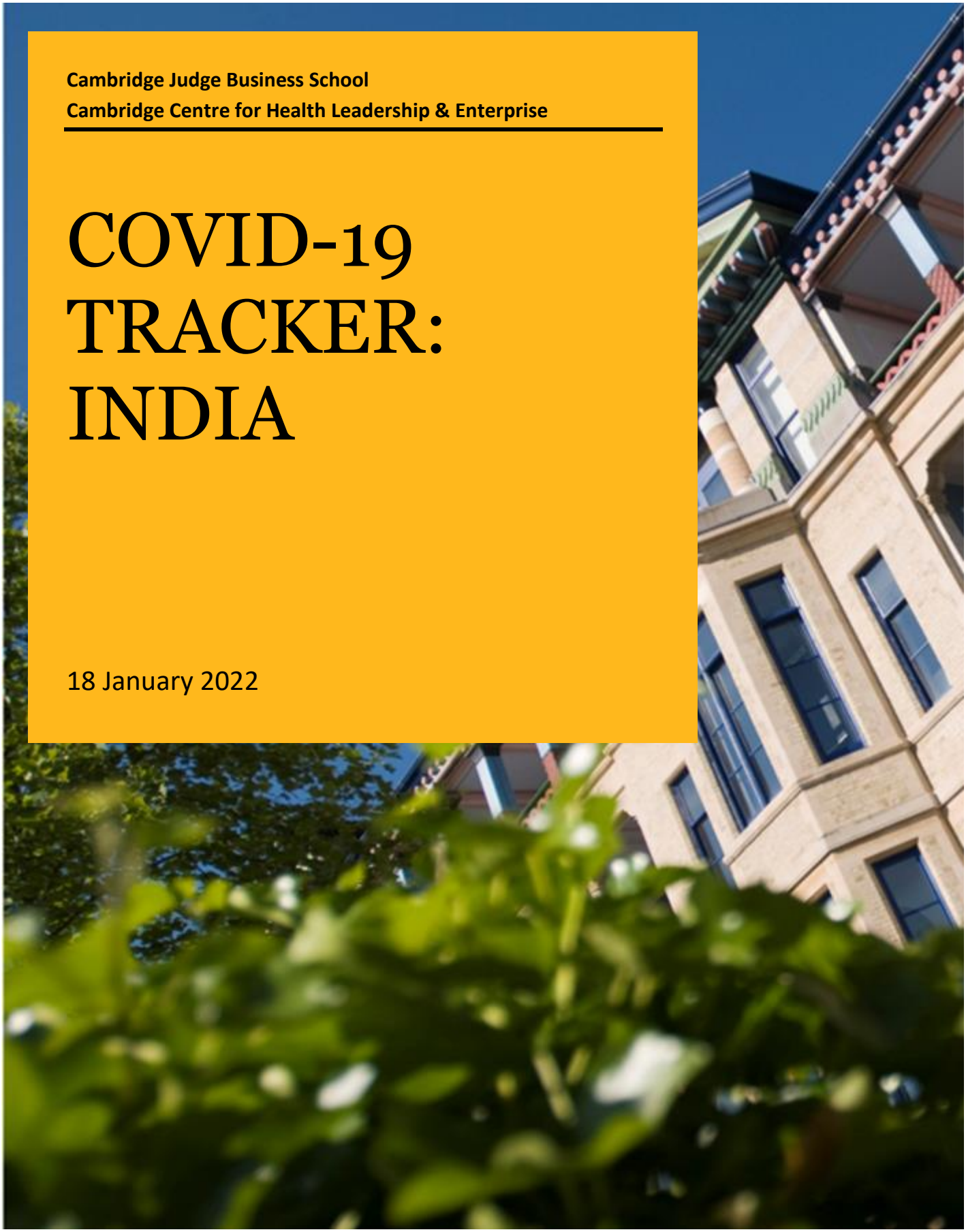
Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

18 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

Daily COVID cases in India can be expected to peak on 24 January at just under 330,000 reported cases in terms of its underlying trend value. By the end of January, the trend value of reported daily cases will drop below 300,000.

