

Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

6 June 2021



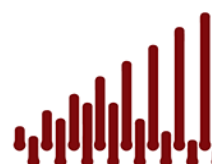
Centre for
**Health Leadership
& Enterprise**



**UNIVERSITY OF
CAMBRIDGE**
Judge Business School



HSTP
Health Systems
Transformation Platform



**National
Institute of
Economic and
Social Research**

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 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.

As of 6 June 2021, the estimated Reproduction number R_t for India stood at 0.79, significantly below one. Newly reported COVID-19 cases are likely to decline to about 44,000 per day by 20 June 2021.

All Indian states and union territories are on downward trajectories for new cases. The estimated trend value of the daily growth rate was -5.9% as of 6 June 2021. This implies that reported new cases will halve in 11 days, under the assumption that the growth rate remains constant.

There are indications that the growth rates of cases, though still negative, have reversed direction from their downward paths in recent days in Bihar, Delhi, Jharkhand, and to lesser extent in Punjab, Rajasthan and Uttar Pradesh.

The trend value of reported daily deaths in India is likely to decline to about 1,450 per day by 20 June 2021. Reported deaths are likely to increase in Mizoram, Odisha and Tripura.

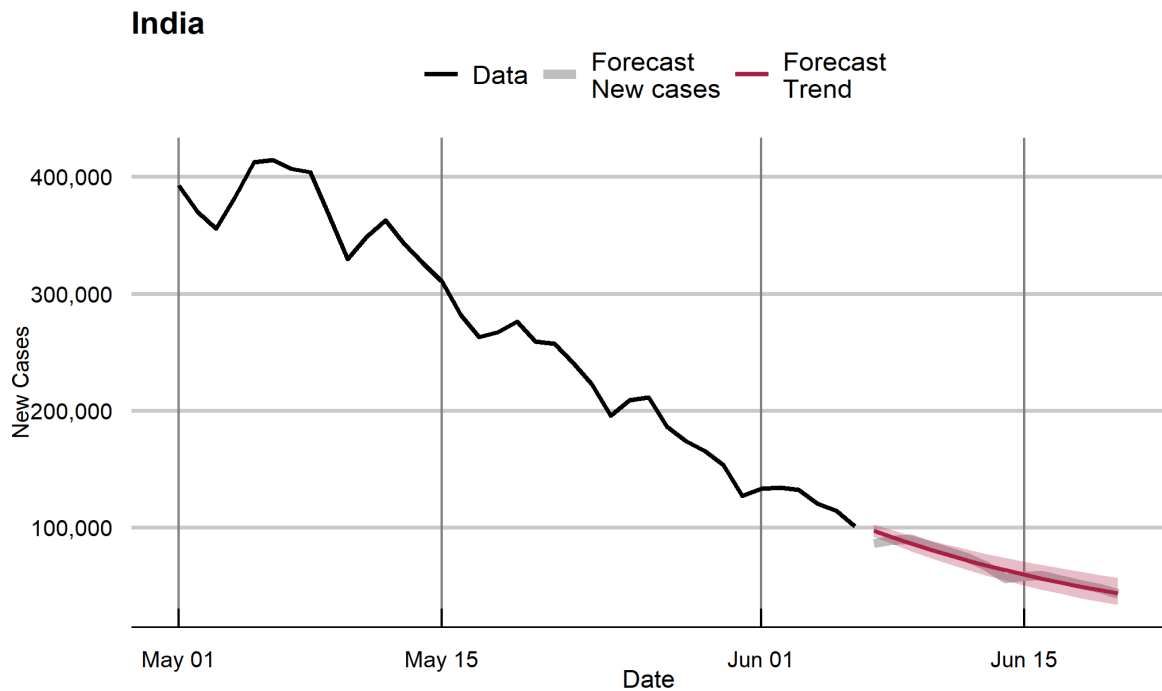
Mean absolute percentage error of the forecasts of daily cases in India given in the 30 May tracker, for the week beginning 31 May 2021, is 7.9%. The corresponding value for deaths is 6.8%. The accuracy of forecasts rely on the quality of the reported data. Changes in government pandemic policies and in transmission relevant social behaviour may cause realised numbers to depart from forecasts. Data have been volatile for Bihar, Jharkhand, Manipur, Mizoram, Odisha and Uttarakhand, making their forecasts less accurate.

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

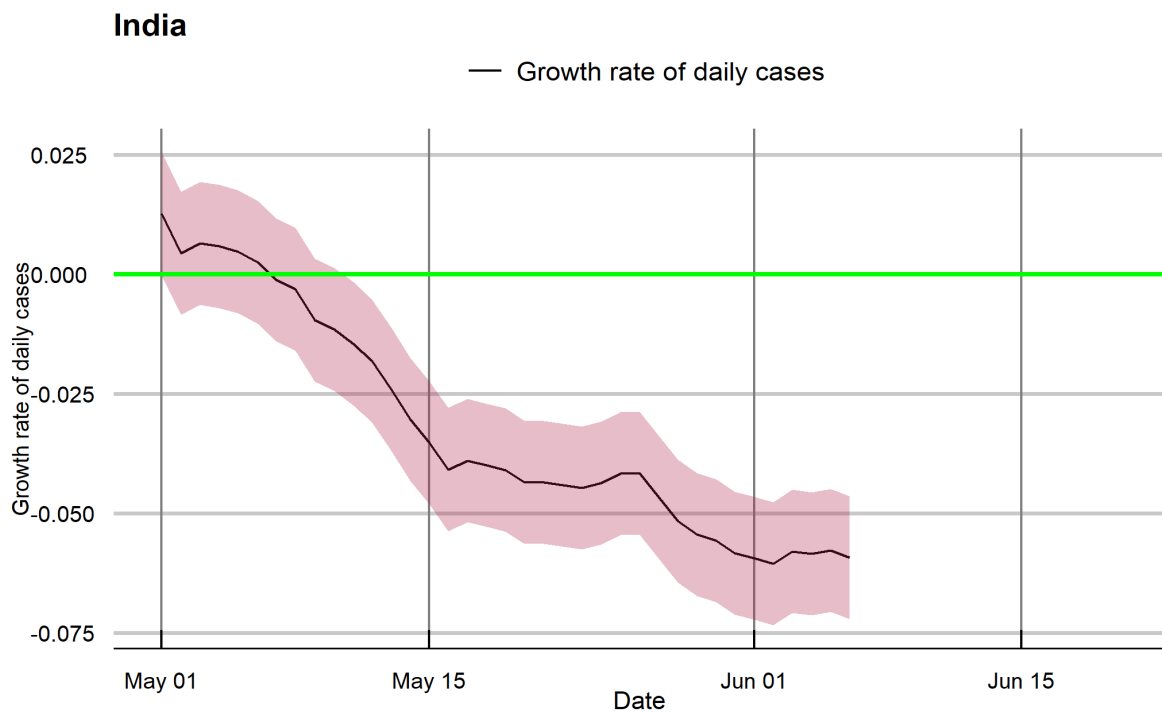
The companion spreadsheet contains all the estimates and forecasts.

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

Daily Covid-19 cases in India: Forecast

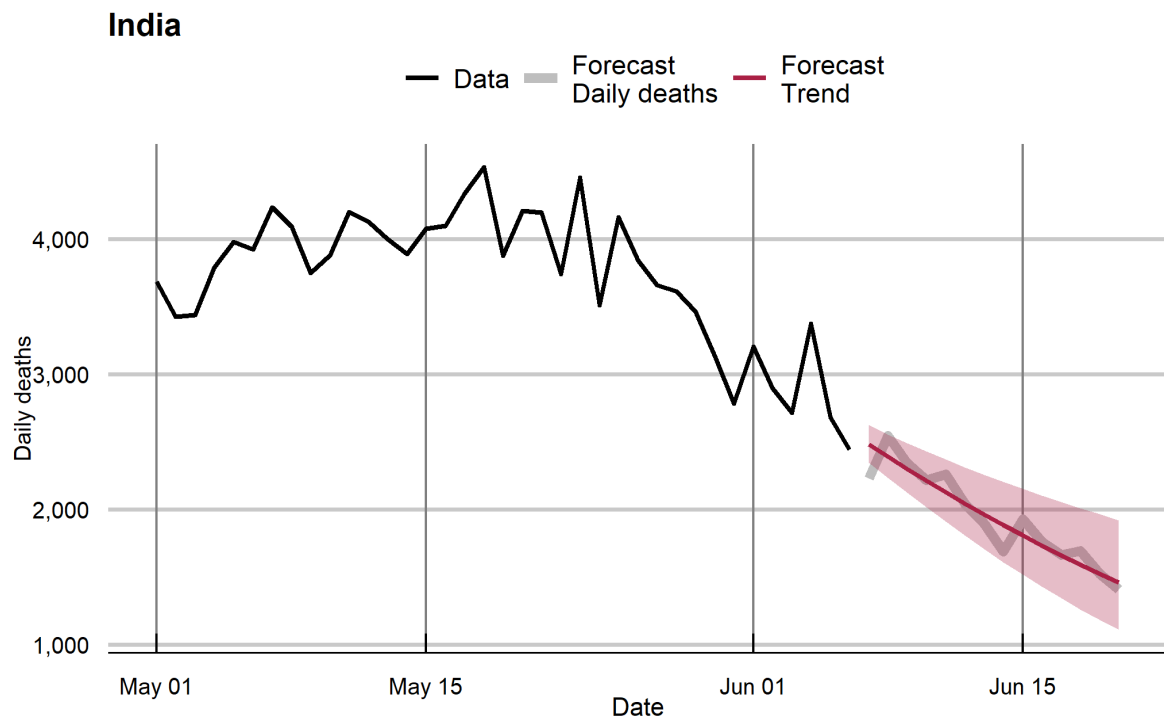


Forecasts of daily new cases for the period 7 June 2021 to 20 June 2021, based on data till 6 June 2021. New COVID-19 cases is likely to decline to about 44,000 per day by 20 June 2021.

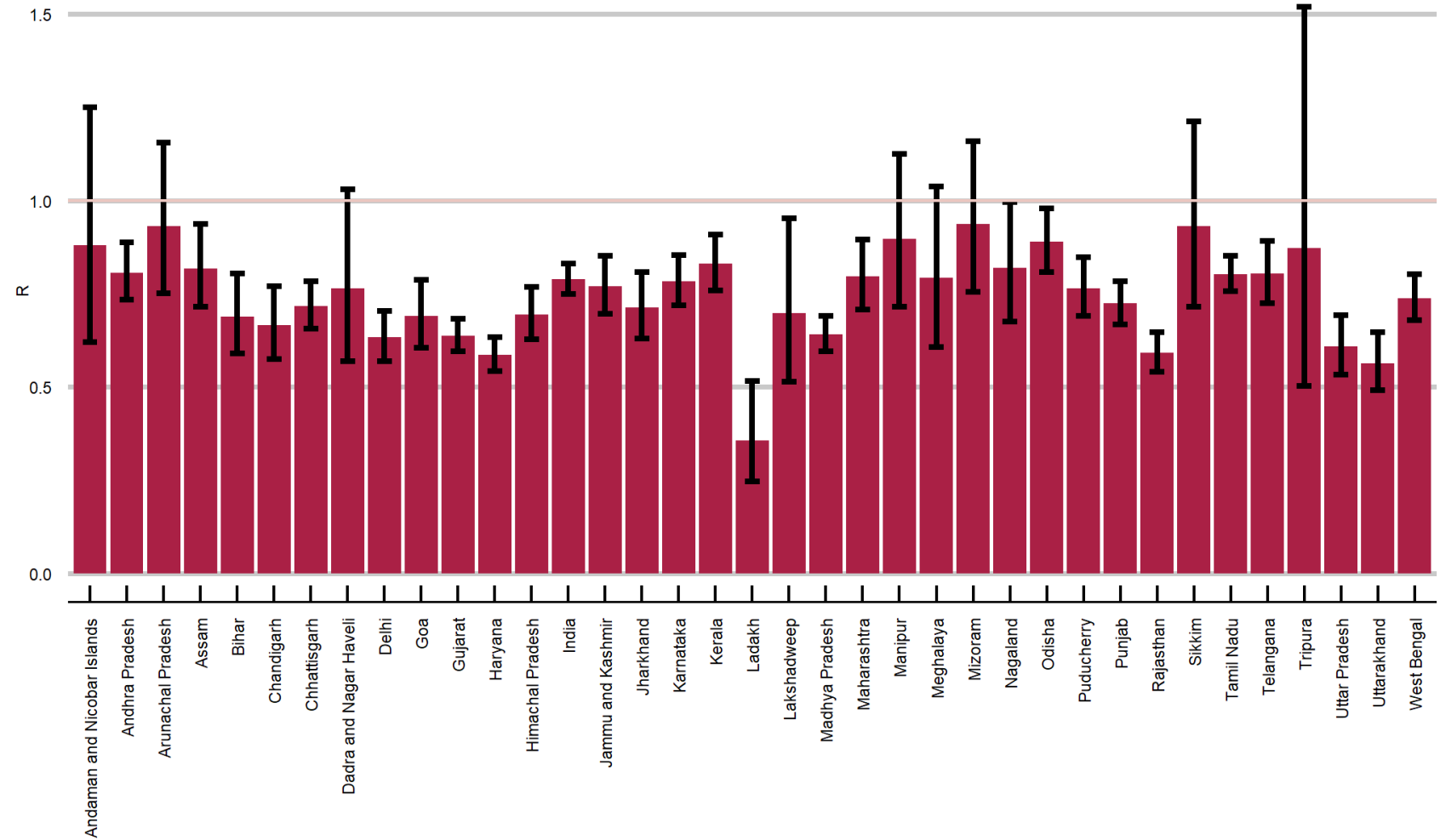


The filtered trend in the growth rate of daily new cases. Final date: 6 June 2021. Reported deaths is likely to decline to about 1,450 per day by 20 June 2021.

