

Update on COVID-19 in Canada: Epidemiology and Modelling

July 30th, 2021

Canada.ca/coronavirus



Public Health
Agency of Canada

Agence de la santé
publique du Canada

Canada

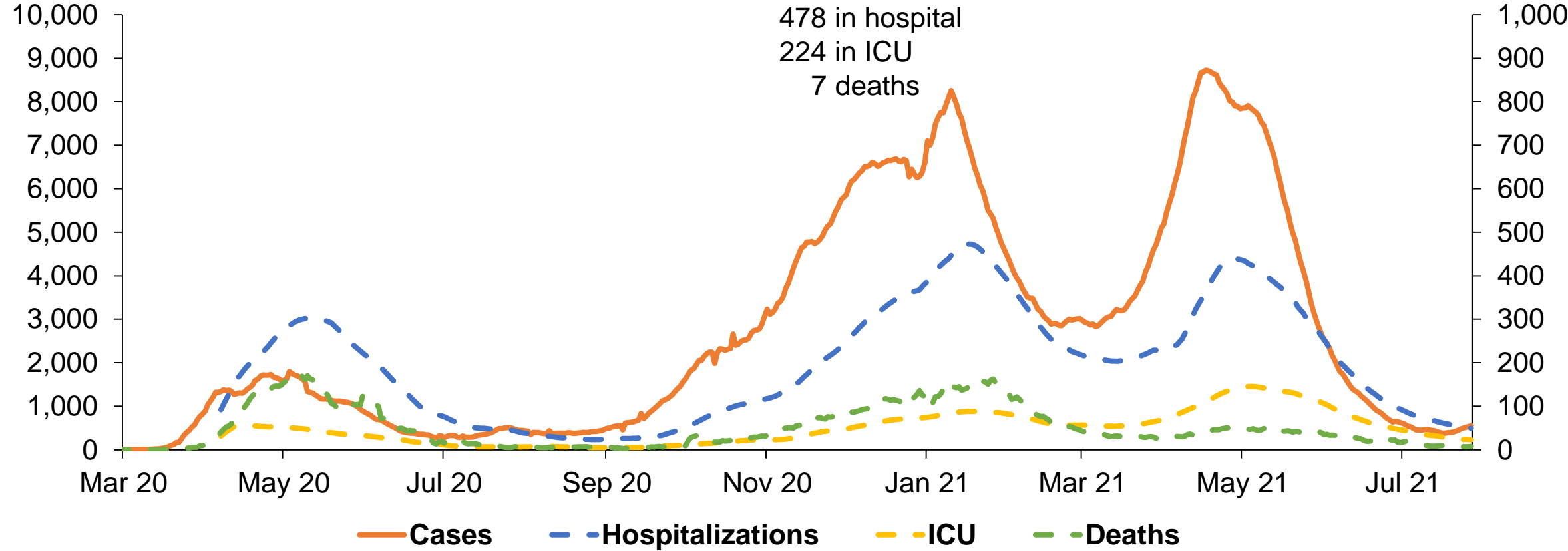
Slight increase in COVID-19 cases nationally, following weeks of sustained national decline across disease activity and severity indicators

Number of cases/
in hospital and ICU

On average over the past 7 days:

641 cases
478 in hospital
224 in ICU
7 deaths

Number of
deaths



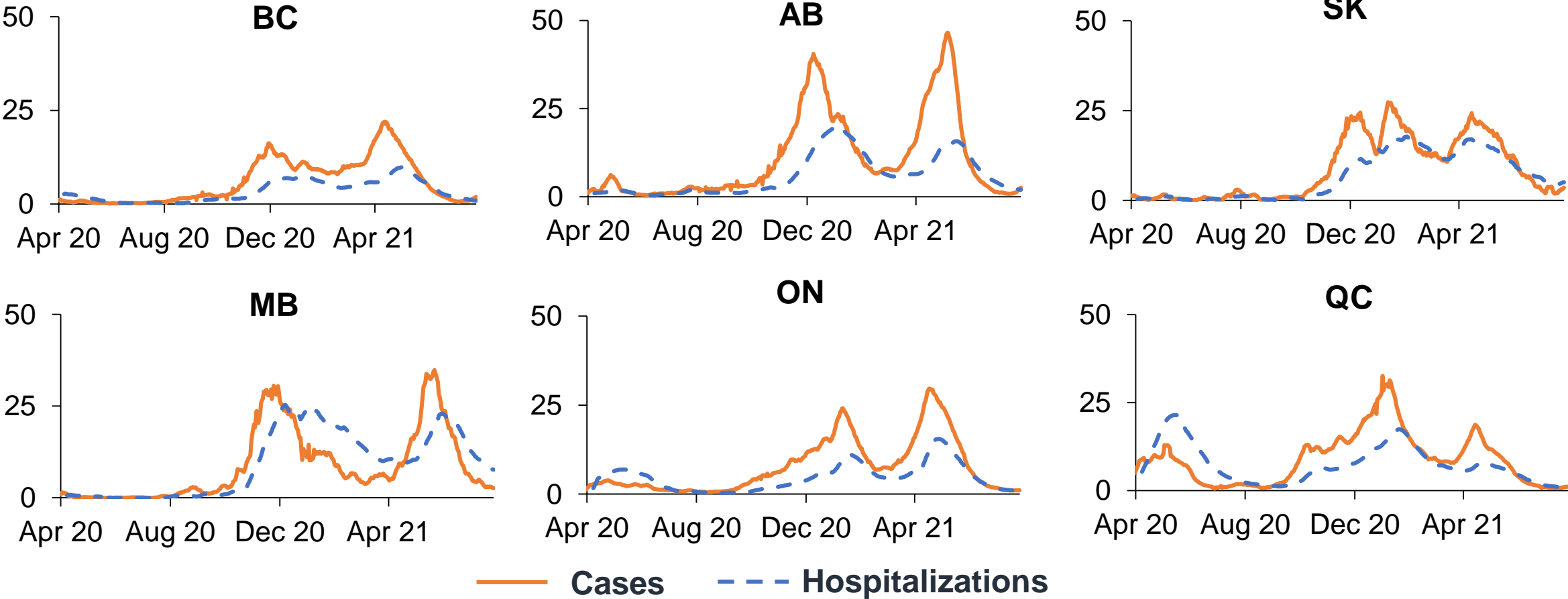
Data in figure as of July 27, 2021

Note: Trend lines reflect 7-day moving averages. Total hospitalizations and ICU admissions include all people in hospital and in ICU on that day.



