TECHNICAL BRIEF

COVID-19 Data Tool

As of November 12, 2021, routine Variants of Concern (VOC) PCR testing of positive COVID-19 samples is no longer being conducted. Eligible positive COVID-19 samples will now be forwarded for whole genome sequencing. Starting on November 16, 2021, VOC and mutation data will be removed from the daily/weekly epidemiological summaries, PHO’s COVID-19 data tool, and the enhanced epidemiological summary Confirmed cases of COVID-19 following vaccination in Ontario. The enhanced epidemiological summary Estimating the Prevalence and Growth of SARS-CoV-2 Variants in Ontario using Mutation Profiles will be discontinued as of November, 17, 2021.

Comprehensive Ontario data on variants will be found in PHO’s Whole Genome Sequencing enhanced epidemiological summary. Historical data on VOCs and mutations can be found on the provincial COVID-19 data webpage.

Background

Public Health Ontario (PHO) developed the COVID-19 Data Tool which contains data on laboratory confirmed cases, confirmed outbreaks of COVID-19 and COVID-19 vaccine uptake in Ontario. This tool will allow users to view summarized COVID-19 data through a series of visuals that shows trends for the province as a whole or for specific sub-populations. The report also contains a summary section that highlights COVID-19 activity in Ontario for key indicators (i.e., change in confirmed cases, number of recent and cumulative confirmed cases, total deaths and hospitalizations, COVID-19 laboratory data for number of tests completed, testing rates and percent positive).

All data, except COVID-19 reproduction and vaccine uptake data, are updated daily (Monday to Friday). Reproduction and vaccine data are updated weekly (on Tuesdays and Thursdays, respectively). Data changes may occur as new case reports and additional case and outbreak details are uploaded. Refer to the COVID-19 Data Tool – Vaccine Uptake technical notes for more information about the vaccine uptake data in the Tool.

Descriptive Measures

Number of Confirmed COVID-19 Cases

- This measure refers to the number of confirmed cases of COVID-19 meeting the MOH Case Definition – Coronavirus Disease (COVID-19).

Number of COVID-19 Hospitalizations

- This measure refers to the number of confirmed COVID-19 cases that reported ever being hospitalized during their infection. It includes cases that are currently hospitalized as well as cases that have been discharged from hospital.
• Includes confirmed cases that were hospitalized due to COVID-19, and cases that were in hospital prior to acquiring the disease.

• Emergency room visits are not included in the number of reported hospitalizations.

• Confirmed cases in an intensive care unit (ICU) are included in this number.

Recent Cases
• Recent cases include confirmed cases with a reported date within the past 14 days using a 3-day lag from date of extraction.

COVID-19 Deaths
• This measure refers to the number of confirmed COVID-19 cases with an outcome of ‘Fatal’ recorded in CCM.

• 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 (i.e., trauma).

COVID-19 Rates
• COVID-19 rates are crude incidence rates that show the number of confirmed COVID-19 cases, deaths or hospitalizations for every 100,000 Ontarians. Rates are calculated for the province as a whole or for sub-groups such as age groups or sex (if selected in the tool). They are calculated by dividing the COVID-19 measure (Cases, Hospitalizations or Deaths) by the total number of people in the applicable population:

\[
\frac{\text{Number of Cases}}{\text{Total number of people in that population}} \times 100,000
\]

7-Day Rolling Average Case Count
• This measure refers to the daily average number of confirmed COVID-19 cases in the previous seven days, using a rolling 7-day window.

New Tests
• This measure refers to the number of COVID-19 tests performed and does not reflect the number of specimens or persons tested. More than one test may be performed per specimen or per person.

Number of COVID-19 Tests Completed
• This measure refers to the number of COVID-19 laboratory tests completed.

• The number of tests performed does not reflect the number of specimens or persons tested. More than one test may be performed per specimen or per person.
Percent Positive

- This measure refers to the percentage of COVID-19 tests performed that were positive for COVID-19.
- The percentage of tests that were positive does not translate to the number of specimens or persons testing positive. More than one test may be performed per specimen or per person.

COVID-19 Outbreaks

- Outbreaks are declared by the local medical officer of health or their designate in accordance to the Health Protection and Promotion Act and criteria outlined in Ministry guidance documents.  
- Only confirmed outbreaks are included in the data tool.

