Exploring the transmission advantage of Omicron in England

Epiforecasts

16 December 2021

Aims

- We aimed to assess competing explanations of the transmission advantage of Omicron, compared to the existing dominant strain, Delta, in England.
- We explored the likelihood of increased transmissibility compared to immune escape, using S-gene target failure as a proxy for infection with Omicron.
- We use a model framework where we vary only the relationship between variants while holding all other parameters constant.

Methods

- Data are all test-positive cases for England. Omicron is modelled from those cases reporting an S-gene target result (failure or positive). All dates are by specimen date.
- We excluded data before 2021-11-21, to reduce overfitting to stochastic imports. Data are included up to 2021-12-12.
- We modelled at a 1 day resolution with a 7 day forecast.
- We used a weakly informative prior for a transmission advantage for the VoC vs non-VoC cases of mean 0.21 (standard deviation 0.2), based on early work from South Africa[1]
- We defined the relationship between variants as scaled and independent.

Results

Transmission advantage is shown where 100% is equivalent to the current dominant strain, Delta (figure 1). Both models indicated a stronger transmission advantage for Omicron.

- In a fixed relationship estimated Omicron advantage is 1.33 (95% credible interval 1.31 - 1.35).
- In an independent relationship Omicron advantage is 1.37 (95% CrI 1.25 - 1.51).
- We estimated the growth rate (figure 2), the proportion of cases attributable to Omicron (figure 3) and case counts (figure 4).

Model comparison

- Comparing the models on PSIS-LOO indicated an estimated difference in expected log pointwise predictive density of -7.57 (with a standard error of 1.23) for the independent model compared to the scaled model.
- We also compared each model using model scoring.

Variant relationship	interval_score	sharpness	underprediction	overprediction	coverage_deviation	bias
scaled	3540	3030	110	401	0.16	-0.27
independent	3760	3140	152	472	0.11	-0.16

[1] 2021-12-03, Carl Pearson and others, "Omicron spread in South Africa", Epidemics8

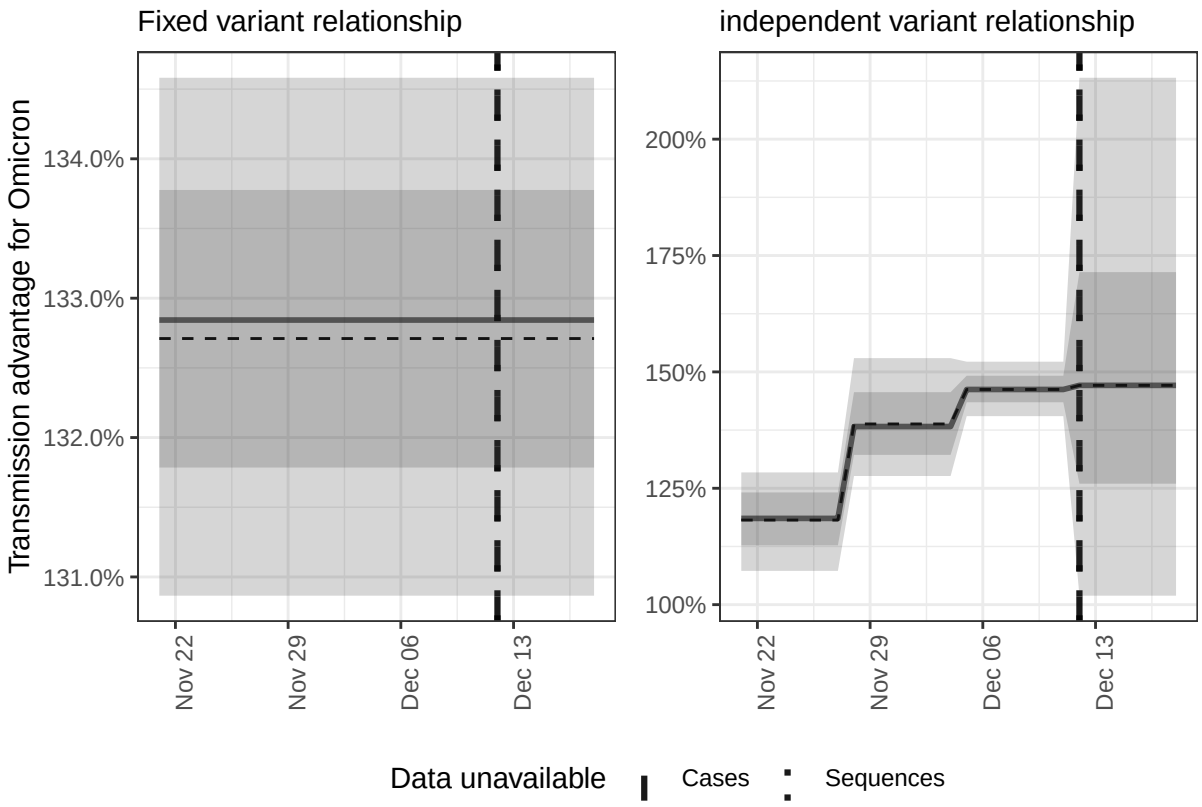

Figure 1: The transmission advantage of Omicron, modelled in a fixed relationship to Delta (left) and a time-varying relationship (right).