The reproduction number at the national level stood at 1.1 on 18th January, sharply down from 2.24 on 13th, and 4.03 on 9th January. The filtered daily growth rate of national level cases was 3.02% on 18th January, down from 20.2% on 13th, and 34.9% on 9th January.

Daily cases are clearly past their peaks in Bihar, Chhattisgarh, Delhi, Goa, Jharkhand, Maharashtra and West Bengal, in terms of their underlying trends. Their reproduction numbers are below one and daily growth rates are negative.

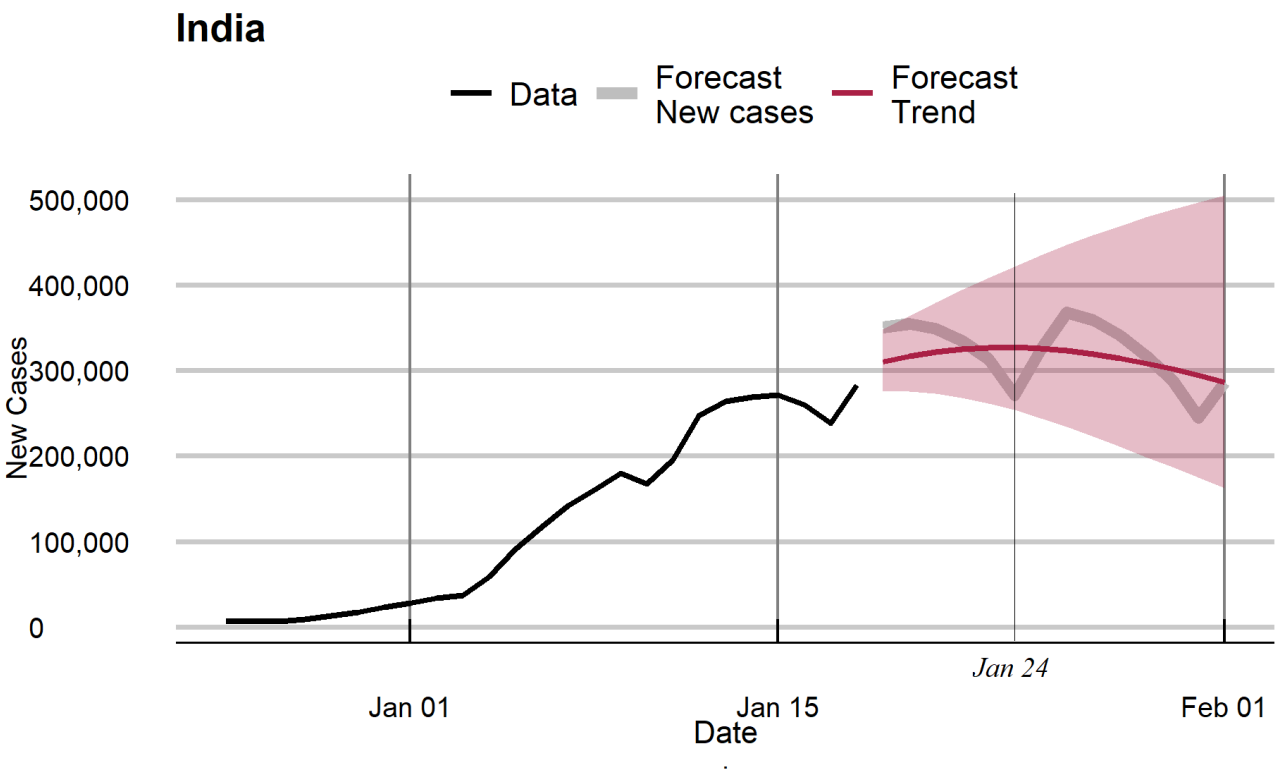
Daily cases in Chandigarh, Gujarat, Haryana, Mizoram, Punjab, Rajasthan, Telangana, Uttarakhand and Uttar Pradesh can be expected to peak within this week. Their filtered daily growth rates of cases are rapidly declining to zero. Tamil Nadu and Madhya Pradesh are likely to peak towards the end of January.

