

Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

8 August 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 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.

With many Indian states enforcing containment policies as infections rose, the effective reproduction number (R_t) for India as a whole has dropped below the threshold of one, to 0.98. The trend value of the growth rate of new cases has edged below zero to -0.4%. Reported cases are likely to fall under 38,000 per day by 21st August, lower than predicted last week.

Even so, cases are expected to increase in 10 states across the country in the coming week (down from 13 states, last week). Cases appear to be accelerating at the present time in Goa, Himachal Pradesh, Nagaland, Punjab, Tamil Nadu and West Bengal (pages 40-43).

The pragmatic policy of enforcing containment and closure measures when infections increase and easing restrictions when possible is likely to drive state level reproduction numbers to oscillate around the threshold of 1 in the coming weeks. Given the infectiousness of the dominant variant and depending on the sizes of their non-immune populations, the policy is likely to result in recurrent flare-ups that moderate, in several states. The nation-wide trajectory is likely to increase in amplitude and turn volatile if geographic spill-overs synchronise the epidemic arcs of states.

This stage is likely to last till vaccination coverage grows to a level consistent with herd immunity.

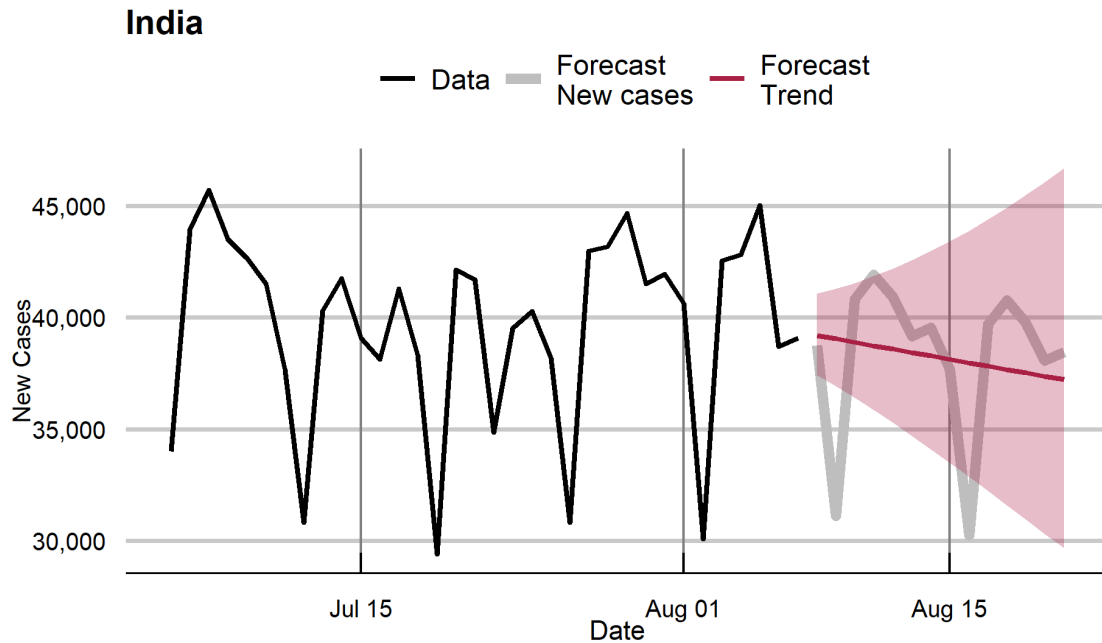
Mean absolute percentage error of the forecasts of daily cases in India given in the July 25 tracker, for the period August 2 to 7, was 9.29%. Changes in government pandemic policies and in transmission relevant social behaviour may cause realised numbers to depart from forecasts.

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

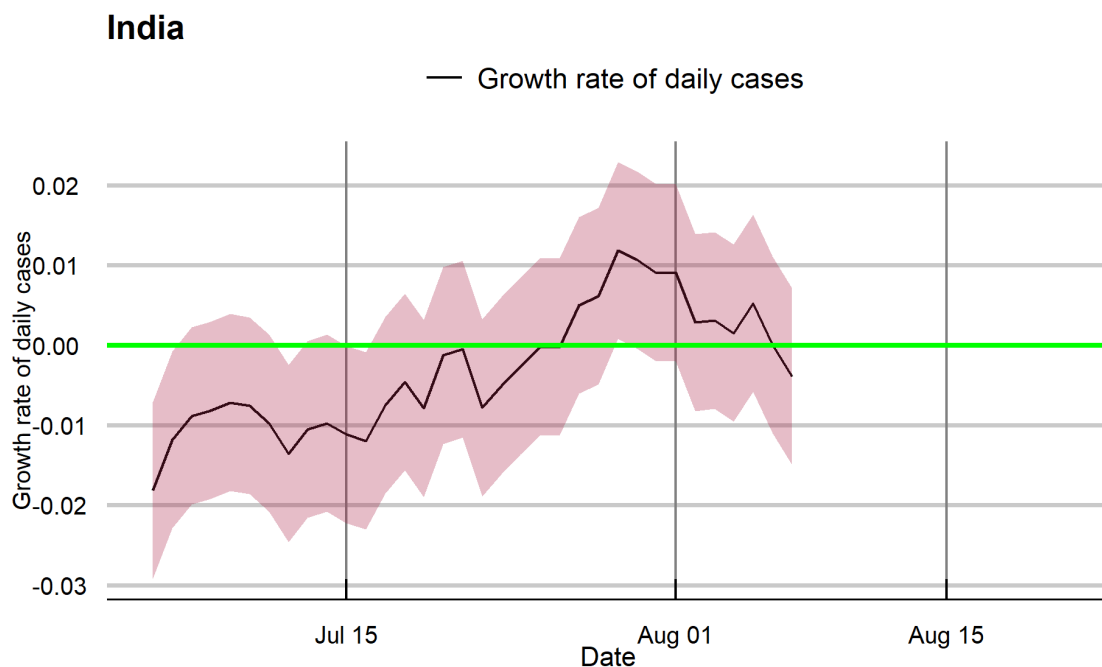
The companion spreadsheet contains all the estimates and forecasts.

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

Daily Covid-19 cases in India: Forecast



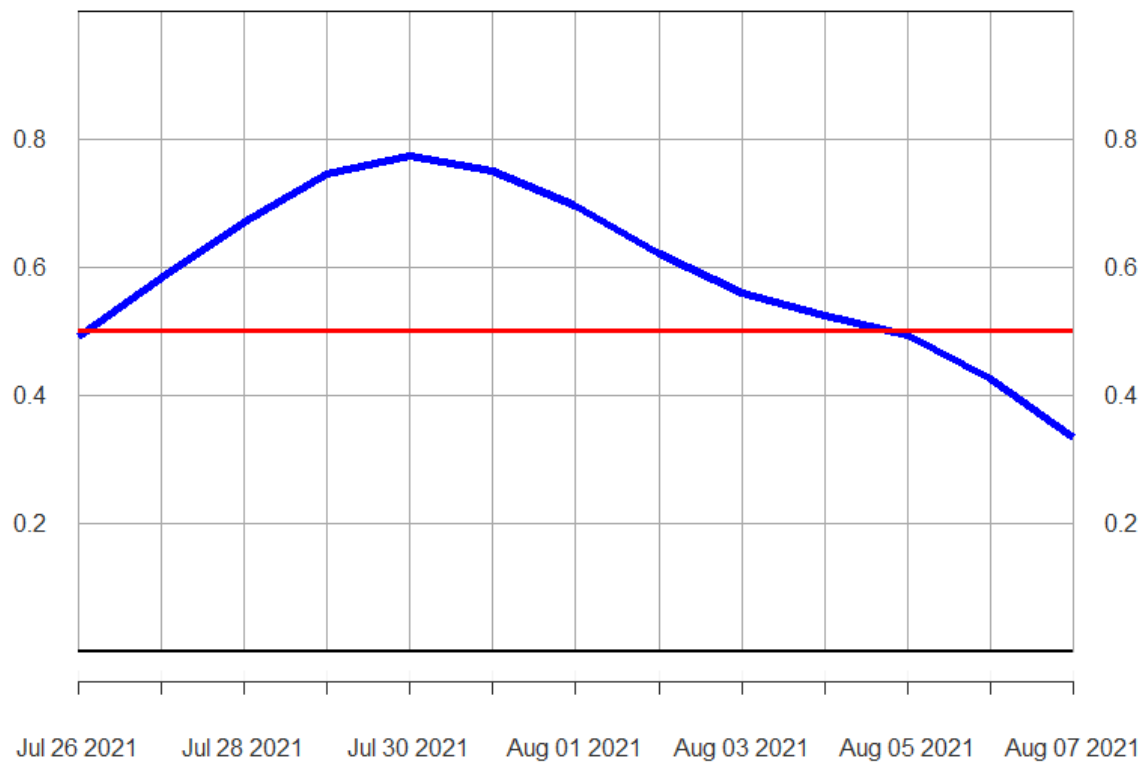
Forecasts of daily new cases for the period 8th to 21nd August 2021, based on data till 7th August 2021. New COVID-19 cases is likely to be about 37,800 per day by 21th August 2021.



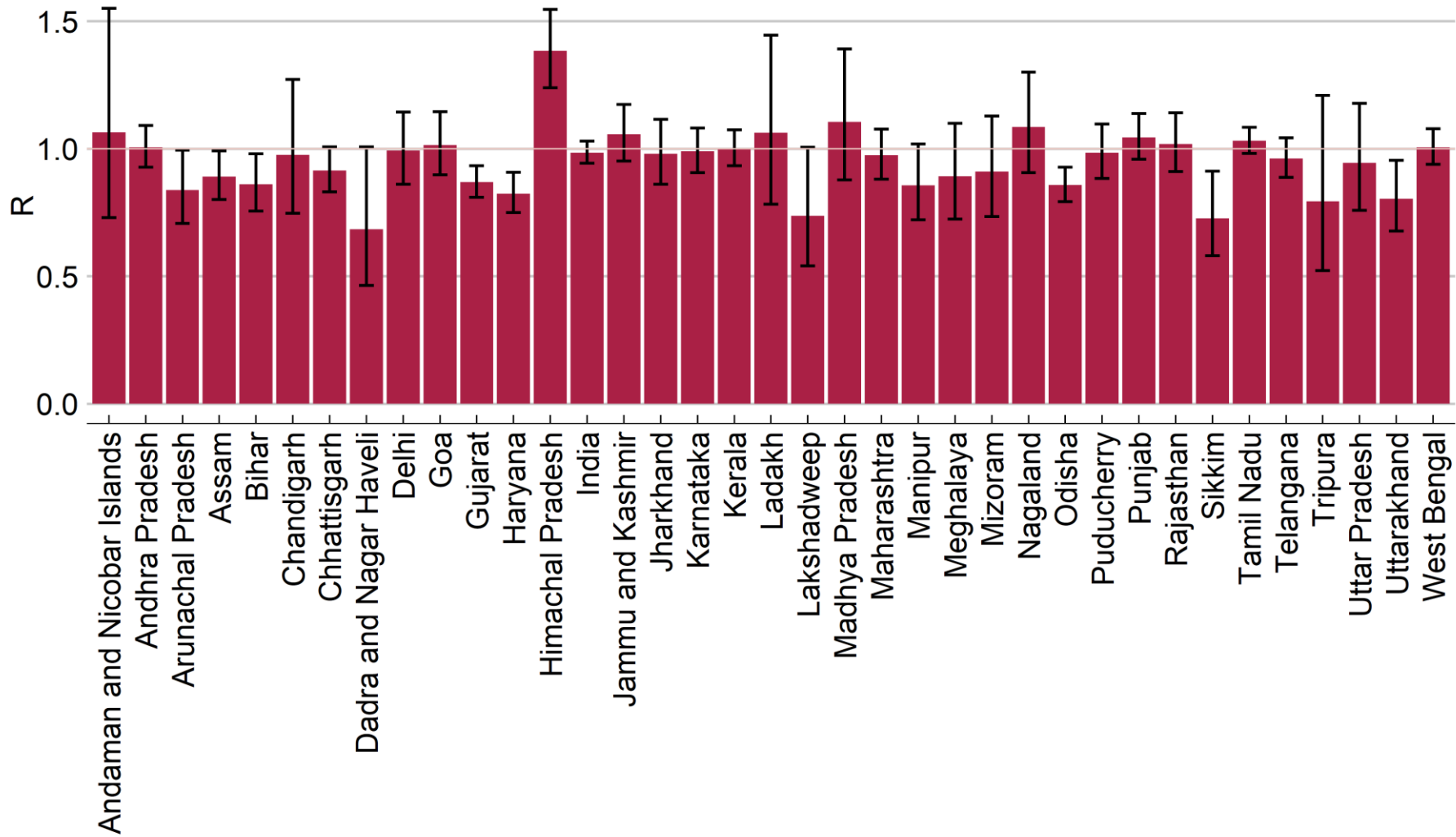
The filtered trend in the growth rate of daily new cases was -0.4% as on 7 August 2021.

