Update on COVID-19 in Canada: Epidemiology and Modelling

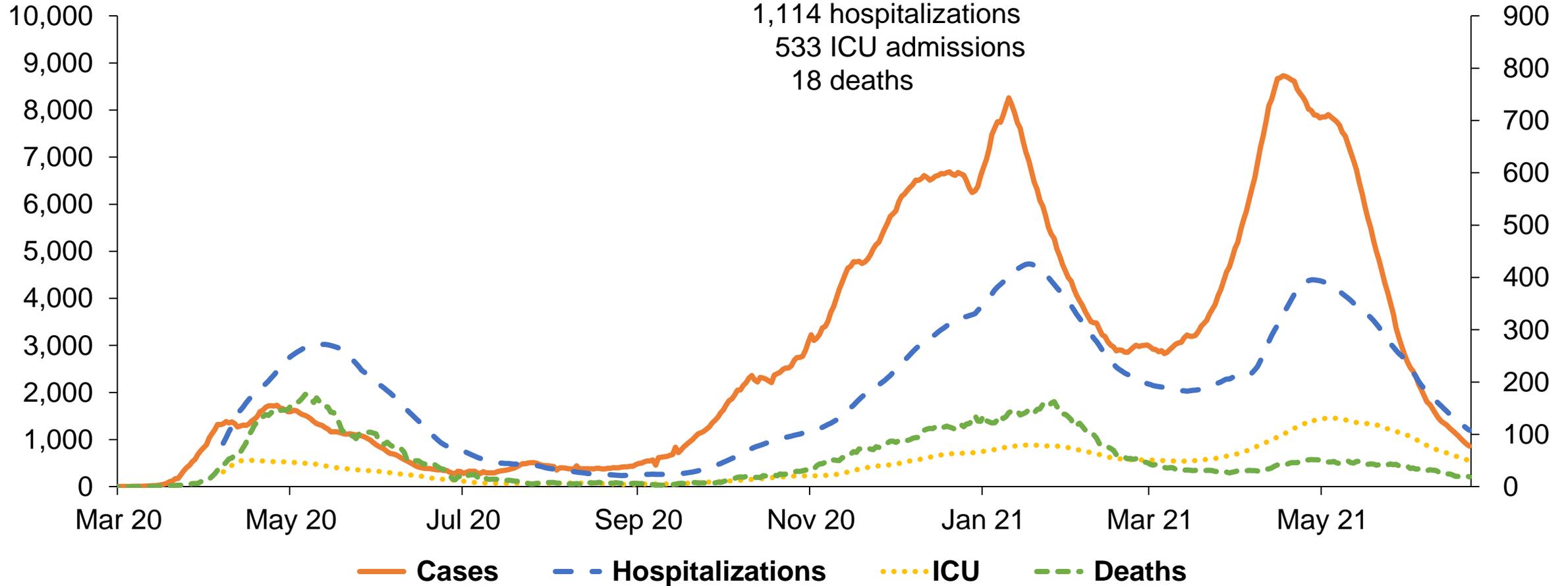*June 25th, 2021*

Canada.ca/coronavirus

Sustained national decline across COVID-19 disease activity and severity indicators

Number of cases, total in hospital and ICU

On average over the past 7 days:
758 cases
1,114 hospitalizations
533 ICU admissions
18 deaths
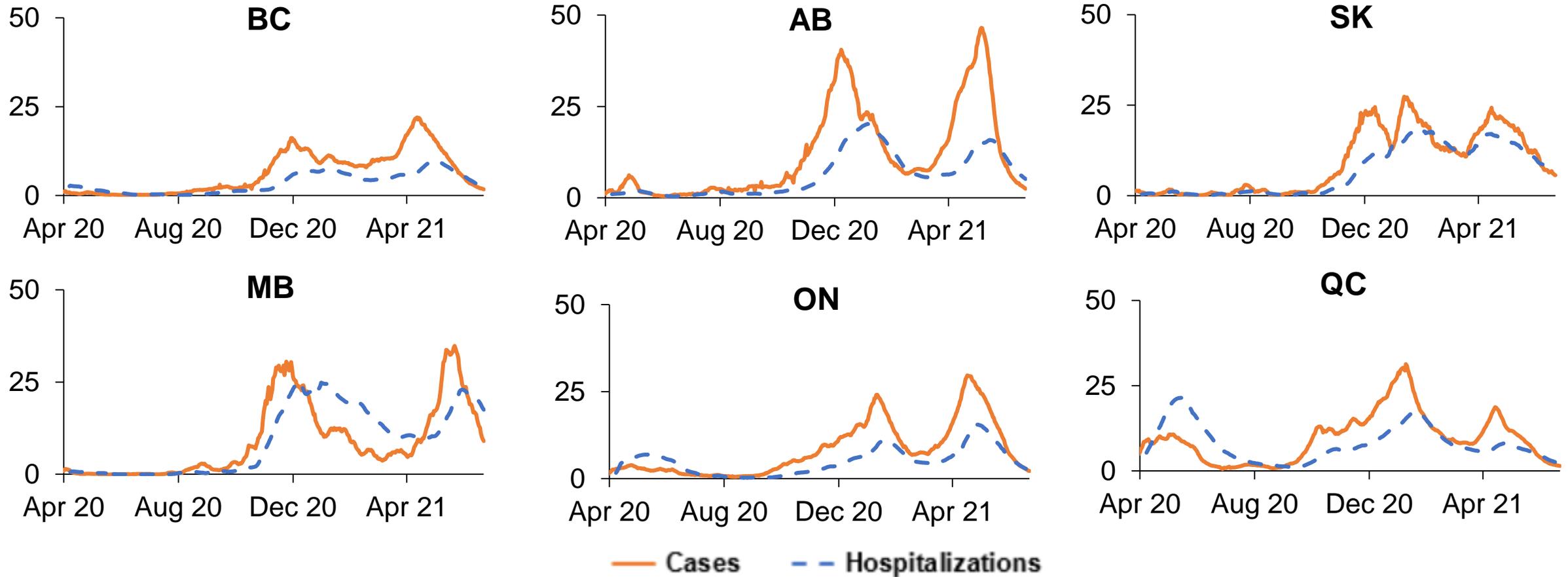
Number of deaths

Data in figure as of June 22, 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.*

1

Regional COVID-19 trends show decreasing hospital occupancy following sustained decline in disease incidence

