COVID Model Projections

September 15, 2021

BC COVID-19 Modelling Group

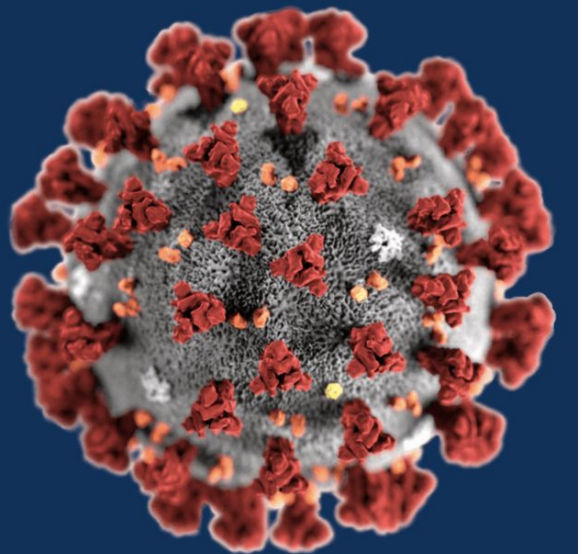
**Given the changing COVID-19 situation in BC,
this is an intermediate report
(only updated data slides are included - see September 1 report for details).**

@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

Contributors to report
Eric Cytrynbaum (UBC, co-editor)
Sarah Otto (UBC, co-editor)
Dean Karlen (UVic and TRIUMF)
Caroline Colijn (SFU)
Jens von Bergmann (MountainMath)
Rob James (evidently.ca)
James Colliander (UBC and PIMS)
Daniel McDonald (UBC)
Paul Tupper (SFU)
Daniel Coombs (UBC)
Elisha Are (SFU)
Bryn Wiley (UBC)

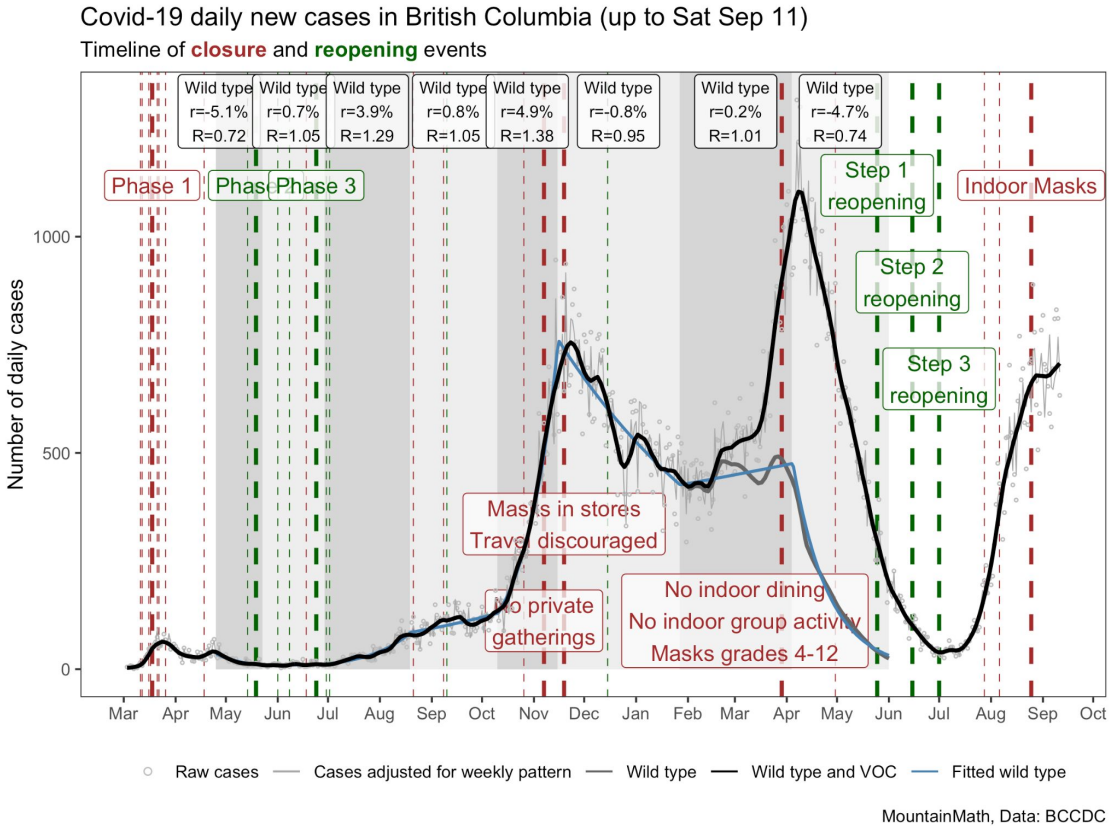
Independent and freely offered advice, using a diversity of modelling approaches.

BC: A transition period

Overall summary

- Province-wide measures have lead to a slowing of growth in BC, even stopping growth in some health authorities.
- Growth is still fast in the Northern Health Authority (two week doubling time) but it is too early for the September 7 social restrictions to be reflected in case counts.
- The number of cases is growing in the Northern Health Authority in a similar way to cases in Alberta and Saskatchewan, where emergency medical care is under great stress.
- Hospitalizations continue to increase, tracking case counts with a delay. With case counts flattening, hospitalizations should follow.
- Recently, a larger fraction of hospitalized patients need ICU care than earlier in the year.
- The number of first-dose vaccinations rose after the vaccine passport was announced, but not by much considering the number of unvaccinated individuals remaining.
- Vaccines are showing high effectiveness in BC across age groups, reducing cases 12-fold and hospitalization rates 29-fold once fully vaccinated (age-corrected analysis) and protecting communities by lowering case counts in more vaccinated regions.

