Public Health Ontario | Santé publique Ontario

Enhanced Epidemiological Summary

(ARCHIVED) COVID-19 in Ontario: A Summary of Wave 1 Transmission Patterns and Case Identification

Published: July 2020
Archived: December 2023

This report includes the most current information available from iPHIS and other local case management systems (iPHIS plus) as of **July 15, 2020**.

A Daily Epidemiological Summary, a Weekly Epidemiological Summary, as well as additional Enhanced Epidemiological Reports are available on the Public Health Ontario website.

Purpose

This report provides a focused analysis of the COVID-19 outbreak in Ontario to date. The report describes how transmission patterns, testing strategy and case detection, time to case identification, as well as severe outcomes have changed over the course of the outbreak. The report also puts these changes over time within the context of key public health measures. All data in this report are preliminary and may change as more case reports and case details are received.

Highlights

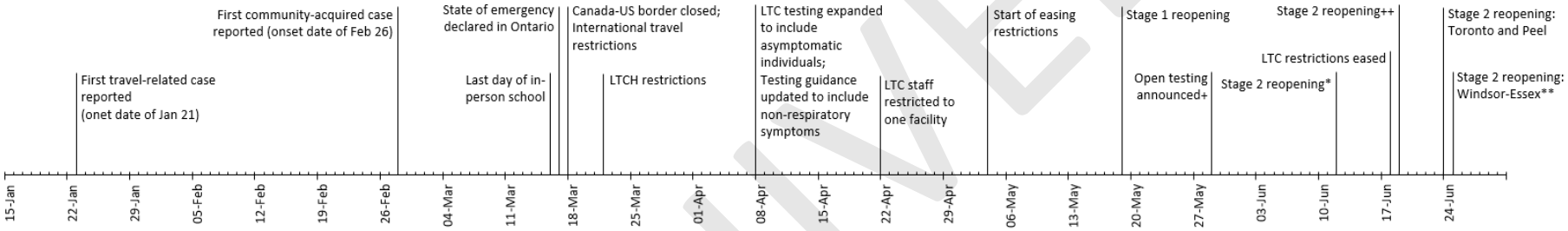
- As of July 15, there were 37,163 confirmed cases of COVID-19 reported in Ontario.
- Early in the outbreak, transmission was primarily driven by travel-related cases which peaked in mid-March. By early to mid-April cases were predominantly linked to outbreaks in long-term care homes (LTCH). Since May, the majority of cases have reported close contact with a confirmed case (including household transmission).
- The types of symptoms reported by cases have changed throughout the course of the outbreak as testing strategies have evolved. Early in the outbreak a large proportion of cases reported fever, cough and shortness of breath. This proportion later declined following expanded testing criteria which included non-respiratory symptoms and asymptomatic individuals.

- Timely case identification, measured by the number of cases tested within zero to four days of symptom onset, increased over the course of the outbreak. For the months of May and June, 62.7% of cases were tested within zero to four days of symptom onset.
- The time to testing also differed by types of exposures reported by cases. The median time from symptom onset to testing for cases with a known epidemiological link (such as cases that were part of an outbreak) was three days compared to four days for cases with no known epidemiological link. In particular, the median time from symptom onset to testing was two days for cases that were part of an outbreak.

Timeline of Key Events

Figure 1 shows a timeline of key events that have occurred throughout the course of the COVID-19 outbreak in Ontario (to July 15, 2020). The reported dates for the first the travel-related and community-acquired cases, key public health measures, and major changes to testing criteria are shown. Throughout the report, select measures most relevant for context for the particular analysis are indicated in figures.

Figure 1. Timeline of key events in COVID-19 outbreak in Ontario (January 15, 2020 to 15 July 2020)



[+] Testing open to all individuals in the province. This included symptomatic individuals as well as risk-based testing for asymptomatic individuals, including essential workers and individuals that were concerned they may have been exposed.