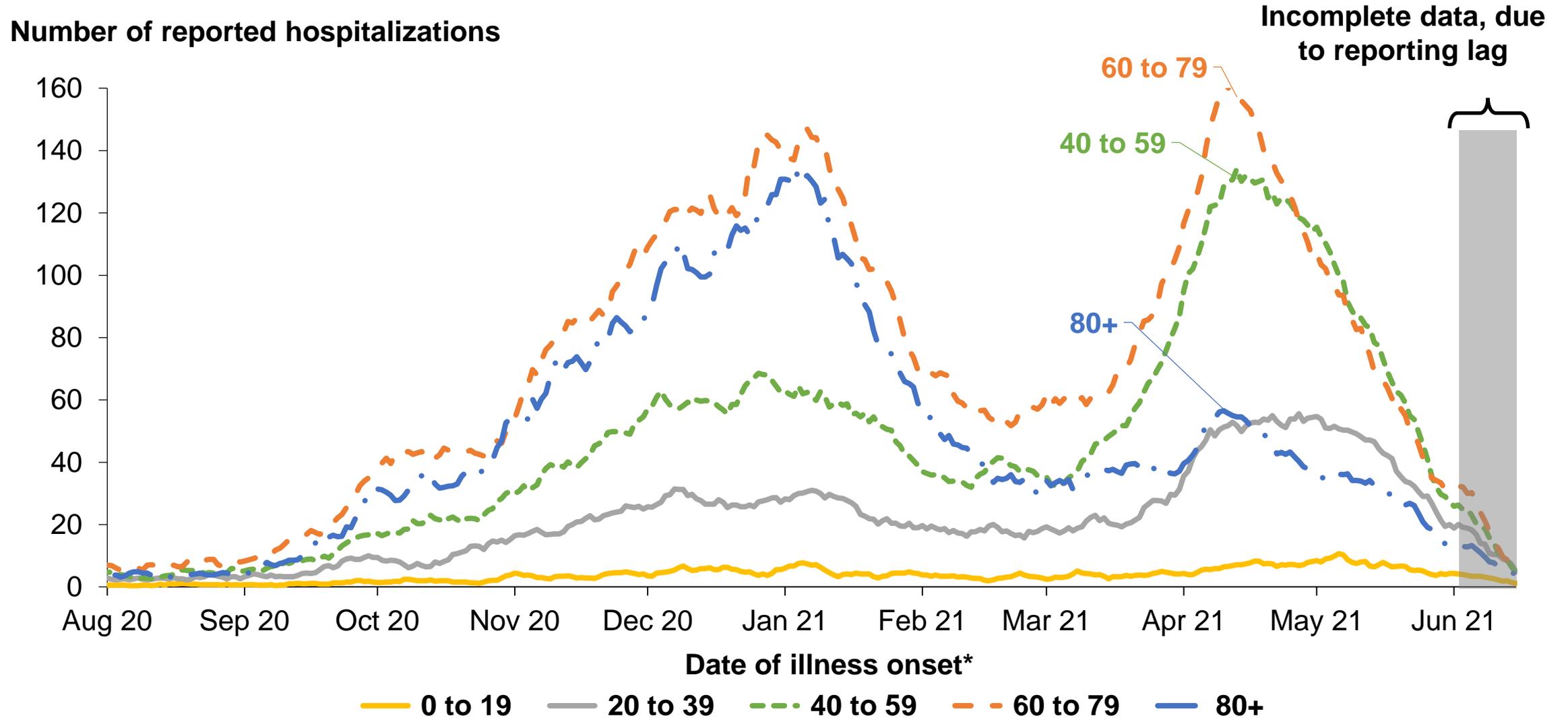**Number of cases and total in hospital per 100,000 population**

Data as of June 22, 2021
Note: *Trend lines reflect 7-day moving averages. Total hospitalizations include all people in hospital on that day.*

2

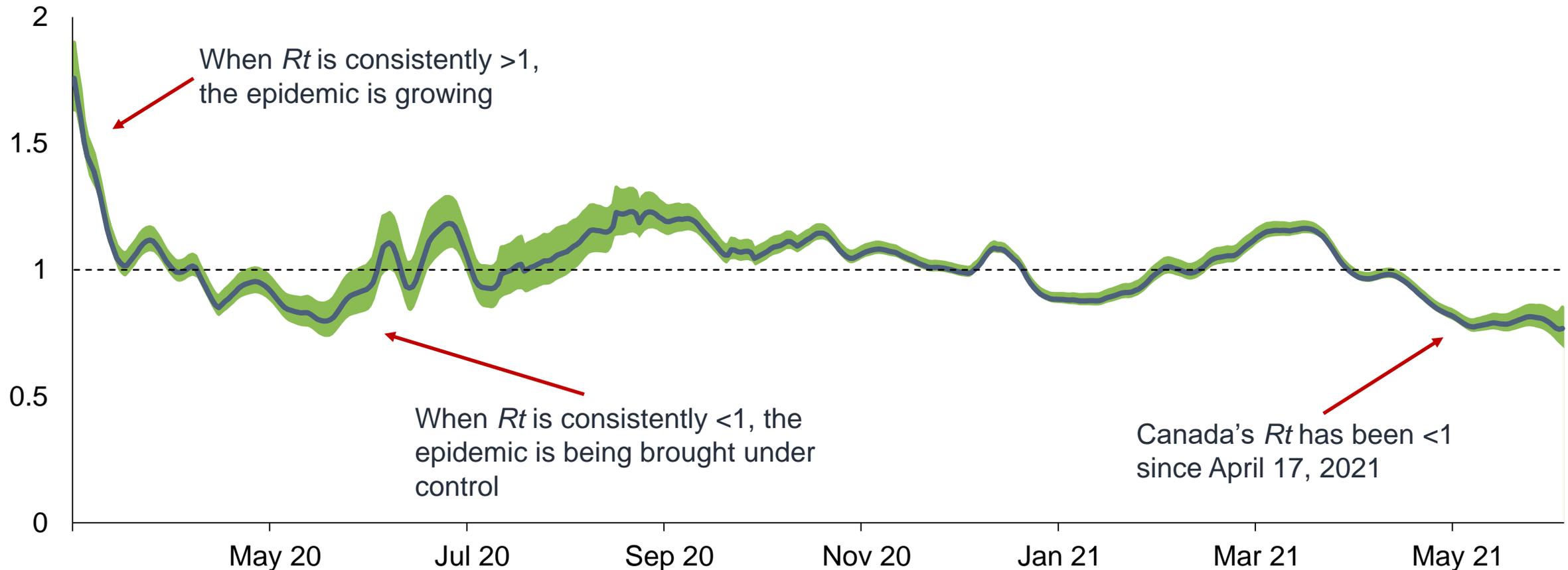# Hospitalizations continue to decline across all age groups

Number of reported hospitalizations

Incomplete data, due to reporting lag

60 to 79

40 to 59

80+

Date of illness onset*

0 to 19   20 to 39   40 to 59   60 to 79   80+

3

National *Rt* has remained out of an epidemic growth pattern (*Rt*<1) since mid-April

When *Rt* is consistently >1, the epidemic is growing

When *Rt* is consistently <1, the epidemic is being brought under control

Canada's *Rt* has been <1 since April 17, 2021

Data as of June 22, 2021
Note: *7-day moving average.*

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Characteristics of the Delta variant require sustained control efforts

↑ transmissibility

- ~50% more transmissible than Alpha

- 4-fold increase in proportion of Delta cases in Canada (between April 25 and May 23)

- Greater transmissibility could drive resurgence

↑ severity

- UK: Increased hospitalization risk for Delta vs. Alpha

- Canada: Delta cases are 54% more likely to be hospitalized compared to Alpha cases

- Could impact healthcare utilization

↓ vaccine effectiveness

- UK: Reduced effectiveness against symptomatic infection after 1 dose vs. Alpha

- Vaccines still effective at preventing hospitalization

- Majority of Delta cases in Canada unvaccinated or partially vaccinated

2 doses provide better protection against variants of concern!

