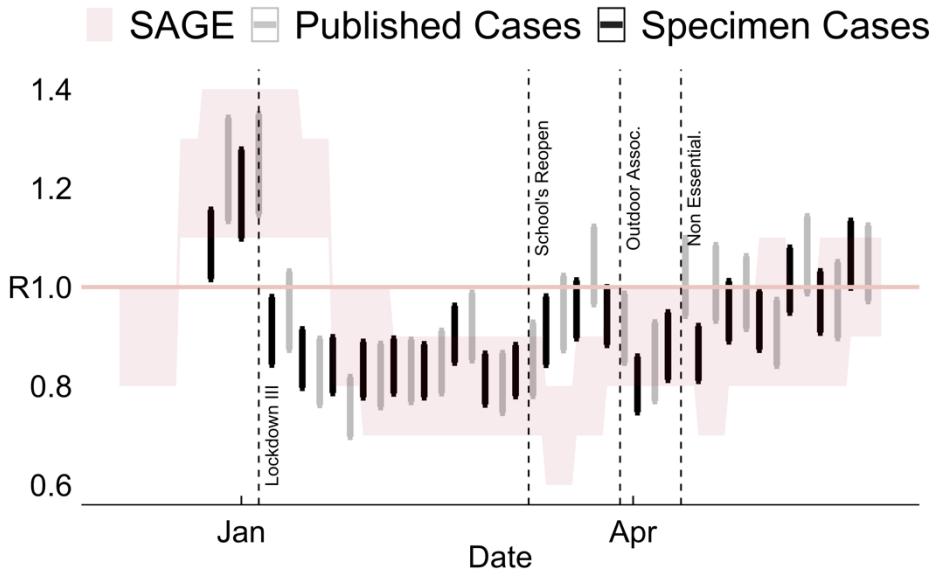
National Institute
NIESR Weekly Covid-19
Tracker No. 15

Thursday, 27th May 2021 niesr.ac.uk

Reproduction Number (R) and Forecasts of New Cases:

Continued local surges and flare ups

Figure 1 - England R – NIESR and SAGE



Shaded pink area is SAGE upper and lower bounds (www.gov.uk/guidance/the-r-number-in-the-uk)
NIESR estimates of R show ± 1 standard deviation confidence intervals estimated on published and specimen cases. For specimen cases we discard the last 3 days data.

Main points

- We report estimates of the R number and forecasts for new cases of Covid-19, hospital admissions, and deaths due to Covid-19 using data that was publicly available as of 25th May 2021. In light of the low case rates (see below) this tracker will now be produced at fortnightly frequency from next week. Deaths are currently very low, so forecasts of it have been dropped.
- Figure 1 shows that the Reproduction number, R, for England. R is the average number of secondary infections currently generated by an infected individual, and is estimated to be in the range of 1.00 – 1.15 based on specimen date data until 21st May.
- This is to be seen in the context of 7-day case rates (calculated as the count of cases per 100,000 people over the last 7 days) in all nations and regions being less than 50 per 100,000 people. From this low base small changes in case numbers can have large effects on growth rates of new cases. As R is calculated directly as a function of growth rates of new cases (see Harvey and Kattuman, 2020b) the

Reproduction number, R, if considered in isolation, can give a misleading picture. In particular, an increase in cases within a local area can affect a wider region's reported R and not the underlying transmission within the region.

- For Northern Ireland the R number is in the range 0.90 – 1.10 (7-day case rate per 100, 000 of 33); for Wales, 0.95 – 1.10 (case rate of 9) and for Scotland, 1.10 – 1.25 (case rate of 44). The regional R number estimates and case rates given in Figure 5 show that, currently, the East Midlands (case rate of 21) has the lowest R number while the North West (case rate of 50) has the highest value across England's regions.
- Based on our model, by 21st June when step 4 re-opening is due, we expect the trend value of daily cases in the UK to be around 3,100 and admissions to be below 100 (Figures 3-4).
- ***We also monitor local authorities with relatively high case rates.*** Figure 5 shows that the R number is in the range 1.05 - 1.35 for Bolton (case rate 451), 1.35 - 1.85 for Blackburn and Darwen (case rate 281) and 1.15 – 1.70 for Bedford (case rate 128). These numbers are to be seen in the context of the policy of ***increased testing in local authorities with relatively high case rates.***

"It is reassuring that the weekly case rate per 100,000 is smaller than 50 in all regions and nations. However, evident localised outbreaks have the potential to seed a new wave. The extent to which flare ups are contained will be key in the weeks ahead. Based on the latest data on new cases, our estimate of the R number for England lies in the range 1.00 – 1.15, increasing from last week. This estimate is based on data up to 25th May 2021."

