ENHANCED EPIDEMIOLOGICAL SUMMARY

Confirmed Cases of COVID-19 Following Vaccination in Ontario: December 14, 2020 to January 3, 2022

Purpose

This report describes severe outcomes (i.e. hospitalizations) among confirmed cases of coronavirus disease 2019 (COVID-19) following COVID-19 vaccination.

NOTE: Due to the changes in COVID-19 testing (effective December 31, 2021) driven by increasing COVID-19 cases related to the Omicron variant, case counts of COVID-19 are an underestimate of the true number of infected individuals in Ontario. As a result, the report focuses on hospitalized cases where testing is still recommended.

Data in this report include the most current information extracted from COVaxON as of January 4, 2022 at approximately 7:00 a.m. and CCM as of January 4, 2022 at 1:00 p.m. The report includes COVID-19 vaccinations and cases reported up to January 3, 2022.

For additional information on COVID-19 vaccine uptake in the province, please visit the interactive Ontario COVID-19 Data Tool which includes vaccination uptake data by public health unit, age group and trends over time. The weekly report on COVID-19 Vaccine Uptake in Ontario further describes vaccine uptake across the province.

Definition of Terms

The following definitions, were used to describe COVID-19 infection following vaccination. Please refer to the Technical Notes for further details.

Post-vaccination Cases

- **Case not yet protected from vaccination:** Cases with a symptom onset date that was 0 to <14 days following the first dose of a Health Canada authorized 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 of a Health Canada authorized COVID-19 vaccine or 0 to <14 days after receiving the second dose of a 2-dose Health Canada authorized COVID-19 vaccine series.
• **Post-dose 2 case (i.e., case following the primary vaccine series):** Cases with a symptom onset date that was 14 or more days following receipt of the second dose of a 2-dose series of a Health Canada authorized COVID-19 vaccine or 0 to <14 days after receiving the third dose of a Health Canada authorized COVID-19 vaccine following a 2-dose primary series.

• **Post-dose 3 case (i.e. case following a third dose):** Cases with a symptom onset date that was 14 or more days following the receipt of a third dose of a Health Canada authorized COVID-19 vaccine, following two doses of Health Canada authorized COVID-19 vaccine products.

**Highlights**

• Since the COVID-19 vaccination program began on December 14, 2020 and up to January 3, 2022, a total of 11,384,888 individuals in Ontario have completed their primary vaccine series and 3,908,388 individuals have received a third dose\(^1\).

  • Among these individuals, 1,395 cases were hospitalized following a second dose (i.e. following completion of their primary series) and 126 cases were hospitalized following a third dose (Table 1).

• Overall, in Ontario rates of hospitalization are higher among unvaccinated individuals compared to those who have completed the primary vaccine series. This trend has remained consistent over time (Figure 1).

• In each age group, the rate of COVID-19-related hospitalizations was higher among unvaccinated individuals compared to those who have completed the primary vaccine series, as well as those that have received three doses of a COVID-19 vaccine (Figures 2, 3 and 4).

  • In the past 30 days, unvaccinated adults 60 years of age or older were approximately 15.0 times more likely to be hospitalized due to COVID-19 compared to adults 60 years of age and older who have completed the primary vaccine series (Figure 2).

  • In the past 30 days, unvaccinated adults 60 years of age or older were approximately 19.0 times more likely to be hospitalized due to COVID-19 compared to adults 60 years of age and older with a third dose (Figure 2).

  • In the previous 30 days, very few hospitalizations were reported among vaccinated and unvaccinated individuals under 20 years of age (Table 1a).
Severe Outcomes

Figure 1. Seven-day average rate of COVID-19 hospitalization per 100,000 person days among by vaccination status: Ontario

Notes:
1. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
2. Due to instability from small denominators as a result of lower vaccination coverage at the beginning of the vaccination program, rates are shown from February 15, 2021 on.
3. Post-dose 3 cases are not show as only individuals 18 years of age and older are eligible for a third dose.
4. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
5. Definitions for denominators (vaccination status of individuals) are included in the Technical Notes.
Figure 2. Seven-day average rate of COVID-19 hospitalization per 100,000 person days among individuals 60 years of age and older by vaccination status: Ontario

Notes:
1. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
2. Due to instability from small denominators as a result of lower vaccination coverage at the beginning of the vaccination program, rates are shown from February 15, 2021 on, and post-dose 3 cases are shown since December 1, 2021. The third dose program began in August in Ontario.
3. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
4. Definitions for denominators (vaccination status of individuals) are included in the Technical Notes.
Figure 3. Seven-day average rate of COVID-19 hospitalizations per 100,000 person days among individuals 50 years of age and older by vaccination status and age group: Ontario

