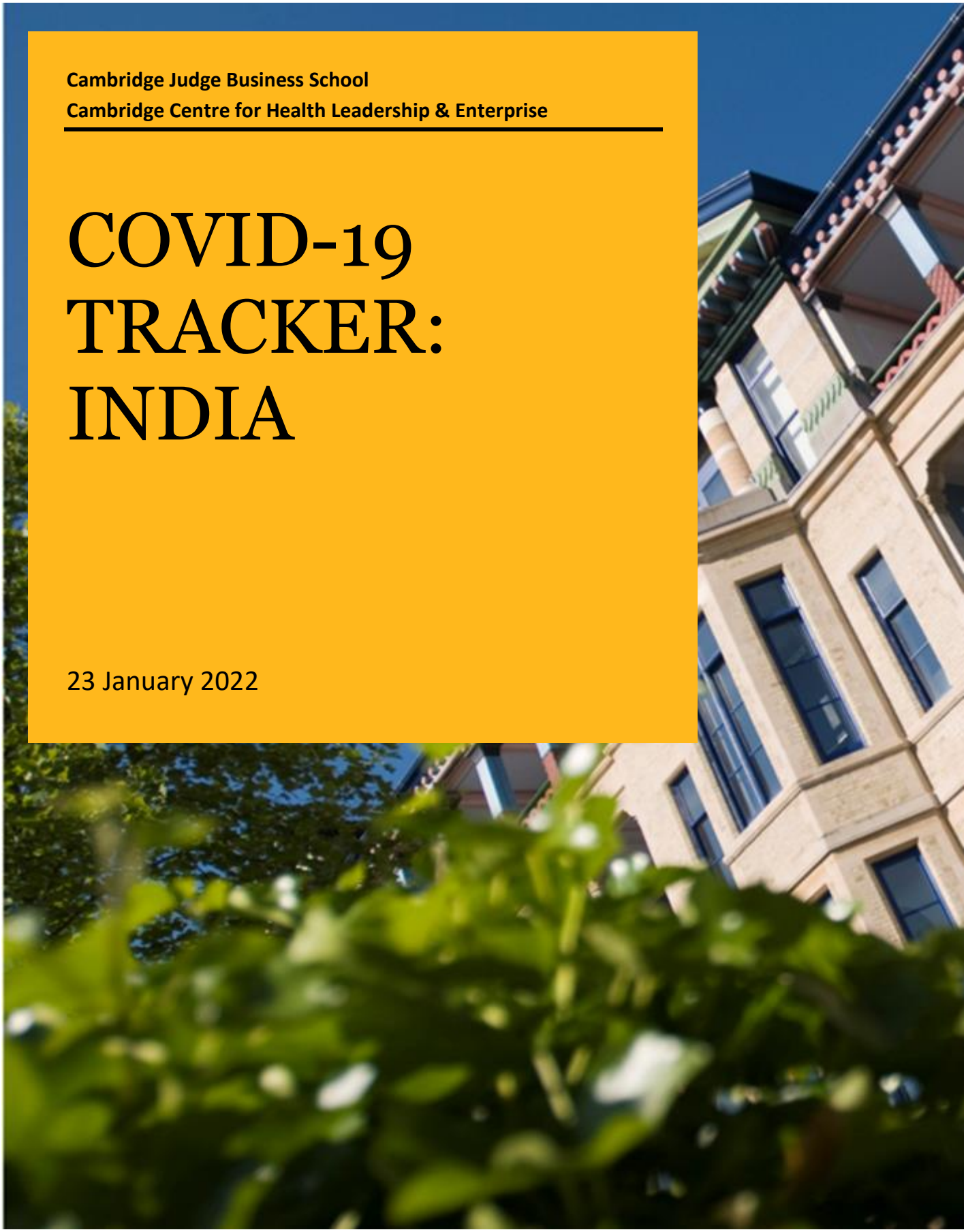
Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

23 January 2022



Centre for Health Leadership & Enterprise
UNIVERSITY OF CAMBRIDGE Judge Business School
HSTP Health Systems Transformation Platform
National Institute of Economic and Social Research

Reported daily COVID cases in India peaked on 23 January in terms of its underlying trend value. The reproduction number for India as a whole stood at 0.98, down from 1.1 on 18th January. The filtered daily growth rate of cases was negative at -0.6%, down from 3.02% on 18th. By the end of January the trend value of reported daily cases can be expected to drop to about 270,000; and by 6th February to about 210,000.

Reported daily cases are clearly past their peaks in 19 states and union territories: Andaman and Nicobar Islands, Assam, Bihar, Chandigarh, Chhattisgarh, Dadra and Nagar Haveli, Delhi, Goa, Haryana, Himachal Pradesh, Jharkhand, Maharashtra, Odisha, Punjab, Sikkim, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

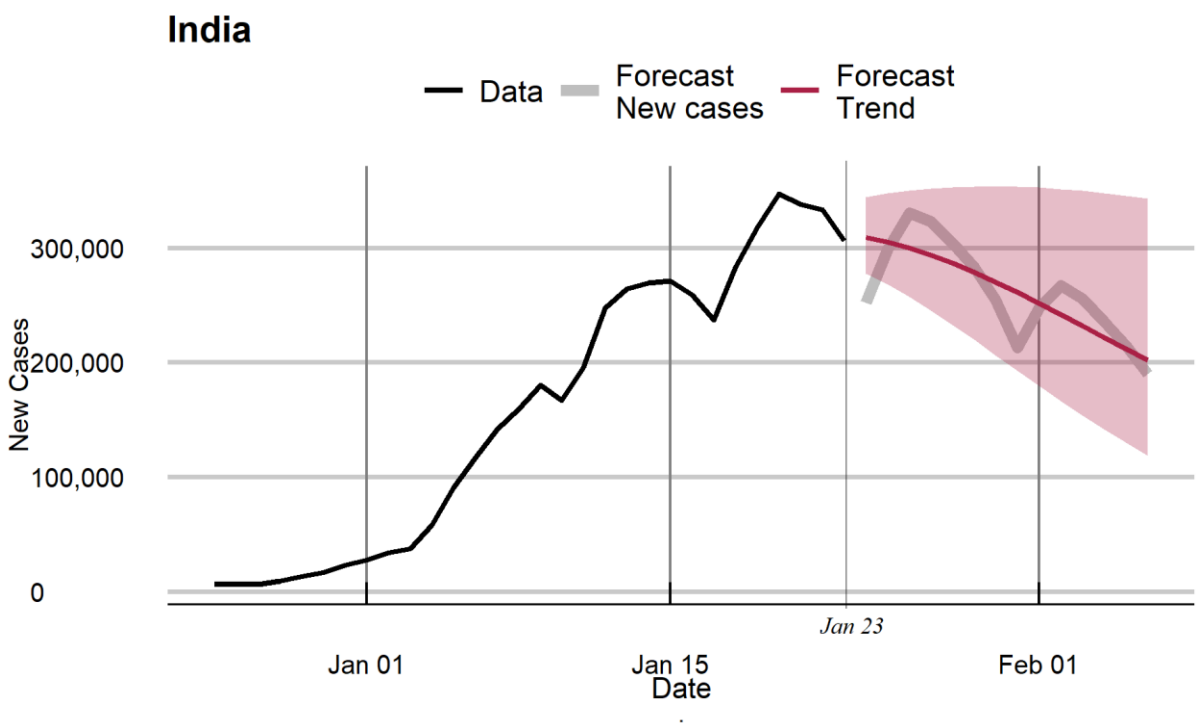
Reported Daily cases are expected to peak within the week in 7 states and union territories. Karnataka, Manipur, Meghalaya, Puducherry and Rajasthan can be expected to peak in the early part of the week beginning 24 January, while Andhra Pradesh and Madhya Pradesh can be expected to peak towards the end of the week.

Arunachal Pradesh, Gujarat and Jammu, Kashmir and Kerala can be expected to see their peaks in reported daily cases in the first week of February.

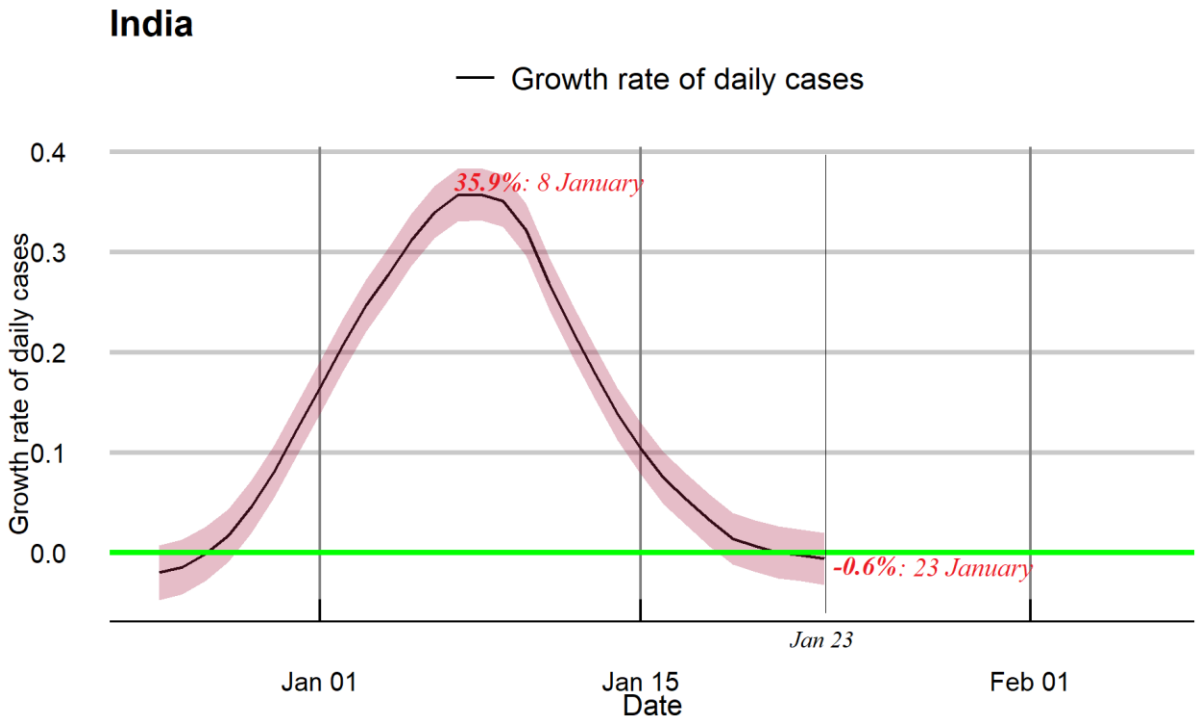
There are however, concerning indications of flare ups in Mizoram, Nagaland and particularly Telangana. In these states the daily growth rates of cases have nudged back upwards into positive territory in recent days after having declined to zero.

This tracker can be accessed at: www.jbs.cam.ac.uk/covid-india
Contact: Paul Kattuman <p.kattuman@jbs.cam.ac.uk>

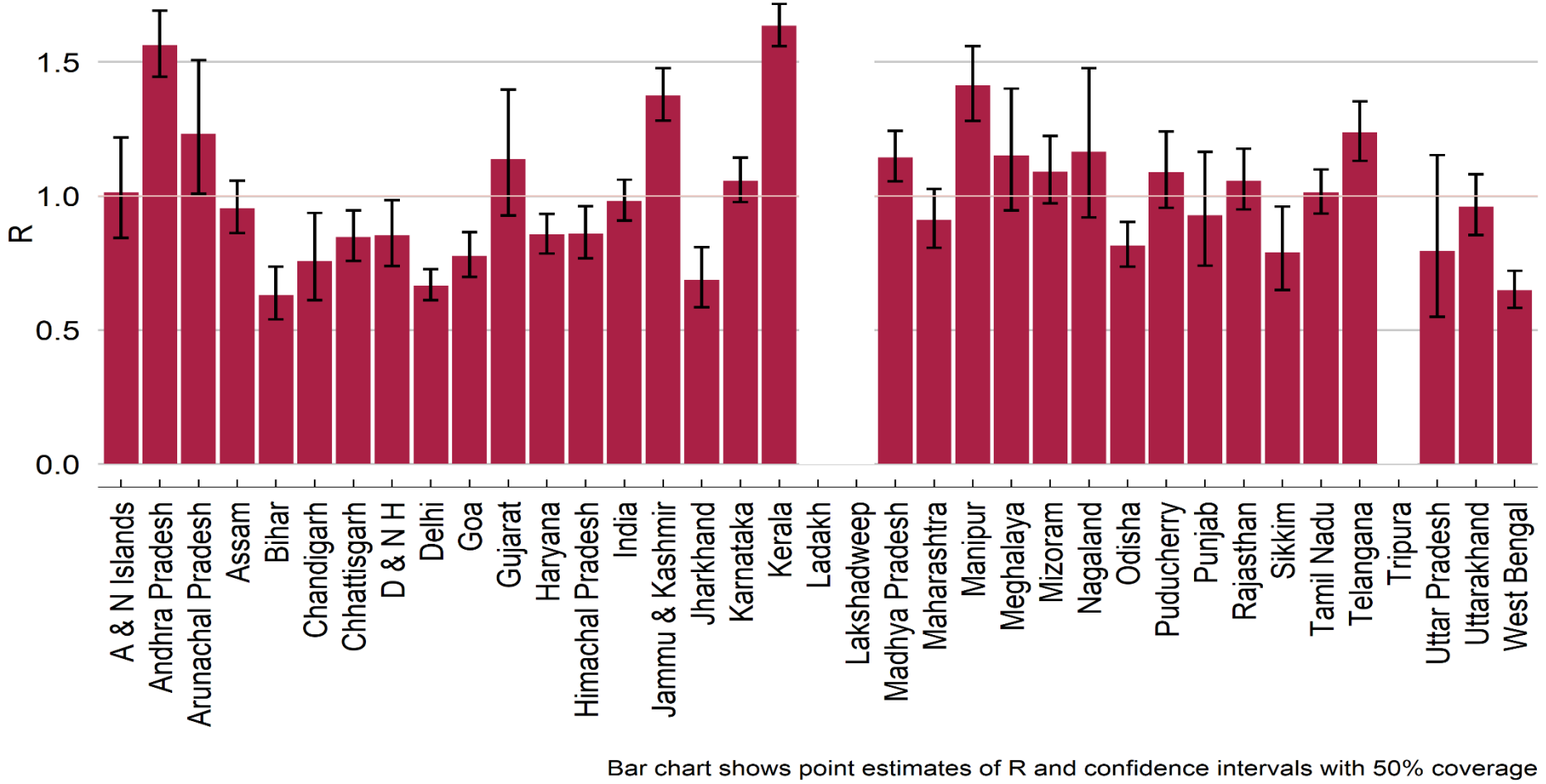
Forecasts of daily cases: 24 January to 6 February 2022



Filtered daily growth rates of new cases: days leading up to 23 January 2022



Reproduction numbers on 23 January 2022



Bar chart shows point estimates of R and confidence intervals with 50% coverage

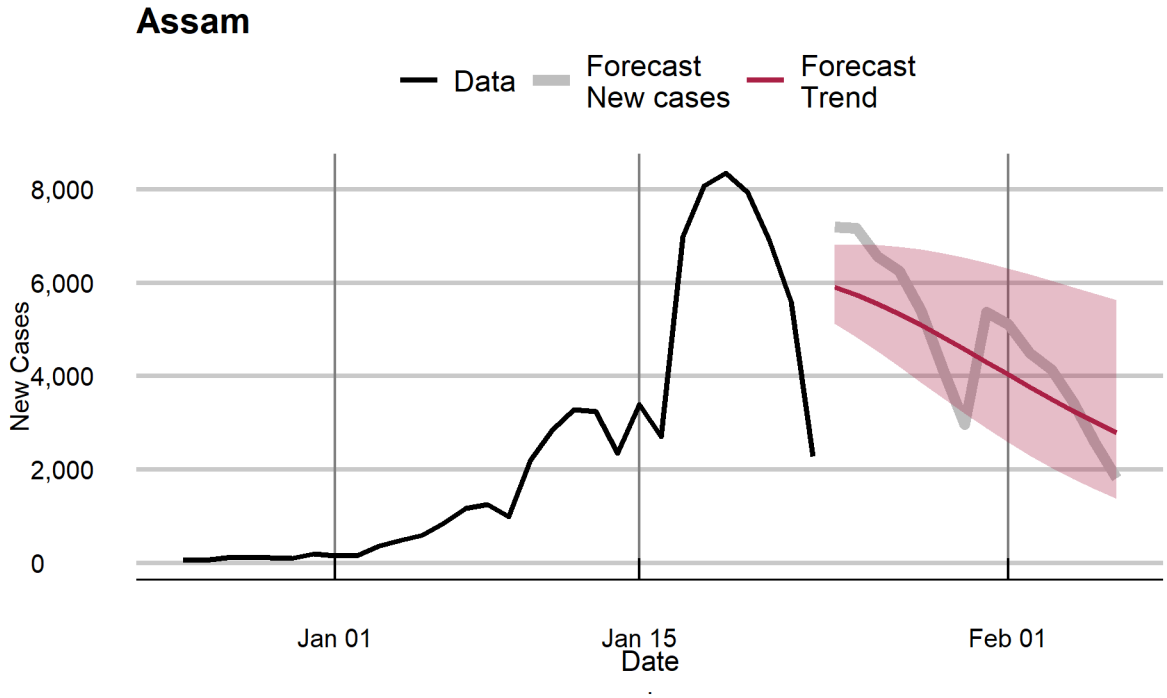
Note: Cases data for 23rd January not available for Ladakh, Lakshadweep and Tripura. Small numbers in Dadra and Nager Haveli make the estimates less reliable.

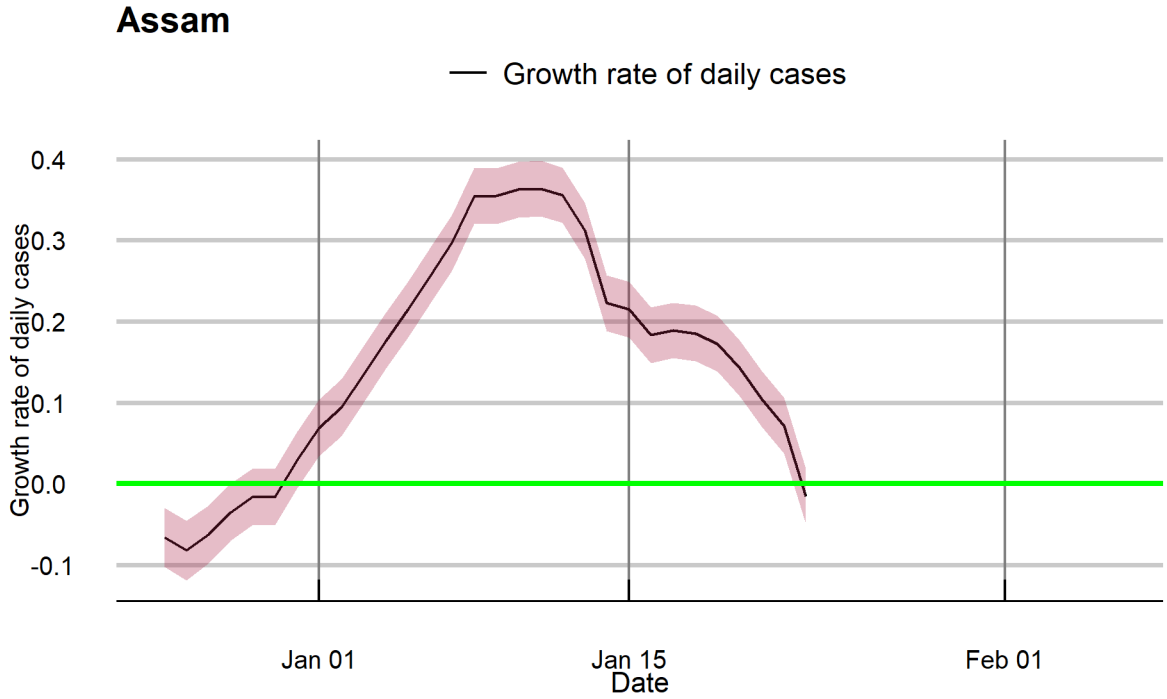
Reproduction numbers and Filtered daily growth rates:23 January 2022