The peak is not yet in sight for Kerala, where the daily growth rate appears to be approaching its plateau at 21%.

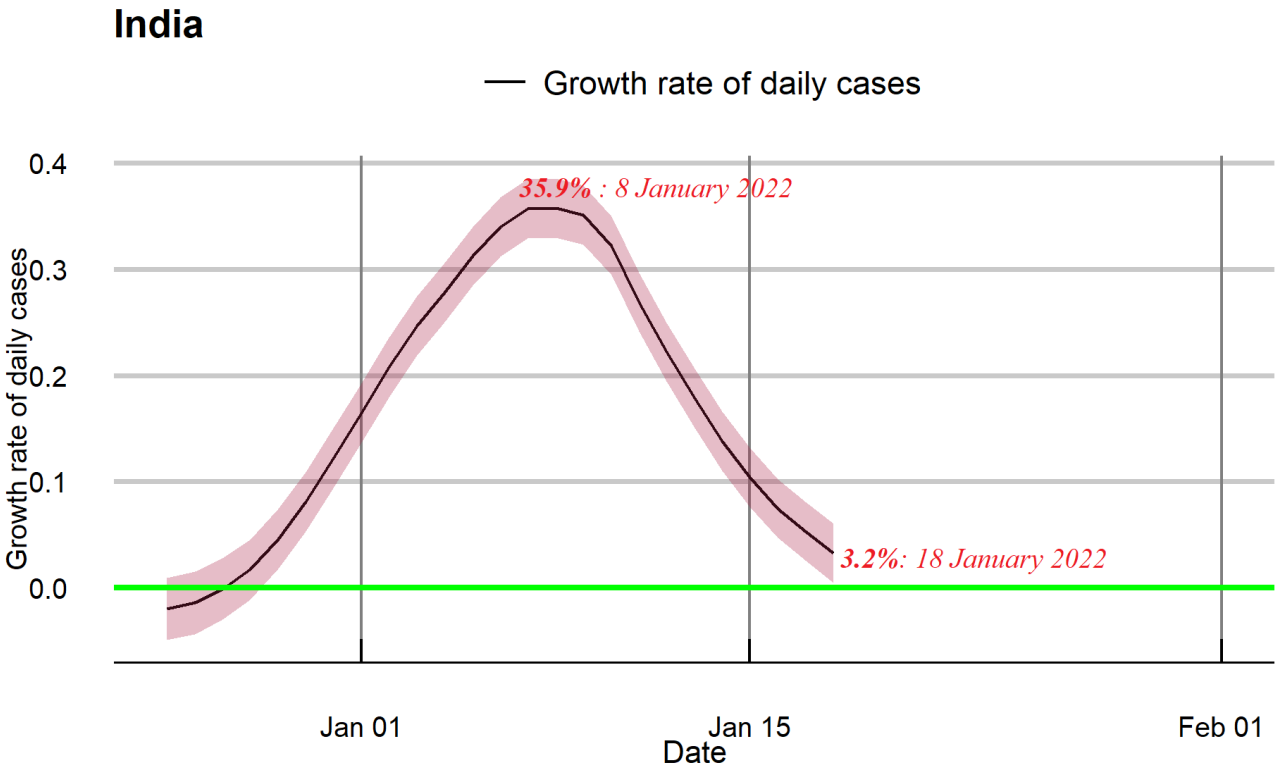
This tracker can be accessed at: www.jbs.cam.ac.uk/covid-india