India:
Probability that cases are accelerating
as on 2021-08-07 : 0.33

2021-07-26 / 2021-08-07

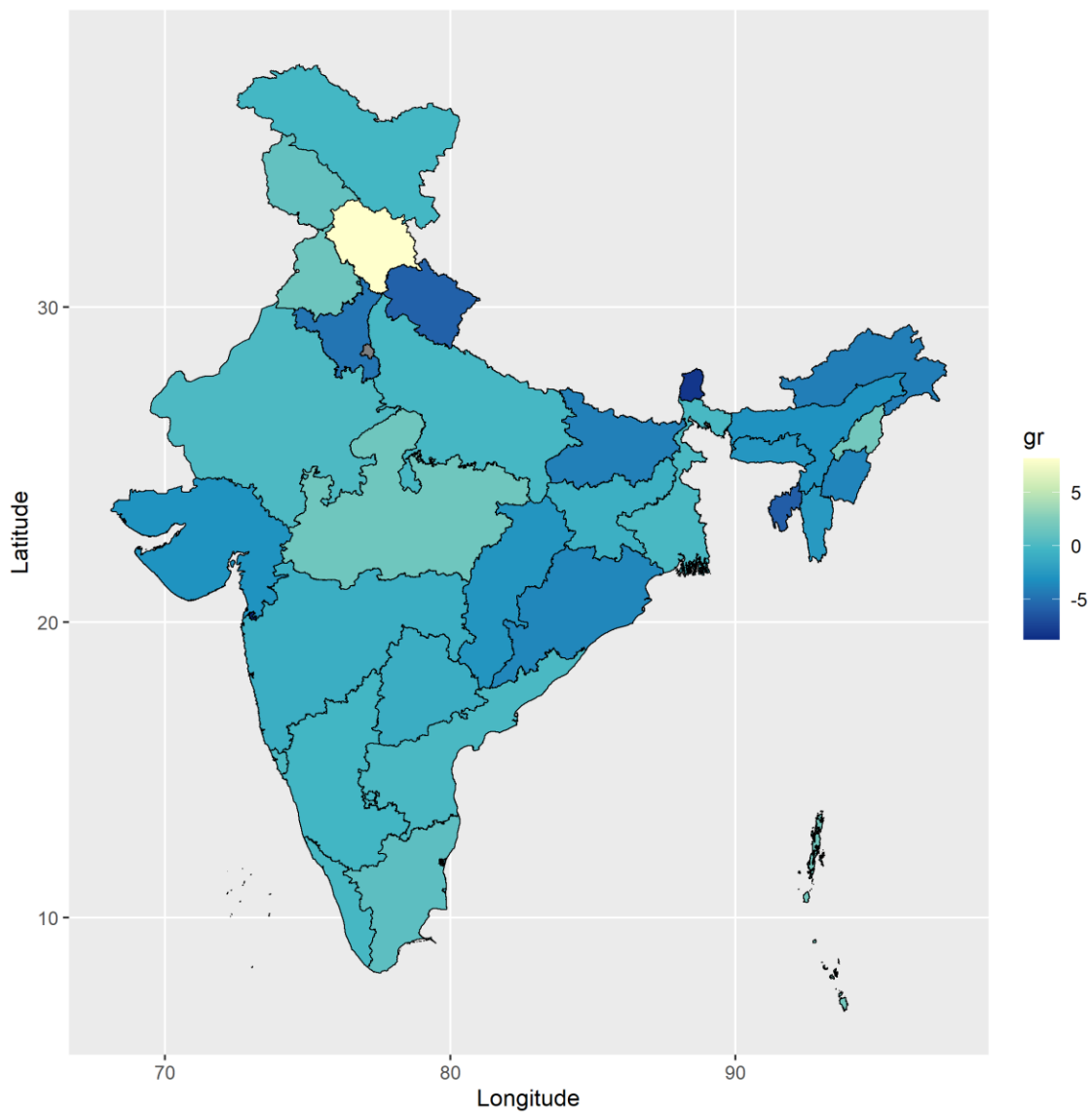


R_t: 7 August 2021

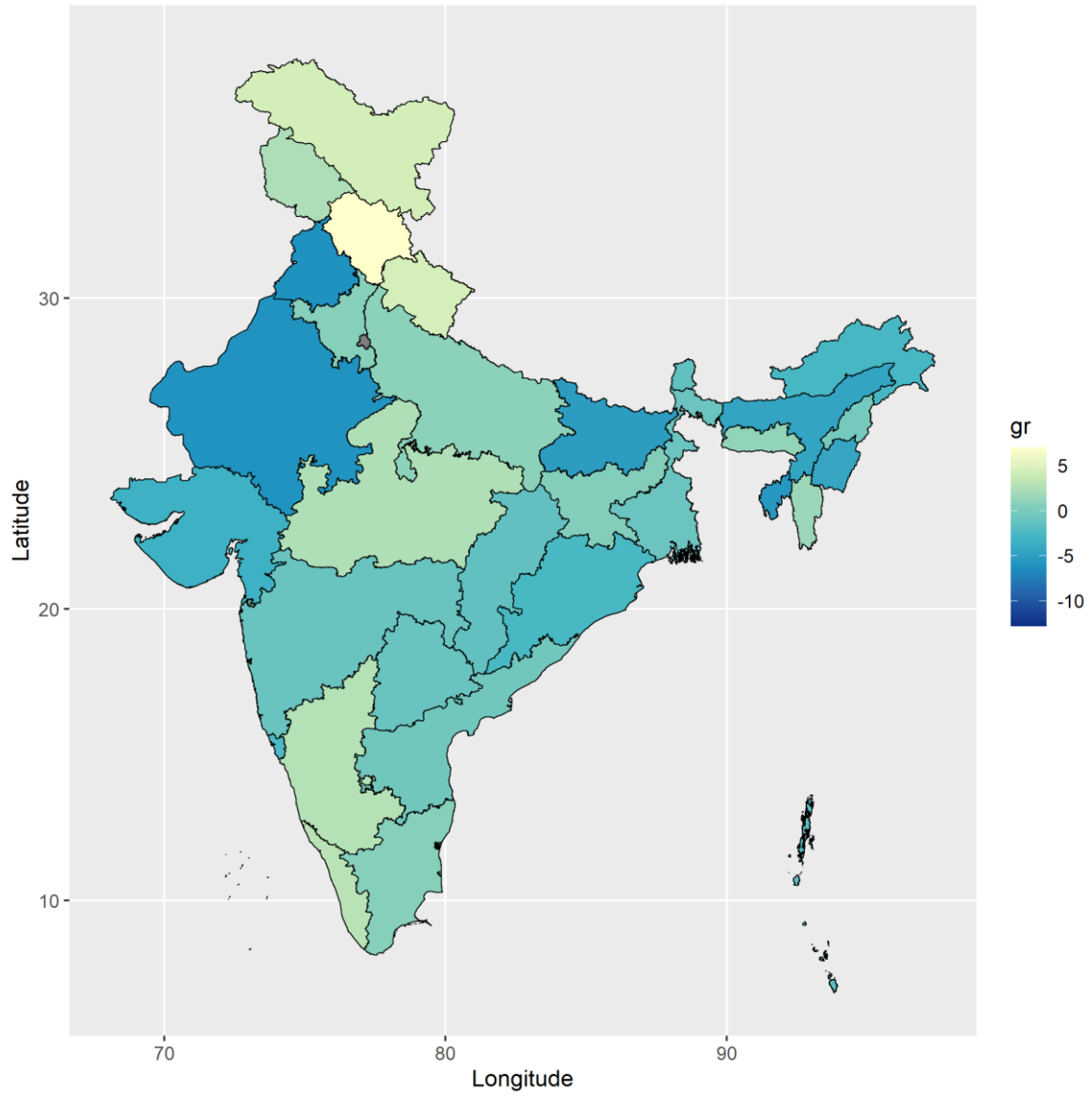


Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

Daily growth rates of cases (%)
Trend values as on 07 August 2021

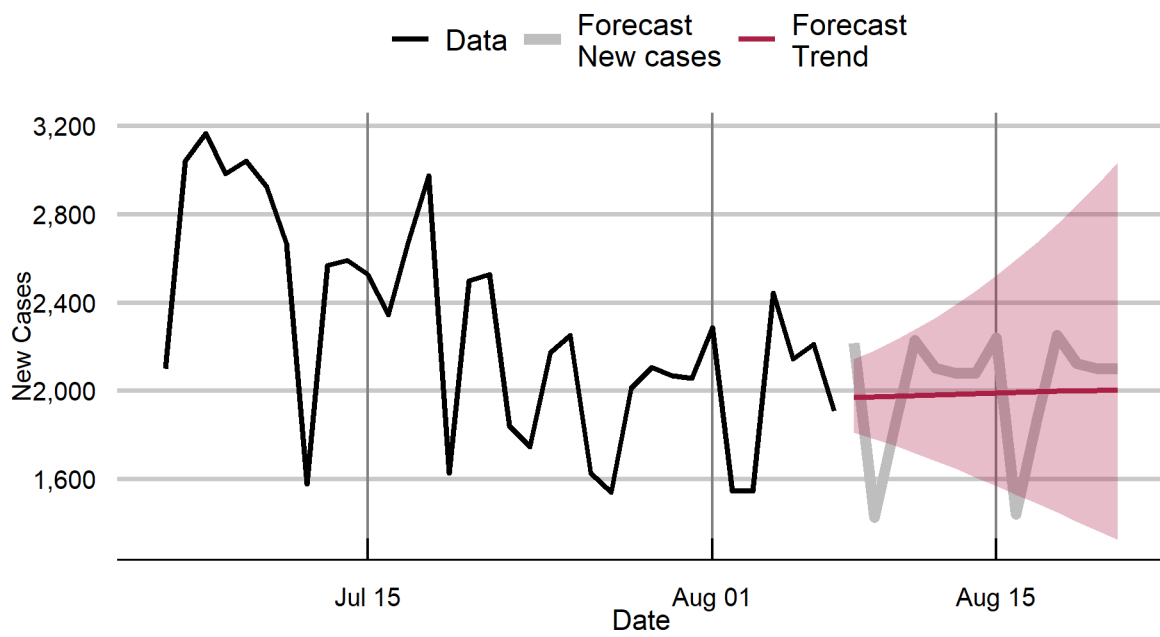


Daily growth rates of cases (%)
Trend values as on 01 August 2021

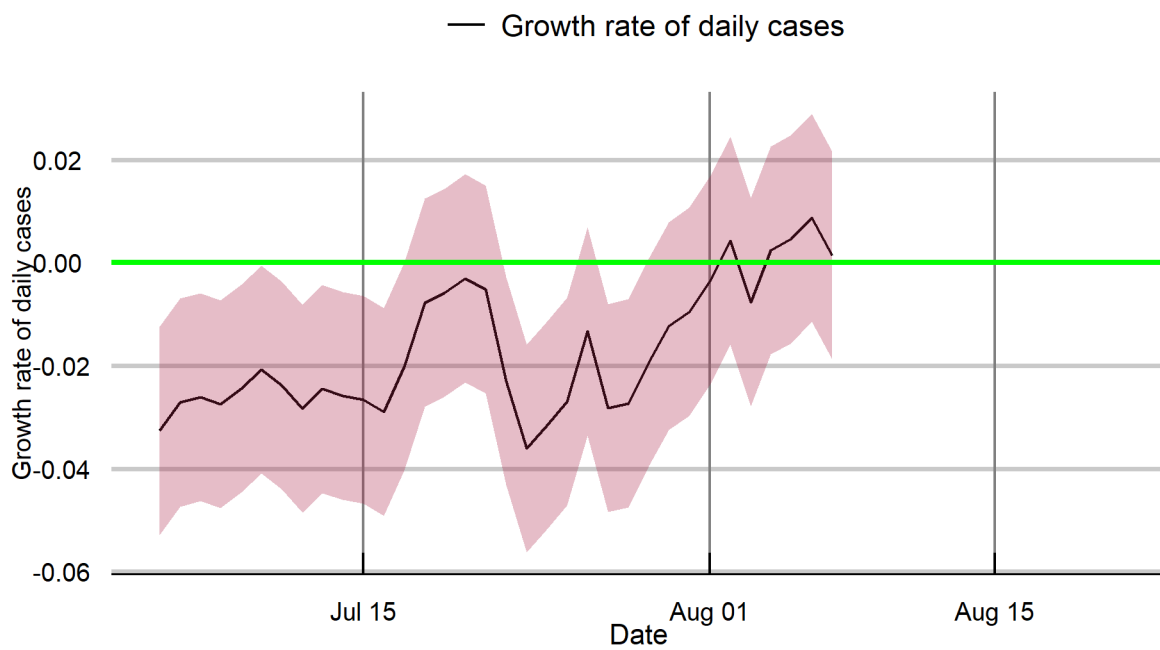


Case forecasts and growth rates: States and Union territories

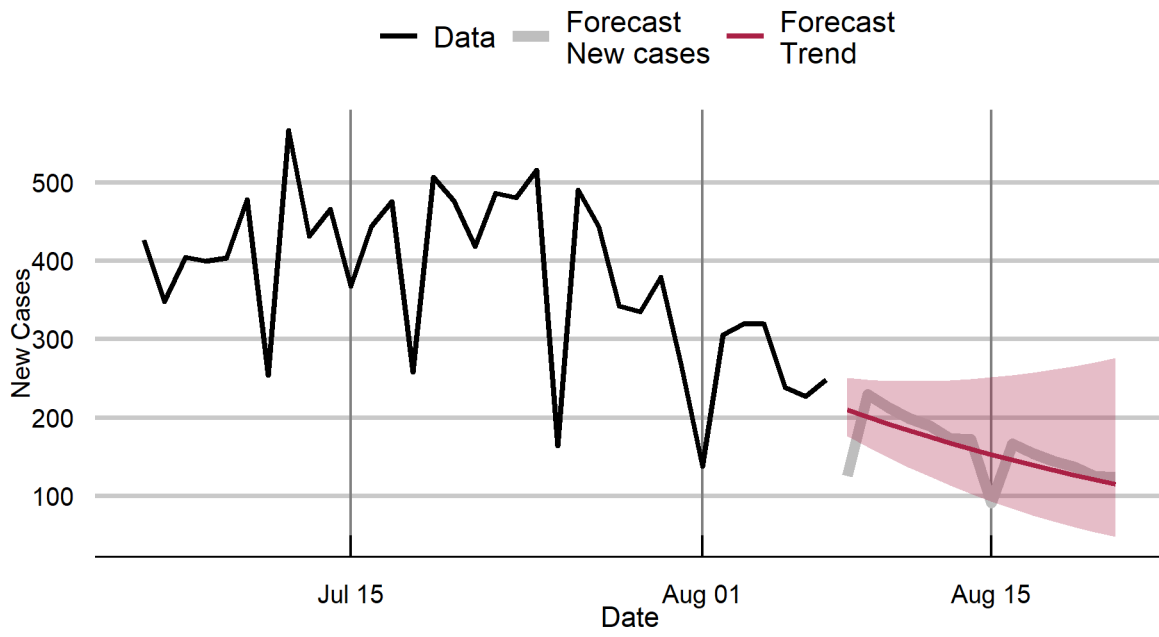
Andhra Pradesh



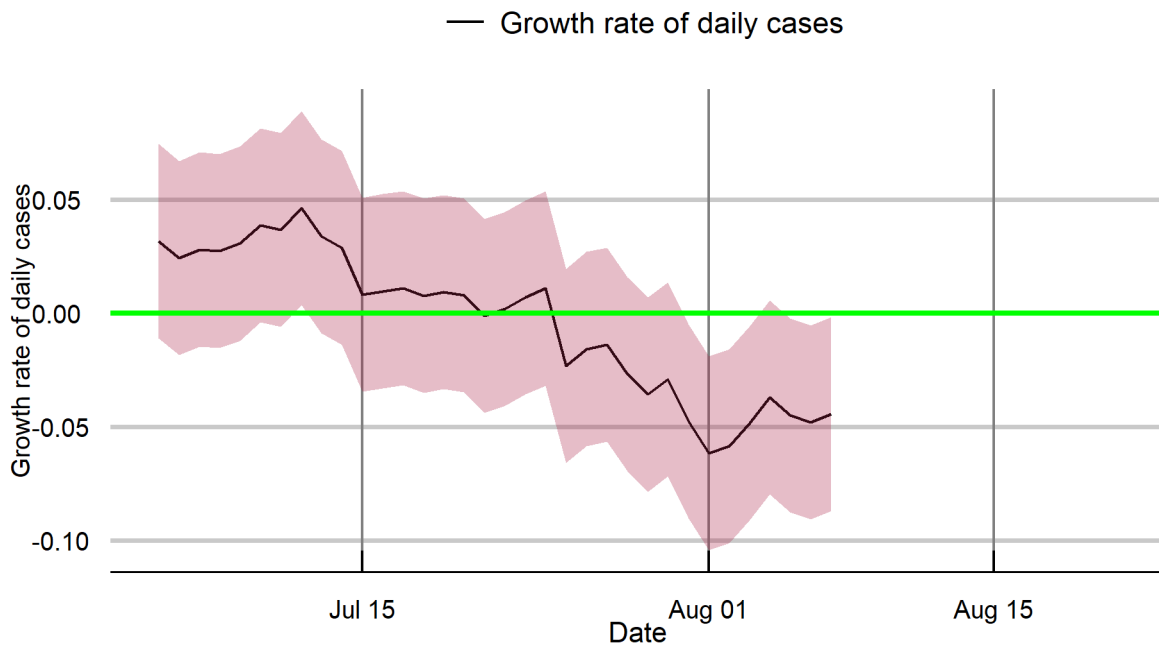
Andhra Pradesh



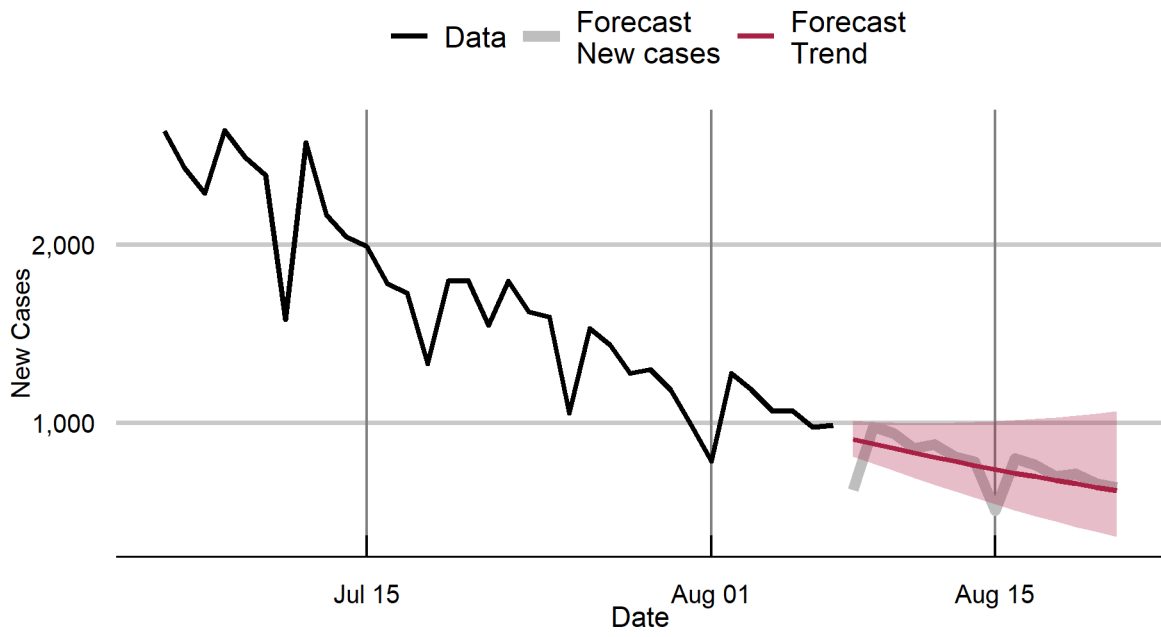
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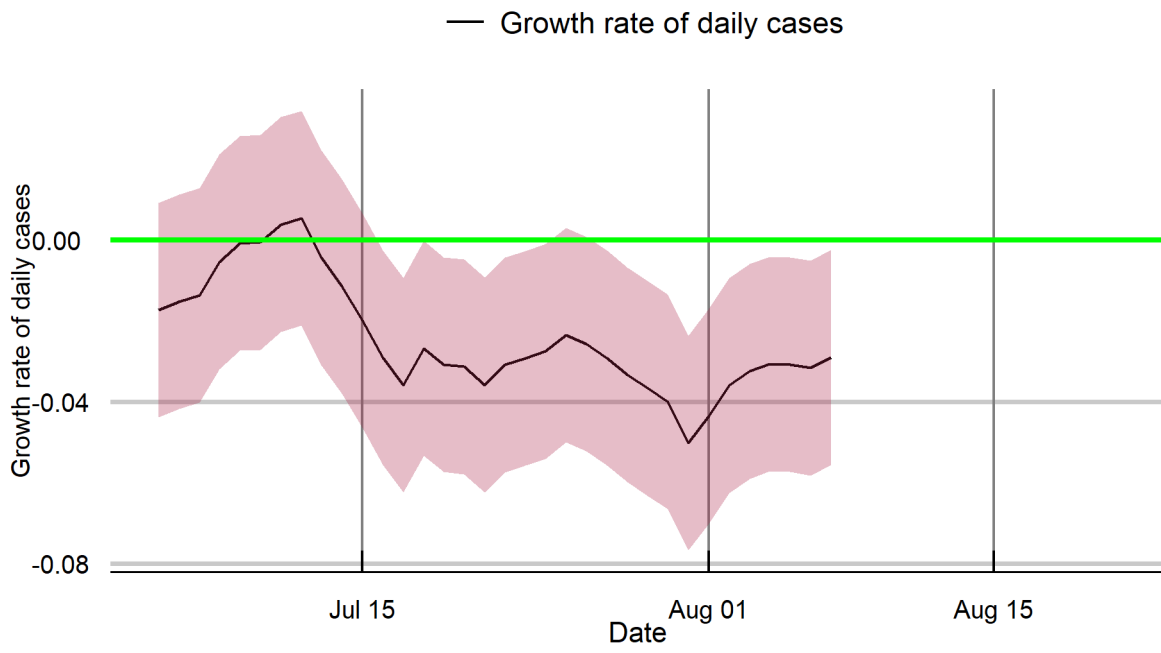
Arunachal Pradesh



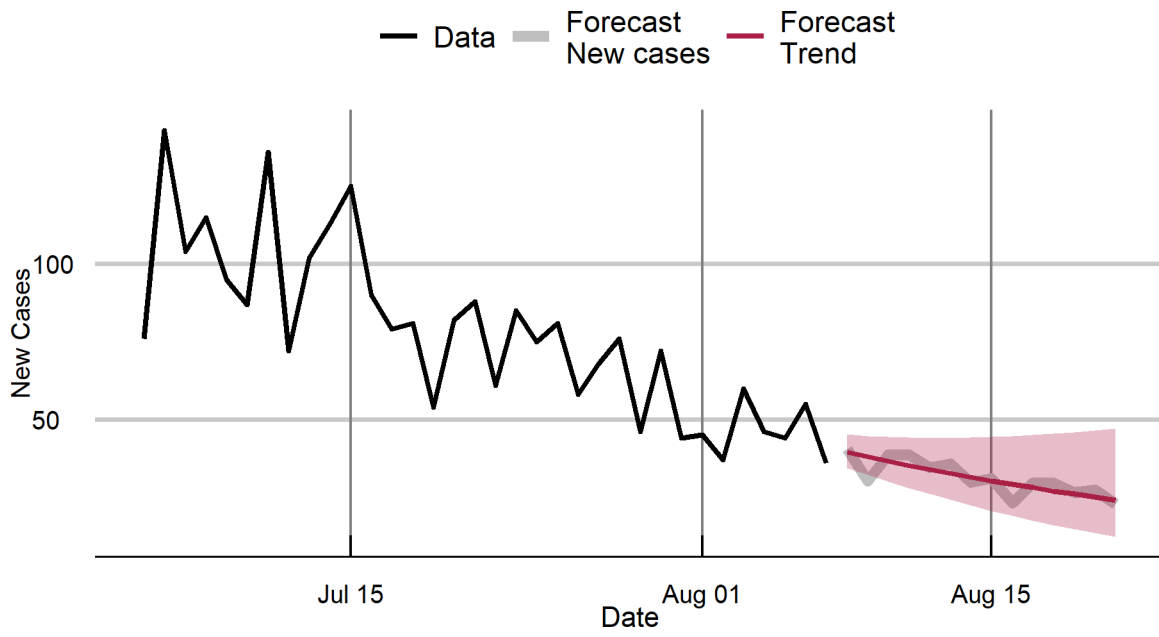
Assam



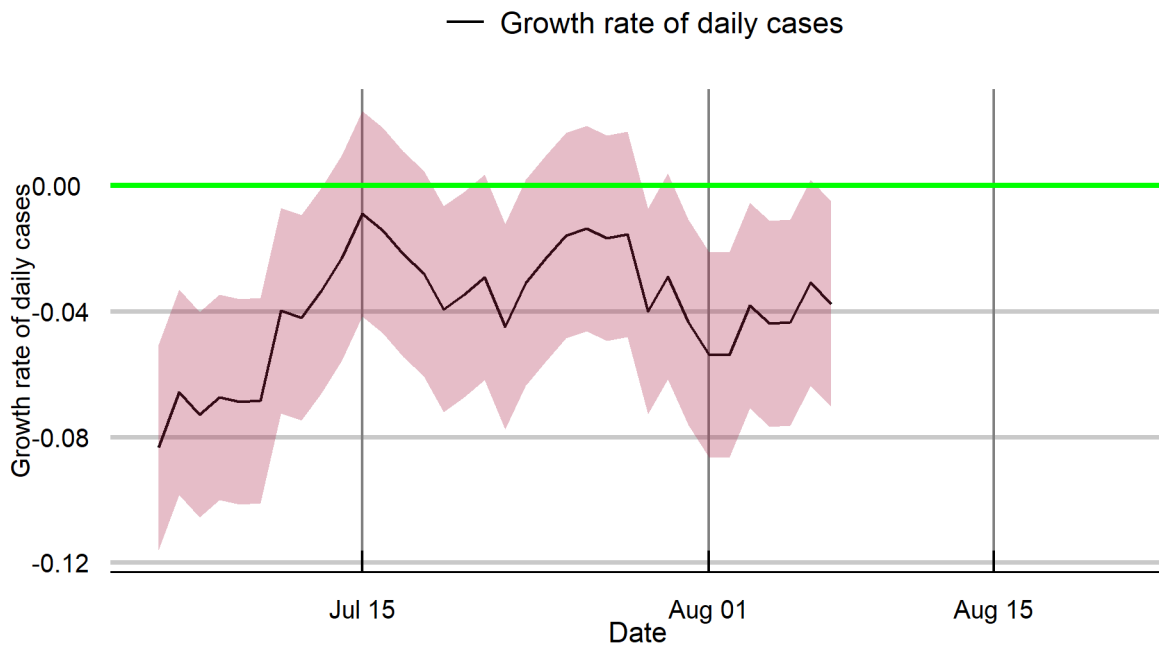
Assam



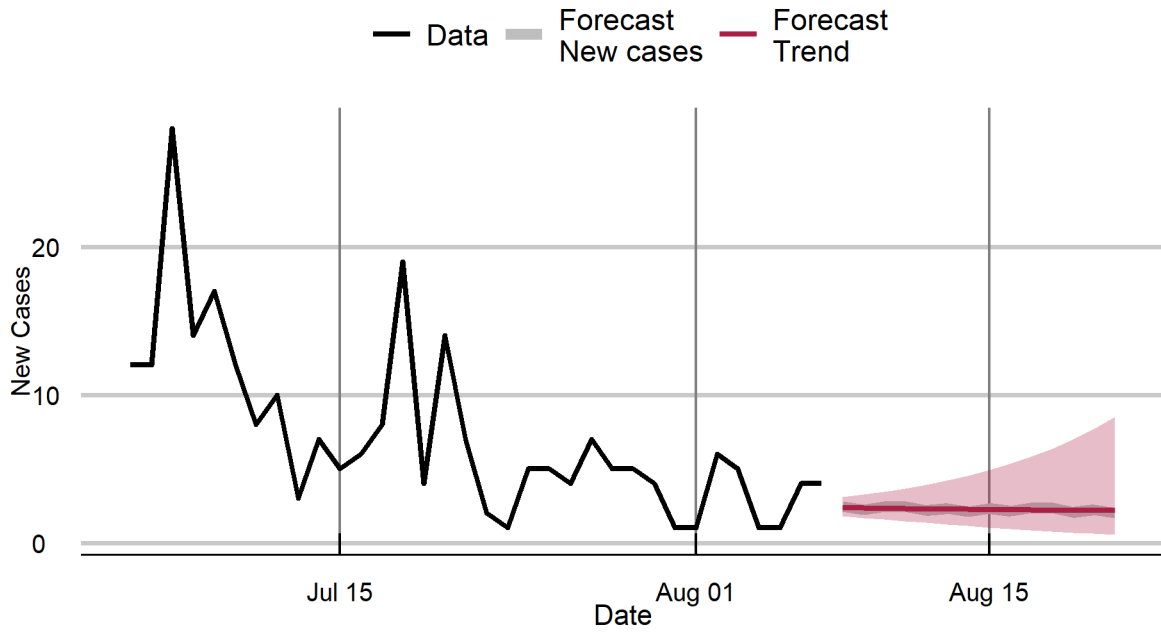
Bihar



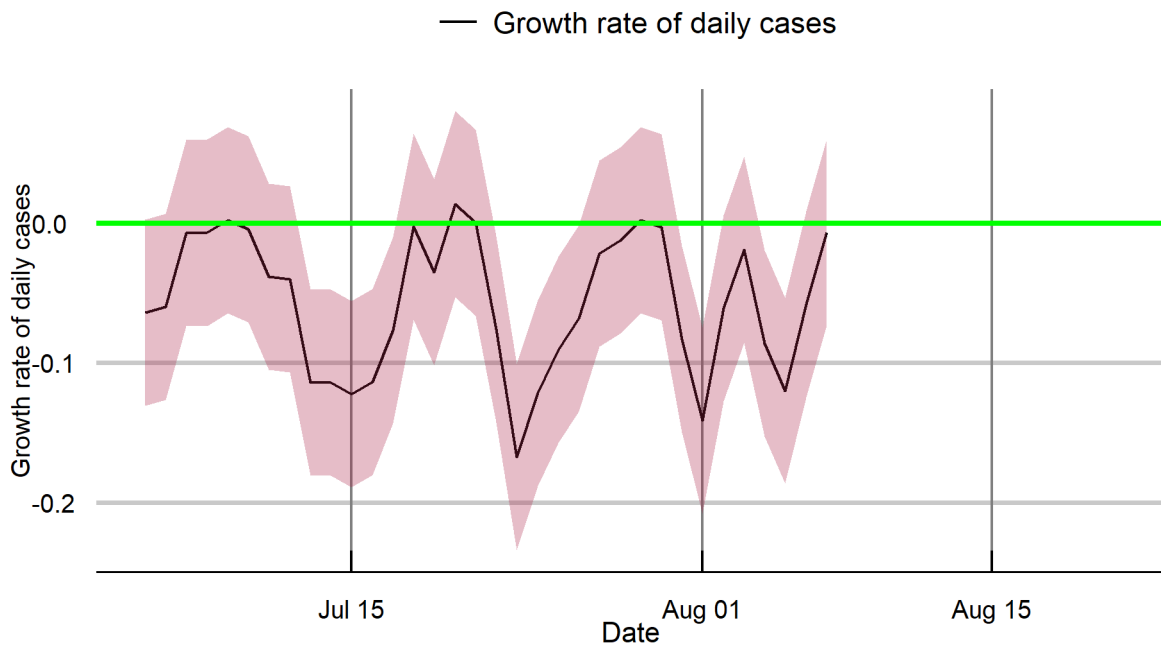
Bihar



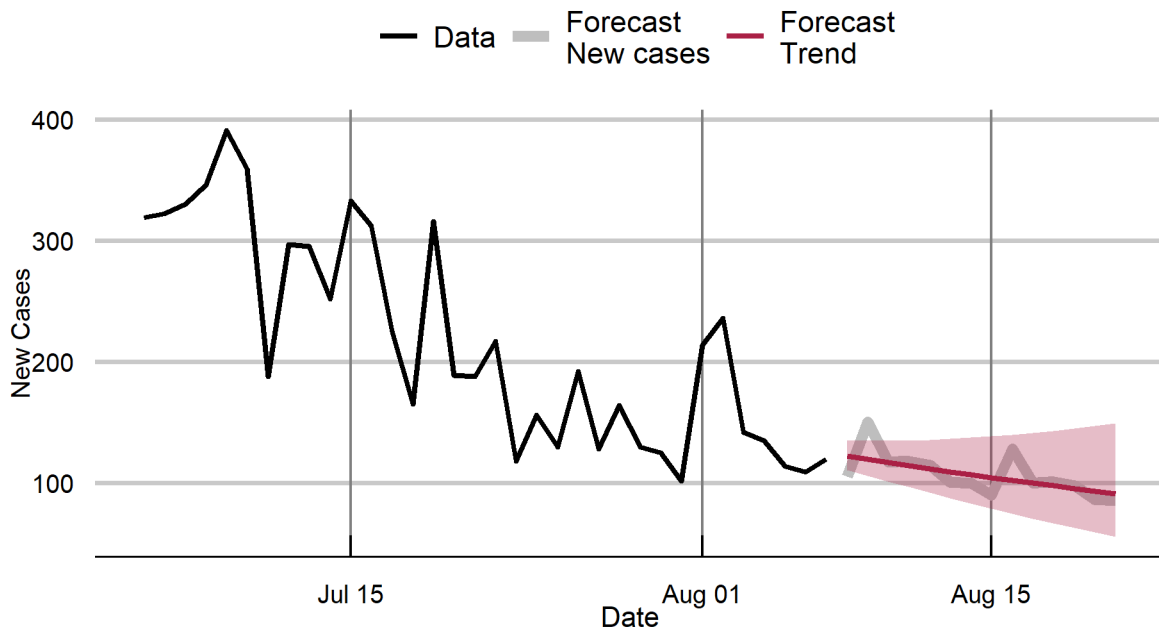
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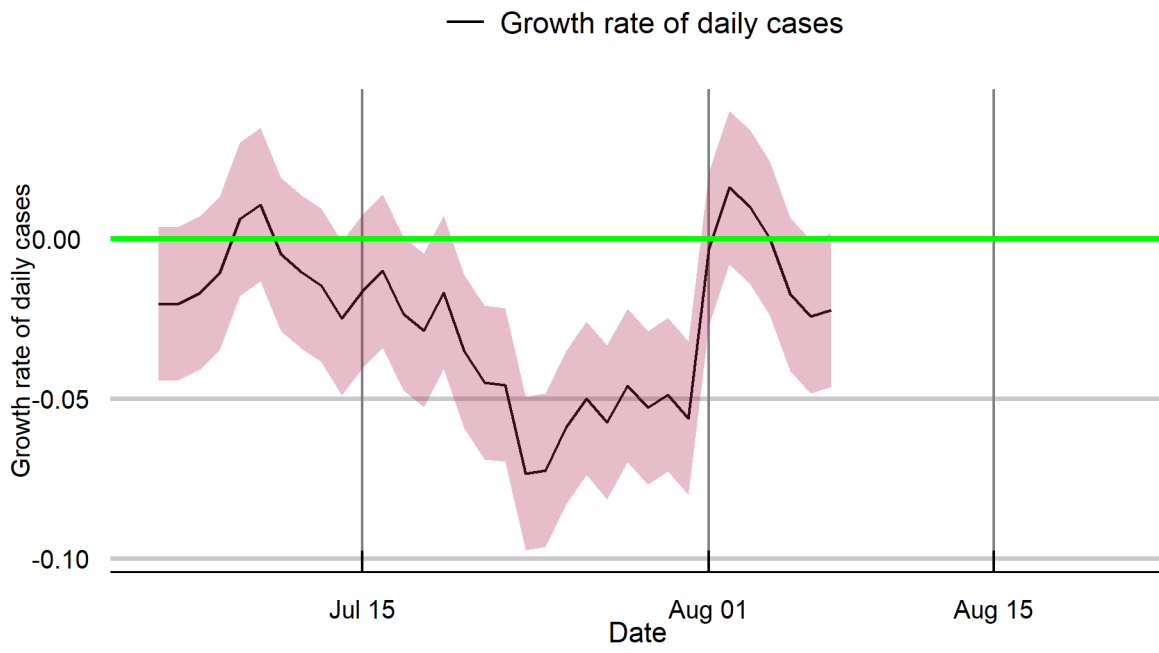
Chandigarh



