

1 EXECUTIVE SUMMARY AND CONTEXT

This is the September 16, 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 4, 2021, estimated using date of illness onset, was 1.04. Nationally, R_t began to increase at the end of June and has been above 1 since mid-July, although a decreasing trend has been observed since mid-August. On September 14, R_t was >1 in four of the six provinces analysed (Alberta, Saskatchewan, Ontario and Quebec) and ~ 1 in British Columbia and Manitoba.

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

- 1,596,352 cumulative cases (range: 1,590,167 to 1,602,696); and
- 27,426 cumulative deaths (range 27,350 to 27,518) by that date.

Overall, case incidence is projected to increase by 1.9% over the next week in Canada. Mean case incidence is projected to increase throughout the projection period in all modelled provinces, except for British Columbia. The incidence of new deaths is projected to remain stable in Canada.

The NOWcast of the force of infection suggests the epidemic is increasing in five of the eight provinces analysed (British Columbia, Saskatchewan, Ontario, Quebec Nova Scotia). Force of infection is forecast to decline and remain low in Manitoba and New Brunswick and to remain high but start to decline in Alberta.

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 $\sim 10,000$ daily cases by mid-October 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 some provinces (Alberta, Saskatchewan and Quebec), the trajectory is also towards a resurgence over the coming two months if contact rates remain at the current levels, and the epidemic is forecast to plateau in British Columbia, Manitoba and Ontario.

The long-range dynamic modelling forecast (PHAC-McMaster University model) suggests that nationally and in each province (except for British Columbia and Quebec), the trajectory is towards a resurgence of the epidemic, with $\sim 9,000$ daily cases by mid-October assuming current contact rates. If public health measures or behavioral changes reduce contacts by 25%, resurgence may be avoided in most provinces except Saskatchewan.

International

Importation risk modelling for the week of September 5 to 11, 2021, suggests that an estimated 2,697 people with COVID-19 came to Canada including 796 air travellers, primarily from the United States of America (USA) and the United Kingdom and 1,902 land travellers from the USA. From September 5 to 11, 2021, the estimated percentages of imported cases from air travel that may be variants of concern or variants of interest are 96.1% B.1.617.2 (delta), 0.2% B.1.1.7 (alpha), 0.2% P.1 (gamma) and 0.1% B.1621 (mu).

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 increased over the last two and a half weeks from a value of 61 to 69. Despite the increase in the stringency index, case numbers continue to increase.
- Experience suggests that swift re-implementation of public health measures to reach a stringency index of 75 may be needed to mitigate the resurgence expected as the virus evolves and pockets of vulnerable populations remain.

Dynamic modelling

The PHAC agent-based model (ABM) explored the impact of alternative public health (PH) measures to shutdowns to slow the delta-driven resurgence and protect healthcare capacity. Two analyses are presented: (i) the reintroduction of physical distancing and masking, in schools and in the community and (ii) the introduction of a vaccine proof requirements that restrict the number of contacts, and transmission, amongst unvaccinated individuals in schools or in the community. This analysis suggests that a more targeted approach in reducing contacts amongst unvaccinated individuals, implemented for a short period of time was more effective than reducing contacts between individuals of any vaccination status.

The PHAC compartment model explored the potential impact of various hypothetical levels of loss of protection against transmission. All scenarios resulted in a significant fourth wave of infection, which was greater than or equal to previously waves in the epidemic. Although vaccine protection against severe symptoms was unaffected in simulations, the increased case incidence resulting from reduced protection against infection caused a significant increase in hospitalizations, especially for scenarios of rapid loss of protection against infection.