Percentage of eligible people (≥ 12 years) with at least one dose and fully vaccinated by jurisdiction, as of June 24th
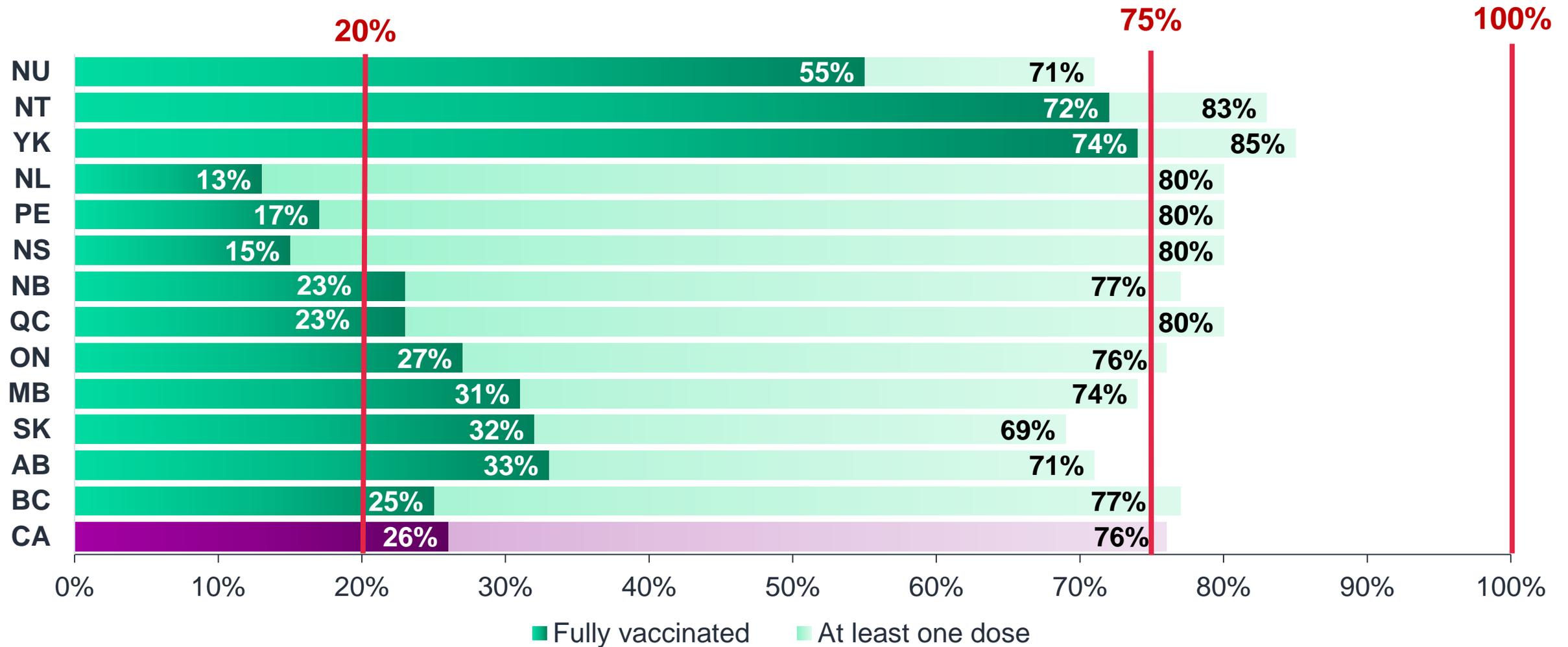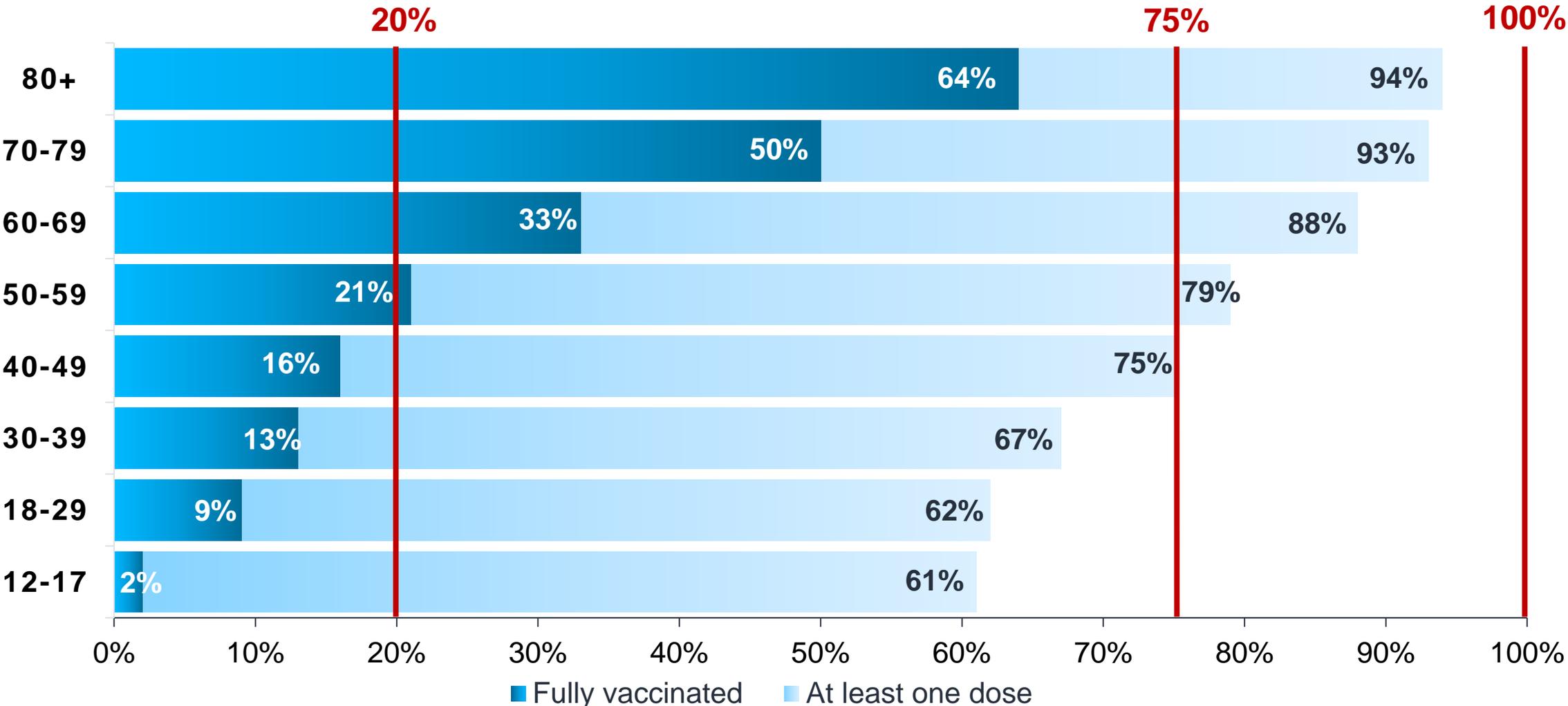

Data as of June 24, 2021
Note: Data obtained from the COVID19 Tracker. Accessed on 24 June, 2021. https://covid19tracker.ca/vaccinationtracker.html