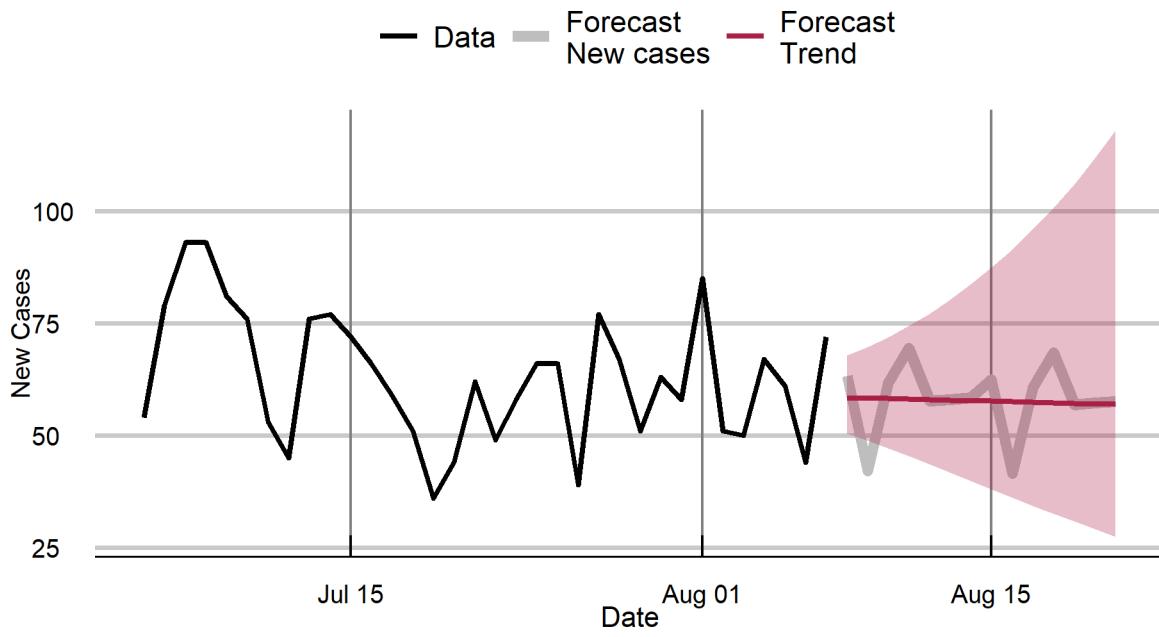
Chhattisgarh



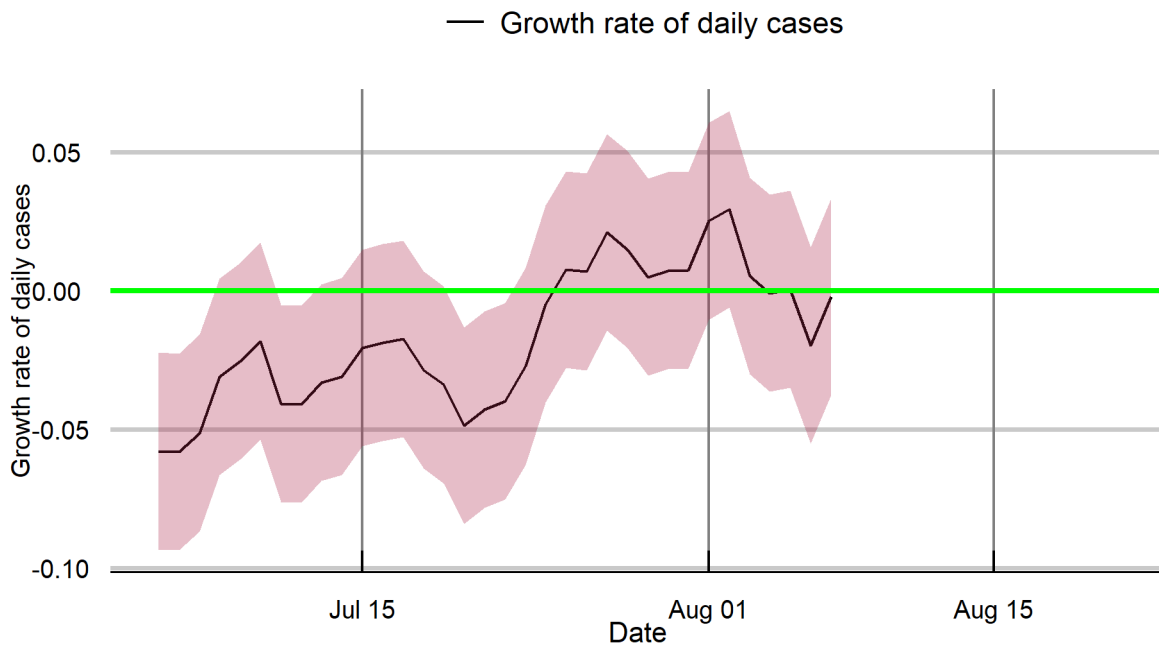
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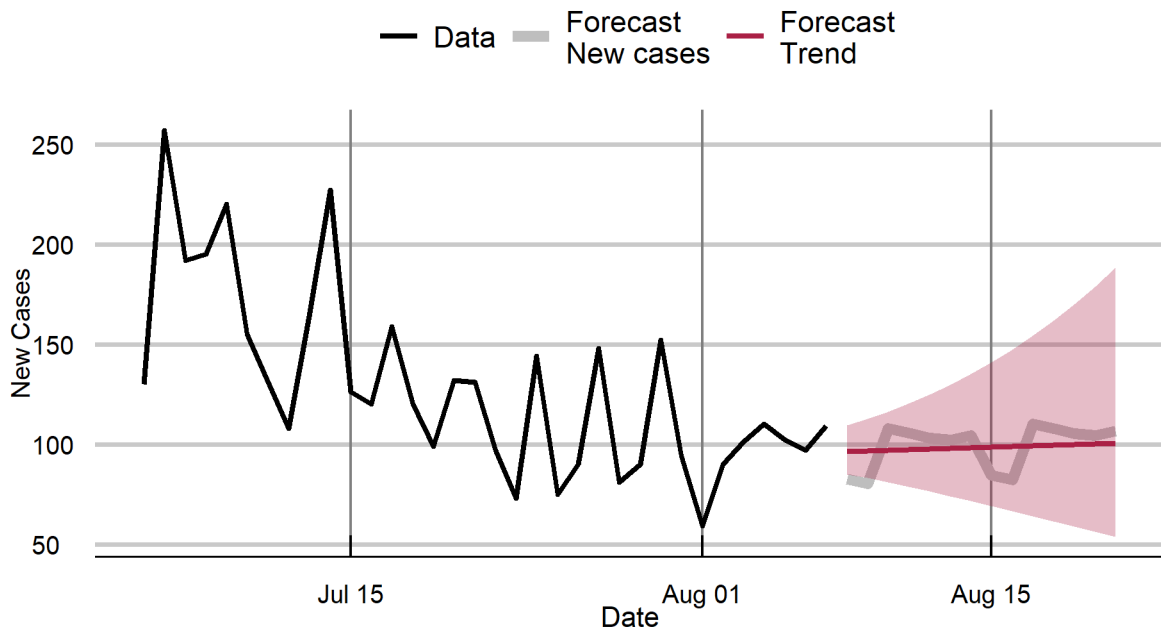
Delhi



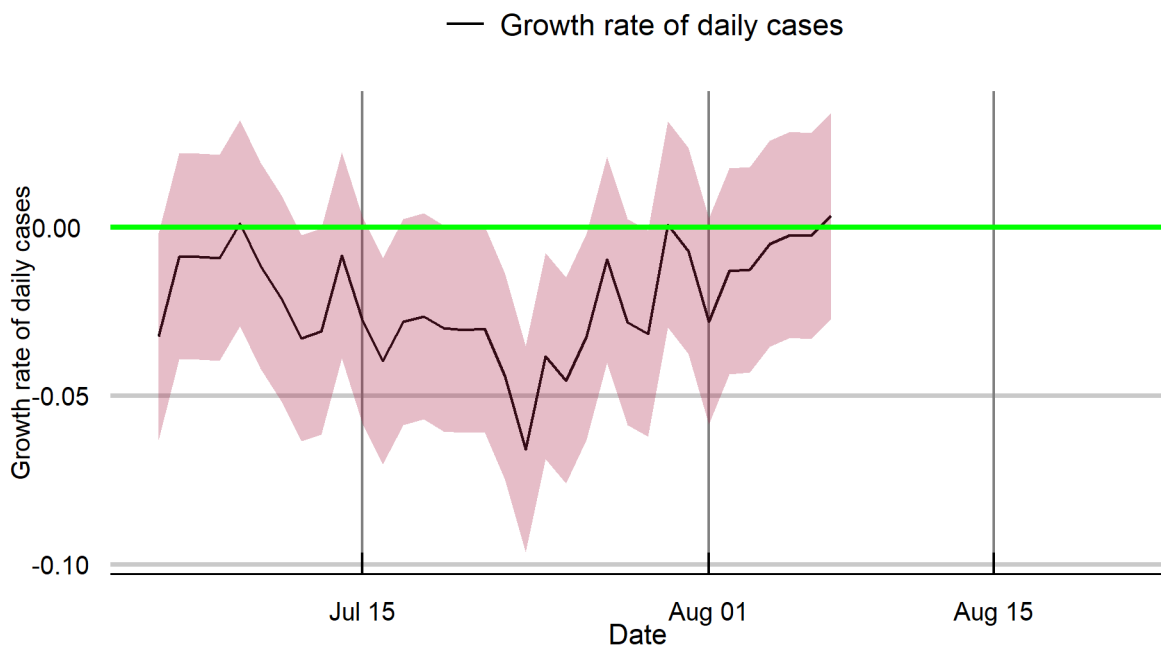
Delhi



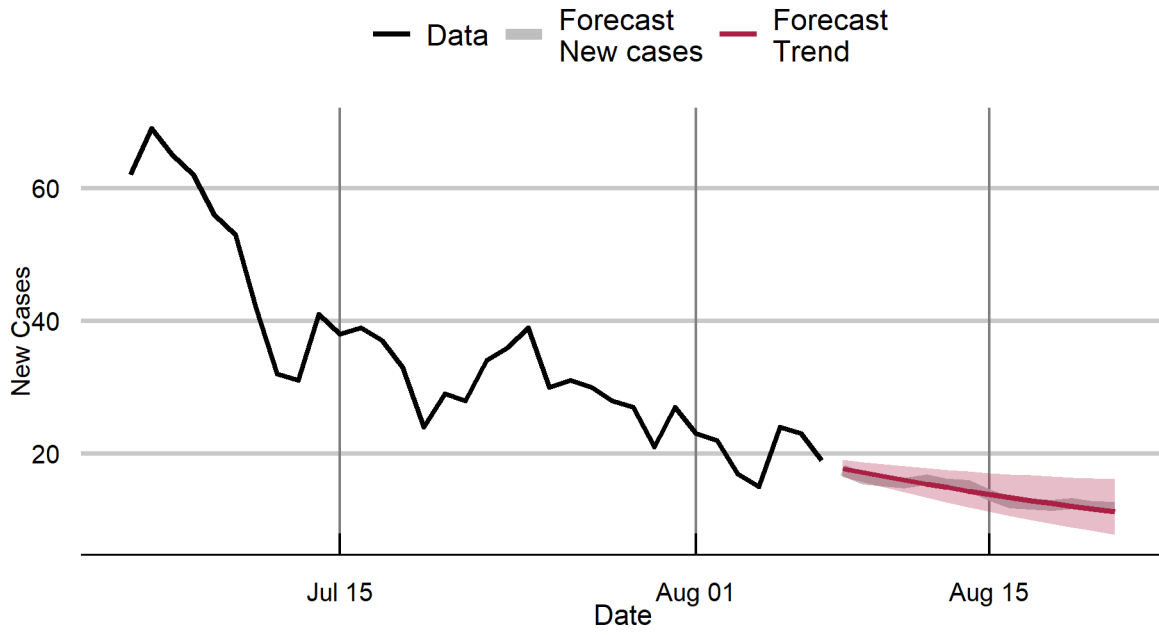
Goa



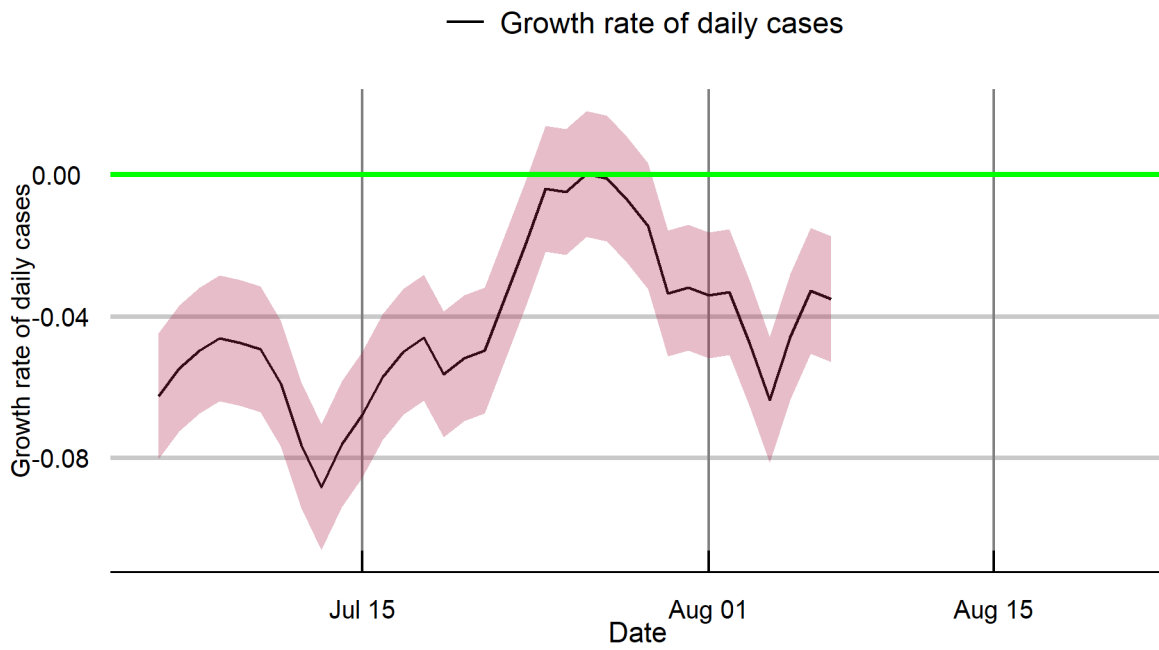
Goa



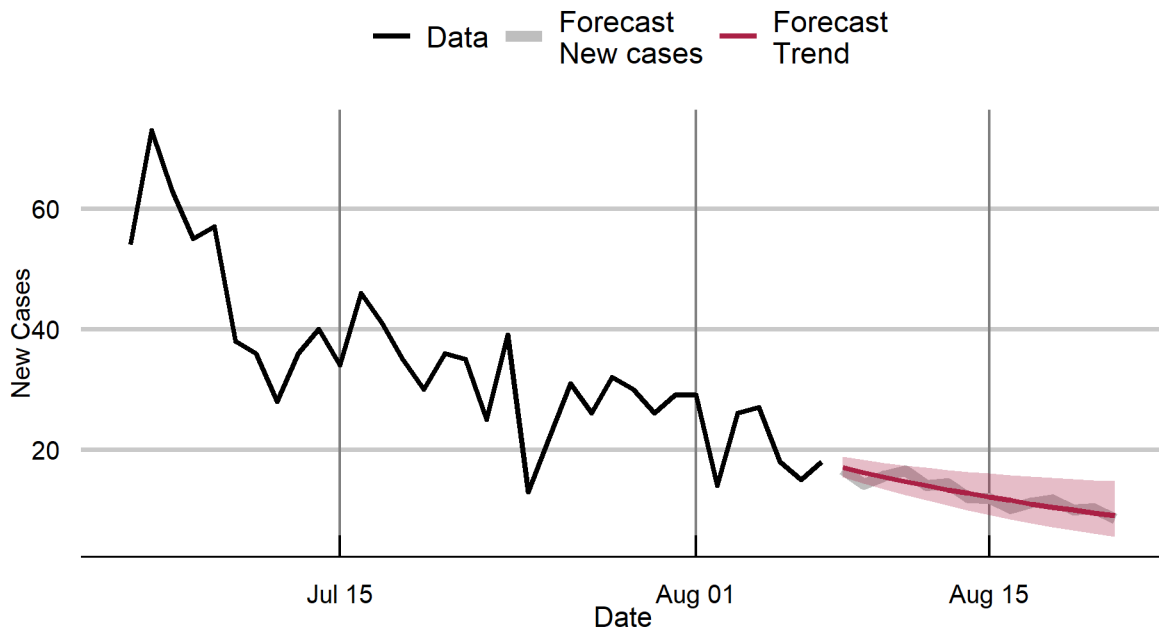
Gujarat



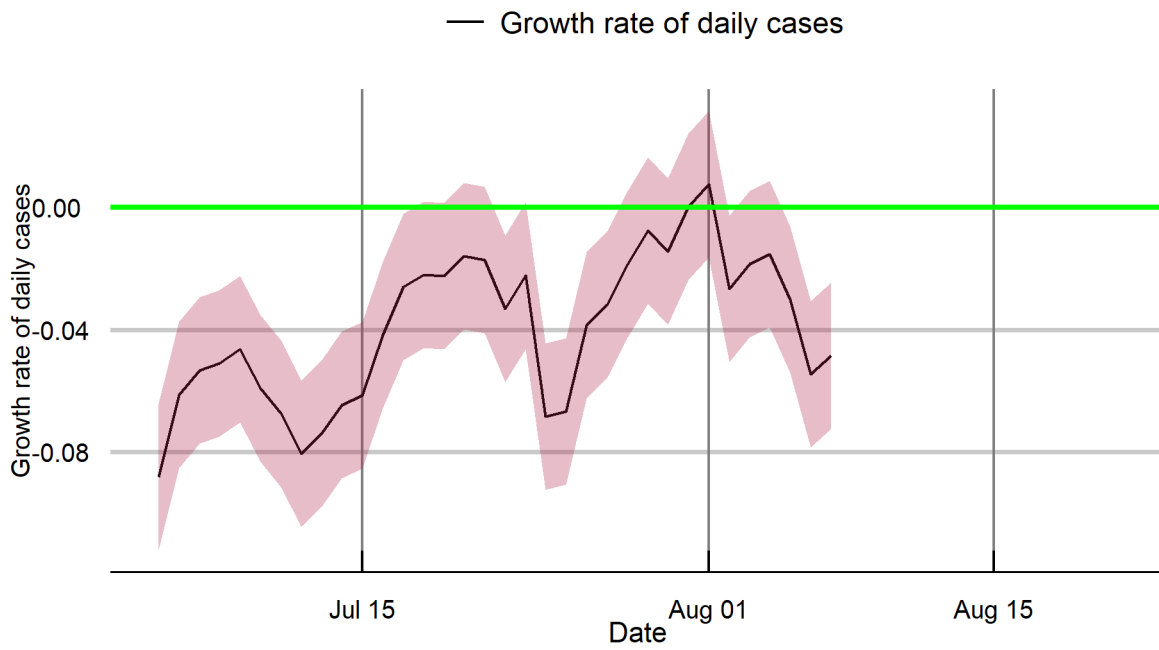
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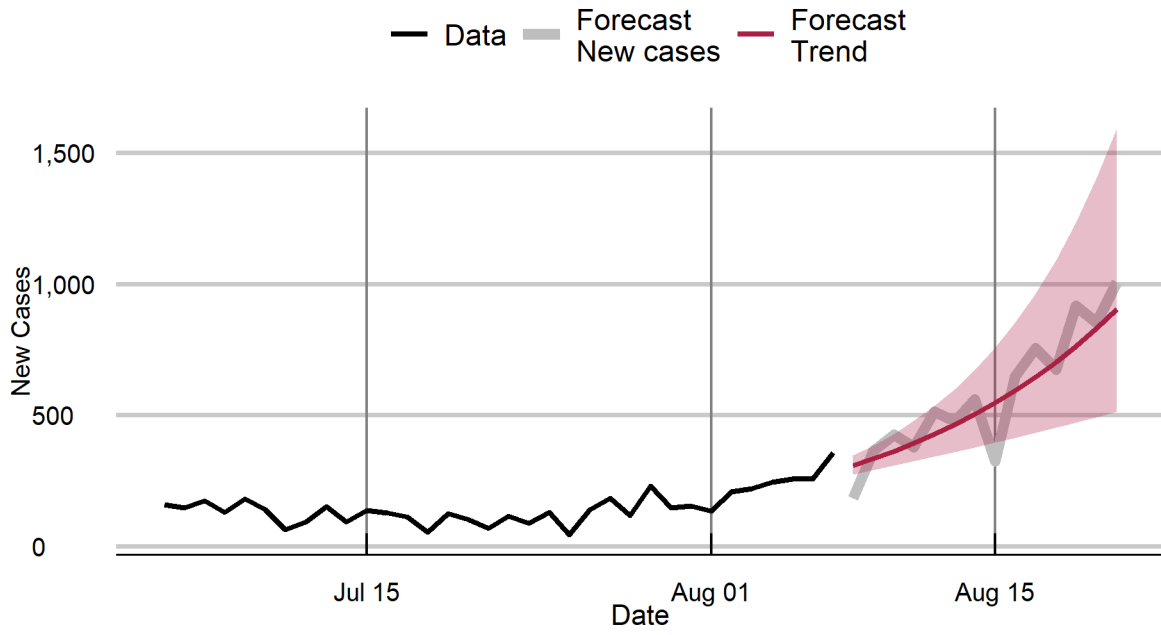
Haryana



