



Wastewater Modelling Report: Forecasting the State of the Pandemic using Wastewater Data

Published on: 2022-07-20

Public Health Agency of Canada has developed a [mathematical model](#) for conducting wastewater based forecasting that describes infections of COVID-19 in the community and also considers how infected people shed the COVID-19 virus into the sewer systems and how that shed virus signal is detected and reported. The clinical case and wastewater surveillance data are used to generate forecasts and help understand what is happening in the community.

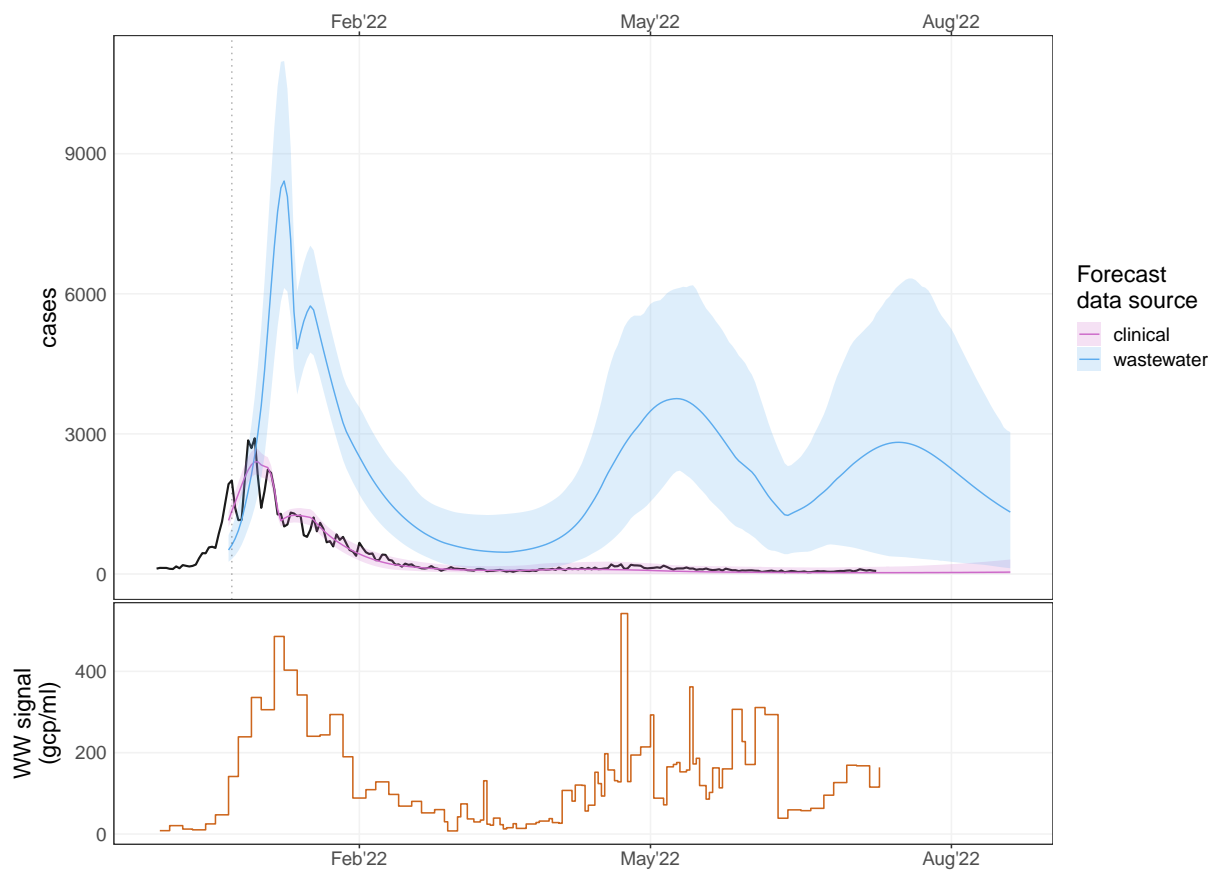
The next figures show clinical case and wastewater surveillance data for each city during the Omicron wave. In each figure, the top panel shows the traditional reported human clinical case data (solid black line), model forecasts using only clinical data (pink shaded area), and model forecasts using only wastewater data (blue shaded area). The bottom panel shows the SARS-CoV-2 signal in wastewater (brown line).