State of the COVID-19 Pandemic in BC



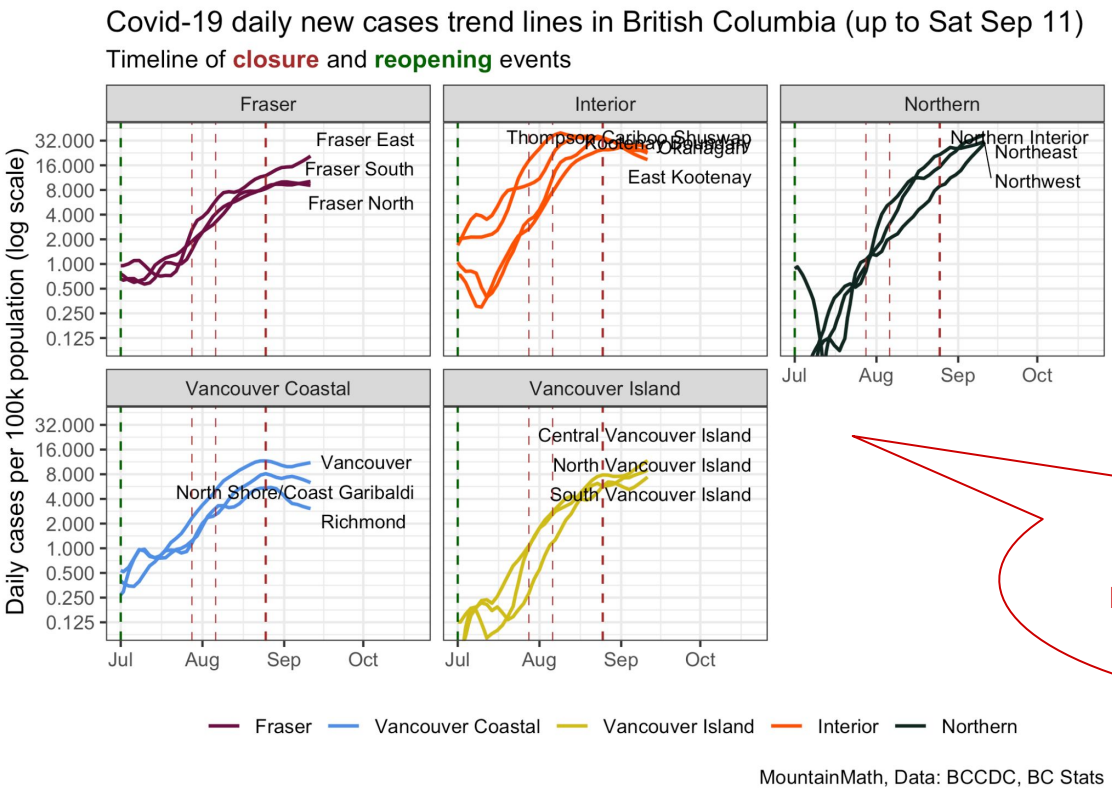
After a period of rapid growth, case growth rates are slowing.

A slow down is visible following public health orders in the Interior and subsequent BC-wide restrictions

COVID-19 continues to spread, but now more slowly, in BC.

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; vaccine passport to come into effect on September 13 (first dose) and October 24 (second dose)

