COVID-19 Vaccine Uptake and Program Impact in Ontario: December 14, 2020 to September 18, 2021

This report describes vaccine uptake using data extracted from the Ontario Ministry of Health’s COVaxON application. Data in this report includes the most current information extracted from COVaxON as of September 20, 2021 at approximately 7:00 a.m., and describes immunizations reported up to September 18, 2021.

Data presented may differ from other sources for various reasons, including differing extract times and methodologies for processing COVaxON data. Further details pertaining to the methodology for this report are described in the Technical Notes.

Please visit the interactive Ontario COVID-19 Data Tool to explore COVID-19 vaccination uptake data by public health unit, age group and trends over time.

Background

The COVID-19 immunization program began in Ontario with a three-phased distribution plan. Phase 1 began on December 14, 2020 with a limited number of doses for Ontario’s most vulnerable populations including residents, staff and essential care givers in long-term care (LTCH) and retirement homes (RH), health care workers (HCW), and indigenous adults in northern remote and higher risk communities (on-reserve and urban). Over time the program has expanded to include additional priority populations.

With some exceptions, Ontario has implemented a delayed second dose interval, as recommended by the National Advisory Committee on Immunization (NACI),2 in order to maximize the number of individuals receiving protection from the first dose of a COVID-19 vaccine. In June, corresponding with increased vaccine supply, the timing and scheduling of second dose appointments was accelerated.

Note the following updates to the vaccine name for the three COVID-19 vaccines in use in Ontario:

- Pfizer-BioNTech Comirnaty™ COVID-19 vaccine (referred to as Pfizer-BioNTech in the report)
- Moderna Spikevax™ COVID-19 vaccine (referred to as Moderna in the report)
- AstraZeneca Vaxzevria™/COVISHIELD COVID-19 vaccine (referred to as AstraZeneca or COVISHIELD in the report)
Highlights

- A total of 11,088,718 individuals or 75.3% of the Ontario population, and 11,056,583 individuals or 85.5% of the population aged 12 years and older, have received at least one dose of a COVID-19 vaccine (Figure 2).
  - 10,301,653 individuals, or 69.9% of the Ontario population, are fully vaccinated.
  - 787,065 individuals, or 5.3% of the Ontario population, are partially vaccinated and have received only the first dose of a two dose vaccine series.
- A total of 21,273,477 doses have been administered since Ontario’s COVID-19 immunization program began. This represents an increase of 206,265 doses administered from the previous week.
  - 11,023,833 first doses and 10,249,644 second doses have been administered (Figure 1a).
- Coverage estimates for at least one dose of the vaccine are over 85% among individuals 80 years of age and older (92.9%), 70-79 years of age (94.3%), 60-69 years of age (92.1%) and 50-59 years of age (87.4%) and over 75% for all remaining individuals aged 12 and older (Table 1).
  - Over 85% of individuals 80 years of age and older (90.0%), 70-79 years of age (92.3%), 60-69 years of age (89.3%) are fully vaccinated; and over 75% of individuals 50-59 years of age (83.3%) and 40-49 years of age (79.0%) are fully vaccinated.
- As a result of the direct effects of the vaccination program, an estimated 95,213 cases have been prevented to date among individuals 18 years of age and older (Figures 4a and 4b).
  - Further, an estimated 5,795 severe outcomes (hospitalizations or deaths) have been prevented among individuals 70 years of age and older (Figure 5).
  - Since only the direct effects of vaccination are estimated in this analysis (e.g., indirect effects such as reduced transmission are not included) the reduction in cases and severe outcomes are likely to be underestimates.
Definition of Terms

**Vaccine series** refers to the number of vaccine doses within a schedule that has been approved by Health Canada. COVID-19 vaccine products currently available in Ontario have a two-dose (i.e. Moderna, Pfizer-BioNTech, AstraZeneca or COVISHIELD) schedule.

**Interval** refers to the period of time (e.g. number of days) between doses. For all available COVID-19 vaccines, there is a recommended minimum number of days that an individual must wait after receiving their first dose and before receiving their second dose.

**Partially vaccinated** refers to individuals that have received only the first dose of a two-dose vaccine series.

**Fully vaccinated** refers to individuals that have received both doses of a two-dose COVID-19 vaccine series (i.e. dose two of two) or one dose of a one-dose COVID-19 vaccine product (i.e. dose one of one). Reflects individuals that have completed a COVID-19 vaccine series.