Daily Covid-19 deaths in India: Forecast

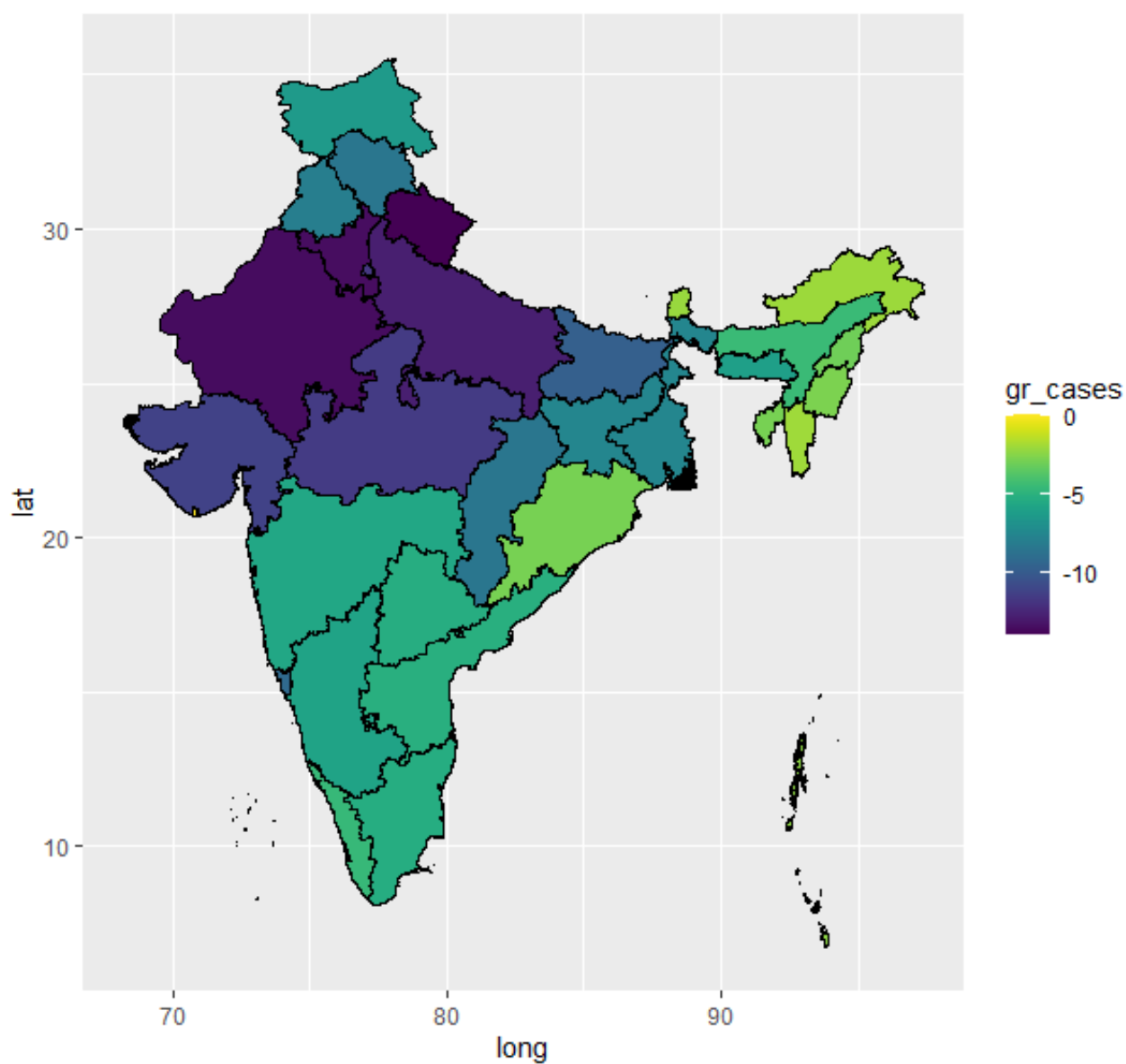


R_t: 6 June 2021

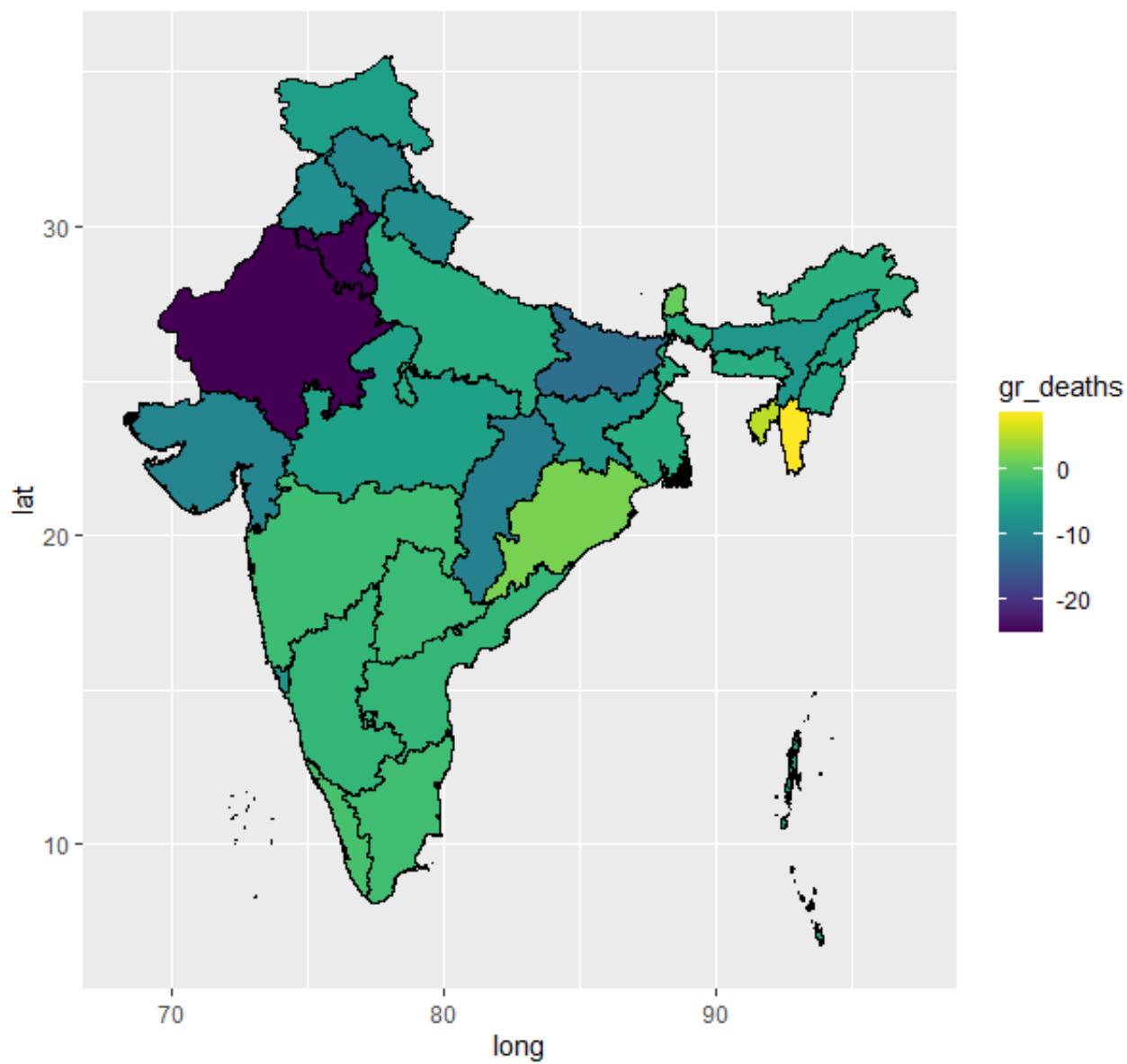


Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

Daily growth rate (%) of cases
Trend value on 6 June 2021

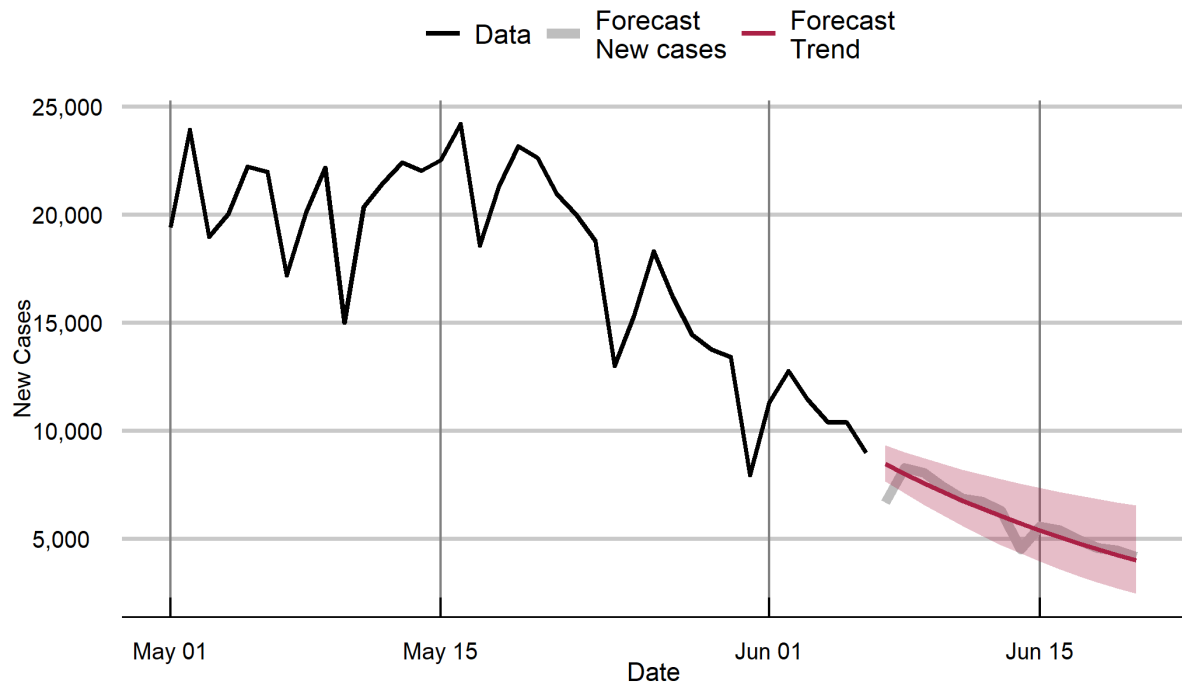


Daily growth rate (%) of deaths:
Trend value on 6 June 2021

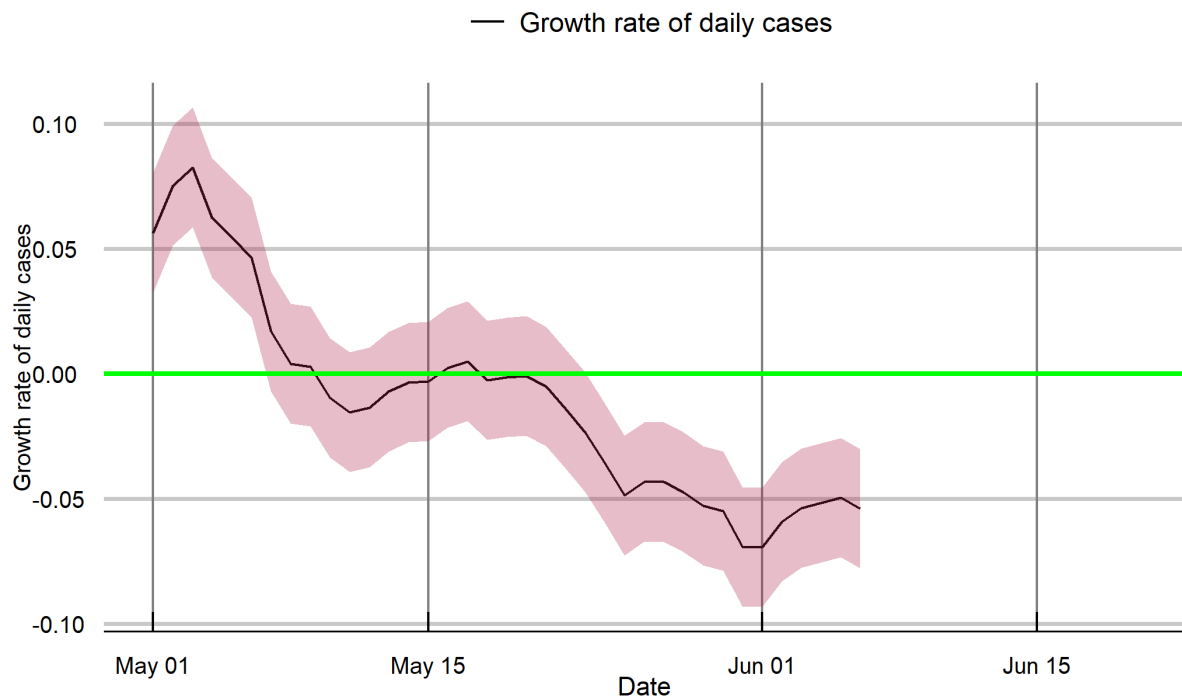


Daily Cases forecast: States and Union territories

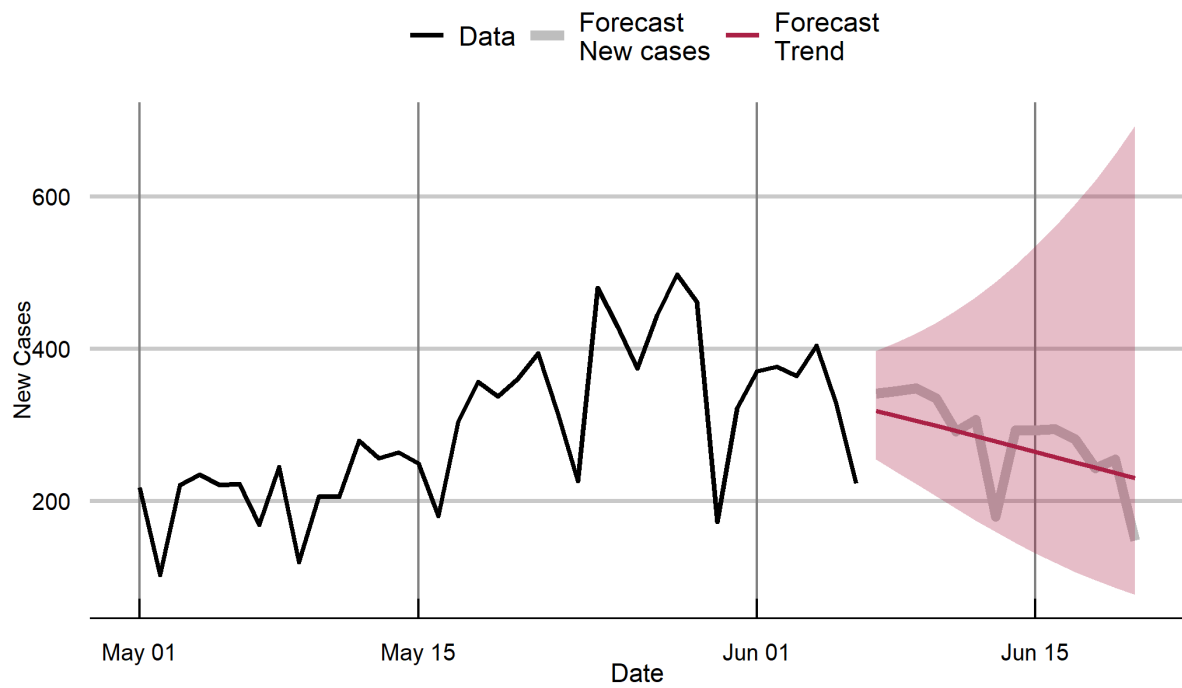
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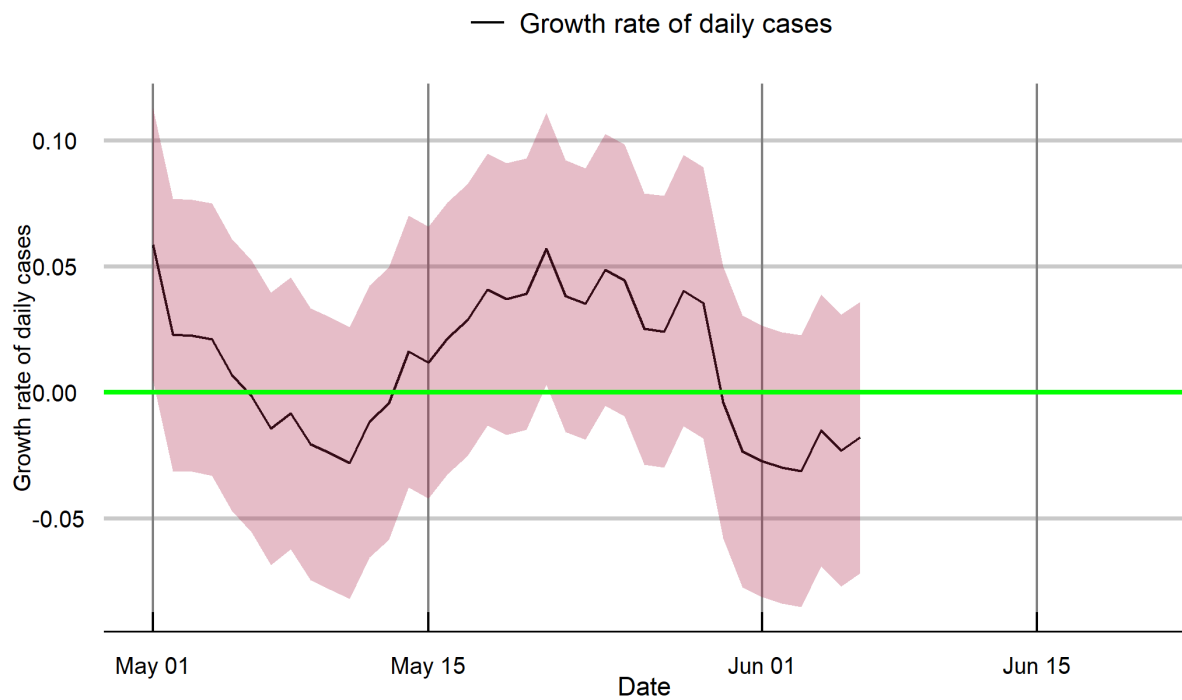
Andhra Pradesh



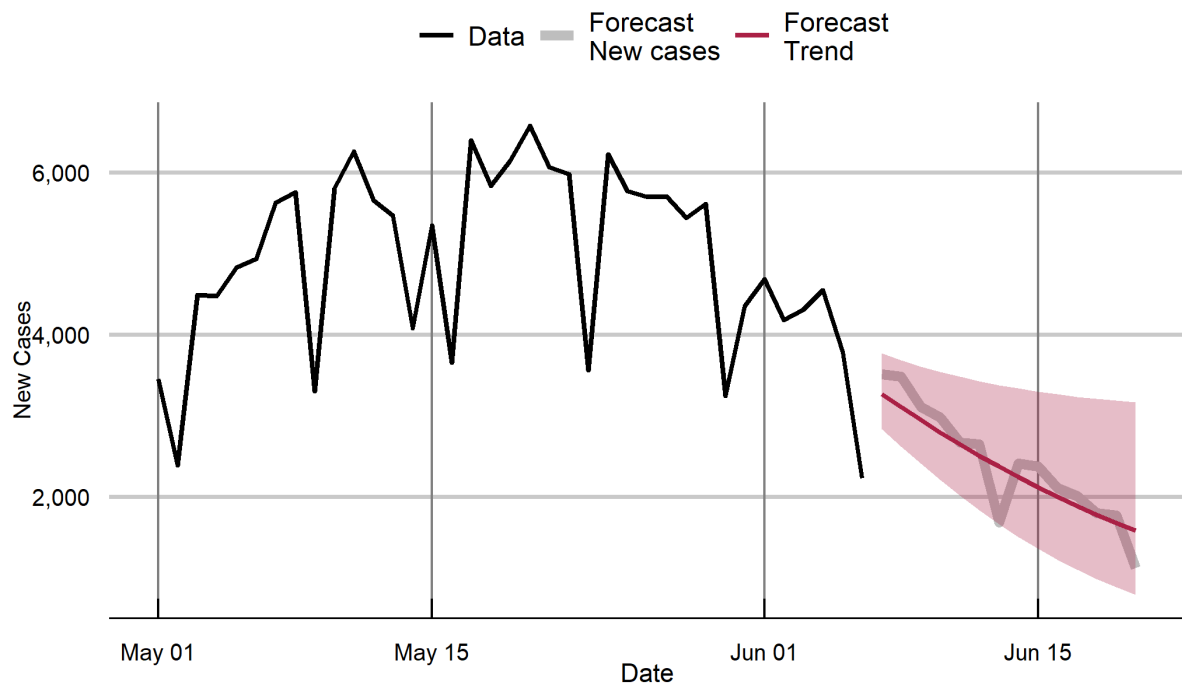
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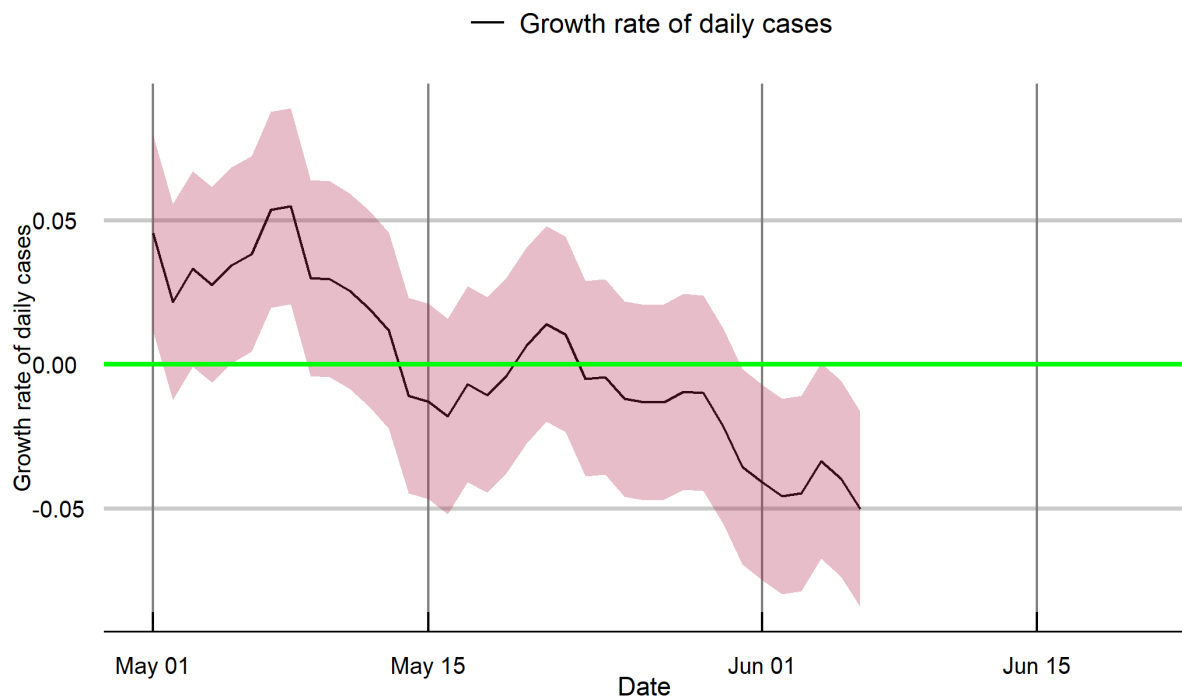
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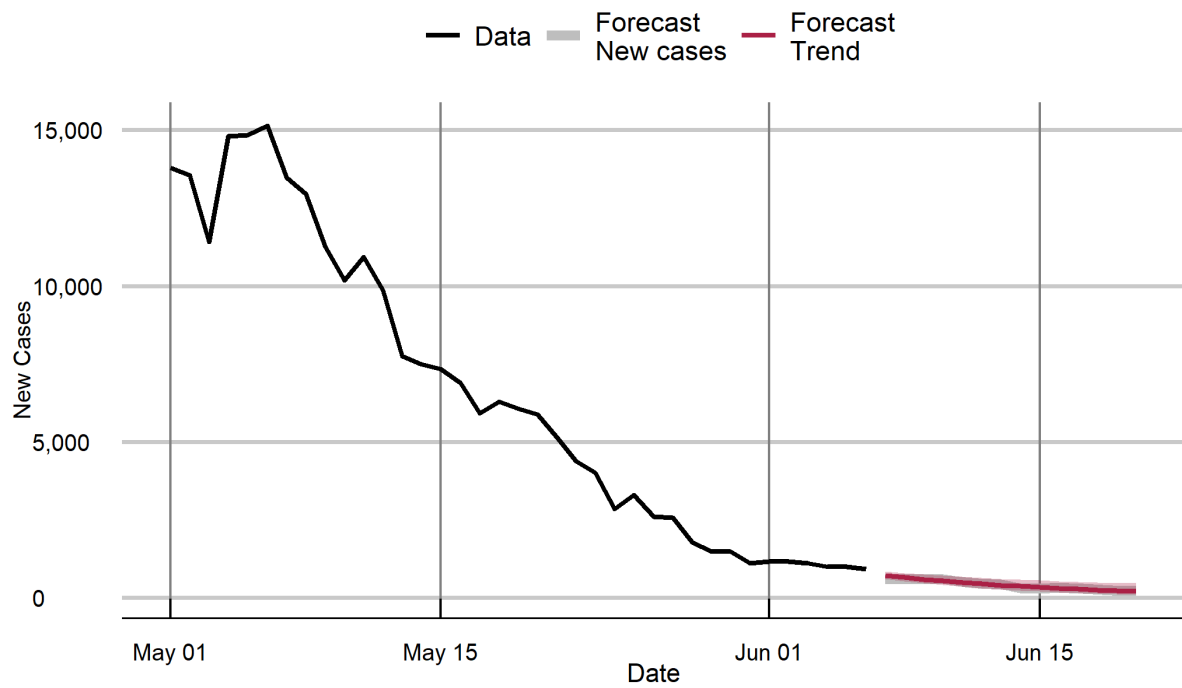
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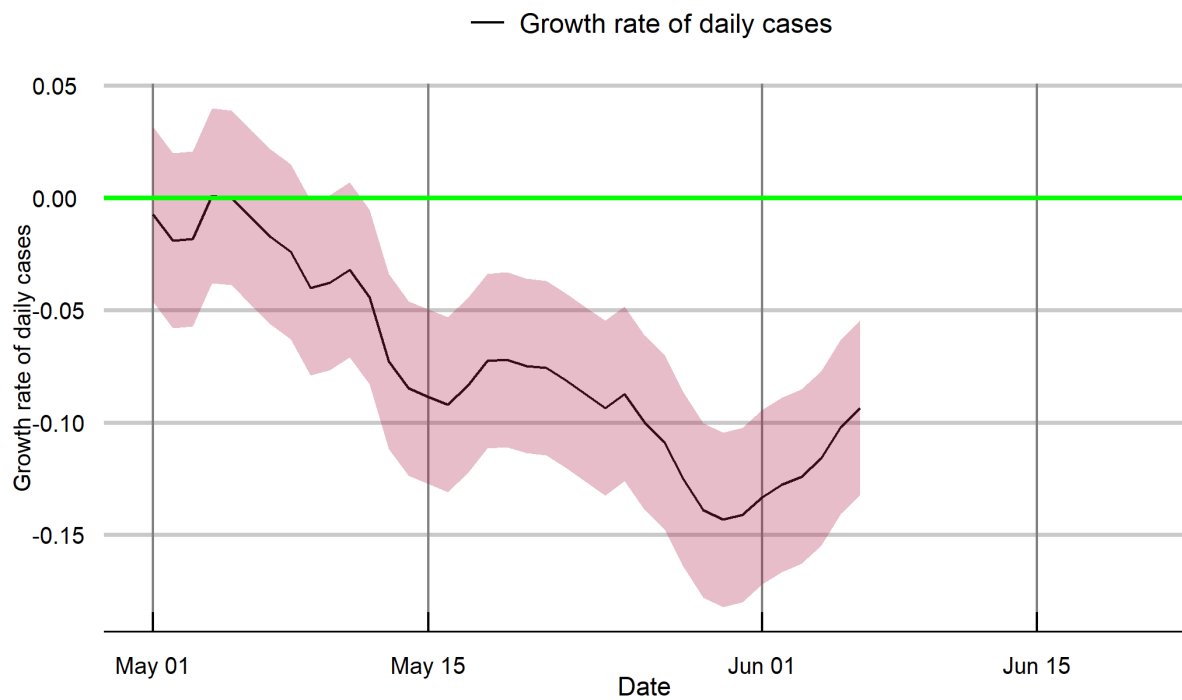
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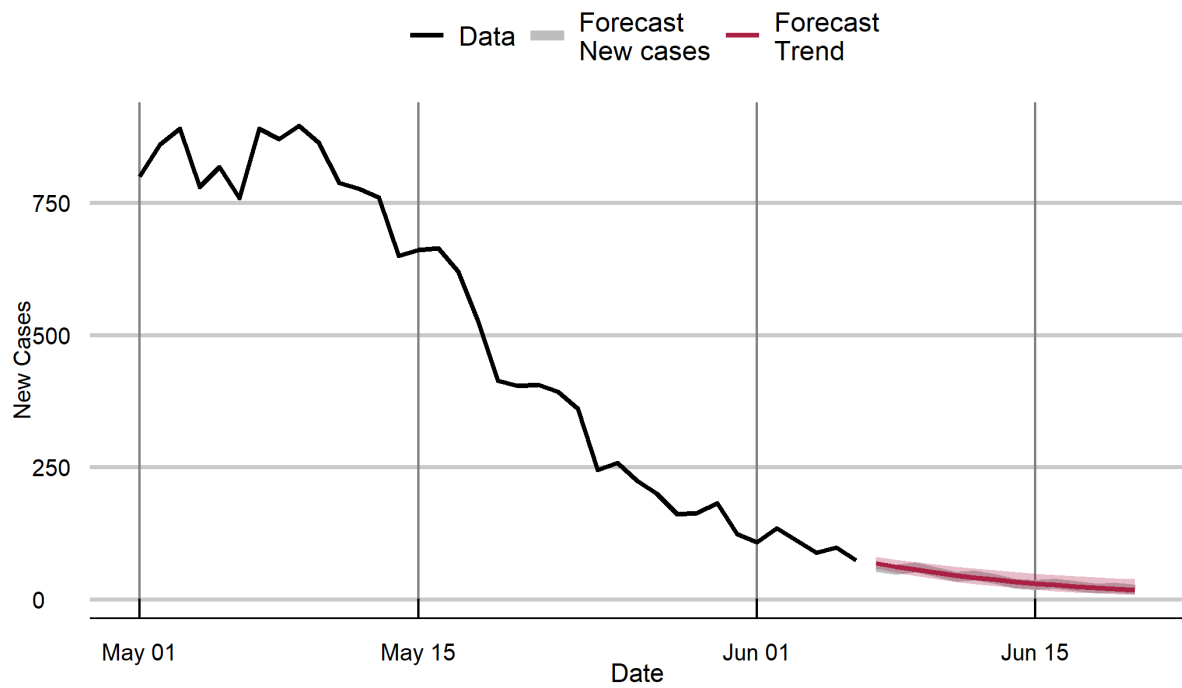
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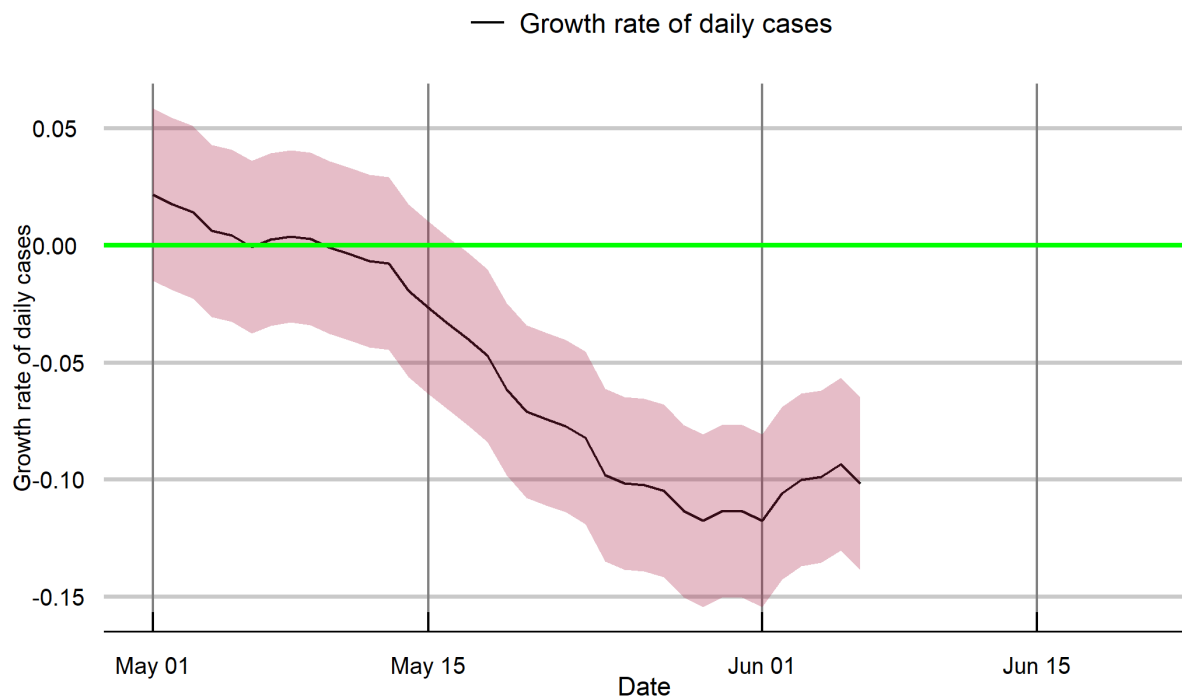
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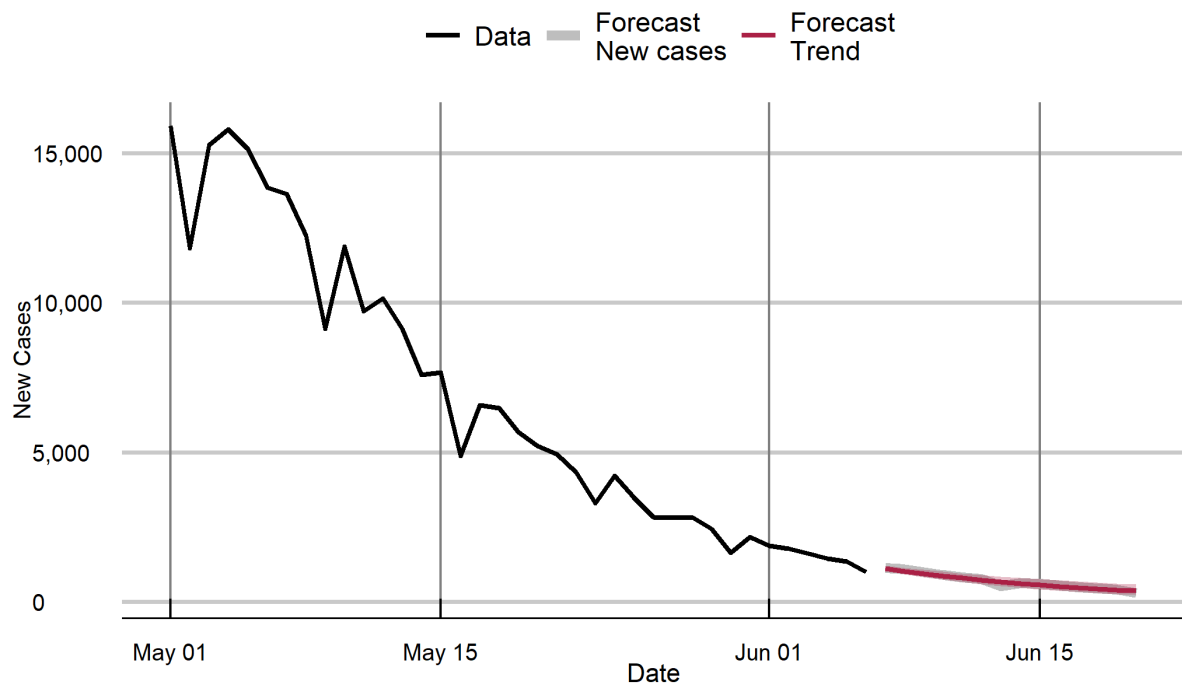
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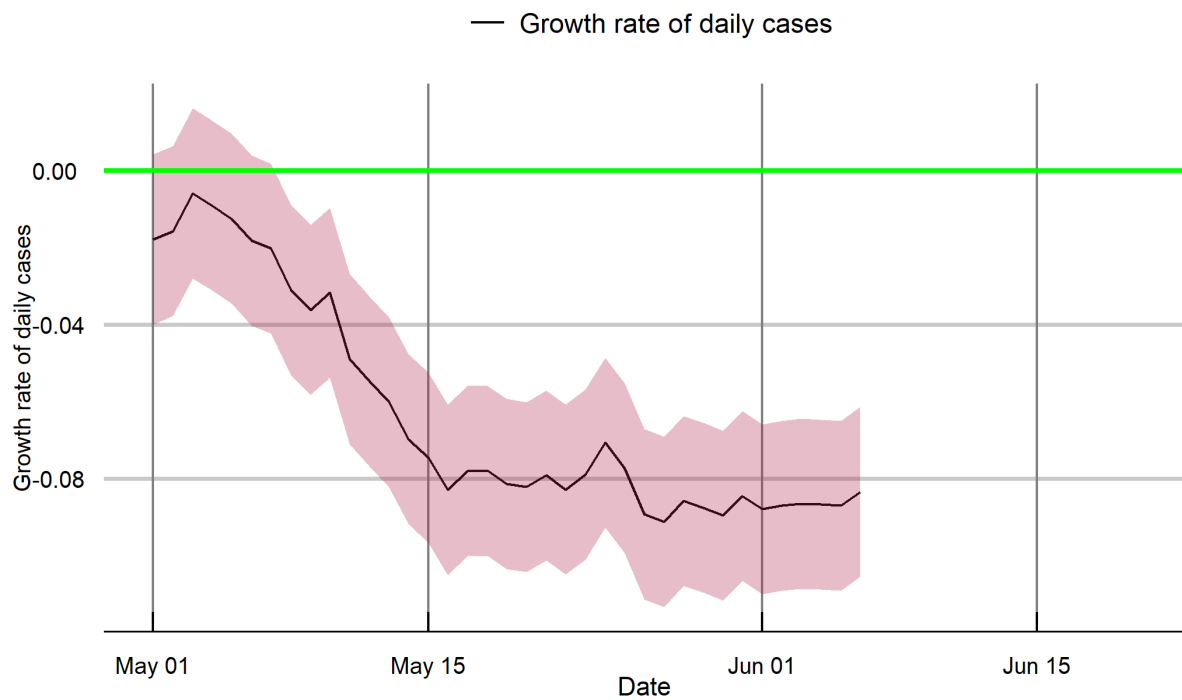
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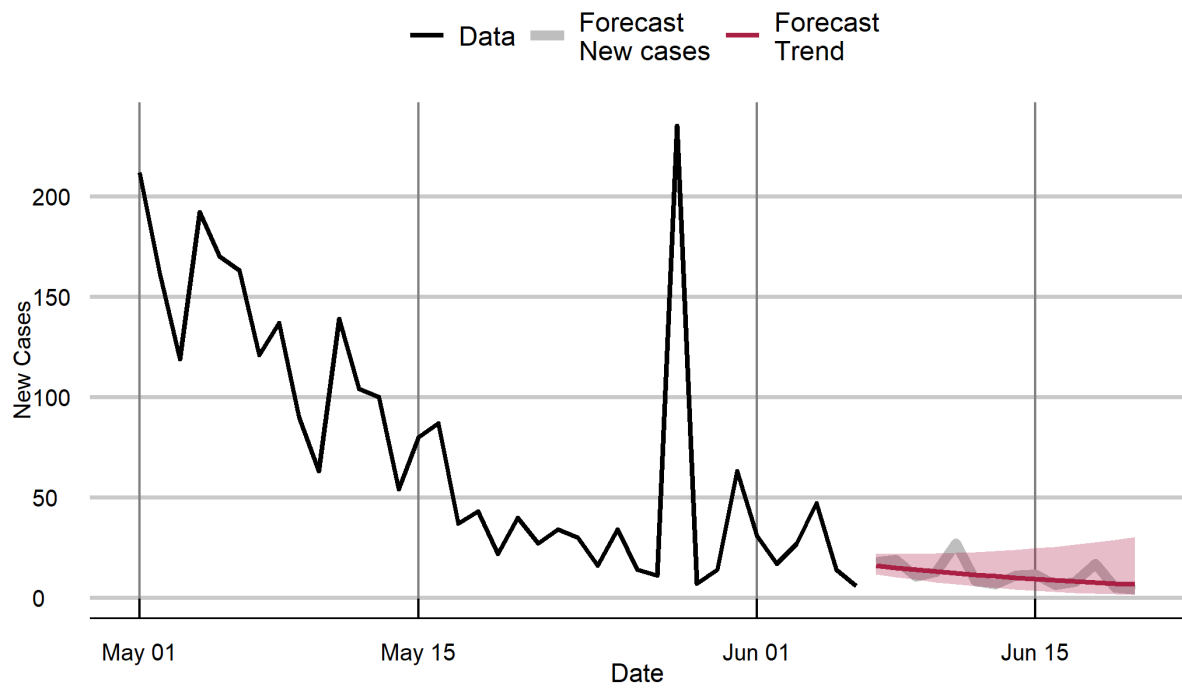
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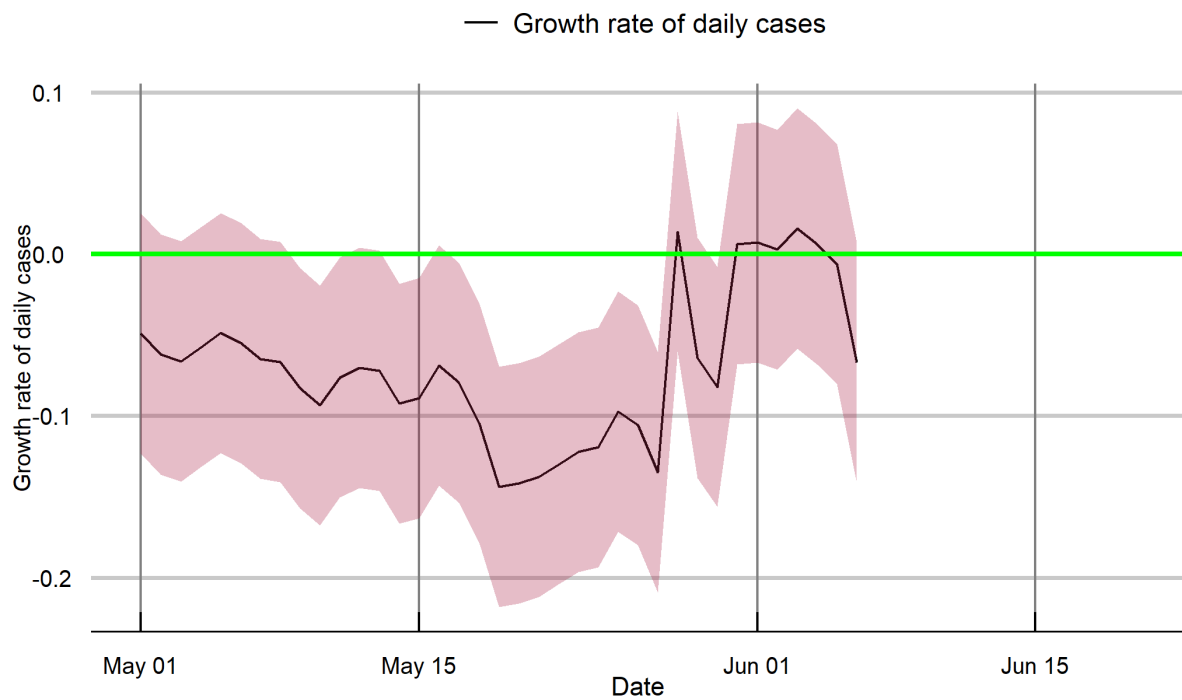
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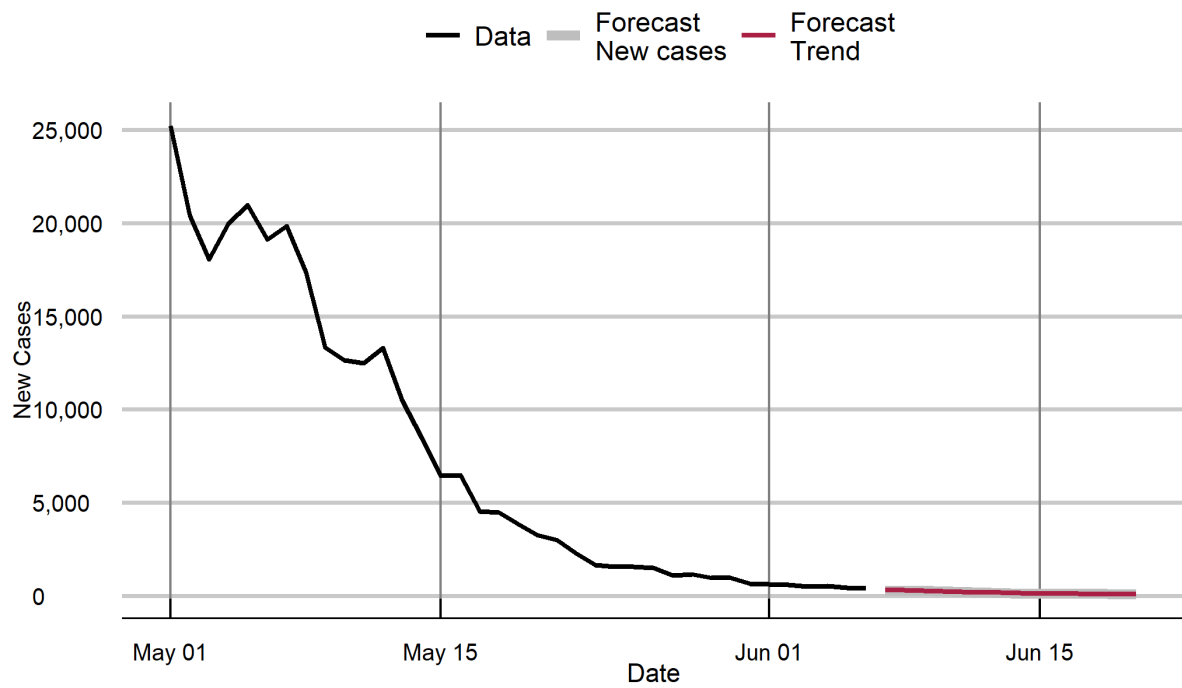
Dadra and Nagar Haveli