* Includes the following public health units: Algoma, Brant County, Chatham-Kent, Eastern Ontario, Grey Bruce, Haliburton Kawartha Pine Ridge, Hastings Prince Edward, Huron Perth, Kingston Frontenac Lennox and Addington, Leeds Grenville and Lanark District, Middlesex-London, North Bay Perry Sound, Northwestern, Ottawa, Peterborough, Porcupine, Sudbury and Districts, Region of Waterloo, Renfrew County, Simcoe-Muskoka, Southwestern, Thunder Bay District, Timiskaming, Wellington-Dufferin Guelph

[++] Includes the following publc health units: Durham Region, Haldimand-Norfolk, Halton Region, Hamilton, Lambton, Niagara Region, York Region

** Excluding Leamington and Kingsville

Transmission Patterns

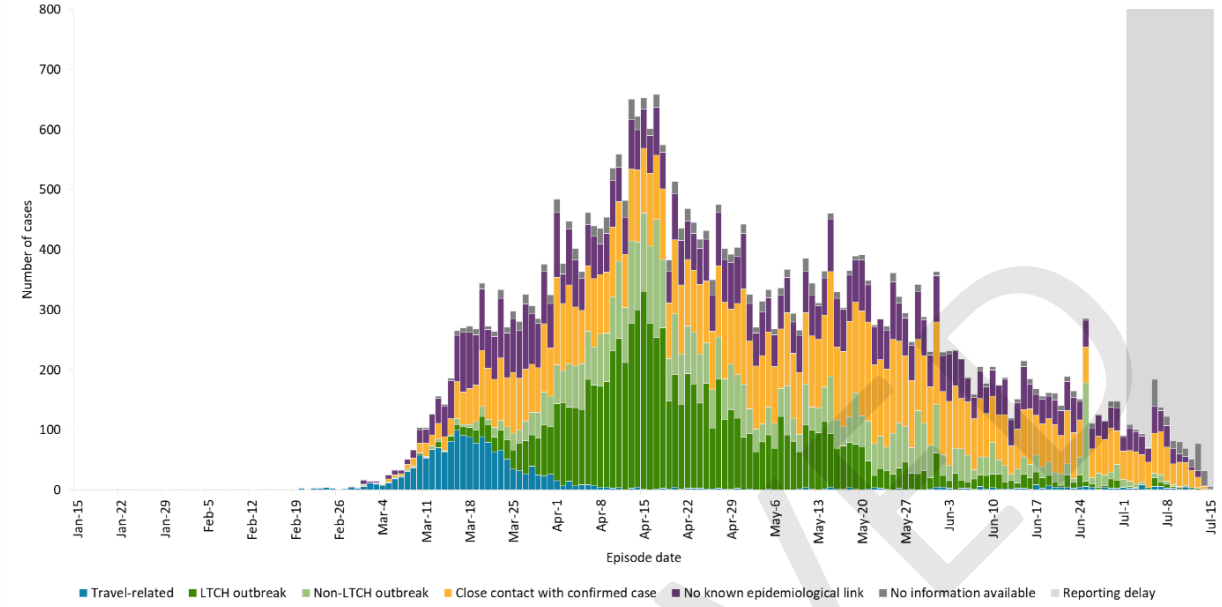
The types of acquisition exposures reported by cases are important in describing transmission in an outbreak, as well as describing how transmission patterns have changed over the course of the outbreak. Initially, in late-January, the outbreak was driven by travel-related cases (Figure 2). Travel-related cases peaked in mid-March, however account for a very small number of cases between the end of March until mid-July. The decline coincided with international travel restrictions, including closing the Canada-US border to all non-essential travel on March 18.

Figures 3a shows a subset of the cases in Figure 2. It includes only cases linked to an outbreak, including outbreaks at long-term care homes (LTCH) and other non-LTCH outbreak settings (such as retirement homes (RH), hospitals, workplaces, and farms). The vast majority of outbreak cases were associated with LTCH. LTCH outbreak cases began in February and increased with the majority occurring in mid-April. Between mid-April and mid-July, the number of outbreak-related cases, including those linked to LTCH, have continued to decline.

Figures 3b also shows a subset of the cases in Figure 2. It shows cases reporting travel, close contact with a confirmed case (including household contacts), and cases reporting no known epidemiological link. Cases with no known epidemiological link are those where a likely exposure could not be determined (i.e. the cases were not reported to be linked to an outbreak or have contact with another confirmed case). Cases reporting close contact with a confirmed case and those with no known epidemiological link increased from mid to late-February (Figure 3b). Following the declaration of a provincial state of emergency on March 17, cases reporting close contact with a confirmed case and those with no known epidemiological link remained relatively stable and the overall increasing trend (shown in Figure 2) was driven largely by cases linked to LTCH outbreaks. A small increase in cases reporting close contact with a confirmed case and those with no known epidemiological link was observed in mid to late May, following the initial easing of public health measures.

