COVID Model Projections

October 27, 2021

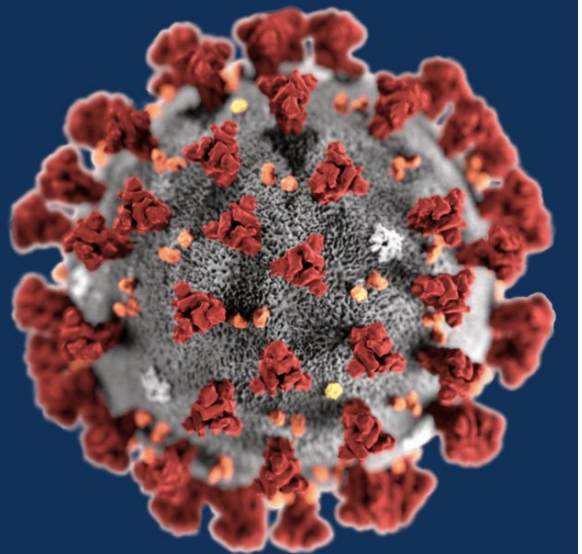
BC COVID-19 Modelling Group

@bcCOVID19group

About BC COVID-19 Modelling Group

The BC COVID-19 Modelling Group works on rapid response modelling of the COVID-19 pandemic, with a special focus on British Columbia and Canada.

The interdisciplinary group, working independently from Government, includes experts in epidemiology, mathematics, and data analysis from UBC, SFU, UVic, and the private sector, with support from the Pacific Institute for the Mathematical Sciences.



https://bccovid-19group.ca

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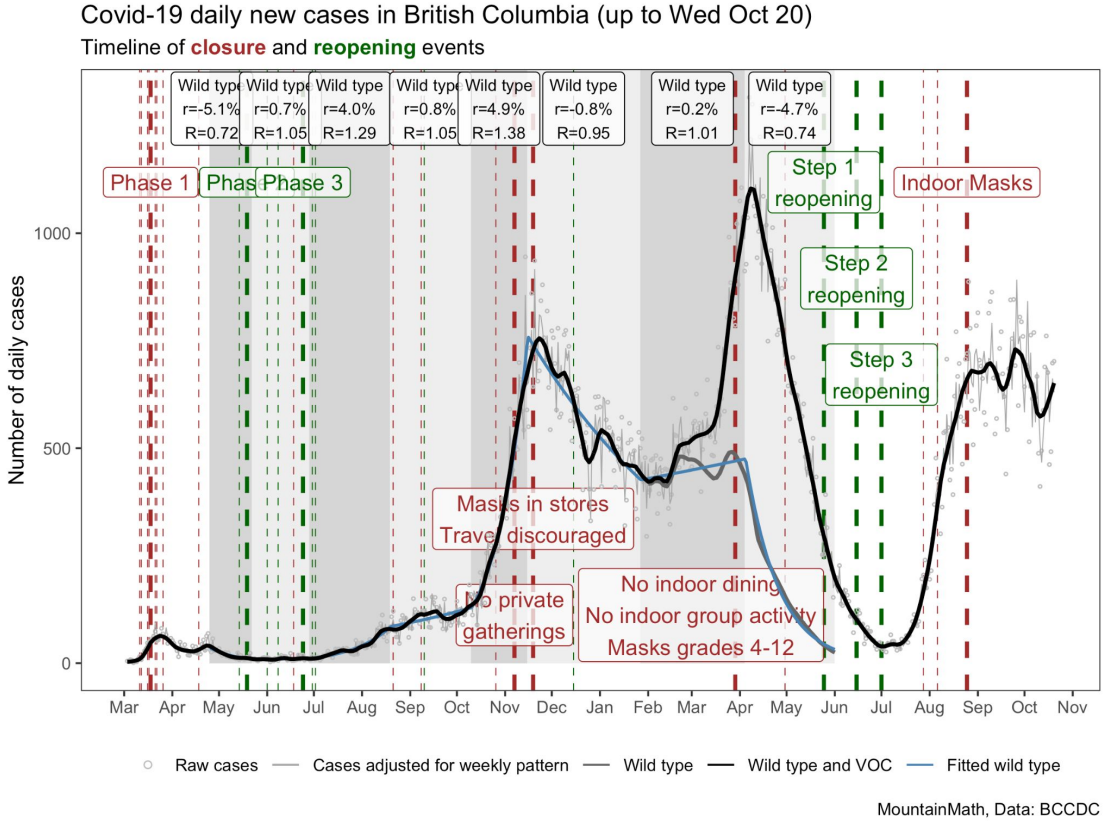
Independent and freely offered advice, using a diversity of modelling approaches.

Overview

- State of the pandemic in BC
  - Case numbers have stabilized at around 600 cases per day.
- Cases among children
  - Dramatic rise in case rate among <12 year olds has reversed.
  - Incidence remains slightly higher among <12 year olds across the province.
- A new analysis sheds light on testing rates in BC
- Hospitalizations and ICU
- Vaccination and its impact
- Vaccine uptake
- Impact of changing transmission in children
- Prospects for vaccinating children aged 5-11: direct and indirect impacts
- Situation update for Alberta: Hospital admissions declining - good news