The model uses clinical surveillance and wastewater data with the following last observation dates for each site:

City	clinical	wastewater
Edmonton	2022-07-11	2022-07-03
Halifax	2022-07-15	2022-07-06
Montreal	2022-07-05	2022-07-10
Toronto	2022-07-12	2022-07-10
Vancouver	2022-07-09	2022-07-10

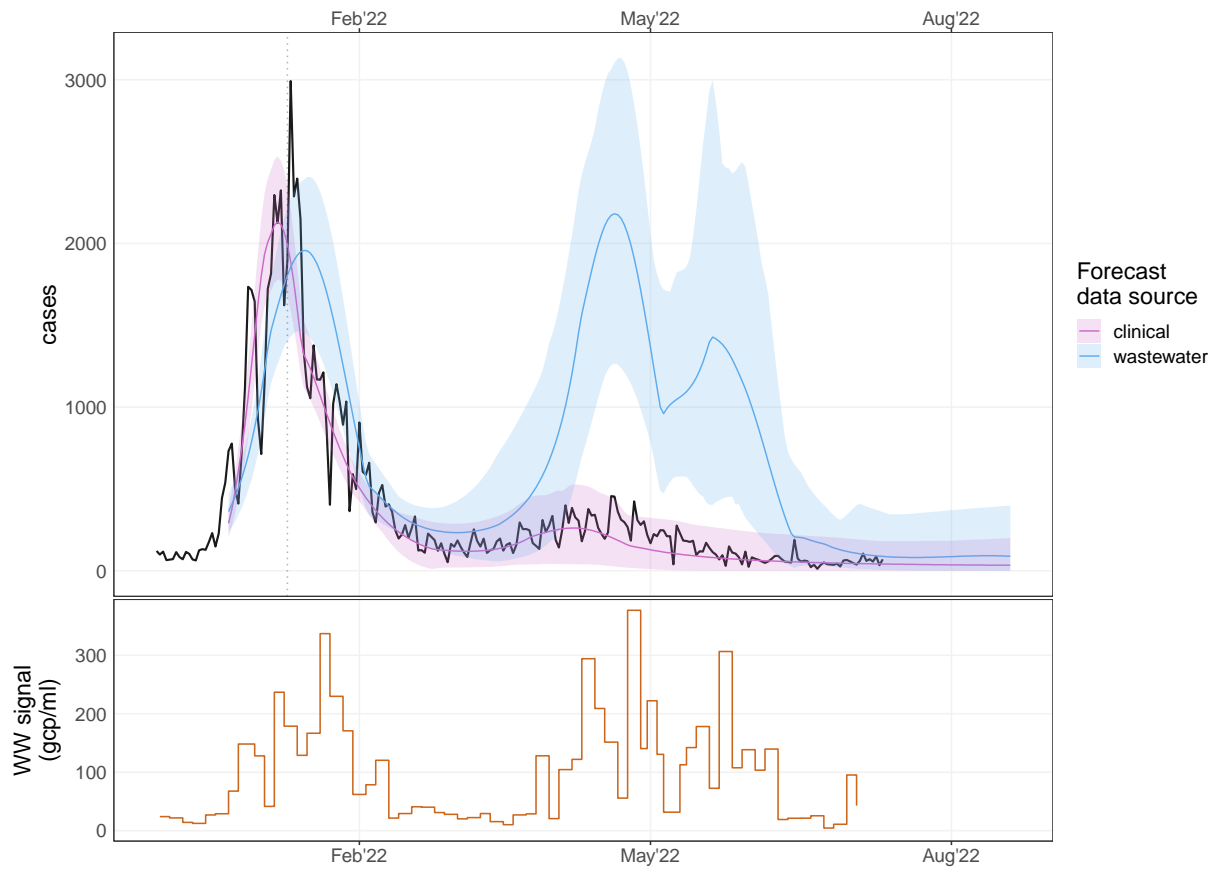
Vancouver

Wastewater data (bottom panel, brown curve) suggests that there was an increase in the number of infections through June and July. However, the reported clinical data (top panel, black curve) did not identify this recent wave of infections, suggesting an under-reporting of clinical cases during the June-to-July wave. The projections based on reported clinical cases continues to suggest a low and stable number of infections over the next few weeks (top panel, pink curve). Wastewater-based projections (top panel, blue curve) indicate that the most recent wave has reached a peak and anticipate a decrease in the number of infections in the coming weeks.



