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ENHANCED EPIDEMIOLOGICAL SUMMARY

Confirmed Cases of COVID-19 Following Vaccination in Long-Term Care Homes & Retirement Homes in Ontario: December 14, 2020 to June 30, 2021

This report includes the most current information available from Public Health Case and Contact Management Solution (CCM) and vaccine uptake data extracted from the Ontario Ministry of Health's COVaxON application for all public health units (PHUs) in Ontario as of **July 6, 2021**.

Purpose

This report provides a focused analysis of confirmed COVID-19 cases among vaccinated long-term care home (LTCH) and retirement home (RH) health care workers and residents in Ontario reported from the beginning of the immunization program on December 14, 2020 to June 30, 2021. Only cases experiencing symptoms of COVID-19 were included in the analysis. Information on how LTCH/RH health care workers and residents are defined is available in the Technical Notes along with additional information.

For a summary of all post-vaccination COVID-19 cases in Ontario, please see the enhanced epidemiological summary, Confirmed Cases of COVID-19 Following Vaccination in Ontario. The interactive Ontario COVID-19 Data Tool is available on the Public Health Ontario website to explore recent COVID-19 case and vaccination data by public health unit, age group, sex, and trends over time along with the Daily Epidemiological Summary, Weekly Epidemiological Summary, and additional Epidemiological Reports .

Context

- Since December 14, 2020 (the start of the COVID-19 vaccination program) to June 26, 2021, a total of 243,114 LTCH/RH health care workers and residents received at least one vaccine dose. There has been a large decline in COVID-19 cases among LTCH/RH health care workers and residents since early February 2021, which has been sustained at a low level despite high levels of community transmission in the third wave in Ontario. Among partially and fully vaccinated LTCH/RH health care workers and residents, only 503 symptomatic COVID-19 cases were reported as of June 30, 2021.

Highlights

- Between December 14, 2020 and June 30, 2021, there were 11,406 confirmed COVID-19 cases reported among LTCH/RH health care workers and residents, of which 3,730 were asymptomatic and 7,676 were symptomatic. Among symptomatic cases, 503 (6.6%) were fully or partially vaccinated prior to symptom onset. Only 2.0% of confirmed symptomatic COVID-19 cases among LTCH/RH health care workers and residents reported during this period were fully vaccinated.

- 153 (11.3%) of 1,351 vaccinated LTCH/RH health care workers and residents were fully vaccinated breakthrough cases, and 350 (25.9%) were partially vaccinated.

- Among breakthrough health care worker and resident cases, 50.0% and 51.3% respectively were identified as having a variant of concern (VOC) or mutation of interest.

    - However, it is important to note that VOC screening was limited until early February, after which VOC screening became routine.

- No severe outcomes were reported among breakthrough health care worker cases. Among 115 breakthrough resident cases, 19 (16.5%) were hospitalized and 13 deaths (11.3%) were reported. In comparison, among 4,038 unvaccinated resident cases, 689 (17.1%) were hospitalized and 1,015 (25.1%) deaths reported.

Definition of Terms

The following definitions were used to describe COVID-19 infection following vaccination. Note: These definitions have been modified from past reports. A breakthrough case is now defined as a case with a symptom onset date 14 or more days following the final dose of vaccine, to align with the definition of 'fully vaccinated' used in public health guidance.

- **Not vaccinated:** Symptomatic confirmed COVID-19 cases with no evidence of having received a valid COVID-19 vaccine dose following data linkage between CCM and COVAXON