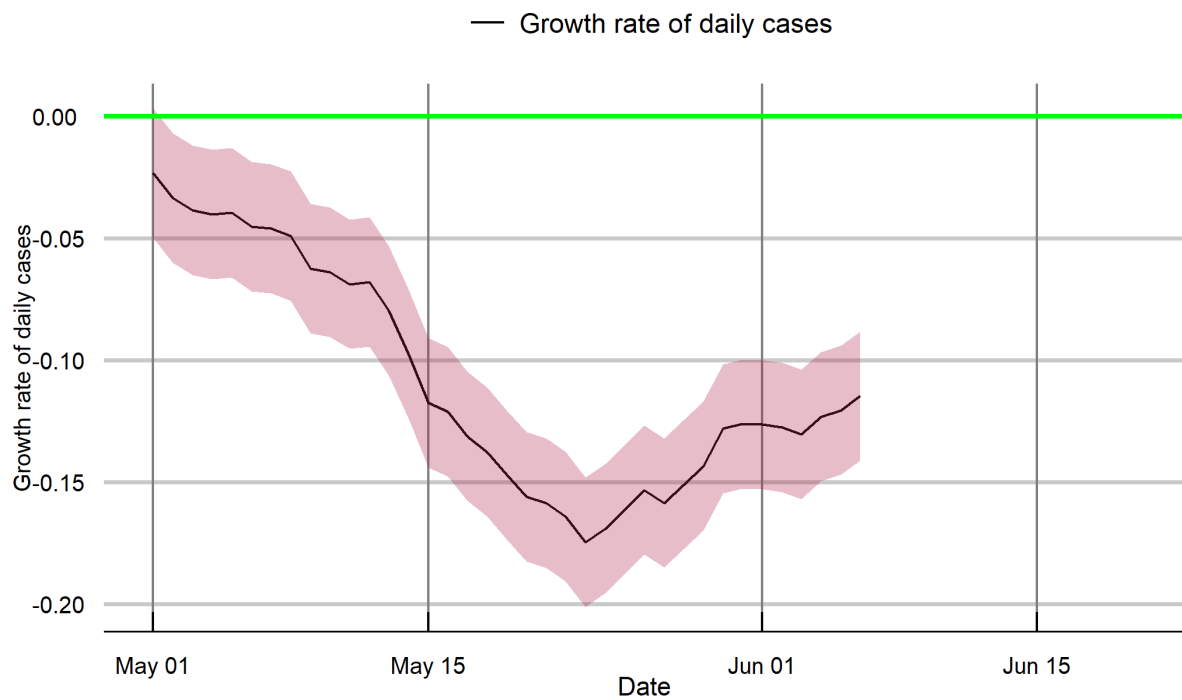
Dadra and Nagar Haveli



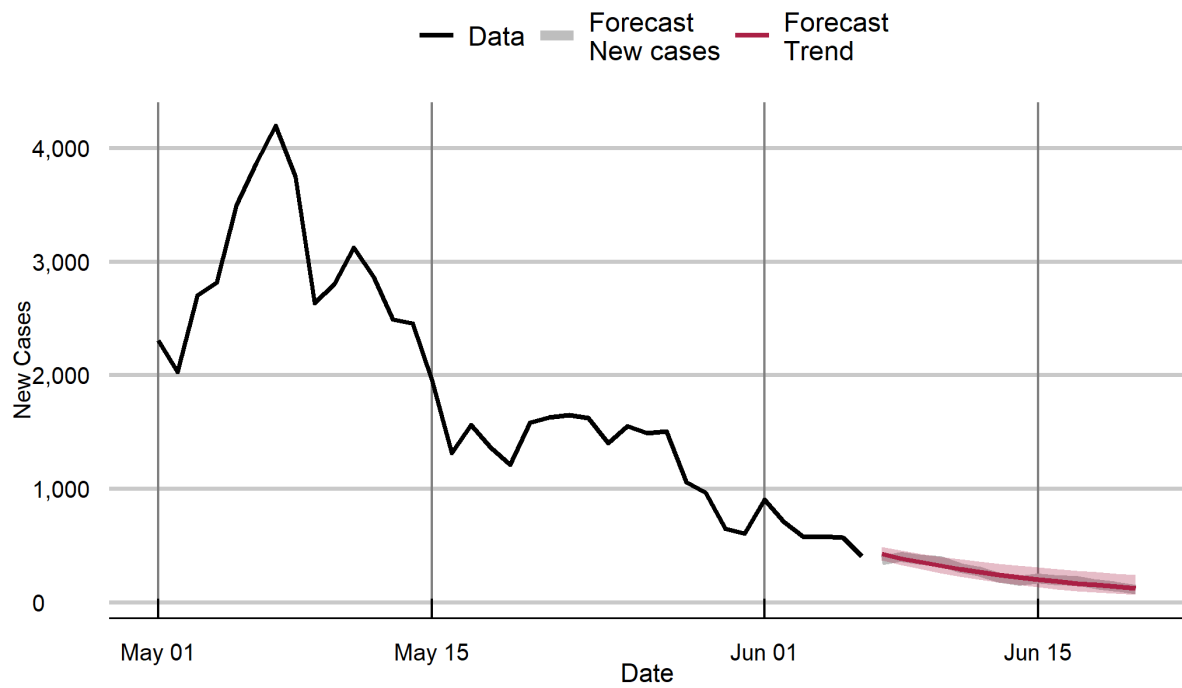
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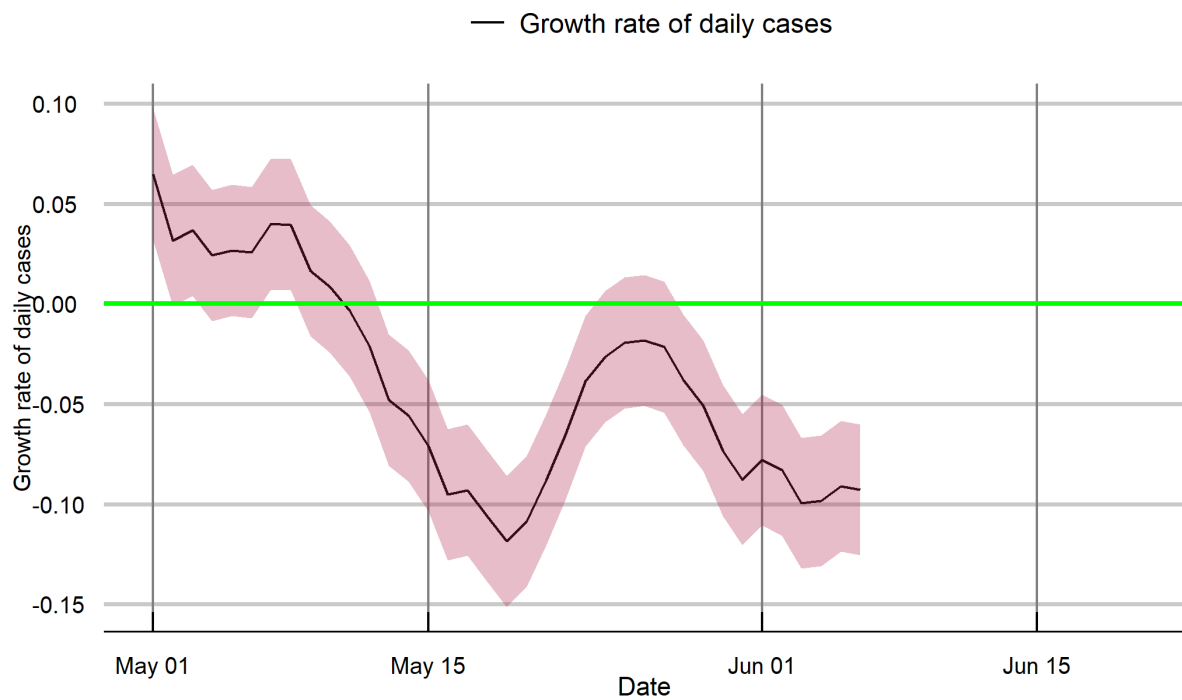
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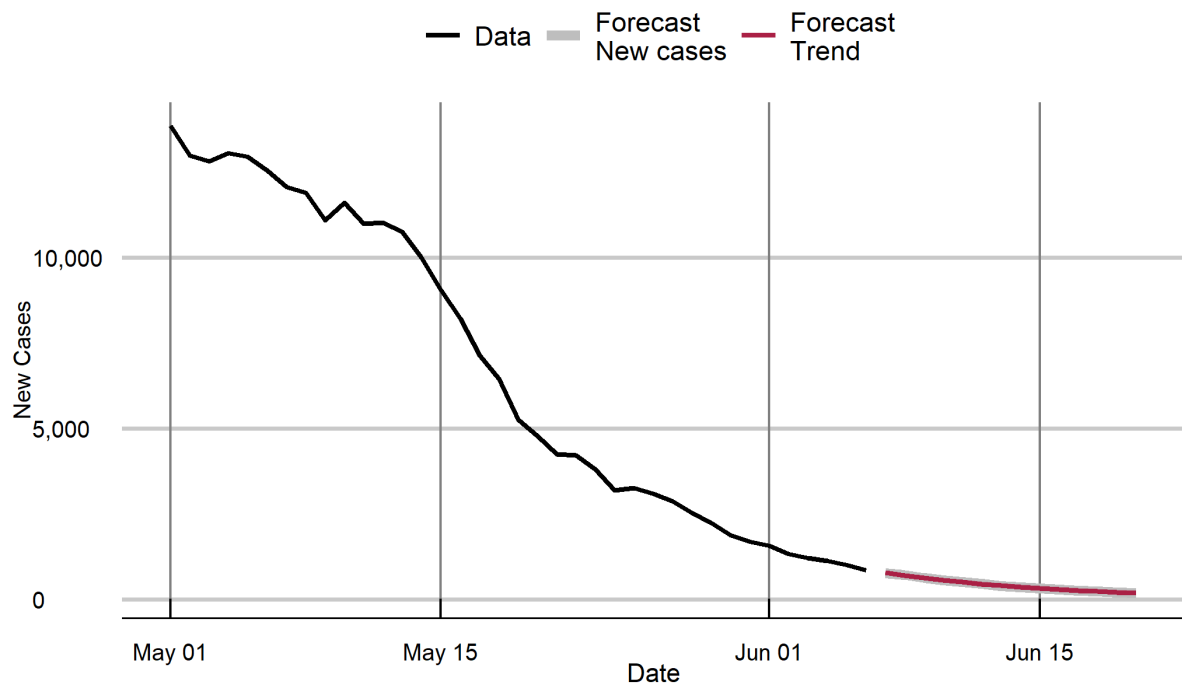
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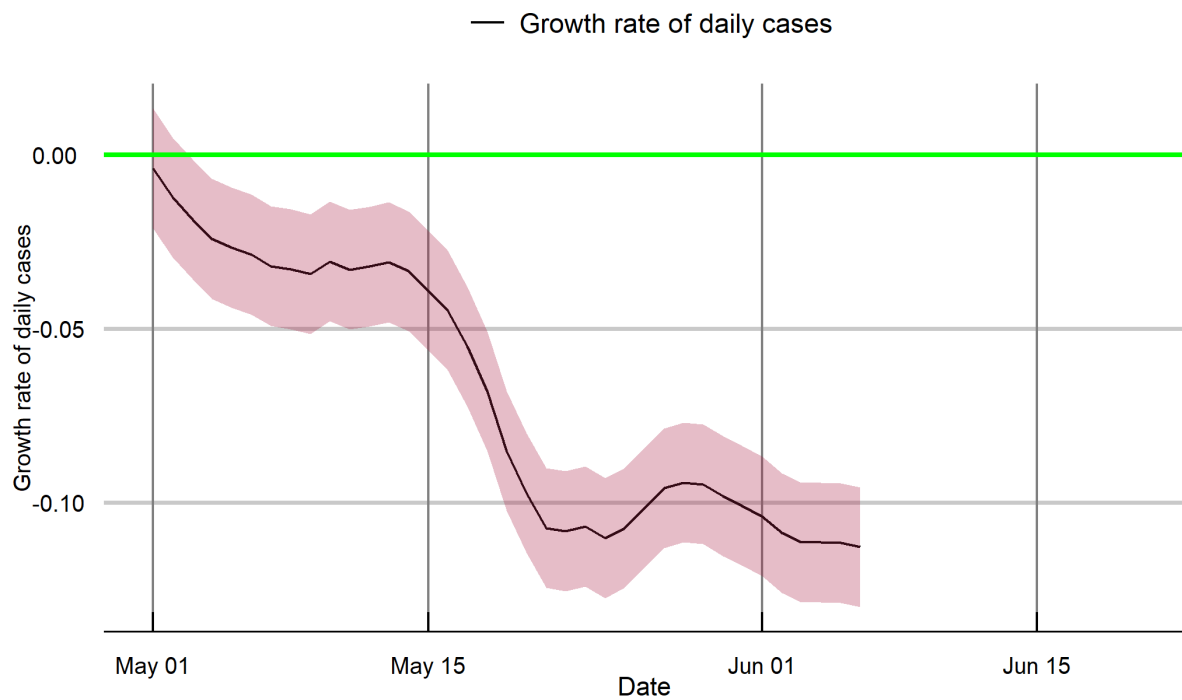
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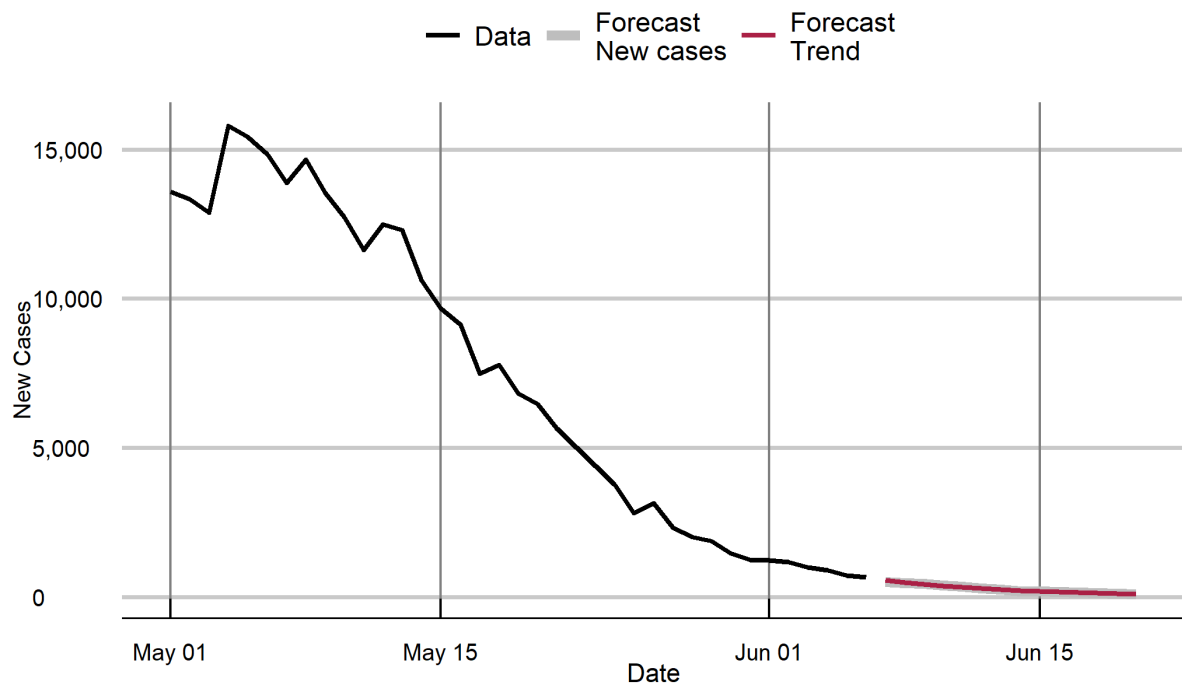
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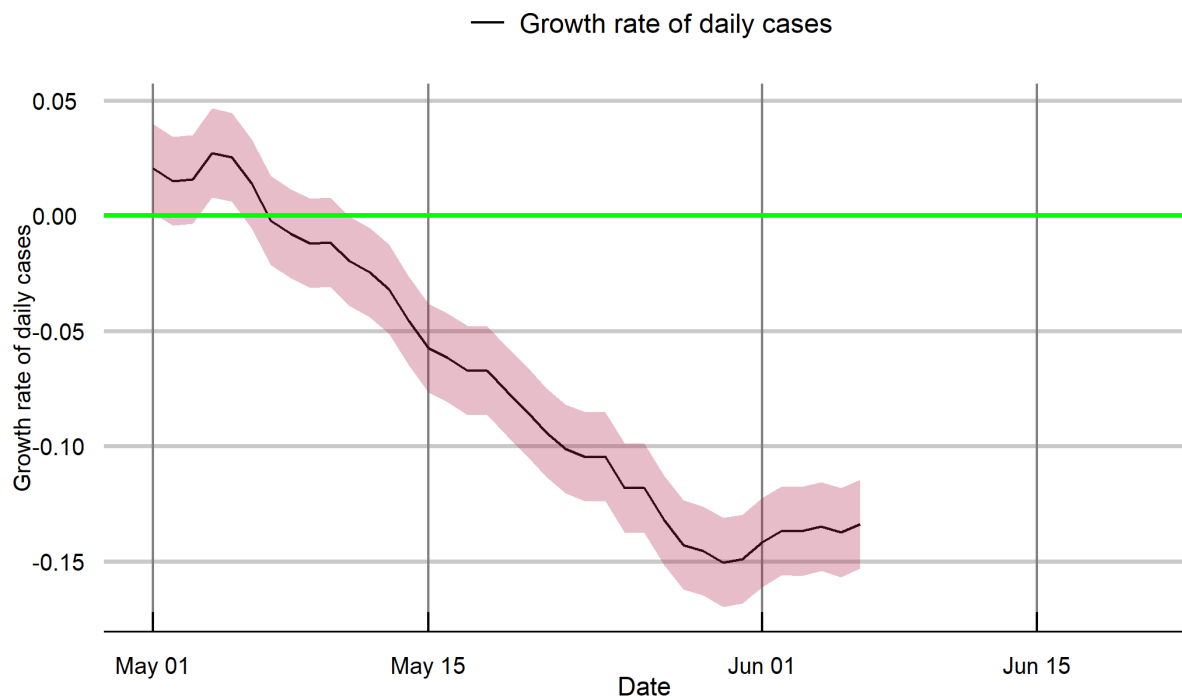
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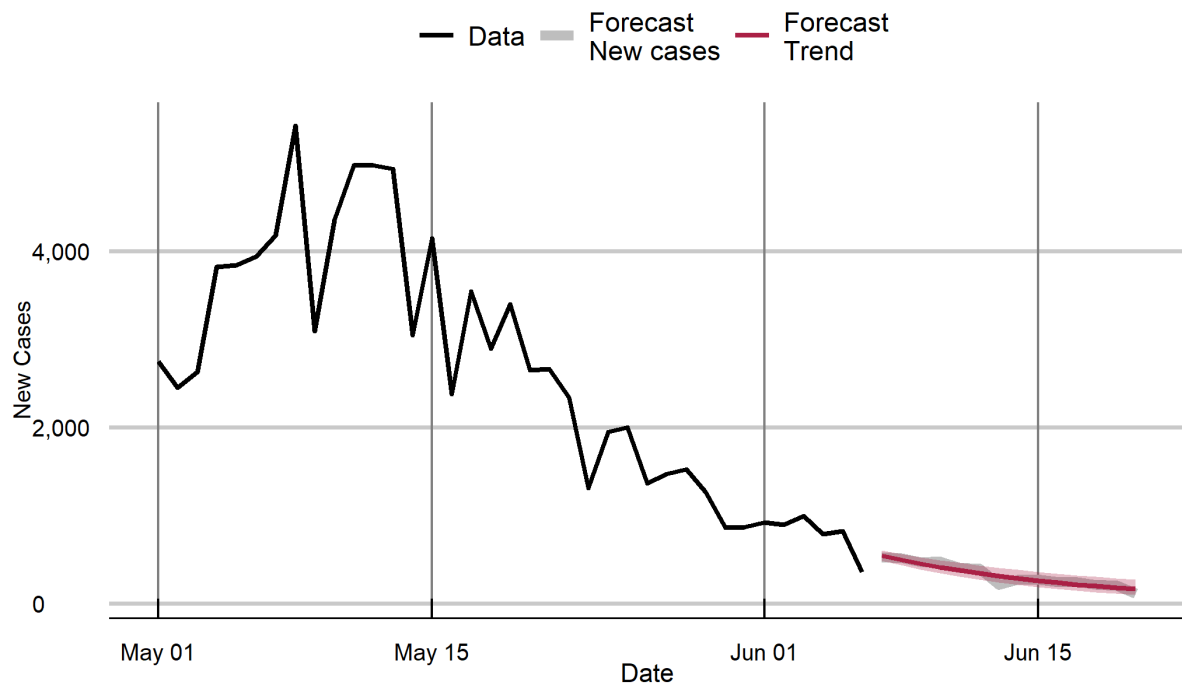
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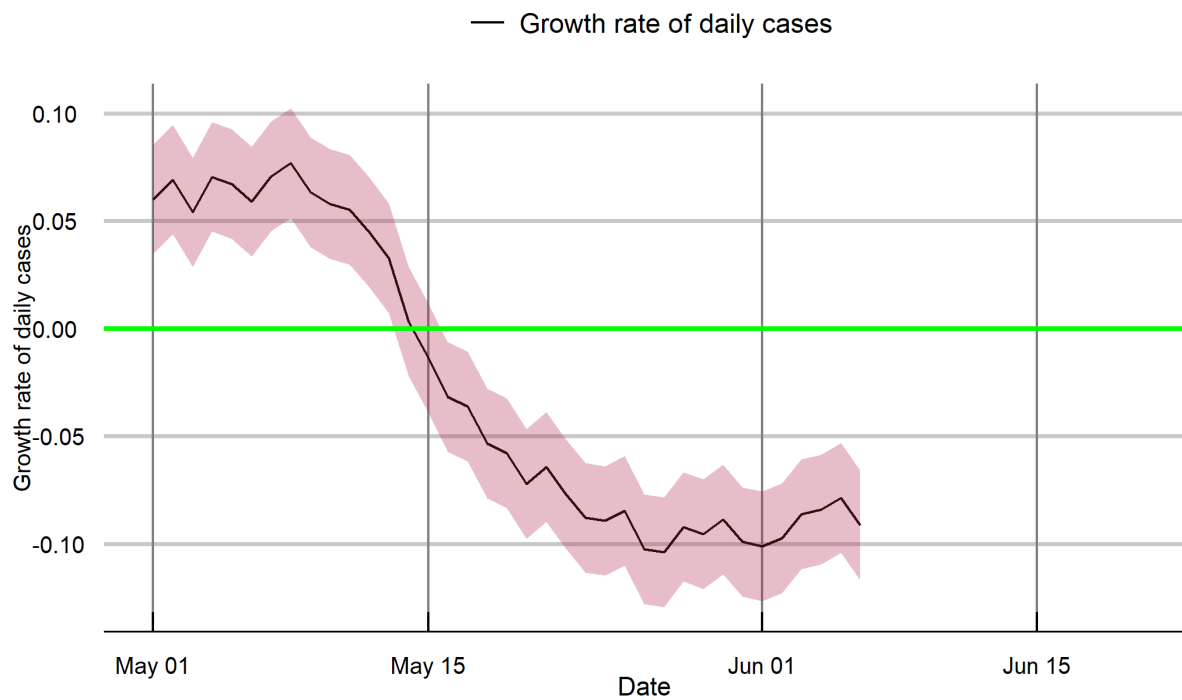
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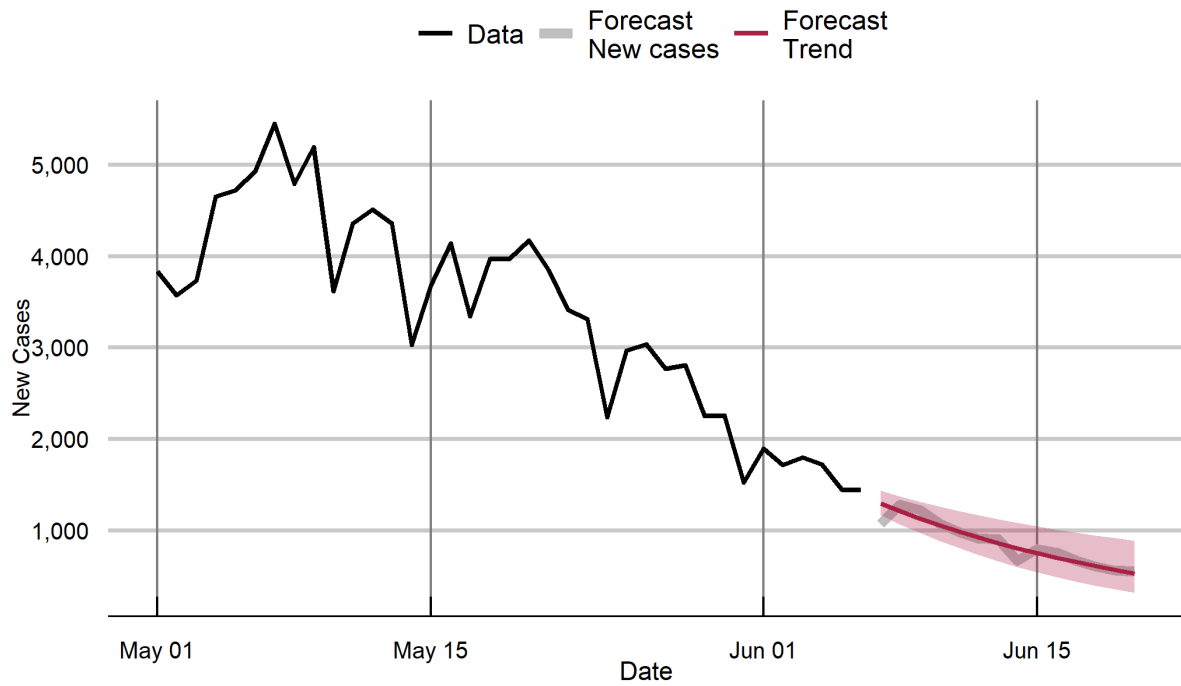
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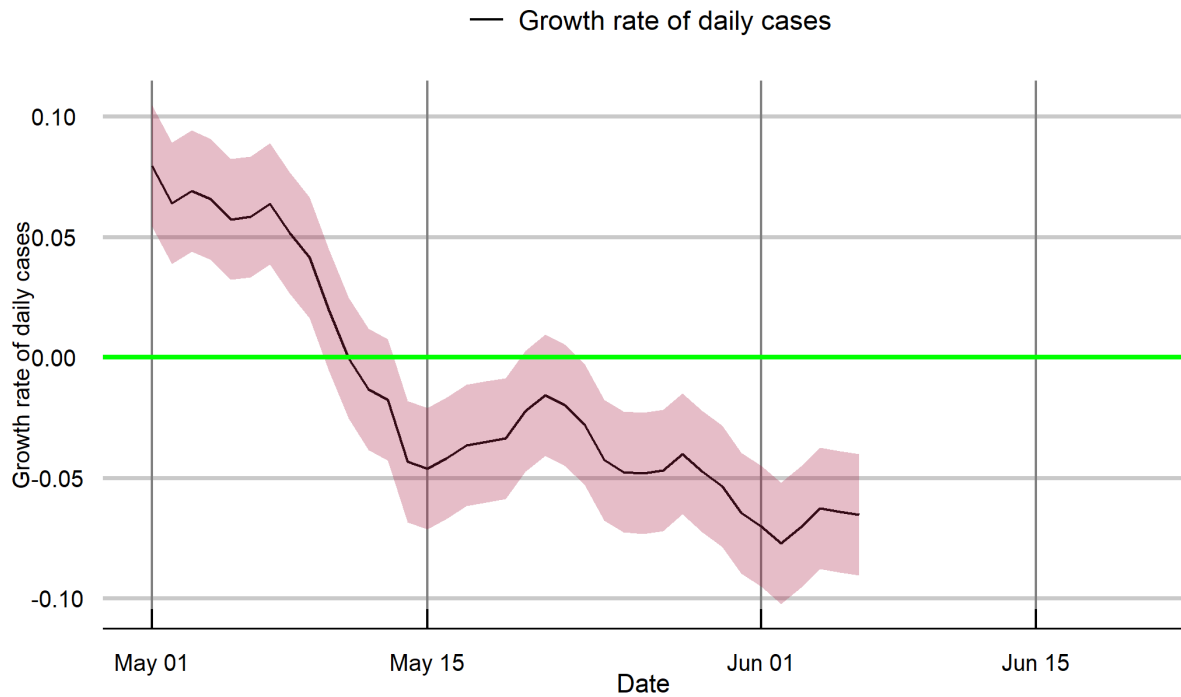
