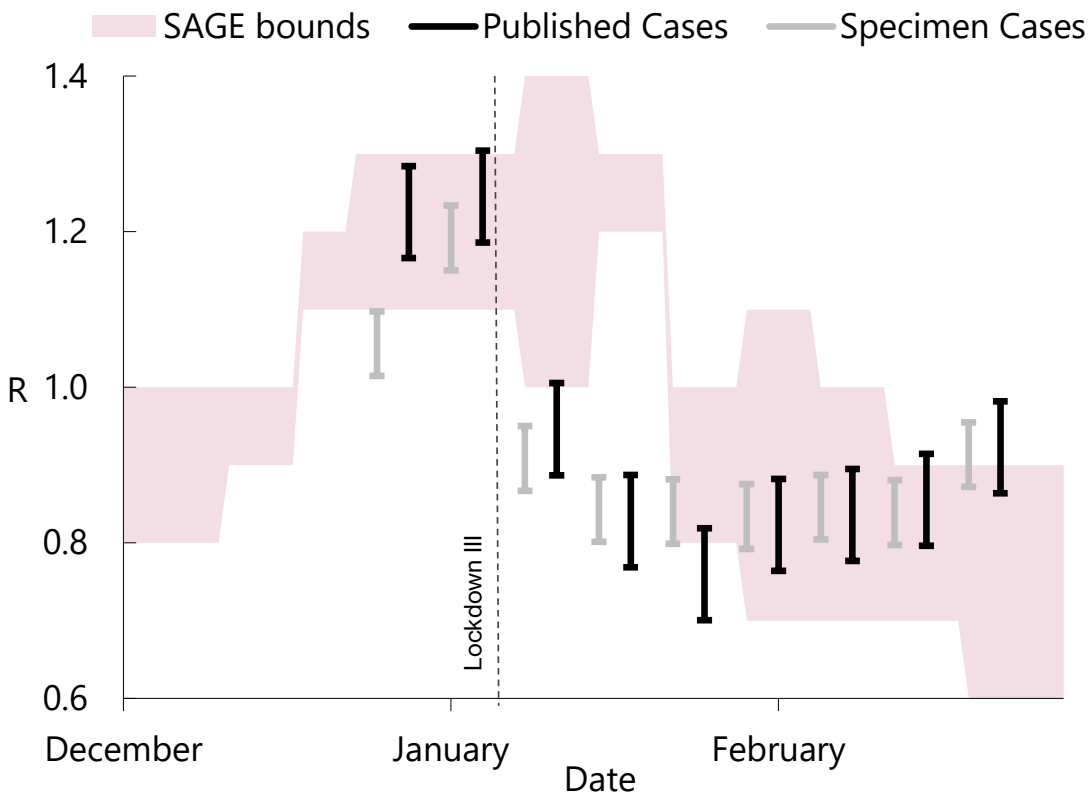
Reproduction Number (R) and Forecasts of New Cases: An upward revision

Figure 1 - UK R – NIESR and SAGE



The shaded pink area shows SAGE upper and lower bounds (https://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 latest 3 days data.

Main points

- The NIESR estimates use a new time series model to project new cases of Covid-19 and produce timely estimates of the R number. The forecasts reported here were made using publicly available data on 23rd February 2021.
- Figure 1 shows that the Reproduction number, R, which is the average number of secondary infections currently generated by an infected individual, **is starting to move up to 0.9 – 1.0 from a range of 0.8 – 0.9 where it had been since mid-January**.

- Should new cases in the UK continue to fall at the current rate, we can expect them to be around 6,800 on 8th March, when schools reopen; see Figure 2. This figure has been revised upwards from 3,900 last week.
- Regional differences, shown in Figure 3, are still apparent and are responsible for driving up the overall UK figure. It is no longer the case that all regional R number estimates are below one as it was last week. Currently, London has the lowest R number while Scotland and Yorkshire and the Humber again have the highest, with both slightly above 1.0.
- There may be a number of explanations for the rise, one of which may simply be increased testing. On the other hand, it may reflect a behavioural response to the success of the vaccination roll out and the fall in deaths and hospital admissions.