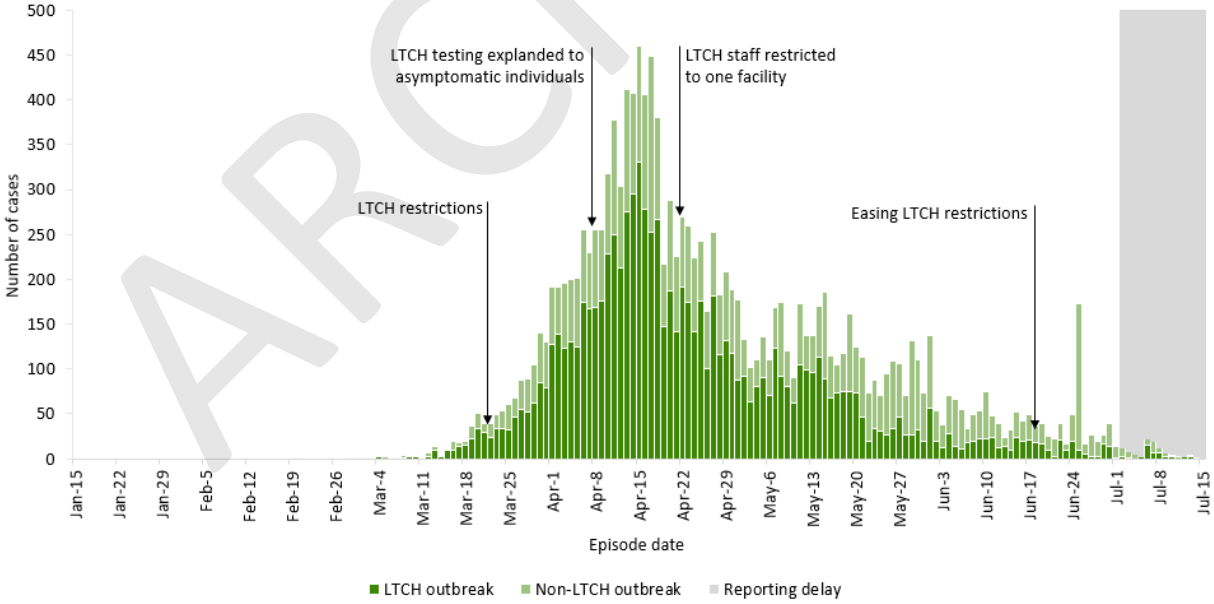
Ontario entered Stage 1 of Framework for Reopening the Province on May 19, 2020 and most of the province entered Stage 2 on June 12. By June 25 all of Ontario (with the exception of two regions with in Windsor-Essex Country Health Unit) had entered stage 2. Re-opening has continued beyond the timeframe described in this report. Between late May and mid-July, cases reporting close contact with a confirmed case and those with no known epidemiological link appear to be declining. However, the number of cases where information is unknown or missing is higher during the reporting lag period as investigations are ongoing.

Figure 2. Confirmed cases of COVID-19 by most likely source of acquisition and approximation of symptom onset date: Ontario, January 15, 2020 to July 15, 2020



