Update on COVID-19 in Canada: Epidemiology and Modelling

June 29, 2020
EPIDEMIOLOGY
COVID-19 has impacted some health regions more than others

Cumulative number of cases per 100,000 population

- > 700
- > 350 - 700
- > 150 - 350
- > 50 - 150
- 1 - 50
- 0

Median age (range) 51 years (<1 to 112)
Females 57,332 (56%)
Males 44,658 (44%)
Other gender 15 (<1%)

Age and gender available for 102,341 and 102,005 cases, respectively.

Deaths 8,508 (8.3%)
Hospitalizations 10,168 (15%)
ICU Admissions 2,085 (3.1%)

* Of 102,794 total cases as of June 26.  * Of 67,289 case reports for which the hospitalization fields were completed.

Data as of June 26, 2020 at 7pm
Indicators of COVID-19 transmission show steady decline nationally

- Daily new cases and deaths have been steadily declining.

- Daily numbers of hospitalised and critical care cases also steadily declining as recoveries increase and admission rates decline.

Data as of June 26, 2020, x-axes represent date of report.
Canada’s effective reproduction number ($Rt$) has been $<1$ for eight weeks

$Rt$, or the time varying effective reproduction number, represents the average number of people infected by each case

$Rt > 1$ is an indication the epidemic is growing

$Rt < 1$ is an indication the epidemic is being brought under control

Recent fluctuations in Canada’s $Rt$ are driven by localised outbreaks and ongoing transmission in some communities

Data as of June 26, 2020
Calculations are based on date of case report
Steepest declines in transmission observed among oldest age groups with relative increase in 20 to 39 year-olds since late May

Number of cases by date of illness onset and age group

Including 80+ age group

Excluding 80+ age group

Data as of June 26, 2020
*First available of illness onset, specimen collection, laboratory test date; cases may not yet be reported in shaded area due to reporting lag
National trends reflect a series of regional epidemics

<table>
<thead>
<tr>
<th>Province</th>
<th>Number of Cases (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC</td>
<td>49,656</td>
</tr>
<tr>
<td>ON</td>
<td>33,642</td>
</tr>
<tr>
<td>AB</td>
<td>7,588</td>
</tr>
<tr>
<td>BC</td>
<td>2,628</td>
</tr>
<tr>
<td>NS</td>
<td>1,067</td>
</tr>
<tr>
<td>SK</td>
<td>736</td>
</tr>
<tr>
<td>MB</td>
<td>314</td>
</tr>
<tr>
<td>NL</td>
<td>261</td>
</tr>
<tr>
<td>NB</td>
<td>164</td>
</tr>
</tbody>
</table>

Data as of June 25, 2020

There has been no community transmission in Prince Edward Island, the Yukon and the Northwest Territories and no cases reported in Nunavut to date.

Sample size (N) reflects the number of cases for which dates have been provided through detailed case reports.

*First available of illness onset, specimen collection, laboratory test date; cases may not yet be reported in shaded area due to reporting lag.
Recent trends reflect community transmission hot spots and localised outbreaks

Past 14 days - number of cases per 100,000 population

<table>
<thead>
<tr>
<th>Health regions with highest number of cases per population in past 14 days</th>
<th>Cases per 100,000 population in past 14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>SK – South</td>
<td>&gt;40 - 101</td>
</tr>
<tr>
<td>SK – Far North</td>
<td></td>
</tr>
<tr>
<td>ON – Windsor-Essex County</td>
<td></td>
</tr>
<tr>
<td>ON – Peel Region</td>
<td></td>
</tr>
<tr>
<td>QC – Région des Laurentides</td>
<td>&gt;17 – 40</td>
</tr>
<tr>
<td>ON – City of Toronto</td>
<td></td>
</tr>
<tr>
<td>ON – Haldimand-Norfolk</td>
<td></td>
</tr>
<tr>
<td>NB – Zone 5 (Campbellton)</td>
<td></td>
</tr>
<tr>
<td>QC – Région de Montréal</td>
<td></td>
</tr>
<tr>
<td>QC – Région de Laval</td>
<td></td>
</tr>
</tbody>
</table>

Data as of June 26, 2020
Note: Map only shows COVID-19 cases where health region had been attributed in source data
Outbreaks point to vulnerabilities in closed and crowded settings

<table>
<thead>
<tr>
<th>Outbreak Setting</th>
<th>Reported Number of Outbreaks</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term care and seniors’ homes</td>
<td>1 052</td>
<td>20 604</td>
<td>6 920</td>
</tr>
<tr>
<td>Hospitals</td>
<td>124</td>
<td>1 644</td>
<td>184</td>
</tr>
<tr>
<td>Correctional facilities</td>
<td>26</td>
<td>818</td>
<td>5</td>
</tr>
<tr>
<td>Meat and poultry plants</td>
<td>13</td>
<td>3 025</td>
<td>6</td>
</tr>
<tr>
<td>Agricultural work settings including those with</td>
<td>21</td>
<td>954</td>
<td>3</td>
</tr>
<tr>
<td>congregate living for workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workplaces including those with congregate living for</td>
<td>83</td>
<td>977</td>
<td>4</td>
</tr>
<tr>
<td>workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shelters</td>
<td>31</td>
<td>581</td>
<td>3</td>
</tr>
</tbody>
</table>

Data as of June 26, 2020

*Estimates are based on public information sources and likely underestimate the true number of outbreaks and cases in these settings.