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At least one dose and fully vaccinated coverage increasing stepwise as vaccination programs expand to younger age groups, as of June 19th
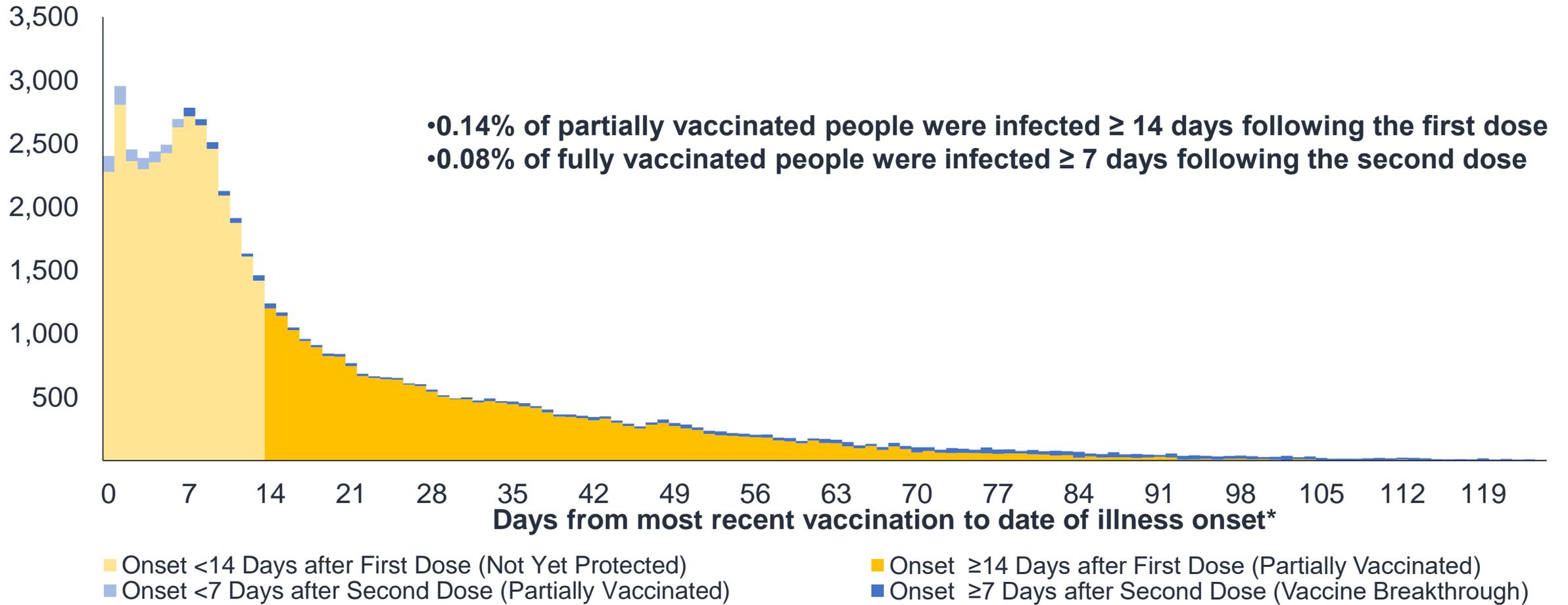
Evidence shows COVID-19 vaccines highly protective, with a low percentage of cases reported following vaccination

Number of cases following vaccination

•0.14% of partially vaccinated people were infected ≥ 14 days following the first dose
•0.08% of fully vaccinated people were infected ≥ 7 days following the second dose

Days from most recent vaccination to date of illness onset*

- Onset <14 Days after First Dose (Not Yet Protected)
- Onset ≥14 Days after First Dose (Partially Vaccinated)
- Onset <7 Days after Second Dose (Partially Vaccinated)
- Onset ≥7 Days after Second Dose (Vaccine Breakthrough)
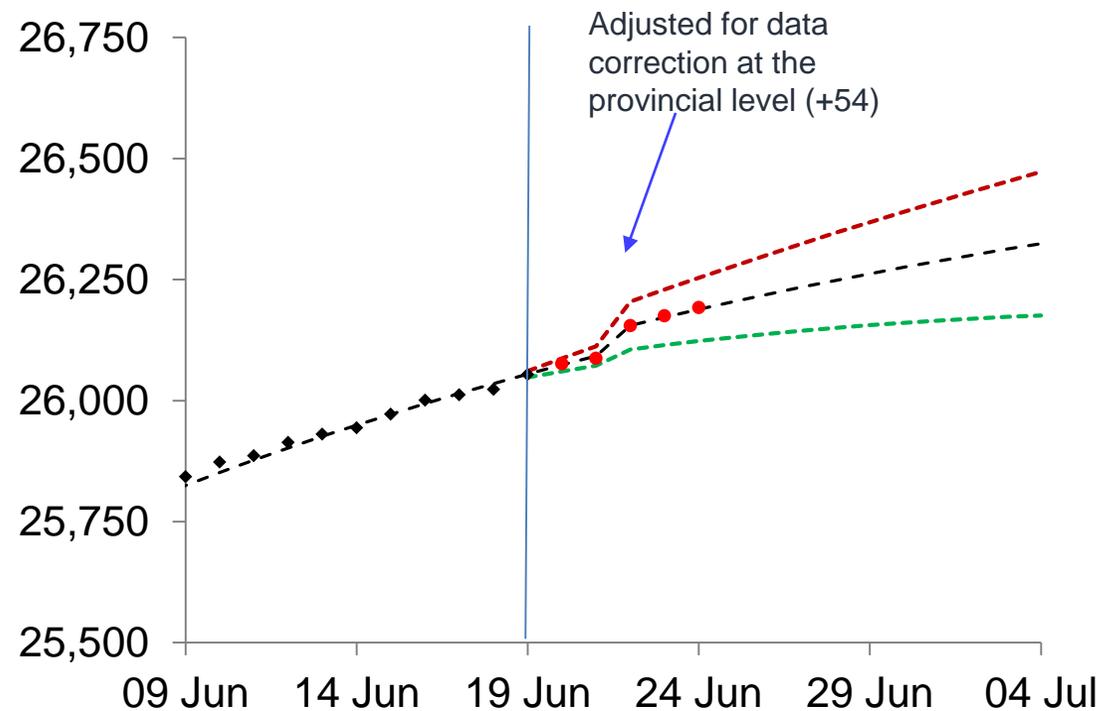
Data as of June 22, 2021
Note: *If the date of illness onset was not available, the earliest of lab collection date or last test result date was used. The above figure does not include data from Saskatchewan, Quebec, or Newfoundland and Labrador.*

8

Short-term forecast predicts slowing rate of growth for cumulative cases as well as cumulative deaths

Cumulative <u>cases</u> predicted to July 4, 2021:
1,413,010 to 1,420,740
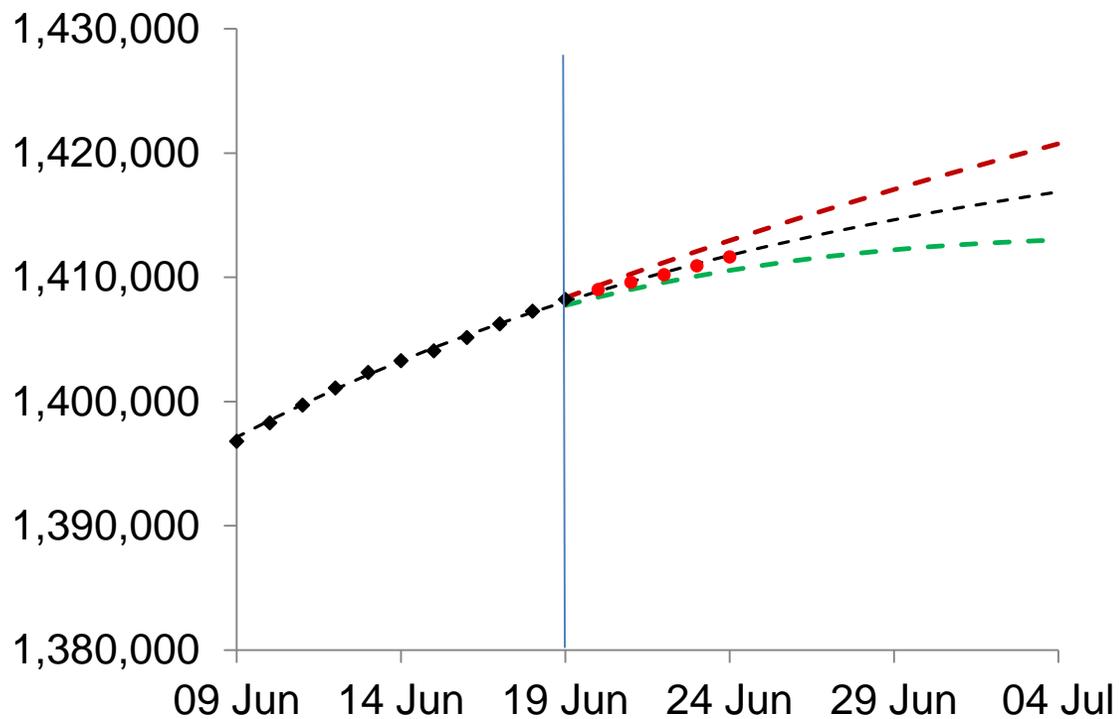
Cumulative <u>deaths</u> predicted to July 4, 2021:
26,175 to 26,475

