower**

Indicator: Overall Weekly Indicator Change

The interpretation of the weekly indicator change is compared against the current epidemiologic context. When a percent positivity level is crossed (e.g., from low to moderate) this may be considered as well. If there is discordance between the indicator assessments, the magnitude of the change in each indicator is considered and cases and percent positivity are given greater consideration.

Appendix C: RSV Indicators

Indicator: Percent Positivity

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If percent positivity in the previous week was under 10%:
  - an increase of 0.5 percentage point or more → **Higher**
  - a change less than 0.5 percentage point → **Similar**
  - a decrease of 0.5 percentage point or more → **Lower**
- If percent positivity in the previous week was 10% or over:
  - an increase of 5% or more → **Higher**
  - a change less than 5% → **Similar**
  - a decrease of 5% or more → **Lower**

Indicator: Outbreaks

- Any move from 0 → **Higher**
- Any move to 0 → **Lower**
- If the number of new outbreaks in the previous week was under 50:
  - an increase of 5 or more outbreaks → **Higher**
  - a change less than 5 outbreaks → **Similar**
  - a decrease of 5 or more outbreaks → **Lower**
- If the number of new outbreaks in the previous week was over 50:
  - an increase of 10% or more → **Higher**
  - a change less than 10% → **Similar**
  - a decrease of 10% or more → **Lower**

Overall Weekly Indicator Change

The interpretation of the weekly indicator change is compared against the current epidemiologic context. When a percent positivity level is crossed (e.g., from low to moderate) this may be considered as well. If there is discordance between the indicator assessments, the magnitude of the change in each indicator is considered.

Appendix D: Hospital Bed Occupancy Data and Start Dates

Table D1: Start Dates for Bed Occupancy Indicators

Indicator	Start date
COVID-19 hospital bed occupancy (total); overall	April 1, 2020
COVID-19 hospital bed occupancy (total); by age group	October 11, 2021
COVID-19 hospital bed occupancy (due to infection)	January 9, 2022
COVID-19 hospital ICU bed occupancy	April 1, 2020
Influenza hospital bed occupancy (total); overall and by age group*	November 27, 2022
Influenza hospital bed occupancy (total); age groups: 0 to 4, 5 to 11, 12 to 17 years	November 1, 2023
Influenza hospital bed occupancy (due to infection)	November 27, 2022
RSV hospital bed occupancy	November 27, 2022

* Influenza bed occupancy for people aged 0 to 17 years are presented from November 24, 2022 to October 31, 2023 as a single stratum and as of November 1, 2023 as three mutually exclusive age groups (0 to 4, 5 to 11, 12 to 17).

Appendix E: Percent Positivity Levels and Weekly Indicator Change Assessment Data Sources

Table E1: Data Source and Dates for Indicators Used in Weekly Indicator Change Assessments by Disease

Disease	Indicator	Data Source and Dates
COVID-19	Cases	CCM (up to June 1, 2024) **Indicator removed from assessments after June 1, 2024**
COVID-19	Percent Positivity	PD-NOC (up to June 1, 2024) OLIS (after June 1, 2024)
COVID-19	Outbreaks	CCM (up to June 1, 2024) iPHIS (after June 1, 2024)
Influenza	Cases	iPHIS for all PHUs except Toronto Public Health and Ottawa Public Health (up to October 12, 2024) iPHIS or reported in aggregate directly to PHO (after October 12, 2024)
Influenza	Percent Positivity	PHAC CERIPP respiratory virus detection tables (up to October 12, 2024) OLIS (after October 12, 2024)
Influenza	Outbreaks	iPHIS
RSV*	Percent Positivity	OLIS
RSV*	Outbreaks	iPHIS

* RSV percent positivity levels and weekly indicator change assessments began the week of October 13, 2024.

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Technical notes: Ontario respiratory virus tool. Toronto, ON: King's Printer for Ontario; 2024.

How to Cite this Tool

Generic Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario respiratory virus tool >> [indicator title in sentence case] [Internet]. Toronto, ON: King's Printer for Ontario; cYYYY [modified YYYY Mon DD; cited YYYY Mon DD]. Available from: URL

Example Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario respiratory virus tool >> exact title of chart in sentence case [Internet]. Toronto, ON: King's Printer for Ontario; c2024 [modified 2024 Oct 25; cited 2024 Oct 31]. Available from: URL

Disclaimer

Public Health Ontario

Public Health Ontario is an agency of the Government of Ontario 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.

For more information about PHO, visit publichealthontario.ca.

Ontario