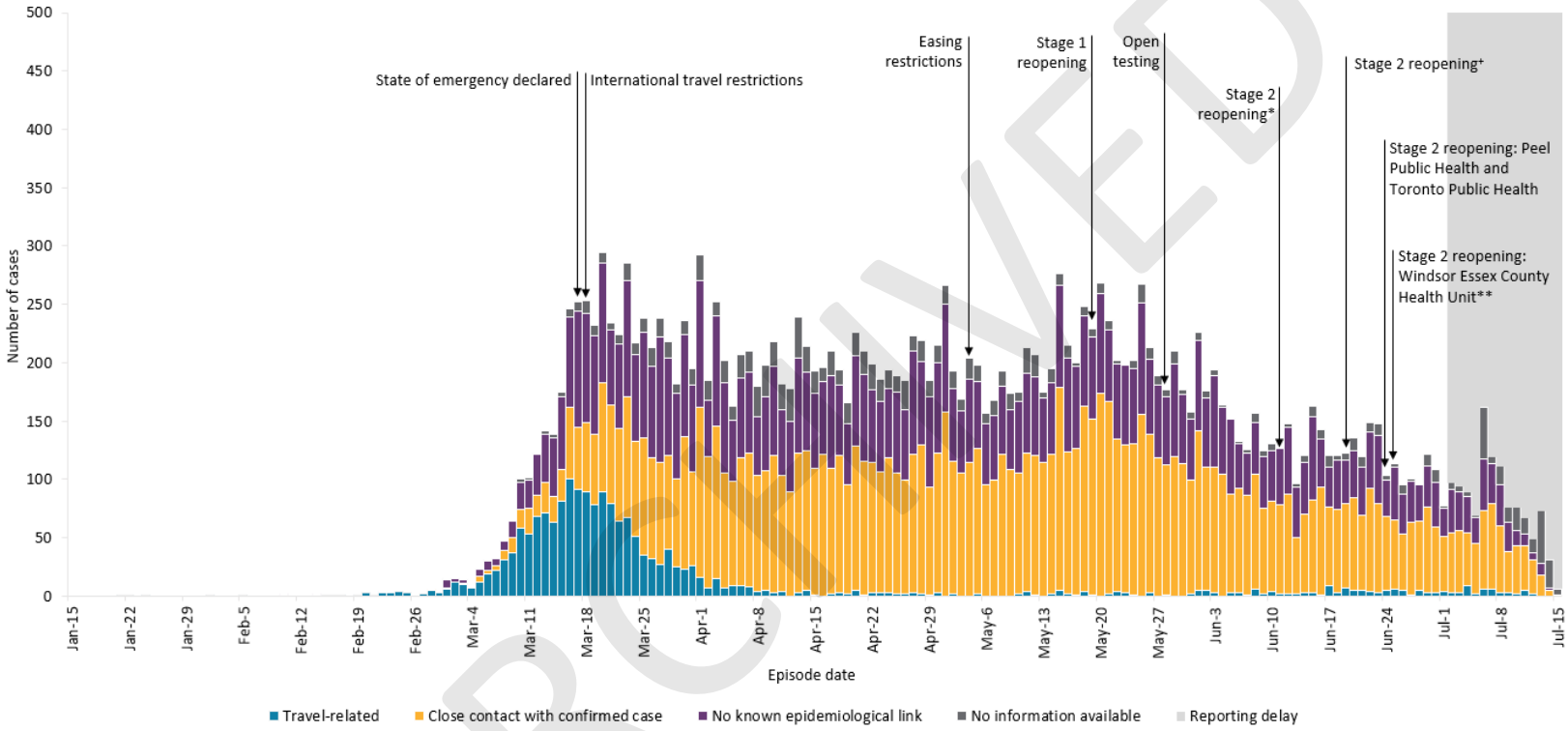
Note: The episode date is an estimate of symptom onset in a case.
Data Source: iPHIS plus

Figure 3a. Confirmed cases of COVID-19 linked to an outbreak by approximation of symptom onset date: Ontario, January 15, 2020 to July 15, 2020



Note: The episode date is an estimate of symptom onset in a case.
Data Source: iPHIS plus

Figure 3b. Confirmed cases of COVID-19 not linked to an outbreak by approximation of symptom onset date: Ontario, January 15, 2020 to July 15, 2020



* Inlcudes the following public health units: Algoma, Brant County, Chatham-Kent, Eastern Ontario, Grey Bruce, Haliburton Kawartha Pine Ridge, Hastings Prince Edward, Huron Perth, Kingston Frontenac Lennox and Addington, Leeds Grenville and Lanark District, Middlesex-London, North Bay Perry Sound, Northwestern, Ottawa, Peterborough, Procupine, Sudbury and Districts, Region of Waterloo, Renfrew County, Simcoe-Muskoka, Southwestern, Thunder Bay Dsictrict, Timiskaming, Wellington-Dufferin Guelph

+ Includes the following publc health units: Durham Region, Haldimand-Norfolk, Halton Region, Hamilton, Lambton, Niagara Region, York Region

** Excluding Leamington and Kingsville

Note: The episode date is an estimate of symptom onset in a case.

