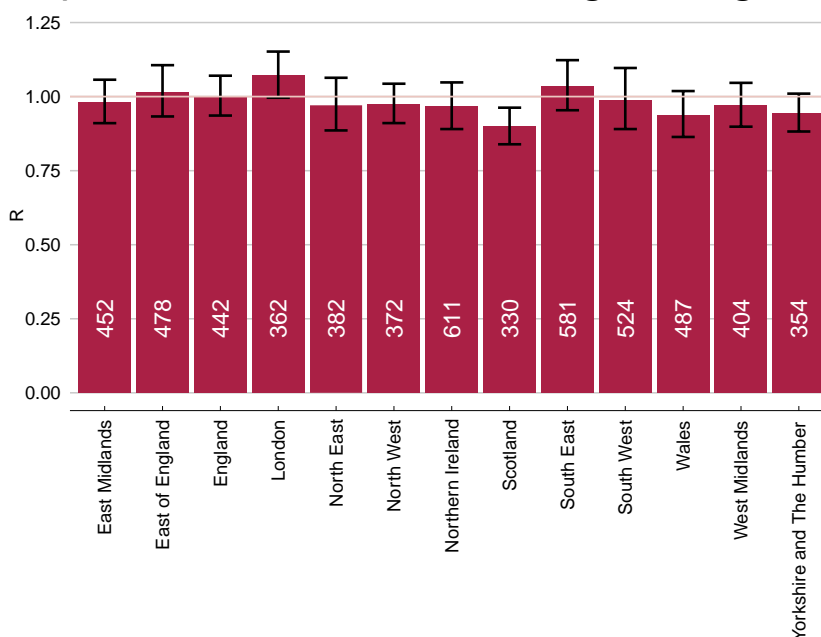


Reproduction Number (R) and Forecasts of New Cases: Awaiting Omicron - R continues to hover around 1

Figure 1 – R and Seven-day Case Counts per 100,000
Population: UK nations and England regions



Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals. The numbers in each bar represent the count of cases in the last seven days of the estimation sample per 100,000 population.

Main points

- We report R estimates and forecasts of new cases, hospital admissions and deaths for the nations and regions. *The next tracker will be released on 11th January.*
- The R number is around 1 in all regions and nations apart from Scotland where it is significantly below 1 (Figure 1).
- Looking at the trajectory of new cases across different age brackets for England we observe a noteworthy compositional change relative to the forecasts made four weeks ago. We highlighted then that cases in those aged 0-19 and 40-49 were forecast to fall, now they are forecast to increase or remain flat in the 10-19 age group. The patterns in those aged 50 and above and 20-29 are similar to those forecast previously (Figure 2).

- New Covid-19 cases are forecast to increase in the South East, London and East of England and decline in all other English regions (Figure 3). Decreases can be expected in all UK nations apart from England where they are forecast to remain flat (Figure 4).
- Hospital admissions are forecast to decrease modestly. This represents a change from our previous forecast which had modest increases in admissions (Figure 5). Trend deaths are forecast to decline modestly whilst they were forecast to remain constant previously (Figure 6).
- The proportion of those over 12 who have received their first vaccination dose is now 89 per cent; 81 per cent have received their second dose; and 33 per cent have received their third dose as well. This summary figure conceals important heterogeneity across age brackets (Figure 7).

“The R number continues to hover around 1 whilst we await the effect of Omicron that has yet to show up in the data. Forecasts of new cases will be affected by how quickly the variant spreads and any changes in behaviour that result, either mandated or voluntary. Reassuringly, hospital admissions and deaths are forecast to decrease modestly in the coming weeks.”