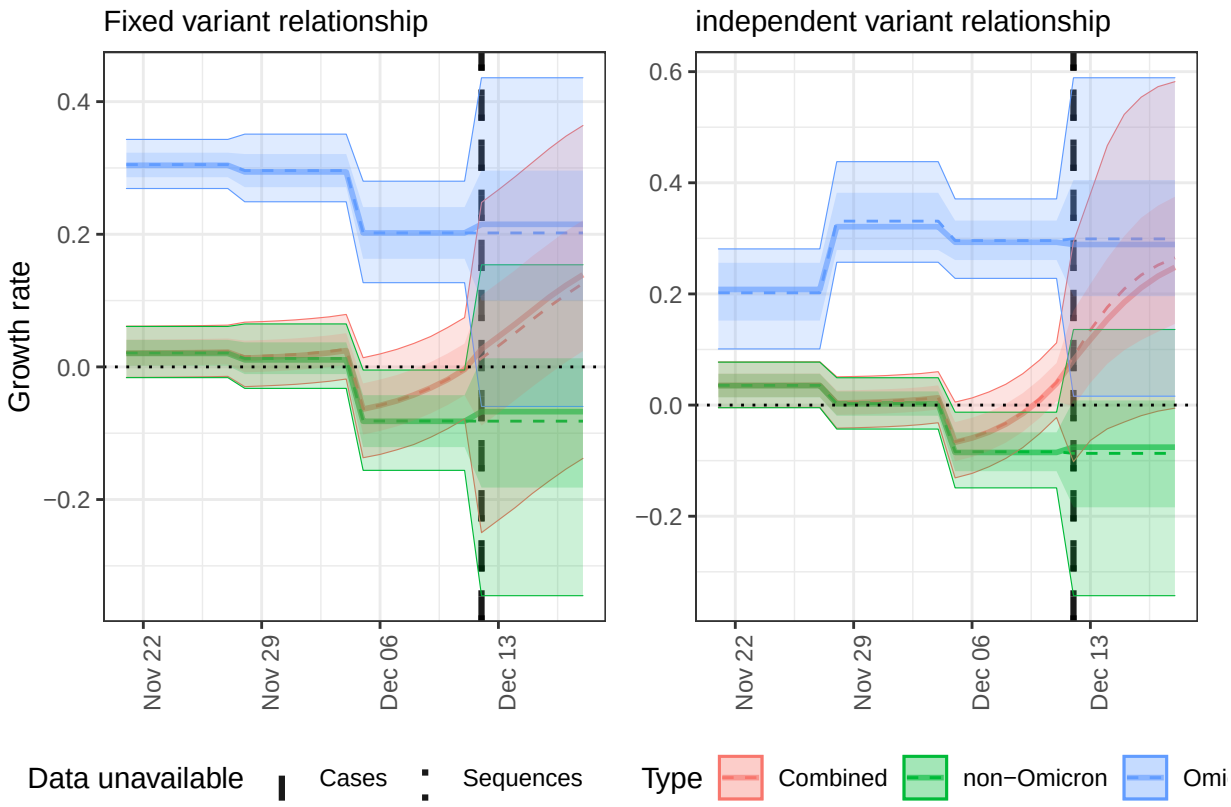

Figure 2: The growth rate and reproduction number of Omicron, modelled in a fixed relationship to Delta (left) and a time-varying relationship (right).