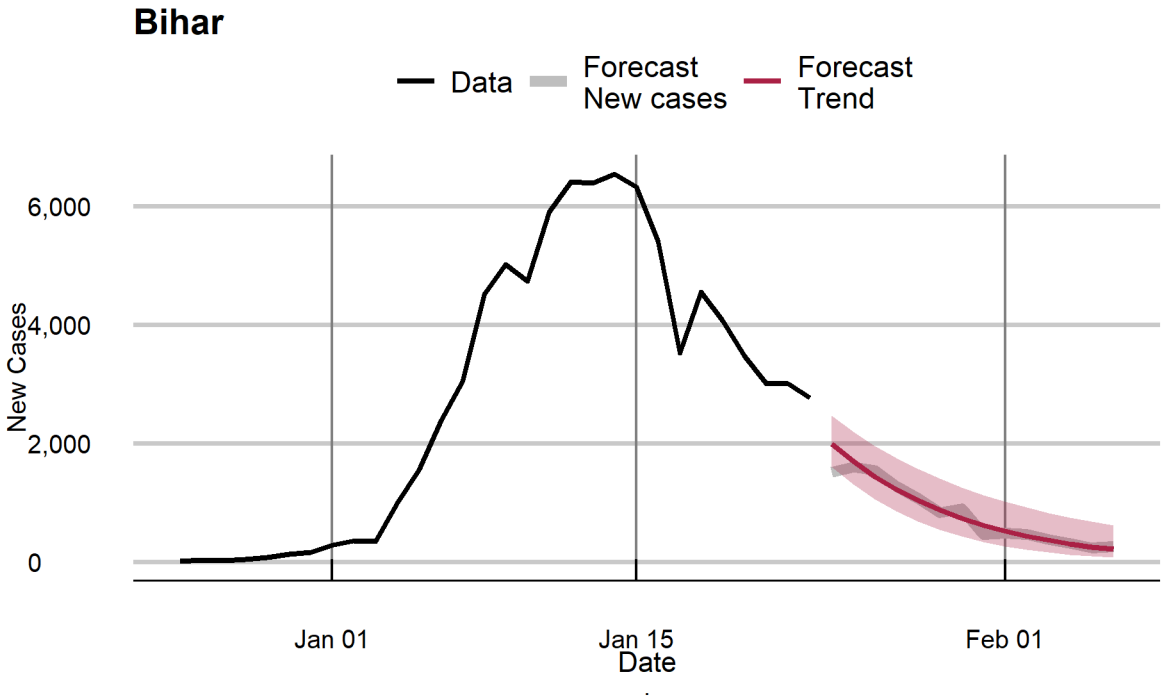
	Reproduction number	Filtered daily growth rate
India	0.98	-0.6%
A & N Islands	1.01	0.4%
Andhra Pradesh	1.56	14.9%
Arunachal Pradesh	1.23	7.0%
Assam	0.95	-1.6%
Bihar	0.63	-15.4%
Chandigarh	0.76	-9.3%
Chhattisgarh	0.85	-5.5%
D & N H	0.85	-5.3%
Delhi	0.67	-13.6%
Goa	0.78	-8.4%
Gujarat	1.14	4.3%
Haryana	0.86	-5.2%
Himachal Pradesh	0.86	-5.1%
Jammu & Kashmir	1.38	10.6%
Jharkhand	0.69	-12.5%
Karnataka	1.06	1.8%
Kerala	1.64	16.4%
Ladakh	1.30	8.7%
Lakshadweep	2.07	24.3%
Madhya Pradesh	1.14	4.5%
Maharashtra	0.91	-3.2%
Manipur	1.41	11.5%
Meghalaya	1.15	4.7%
Mizoram	1.09	2.9%
Nagaland	1.16	5.1%
Odisha	0.82	-6.8%
Puducherry	1.09	2.8%
Punjab	0.93	-2.5%
Rajasthan	1.06	1.8%
Sikkim	0.79	-7.9%
Tamil Nadu	1.01	0.4%
Telangana	1.24	7.1%
Tripura	0.73	-10.5%
Uttar Pradesh	0.79	-7.7%
Uttarakhand	0.96	-1.3%
West Bengal	0.65	-14.5%

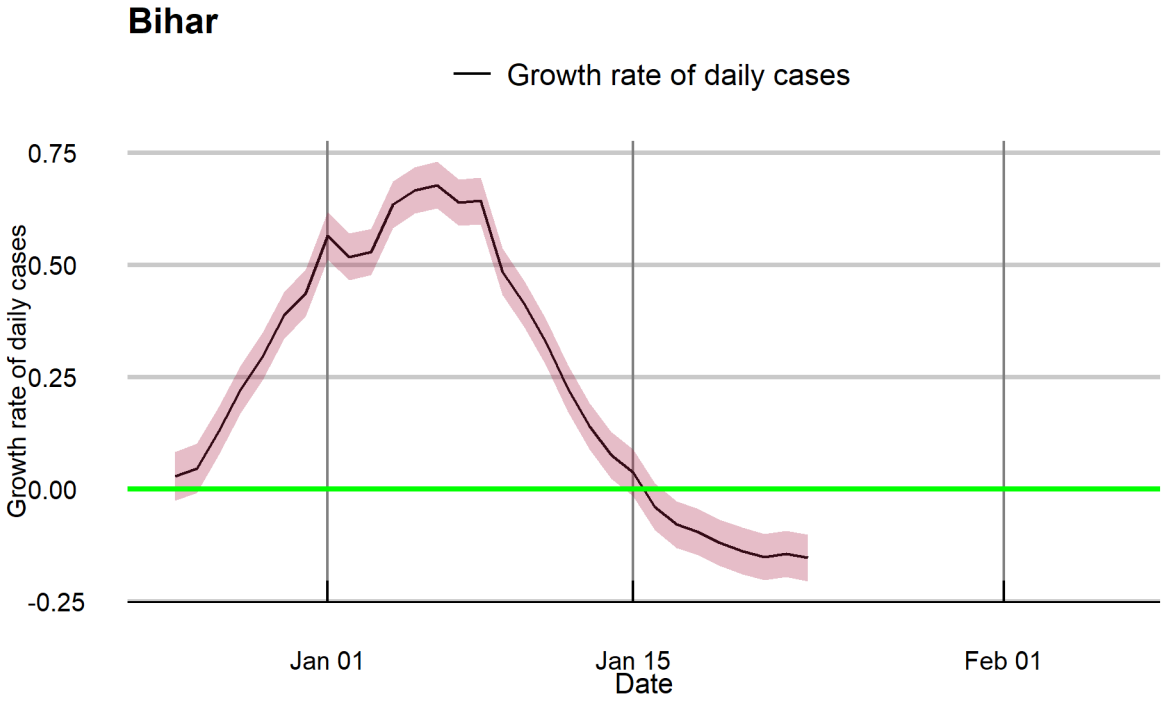
Note: For Ladakh, Lakshadweep and Tripura, the estimates relate to 22nd January.

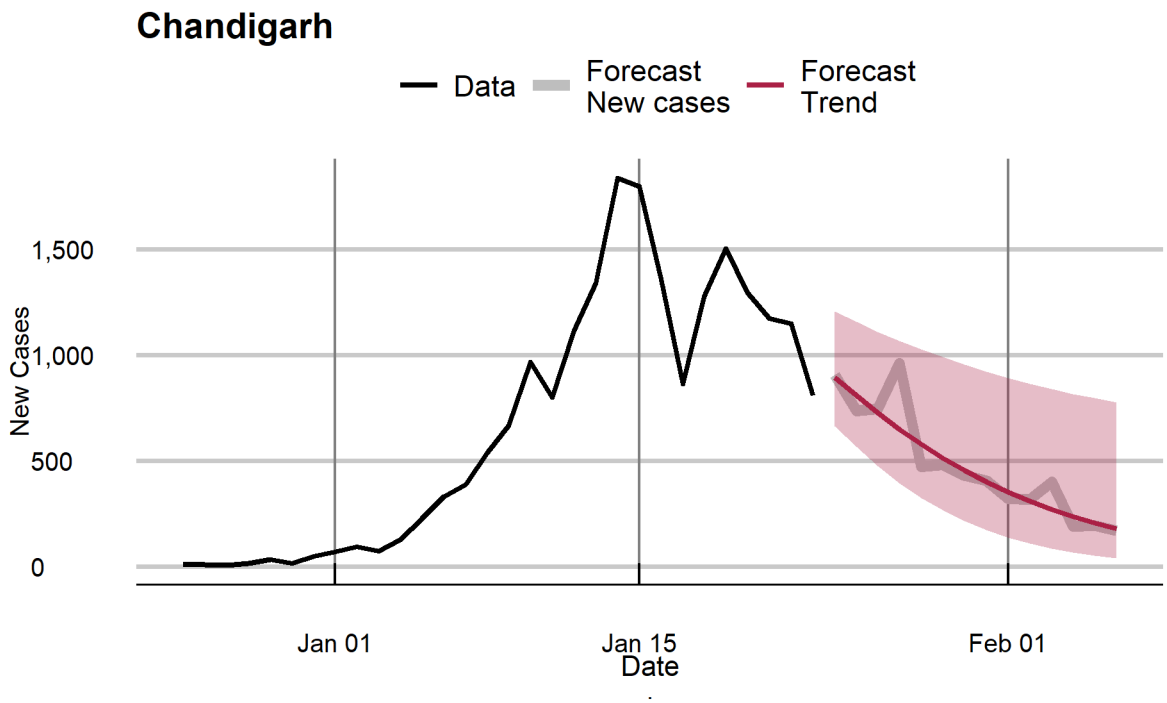
Forecasts of daily cases and filtered daily growth rates of cases for states and union territories that are past their peaks

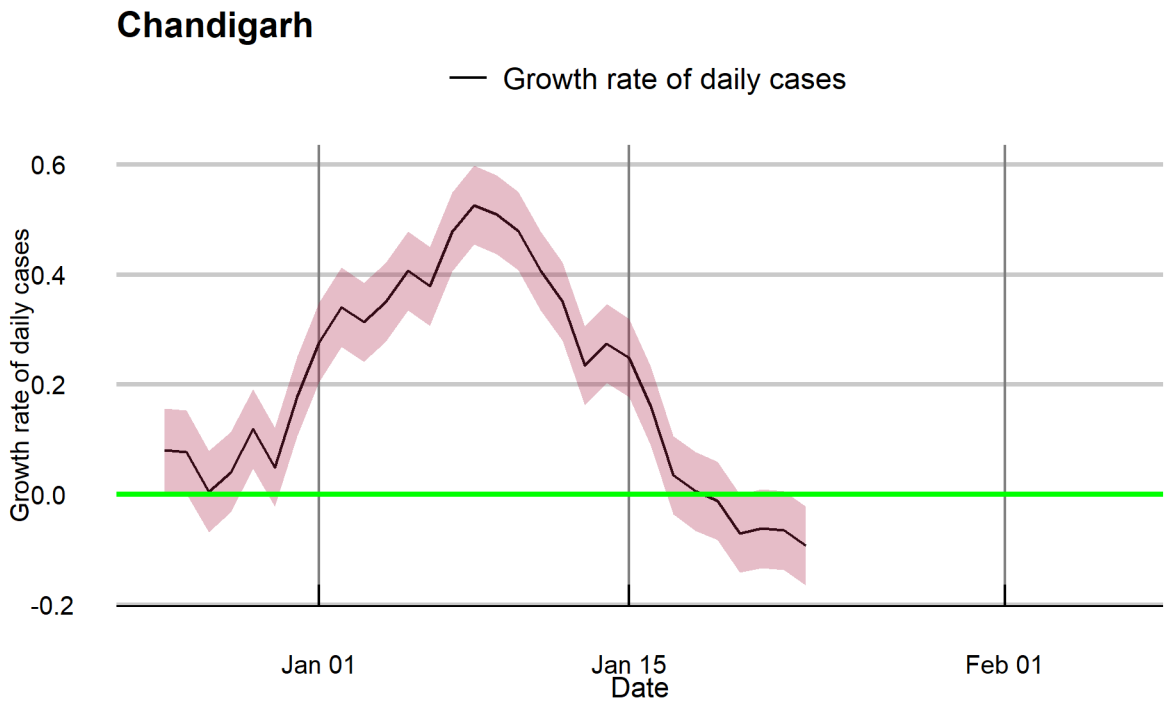


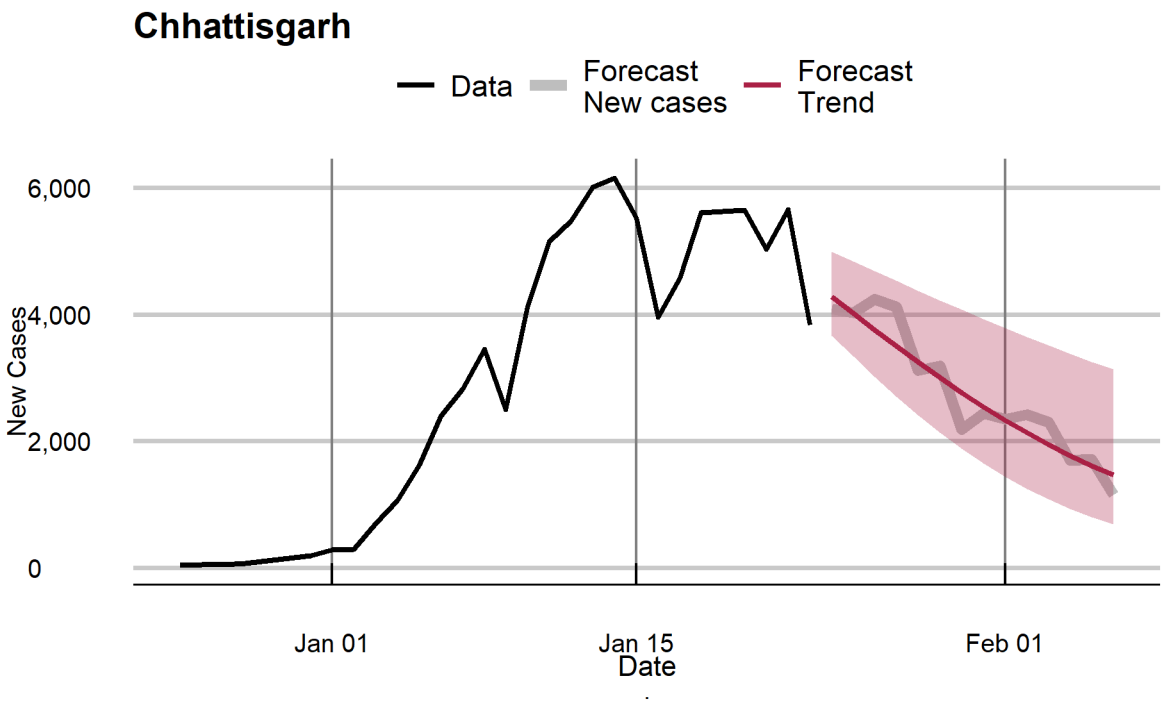


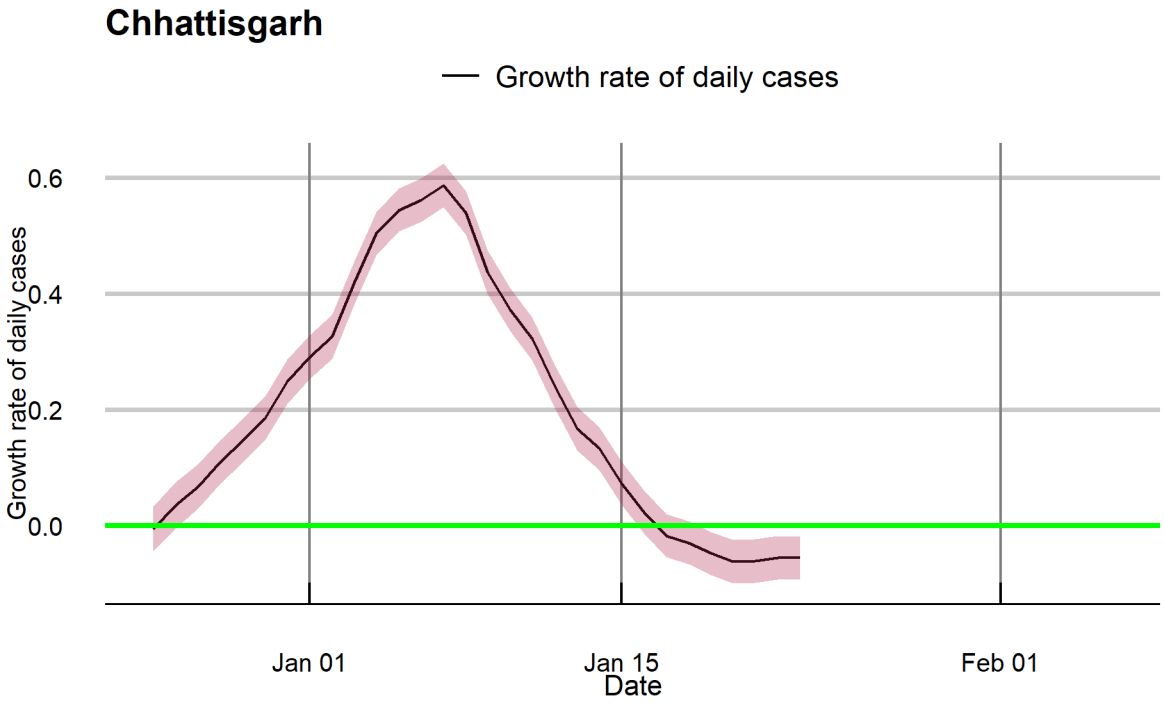

Bihar
Data
Forecast
New cases
Forecast
Trend
6,000
4,000
2,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

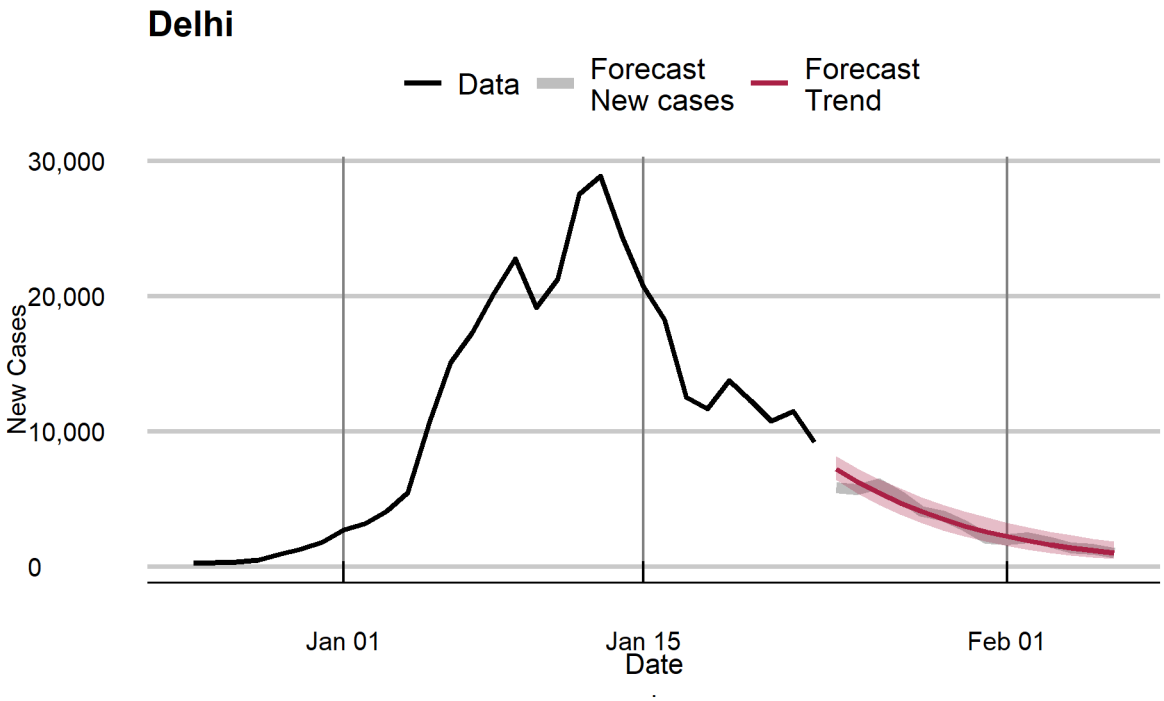

Bihar
Growth rate of daily cases
0.75
0.50
0.25
0.00
-0.25
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

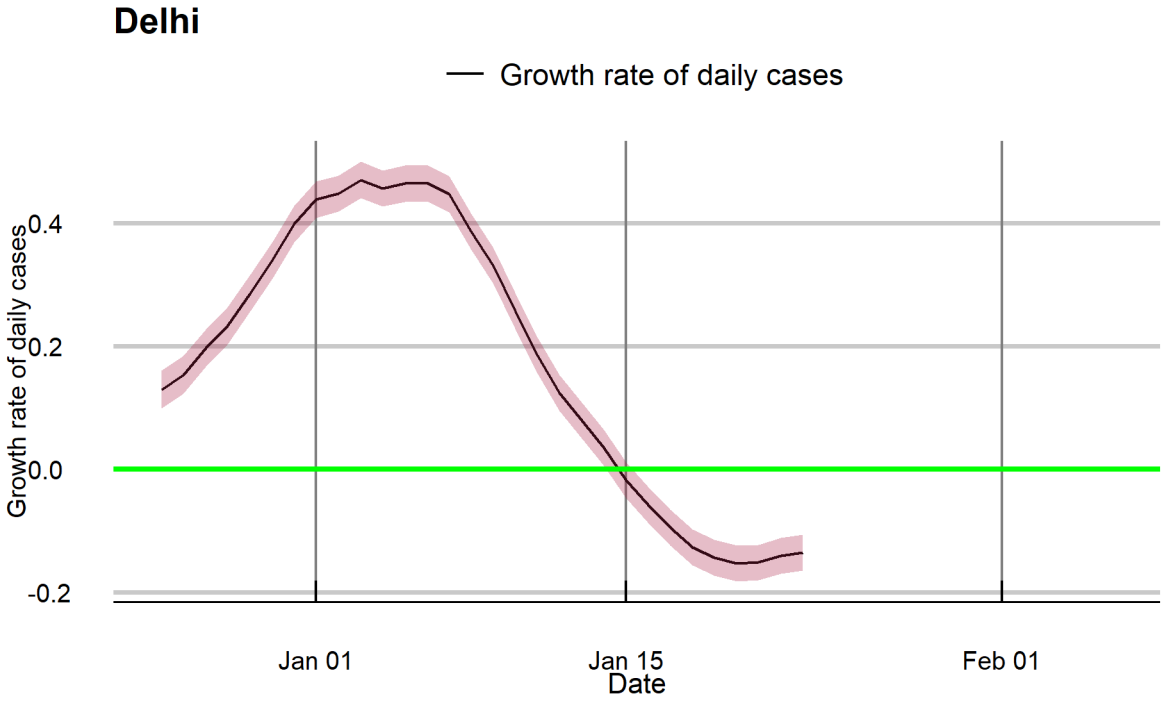

Chandigarh
Data
Forecast
New cases
Forecast
Trend
1,500
1,000
500
0
New Cases
Jan 01
Jan 15
Feb 01
Date