Dr Craig Thamotheram

Senior Economist - Macroeconomic Modelling and Forecasting

Results

Figure 2: England Forecasts of New COVID-19 Cases by Age Brackets

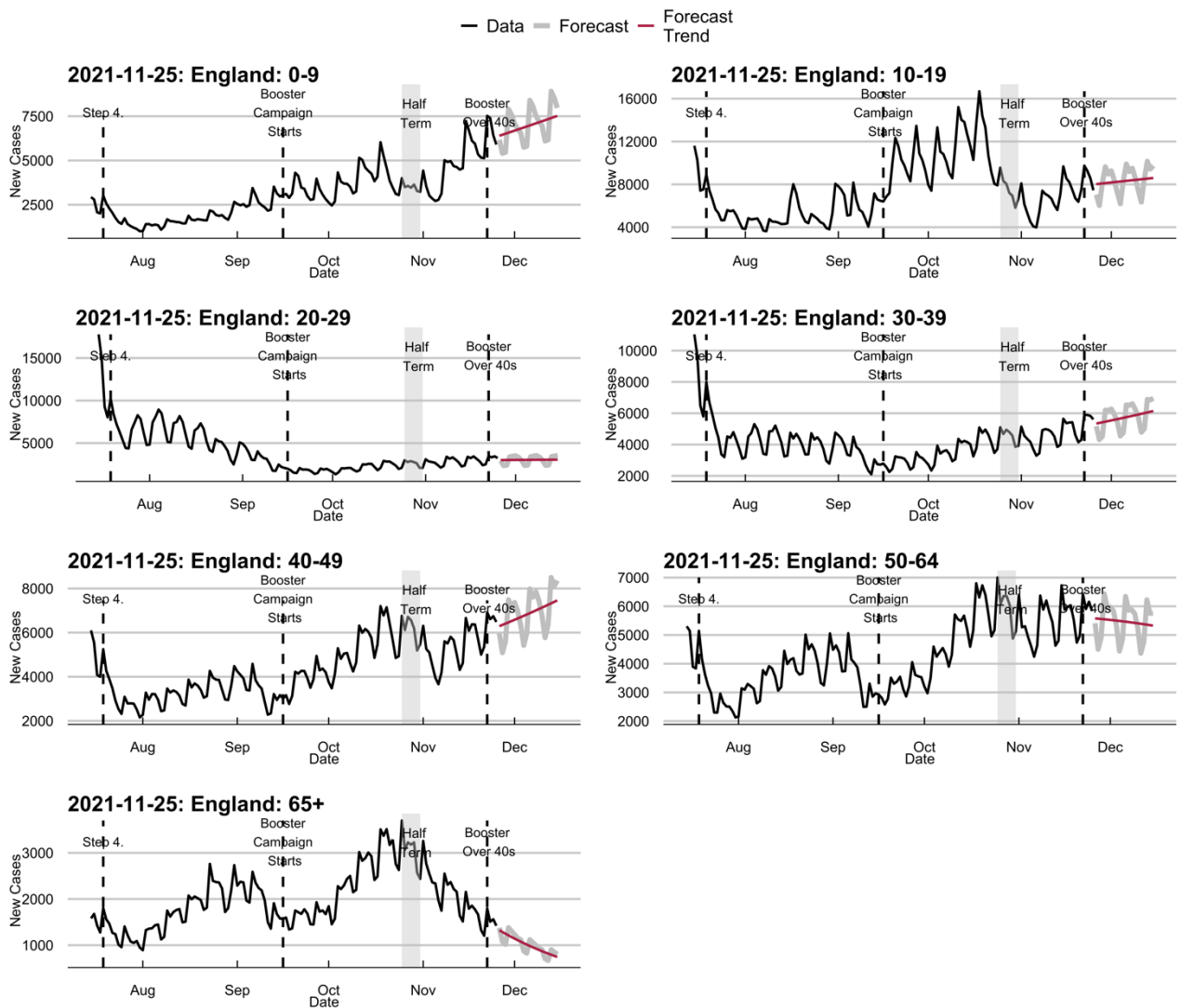


Figure 2 provides forecasts of daily cases of Covid-19 for the period until mid-December for England by age brackets. Relative to forecasts made a four weeks ago, new cases are now forecast to be increasing or flat in those aged 0-19 and 30-49. Notably, the patterns in those aged 50 and above and 20-29 are similar to those forecast previously.

Figure 3 provides forecasts of daily cases of Covid-19 for the period until the end of December for the regions of England, based on data released on the 30th November.

