

Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

30 May 2021



Centre for
**Health Leadership
& Enterprise**



This tracker¹ has been developed by researchers at Cambridge Judge Business School and National Institute of Economic and Social Research, working with Health Systems Transformation Platform in India, as part of a pandemic monitoring series devoted to India and its states and union territories. It provides short term forecasts of the trajectory of the pandemic, identifying states and union territories that are at high risk of increases in infection incidence.

The forecasts are based on a structural time series model that uses historical data in estimation but adapts to the trend emerging in the most recent period. The model is described in Harvey and Kattuman (2021) "Time series models based on growth curves with applications to forecasting coronavirus". *Harvard Data Science Review*, Special issue 1 - COVID -19.

Newly reported COVID-19 cases in India are likely to decline to about 68,000 per day by 13 June 2021. The trend value of reported daily deaths is likely to decline to about 2000 per day by that date.

With the exception of Manipur and Mizoram, all Indian states and union territories are on clear downward paths in new cases. The estimates of the daily growth rates of new cases at the end of the observation period on 30 May imply new cases doubling times of 16 days for Manipur and 24 days for Mizoram, under the assumption that the growth rates remain constant.

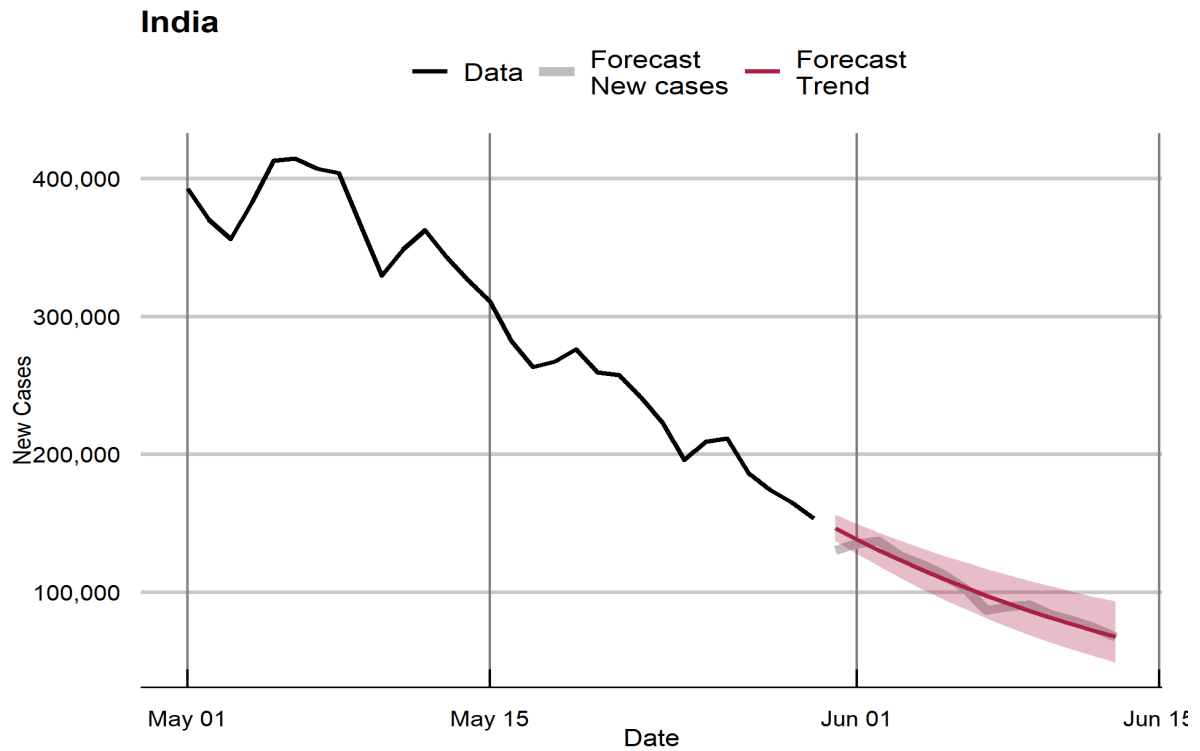
Mean absolute percentage error of the forecasts of daily cases in India given in the 23 May tracker, for the week beginning 24 May 2021, is 3.8%. The accuracy of forecasts rely on the quality of the reported data. Changes in government pandemic policies and in transmission relevant social behaviour may cause realised numbers to depart from forecasts. Data have been volatile for Chandigarh, Delhi, Haryana and Rajasthan as well as for some smaller states and union territories, making their forecasts less accurate.

¹ CJBS COVID-19 Tracker for India can be accessed at: www.jbs.cam.ac.uk/covid-india

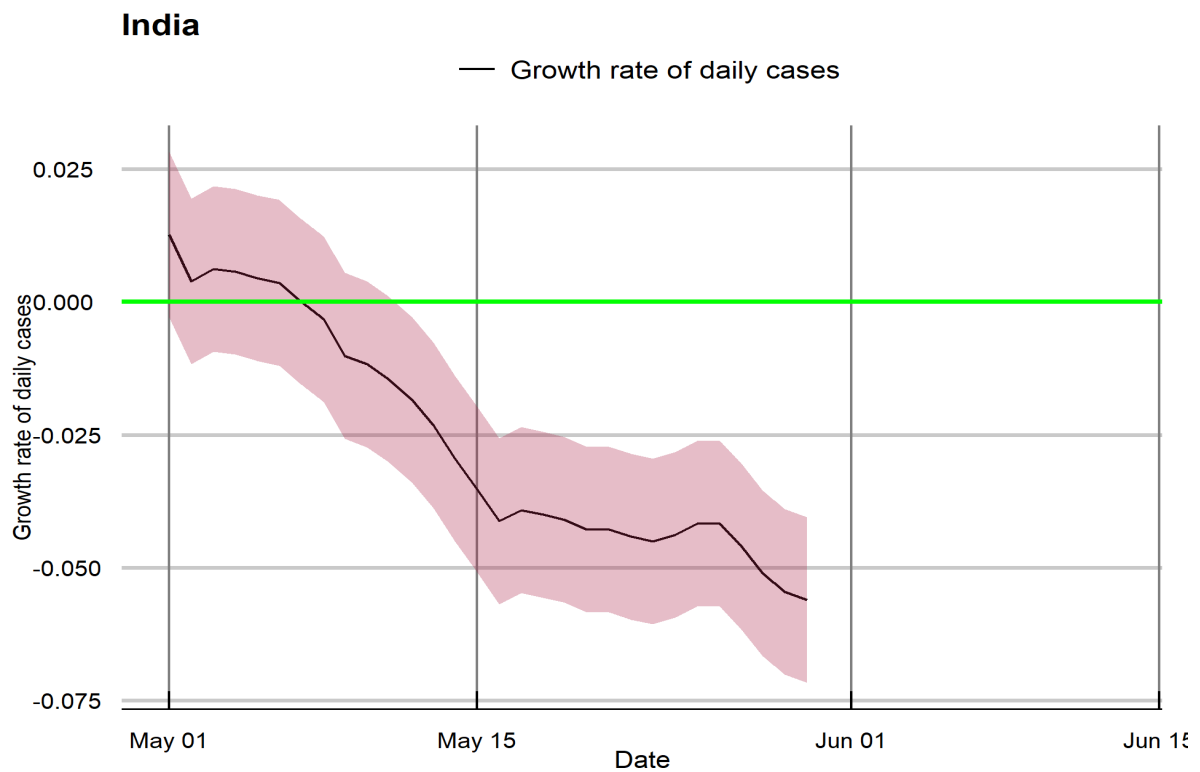
The companion spreadsheet contains all the estimates and forecasts.

Contact: Paul Kattuman <p.kattuman@jbs.cam.ac.uk>

Daily Covid-19 cases in India: Forecast

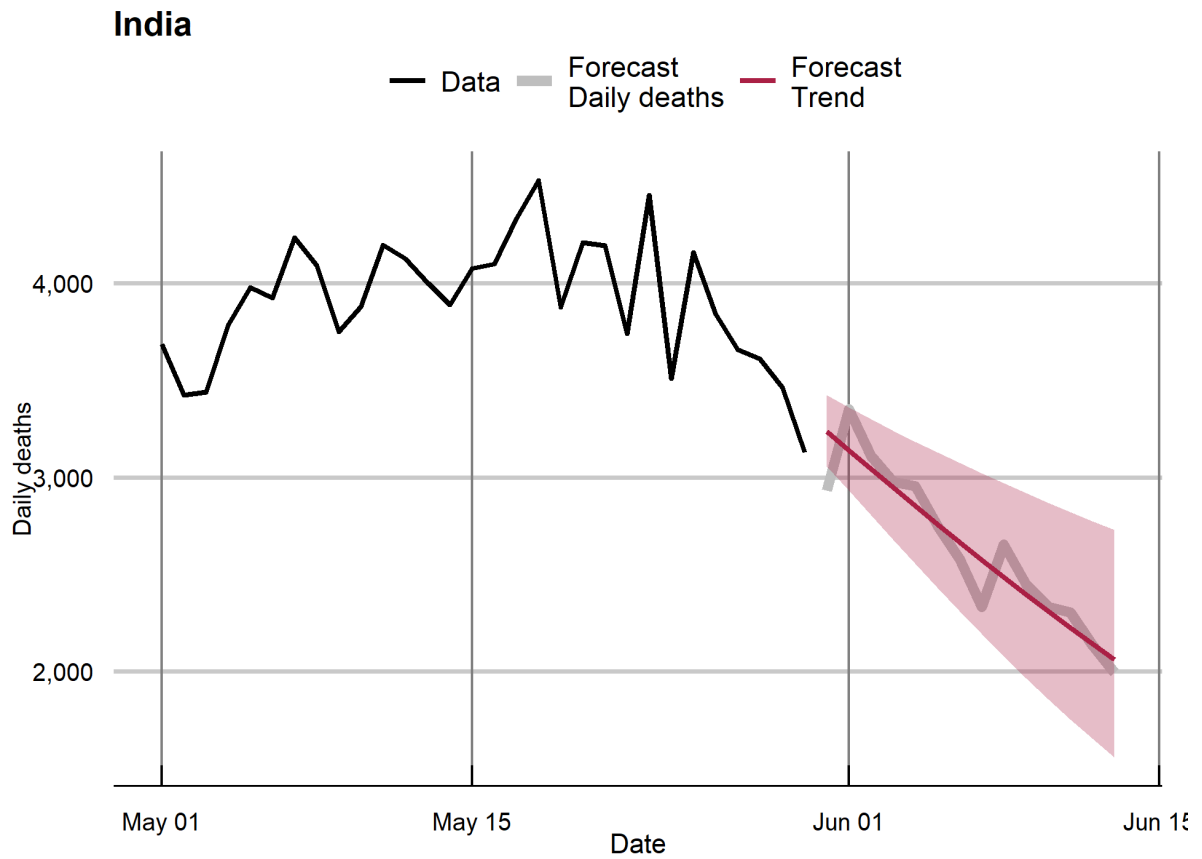


Forecasts of daily new cases for the period 31 May 2021 to 13 June 2021, based on data till 30 May 2021.

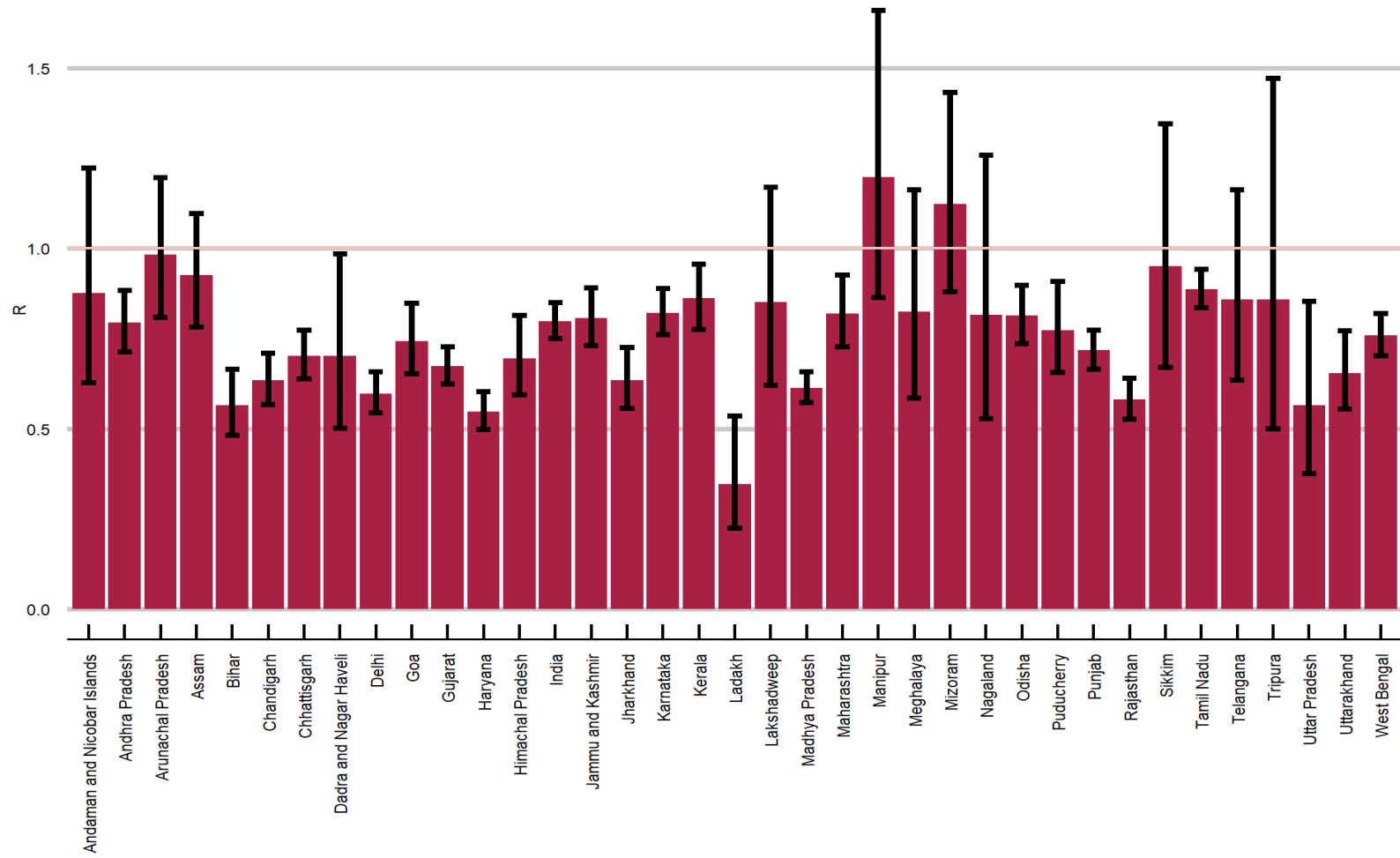


The filtered trend in the growth rate of daily new cases. Final date: 30 May 2021.

Daily Covid-19 deaths in India: Forecast

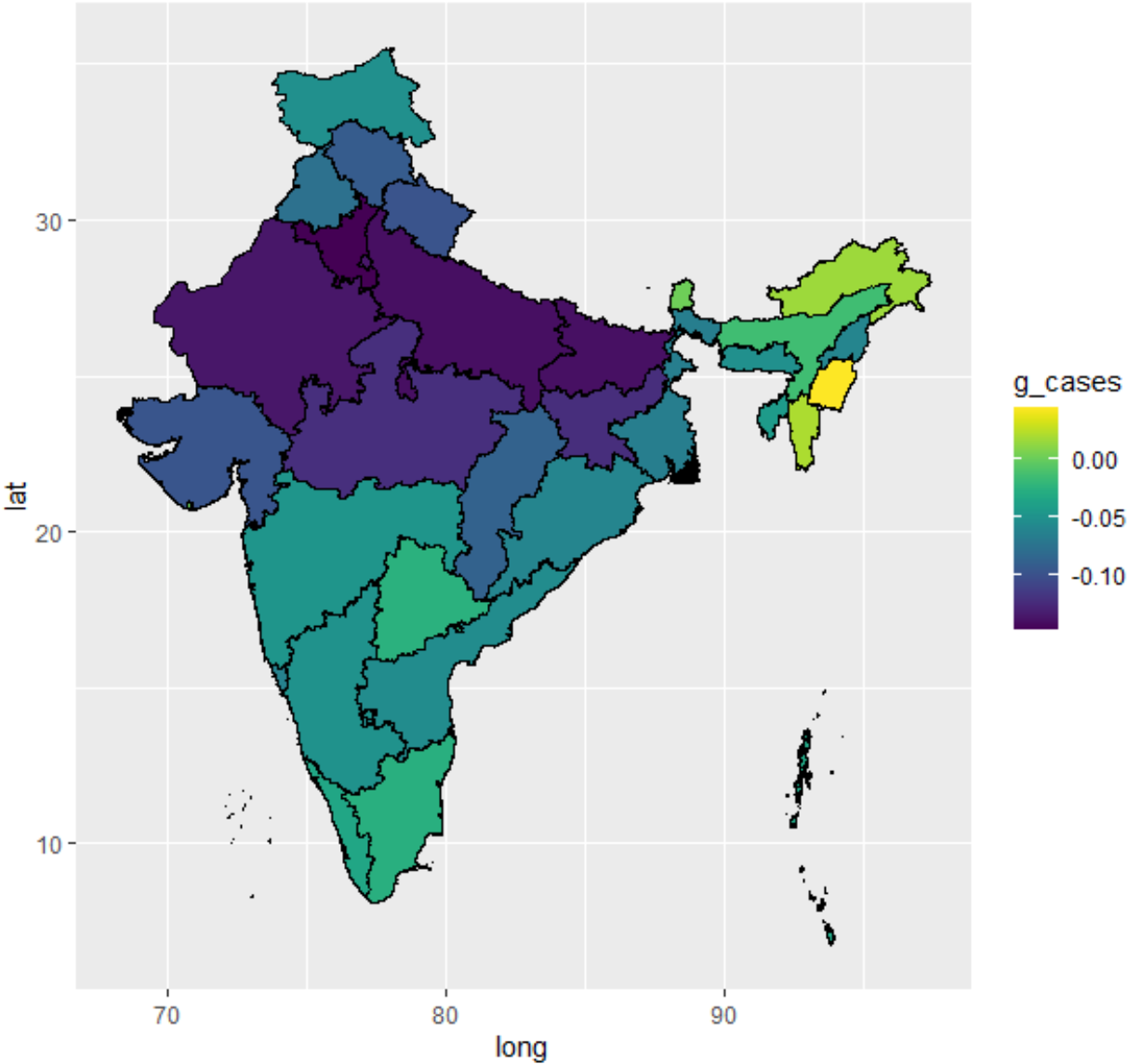


R_t: 30 May 2021

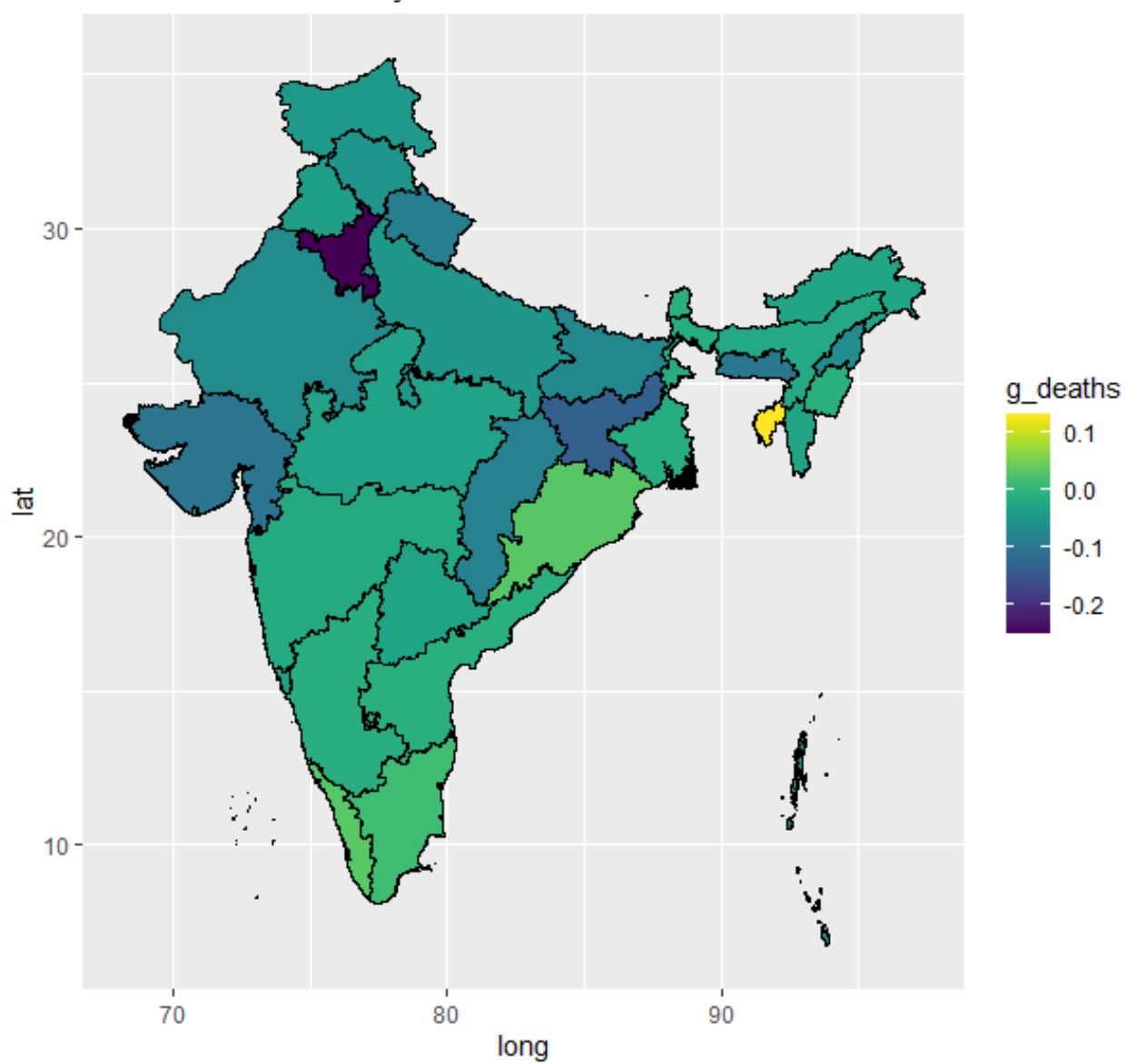


Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

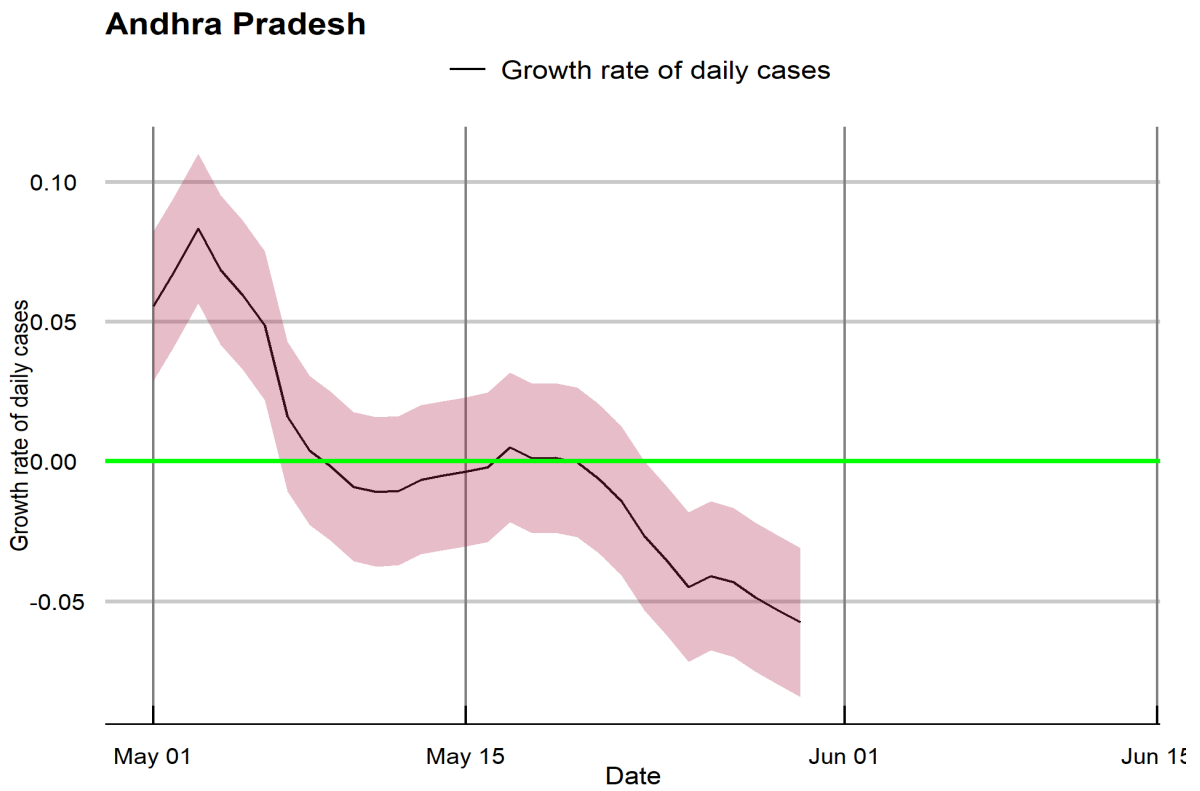
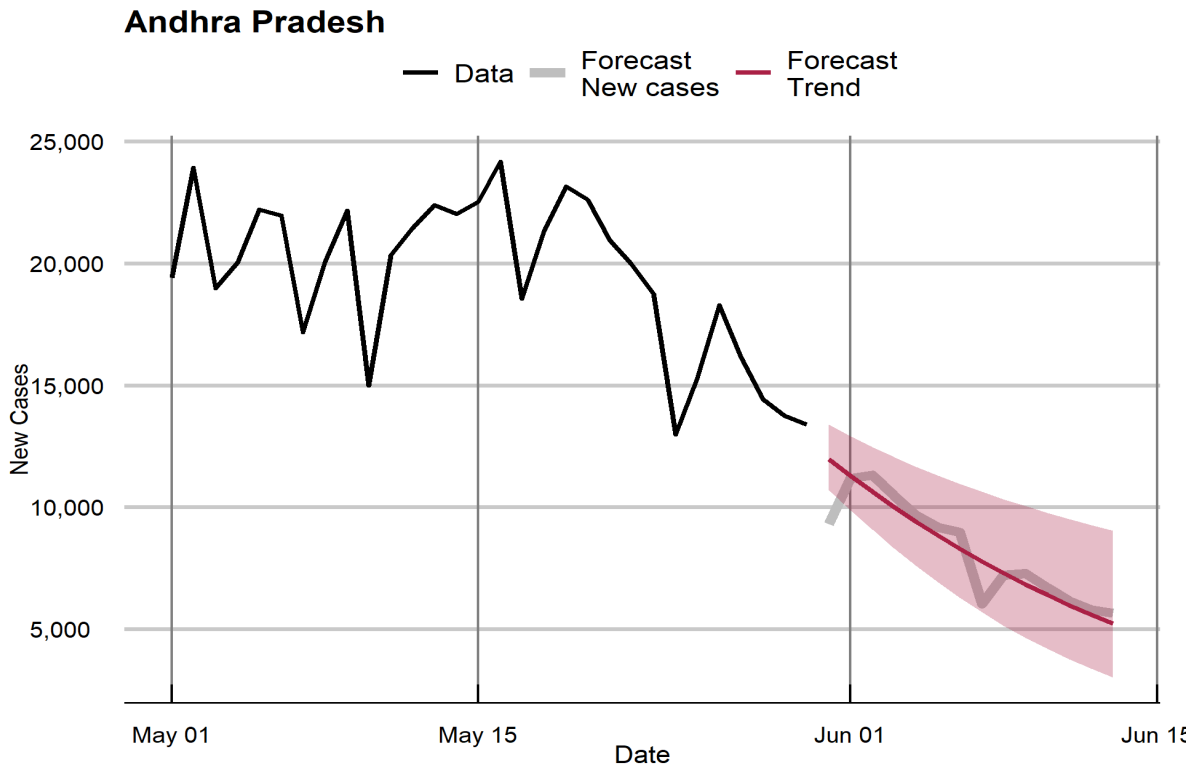
Daily growth rate of cases
Trend value on 30 May 2021