**Coverage estimate (at least one dose)** refers to the proportion of the population that has received at least one dose of a COVID-19 vaccine. Reflects individuals that have received the first dose of a two-dose series as well as individuals who have received both doses of a two-dose series.

**Coverage estimate (fully vaccinated)** refers to the proportion of the population that has received both doses of a two-dose COVID-19 vaccine series (i.e. dose two of two) or one dose of a one-dose COVID-19 vaccine series (i.e. dose one of one). Reflects individuals that have completed a COVID-19 vaccine series.
Doses Administered Over Time

Figure 1a. Number of COVID-19 vaccine doses administered in Ontario by dose number and date
Figure 1b. Number of COVID-19 vaccine doses administered in Ontario by vaccine product and date
Figure 1c. Number of COVID-19 vaccine doses administered in Ontario by vaccination setting and date

*The ‘mass immunization clinic’ group includes mass immunization, mobile, drive-through, and occupational clinics.

**The ‘other/not reported’ category includes dose administration records where a vaccination setting was not specified (reported as ‘other’) or was missing (not reported).
Vaccination Coverage Over Time

Figure 2. Cumulative number of individuals who received a COVID-19 vaccine and provincial coverage estimates by date*

Counts are shown using the date of dose one administration for at least one dose coverage estimates and the date of dose two administration for fully vaccinated coverage estimates.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.
Figure 3a. Provincial COVID-19 vaccine coverage estimates for at least one dose by age group and date*

Counts are shown using the date of dose one administration for at least one dose coverage estimates and the date of dose two administration for fully vaccinated coverage estimates.

**Indicates the age-specific proportion of the Ontario population that have received at least one dose of a COVID-19 vaccine. For example, the number of individuals that are 60-69 years of age who have received at least one dose is shown as the proportion of the Ontario population that is 60-69 years of age.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.
Figure 3b. Provincial COVID-19 vaccine coverage estimates for fully vaccinated by age group and date*

*Counts are shown using the date of dose one administration for at least one dose coverage estimates and the date of dose two administration for fully vaccinated coverage estimates.

**Indicates the age-specific proportion of the Ontario population that have received at least one dose of a COVID-19 vaccine. For example, the number of individuals that are 60-69 years of age who have received at least one dose is shown as the proportion of the Ontario population that is 60-69 years of age.

**Note:** Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.
Vaccination Program Impact

Figure 4a. Observed number of COVID-19 cases and expected number of COVID-19 cases in the absence of vaccination among individuals 18 to 69 years of age

*Indicates the age-specific proportion of the Ontario population that have received at least one dose of a COVID-19 vaccine. For example, the number of individuals that are 40-69 years of age who have received at least one dose is shown as the proportion of the Ontario population that is 40-69 years of age.

Note: Only direct effects of vaccination on cases were estimated. Indirect effects, including reduced transmission as a result of vaccination were not estimated. As a result, the impact of the vaccination program on the reduction in cases is likely an underestimate.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.

Note: This figure includes the effects of both dose 1 and dose 2. Further details are provided in the Technical Notes.
Figure 4b. Observed number of COVID-19 cases and expected number of COVID-19 cases in the absence of vaccination among individuals 70 years of age and older

* Indicates the age-specific proportion of the Ontario population that have received at least one dose of a COVID-19 vaccine. For example, the number of individuals that are 70+ years of age who have received at least one dose is shown as the proportion of the Ontario population that is 70+ years of age.

Note: Only direct effects of vaccination on cases were estimated. Indirect effects, including reduced transmission as a result of vaccination were not estimated. As a result, the impact of the vaccination program on the reduction in cases and is likely an underestimate.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.

Note: This figure includes the effects of both dose 1 and dose 2. Further details are provided in the Technical Notes.
Figure 5. Observed number of COVID-19 severe outcomes (hospitalizations or deaths) and expected number of COVID-19 severe outcomes in the absence of vaccination among individuals 70 years of age and older

* Indicates the age-specific proportion of the Ontario population that have received at least one dose of a COVID-19 vaccine. For example, the number of individuals that are 70-79 years of age who have received at least one dose is shown as the proportion of the Ontario population that is 70-79 years of age.