Figure 3 –Regional Forecasts of New COVID-19 Cases

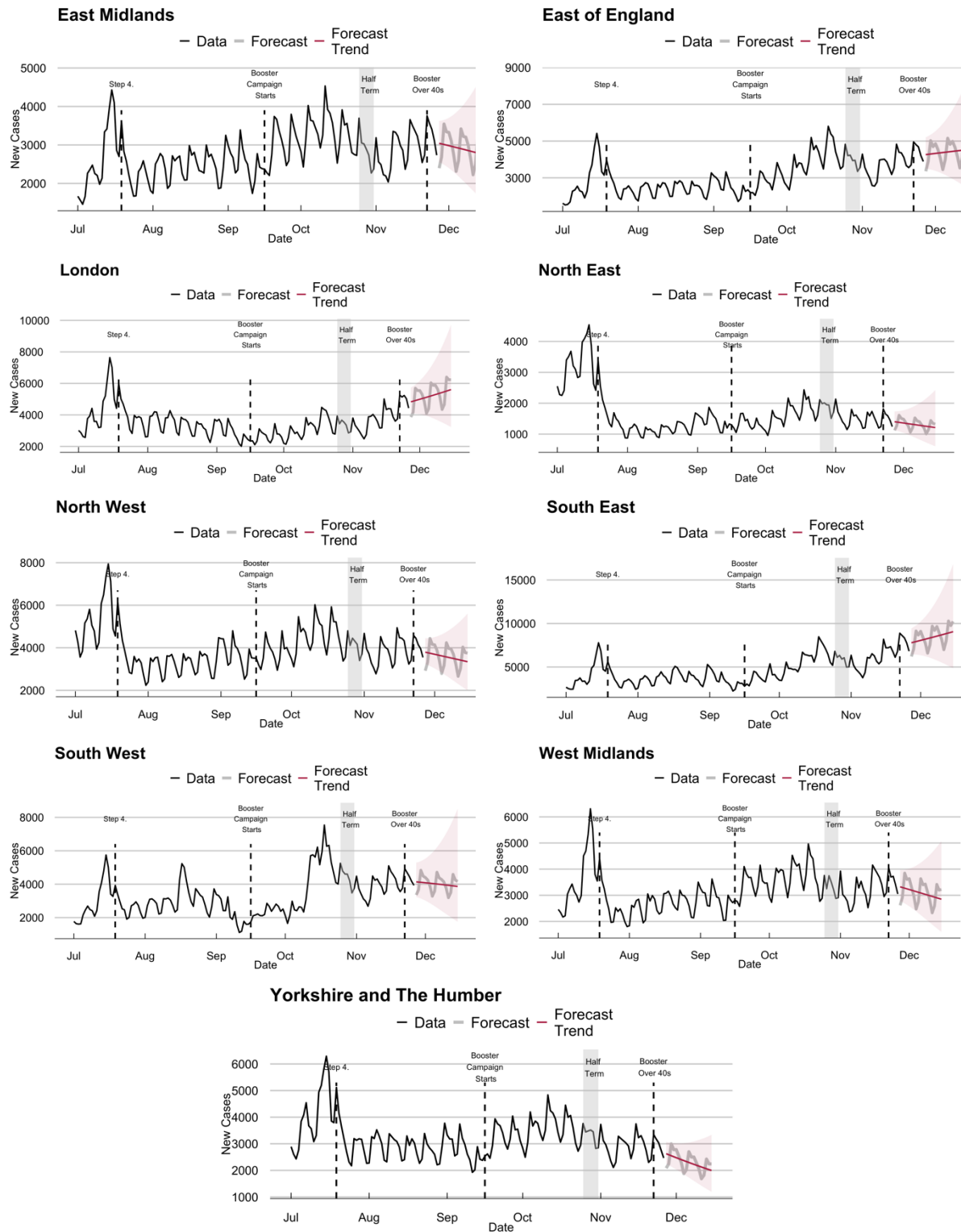
