

Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

27 June 2021



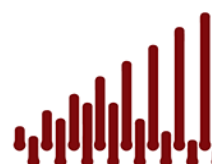
Centre for
**Health Leadership
& Enterprise**



**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.

The reproduction number (R_t) for India increased over the past week and stands at 0.9 as of 27 June 2021. The trend value of the daily growth rate of cases in India remain negative, but has drifted upwards to -2.5%. Newly reported COVID-19 cases are likely to decline at a diminished rate in the coming days. By 11 July 2021, about 31,400 reported cases per day can be expected.

With reproduction numbers exceeding one, daily reported cases are likely to increase in Maharashtra, Nagaland, Arunachal Pradesh, Manipur, Meghalaya and Sikkim. Maharashtra and Nagaland are of particular concern due to the faster rate of increase of their positive case growth rates.

In all but a few of the remaining states and union territories the daily growth rates of new cases, though currently negative, are trended upwards, indicating the need for close monitoring of the transmission environments and prompt policy corrections. The present exceptions to this are Assam, Bihar, Chandigarh, Madhya Pradesh, Mizoram, Punjab, Telangana and Tripura.

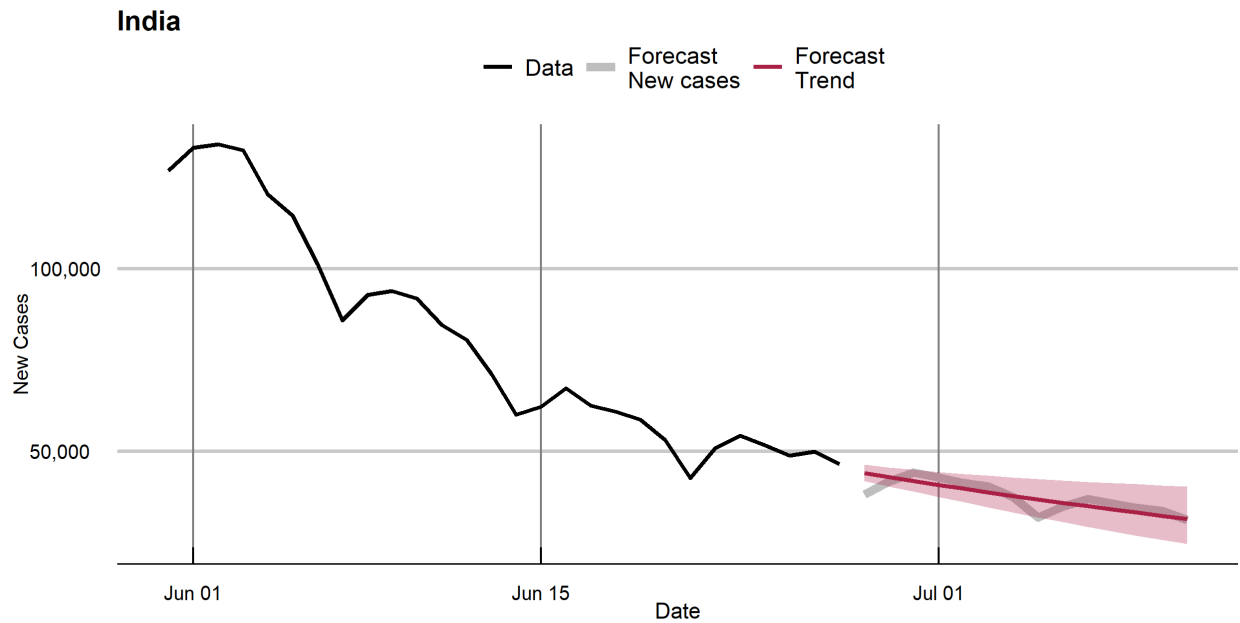
Mean absolute percentage error of the forecasts of daily cases in India given in the 20 June tracker, for the week beginning that day, is 10.2%. The accuracy of forecasts rely on the quality of the reported data. Changes in government pandemic policies and in transmission relevant social behaviour may cause realised numbers to depart from forecasts.

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

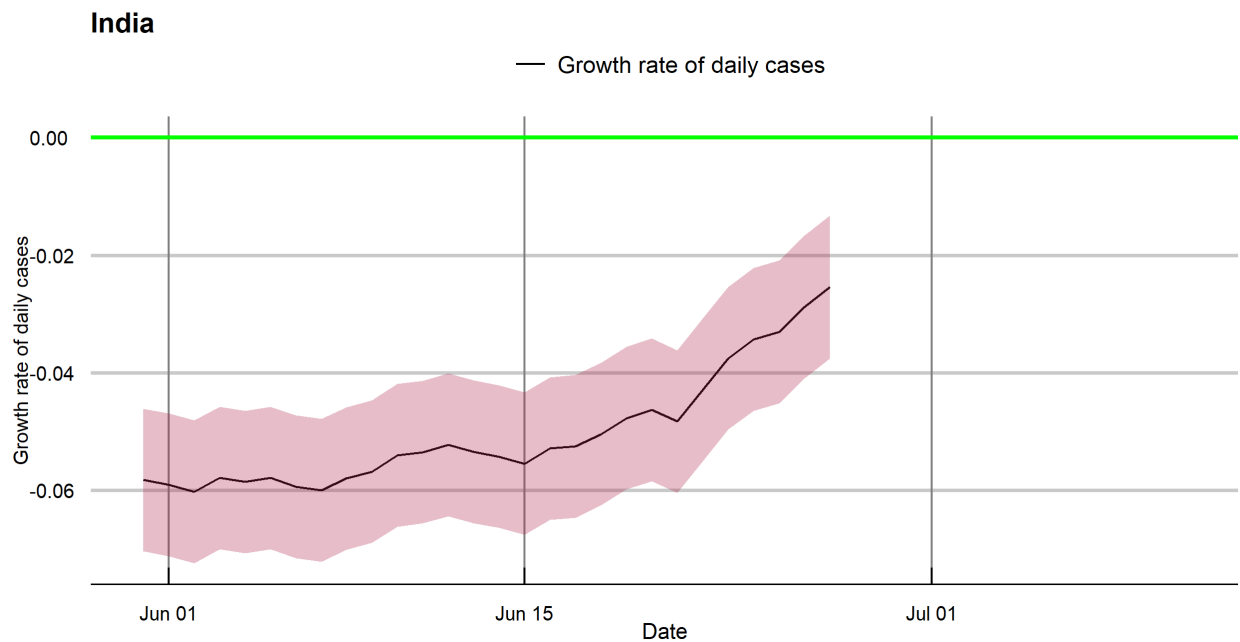
The companion spreadsheet contains all the estimates and forecasts.

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

Daily Covid-19 cases in India: Forecast

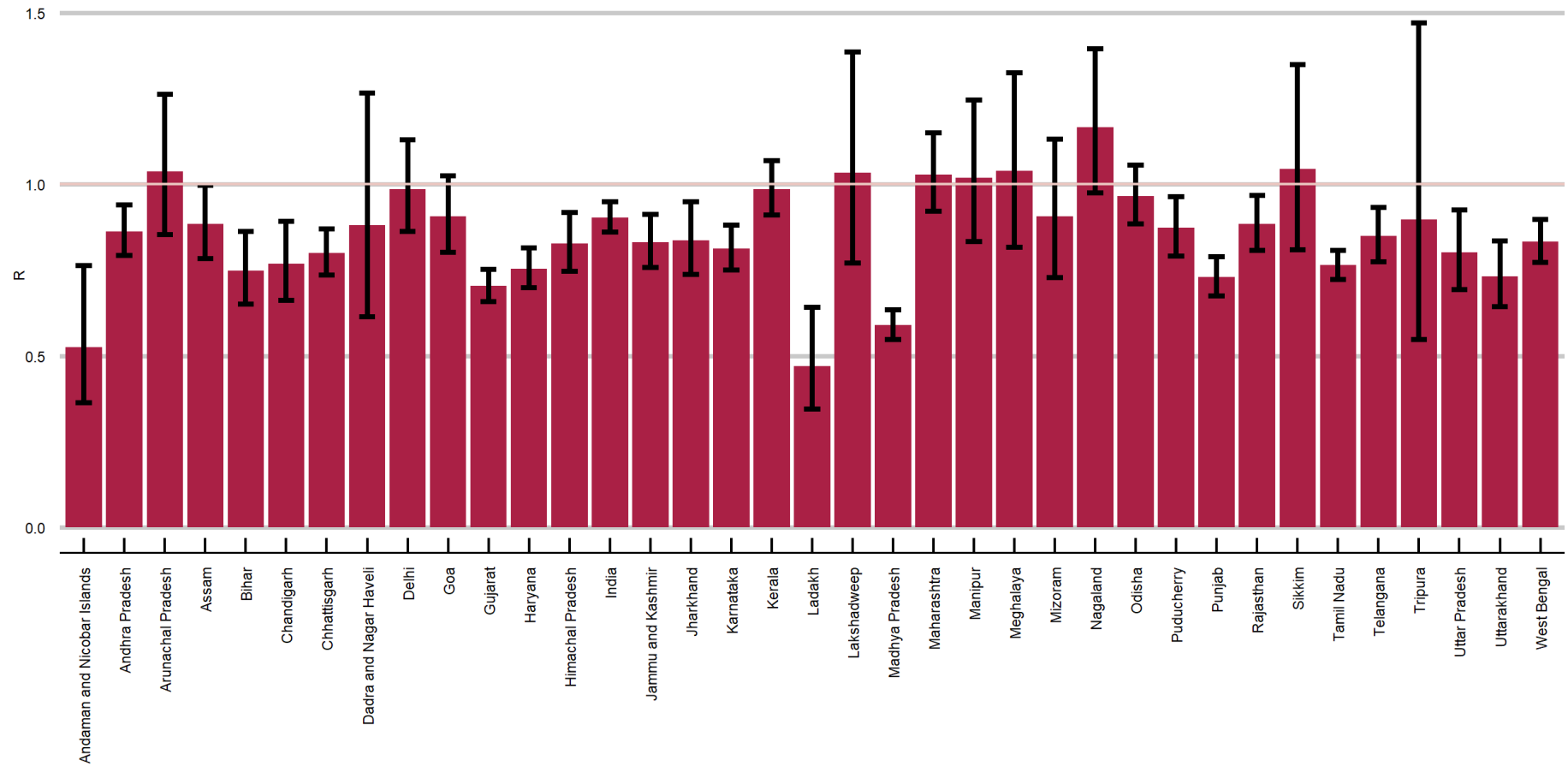


Forecasts of daily new cases for the period 28 June 2021 to 11 July 2021, based on data till 27 June 2021. New COVID-19 cases is likely to number about 31,400 per day by 11 July 2021.



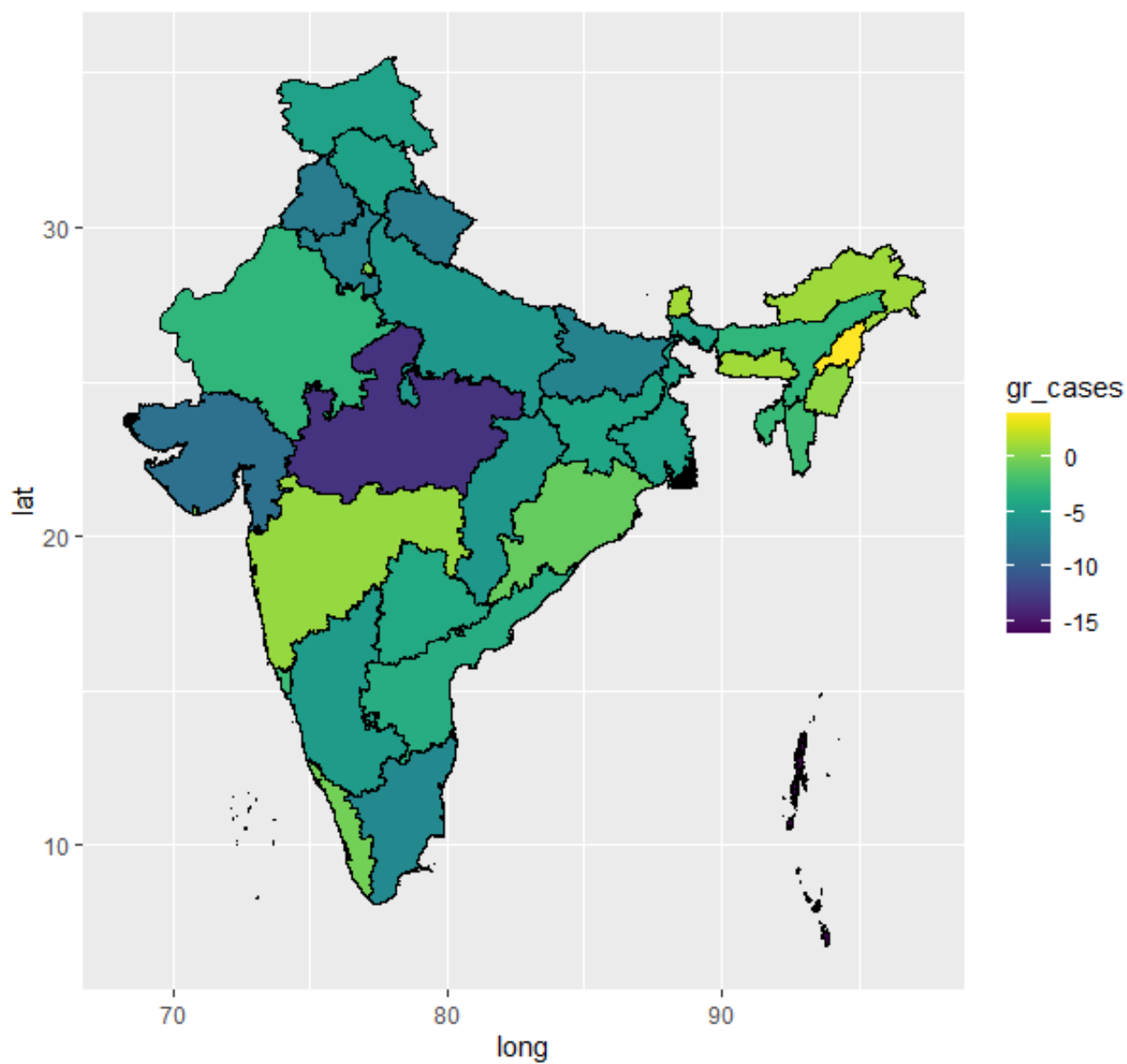
The filtered trend in the growth rate of daily new cases. Final date: 27 June 2021.

R_t : 27 June 2021



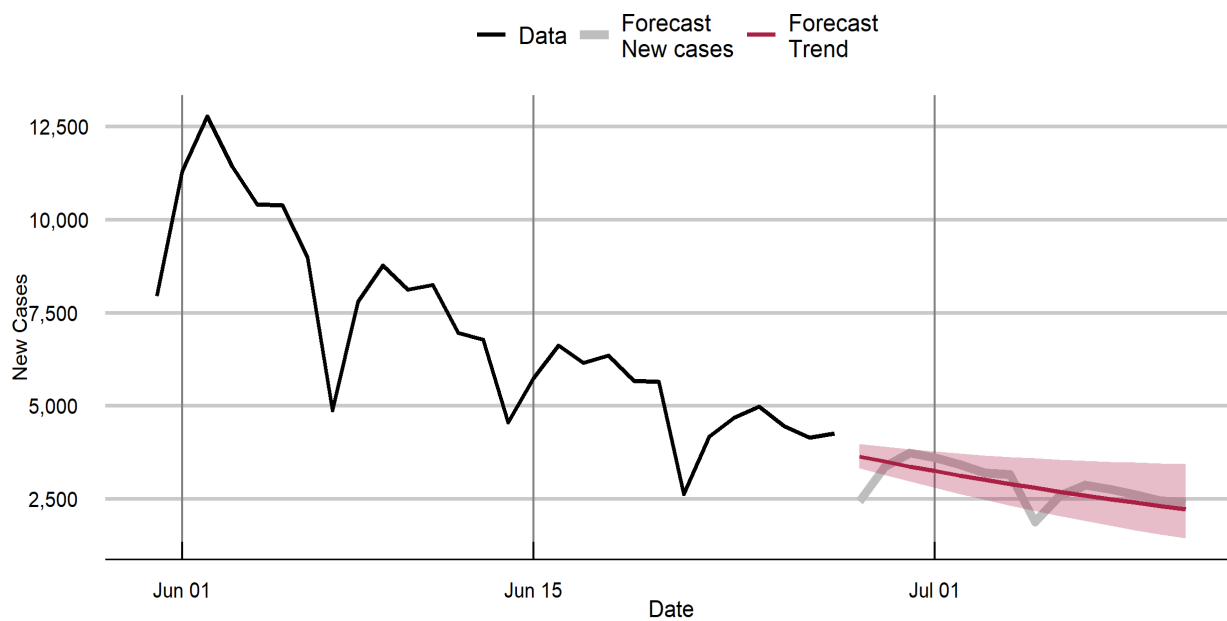
Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

Daily growth rate (%) of cases
Trend value on 27 June 2021

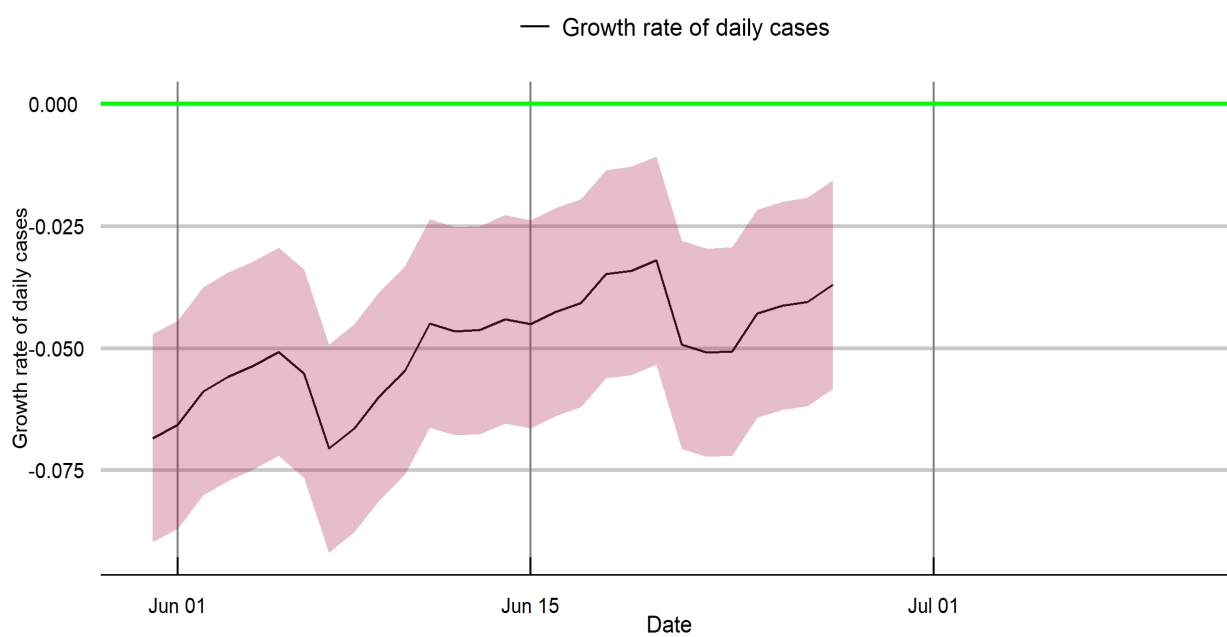


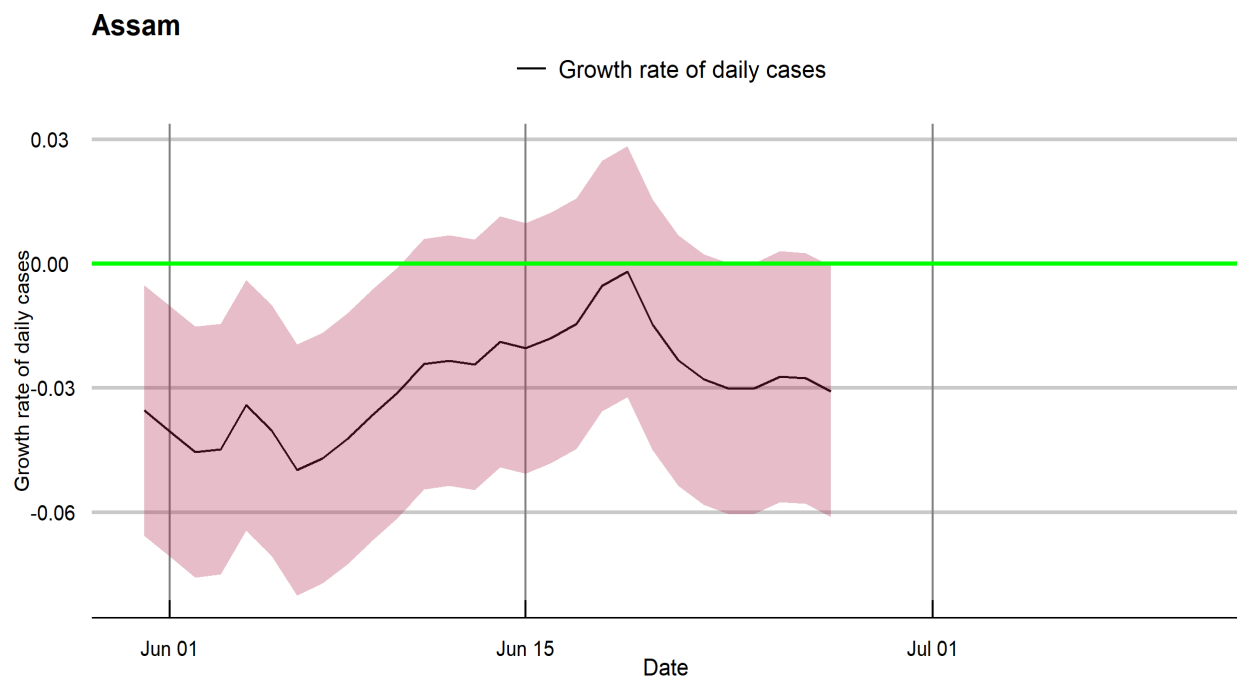
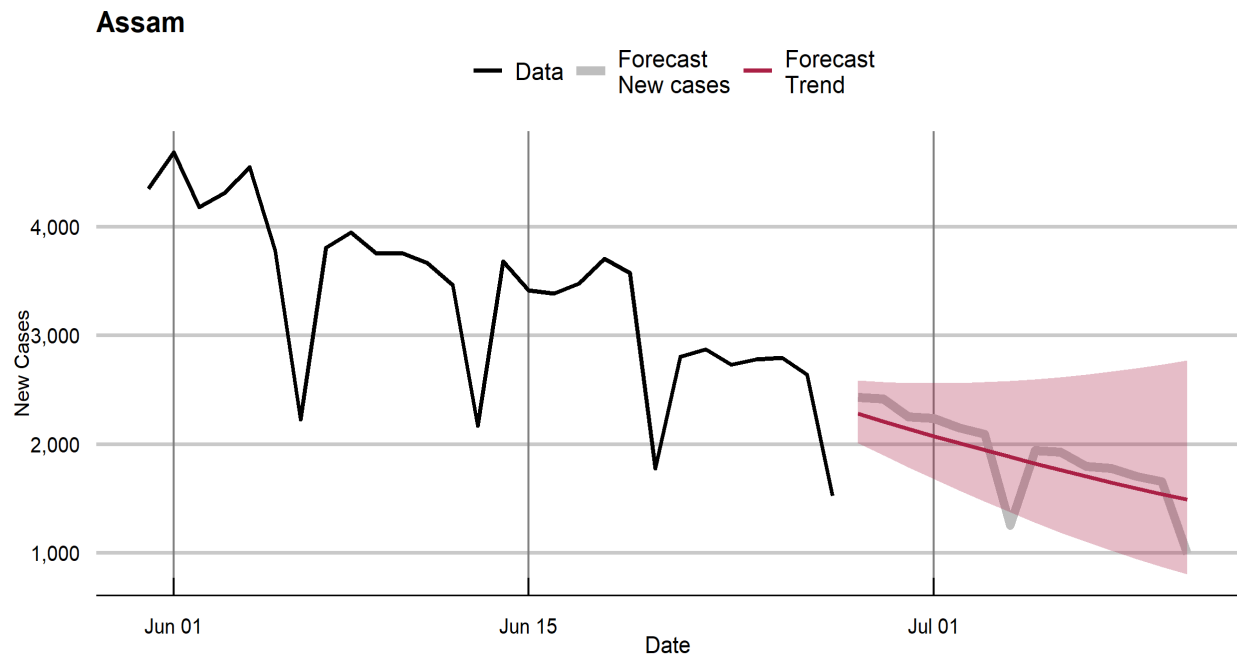
Daily Cases forecast: States and Union territories