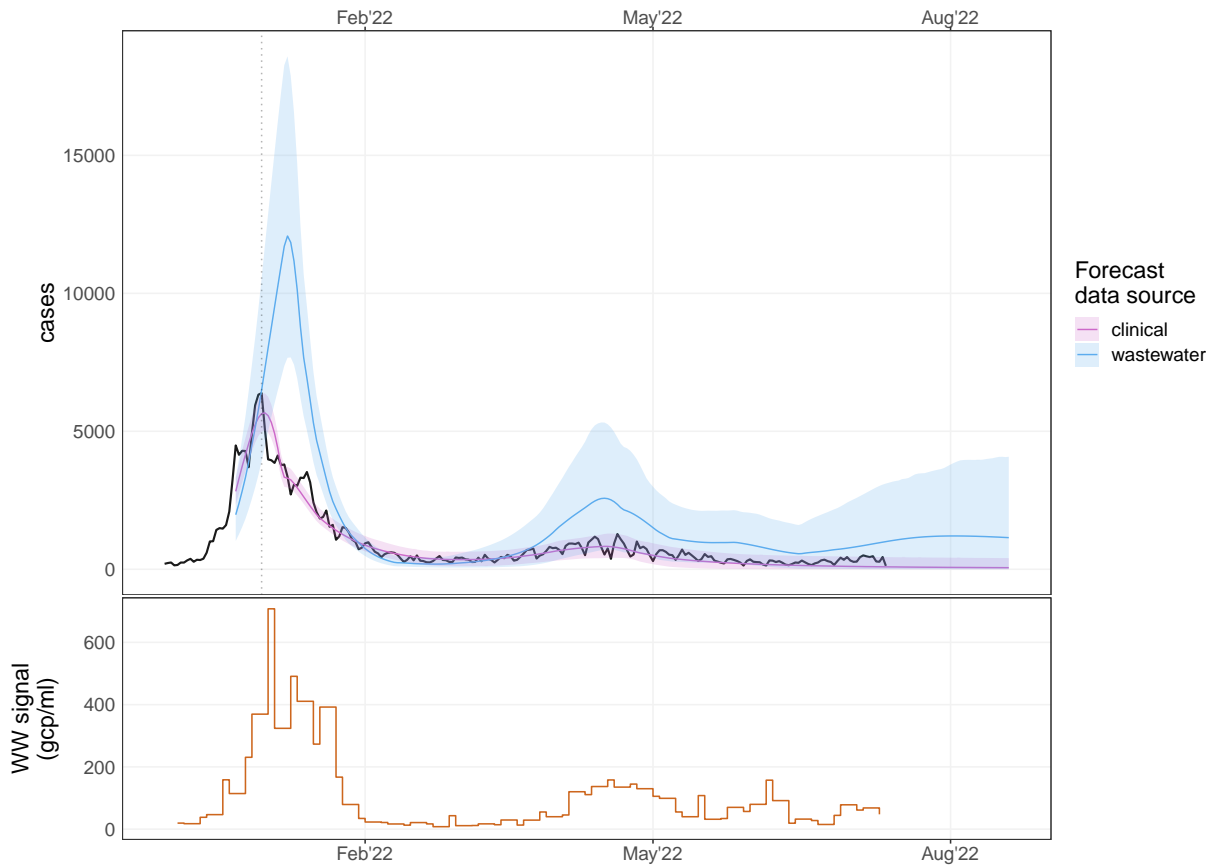
Edmonton

The modelling forecast on the wastewater signal (bottom panel, brown curve) suggests there was a decrease in new infections in the community through June and July. However, these cases were largely under-reported through clinical surveillance, as shown by the difference between reported clinical cases (top panel, black curve) and case projections based on wastewater signals (top panel, blue curve). Both clinical- and wastewater-based projections indicate infections will decline to a low and stable level over the next few weeks.