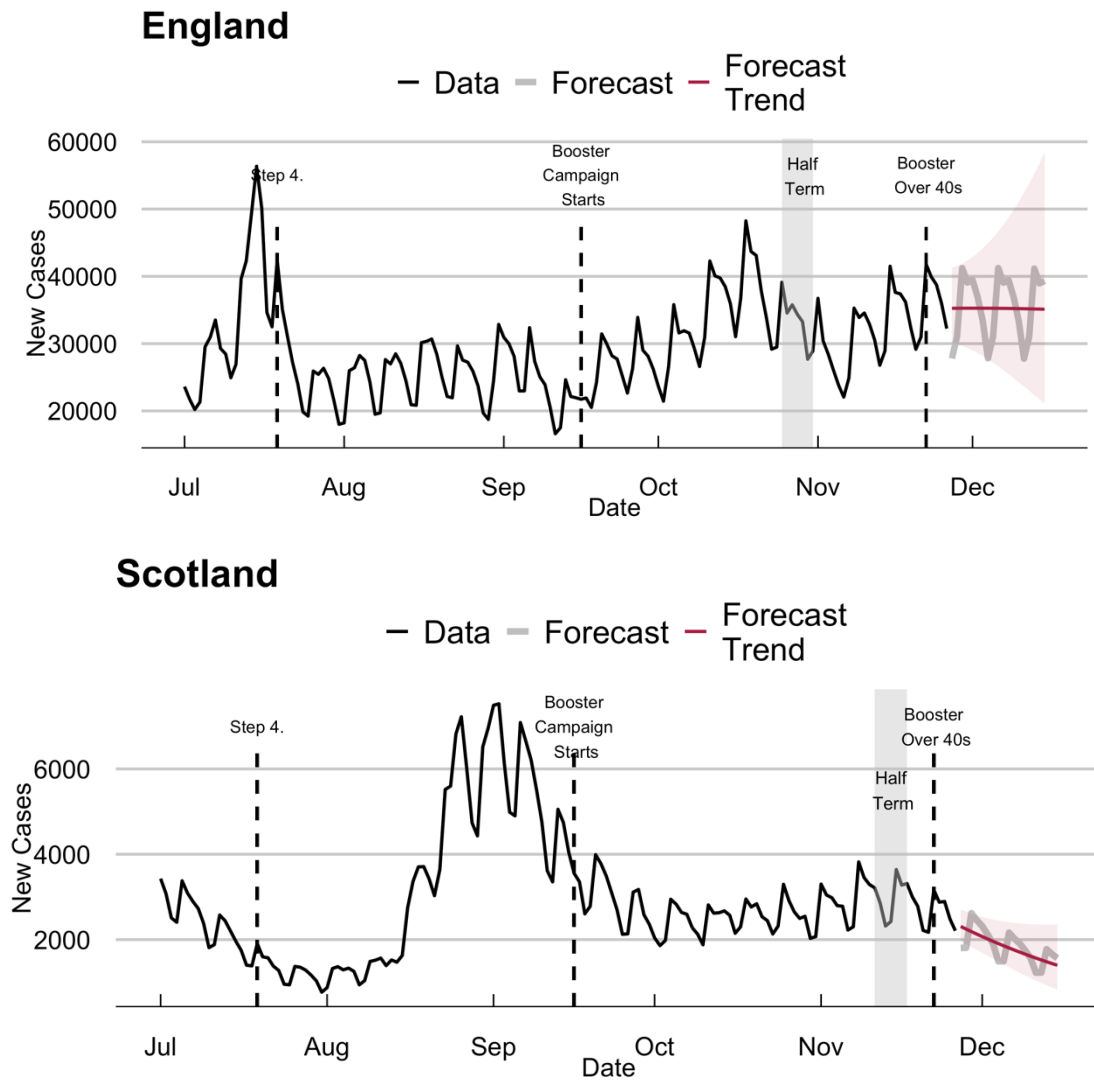
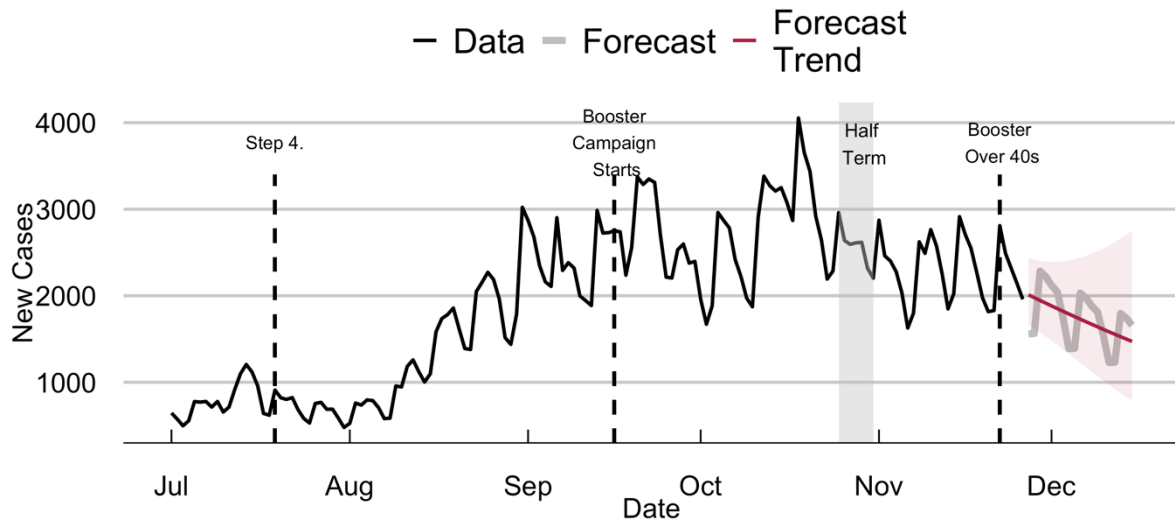