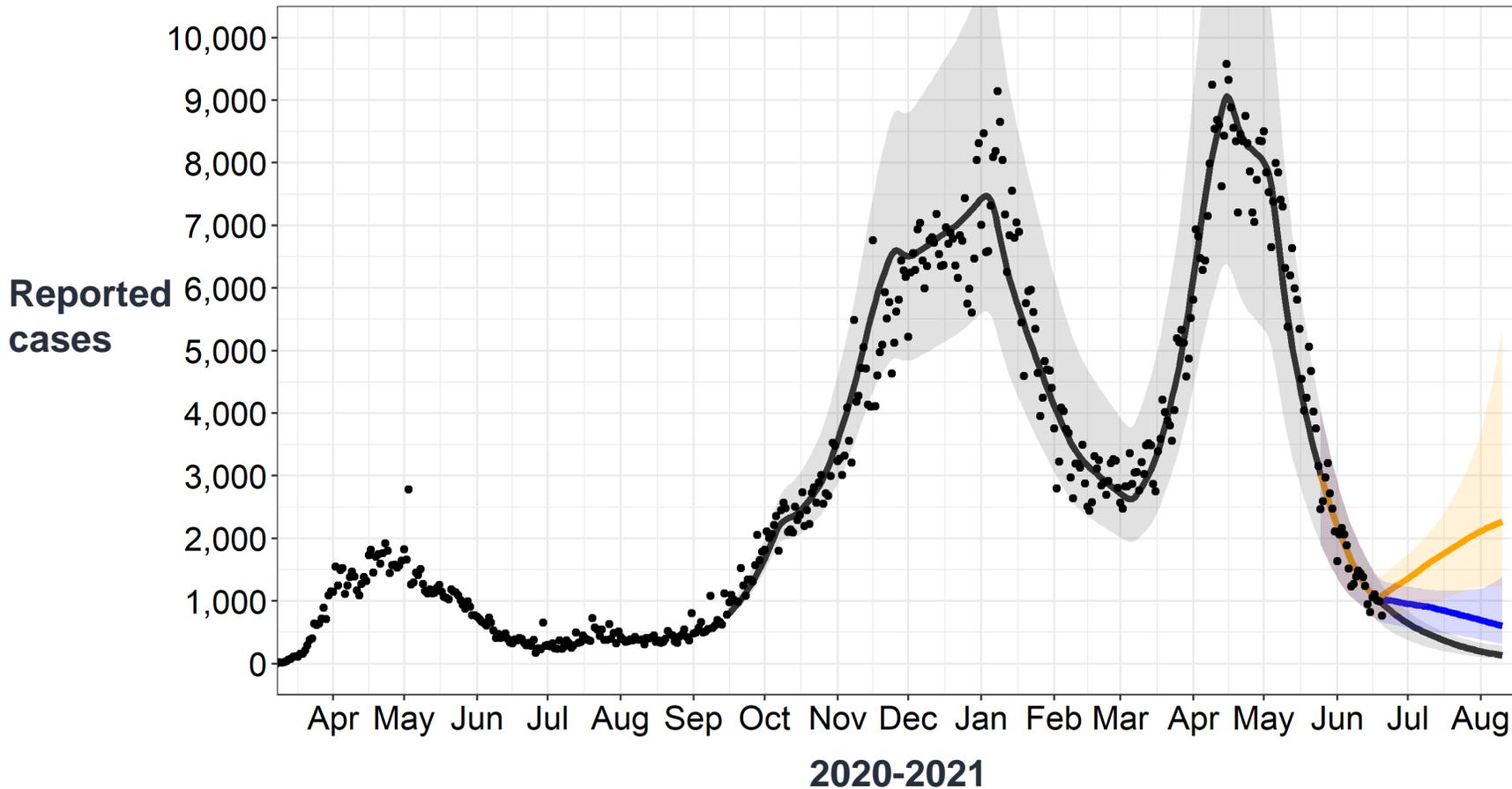Adjusted for data correction at the provincial level (+54)

◆ Cumulatively reported cases in Canada by June 19   ● Cases added since June 19 when the prediction was made

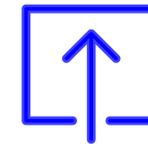- - - Prediction to July 4   - - - Lower 95% prediction limit   - - - Upper 95% prediction limit

Two-month forecast shows the epidemic is projected to decline nationally, but could resurge if re-opening increases contact rates by 50% or more

Reported cases

2020-2021

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%

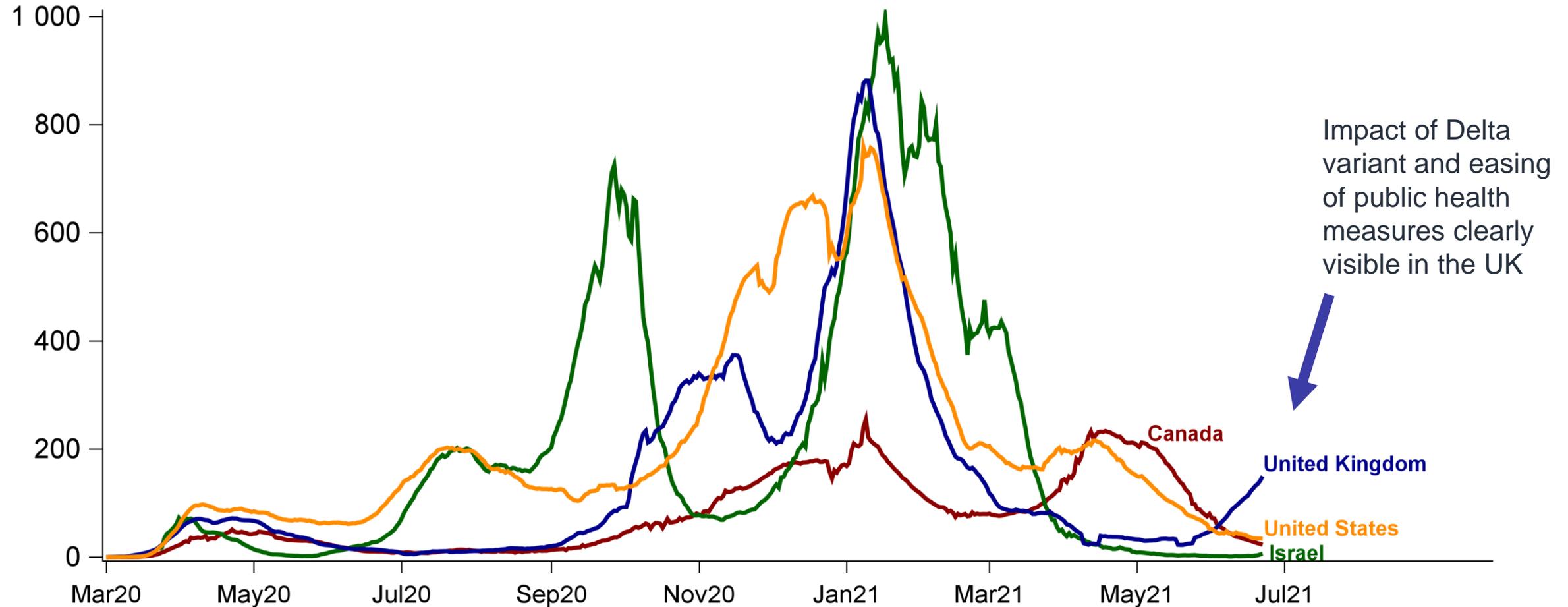If we **maintain** the current number of people we contact each day