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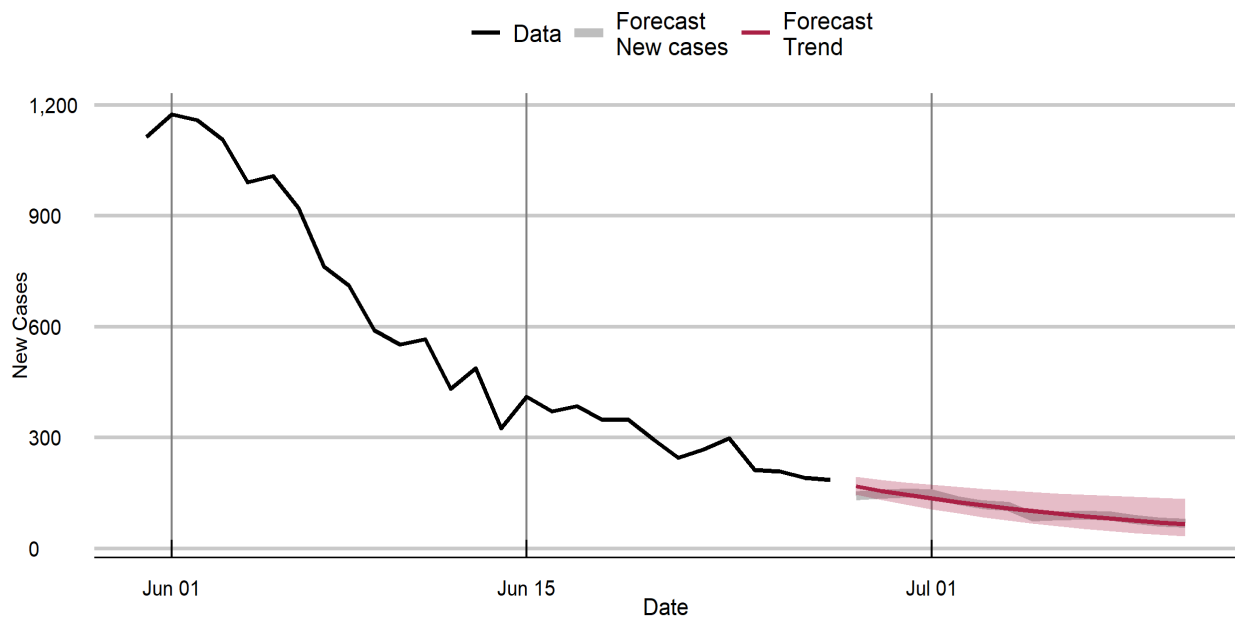


Andhra Pradesh

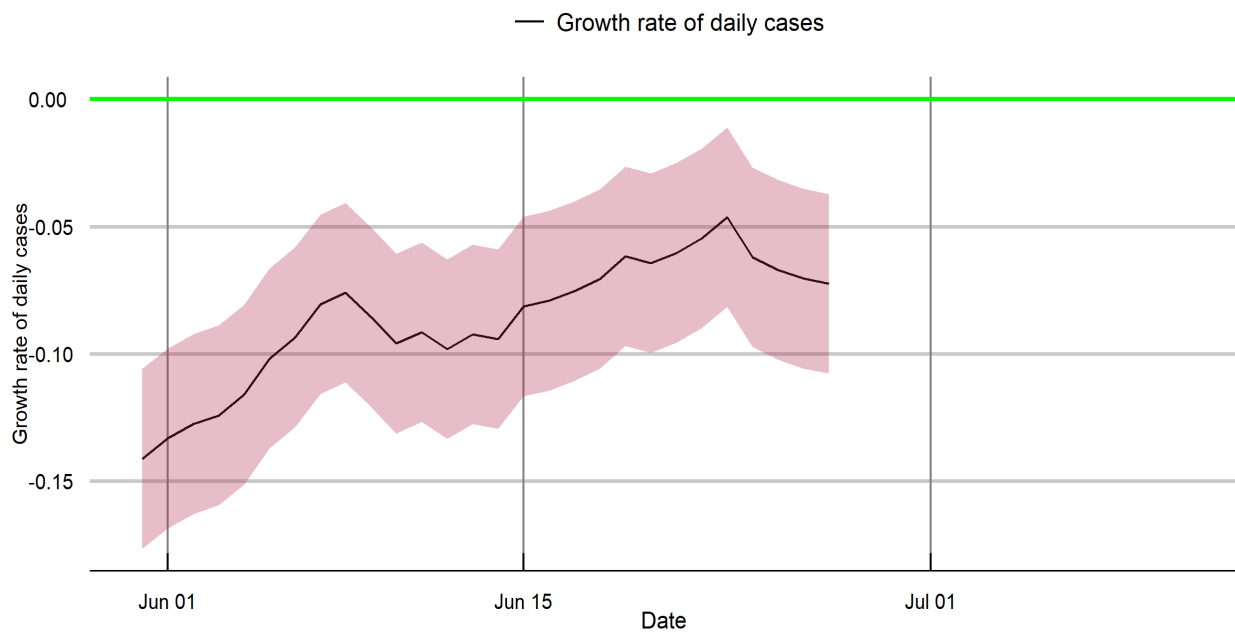




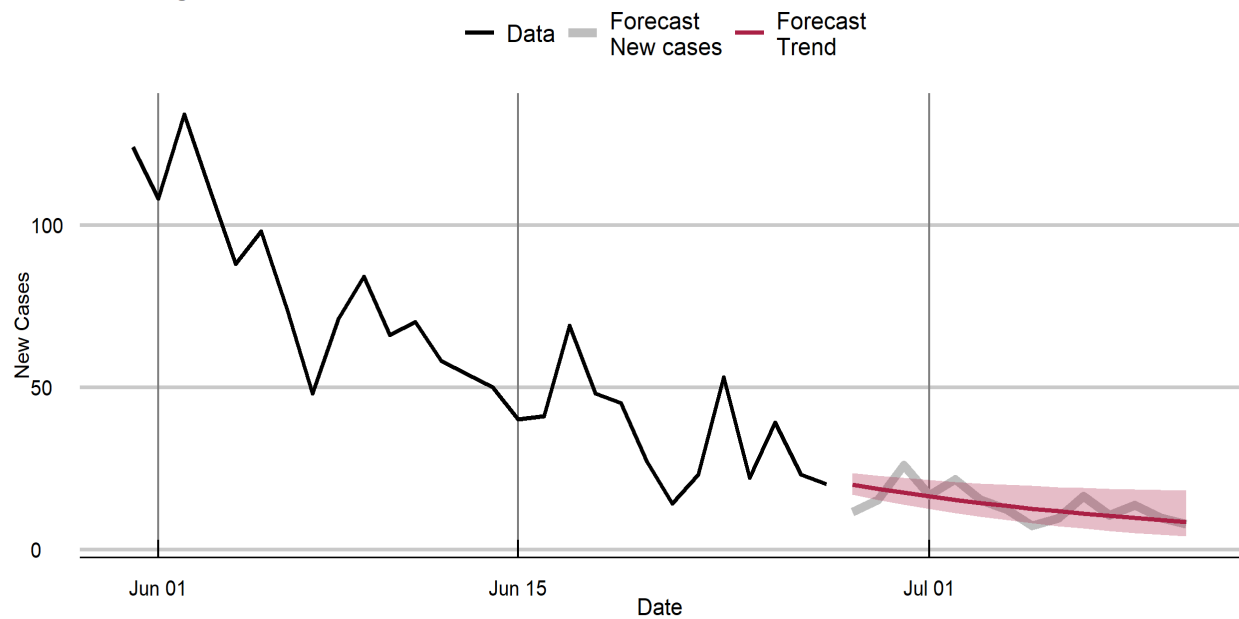
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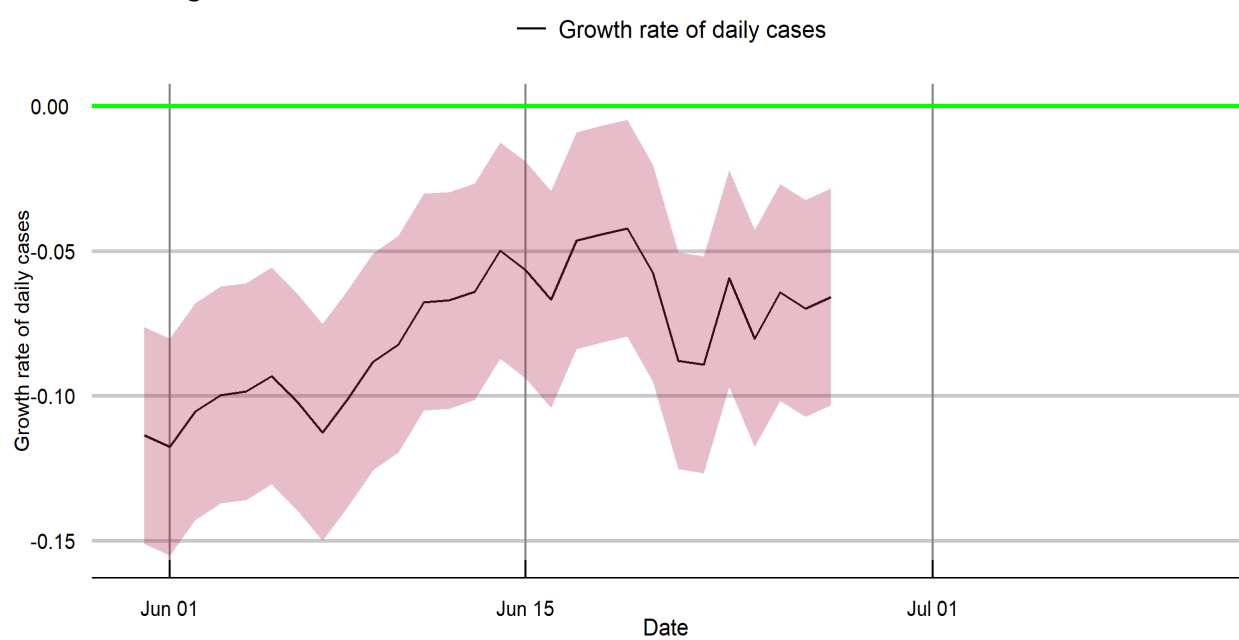
Bihar



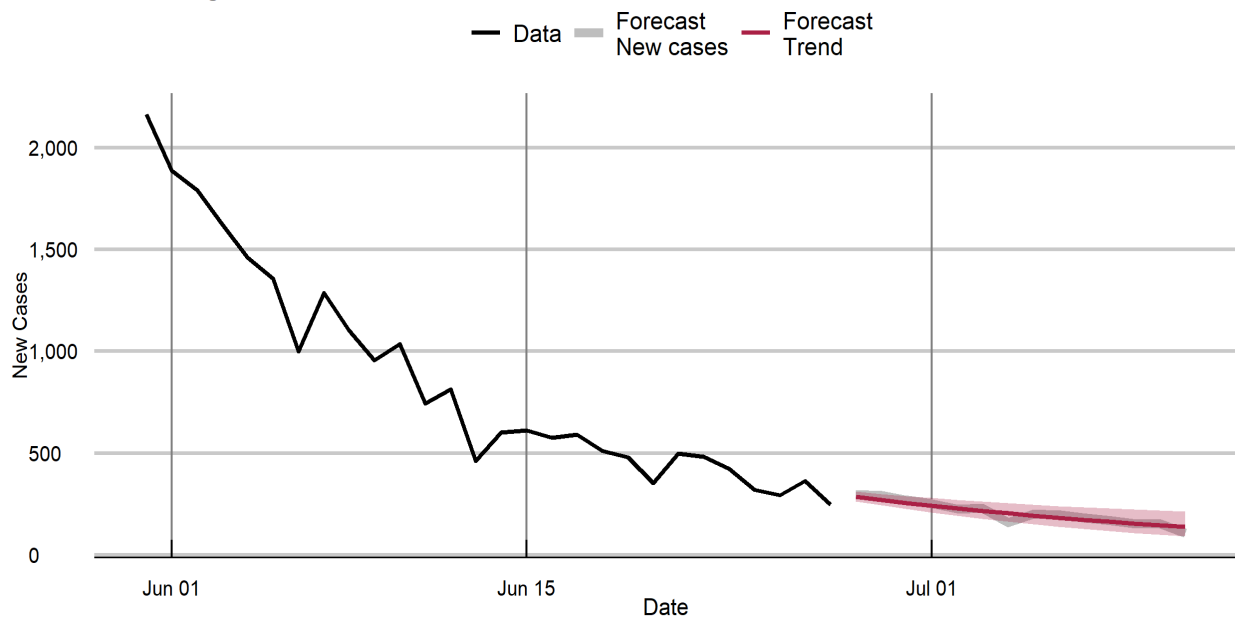
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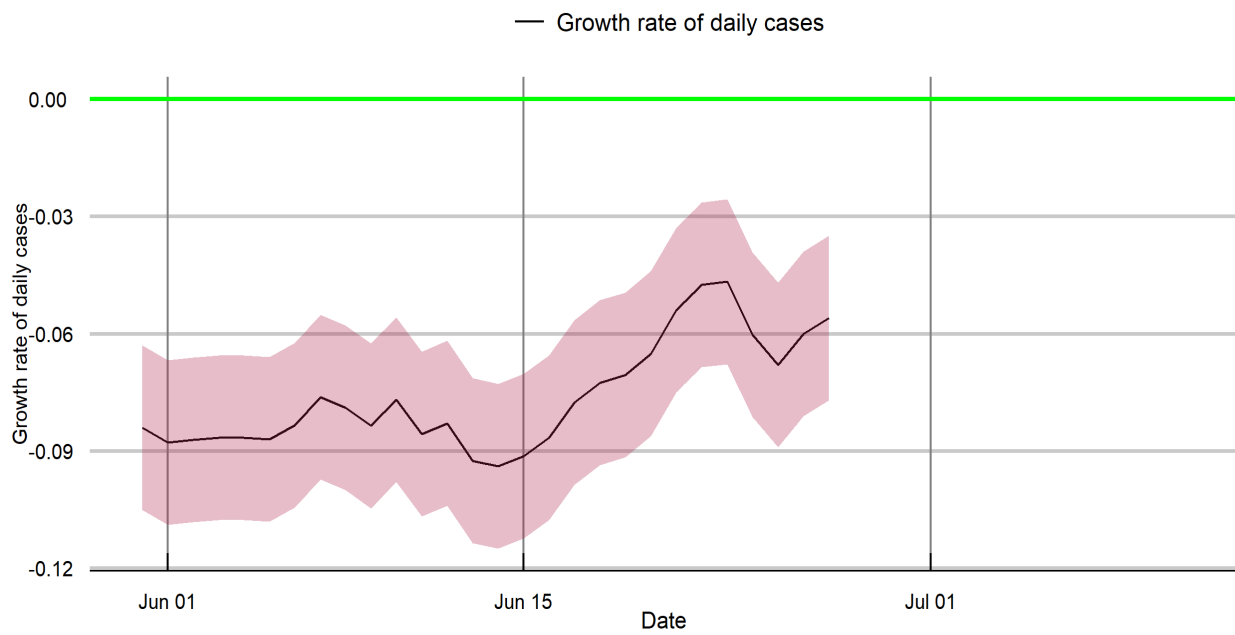
Chandigarh

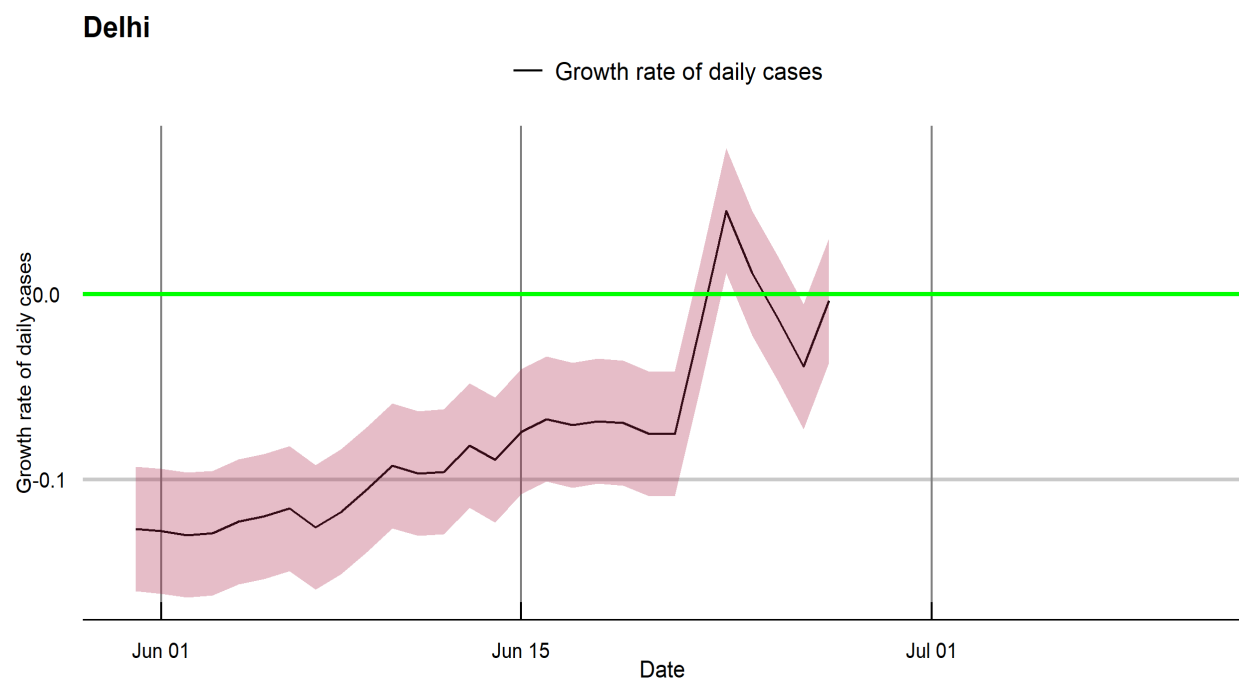
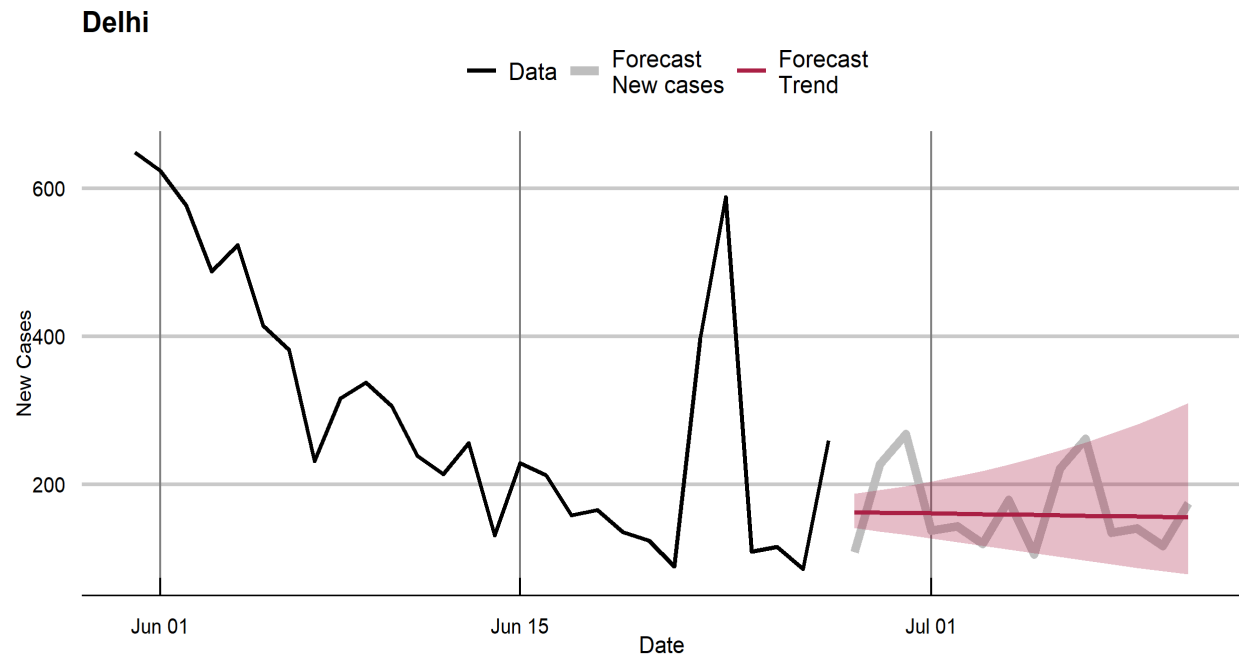