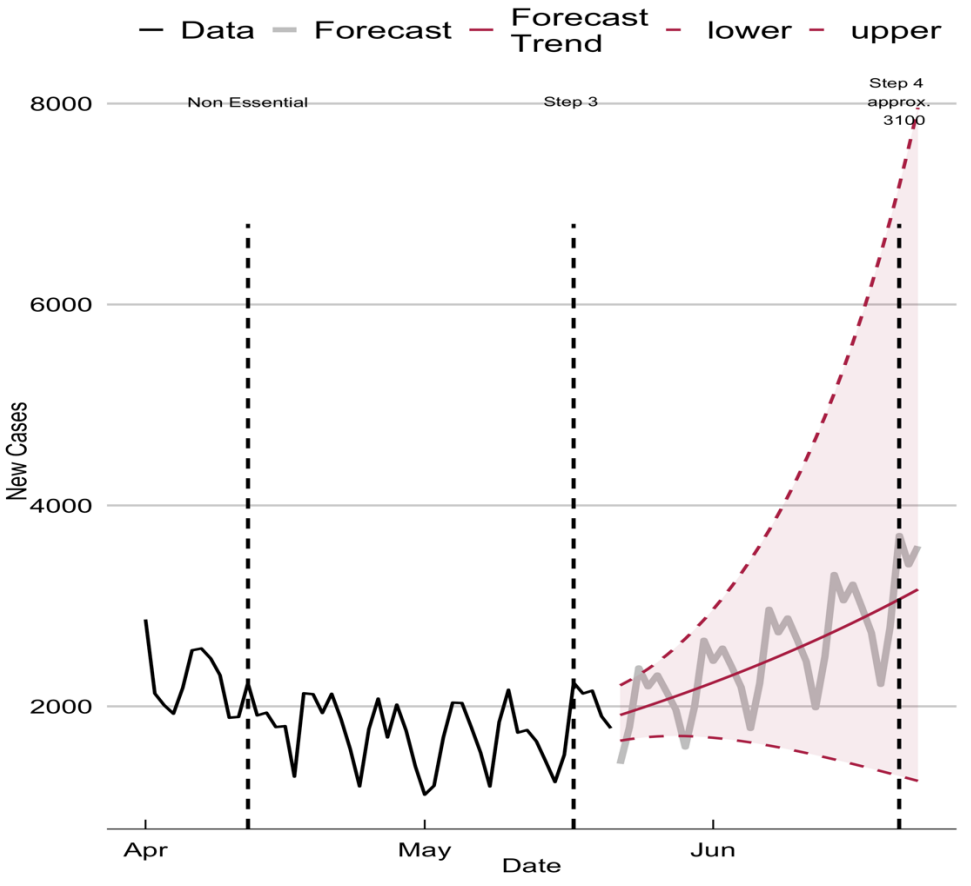
Dr Craig Thamotheram
Senior Economist - Macroeconomic Modelling and Forecasting

Results

Figure 2 provides forecasts of daily cases of Covid-19 for the period until mid-June and highlights the underlying trend value of new cases to be expected on remaining key dates in the Government's roadmap: step 4 reopening expected on 21st June. Projections include a correction for the increased testing due to the reopening of schools as well as for the reduced testing during the Easter break.

- Trend values of daily cases are forecast to be around 3,100 by 21st of June.