Data Source: iPHIS plus

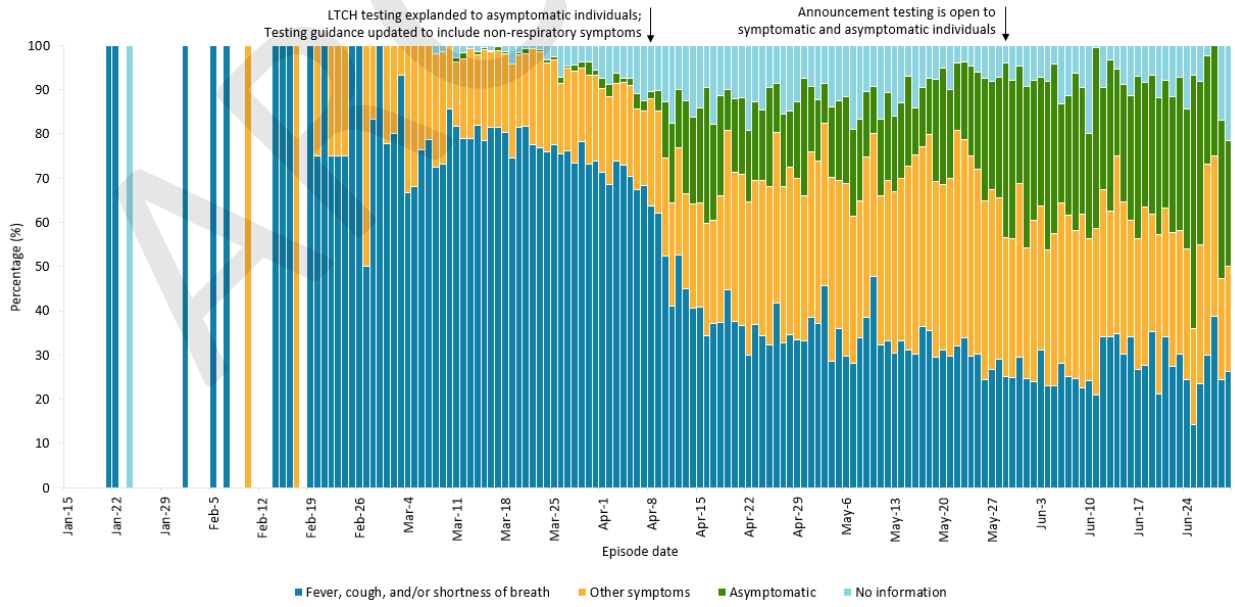
Testing Strategy and Case Detection

Detection and reporting of cases is strongly influenced by the laboratory testing strategy (i.e. who is tested). The testing strategy in Ontario has changed over time as symptoms associated with COVID-19, laboratory testing capacity, and priority populations have evolved over the course of the outbreak. Figure 4 shows the proportion of cases by reported symptom type up to June 30. Due to delays in reporting, and in particular collecting and reporting symptom information, cases are shown until the end of June.

Earlier in the outbreak, testing prioritized individuals reporting respiratory symptoms (such as fever, cough and shortness of breath). On April 8, provincial testing guidelines were updated to include non-respiratory symptoms such as headache, nausea/vomiting, diarrhea, and olfactory or taste disorders. Testing in LTCH and RH was also expanded to include asymptomatic individuals, such that following the identification of a single positive COVID-19 case all residents and staff were tested. Following these changes to testing, the proportion of cases with fever, cough, and/or shortness of breath declined while the proportion of cases with other symptoms as well as asymptomatic cases increased.

On May 29, an announcement was made that testing was open to all individuals in the province. This included symptomatic individuals as well as risk-based testing for asymptomatic individuals, including essential workers and individuals that were concerned they may have been exposed. Following these changes, the proportion of asymptomatic cases further increased. Despite the increasing proportion of asymptomatic cases, the overall number of asymptomatic cases has remained low throughout the outbreak and accounts for only 18.5% (6,203 cases) of cases where symptom information is available. For information related to testing and percent positivity, refer to the Daily Epidemiological Summary.

Figure 4. Confirmed cases of COVID-19 by symptom type and approximation of symptom onset date: Ontario, January 15, 2020 to June 30, 2020



Note: The episode date is an estimate of symptom onset in a case.
Data Source: iPHIS plus

Time to Case Identification and Reporting

Timely case identification through early testing and reporting to public health is a key outbreak control measure. It allows for interventions, such as self-isolation, to be implemented as soon as possible during the period of communicability in order to prevent further spread. Table 1 shows the number of days from onset of first symptom to testing. The analysis includes confirmed cases with a symptom onset date and where a positive laboratory result was reported five days prior to symptoms onset [1] and less than 28 days after symptom onset,[2] among cases where symptoms were reported. Cases with onset and specimen collection dates outside this range (517 cases) were excluded as it could not be determined if the if symptom onset was related to the positive laboratory result. Further, cases where a symptom onset date and specimen collection date or where no symptom information was reported were not available (10,952 cases) were also excluded.

The majority of cases were tested when symptomatic (i.e. tested after symptom onset), with only 6.2% (1,600 cases) of cases tested prior to developing symptoms. This may represent individuals that were tested as a result of contact with a confirmed case or as part of the LTCH or RH outbreak and surveillance testing strategies where all residents and staff were tested, regardless of symptoms.