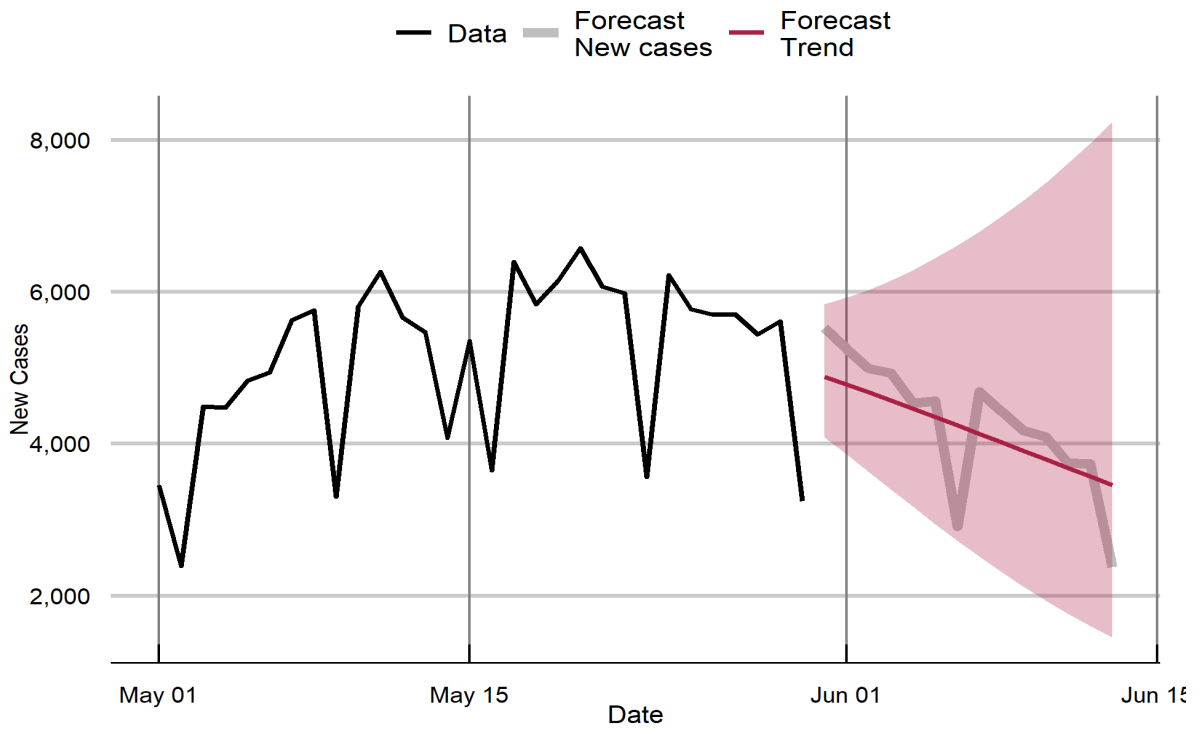
Daily growth rate of deaths:
Trend value on 30 May 2021



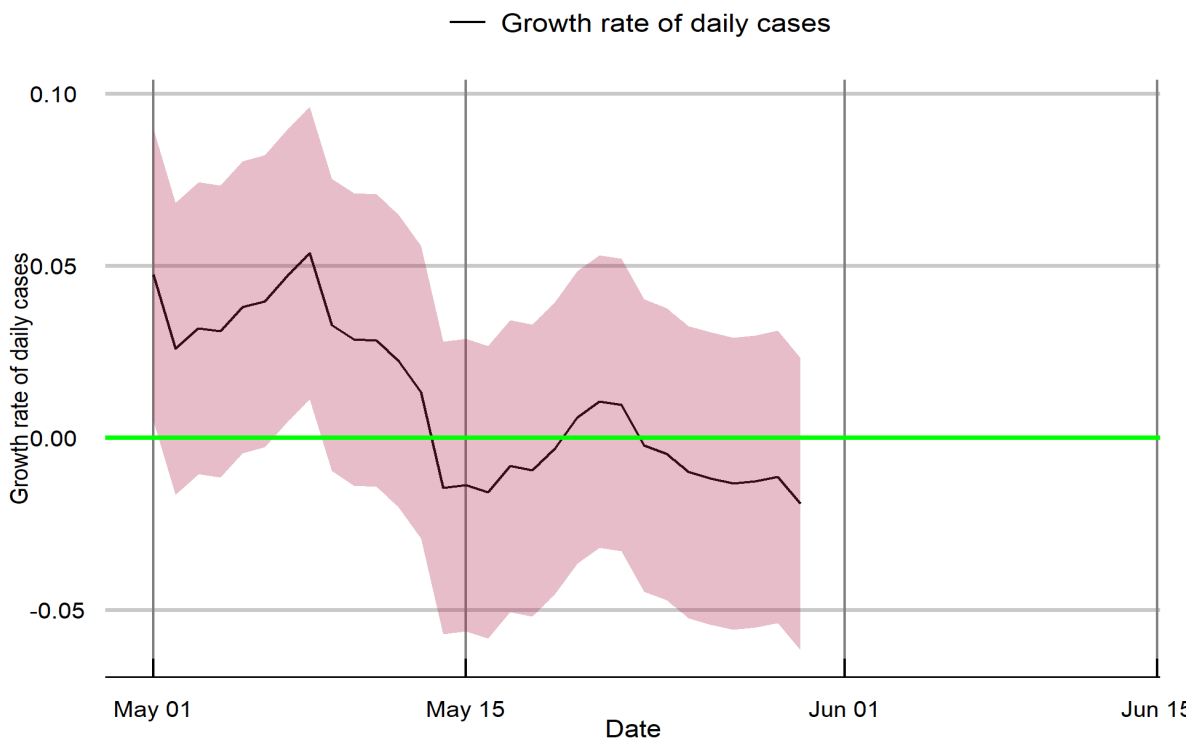
Daily Cases forecast: States and Union territories