Figure 4 provides forecasts of daily cases of Covid-19 for the period until mid-December for the four nations with data released on the 30th November.

Figure 4 – National Forecasts of New COVID-19 Cases



Wales



Northern Ireland

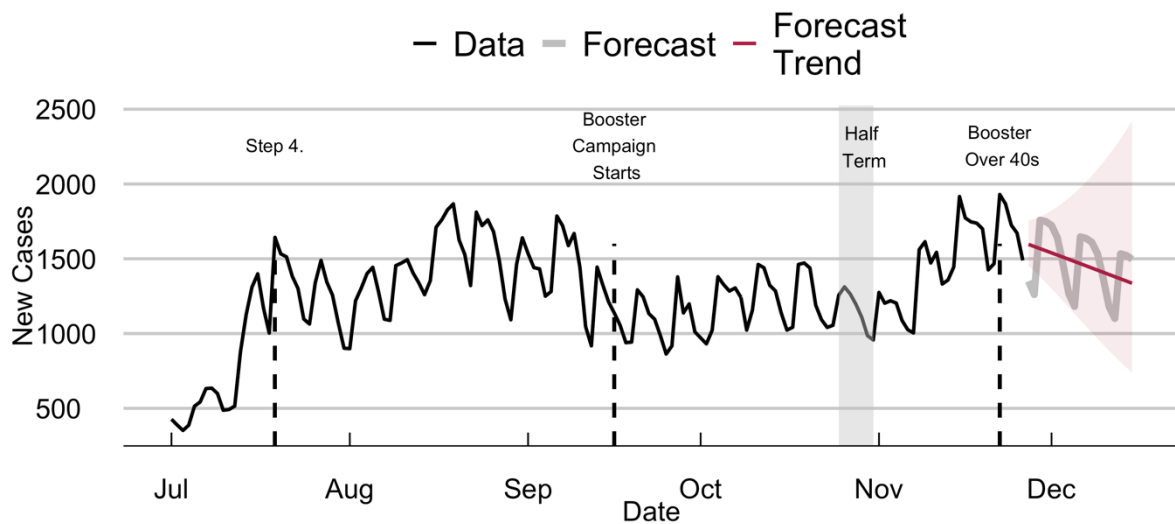


Figure 5 provides forecasts of daily hospital admissions for Covid-19 and highlights the underlying number of new admissions to be expected until mid-December. Hospital admissions are forecast to decrease modestly.