Number of COVID-19 Outbreaks in Long-Term care Homes (LTCH) or Retirement Homes

- A confirmed COVID-19 outbreak in a long-term care home or retirement home is defined as two or more laboratory confirmed COVID-19 cases in residents and/or staff (or other visitors) in a home with an epidemiological link, within a 14-day period, where at least one case could have reasonably acquired their infection in the home.
  - Examples of reasonably having acquired infection in a home include: no obvious source of infection outside the LTCH setting; OR known exposure in the LTCH setting.
  - 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.

Number of COVID-19 Outbreaks in Hospitals

- A confirmed COVID-19 outbreak in a public hospital is defined as two or more laboratory-confirmed COVID-19 cases (patients and/or staff) within a specified area (unit/floor/service) within a 14-day period where both cases could have reasonably acquired their infection in the hospital.
  - Examples of reasonably having acquired infection in hospital include: no obvious source of infection outside of the hospital; OR admitted for 5 or more days before symptom onset (based on the median incubation period of the virus).

Number of COVID-19 Outbreaks in Schools

- A confirmed COVID-19 outbreak in a school is defined as two or more lab-confirmed COVID-19 confirmed cases in students and/or staff (or other visitors) in a school with an epidemiological link, within a 14-day period, where at least one case could have reasonably acquired their infection in the school (including transportation and before/after school care).
Examples of reasonably having acquired infection in school include: no obvious source of infection outside of the school setting; OR known exposure within the school setting.

Number of COVID-19 Outbreaks in Child Care

- A confirmed COVID-19 outbreak in a child care setting is defined as two or more laboratory-confirmed COVID-19 cases within a 14-day period among children, staff/providers or other visitors with an epidemiological link (e.g., cases in the same room, cases that are part of the same before/after school care cohort) where at least one case could have reasonably acquired their infection in the child care setting.

  - Note: Prior to November 9, 2020, a confirmed COVID-19 outbreak in a child care setting was defined as a single, symptomatic, laboratory confirmed case of COVID-19 in a staff member or child as a confirmed COVID-19 outbreak.

Number of COVID-19 Outbreaks in Congregate Living Settings

- A confirmed COVID-19 outbreak in a congregate living setting is defined as one or more cases of COVID-19 in a resident or staff associated with the facility.

- Congregate living settings include homeless shelters, group homes/supportive housing, short-term accommodations, and other congregate setting such as disability-specific communities/congregate settings, hospices, and other shelters.

Number of COVID-19 Outbreaks in Workplace (Non-health Care)

- A confirmed COVID-19 outbreak in a workplace setting is defined as two or more laboratory-confirmed COVID-19 cases with an epidemiological link in the workplace (e.g., same work area, same shift) within a 14-day period where both cases could have reasonably acquired their infection in the workplace.

  - Examples of reasonably having acquired infection in workplace include: no obvious source of infection outside of the workplace; OR known exposure in the workplace.

- Due to the congregate nature of some farm settings, the definition of a farm outbreak may differ from the workplace definition above. Typically, one case in a congregate living area or two cases of COVID-19, either asymptomatic or symptomatic, where there is evidence of COVID-19 transmission in the workplace could result in the declaration of an outbreak.

- Workplace outbreak sub-categories include:

  - Food Processing: A food service establishment that is a commercial operation that processes food for human consumption, and provides processed food for sale and distribution to other business entities such as restaurants and grocery stores.

  - Farm: A workplace comprised of an area of land and its buildings used for growing crops and/or rearing animals.
- **Other workplaces**: Any other setting that is a place of employment. This includes but is not limited to offices as well as warehousing, shipping and distribution centres, manufacturing facilities, mines and construction sites.

### Number of COVID-19 Outbreaks in Other Settings

- The outbreaks in the following locations are determined and declared by local medical officers of health based on their investigation. These will typically require, at a minimum, more than one case in a defined setting within a specific timeframe.

  - **Retail**: A setting in which goods and/or services are sold to individual consumers for their personal use. This includes but is not limited to grocery stores, pharmacies, and shopping malls.

  - **Medical/health services**: A facility or business that provides health or medical services in a community or non-institutional setting. This includes but is not limited to doctors’ offices or clinics, wellness clinics, dental offices, and at home care.

  - **Bar/restaurant/nightclub**: A facility for socialization/entertainment where food and/or drinks may be served.

  - **Recreational fitness**: A facility that provides activities where the primary purpose of the activity is participation, with the related goals of improved physical fitness, fun, and social involvement.

  - **Other recreation/community**: Settings other than recreational fitness settings for spending leisure time. This includes but is not limited to entertainment and event venues, social gatherings (e.g., weddings), and spaces for religious activities.

