

1 EXECUTIVE SUMMARY AND CONTEXT

This is the October 7, 2021 overview of findings 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 on September 25, 2021, estimated using date of illness onset, was 0.96. Nationally, R_t has been above 1 since mid-July, but has declined in recent weeks. On September 25, R_t was <1 in all of the six provinces analysed, except Manitoba.

The short-range statistical forecast for Canada up to October 14, 2021 is for:

- 1,681,437 cumulative cases (range: 1,676,045 to 1,686,623); and
- 28,397 cumulative deaths (range 28,293 to 28,506) by that date.

Overall, case incidence is projected to remain constant over the next week in Canada. Mean case incidence is projected to remain fairly constant throughout the projection period in all modelled provinces, except for Quebec and Saskatchewan, where case incidence is projected to decrease. The incidence of new deaths is projected to remain stable in Canada.

The long-range dynamic modelling forecast (Simon Fraser University model) for Canada suggests the trajectory is towards a decline over the coming two months, with $\sim 3,000$ daily cases by early November if contact rates remain at the current level. Increasing contacts by a further 15% would result in a resurgence, but a reduction of contacts by 15% would further maintain the epidemic under control. In Manitoba and Saskatchewan, the trajectory is towards a slight increase then plateauing or decline over the coming 2 months if contact rates remain at the current levels, and the epidemic is forecast to plateau or decline in all other provinces.

The long-range dynamic modelling forecast (PHAC-McMaster University model) suggests that nationally and in each province (except for Manitoba), the trajectory is towards a plateau or a decline of the epidemic, with $\sim 3,000$ daily cases by early November assuming current contact rates. A slow increase in cases is forecast for Manitoba. If relaxation of public health measures or behavioral changes increase contacts by 15%, resurgence is forecast in British Columbia, Alberta, Saskatchewan and Manitoba.

International

Importation risk modelling for the week of September 26 to October 2, 2021, suggests that an estimated 3,720 people with COVID-19 came to Canada including 444 air travellers, primarily from the United States of America (USA) and the United Kingdom and 3,276 land travellers from the USA. From September 26 to October 2, 2021, the estimated percentages of imported cases from air travel that may be variants of

concern or variants of interest are 94.8% B.1.617.2 (delta), 0.06% B.1.1.7 (alpha), 0.05% B.162.1 (mu) and 0.04% 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:

- Canada's stringency index has remained constant at 68 over the last two and a half weeks, and case numbers are beginning to decline.
- In several countries, implementation of strict, well-timed measures have successfully decreased cases in past waves as vaccines have rolled out.
- Experiences in some countries suggest that swift re-implementation of public health measures may still be needed as new virus variants and infection in pockets of vulnerable populations have led to resurgence.

DYNAMIC MODELLING

The PHAC agent-based model (ABM) explored the impact of expanding vaccination to the 5 to 11 age group commencing either in the fall (October 15, 2021) or the winter (December 15, 2021) and administering vaccines at a rate of 7,500 children per day or an expedited rate of 22,500 children per day. Results suggest that expanding vaccination in the 5 to 11 age group in the fall or winter of 2021 is unlikely on its own to suppress resurgence because resurgence is already underway, and because vaccination has an impact delayed by the period it takes to gain immunity. Enhanced public health measures such as masking and adherence to personal physical distancing would more immediately control the fall/winter wave.

The PHAC compartment model explored the potential impact of hypothetical levels of loss of protection against transmission, and the possible impacts of enhanced vaccine uptake and booster vaccinations, on control of the fourth wave of COVID-19. In model scenarios in which vaccine immunity wanes, increased population vaccine coverage either through targeting the 5 to 11 age group, or increased uptake in the older population or booster doses to the older age groups all contributed to reducing the current epidemic. Booster doses contributed the most to reduction in hospitalization for the older age groups and resulted in a shorter fourth wave.

SPECIAL REPORT

The report *Impact of vaccinating the 5 to 11 age group and increasing vaccination coverage of those aged 12 and older in achieving herd immunity* explored the scenarios of obtaining herd immunity against COVID-19 by vaccination of 5 to 11 year olds alone or through a combination of vaccination and social activity level reduction. Results indicated that to reach herd immunity by vaccination and reduction of social activity levels, ~ 95% of those aged 12 and older need to be vaccinated, together with at least ~ 20% effective vaccination coverage for the 5 to 11 age group, and a reduction in social activity levels in 5 to 11 year olds by 50%.