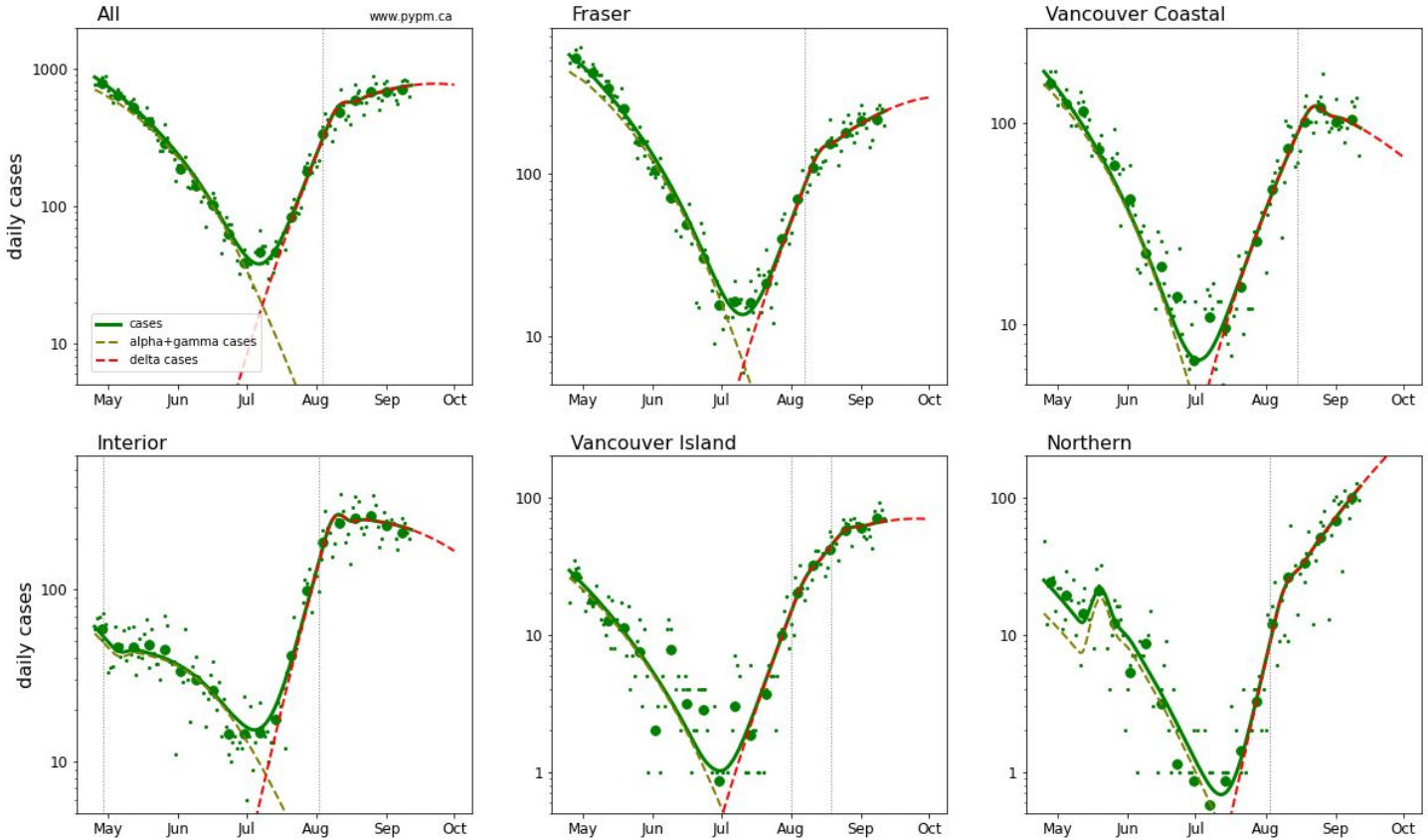
State of the COVID-19 Pandemic in BC



All Health Service Delivery Areas follow similar trends within a Health Authority.
Regions in the Interior, including the Okanagan, have slowed substantially in growth.

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

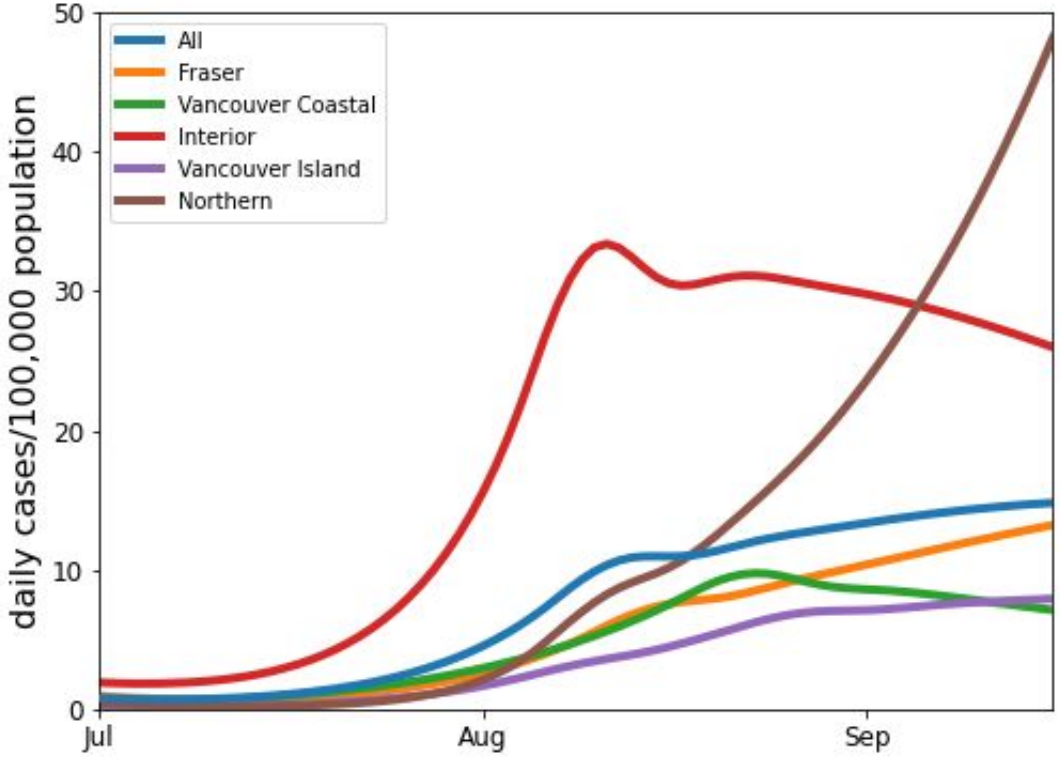


Recent measures and the public's response have stopped growth in the Interior and have significantly slowed growth in all other regions.

Northern growth rate is about 5% per day (2 week doubling time). It is too early to see the effect of additional measures enacted in the North in early September.

Source (D. Karlen). See www.pypm.ca. These models have no age structure. Fits include past vaccination schedule. Overall growth in BC is currently at 1% per day but rates may be in transition due to recent mandates in BC. The larger dots show weekly averages to guide the eye.