  - **Personal service settings**: A facility that provides personal services including invasive services that is operated under the O. Reg. 136/18. (E.g. tattoo parlours, hair salons, tanning studios).

  - **Other**: Any setting other than those classified above.

  - **Unknown**: Setting that cannot be classified due to missing or inadequate data.

### Reproduction Number (Re)

- The effective reproduction number (Re) is the average number of secondary cases of infection generated by each person infected with COVID-19.

- An Re greater than 1 means that the overall number of new cases in a region is growing. An Re equal to 1 means the overall number of new cases will remain stable. And a Re less than 1 means the overall number of new cases is decreasing and suggests that COVID-19 is coming under control in a region.

- Re is measured using the EpiEstim package in R. The procedure uses daily reported case counts and a 7-day rolling window for estimation. The mean serial interval was set at 4.5 days with a standard deviation of 2.5 days, as adapted from published estimates.
Doubling Time (Td)

- The doubling time (Td) is an estimate of the number of days it will take for the number of daily COVID-19 cases to double given the current trends in incidence. It is related to the Re; as Re increases, the case doubling time decreases.

- The following formula was used to estimate doubling time, where serial interval was set as 4.5 days with a standard deviation of 2.5 days (as adapted from published estimates\(^5,6\): \(\frac{\text{serial interval}}{\log_2 (\text{reproduction number})}\)

Public Health Unit Distribution

- This measure refers to the number of confirmed COVID-19 cases reported by all 34 public health units.

- 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.

Sex

- This measure uses the Sex field in CCM to indicate the sex of a case as either male, female, or did not specify male or female. See data caveats for more information.

Dates

- Reported Date is the date the case was reported to public health (not the specimen collection/test date).

- Case Episode Date is based on the best estimate of the date of disease onset. This date is calculated based on either the date of symptom onset, specimen collection/test date for the COVID-19 test, or the date the COVID-19 case was reported to public health (not the specimen collection/test date).

- The date of death is determined using the outcome date field for cases marked as ‘Fatal’ in the outcome field.

- Public Reporting Date is the date the public health unit reported the case to Public Health Ontario plus one day to account for the delay in public reporting.
  - In certain instances, when the delay between a case’s specimen collection date and case creation date in CCM is between 7 and 90 days, the public reporting date is replaced with the specimen collection date + 3 days (the mode of the distribution from specimen collection date to public reporting date).
  - In rare circumstances, when this delay is more than 90 days, this date replacement is not made.

- Surveillance week corresponds to the Public Health Agency of Canada (PHAC) influenza surveillance weeks.\(^7\)
Tool Overview

Summary

- This section of the tool presents high level summary information about confirmed COVID-19 cases in Ontario. Data will change as public health units update information in CCM. There are eight metrics on the summary page:
  
  - **Change in cases**: The change in the cumulative number of confirmed COVID-19 cases from the previous day.
  
  - **Recent cases**: Cumulative recent COVID-19 case count and percentage. Recent cases include confirmed cases with a reported date within the past 14 days using a 3-day lag from date of extraction.
  
  - **Total cases**: Refers to: The cumulative number of confirmed COVID-19, as a count and rate per 100,000 population.
  
  - **Total hospitalized**: The number of COVID-19 cases that reported ever being hospitalized, as a count, rate per 100,000 population and proportion.
  
  - **Total deaths**: The number of deaths reported amongst COVID-19 cases as a count, rate per 100,000 population and proportion.
  
  - **New tests**: The number of daily tests performed for COVID-19 as well as the rate of tests performed daily per 100,000 population. The number of tests performed does not reflect the number of specimens or persons tested. More than one test may be performed per specimen or per person.
  
  - **Daily percent positive**: This measure refers to the percentage of daily COVID-19 tests performed that were positive for COVID-19. It does not translate to the number of specimens or persons testing positive in a given day. More than one test may be performed per specimen or per person.
  
  - **Total tests**: The number of cumulative tests performed for COVID-19 as well as the cumulative rate of tests performed to date per 100,000 population.

Case Trends

- This tab displays trends in counts, hospitalizations and deaths over time amongst confirmed COVID-19 cases.
  
- The time period displayed can be modified.
  
- Hospitalizations include all COVID-19 cases reported as ever being hospitalized during their infection.
• Data can be viewed for Ontario or by local public health unit and by daily or weekly period. Case and hospitalization data can be viewed by episode or reported date type. Deaths are displayed by date of death.

• Data can be presented as counts with 7-day rolling averages, rates per 100,000 population or both.