Figure 5 – UK Forecast of Daily Covid-19 Hospital Admissions

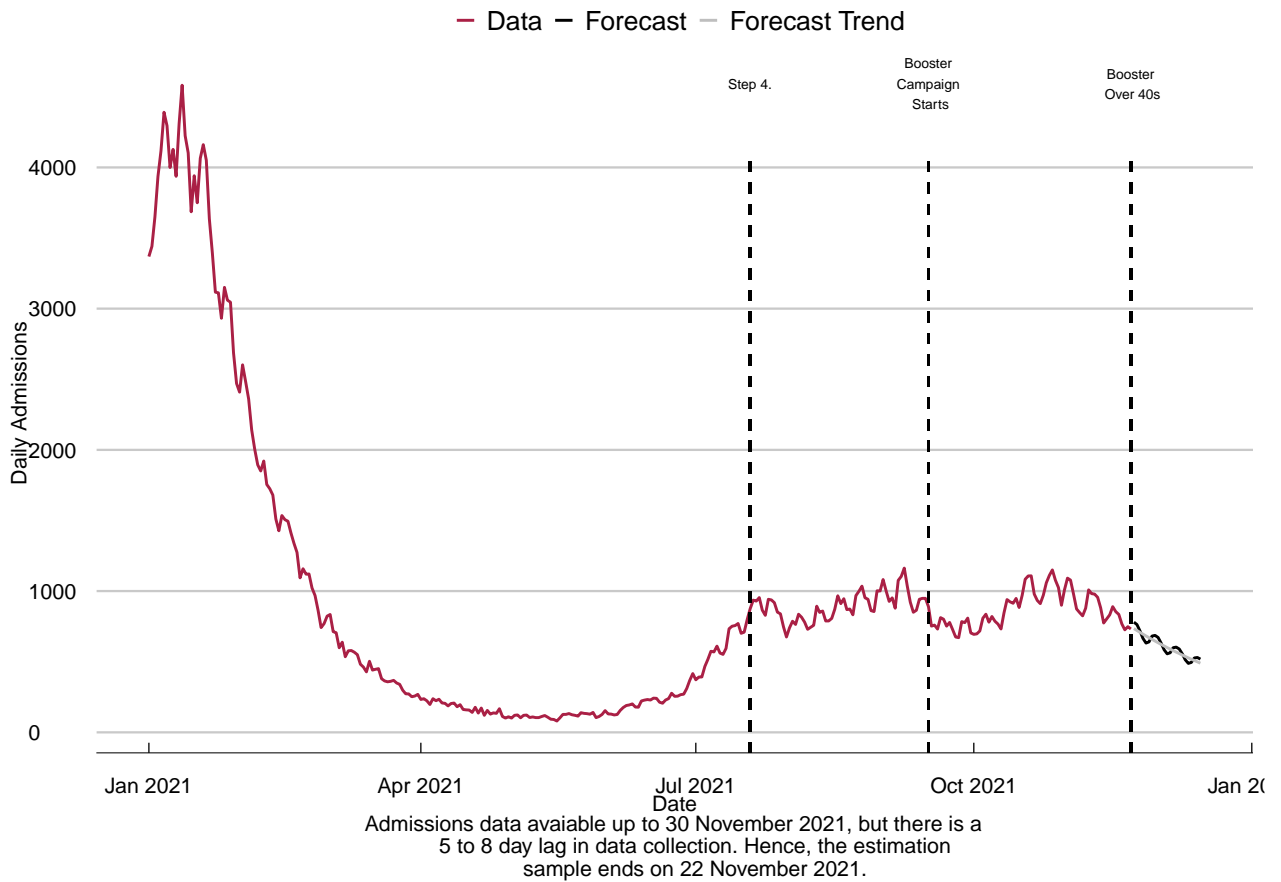


Figure 6 provides forecasts of daily deaths due to Covid-19. Trend daily deaths are forecast to decrease modestly in the coming weeks.