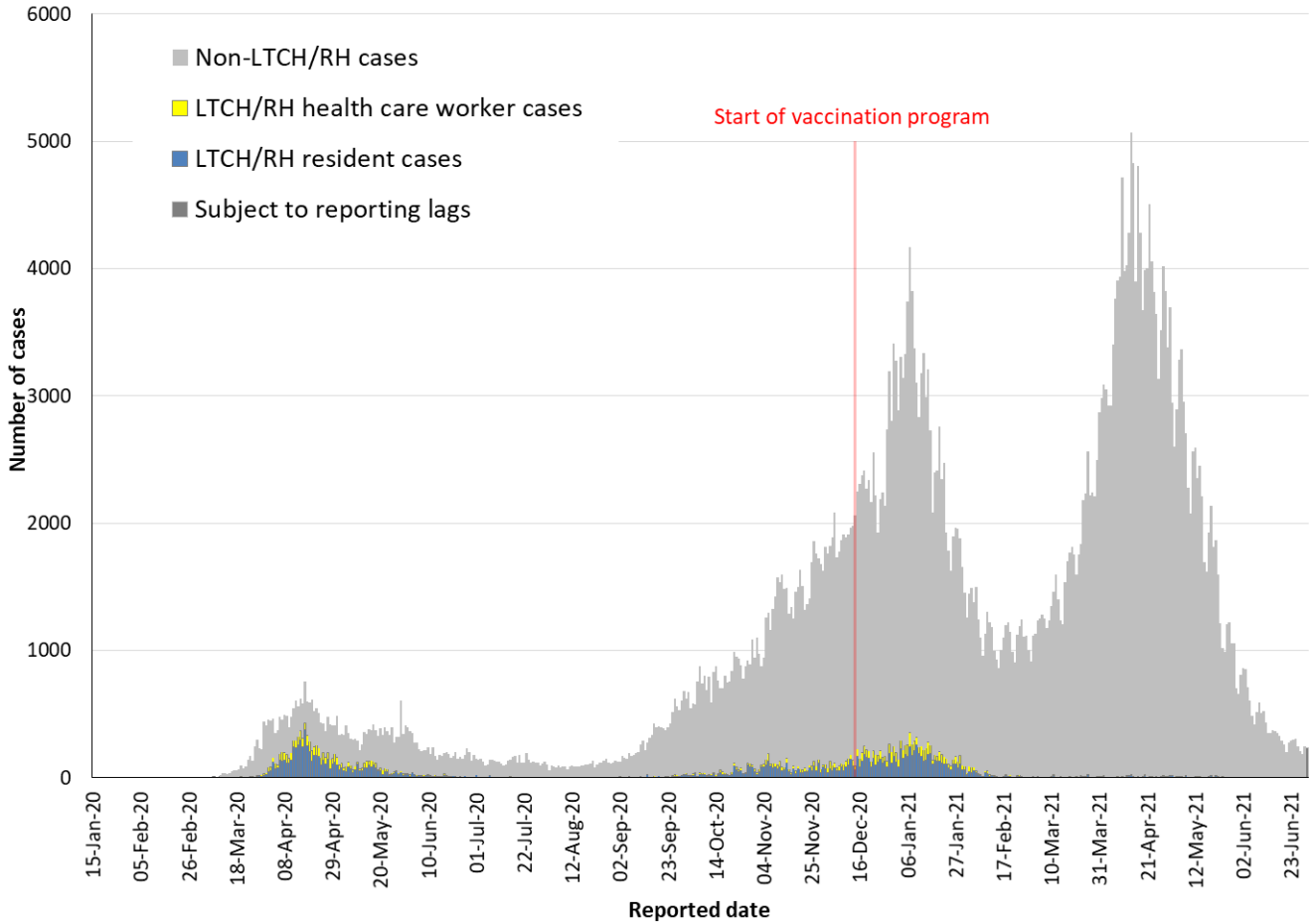
- . **Case not yet protected by vaccination:** Cases with a symptom onset date that was 0 to <14 days following the first dose of a COVID-19 vaccine. This time period from vaccination is not sufficient to develop immunity, therefore these cases are not considered protected from vaccination.

- **Partially vaccinated case:** Cases with a symptom onset date that was 14 or more days following the first dose of a 2-dose series COVID-19 vaccine or 0 to <14 days after receiving the second dose of a 2-dose COVID-19 vaccine series. This time period from vaccination may be sufficient to develop some degree of immunity, but these cases are not considered fully protected as they have not yet received the second dose or have only recently received the second dose.

- **Breakthrough (i.e., fully vaccinated) case:** Cases with a symptom onset date that was 14 or more days following receipt of the second dose of a 2-dose series COVID-19 vaccine or 14 or more days following the first dose of a COVID-19 vaccine product with a 1-dose schedule. These individuals are considered fully protected from vaccination, however, as vaccine effectiveness is not 100%, it is expected that a small number of cases will occur following complete vaccination.