A large proportion of confirmed cases 24.4% (6,266 cases) were tested immediately following symptom onset (either the same day they developed symptoms or within one day of developing symptoms) and 32.8% (8,437 cases) were tested within two to four days of developing symptoms. The proportion of cases tested within zero to four days from symptom onset has increased over time (Table 2, Figure 5). From mid-January to the end of February, only 31.0% of cases were tested within zero to four days of symptoms onset, compared to May and June where 62.7% of cases were tested within zero to four days of symptom onset. The increase in early testing over time (and corresponding decline in delayed testing) may be a result of improved testing capacity, changes in testing assays, expanded testing criteria, and greater public awareness.

The number of days from symptom onset to testing differed across exposure types (Table 3). The median number of days from symptom onset to testing (three days) was shorter for cases with an epidemiological link compared to cases with no known epidemiological link (four days). Among cases with an epidemiological link, the median time to testing was shortest for cases with a link to an outbreak setting (two days) compared to cases reporting close contact with a confirmed case (three days) and cases reporting travel outside of Ontario (five days).

The number of days from symptom onset to testing also differed by type of reported symptoms. For cases reporting at least one symptom the median time to testing was the three days. The median time to testing was also three days for cases reporting fever, cough, and/or shortness of breath – symptoms commonly associated with respiratory infection – and cases reporting headache and/or neurologic symptoms. The median number of days was longer (four days) for cases reporting gastrointestinal symptoms – symptoms that are less commonly associated with respiratory infections.

Table 1. Timeframe for specimen collection relative to symptom onset for cases reporting symptoms: Ontario, January 15 to July 15, 2020

Timeframe for specimen collection relative to symptom onset	Number of cases	% of cases
1-5 days prior to onset	1,600	6.2
0-1 days after onset	6,266	24.4
2-4 days after onset	8,437	32.8
5-7 days after onset	4,377	17.0
8-14 days after onset	3,801	14.8
15-28 days after onset	1,213	4.7
Total	**25,694**	**100.0**

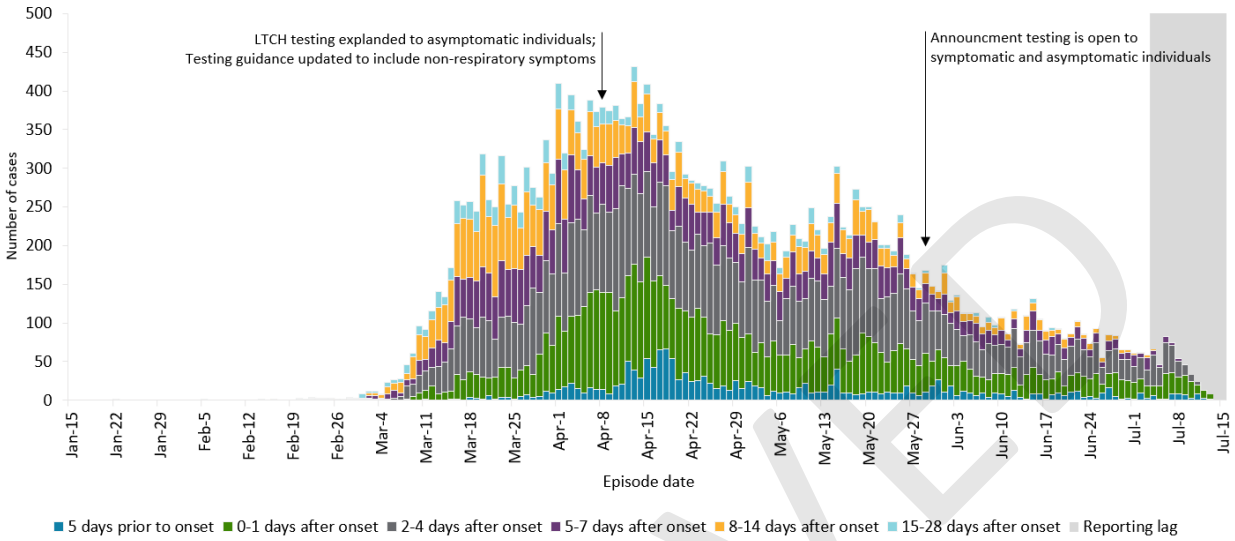
Data Source: iPHIS plus

Table 2. Timeframe for specimen collection relative to symptom onset for cases reporting symptoms: Ontario, January 15 to June 30, 2020