Regional COVID-19 trends show low levels of hospital occupancy with the substantial reduction in disease activity since the peak of the 3rd wave

Number cases/ in hospital per 100,000 population

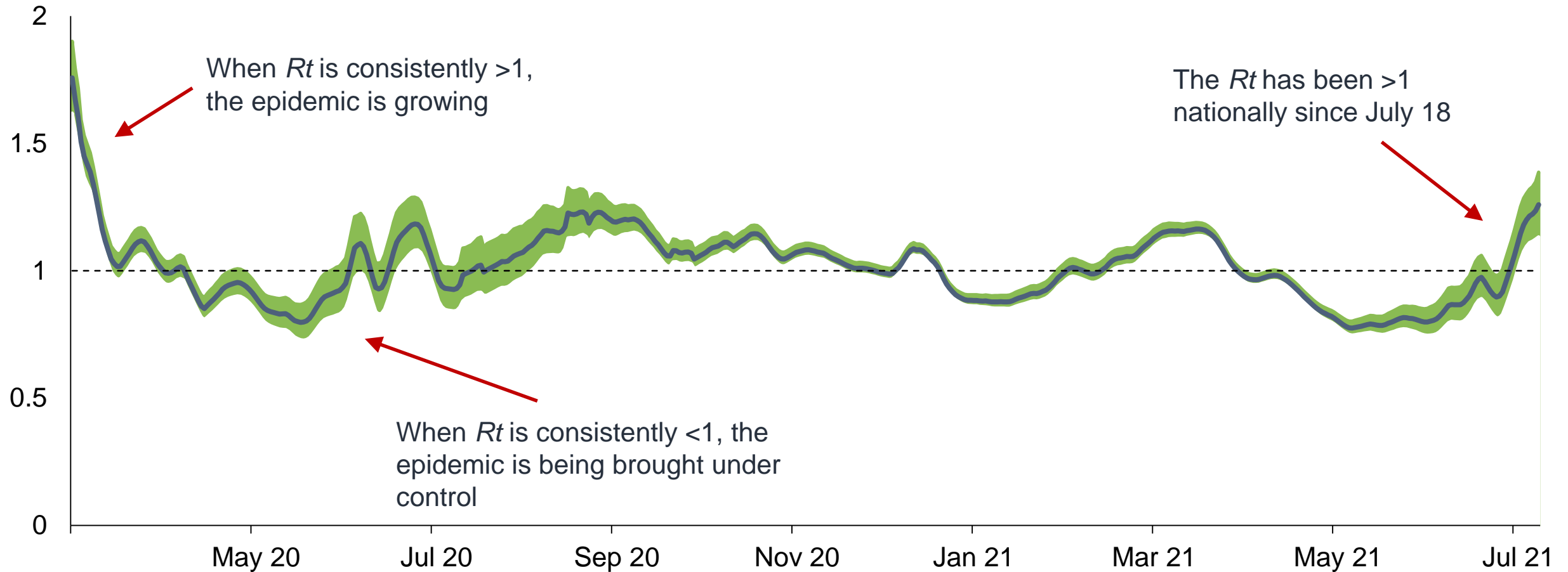


Data as of July 27, 2021

Note: Daily cases trend lines reflect 7-day moving averages. Total number in hospitals include all people in hospital on that day.



National R_t recently trending above 1, signalling early signs of epidemic growth in some areas



Data as of July 27, 2021

Note: 7-day moving average.

Predominance of the Delta variant underscores the need for high vaccination coverage and continued caution as restrictions are eased

↑ transmissibility



- Most transmissible variant to date
- **5-fold** increase in proportion of Delta cases in June
- Delta variant associated with strong resurgence

↑ severity



- Delta cases have increased risk for hospitalization
- Expected increased impact on healthcare utilization/capacity with Delta driven wave

↓ vaccine effectiveness

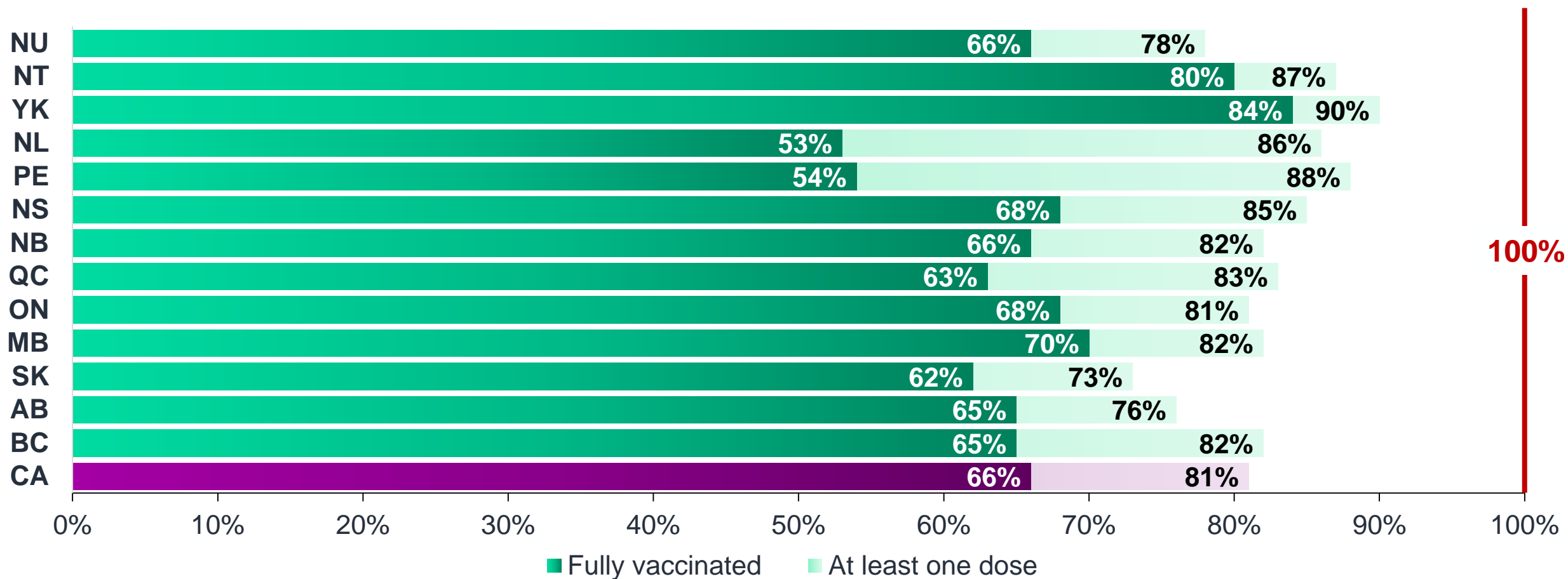


- Reduced effectiveness against symptomatic infection after 1 dose; small reduction after 2 doses
- Substantial protection against hospitalization
- Majority of Delta cases in Canada in unvaccinated or partially vaccinated people

2 vaccine doses needed for strong protection against variants of concern, including Delta

Over 81% of the eligible people, aged 12 years or older, have at least one dose of COVID-19 vaccines and over 66% are fully vaccinated

Percentage of eligible people (≥ 12 years) with at least one dose and fully vaccinated by jurisdiction, as of July 29th, 2021