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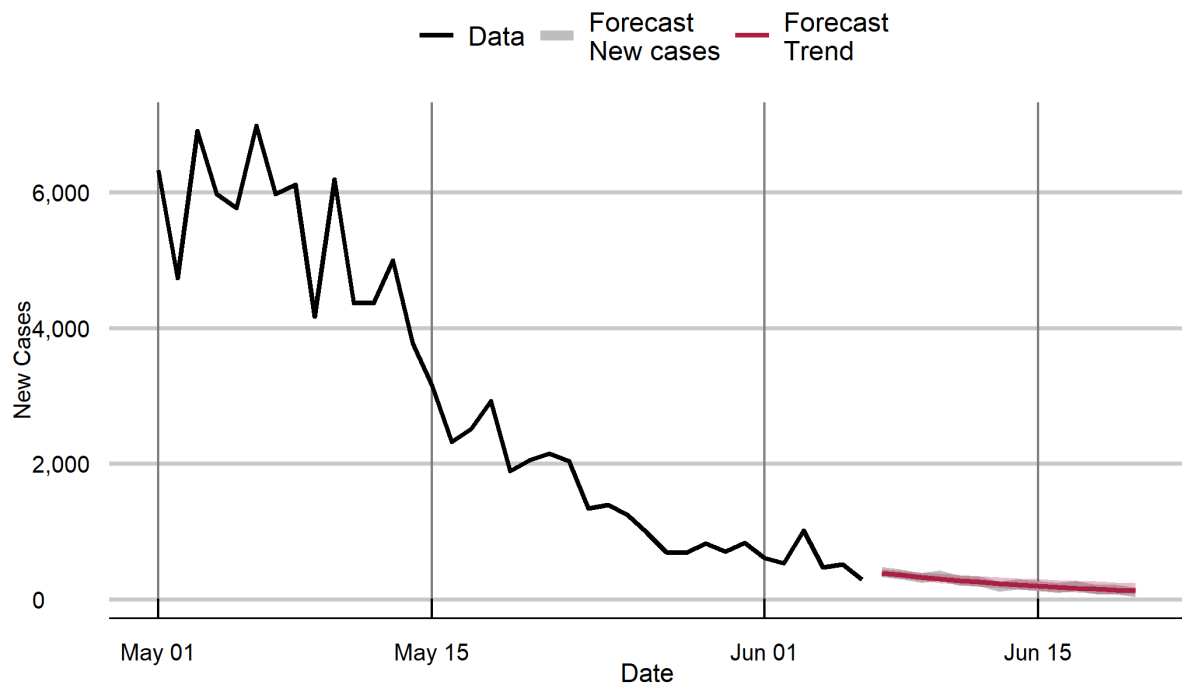
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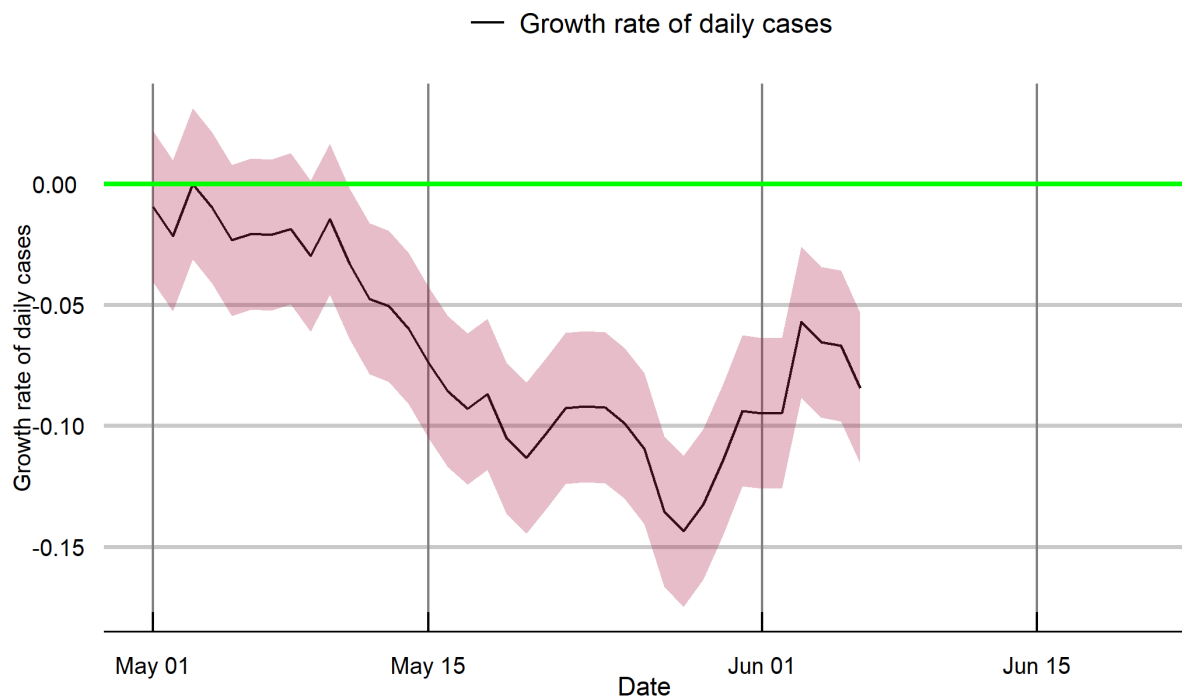
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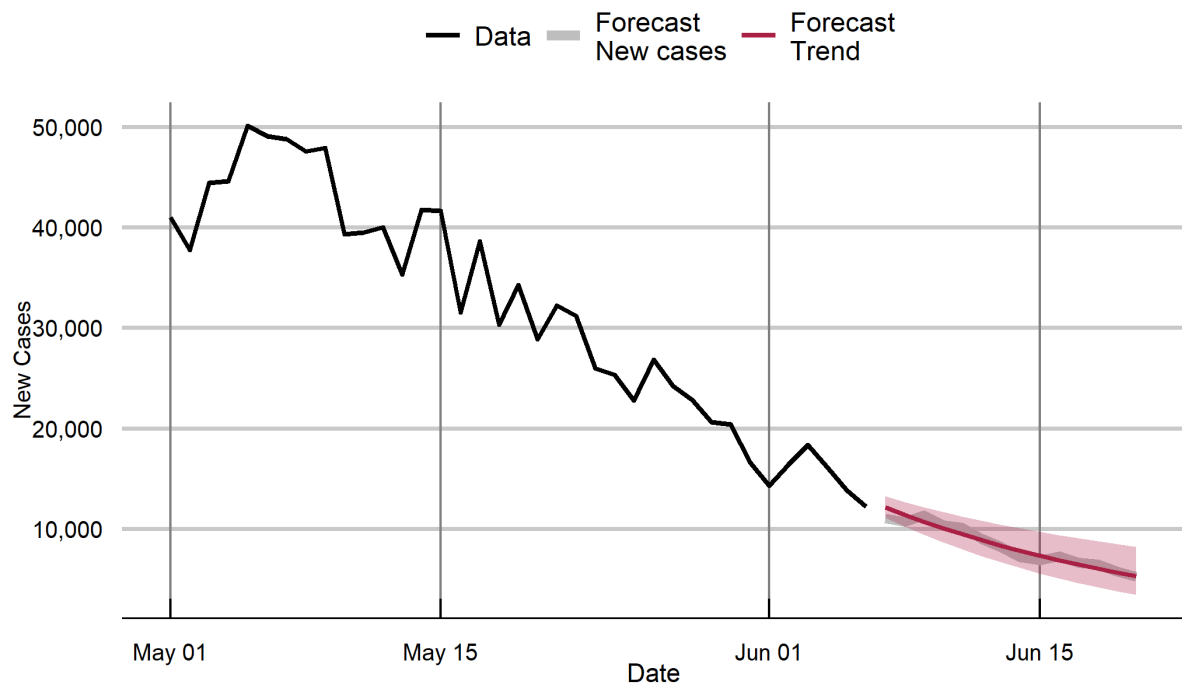
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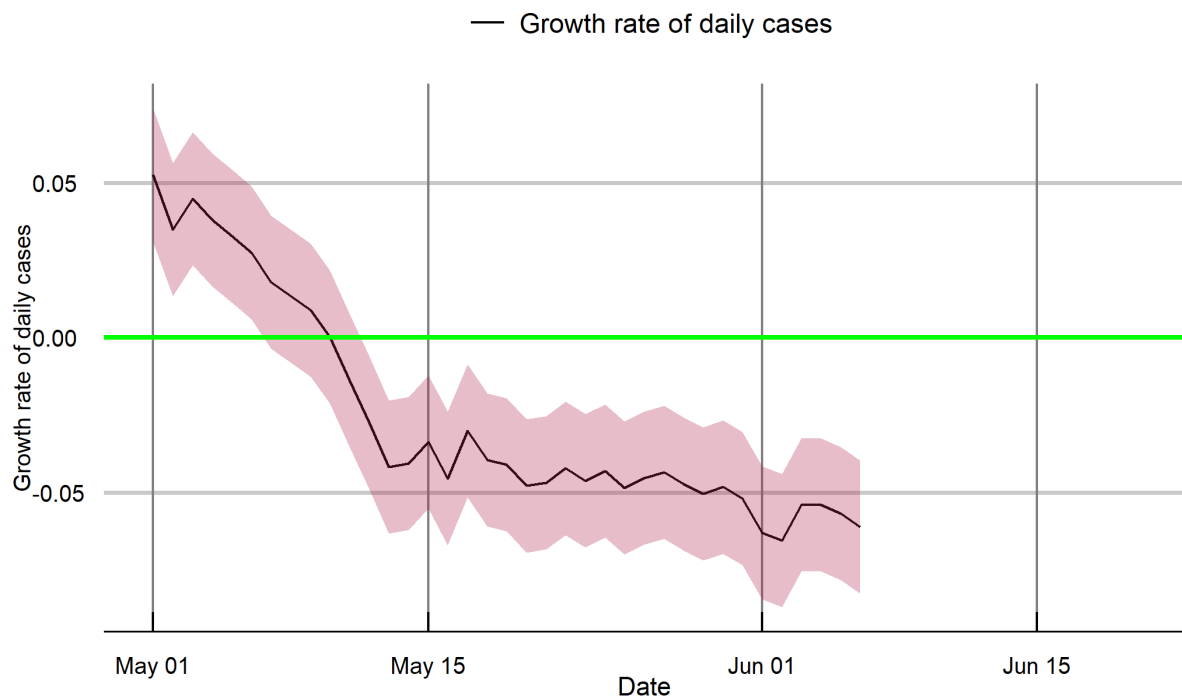
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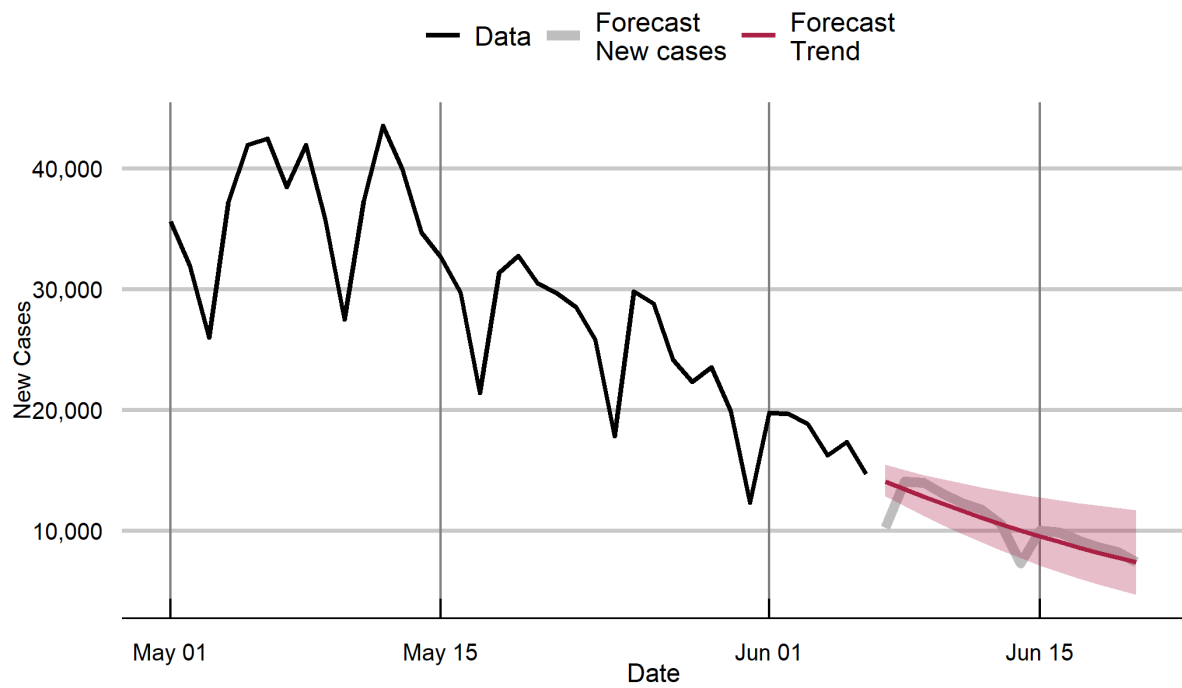
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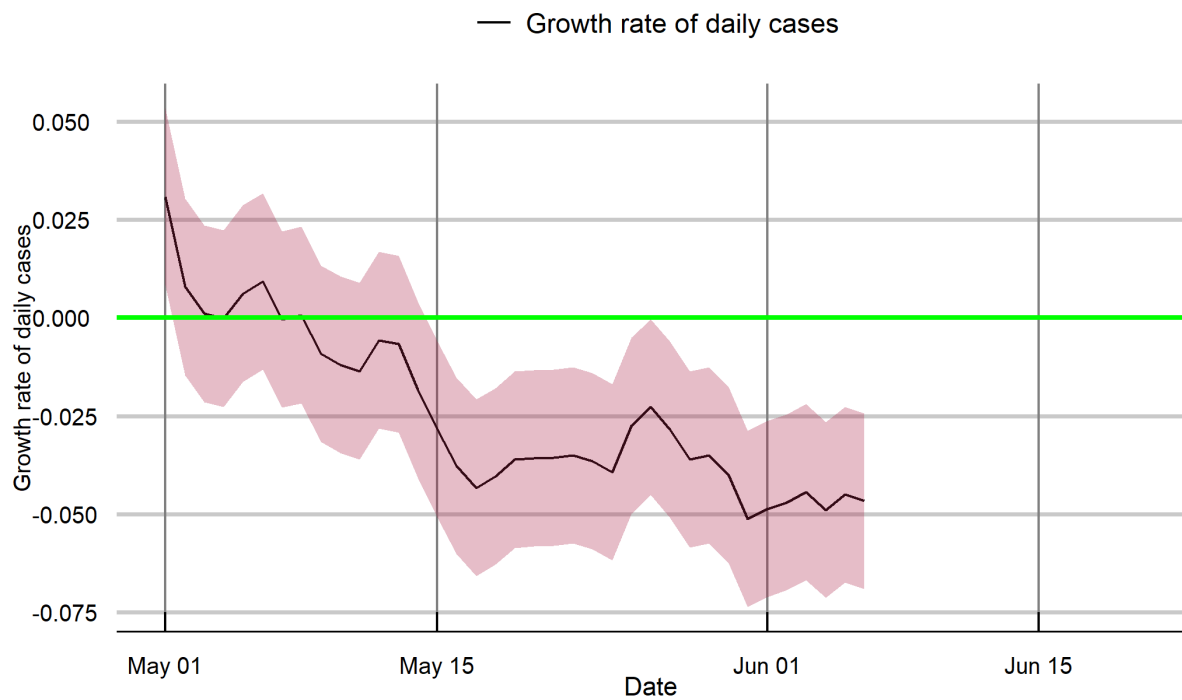
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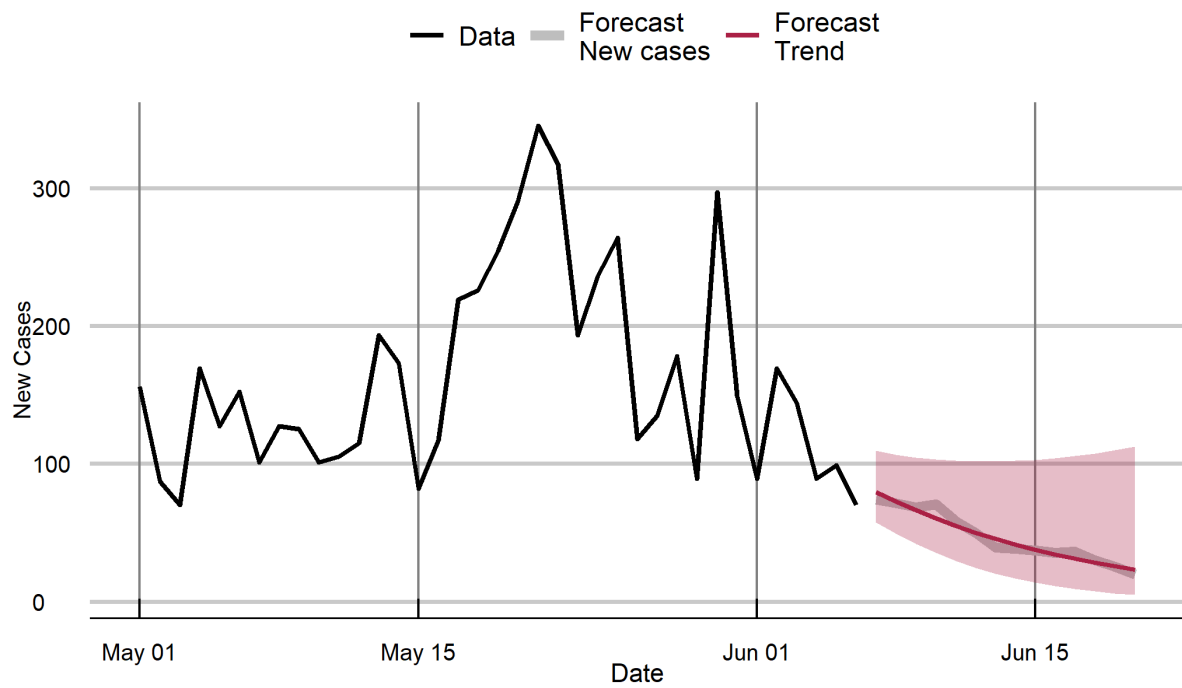
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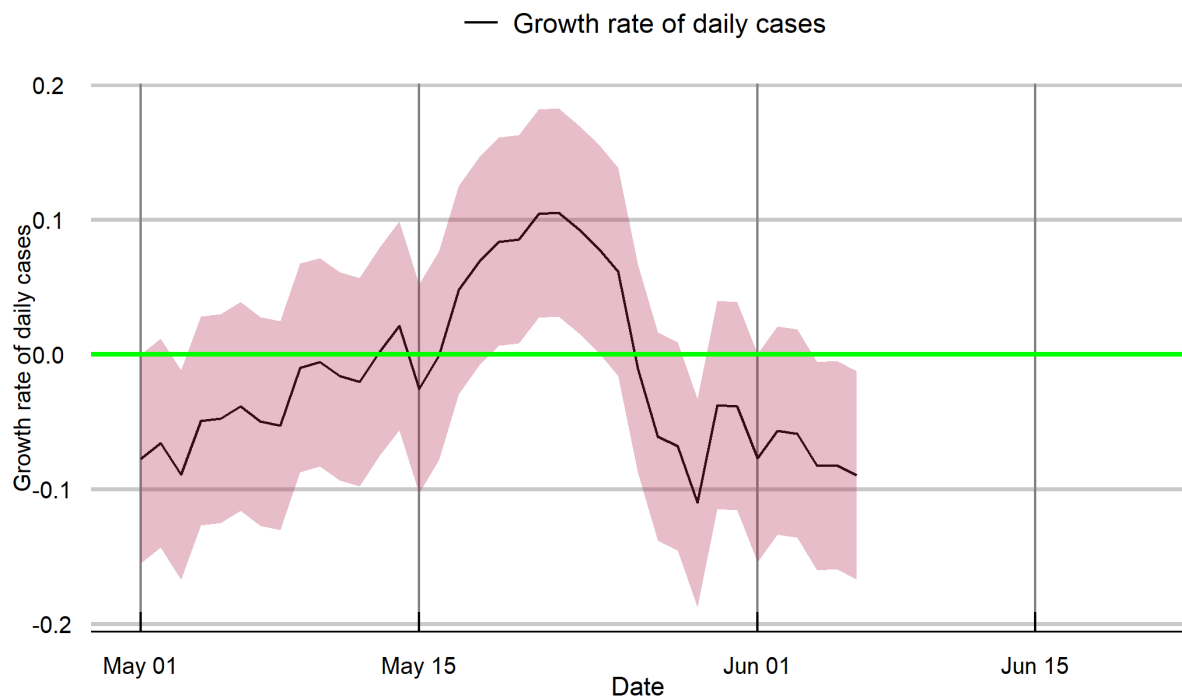
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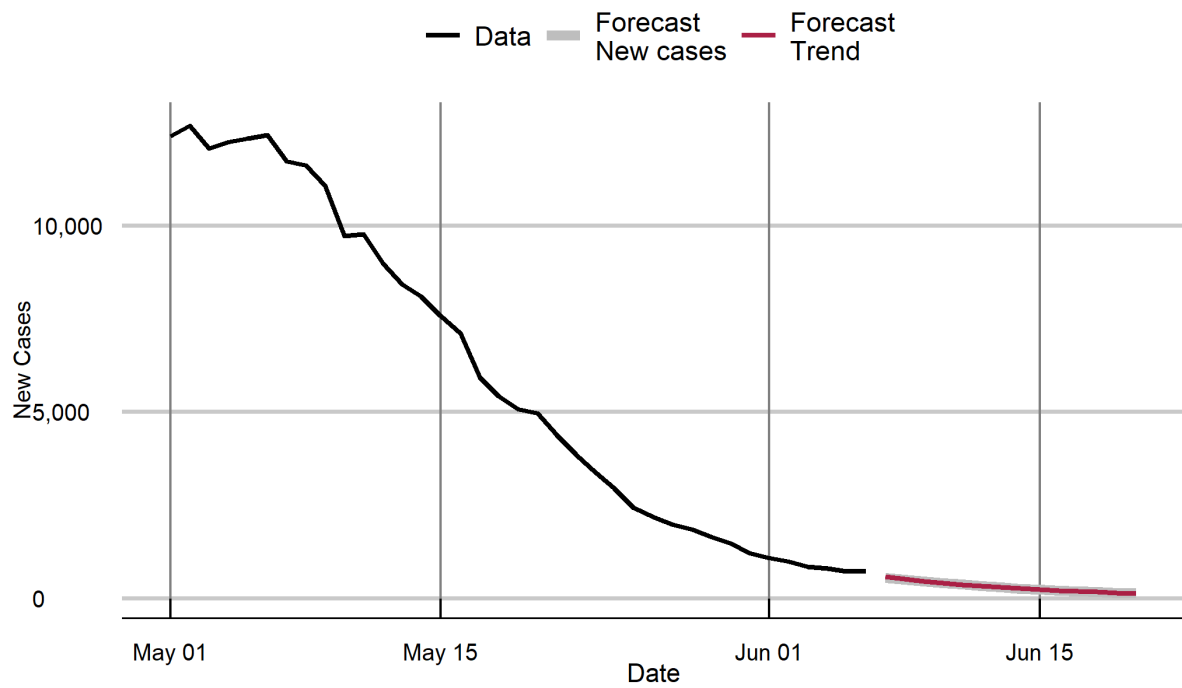
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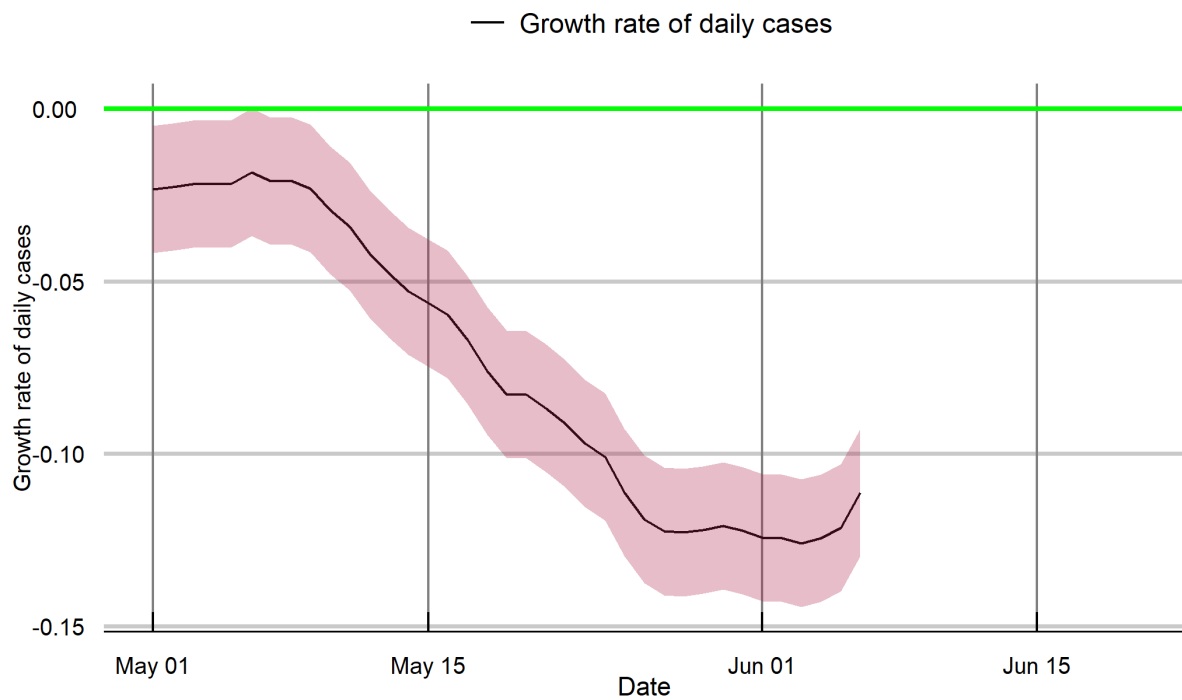