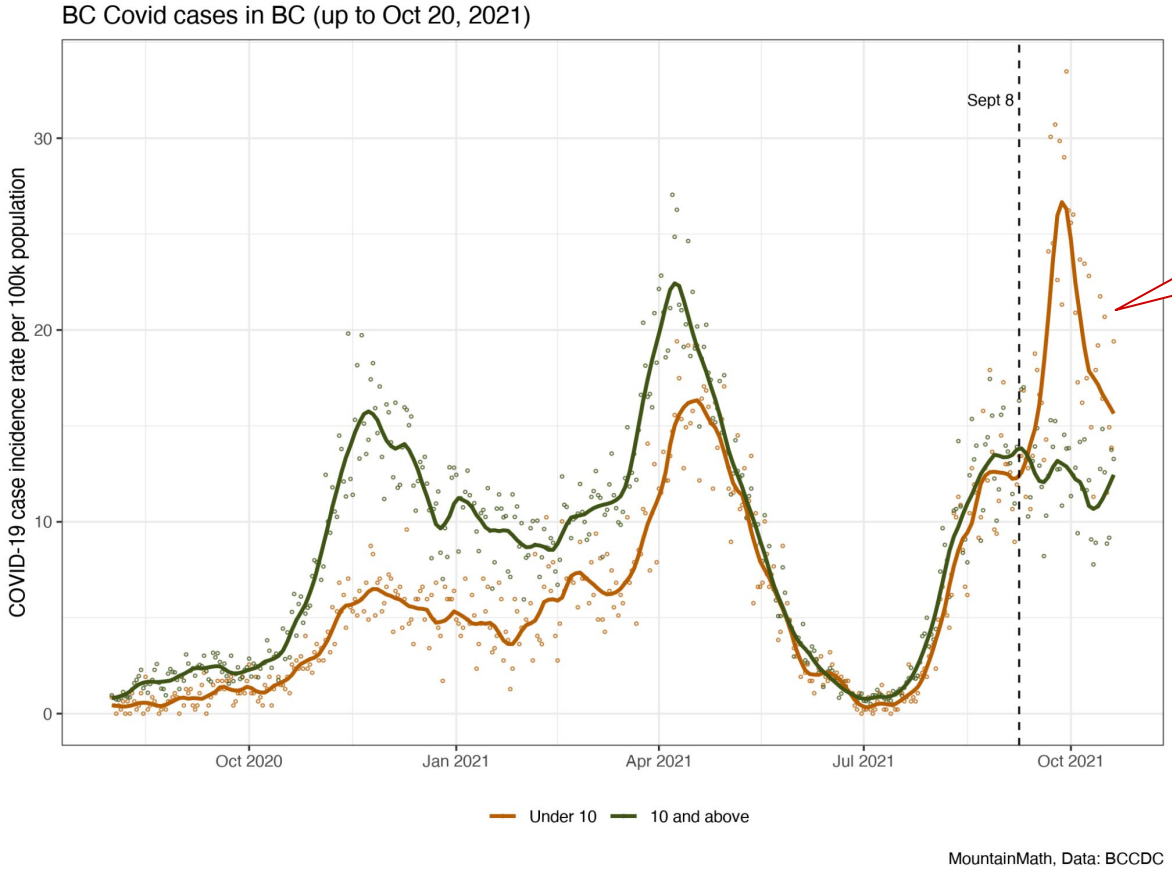
State of the COVID-19 Pandemic in BC



Indoor masking and localized measures in regions with high case counts (Interior and Northern Health Authorities) stabilized cases through September.

Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data). Vertical lines give dates of public health measures (major as thick lines, minor as thin lines). Grey dots are raw case counts, grey lines is cases abused for weekly pattern, black STL trend line and blue fitted periods of constant exponential growth. *Central Okanagan – July 29: masks, August 6: restrictions on group gatherings; Interior – August 21: masks; August 23: some restrictions on group gatherings. BC – August 25 mask mandate; BC's Vaccine Card to come into effect on September 13 (first dose) and October 24 (second dose)

State of the COVID-19 Pandemic in BC



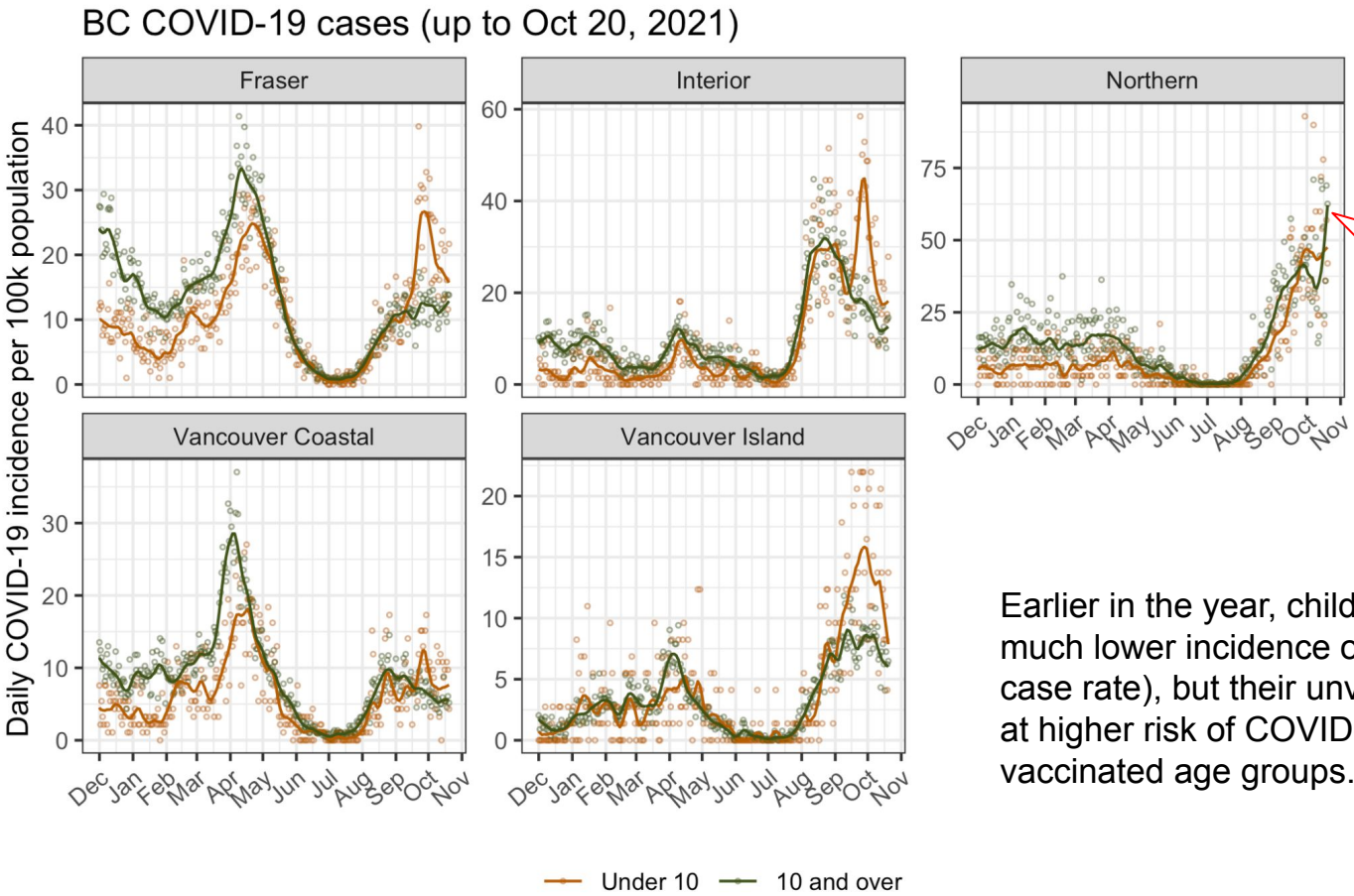
Rapid rise in <10 cases has largely reversed.