• A grey background is used to indicate days for which data are more likely to change as a result of lags in case identification, reporting and/or data entry.

**Age and Sex**

• This tab displays confirmed COVID-19 cases, hospitalizations and deaths for recent or cumulative confirmed cases by 5- to 10-year age groupings, sex and geography (Ontario, or any of the 34 local public health units).

• Hospitalizations include all cases reported as ever being hospitalized during their infection.

• Recent cases include confirmed cases with a reported date within the past 14 days using a 3-day lag from date of extraction.

• Data can be presented as counts, rates per 100,000 population or both.

**Map**

• This tab displays confirmed COVID-19 cases, hospitalizations and deaths for recent or cumulative confirmed cases and corresponding rates per 100,000 population by public health unit.

• Recent cases include confirmed cases with a reported date within the past 14 days using a 3-day lag from date of extraction.

• Public Health Unit data can be viewed when selecting the public health unit on the graph.

**Acquisition**

• This tab displays confirmed COVID-19 cases by acquisition type and geography (Ontario, or any of the 34 local public health units).

• Acquisition types include: Outbreak, Close contact, No known Epi-link, Travel, No Information, and Epi Link - type unspecified. See data caveats for a description of these categories.

• The data are presented by reported date. The time period displayed can be modified.

• A grey background is used to indicate days for which data are more likely to change as a result of lags in case identification, reporting and/or data entry.

**Reproduction**

• This tab displays the estimated reproduction number (Re) and doubling time (Td) of confirmed COVID-19 cases over time. The shaded areas display 95% credible intervals for these estimates,
which represent the range in estimates where the true estimates lies with 95% probability, based on observed data.

- The data are presented by public reporting date. The time period displayed can be modified.
- The data can be viewed by geography (Ontario, or any of the 34 local public health units) and data for multiple geographies can be selected and compared at once, with or without 95% credible interval.
- The Re is not shown when there are fewer than 12 cases in the last 7 days for a local public health unit, as these estimates are less reliable.
- When Td estimates are greater than 100 days, it is reported as >100.

**Outbreaks**

- This section of the tool presents high level summary information about confirmed COVID-19 outbreaks in Ontario.

- There are 8 summary boxes that display the number of ongoing outbreaks in hospitals, long-term care homes, retirement homes, school and childcare, congregate living, workplace and other settings when “All categories” is selected under the Setting dropdown menu. When an outbreak setting category is selected in the “Setting” dropdown menu, the summary of ongoing outbreaks updates to display the number of ongoing outbreaks in each of the setting sub-categories. This summary can be viewed for Ontario or by local public health unit.

- Cumulative outbreak data in the graph can be viewed for Ontario or by local public health unit and by daily or weekly period (by Surveillance week) as well as by outbreak setting category (All categories, Congregate Care, Congregate Living, School and Childcare, Workplace and Other).

- A grey background is used to indicate days for which data are more likely to change as a result of lags in case identification, reporting and/or data entry.

**Lab Tests**

- This tab displays the number of COVID-19 tests completed by a network of laboratories across the province as well as the percentage of those tests that were positive (percent positive).

- The time period displayed can be modified.

- Laboratory testing data was made available starting March, 29 2020. Percent positivity data was made available starting April 16, 2020.

- Note: The data displays the number of tests completed not the number of people tested.

**Data Limitations**

The following limitations apply to the data presented in the COVID-19 Data Tool.
Data Sources

- Case data for this report were based on information extracted from the Public Health Case and Contact Management Solution (CCM) for all PHUs at 1 pm the day prior to posting in the COVID-19 Data Tool.

- CCM is a dynamic disease reporting systems, which allow ongoing updates to data previously entered. As a result, data extracted from CCM represent a snapshot at the time of extraction and may differ from previous or subsequent reports.

- Ontario population estimate data were sourced from Statistics Canada.8

- Laboratory testing data for this tool were based on information from The Provincial COVID-19 Diagnostics Network, reported by member microbiology laboratories.

Data Caveats

- The data only represent cases reported to public health units and recorded in CCM. As a result, all counts will be subject to varying degrees of underreporting 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, and reporting behaviours.

- Hospitalization includes all cases reported as ever being hospitalized. It includes cases that have been discharged from hospital as well as cases that are currently hospitalized. Emergency room visits are not included in the number of reported hospitalizations.

- ICU admission includes all cases for which admission to an ICU was reported at the time of data extraction. It is a subset of the count of hospitalized cases. It includes cases that have been treated or that are currently being treated in an ICU.