Timeframe for specimen collection relative to symptom onset	Number of cases Jan 15-Feb 29	% cases Jan 15-Feb 29	Number of cases Mar 1-Apr 30	% cases Mar 1-Apr 30	Number of cases May 1-Jun 30	% cases May 1-Jun 30
1-5 days prior to onset	1	3.4	889	5.7	648	6.8
0-1 days after onset	2	6.9	3,594	23.2	2,427	25.4
2-4 days after onset	7	24.1	4,601	29.7	3,575	37.4
5-7 days after onset	5	17.2	2,737	17.7	1,573	16.4
8-14 days after onset	7	24.1	2,732	17.7	1,053	11.0
15-28 days after onset	7	24.1	913	5.9	293	3.1
Total	**29**	**100.0**	**15,466**	**100.0**	**9,569**	**100.0**

Data Source: iPHIS plus

Figure 5. Confirmed cases of COVID-19 by number of days to testing and approximation of symptom onset date: Ontario, January 15, 2020 to July 15, 2020



Note: The episode date is an estimate of symptom onset in a case.
Data Source: iPHIS plus

Table 3. Number of days from onset to specimen collection by group for cases reporting symptoms: Ontario, January 15 to July 15, 2020

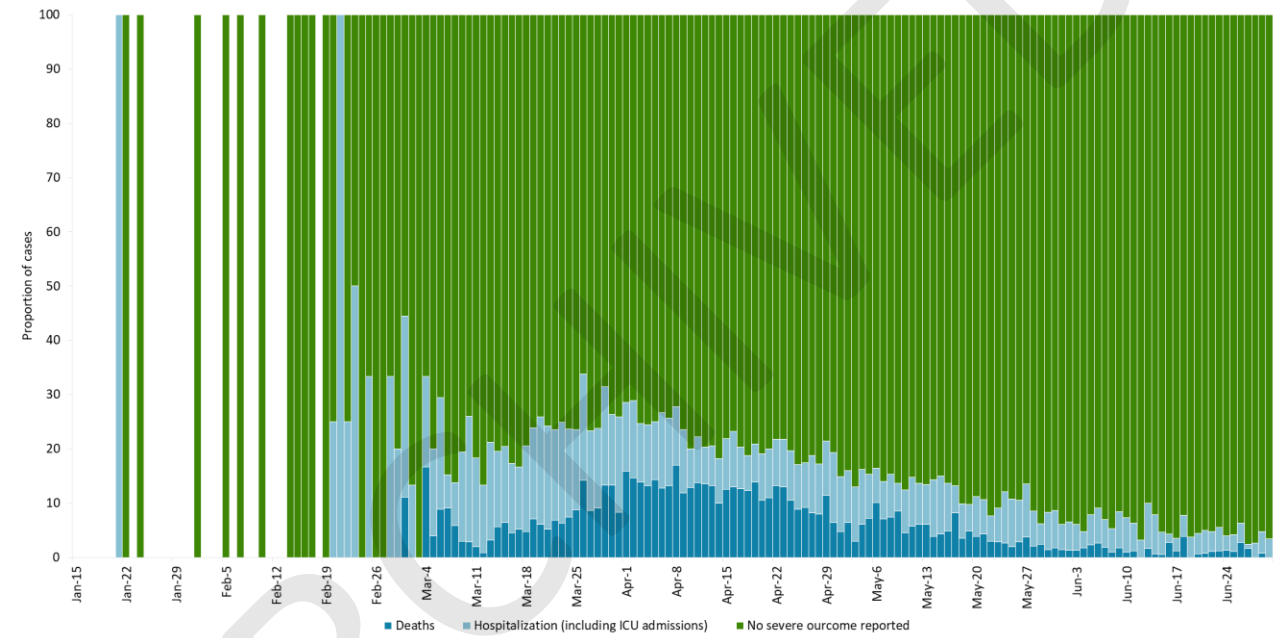
Group	Median	Number of cases
Epidemiological link	3	19,143
Outbreak	2	8,309
Contact with a confirmed case	3	9,147
Travel-related	5	1,687
No known epidemiological link	4	6,073
Symptomatic		
At least one symptom reported	3	25,464
Fever, cough, shortness of breath	3	15,949
Headache or neurologic	3	9,459
Gastrointestinal	4	5,818

Note: Symptoms categories are not mutually exclusive as cases can report multiple symptoms.
Data Source: iPHIS plus

Severe Outcomes

Severity of illness in an outbreak is important to inform decision-making related to the implementation of prevention and control measures. Figure 6 shown the proportion of cases by severe outcomes up to June 30. Due to delays in reporting, and in particular reporting severe outcomes, cases are shown until the end of June. The proportion of cases reporting hospitalizations (including intensive care unit (ICU) admissions) was highest in mid to late-March and the proportion of reported deaths was highest in April. Both the proportion of hospitalizations and deaths have since declined. The decline in cases with severe outcomes is likely related to the decline in cases reported in LTCH.