"According to the latest data on new cases, our work shows an R number for the UK in the range 0.9 – 1.0, taking it above the range of 0.8 – 0.9 that it has been in since mid-January. Strong data relative to that forecast in the previous week has increased our estimates of R number and regional differences remain pronounced with Scotland, Northern Ireland and Yorkshire and the Humber above 1.0."

Dr Craig Thamotheram
Senior Economist - Macroeconomic Modelling and Forecasting

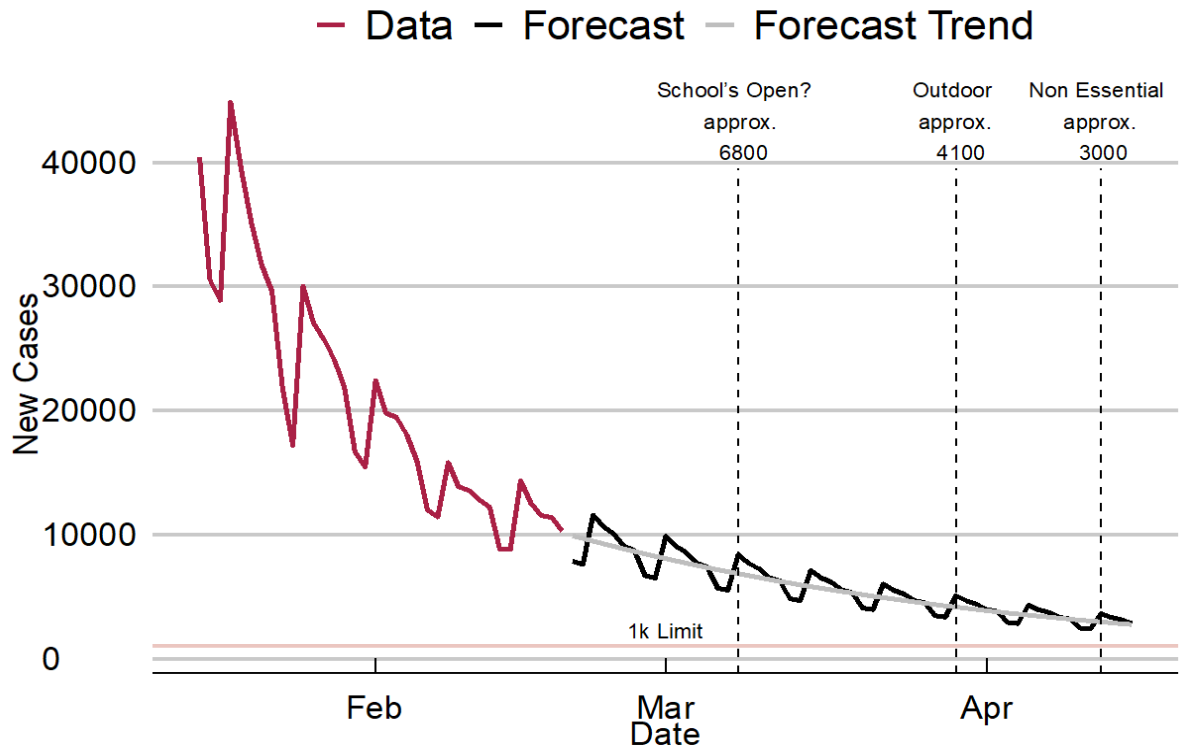
Results

The forecasts of new cases are based primarily on specimen date data. The forecasts do not make assumptions about the timing or effects of pandemic control measures that may be imposed or relaxed in the days ahead. We use historical data to make predictions.

In Figure 2 we highlight the number of new cases on key dates provided by the Government this week.

- On this basis new cases in the UK are expected to be around 6,800 on 8th March 2021, the school re-opening date. This is up from 3,900 last week.