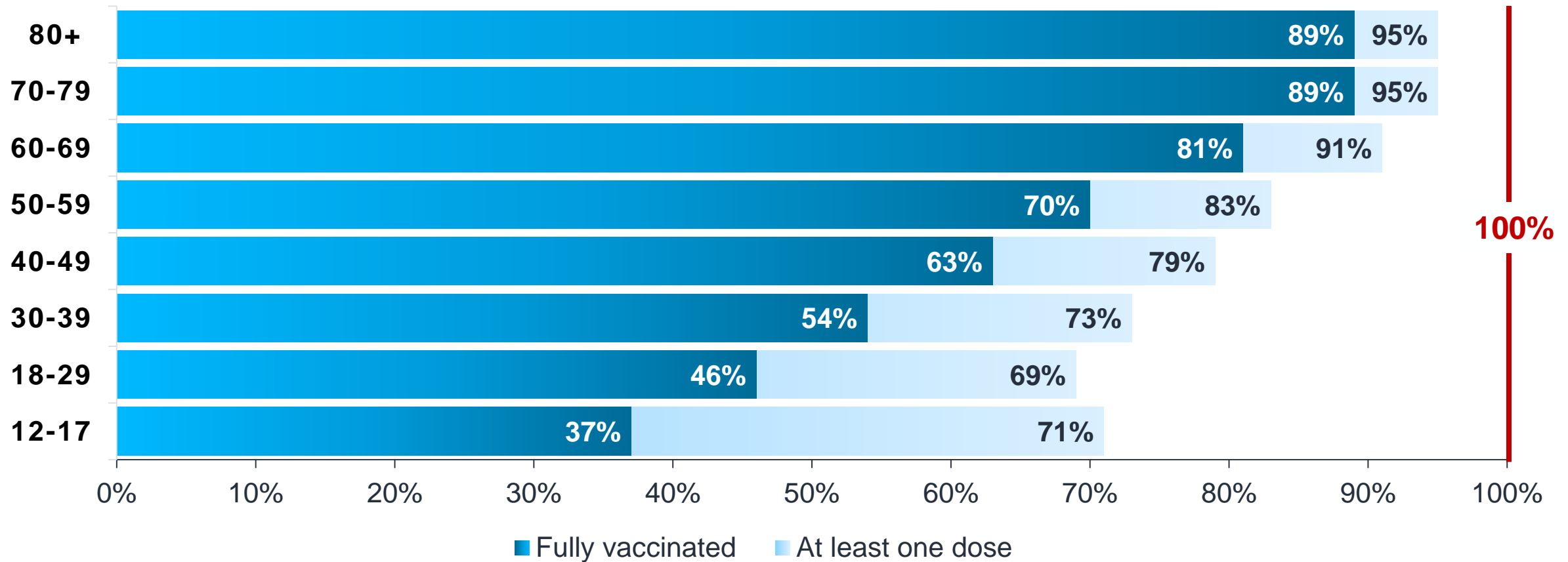
Data as of July 29, 2021

Note: Data obtained from <https://covid19tracker.ca/vaccinationtracker.html>. Accessed on 29 July, 2021 (9:00PM EST)



At least one dose and fully vaccinated coverage has increased stepwise as vaccination programs expanded to younger age groups

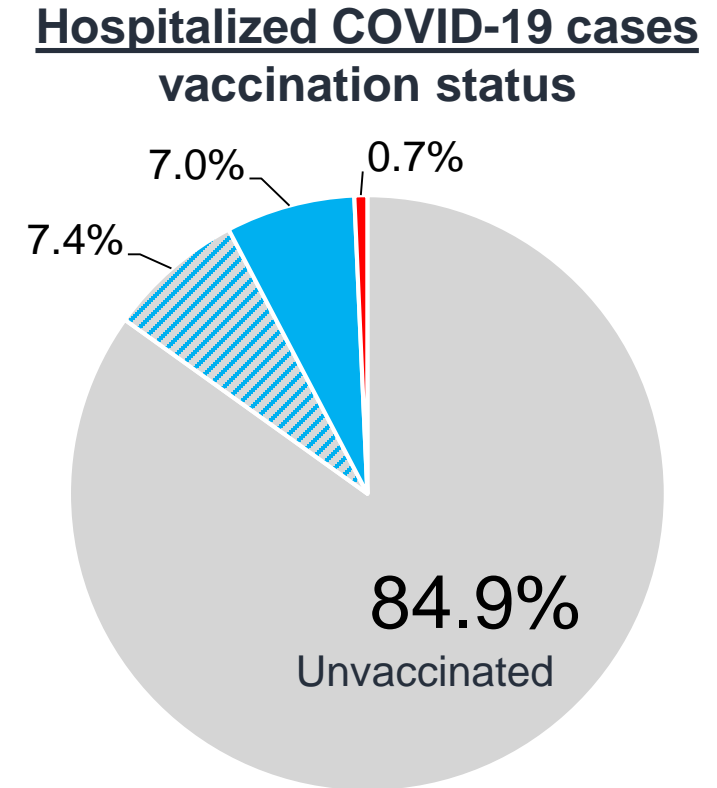
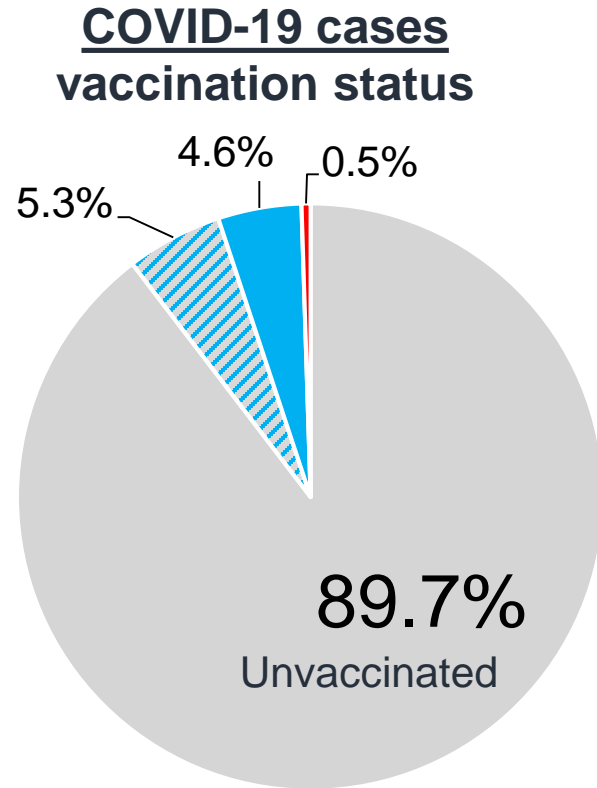
Percentage of eligible people (≥ 12 years) with at least one dose and fully vaccinated by age group, as of July 24th, 2021



Data as of July 24, 2021

Note: Data obtained from the Canadian COVID-19 Vaccination Coverage Surveillance System

Evidence shows COVID-19 vaccines are highly protective, with <1% of reported cases and <1% of hospitalized cases occurring in fully vaccinated people