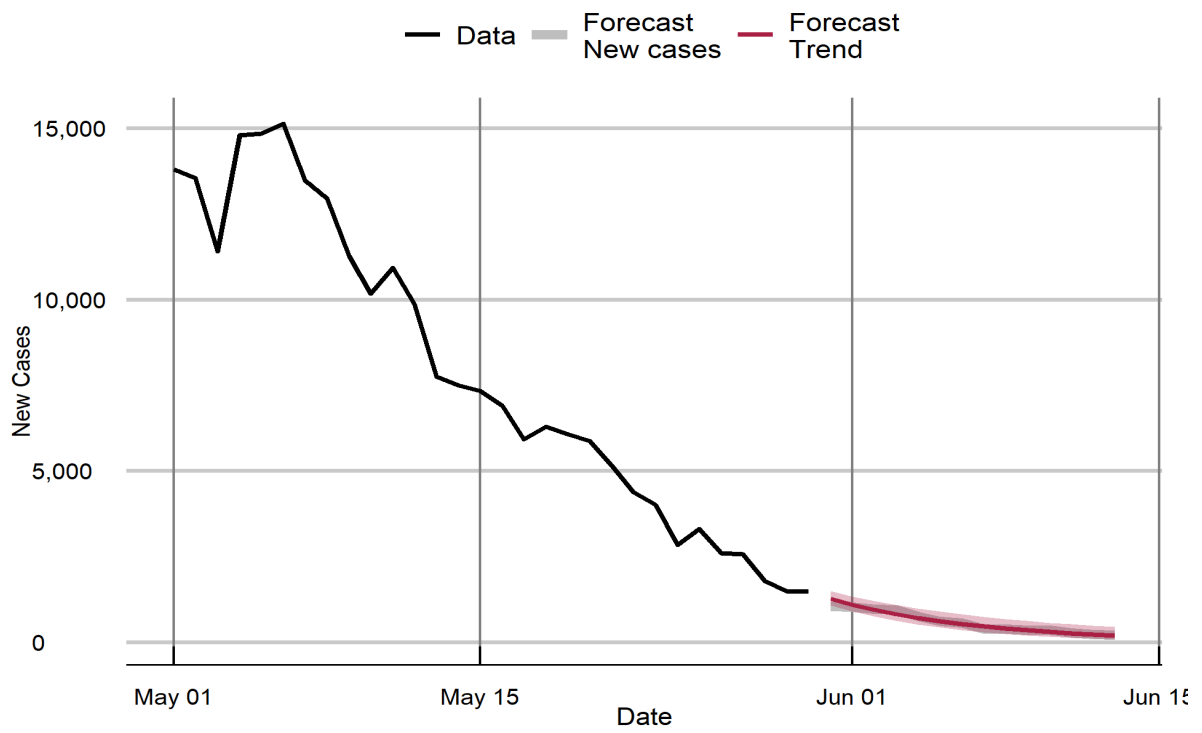
Assam



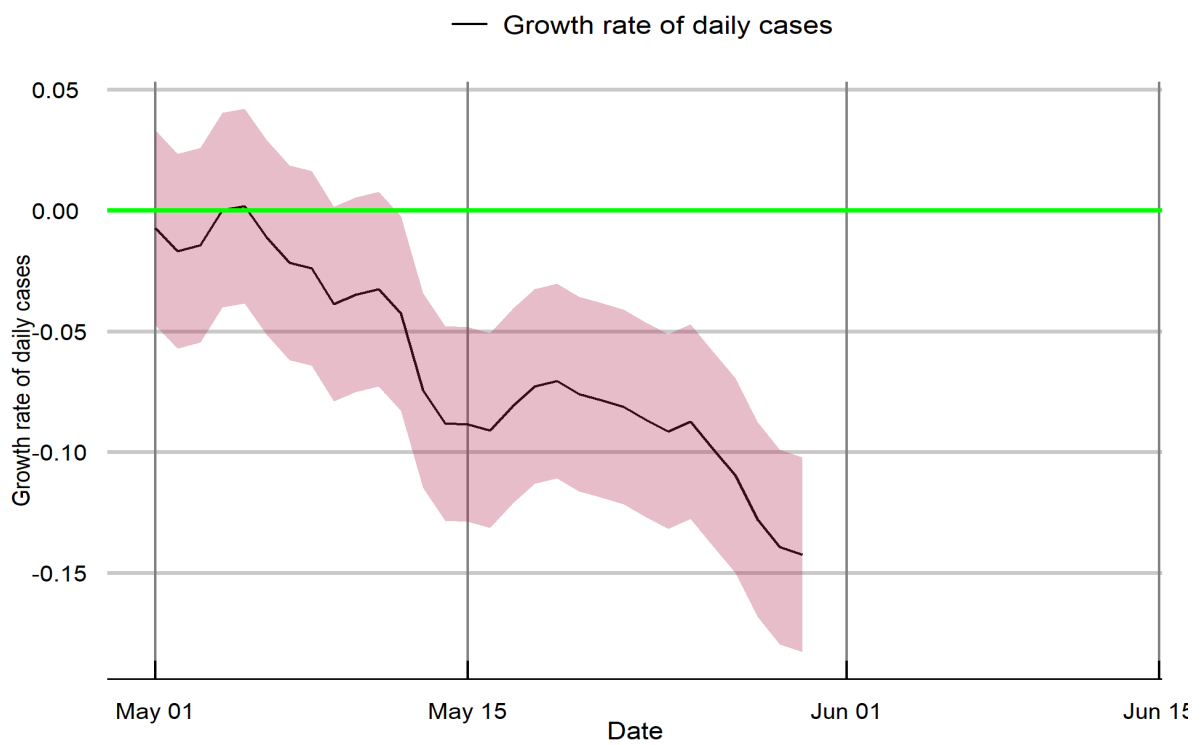
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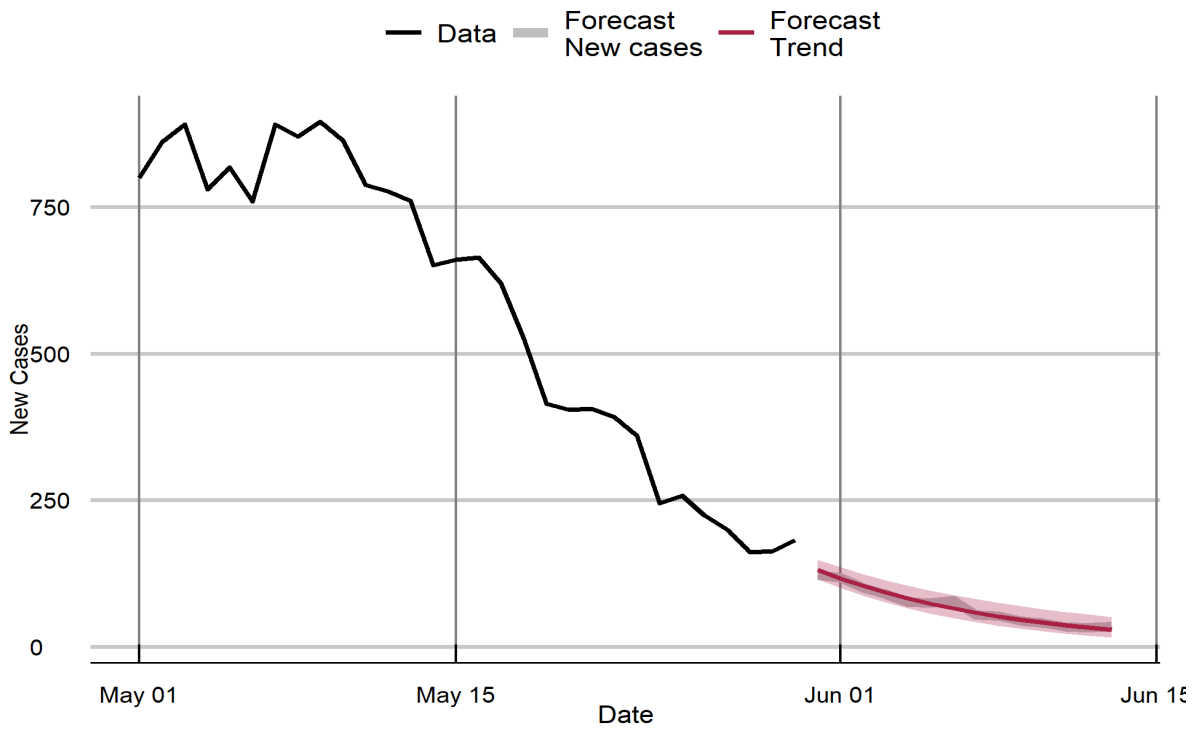
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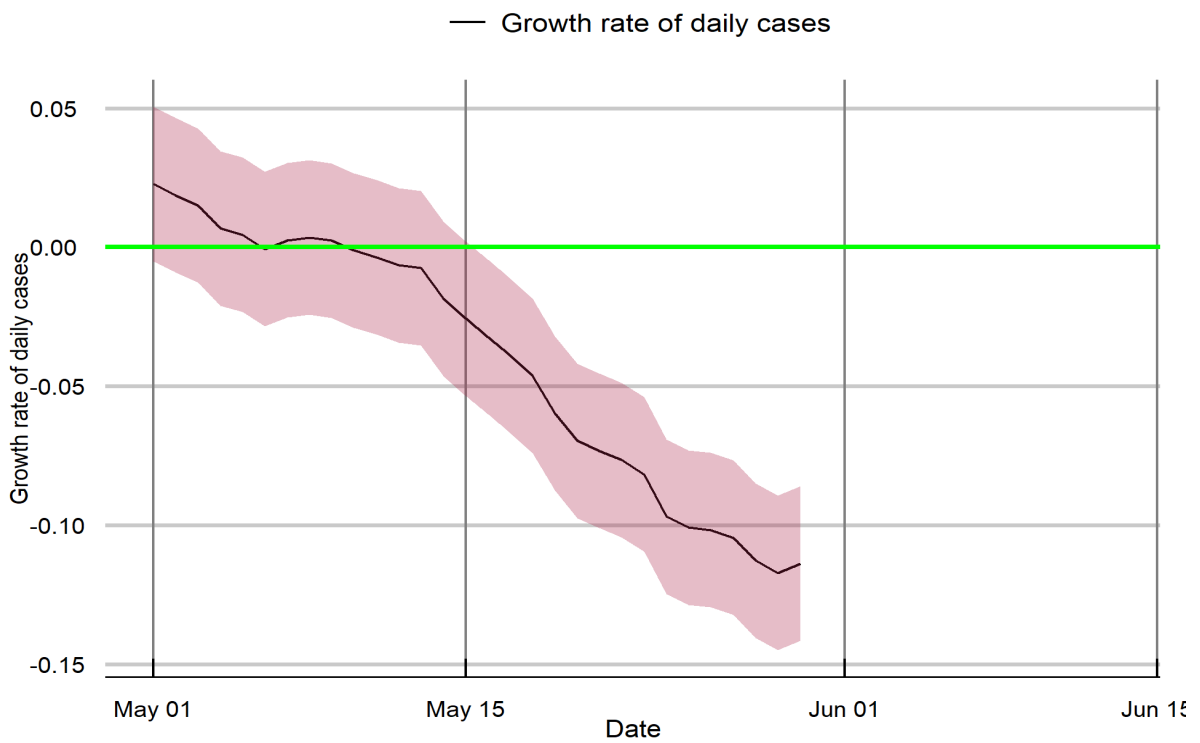
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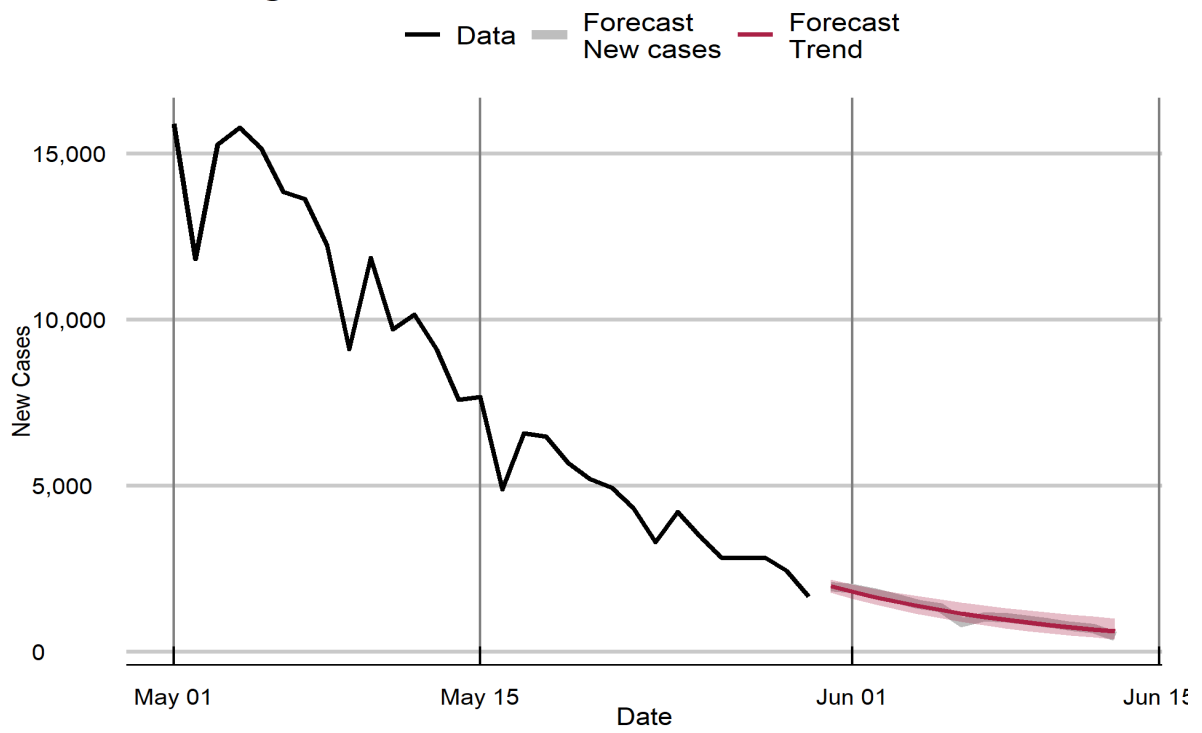
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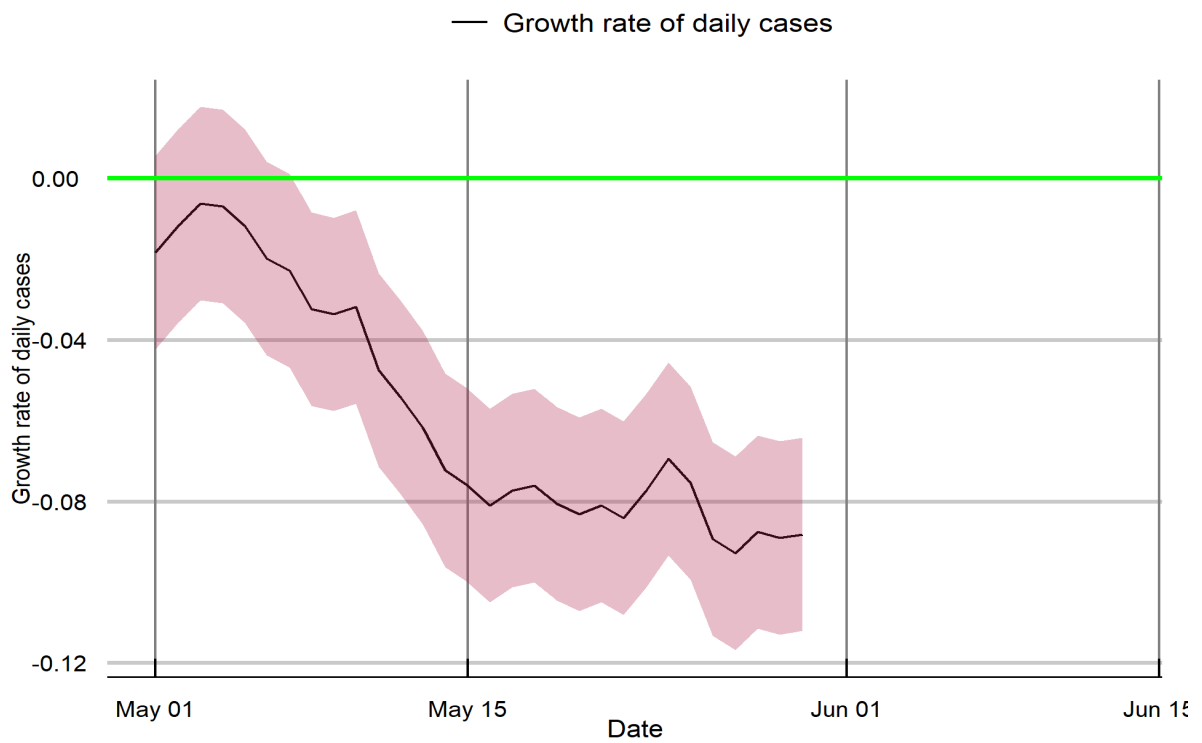
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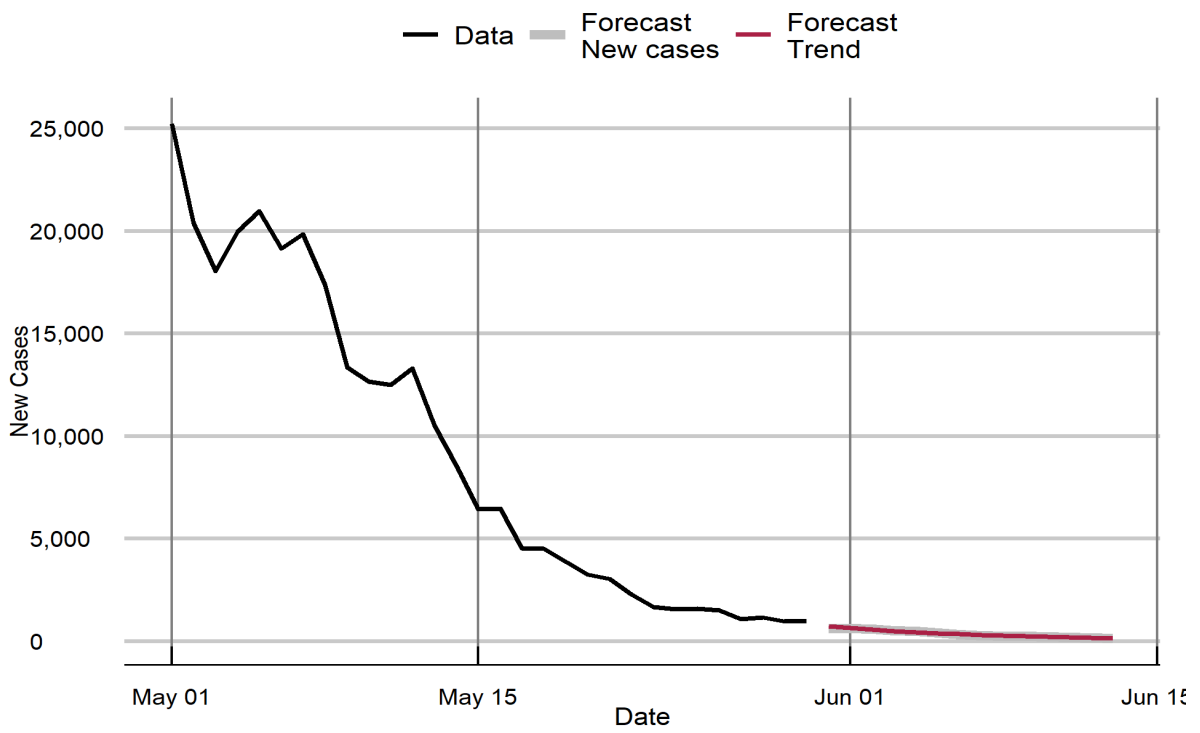
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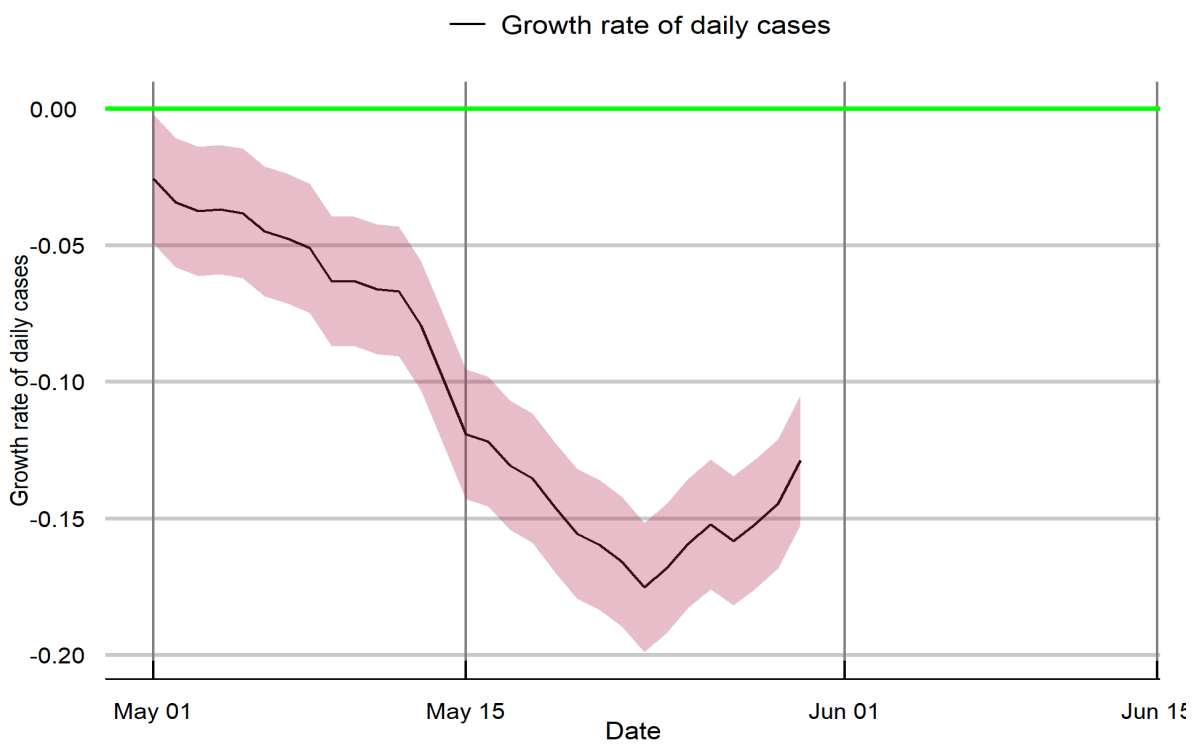
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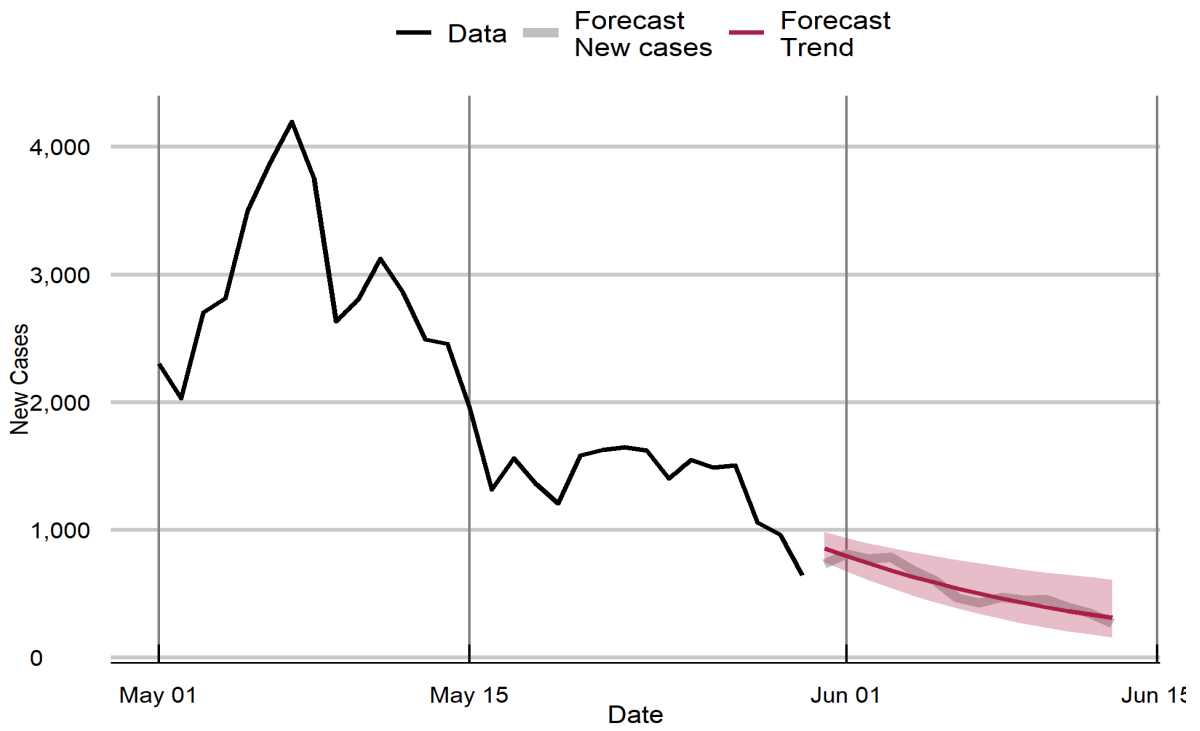
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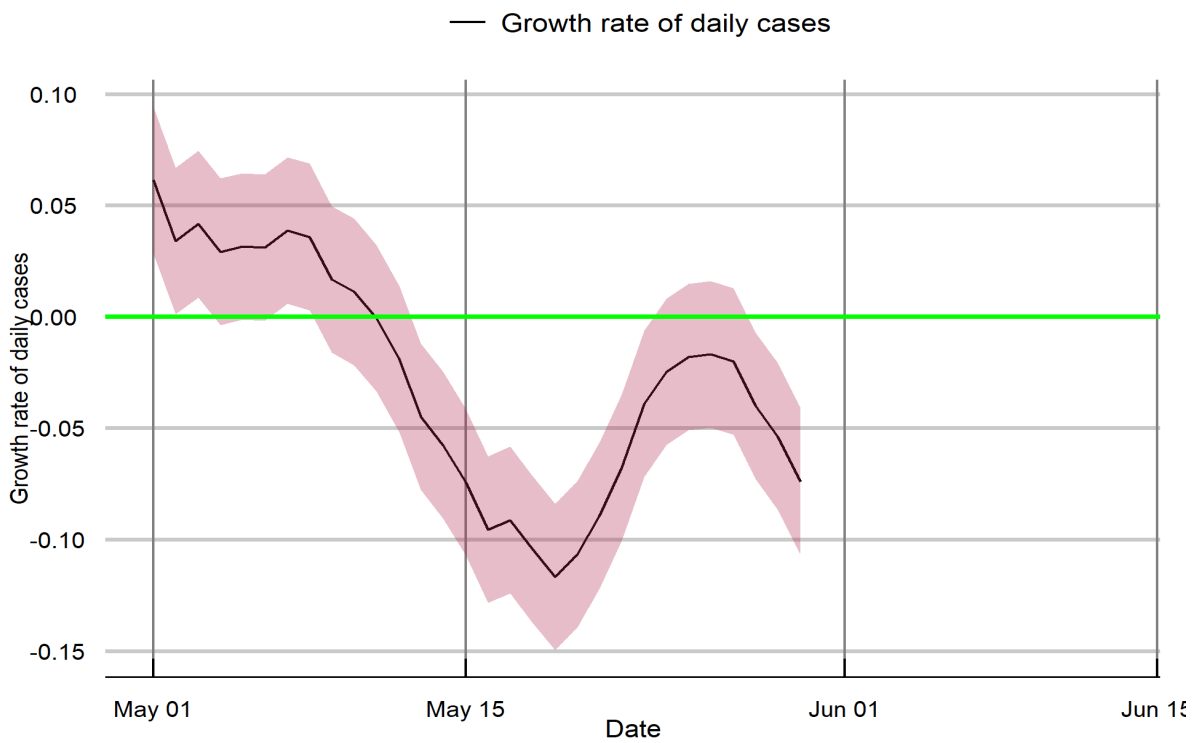
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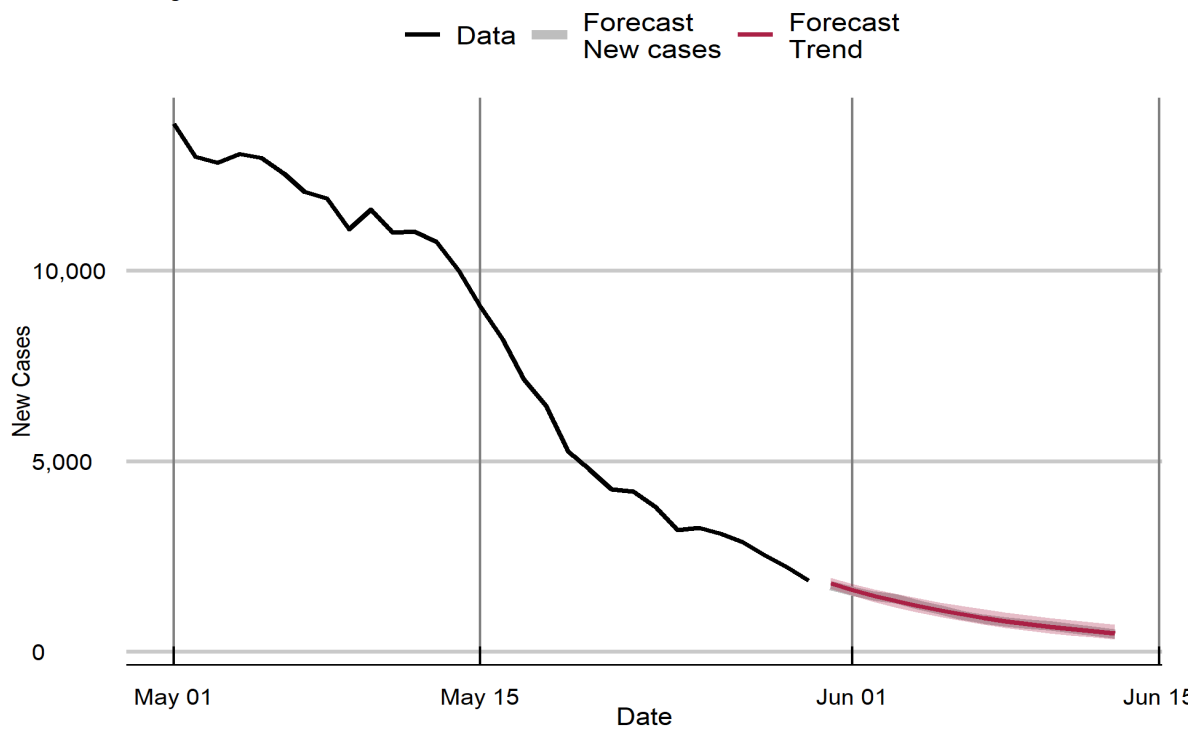
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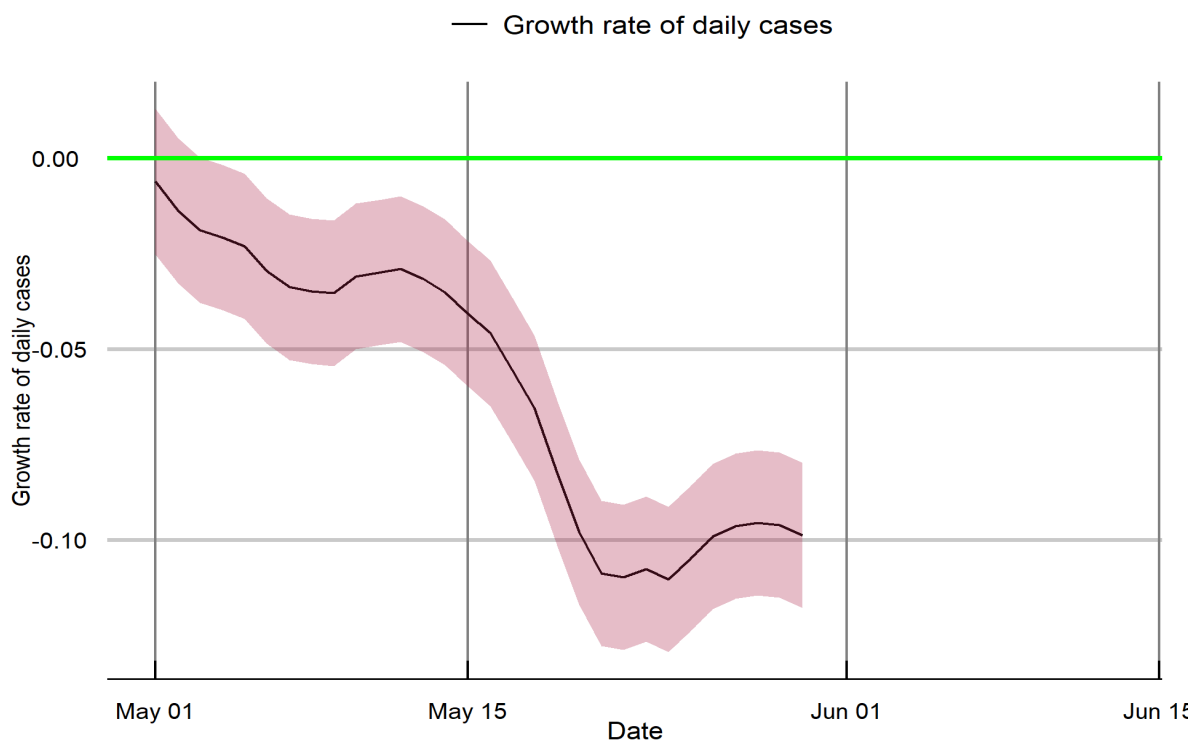