The rapid rise and fall in cases in this age group suggest more contacts at the end of summer & beginning of the school year, stabilizing afterwards.

Testing also increased, but whether increased testing was a cause or consequence of higher case rates is unclear.

Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data).

State of the COVID-19 Pandemic in BC



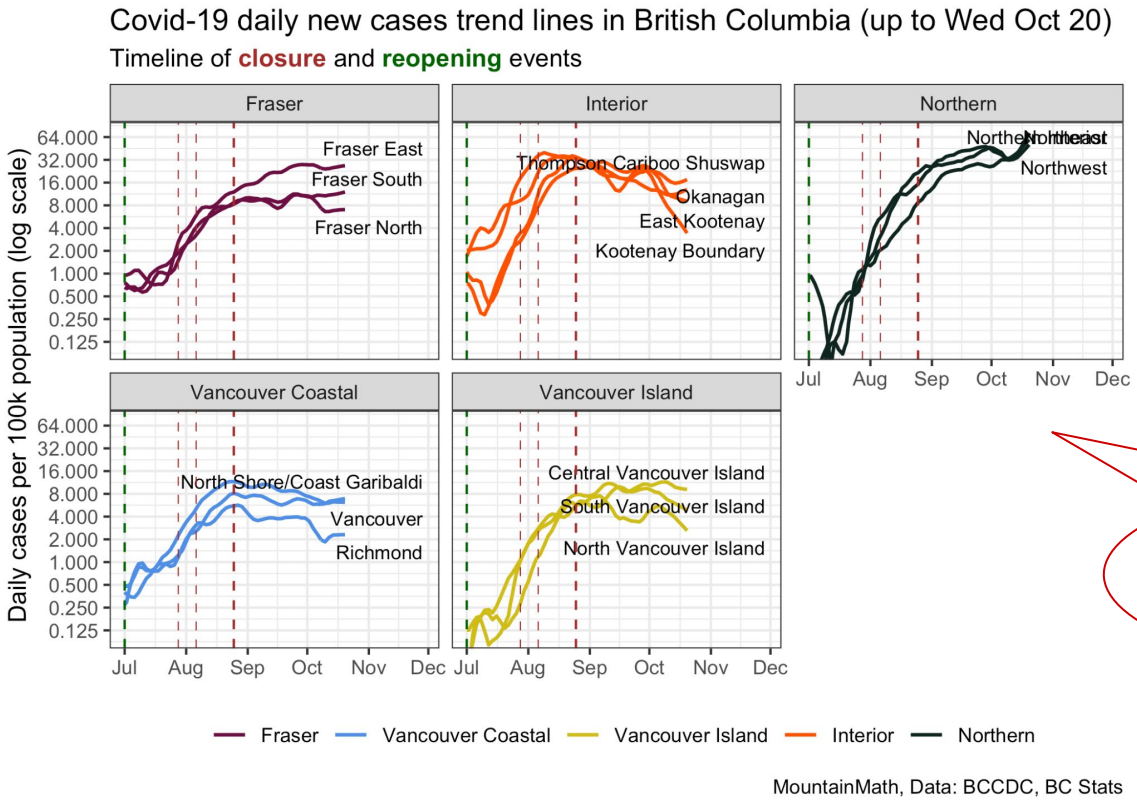
Incidence among children <10 is now similar to or slightly higher than other ages, across all HA.

Earlier in the year, children under 10 tended to have a much lower incidence of COVID-19 (roughly half the case rate), but their unvaccinated status is placing them at higher risk of COVID-19 relative to older and more vaccinated age groups.

Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data).

MountainMath, Data: BCCDC

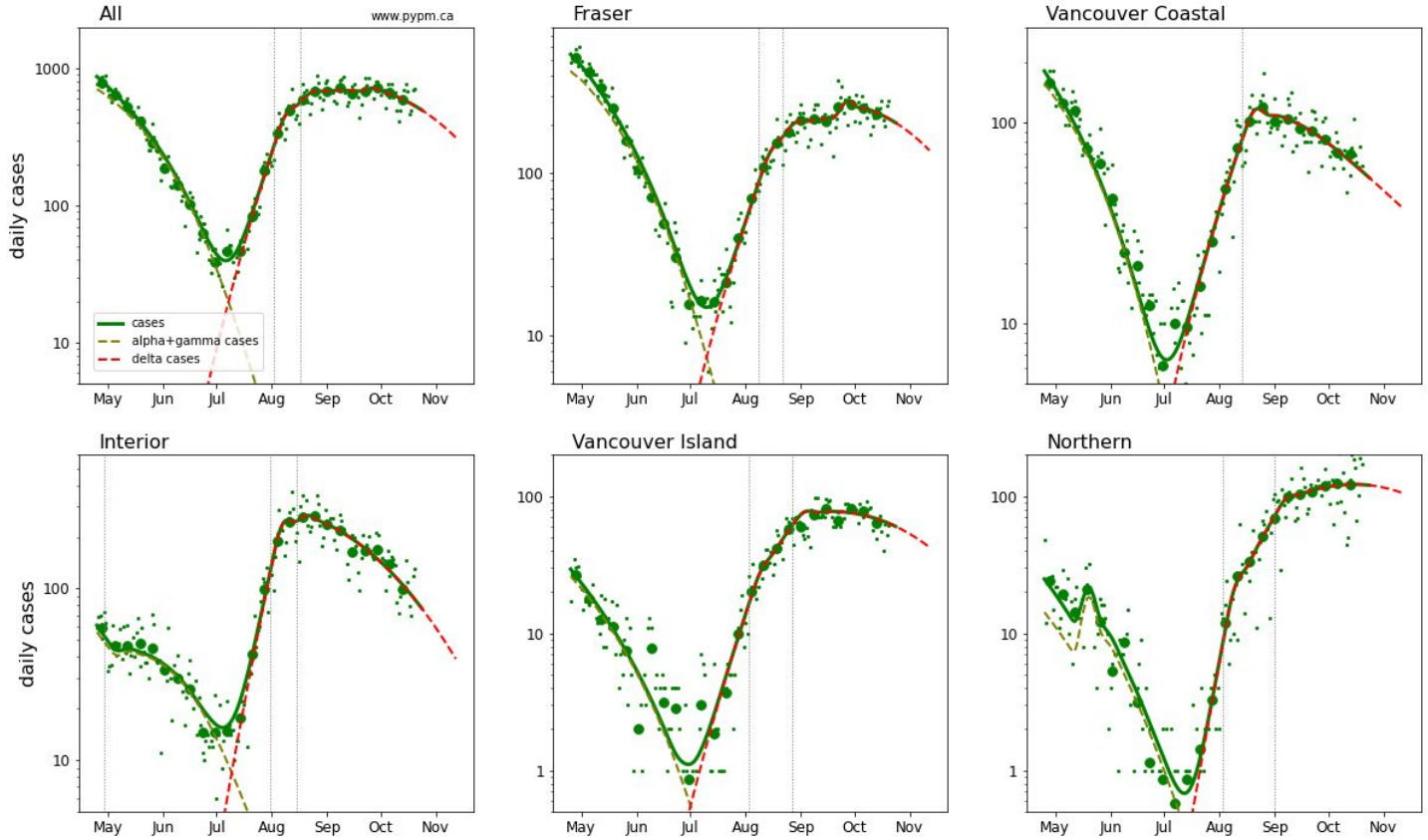
State of the COVID-19 Pandemic in BC



Health Service Delivery Areas (HSDA) follow similar trends within a Health Authority, with the highest case rates in Northern Health.

Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data). Vertical lines give dates of public health measures (major as thick lines, minor as thin lines). STL trend lines on log scale.

Model fits to BC data



The measures taken in August and the public's response significantly reduced transmission.

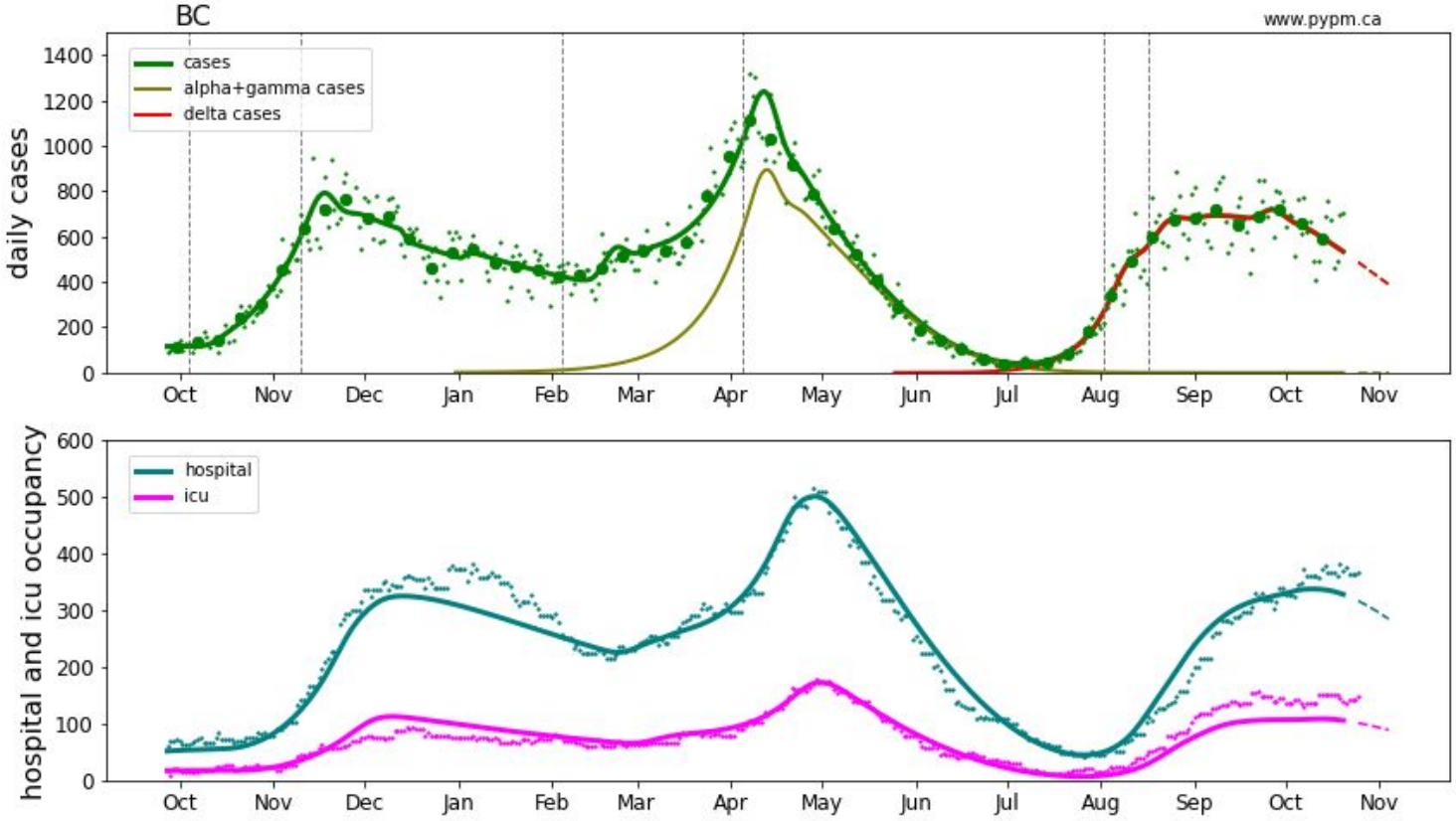
Cases in BC are currently declining at a rate of 2% per day.

Case rates are predicted to decline in all Health Authorities.

Fraser HA model indicates a burst of infections in early September.

Source (D. Karlen). See www.pypm.ca. These models have no age structure. Fits include past vaccination schedule. Seasonal effects, such as the increased transmission in Fall 2020, or the appearance of new variants may increase growth, additional vaccinations beyond current rates of vaccination would bring growth rates down. Vertical lines show fitted dates for transmission rate changes. The larger dots show weekly averages.

Estimating demands on health care



The COVID-19 pandemic is tracked using positive tests (cases), yielding an infection model (green curve).

The infection model well describes past hospital occupancy.