■ Unvaccinated ▨ Not yet protected ■ Partially vaccinated ■ Fully vaccinated

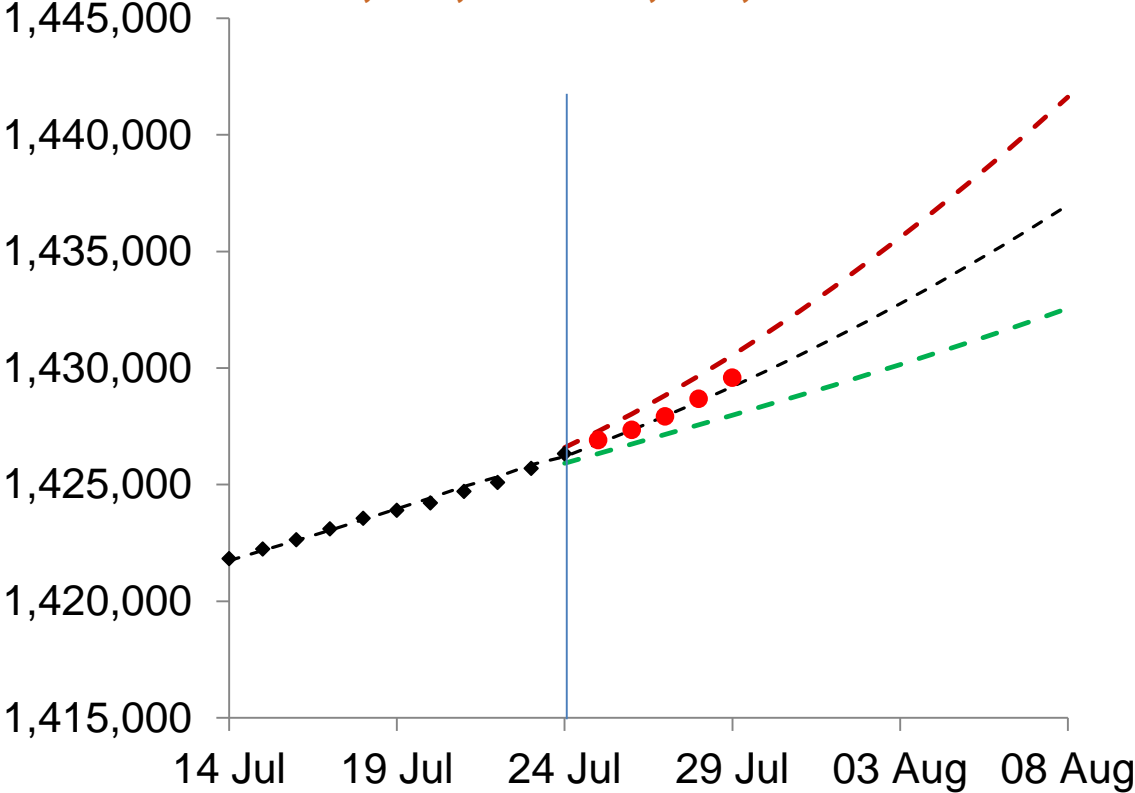
Data as of July 12, 2021. Note: The above figure includes data 14 Dec – 12 Jul from 11 jurisdictions (not including Saskatchewan, Quebec).

Definitions: cases **not yet protected** from vaccination had onset <14 days from their first dose; **partially vaccinated cases** had onset between ≥14 days from their first dose and <14 days after their second dose; **fully vaccinated cases** had onset ≥14 days after their second dose.

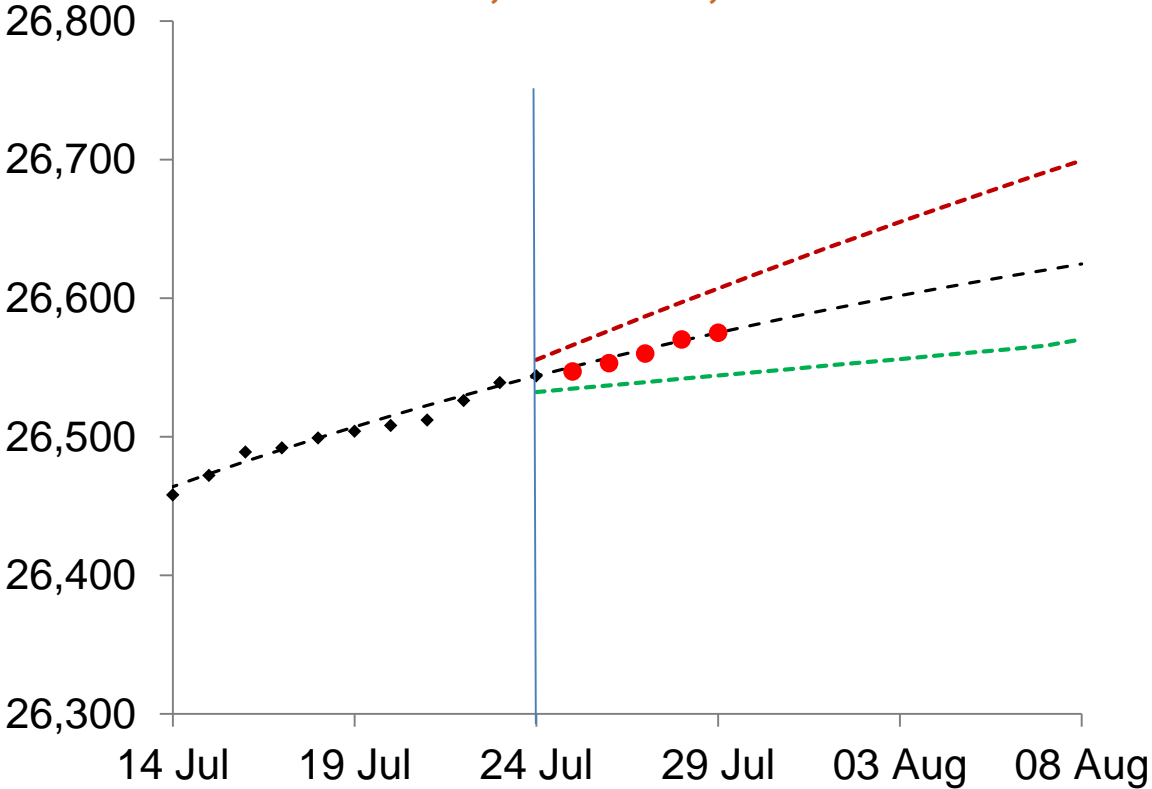


Short-term forecast predicts increased rate of growth for cumulative cases but not for cumulative deaths