Comparing daily case prevalence among Health Authorities

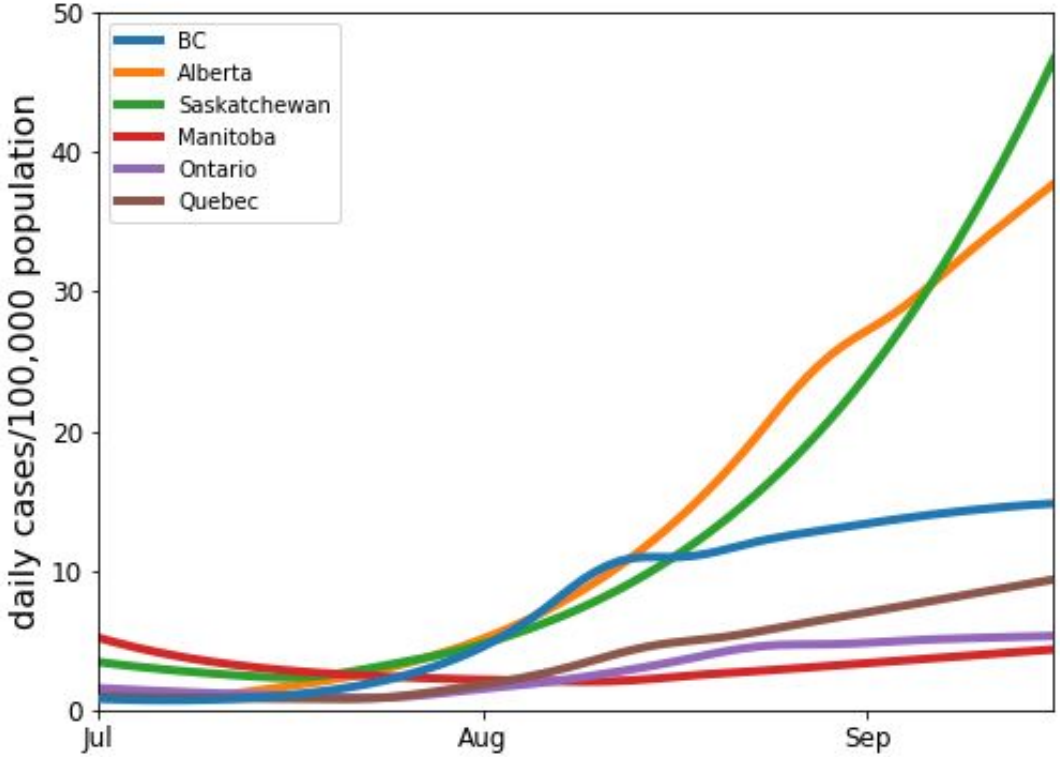


These curves show the model fits to daily cases (from previous slide) as a proportion of each Health Authority (HA).

The case prevalence in the Northern HA is very high and continuing to grow. It is following the track of Alberta and Saskatchewan (next slide).

Source (D. Karlen). See www.pypm.ca. The curves show the model fits from the previous page scaled by the population of the Health Authority.

Comparing daily case prevalence with other Provinces



These curves show the model fits to daily cases as a proportion of the provincial populations.

Health care in Alberta and Saskatchewan is severely affected by the current number of COVID-19 patients.

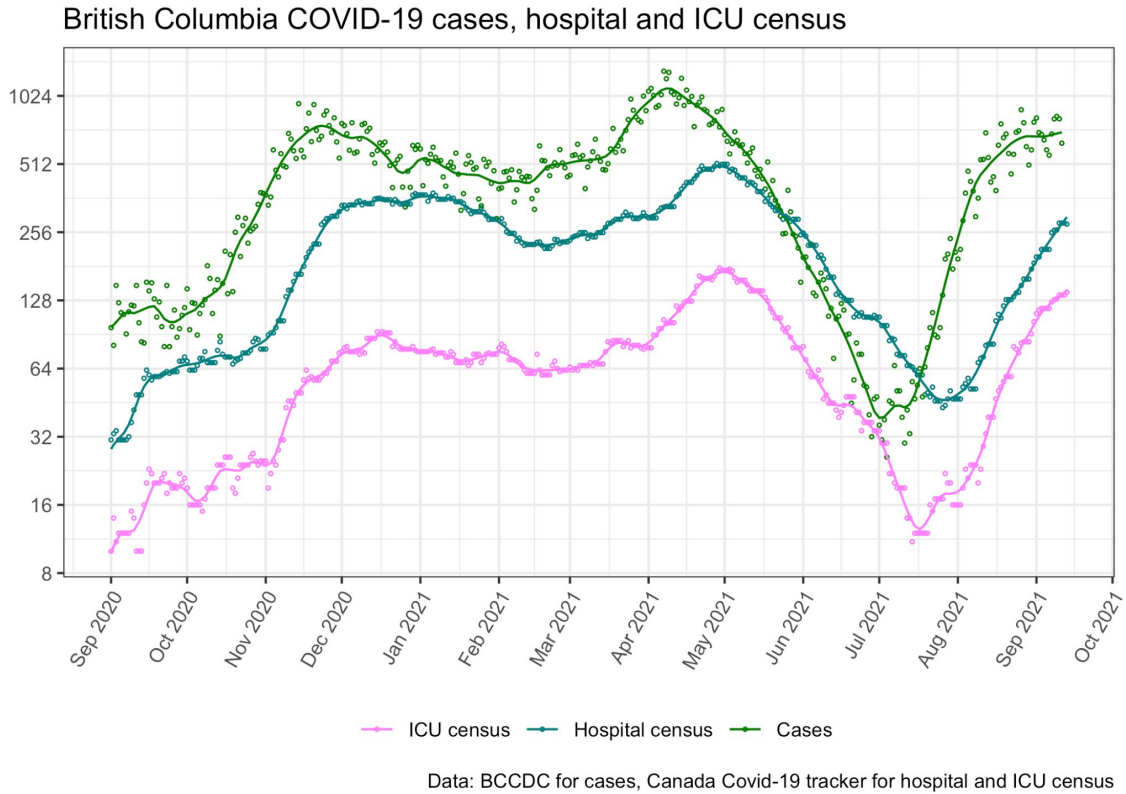
Measures brought in for BC were essential to avoid a similar crisis.

