

Exploring the transmission advantage of Omicron in England

Epiforecasts

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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).
- We used raw data by specimen date (figure 5).
- Models are based on data between 2021-11-21 and 2021-12-11. We used only the most recent three weeks of data and excluded the latest 1 reported data.
- 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 0.2 (standard deviation 0.2), based on early work from South Africa¹
- We defined the relationship between variants as scaled and correlated.

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. For England as a whole:

- In a fixed relationship estimated Omicron advantage is 1.32 (95% credible interval 1.3 - 1.34).
- In an correlated relationship Omicron advantage is 1.36 (95% CrI 1.25 - 1.49).

We also estimated the growth rate (figure 2), the proportion of cases attributable to Omicron (figure 3) and case counts (figure 4).

Model comparison We compared PSIS-LOO by region (table 1). Using data for all England, comparing the models on PSIS-LOO indicated an estimated difference in expected log pointwise predictive density of -6 (with a standard error of 1) for the correlated model compared to the scaled model.

¹2021-12-03, Carl Pearson et al., “Omicron spread in South Africa”, *Epidemics*8



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

Table 1: PSIS-LOO cross validation by NHS region comparing models with fixed and correlated over time relationships between variants

nhs_region	best_model	elpd_diff	se_diff
England	correlated	-6.0	1.0
East of England	correlated	-5.8	1.1
London	correlated	-0.6	0.4
Midlands	correlated	-7.4	1.3
North East and Yorkshire	correlated	-11.5	2.0
North West	correlated	-2.7	0.6
South East	correlated	-2.5	1.6
South West	correlated	-1.7	0.4
Unknown	scaled	-2.4	0.9