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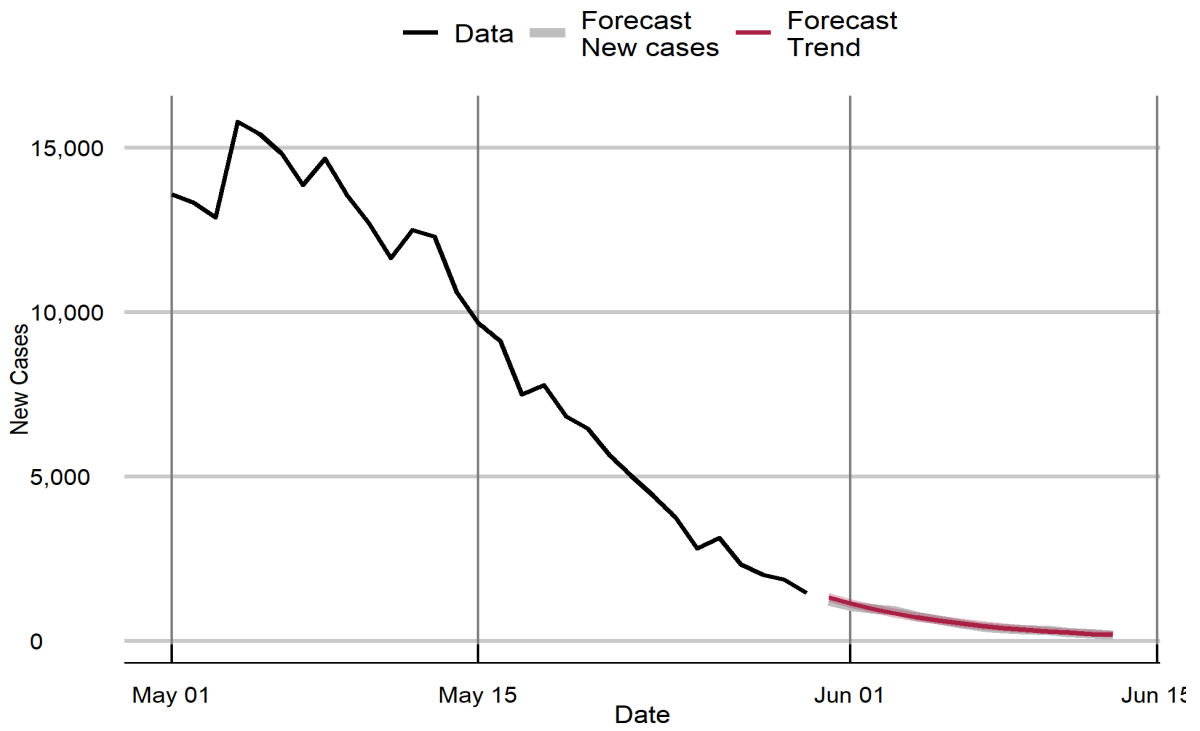
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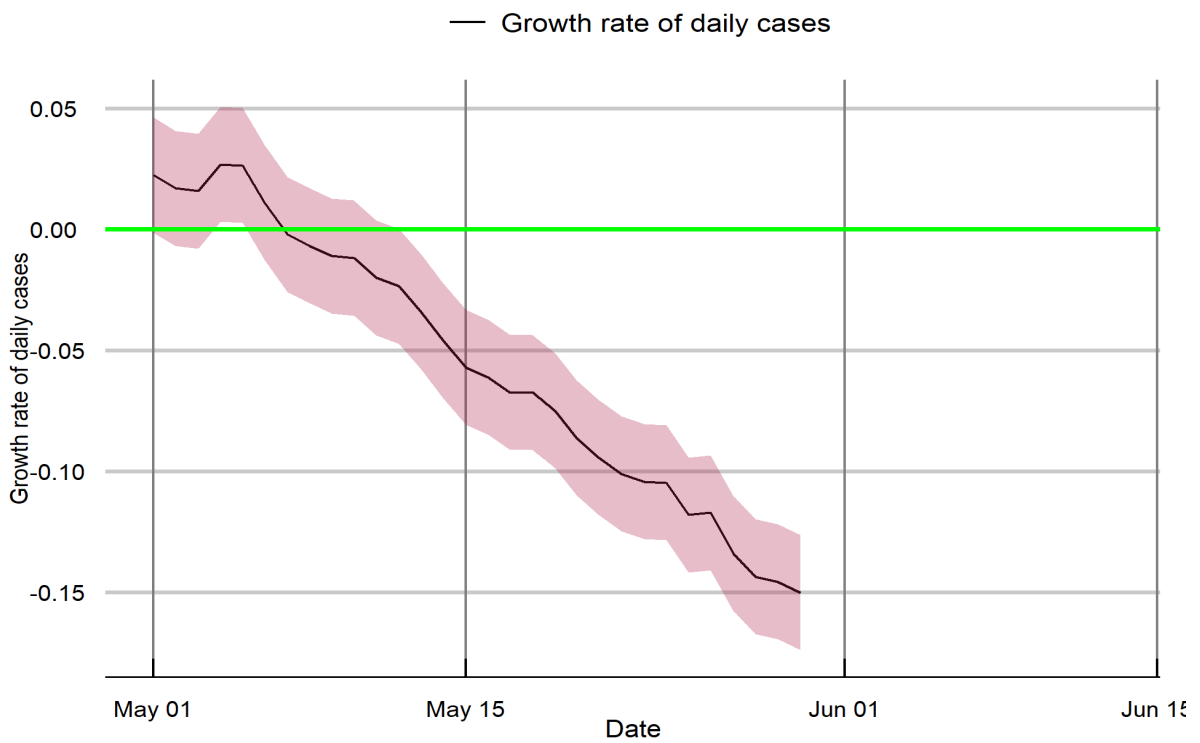
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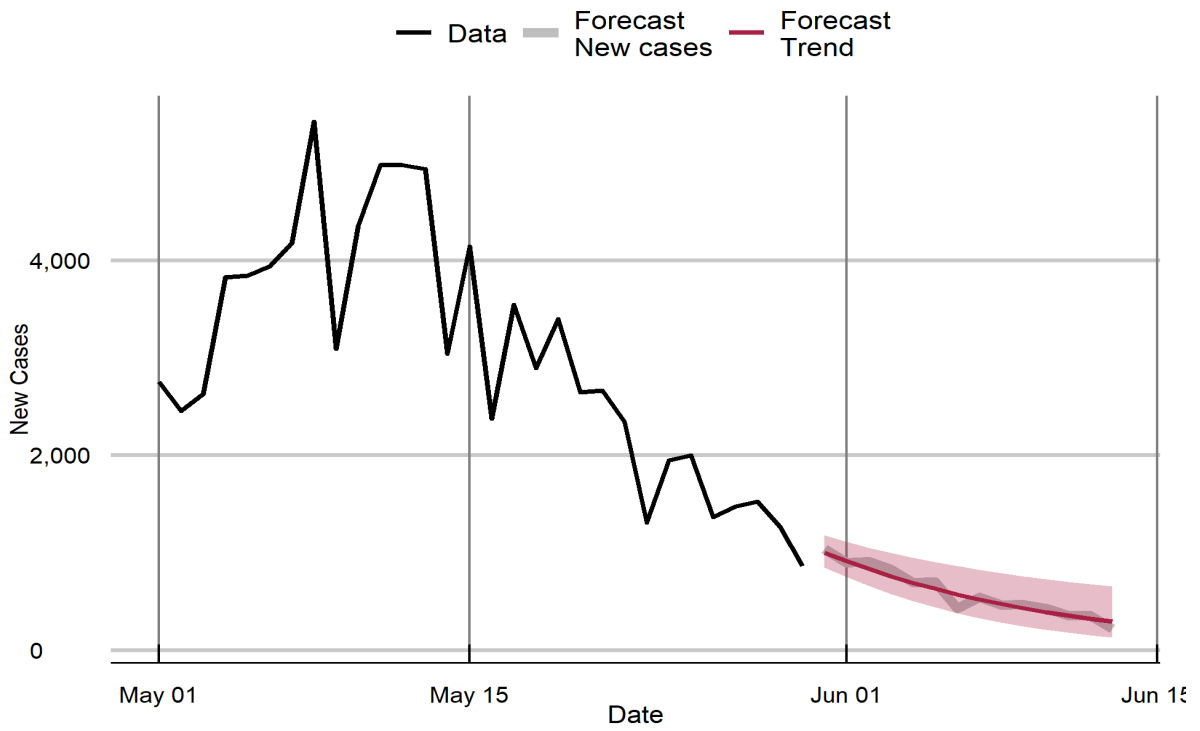
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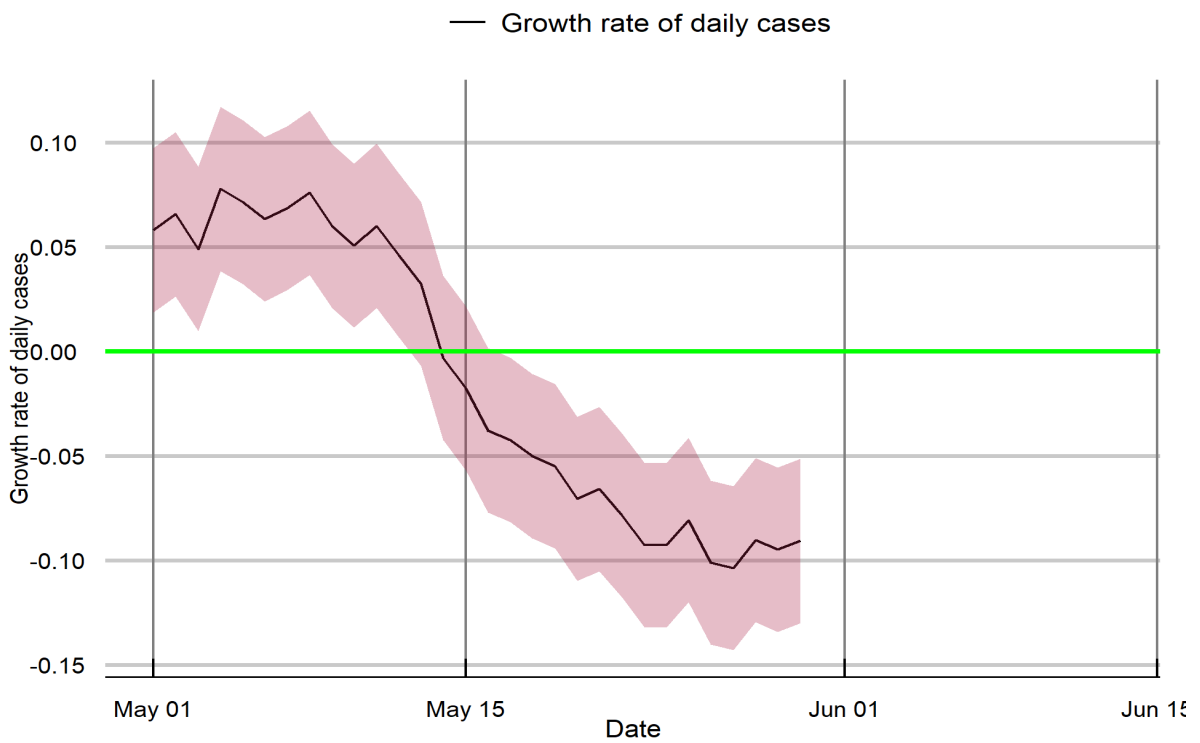
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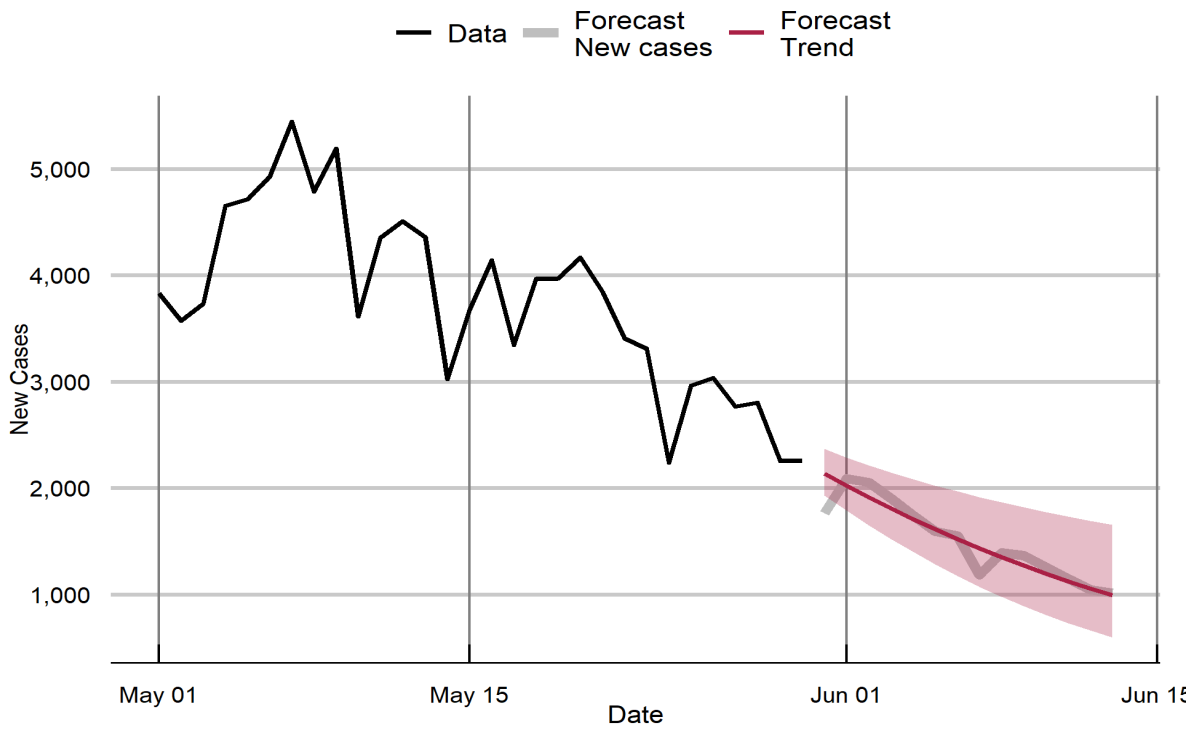
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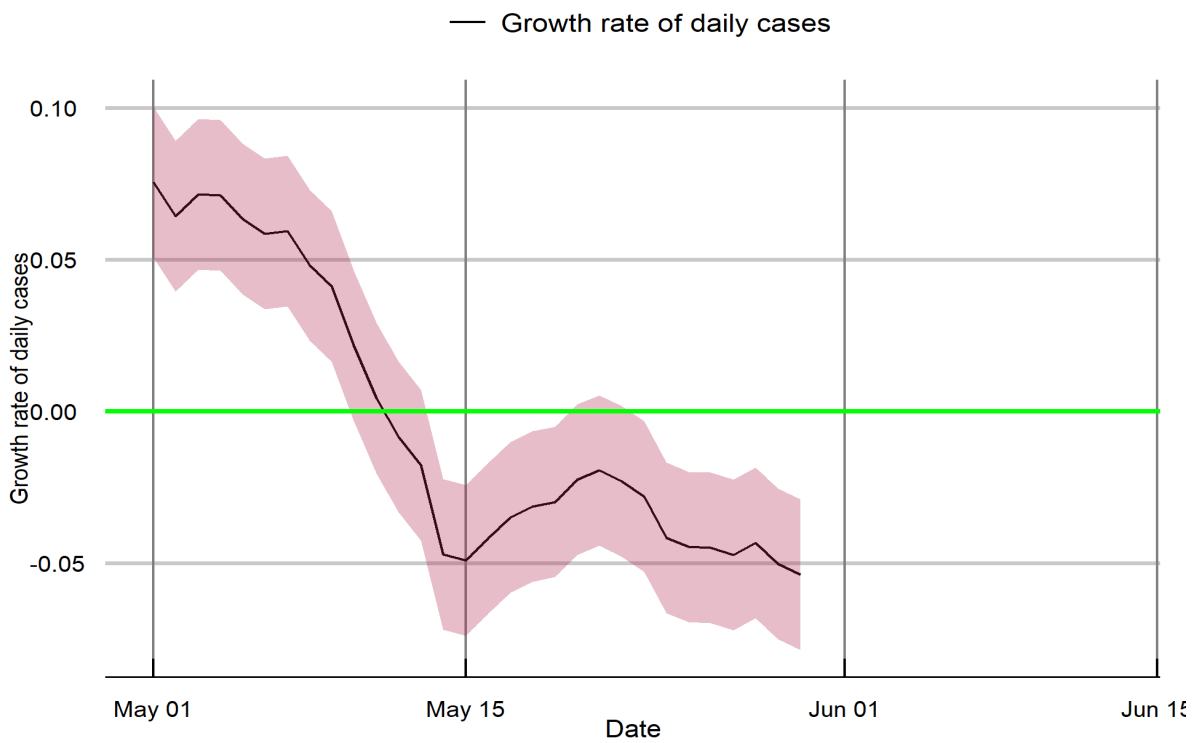
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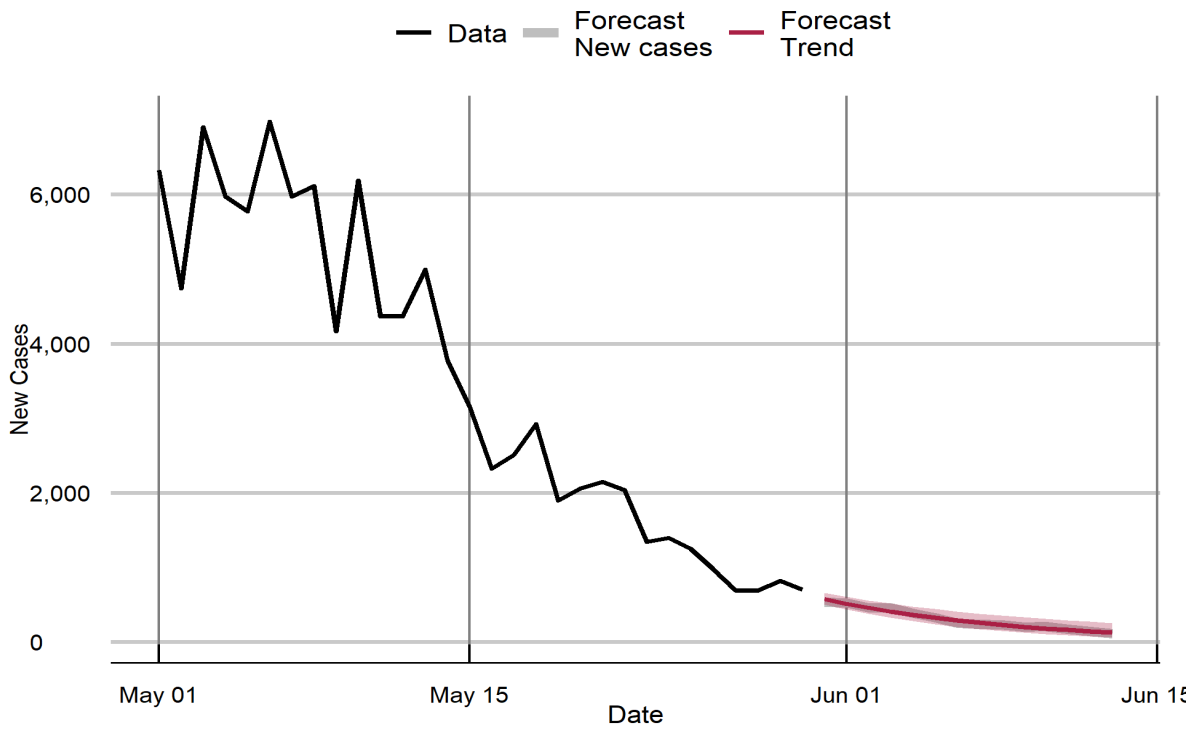
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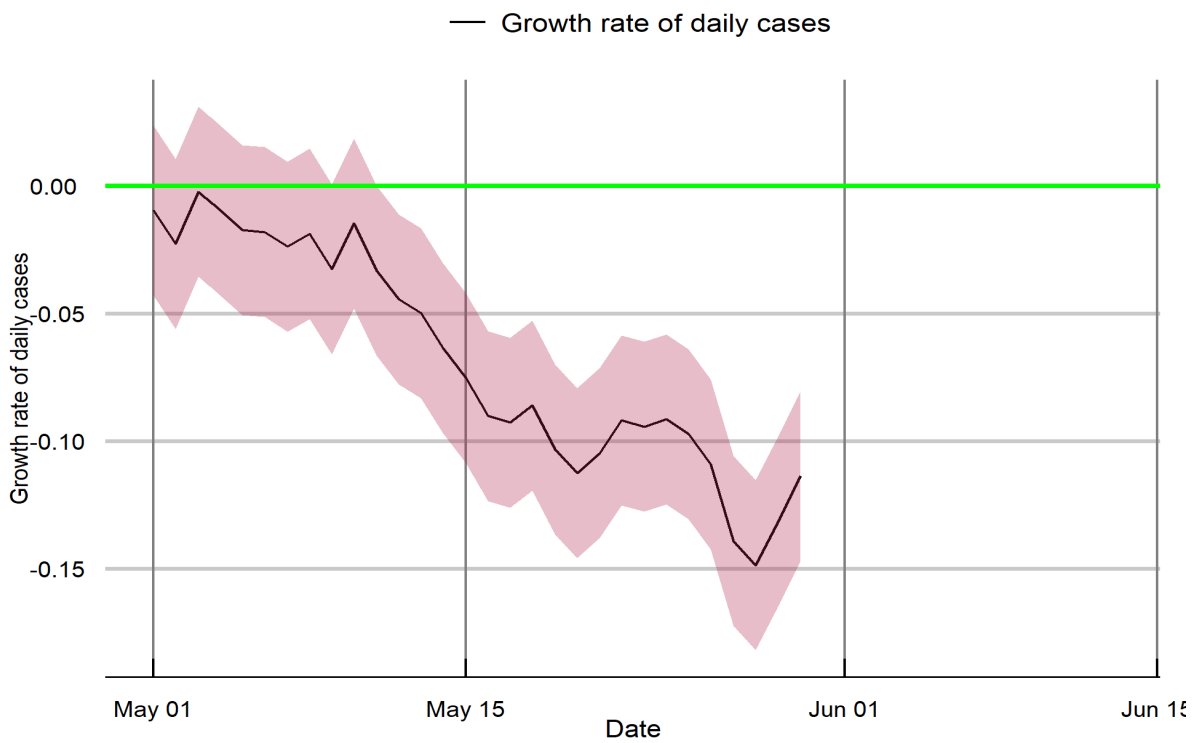
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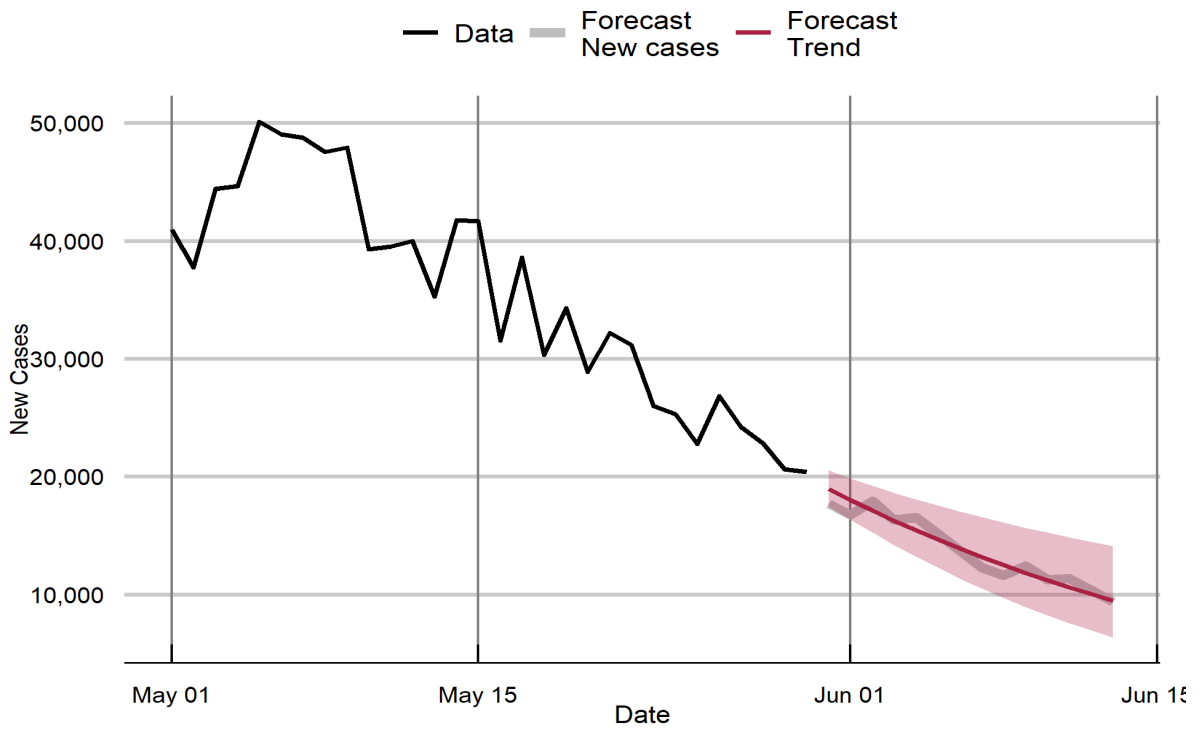
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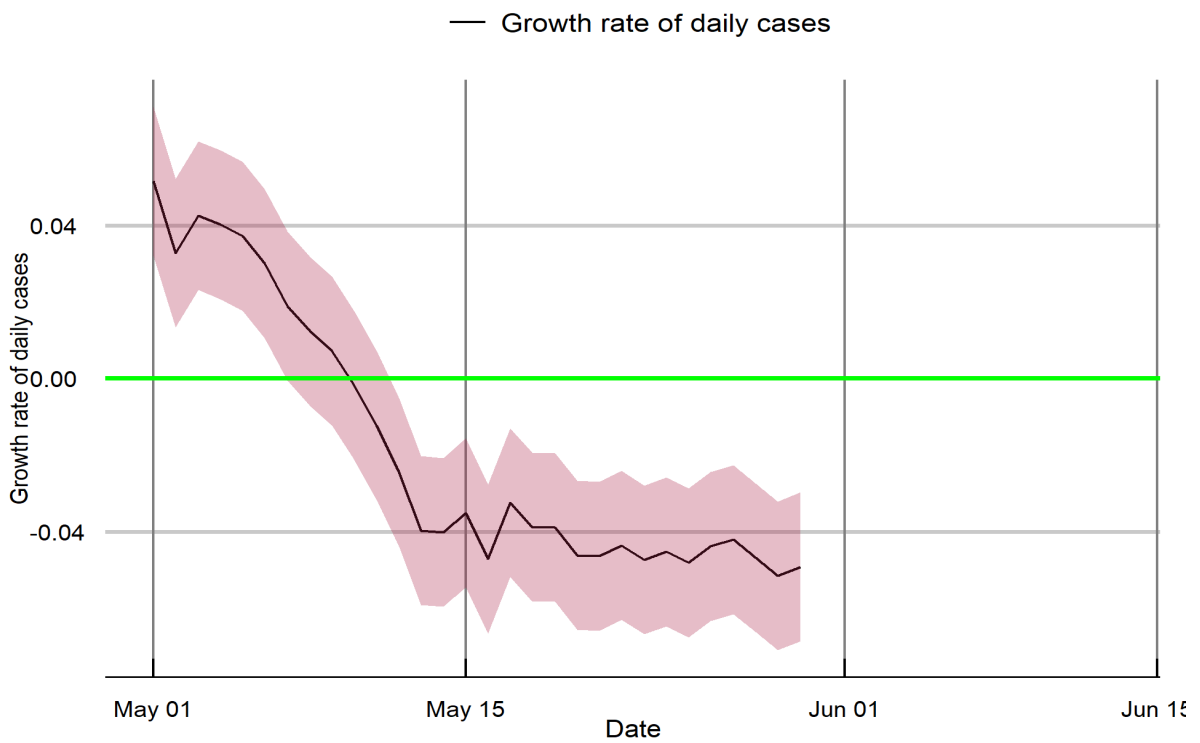
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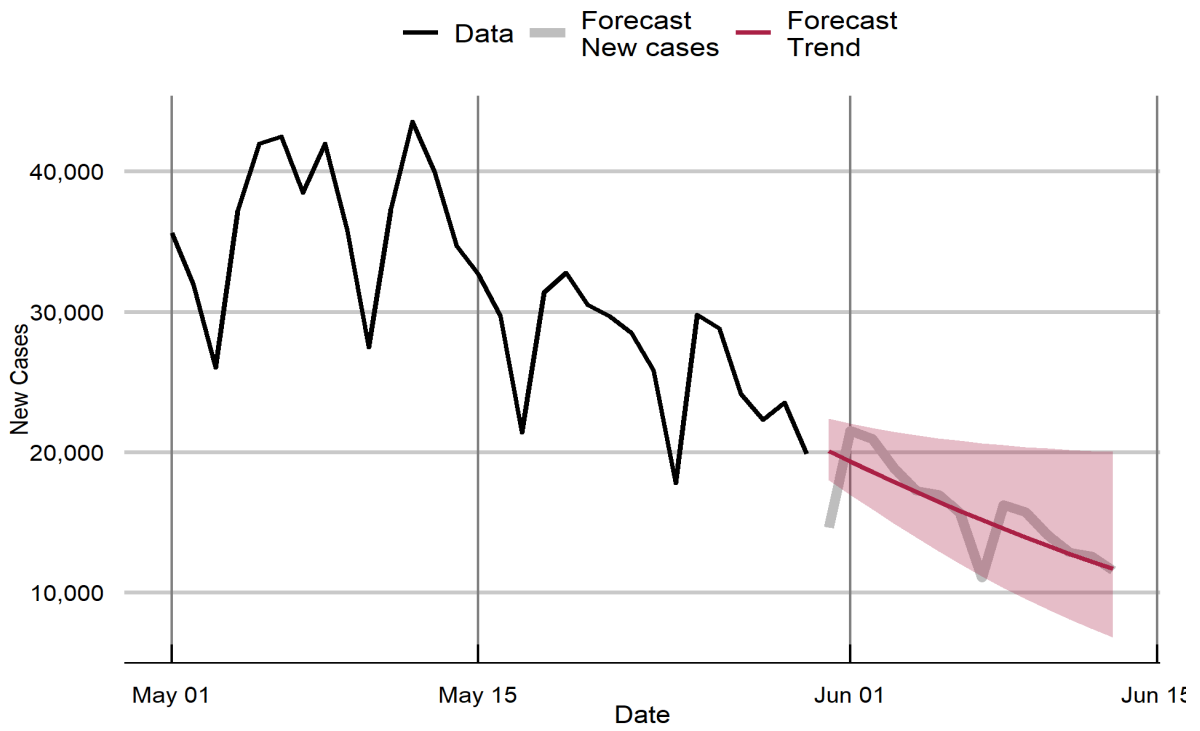
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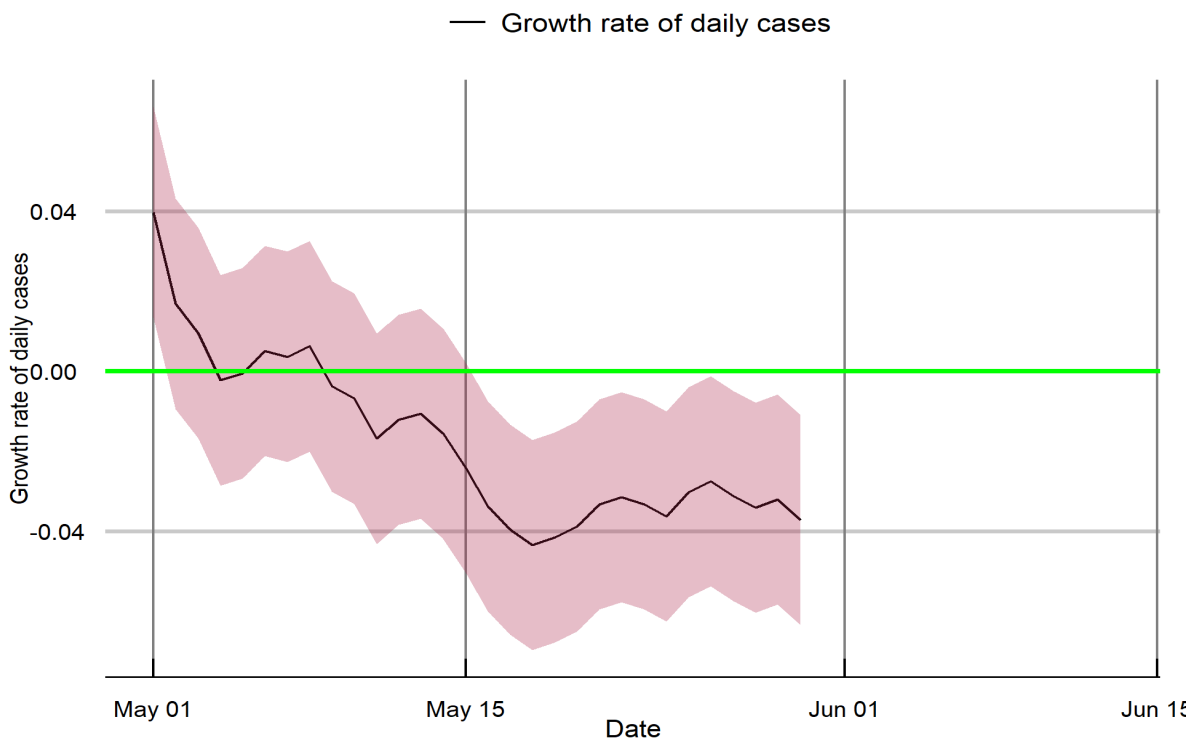