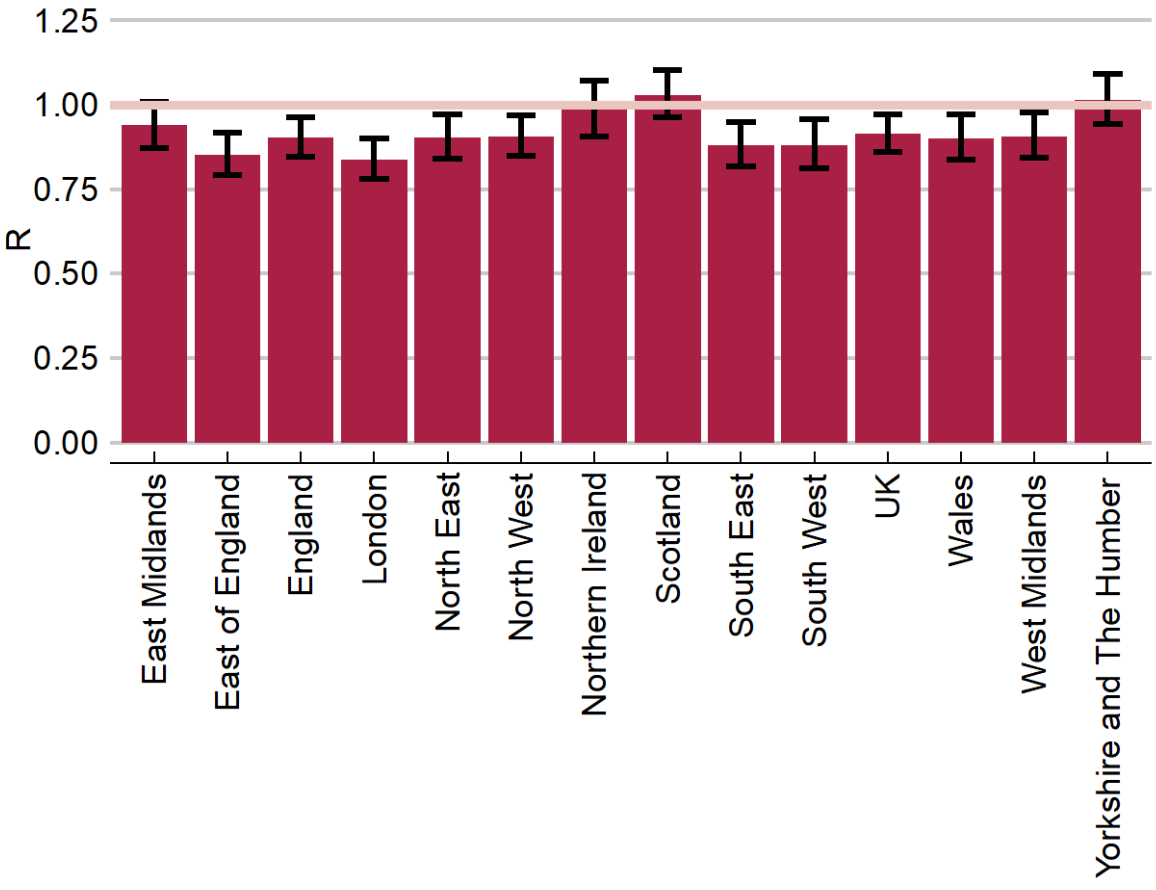
Figure 2 - UK forecast of new COVID-19 cases



Vertical dashed lines show trend new cases on 8th March, 29th March and 12th April rounded to nearest 100.
The data used in this forecast runs up to 19/02/2021.

- It is no longer the case that all regional R number estimates are below one as it was last week. As of 19th February 2021, both Scotland and Yorkshire and the Humber are above 1.0.
- Among nations of the UK, Scotland has the largest R number (1.03) and Wales has the lowest (0.90).
- Among regions of England, Yorkshire and Humber has the highest R number (1.01) and London has the lowest (0.84).

Figure 3 - UK Regional R



Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

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

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 the schools 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

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