International experience with emergence of the Delta variant highlights the need for caution until vaccination coverage is high across the population
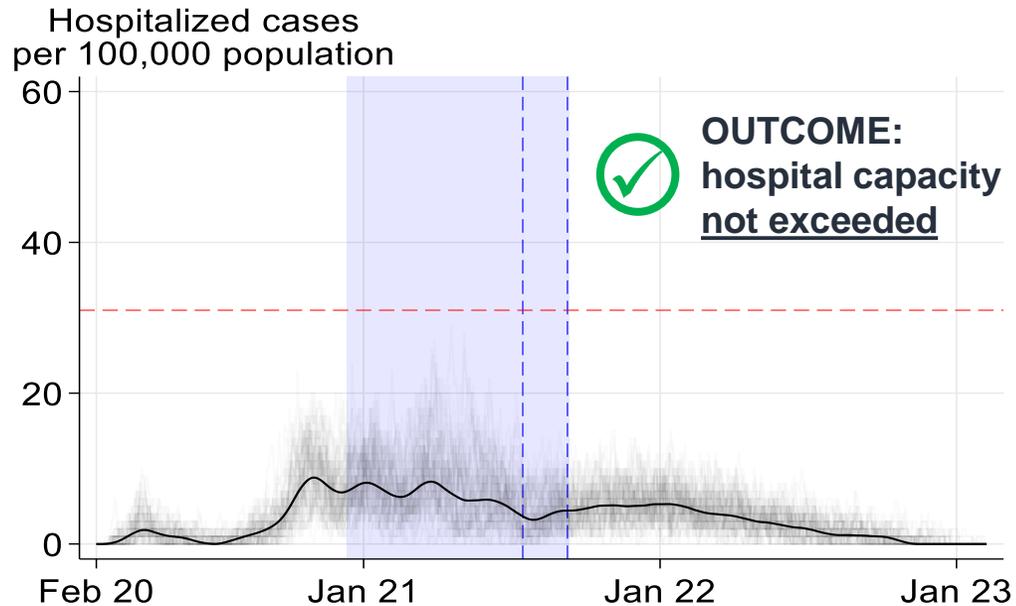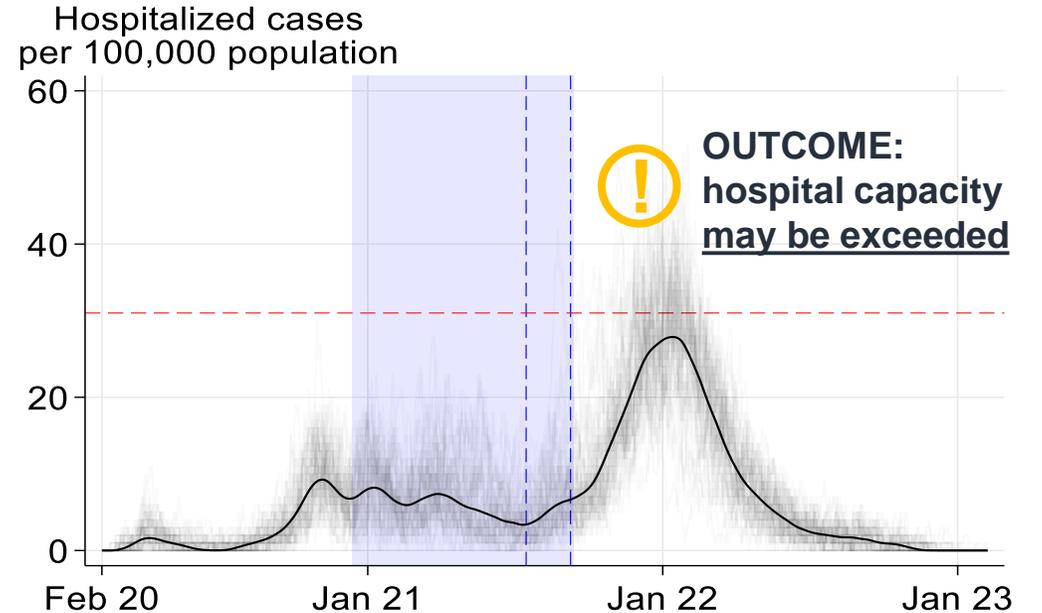
Rate per 1,000,000 population

Impact of Delta variant and easing of public health measures clearly visible in the UK

Canada

United Kingdom

United States

Israel

The more contagious and severe Delta variant may result in greater than previously expected resurgence this fall/winter

WITHOUT Delta

Hospitalized cases per 100,000 population

OUTCOME: hospital capacity not exceeded

WITH Delta predominating

Hospitalized cases per 100,000 population

OUTCOME: hospital capacity may be exceeded

- - Hospital capacity   - - Measures lifted   — Median hospitalized cases   ▨ Vaccination period
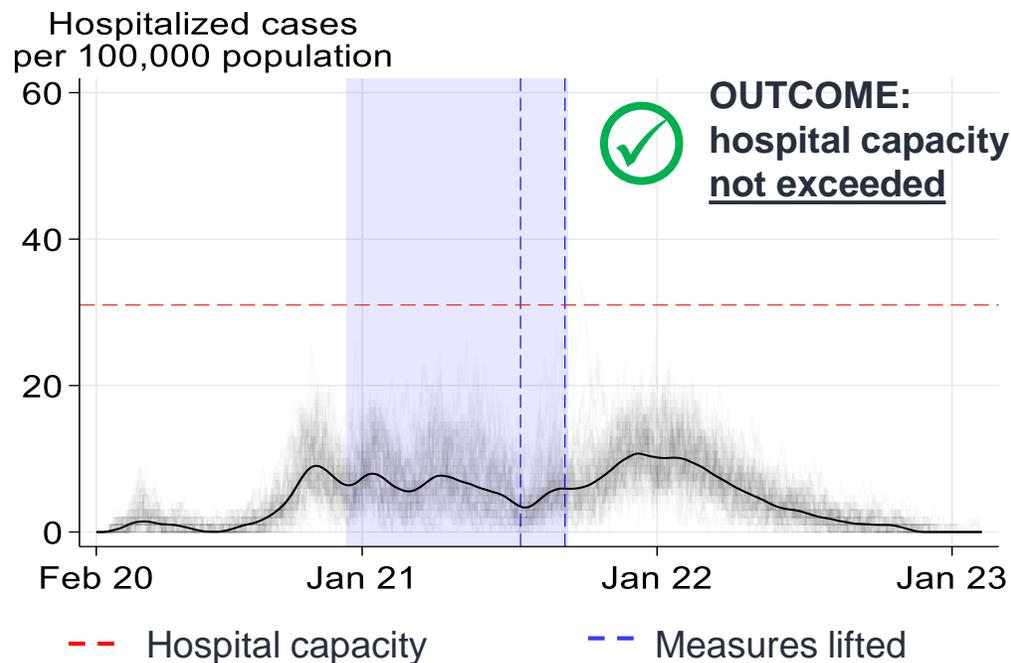
The Delta variant is assumed to be 1.5x more transmissible and 2x more virulent than Alpha

Note: For all scenarios, a two-step approach to lifting public health measures is modelled. For scenarios on this slide, restrictive measures are lifted 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. The easing of personal protective measures occurs when at least 75% of those 12 and over have received their second dose. Refer to annex for detailed assumptions on modelling.