Figure 6 – UK Forecast of Daily Covid-19 Deaths

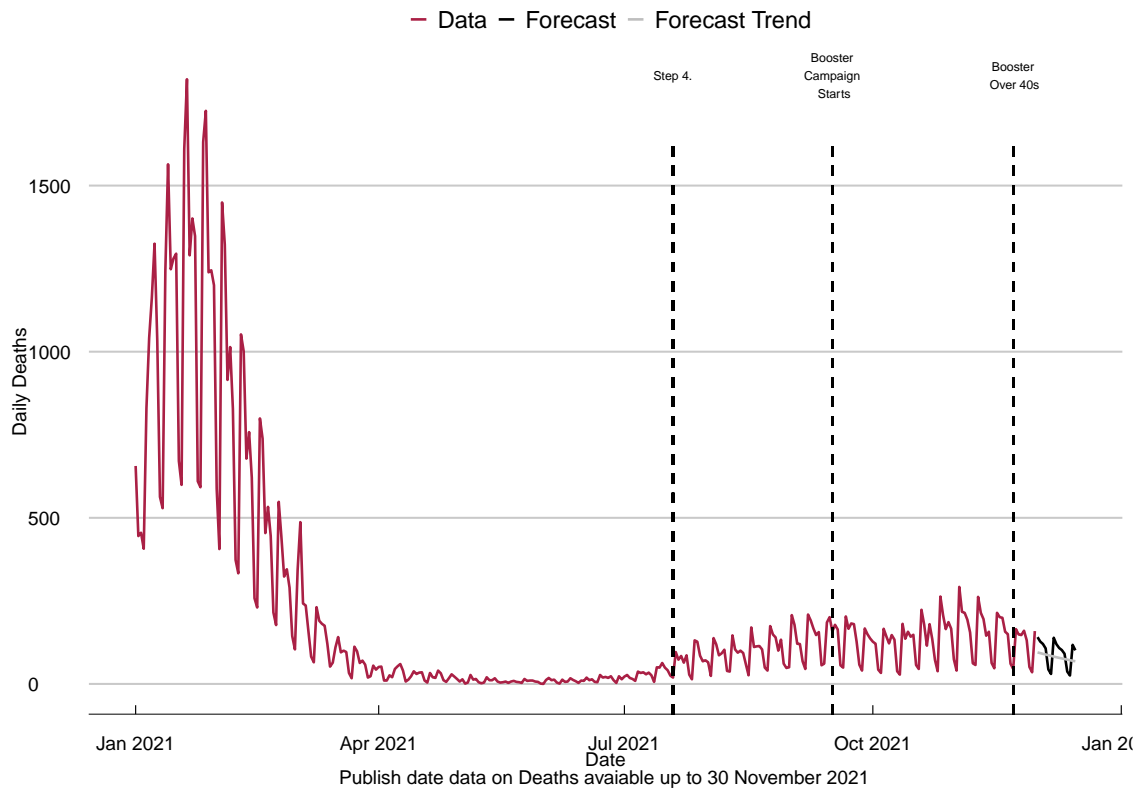
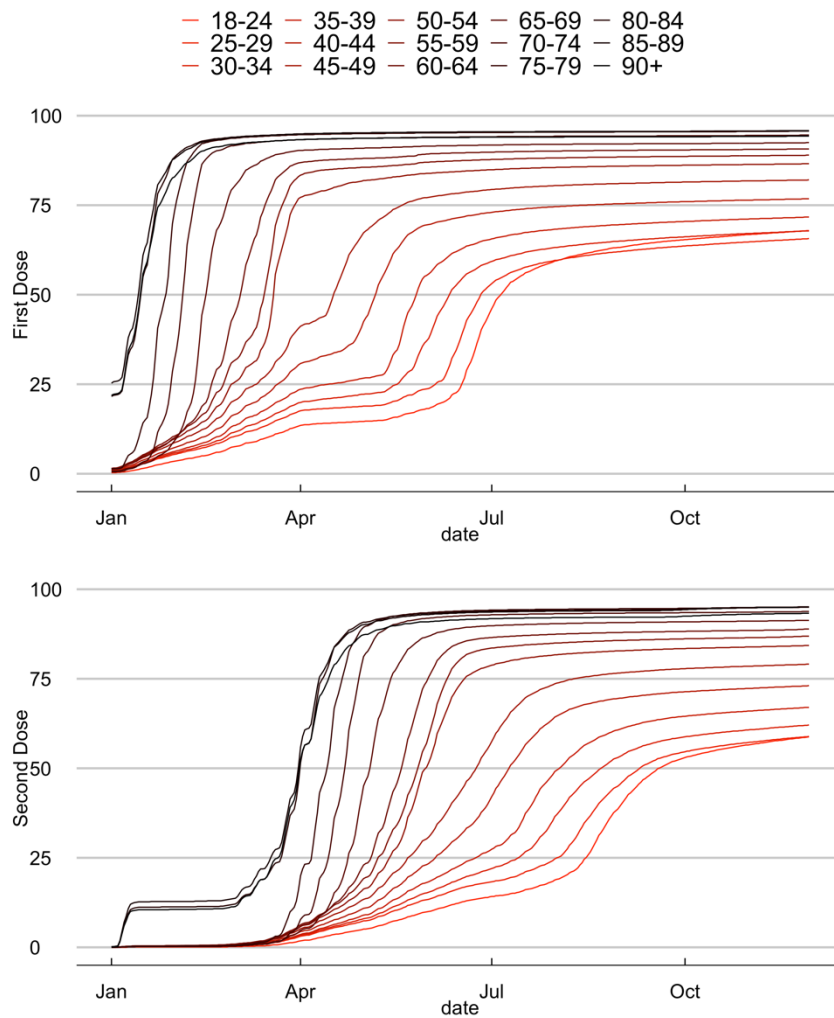


Figure 7 provides data on the percentage of England’s adult population that has been vaccinated broken down by age groups. It highlights the fact that the older population have now been fully vaccinated for a duration consistent with levels of antibody waning according to sero-prevalence [research](#). However, at least 50 per cent of the younger age groups are now fully vaccinated.

Figure 7 – England Vaccination Percentages by Age Brackets



Background

NIESR aims to set out projections of the future path of the Covid-19 epidemic in the United Kingdom, its constituent nations and the regions of England, based on current policies.

NIESR has been producing weekly updates on Thursdays, projecting new cases and estimating the R number using a class of time series models developed by Prof. Andrew Harvey and Dr. Paul Kattuman of Cambridge University; see [Harvey and Kattuman \(2020a\)](#). From June 3, 2021 onwards NIESR have been producing fortnightly updates on Thursdays, focusing on monitoring whether sudden increases observed are local spikes or are indicative of the start of a new wave.

The models generate forecasts by extracting changing trends from historical data. They are relatively simple and transparent, and their specifications can be assessed by standard statistical test procedures. The advantage of the time series approach is that it can adapt very quickly to the most recent information and hence produce timely estimates. This flexibility enables the effects of changes in policy, virus mutations and human behaviour to be tracked. The models are data driven and so are different from the structural models used by epidemiologists which rely on assumptions about transmission and behaviour; see [Avery et al \(2020\)](#).