Trends

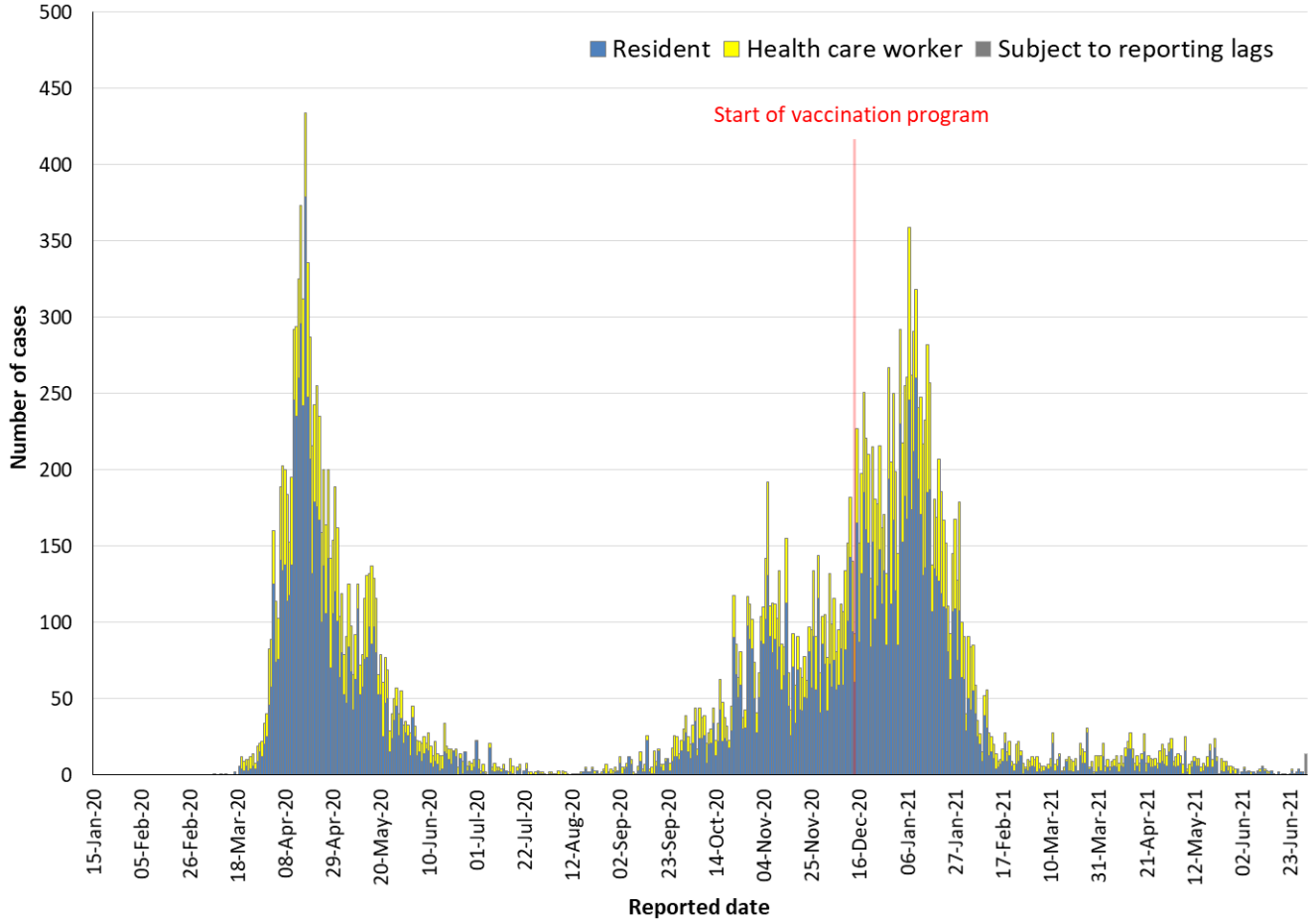
Figure 1: Number of COVID-19 cases by LTCH/RH status and reported date: Ontario, January 15, 2020 to June 30, 2021



Data Source: CCM

Notes: Includes all cases of COVID-19, regardless of vaccination or symptom status. On December 14, 2020, the COVID-19 vaccination program began. By mid-February 2021, individuals across LTCHs in Ontario were offered at least one dose of COVID-19 vaccine.