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

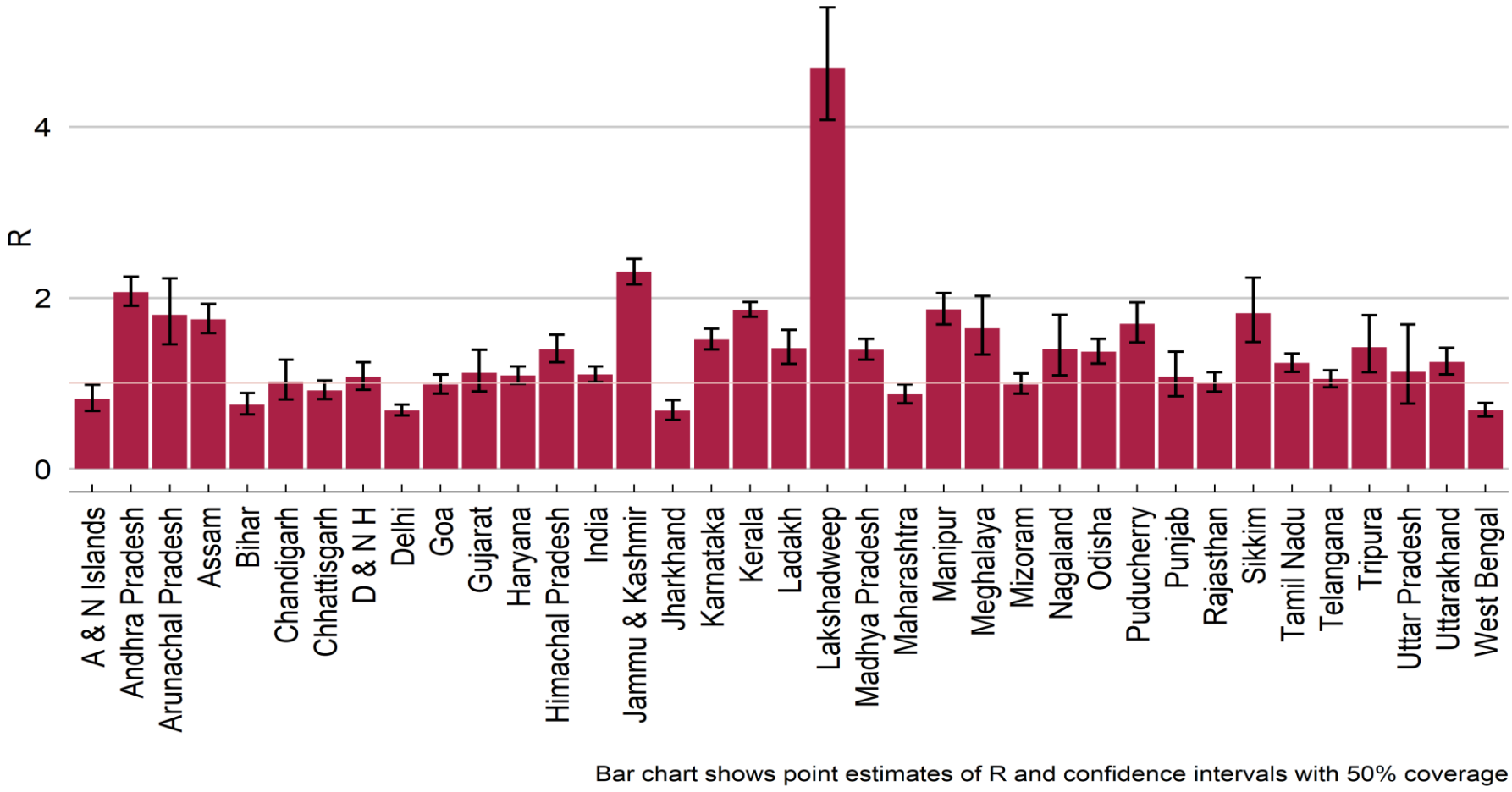
Forecasts of daily cases: 19 January to 1 February 2022