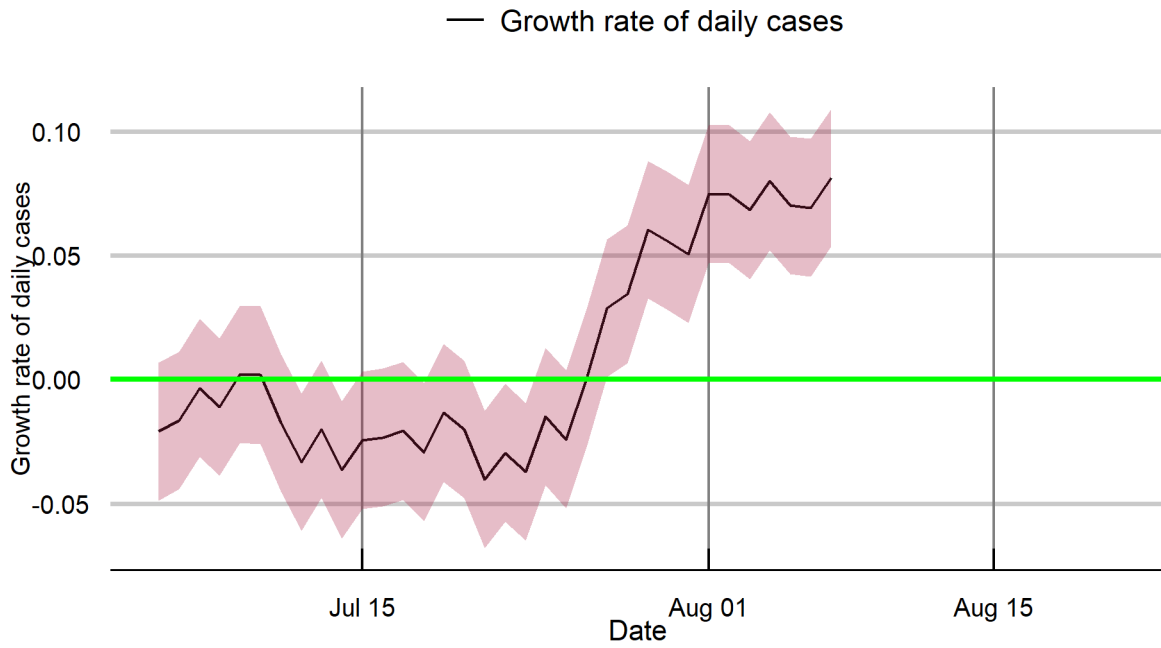
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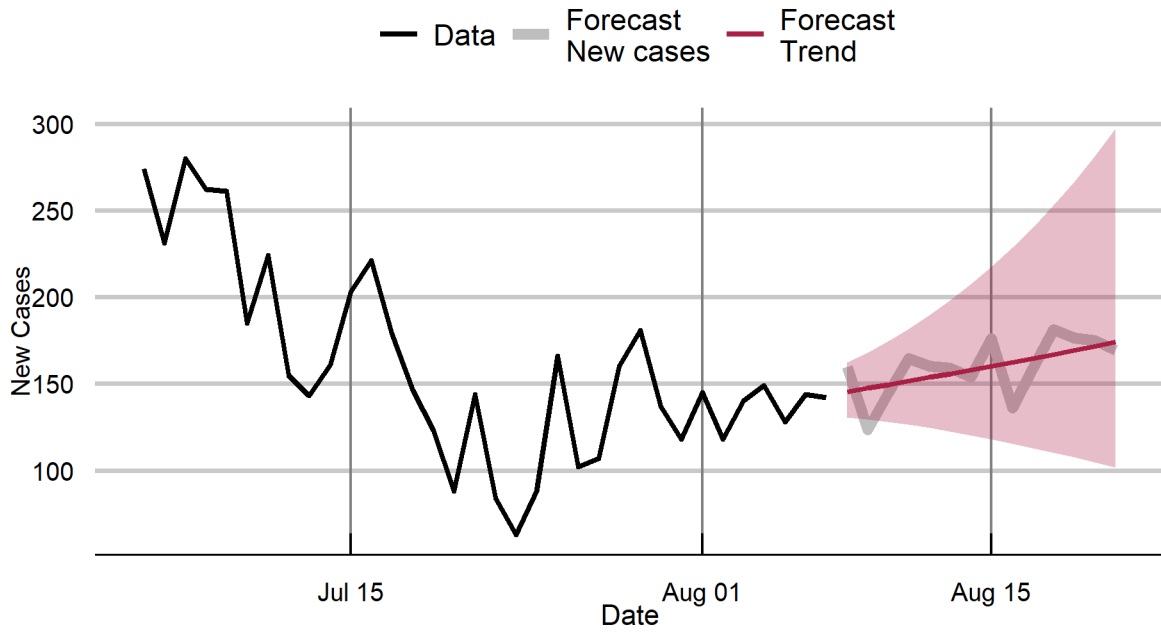
Himachal Pradesh



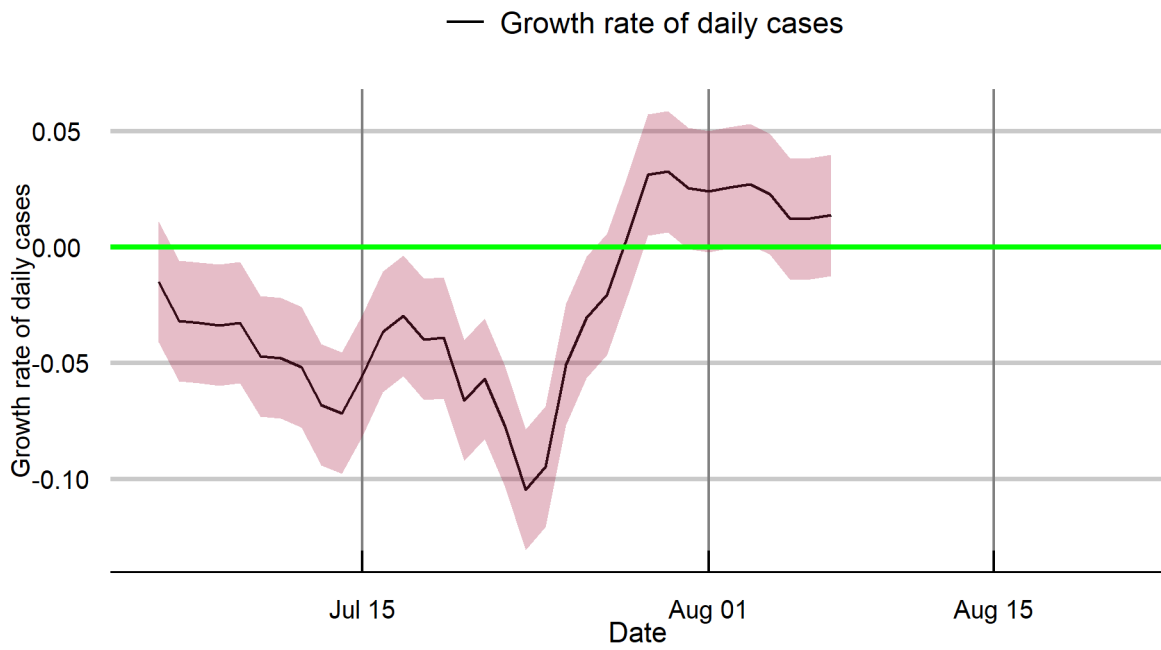
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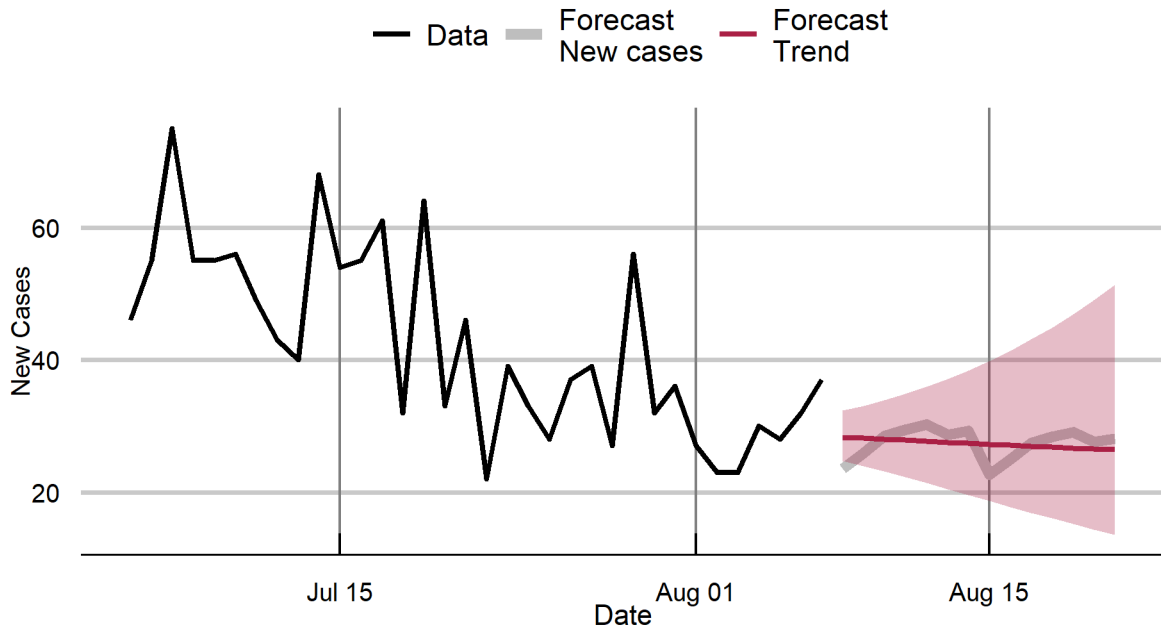
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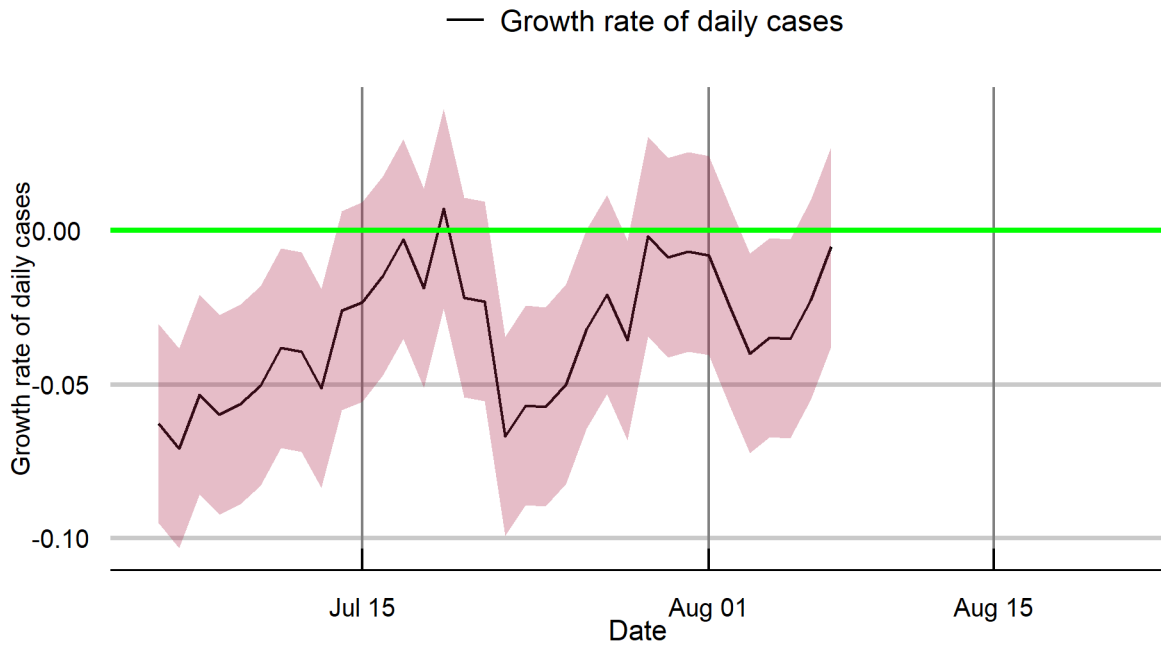
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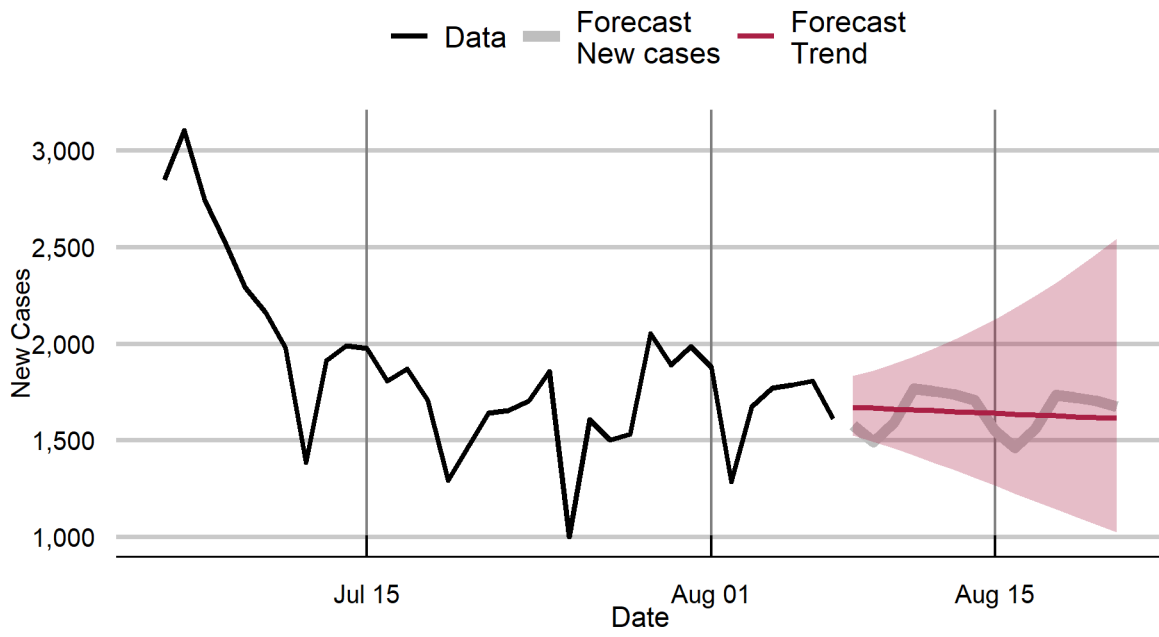
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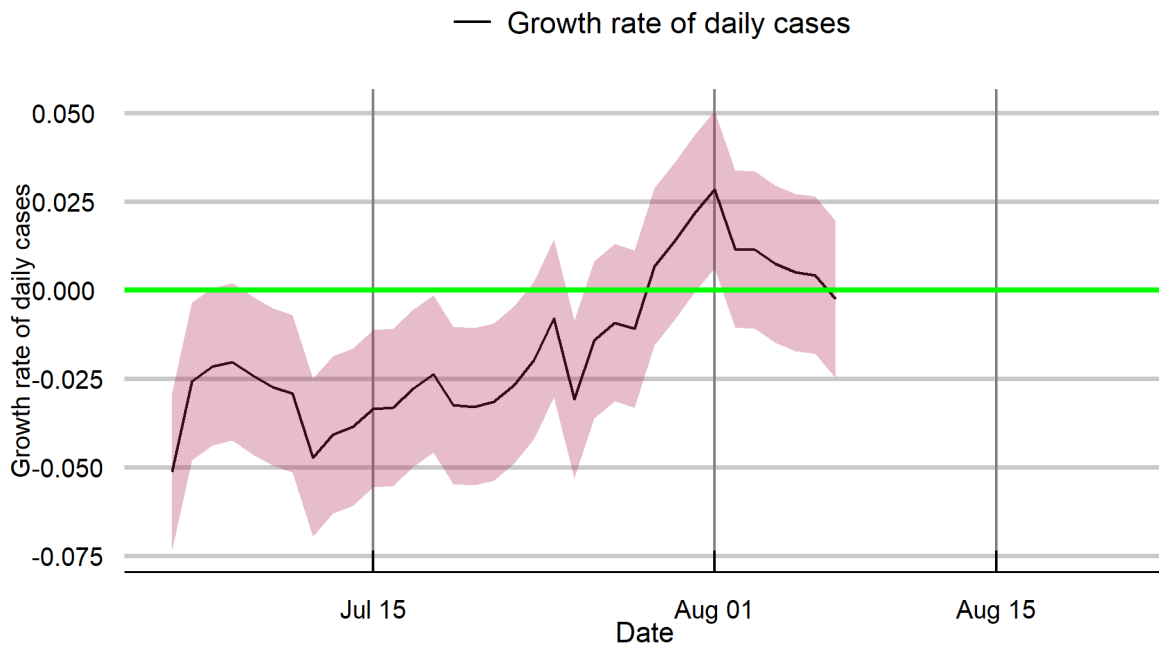
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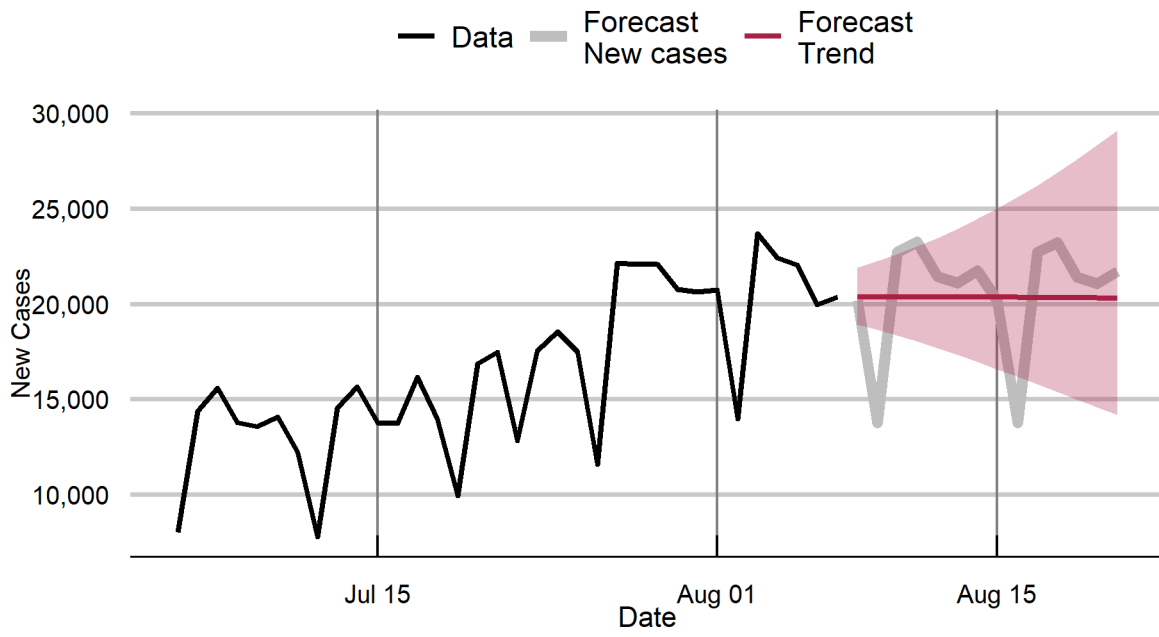
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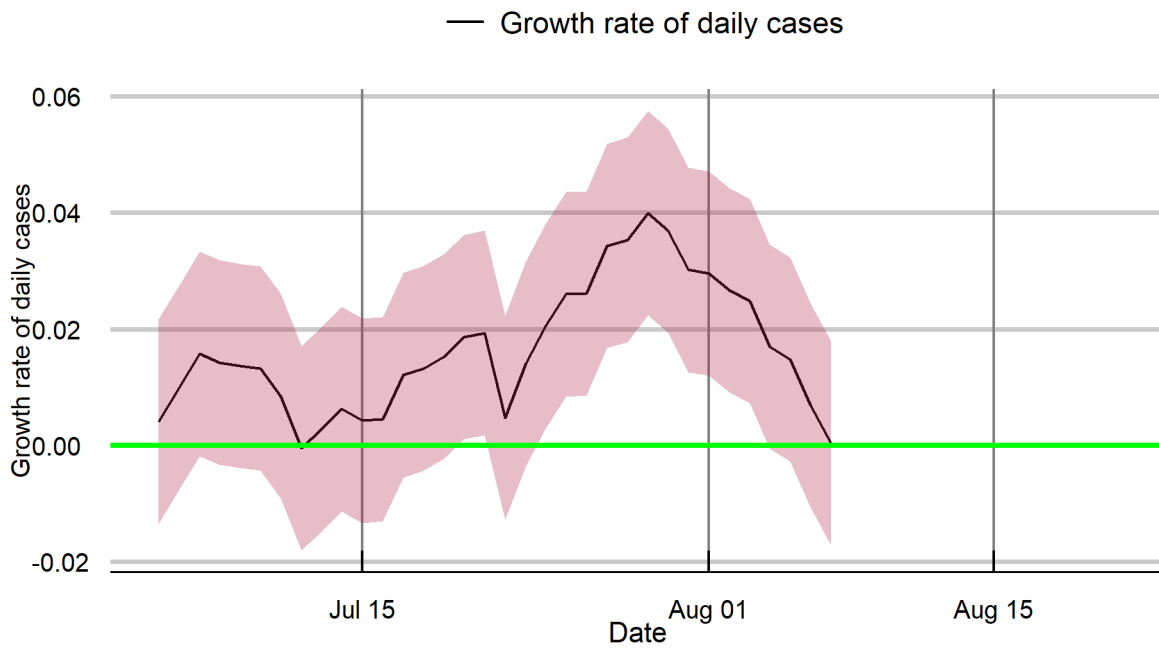
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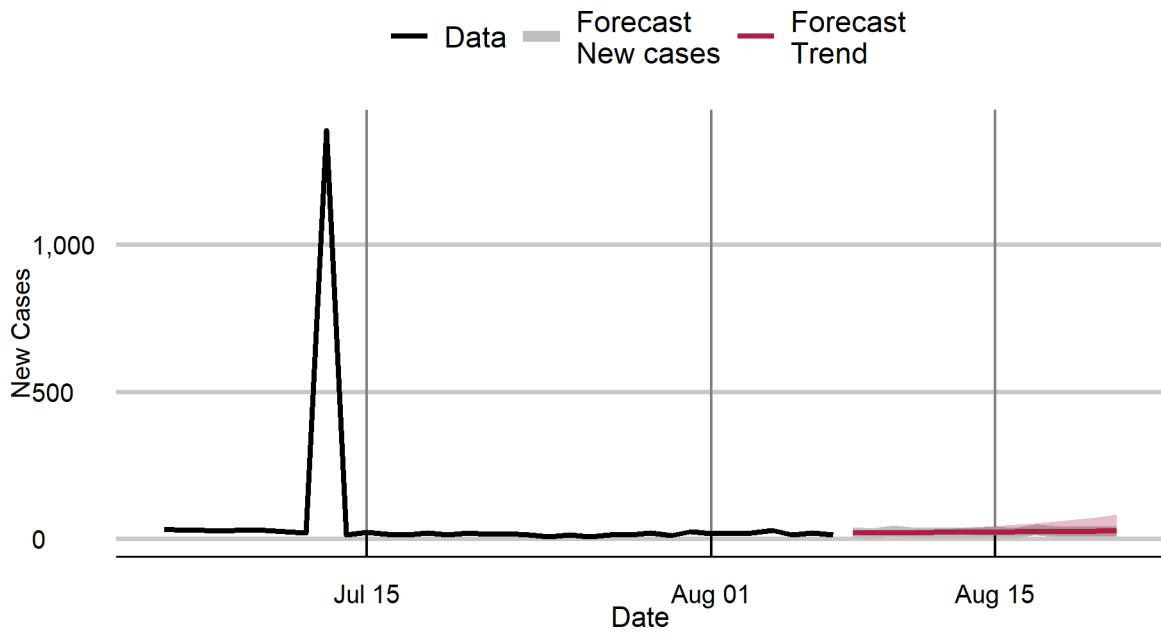
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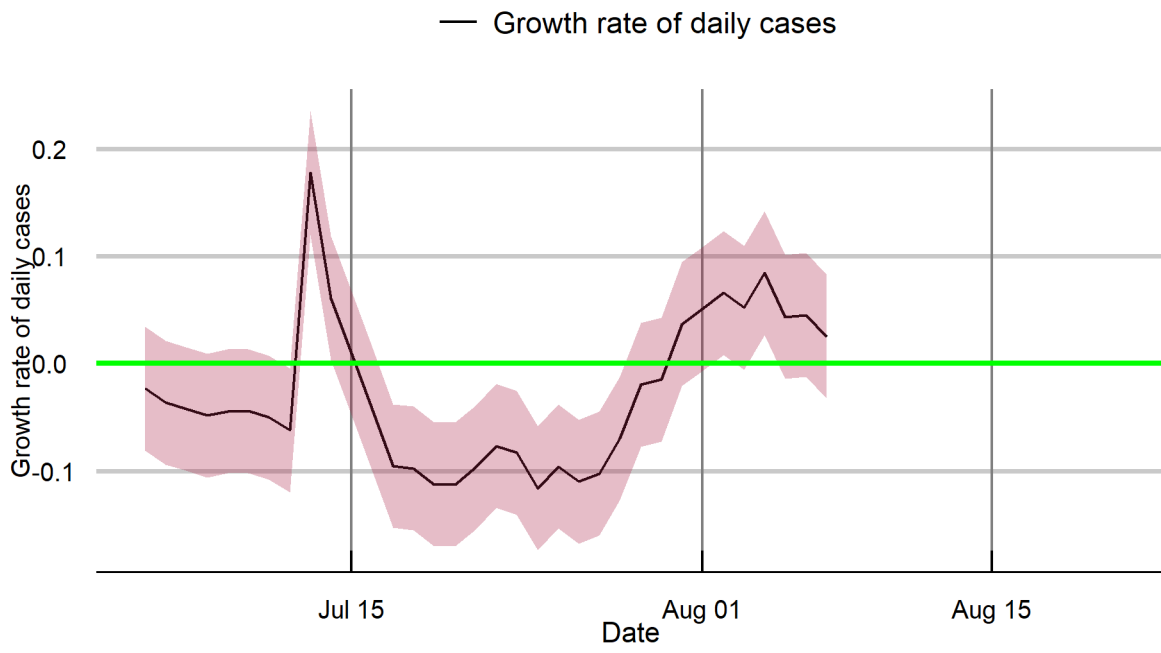
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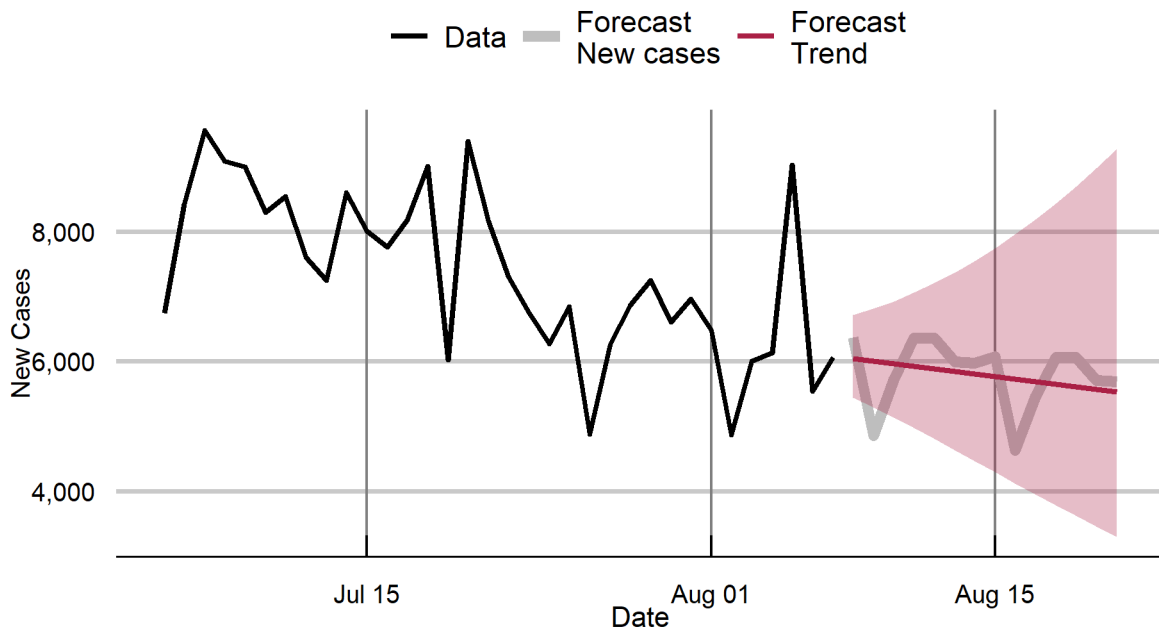
Madhya Pradesh



