

Public Health Agency of Canada

National Microbiology Laboratory  
Health Canada - Santé Canada

COVID-19:

PHAC Modelling Group

Report



Public Health  
Agency of Canada

Agence de la santé  
publique du Canada

Executive Summary

# EXECUTIVE SUMMARY

This is the January 28, 2021 overview of findings of modelling studies conducted by the PHAC Modelling Group with some additional findings from external modelling partners.

## Current situational awareness

The reproduction number ( $R_t$ ) for Canada up to January 16, 2021, estimated using date of illness onset is  $<1$  and is  $<1$  in larger provinces.

The short-range statistical forecast in Canada up to February 4, 2021 is:

- 793,752 cumulative cases (range: 787,059 and 799,057)
- 20,905 cumulative deaths (range 20,604 to 21,202)

Mean case incidence is projected to decrease in Canada overall, as well as all modelled provinces except Manitoba (case incidence in Manitoba is projected to remain stable). The rate of new deaths is projected to continue increase.

The nowcast of the force of infection suggests that the epidemic is increasing in MB, SK, ON and NB. Force of infection is forecasted to decline in AB and QC, to remain low in NS and to plateau in BC.

The long-range dynamic modelling forecast in Canada over the next two months included three scenarios: With current contact rates, the model projects control of the epidemic. With a 20% increase in contact rates, the model predicts an increase in number of cases over time. With public health measures that result in the equivalent of a 25% reduction in contact rates, the model predicts the epidemic can be brought further under control.

Importation risk modelling for the week of January 17 to 23, 2021, an estimated 582 people with COVID-19 came into Canada, primarily from the US, Mexico and the UK. Variants of concern (VOC) estimated to have arrived in Canada for the week January 17 to 23, 2021 in infected travellers (in order of risk) are: the UK variant from the US, UK and France; and the South Africa variant from France and the UK.

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

- In Canada, there is variation in both magnitude and trends in the stringency index across Canadian provinces and territories. Although cases are decreasing or holding steady in many regions, the stringency index may be too low or declining too rapidly while case numbers are still high in some regions.
- In many countries, resurgence of the epidemic is occurring, including those with newly identified SARS-CoV-2 variants. Trends in cases, deaths and stringency index vary in some countries where SARS-CoV-2 variants have been detected.

## Dynamic modelling

A study *Exploring the impact of a vaccination rollout and reduced physical distancing in the Canadian population* assessed the impact of personal distancing of the Canadian population during roll-out of the vaccines. Assuming restrictive closures are still occurring at times to prevent healthcare system overload, participation of the public in maintaining distancing can help bring the epidemic to an end earlier or minimize the number of shutdowns needed.

A study *Exploring the effects of different dates of variant of concern (VOC) introduction and effects of enhanced restrictive closures* presented projections of reported cases for major Provinces according to different dates of introduction of a VOC. The projections suggest that the epidemic would accelerate markedly in all provinces with introduction and expansion of the VOC, in the face of current public health measures and restrictive closures.

A study on *The COVID-19 trajectory with and without the new strain B.1.1.7 (VOC-202012/01), and corresponding non-pharmaceutical interventions required to control the epidemic* explored the effect of introducing a more transmissible SARS-CoV-2 strain (e.g. VOC-202012/01) on the COVID-19 epidemic in Canada, and the public health measures needed to control it. All scenarios suggest a third wave of cases and hospitalizations will occur in 2021 even if public health measures are maintained at late December levels, in the absence of any additional public health measures or vaccination.

## Special reports

A report on *What do we mean by vaccine efficacy?* explored the different measures of efficacy of vaccines in terms of preventing infection, preventing illness and preventing transmission in communities. Vaccination could interact with population characteristics such as pre-existing immunity, genetic composition, intensity of transmission, so that estimates of efficacy of a given vaccine in different populations could differ considerably.

A report on *The potential impact of Variant of Concern establishment on COVID-19 epidemiology in Newfoundland and Labrador (NL)* used a two-variant deterministic SIR model with importations to describe the epidemiological dynamics of COVID-19 in NL. Modelling suggests that if VOCs are prevalent in departure locations for travellers to NL, the number of active cases in NL will be larger, but at a constant level. More travellers arriving in NL may be COVID-19-infected, and more infections may be spread to the NL community, but exponential growth may not occur. The results also suggest that if test-trace-isolate efficiency is reduced, then exponential growth of community cases in NL may occur.

Report *Exploration of effects of different vaccination regimes with and without relaxation of non-pharmaceutical interventions (NPIs)* explored the effectiveness of different vaccination program strategies, combined with different vaccine types, and different levels of non-pharmaceutical interventions. Model outputs suggest that relaxation of NPIs during vaccine rollout had a very marked impact on the incidence of infections and in their absence the epidemic resurges markedly. With the maintenance of NPIs, vaccines that are neutralizing and effective after one dose were most effective. Also, a one-dose non-neutralizing vaccine that gets to all targeted people rather outperforms a two-dose neutralizing vaccine that only gets to half of the planned population.