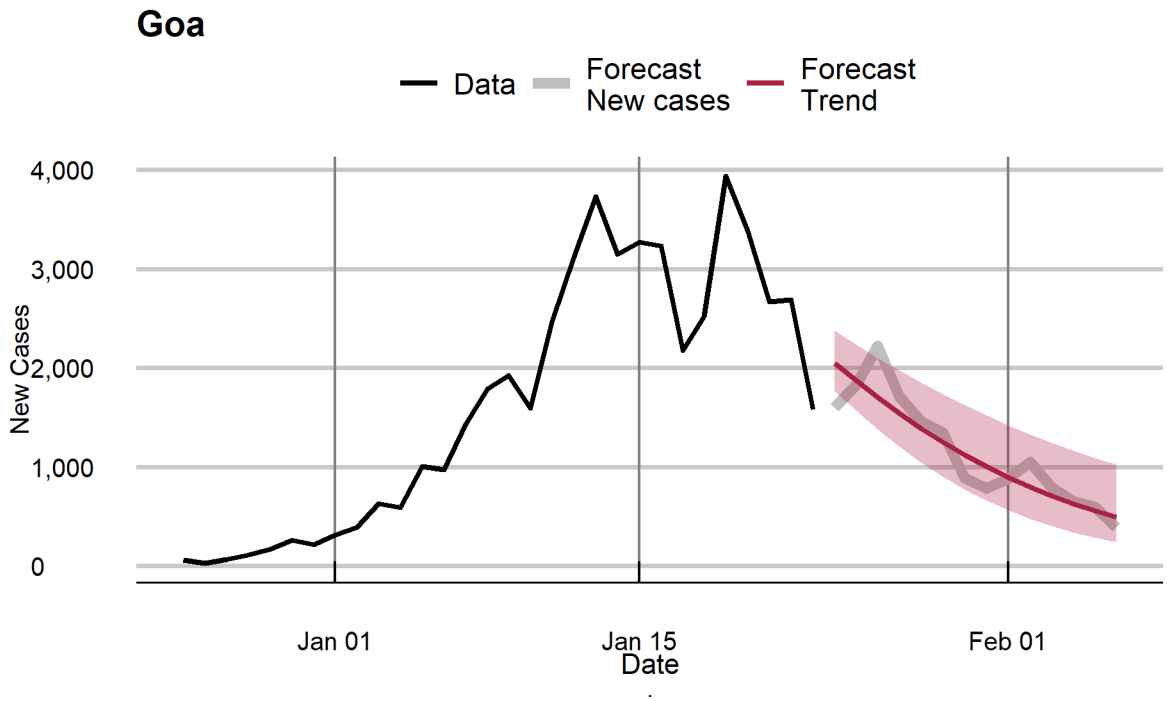

Chandigarh
Growth rate of daily cases
0.6
0.4
0.2
0.0
-0.2
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

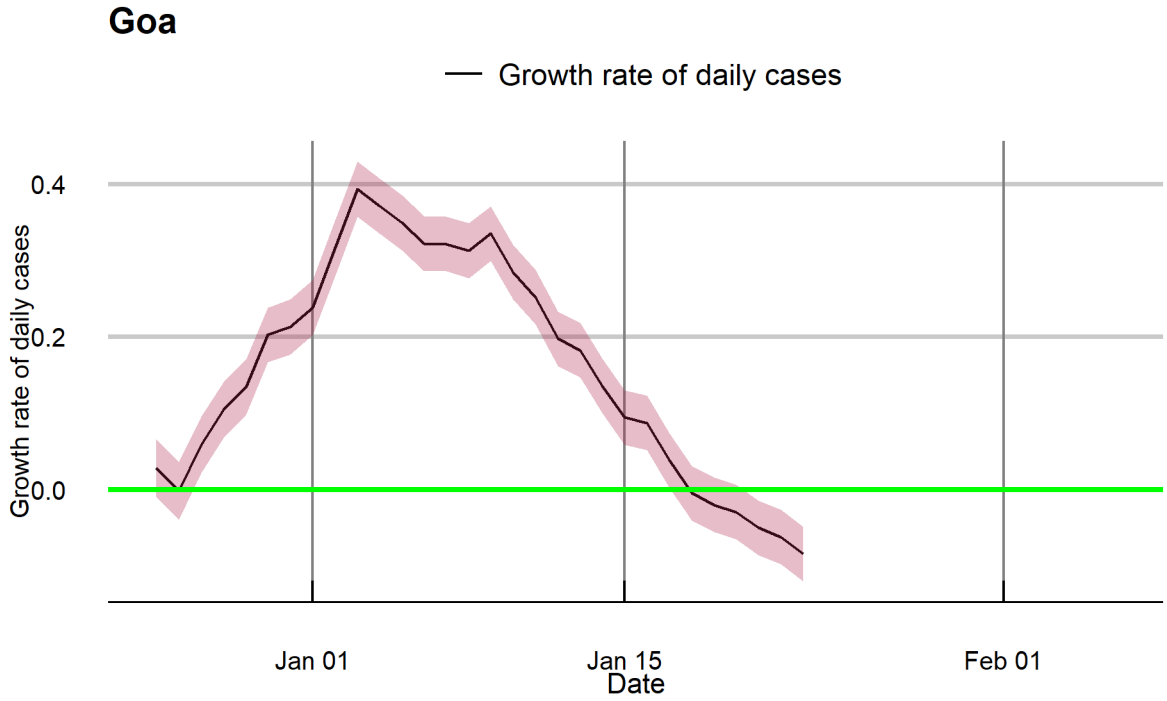

Chhattisgarh
Data
Forecast
New cases
Forecast
Trend
6,000
4,000
2,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

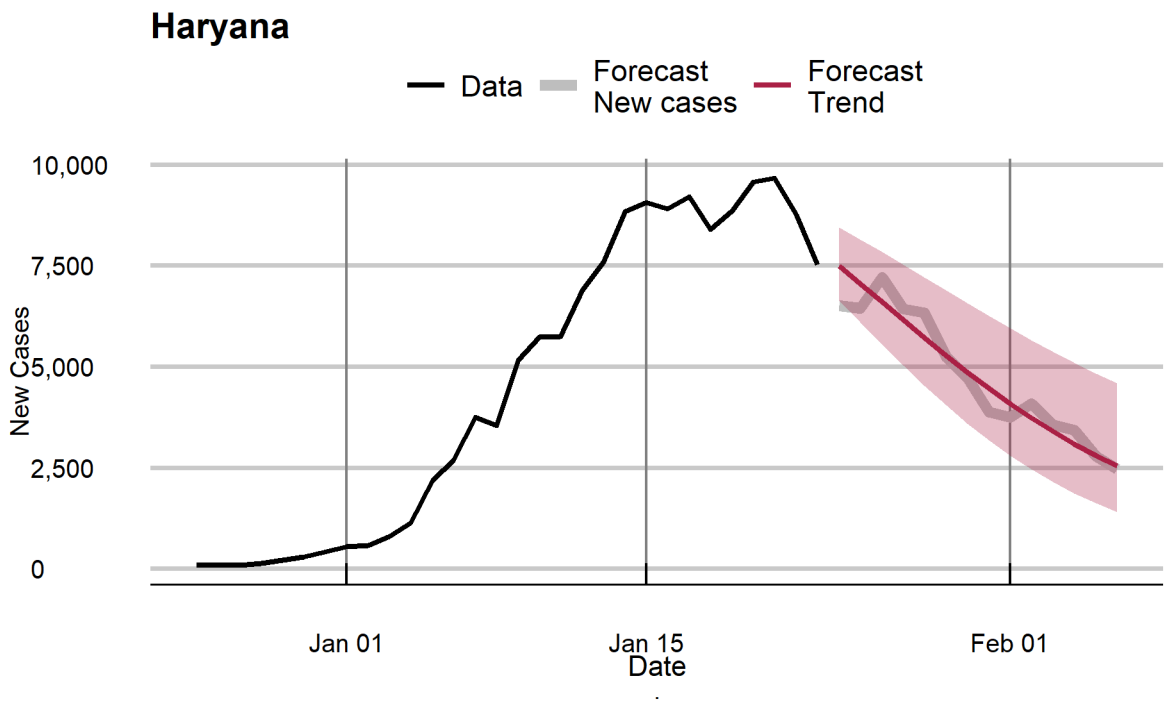

Chhattisgarh
Growth rate of daily cases
0.6
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

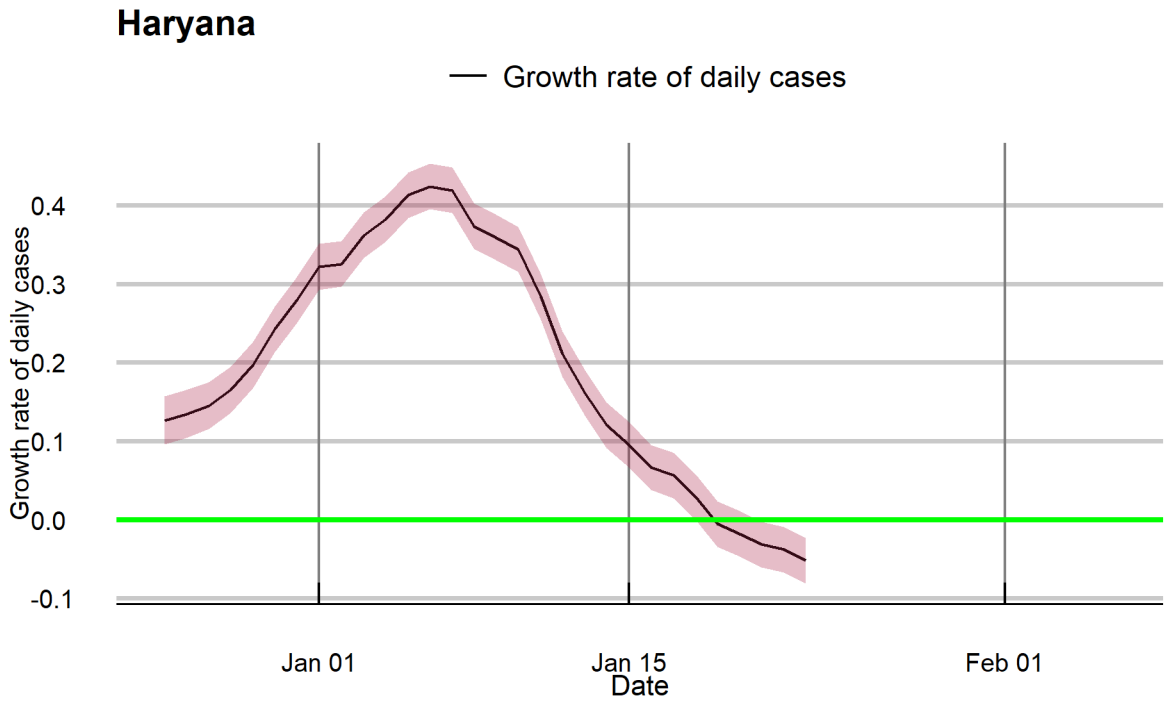

Delhi
Data
Forecast
New cases
Forecast
Trend
30,000
20,000
10,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

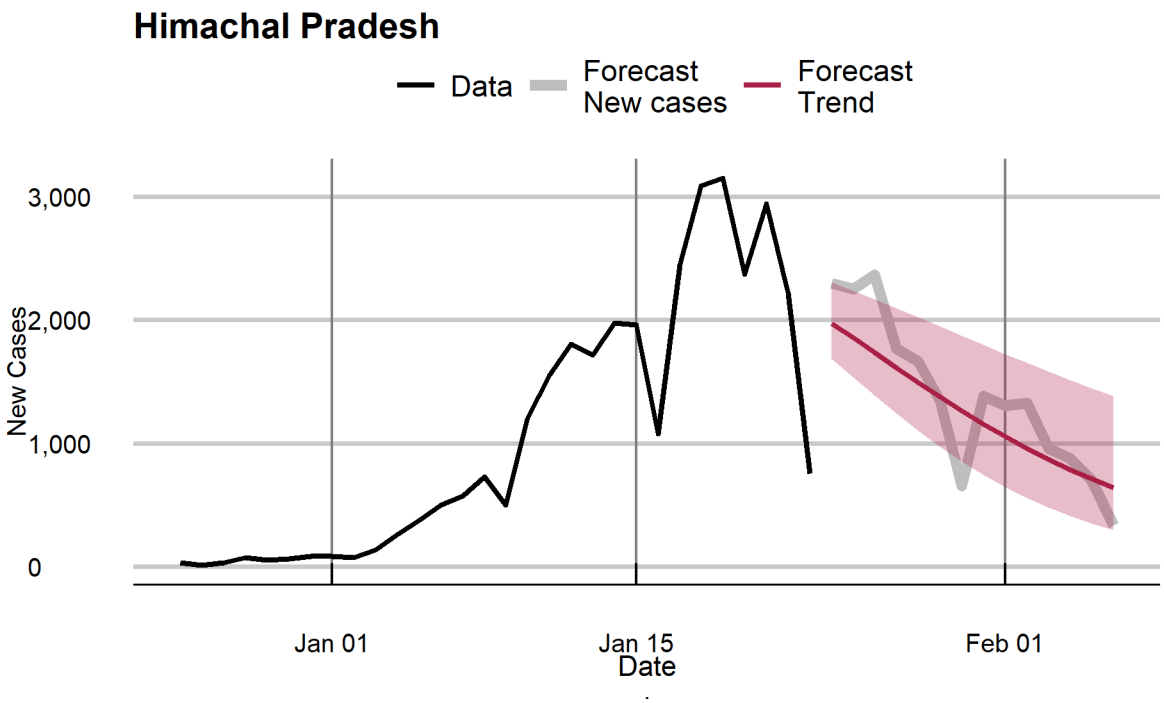

Delhi
Growth rate of daily cases
0.4
0.2
0.0
-0.2
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

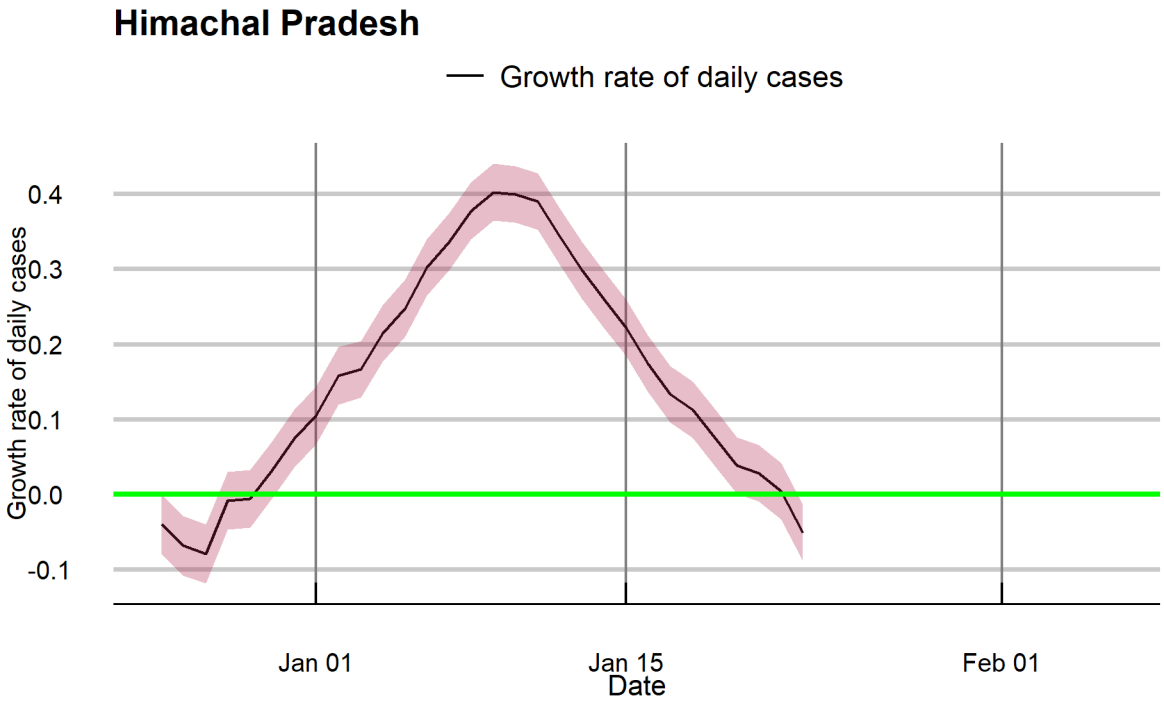

Goa
Data
Forecast
New cases
Forecast
Trend
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

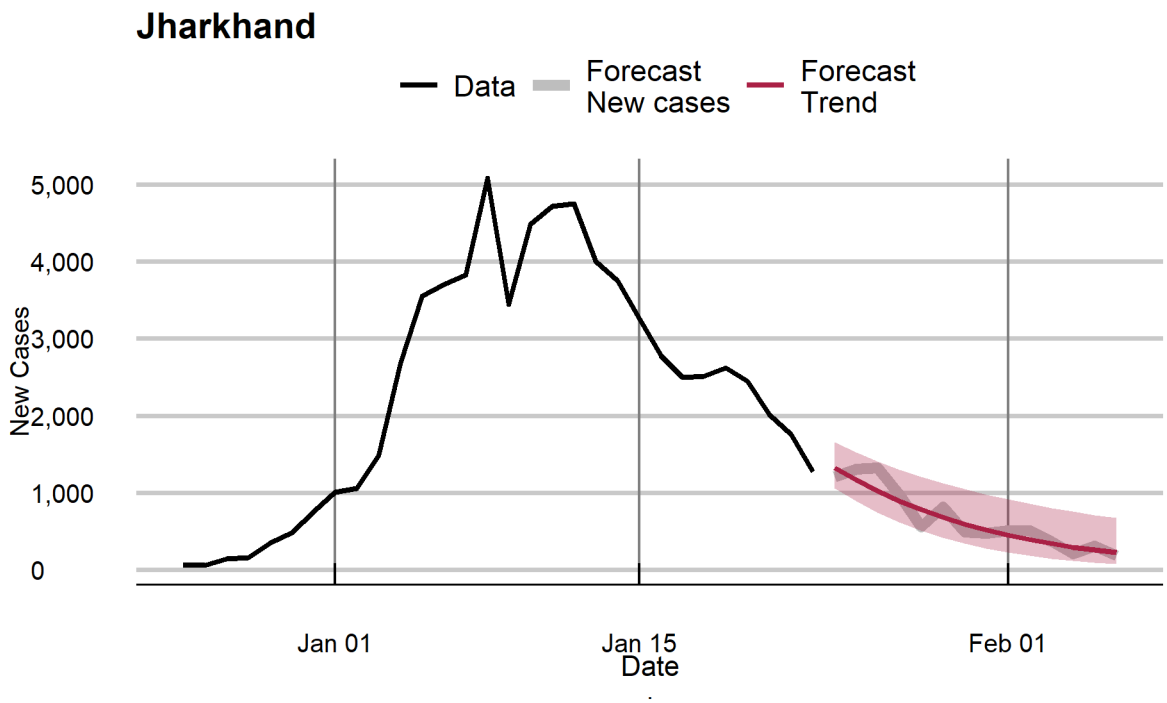

Goa
Growth rate of daily cases
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

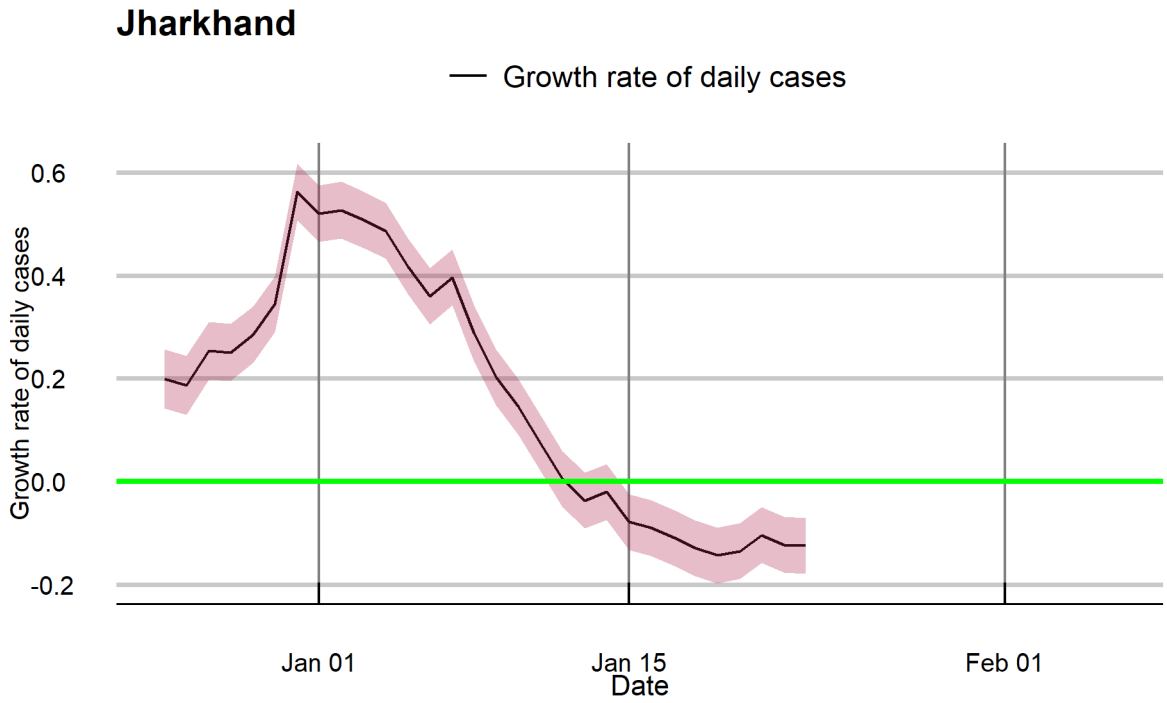

Haryana
Data
Forecast
New cases
Forecast
Trend
10,000
7,500
5,000
2,500
0
New Cases
Jan 01
Jan 15
Feb 01
Date