Filtered daily growth rates of new cases: days leading up to 18 January 2022



Reproduction numbers on 18 January 2022



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

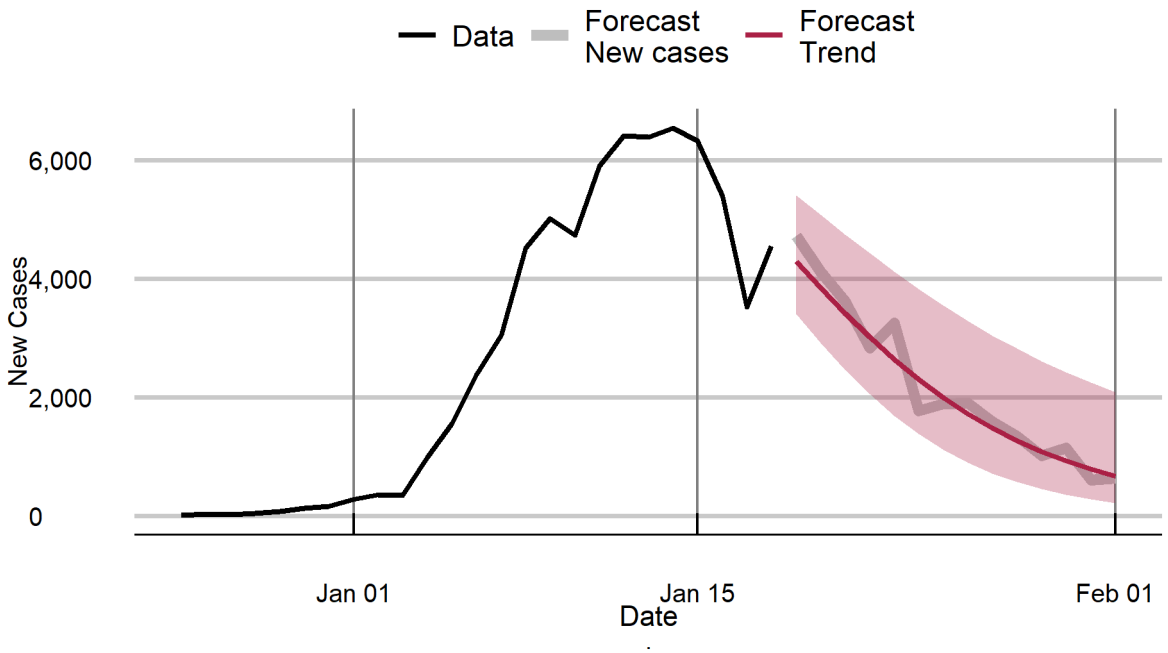
Note: Small numbers in Dadra and Nager Haveli and Lakshadweep make their estimates less reliable.

	Reproduction number	Filtered daily growth rate
India	1.10	3.2%
A & N Islands	0.81	-6.8%
Andhra Pradesh	2.07	24.2%
Arunachal Pradesh	1.80	19.6%
Assam	1.75	18.6%
Bihar	0.75	-9.6%
Chandigarh	1.02	0.5%
Chhattisgarh	0.91	-3.0%
D & N H	1.07	2.3%
Delhi	0.68	-12.6%
Goa	0.98	-0.5%
Gujarat	1.12	3.8%
Haryana	1.09	2.9%
Himachal Pradesh	1.40	11.2%
Jammu & Kashmir	2.30	27.8%
Jharkhand	0.68	-13.0%
Karnataka	1.51	13.8%
Kerala	1.86	20.7%
Ladakh	1.41	11.5%
Lakshadweep	4.69	51.5%
Madhya Pradesh	1.39	11.0%
Maharashtra	0.87	-4.7%
Manipur	1.86	20.7%
Meghalaya	1.64	16.5%
Mizoram	0.99	-0.4%
Nagaland	1.40	11.3%
Odisha	1.37	10.4%
Puducherry	1.69	17.6%
Punjab	1.08	2.5%
Rajasthan	1.01	0.2%
Sikkim	1.82	19.9%
Tamil Nadu	1.24	7.1%
Telangana	1.05	1.6%
Tripura	1.42	11.8%
Uttar Pradesh	1.13	4.2%
Uttarakhand	1.25	7.4%
West Bengal	0.69	-12.5%