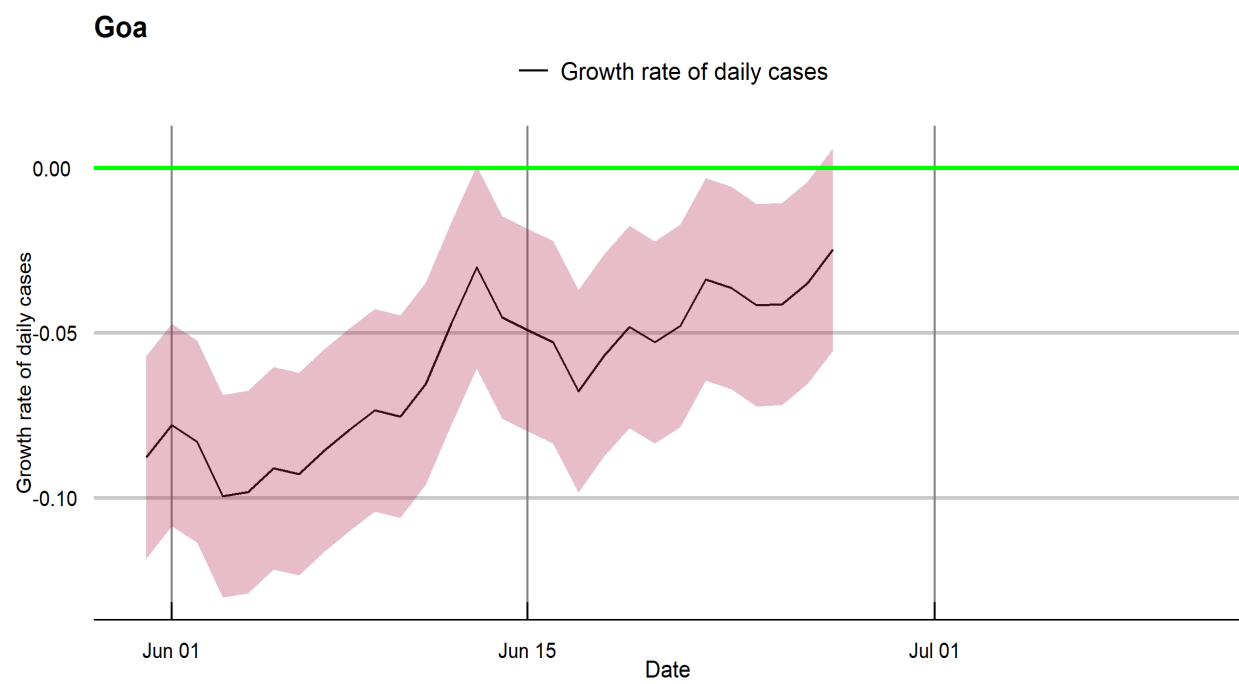
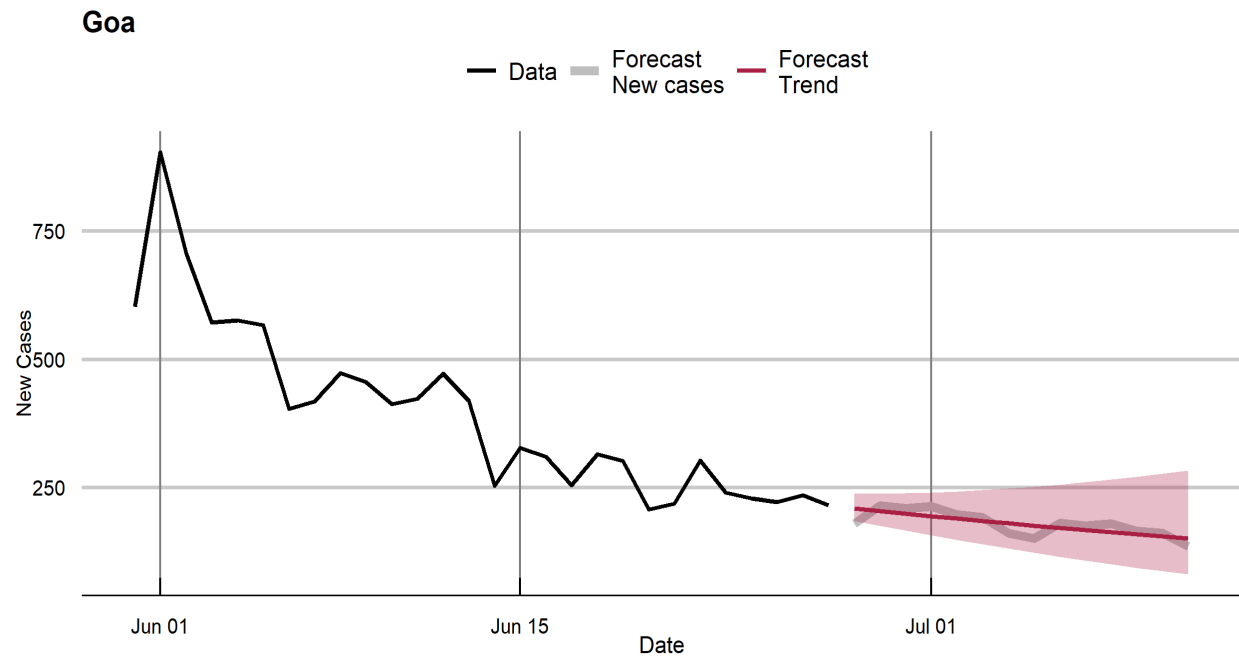
Chhattisgarh

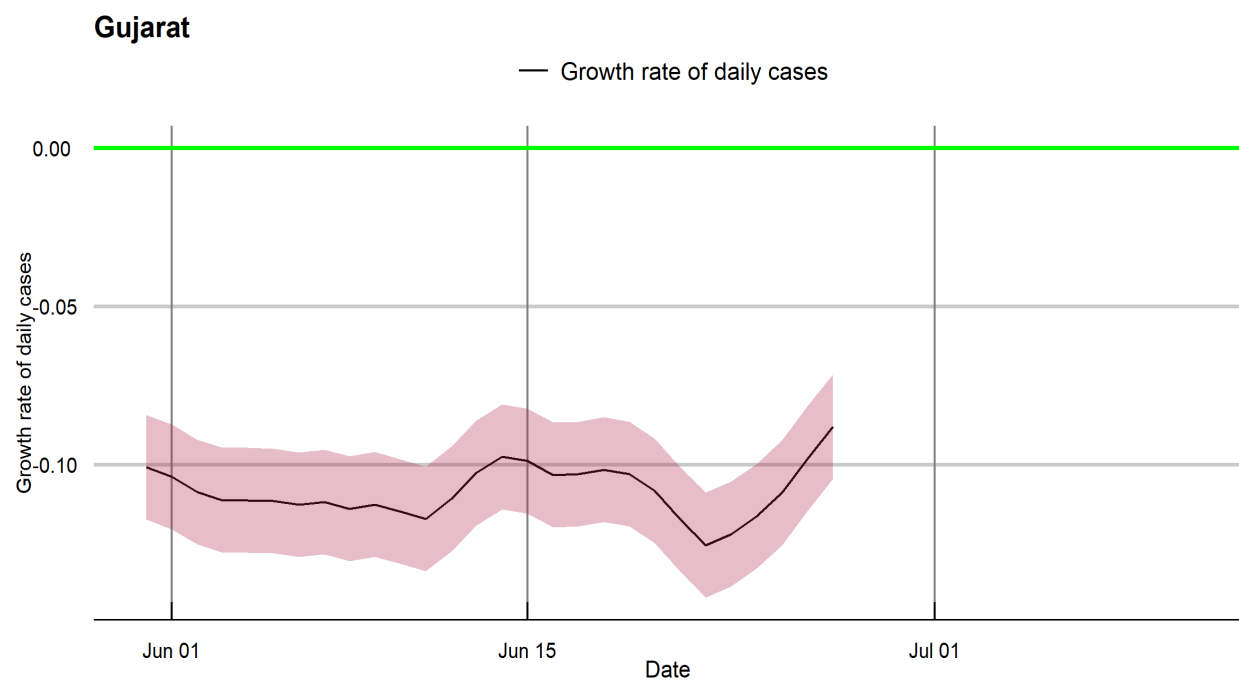
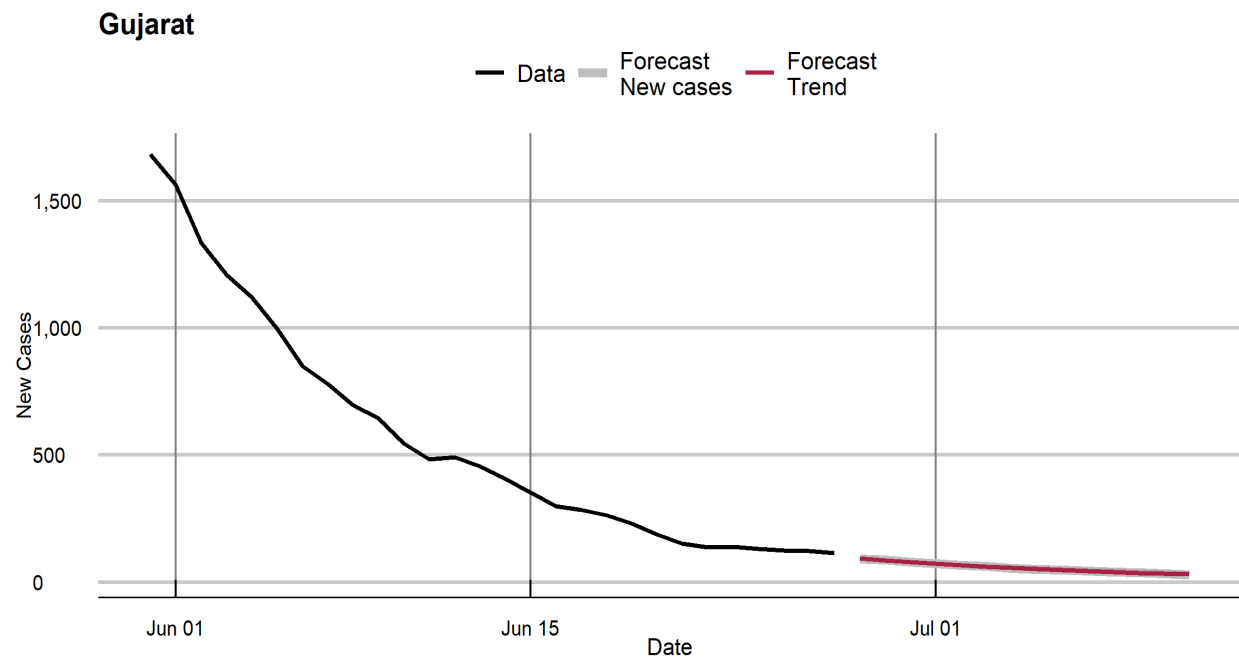


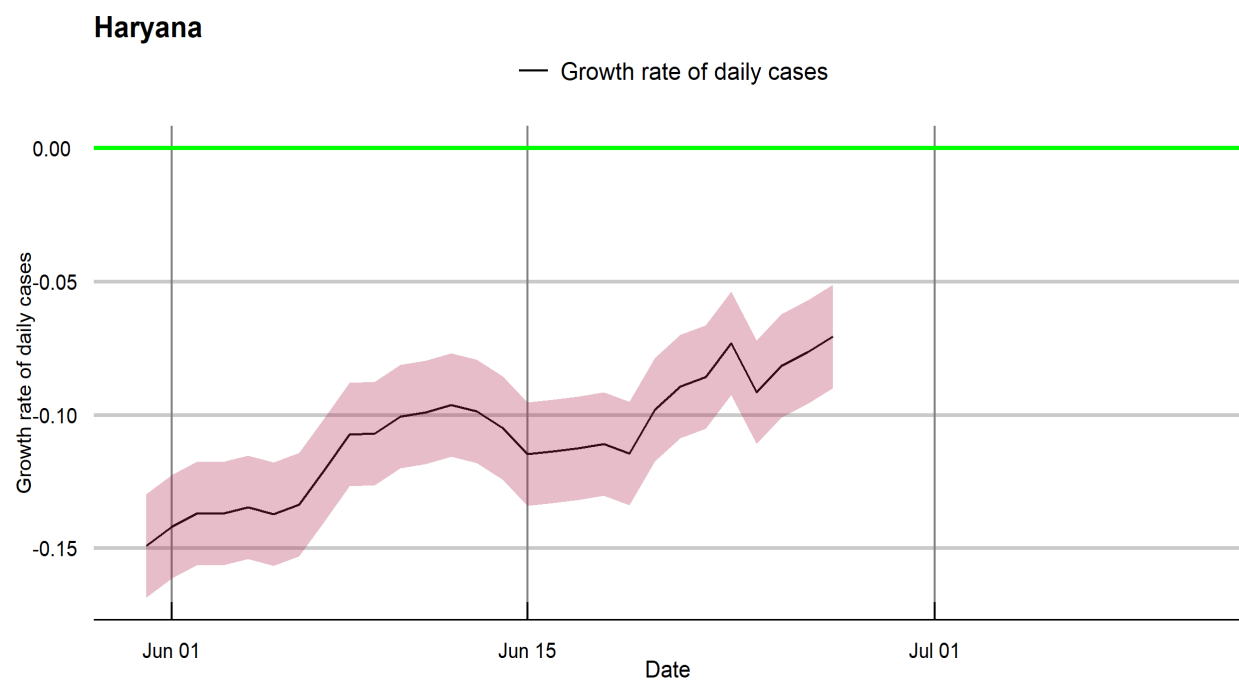
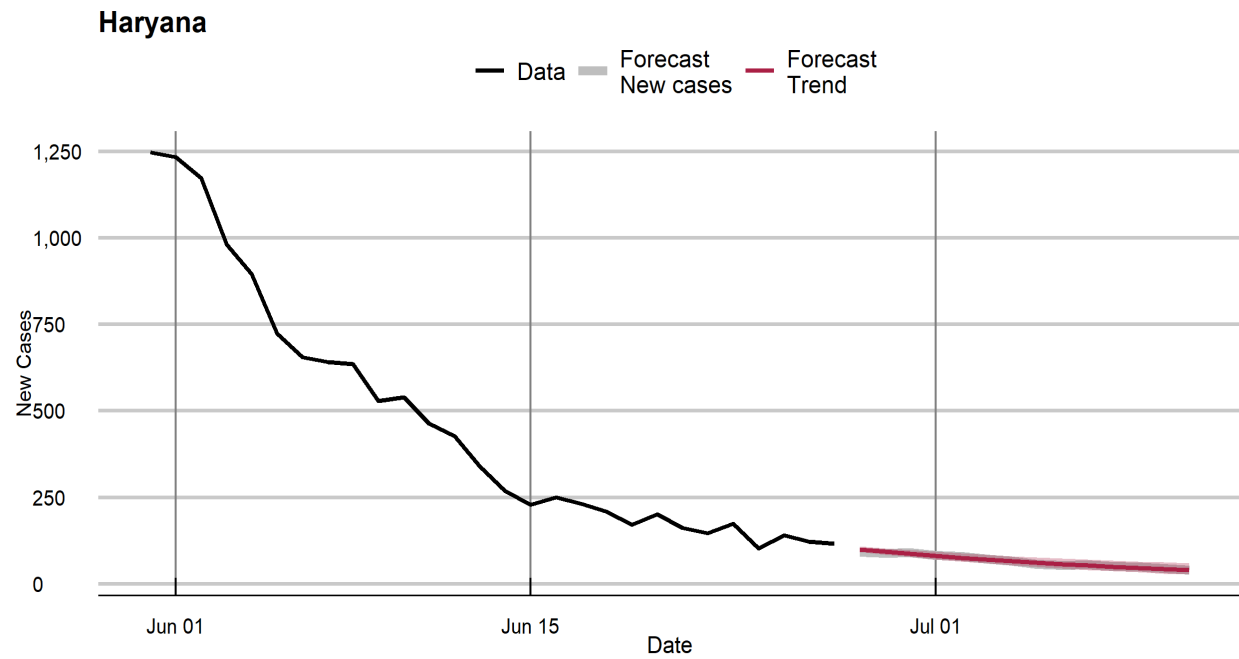
Chhattisgarh