Cumulative cases predicted to August 8, 2021:
1,432,555 to 1,441,610



Cumulative deaths predicted to August 8, 2021:
26,570 to 26,700

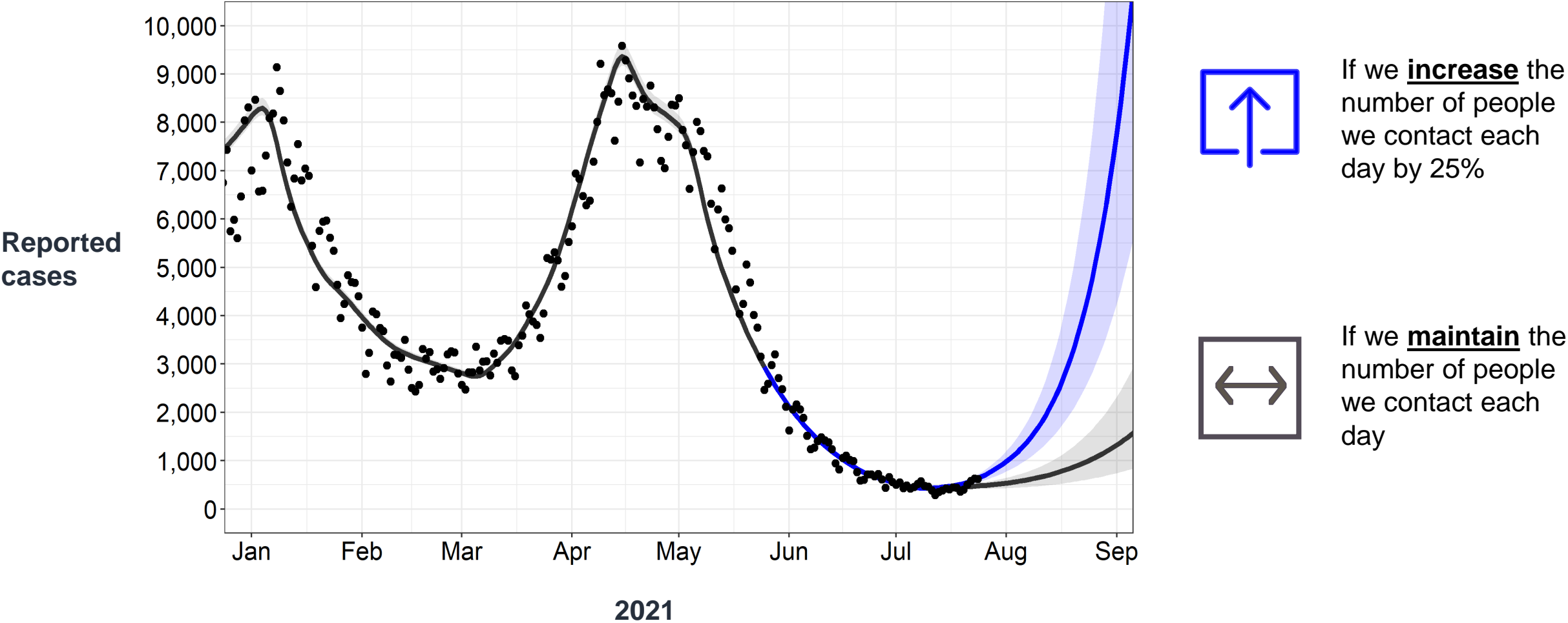


- ◆ Cumulatively reported cases in Canada by July 24
- Cases added since July 24 when the prediction was made
- Prediction to August 8
- - - Lower 95% prediction limit
- - - Upper 95% prediction limit

Data as of July 24, 2021

Note: Extrapolation based on recent trends using a forecasting model (with ranges of uncertainty).

The longer term forecast predicts stronger resurgence if community-wide contact rates increase too quickly, highlighting the need for ongoing caution



Data as of July 26, 2021

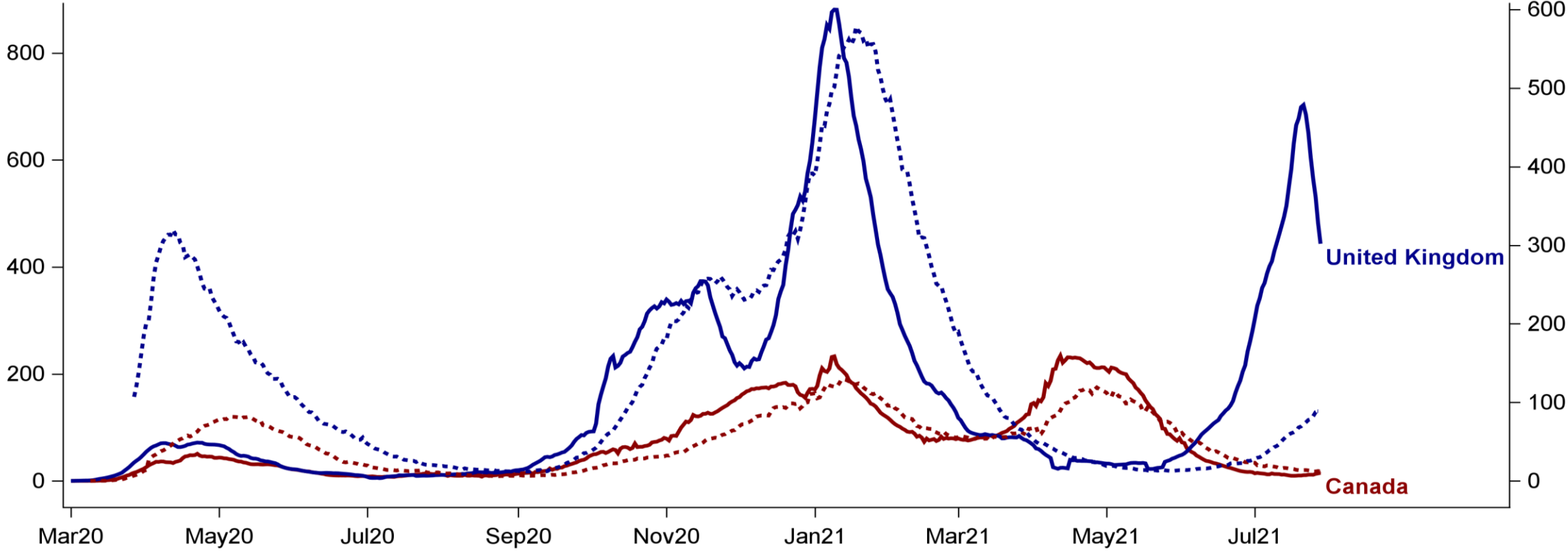
Note: Output from PHAC-McMaster model. Model considers impact of vaccination and increased transmissibility of VOCs (including Delta), refer to annex for detailed assumptions on modelling.



International experience with spread of Delta highlights the need to maintain precautions until fully vaccinated coverage is very high

Cases per 1 million population (solid line)

Hospitalizations per 1 million population (dotted line)



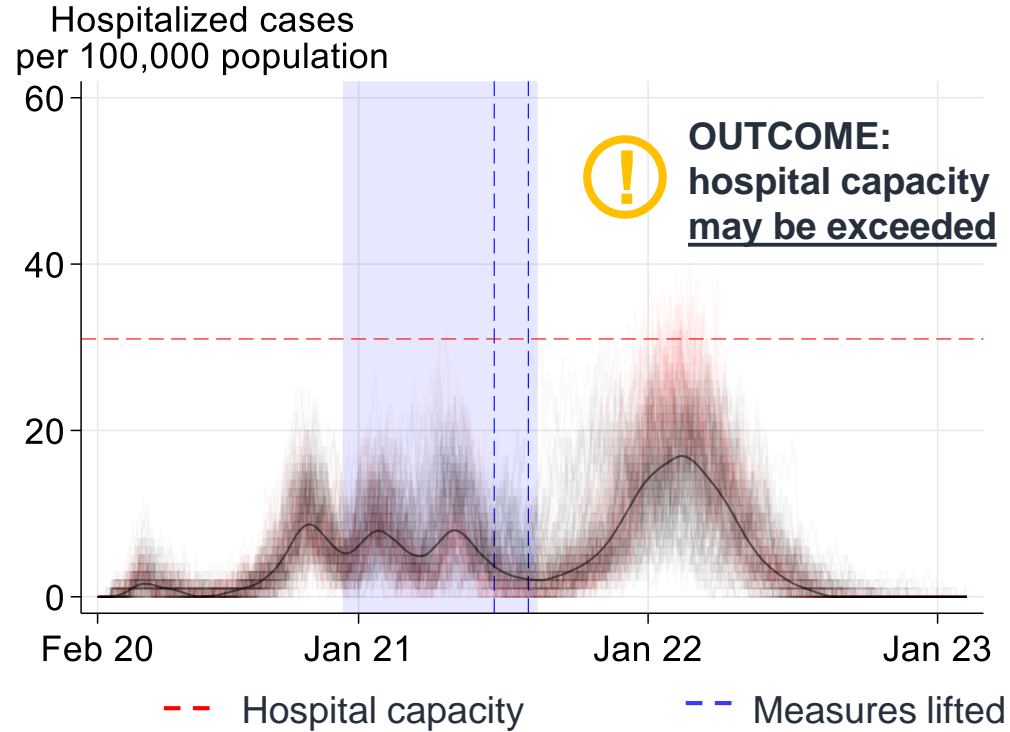
Data as of July 27, 2021

Note: 7-day moving average. Data for figure obtained from Our World in Data.