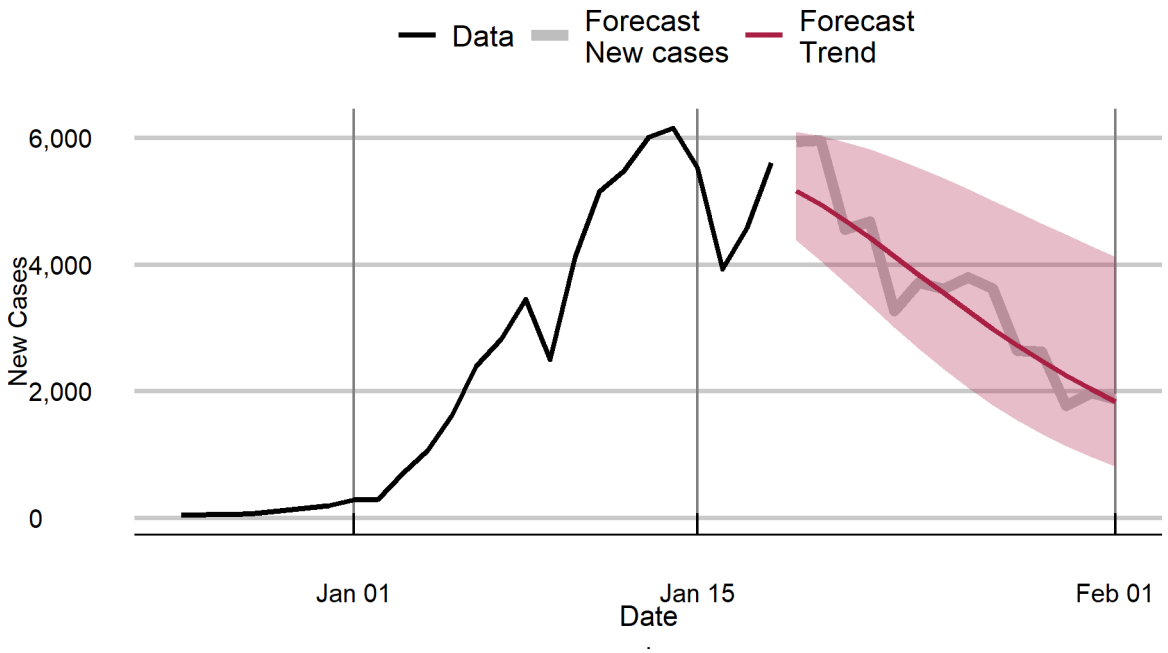
Reproduction numbers and Filtered daily growth rates:18 January 2022

Forecasts of daily cases for states and union territories that are <u>past their peaks</u>