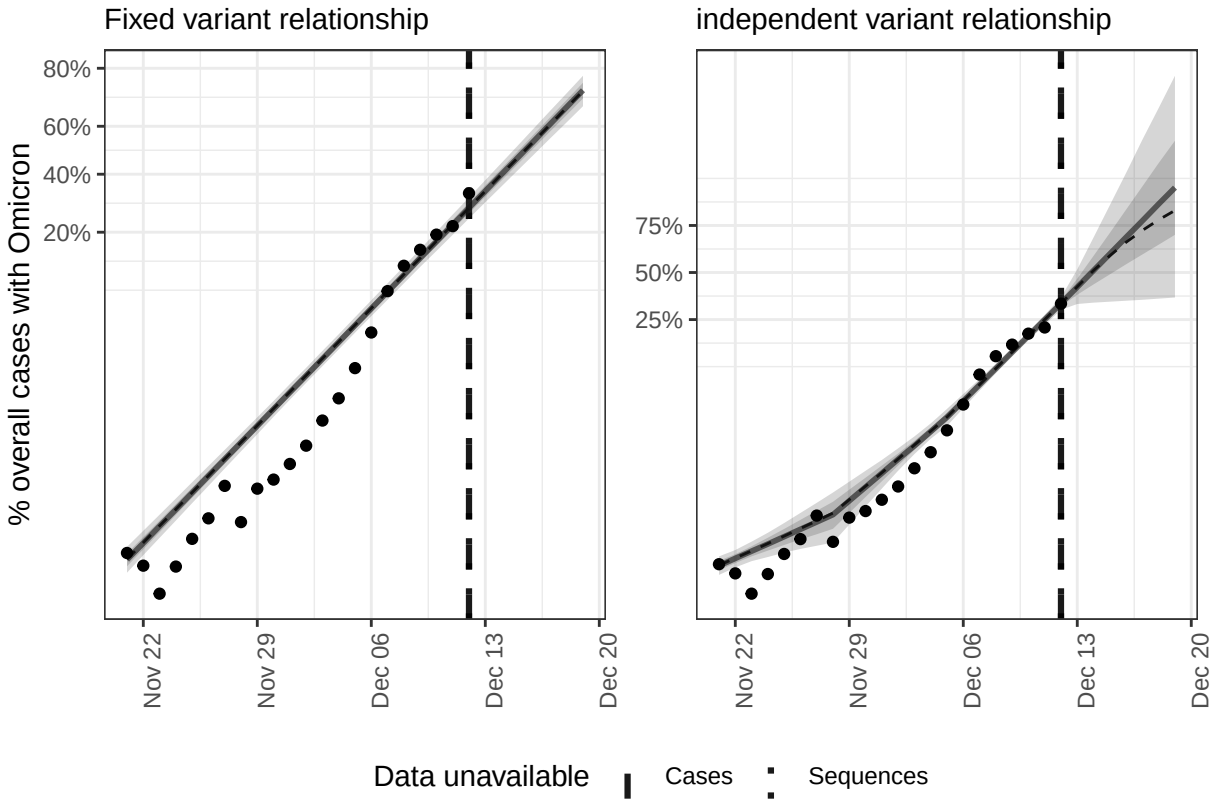

Figure 3: Fraction of cases attributable to Omicron, modelled in a fixed relationship to Delta (left) and a time-varying relationship (right).

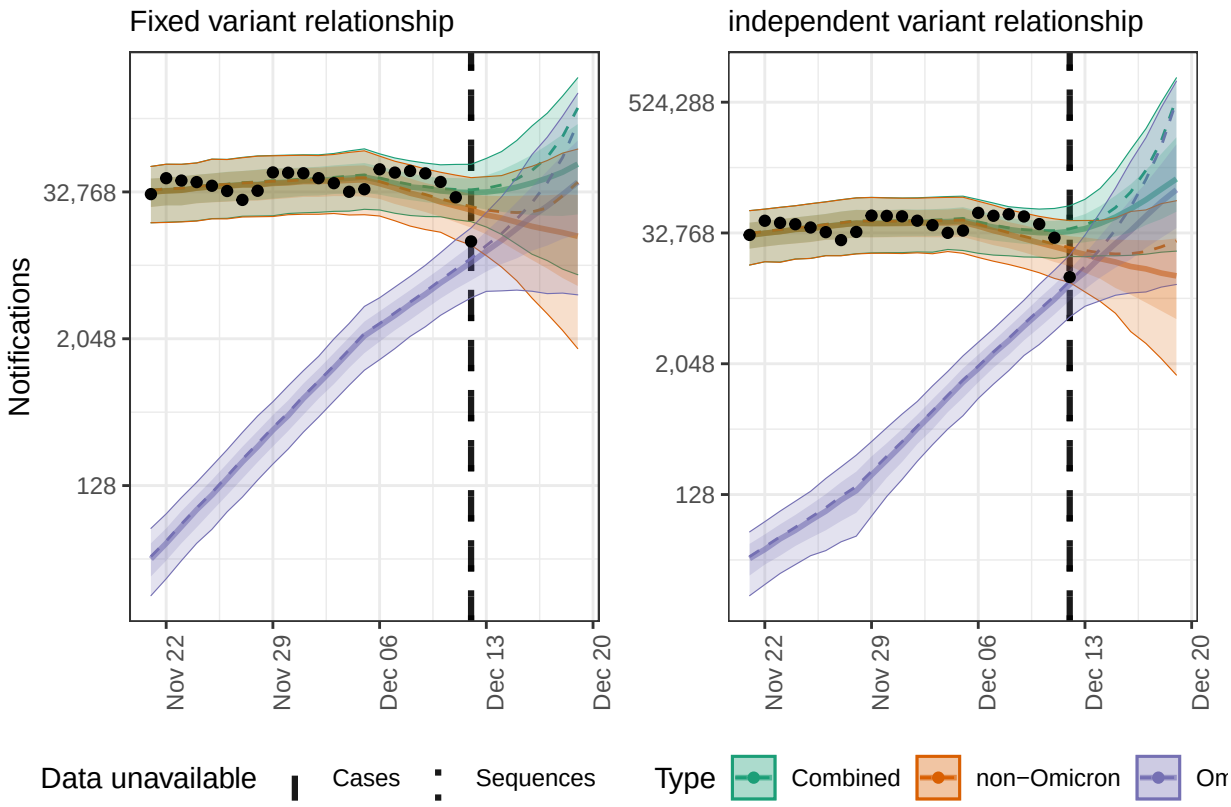

Figure 4: Weekly cases shown on a log scale, modelled in a fixed relationship to Delta (left) and a time-varying relationship (right).