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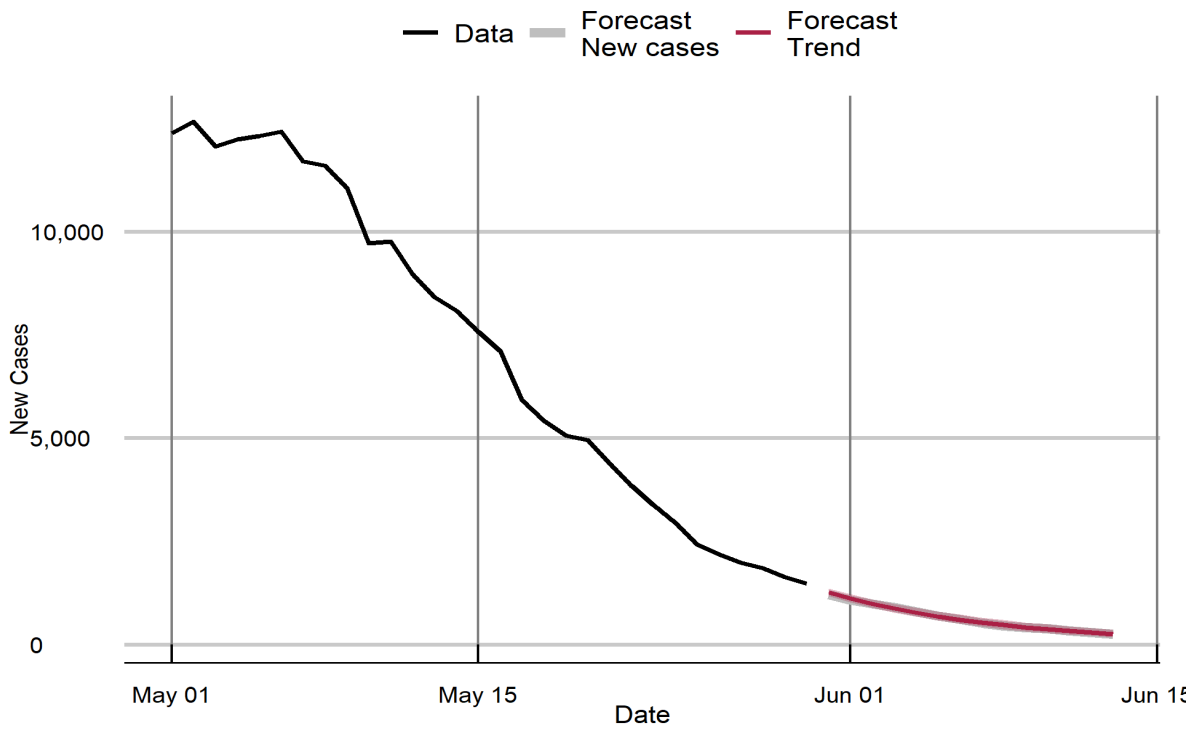
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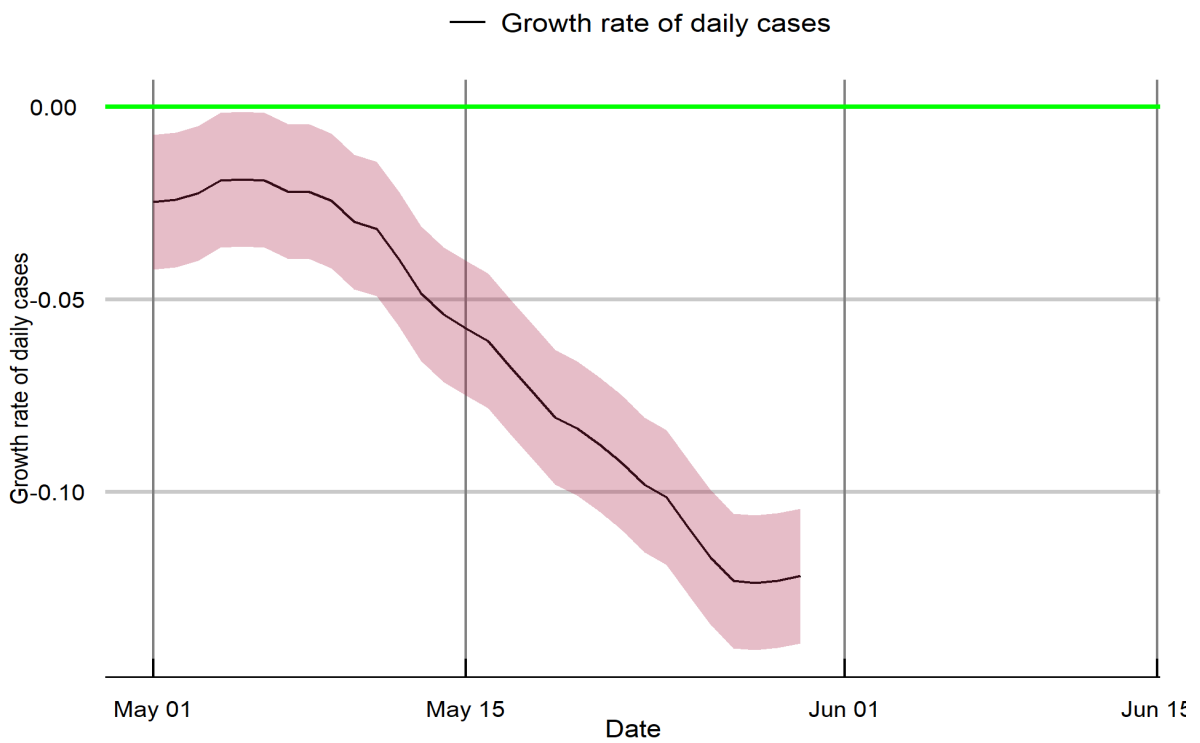
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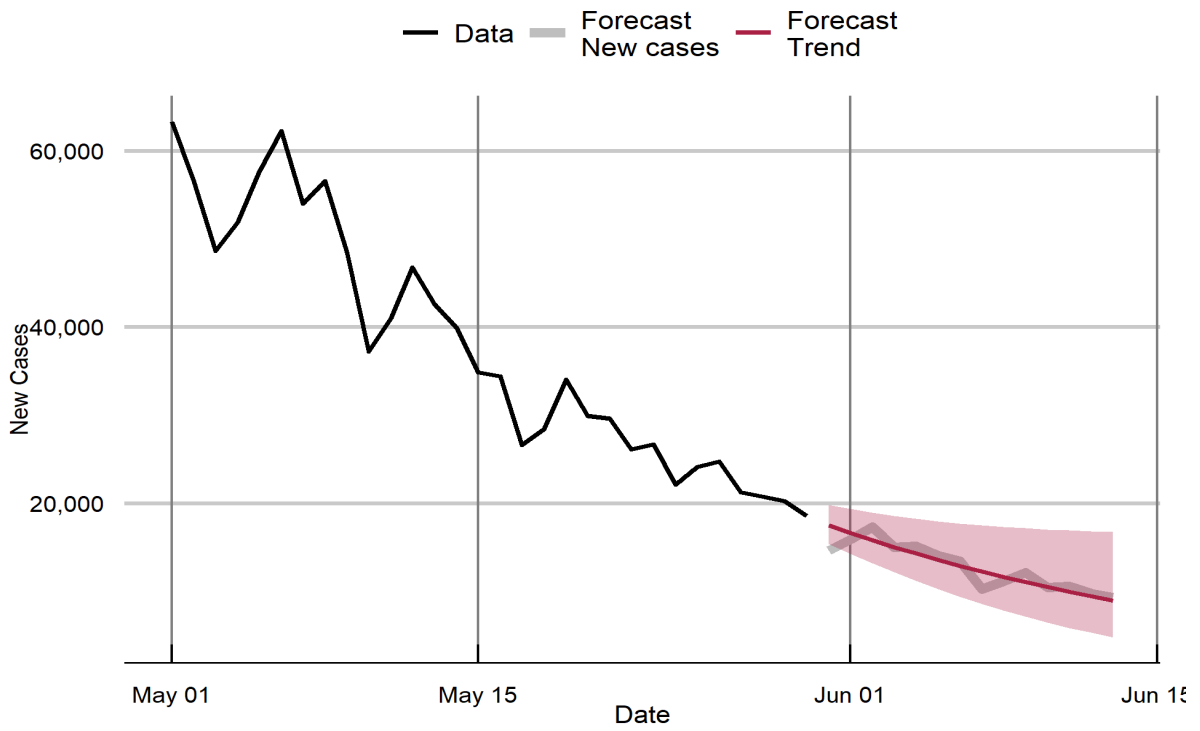
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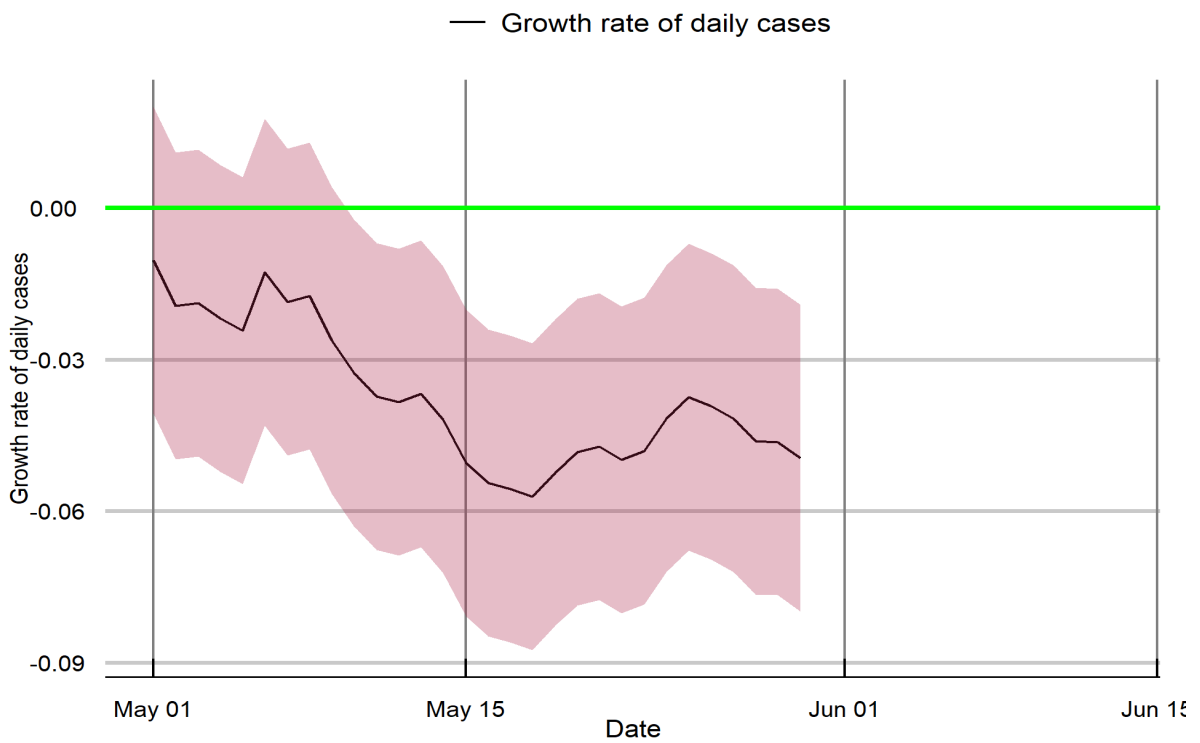
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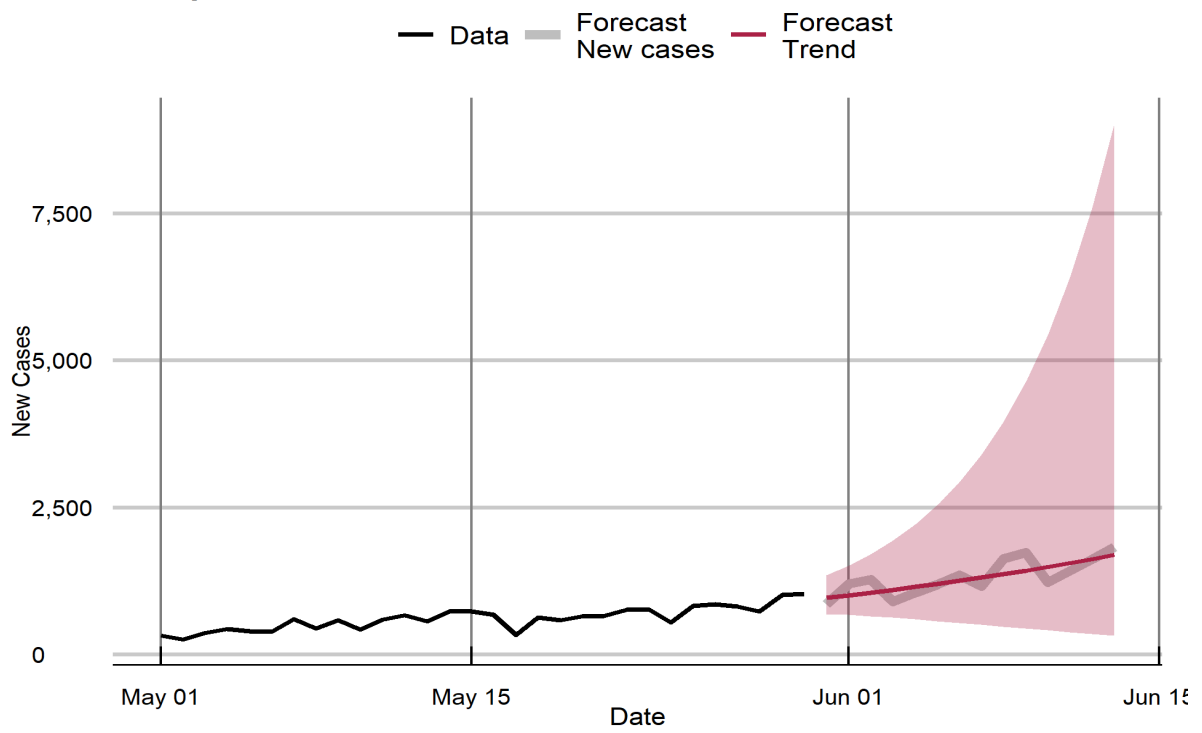
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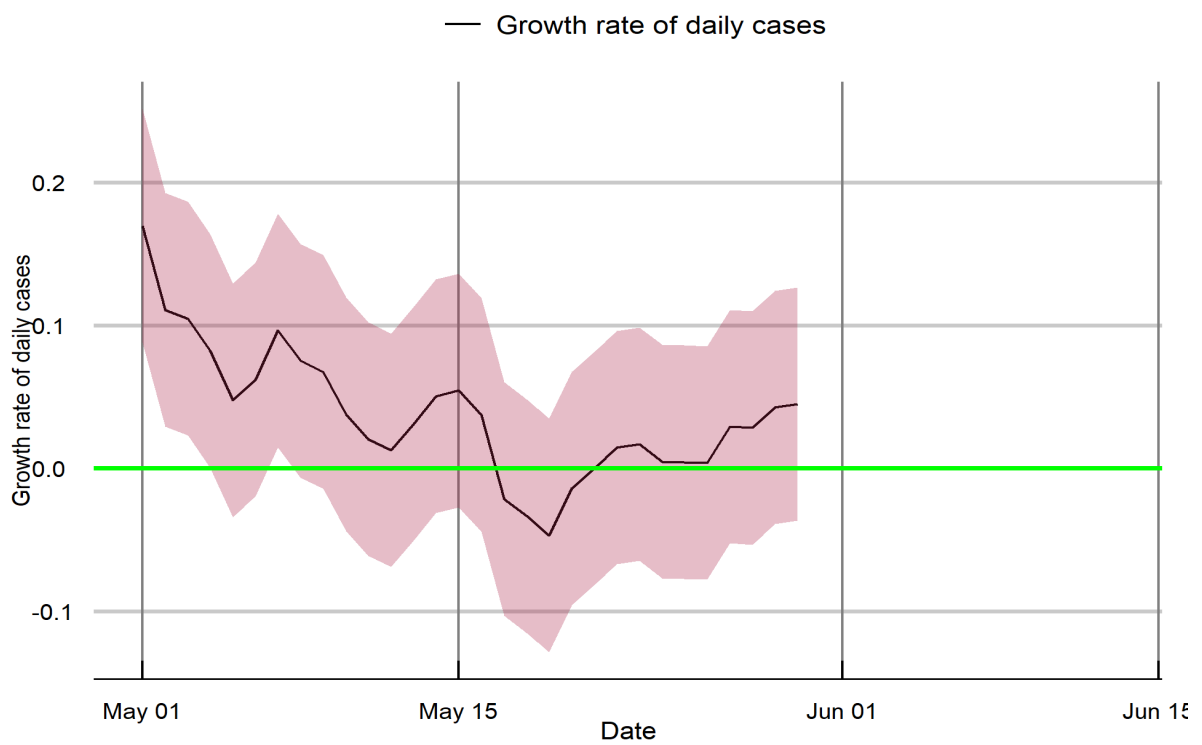
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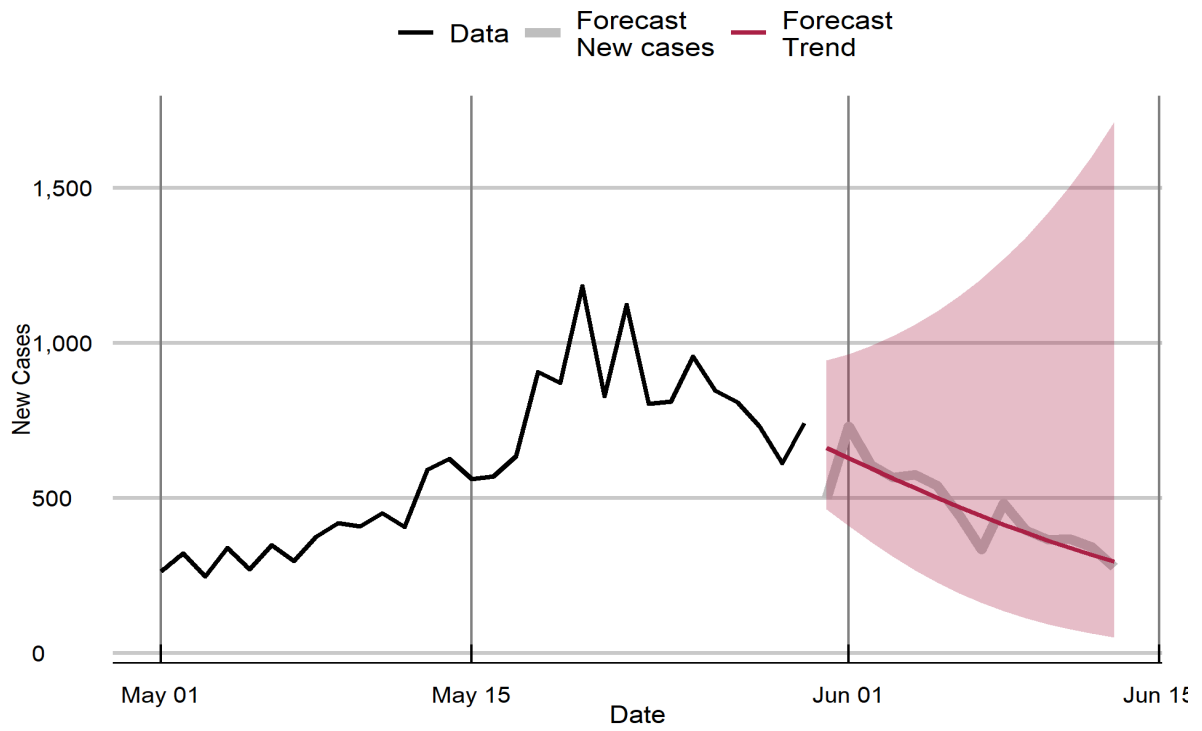
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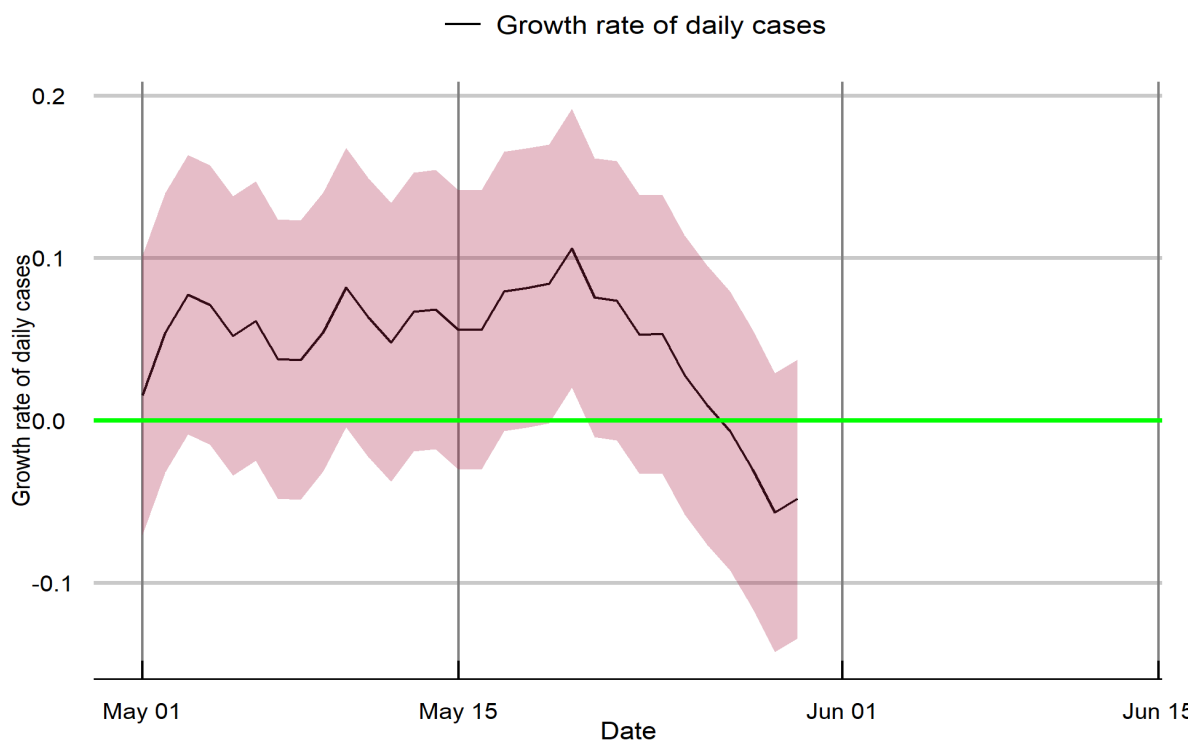
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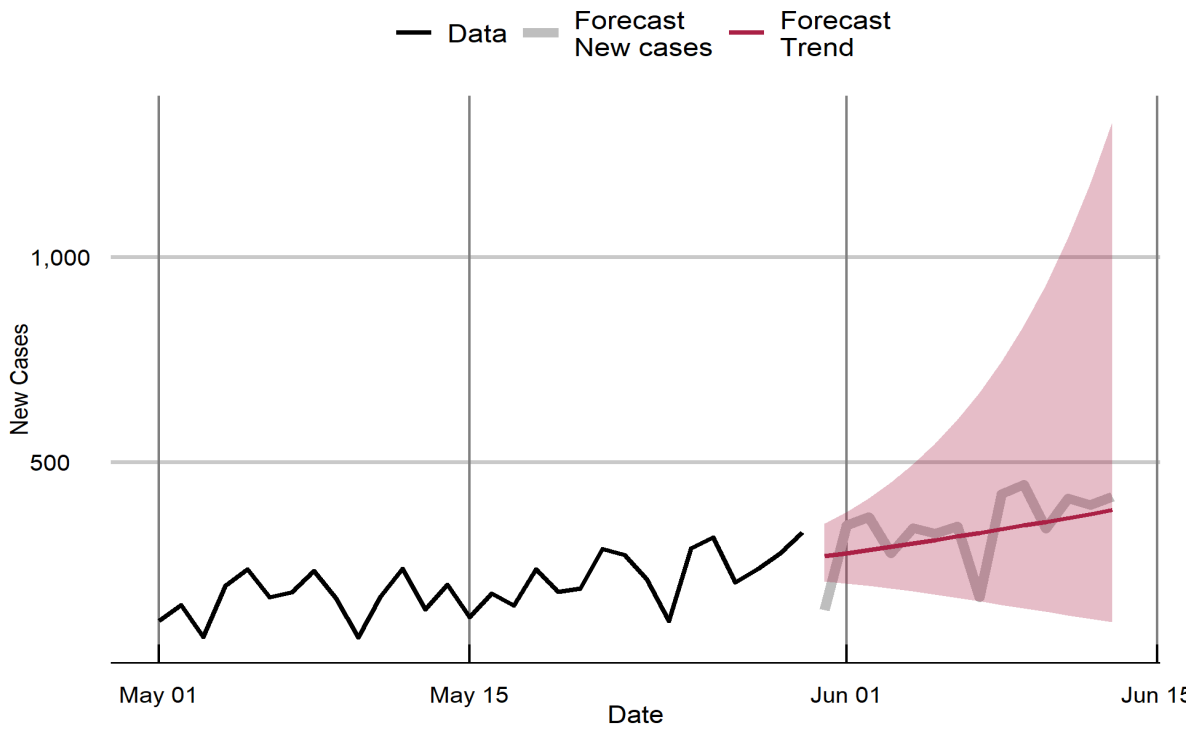
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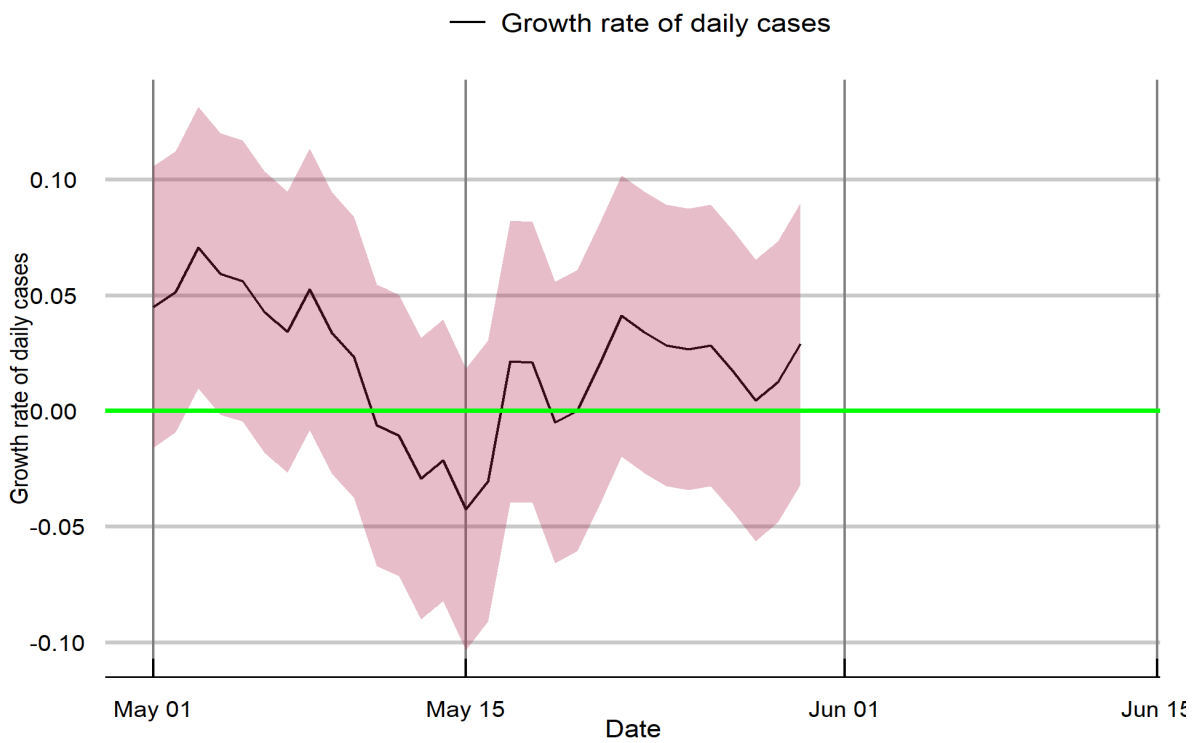
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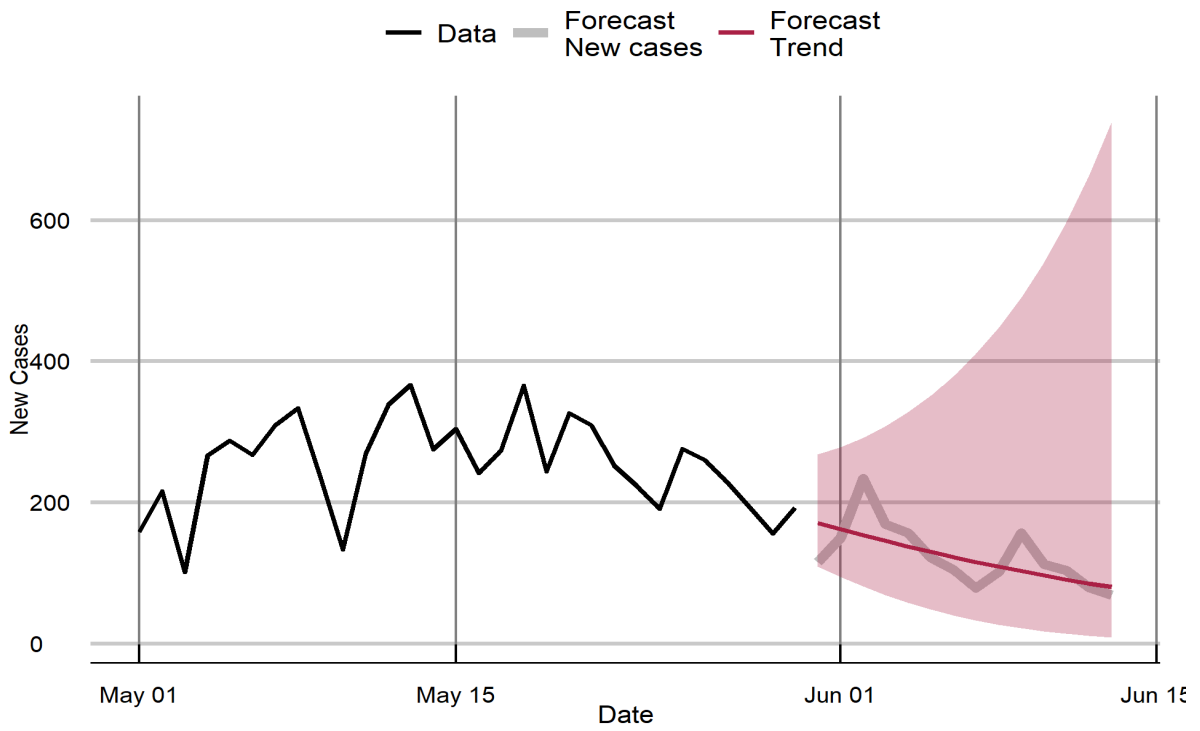