In addition, outbreaks have also recently been linked to social gatherings, particularly in closed settings with close contacts (e.g., funerals, indoor family gatherings).
MODELLING UPDATE
Canada is aiming for strong epidemic control over the course of the pandemic.
Public health measures remain essential to control the epidemic

- Dynamic models show lifting population-based measures (e.g., business and school closures, stay-at-home requirements) without strengthening other controls (e.g., personal public health practices, detect and isolate cases, trace and quarantine contacts) will likely cause the epidemic to rebound.
Fast and thorough case detection and contact tracing are key to limit spread

• To maintain epidemic control, public health authorities are continuing to build capacity to:
  > Detect and isolate as many cases as possible early in their infectious period
  > Identify (trace) and quarantine as many contacts as possible and as soon as possible after exposure

• Fast and thorough case detection and contact tracing means cases (including contacts that become cases) will be less likely to spread infection to others

Figures are for illustration purposes. The actual figures needed to maintain control of the epidemic will vary in different jurisdictions and communities.
Speed and completeness of case detection improving over time

Number of people tested and the percentage that tested positive, April 6 to June 21, 2020

Average number of days from symptom onset to lab specimen collection, March 1 to June 10, 2020
Effective contact tracing means we know how people were exposed to the virus

- Lower daily case counts facilitate contact tracing to link cases and break chains of transmission
- The more cases that are unlinked (i.e., we don’t know how they were exposed) the harder it is to stop community spread

Number of cases by date of illness onset* and exposure status as of June 25, 2020 (n=102,315)

* Specimen collection date or laboratory testing date was used if illness onset not available.
Note: Cases that occurred during the shaded time period may not yet be reported.
Important to minimise number of contacts between people to maintain epidemic control

COVID-19 control depends on the actions of individuals

Increasing the average number of close contacts between individuals makes it much more difficult to control spread:

- Higher number of cases and contacts to detect/trace
- Higher proportion must be completed to maintain control

Shades of blue represent combinations that are likely to result in <10% of the population being infected overall (darker = more likely)

### Average number of contacts with other individuals per person per day

<table>
<thead>
<tr>
<th>Average Number of Contacts</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6</td>
<td>Reflects restrictive community-based public health measures such as business and school closures</td>
</tr>
<tr>
<td>8</td>
<td>Reflects reopening of some social and economic spaces with appropriate controls and conditions in place</td>
</tr>
<tr>
<td>10</td>
<td>Reflects reopening of more social spaces and larger gatherings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% cases detected</th>
<th>% contacts traced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35-55%</td>
</tr>
<tr>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>

Proportion of cases detected and contacts traced to maintain infection rate of <10%
Protect yourself, your loved ones and help control COVID-19 in Canada

• Be aware of local COVID-19 activity to make informed decisions and reduce your risk

• Take precautions to lower your risk of exposure
  • **Maintain good hygiene practices:** handwashing, cough/sneeze etiquette, avoiding contaminated surfaces and objects
  • **Keep 2-metres physical distance from others** when outside your home/bubble or wear a non-medical mask or face covering when you can’t
  • **Minimise your number of close contacts**

• **Avoid high-risk settings and situations**
  • Avoid or strictly limit your exposure to **closed spaces, crowded places, close contact** with others

• **If you have symptoms, no matter how mild, stay home**
  • Stay at home and isolate yourself from others to prevent spread to others
  • Consult your local health authority to be assessed and guided safely to care

**Consider:**

• **If you test positive,** how long would your list of close contacts be?

• **No one is immune to severe illness due to COVID-19**

• **You or your contacts may be at high risk**

• **Keeping COVID-19 controlled and away from vulnerable populations is a shared responsibility of all Canadians**
Data driven models forecast short-term epidemic trajectory

Cumulative cases by July 12: from 103,940 to 108,130 based on data by June 26

Cumulative deaths by July 12: from 8,545 to 8,865 based on data by June 26

Extrapolation based on recent trends using a forecasting model (with ranges of uncertainty)
We are learning from the experience of the global community

Canada flattened the curve sooner than a number of countries such as the UK, Italy and US.

Other countries such as South Korea and Japan demonstrated strong epidemic control to keep their curves smaller overall.

All countries realise this is an ongoing effort, requiring sustained public health measures to avoid resurgent transmission.

Data as of June 26, 2020
Dynamic models of scenarios

Model moves people through different states of infection. All start out as susceptible. Individuals are then exposed. They either become infected, or remain susceptible.

Disease Stages

Latent period → Asymptomatic infectious period → Symptomatic infectious period → Outcome

The duration of each stage has an impact on the speed of spread of the disease. The models are run with different values for these periods.

Mitigating factors

Model includes factors that reduce transmission, with different scenarios for different levels of public health measures possible. Hospitalization in the models is also assumed to include no further transmission.

Exacerbating factors

Model includes factors that increase transmission, i.e., the movement of infectious (symptomatic/asymptomatic) people, where contacts take place (e.g., school, work, etc.).