Increasing vaccine uptake, especially in younger populations, could reduce the potential resurgence of the Delta variant this fall

With Delta predominating AND ≥80% 2 dose vaccine uptake

Hospitalized cases per 100,000 population

OUTCOME: hospital capacity not exceeded ✓

- - Hospital capacity   - - Measures lifted   — Median hospitalized cases   ▨ Vaccination period

- It is **more important than ever** for as many people as possible to **get fully vaccinated**

- While **some resurgence may still occur** this fall/winter, **increasing vaccine uptake** in younger populations can **reduce the risk of overwhelming hospitals**

The Delta variant is assumed to be 1.5x more transmissible and 2x more virulent than Alpha. Vaccine uptake for first and second dose is increased for all age groups, and at least 80% among those aged 12-54

Note: For all scenarios, a two-step approach to lifting public health measures is modelled. For scenarios on this slide, restrictive measures are lifted in summer when at least 75% of those 12 and over have received their first dose and at least 40% have received their second dose. The easing of personal protective measures occurs when 83% of those 12 and over have received their second dose. Refer to annex for detailed assumptions on modelling.

As vaccine coverage gets higher, opening up, going out and heading into the fall and winter becomes safer

- **We've done the work for a better summer and by staying vigilant to keep cases low we can stay on track for a safer fall & winter...**

- **Increasing first and second doses** will build a stronger wall of vaccination protection against COVID-19, including the Delta variant!

- **Half way is not okay, two doses of COVID-19 vaccine are needed to:**
  - protect ourselves from severe illness due to COVID-19
  - give better protection against more contagious & severe variants of concern
  - build strong immunity across the population to keep COVID-19 under control *without restrictions*

New!

Risk assessment tools to assist Canadians with decision making for going out safer

My COVID-19 VISIT RISK

Financial contribution from
Avec le financement de

NIA NATIONAL INSTITUTE ON AGEING

Canada

My COVID-19 Visit Risk Calculator
Quick Assessment (3 minutes)

My COVID-19 Visit Risk Decision Aid
Comprehensive Assessment (10 minutes)

Updated awareness resources on Canada.ca

Going out? Do it safely.
Your actions matter now more than ever.

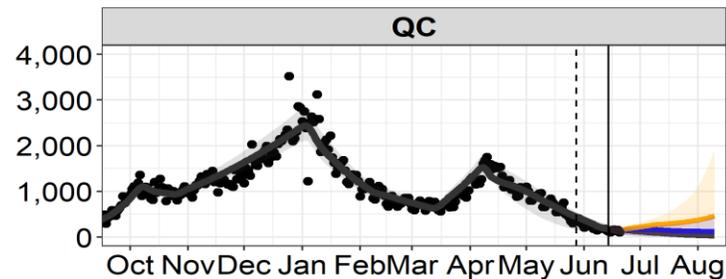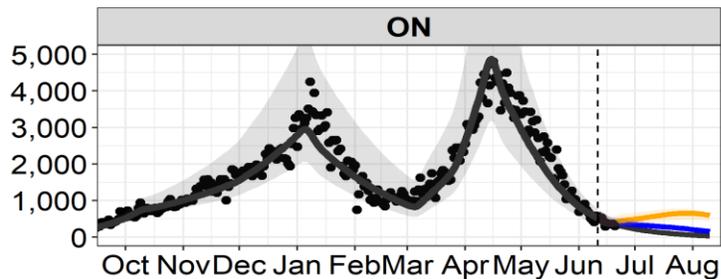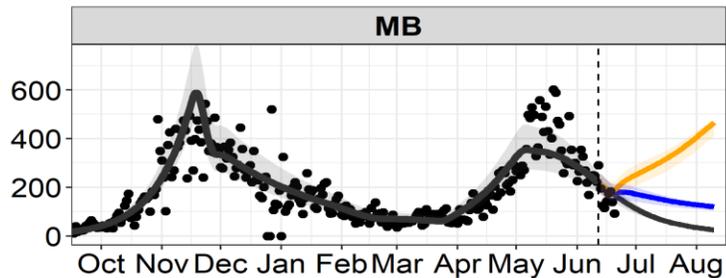**Your Health & Vaccination Status**
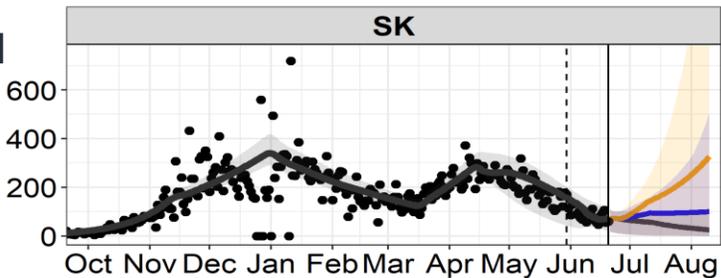
Ventilation & Setting Safety

COVID-Wise Precautions

ANNEX

Longer-range forecasts predict overall downward trends in most jurisdictions across the country, but resurgence could occur in some areas with reopening

Reported cases
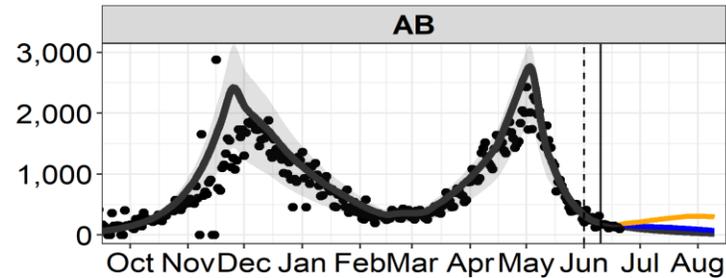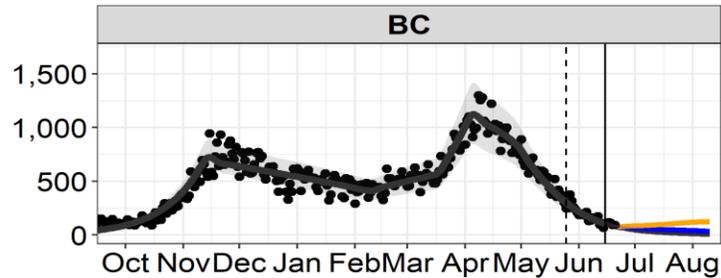
If we **increase** the number of people we contact each day by 50%
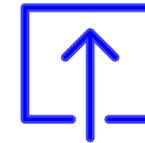
If we **increase** the number of people we contact each day by 25%

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

Data as June 21, 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.*

16

Previous longer-range modelling forecast from May 28 shows that sustained control measures supported the rapid decline of the epidemic as vaccines rolled out