Source (D. Karlen). See www.pypm.ca. The curves show the model fits to case data scaled by the population of the Provinces.

Hospital and ICU occupancy over time

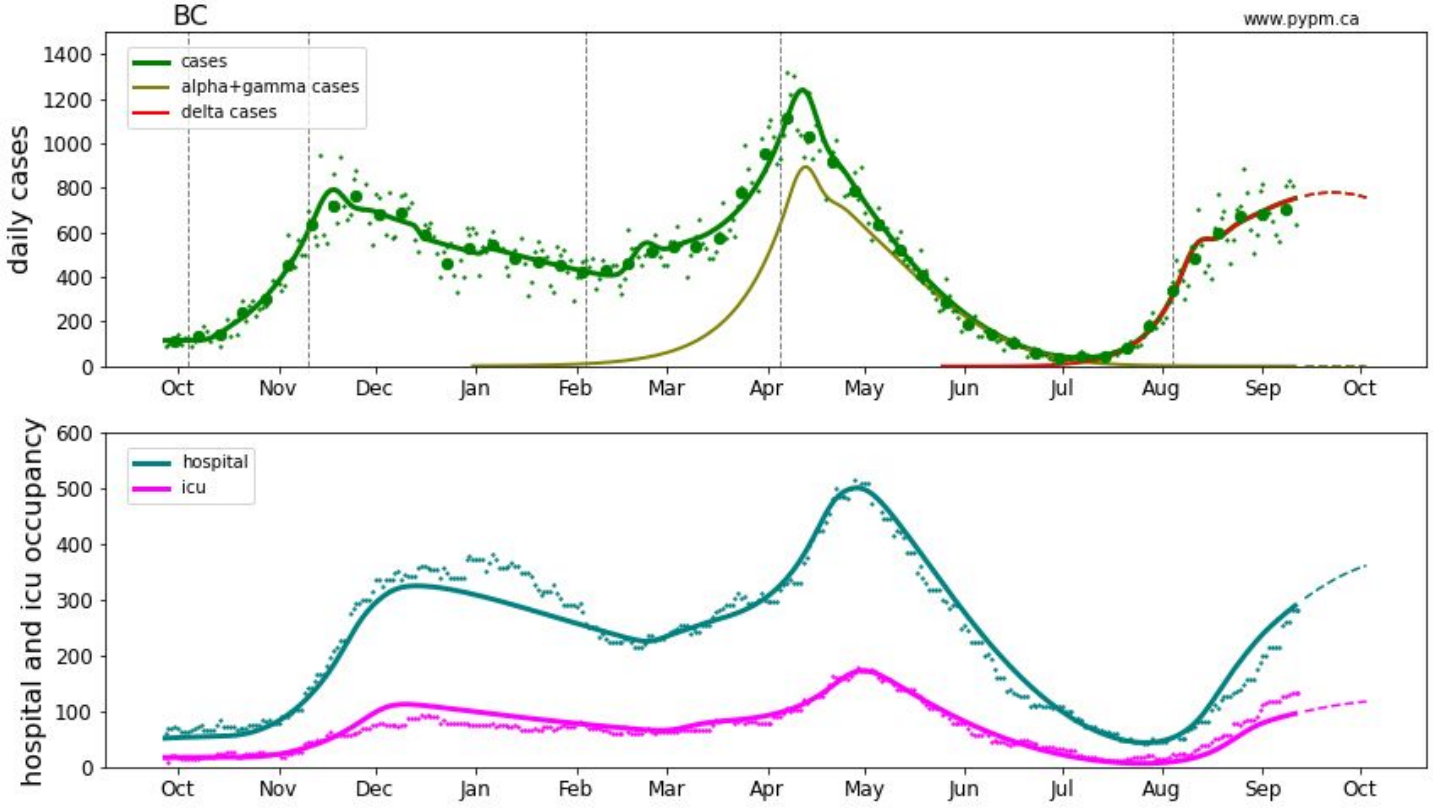
Hospitalization and ICU occupancy continue to rise, tracking the rise in COVID-19 cases, with a slight delay as symptoms develop and patients remain in need of hospital care.

The number of people in hospital and ICU is expected to grow more slowly in the near future, because the August measures have lowered the growth rate of cases in BC.



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 log scale.

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.