- Data on hospital admissions, ICU admissions and deaths are likely under-reported as these events may occur after the completion of public health follow up of cases. Cases that were admitted to hospital or died after follow-up was completed may not be captured in CCM.

- Likely source of acquisition is determined by examining the epidemiologic link and epidemiologic link status fields in CCM and local systems. If no epidemiologic link is identified in those fields the risk factor fields are examined to determine whether a case travelled, was associated with a confirmed outbreak, was a contact of a case, had no known epidemiological link (sporadic community transmission) or was reported to have an unknown source/no information was reported. Some cases may have no information reported if the case is untraceable, was lost to follow-up or referred to FNIHB. Cases with multiple risk factors were assigned to a single likely acquisition source group which was determined hierarchically in the following order:
  
  o For cases with an episode date on or after April 1, 2020: Outbreak-associated > close contact of a confirmed case > travel > no known epidemiological link > information missing or unknown

  o For cases with an episode date before April 1, 2020: Travel > outbreak-associated > close contact of a confirmed case > no known epidemiological link > information missing or unknown
• The Ontario population data file used to calculate rates was updated on August 3, 2021. The file now uses population estimates for 2020 instead of population projections as a proxy for the Ontario population. This may result in differences in rates compared to those reported in previous weeks.

• Male/Female information presented in the Tool 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.

• Lags in CCM data entry due to weekend staffing may result in lower case counts than would otherwise be recorded.

• Only cases meeting the confirmed case classification as listed in the MOH Case Definition – Coronavirus Disease (COVID-19) document are included. Cases of confirmed reinfection, as defined in the provincial case definitions, are counted as unique investigations.

• Case classification information may be updated for individuals with a positive result issued from a point-of-care assays.

• Due to differences in reporting timeframes, counts presented here may not align with counts presented on public health units’ websites. For discrepancies in counts, data presented on the public health unit website should be used.

• Orientation of case counts by geography is based on the diagnosing health unit (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 (to signify a case that is not a resident of Ontario) have been excluded from the analyses.

• 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.

• Recent cases include confirmed cases with a reported date within the past 14 days using a three day lag from the time of extraction.

• 7-day rolling average case count is the daily average case count in the previous 7 days and is calculated using a 7-day advancing window for the average.

• Deaths are determined by using the outcome field in CCM. Any case marked ‘Fatal’ is included in the deaths data. The CCM field Type of Death is not used to further categorize the data.
  o The date of death is determined using the outcome date field for cases marked as ‘Fatal’ in the outcome field.

• Outbreak reported week is based on the outbreak reported date, and if unavailable, the date the public health unit created the outbreak.
• Surveillance weeks were created to align with the Public Health Agency of Canada (PHAC) influenza surveillance weeks.7

• Ongoing outbreaks are those that are reported in CCM as ‘Open’ without a ‘Declared Over Date’ recorded.

• School classification types are defined by the Ministry of Education.
  o Elementary/Secondary schools include public or private schools educating children in a combination of elementary and secondary grades (e.g., Kindergarten to Grade 8, Grades 9 to 12, and Kindergarten to Grade 12).
  o Some schools classified as secondary may also have an intermediate school in the same location that start in Grade 7.

• Outbreaks are declared by the local medical officer of health or their designate in accordance to the Health Protection and Promotion Act and criteria outlined in Ministry guidance documents.

• School outbreaks include outbreaks declared on or after week 36 (August 30 to September 5, 2020).

• The number of tests performed does not reflect the number of specimens or persons tested. More than one test may be performed per specimen or per person. As such, the percentage of tests that were positive does not necessarily translate to the number of specimens or persons testing positive.

• Reproduction number is measured using the EpiEstim package in R.4 EpiEstim uses a Markov Chain Monte Carlo sampling procedure, and the median represents the middle of the distribution of most probable values of the reproduction number.

• For reproduction number analyses, all cases since initial importation were presumed to be locally transmitted. Further, the estimates of the reproduction number are influenced by the choice of serial interval. As such, the reported estimates in the analysis are subject to change as additional data on the estimated serial interval are published.

• The public reporting date lags (comes after) the case infection date; as such, public reporting dates likely represent infections that occurred approximately 10 days earlier. The public reporting date was specifically chosen to provide an early signal for increasing cases. This early signal would typically be challenging to derive using either case episode date or reported date due to further lags in data entry and back-filling.

• Due to de-duplication efforts, cases from Toronto Public Health first appearing on February 10 and 11 and with a case created date in January were assigned a public reporting date based on case created date + 1.
References


Citation


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