Notes:
1. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
2. Due to instability from small denominators as a result of lower vaccination coverage at the beginning of the vaccination program, rates are shown from February 15, 2021 on, and post-dose 3 cases are shown since December 1, 2021. The third dose program began in August in Ontario.
3. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
4. Definitions for denominators (vaccination status of individuals) are included in the Technical Notes.
5. High coverage, particularly in older age groups (e.g. 70-79 year olds), and a small number of unvaccinated individuals has resulted in instability of rates in unvaccinated individuals over time.
Figure 4. Rate of COVID-19 hospitalizations per 100,000 person days by vaccination status and age group in the previous 30 days: Ontario

Notes:
1. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
2. Individuals with unknown age are excluded.
3. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
4. Definitions for denominators (vaccination status of individuals) are included in the Technical Notes.
Table 1a. Hospitalizations (including intensive care unit admissions) confirmed cases of COVID-19 by vaccination status in the previous 30 days: Ontario

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Hospitalized partially vaccinated cases: Number</th>
<th>Hospitalized post-dose 2 cases: Number</th>
<th>Hospitalized post-dose 3 cases: Number</th>
<th>Hospitalized unvaccinated cases: Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-11</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>12-17</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>4</td>
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<td>29</td>
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<td>221</td>
<td>47</td>
<td>84</td>
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Notes:
1. Individuals with unknown age are excluded.
2. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
3. Age groups are informed by vaccine product recommendations (i.e. no vaccine currently authorized or recommended in individuals <5 years of age) and vaccine program eligibility.
4. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
Table 1b. Hospitalizations (including intensive care unit admissions) confirmed cases of COVID-19 by vaccination status: Ontario, December 14, 2020 to January 3, 2022

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Hospitalized partially vaccinated cases: Number</th>
<th>Hospitalized post-dose 2 cases: Number</th>
<th>Hospitalized post-dose 3 cases: Number</th>
<th>Hospitalized unvaccinated cases: Number</th>
</tr>
</thead>
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<td>564</td>
<td>55</td>
<td>3,963</td>
</tr>
</tbody>
</table>

Notes:
1. Individuals with unknown age are excluded.
2. Post-dose 2 cases include a small number of individuals that completed their primary series with a vaccine product with a 1-dose schedule (i.e. Janssen).
3. Age groups are informed by vaccine product recommendations (i.e. no vaccine currently authorized or recommended in individuals <5 years of age) and vaccine program eligibility.
4. Trends in hospitalizations in the most recent weeks should be interpreted with caution due to delays in reporting.
Technical Notes

Data Sources

- COVID-19 case data were based on information successfully extracted from the Ontario Ministry of Health’s CCM application as of January 4, 2020 at approximately 1:00 p.m. for cases reported from February 1, 2021 on and as of December 30, 2021 at approximately 9:00 a.m. for cases reported up to January 31, 2021.

- COVID-19 vaccination data were based on information successfully extracted from the Ontario Ministry of Health’s COVaxON application as of January 4, 2022 at approximately 7:00 a.m. for vaccination records created on or after June 1, 2021 and January 4, 2022 at approximately 7:00 a.m. for vaccination records created up to May 31, 2021.

- Ontario population estimate data were sourced from Statistics Canada. Population estimates 2001-2020: Table 1 annual population estimates by age and sex for July 1, 2001 to 2020, health regions, Ontario [unpublished data table]. Ottawa, ON: Government of Canada; 2021 [received April 22, 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 vaccinations and case information reported and recorded in COVaxON or CCM, respectively. As a result, all counts may be subject to varying degrees of underreporting due to a variety of factors.

- Only cases meeting the confirmed case classification as listed in the MOH COVID-19 case definition are included.3

- 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.

- Only cases that have received Health Canada authorized vaccines including, Pfizer-BioNTech Comirnaty, Moderna Spikevax, AstraZeneca Vaxzevria/COVISHIELD, and Janssen COVID-19 vaccines are included. Cases that received one or more doses of a non-Health Canada authorized vaccine are excluded.

- The time interval between doses was not assessed to determine if subsequent doses were administered as per the product-specific recommended minimum interval.
• High coverage, particularly in older age group (e.g. 70-79 year olds), and a small number of unvaccinated individuals has resulted in instability in rates in unvaccinated individuals over time.