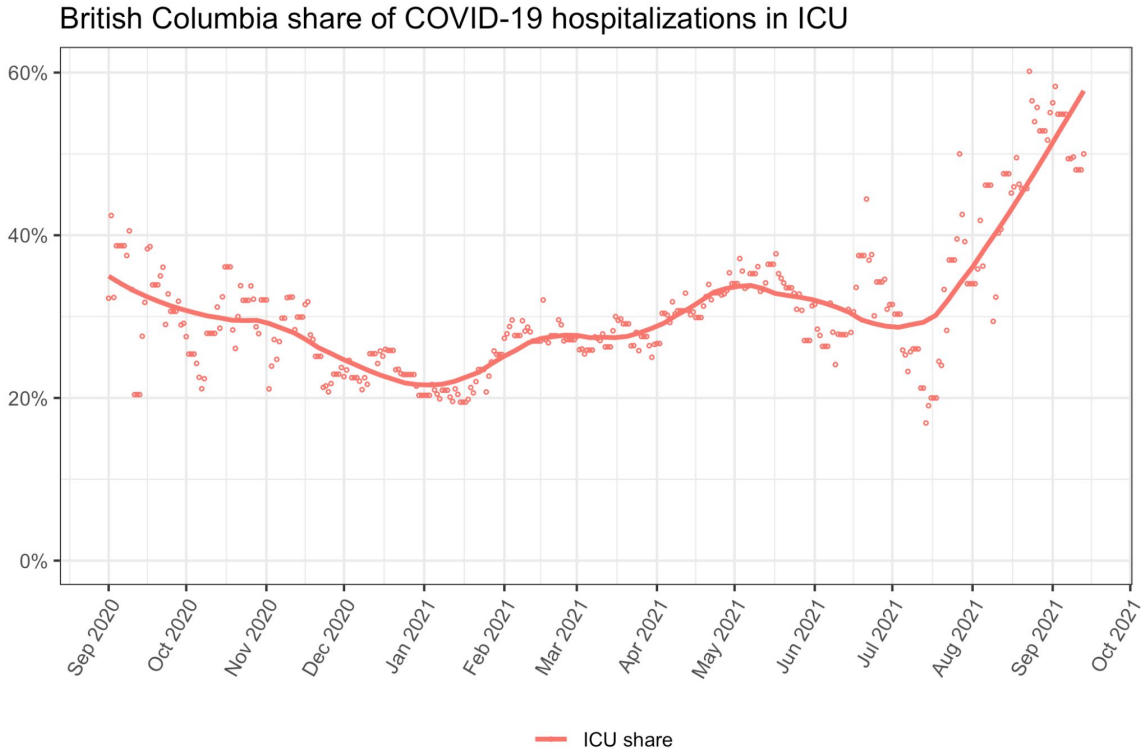
Recent hospital occupancy matches the projection, while ICU occupancy is higher than projected.

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 fraction in ICU has recently increased.

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*.



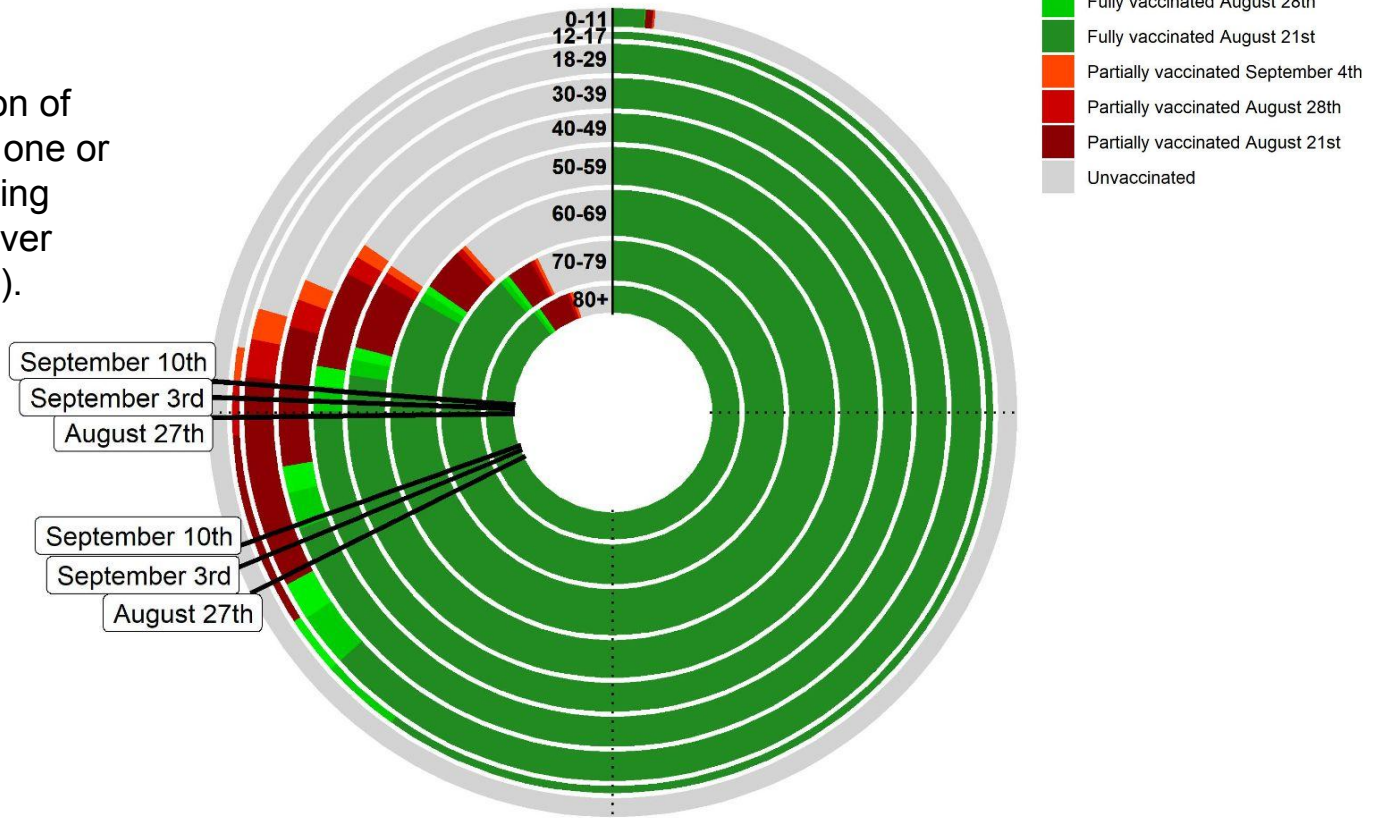
Data: BCCDC for cases, Canada Covid-19 tracker for hospital and ICU census

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

September 11th update includes data through September 4th, 2021

Slow progress: The fraction of BC's entire population with one or two doses is very slowly rising (0.6% and 0.8% increase over the past week, respectively).



