

1 EXECUTIVE SUMMARY AND CONTEXT

This is the January 13, 2022 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 January 1, 2022, estimated using date of illness onset, was 1.48. Nationally, R_t has been increasing and above 1 since mid-December. On January 1, 2022, R_t was above 1 in all major provinces.

The short-range statistical forecast for Canada up to January 20, 2022 is:

- 30,541 cumulative deaths (range 31,395 to 31,702).

Short-range forecasts for cases were not produced given the recent changes to testing protocols across Canada. However, the rate of new cases increased considerably compared to case forecasts produced for the previous modelling report. The incidence of new deaths is projected to remain stable at an average of 68 deaths per day.

The long-range dynamic modelling forecast (Simon Fraser University model) for Canada suggests the trajectory is towards a rapid Omicron-driven resurgence and then a decline. If there is a 50% reduction in contact rates or transmission, the decline is forecast to be more rapid than if no reduction. Due to surveillance limitations, the uncertainty of the recent measures are large.

The long-range dynamic modelling forecast (PHAC-McMaster University model) suggests a high resurgence of infections that peaks and begins to decline in mid-January. While incidence is expected to rise then decline rapidly after the peak, hospitalization occupancy is forecast to decline more slowly.

The forecast of hospital admissions suggests an increase in hospital admission for all provinces, albeit later for Saskatchewan, which may be attributed to a possibly slower invasion of Omicron in that province.

International

Importation risk modelling for the week of January 2 to 11, 2022 suggests that an estimated 13,382 people with COVID-19 came to Canada including 5,800 air travellers, primarily from the United States of America (USA), Mexico, and France, and 7,582 land travellers from the USA. From January 2 to 11, 2022, the estimated percentages of imported cases from air travel that may be variants of concern or variants of interest are 77.43% B.1.1.529 (Omicron), 21.7% B.1.617.2 (Delta), and 0.24% for AY.4.2 (Delta). Many jurisdictions are limiting the use of COVID-19 tests, impacting global case count and testing data estimates. The resulting paucity of data could result in an underestimation of the model results.

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

- Since late December 2021, the stringency index in Canada has increased to a current value of 75.
- Most provinces and territories have implemented public health restrictions in the last month in response to Omicron-driven resurgence. Currently, Saskatchewan has the lowest stringency index value and Quebec has the highest stringency index value.
- Experiences in several countries suggest a need for either swift re-implementation or continuation of a high level of public health measures coupled with accelerated booster dose rollout, to limit the impact of the high volume of cases on health care systems.

DYNAMIC MODELLING

The PHAC agent-based model (ABM) explored the impact of expedited booster administration, change in test capacity and implementation of public health measures. Simulation results suggest that the Omicron wave is expected to strain health care capacity even with reduced virulence. Expedited booster administration was insufficient on its own to prevent the strain on health care capacity but in combination with public health measures some additional benefit is realized. The length of hospital stay for Omicron patients had the biggest impact on health care strain.

The PHAC compartment model explored the Omicron take-over using updated information on Omicron variant transmission, severity and immune escape characteristics. The potential impact of a reduced hospital length of stay on hospital occupation was also explored through scenarios. Simulated hospitalizations due to Omicron infections in Canada correlated closer with surveillance data for Delta infections if the risk of hospitalization for Omicron infections was reduced 50%. Simulations also suggested that if Omicron infections had a reduced risk of hospitalization and, if hospitalized, a decreased length of stay, hospital capacity may be strained but not exceeded.

Invasion of SARS-CoV-2 Variants of Concern explores the invasion dynamics of the main SARS-CoV-2 variants that have circulated in Canada. Results suggested that SARS-CoV-2 variants of concern have spread to different Canadian provinces at about the same time and with similar speeds. The exception is the high speed with which Omicron has spread relative to the other variants (Alpha and Delta). Fitting SARS-CoV-2 VOC data in surveillance to a logistic curve provides estimates of possible invasion speeds and provides information for managing future VOCs.