• Asymptomatic cases were included in the analysis. The timing of infection (i.e. date of infection approximated with symptoms onset date) relative to vaccination (i.e. date of dose administration) unclear for these cases. Thus, it is possible some of these cases maybe have been infected prior to vaccination and are not post-vaccinations cases.

• Post-dose 2 cases (i.e. cases following primary series) also includes cases occurring 14 or more days following receipt of a Health Canada authorized COVID-19 vaccine product with a 1-dose schedule (i.e. Janssen).

• For certain populations (e.g. immunocompromised individuals) 3 doses are recommended to complete the primary series. Due to challenges in identifying these individuals in the COVaxON data, it was not possible to account for a 3-dose primary series in the analysis.

• Demographic information (sex, age, public health unit of residence) in this report are sourced from demographic fields in CCM. Further details on CCM case data are described in the Technical Notes of the COVID-19 Daily Epidemiological Summary.³

Methods

• In order to identify cases post-vaccination, vaccine uptake data extracted from the Ontario Ministry of Health’s (MOH) COVaxON application was linked to case data extracted from the MOH’s Public Health Case and Contact Management Solution (CCM).

  • Clients in COVaxON and CCM were linked using health care number as well as other personal identifiers, including name, date of birth, gender, and postal code.

  • Linkage was done using processed COVaxON and CCM data. Methods for processing COVaxON vaccine uptake data are described in the Technical Notes of the COVID-19 Vaccine Uptake Report ² and methods for processing the CCM case data are described in the Technical Notes of the COVID-19 Daily Epidemiological Summary.³

• Unvaccinated cases include cases that are not yet protected from immunization, and are 0-13 days post-dose 1.

• Remote positive COVID-19 cases were excluded from the analysis.

  • Remote positive cases are defined as asymptomatic positive cases with a low pre-test probability (e.g., no epidemiologic link to a confirmed case or an outbreak) and a repeat test that is negative. For these cases, the timing of infection may be unclear.

• Cases are reported using age at the time of illness.

• Cases are shown using earliest (i.e. the first in time) of symptom onset or positive specimen collection date, then first available of symptom onset, positive specimen collection, or reported date.
To determine daily COVID-19 rates, individuals were classified as individuals vaccinated with a third dose, fully vaccinated, partially vaccinated, and unvaccinated. Data extracted from COVaxON was used to determine the number of individuals vaccinated with a third dose, fully vaccinated, and partially vaccinated each day, and aggregated population data was used to determine the number of unvaccinated individuals each day (i.e. the number of individuals vaccinated with a third dose, fully vaccinated, and partially vaccinated was subtracted from aggregated populations estimates).

- Individuals reported as deceased in COVaxON were excluded from denominators used in rate calculations.

- Risk of COVID-19 hospitalization was calculated by summing the rate per 100,000 person days and hospitalizations in each vaccine status category (individuals vaccinated with a third dose, individuals that completed their primary series, partially vaccinated, and unvaccinated).

- Age at the time of data extraction was calculated for COVaxON denominators used in rate calculations. Age at the time of data extraction was calculated using the client date of birth and date of data extraction. Note that the age at the time of illness is used for cases by vaccination status (numerator).

- Rate are not adjusted for other factors (e.g. age) that may affect risk of COVID-19 infection or hospitalization.

- Estimates for risk may differ from other reports due to differing methodologies and data extracts.

- Estimates of relative risk for unvaccinated versus vaccinated individuals may change over time.

- Definitions for individual-level denominators for rate calculation were as follows:

  - **Unvaccinated individual** refers to individuals that have not received a dose of a COVID-19 vaccine, as well as individuals that are not yet protected from vaccination (0 to 13 days following dose 1 administration).

  - **Partially vaccinated individual** refers to individuals that have received only the first dose of a two-dose Health Canada authorized COVID-19 vaccine series and 14 or more days have elapsed following dose 1 administration.

  - **Individuals that completed their primary series** refers to individuals that have received both doses of a two-dose Health Canada authorized COVID-19 vaccine series (i.e. dose two of two) or one dose of a one-dose Health Canada authorized COVID-19 vaccine product (i.e. dose one of one) and 14 or more days have elapsed following administration of the final dose. Reflects individuals that have completed a primary COVID-19 vaccine series.

  - **Vaccinated with three doses** refers to individuals that have received three doses of a Health Canada authorized vaccine.
References