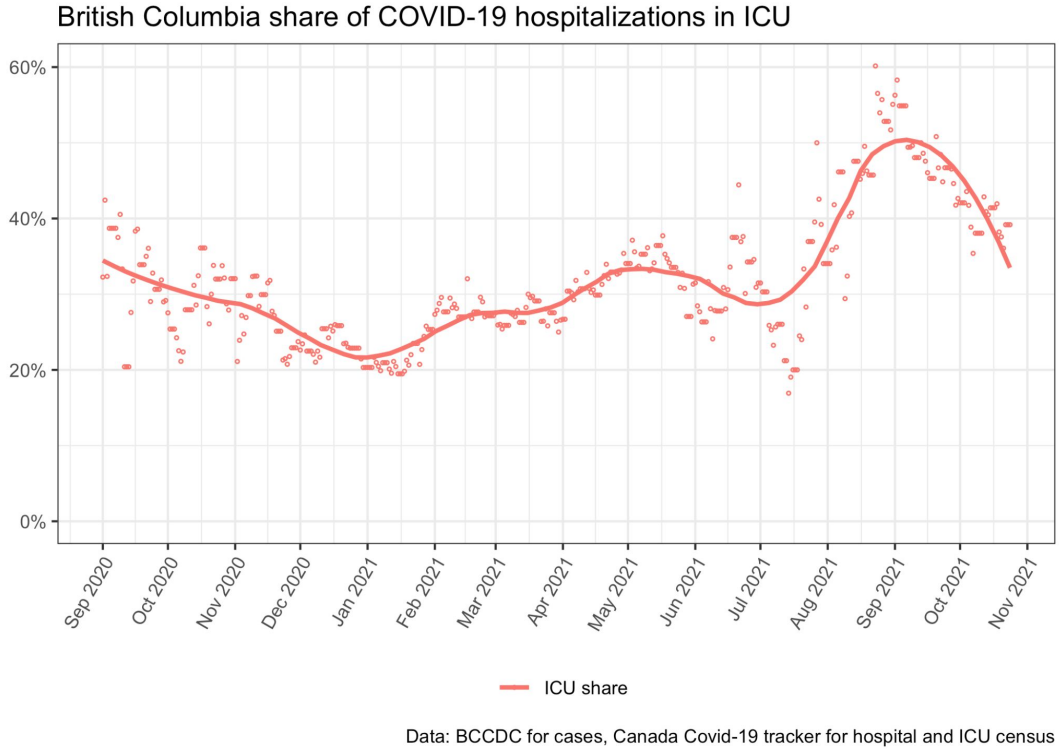
Recent hospital and ICU occupancies exceed projections calibrated by data from the third wave.

Source (D. Karlen). See www.pypm.ca. These models have no age structure. Fits include past vaccination schedule.

Hospital and ICU occupancy over time

Of those patients in hospital, the recent increase of the fraction in ICU has stabilized and reverted.

Although many factors may contribute, the Delta variant that now predominates (98% of BC cases) has been found to be more severe in other jurisdictions*.

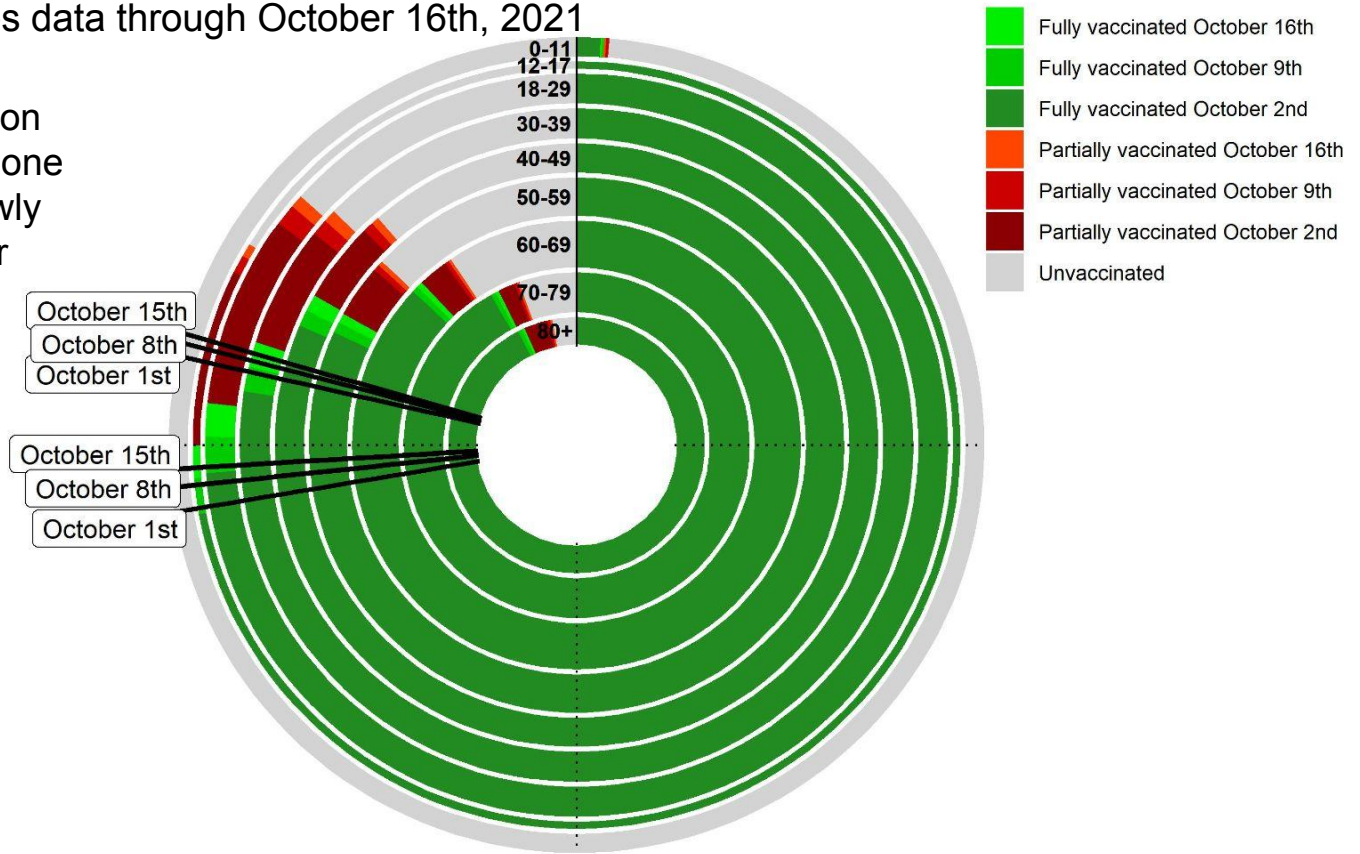


Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data). STL trend lines on linear scale. *Singapore study found that Delta was 4.9 times more likely to lead to an oxygen requirement, ICU admission, or death among unvaccinated hospitalized patients; see overview of Delta severity in CBC article.

Closing the circle: Vaccination status by age

October 22nd update includes data through October 16th, 2021

Slowing progress: The fraction of BC's entire population with one or two doses is rising, but slowly (0.3% and 0.7% increase over the past week, respectively).