Reported cases

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

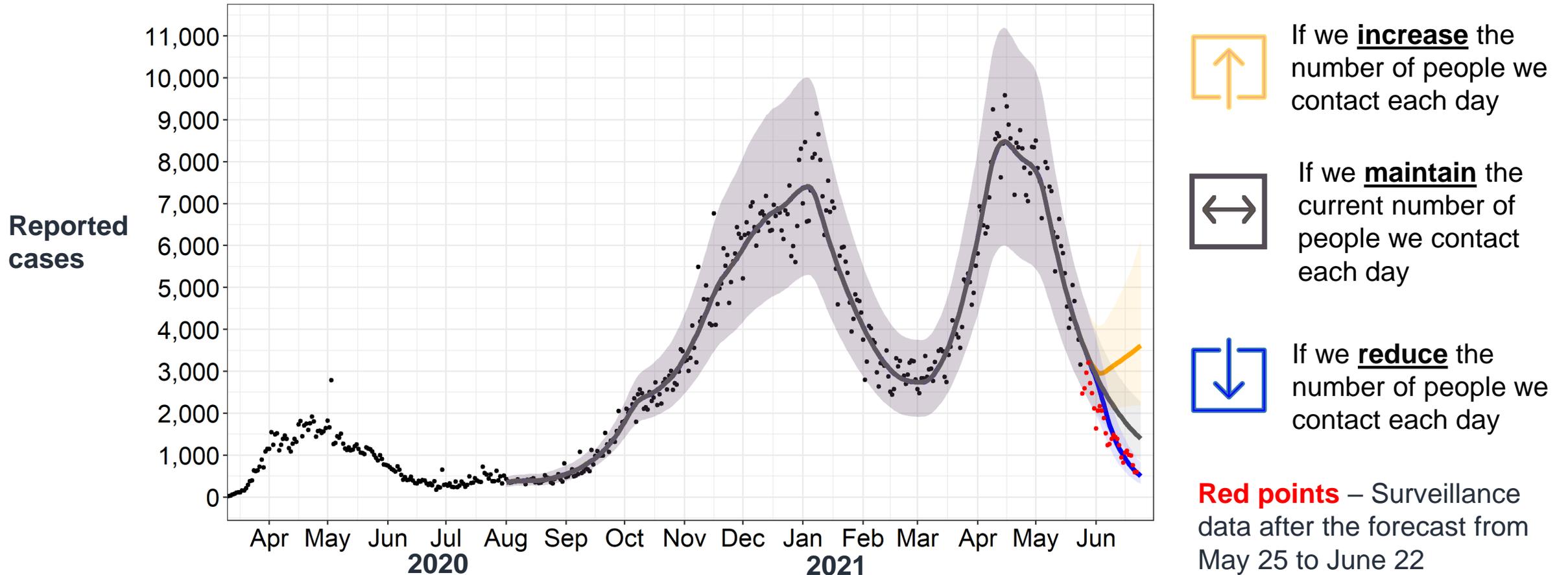If we **maintain** the current number of people we contact each day

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

Red points – Surveillance data after the forecast from May 25 to June 22

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
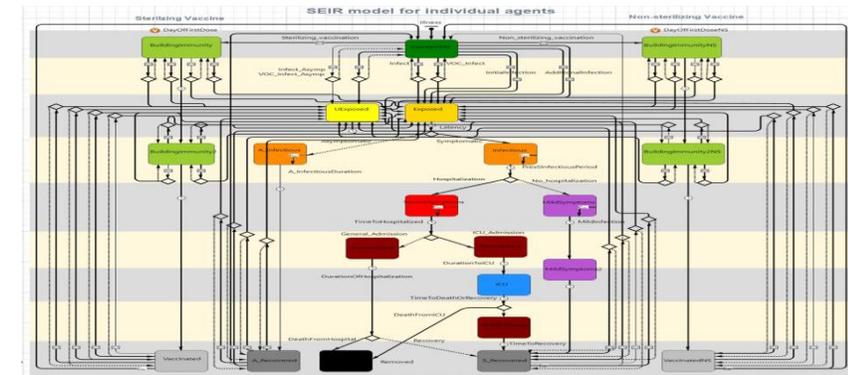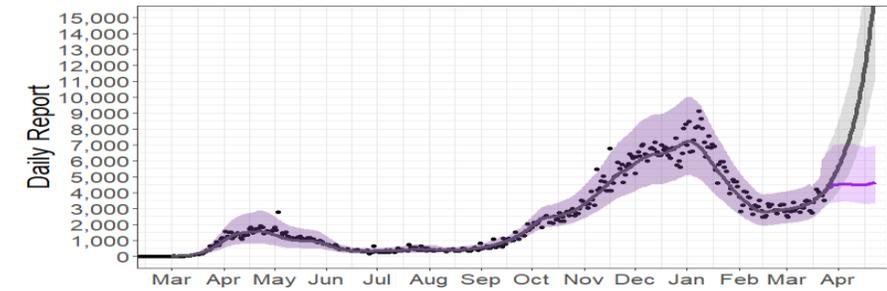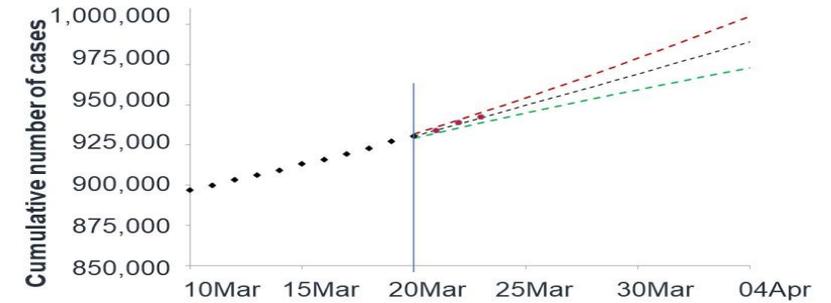
Longer-range forecasting model assumptions

- 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 (VOCs) and vaccination.

- The model assumes that the B.1.617.2 (Delta) VOC is 50% more transmissible compared to the dominant B.1.1.7 (Alpha) VOC. This value is used to estimate the rate at which VOCs replace existing strains.

- The B.1.617.2 (Delta) VOC is considered to have been introduced in mid-March at very low prevalence. Proportions vary across provinces (ON, AB ~ 30%, BC ~ 25%, MB, SK, QC ~ 5% as of mid-June). The proportion of cases due to VOCs are indirectly fitted when calibrating to data.

- Changes to public health measures, including multi-stage reopening, is accounted for in the forecast. In the provincial forecasts (slide 16), Stage 1 reopening is represented by a dashed vertical line and stage 2 reopening is represented by a solid vertical line

- The forecast includes a line showing the expected decrease in cases if public health measures remains constant (grey line), a line that assumes recent changes to public health measures will increase effective transmission further by 25% (blue line) and a line that assumes recent changes to public health measures will increase effective transmission by a further 50% (orange line).

- The PHAC-McMaster model forecast includes current vaccine roll-out, including an assumption that vaccinations are 60% effective against infection for non-Delta variants (30% for Delta variants) after one dose and 90% (80% for Delta variants) effective against infection after second dose. This model uses the current daily administered vaccination numbers and a statistical model to fit and project the rapid switch to a second dose, however it does not prioritise by age, and uses a static vaccination rate.

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 (slides 12 and 13).

- 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 the 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 in Canada is estimated at 31 per 100,000;
  - The vaccination period is Dec 14, 2020 to either mid-August, 2021 (with 75% vaccine acceptance by the eligible population) or late August, 2021 (at least 80% vaccine acceptance by the eligible population). 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). Acceptance in parents of adolescents is from an internal national survey. Increased acceptance rates in older age groups (≥ 55 years) is based on Quebec's current vaccination rate which has surpassed Canadian survey rates, while 80% acceptance in the younger age groups (12 to 54 years) is a model scenario.
  - For all scenarios, a two-step approach to lifting public health measures is modelled. Restrictive measures are lifted 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 (or 40% in simulations with increased uptake). The easing of personal protective measures occurs when at least 75% of those 12 and over have received their second dose (or 83% in simulations with increased uptake). 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.
  - The model assumes on the day restrictive measures are lifted, the border reopens and the number of imported cases increases from 2 per 100,000 per week to 12 per 100,000 based on current reduction in travel volume due to border restrictions, imported cases are estimated from the PHAC importation model