A description of the methods used to produce these estimates and an evaluation of their forecasting performance can be found in Harvey, Kattuman, and Thamotheram (2021).

Data

Data: COVID-19 confirmed cases and deaths data are sourced from <https://coronavirus.data.gov.uk>

Data on Covid-19 cases are reported by the government by 'specimen date' and by 'published date'. Specimen cases relate to the date when the sample was taken from the person being tested, while published cases relate to the first date when they are included in the published numbers. At the present time we regard the specimen date data as a more reliable indicator of the trend in new cases. The model based on specimen dated observations has better captured the effect of the sharp increase in testing on the day that schools reopened and also suffers less from data errors or revisions.

On 27 March 2021, 850 historic cases were removed due to a laboratory processing error. This affected specimen date data between 23 and 25 March in local authorities primarily in the North East and Yorkshire. The cumulative total number of people tested positive was revised down on 27 March 2021. Historic published date totals have not been changed. The downward correction on 27th March is mixed with the positive upward revisions of cases as more test results are returned over time making it impossible to date these corrections accurately. Thus, we cannot back out on which day these corrections were made. For published data, we choose to remove 300, 300 and 250 cases on 24, 25 and 26th of March respectively.

Between 2nd to the 5th April significant disruption to cases and deaths for Wales and Northern Ireland occurred. This was corrected on the 6th April but with a 48-hour reporting period. As the last date in the estimation sample for specimen cases is April 2nd we will decide how to account for this change in next week's forecast. We leave published cases unchanged.

On April 9th rapid LF tests that are confirmed as negative by Polymerase Chain Reaction (PCR) test within 3 days were removed. For published cases, we set 9th April as missing as no correction is applied to the historic data by Public Health England.

Caveat

The model relies on historical data and does not incorporate future outlined changes in the underlying environment. Thus, it is important to read the forecasts in this context. For example, the current forecasts make no assumptions about the effect of reopening non-essential retail on increasing transmissions. On the other hand, the effect of the vaccine program will be in the opposite direction.

Authors

Professor Andrew Harvey is Emeritus Professor of Econometrics at the University of Cambridge and a Fellow of Corpus Christi College. He has published over 100 articles and is the author of four books: *The Econometric Analysis of Time Series* (1981), *Time Series Models* (1981), *Forecasting. Structural Time Series Models and the Kalman Filter* (1989) and *Dynamic models for Volatility and Heavy Tails* (2013). He is a Fellow of the British Academy and the Econometric Society.

Dr Paul Kattuman is Professor of Economics at Cambridge University. He has been a Senior Research Fellow at the University of Cambridge Department of Applied Economics, and a lecturer in economics at Durham. He has held Visiting Professorships at Université Paris 12 and Paris-Est Créteil and was appointed Grupo Santander Visiting Professor at Universidad Complutense de Madrid. He was visiting Faculty Scholar at the Kennedy School of Government, and at the Department of Statistics, both at Harvard University.

Dr Craig Thamotheram is a Senior Economist at NIESR. Prior to joining NIESR, he studied Engineering at Imperial and obtained a PhD in Economics at Warwick. He has work experience as a post-doc in macro and financial econometrics.

Bibliography

Avery, C., W. Bossert, A. Clark, G. Ellison, and S. F. Ellison (2020). An economist's guide to epidemiology models of infectious disease. *Journal of Economic Perspectives* 34(4), 79–104.

Harvey, A. and P. Kattuman (2020a). Time series models based on growth curves with applications to forecasting coronavirus. *Harvard Data Science Review*, Special issue 1 - COVID-19. <https://hdsr.mitpress.mit.edu/pub/ozgix0yn>

Harvey, A. and P. Kattuman (forthcoming). A farewell to R: Time series models for tracking and forecasting epidemics. *Journal of the Royal Society Interface*, 18: 20210179.

Harvey, A., P. Kattuman, and C. Thamotheram (2021). Tracking the mutant: forecasting and nowcasting COVID-19 in the UK in 2021. *National Institute Economic Review*, 256, 110--126. <https://doi.org/10.1017/nie.2021.12>.

Notes for editors

For further information and to arrange interviews please contact the NIESR Press Office: press@niesr.ac.uk or Luca Pieri on l.pieri@niesr.ac.uk / 07930 544 631

National Institute of Economic and Social Research

2 Dean Trench Street
Smith Square
London, SW1P 3HE
United Kingdom

Switchboard Telephone Number: 020 7222 7665

Website: <http://www.niesr.ac.uk>