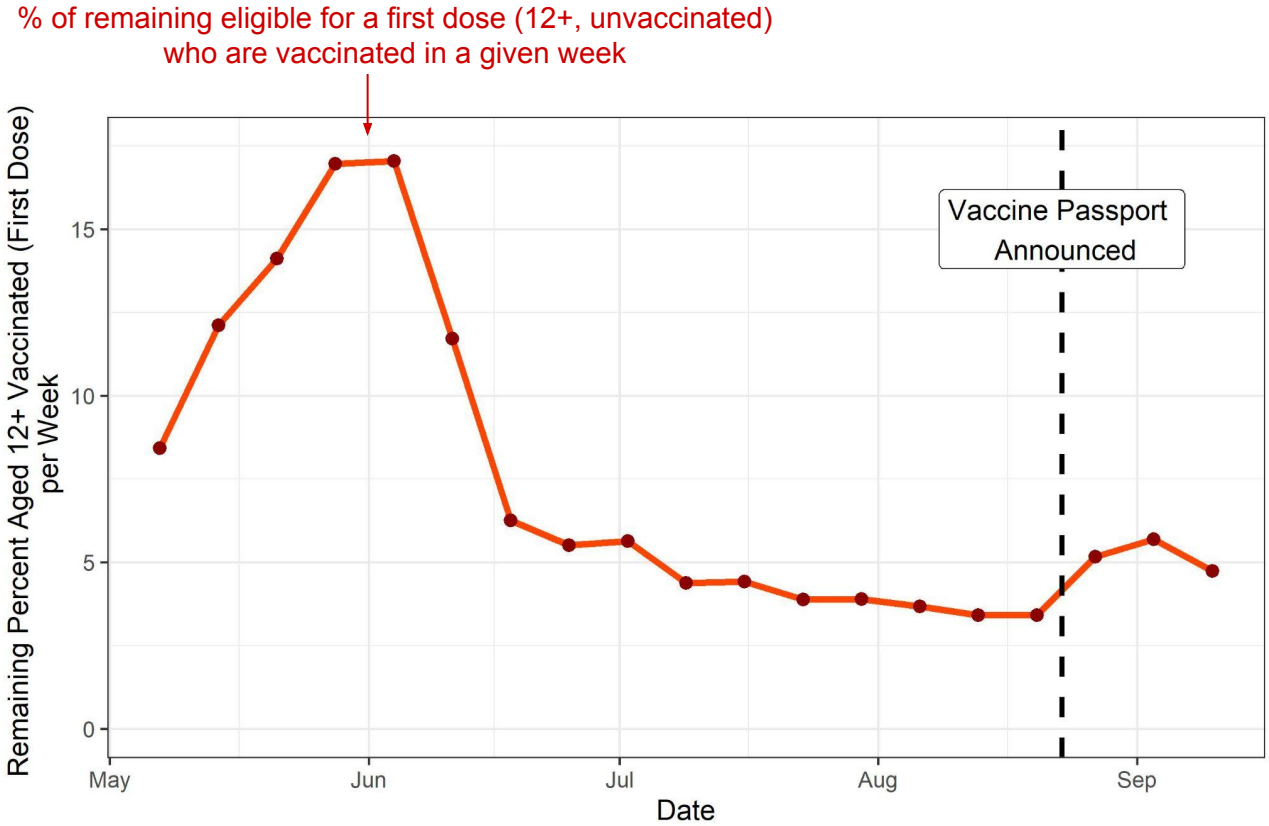
Source (B. Wiley). Design by Blake Shaffer (https://blakeshaffer.shinyapps.io/app_vaccines/) BC Vaccination data from https://health-infobase.canada.ca/covid-19/vaccination-coverage/, with area of each circle segment proportional to BC's population in that age class. BC 2021 Population projections for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

Slow progress:
The vaccine passport announced on August 23 (dashed line) has helped increase the rate of vaccinations, but at this rate, it would take **~2 months** to vaccinate half of the remaining eligible population in BC.

We need a game changer to vaccinate more people faster.

Will the launch of the vaccine passport on September 13 be it?



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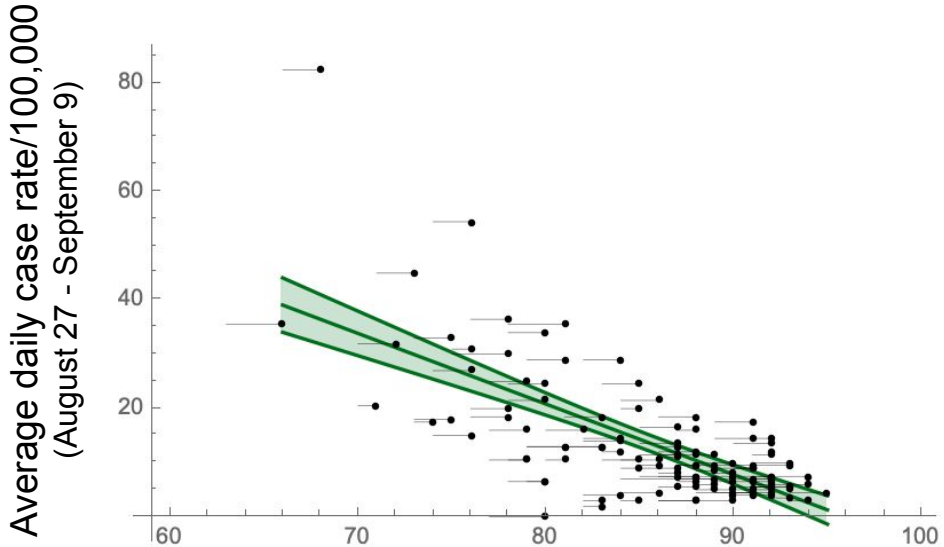
Vaccination helps

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 70% of eligible people vaccinated have **4.3 times** more COVID-19 cases than those with 90% vaccination.