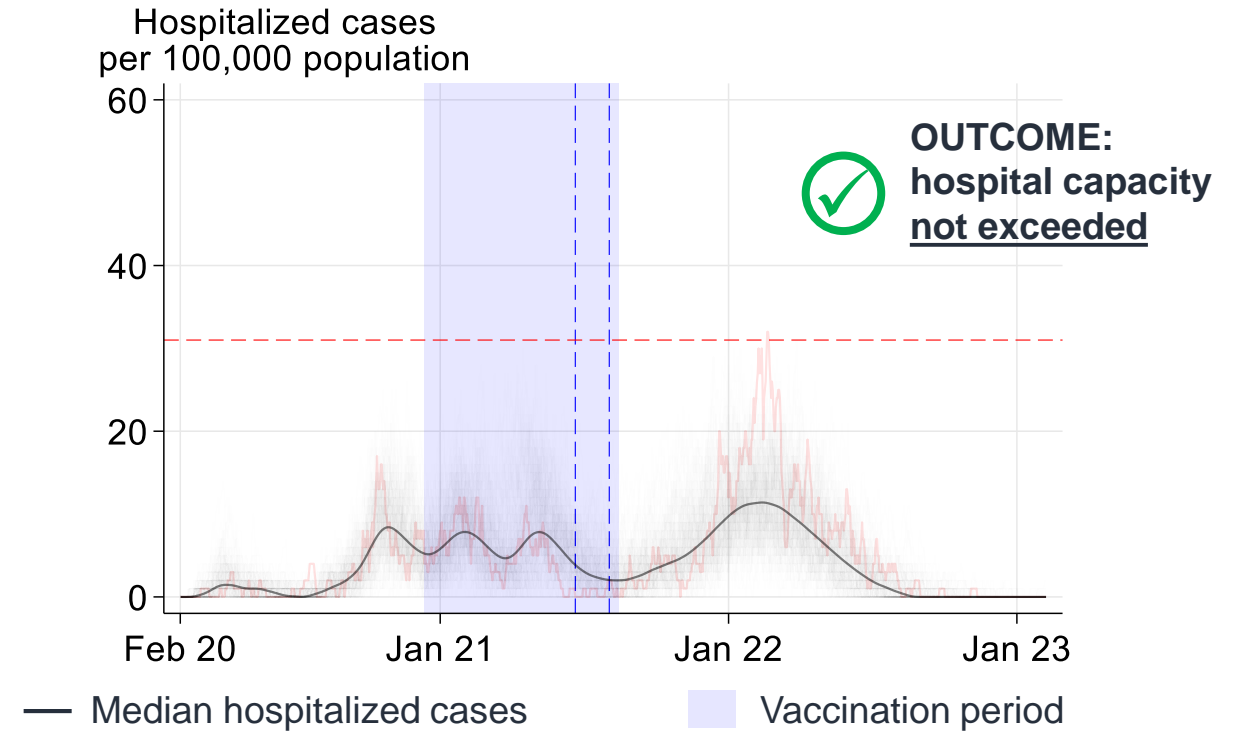


Increasing vaccine uptake among young adults, aged 18 to 39 years, could reduce the impact of a serious resurgence this fall/winter

UPDATED FORECAST WITH DELTA



UPDATED FORECAST WITH DELTA AND INCREASED UPTAKE AMONG AGES 18-39



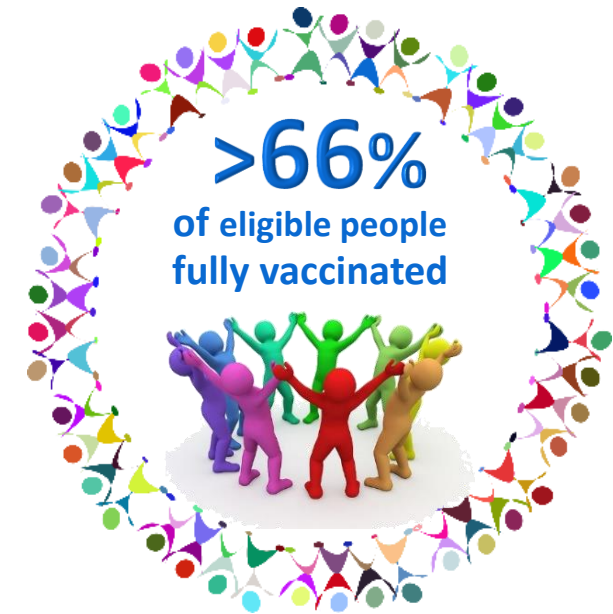
The Delta variant is assumed to be 1.5x more transmissible and 2x more virulent than Alpha.

Note: For all scenarios, a two-step approach to lifting public health measures is modelled. Vaccine acceptance varies by age group and is informed by a combination of Canadian survey data and actual rates of vaccine uptake by age groups (as of July 8, 2021). In the scenario on the left, vaccine acceptance among those aged 18-39 years is 72%. In the scenario on the right, vaccine acceptance among those aged 18-39 years is 80%. Refer to annex for detailed assumptions on modelling.

Every vaccination counts for better protection, better connection!

- **Canada has made great progress on increasing vaccine coverage over the past month**, but we need more eligible people vaccinated with first and second doses.
- This ***Call For Arms*** is to shoot for the stars in vaccination coverage! - with **just over 5 weeks** until **Labour Day** in Canada, this time is crucial for building up protection *before we gather* indoors this fall!
- This means increasing **fully vaccinated coverage** above **80%** across *all age groups*.
- **Uptake among younger age groups can have a big impact!**