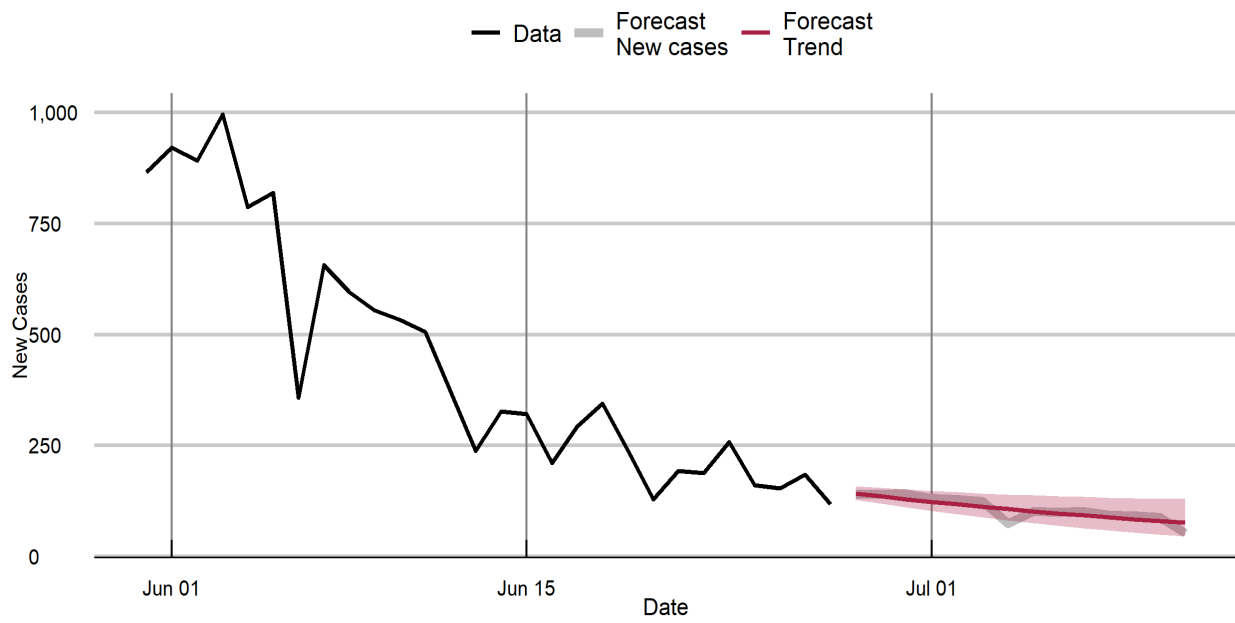




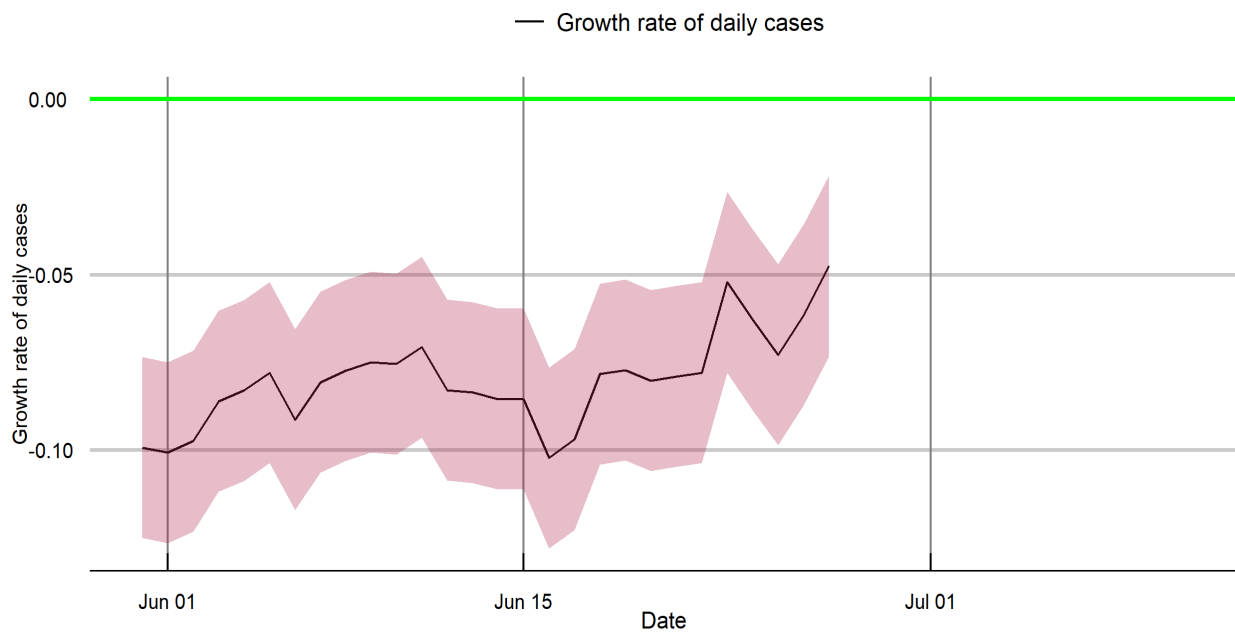




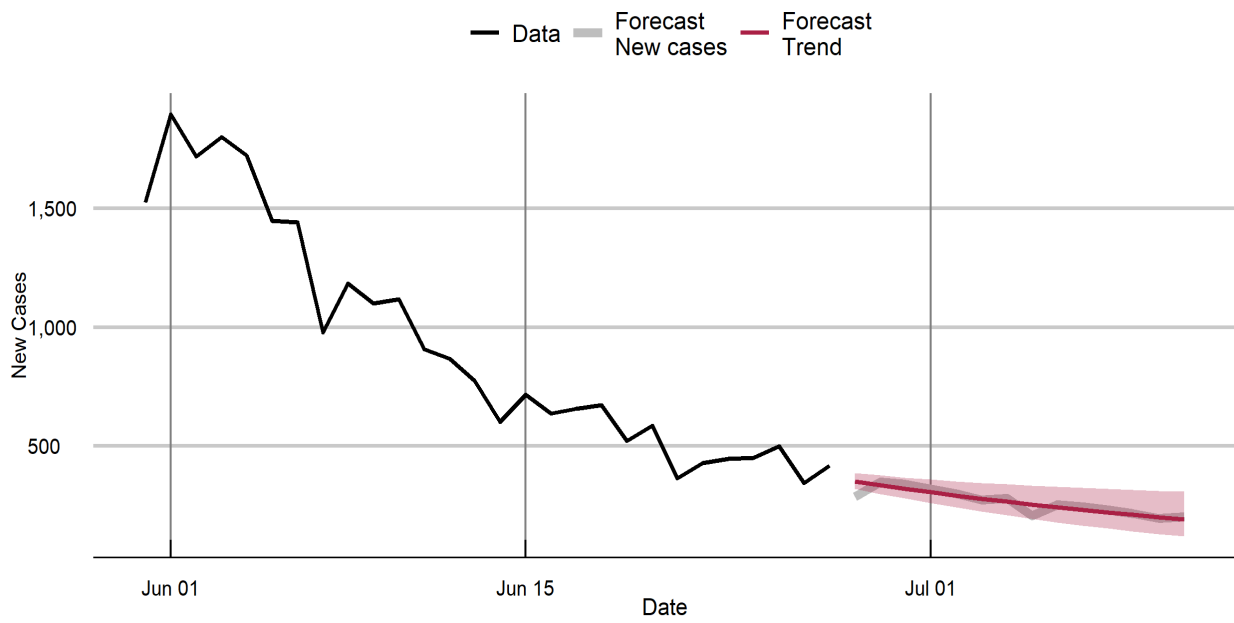
Himachal Pradesh



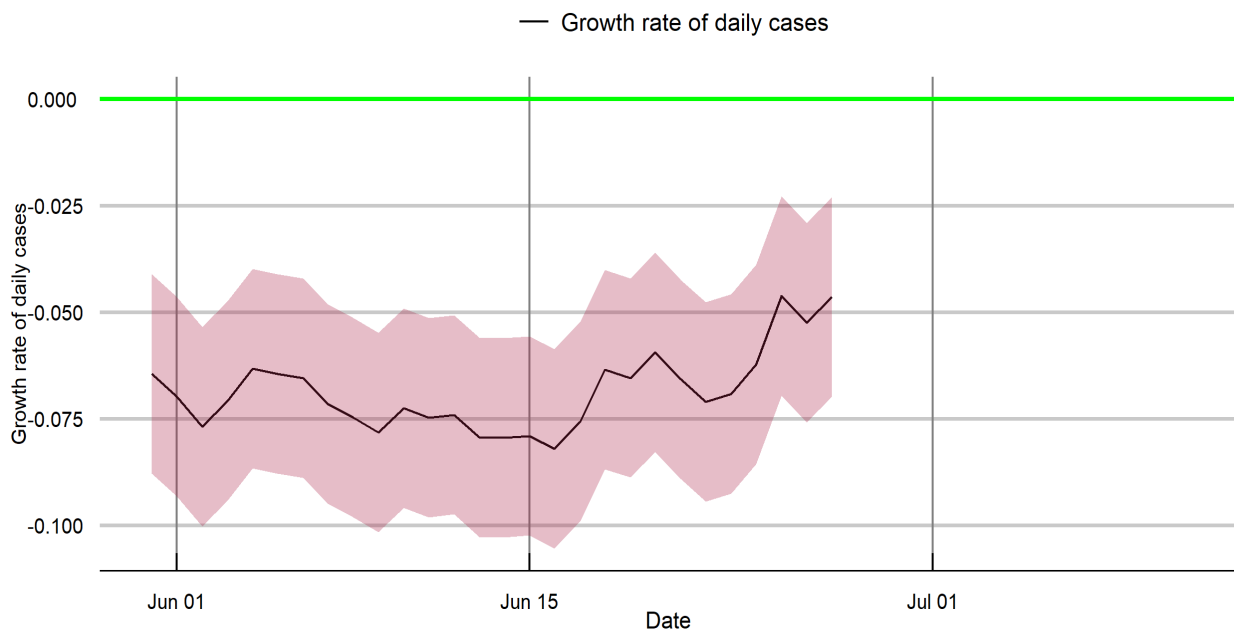
Himachal Pradesh



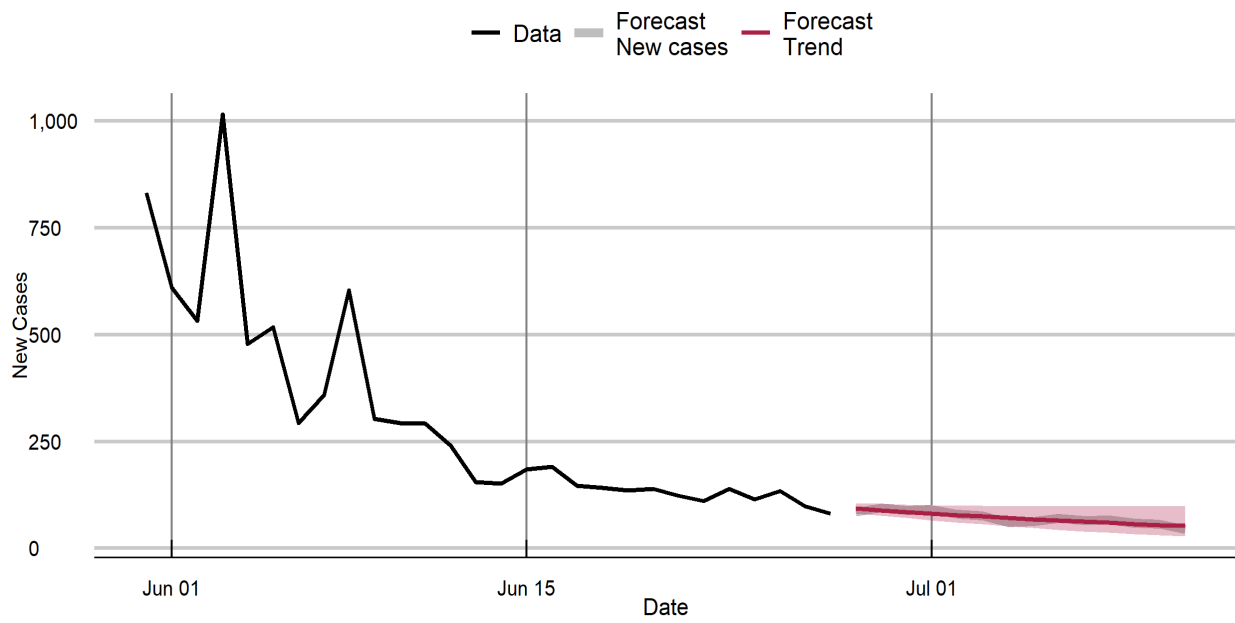
Jammu and Kashmir



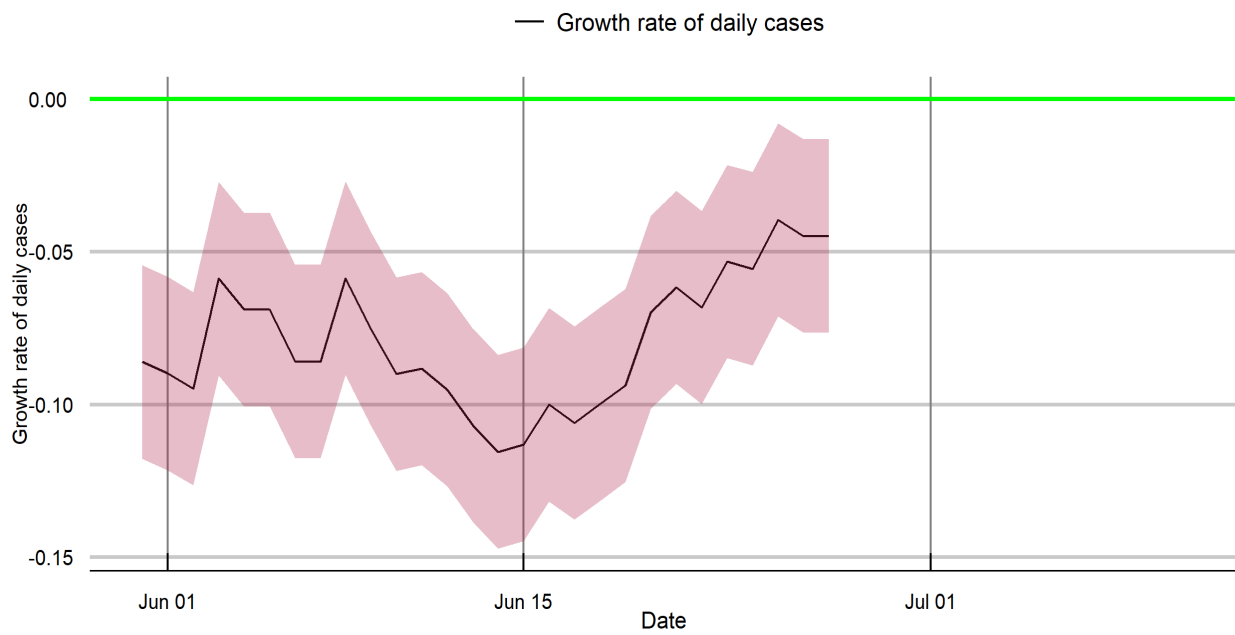
Jammu and Kashmir



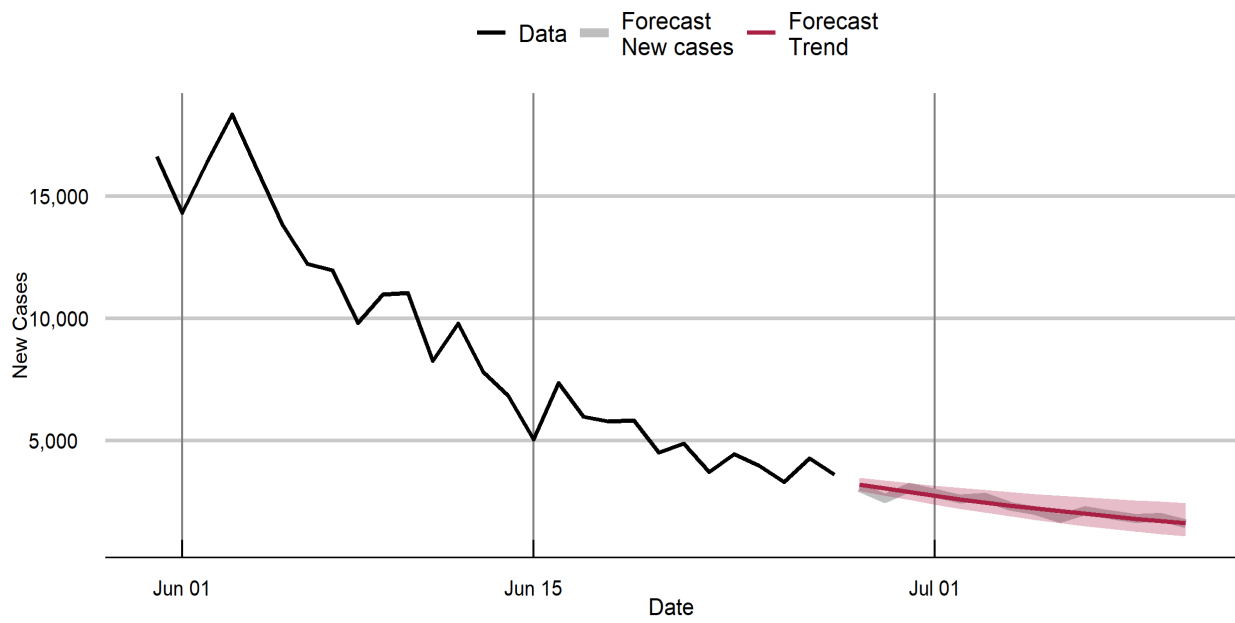
Jharkhand



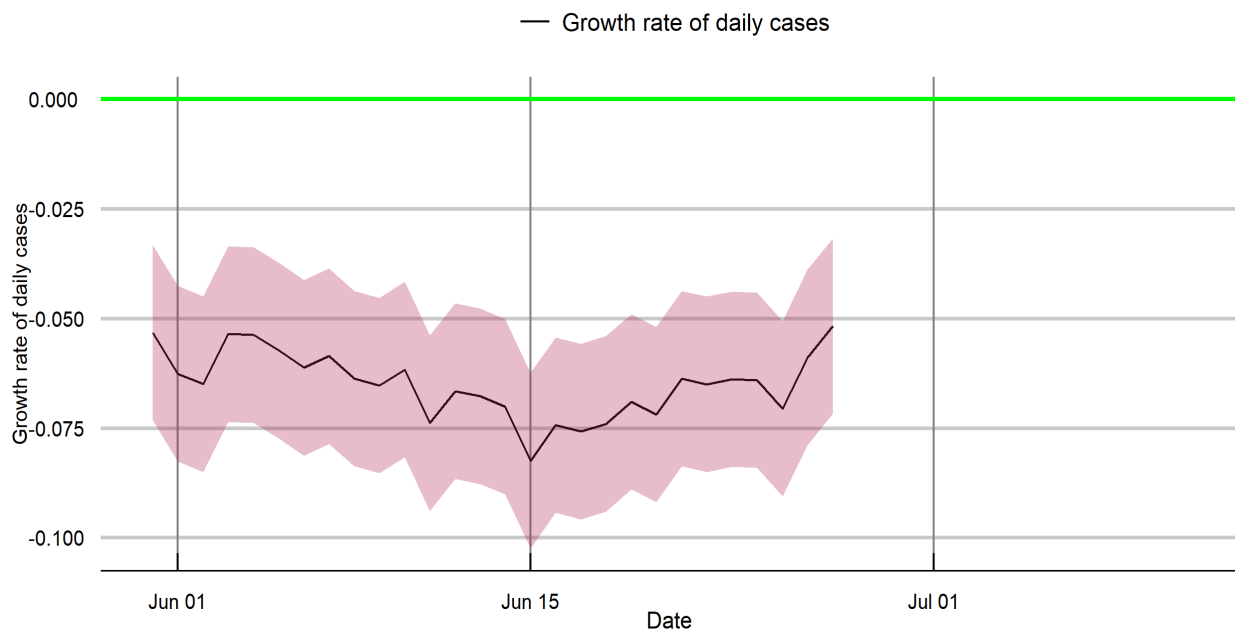
Jharkhand



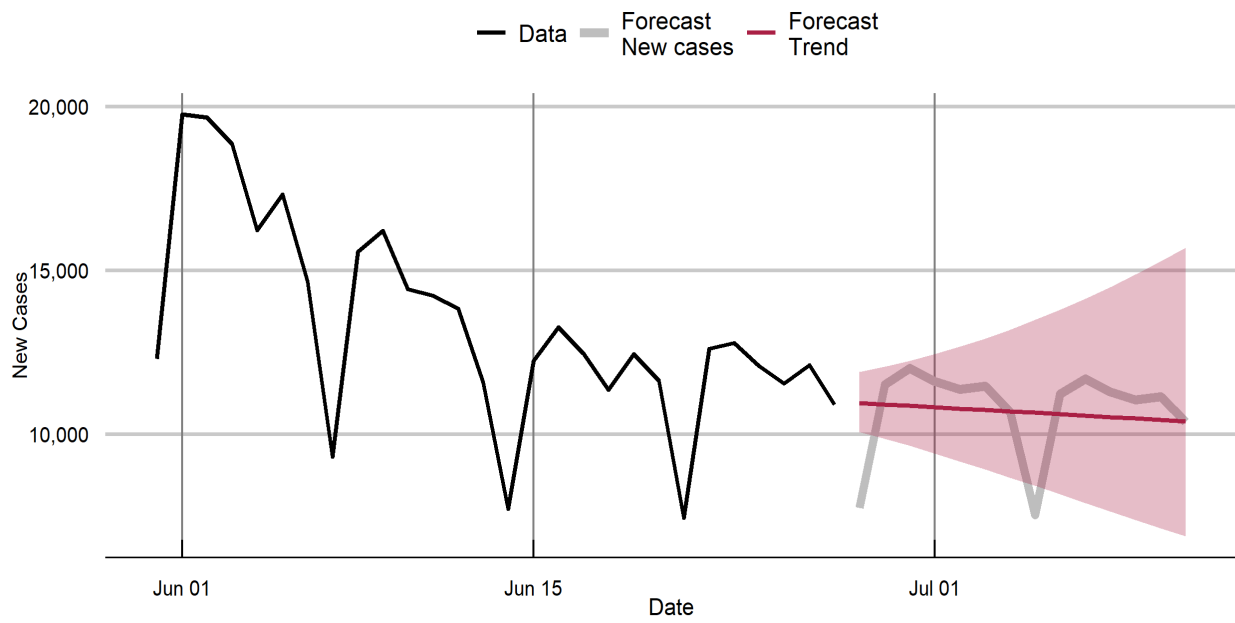
Karnataka



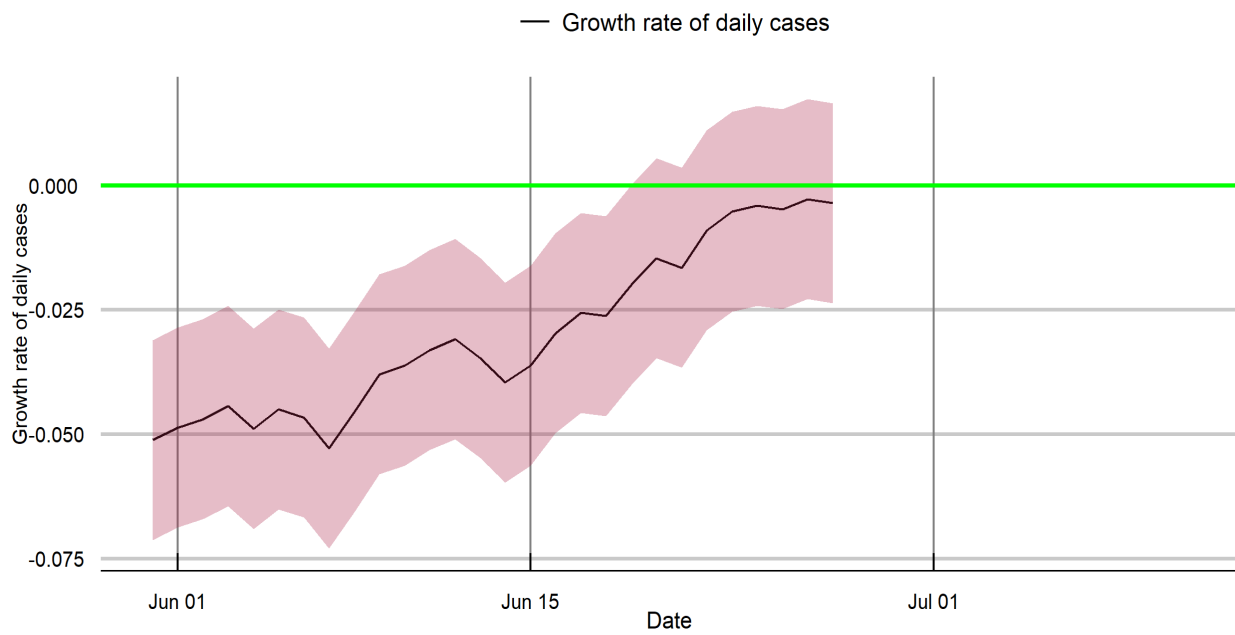
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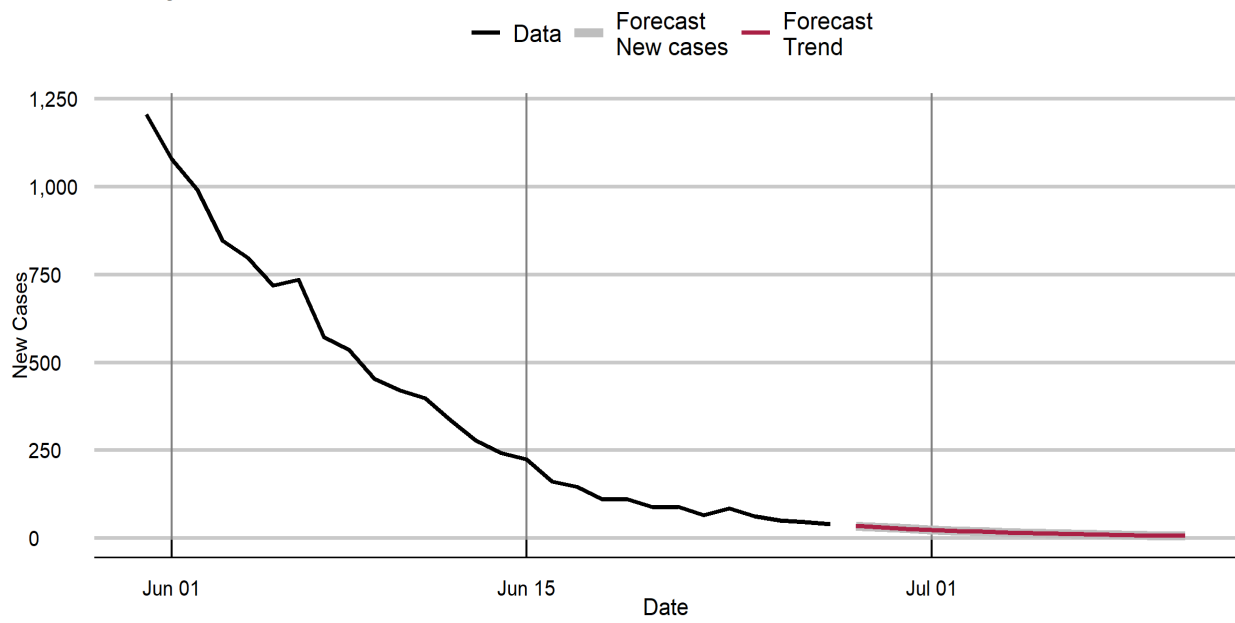
Kerala