Figure 2 - UK forecast of new COVID-19 cases

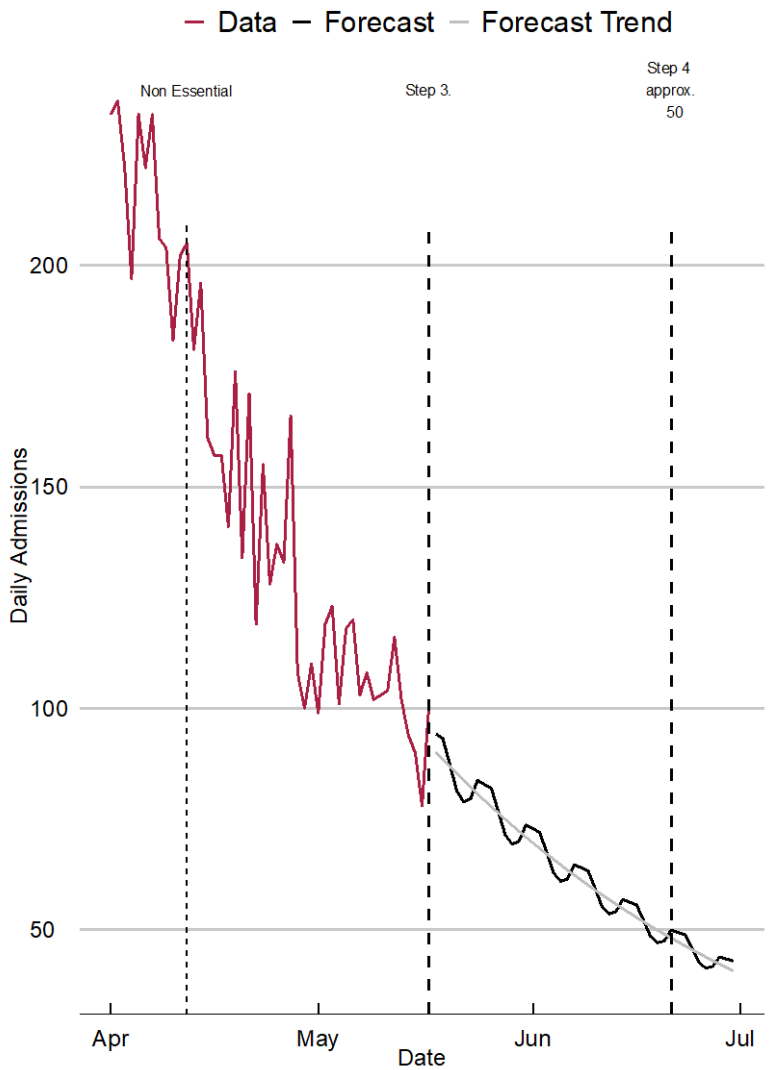


Vertical dashed lines highlight reopening dates and show forecast trend new cases rounded to nearest 100. Specimen case data available on 25 May 2021. Data for the last three days which are subject to revision are discarded, so the estimation sample ends on 21 May 2021.

Figure 3 provides forecasts of daily hospital admissions for Covid-19 until mid-June and highlights the underlying number of new admissions to be expected on the key dates in the Government's roadmap: step 4 reopening expected on 21st June.

- Hospital admissions are forecast to be around 50 by the 21st of June.

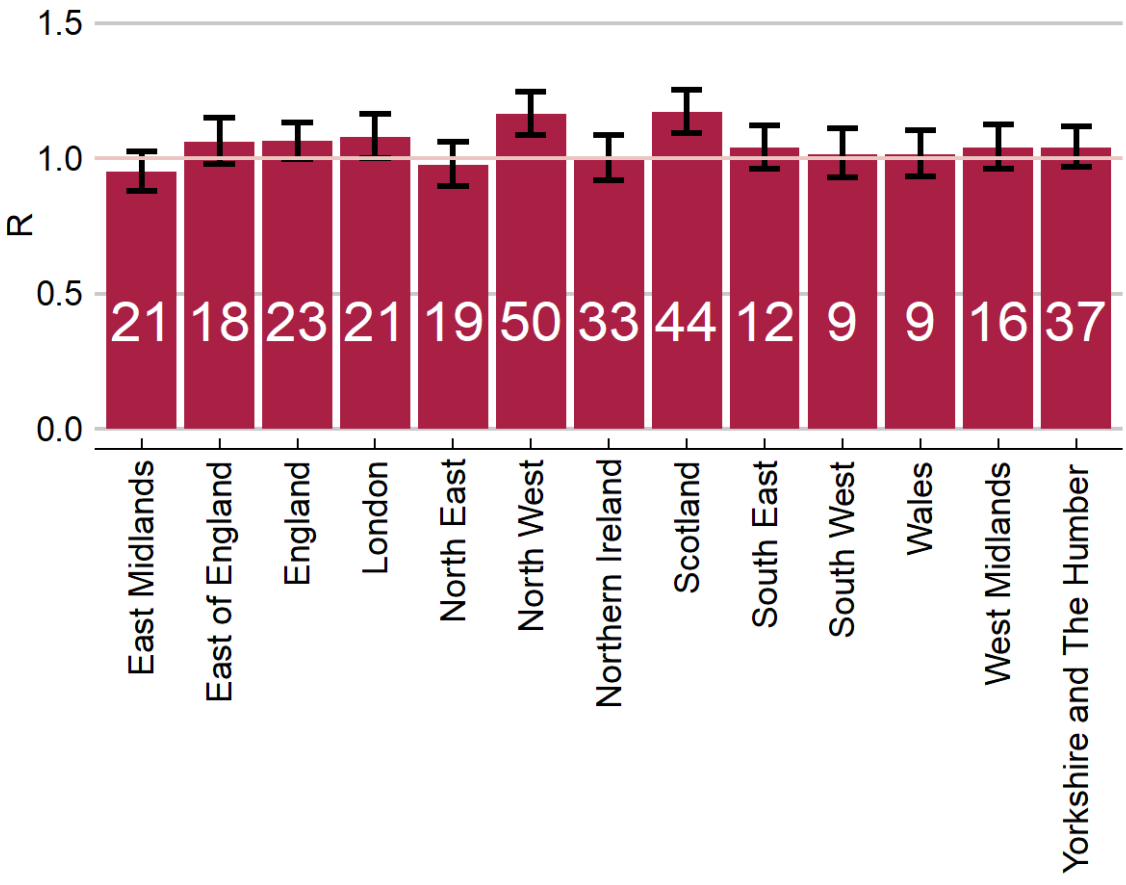
Figure 3 – UK forecast of daily Covid-19 hospital admissions



Vertical dashed lines show trend Admissions on 21 June. Admissions data avaiable up to 25 May 2021, but there is a 5 to 8 day lag in data collection. Hence, the estimation sample ends on 17 May 2021.