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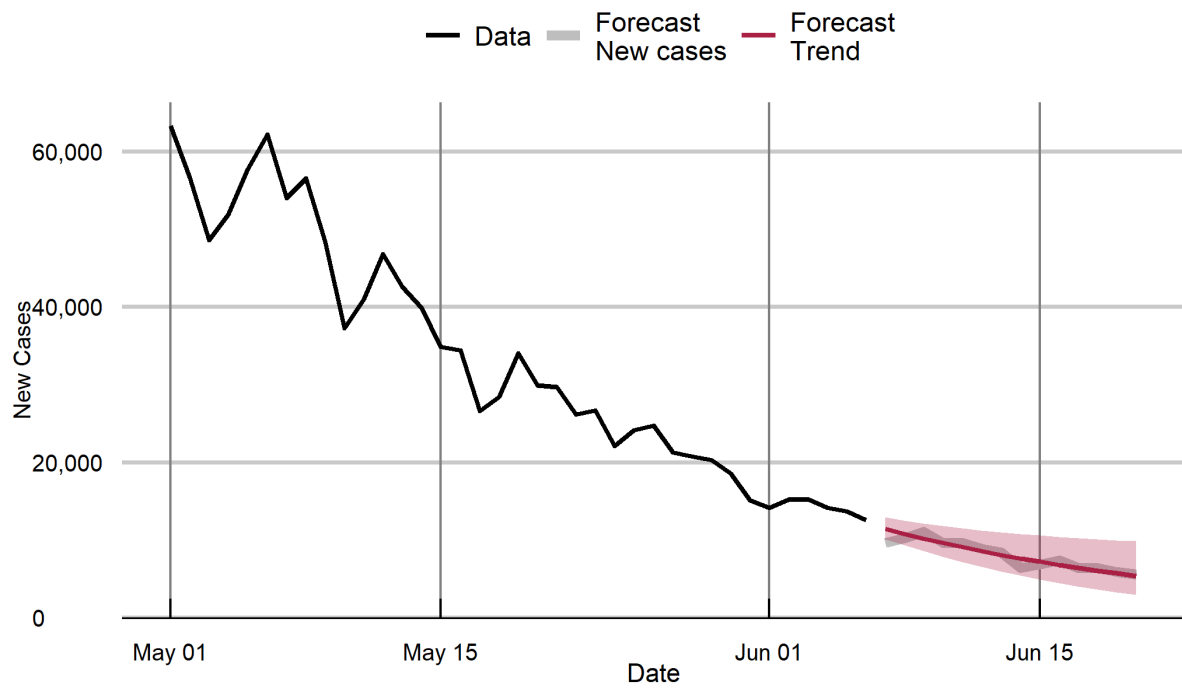
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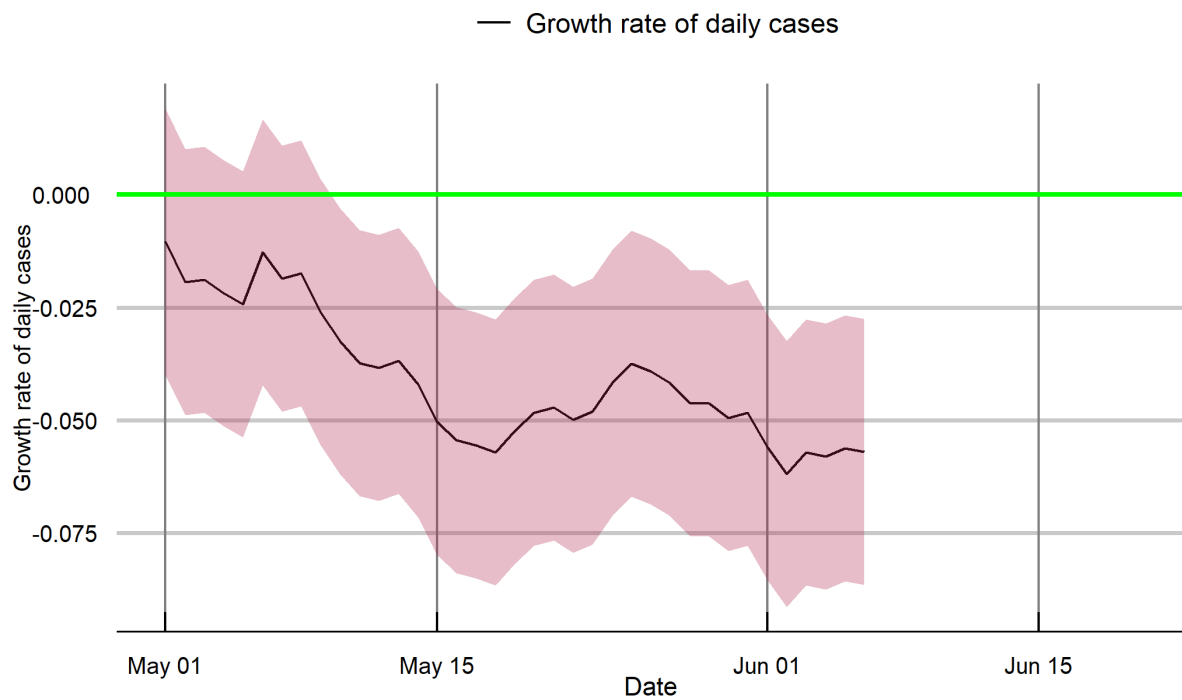
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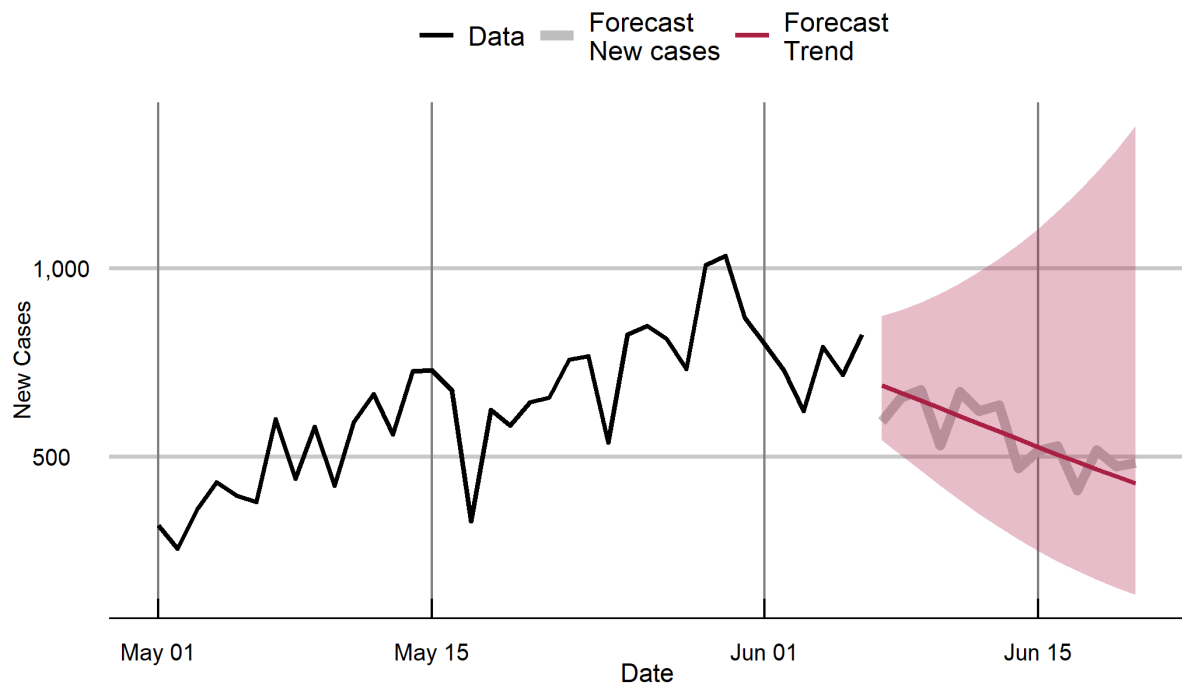
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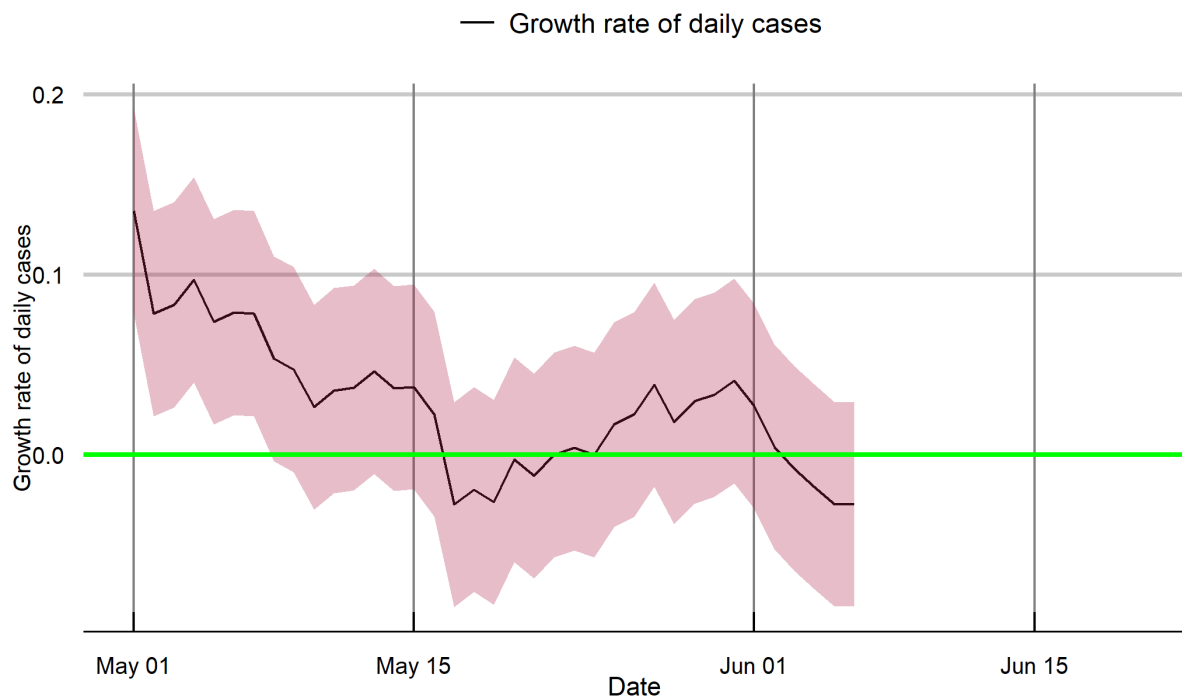
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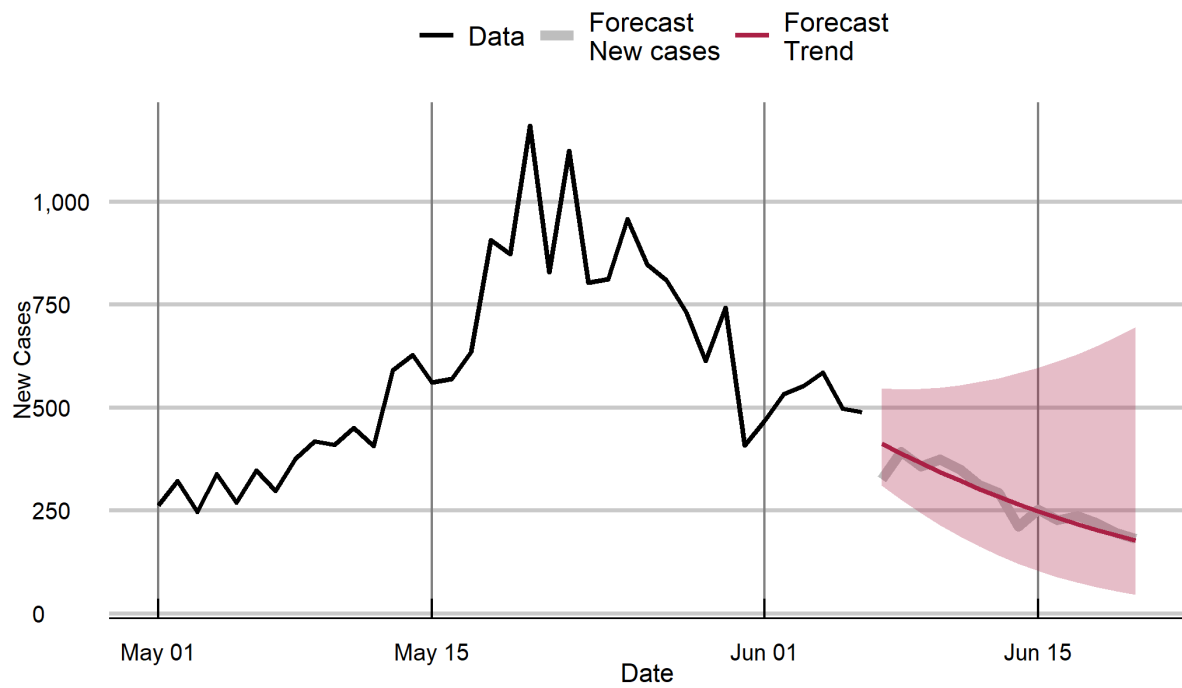
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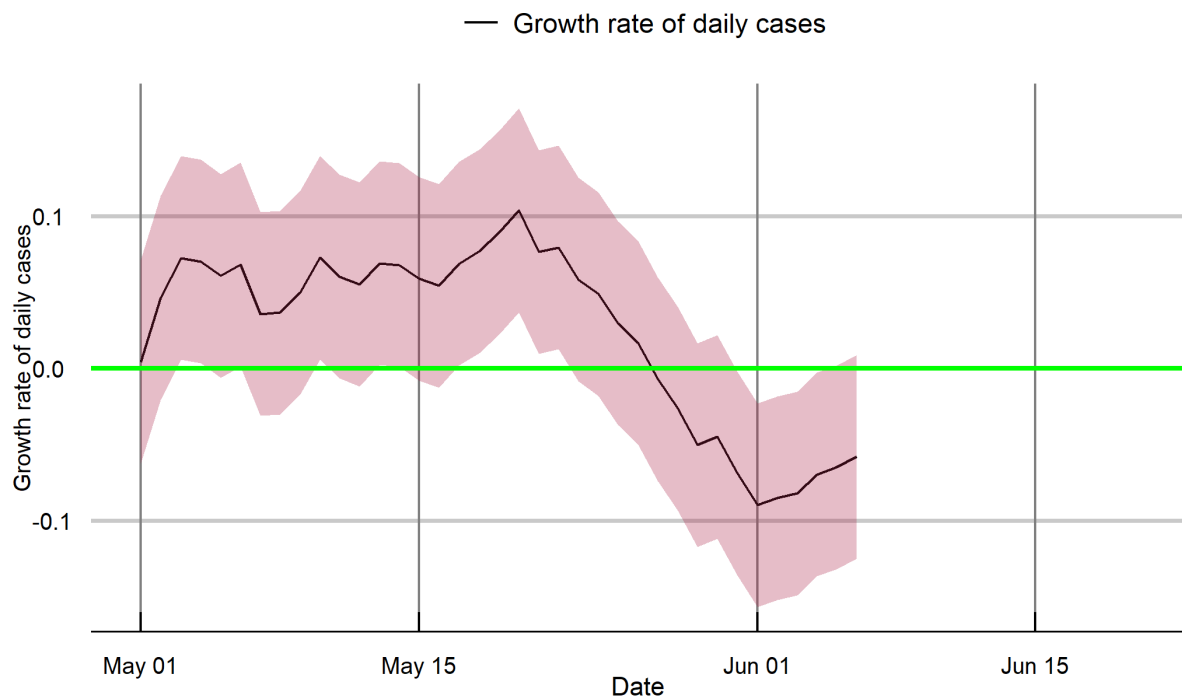
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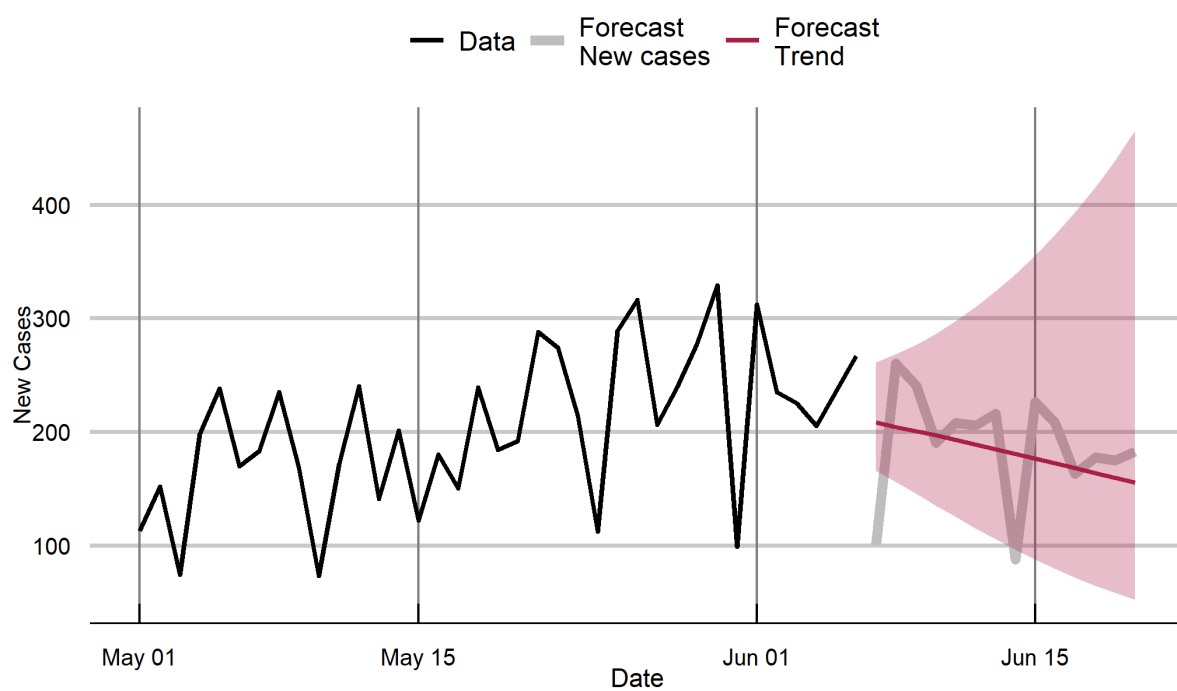
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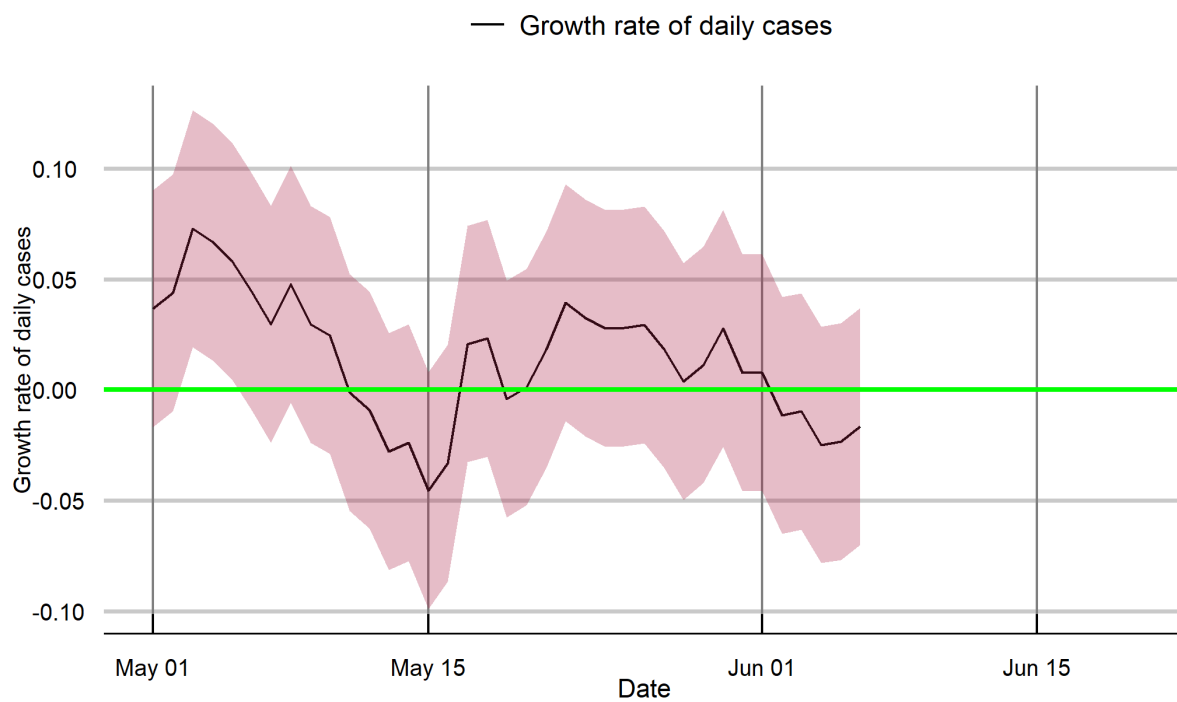
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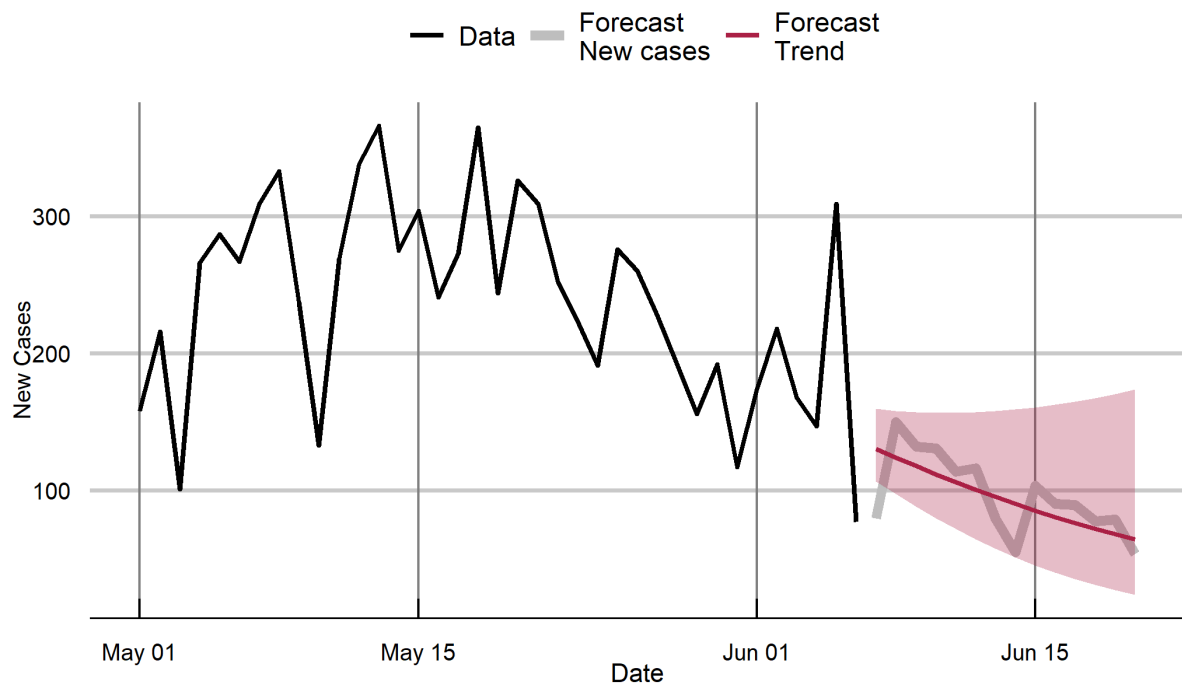
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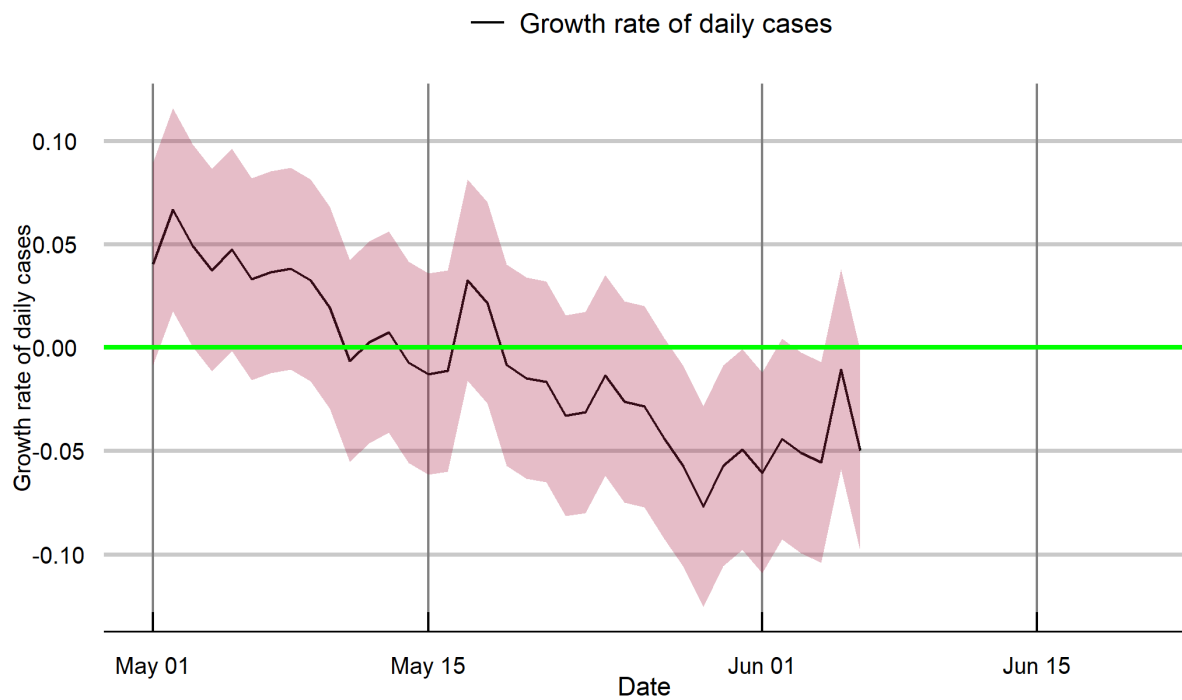
