

1 EXECUTIVE SUMMARY AND CONTEXT

This is the November 25, 2021 overview of modelling studies conducted and collated by the PHAC Modelling Group. Summaries below are hyperlinked to the related section of the report for full details.

CURRENT SITUATIONAL AWARENESS

Domestic

The effective reproduction number (R_t) for Canada as of November 13, 2021, estimated using date of illness onset, was 0.97. Nationally, R_t was below 1 at mid-September, but has been increasing; it transiently exceeded 1 in early November. On November 13, R_t was >1 in Manitoba, Ontario and Quebec, and it remains <1 in British Columbia, Alberta and Saskatchewan.

The short-range statistical forecast for Canada up to December 2, 2021 is:

- 1,794,444 cumulative cases (range: 1,789,189 to 1,799,498); and
- 29,734 cumulative deaths (range 29,628 to 29,834) by that date.

On average, case incidence is projected to increase over the next week in Canada. Mean case incidence is projected to increase throughout the projection period in Ontario and Quebec, and decrease in Alberta, British Columbia, Manitoba, and Saskatchewan. The incidence of new deaths is projected to decrease in Canada.

The long-range dynamic modelling forecast (Simon Fraser University model) for Canada suggests the trajectory is towards a resurgence over the coming two months, with $\sim 3,500$ daily cases by mid-December if contact rates remain at the current level. Increasing contacts by a further 15% would result in a faster resurgence, while a reduction of contacts by 15% would bring the epidemic under control. The epidemic is forecast to resurge in Manitoba, Ontario and Quebec, plateau or decline in British Columbia, Alberta and Saskatchewan.

The long-range dynamic modelling forecast (PHAC-McMaster University model) suggests that nationally, the trajectory is towards a resurgence with $\sim 4,000$ daily cases by the end of December, assuming current contact rates. If contact rates remain at the current level, a resurgence is forecast for Manitoba, Ontario and Quebec and the epidemic is forecast to plateau or decline slowly in British Columbia, Alberta and Saskatchewan.

International

Importation risk modelling for the week of November 14 to 20, 2021 suggests that an estimated 3,251 people with COVID-19 came to Canada including 1,353 air travellers, primarily from the United States of America (USA) and the Dominican Republic and Mexico, and 1,898 land travellers from the USA. From November 14 to 20, 2021, the estimated percentages of imported cases from air travel that may be variants of concern or variants of interest are 64.52% B.1.617.2 (delta), 0.56% for AY.4.2 (delta), and 0.01 % for P.1 (gamma).

Assessment of the impact of interventions on the COVID-19 epidemic in Canada and other countries using the Oxford University stringency index:

- The stringency index in Canada has been at 67 since November 1, 2021; since then, cases have increased slightly.
- In several countries, re-implementation of strict, well-timed measures have successfully decreased cases in past and current waves as vaccines have rolled out.
- Experiences in many European countries suggest that swift re-implementation of public health measures may still be needed as a combination of the more transmissible delta variant, and unvaccinated populations, leads to resurgence.

DYNAMIC MODELLING

The PHAC agent-based model (ABM) explored the potential combined impact of waning immunity, administering a one-time booster dose to varying proportions of the Canadian population ≥ 18 years of age and vaccinating children in the 5 to 11 age group. There is still uncertainty surrounding many aspects of this scenario, including: overall population vaccination coverage; the speed of vaccinating the 5 to 11 age group and deploying boosters; the rate at which immunity wanes and the protection provided by a one-time booster. Current results indicate that a one-dose booster administered to a wider proportion of the population in combination with vaccinating the 5 to 11 age group could delay a resurgence for a considerable period. There may be a need for additional boosters depending upon the long term waning assumptions.

The PHAC compartment model explored the potential impact of lifting of public health measures with vaccination of the 5 to 11 age group, and the administration of boosters to the 60 and older age group with scenarios for waning immunity and lifting of public health measures. The simulations suggest that completely lifting public health measures in early 2022 without additional vaccination, either in the form of booster doses or to the 5 to 11 age group, might result in a resurgence of the epidemic. With booster vaccines in the 60 and older age group or vaccination of the 5 to 11 age group, simulations suggest that lifting most measures will result in limited resurgence of the epidemic over the majority of 2022.