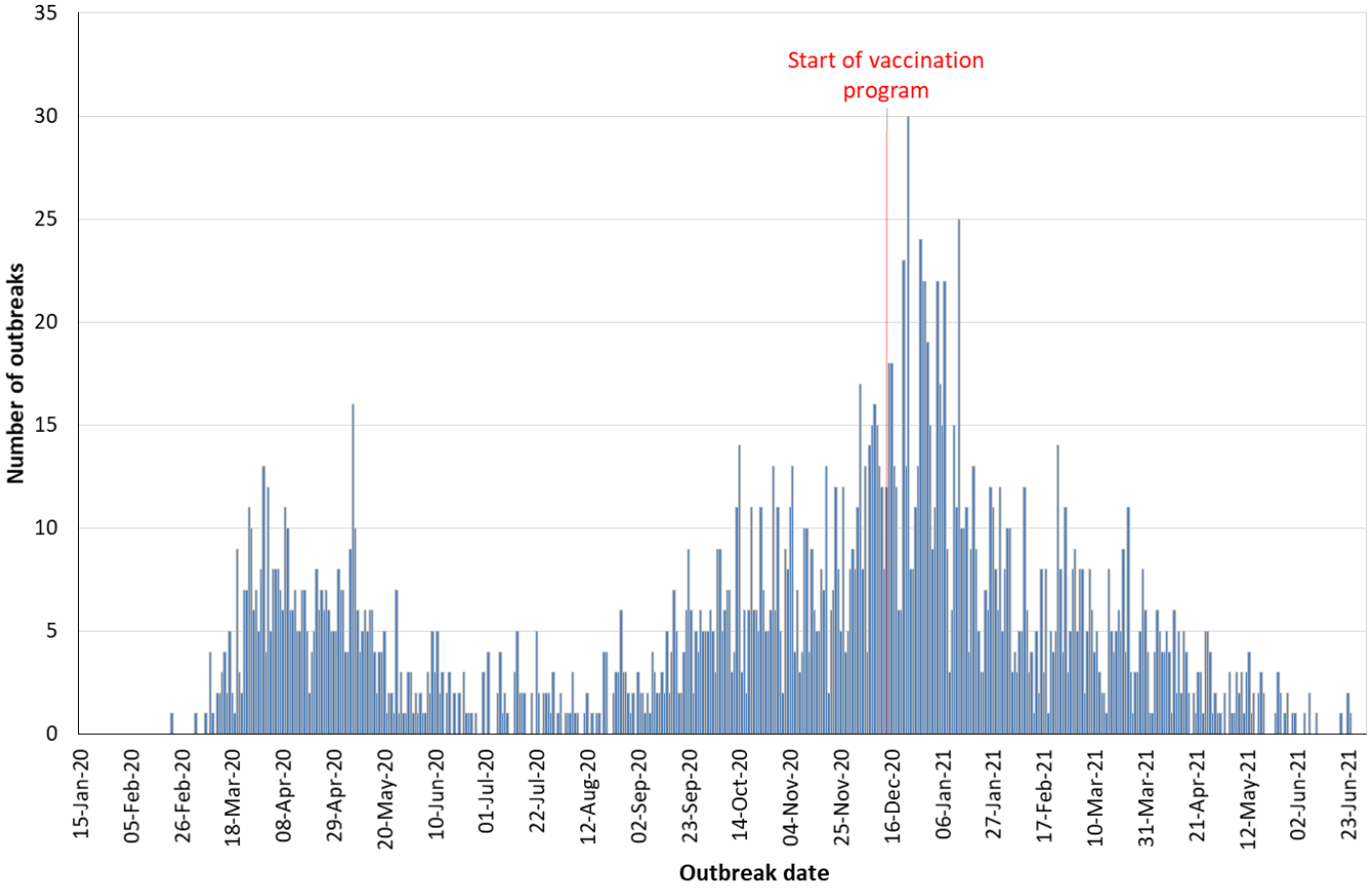
Figure 2: Number of COVID-19 LTCH/RH health care workers and resident cases by reported date: Ontario, January 15, 2020 to June 30, 2021



Data Source: CCM

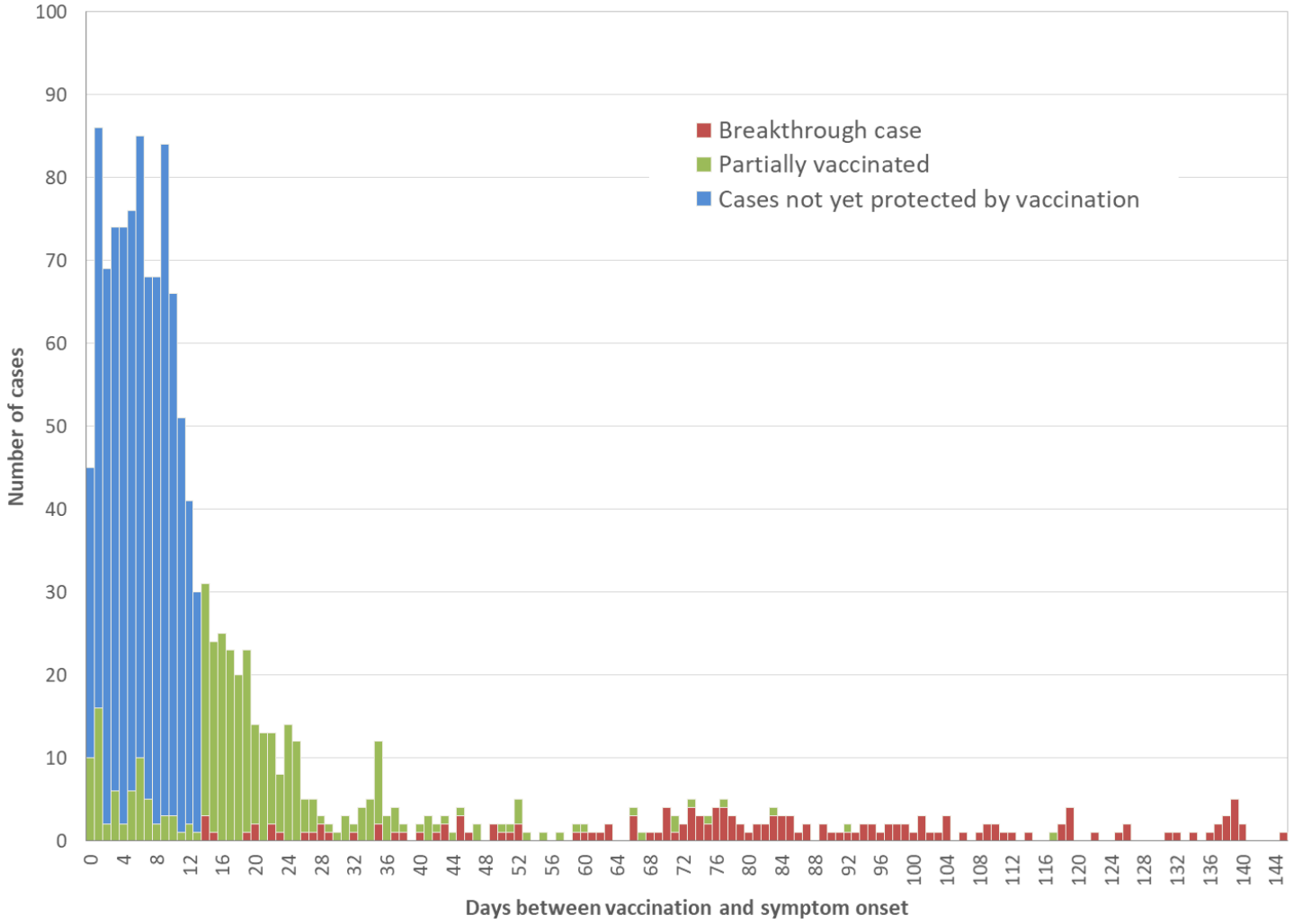
Notes: Includes all cases of COVID-19 in LTCH/RH residents and health care workers, regardless of vaccination or symptom status. On December 14, 2020, the COVID-19 vaccination program began. By mid-February 2021, individuals across LTCHs in Ontario were offered at least one dose of COVID-19 vaccine.