33.2 Million Canadians,
aged 12 years or older,
are eligible for COVID-19 Vaccines

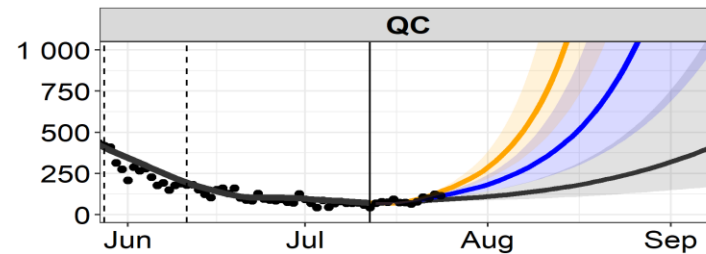
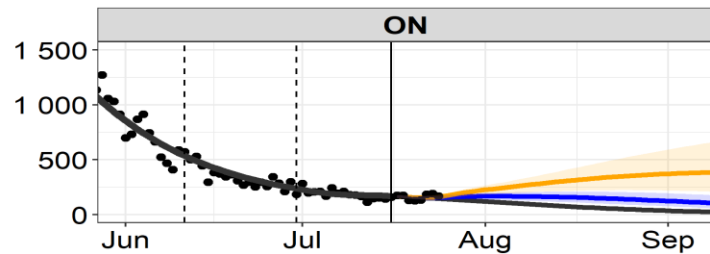
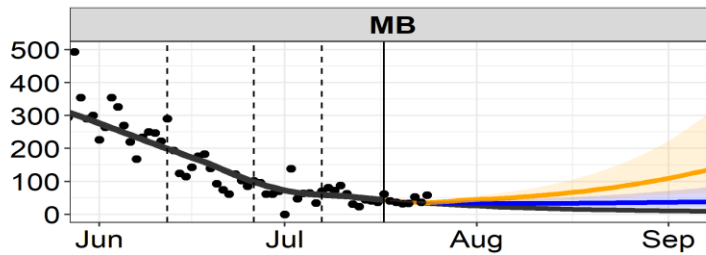
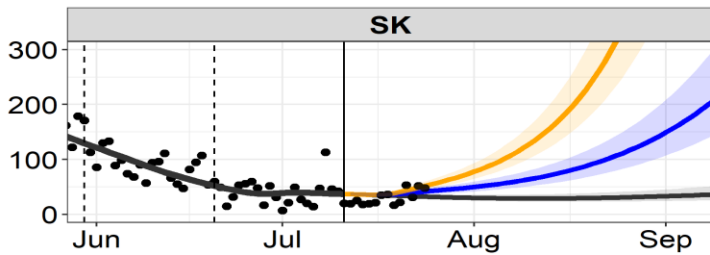
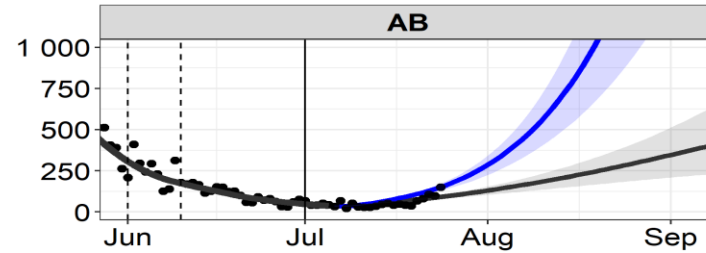
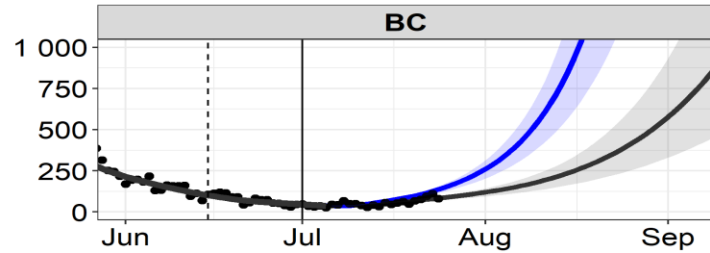


15% >5.0 Million eligible Canadians
with just one dose

19% ~6.3 Million eligible Canadians
not yet vaccinated

ANNEX

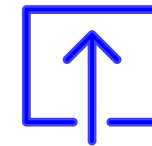
Longer range forecasts predict stronger resurgence in multiple jurisdictions if contact rates increase too quickly with re-opening



Reported cases



If we **increase** the number of people we contact each day by 50%



If we **increase** the number of people we contact each day by 25%



If we **maintain** the number of people we contact each day

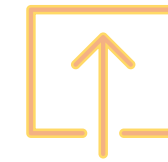
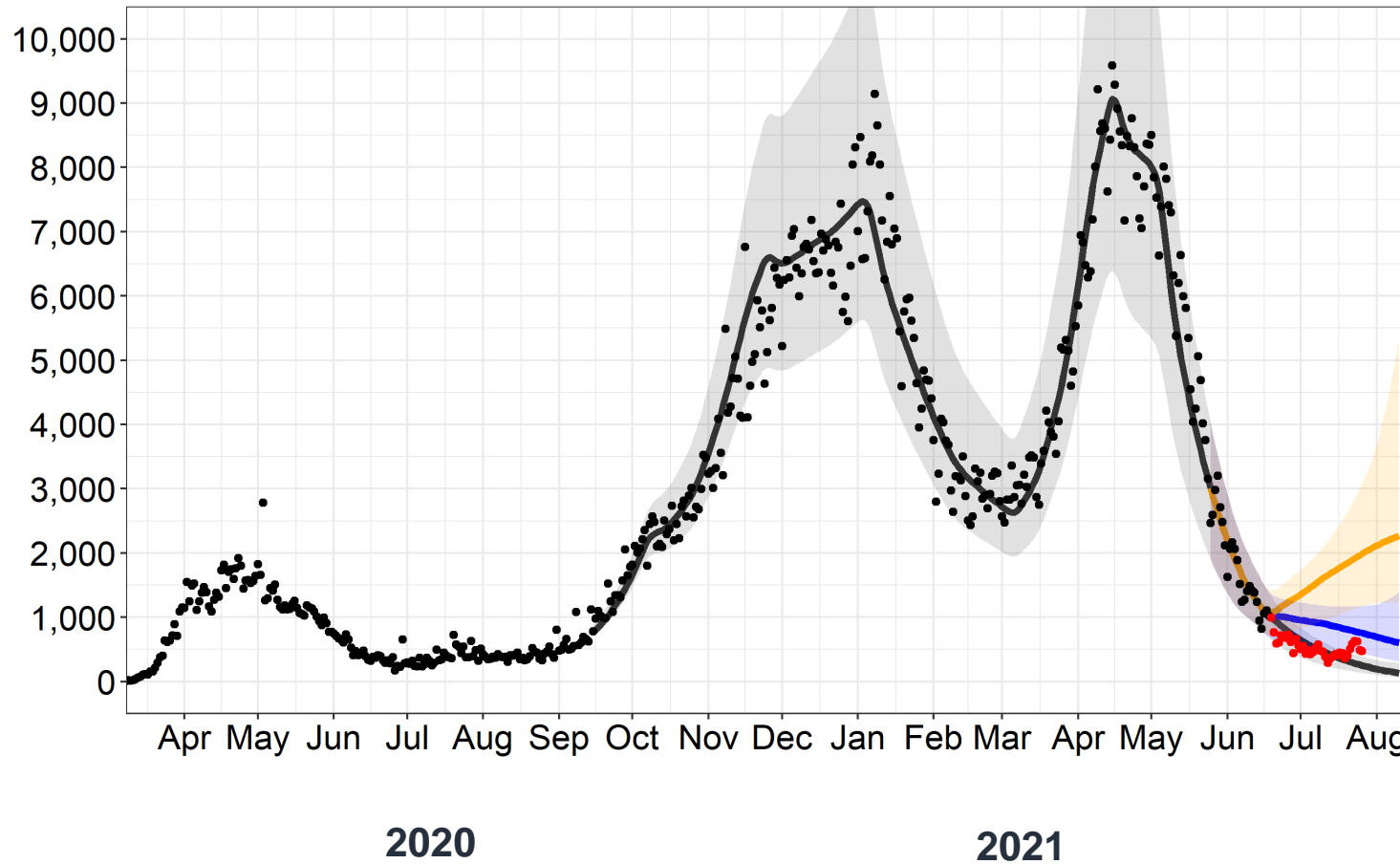
For most provinces (except BC and AB which have already opened widely) there is uncertainty in the forecasts because it is not yet clear how much recent and future re-opening will impact contact rates. For these provinces an additional forecast, with the effect of reopening resulting in a 50% increase in contacts, is also shown by the orange line.

Data as of July 26, 2021

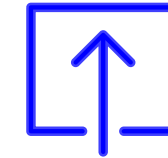
Note: Output from PHAC-McMaster model. Model considers impact of vaccination and increased transmissibility of VOCs (including Delta), refer to annex for detailed assumptions on modelling.



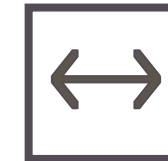
Previous longer-range modelling forecast from June 25 shows that sustained control measures supported the rapid decline of the epidemic as vaccines rolled out



If we **increase** the number of people we contact each day by 50%



If we **increase** the number of people we contact each day by 25%



If we **maintain** the current number of people we contact each day

Red points – Surveillance data after the forecast from June 21 to July 26

Model data as of June 21, 2021. Surveillance data as of July 26, 2021.