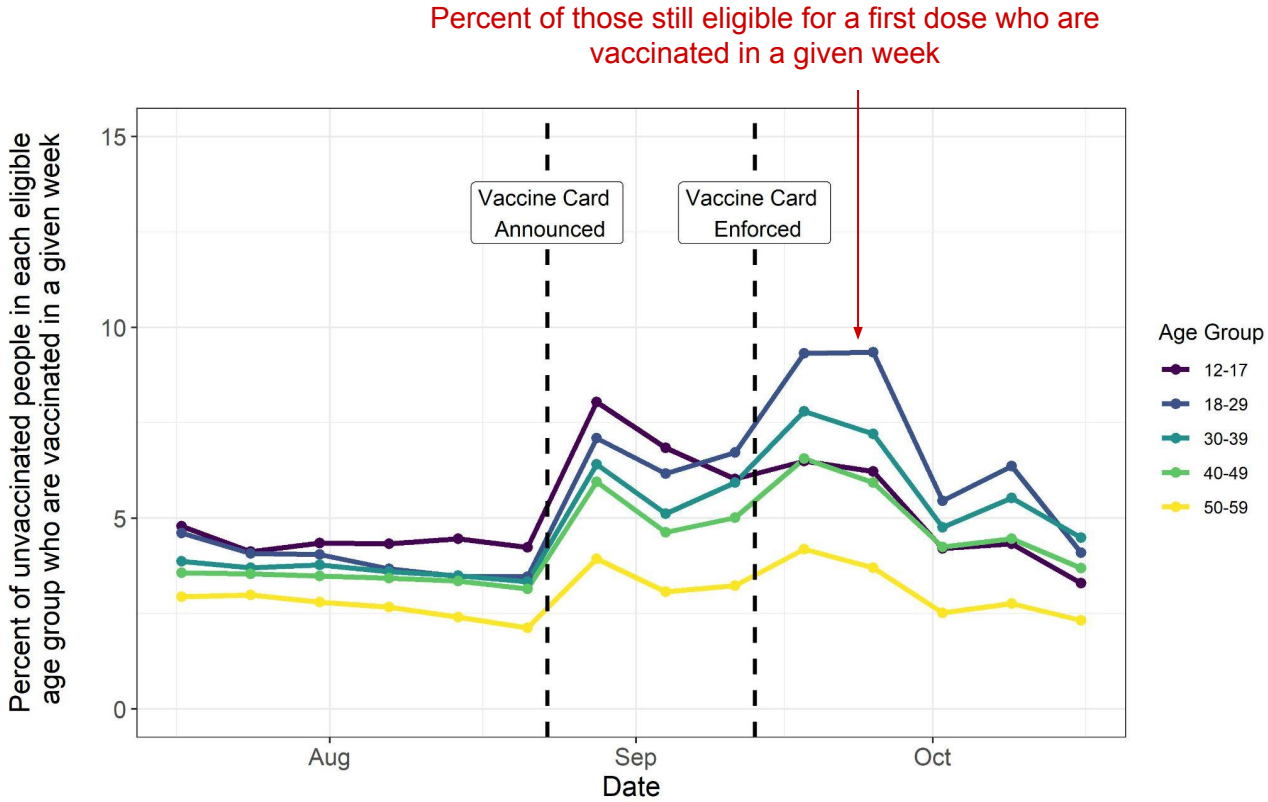
Source (B. Wiley). Design by Blake Shaffer (https://blakeshaffer.shinyapps.io/app_vaccines/) BC Vaccination data from https://health-infobase.canada.ca/covid-19/vaccination-coverage/, with area of each circle segment proportional to BC's population in that age class. BC 2021 Population projections for vaccination percentages from BC Stats: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

Slow movement on vaccinations in BC

Slowing progress:

With the same number of first dose vaccinations per week, it would take **~5 weeks** to vaccinate 90% of the 18-29 age group, and **~9 weeks** to vaccinate 90% of the 50-59 age group.

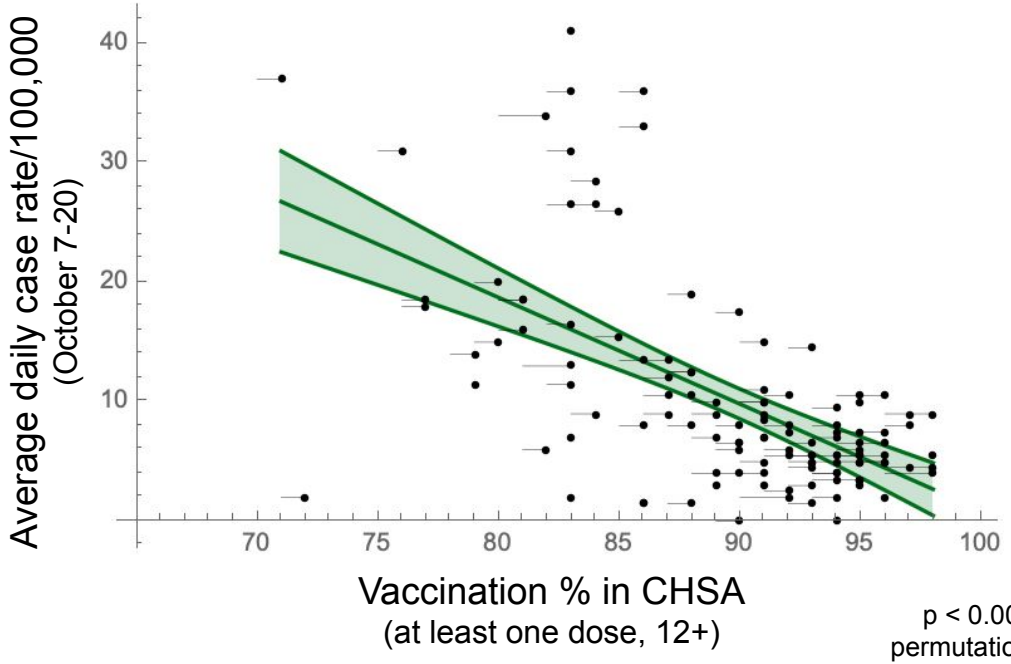
If the first dose vaccination rate had remained constant from **September 18th**, the 18-29 age group would be above 90% vaccinated now, and it would take **~1.5 weeks** to vaccinate 90% of the 50-59 age group



Source (B. Wiley). BC Vaccination data from https://health-infobase.canada.ca/covid-19/vaccination-coverage/. BC 2021 Population projections for vaccination percentages from BC Stats: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

A pandemic of the unvaccinated: Communities at risk

We continue to see a major effect of vaccination levels across Community Health Service Areas (CHSA). For the most recent two-weeks of cases, communities with 95% of eligible people vaccinated have **4.3 times** fewer COVID-19 cases than those with 75% vaccination.



Thin lines show vaccination progress over the past two weeks.

Vaccinations protect communities, as well as protecting individuals.