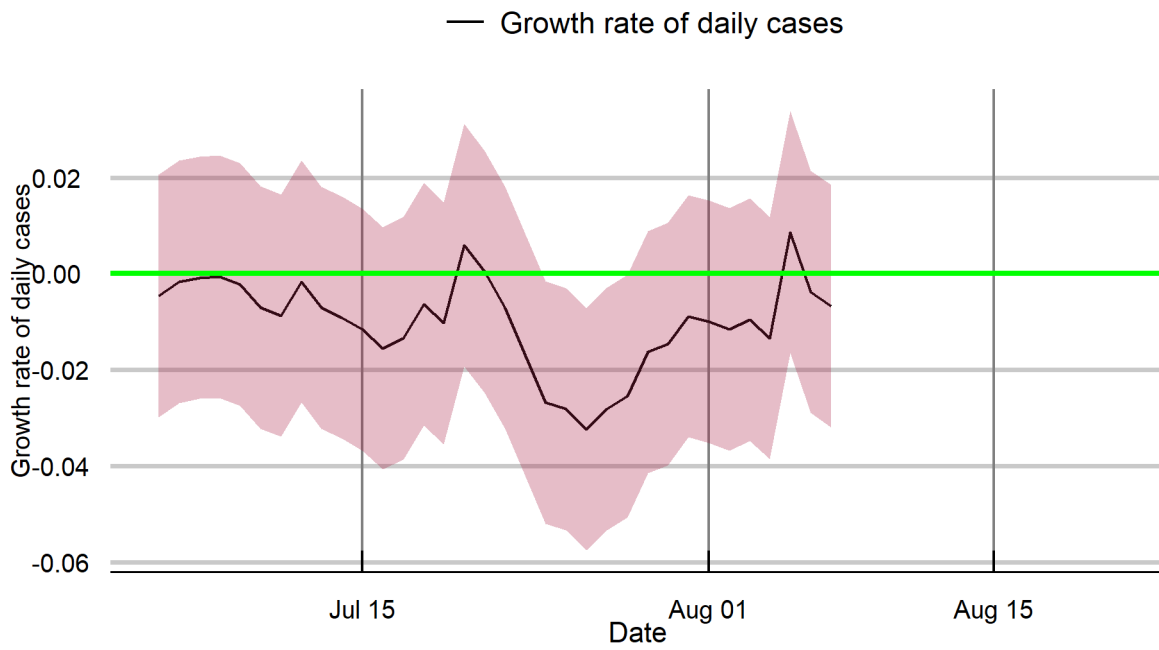
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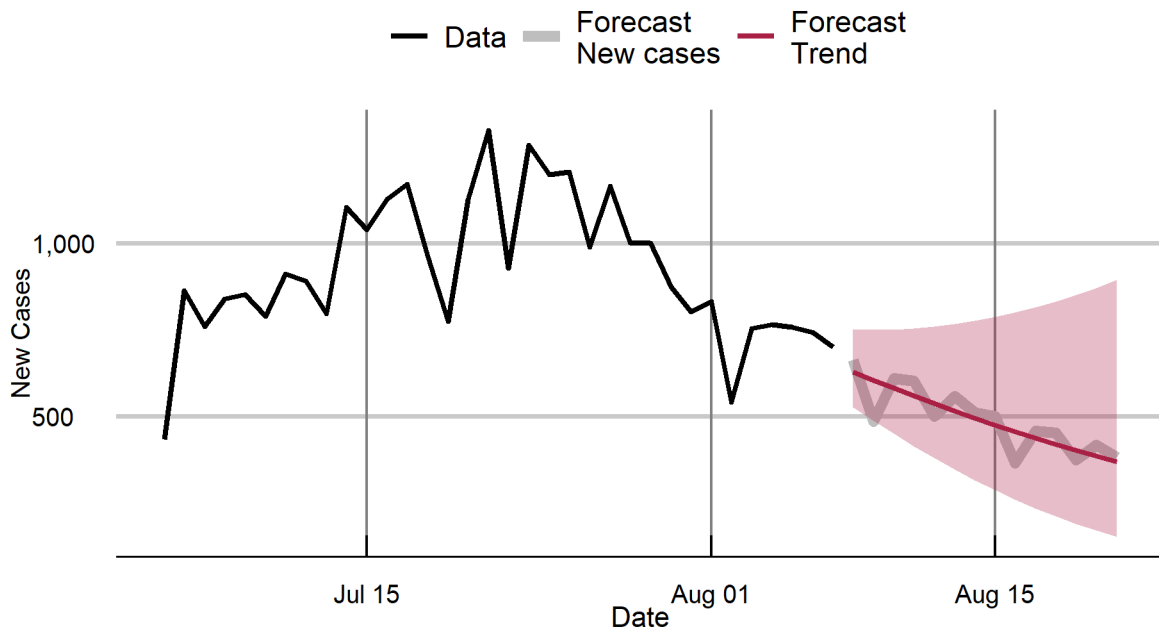
Maharashtra



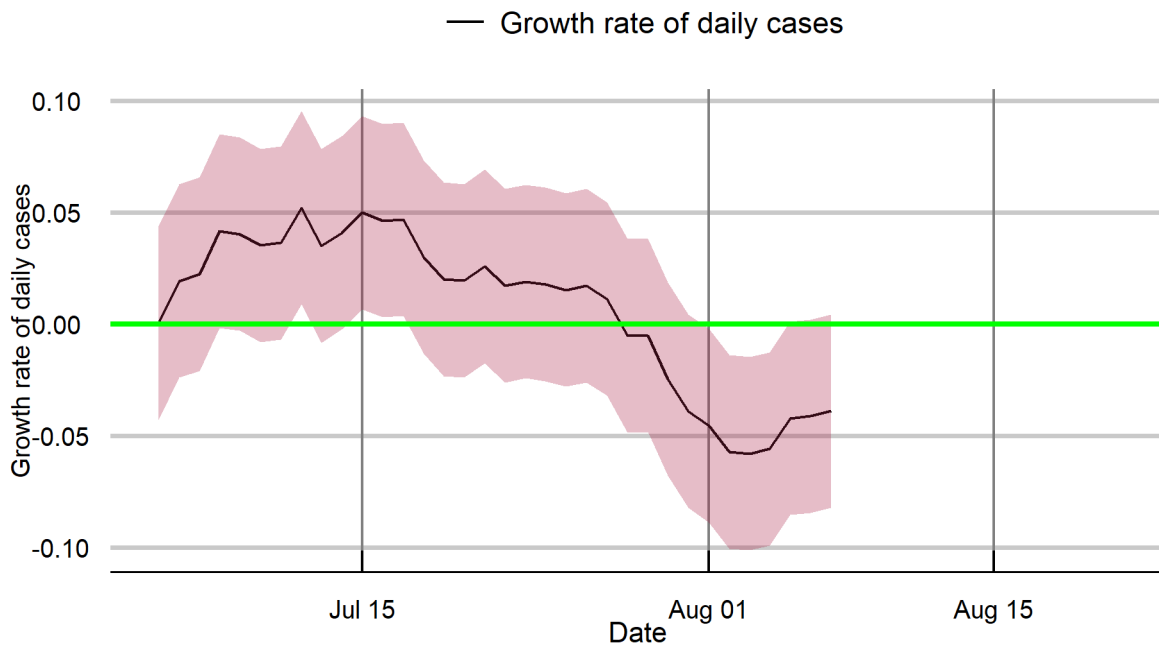
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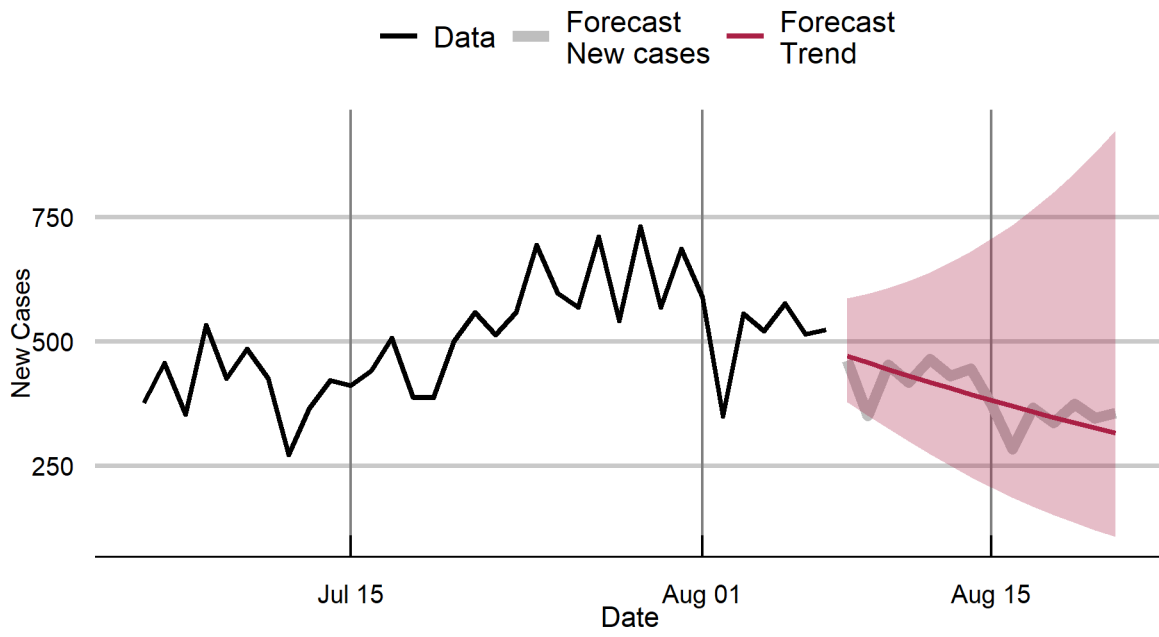
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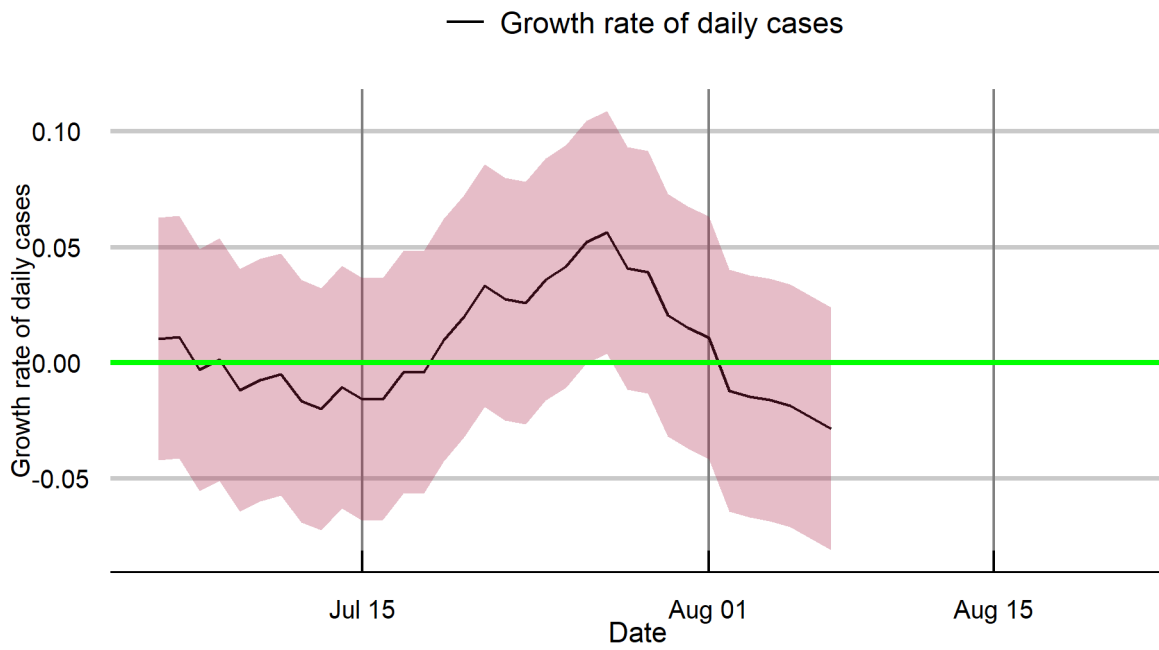
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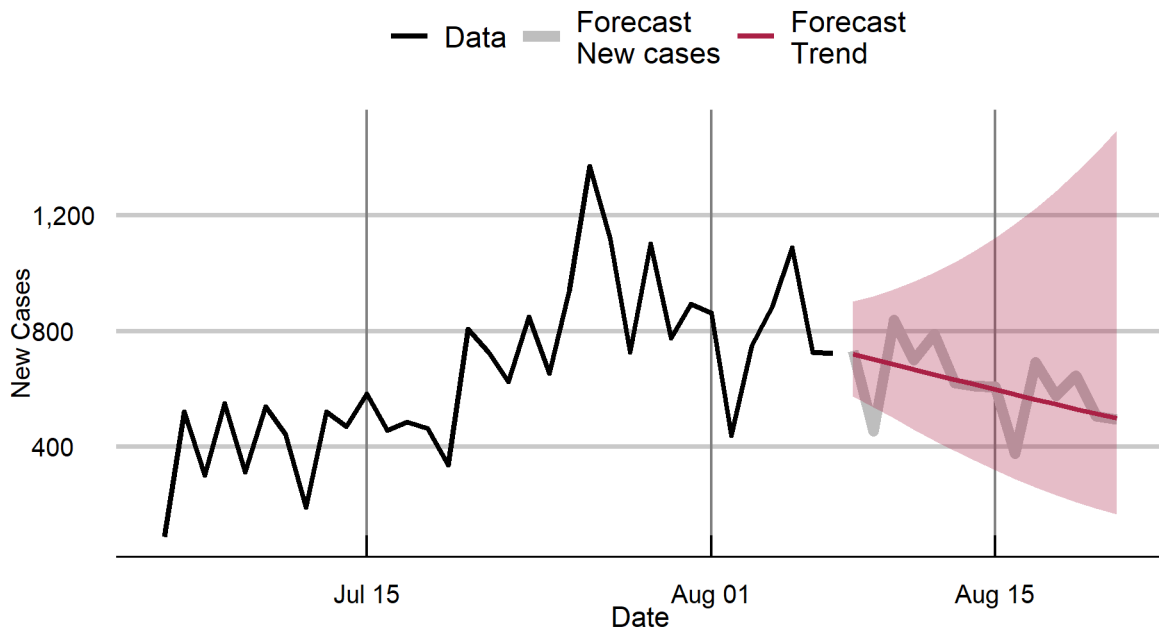
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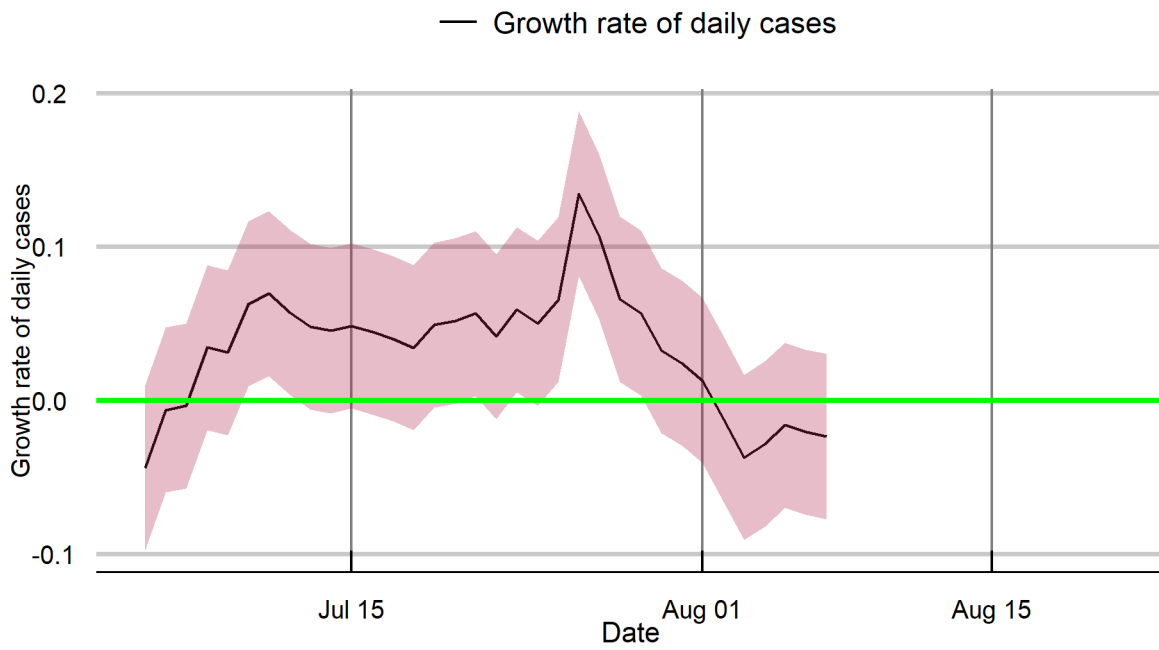
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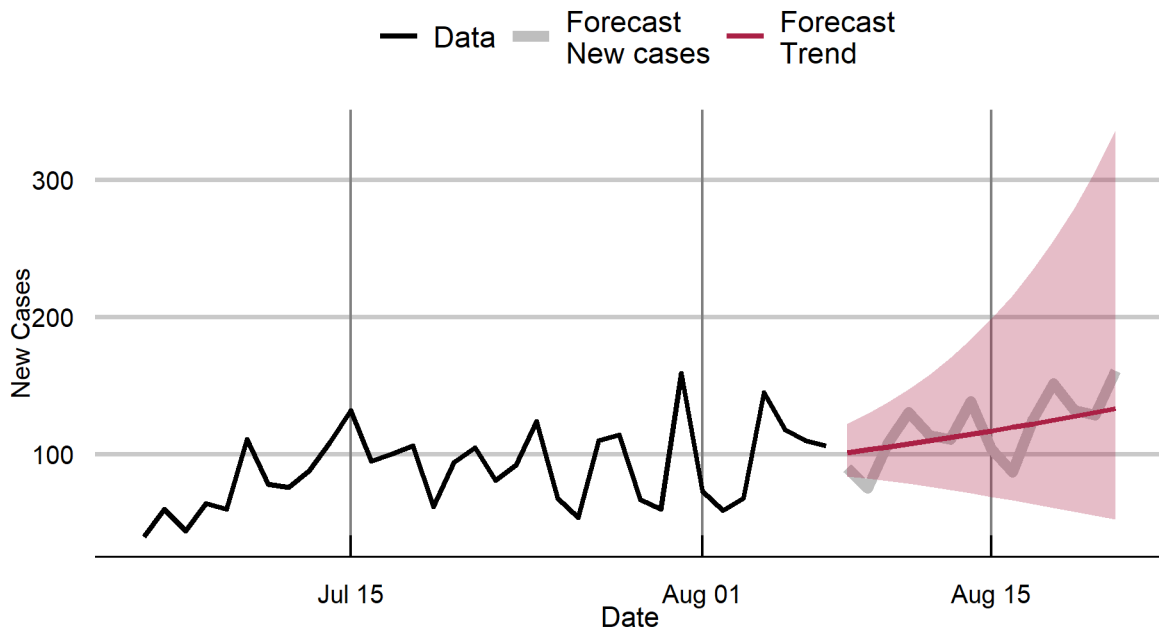
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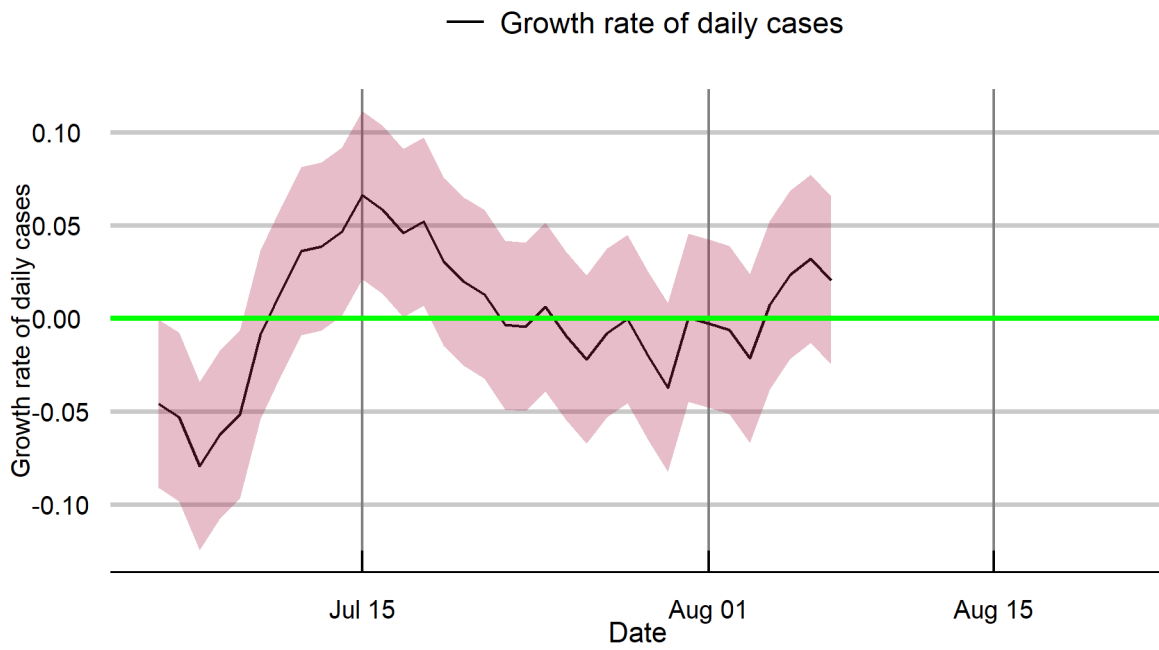
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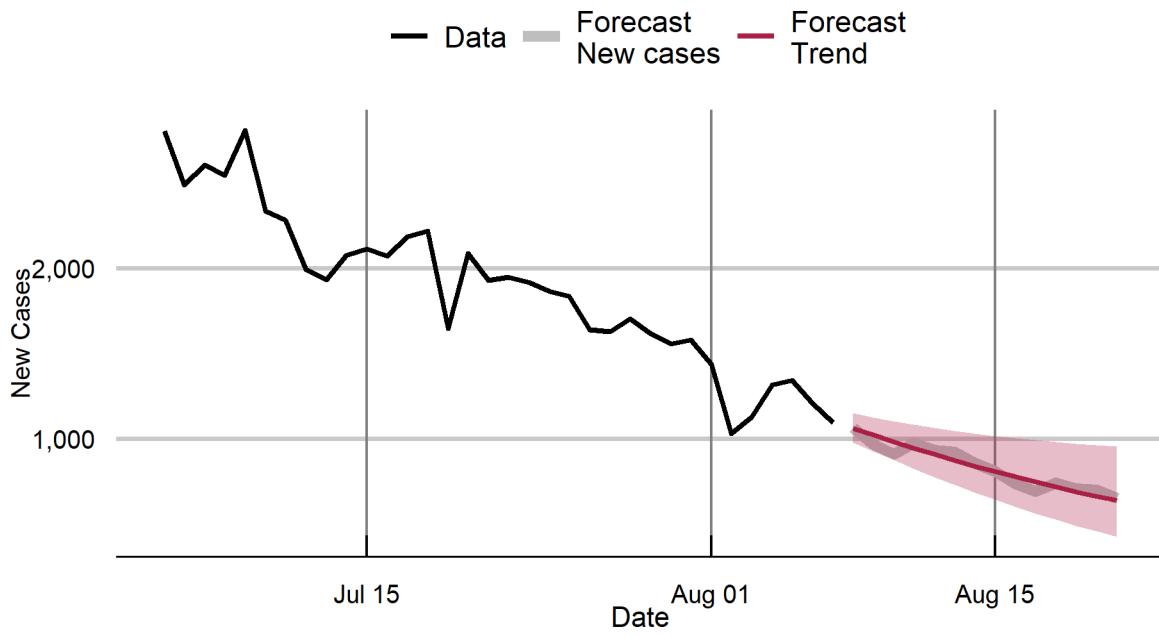
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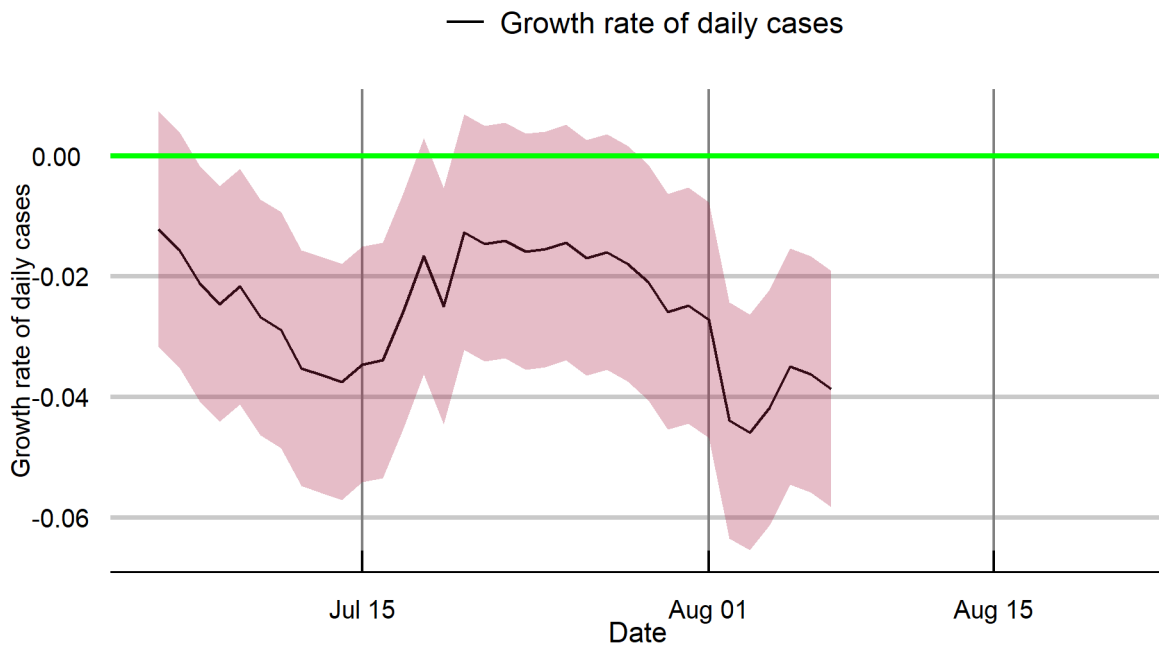
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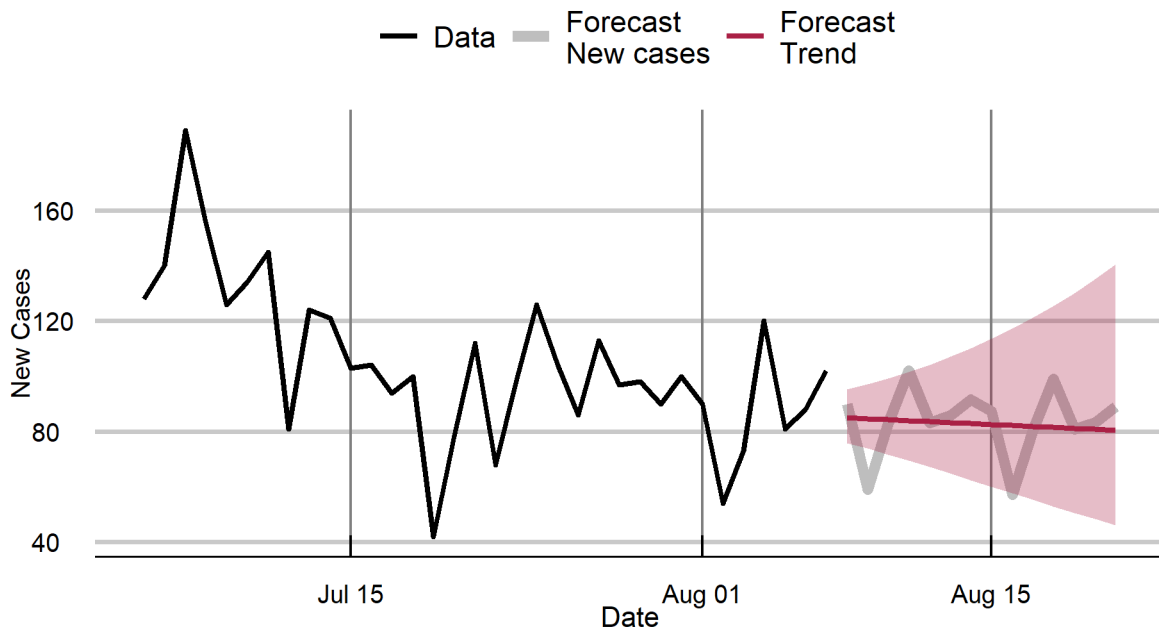
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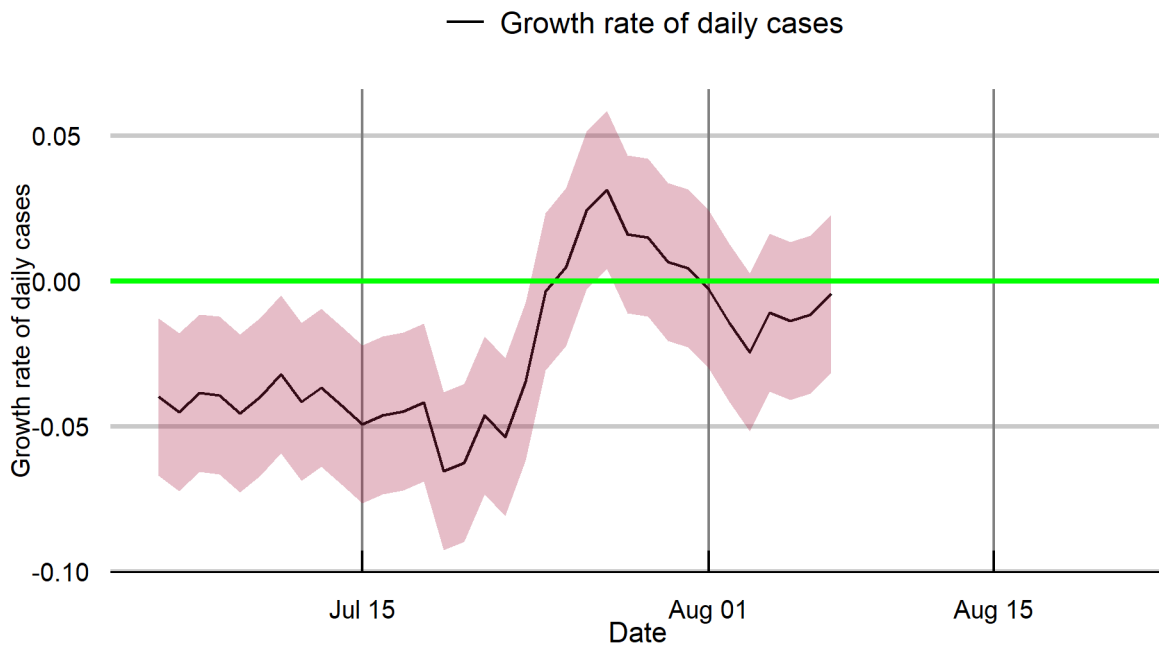
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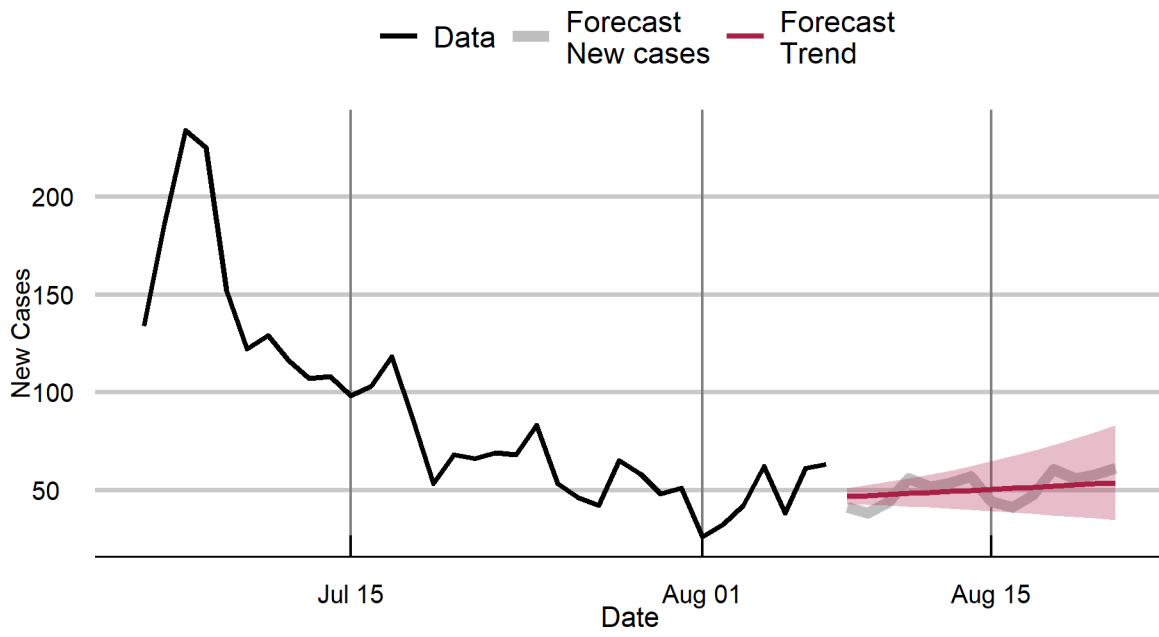
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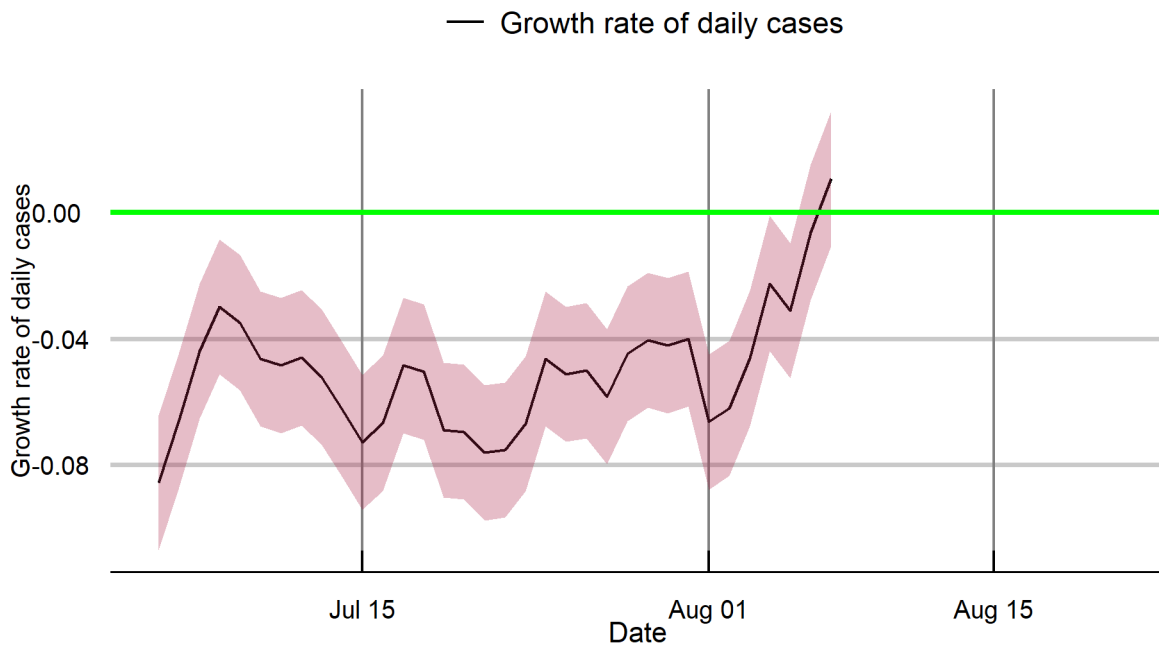
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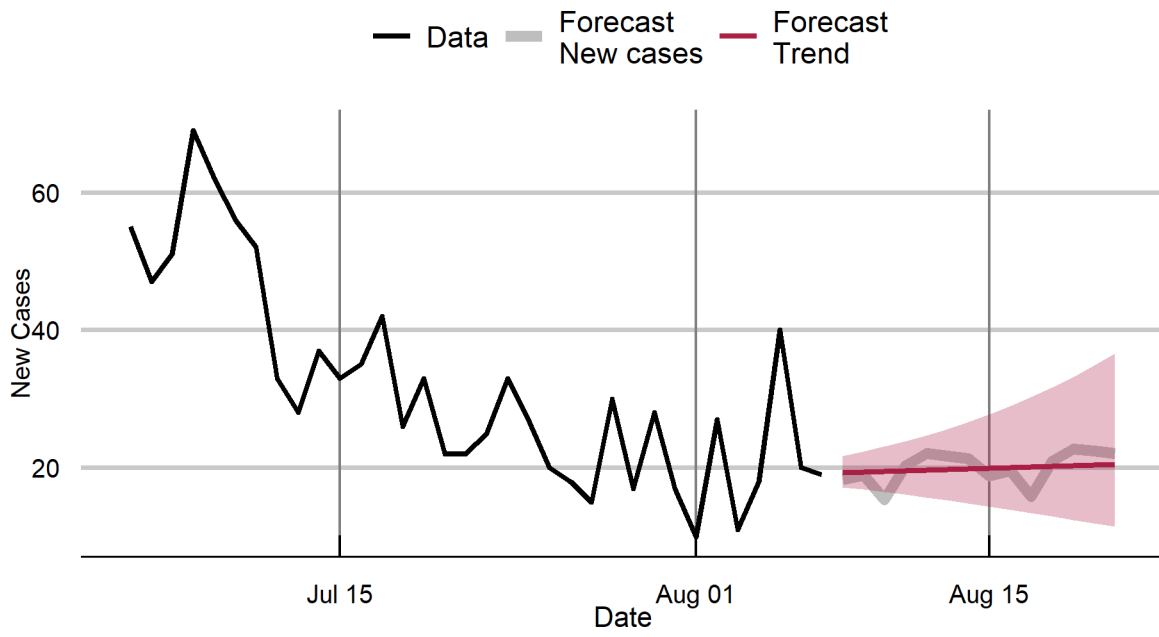
Punjab