Figure 3: Overall number of COVID-19 outbreaks in LTCH/RH settings by outbreak date: Ontario, January 15, 2020 to June 30, 2021



Data Source: CCM
Note: On April 23, 2021 the outbreak definition for confirmed outbreaks was updated to two or more lab-confirmed COVID-19 cases in residents and/or staff. Prior to this date, a single laboratory confirmed case of COVID-19 in a resident or staff was considered a confirmed COVID-19 outbreak.

Figure 4: Number of symptomatic COVID-19 LTCH/RH health care workers and resident cases post-vaccination by days between vaccination and symptom onset: Ontario, December 14, 2020 to June 30, 2021



Data Source: CCM/COVax

Case Characteristics

Table 1: Number of symptomatic COVID-19 LTCH health care workers and resident cases by vaccine category: Ontario, December 14, 2020 to June 30, 2021

Vaccine Category	Number of health care workers cases	Percent of health care workers cases	Number of resident cases	Percent of resident cases	Total LTCH/RH cases	Percent of LTCH/RH cases
Breakthrough case	38	1.4%	115	2.3%	153	2.0%
Partially vaccinated case	112	4.1%	238	4.8%	350	4.6%
Vaccinated but not protected	300	11.0%	548	11.1%	848	11.0%
Not vaccinated	2,287	83.6%	4,038	81.8%	6,325	82.4%
Total	2,737	100.0%	4,939	100.0%	7,676	100.0%

Data Source: CCM/COVax

Table 2. Confirmed symptomatic cases of COVID-19 among vaccinated LTCH/RH residents by vaccine category: Ontario, December 14, 2020 to June 30, 2021

	Number of fully vaccinated breakthrough cases	Percent of fully vaccinated breakthrough cases	Number of partially vaccinated cases	Percent of partially vaccinated cases
Number of cases	115		238	
Gender: Male	38	33.0%	92	38.7%
Gender: Female	76	66.1%	143	60.1%
Gender: Unknown	1	0.9%	3	1.3%
Ages: <60 years	1	0.9%	2	0.8%
Ages: 60-69 years	6	5.2%	13	5.5%
Ages: 70-79 years	16	13.9%	38	16.0%
Ages: 80-89 years	50	43.5%	78	32.8%
Ages: ≥90 years	42	36.5%	107	45.0%

Data Source: CCM/COVax

Variants of Concern

Table 3a. Confirmed symptomatic COVID-19 cases with a mutation or VOC detected among LTCH/RH health care workers: Ontario, December 14, 2020 to June 30, 2021