Note: Only direct effects of vaccination on severe outcomes were estimated. Indirect effects, including reduced transmission as a result of vaccination were not estimated. As a result, the impact of the vaccination program on the reduction of severe outcomes is likely an underestimate.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.

Note: This figure includes the effects of both dose 1 and dose 2. Further details are provided in the Technical Notes.
Figure 6. Number of confirmed COVID-19 cases and provincial coverage estimates** by date*

* Coverage estimates show the proportion of the total Ontario population that has been vaccinated.
** Confirmed COVID-19 cases are shown using the episode date, an estimate of disease onset. Coverage estimates are shown using the date of dose one administration for at least one dose coverage estimates and the date of dose two administration for fully vaccinated coverage estimates.

Note: Interpret COVID-19 case counts for the most recent days with caution due to reporting lags. The light grey shading indicates the most recent period during which case counts are likely to be updated.

Note: The decreases observed in cases cannot be attributed to the vaccination program alone. Public health measures have also had an impact on trends in cases.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.
Figure 7. Number of confirmed COVID-19 cases and provincial coverage estimates* by date** among individuals 80 years of age and older

*Coverage estimates show the proportion of the Ontario population 80 years of age and older that have been vaccinated. **Confirmed COVID-19 cases are shown using the episode date, an estimate of disease onset. Coverage estimates are shown using the date of dose one administration for at least one dose coverage estimates and the date of dose two administration for fully vaccinated coverage estimates.

Note: Interpret COVID-19 case counts for the most recent days with caution due to reporting lags. The light grey shading indicates the most recent period during which case counts are likely to be updated.

Note: The decreases observed in cases cannot be attributed to the vaccination program alone. Public health measures have also had an impact on trends in cases.

Note: Doses administered outside of Ontario and prior to December 14, 2020, when the vaccination program began in Ontario, are excluded from trends over time figures, but are included in overall counts for coverage estimates.
Vaccination Coverage by Age Group and Gender

Table 1. Number of individuals who received a COVID-19 vaccine and coverage estimates by gender or age group: Ontario, December 14, 2020 to September 18, 2021

<table>
<thead>
<tr>
<th>Gender</th>
<th>Partially vaccinated (dose 1 only)</th>
<th>Fully vaccinated (doses 1 and 2)</th>
<th>Coverage (%): At least one dose (dose 1 only and doses 1 and 2)</th>
<th>Coverage (%): Fully vaccinated (doses 1 and 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>358,037</td>
<td>5,345,035</td>
<td>76.5</td>
<td>71.7</td>
</tr>
<tr>
<td>Male</td>
<td>427,284</td>
<td>4,932,860</td>
<td>73.6</td>
<td>67.8</td>
</tr>
<tr>
<td>Age in years*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 to 17</td>
<td>88,775</td>
<td>710,391</td>
<td>83.1</td>
<td>73.9</td>
</tr>
<tr>
<td>18 to 29</td>
<td>245,527</td>
<td>1,704,179</td>
<td>78.5</td>
<td>68.6</td>
</tr>
<tr>
<td>30 to 39</td>
<td>154,061</td>
<td>1,494,489</td>
<td>81.0</td>
<td>73.4</td>
</tr>
<tr>
<td>40 to 49</td>
<td>104,465</td>
<td>1,464,499</td>
<td>84.7</td>
<td>79.0</td>
</tr>
<tr>
<td>50 to 59</td>
<td>83,821</td>
<td>1,701,051</td>
<td>87.4</td>
<td>83.3</td>
</tr>
<tr>
<td>60 to 69</td>
<td>49,573</td>
<td>1,576,313</td>
<td>92.1</td>
<td>89.3</td>
</tr>
<tr>
<td>70 to 79</td>
<td>23,214</td>
<td>1,047,014</td>
<td>94.3</td>
<td>92.3</td>
</tr>
<tr>
<td>80 and over</td>
<td>18,756</td>
<td>590,455</td>
<td>92.9</td>
<td>90.0</td>
</tr>
<tr>
<td>Total*</td>
<td>787,065</td>
<td>10,301,653</td>
<td>75.3</td>
<td>69.9</td>
</tr>
</tbody>
</table>

*Provincial totals include individuals with unknown age and/or gender. Further details are provided in the Technical Notes.