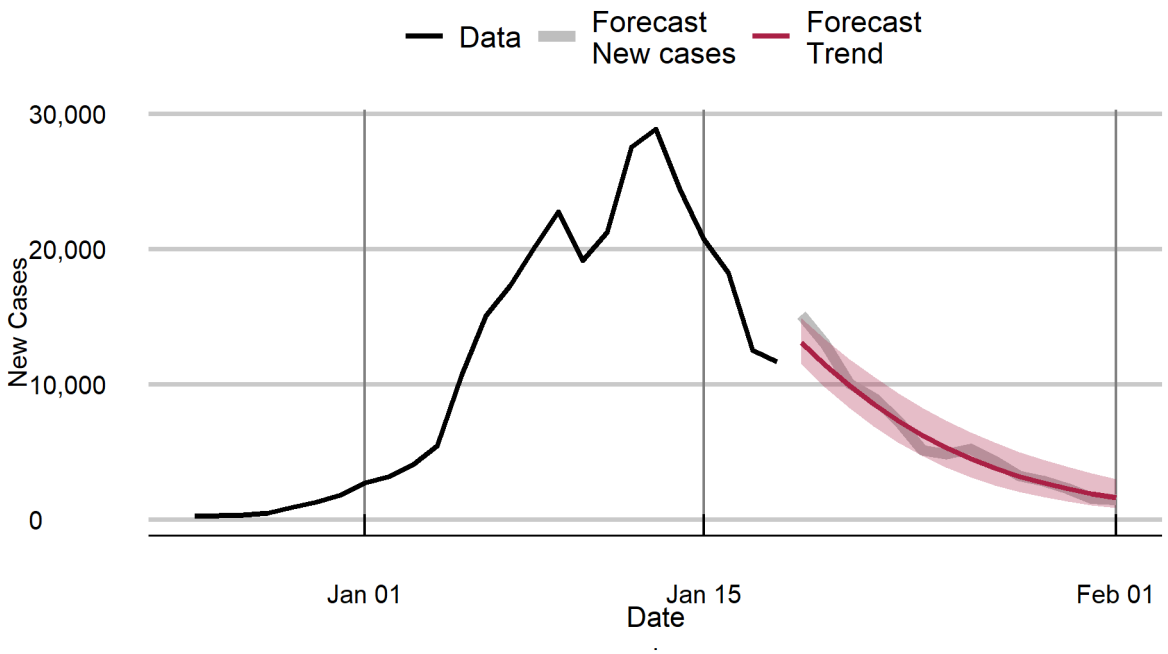
Bihar



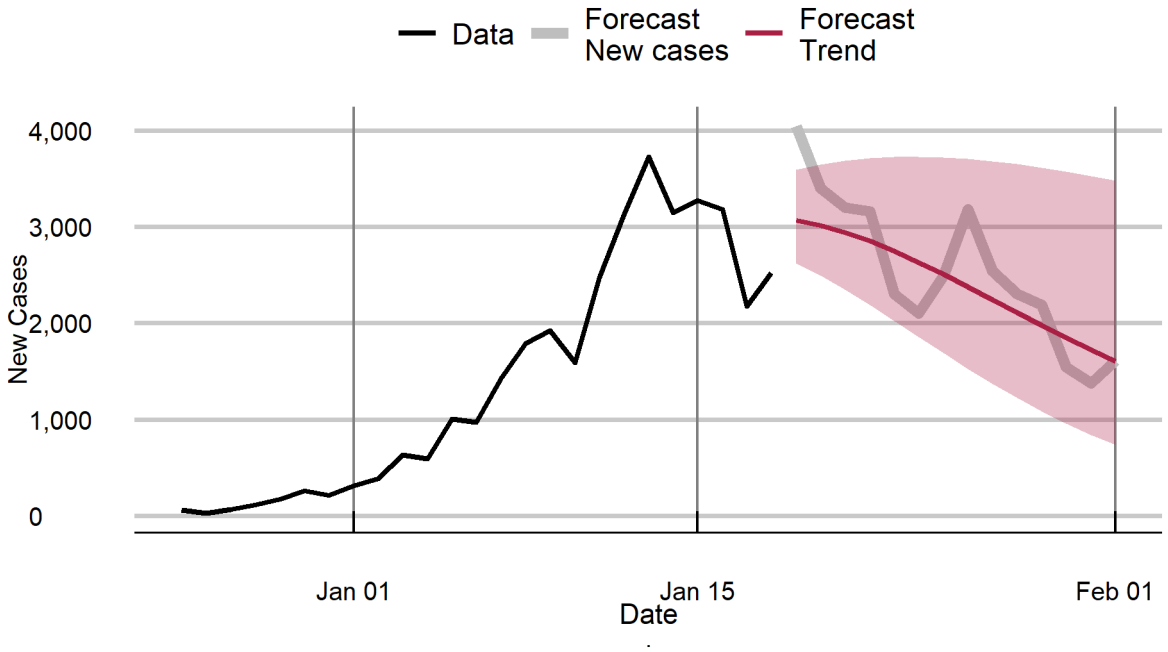
Chhattisgarh



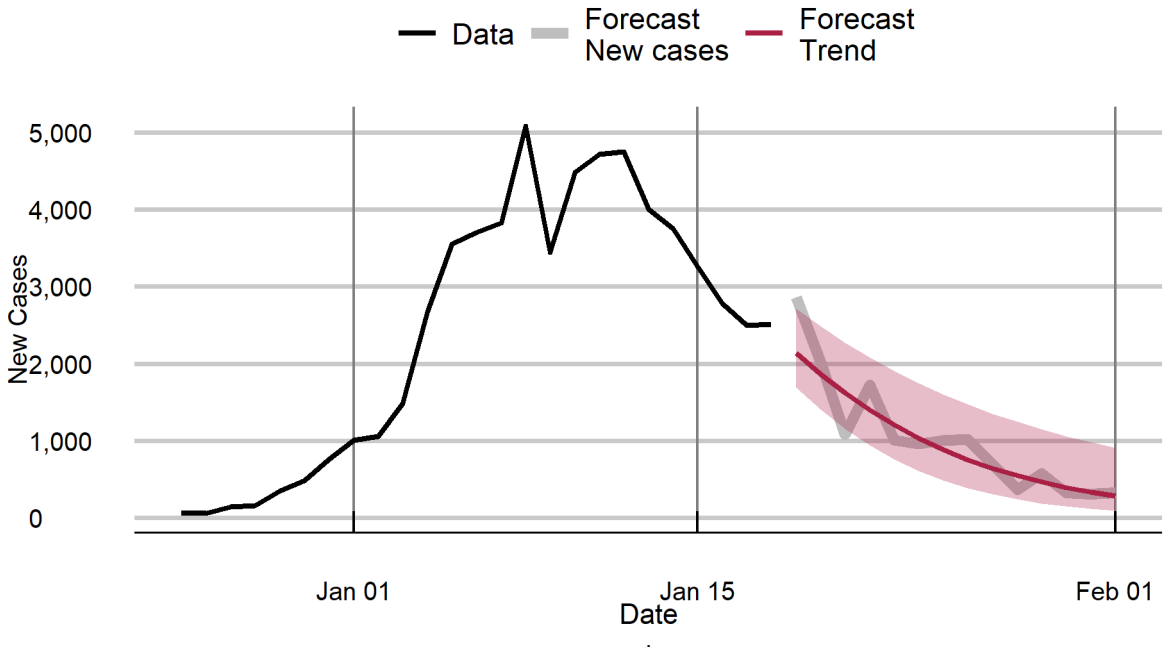