Variant of concern or mutation of interest	Breakthrough cases	%	Partially vaccinated	%	Vaccinated but not protected	%	Not vaccinated	%	Total	%
Lineage B.1.1.7 (Alpha)*	12	31.6%	34	30.4%	34	11.3%	154	6.7%	234	8.5%
Lineage B.1.351 (Beta)**	0	0.0%	0	0.0%	1	0.3%	2	0.1%	3	0.1%
Lineage P.1 (Gamma)***	1	2.6%	0	0.0%	0	0.0%	8	0.3%	9	0.3%
Lineage B1.617.2 (Delta)†	0	0.0%	3	2.7%	0	0.0%	1	<0.1%	4	0.1%
VOC associated mutation‡	6	15.8%	4	3.6%	6	2.0%	37	1.6%	53	1.9%
No VOC/mutation of interest detected	1	2.6%	4	3.6%	1	0.3%	14	0.6%	20	0.7%
Not reported§	18	47.4%	67	59.8%	258	86.0%	2,071	90.6%	2,414	88.2%
Total	38	100.0%	112	100.0%	300	100.0%	2,287	100.0%	2,737	100.0%

Data Source: CCM/COVax

Note: Interpret the VOC and mutation data with caution due to the varying time required to complete VOC testing and/or genomic analysis following the initial positive test for SARS-CoV-2. Due to the nature of the genomic analysis, test results may be completed in batches. Data corrections or updates can result in case records being removed and/or

updated and may result in totals differing from past publicly reported case counts. VOC data presented from the Investigation Subtype field only. Changes to the VOC testing algorithm may impact counts and trends. *Includes all confirmed COVID-19 cases where lineage B.1.1.7 was identified by genomic analysis and those presumed to be B.1.1.7 based on a positive N501Y and negative E484K mutation. **Includes B.1.351 cases identified by genomic analysis and those presumed to be B.1.351 based on 'Mutation K417N+ and N501Y+ and E484K+' in the Investigation Subtype field.***Includes P.1 cases identified by genomic analysis and those presumed to be P.1 based on 'Mutation K417T+ and N501Y+ and E484K+' in the Investigation Subtype field. †Includes B.1.617.2 cases identified by genomic analysis. Mutations common to B.1.617.2 are not included in the current VOC mutation test. ‡Includes all confirmed COVID-19 cases with the following mutations detected, reported from the Investigation Subtype field: N501Y and E484K, N501Y (E484K unknown), E484K (N501Y negative), E484K (N501Y unknown).§Routine screening for the N501Y mutation began February 3, 2021 and routine screening for the E484K mutation started March 22, 2021

Table 3b. Confirmed symptomatic COVID-19 cases with a mutation or VOC detected among LTCH/RH residents: Ontario, December 14, 2020 to June 30, 2021

Variant of concern or mutation of interest	Breakthrough cases	%	Partially vaccinated	%	Vaccinated but not protected	%	Not vaccinated	%	Total	%
Lineage B.1.1.7 (Alpha)*	38	33.0%	36	15.1%	23	4.2%	127	3.1%	224	4.5%
Lineage B.1.351 (Beta)**	8	7.0%	0	0.0%	0	0.0%	2	<0.1%	10	0.2%
Lineage P.1 (Gamma)***	6	5.2%	1	0.4%	0	0.0%	4	0.1%	11	0.2%
Lineage B1.617.2 (Delta)†	7	6.1%	0	0.0%	0	0.0%	2	<0.1%	9	0.2%
VOC associated mutation‡	7	6.1%	4	1.7%	4	0.7%	21	0.5%	36	0.7%
No VOC/mutation of interest detected	14	12.2%	7	2.9%	0	0.0%	33	0.8%	54	1.1%
Not reported§	35	30.4%	190	79.8%	521	95.1%	3,849	95.3%	4,595	93.0%
Total	115	100.0%	238	100.0%	548	100.0%	4,038	100.0%	4,939	100.0%

Data Source: CCM/COVax

Note: Interpret the VOC and mutation data with caution due to the varying time required to complete VOC testing and/or genomic analysis following the initial positive test for SARS-CoV-2. Due to the nature of the genomic analysis, test results may be completed in batches. Data corrections or updates can result in case records being removed and/or updated and may result in totals differing from past publicly reported case counts VOC data presented from the Investigation Subtype field only. Changes to the VOC testing algorithm may impact counts and trends. *Includes all confirmed COVID-19 cases where lineage B.1.1.7 was identified by genomic analysis and those presumed to be B.1.1.7 based on a positive N501Y and negative E484K mutation. **Includes B.1.351 cases identified by genomic analysis and those presumed to be B.1.351 based on 'Mutation K417N+ and N501Y+ and E484K+' in the Investigation Subtype field.***Includes P.1 cases identified by genomic analysis and those presumed to be P.1 based on 'Mutation K417T+ and

N501Y+ and E484K+' in the Investigation Subtype field. †Includes B.1.617.2 cases identified by genomic analysis. Mutations common to B.1.617.2 are not included in the current VOC mutation test. ‡Includes all confirmed COVID-19 cases with the following mutations detected, reported from the Investigation Subtype field: N501Y and E484K, N501Y (E484K unknown), E484K (N501Y negative), E484K (N501Y unknown).§Routine screening for the N501Y mutation began February 3, 2021 and routine screening for the E484K mutation started March 22, 2021.