Note: For the purposes of this report, age was calculated on the date of dose administration. However, vaccination program eligibility may be based on birth year. For example, individuals turning 12 in 2021 are now eligible for immunization. Individuals that are 11 years of age at the time of vaccination are included in provincial totals, but not included in age specific stratum as the number of eligible 11 year olds is small.

Note: Individuals that received a vaccination out of province or from non-Ontario stock are included in coverage estimates, as these individuals are residents of Ontario, but are not included in counts for the number of doses administered in Ontario. As a result, the counts reported for doses administered will not align with the number of individuals immunized.
Figure 8. Provincial COVID-19 vaccine coverage estimates (partially and fully vaccinated) by gender and age group*

* Individuals with unknown age and/or gender were excluded. Further details are provided in the Technical Notes.
Table 2. Number of doses administered in Ontario by product type and age group: Ontario, December 14, 2020 to September 18, 2021

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number of doses: Pfizer-BioNTech (dose 1)</th>
<th>Number of doses: Pfizer-BioNTech (dose 2)</th>
<th>Number of doses: Moderna: Moderna (dose 1)</th>
<th>Number of doses: COVISHIELD (dose 1)</th>
<th>Number of doses: COVISHIELD (dose 2)</th>
<th>Number of doses: AstraZeneca (dose 1)</th>
<th>Number of doses: AstraZeneca (dose 2)</th>
<th>Total: Dose 1**</th>
<th>Total: Dose 2**</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 to 17</td>
<td>793,618</td>
<td>703,456</td>
<td>2,055</td>
<td>4,325</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>795,673</td>
<td>707,781</td>
</tr>
<tr>
<td>18 to 29</td>
<td>1,478,573</td>
<td>1,020,206</td>
<td>452,935</td>
<td>673,731</td>
<td>68</td>
<td>0</td>
<td>444</td>
<td>1,932,020</td>
<td>1,694,209</td>
</tr>
<tr>
<td>30 to 39</td>
<td>1,244,754</td>
<td>895,514</td>
<td>378,596</td>
<td>589,768</td>
<td>190</td>
<td>6</td>
<td>14,101</td>
<td>1,637,641</td>
<td>1,486,923</td>
</tr>
<tr>
<td>40 to 49</td>
<td>1,040,158</td>
<td>869,631</td>
<td>296,308</td>
<td>564,291</td>
<td>754</td>
<td>30</td>
<td>224,184</td>
<td>1,561,404</td>
<td>1,457,748</td>
</tr>
<tr>
<td>50 to 59</td>
<td>1,154,386</td>
<td>1,002,679</td>
<td>313,238</td>
<td>636,052</td>
<td>18,319</td>
<td>173</td>
<td>290,820</td>
<td>1,776,763</td>
<td>1,692,861</td>
</tr>
<tr>
<td>60 to 69</td>
<td>1,056,130</td>
<td>916,848</td>
<td>283,959</td>
<td>523,352</td>
<td>162,354</td>
<td>924</td>
<td>113,576</td>
<td>1,616,019</td>
<td>1,566,562</td>
</tr>
<tr>
<td>70 to 79</td>
<td>858,952</td>
<td>735,925</td>
<td>168,688</td>
<td>289,269</td>
<td>18,278</td>
<td>134</td>
<td>18,214</td>
<td>1,064,132</td>
<td>1,040,929</td>
</tr>
<tr>
<td>80 and over</td>
<td>475,066</td>
<td>419,946</td>
<td>129,752</td>
<td>168,239</td>
<td>492</td>
<td>9</td>
<td>2,920</td>
<td>608,230</td>
<td>589,460</td>
</tr>
<tr>
<td>Total</td>
<td>8,133,272</td>
<td>6,577,288</td>
<td>2,025,811</td>
<td>3,449,108</td>
<td>200,461</td>
<td>1,276</td>
<td>664,289</td>
<td>11,023,833</td>
<td>10,249,644</td>
</tr>
</tbody>
</table>

*Provincial totals include individuals with unknown age. Further detail is provided in the Technical Notes.

**Provincial totals include dose records where the dose was reported as administered in Ontario but the product was unknown/missing.

**Note:** Counts for the number of doses administered in Ontario exclude doses administered out of province and from non-Ontario stock. However, individuals that received a vaccination out of province or from non-Ontario stock are included in coverage estimates, as these individuals are residents of Ontario. As a result, the counts reported for doses administered will not align with the number of individuals immunized.