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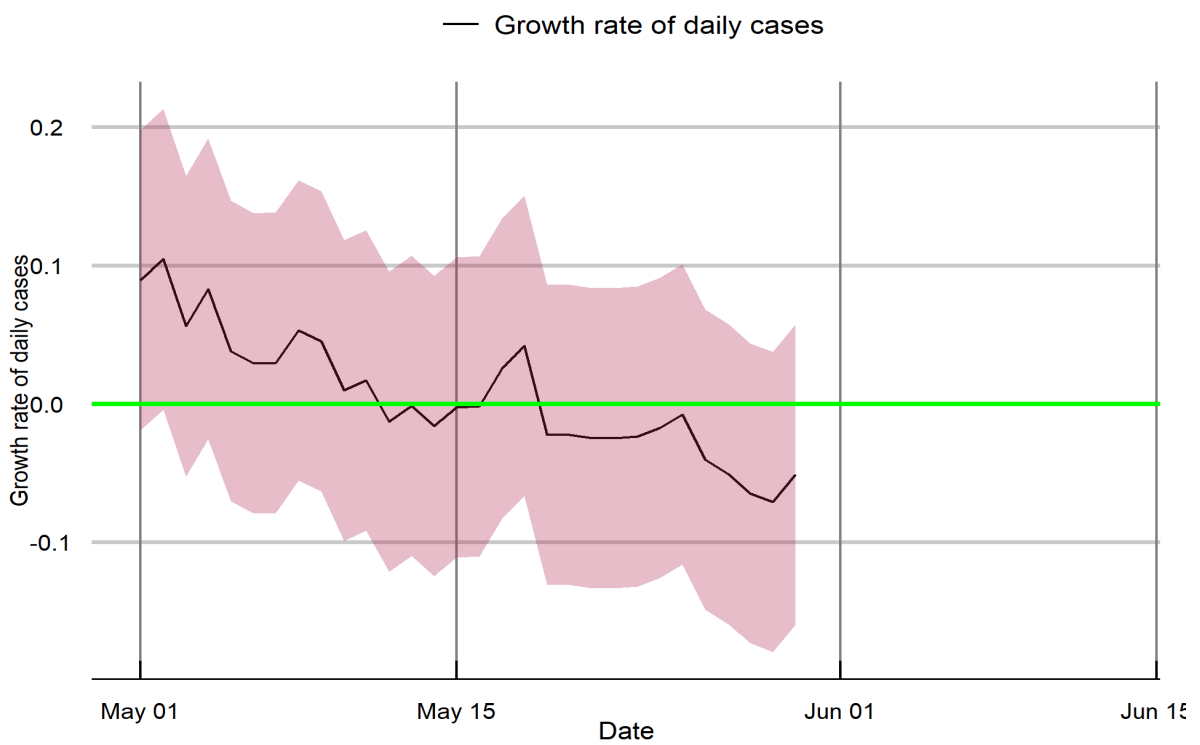
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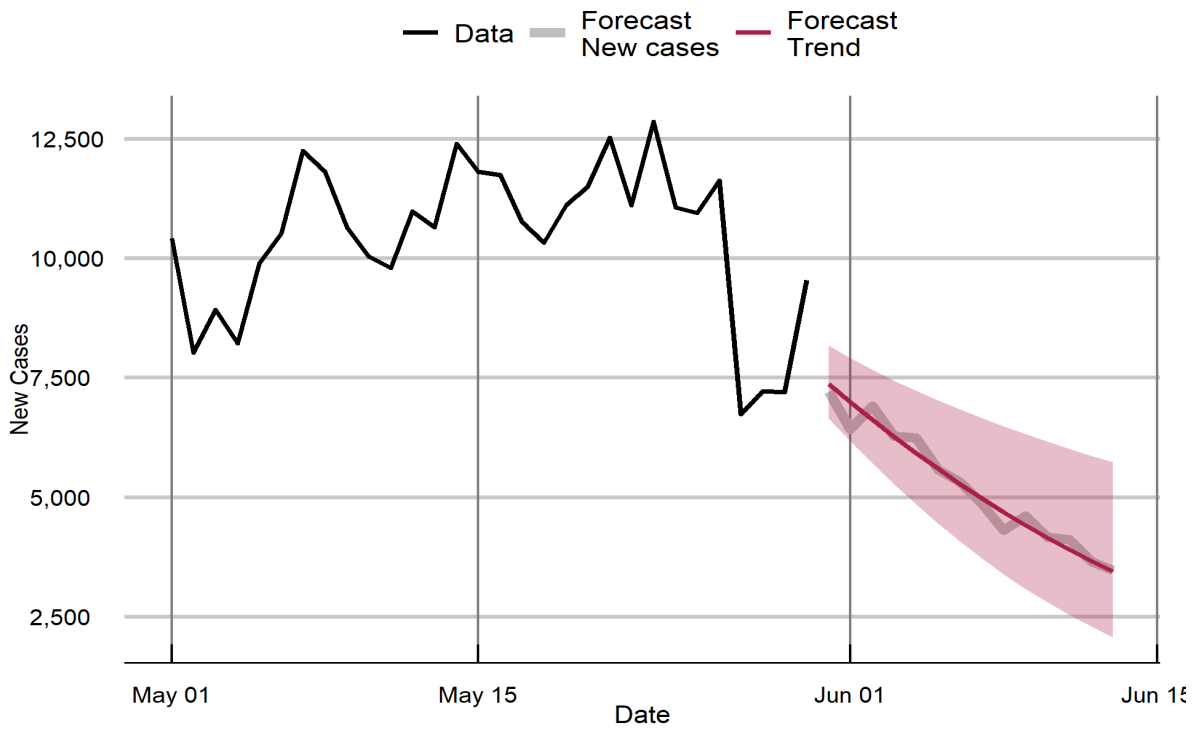
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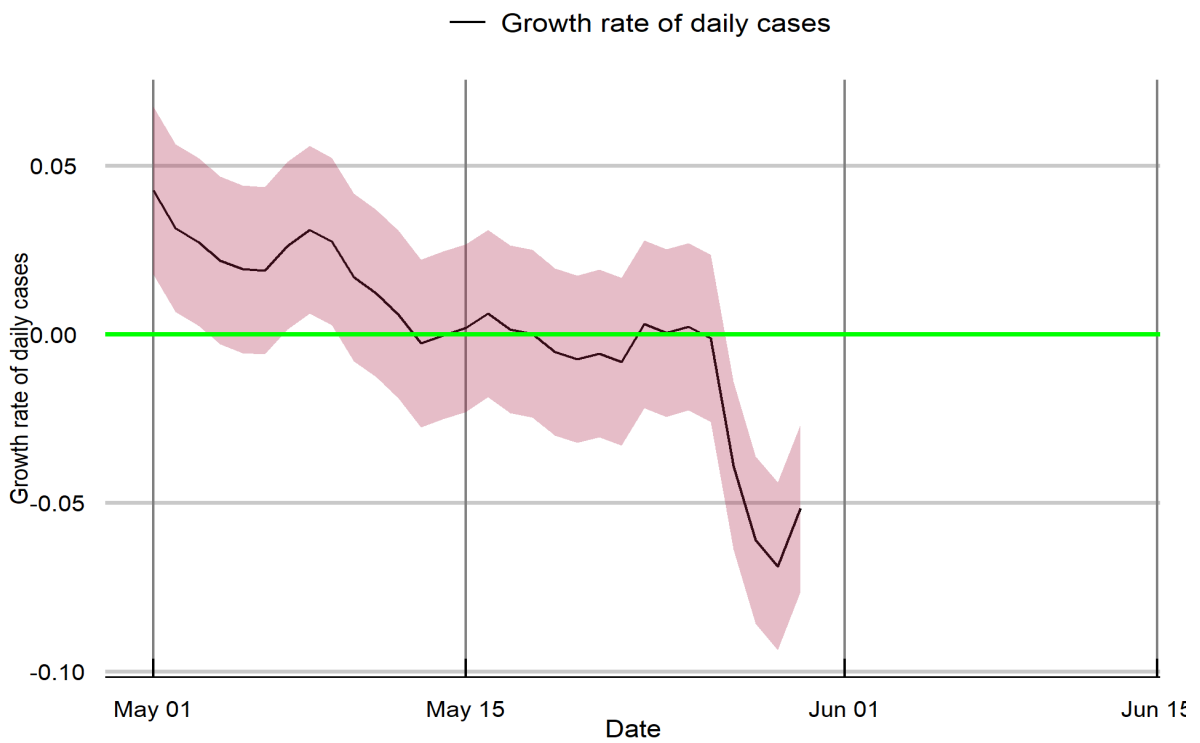
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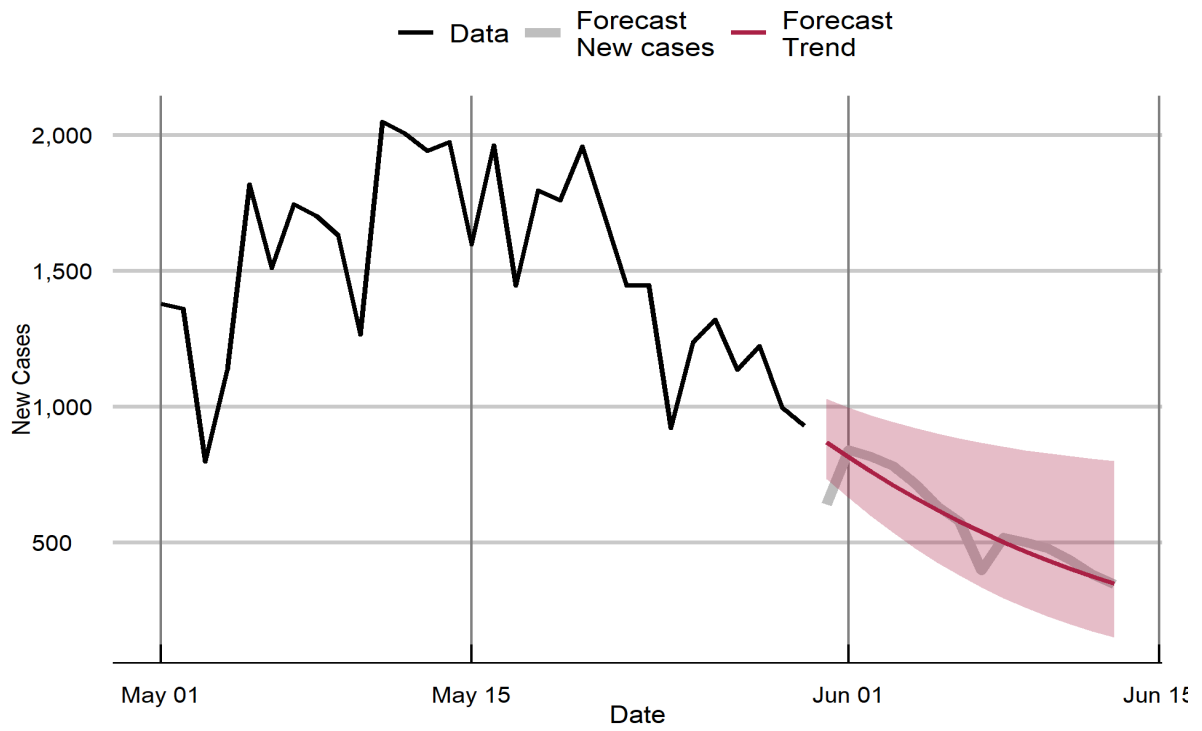
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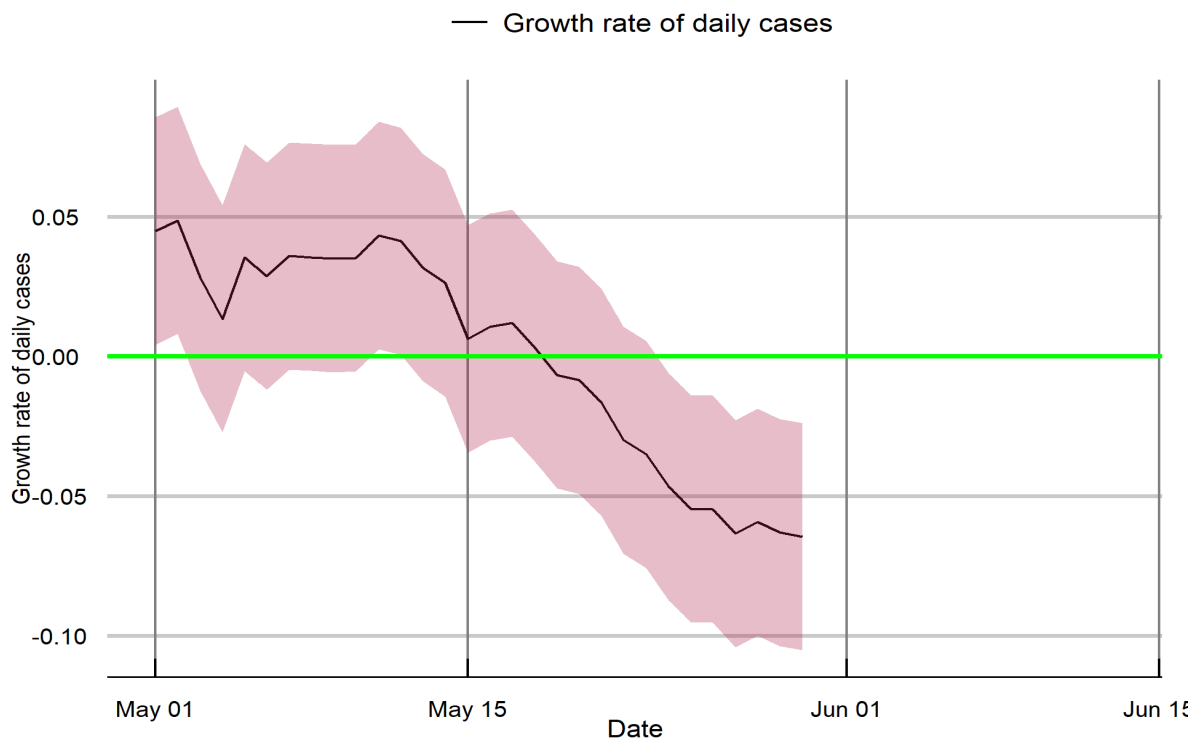
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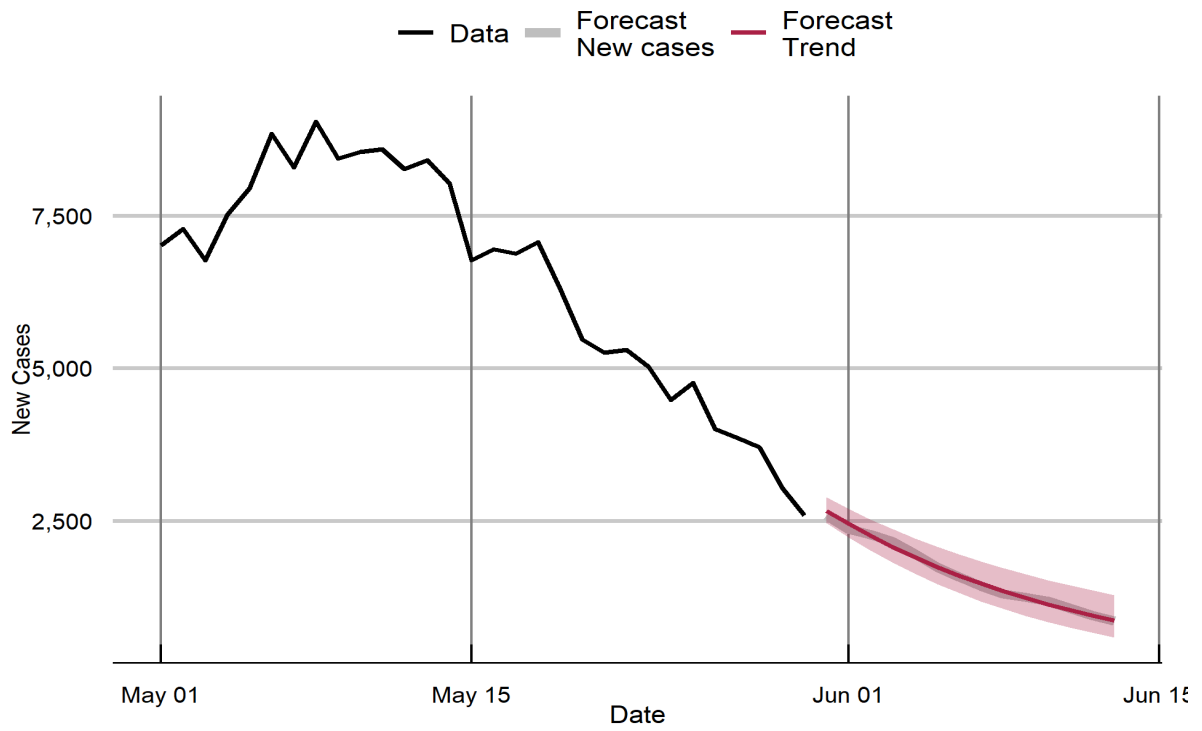
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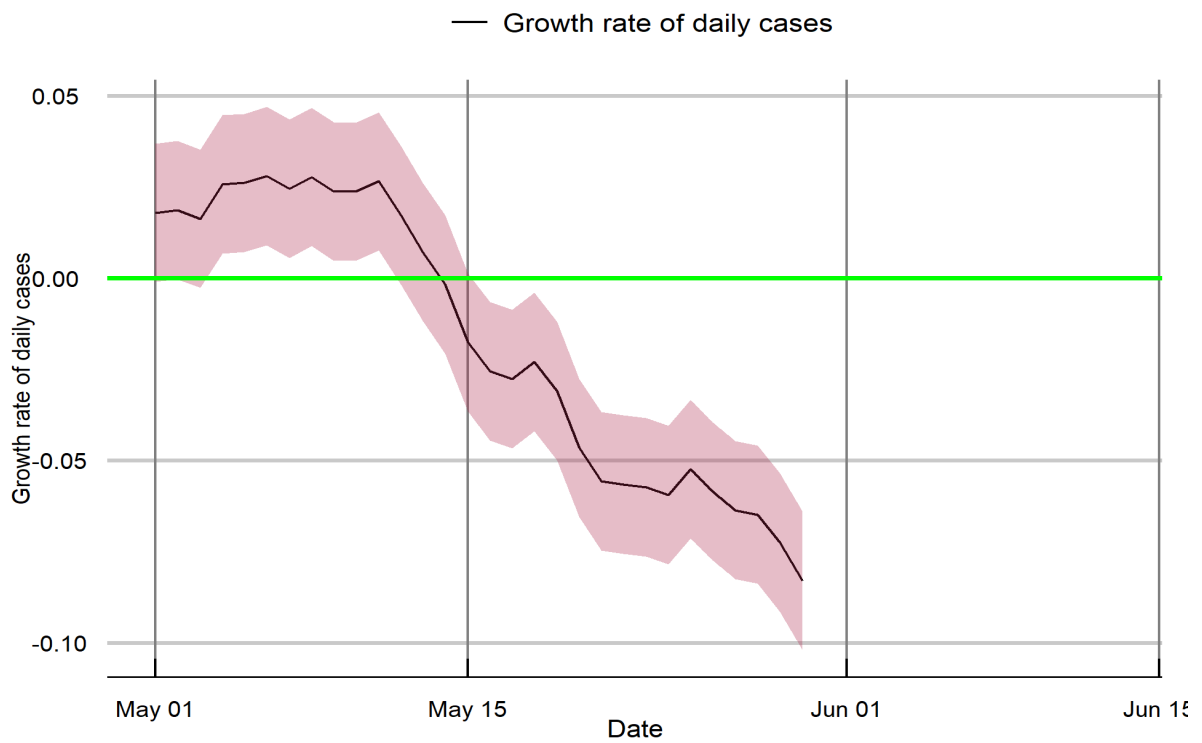
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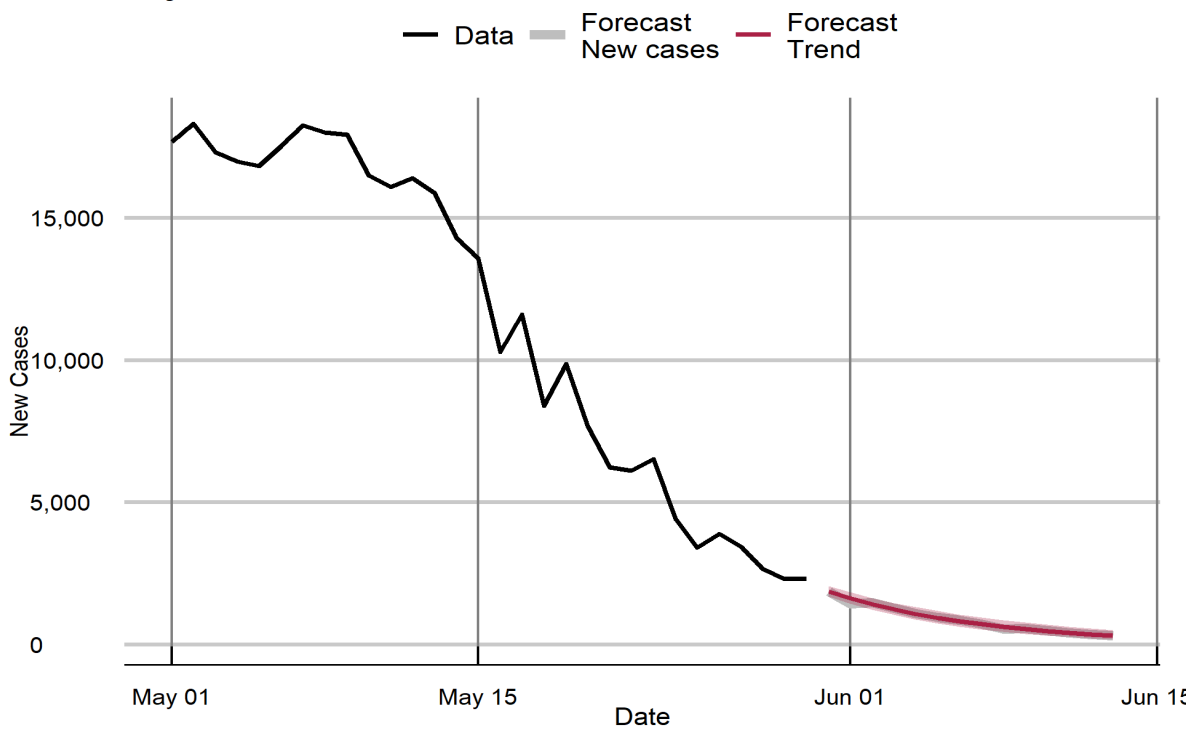
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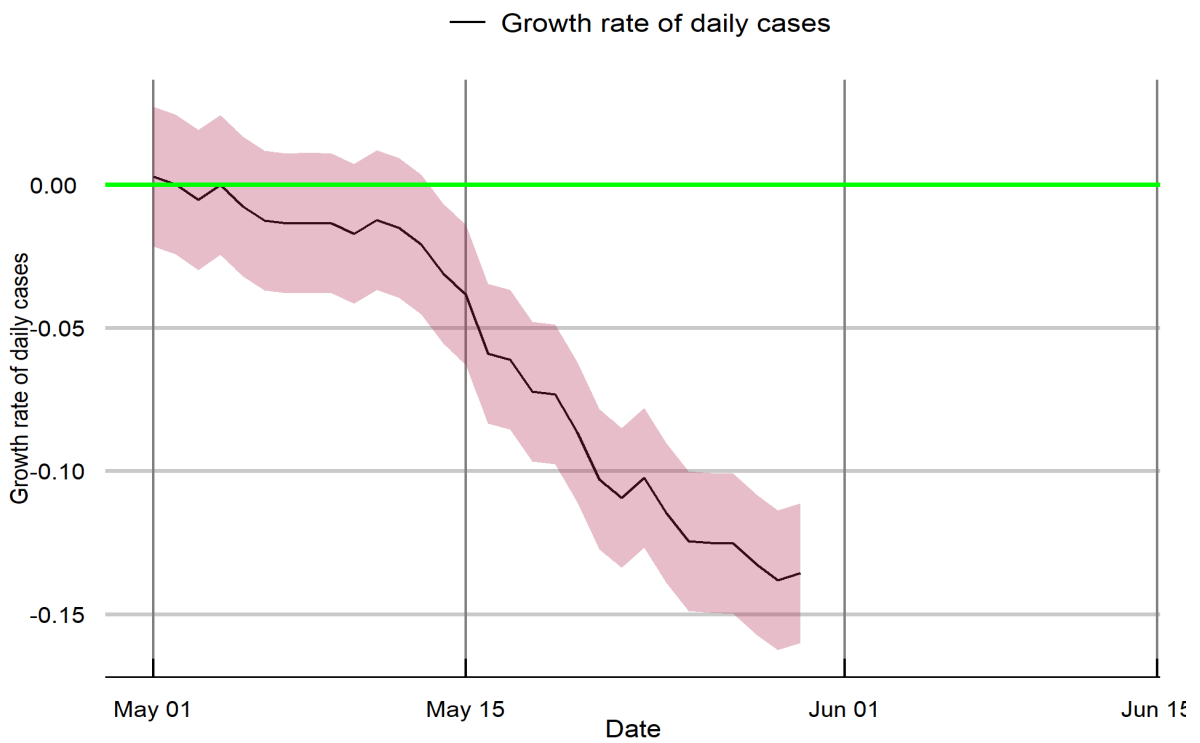
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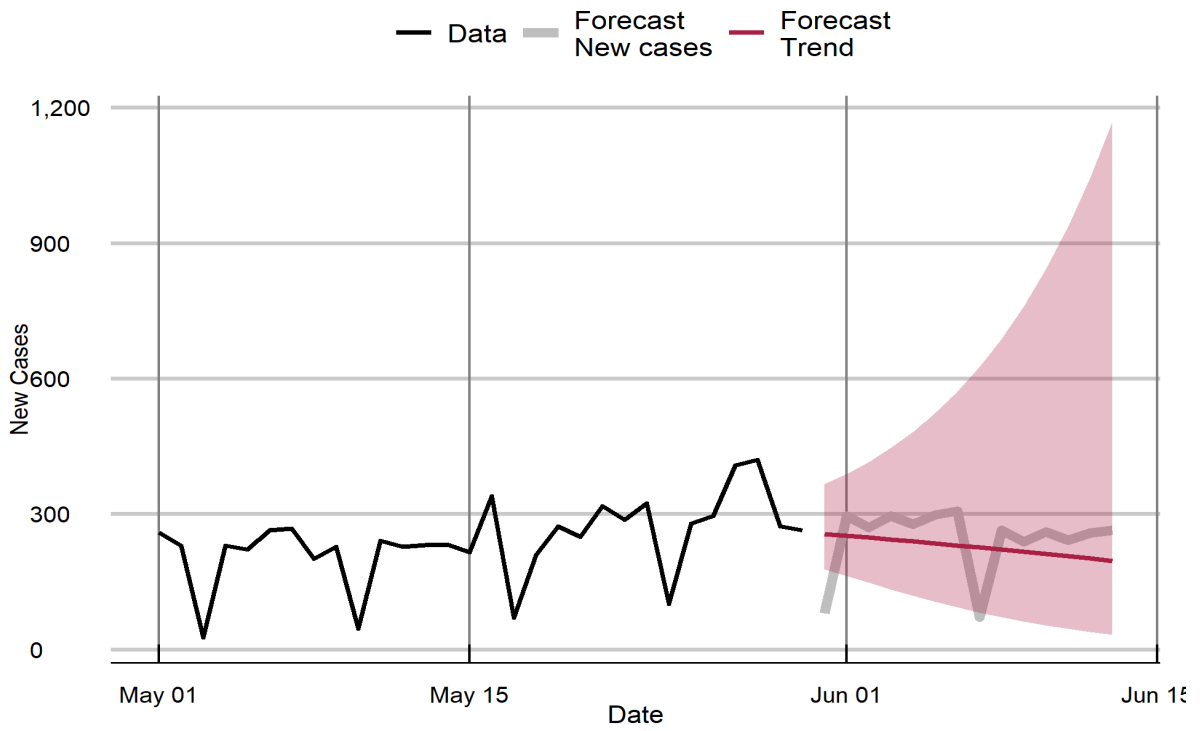
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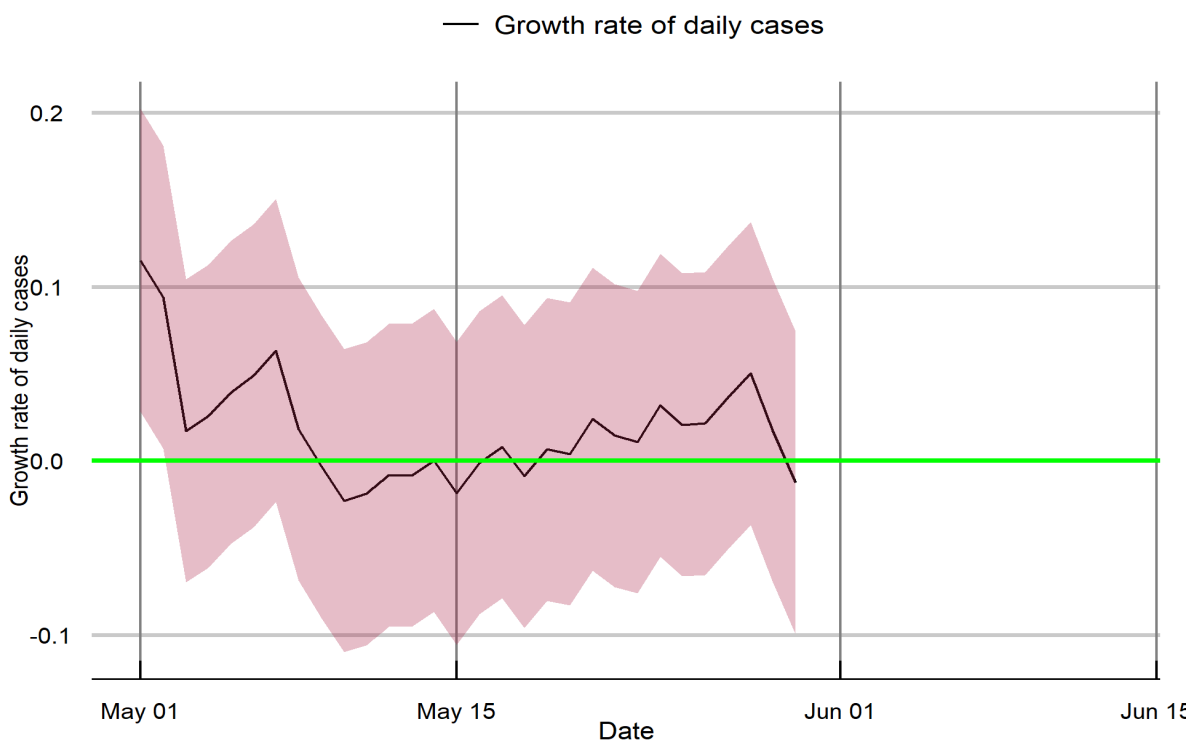
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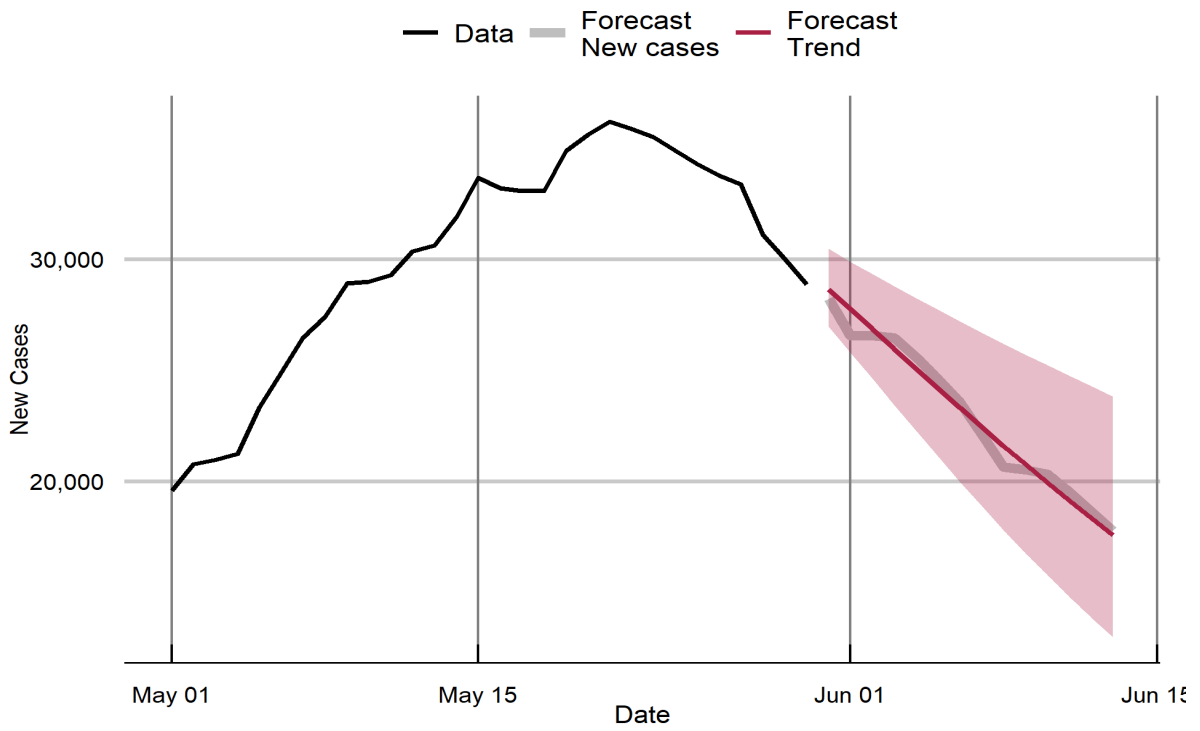