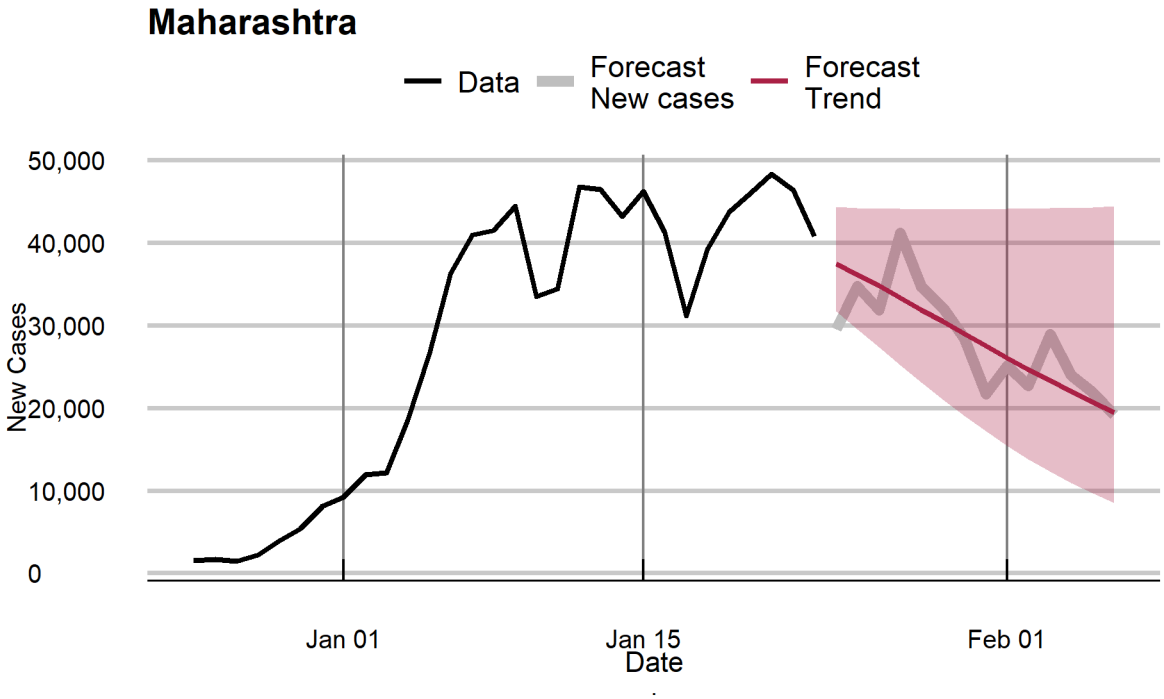

Haryana
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
-0.1
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

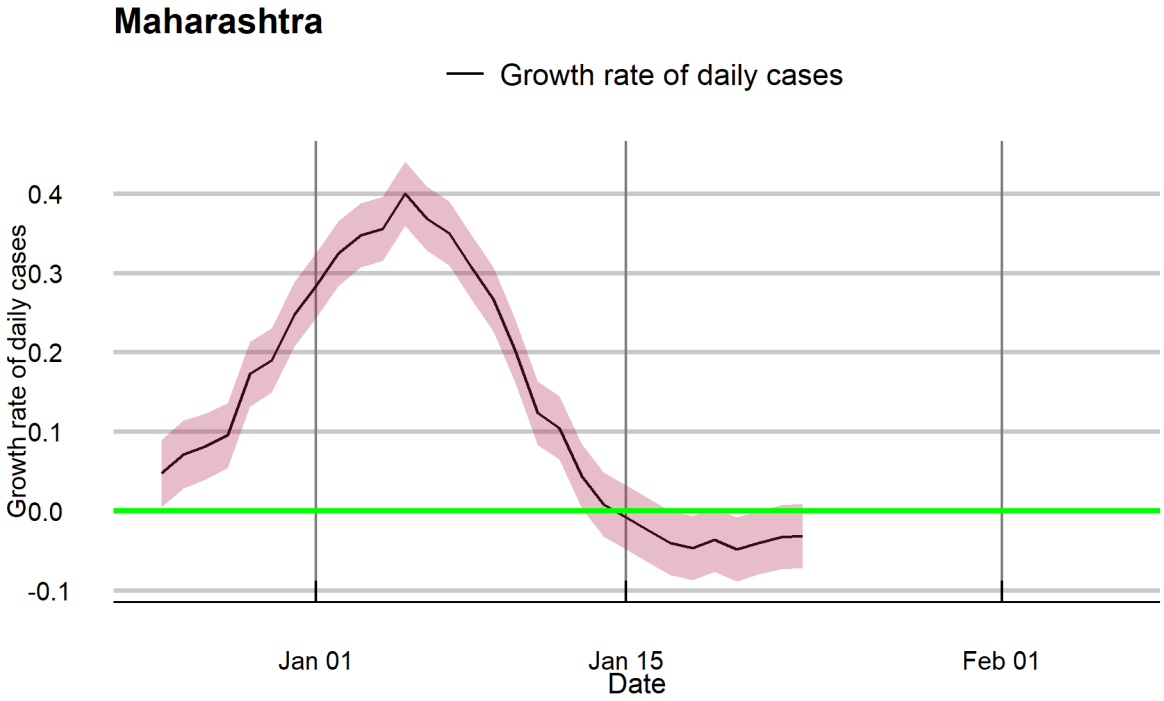

Himachal Pradesh
Data
Forecast
New cases
Forecast
Trend
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

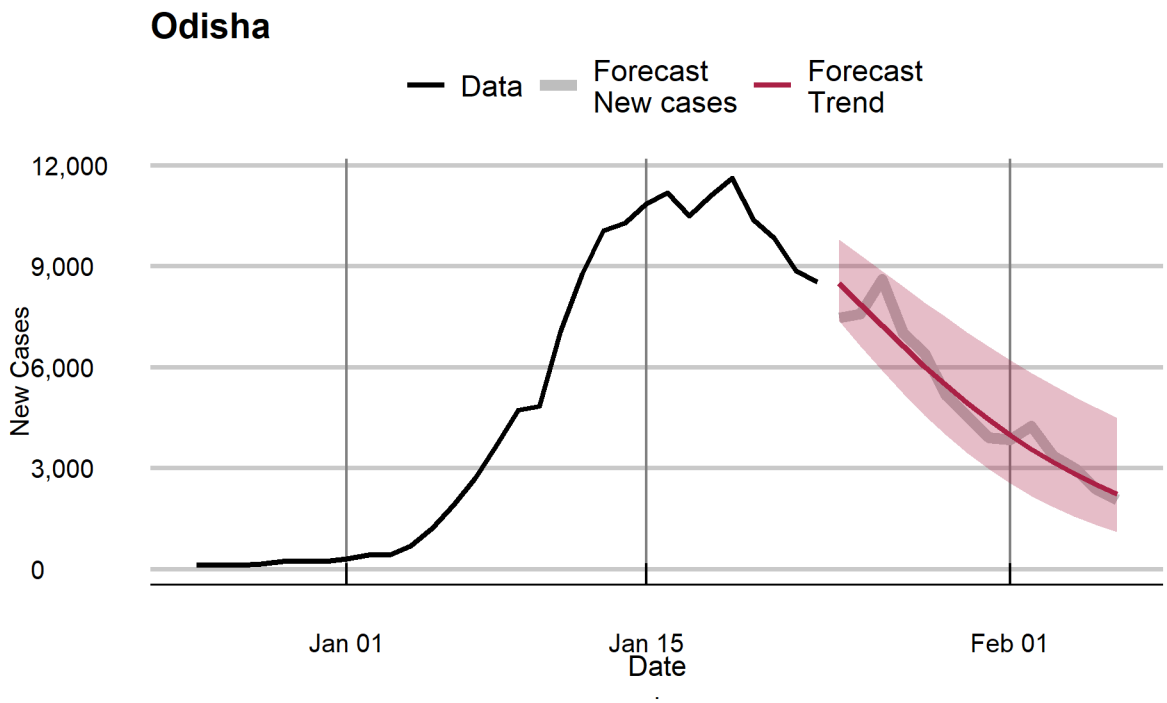

Himachal Pradesh
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
-0.1
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

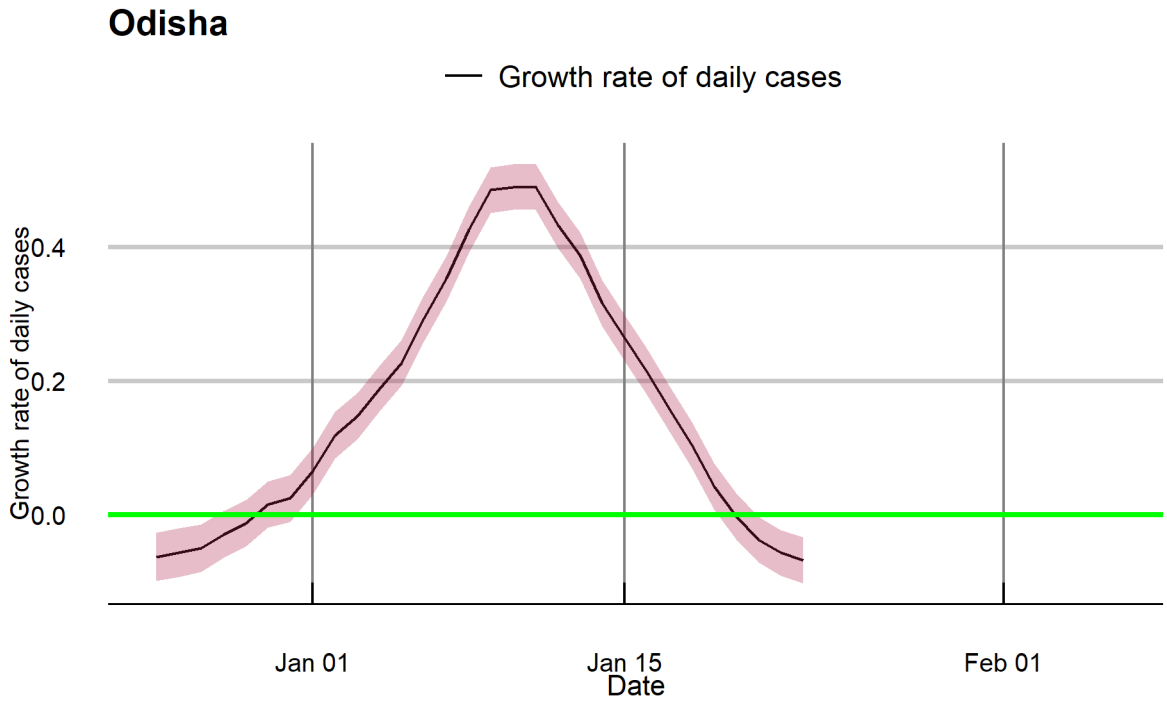

Jharkhand
Data
Forecast
New cases
Forecast
Trend
5,000
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

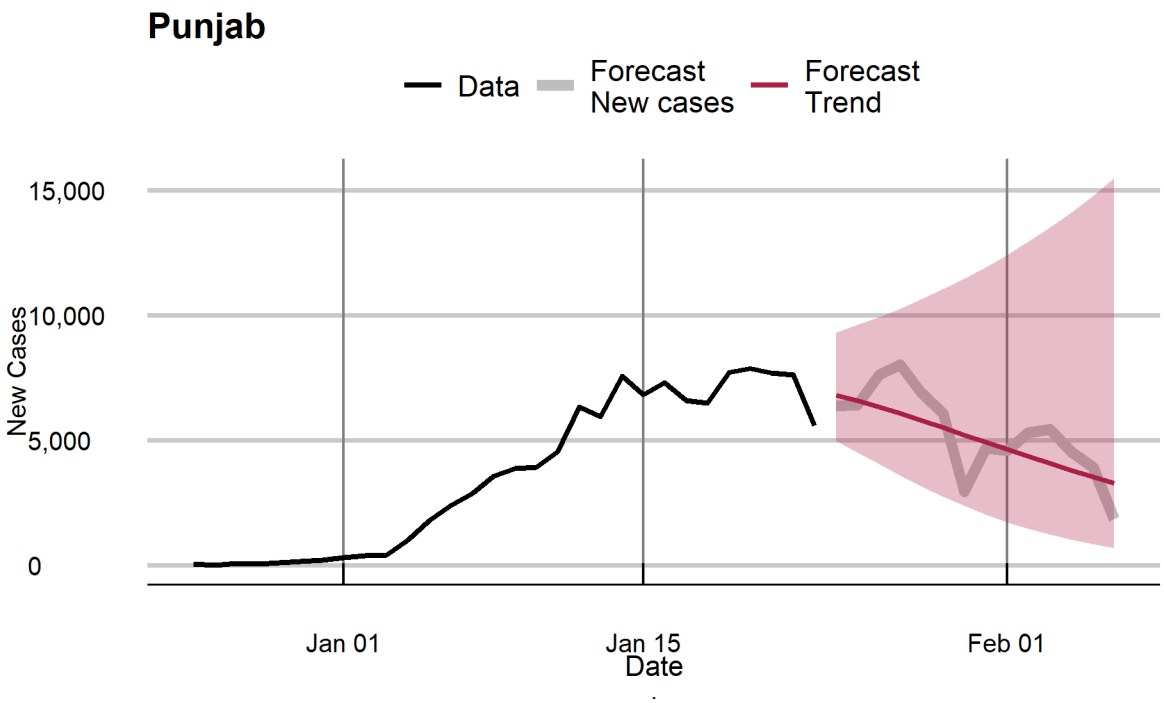

Jharkhand
Growth rate of daily cases
0.6
0.4
0.2
0.0
-0.2
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

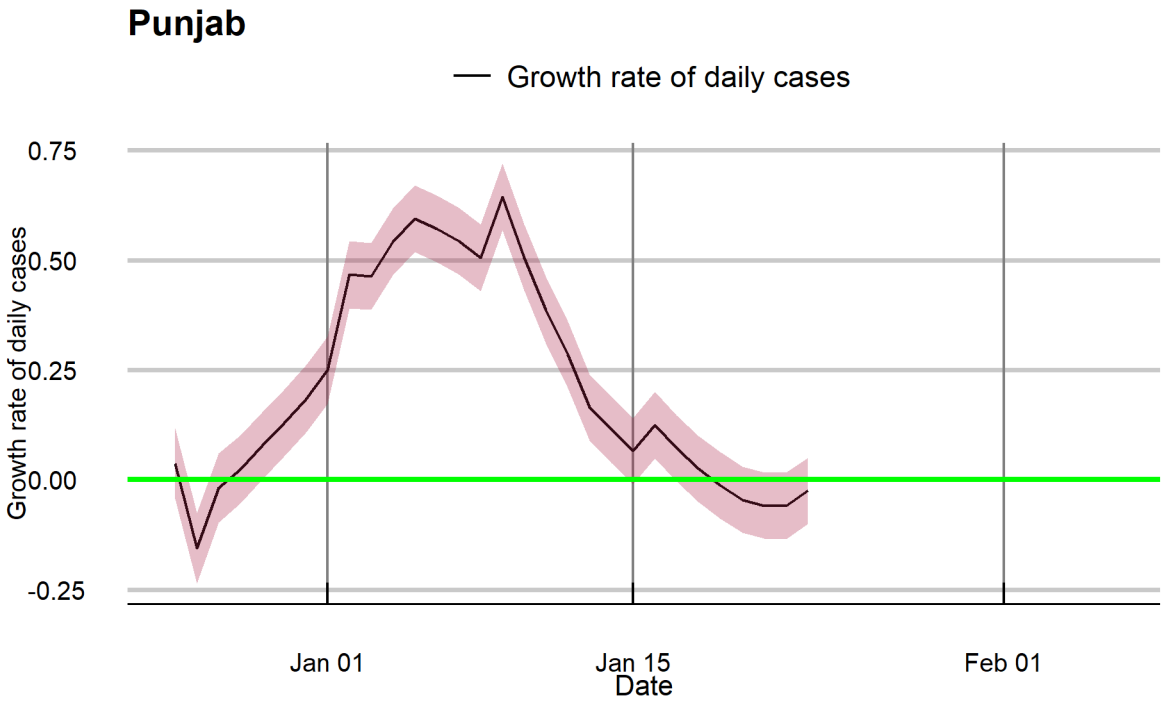

Maharashtra
Data
Forecast
New cases
Forecast
Trend
50,000
40,000
30,000
20,000
10,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

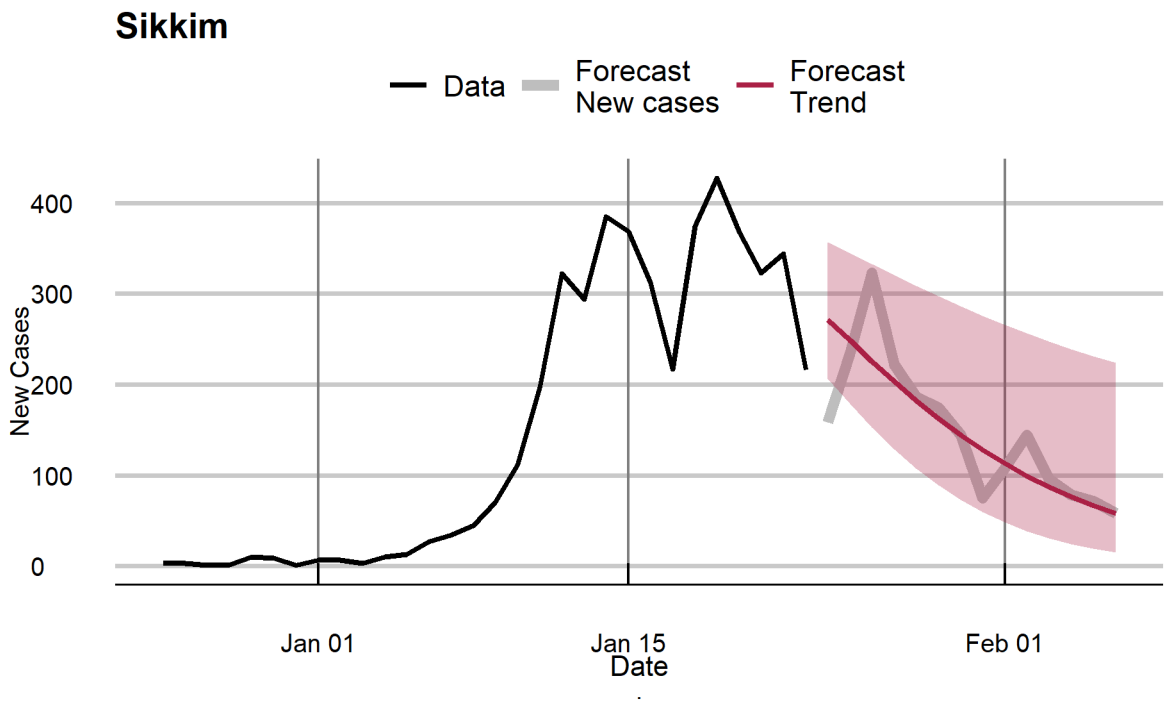

Maharashtra
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
-0.1
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

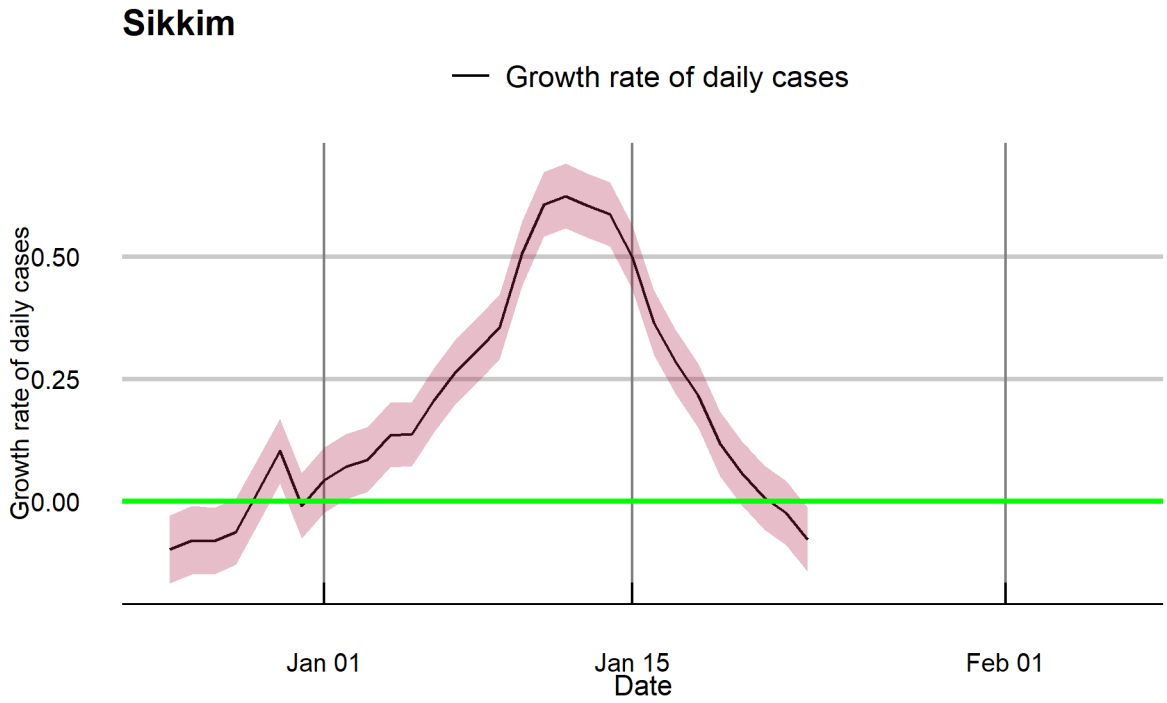

Odisha
Data
Forecast
New cases
Forecast
Trend
12,000
9,000
6,000
3,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