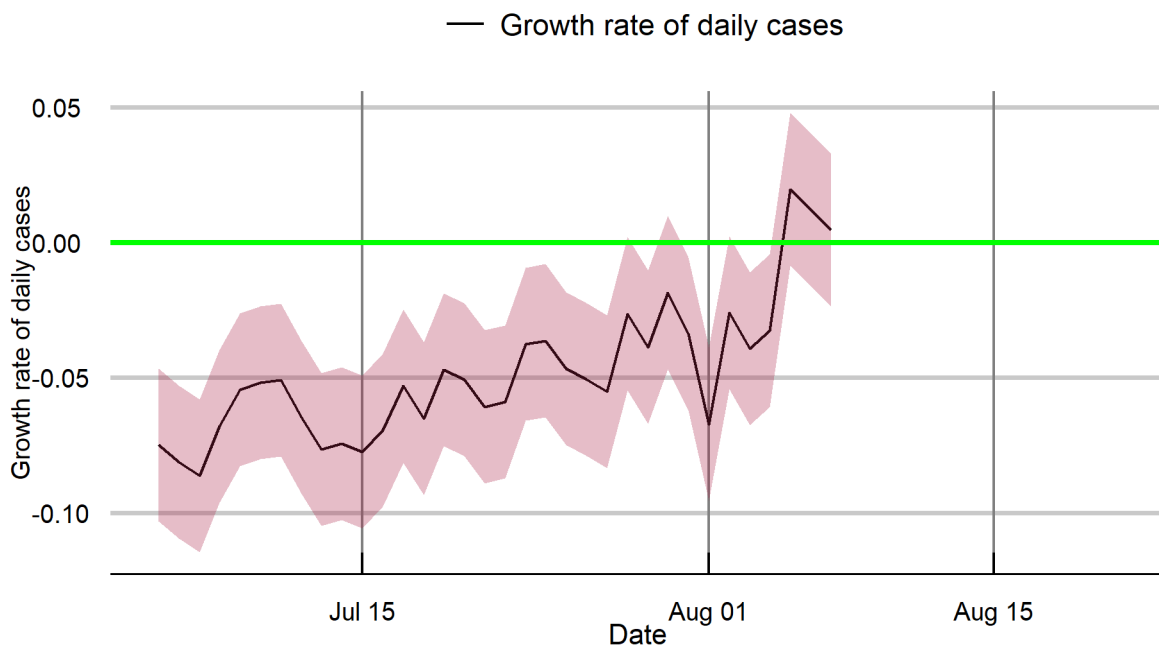
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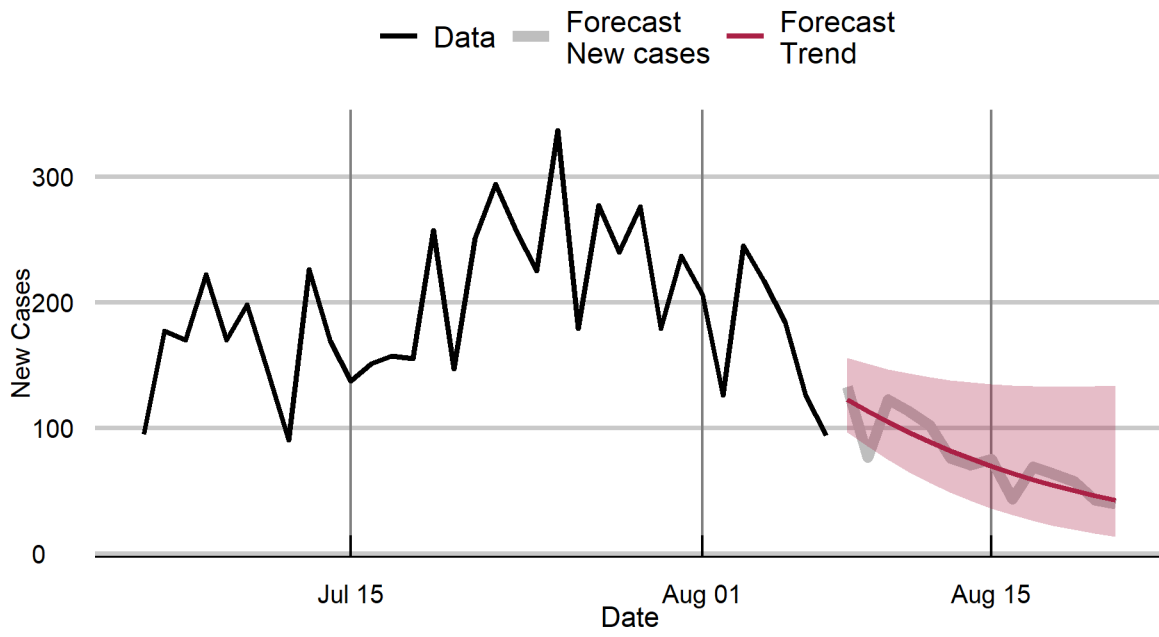
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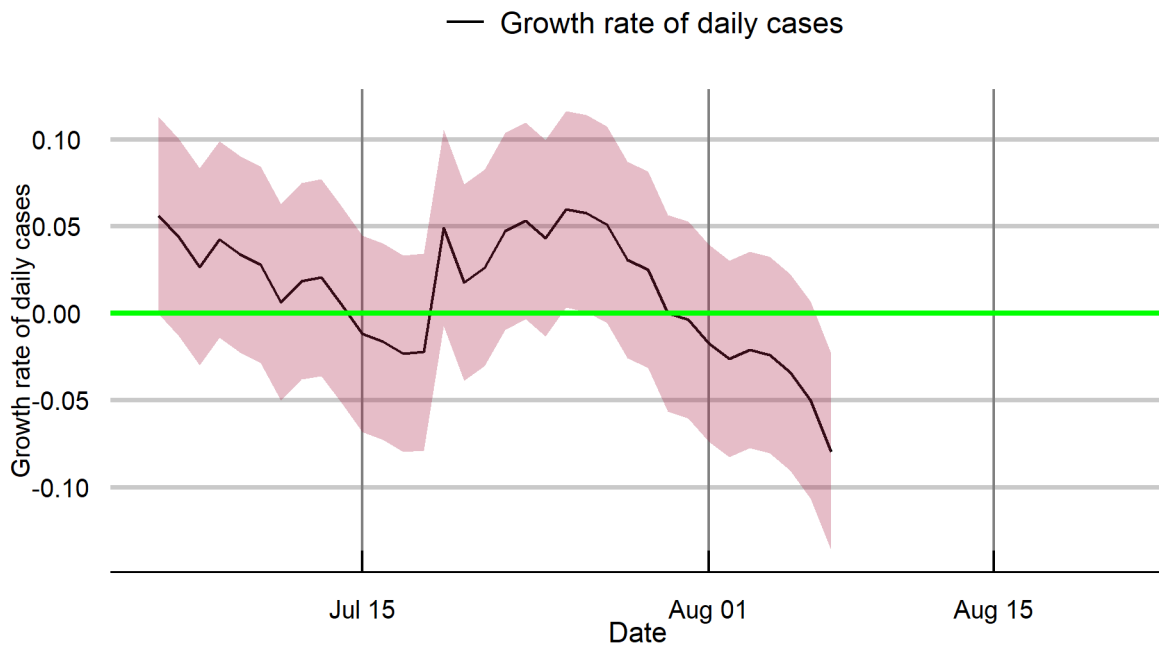
Rajasthan