Source (S. Otto). BCCDC data portal's surveillance dashboard data; see maps for regions that would most benefit from community vaccination drives (accessed October 25, 2021). [a]BC COVID-19 Modelling Report (September 1, 2021), consistent with BCCDC findings for age-corrected analyses.

http://www.getvaccinated.gov.bc.ca

Vaccinating children 5-11: indirect benefits

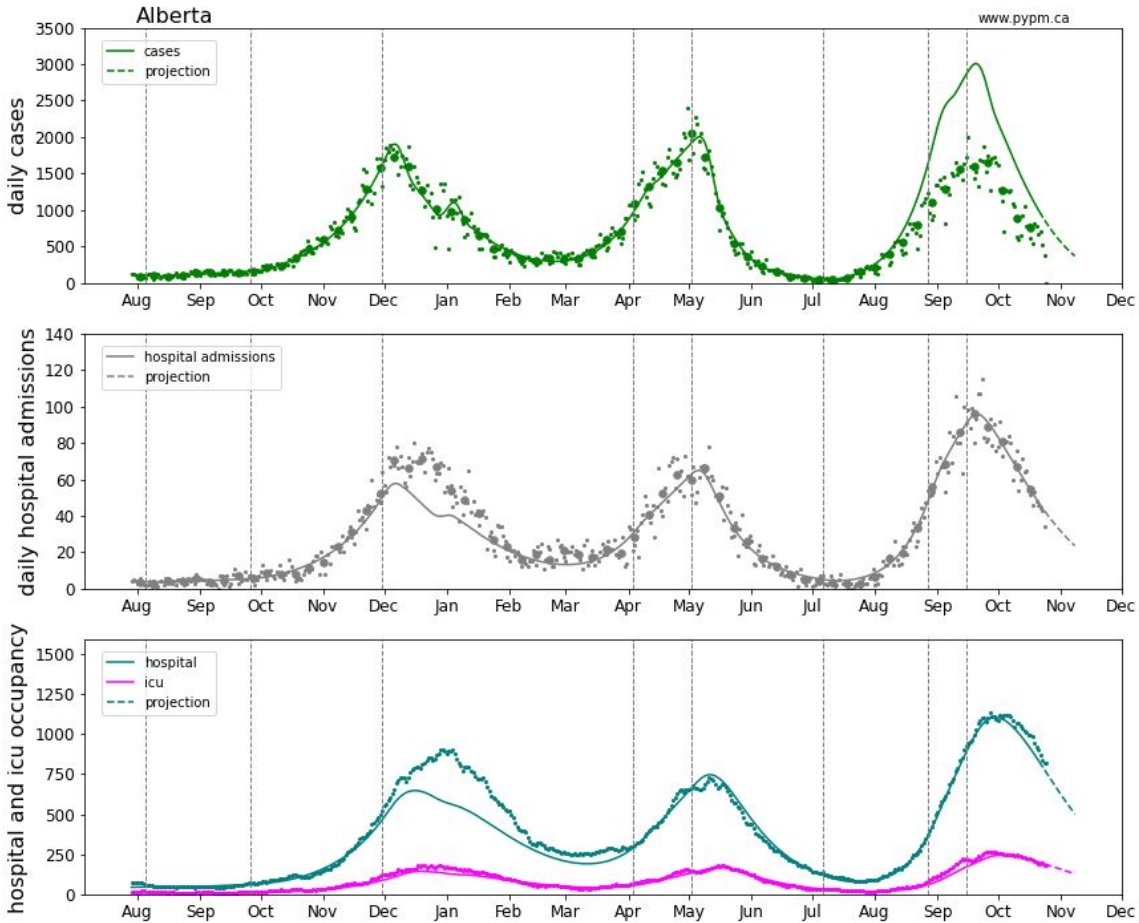
- Children have a unique need for the adults in their lives to remain healthy and we
- Children have contact with parents, grandparents and other adults
- Preventing transmission in children has direct and **indirect benefits** for c
- Preventing transmission in children has broader indirect benefits, too

OLD SLIDE

Vaccinating 5-11s prevents hospitalizations and deaths in older groups, including unvaccinated older individuals

Source (Y. Song [SFU], C. Colijn). NOTE: These are illustrative of the benefits of vaccination in this age group in a BC-like pandemic. Simulations are built upon a fit to BC's demographic and earlier pandemic data followed by growth in cases in coming weeks before child vaccination can begin. Methodology: Mulberry et al 2021

Alberta update



Fits hospital admission data (grey) rather than case data.

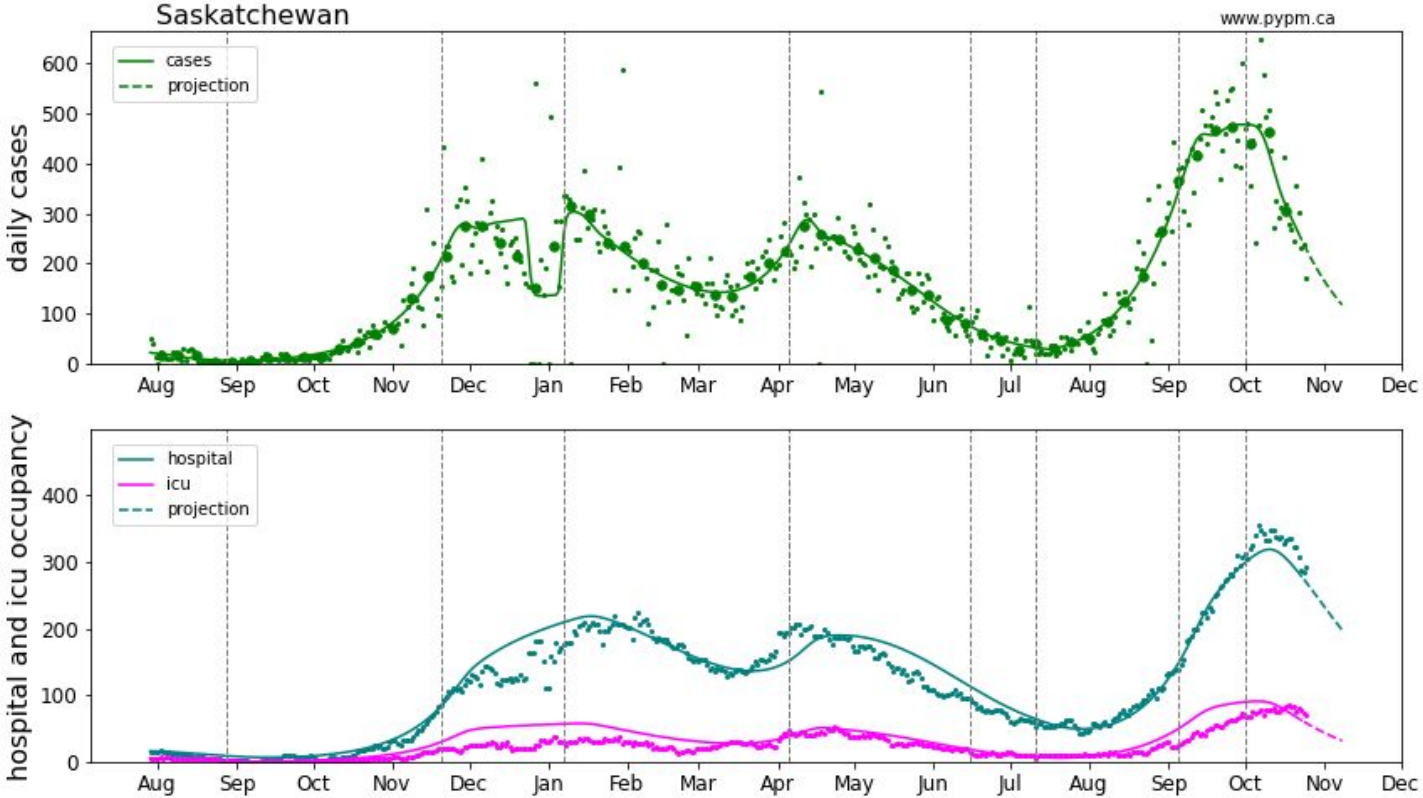
The previous report showed that case rates could no longer be relied upon to track infection rates, likely due to changes in testing practice. Hospital admission data indicated a significant reversal in growth, coinciding with measures announced on September 15.