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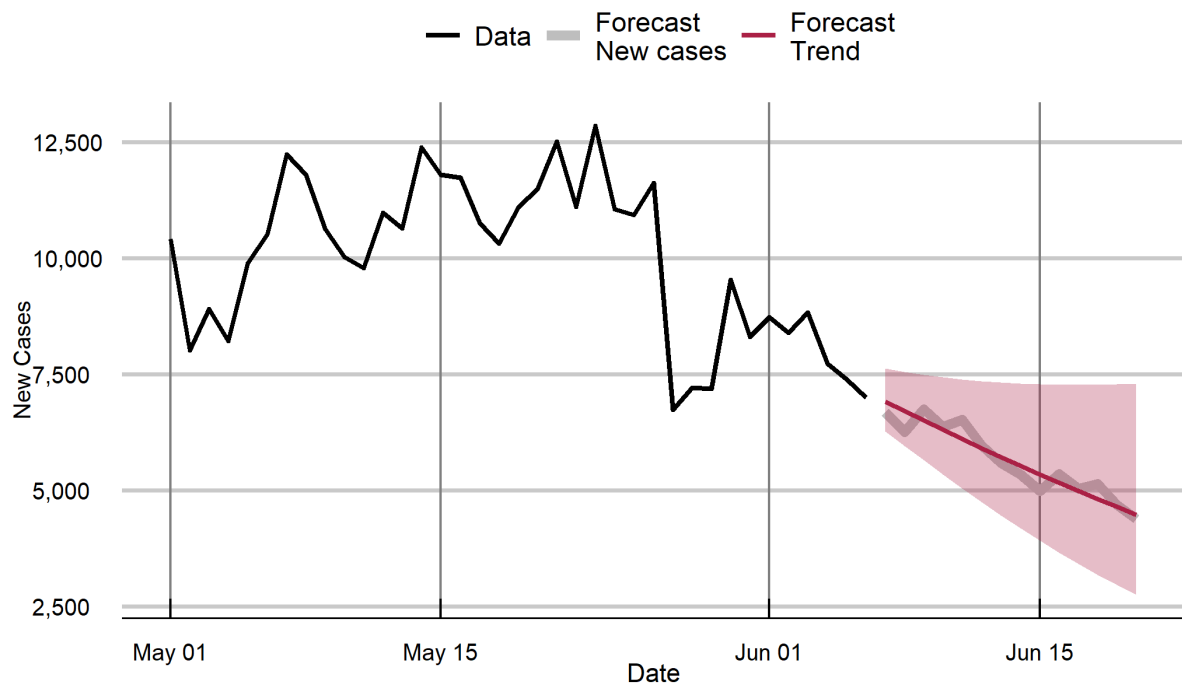
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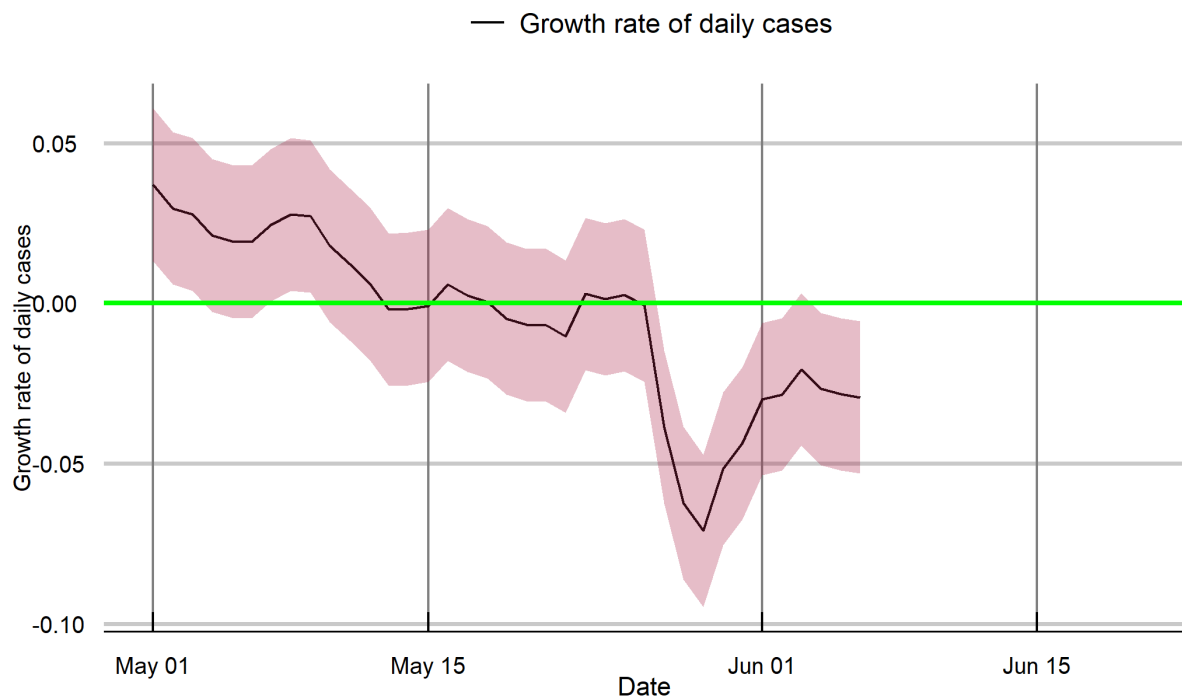
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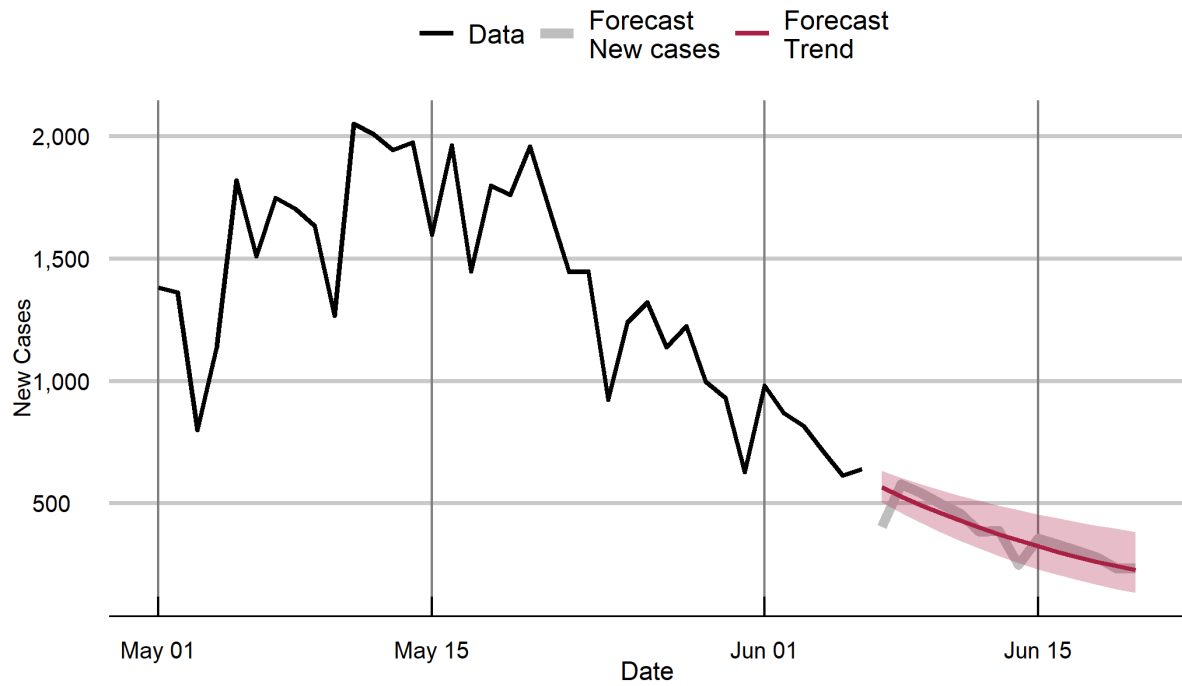
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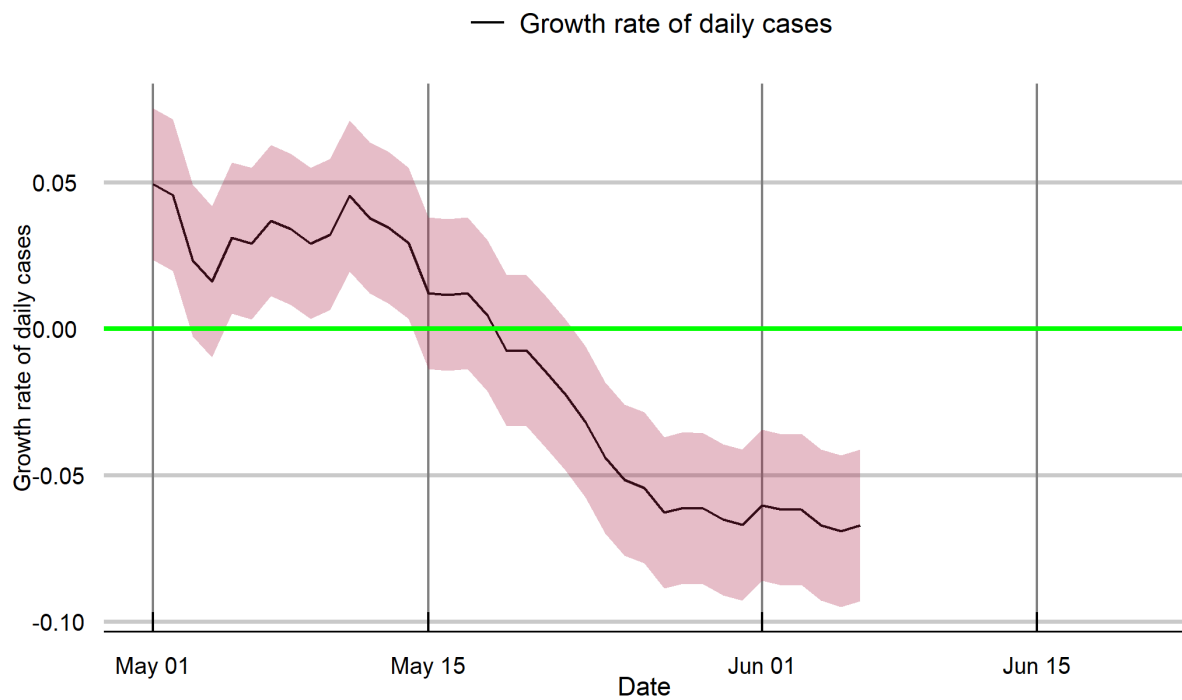
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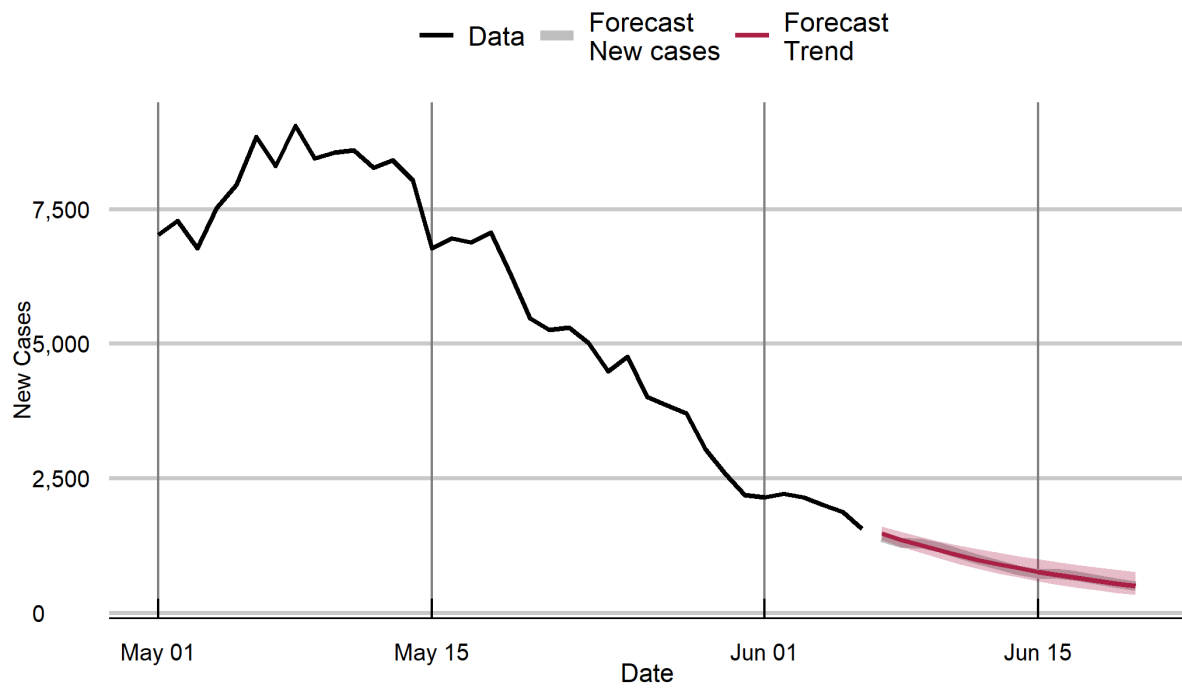
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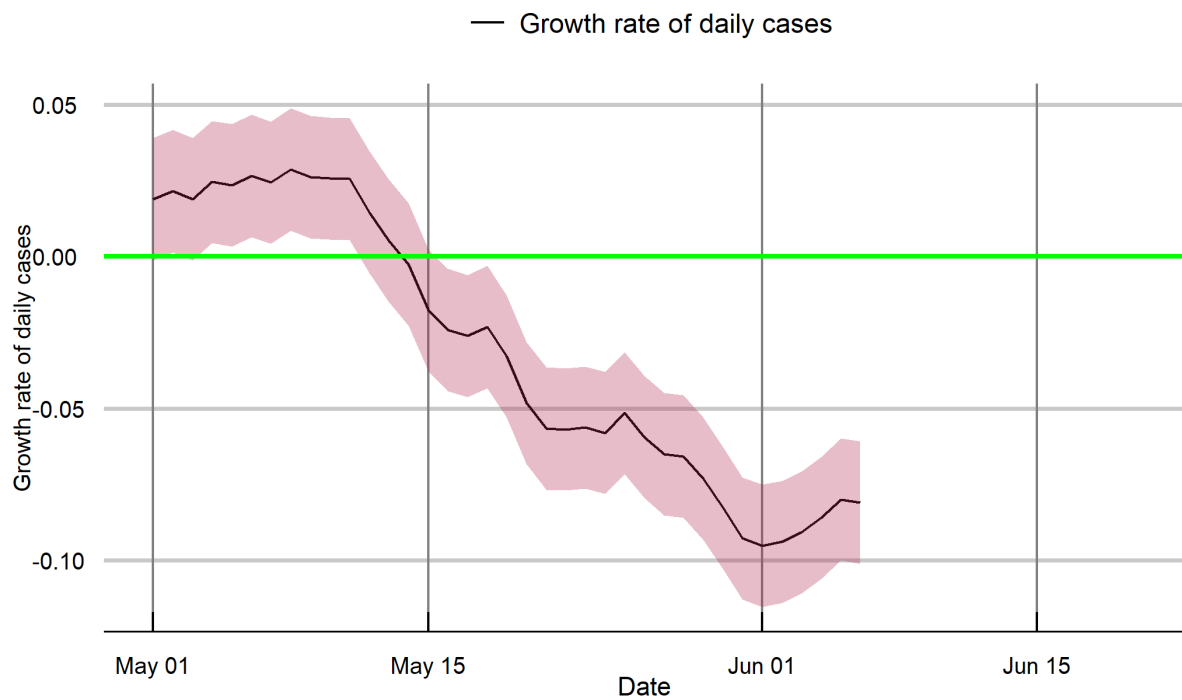
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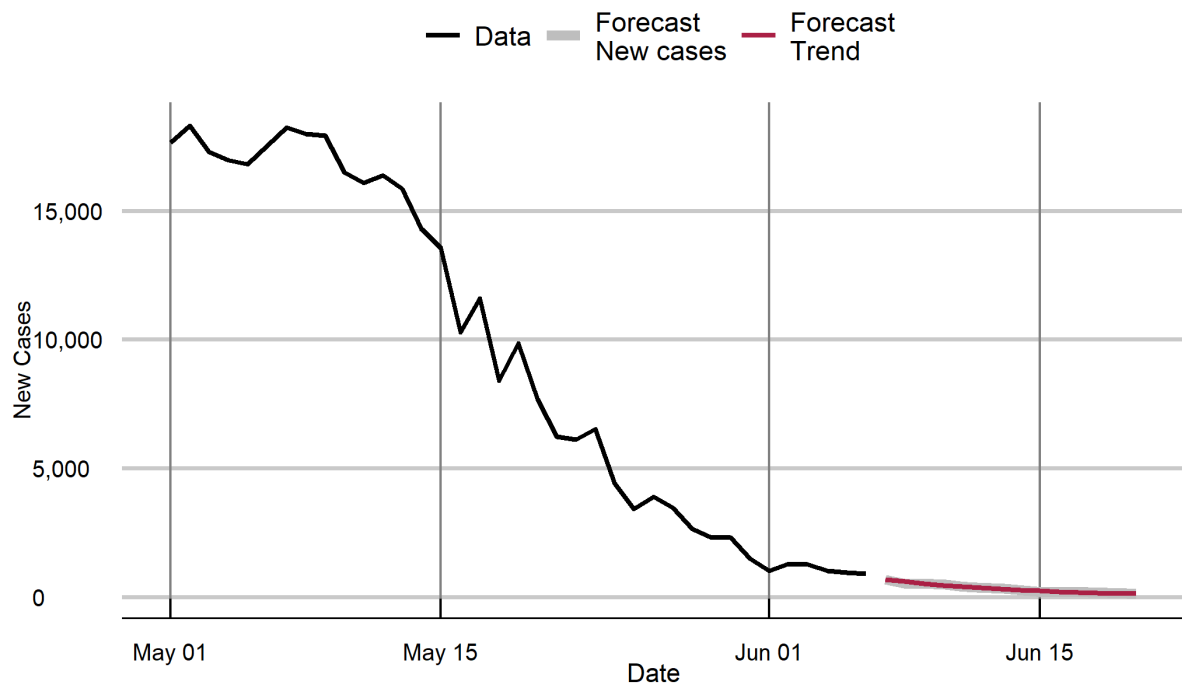
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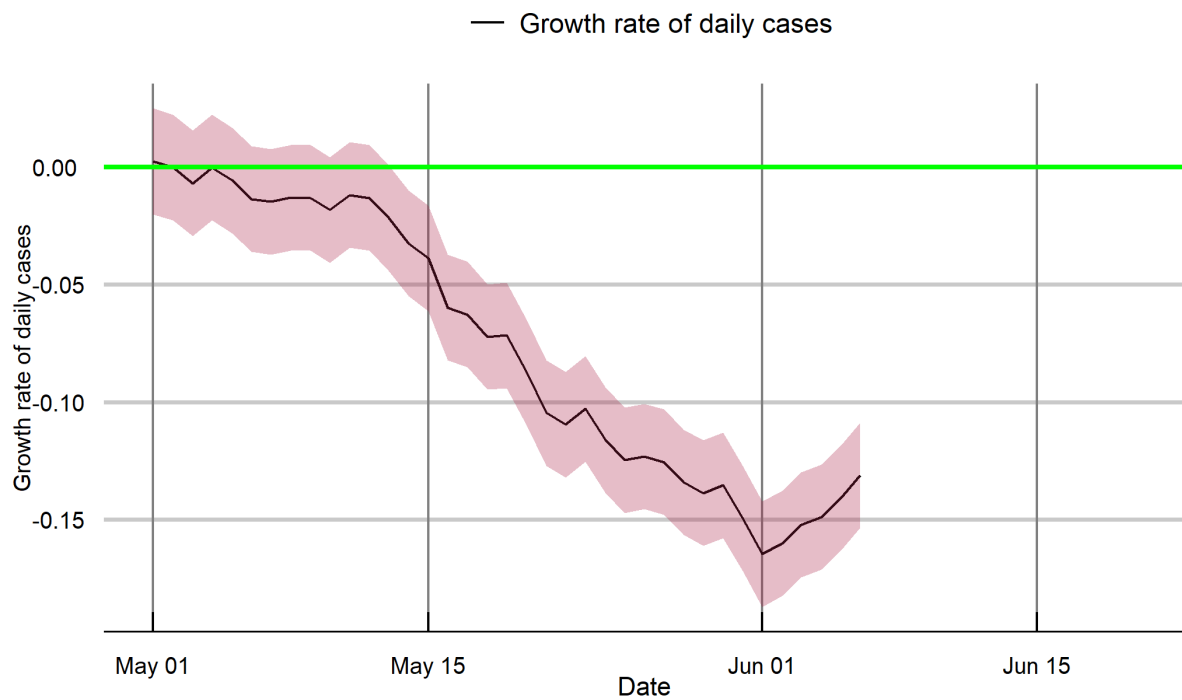
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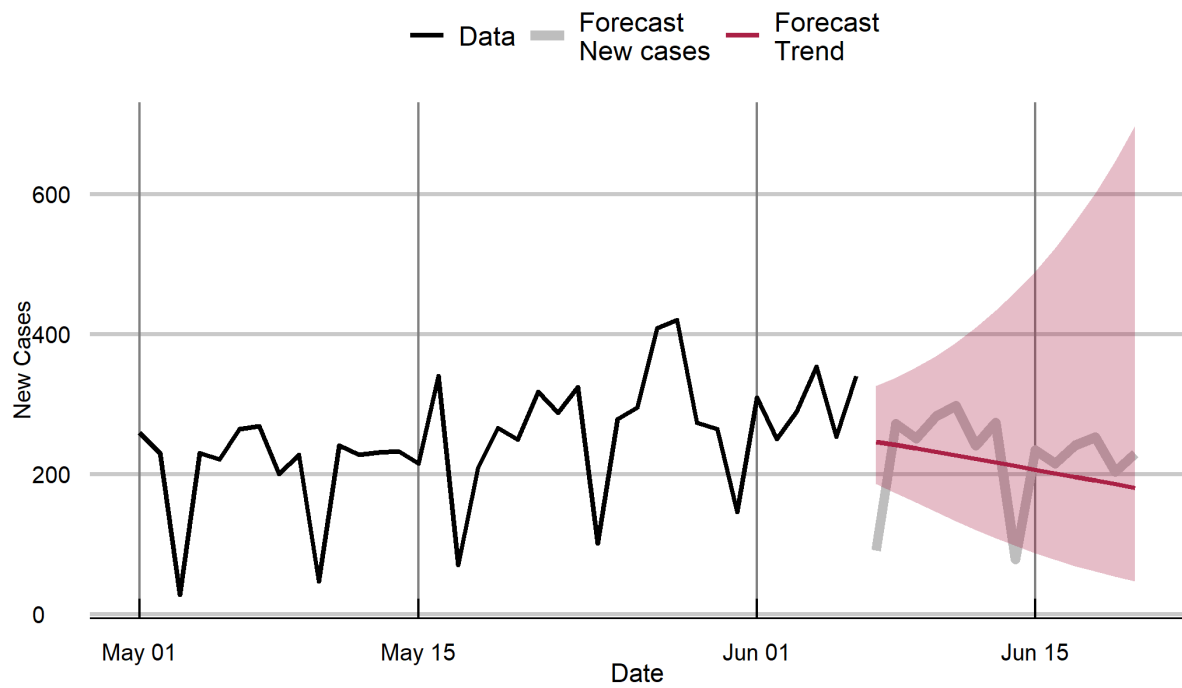
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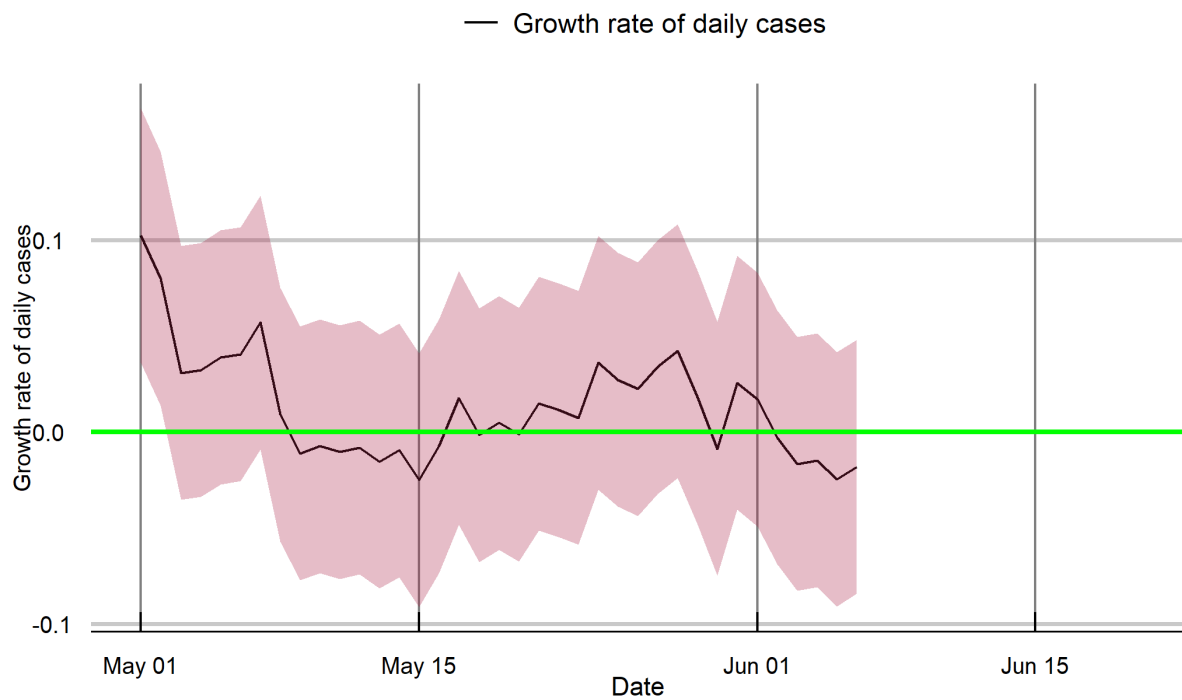