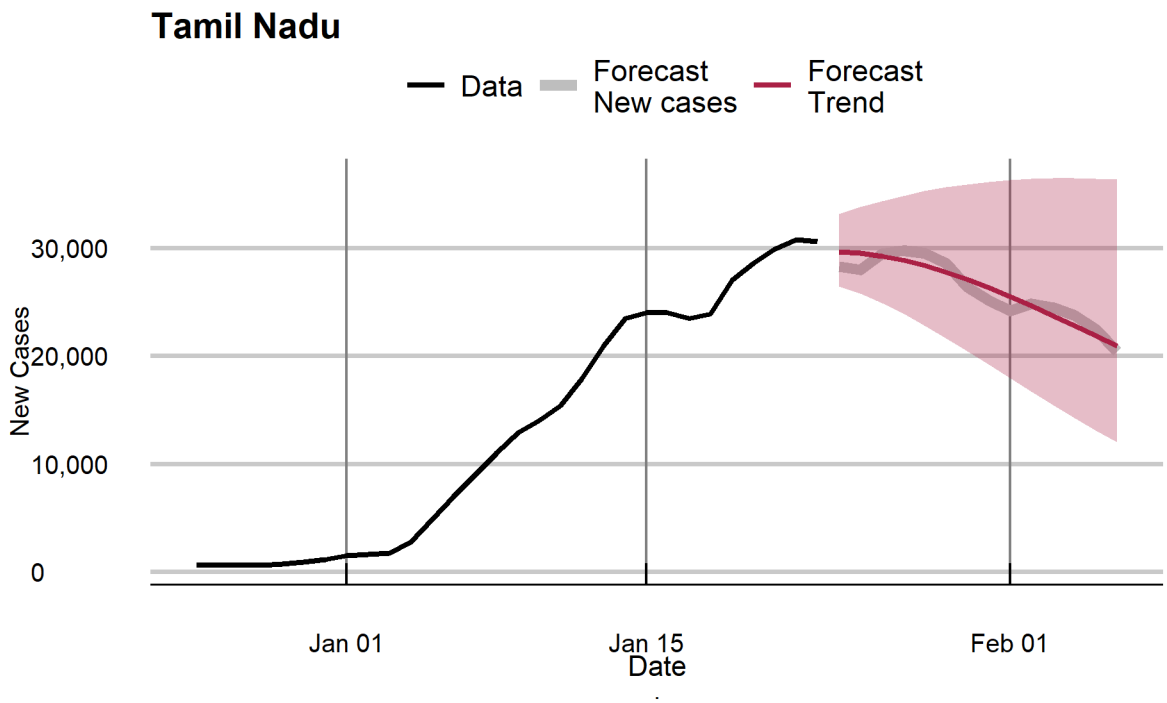

Odisha
Growth rate of daily cases
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

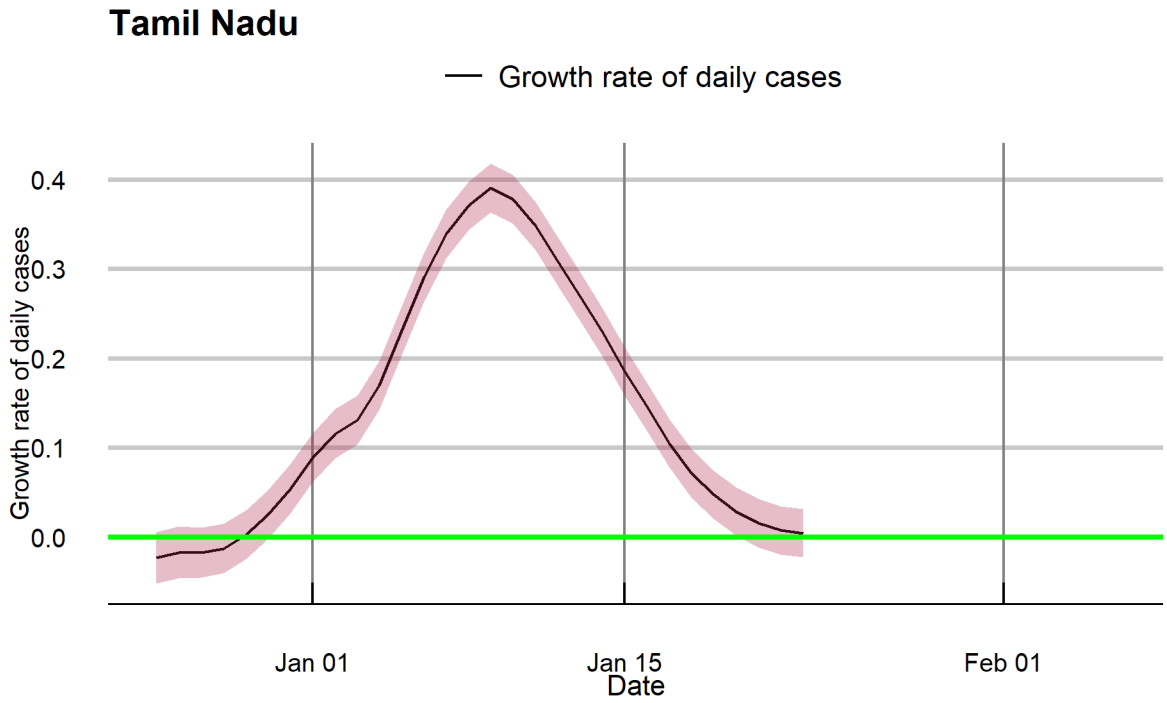

Punjab
Data
Forecast
New cases
Forecast
Trend
15,000
10,000
5,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

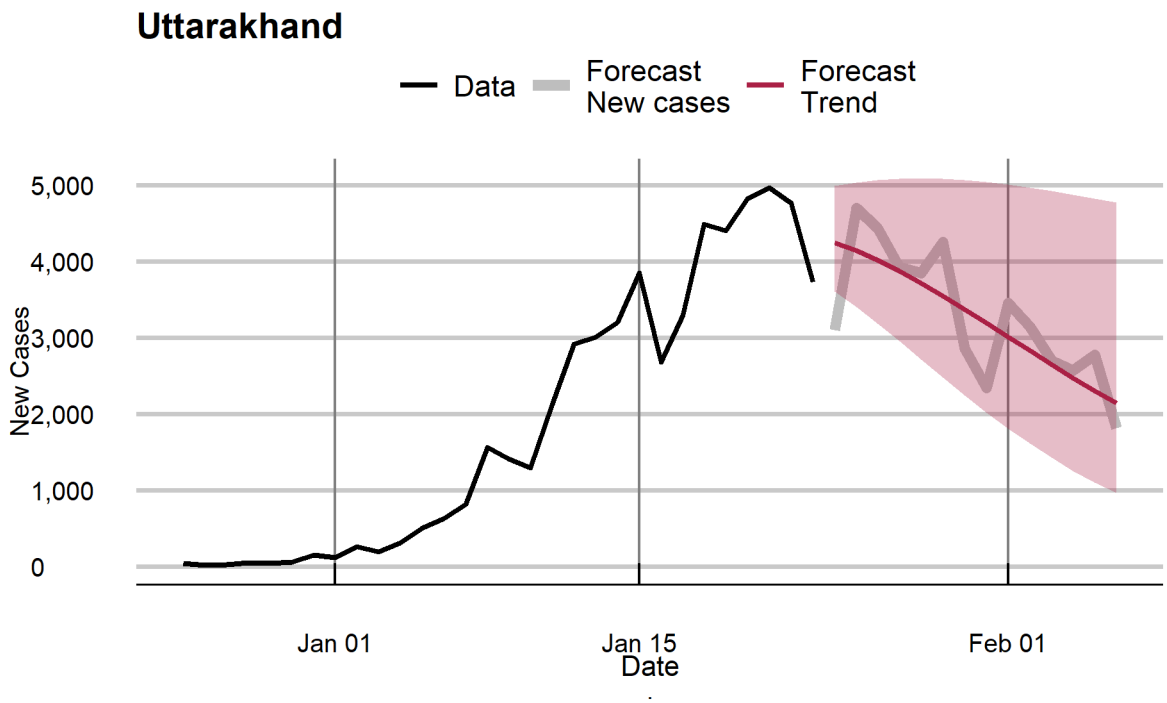

Punjab
Growth rate of daily cases
0.75
0.50
0.25
0.00
-0.25
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

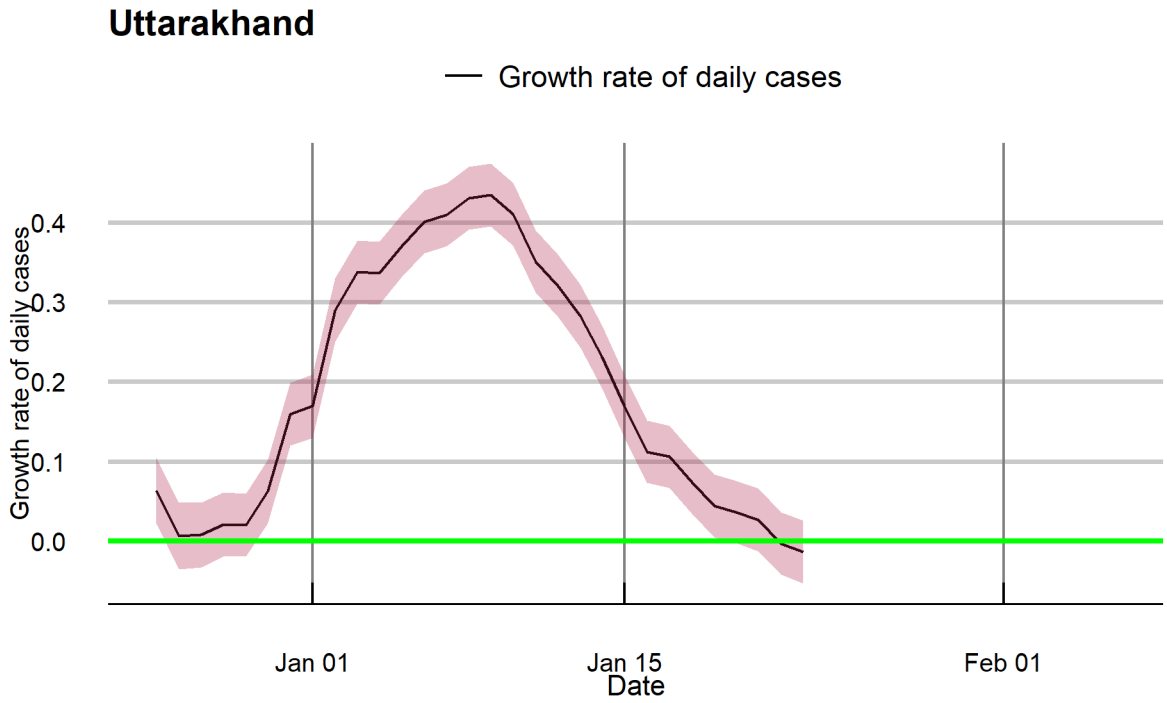

Sikkim
Data
Forecast
New cases
Forecast
Trend
400
300
200
100
0
New Cases
Jan 01
Jan 15
Feb 01
Date

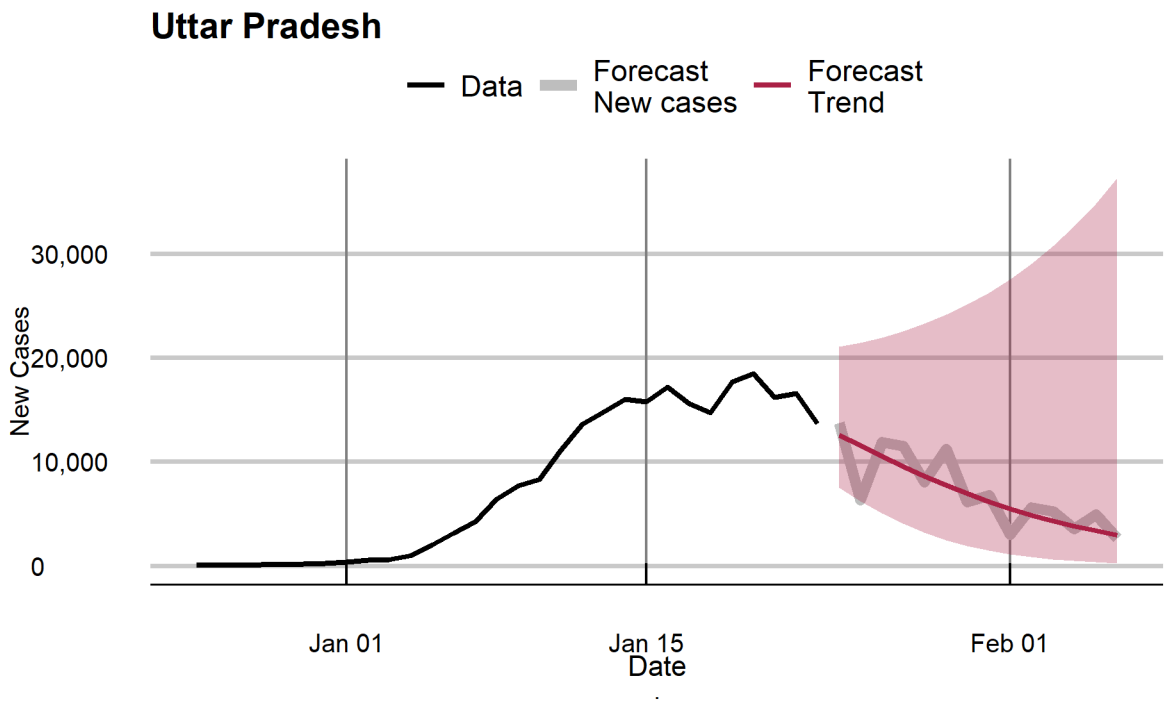

Sikkim
Growth rate of daily cases
0.50
0.25
0.00
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

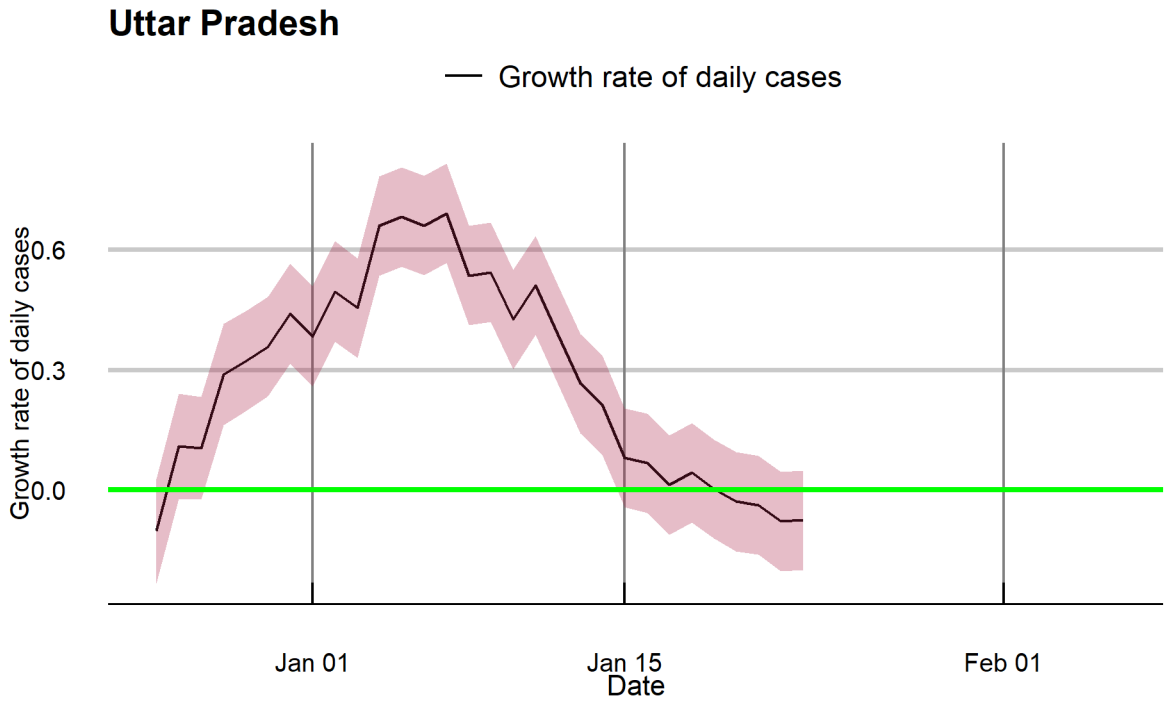

Tamil Nadu
Data
Forecast
New cases
Forecast
Trend
30,000
20,000
10,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

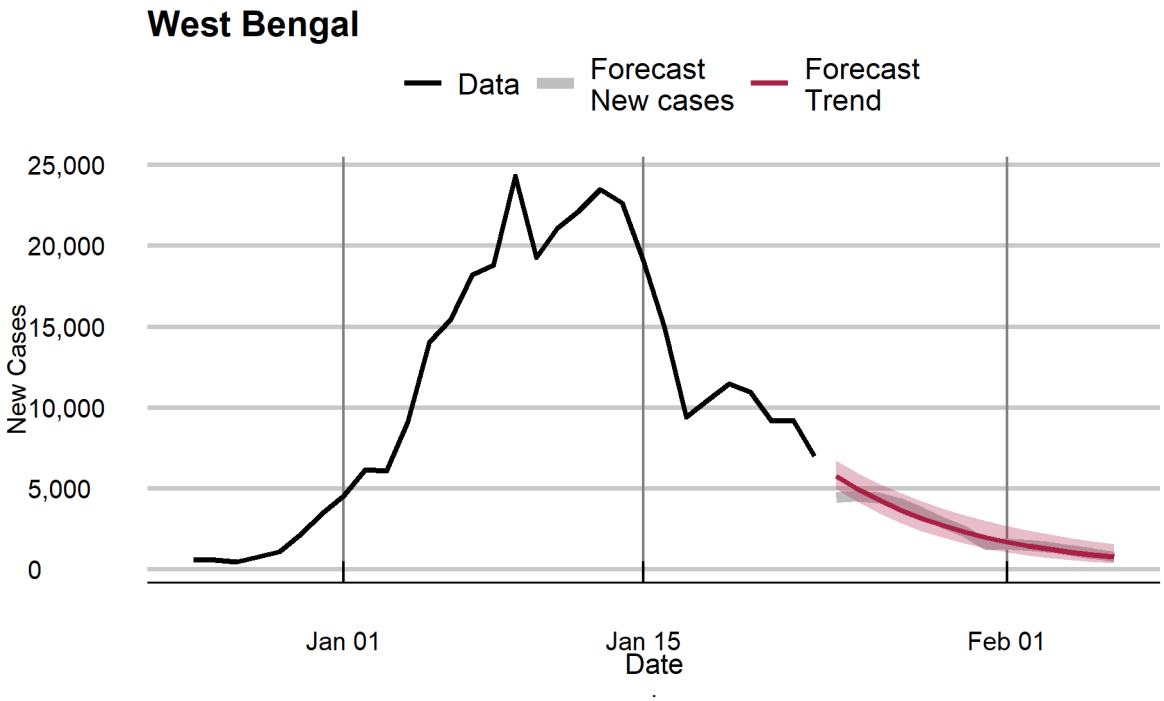

Tamil Nadu
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

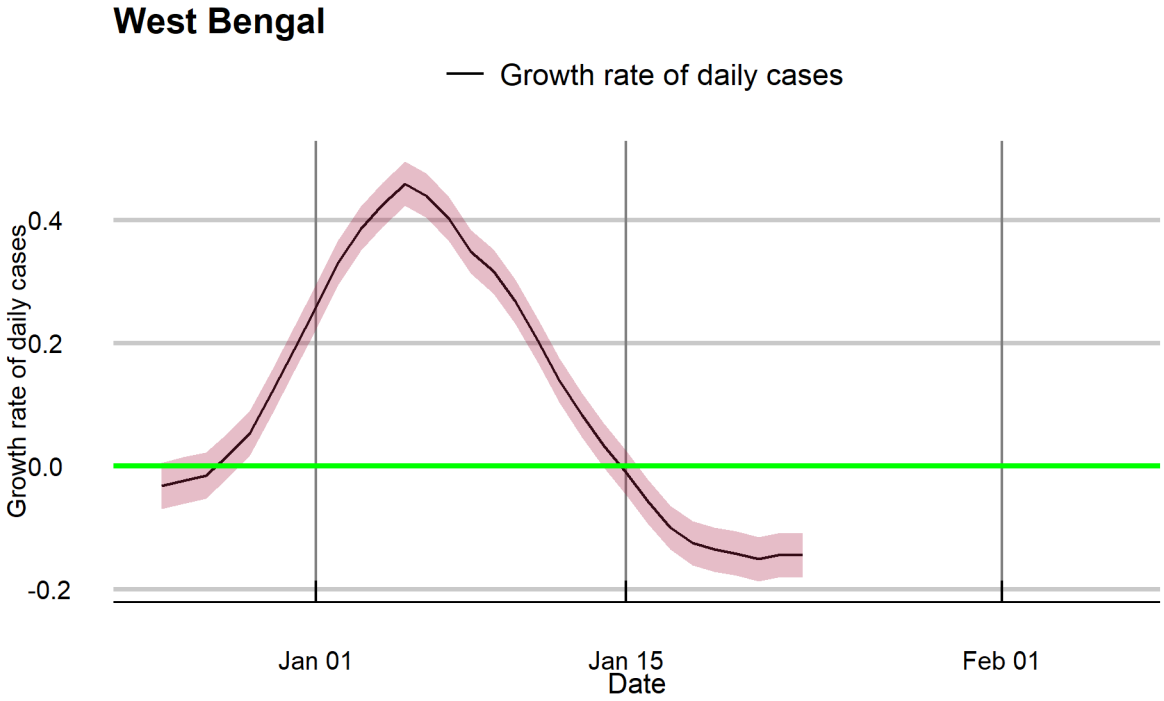

Uttarakhand
Data
Forecast
New cases
Forecast
Trend
5,000
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date