Data from past 3 weeks confirms the turnaround.

Analysis indicates that many more infections have remained undetected recently.

Source (D. Karlen): COVID-19 Alberta Statistics, www.pypm.ca

Saskatchewan update

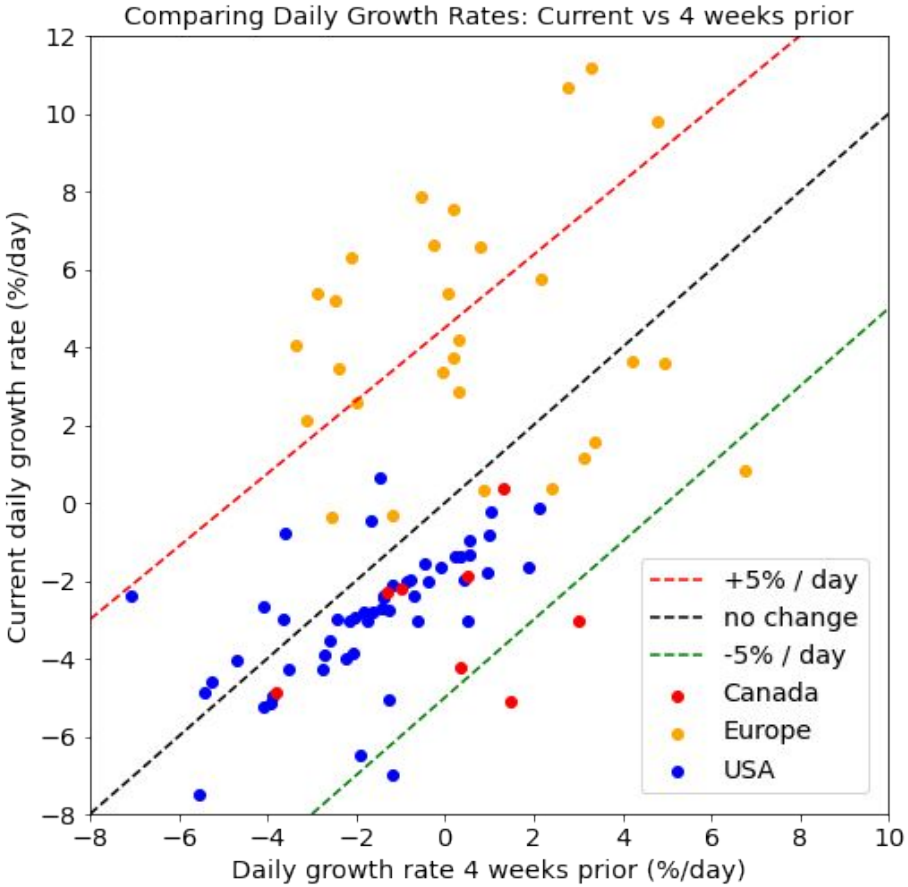


The rapid growth in infections in August has been reversed.

Hospital occupancy is declining, as projected from the case history.

Source (D. Karlen). See www.pypm.ca. These models have no age structure. Fits include past vaccination schedule.

Recent trends in Canada, USA, and Europe



Over the past 4 weeks, growth rates have reduced in all Provinces and most US states.

- The daily growth rates are now typically about 2%/day less than they were a month ago, consistent with the effect of increasing immunity of the populations.

In the past few weeks, most European countries have seen dramatic increases in growth rates.

- Cases now growing 5%/day (or more) faster than they were a month ago.
- This could be due in part to seasonal changes in behaviour.
- Serves as a warning that our situation could rapidly take a turn for the worse.

Source (D. Karlen): www.pypm.ca

Key messages

State of the pandemic:

- BC's COVID-19 cases stabilized through September due to masking, other p[ublic h]ealth measures and vaccination.
- Cases in children rose steeply in Fraser Health, Interior Health and V[ancouver] Island.
- ICU demand remains near peak levels, but hospital and ICU occ[upancy] have begun to stabilize.
- A new analysis reveals that the number of tests performed is [a multip]le of the number of cases plus a constant background number. The multiplicative factor d[iffers by] Health Authority.
- Recent testing rates in ages 0-4 are higher than expe[cted given] the number of cases.

Vaccination:

- Vaccine uptake continues but at a low rate.
- Areas with high vaccination levels hav[e low] case numbers.
- Children account for nearly 50% of [unvac]cinated and are seeing rising case numbers in some health authorities in BC. Chang[es in] transmission in children affect the cases' growth rate more than changes in other grou[ps] because children are less vaccinated and have high contacts.
- Vaccinating children 5-1[1] may to bring benefits to children if the Pfizer vaccine is approved.
- This would have bo[th] direct benefits to children, and indirect benefits to adults.

Alberta: Hospital and ca[se] data disagreement suggests a smaller fraction of infections are being detected than previously. Cases, hospital admissions and occupancy have all begun to decline.

OLD SLIDE