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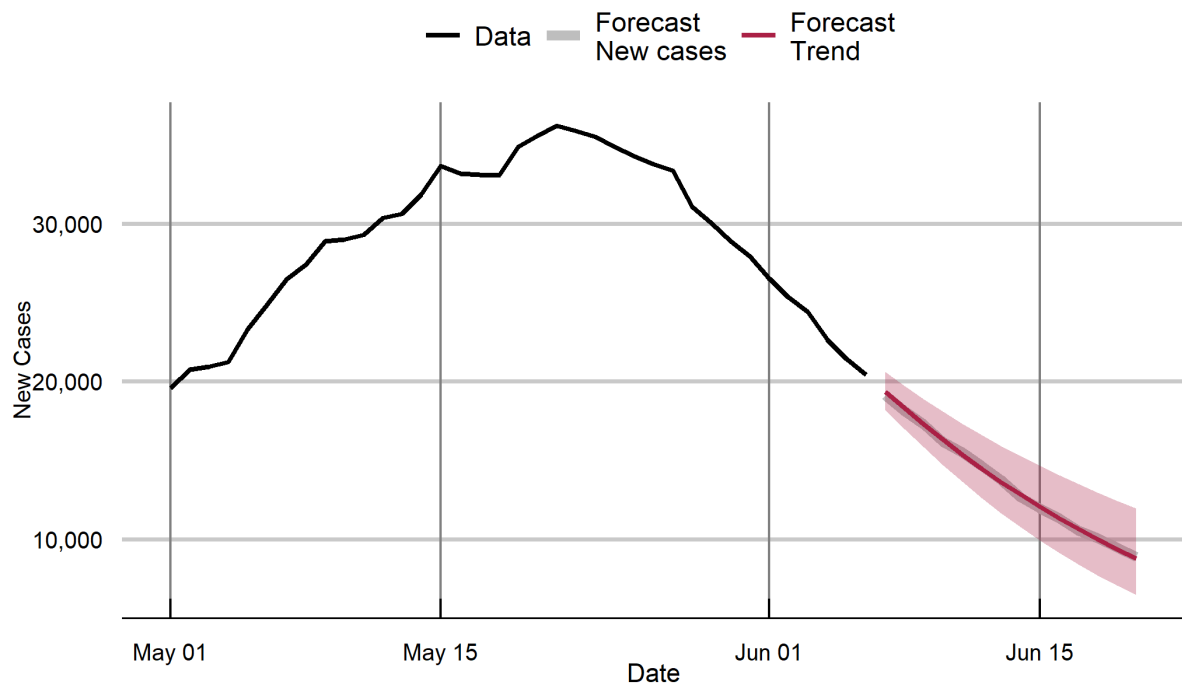
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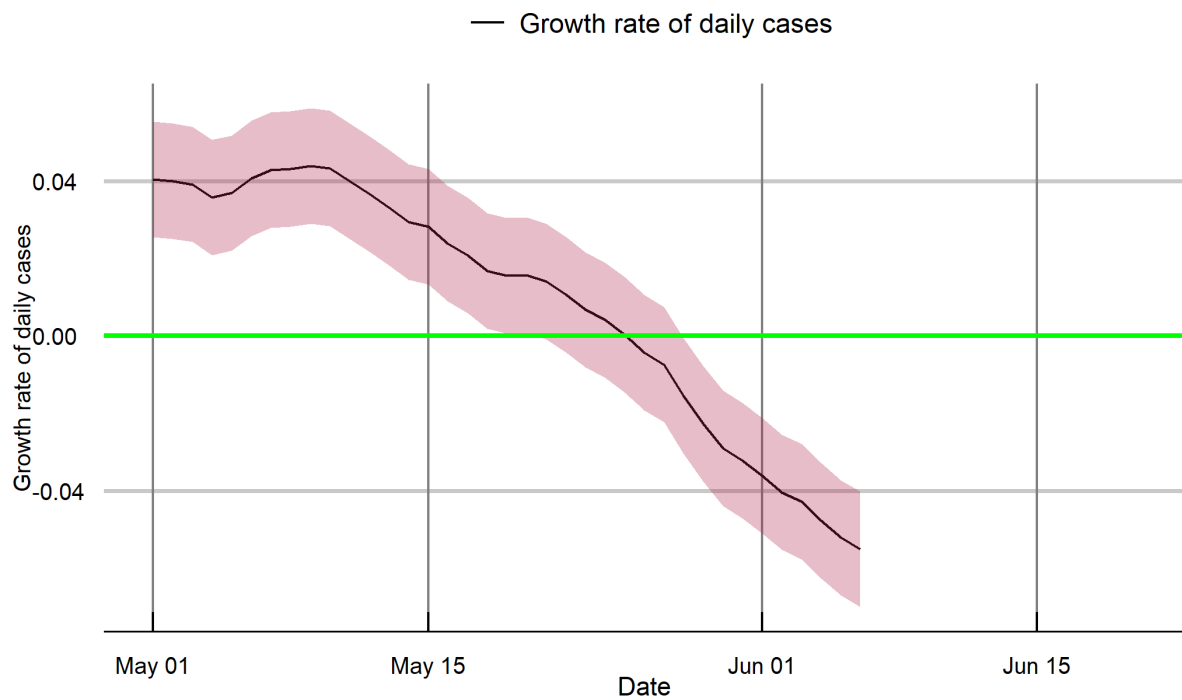
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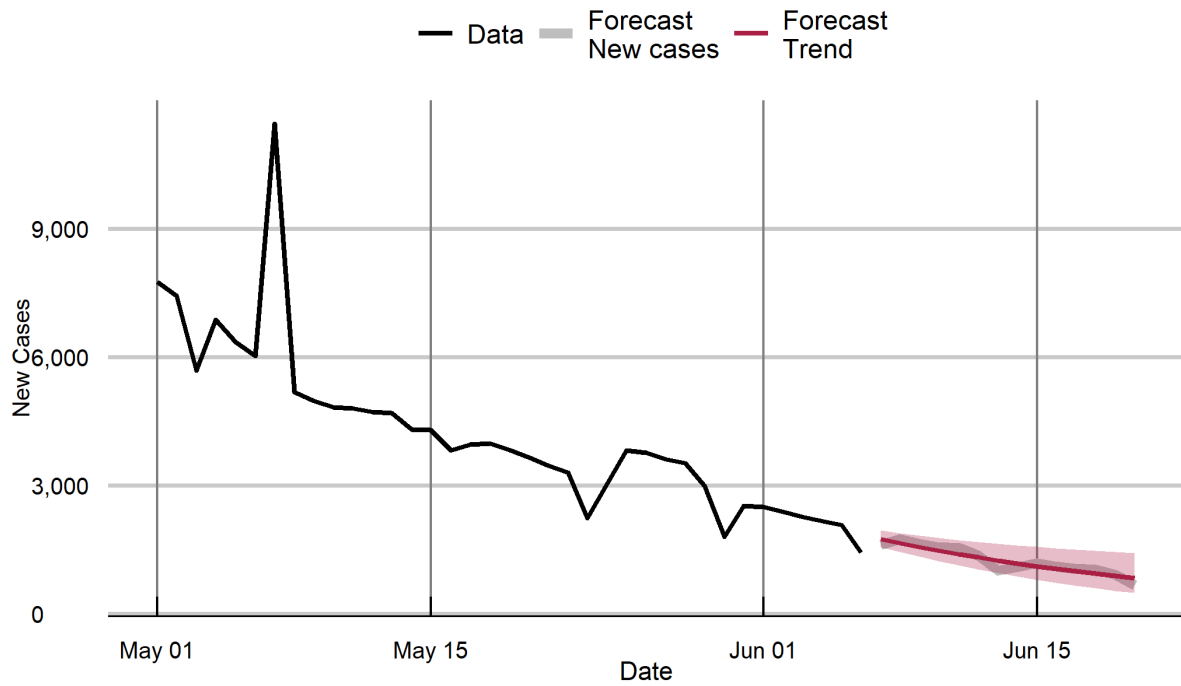
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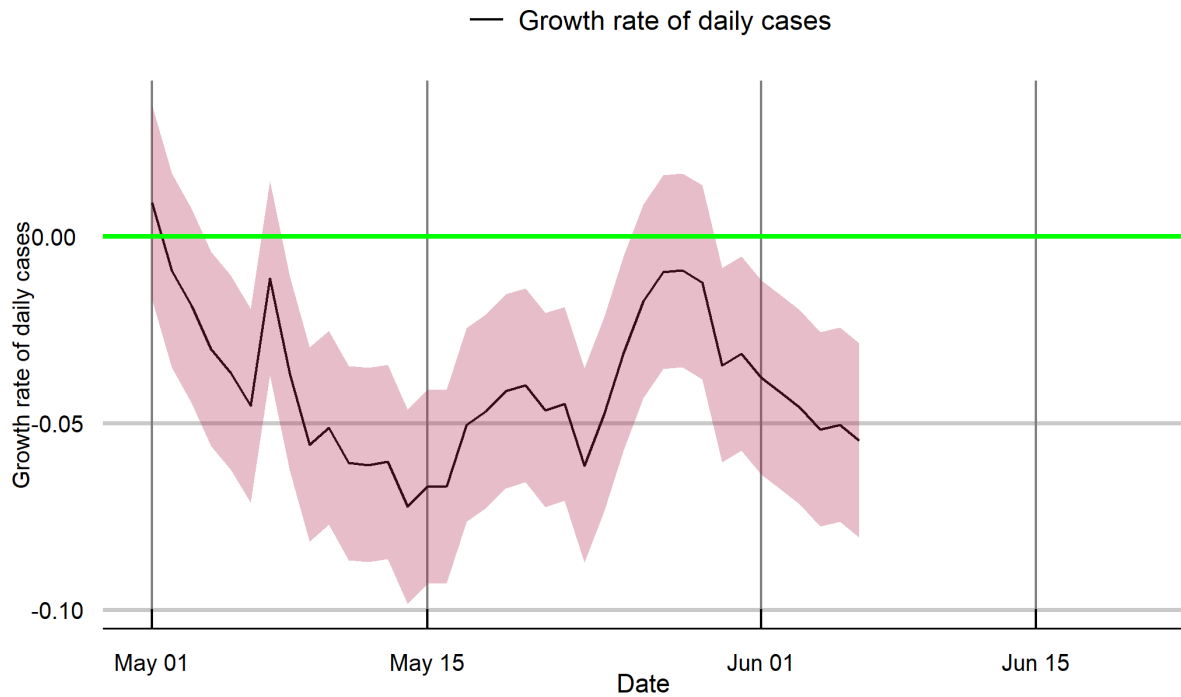
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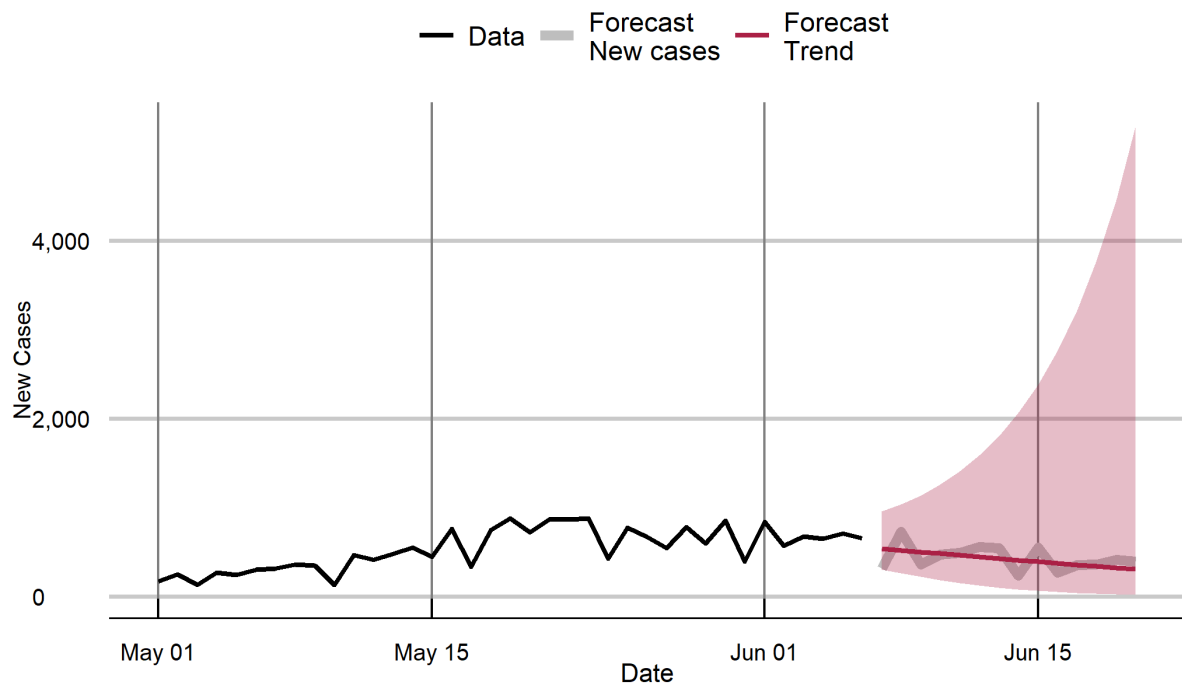
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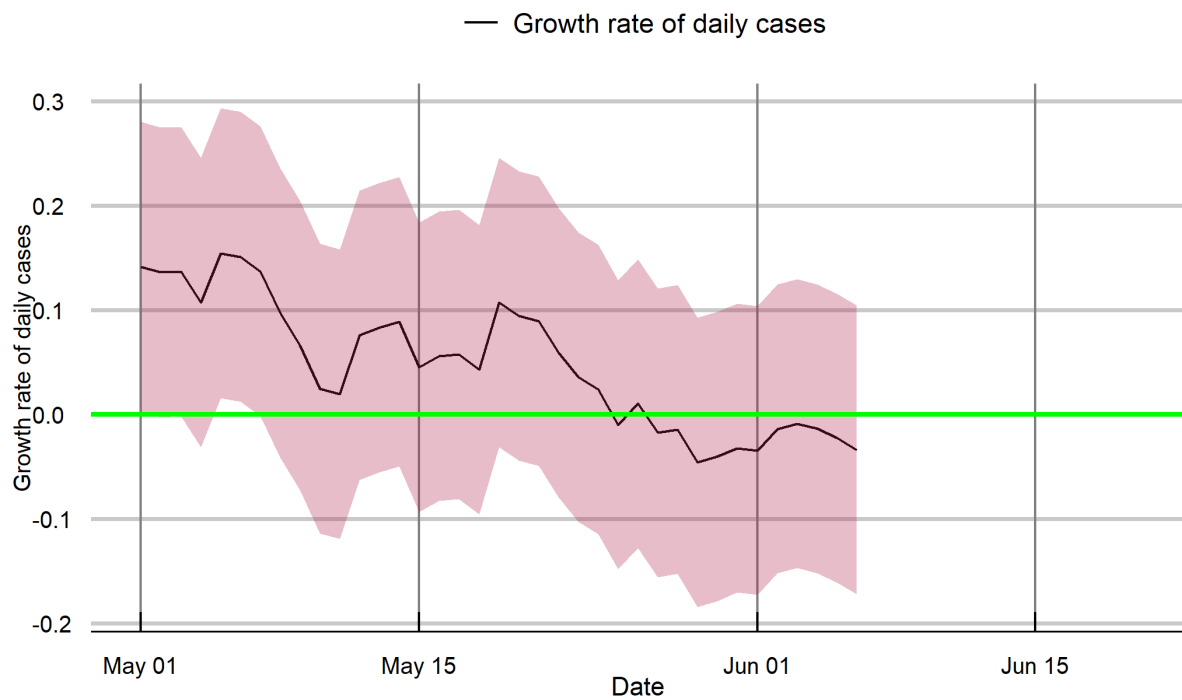
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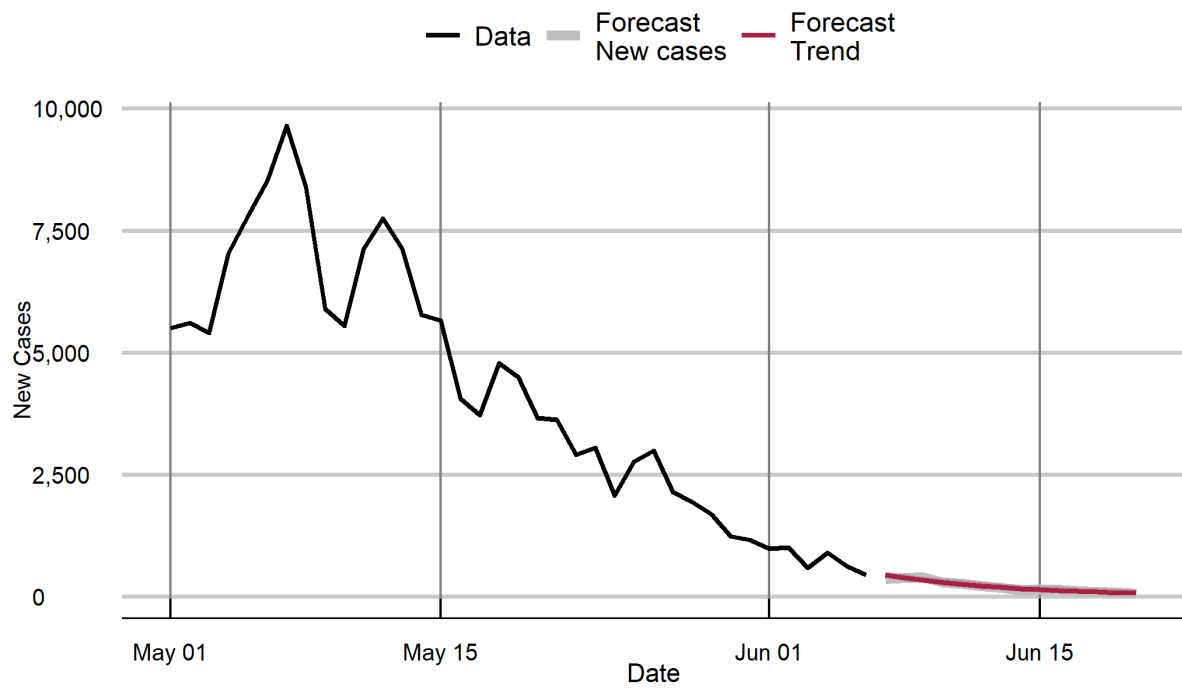
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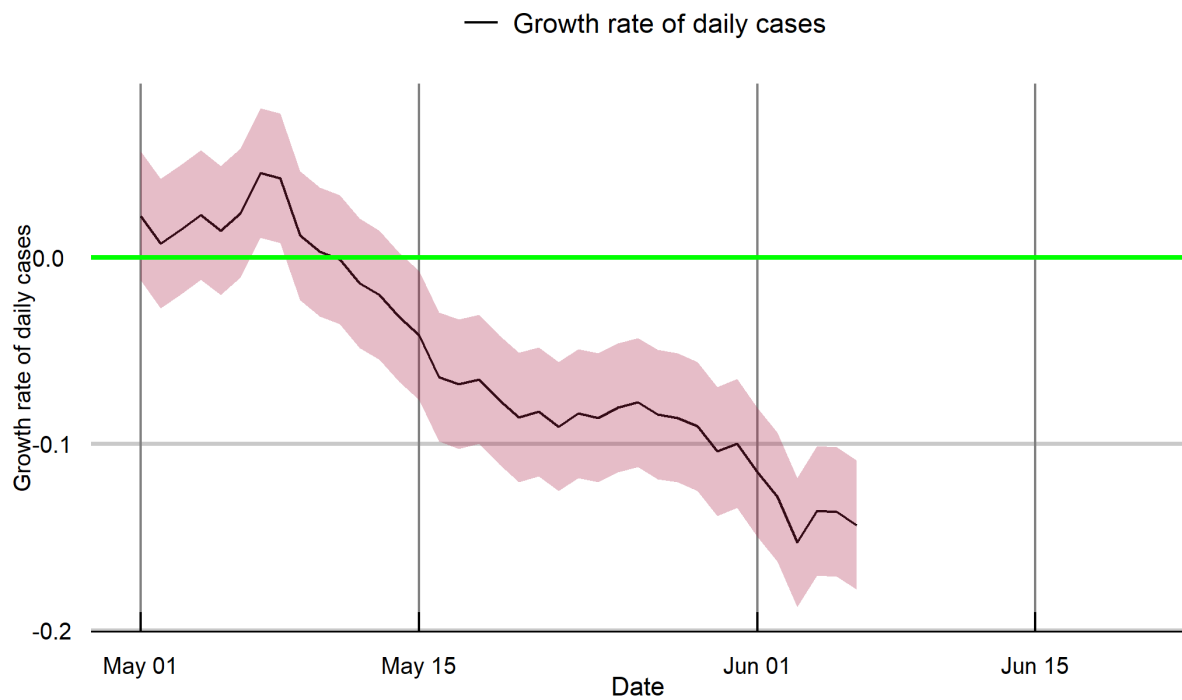
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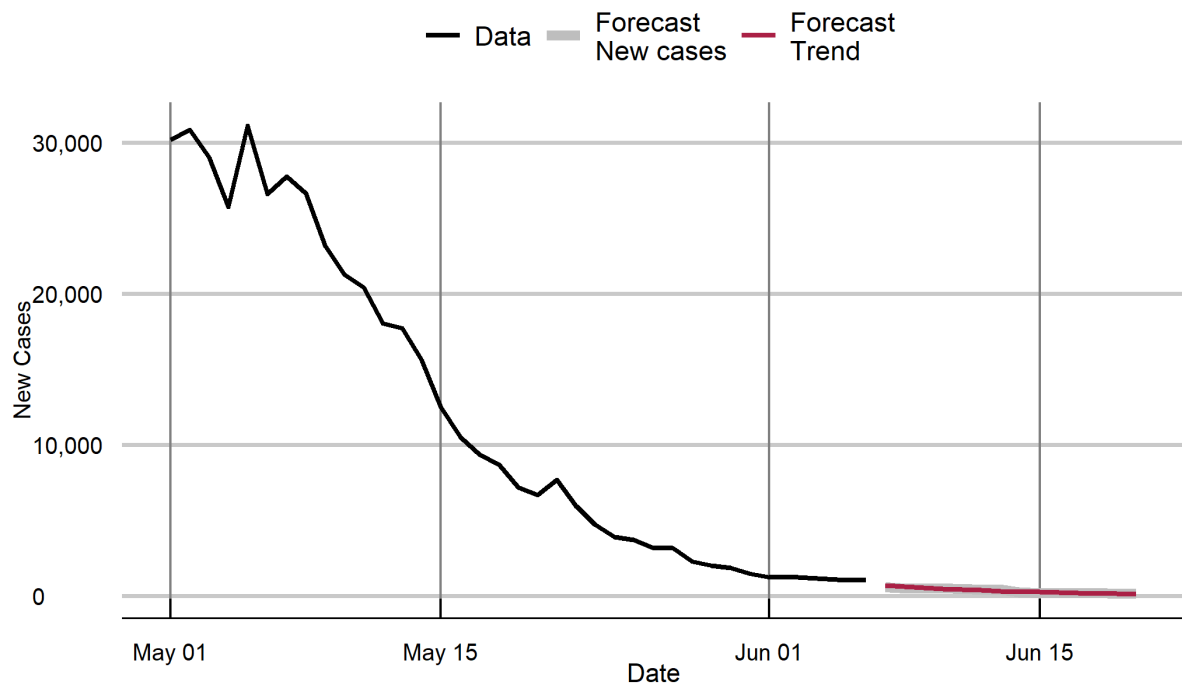
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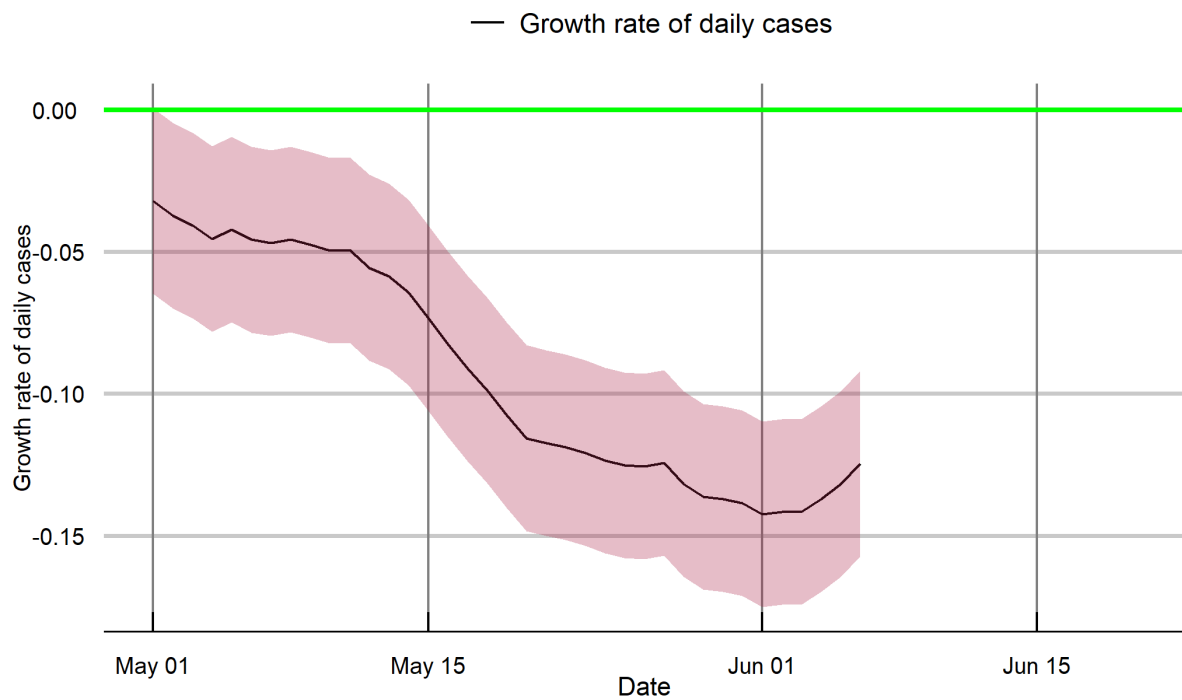
Uttarakhand