Uttarakhand
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

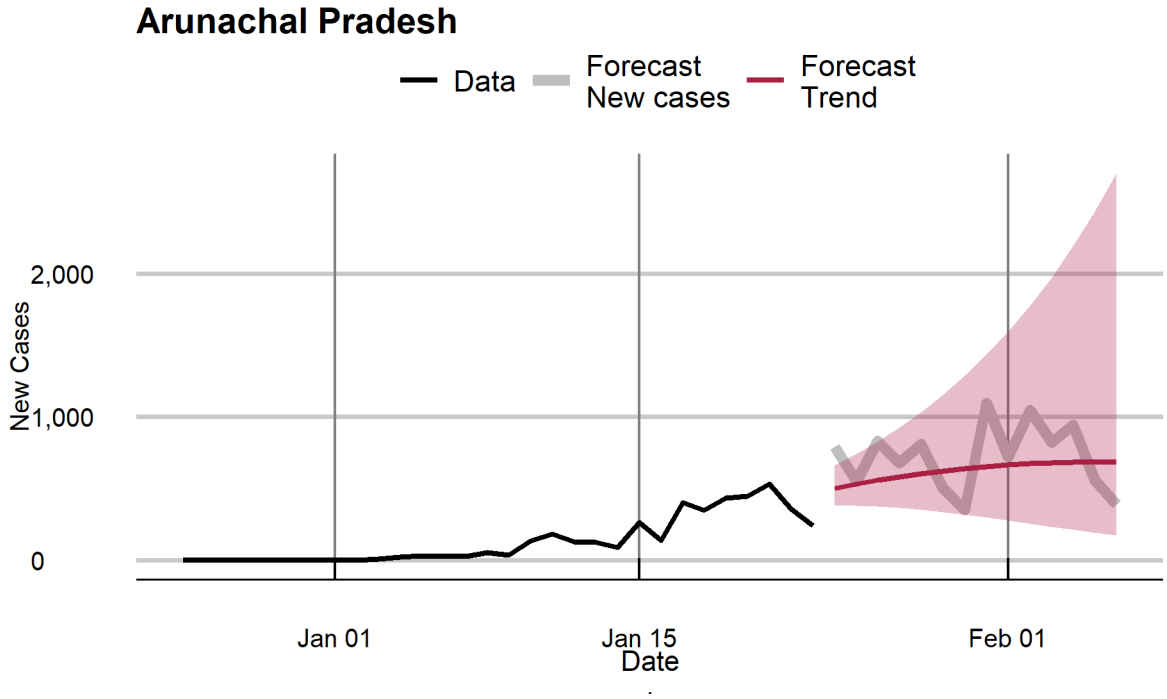

Uttar Pradesh
Data
Forecast
New cases
Forecast
Trend
30,000
20,000
10,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

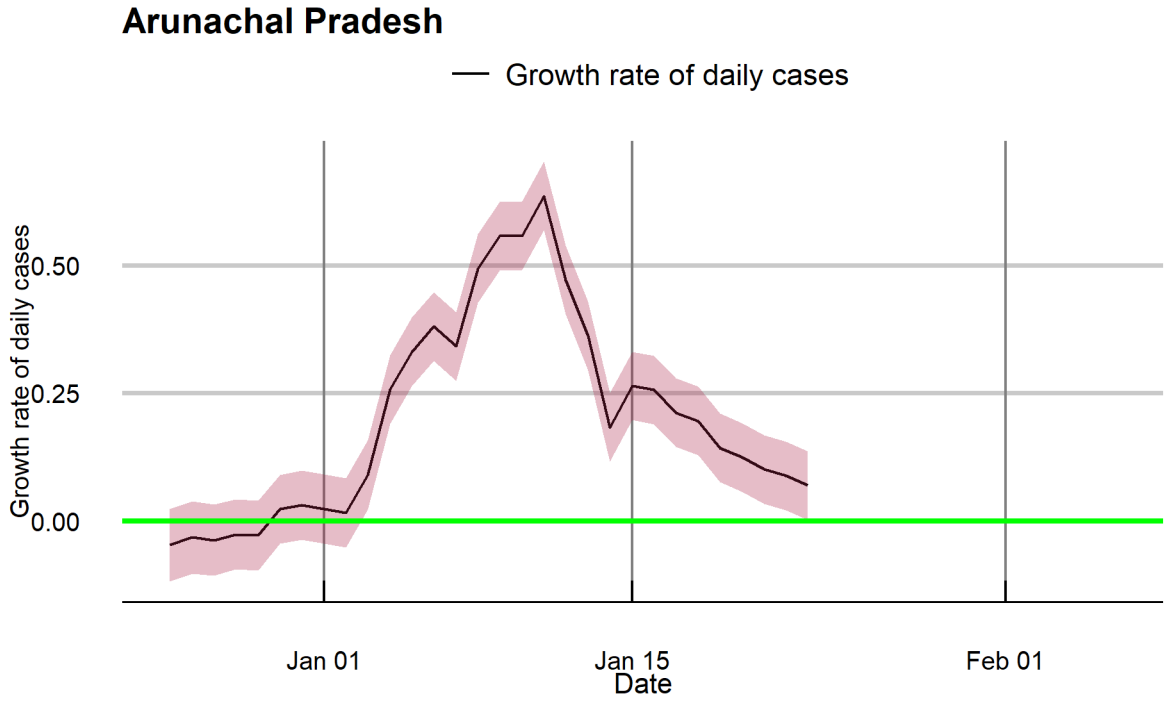

Uttar Pradesh
Growth rate of daily cases
0.6
0.3
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

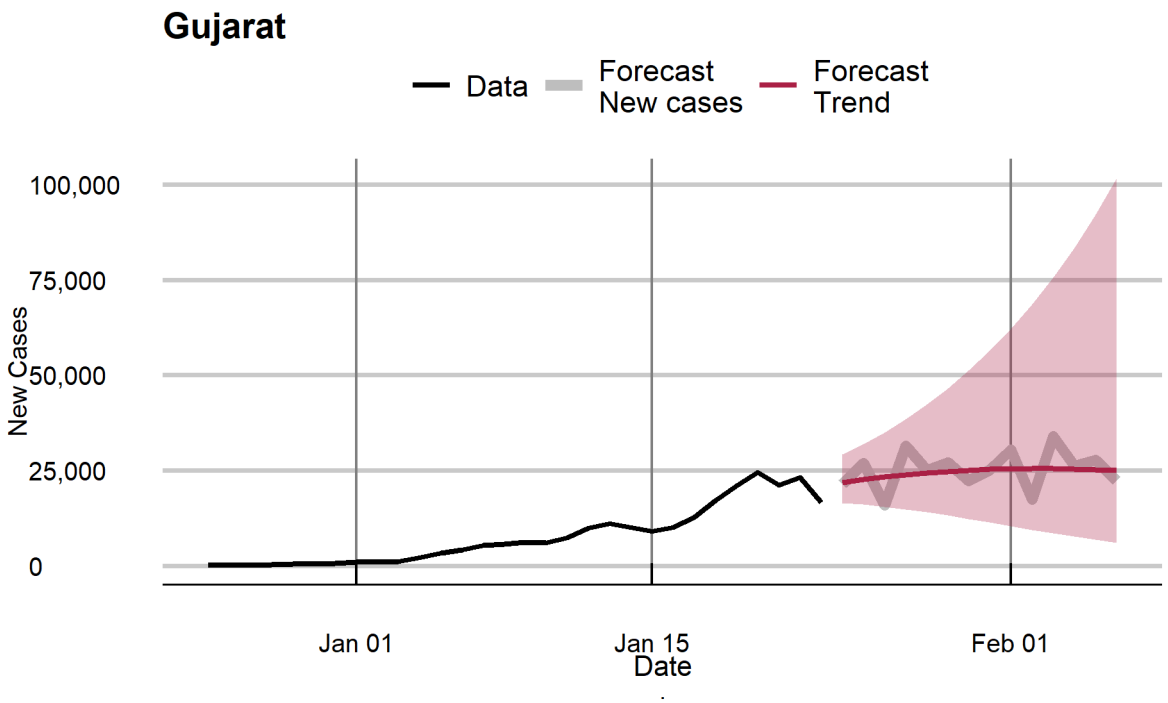

West Bengal
Data
Forecast
New cases
Forecast
Trend
25,000
20,000
15,000
10,000
5,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

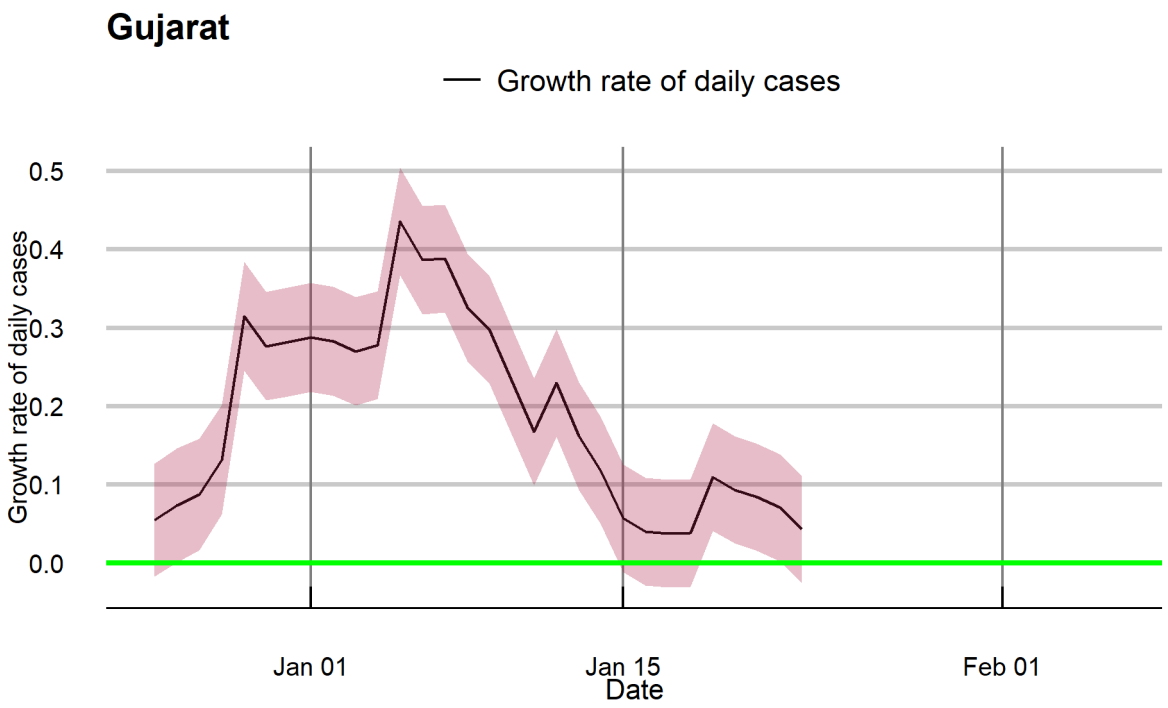

West Bengal
Growth rate of daily cases
0.4
0.2
0.0
-0.2
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

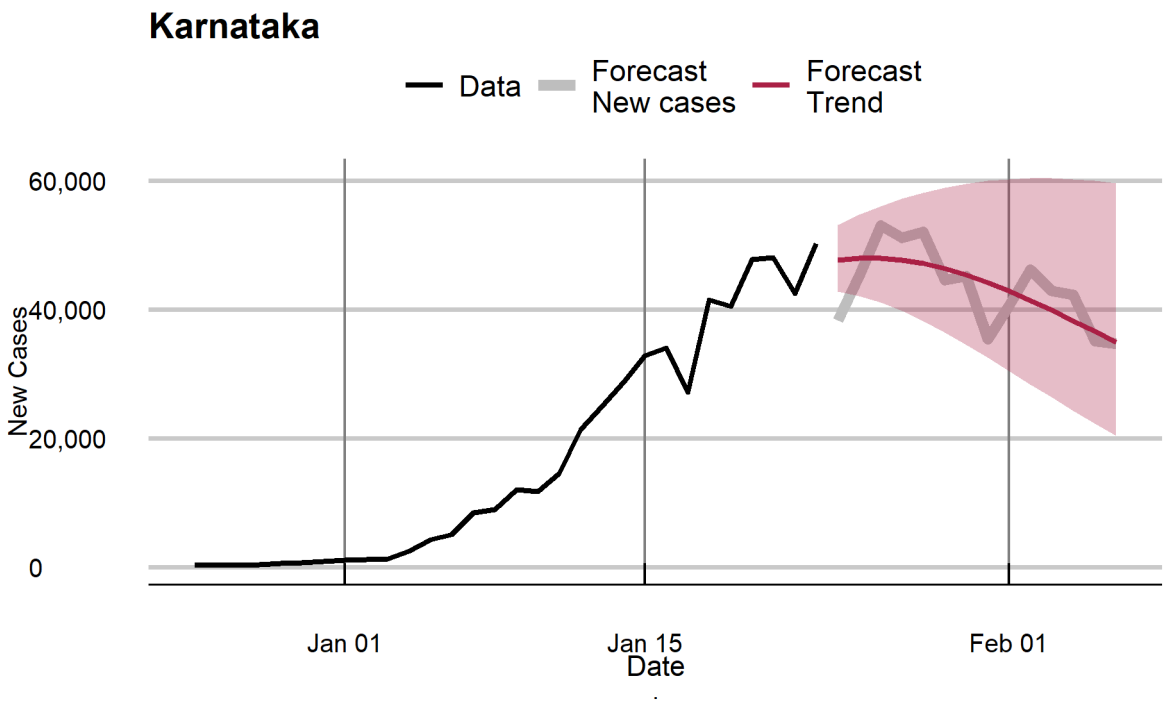
Forecasts of daily cases and filtered daily growth rates of cases for states and union territories whose peaks are reliably imminent

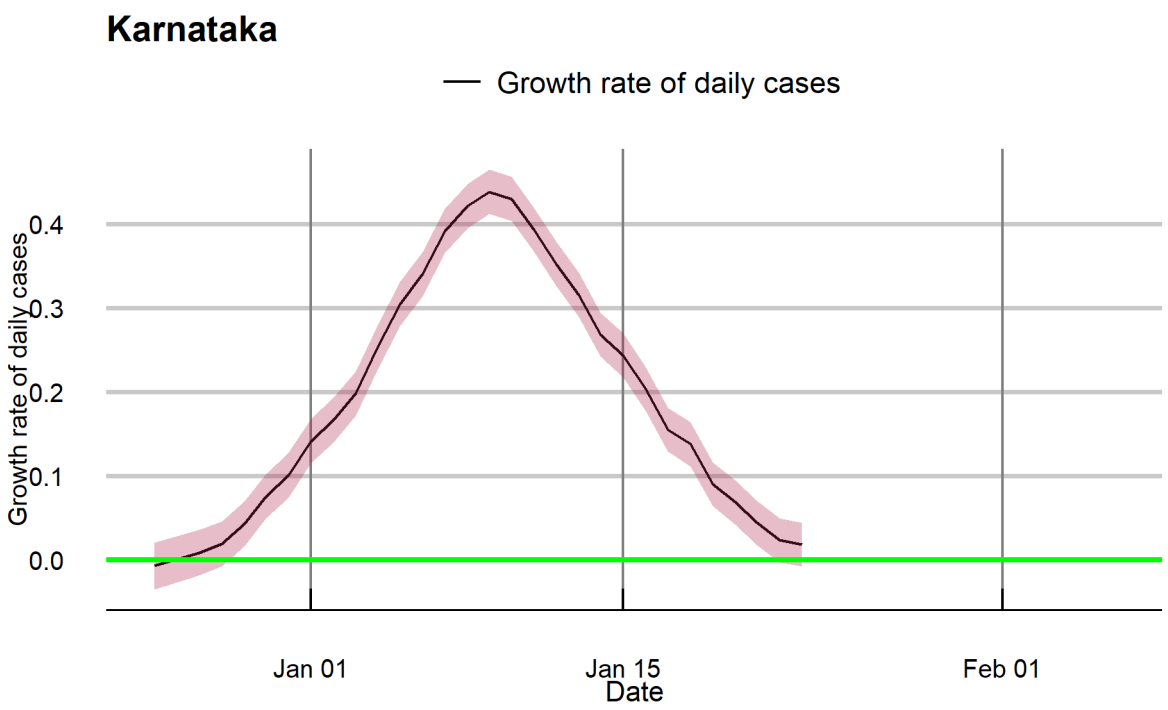


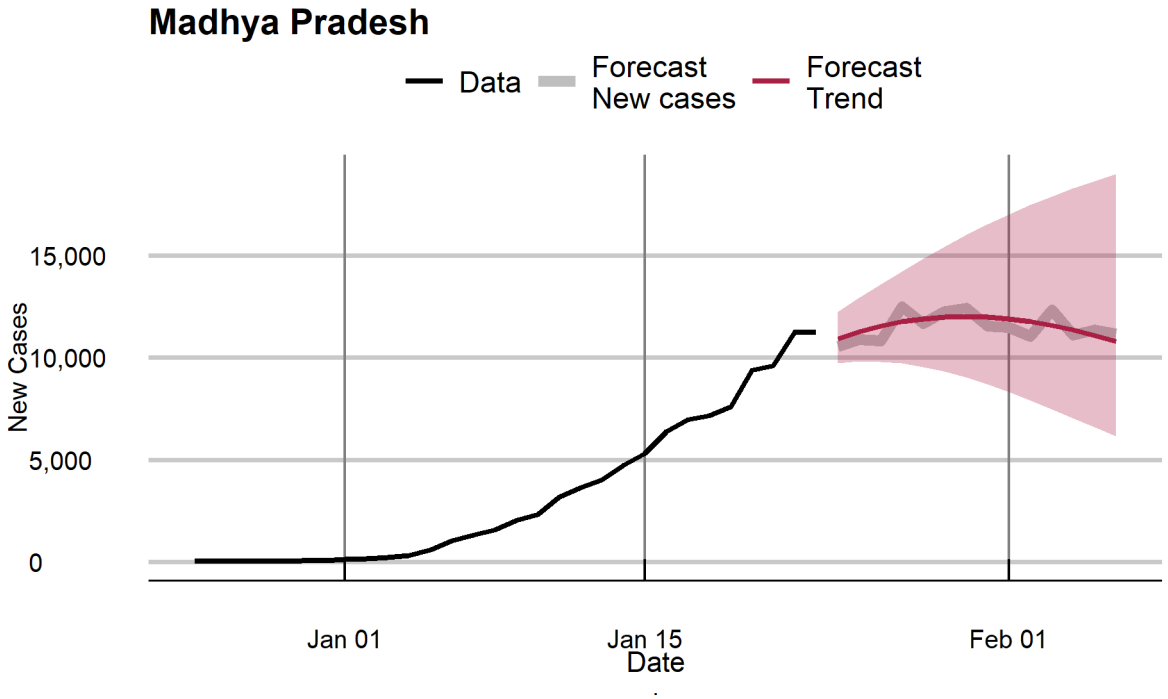


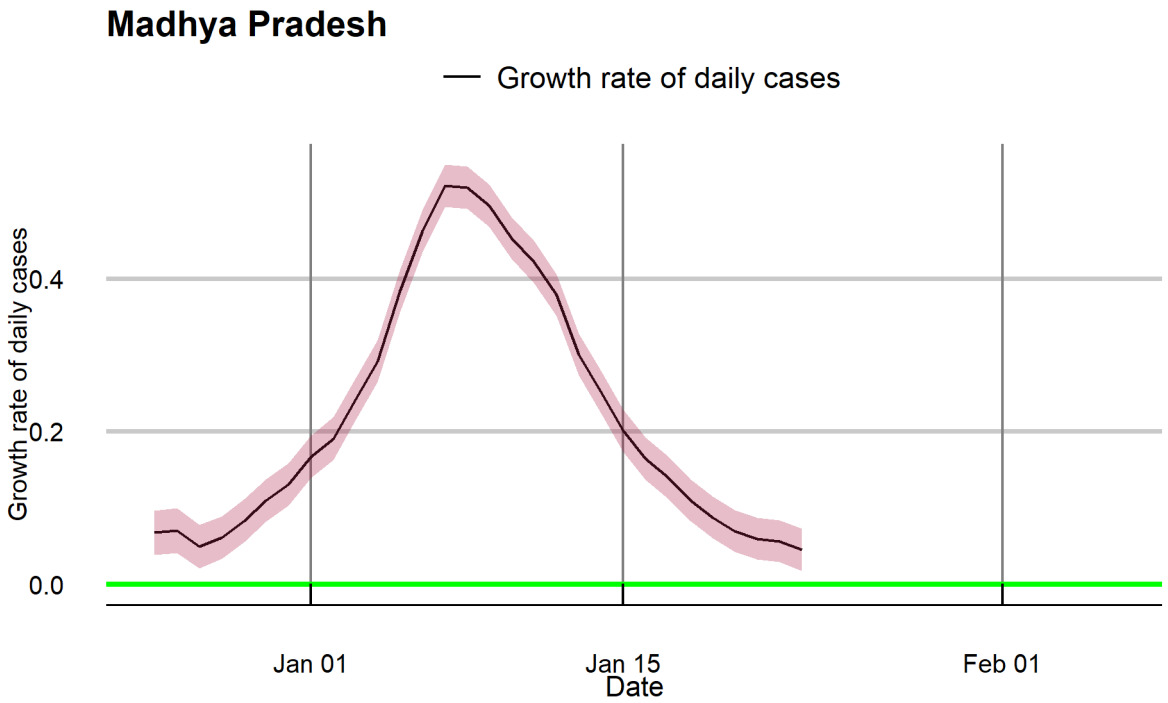

Gujarat
Data
Forecast
New cases
Forecast
Trend
100,000
75,000
50,000
25,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