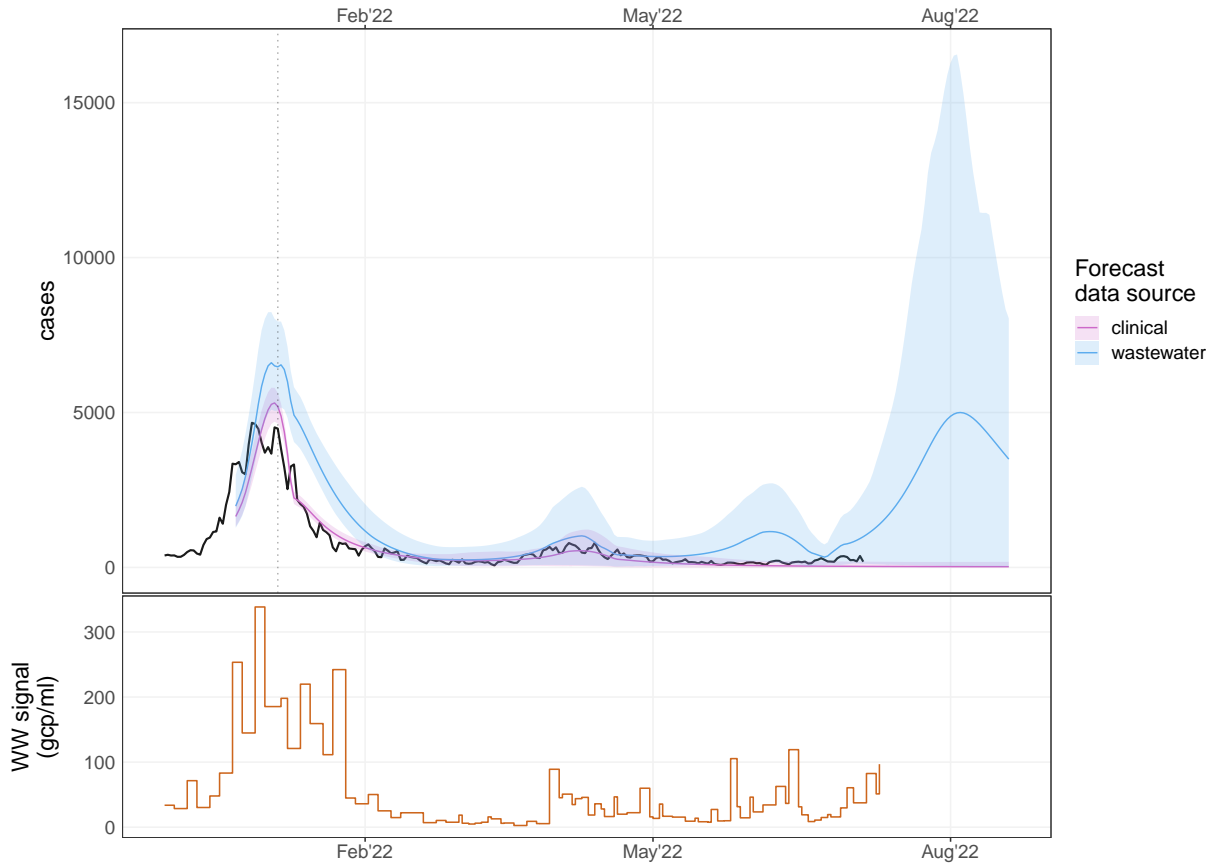
Toronto

Despite a relatively good agreement between clinical and wastewater signals between February and April 2022, the recent trend of the wastewater signal (bottom panel, brown curve) suggests a larger increase in new infections than what clinical data indicates. This is apparent in the trajectories of the forecasts, where forecasts based on wastewater signals are higher than the ones informed by clinical data (top panel, blue curve higher than pink curve). Wastewater-based projections anticipate an increase in the number of cases in the coming weeks.



Montreal

Clinical (top panel, black curve) and wastewater signals (bottom panel, brown curve) do not agree. Clinical data shows a low and stable number of COVID cases. However, based on wastewater data, the model has shown an increase in the number of new infections since early June. Wastewater-based projections suggest an increase in the number of infections in the next few weeks, reaching a peak in August.



Halifax

The wastewater model observed under-reporting of clinical cases during the peak of the Omicron wave in January 2022 until early April 2022 (top panel, blue curve above the black curve). Since late April 2022, the difference between clinical (top panel, black curve) and wastewater signals (bottom panel, brown curve) has increased again indicating further under-reporting of clinical cases during June and July 2022.

The model suggests a sustained prevalence of COVID cases in Halifax and forecasts the number of SARS-CoV-2 infections has peaked and will decline in the next few weeks (top panel, blue curve).