- Figure 4 provides regional R number estimates and the case rates per 100,000 people based on specimen date data series released on 25th May 2021. We discard data for the last 3 days due to data revisions in that time window.
- At the end of our estimation sample on 21st May 2021 several regional R number estimates exceeded 1, but with case rates uniformly low this is not a matter of concern.
- Among nations of the UK, Scotland has the largest R number (1.17) and Northern Ireland has the lowest (1.00).
- Among regions of England, the North West has the highest R number (1.16) and the East Midlands has the lowest (0.95).

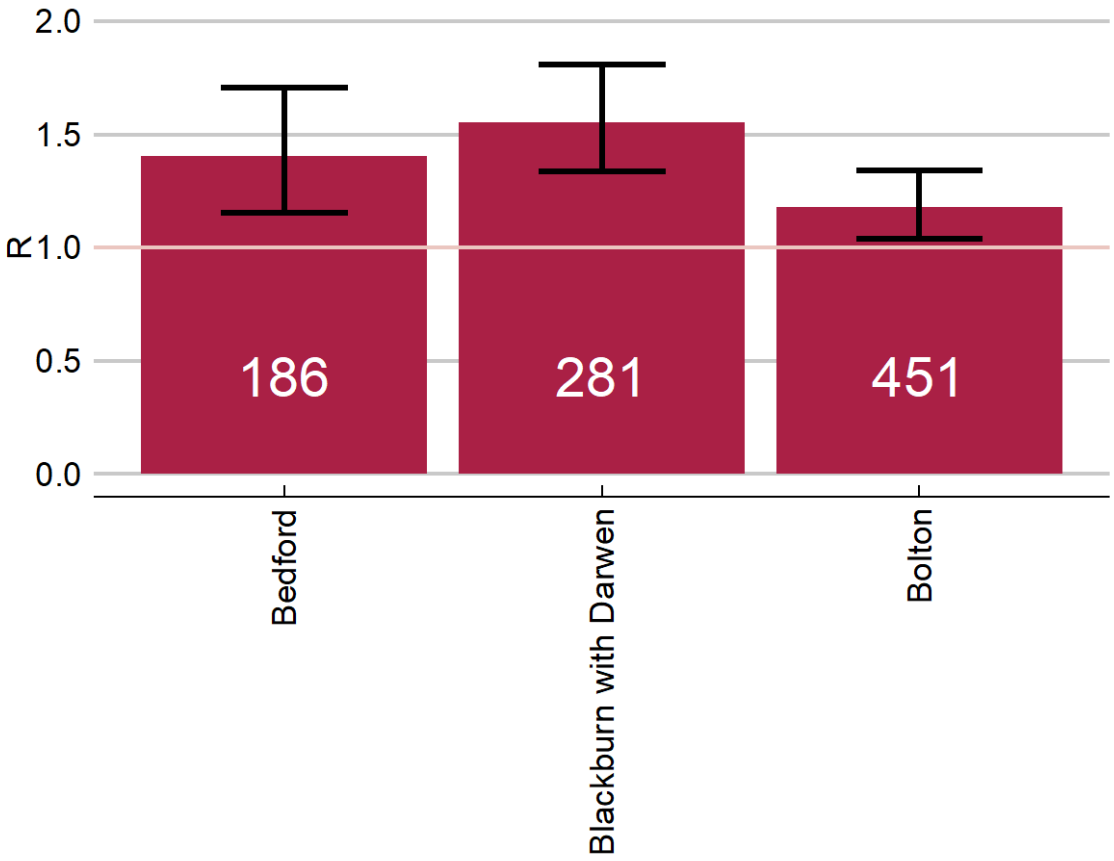
Figure 4 - UK Regional R and seven-day Case Counts per 100,000 Population



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.

- Figure 5 replicates Figure 4 for lower tier local authorities where case rates have surged. The figures reported do not control for increased testing within these areas.
- At the end of our estimation sample on 21st May 2021, the R number was in the range 1.05 - 1.35 for Bolton (case rate 451), 1.35 - 1.85 for Blackburn and Darwen (case rate 281) and 1.15 – 1.70 for Bedford (case rate 128). For comparison, Figure 4 shows that the case rate for England as a whole is 23 per 100,000 and the North West is 50.

Figure 5 – Local Authority R and seven day Case Counts per 100,000 Population



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.

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 will be 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). 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 a reader in 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.

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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

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