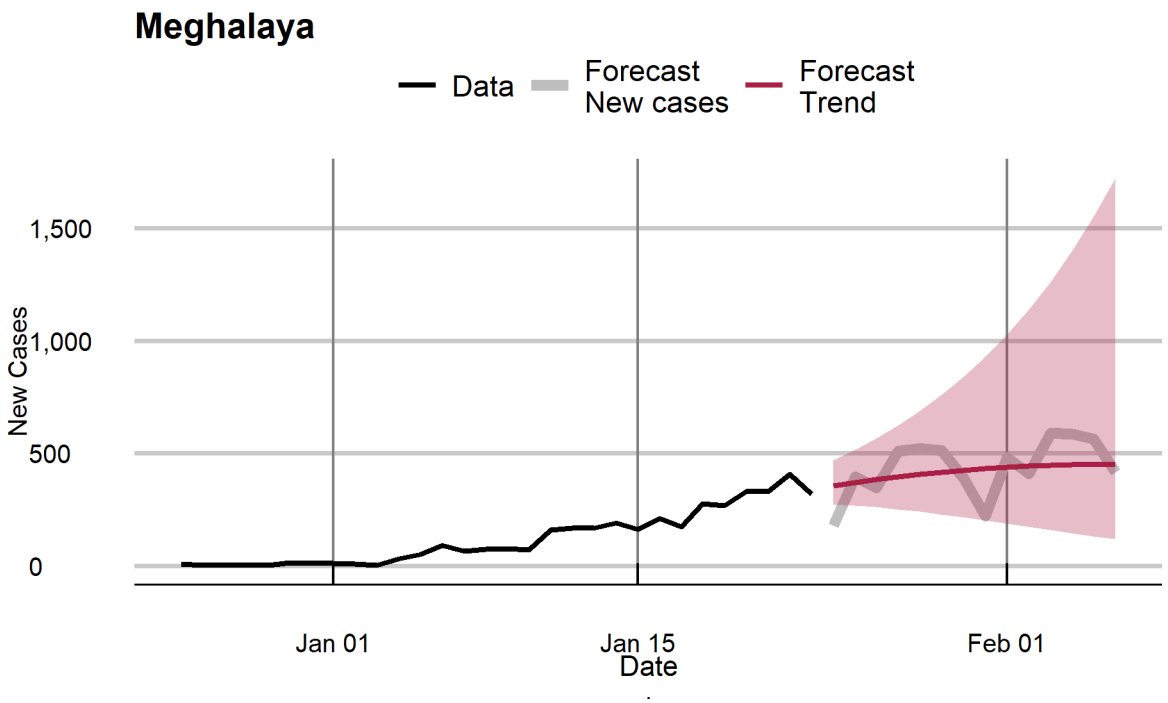

Gujarat
Growth rate of daily cases
0.5
0.4
0.3
0.2
0.1
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

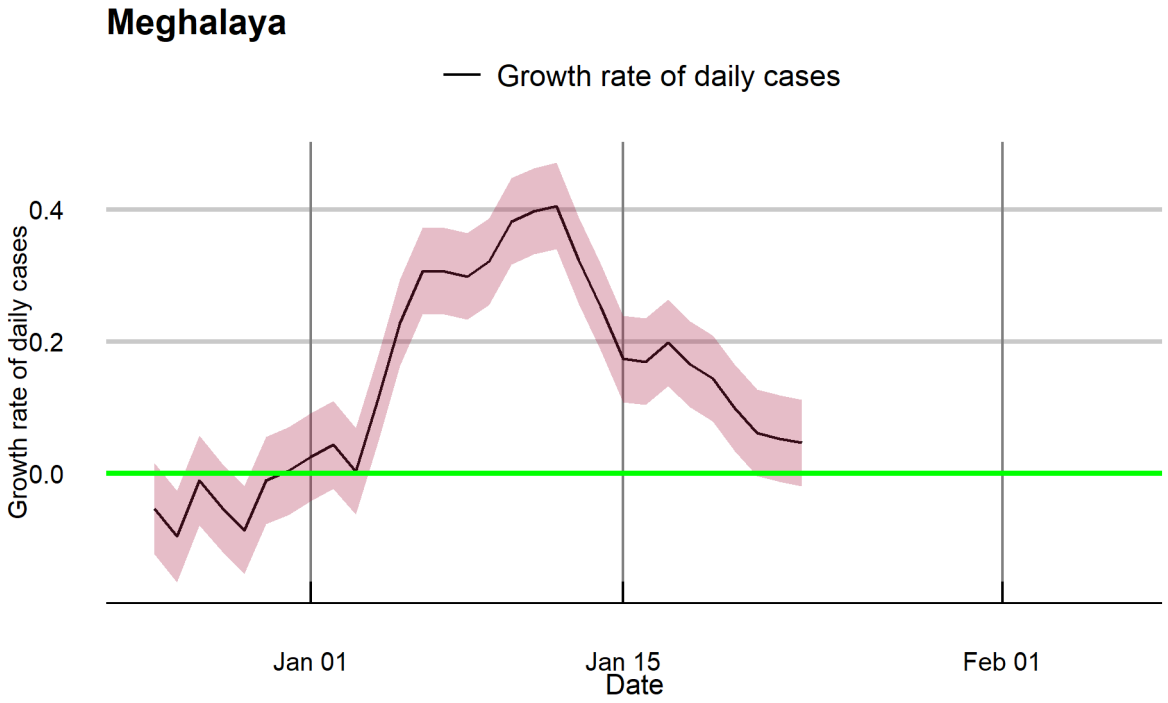

Karnataka
Data
Forecast
New cases
Forecast
Trend
60,000
40,000
20,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

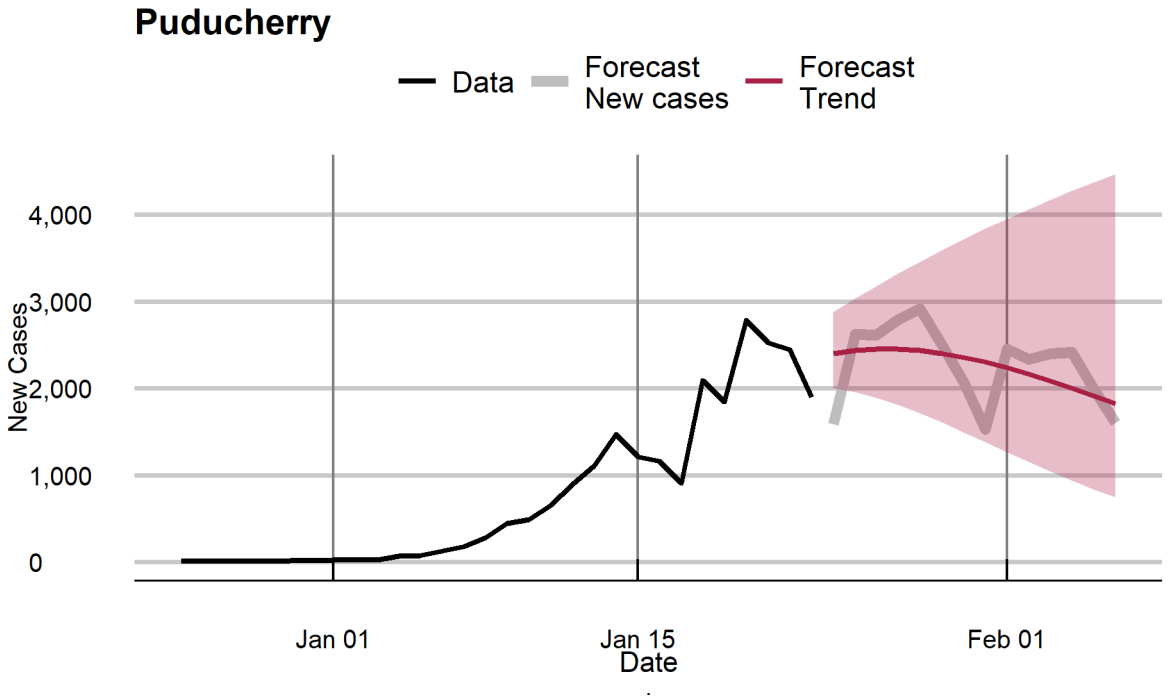

Karnataka
Growth rate of daily cases
0.4
0.3
0.2
0.1
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

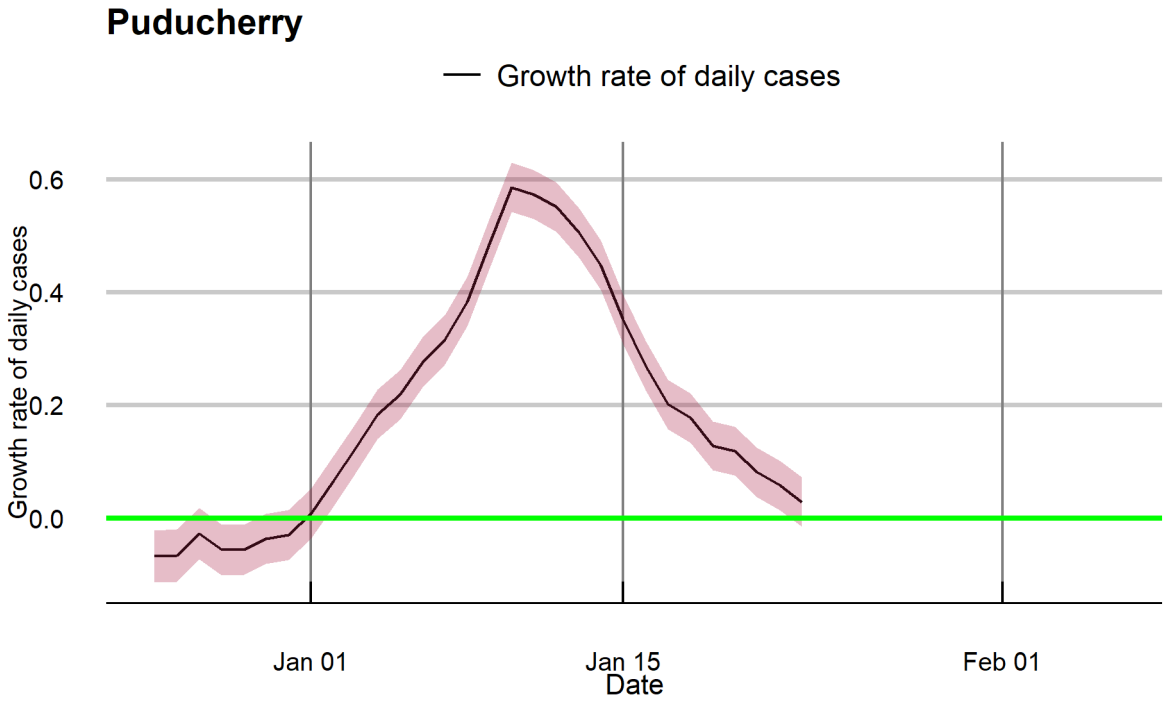

Madhya Pradesh
Data
Forecast
New cases
Forecast
Trend
15,000
10,000
5,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

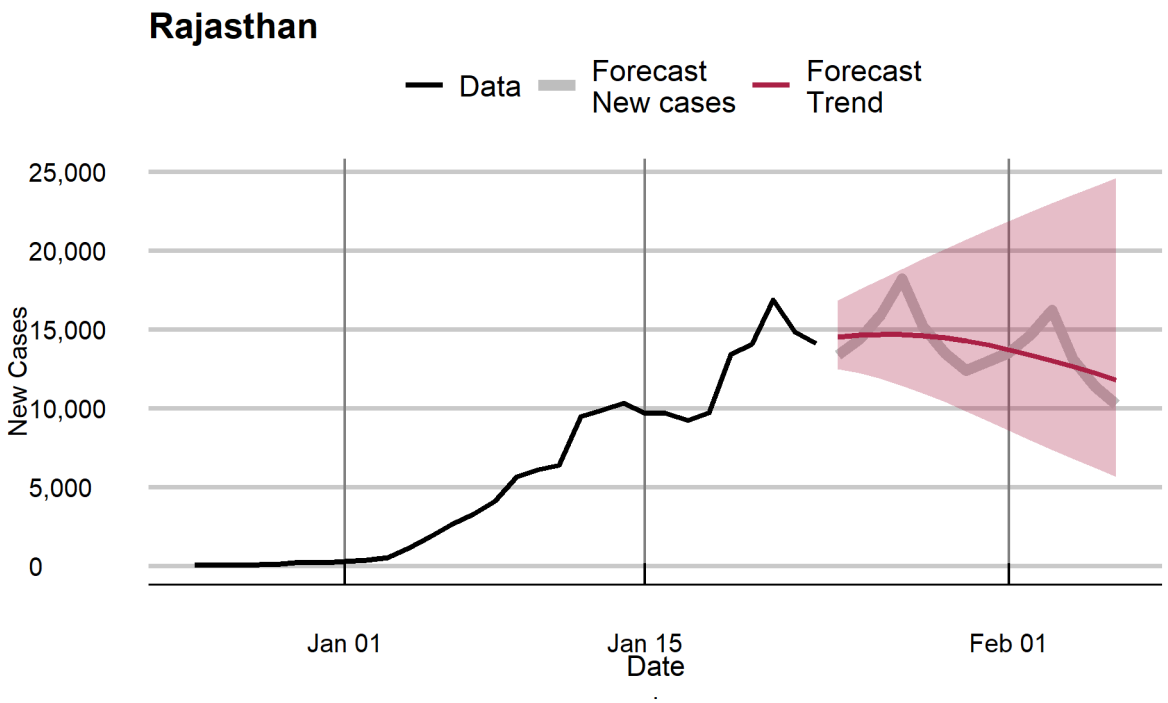

Madhya Pradesh
Growth rate of daily cases
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

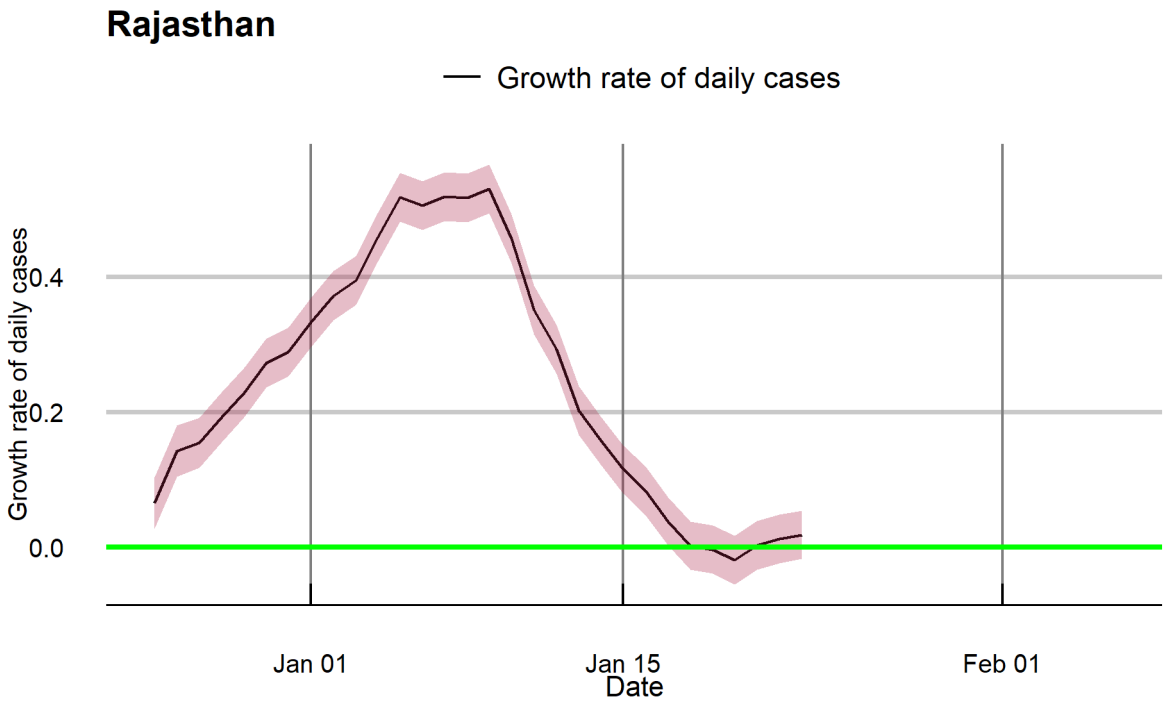

Meghalaya
Data
Forecast
New cases
Forecast
Trend
1,500
1,000
500
0
New Cases
Jan 01
Jan 15
Feb 01
Date


Meghalaya
Growth rate of daily cases
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

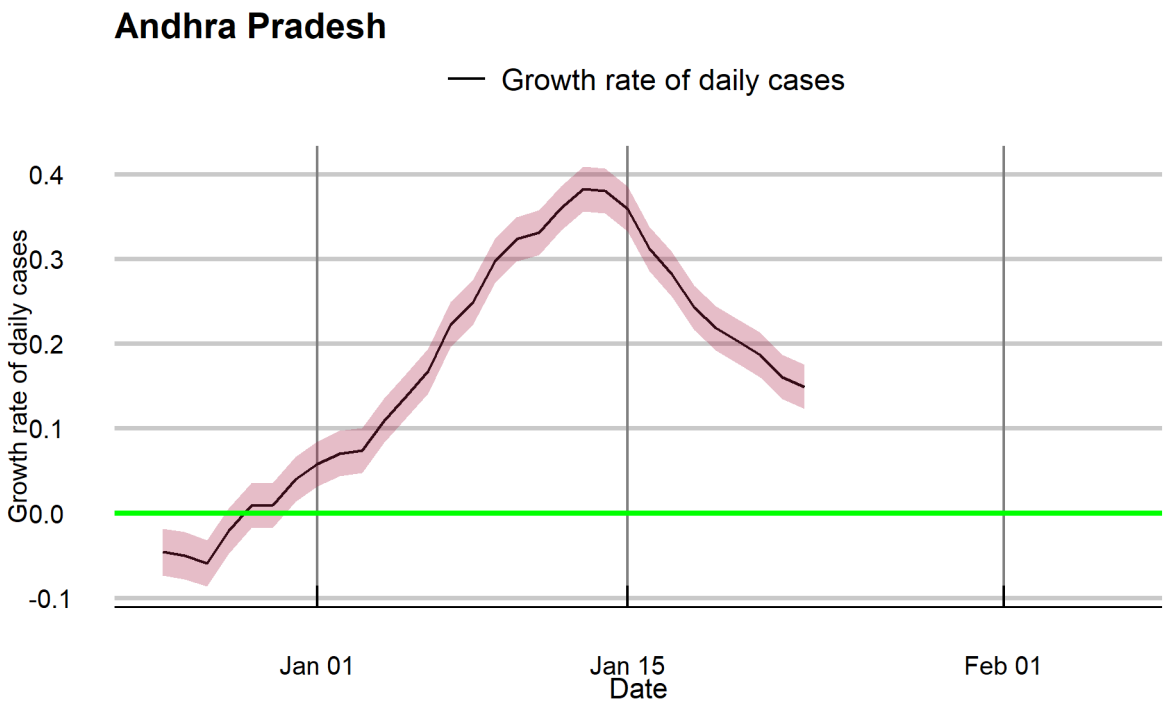

Puducherry
Data
Forecast
New cases
Forecast
Trend
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

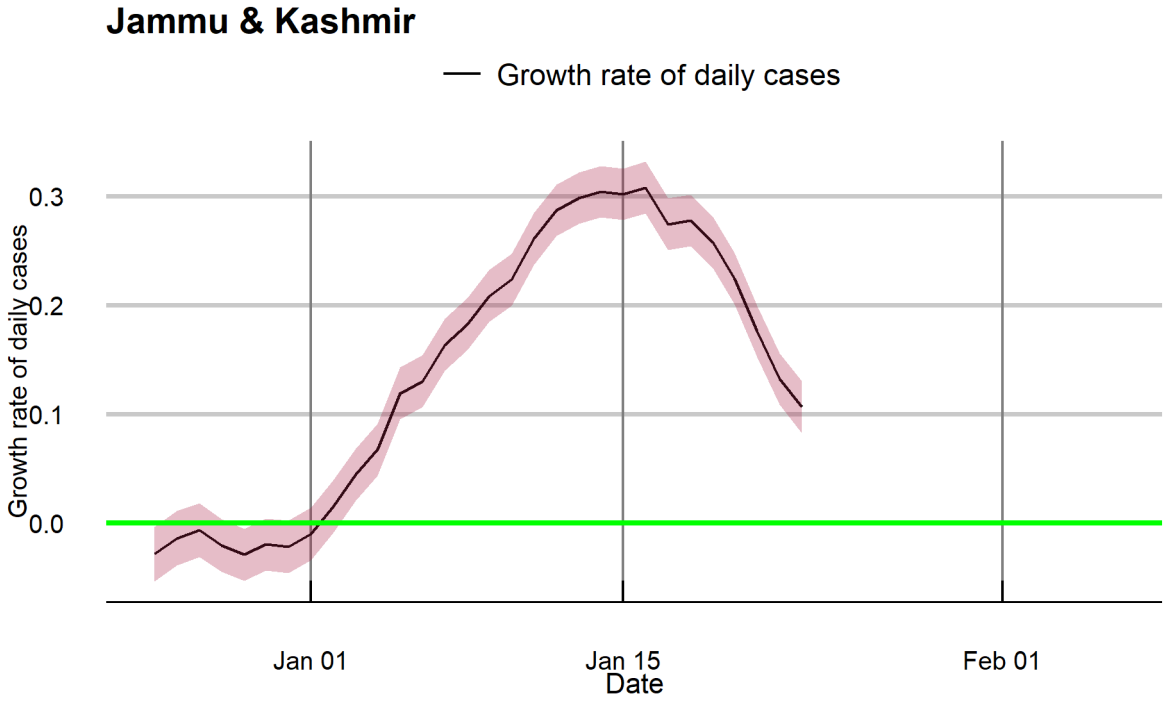

Puducherry
Growth rate of daily cases
0.6
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date