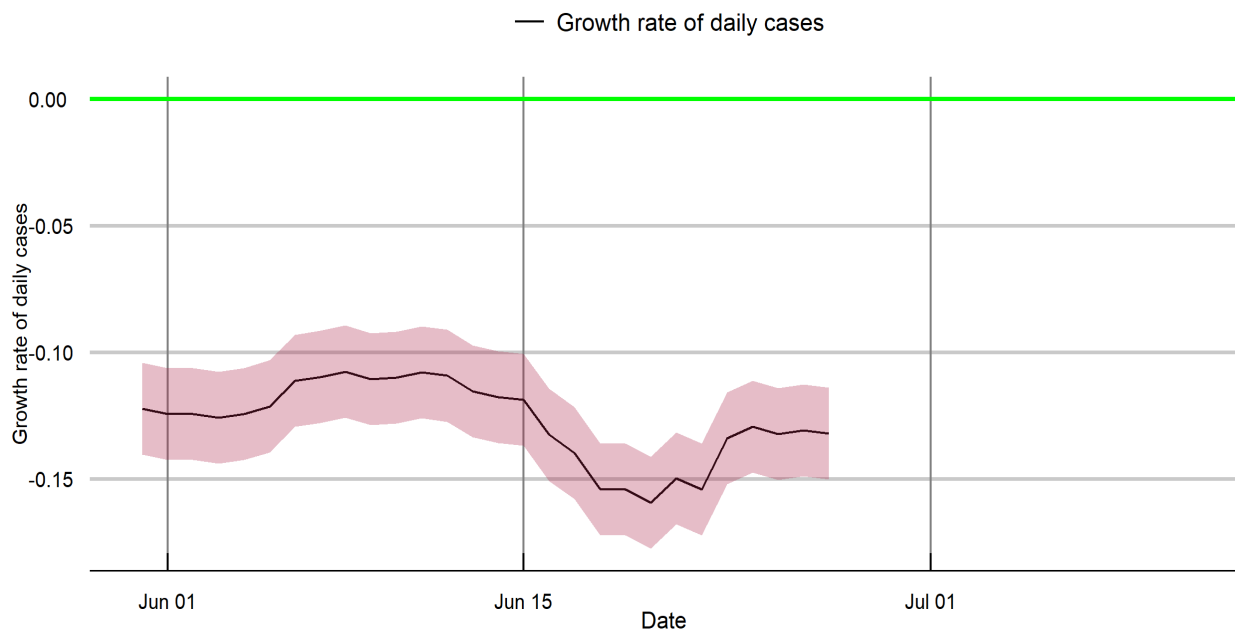
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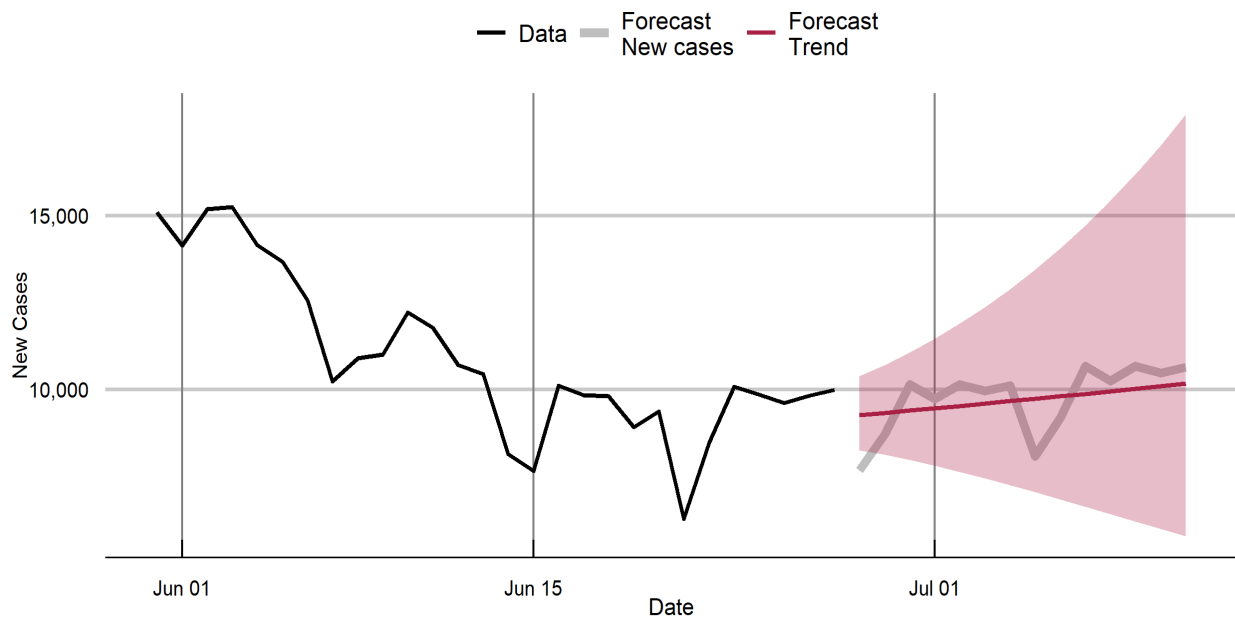
Madhya Pradesh



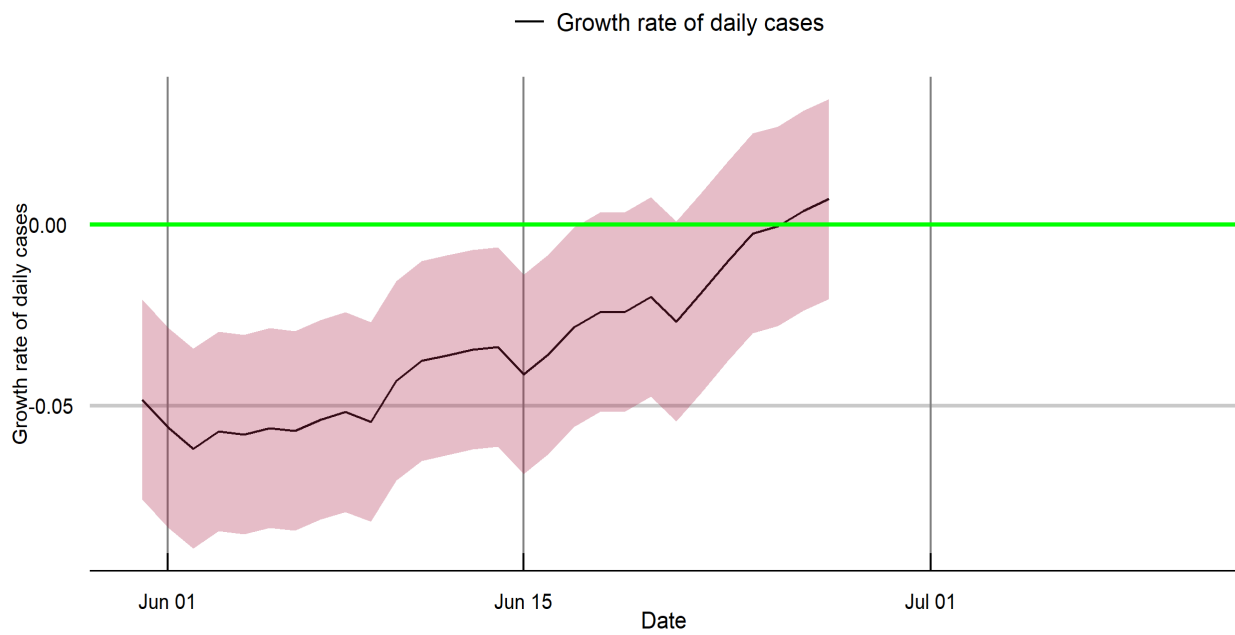
Madhya Pradesh



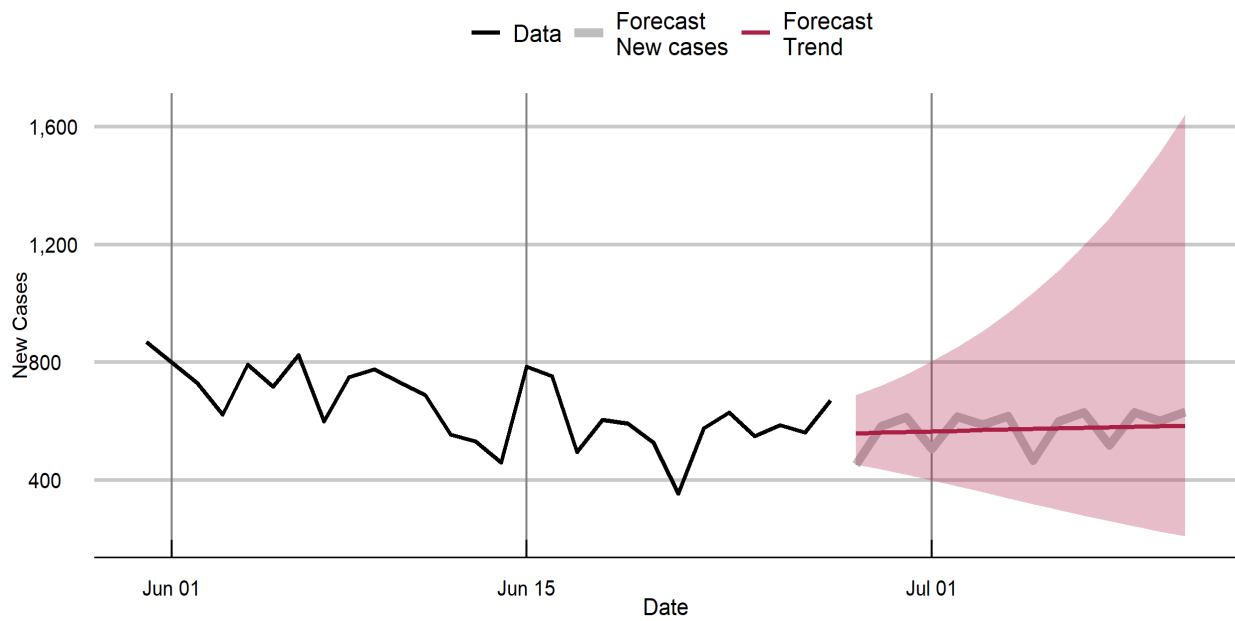
Maharashtra



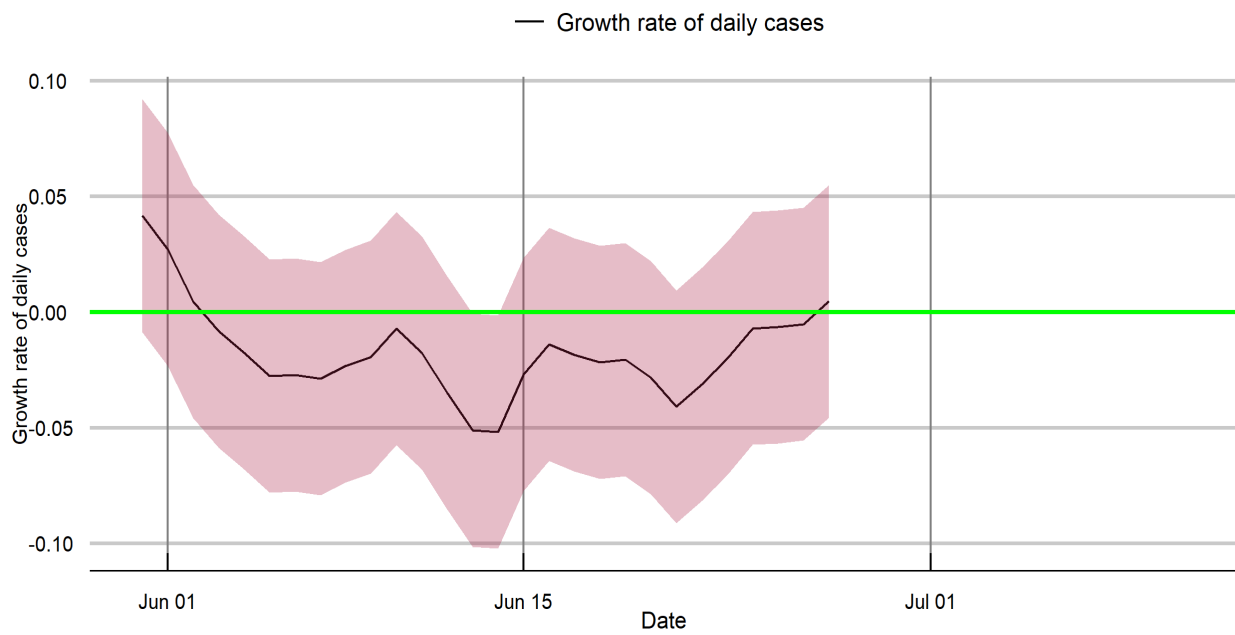
Maharashtra



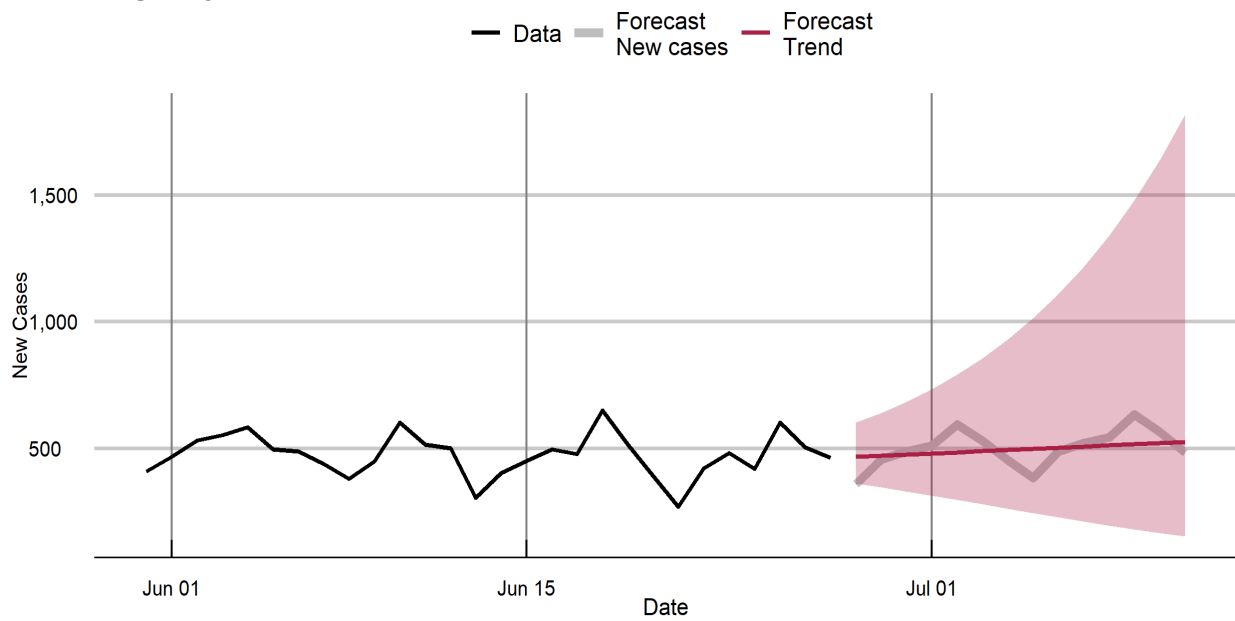
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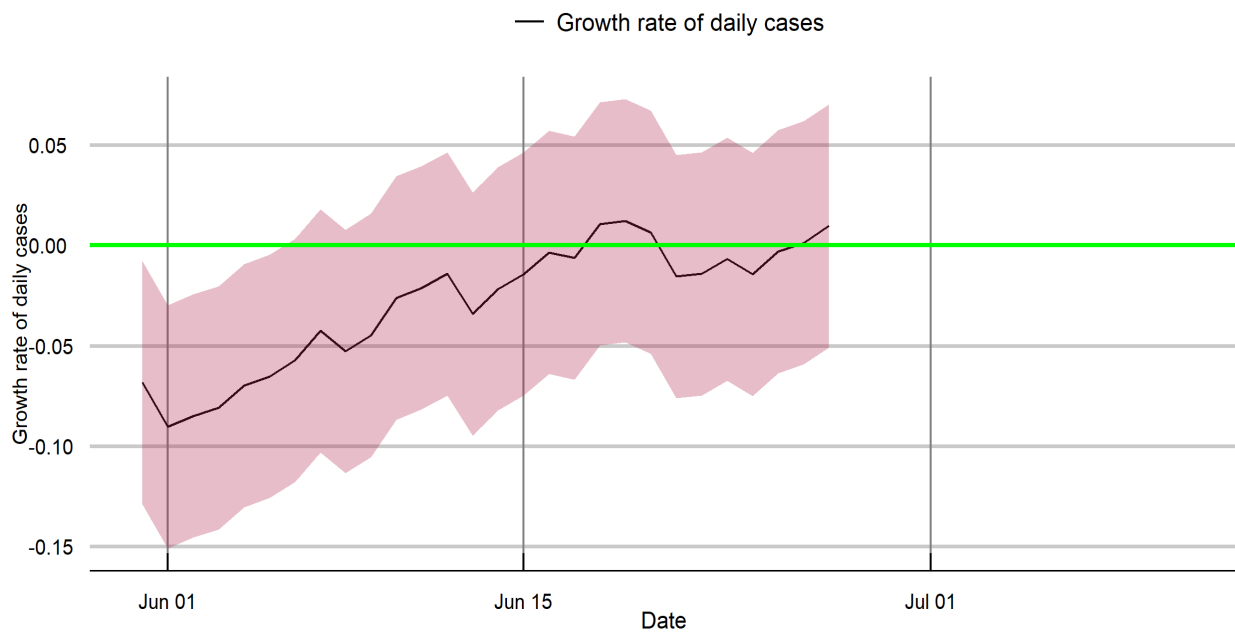
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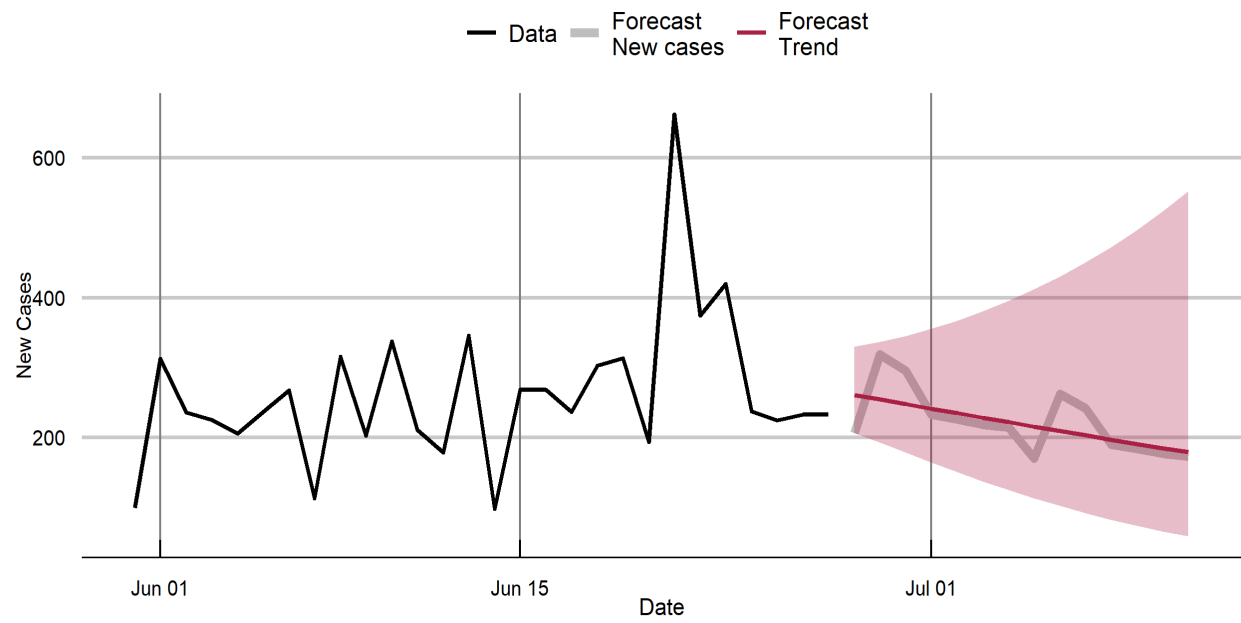
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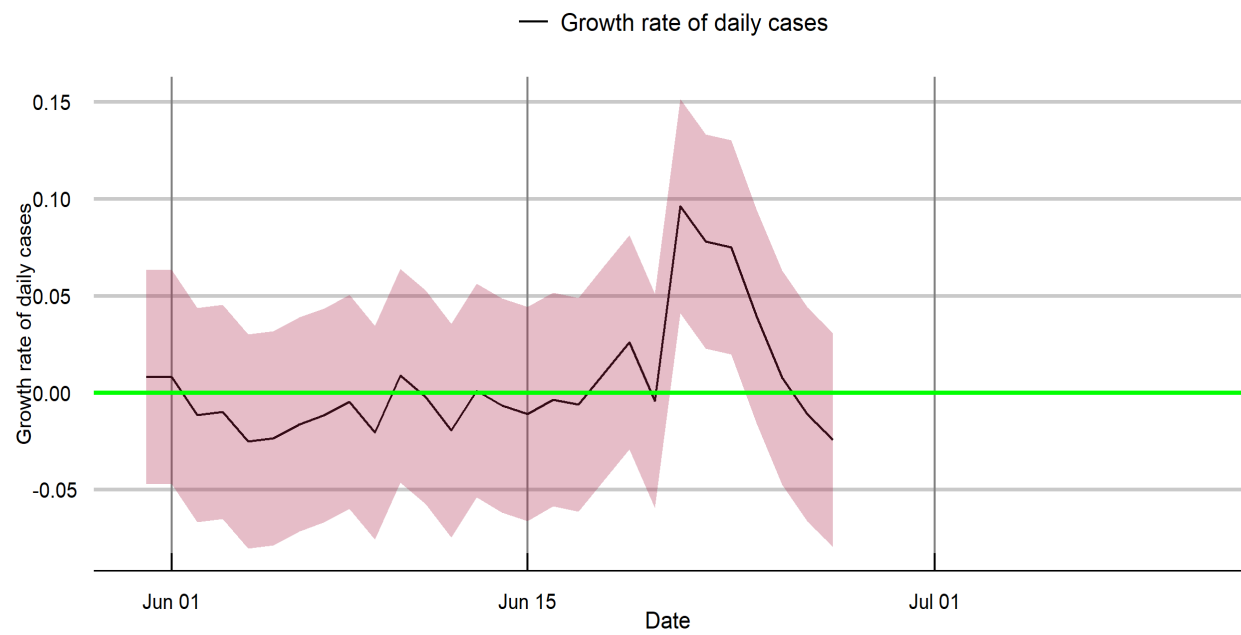
Meghalaya