Severity

Table 4a. Confirmed symptomatic COVID-19 case outcomes among LTCH/RH health care workers by vaccine category: Ontario, December 14, 2020 to June 30, 2021

Vaccine Category	Number hospitalized	Percent* hospitalized	Number of ICU admissions	Percent* ICU admissions	Number of deaths	Percent* of deaths	Total
Health care workers: Breakthrough case	0	0.0%	0	0.0%	0	0.0%	38
Health care workers: Partially vaccinated	0	0.0%	0	0.0%	0	0.0%	112
Health care workers: Vaccinated but not protected	2	0.7%	1	0.3%	0	0.0%	300
Health care workers: Not vaccinated	32	1.4%	7	0.3%	1	<0.1%	2,287
Health care workers: Total	34		8		1		2,737

Data Source: CCM/COVax

*Percentage estimates were calculated using the total number of cases for each vaccine category among health care workers as denominators.

Table 4b. Confirmed symptomatic COVID-19 case outcomes among LTCH/RH residents by vaccine category: Ontario, December 14, 2020 to June 30, 2021

Vaccine Category	Number hospitalized	Percent* hospitalized	Number of ICU admissions	Percent* ICU admissions	Number of deaths	Percent* of deaths	Total number of cases
Residents: Breakthrough case	19	16.5%	2	1.7%	13	11.3%	115
Residents: Partially vaccinated cases	35	14.7%	2	0.8%	38	16.0%	238
Residents: Vaccinated but not protected	75	13.7%	1	0.2%	116	21.2%	548
Residents: Not vaccinated	689	17.1%	48	1.2%	1,015	25.1%	4,038
Residents: Total	818		53		1,182		4,939

Data Source: CCM/COVax

*Percentage estimates were calculated using the total number of cases for each vaccine category among residents as denominators.

Technical Notes

Data Sources

- The data for this report were based on information successfully extracted from the Public Health Case and Contact Management Solution (CCM) for all PHUs by PHO as of **July 6, 2021** at 1 p.m for cases reported from February 1, 2021 onwards and as of **July 5, 2021 at 9 a.m.** for cases reported up to January 31, 2021.

- Data in this report includes the most current information extracted from COVaxON as of **July 6, 2021** at approximately 7:00 a.m.

- VOC data for this report were based on information successfully extracted from CCM for all PHUs by PHO as of **July 6, 2021 at 1 p.m.** for cases reported from April 1, 2021 onwards and as of **July 5, 2021 at 9 a.m.** for cases reported up to March 31, 2021.

Data Caveats

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

- The data represent vaccination and case information reported and recorded in COVaxON or CCM. As a result, all counts may be subject to varying degrees of underreporting due to a variety of factors.

- Linking COVaxON and CCM data is dependent on availability of personal identifiers reported in both databases. For example, if a client was reported in both COVaxON and CCM, but personal identifiers (e.g. such as health card number, date of birth) were not available, then sufficient information would not have been available to identify the client and the client would not have been included in the linkage. Methods for processing COVaxON vaccine uptake data are described in the Technical Notes of the COVID-19 Vaccine Uptake Report

- Only cases meeting the confirmed case classification as listed in the MOH COVID-19 case definition are included in the report counts from CCM.

- The following COVID-19 cases were excluded as the timing of infection (i.e. date of symptom onset) relative to vaccination (i.e. date of dose administration) could not be determined.

    - Cases reported as asymptomatic and where no symptom information was reported. Asymptomatic cases were identified as those where no symptom information was reported or where symptom onset date was not available.

    - Cases reported as re-positive or remote positive.

- Cases of confirmed reinfection, as defined in the provincial case definitions, are counted as unique investigations.

- Reported date is the date the case was reported to the public health unit.

- Hospitalization includes all cases for which a hospital admission date was reported or hospitalization/ICU was reported as 'Yes' at the time of data extraction. 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 an ICU admission date 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.

- 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.

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

- 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.

- The outbreak date is determined by the onset date of first case, or if missing the outbreak reported date, or else if that is also missing, then the outbreak created date.

- 'Long-term care home resident' includes cases that reported 'Yes' to the risk factor 'Resident of a long-term care home'; or 'Yes' to the risk factor 'Resident of nursing home or other chronic care facility' and reported to be part of an outbreak assigned as a long-term care home (via the Outbreak number or case comments field); or were reported to be part of an outbreak assigned as a long-term care home (via the outbreak number) with an age over 70 years and did not report 'No' to the risk factors 'Resident of long-term care home' or 'Resident of nursing home or other chronic care facility'. 'Long-term care home residents' excludes cases that reported 'Yes' to any of the health care worker occupational risk factors.

