

1 EXECUTIVE SUMMARY AND CONTEXT

This is the August 26, 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 August 14, 2021, estimated using date of illness onset, was 1.12. Nationally, R_t began to increase at the end of June and has been above 1 since mid-July. On August 14, R_t was >1 in five of the six provinces analysed (British Columbia, Alberta, Saskatchewan, Ontario and Quebec) and ~ 1 in Manitoba.

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

- 1,502,716 cumulative cases (range: 1,497,272 to 1,508,523); and
- 26,909 cumulative deaths (range 26,867 to 26,952) by that date.

Overall, case incidence is projected to increase by 1% over the next week in Canada. Mean case incidence is projected to remain relatively constant throughout the projection period in all modelled provinces. The incidence of new deaths is projected to remain stable.

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 $\sim 8,000$ daily cases by mid-September if contact rates remain the same. Increasing contacts by a further 25% would enhance the resurgence, but a reduction of contacts by 25% would maintain the epidemic under control. In all provinces except Manitoba, the trajectory is also towards a resurgence over the coming two months if contact rates remain at the current levels, but the resurgence is forecast to be lower in Alberta and British Columbia than 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 strong resurgence of the epidemic, with $\sim 10,000$ daily cases by mid-September assuming current contact rates. If public health measures or behavioral changes reduce contacts by 25%, resurgence may be avoided in most provinces except British Columbia and Saskatchewan.

International

Importation risk modelling: The outputs of the importation risk model are not presented this week due to ongoing work to implement required adjustment in the model. Following the implementation of the Stage 2 of border re-opening, the model has to be modified to account for the additional incoming fully vaccinated travellers from the United States. Data validation is ongoing on travel volume for fully vaccinated, partially vaccinated and non-vaccinated travellers and also on case prevalence data, especially for the United States (nationally and by States).

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 decreased from 70 to 61 on July 16, 2021.

- Cases began to increase a week after the decrease in stringency index and have since increased 6-fold.
- 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 the virus evolves and pockets of vulnerable populations remain – both of which have led to resurgence.

Dynamic modelling

The PHAC agent-based model (ABM) explored the impact of modifying testing and contact tracing measures with the delta variant as the dominant circulating strain. In simulations in which test-trace-isolate measures were removed in early August, a considerable increase in the magnitude of the resurgence in terms of cases, hospitalisations and deaths were observed. Results suggest that case detection and contact tracing measures can be effective tools to prevent a delta-driven resurgence (a fourth wave), which is predicted to occur in the fall/winter of 2021/22, and, ultimately, to prevent our healthcare system from being overwhelmed.

The PHAC agent-based model (ABM) explored the impact of expanding vaccination to the 5 to 11 age group, and the impact of increasing vaccination uptake in the 18 to 39 age group, on the anticipated delta-driven resurgence (fourth wave). Results suggest that expanding vaccination to the 5 to 11 age group will help reduce the size of this wave, as will increasing vaccination in the 18 to 39 age group in which vaccine acceptance rate is currently lowest. Expediting increased vaccine uptake would also reduce the size of the wave. However, other measures including enhancing non-pharmaceutical public health measures such as test-trace-isolate and slowing reopening will likely also be necessary to abate the fourth wave.

The PHAC compartment model explored the impact of waning immunity with the delta variant as the dominant circulating strain. Under modelled scenarios of waning immunity, fourth wave epidemic peaks in case incidence were found to be equal or higher than previously experienced peaks if the duration of vaccine acquired immunity is less than a year. In addition, the magnitude of the case incidence peaks increased and occurred earlier with higher levels of vaccine immunity loss and the addition of waning of immunity following infection. In all modelled scenarios, unvaccinated individuals were found to contribute more to the fourth wave than those who are vaccinated.