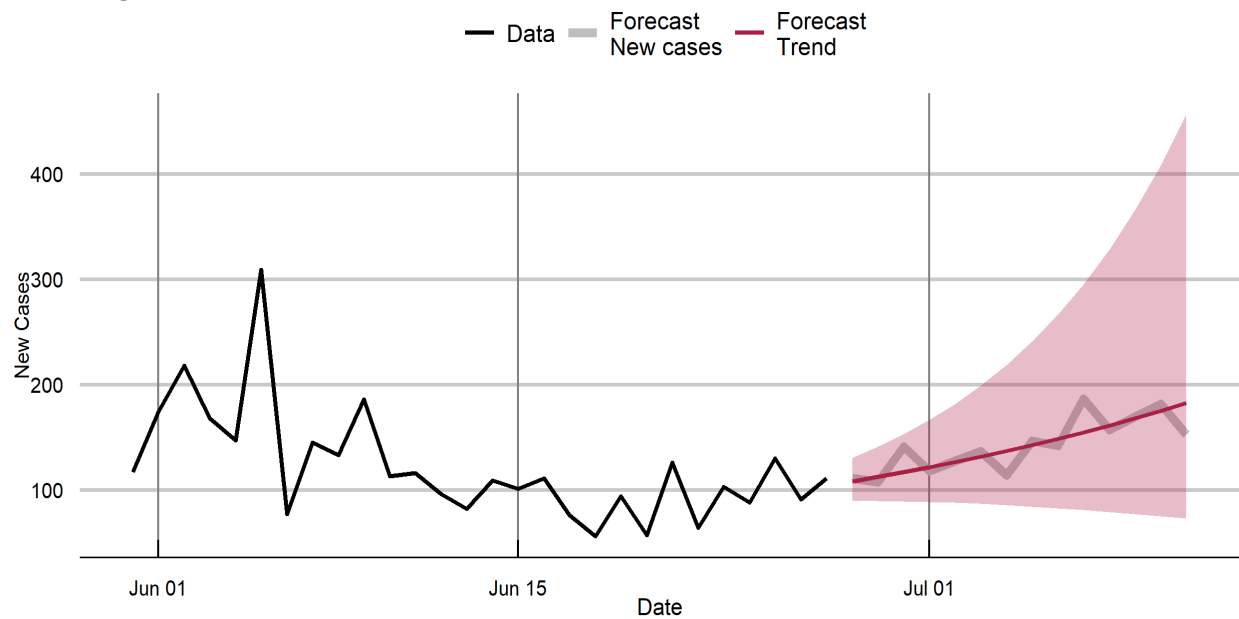
Mizoram



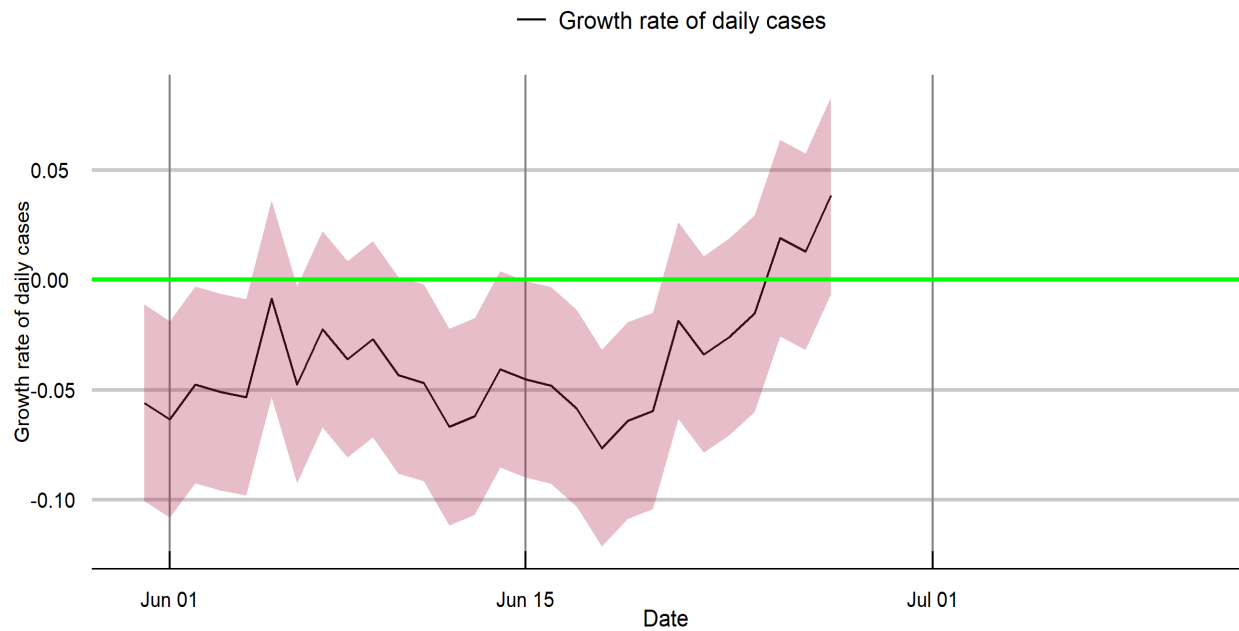
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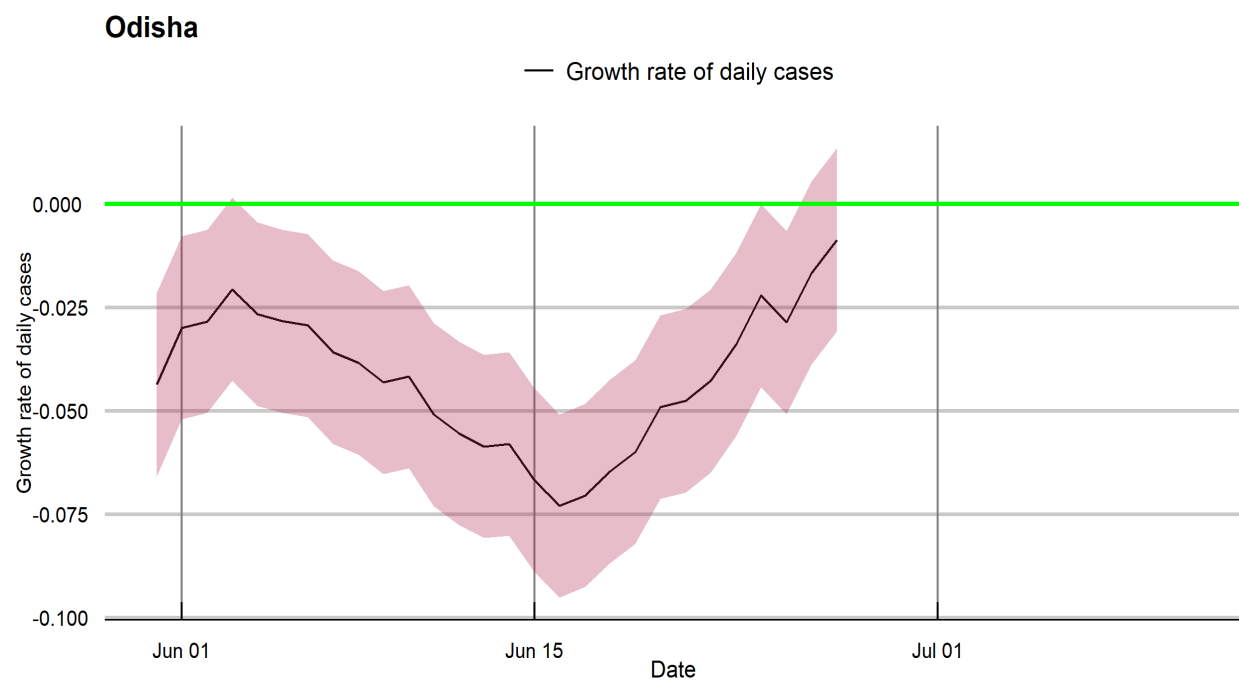
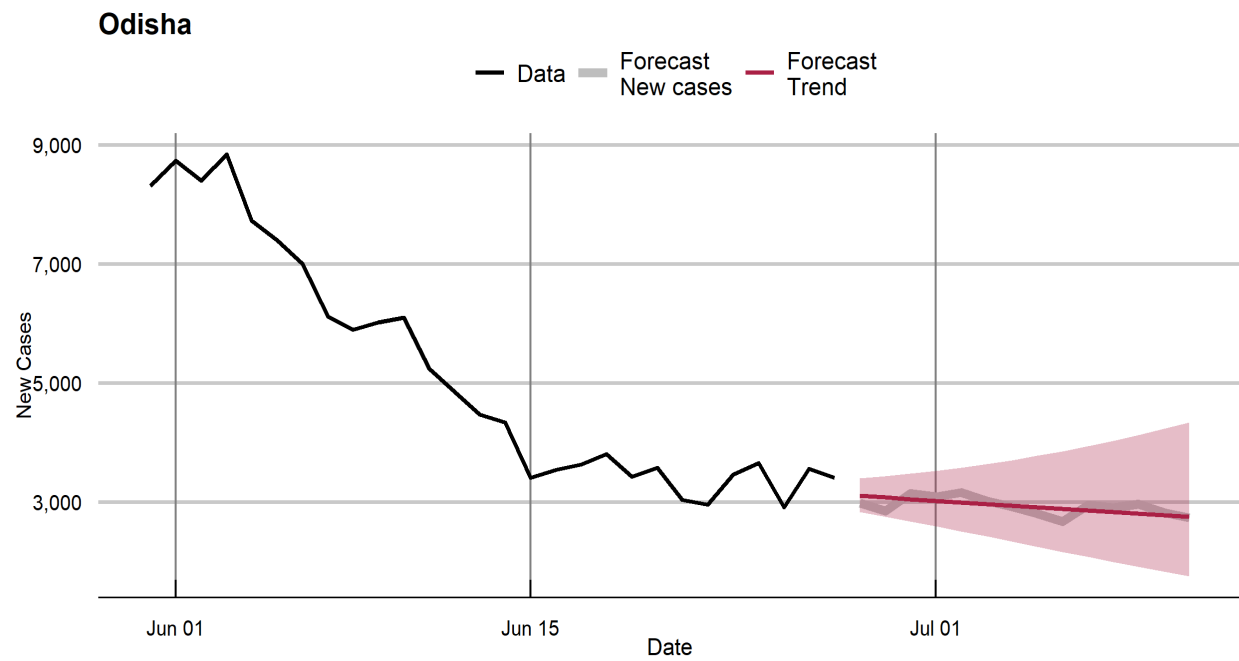


Nagaland

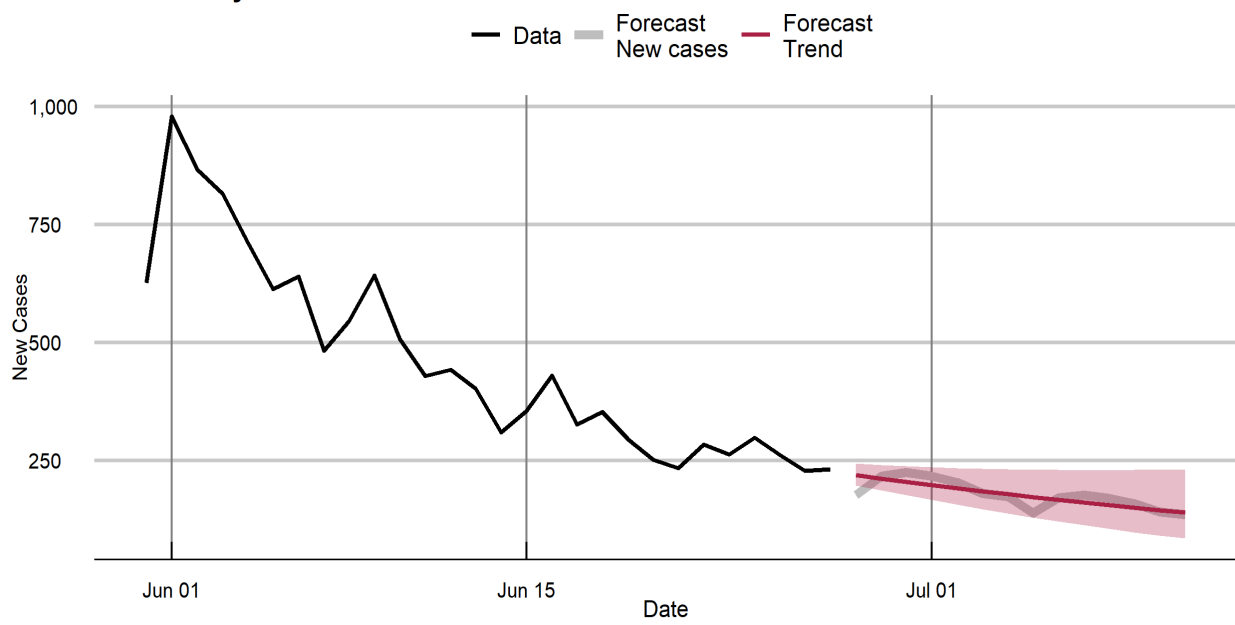


Nagaland

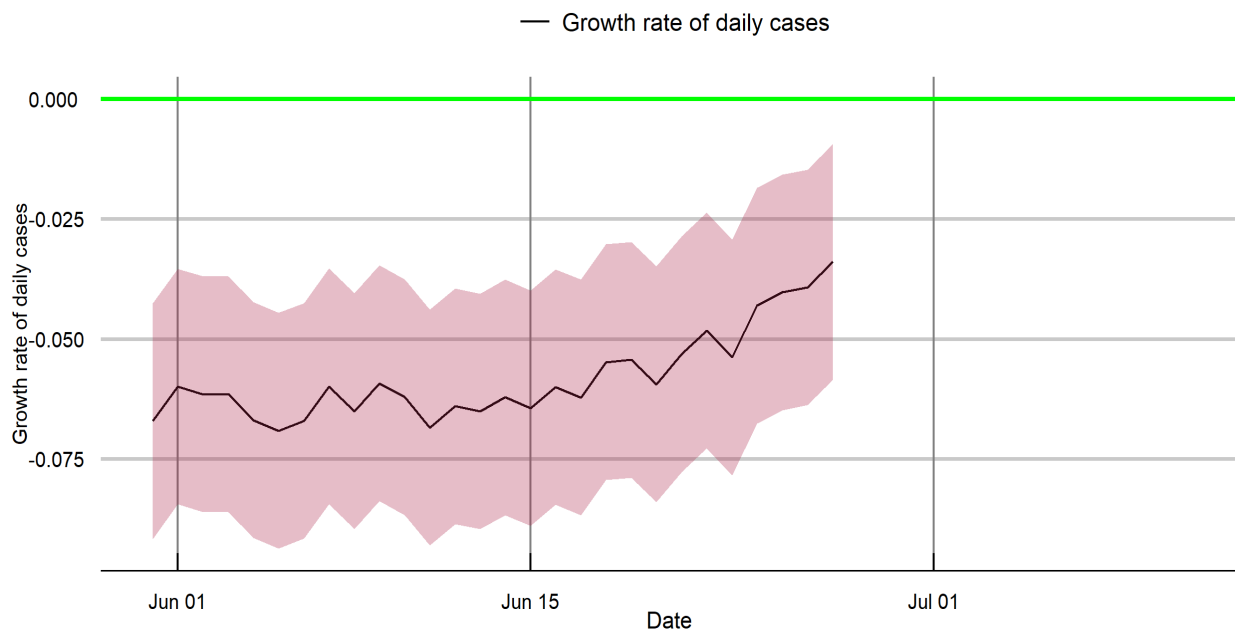


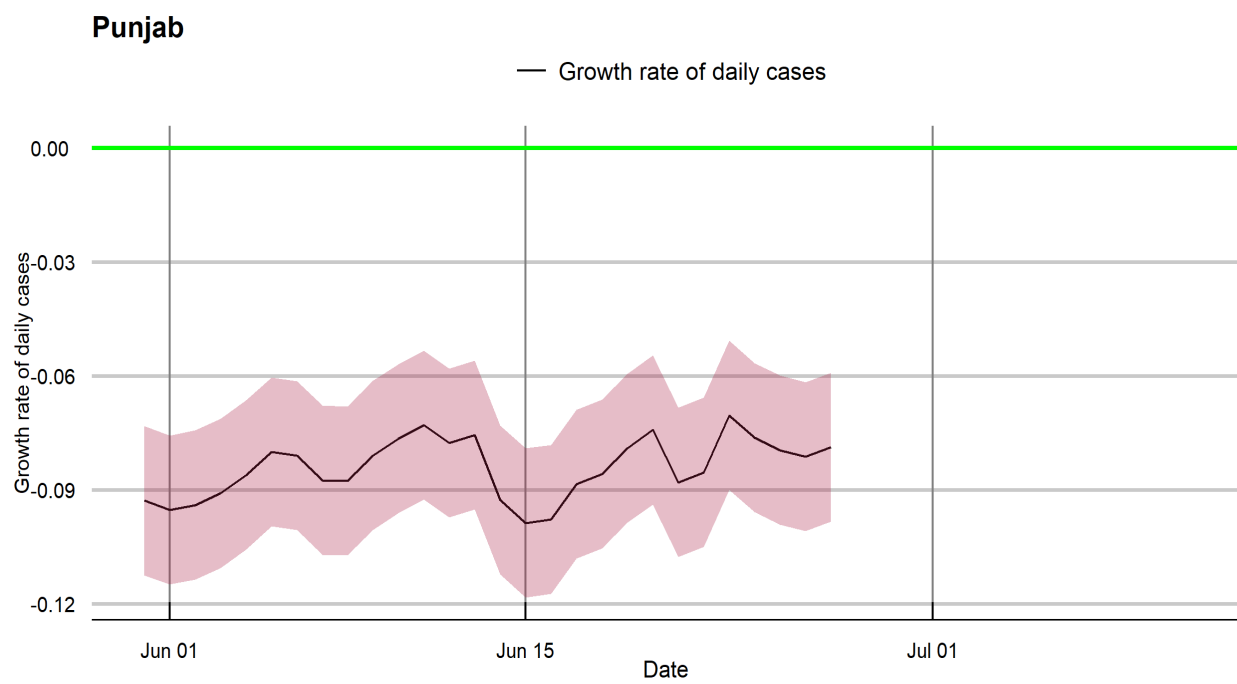
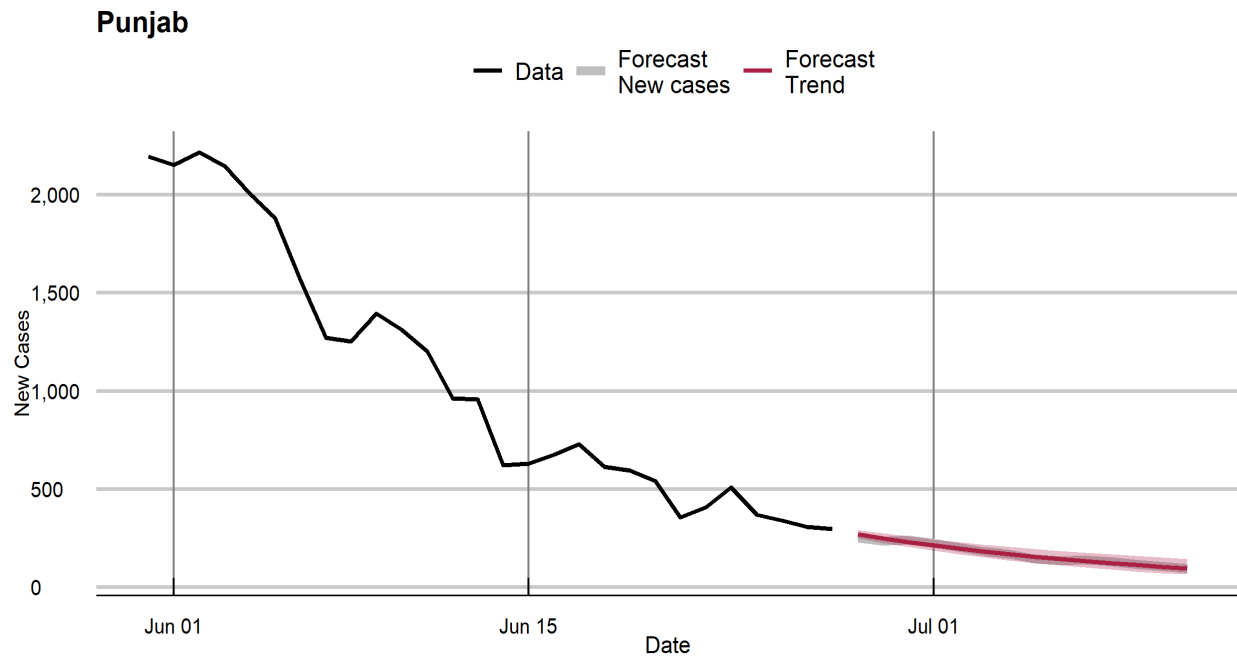