**Note:** For the purposes of this report, age was calculated on the date of dose administration. However, vaccination program eligibility may be based on birth year. For example, individuals turning 12 in 2021 are now eligible for immunization. Individuals that are 11 years of age at the time of vaccination are included in provincial totals, but not included in age specific stratum as the number of eligible 11 year olds is small.
Figure 9. Number of individuals by product type received for dose 1 and dose 2
Table 3. Number of doses (dose 1 and dose 2) administered in Ontario by vaccination setting and age group: Ontario, December 14, 2020 to September 18, 2021

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number of doses: Congregate living/care</th>
<th>Number of doses: Hospital</th>
<th>Number of doses: Mass immunization clinic*</th>
<th>Number of doses: Pharmacy</th>
<th>Number of doses: Physician’s office</th>
<th>Number of doses: Other/Not reported**</th>
<th>Total doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 to 17</td>
<td>3,304</td>
<td>174,264</td>
<td>1,017,509</td>
<td>186,634</td>
<td>20,301</td>
<td>101,442</td>
<td>1,503,454</td>
</tr>
<tr>
<td>18 to 29</td>
<td>29,208</td>
<td>604,302</td>
<td>2,020,565</td>
<td>606,757</td>
<td>92,850</td>
<td>272,547</td>
<td>3,626,229</td>
</tr>
<tr>
<td>30 to 39</td>
<td>28,536</td>
<td>548,173</td>
<td>1,729,936</td>
<td>511,463</td>
<td>85,041</td>
<td>221,415</td>
<td>3,124,564</td>
</tr>
<tr>
<td>40 to 49</td>
<td>30,484</td>
<td>515,472</td>
<td>1,530,129</td>
<td>661,746</td>
<td>114,715</td>
<td>166,606</td>
<td>3,019,152</td>
</tr>
<tr>
<td>50 to 59</td>
<td>41,795</td>
<td>604,701</td>
<td>1,746,622</td>
<td>795,094</td>
<td>124,762</td>
<td>156,650</td>
<td>3,469,624</td>
</tr>
<tr>
<td>60 to 69</td>
<td>42,311</td>
<td>492,240</td>
<td>1,701,147</td>
<td>717,408</td>
<td>119,933</td>
<td>109,542</td>
<td>3,182,581</td>
</tr>
<tr>
<td>70 to 79</td>
<td>44,827</td>
<td>381,066</td>
<td>1,251,229</td>
<td>272,364</td>
<td>46,400</td>
<td>109,175</td>
<td>2,105,061</td>
</tr>
<tr>
<td>80 and over</td>
<td>160,193</td>
<td>260,973</td>
<td>607,816</td>
<td>70,411</td>
<td>25,184</td>
<td>73,113</td>
<td>1,197,690</td>
</tr>
<tr>
<td>Total+</td>
<td>380,783</td>
<td>3,583,702</td>
<td>11,636,136</td>
<td>3,830,330</td>
<td>629,960</td>
<td>1,212,566</td>
<td>21,273,477</td>
</tr>
</tbody>
</table>

*The ’mass immunization clinic’ group includes mass immunization, mobile, drive-through, and occupational clinics.
**The ’other/not reported’ category includes dose administration records where a vaccination setting was not specified (reported as ‘other’) or was missing (not reported).
+Provincial totals include individuals with unknown age. Further detail is provided in the Technical Notes.

Note: Counts for the number of doses administered in Ontario exclude doses administered out of province and from non-Ontario stock. However, individuals that received a vaccination out of province or from non-Ontario stock are included in coverage estimates, as these individuals are residents of Ontario. As a result, the counts reported for doses administered will not align with the number of individuals immunized.

Note: For the purposes of this report, age was calculated on the date of dose administration. However, vaccination program eligibility may be based on birth year. For example, individuals turning 12 in 2021 are now eligible for immunization. Individuals that are 11 years of age at the time of vaccination are included in provincial totals, but not included in age specific stratum as the number of eligible 11 year olds is small.
Technical Notes

Data Sources

- COVID-19 vaccination data were based on information successfully extracted from the Ontario Ministry of Health’s COVaxON application as of September 20, 2021 at approximately 7:00 a.m. for vaccination records created on or after June 1, 2021 and September 16, 2021 at approximately 7:00 a.m. for vaccination records created up to May 31, 2021.