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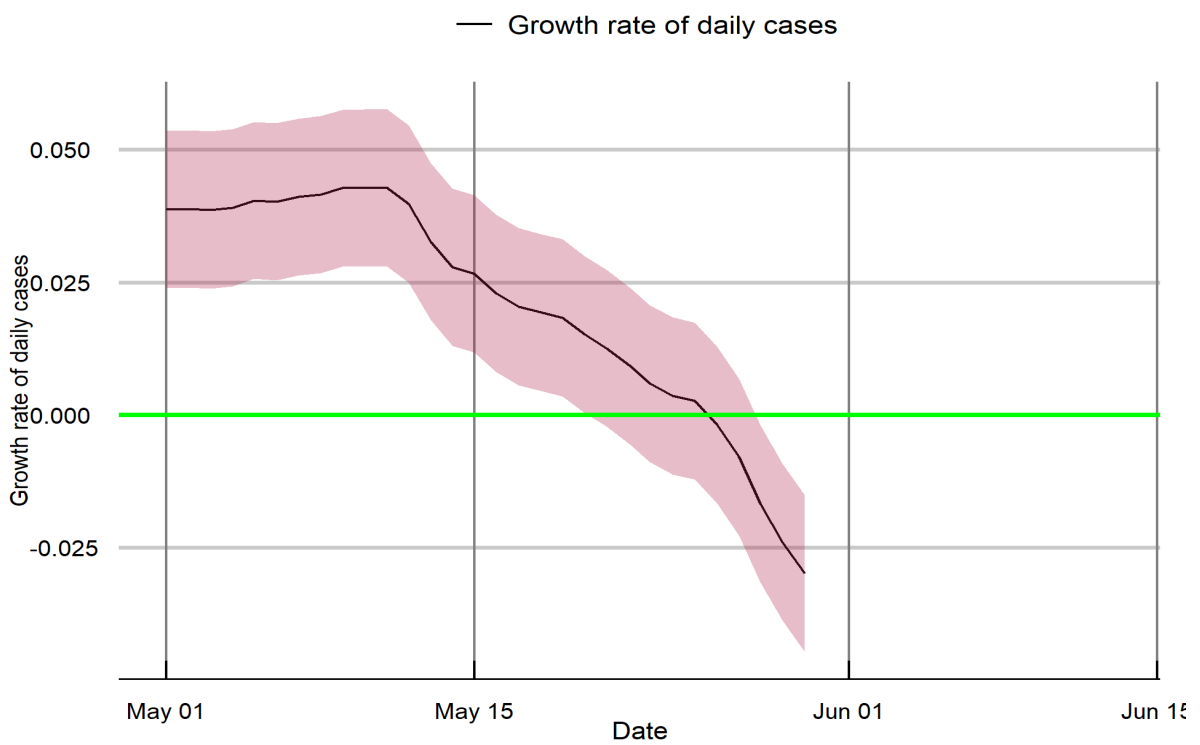
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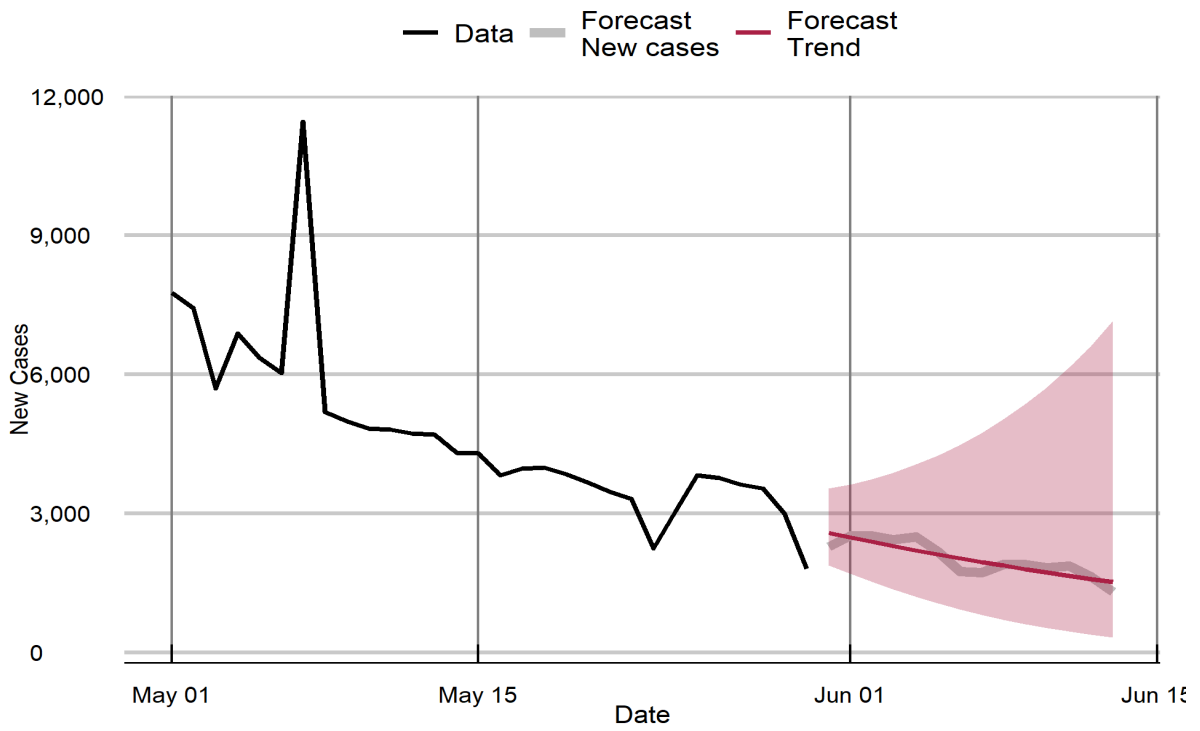
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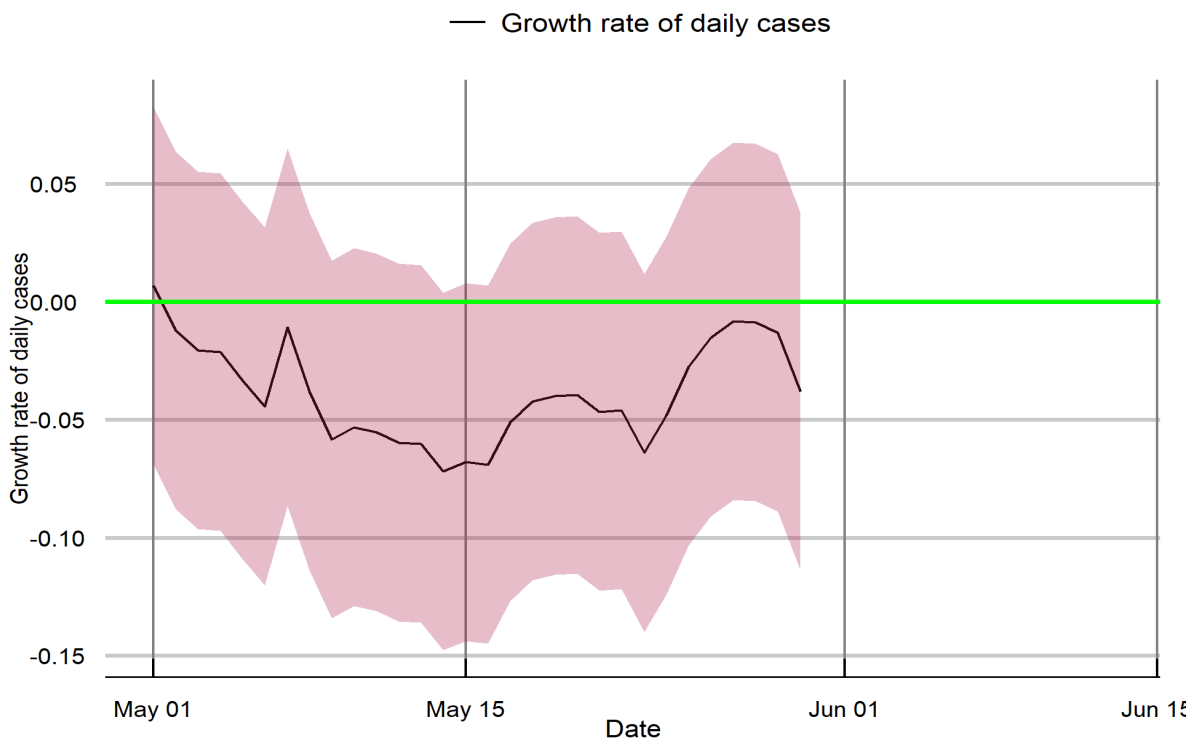
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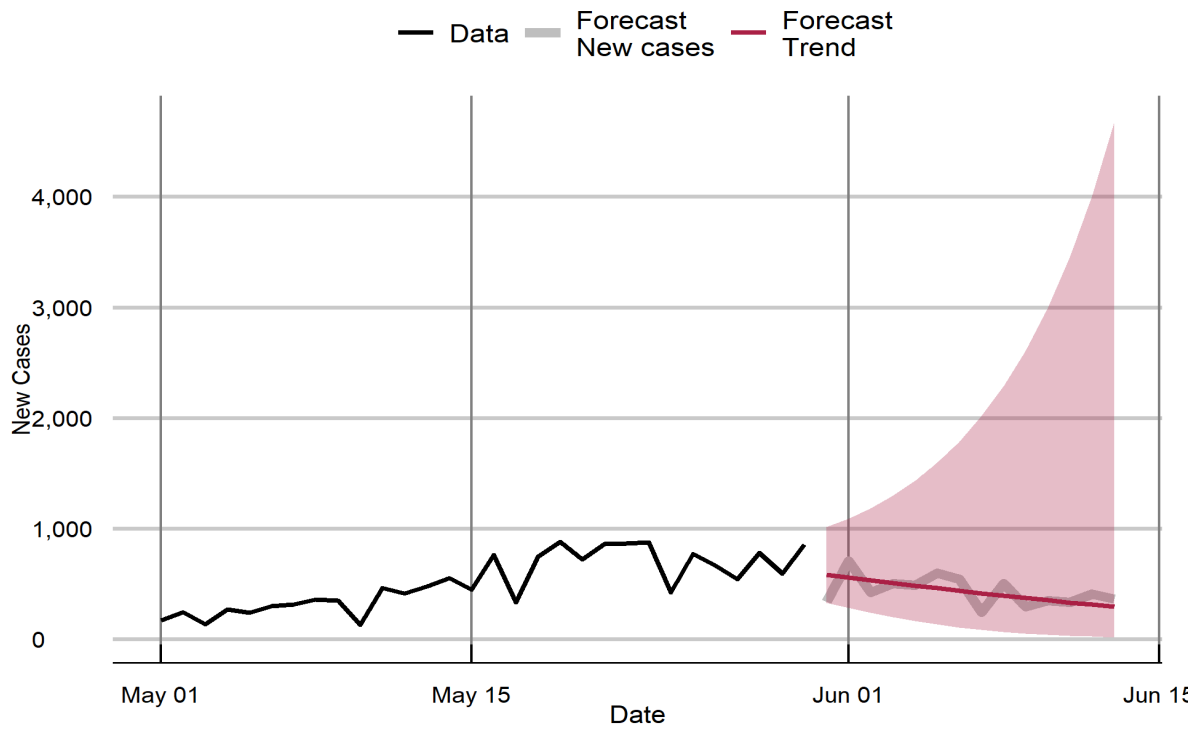
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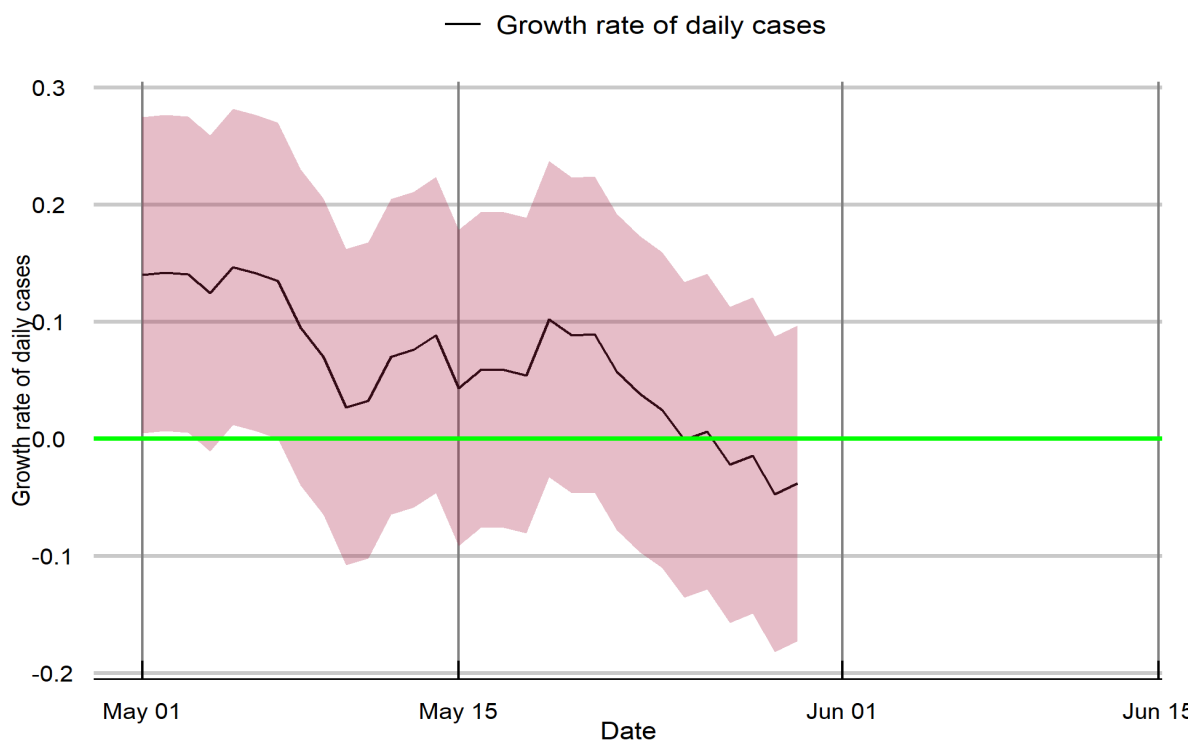
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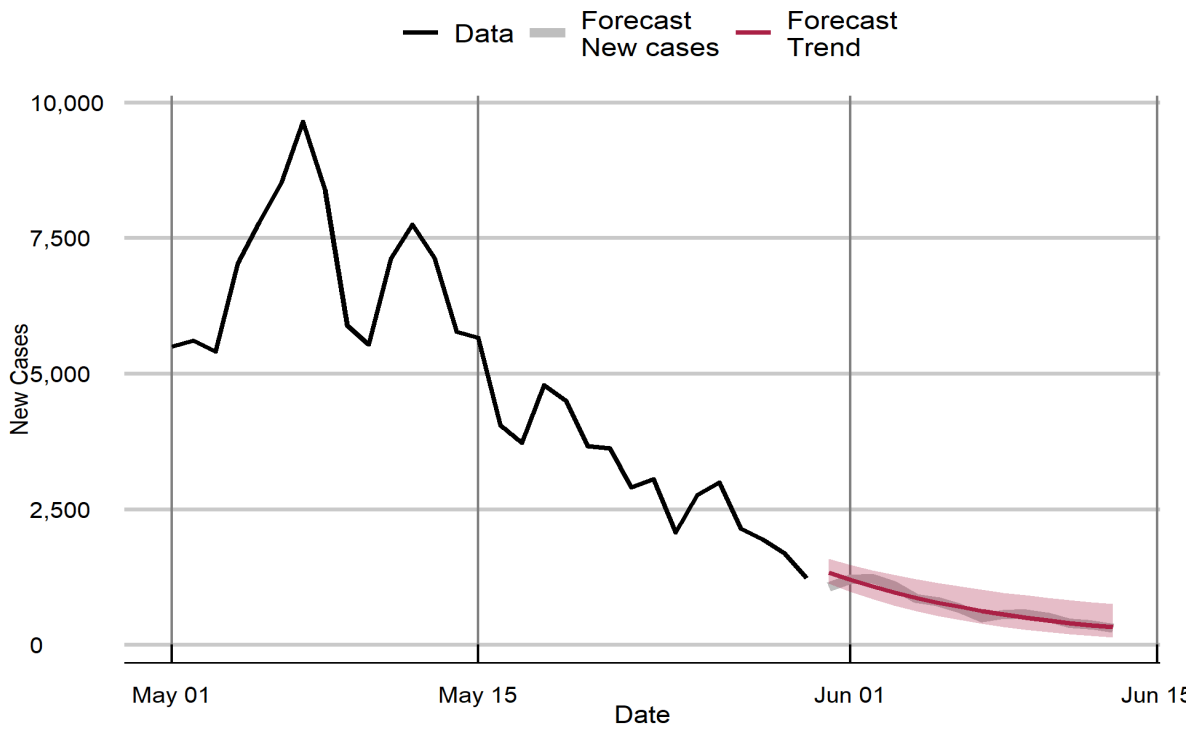
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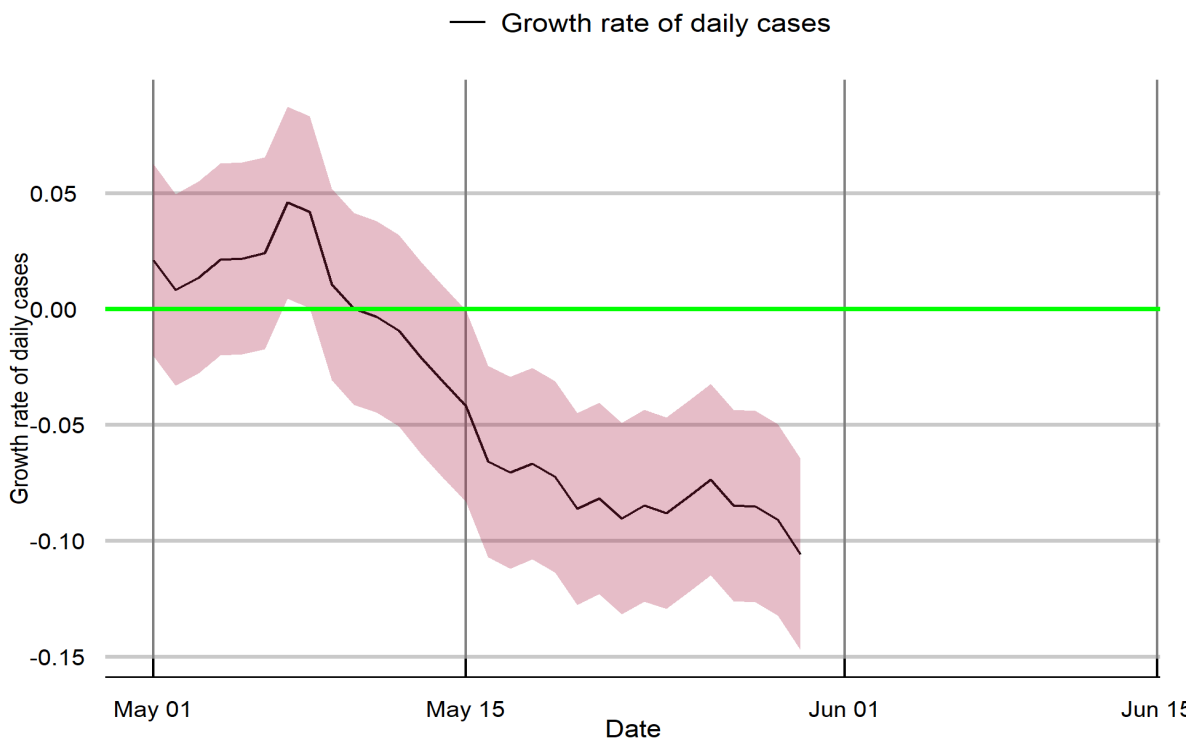
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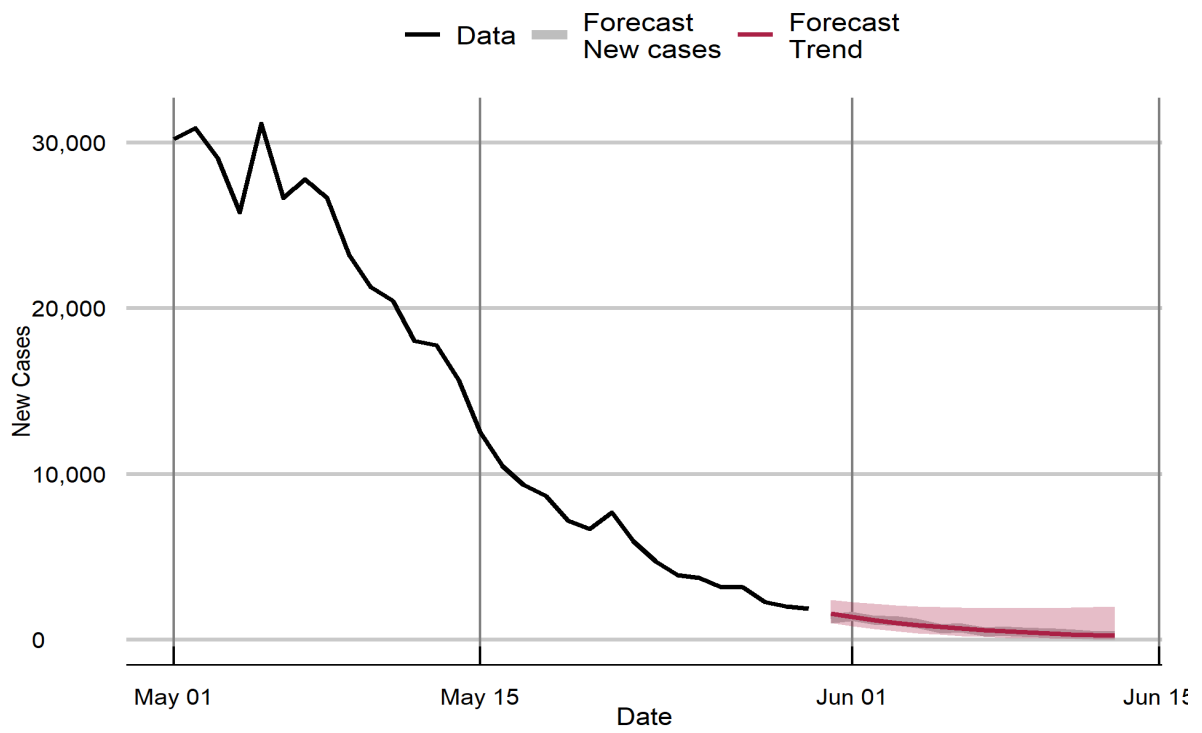
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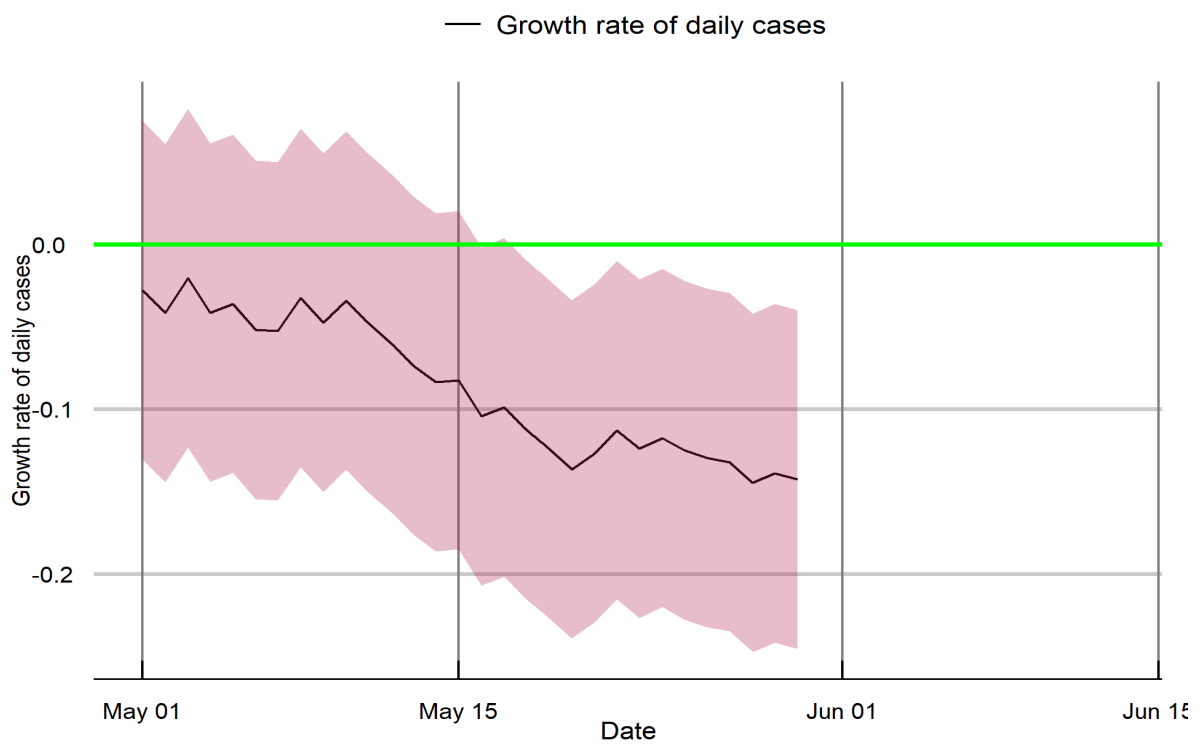
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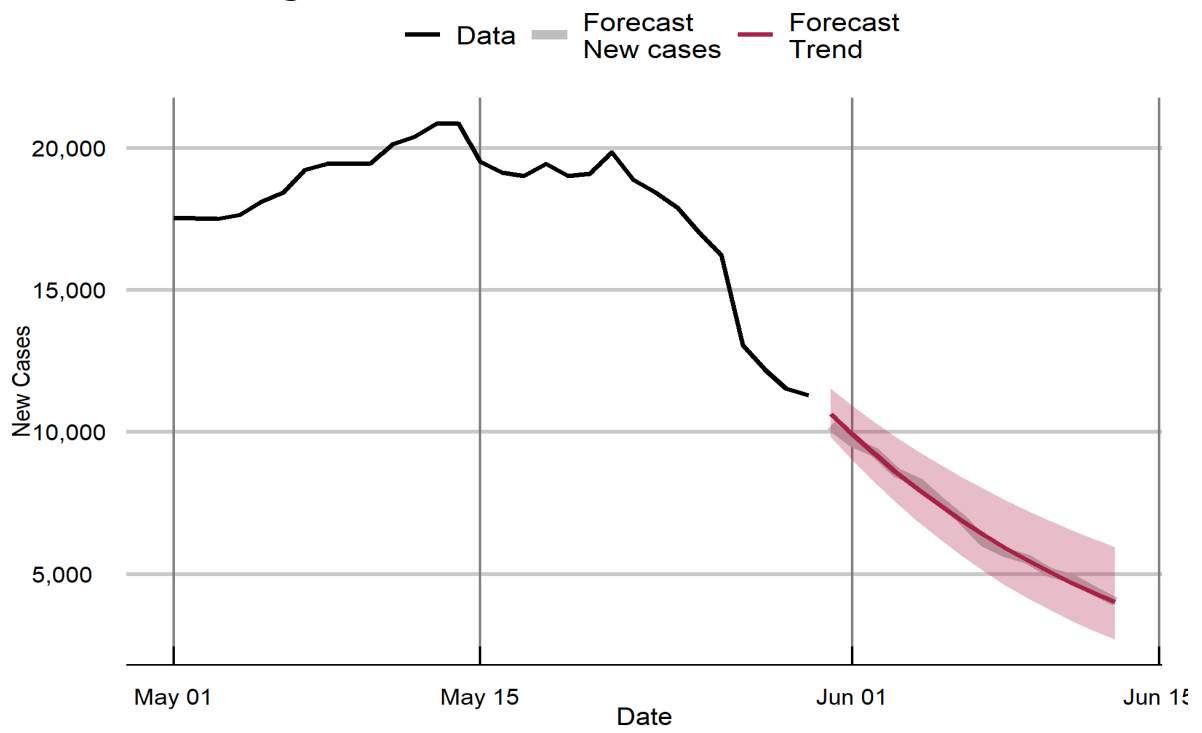
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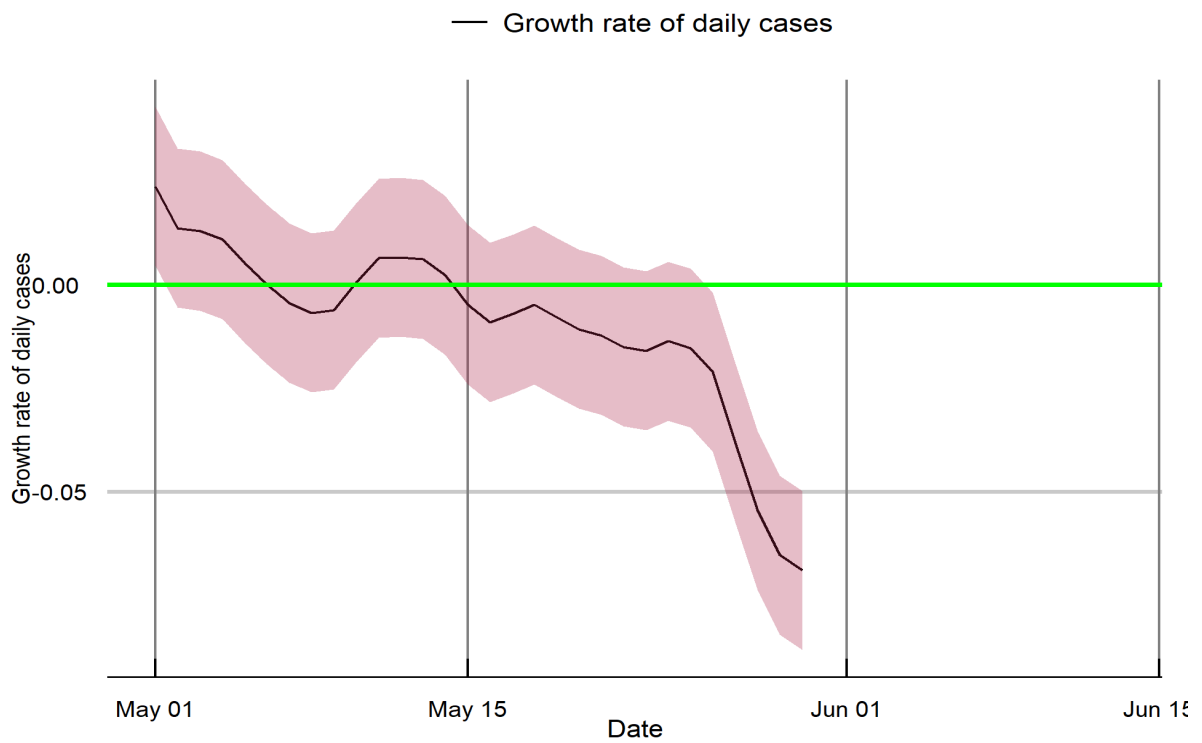
Uttar Pradesh