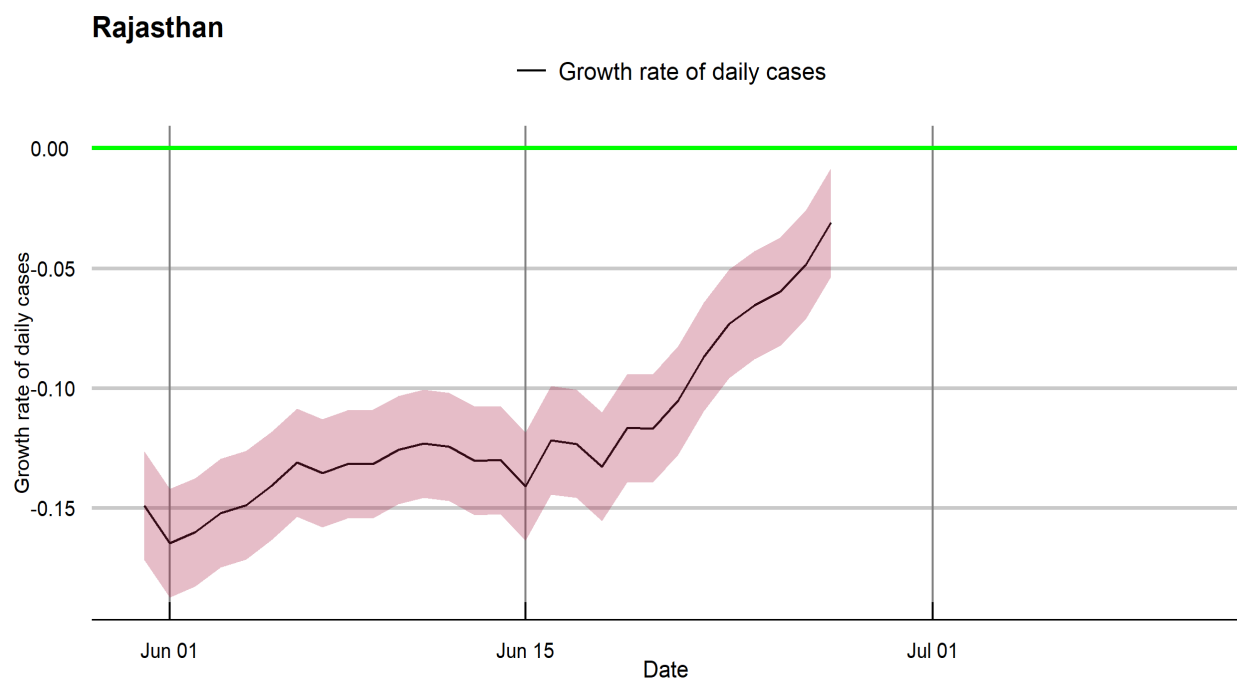
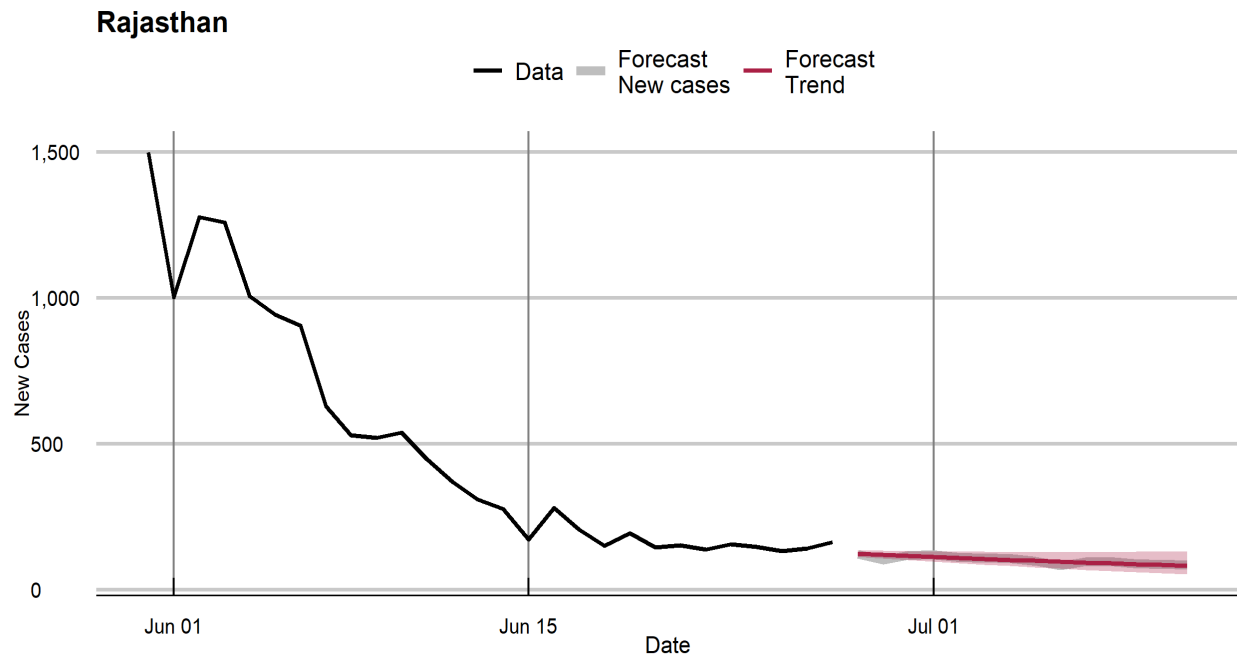
Puducherry



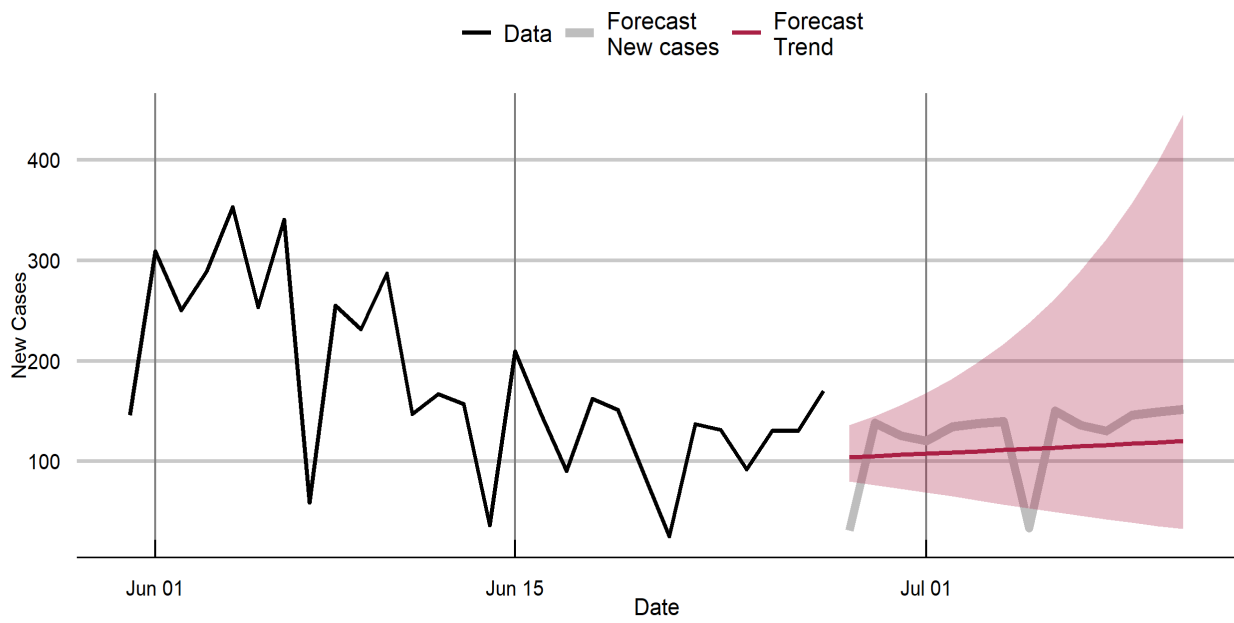
Puducherry



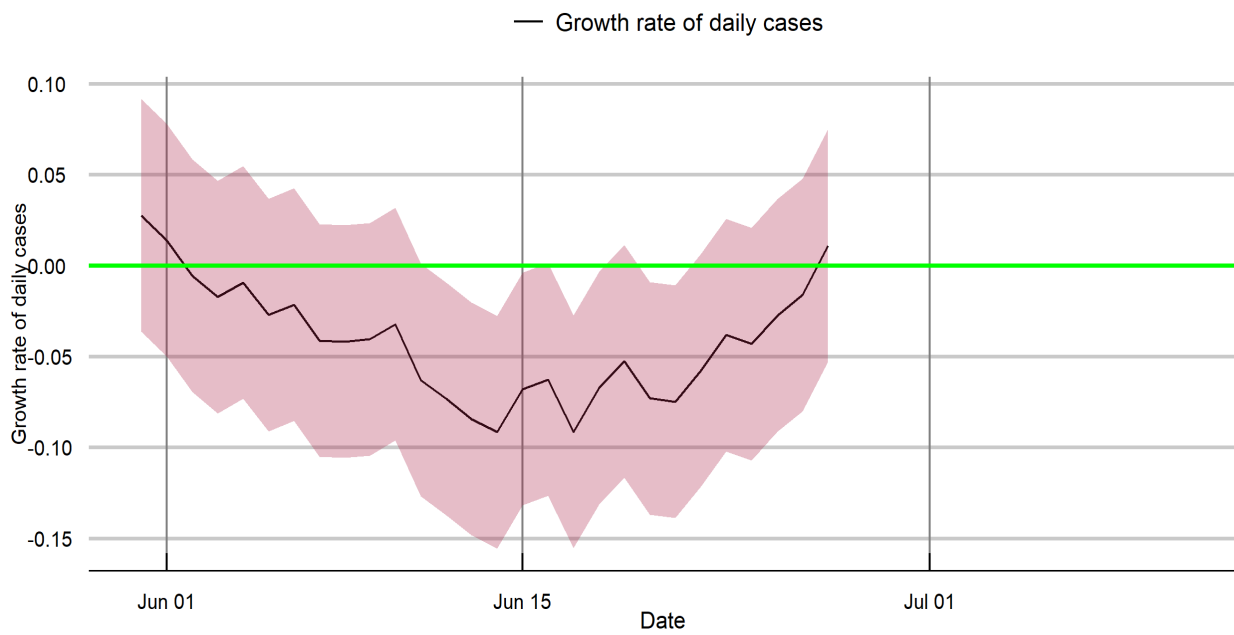




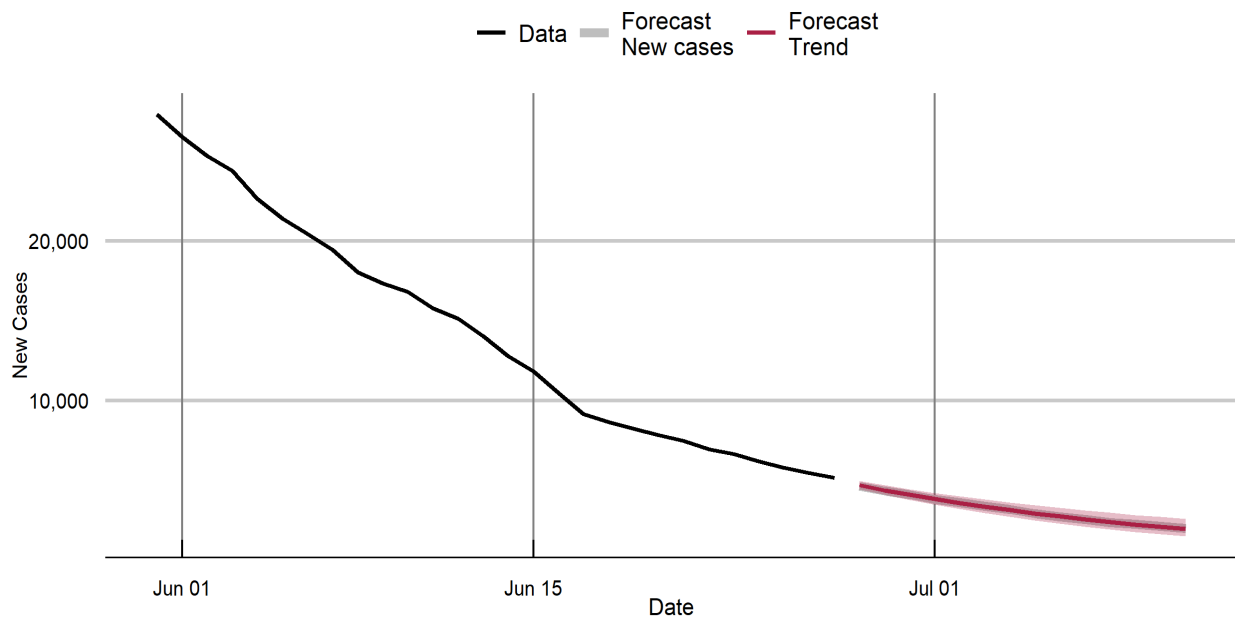
Sikkim



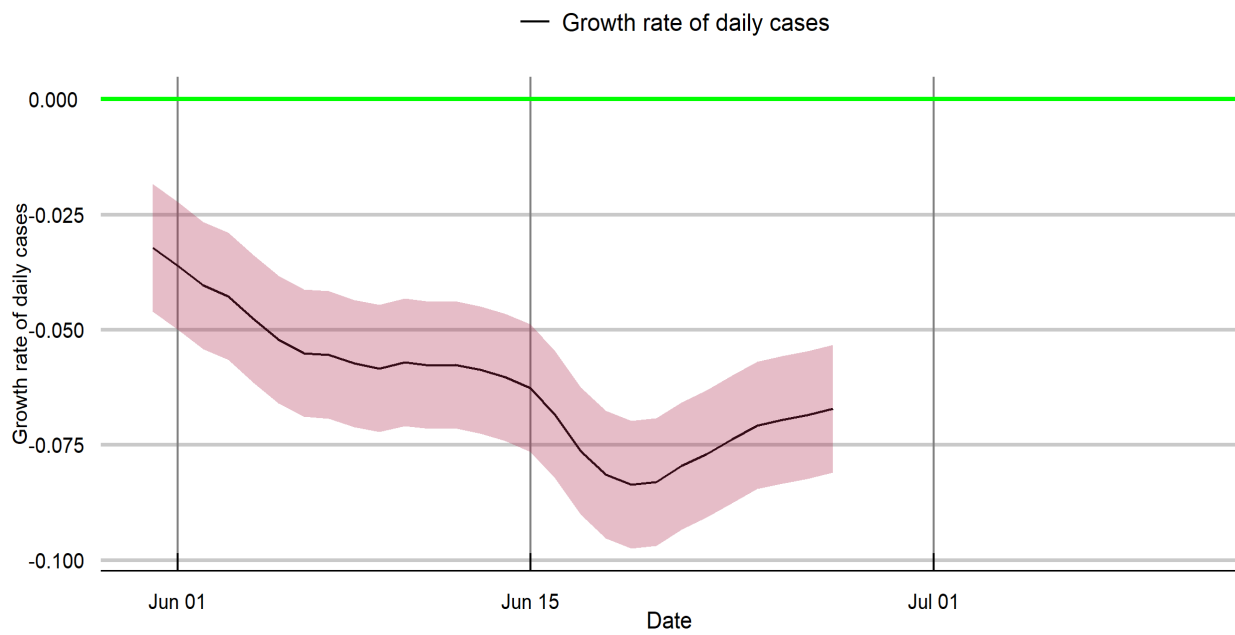
Sikkim



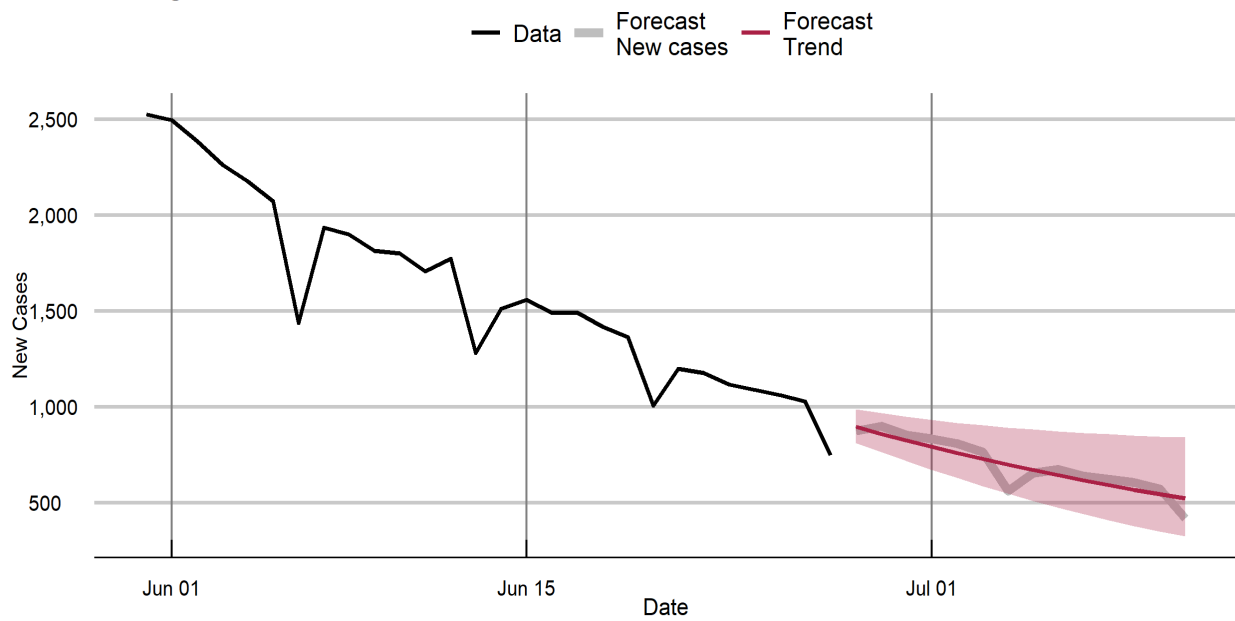
Tamil Nadu



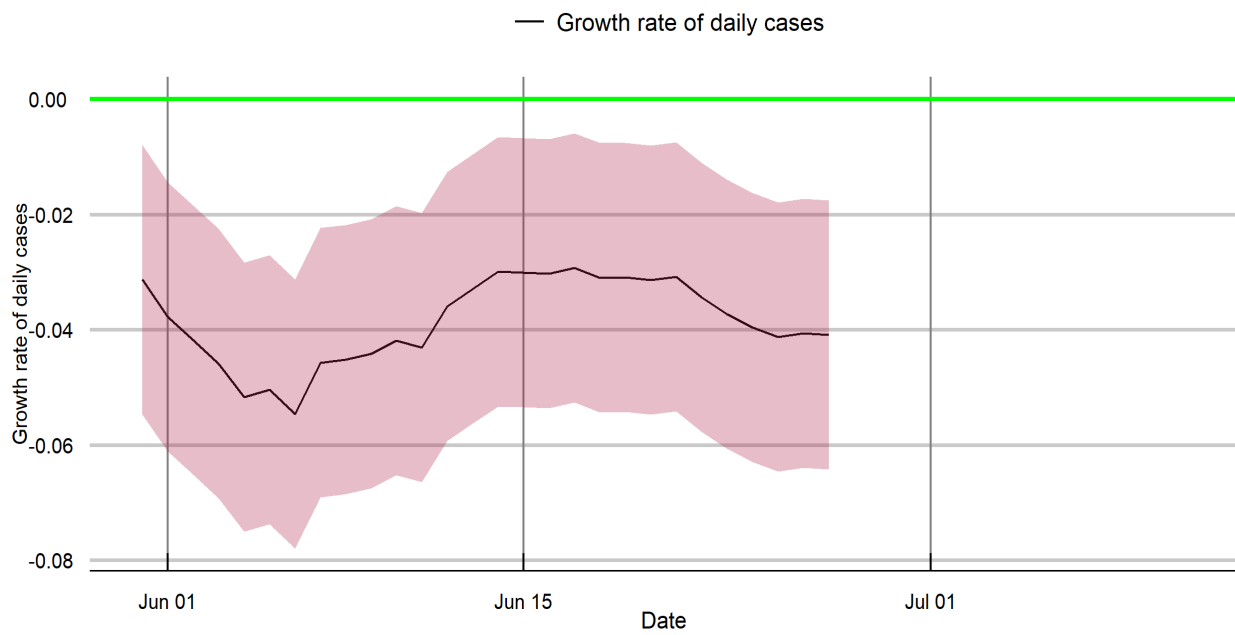
Tamil Nadu



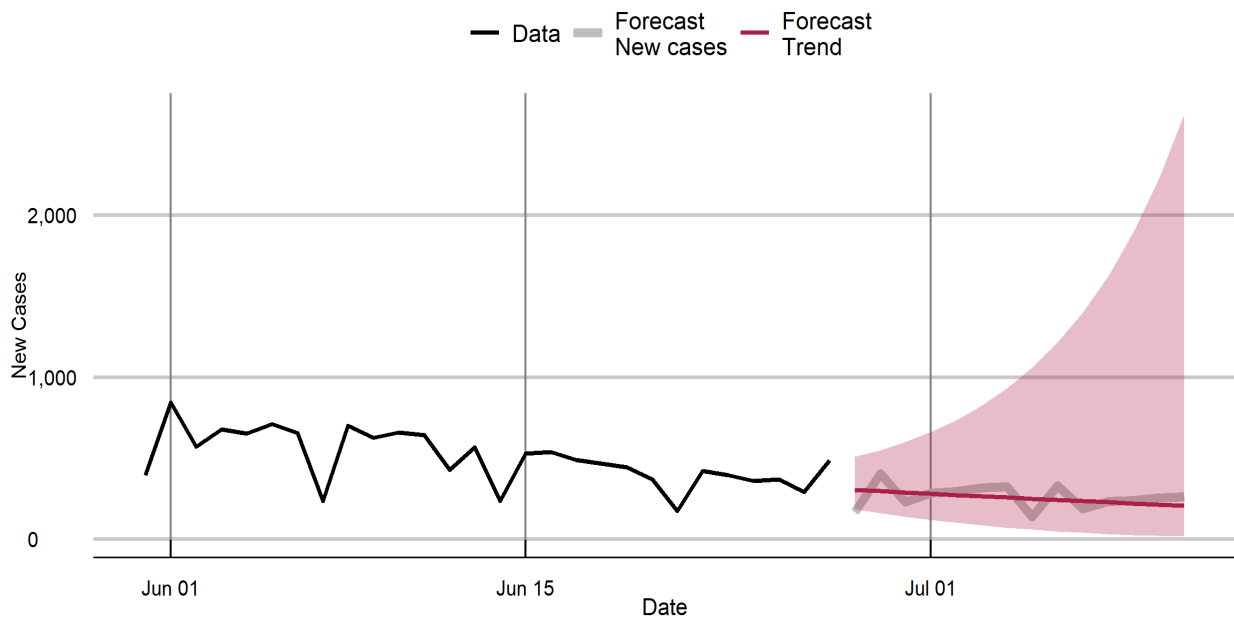
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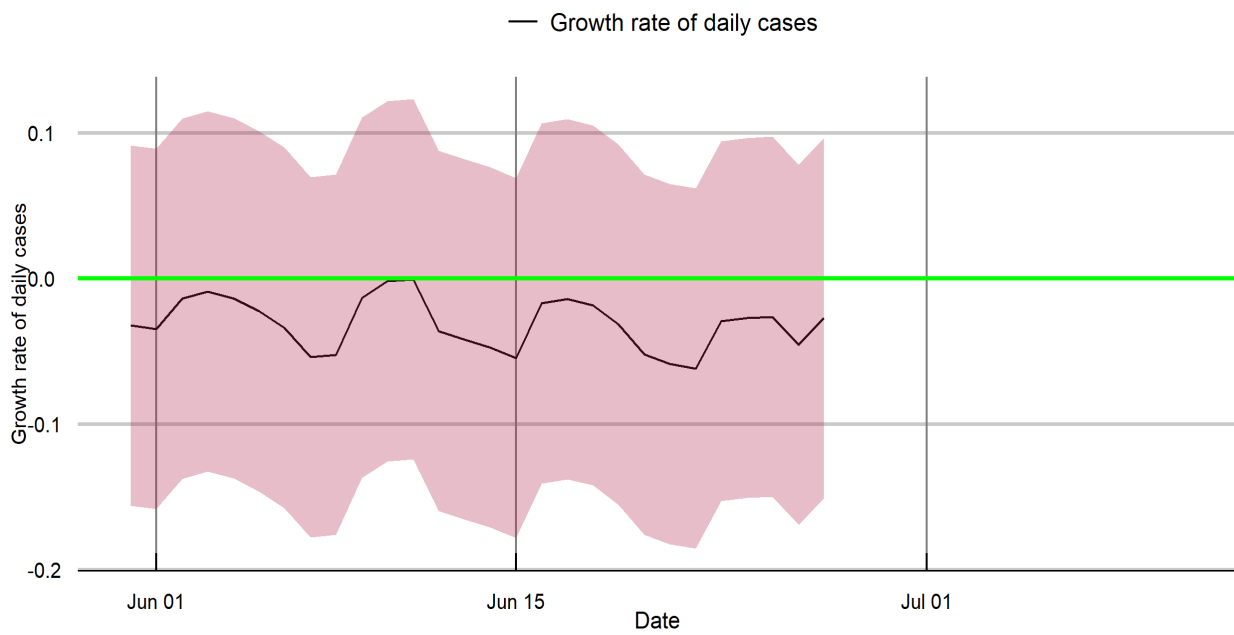
Telangana