- COVID-19 case data were based on information successfully extracted from the Ontario Ministry of Health’s CCM application as of September 19, 2021 at approximately 1:00 p.m. for cases reported from Feb 1, 2021 on and as of September 16, 2021 at approximately 9:00 a.m. for cases reported up to Jan 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 immunization 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.

- Counts for the number of doses administered in Ontario exclude doses administered out of province and from non-Ontario stock. However, individuals that received a vaccination out of province or from non-Ontario stock are included in coverage estimates, as these individuals are residents of Ontario. As a result, the counts reported for doses administered will not align with the number of individuals immunized.

- Only cases meeting the confirmed case classification as listed in the MOH COVID-19 case definition are included. This includes persons with a positive detection of serum/plasma immunoglobulin G (IgG) antibodies to SARS-CoV-2, which was added to the confirmed case definition on August 6, 2020.

- Priority population grouping are not mutually exclusive. Vaccinated individuals may fall into multiple different priority population groupings, however, only one grouping is selected at the time of vaccination. For example, an education worker could also be eligible for vaccine because they provide care for someone with a high risk medical condition, however, only one of the two groupings is selected at the time of vaccination. As a result, reported counts for priority populations should be interpreted with caution.

- Ontario-specific vaccine effectiveness (VE) estimates (for both symptomatic infection and severe outcomes) used in this analysis reflect VE of 14 or more days following dose 1 and dose 2 administration. VE increases with time, particularly for those aged 70 years or older. As such, VE
may be an under-estimate and the number of cases and severe outcomes averted is likely a conservative estimate.

- VE also varies with age, with lower VE among older age groups. As a result the estimated impact on severe outcomes (calculated using VE for individuals 70+ years of age) for individuals 70-79 years of age is likely an underestimate, while the estimated impact for individuals 80+ years of age may be an overestimate.

- Only direct effects of vaccination on cases and severe outcomes were estimated in this analysis. Indirect effects including, reduced transmission, as a result of vaccination were not estimated. Further, only first doses were considered in these analyses. As a result, the impact the vaccination program on the reduction in cases and severe outcomes is likely an underestimate.

**Methods: Vaccination Data**

- Data presented may differ from other sources for various reasons, including differing extract times and methodologies for processing COVaxON data. Further details pertaining to the methodology for this report are described below.

- Data includes clients with a dose administration record recorded in COVaxON which includes a small number of client records with a residential postal code outside of Ontario who may be eligible for immunization on the basis of working in a high-risk setting (i.e. LTCH) in Ontario.
  - Out of province dose administration records well as doses administered from non-Ontario stock (e.g. doses from federal stock for populations such as the Armed Forces) are included in coverage estimates. However, out of province and non-Ontario stock dose administration records are not included in dose counts.

- For missing dose administration dates and dose administration dates prior to December 14, 2020, the date the administration record was created was used as a proxy. It is possible that dose administration records could be created in advance of dose administration, and thus this may not reflect the true dose administration date.

- Dose administration date was used to determine the dose number (e.g. the first chronological dose was considered dose 1) as well as the dose interval (number of days from first to second dose).

- Non-valid dose records were excluded. Non-valid records included doses where the status was reported as ‘entered in error’, ‘invalid’, or other similar variations, as well as doses where the status was valid (e.g. ‘administered’) but that were identified as non-valid client records (e.g. client first and last name were reported as ‘test’, ‘do not use’, ‘error’, ‘ignore’, or other similar variations).

- Duplicate dose administration records were excluded (i.e. clients with multiple dose administration records with the same date). Duplicate dose records were identified and excluded using personal identifiers, such as health card number, name, date of birth, and postal code, where available, as well as dose administration date.
  - After removing duplicate dose administration records, dose 1 and dose 2 were assigned based on the dose administration dates reported. For example, for records with the same client name, date of birth, and postal code, and two dose records on different dates, the
first chronological dose was considered dose 1 and the second dose was considered dose 2.