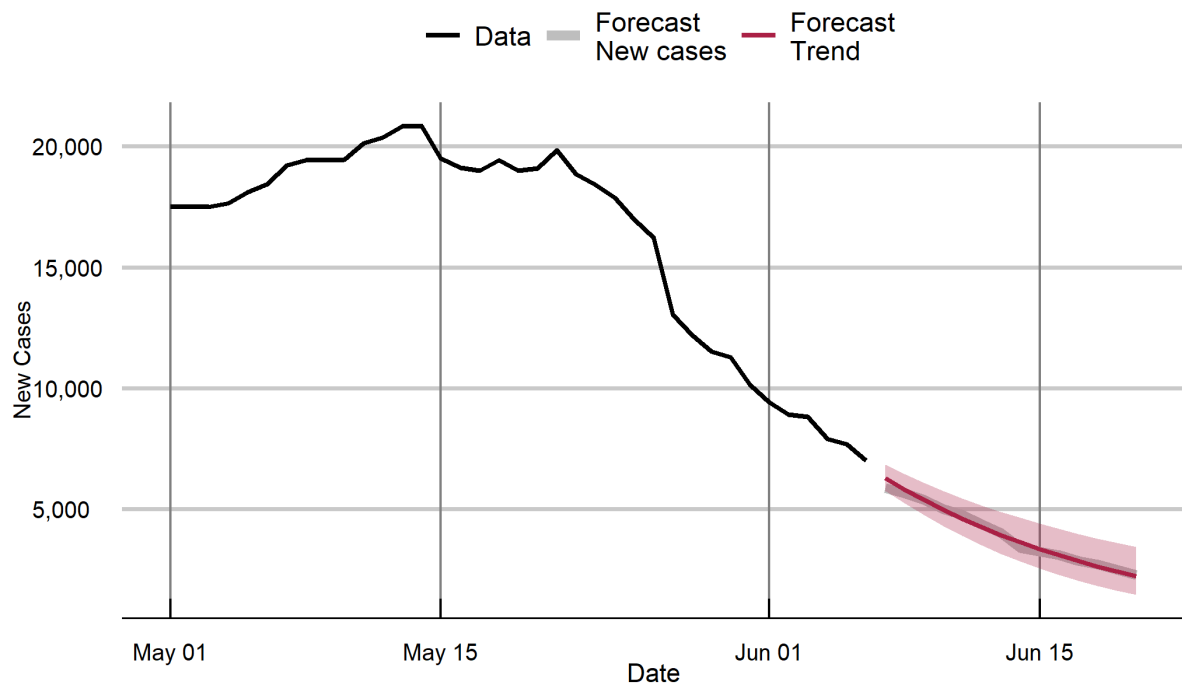
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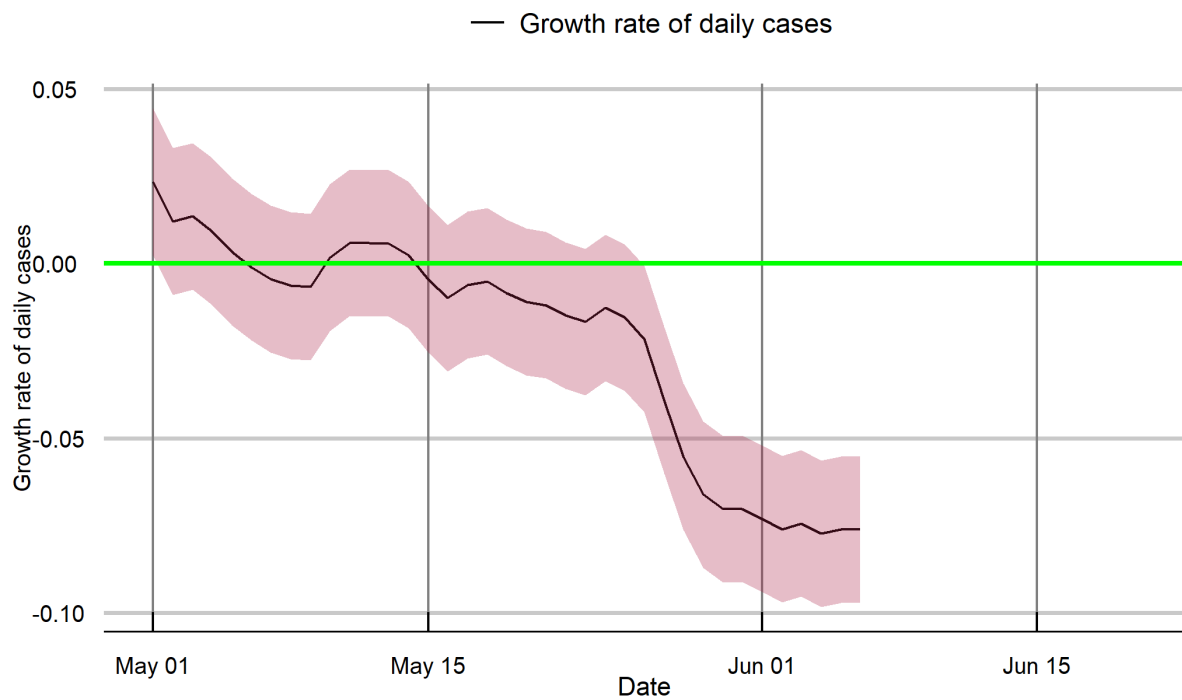
Uttar Pradesh



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/ozgix0yn/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 30, the mean absolute percentage error of the forecasts of cases for India over the 7 day period, May 31-June6, is 7.9%. The corresponding value for deaths is 6.8%. 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 may lead realised numbers to deviate from forecasts.

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

*University of Cambridge

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Cambridge Judge Business School
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