Note: Output from PHAC-McMaster model. Model considers impact of vaccination and increased transmissibility of VOCs (including Delta), refer to annex for detailed assumptions on modelling.



Types of models used to inform decision making

Statistical forecast models:

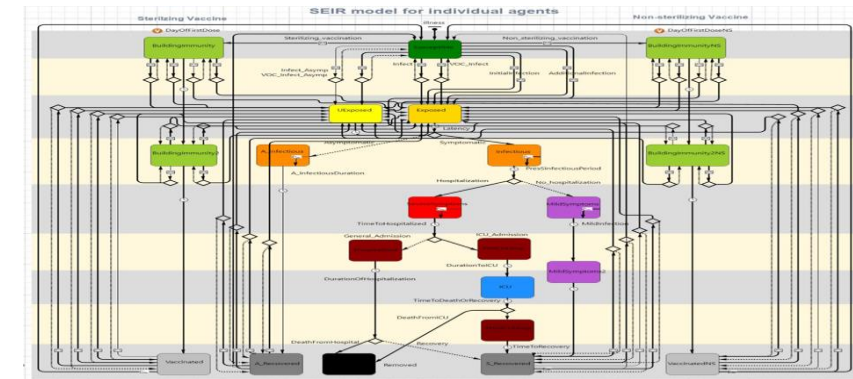
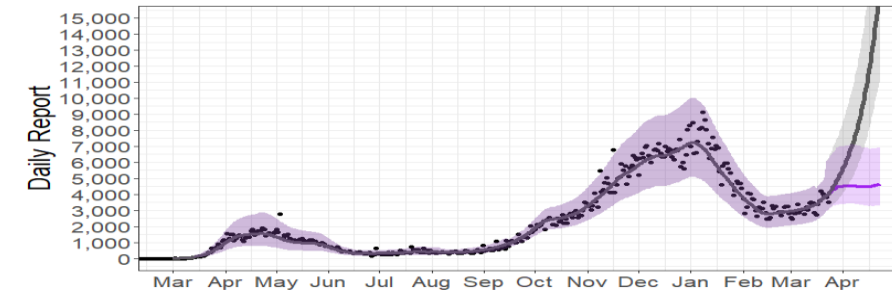
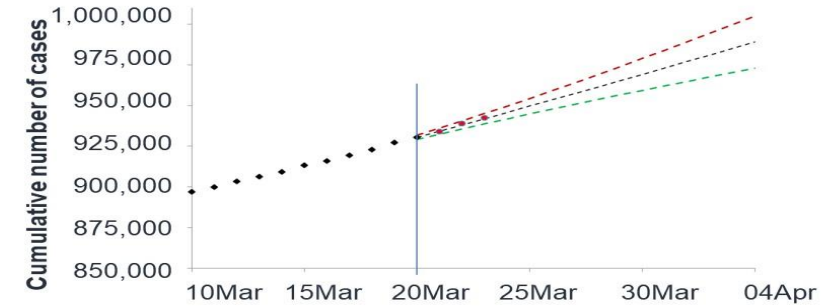
- Short-range forecast of expected cases given recent incidence

Long-range forecast models:

- Dynamic compartment model adapted to project near-future given recent incidence and scenarios for control/release/variants of concern

Models to explore scenarios of opening up:

- More complex models
 - Deterministic, age structured compartment model
 - Agent-based model
- Initially developed to model control measures needed
- Recently adapted to model effects of vaccination and transmission of VOC



Longer-range forecasting model assumptions

- The forecast uses compartmental models reflecting the biology of COVID-19 and public health response developed by PHAC in collaboration with McMaster University. It projects the near future given recent incidence of COVID-19 and scenarios for public health measures, variants of concern and vaccination.
- The model assumes that the B.1.617.2 (Delta) VOC is 50% more transmissible compared to B.1.1.7 (Alpha). This value is used to estimate the rate at which VOCs replace existing strains.
- Delta is considered to have been introduced in mid-March at very low prevalence. Proportions vary across provinces. The proportion of cases due to VOCs are indirectly fitted when calibrating to data.
- Vertical dashed lines represent previous stages of re-opening. Solid vertical lines represent current/upcoming/potential re-opening and result in increases in overall transmission.
- The national forecast includes two scenarios for changes in the effective transmission rate from the last re-opening date. This includes a line showing the expected change in cases if effective transmission rates do not increase (grey line) and a line that assumes effective transmission increases by 25% (blue line). Some PT forecasts also include a third line that assumes effective transmission increases by 50% (orange line). There is uncertainty about the effect of the most recent re-opening, which propagates forward in the forecasting scenarios.
- The PHAC-McMaster model forecast includes current vaccine roll-out, including an assumption that vaccinations are 60% effective against infection after one dose and 90% after second dose for all variants except for Delta (30% after one dose and 80% after second dose). The vaccine projections assume 10% for first dose and 15% for second dose hesitancy of the eligible population.

Assumptions for the modelling of restrictive public health measures

- An age-stratified agent-based model was used for exploring the impact of vaccination rates on lifting of public health measures (slide 11).
- Key model assumptions include:
 - The vaccine is 60% effective at preventing infection and 80% effective at preventing hospitalization after one dose, and 92% effective at preventing infection and 96% effective at preventing hospitalization after two doses;
 - A VOC modelled on B.1.1.7 (alpha) was introduced in December 2020 and is 50% more transmissible and 40% more virulent than the wild-type strain, but does not have immune breakthrough from vaccines;
 - A second VOC modelled on B.1.617.2 (delta) was introduced in March 2021 and is 50% more transmissible and 100% more virulent than alpha with immune escape from vaccines causing a 33% reduction in protection against infection after the first dose and a 6% reduction in protection against infection after the second dose;
 - Hospital bed capacity available for COVID-19 patients in Canada is estimated at 31 per 100,000;
 - The vaccination period begins Dec 14, 2020 and the end date varies from mid-August to early September depending on the scenario and the level of vaccine uptake;
 - Vaccination roll-out proceeds in order of priority groups as recommended by NACI with a 4-month interval between doses starting from March 4, 2021. The 4-month delay progressively decreases to a 28-day interval by June;
 - Vaccine acceptance by age group is estimated from two Canadian surveys (2020 Canadian Community Health Survey – September 2020) and EKOS probability based research panel (January 6-11, 2021) and data from the Canadian Immunization Committee (data used for these models were from the report dated July 8). Increased acceptance rates in the 18 to 39 year olds was based on 72% of Canadians in this age group indicating willingness to accept a vaccine, an increase to 80% is assumed to be a reasonable increase given estimated vaccine acceptance;
 - For all scenarios, a two-step gradual approach to lifting public health measures was modelled. Restrictive measures are lifted gradually in summer when at least 75% of those 12 and over have received their first dose and at least 20% have received their second dose (commencing June 21, 2021 with full reopening by September 1, 2021). The easing of personal protective measures occurs when at least 75% of those 12 and over have received their second dose (commencing August 2, 2021 with return to pre-pandemic contact rates by September 1, 2021). Until these time points, the epidemic is controlled by a combination of restrictive closures, case detection and isolation, contact tracing and quarantine, and physical distancing.
 - Reopening of the Canadian border to travellers commences on August 6, 2021, with the assumption that imported cases increases three-fold from the current rate of 2 per 100,000 to 6 per 100,000 per week, imported cases are estimated from the PHAC importation model