- For clients with three or more doses reported with different administration dates, the first chronological dose was considered the first dose. To determine a date for the second dose, the first subsequent date on or after the product-specific recommended minimum interval was used. If all subsequent doses were before the product-specific recommended minimum interval, the date closest to the recommended minimum interval was used. For example, if there were two subsequent Moderna doses that were 7 days and 21 days from the first dose, respectively, then the dose that was 21 days from the first dose was used as the second dose. Similarly, if there were two subsequent doses that were 10 days and 12 days from the first dose, respectively, then the dose that was 12 days from the first dose was used as the second dose. However, in this example the second dose would later be excluded (see below). The recommended product specific minimum intervals as outlined by the National Advisory Committee on Immunization (NACI) are as follows:
  - Pfizer-BioNTech: 19 days.² There is currently no maximum interval for second doses (i.e. no recommendation to restart a vaccine series regardless of the length of delay of the second dose).
  - Moderna: 21 days.² There is currently no maximum interval for second doses (i.e. no recommendation to restart a vaccine series regardless of delay of second dose).
  - AstraZeneca/COVISHIELD: 28 days.² There is currently no maximum interval for second doses (i.e. no recommendation to restart a vaccine series regardless of delay of second dose).

- Second doses administered before 14 days (regardless of the vaccine product) were considered data entry errors and were excluded.

- Age at the time of dose 1 administration was calculated using the client date of birth and the date of dose 1 administration. Ages reported as ≥120 years, <0 years, or where date of birth was missing were considered unknown. In Canada, the Pfizer-BioNTech and Moderna COVID-19 vaccines are authorized for use in individuals aged 12 years and older. The AstraZeneca/COVISHIELD COVID-19 vaccines are authorized for use in individuals aged 18 years and older.⁴⁻⁵ Based on expected vaccine product use as per NACI and product monographs, clients under 12 years of age that received the Pfizer-BioNTech or Moderna COVID-19 vaccine, and clients under 18 years of age that received the AstraZeneca/COVISHIELD COVID-19 vaccines, were also considered to have unknown age.

- Clients reporting a gender of ‘Non-binary/third gender’ and ‘Other’ were combined into an ‘Other’ category. ‘Unknown’ gender included clients where gender was reported as ‘Prefer not to say’, ‘Unknown’, or where gender was missing.

- Organization postal code and public health unit were assigned using institution-specific IDs.

- Postal code of residence was extracted from the client residential address. For clients where the public health unit of residence was not reported and the postal code of residence was available, the postal code of residence was used to assign clients to a public health unit of residence.

- Priority population categories were informed by the MOH’s COVID-19: Guidance for Prioritization Health Care Workers for COVID-19 Vaccination.⁶
The ‘reason for immunization’ field was used to derive priority population categories as follows:

- LTCH/RH residents includes individuals identified as a resident of a LTCH/RH.
- HCW in LTCH/RH include individuals employed as LTCH/RH in a health care capacity.
- LTCH/RH other employees/essential caregivers include individuals employed in LTCH/RH in a non-health care capacity as well as individuals that are not employees and provide care to residents.
- HCW (not LTCH/RH) includes hospital staff as well as individuals working in a health care setting, such as laboratory staff and clinic staff.
- Congregate setting (not LTCH/RH) staff/residents include individuals that are employed or reside in congregate living settings, such as shelters.
- Adult recipients of chronic home care includes individuals receiving chronic home care.
- Advanced age includes individuals that were immunized due to older age and who reside in the community (non-congregate settings).
- Adults with high risk conditions includes individuals prioritized for immunization due to a high risk medical condition (such as immune compromising conditions) as well as their caregivers.
- Agricultural/farm/food manufacturer worker includes temporary and non-temporary agricultural and/or farm workers and individuals that work in food manufacturing.
- Community at greater risk includes individuals residing in areas with high COVID-19 incidence.
- Education/child care worker includes teachers and other individuals employed in education and child care.
- Essential worker who cannot work from home includes workers, such as justice and social service workers, workers essential to good production and the supply chain, etc.
- School aged children/children 12 to 17 years of age includes individuals that are 12 to 17 years of age and likely attending school in Ontario.
- Other priority population includes individuals where a specific reason for immunization was not provided as well as priority populations not outlined above.
- Not reported includes individuals where no reason for immunization was provided.

Methods: Case Data

- Methods for processing the CCM case data are described in the Technical Notes of the COVID-19 Daily Epidemiological Summary.

Methods: Vaccination Program Impact

- The estimated number of cases and severe outcomes (i.e., hospitalizations or deaths) averted by COVID-19 vaccination was estimated using a methodology outlined by Public Health England.
For cases with multiple severe outcomes (i.e., hospitalization and death) only the hospitalization was used.