- 'Long-term care home health care workers' includes cases that reported 'Yes' to any of the following occupational risk factors: health care worker, doctor, nurse, dentist, dental hygienist, midwife, other medical technicians, personal support worker, respiratory therapist, first responder; and reported to be part of an outbreak assigned as a long-term care home (via the outbreak number). It also includes cases who responded 'Yes' to the occupational risk factor - long term care home. Cases that also reported 'Yes' to 'Resident of nursing home or other chronic care facility' and/or 'Resident of Long-Term Care home' are excluded.

- 'Retirement home resident' includes cases that reported 'Yes' for the risk factor 'Resident of Retirement home' (whether or not they are linked to a local outbreak) and did not have 'Yes' selected for any health care worker risk factor.

- 'Retirement home health care workers' includes cases that reported 'Yes' to any of the following occupational risk factors: health care worker, doctor, nurse, dentist, dental hygienist, midwife, other medical technicians, personal support worker, respiratory therapist, first responder; and reported to be part of an outbreak assigned as a retirement home (via the outbreak number) and did not report 'No' to the occupational risk factor - Retirement Home. It also includes cases who reported 'Yes' to the occupational risk factor for retirement homes. Cases who reported ' Yes' for the risk factor 'Resident of Retirement home' are excluded.

- Public Health Ontario conducts testing and genomic analyses for SARS-CoV-2 positive specimens using the criteria outlined here: https://www.publichealthontario.ca/en/laboratory-services/test-information-index/covid-19-voc

- Lineage nomenclature is dynamic. PANGO lineage naming and assignment may change as more samples are sequenced and analyzed.

- Variant status may be updated based on scientific evidence. Variants designated as a VOC in Canada is available on the Public Health Agency of Canada's SARS-CoV-2 Variants webpage.

- Changes to the VOC testing algorithm may occur over time and trends should be interpreted with caution. Since February 3, 2021 all PCR positive SARS-Co-V-2 specimens with Ct values ≤ 35 are tested for a N501Y mutation. As of March 22, 2021, positive specimens with a Ct ≤ 35 are tested for both the N501Y and E484K mutation, with all E484K positive specimens with a Ct ≤ 30 forwarded for further genomic analysis. If found to be positive for the N501Y mutation only, no further genomic analysis are performed as these are presumed to be B.1.1.7. As of June 30, 2021, cases where a E484K mutation is detected will no longer be reflexed for sequencing as VOC testing labs switched to a representative sampling method where only a proportion of all positives with a Ct ≤ 30 are forwarded for further genomic analysis. This proportion was initially set at 10% and will be adjusted periodically based on case volumes.

- The laboratory detection of a variant of concern is a multi-step process. Samples that test positive for SARS-CoV-2 and have a cycle threshold (Ct) value ≤ 35 can be tested for mutations common to variants of concern. If positive for the mutation of interest these samples may then undergo genomic analyses to identify the VOC. VOC lineages may still be confirmed using genomic analysis despite specific S gene mutation(s) being documented as 'unable to complete' due to poor sequence quality at the genome position.

- VOC testing data are analyzed for cases with a reported date on or after February 07, 2021. VOC testing data are based on CCM information reported within the laboratory object for select Logical Observation Identifiers Names and Codes (LOINC) and supplemented with information from the Investigation Subtype field. A confirmed Case Investigation is assigned a VOC test value (e.g., VOC test detected, VOC test not detected) based on the following hierarchy:

    - If multiple laboratory results are identified, a VOC test value is assigned based on the following hierarchy: Detected > Not Detected > Unable to complete

    - If a laboratory result is 'Not Detected' or 'Unable to complete', but data on the Investigation Subtype field is listed as a lineage or mutation common to a VOC, then the VOC test value is set to 'Detected'

- If a VOC is identified through genomic analysis cases initially classified as a mutation may be updated and moved to the appropriate lineage (B.1.1.7, B.1.351, P.1 and B1.617.2).

- LOINCs are a set of internationally used result description codes. In the absence of a standard LOINC, Ontario Health can create local result codes, which are identified with an 'XON' prefix. LOINCs incorporate details of the result value (e.g. test method, target detected - such as IgG, DNA, isolate etc.) and are unique to each result.

- VOC testing data in this report are assigned on a per case basis. Multiple laboratory results may be associated to a single case investigation, but for analysis purposes are only counted once.

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Confirmed cases of COVID-19 following vaccination in long-term care homes & retirement homes in Ontario: December 14, 2020 to June 30, 2021. Toronto, ON: Queen's Printer for Ontario; 2021.

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