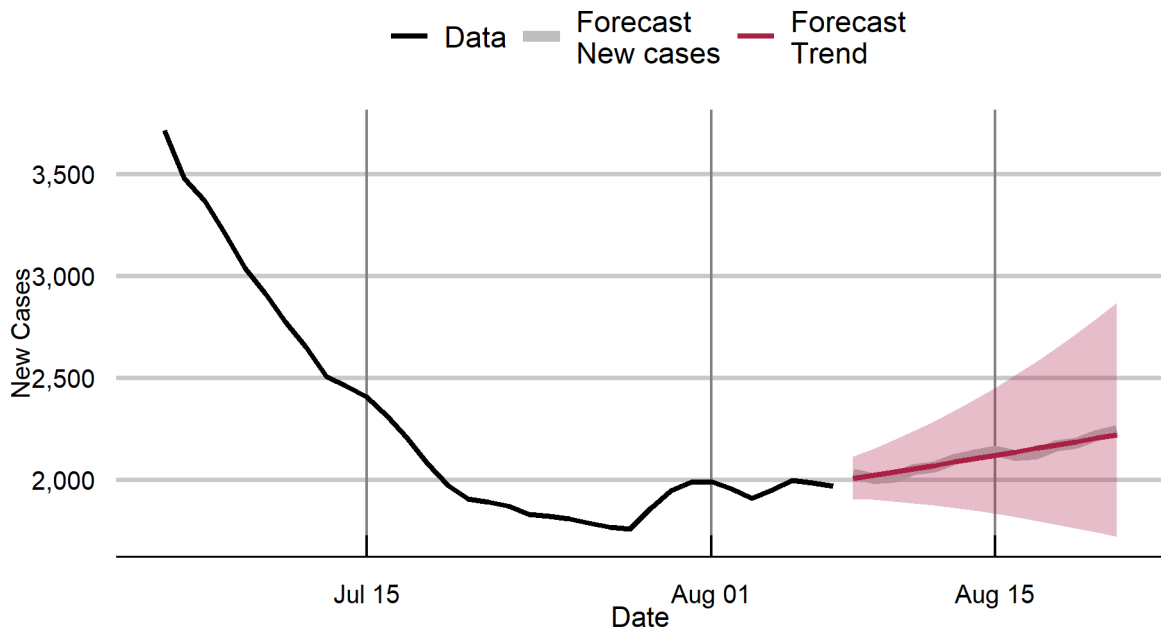
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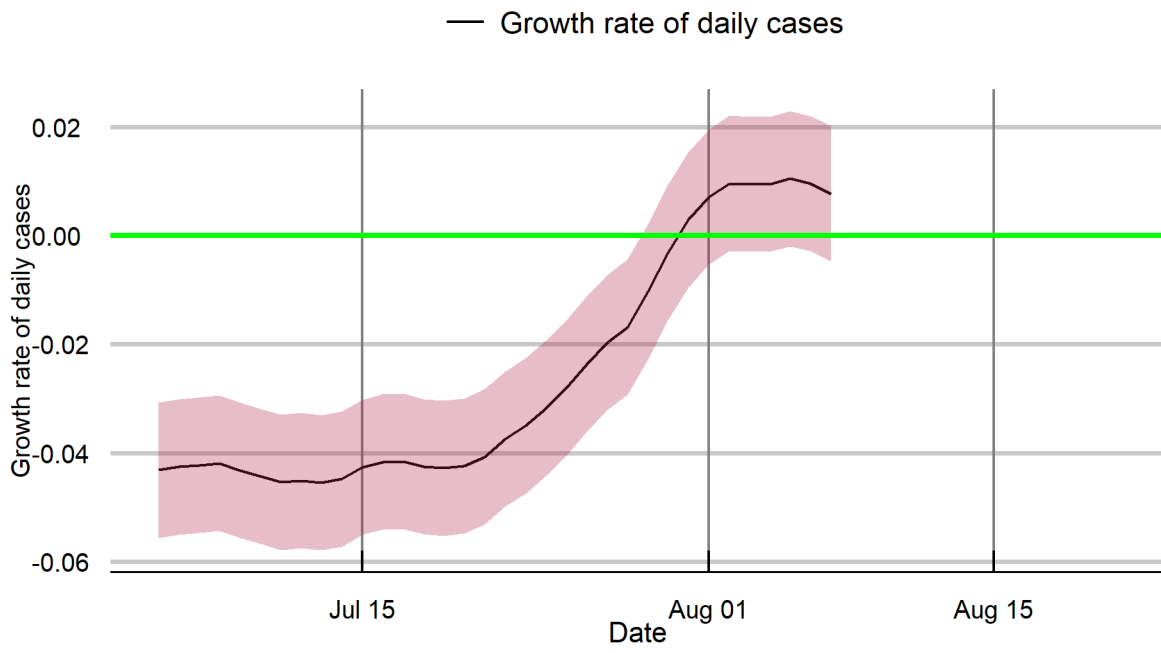
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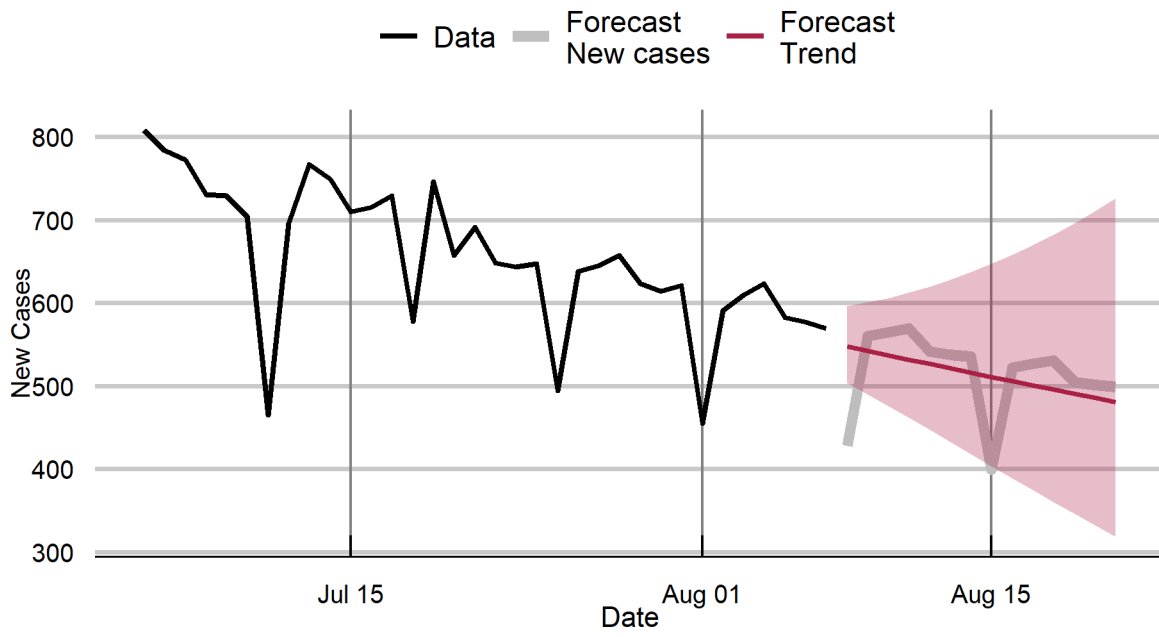
Tamil Nadu



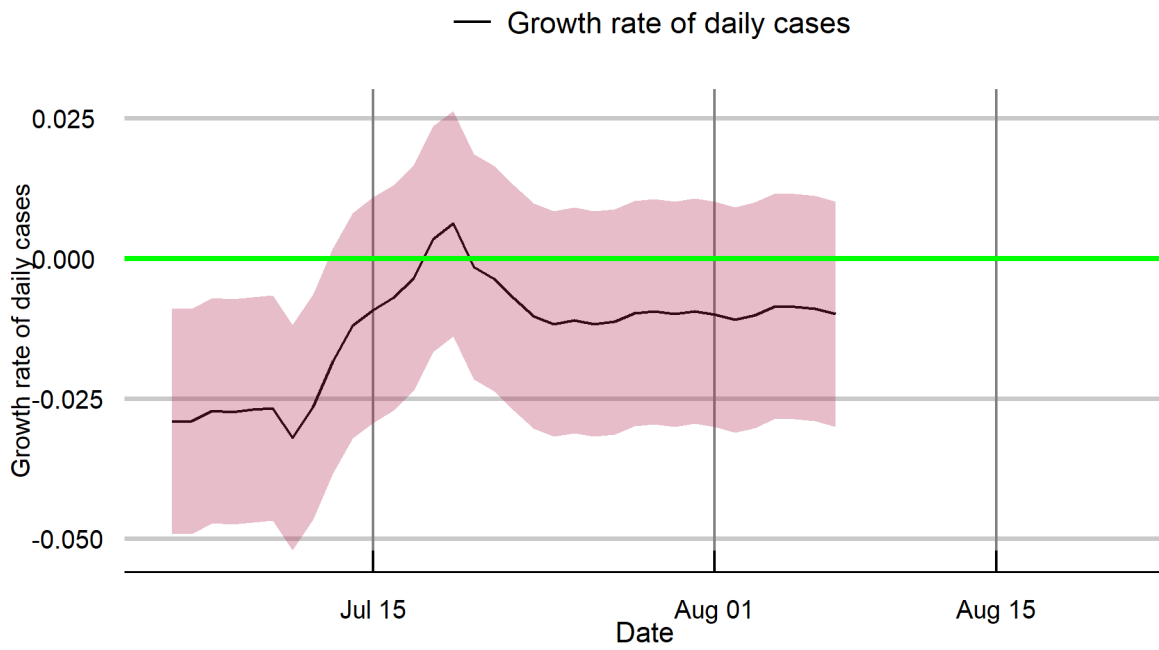
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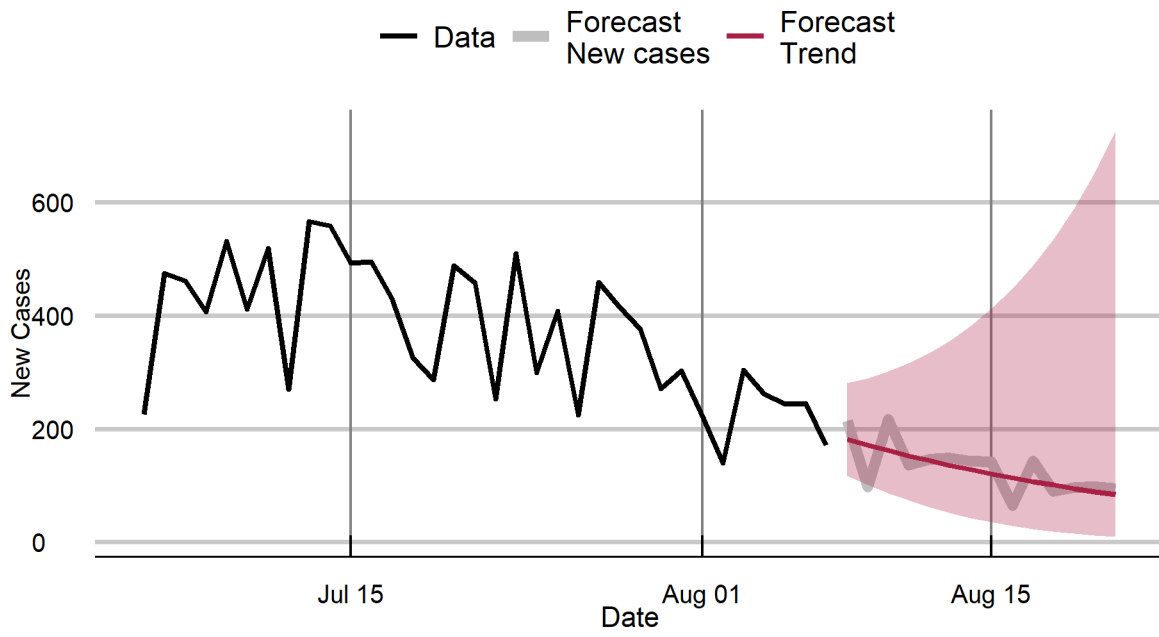
Telangana



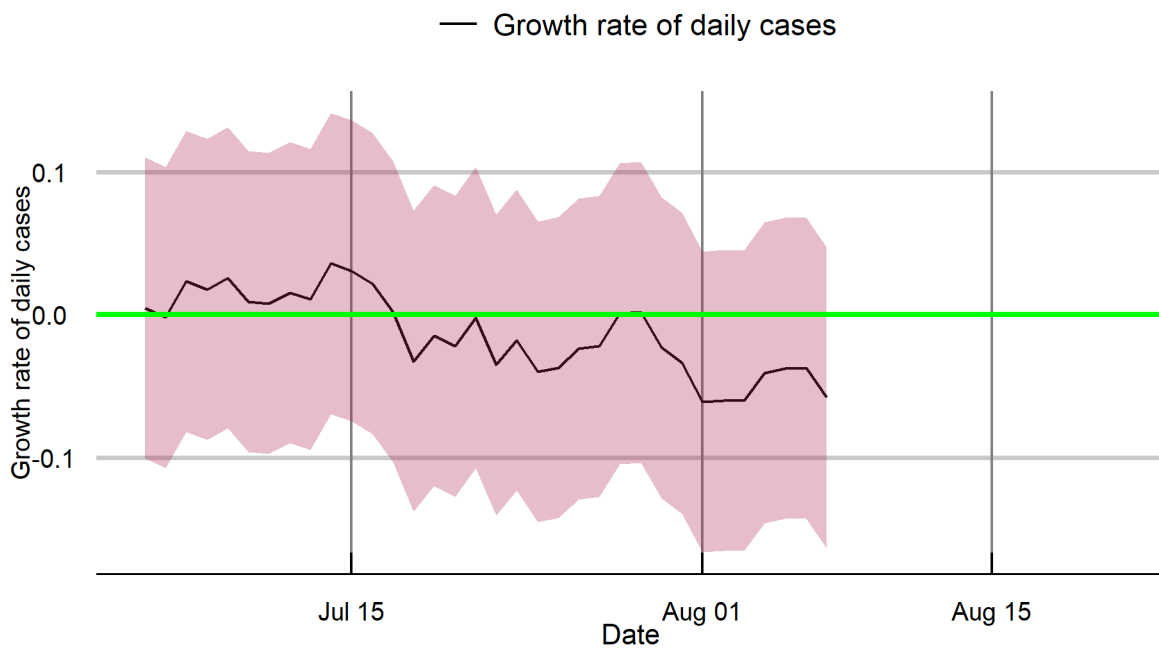
Telangana



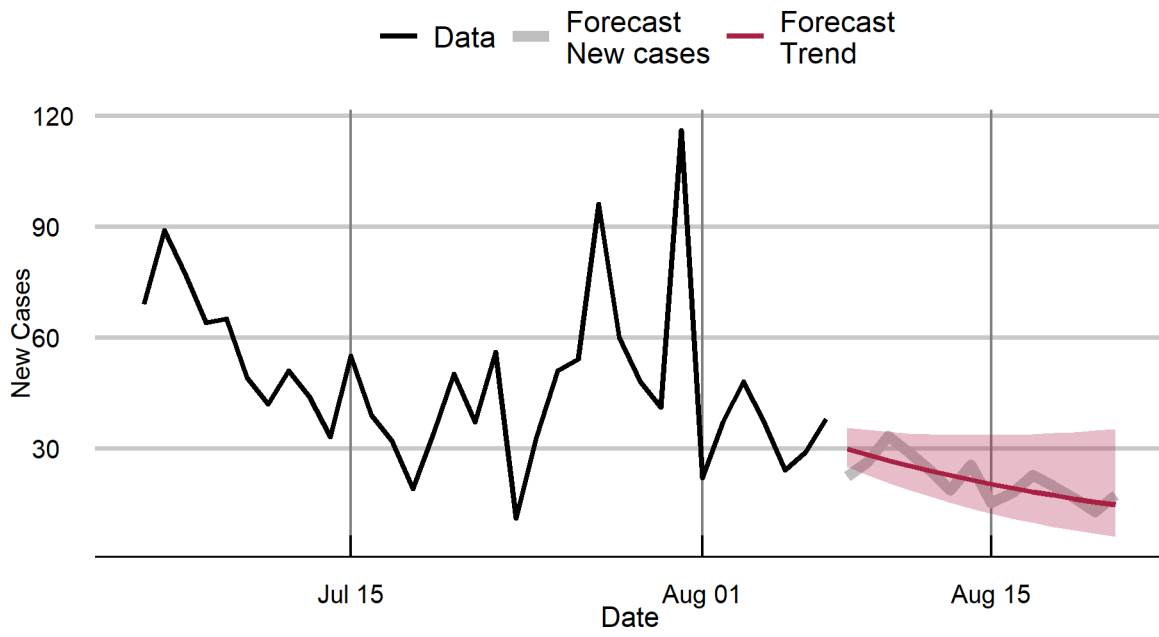
Tripura



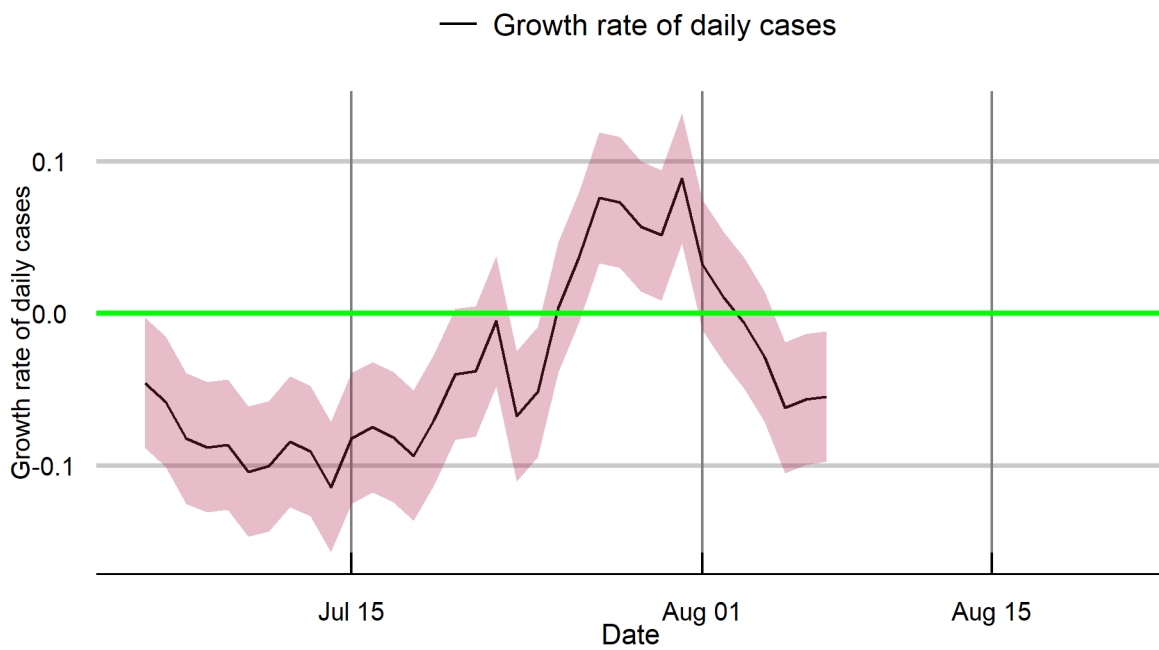
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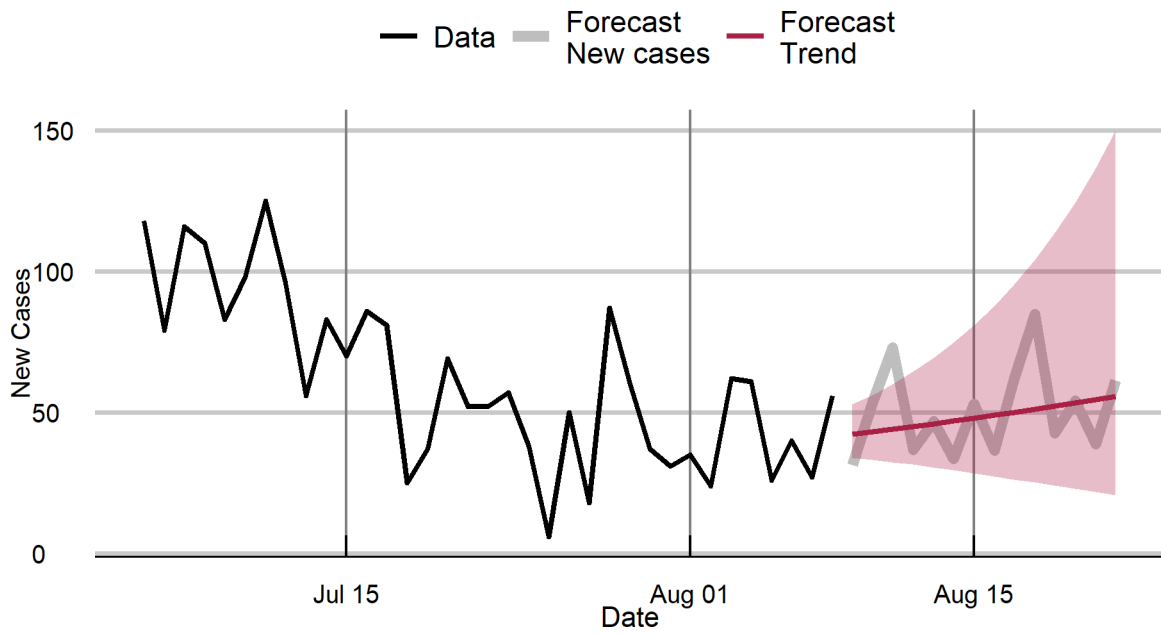
Uttarakhand



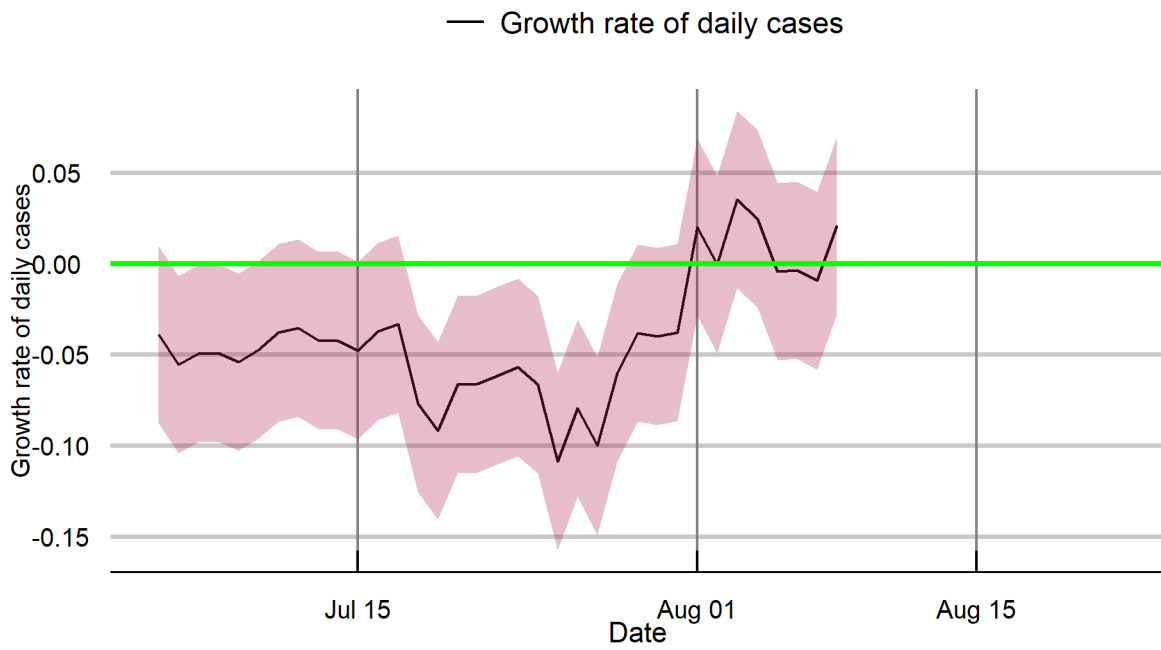
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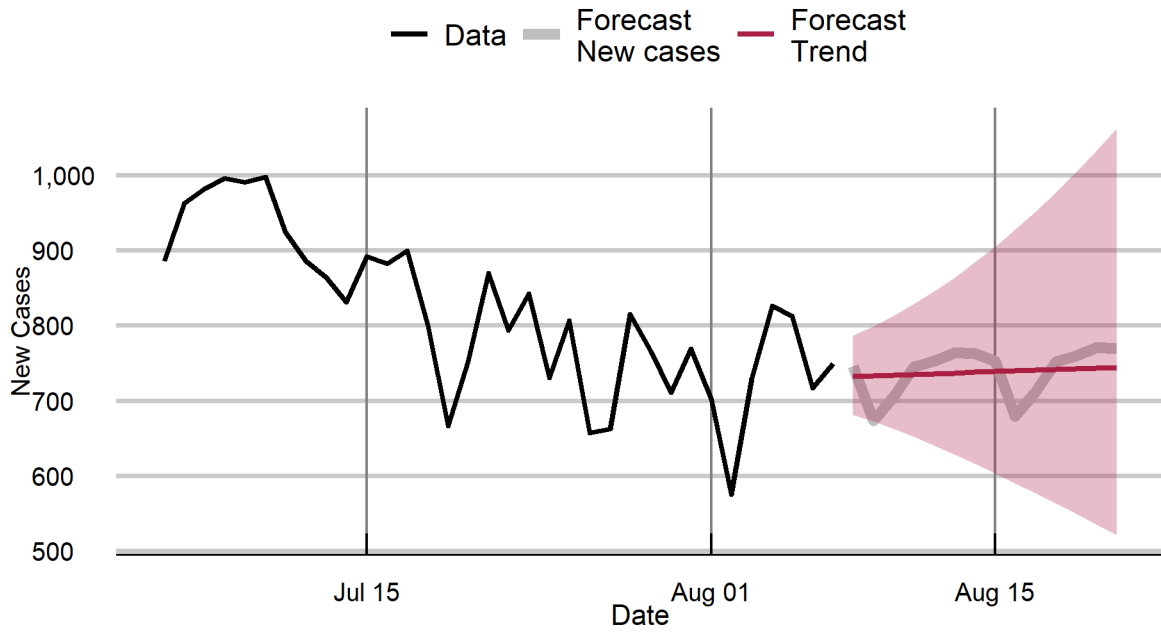
Uttar Pradesh