Rajasthan
Data
Forecast
New cases
Forecast
Trend
25,000
20,000
15,000
10,000
5,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

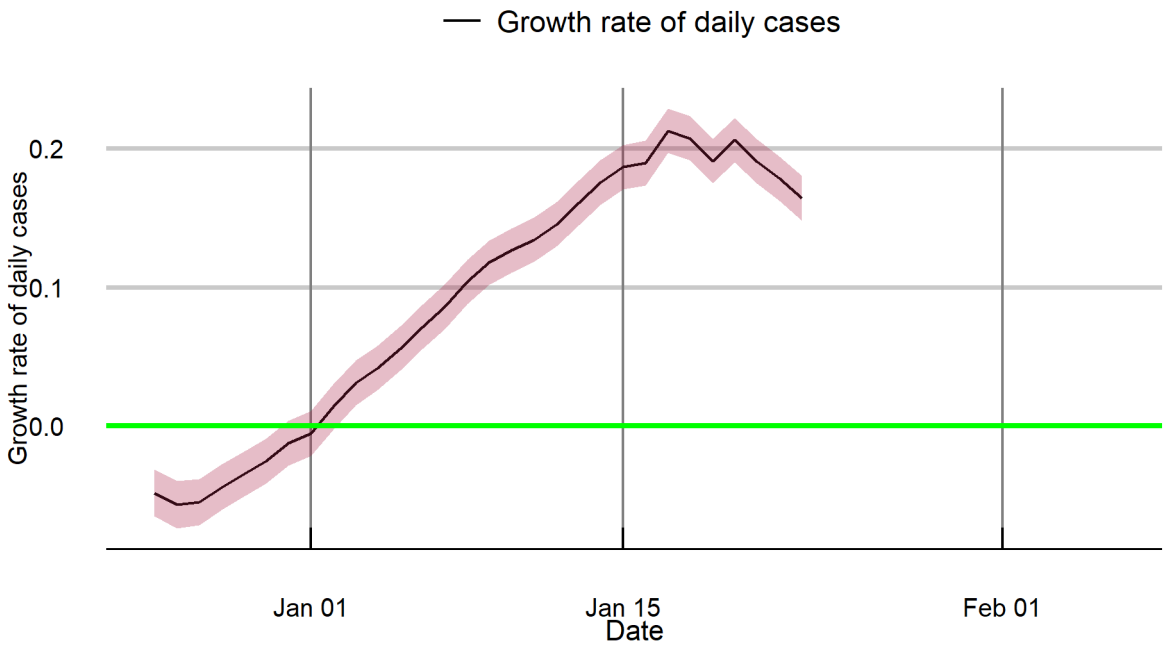

Rajasthan
Growth rate of daily cases
0.4
0.2
0.0
Growth rate of daily cases
Jan 01
Jan 15
Feb 01
Date

<u>Filtered daily growth rates of new cases</u> for states and union territories whose peak estimates are less reliable: days leading up to 23 January 2022

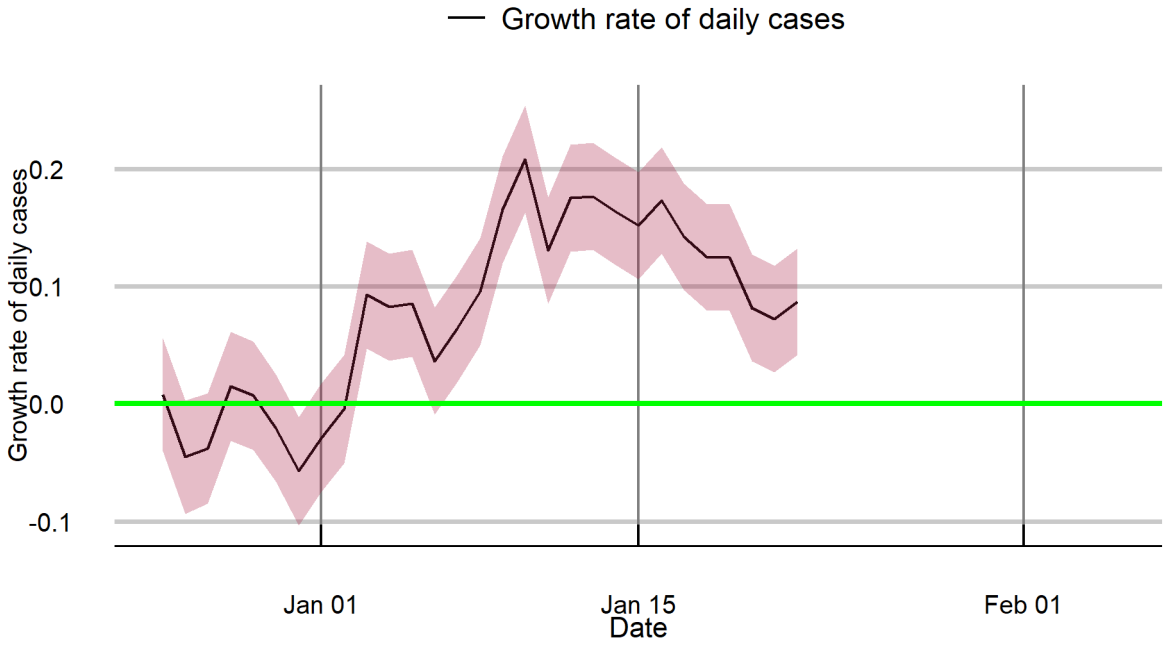




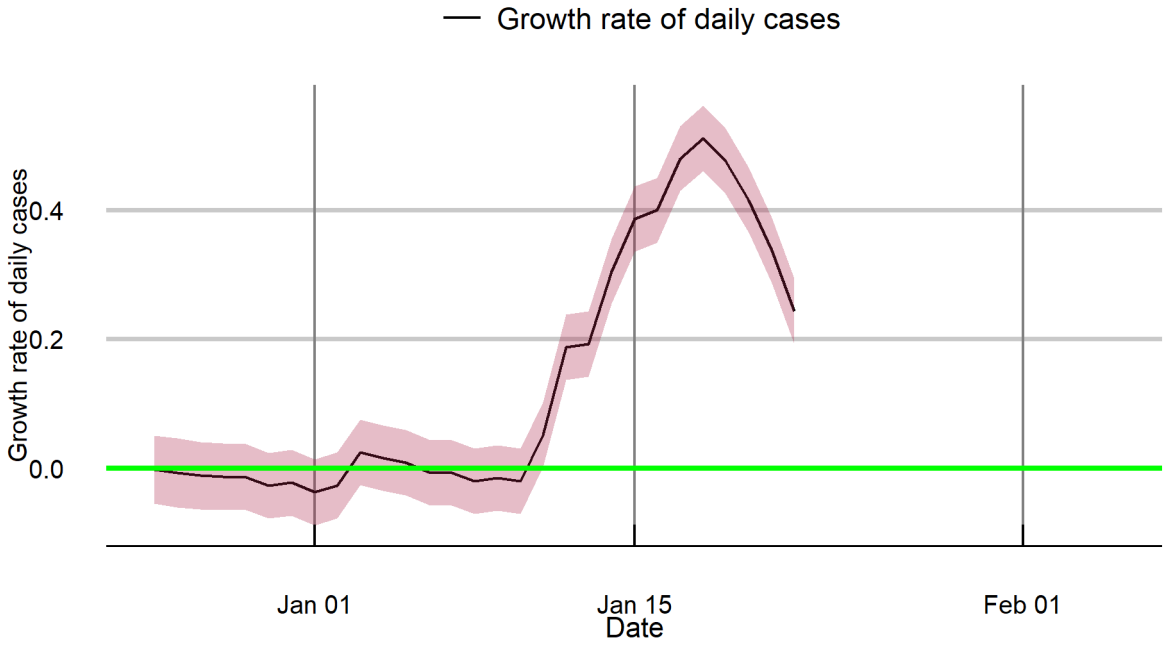
Kerala



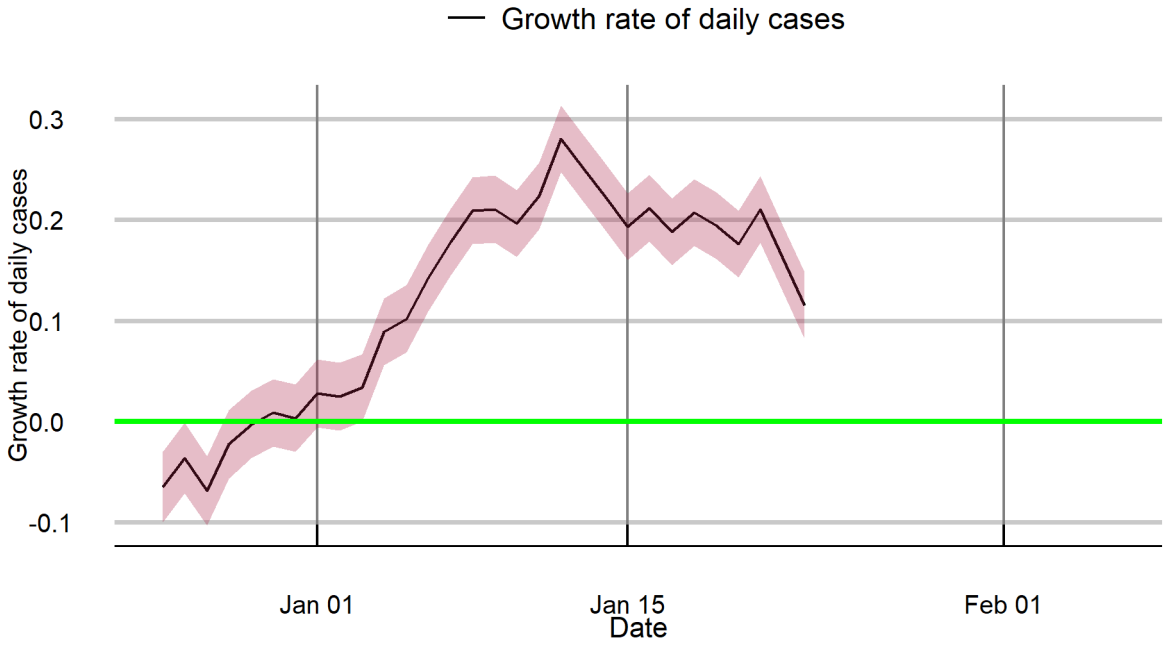
Ladakh

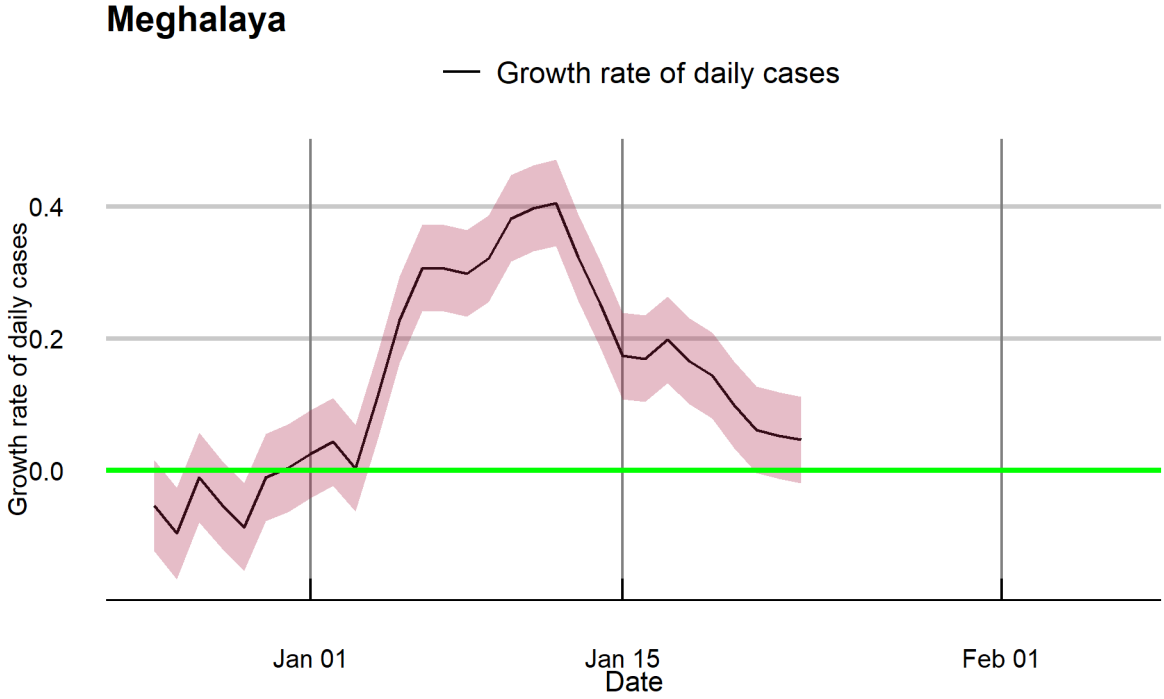


Lakshadweep

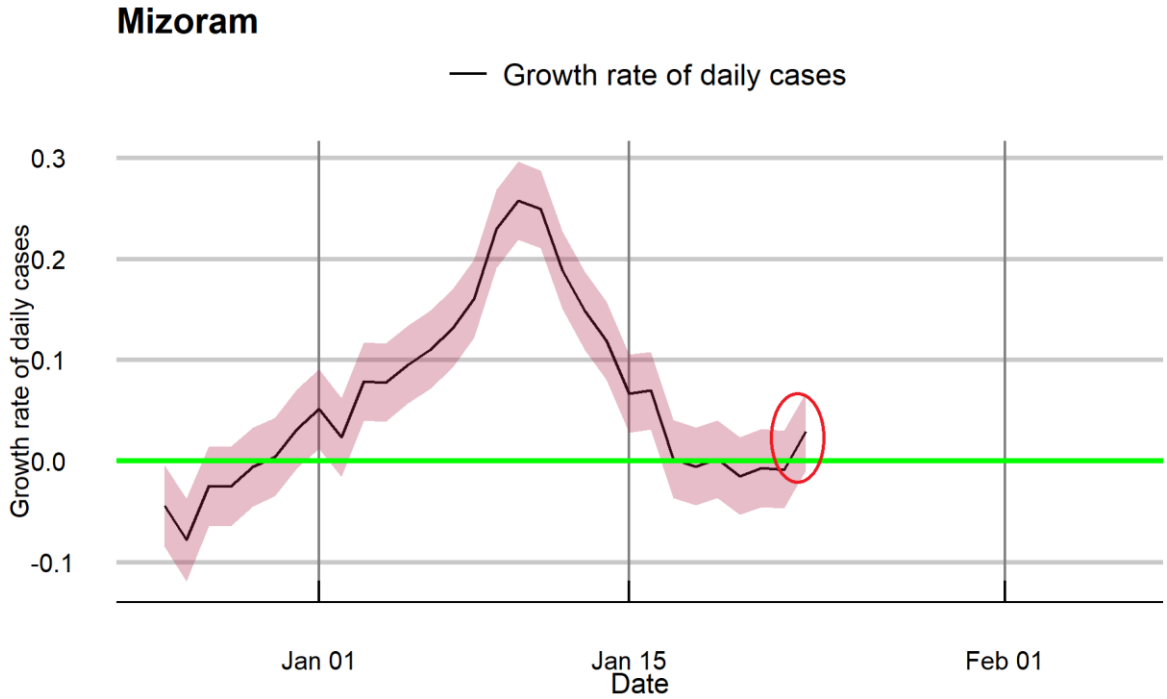


Manipur

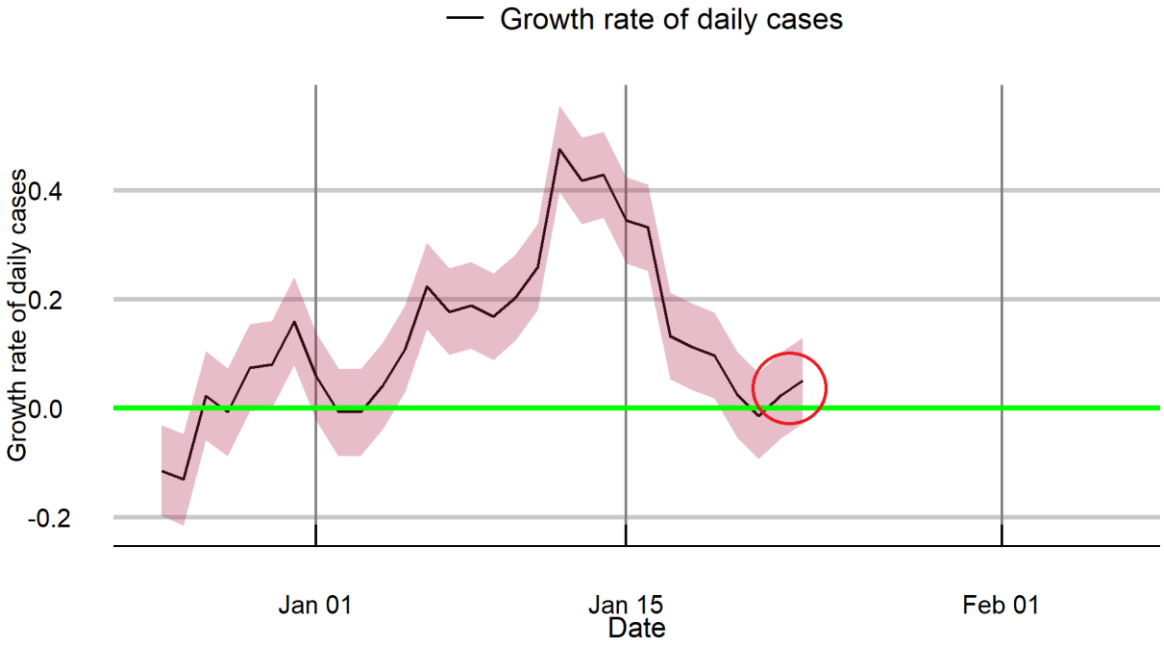



Meghalaya
Growth rate of daily cases
Growth rate of daily cases
0.4
0.2
0.0
Jan 01
Jan 15
Feb 01
Date

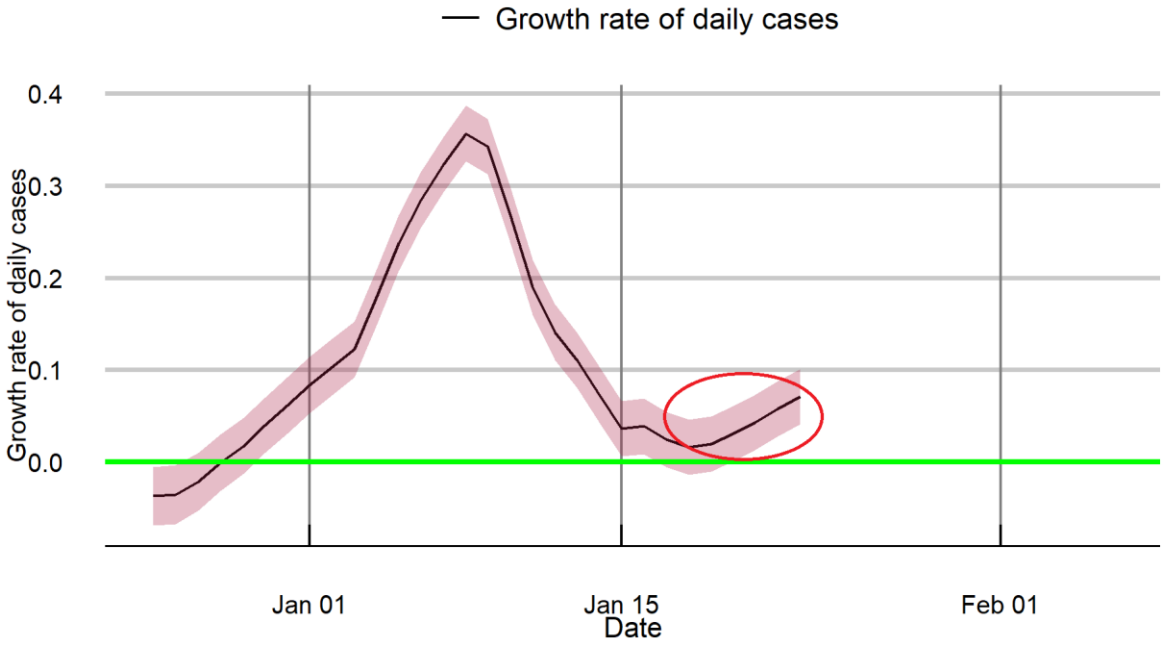
Filtered daily growth rates of new cases for states showing indications of <u>flare ups</u>



Nagaland



Telangana



Notes

This tracker was 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.

Data: COVID-19 confirmed cases data are sourced from Johns Hopkins University (JHU), Center for Systems Science and Engineering (CSSE) and COVID19-Bharat API.

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*. 256, 110-126. doi:10.1017/nie.2021.12.

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 (2021). A farewell to R: Time series models for tracking and forecasting epidemics. Journal of the Royal Society Interface, 18, 20210179, https://royalsocietypublishing.org/doi/10.1098/rsif.2021.0179.The confidence interval is based on one standard deviation, with coverage of 68%.

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.
[+]National Institute of Economic and Social Research

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