Cases where the date of hospital admission and/or fatal outcome was not reported were excluded.

The impact of COVID-19 vaccines against cases and severe outcomes was estimated by multiplying vaccination coverage by vaccine effectiveness (VE) against cases and severe outcomes, respectively. The following Ontario-specific VE estimates for dose 1 and dose 2 were used:10

- A VE of 71% against symptomatic infection 14 or more days after dose 1 was applied for cases 18-39 years of age, a VE of 66% was applied for cases 40-69 years of age, and a VE of 40% was applied for cases 70+ years of age.
- A VE of 93% against symptomatic infection 14 or more days after dose 2 was applied for cases 18-39 years of age, a VE of 89% was applied for cases 40-69 years of age, and a VE of 94% was applied for cases 70+ years of age.
- A VE of 67% against severe outcomes 14 or more days after dose 1 was applied for severe outcomes among cases 70-79 and 80+ years of age.
- A VE of 97% against severe outcomes 14 or more days after dose 2 was applied for severe outcomes among cases 70-79 and 80+ years of age.

Given the time required from vaccination to protection for vaccination (i.e., to mount an immune response), the following lags were applied when estimating impacts:

- A lag of 14 days (corresponding to VE estimates) was applied to estimate the impact on cases.
- A lag of 20 days for hospitalizations and 27 days for death (corresponding to VE estimates plus median number of days from onset to hospitalization or death) were applied to estimate the impact on severe outcomes.
References


### Appendix A

**Table A1. Number of individuals who received a COVID-19 vaccine by priority population: Ontario, December 14, 2020 to September 18, 2021**

<table>
<thead>
<tr>
<th>Priority Population*</th>
<th>Number of individuals: Partially vaccinated (dose 1 only)</th>
<th>Number of individuals: Fully vaccinated (doses 1 and 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term care home (LTCH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residents</td>
<td>3,222</td>
<td>74,350</td>
</tr>
<tr>
<td>Health care workers (HCW)</td>
<td>1,530</td>
<td>80,872</td>
</tr>
<tr>
<td>Retirement home (RH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residents</td>
<td>1,398</td>
<td>61,195</td>
</tr>
<tr>
<td>HCWs</td>
<td>391</td>
<td>23,884</td>
</tr>
<tr>
<td>LTCH/RH other employees/essential caregivers</td>
<td>988</td>
<td>85,933</td>
</tr>
<tr>
<td>HCWs (not in LTCH/RH)</td>
<td>9,999</td>
<td>588,233</td>
</tr>
<tr>
<td>Congregate setting (not LTCH/RH) staff/residents</td>
<td>3,907</td>
<td>34,696</td>
</tr>
<tr>
<td>Adult recipients of chronic home care</td>
<td>3,855</td>
<td>115,267</td>
</tr>
<tr>
<td>Age-based eligibility</td>
<td>535,969</td>
<td>5,345,803</td>
</tr>
<tr>
<td>Adults with high risk condition and their caregivers</td>
<td>4,812</td>
<td>211,675</td>
</tr>
<tr>
<td>Community at greater risk</td>
<td>66,289</td>
<td>1,371,736</td>
</tr>
<tr>
<td>Agricultural/farm/food manufacturing worker</td>
<td>3,651</td>
<td>60,817</td>
</tr>
<tr>
<td>Education/child care worker</td>
<td>1,323</td>
<td>117,043</td>
</tr>
<tr>
<td>Essential worker that cannot work from home</td>
<td>15,838</td>
<td>374,353</td>
</tr>
<tr>
<td>School aged children/children 12 to 17 years of age</td>
<td>66,916</td>
<td>544,748</td>
</tr>
<tr>
<td>Other priority populations</td>
<td>63,418</td>
<td>1,179,173</td>
</tr>
<tr>
<td>Not reported</td>
<td>3,559</td>
<td>31,875</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>787,065</strong></td>
<td><strong>10,301,653</strong></td>
</tr>
</tbody>
</table>

*Priority population groupings are further described in the Technical Notes.

**Note:** Priority population grouping are not mutually exclusive. Individuals may fall into multiple different priority population groupings, however, only one grouping is selected at the time of vaccination. As a result, reported counts for specific priority populations should be interpreted with caution.