Public Health Agency of Canada

National Microbiology Laboratory

March 25, 2021

COVID-19:

PHAC Modelling Group

Report

Public Health Agency of Canada | Agence de la santé publique du Canada

01 EXECUTIVE SUMMARY AND CONTEXT

EXECUTIVE SUMMARY

This is the March 25, 2021 overview of findings of modelling studies conducted and collated by the PHAC Modelling Group.

Current situational awareness

The effective reproduction number (Rt) for Canada on March 13, 2021, estimated using date of illness onset is ≥1. There is an increasing trend in *Rt* in most provinces since early February and *Rt* was >1 for AB, MB and ON on March 13, 2021. For this date, *Rt* was still <1 for BC, SK and QC.

The short-range statistical forecast in Canada up to April 1, 2021 is for:

- 976,165 cumulative cases (range: 971,582 to 980,728)
- 23,031 cumulative deaths (range 22,902 to 23,150)

Overall, mean case incidence is projected to increase in Canada and all major provinces (BC, AB, SK, MB and ON), except Quebec where rates are projected to remain constant. The incidence of new deaths is projected to remain unchanged in Canada.

The nowcast of the force of infection suggests that the epidemic is stable in QC, NB and NS. However, the force of infection is forecast to continue to increase in BC, AB, SK and ON. The force of infection is now also showing an increasing trend in MB.

The long-range dynamic modelling forecast for Canada, not accounting for variants of concern (VOC), suggests ~6,000 cases by end of April without enhancements to control.

The long-range ensemble forecast including the introduction of variants of concern in Canada suggests that nationally, and in all major provinces, current controls may not be sufficient to fully control more transmissible variants of concern. If variants successfully spread and replace existing strain, and control measures remain unchanged there could be ~ 12,000 cases per day by mid-April.

Importation risk modelling for the week March 4 to 20, 2021, an estimated 3,119 people with COVID-19 came to Canada, primarily from India, the USA and Lebanon. For the top 10 countries estimated to contribute infected travelers to Canada for that week, the percent contribution from VOC or of interest (VOI) are from B.1.1.7 (UK variant) at 22%, B.1.427 and B.1.429 (Californian variants) at 5%, and each at <1% for the B.1.525 (Nigerian variant), P.1 and P2 (Brazilian variants) and B.1.351 (SA variant).

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

- While Canada's stringency index has recently decreased to 72, the number of reported cases has been increasing for almost three weeks.
- The stringency index in Canadian provinces and territories has either dropped or remained constant in recent weeks while cases are increasing in many regions of Canada. This may suggest the stringency index is too low in some regions to prevent resurgence of the epidemic.

Dynamic modelling

The impact of Canada's vaccination rollout on the timing of lifting restrictive closures under regular and extended dose intervals explored the rollout of five different vaccines during 2021 assuming invasion of a more transmissible variant of concern (VOC). In simulations with a 28-day interval between doses, and a vaccine efficacy of ≥60% against infection and disease after 1 dose, 66% of the eligible population (18 years and over) had to receive a first dose of vaccine for safe lifting of restrictive closures. This corresponds to mid-July given anticipated vaccination rollout. In simulations with a four-month interval between doses, for the same vaccine efficacy, 75% of the eligible population had to receive a first dose of vaccine for safe lifting of restrictive closures. This corresponds to early June given anticipated vaccination rollout.

Exploration of greater VOC virulence, vaccination rollout and lifting of restrictive closures presented prevalent acute hospitalisations and ICU admissions for four models to explore the impact of a more virulent VOC that causes 40% more severe infections, as well as being more transmissible. In simulations with an effective vaccine (>60% against disease and infection after 1 dose), lifting restrictive closures when 66% of the eligible population had received a first dose of vaccine resulted in a resurgence of COVID-19 that did not threaten healthcare capacity. This corresponds to mid-July given anticipated vaccine rollout. In simulations with a vaccine that is less effective, lifting restrictive closures when 75% of the eligible population had received a first dose of vaccine resulted in a COVID-19 resurgence that threatens healthcare capacity.

The impact of vaccine efficacy on the timing of when restrictive closures can be lifted safely based on second vaccine dose coverage explored the rollout of two different vaccines with assumed invasion of a more transmissible VOC. In simulations using a highly effective vaccine (92% and 94% effective against infection and symptoms after the second dose) lifting restrictive closures when ~10% of the eligible population has received the second dose of vaccine did not result in a resurgence of COVID-19 that threatened healthcare capacity. This corresponded to early July 2021 given anticipated vaccination rollout. In simulations using a less effective vaccine lifting restrictive closures could occur safely only when at least 50% of the eligible population has been vaccinated with the second dose. This corresponds to mid-August given anticipated vaccine supply and vaccination rollout.

The study *Strategies for safe lifting of restrictive closures, with vaccination rollout, different vaccine characteristics and emergence of B 1.1.7 (VOC-202012/01) using the deterministic model* provided insight on the timing and rate of lifting restrictive closures while maintaining the epidemic under control during and beyond vaccine rollout. In simulations, stepwise lifting of restrictions allowed for an earlier start date (but a later completion of lifting), less chance of epidemic resurgence and reduced hospitalizations compared to instant lifting of restrictions. Vaccine rollout using a 4-month interval between vaccine doses allowed for an earlier lifting of physical distancing restrictions and reduced the impact on hospitalizations compared to a rollout using a 28-day dose interval in modelled simulations.