$p < 0.0001$
permutation test

Thin lines show vaccination progress over past two weeks.

Vaccines show high effectiveness in BC across age groups[a]

- reducing cases 12-fold
- reducing hospitalization rates 29-fold once fully vaccinated

→ **Vaccines protect people & communities**

Source (S. Otto). BCCDC data portal's surveillance dashboard data; see maps for regions that would most benefit from community vaccination drives (accessed September 13, 2021). BC COVID-19 Modelling Report (September 1, 2021), consistent with BCCDC findings for age-corrected analyses..

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

Final words

The Delta wave of COVID-19 infections has been slowed in British Columbia.

Measures taken in the Interior stopped the growth in cases there.

Growth in the Northern HA remains concerning, but it is too early to detect the impact of recent social restrictions in this region.

We're still waiting to see the effect of school reopening on transmission rates. Stay tuned for the next report to capture those changes.

The announcement of a vaccination passport nearly doubled the rate at which unvaccinated individuals had their first shot, but at this rate it would still take a couple of months to vaccinate half of the remaining people eligible in BC.

With the passport coming into effect this week, we'll see soon if it helps to encourage more of our population to get vaccinated.

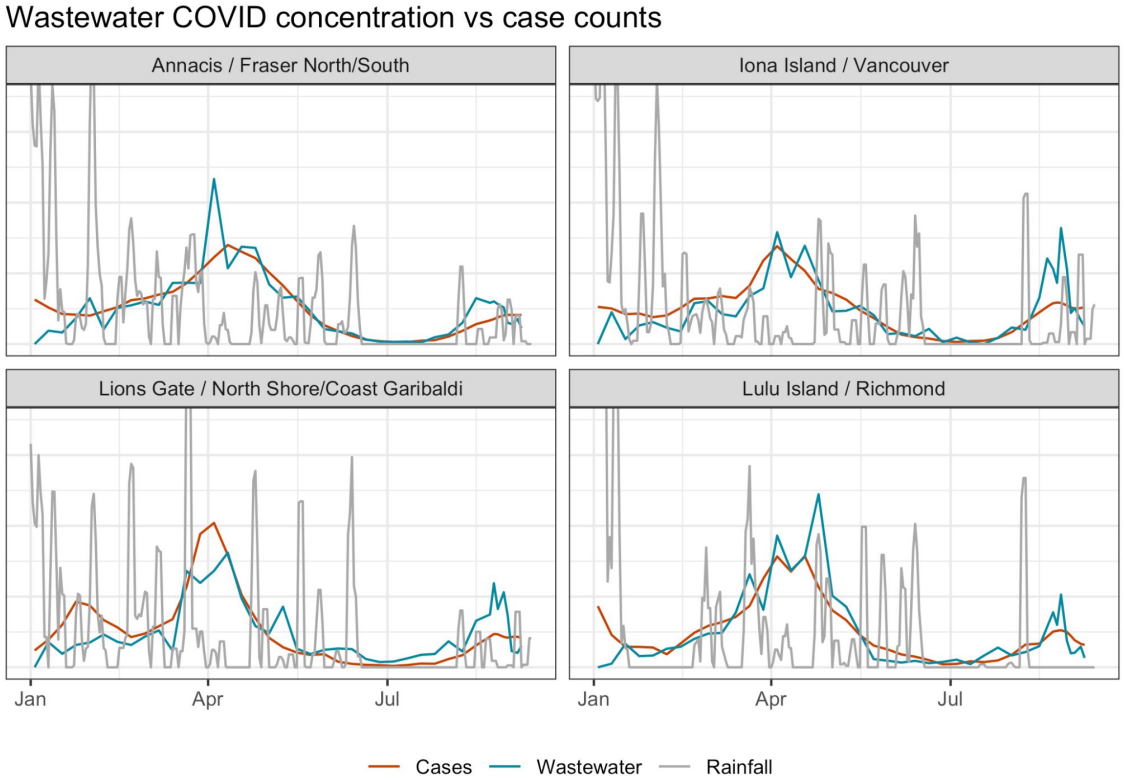
Appendix

COVID-19 prevalence: Cases and wastewater

Wastewater is being monitored for COVID-19 viral concentration in Metro Vancouver.

Wastewater trends (blue) have largely matched case numbers (red) in 2021.

Comparing these trends will allow us to detect major changes in the fraction of infections that remain undetected and to identify when COVID-19 appears in an area without cases.



Source (J. von Bergmann) Case data from BC COVID-19 Database (http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data). Wastewater data from Metro Vancouver (http://www.metrovancouver.org/services/liquid-waste/environmental-management/covid-19-wastewater/Pages/default.aspx). Wastewater viral concentration (blue), cases in the local health region (red), and rainfall (grey) are drawn with the same average height, showing relative changes only.