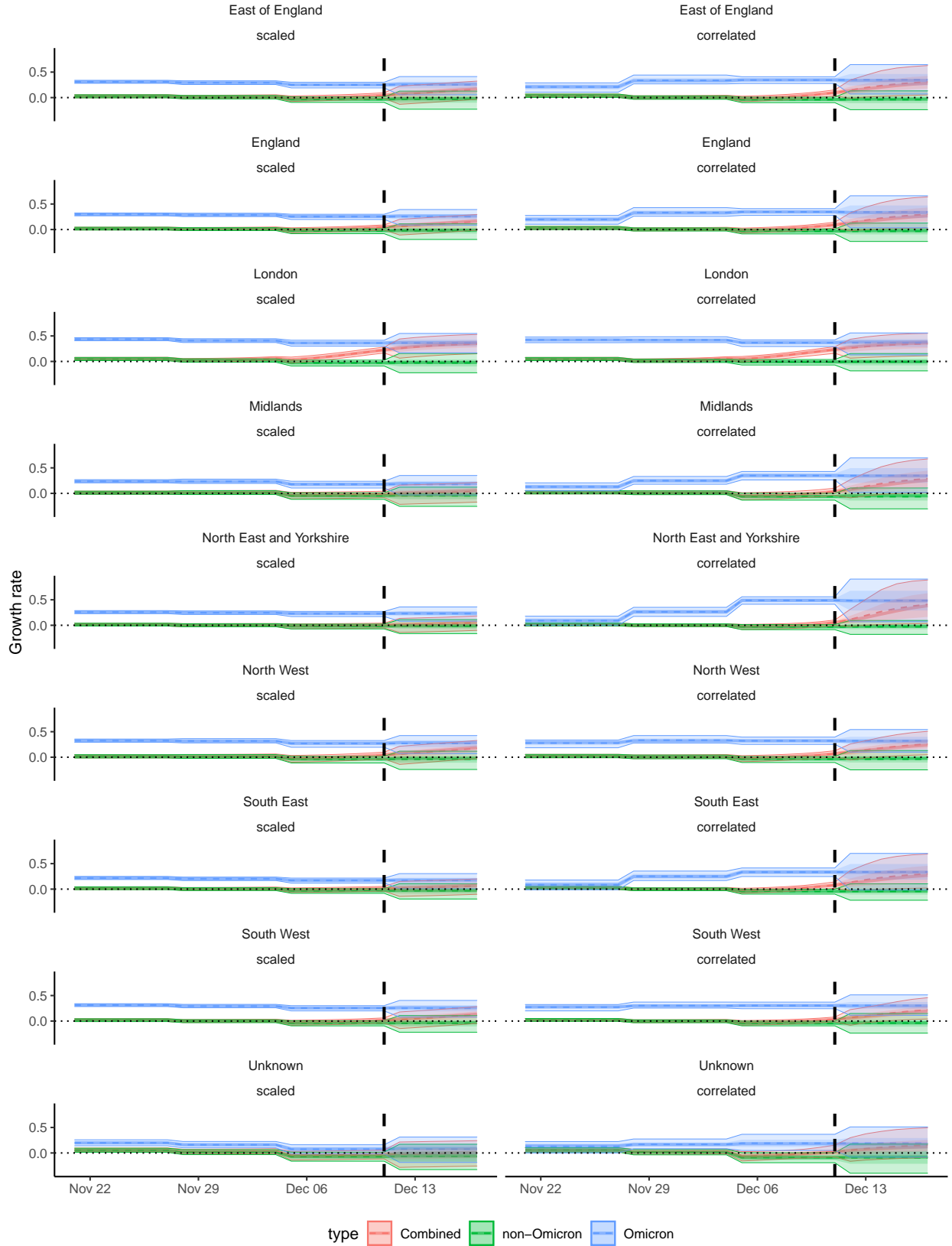


Figure 2: The growth rate of Omicron, modelled by NHS region in a fixed relationship to Delta (left) and a time-varying correlated relationship (right).

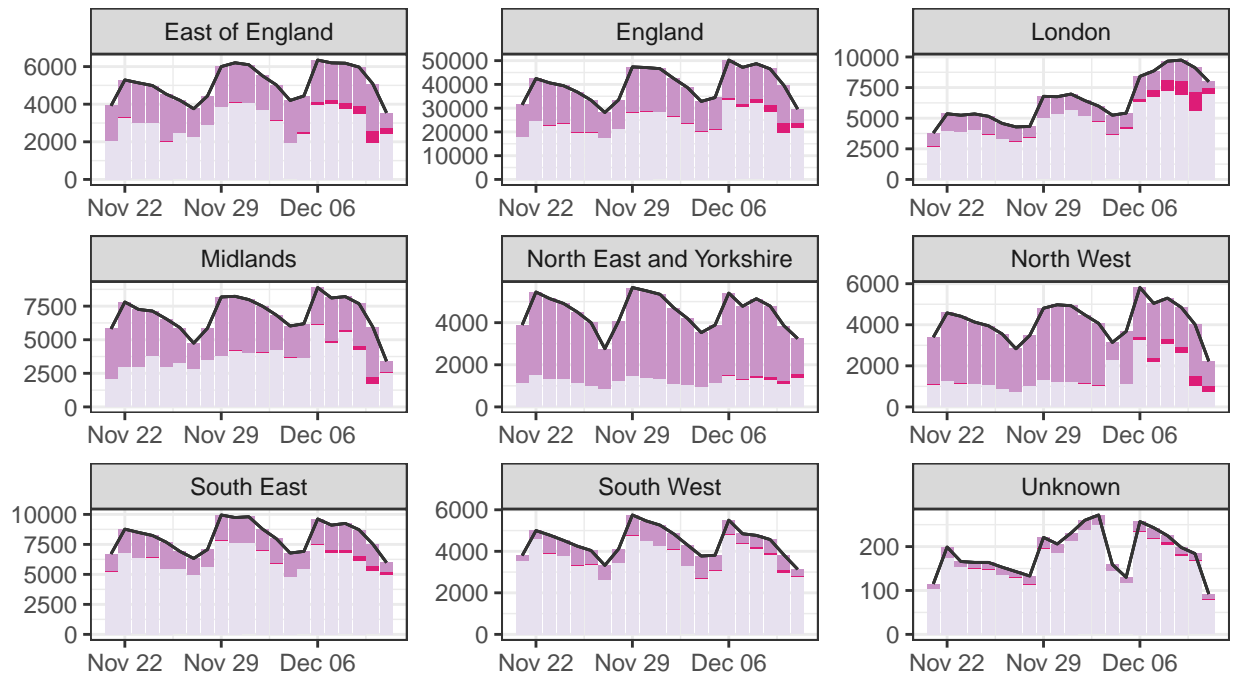


Figure 3: Fraction of cases attributable to Omicron, modelled by NHS region in a fixed relationship to Delta (left) and a time-varying correlated relationship (right).



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

Raw data



S-gene result non_sgtf sgtf sgtf_unknown

Data by specimen date
Excludes most recent 1 days

Figure 5: Raw data