West Bengal



West Bengal



Notes

Data: COVID-19 confirmed cases and deaths data are sourced from COVID19-India API: <https://api.covid19india.org/>

New cases: forecasts. Forecasts above are based on a structural time series model that uses all the data in estimation but adapts to the trend emerging in the most recent period. The method is described in: Harvey, A. and P. Kattuman (2020). 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/ozgjx0yn/release/2> , and 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*. Forthcoming.

Forecast accuracy: When estimated with data up to May 23, the mean absolute percentage error of the forecasts of cases for India over the 7 day period, May 24-30, is 3.8%. Forecast accuracy will in general be lower for the smaller states / union territories. It is important to pay attention to the confidence intervals around the forecasts. The coverage of the confidence intervals presented is 68%, implying there is 16% probability of the upper bound being exceeded.

New cases: growth rate. The filtered trends presented for daily growth rates of cases are estimated using the Kalman filter, applied to the observed series. The method filters out day of the week effects and random noise to reveal the underlying signal. Unlike methods such as the moving average, this method adapts the trend to changes in real time and characterises underlying patterns of surges or attenuations that are hidden in the volatile series. The method is described in the papers listed above.

R: The *R*-estimates are based on the nowcast of the growth rate; the estimation approach is described in Harvey, A. and P. Kattuman (2020b). A farewell to *R*: Time series models for tracking and forecasting epidemics. *Center for Economic Policy Research* (CEPR) working paper, 51. <https://cepr.org/content/covid-economics>. The confidence interval is based on one standard deviation, with coverage of 68%.

The accuracy of forecasts rely on the quality of the published data. Further, changes in government pandemic policies and in transmission relevant social behaviour will realised numbers to depart from forecasts.

Andrew Harvey*, Paul Kattuman*, Rajeev Sadanandan#, Stefan Scholtes*, Craig Thamotheram+

*University of Cambridge

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