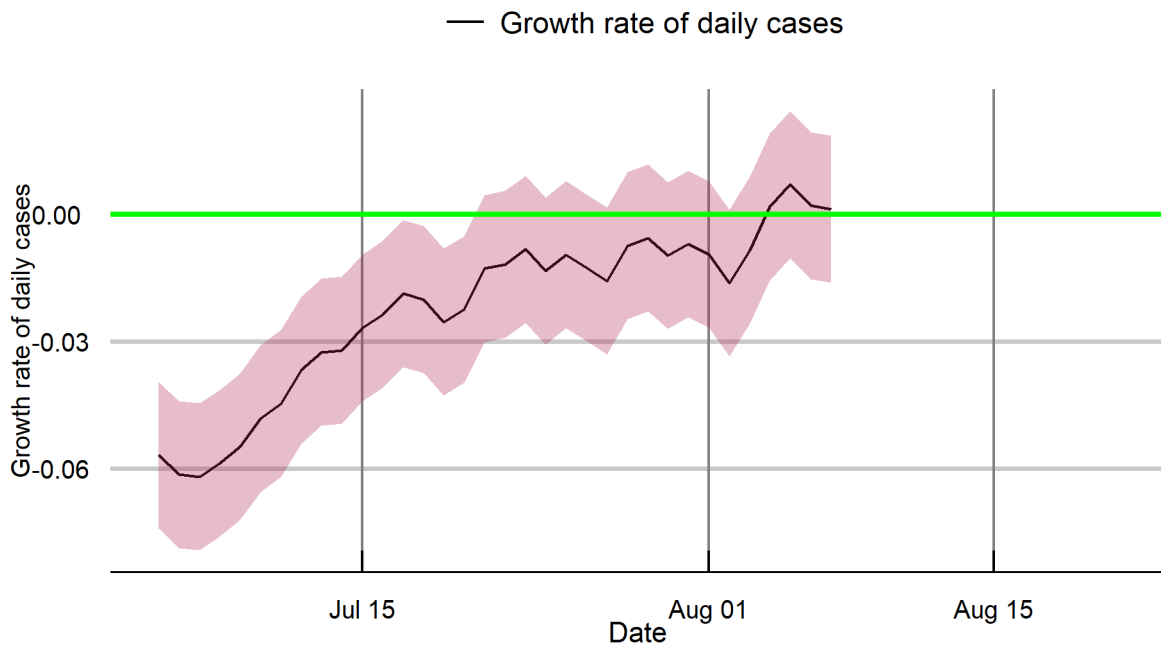
Uttar Pradesh



West Bengal



West Bengal



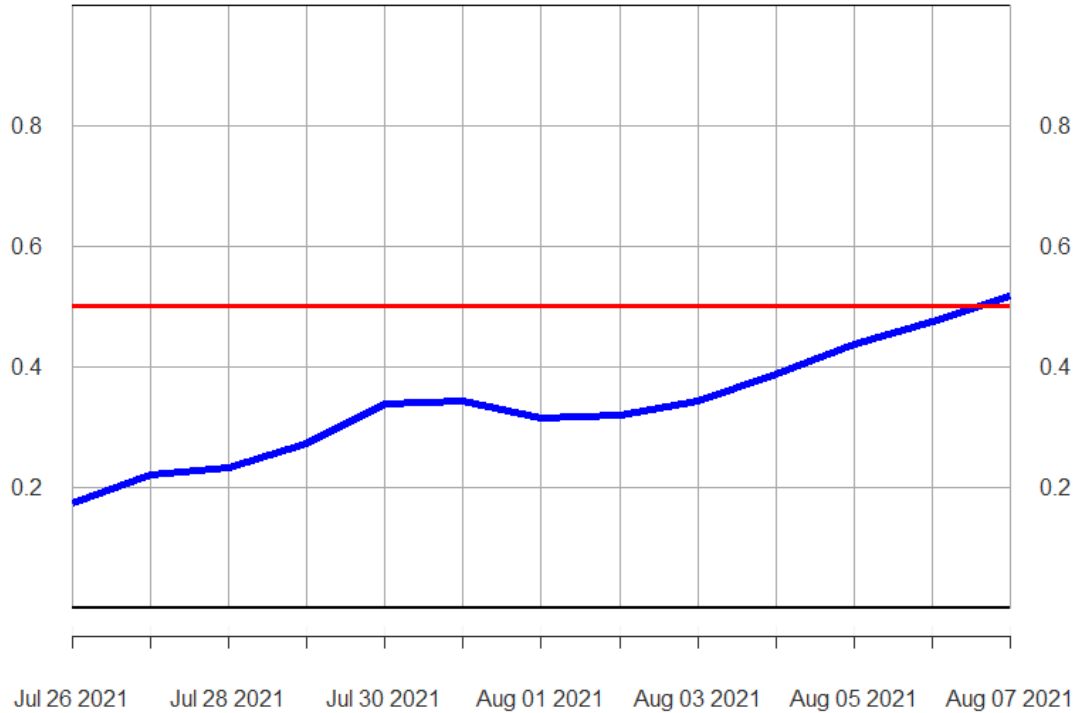
The nature of growth in new cases:

States with accelerating case numbers (were growth rate of cases is increasing)

Goa:

**Probability that cases are accelerating
as on 2021-08-07 : 0.52**

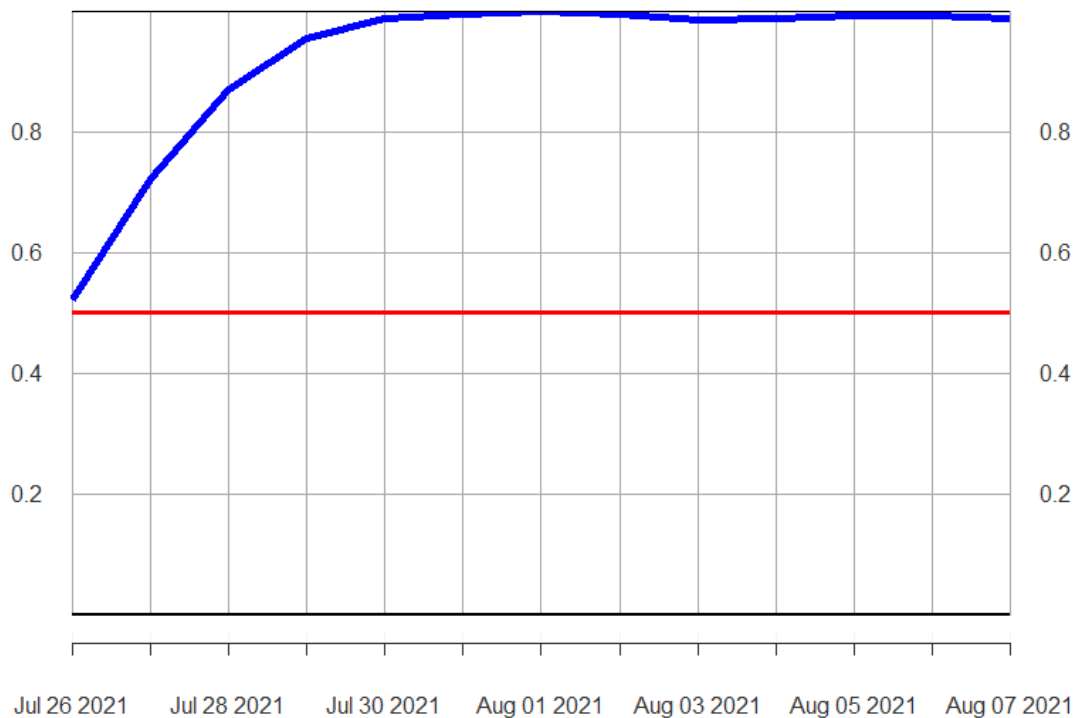
2021-07-26 / 2021-08-07



Himachal Pradesh:

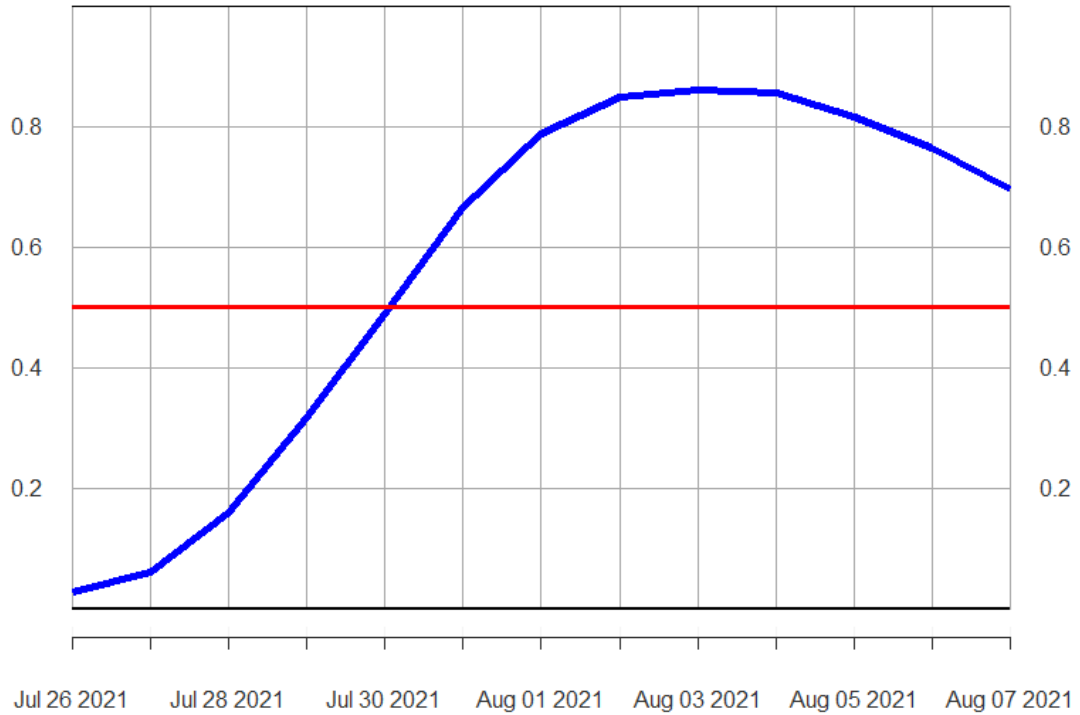
**Probability that cases are accelerating
as on 2021-08-07 : 0.99**

2021-07-26 / 2021-08-07



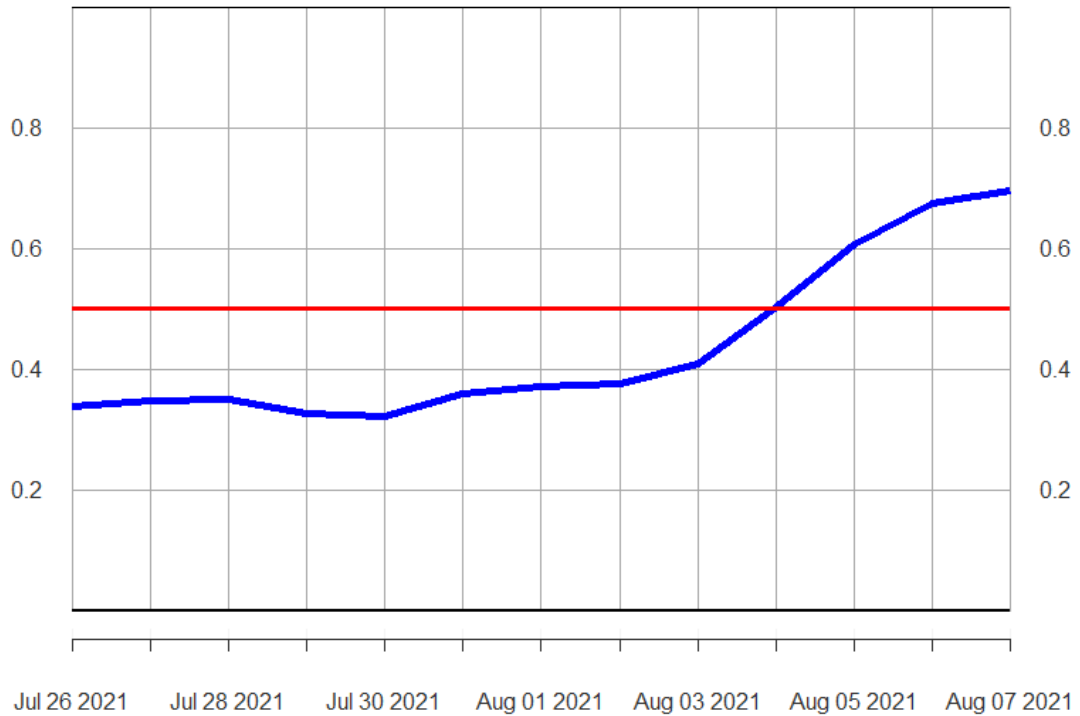
Madhya Pradesh:
Probability that cases are accelerating
as on 2021-08-07 : 0.7

2021-07-26 / 2021-08-07



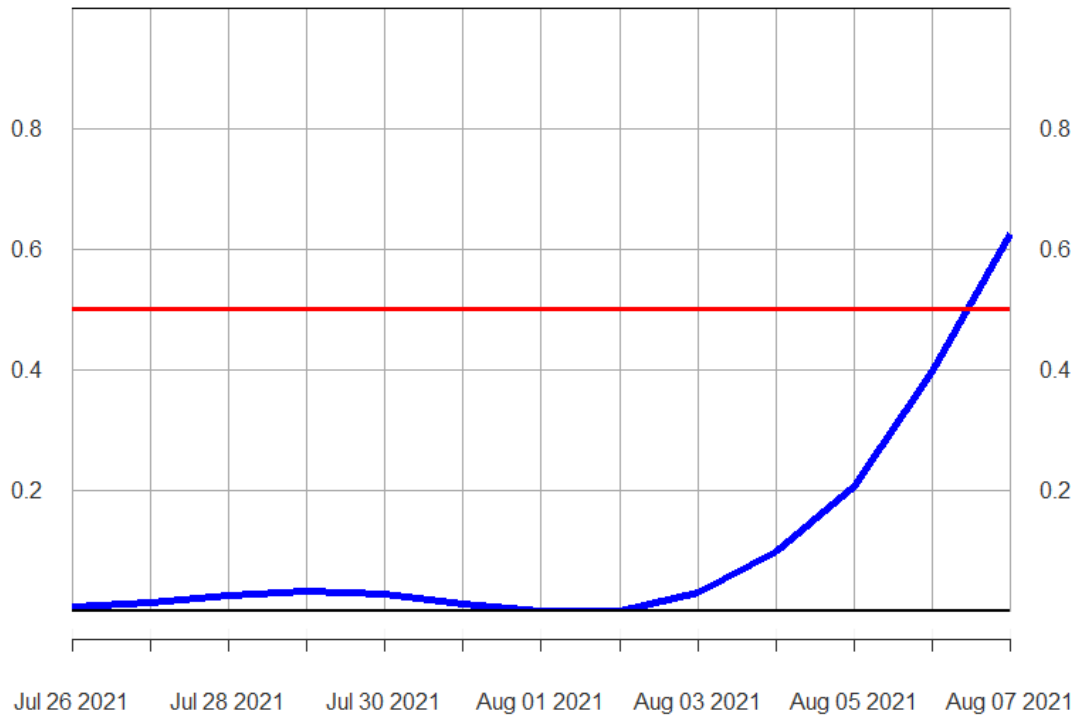
Nagaland:
Probability that cases are accelerating
as on 2021-08-07 : 0.7

2021-07-26 / 2021-08-07



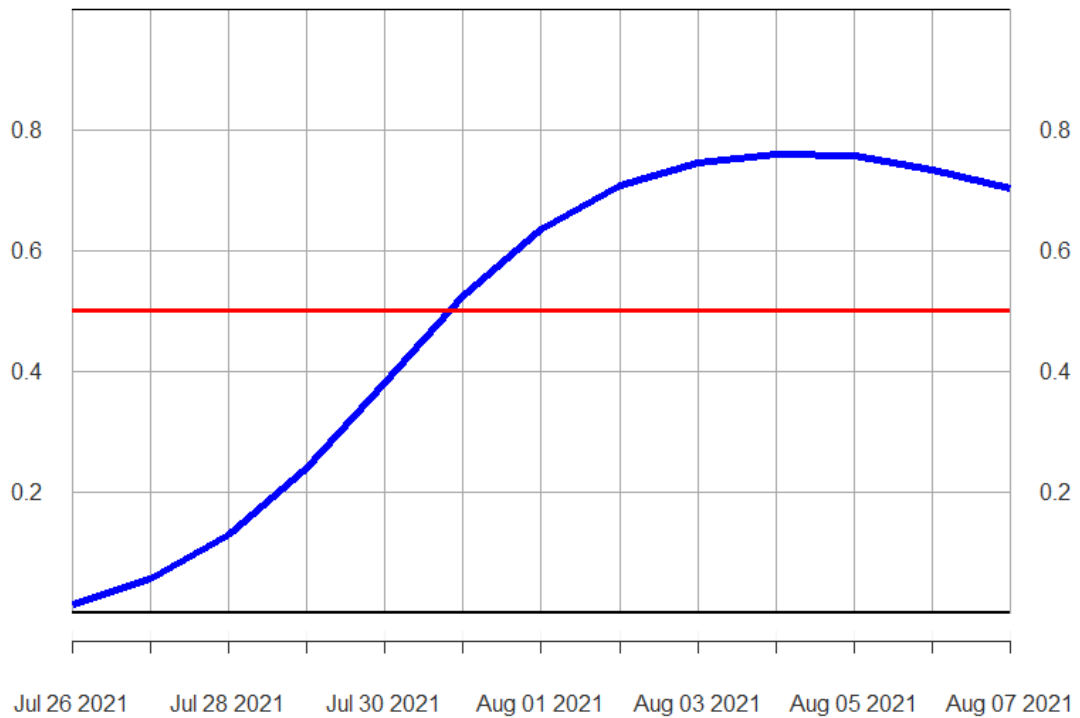
Punjab:
Probability that cases are accelerating
as on 2021-08-07 : 0.62

2021-07-26 / 2021-08-07



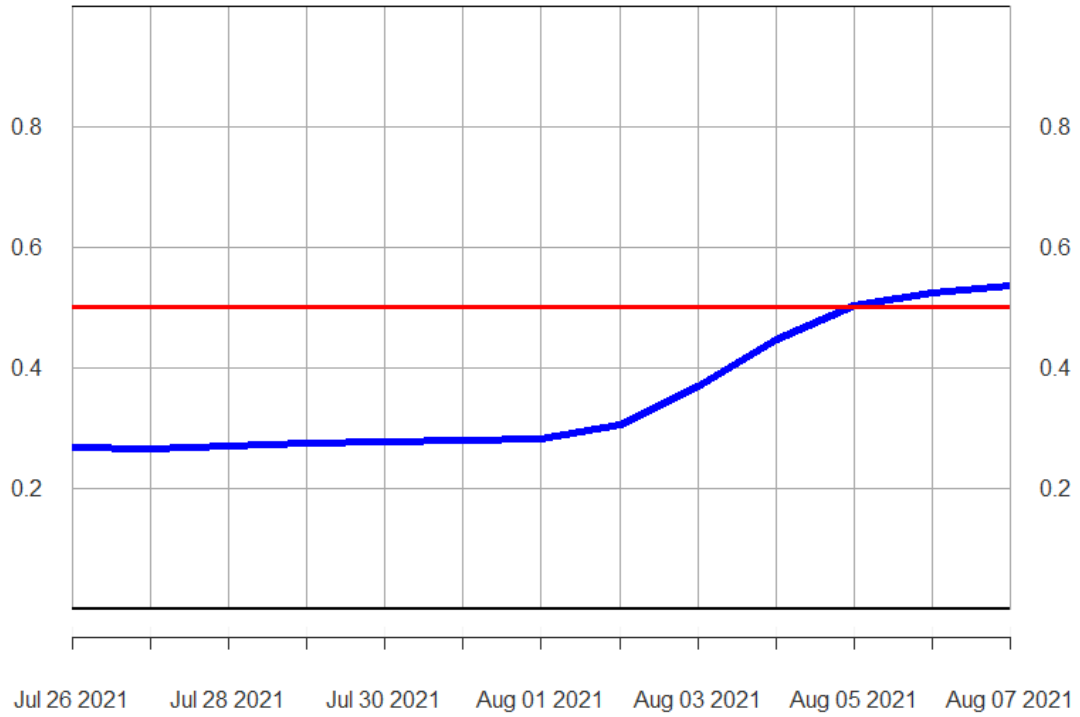
Tamil Nadu:
Probability that cases are accelerating
as on 2021-08-07 : 0.7

2021-07-26 / 2021-08-07



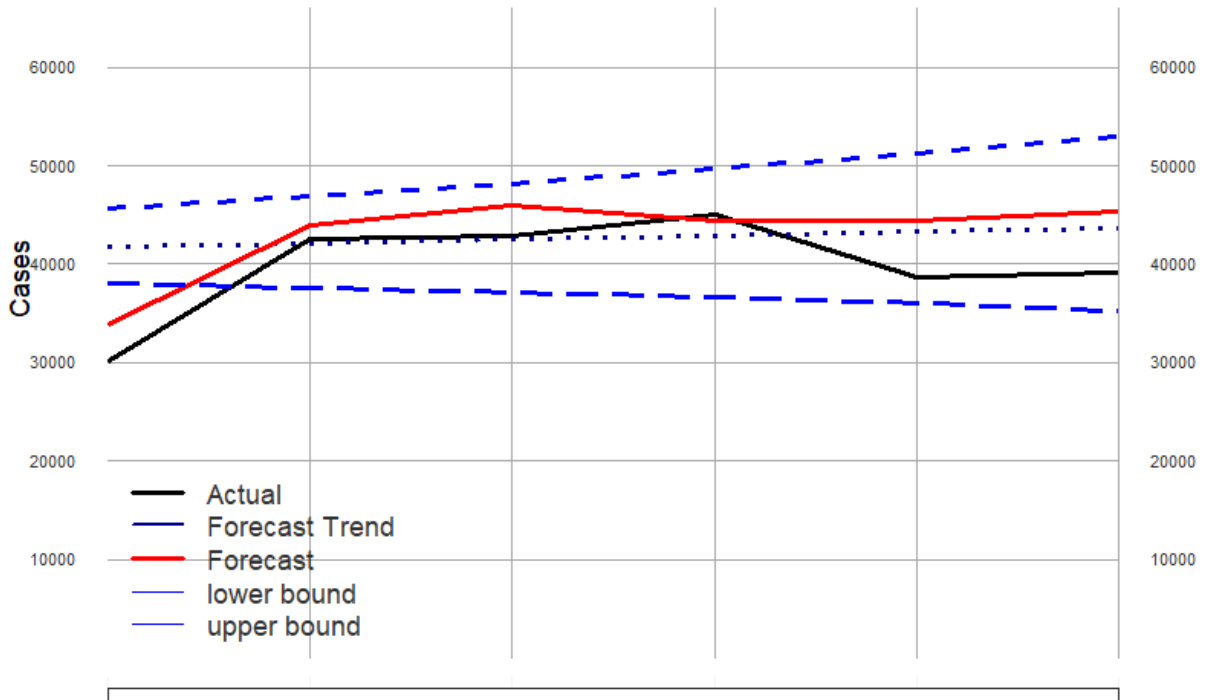
West Bengal:
Probability that cases are accelerating
as on 2021-08-07 : 0.54

2021-07-26 / 2021-08-07



India: Accuracy of last week's forecasts
Mean Absolute Percentage Error: 9.29%

2021-08-02 / 2021-08-07



02/08/2021

07/08/2021

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: is assessed using mean absolute percentage error of the forecasts of cases over the past week. 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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