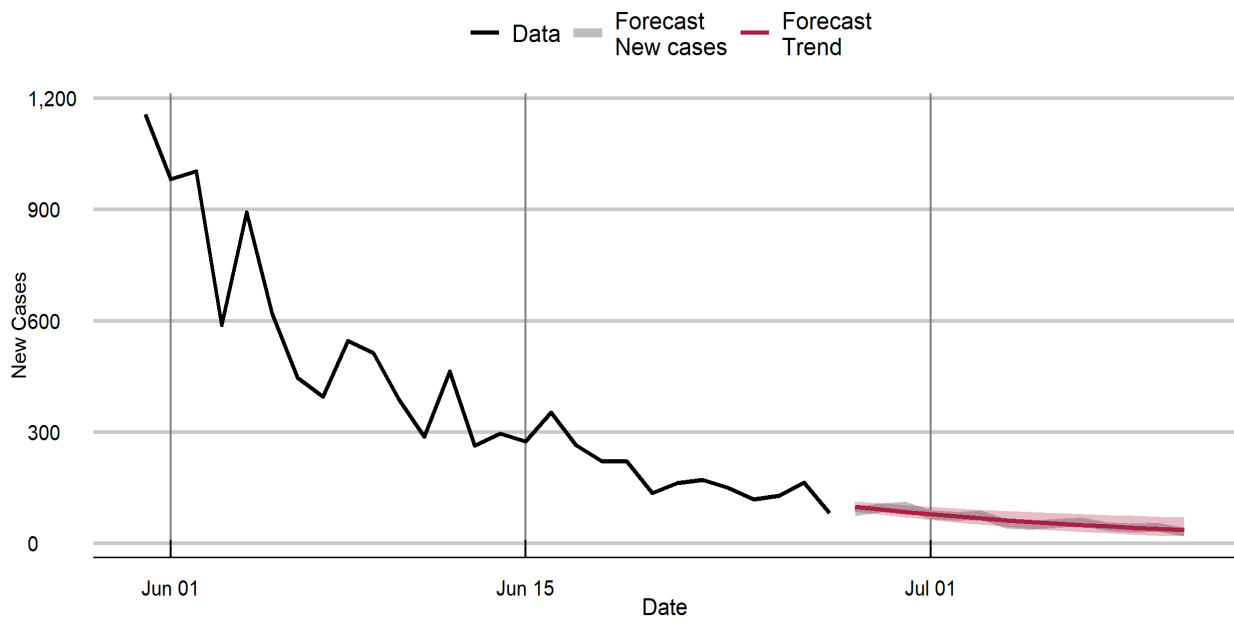
Tripura



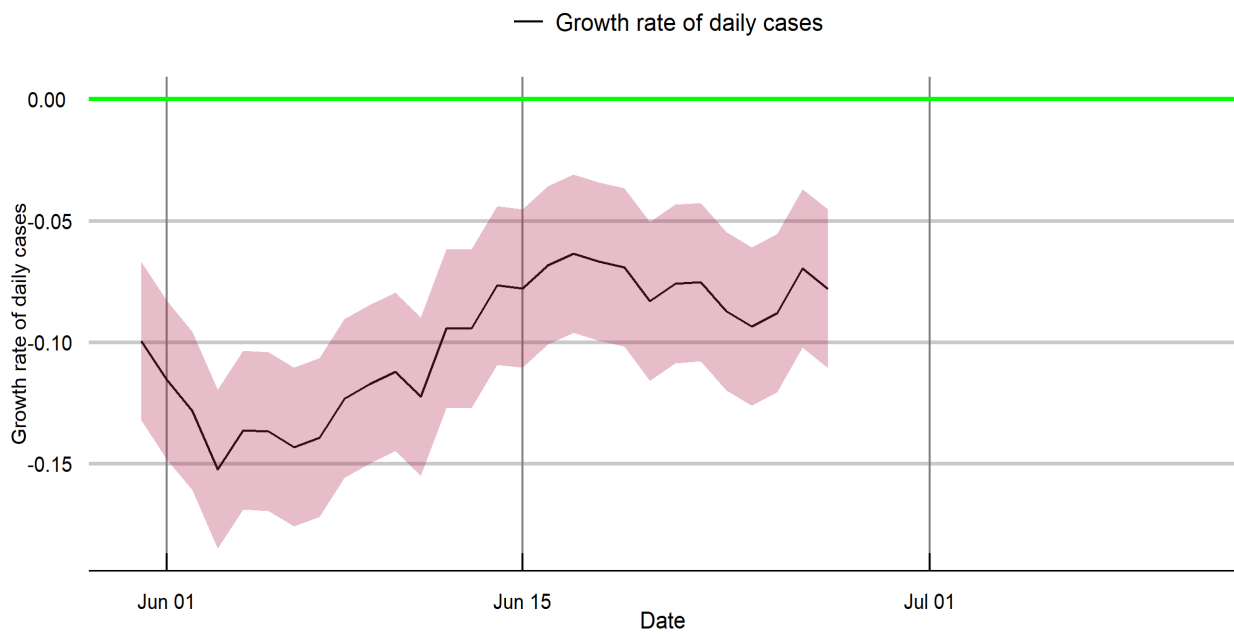
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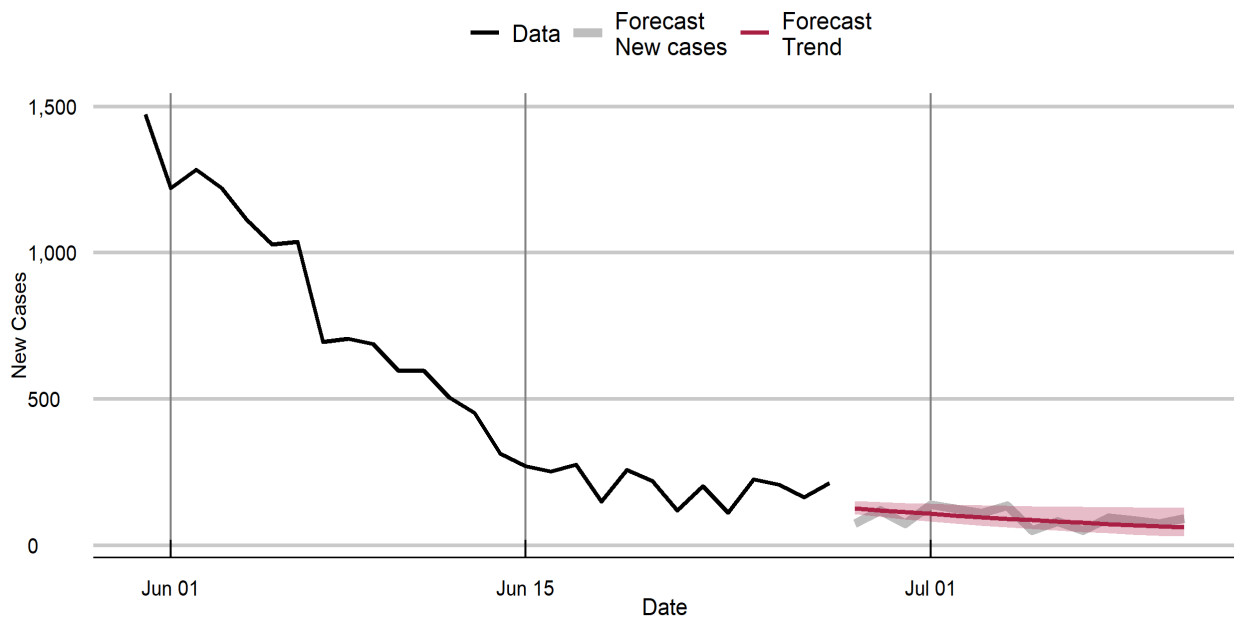
Uttarakhand



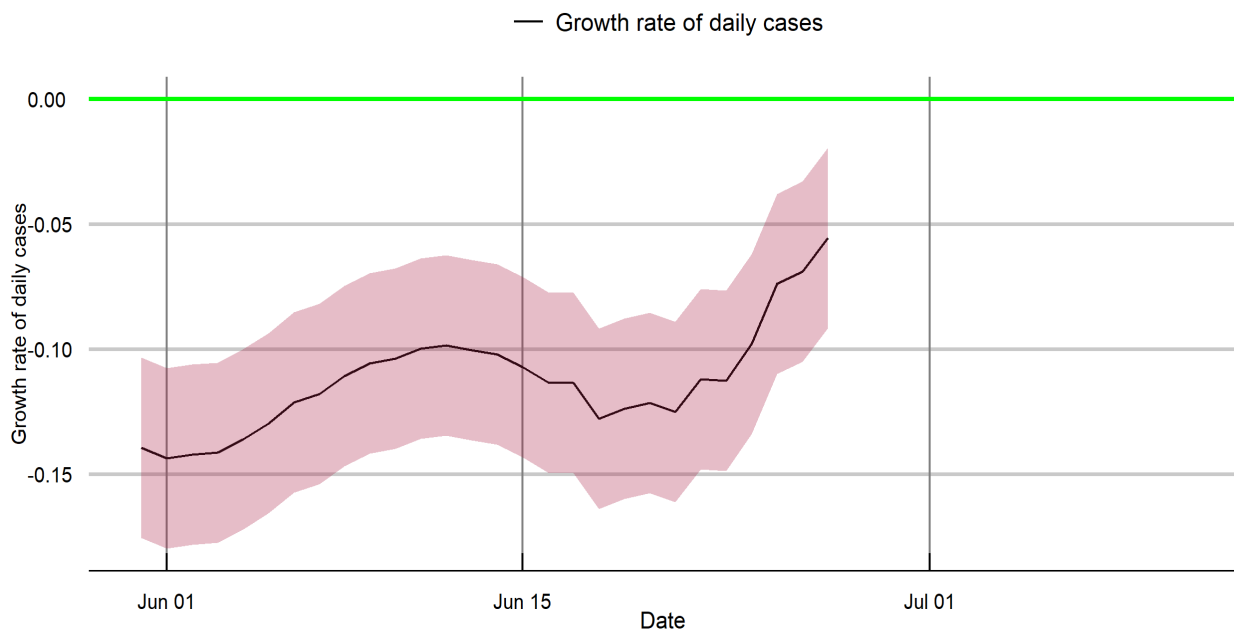
Uttarakhand



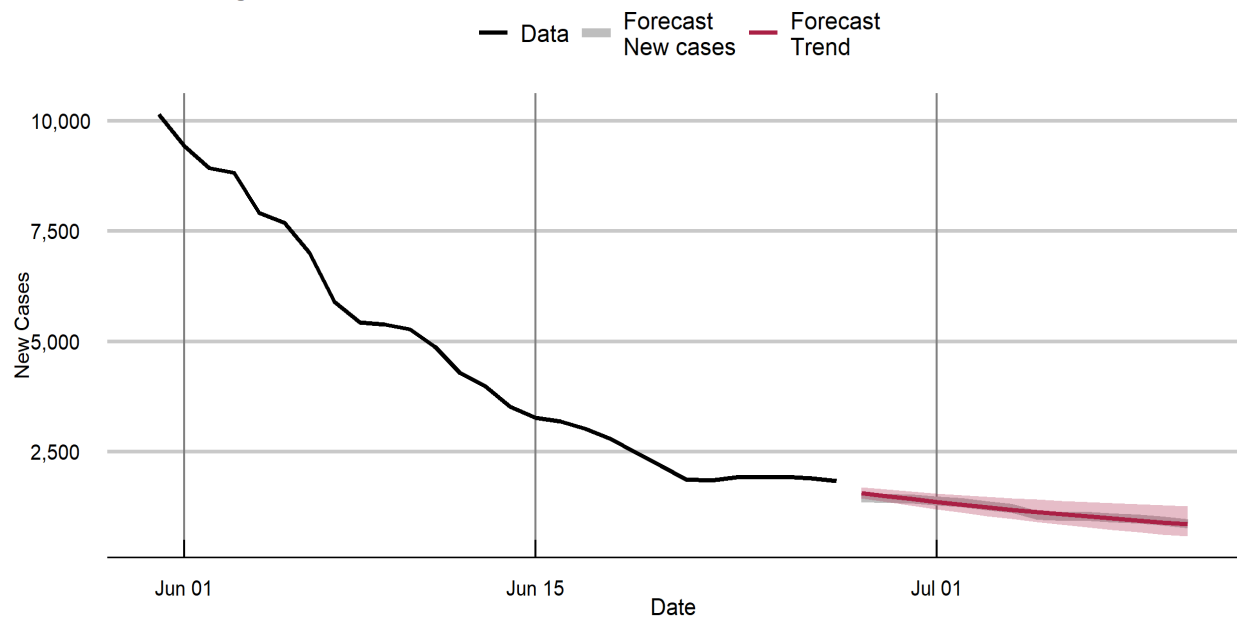
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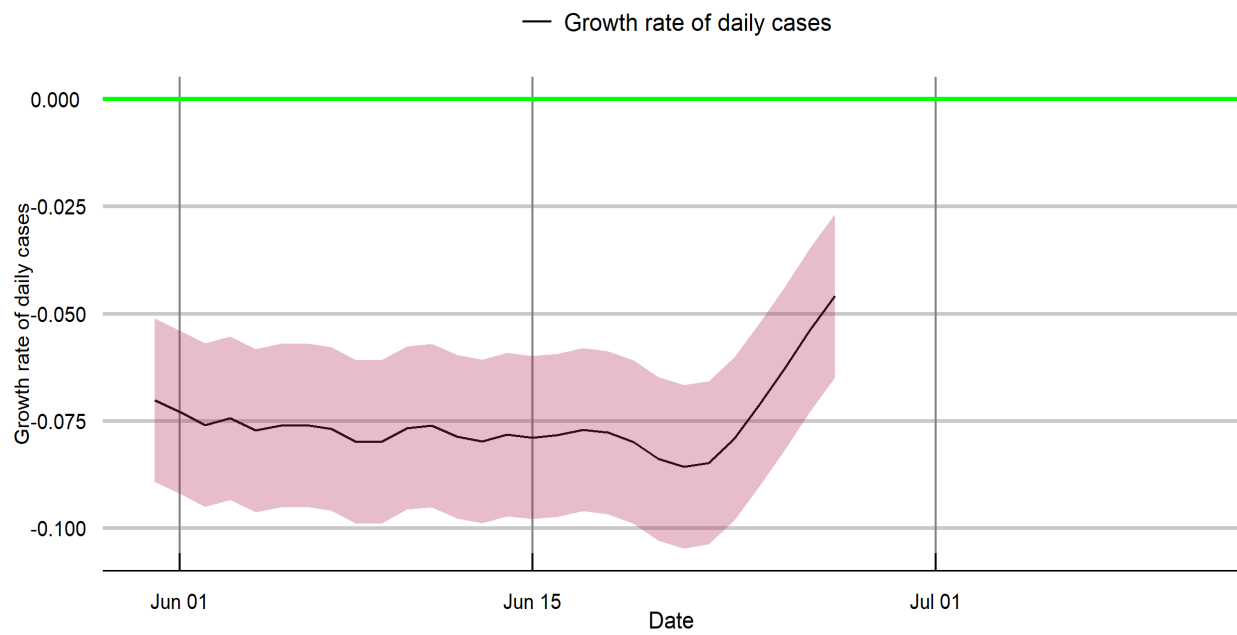
Uttar Pradesh



West Bengal



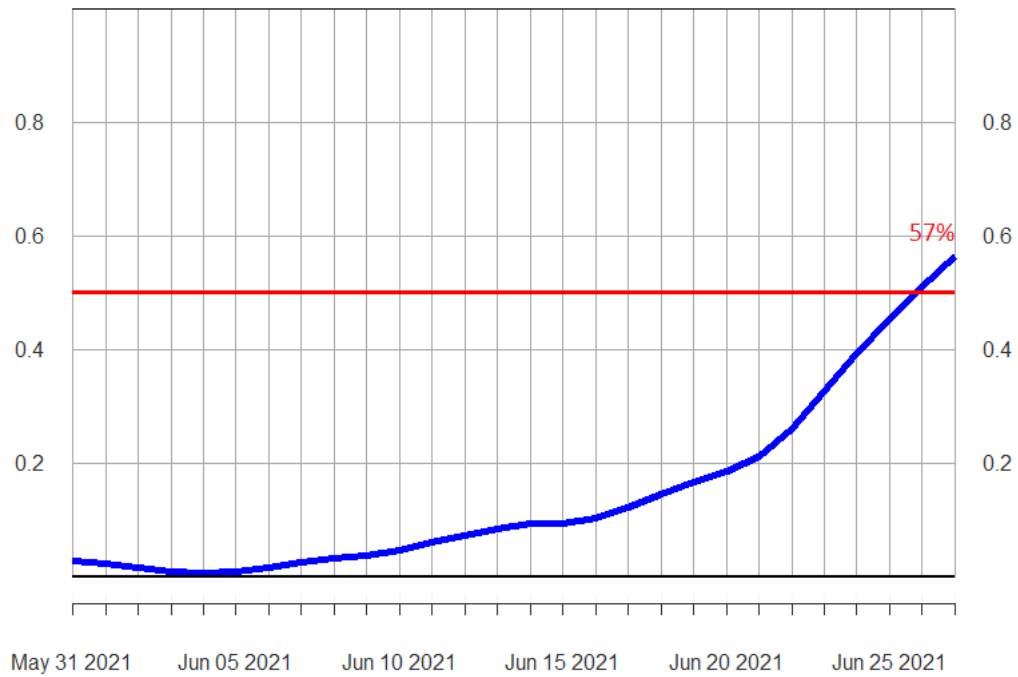
West Bengal



The nature of growth in new cases: Maharashtra and Nagaland

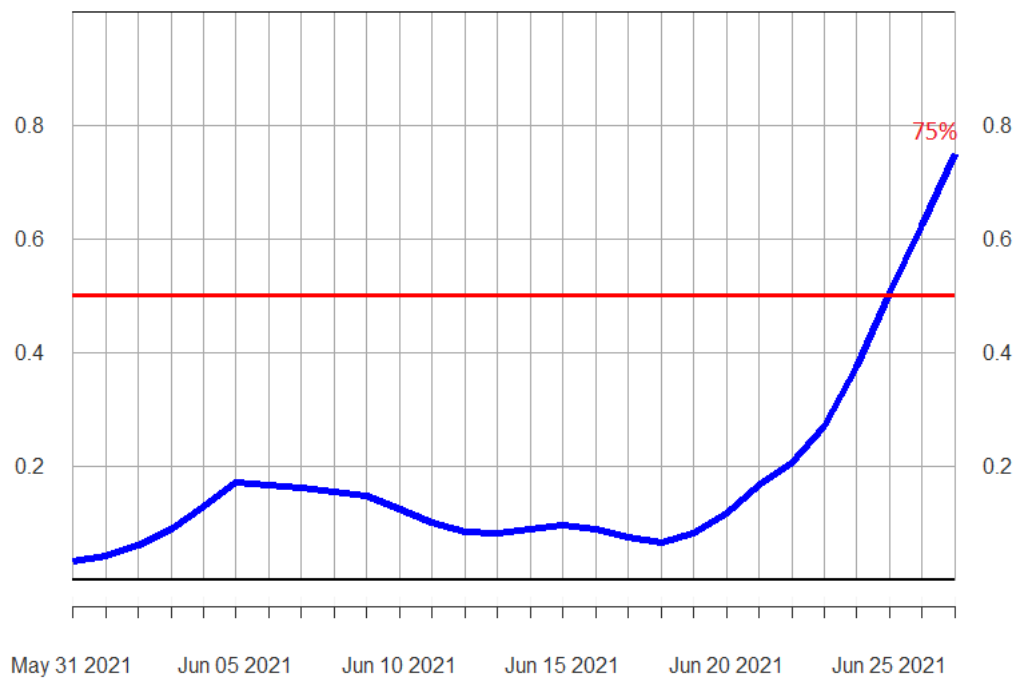
Maharashtra: Probability that case growth rate is increasing at an increasing rate

2021-05-31 / 2021-06-27



Nagaland: Probability that case growth rate is increasing at an increasing rate

2021-05-31 / 2021-06-27



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 June 19, the mean absolute percentage error of the forecasts of cases for India over the period, June 20– 26, is 10.2%. 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%.

Probability The probability that the growth of new cases is increasing at an increasing rate is extracted from the statistical model. The pandemic phase is of extreme concern when this probability exceeds 0.5.

Note: 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.

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#Health Systems Transformation Platform.

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