Figure 6. Confirmed cases of COVID-19 by ranked level of severity and approximation of symptom onset date: Ontario, January 15, 2020 to June 30, 2020



Technical Notes

Data Sources

- The data for this report were based on:
    - Information extracted from the Ontario Ministry of Health (Ministry) integrated Public Health Information System (iPHIS) database, as of **July 15, 2020 at 4 p.m.**
    - Information successfully uploaded to the Ministry from Local Systems: Toronto Public Health (Coronavirus Rapid Entry System) CORES, The Ottawa Public Health COVID-19 Ottawa Database (The COD) and Middlesex-London COVID-19 Case and Contact Management Tool (CCMtool) as of **July 15, 2020 at 2 p.m.**
- iPHIS and iPHIS plus (which includes iPHIS, CORES, The COD and COVID-19 CCMtool) are dynamic disease reporting systems, which allow ongoing updates to data previously entered. As a result, data extracted from iPHIS and the Local Systems represent a snapshot at the time of extraction and may differ from previous or subsequent reports.

Data Caveats:

- The data only represent cases reported to public health units and recorded in iPHIS plus. 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.
- Case counts for the recent days should be interpreted with caution due to reporting delays.
- Only cases meeting the confirmed case classification as listed in the MOH COVID-19 case definition [3] are included in the report counts from iPHIS plus.
- Case episode date is based on an estimate of the best date of disease onset. This date is calculated based on either the date of symptom onset, specimen collection/test date, or the date reported to the public health unit.
- Cases with missing episode dates were excluded from episode date-specific analysis.
- Likely source of acquisition is determined by examining the exposure and risk factor fields from iPHIS and local systems to determine whether a case travelled, was associated with an outbreak (LTCH or other), 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. Cases with multiple exposures or risk factors were assigned to a single likely acquisition source group which was determined hierarchically in the following order:
    - For cases with an episode date *on or after* April 1, 2020: Outbreak-associated (LTCH or other) > close contact of a confirmed case > travel > no known epidemiological link > information missing or unknown

    - For cases with an episode date *before* April 1, 2020: Travel > outbreak-associated (LTCH or other) > close contact of a confirmed case > no known epidemiological link > information missing or unknown

- iPHIS cases for which the Disposition Status was reported as 'entered in error', 'does not meet definition', 'duplicate – do not use', or any variation on these values have been excluded.

- Symptoms are self or proxy-reported, and not reported by a health care professional. Cases may report multiple symptoms. Only cases reporting 'yes' to symptoms were included in the analysis. Cases for which symptom information was not reported include cases reporting 'no', 'unknown', 'not asked' as well as cases with missing information.

- Asymptomatic was defined as any case reporting 'yes' to asymptomatic infection and 'no', 'unknown', 'not asked' to all other symptoms or where information was missing for those symptoms.

- Multiple laboratory results can be reported for a single case. The earliest specimen collection date indicating a positive laboratory test result was used in the time from symptom onset to specimen collection calculations.

- Only cases with valid dates were included in the time from symptom onset to specimen collection calculations. For example, cases with a missing symptom onset and/or specimen collection dates were excluded. Further, cases with a specimen collection date over seven days prior to onset and over 28 days after onset were excluded, as it could not be verified if the symptom onset was related to the positive laboratory result.

- For Figure 6, cases were classified based on the most severe outcome reported using the following hierarchy: death > hospitalization (including ICU admission) > no severe outcome. For example, a hospitalized case that later died would be assigned to the fatal outcome category.

References

1. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 – what we know so far about…asymptomatic infection and asymptomatic transmission [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2020 Jul 30]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/what-we-know-jan-30-2020.pdf?la=en
2. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 – what we know so far about…viral detection [Internet]. Toronto, ON: Queens's Printer for Ontario; 2020 [cited 2020 Jul 30]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/covid-wwksf/2020/05/what-we-know-viral-detection.pdf?la=en
3. Ontario. Ministry of Health. COVID-19: guidance for the health sector. Case definition [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [modified 2020 Aug 07; cited 2020 July 30]. Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/2019_guidance.aspx#case

Disclaimer

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

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

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Enhanced epidemiological summary: COVID-19 in Ontario: a summary of wave 1 transmission patterns and case identification. Toronto, ON: Queen's Printer for Ontario; 2020.

For Further Information

For more information, email cd@oahpp.ca.

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