Delhi


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

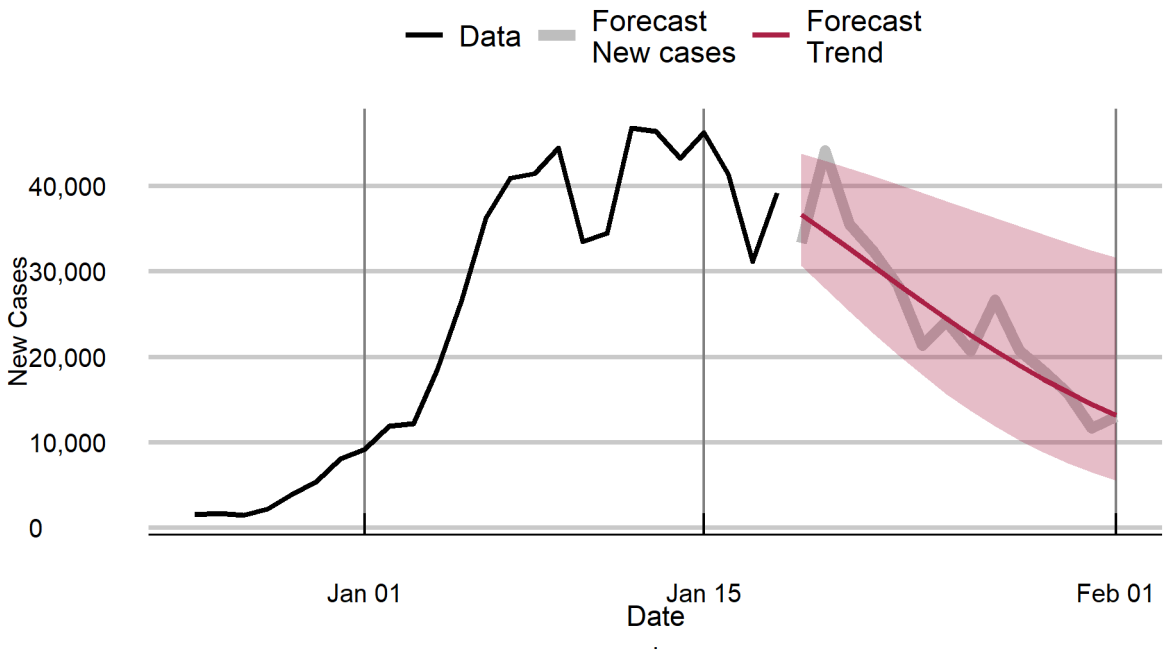
Goa

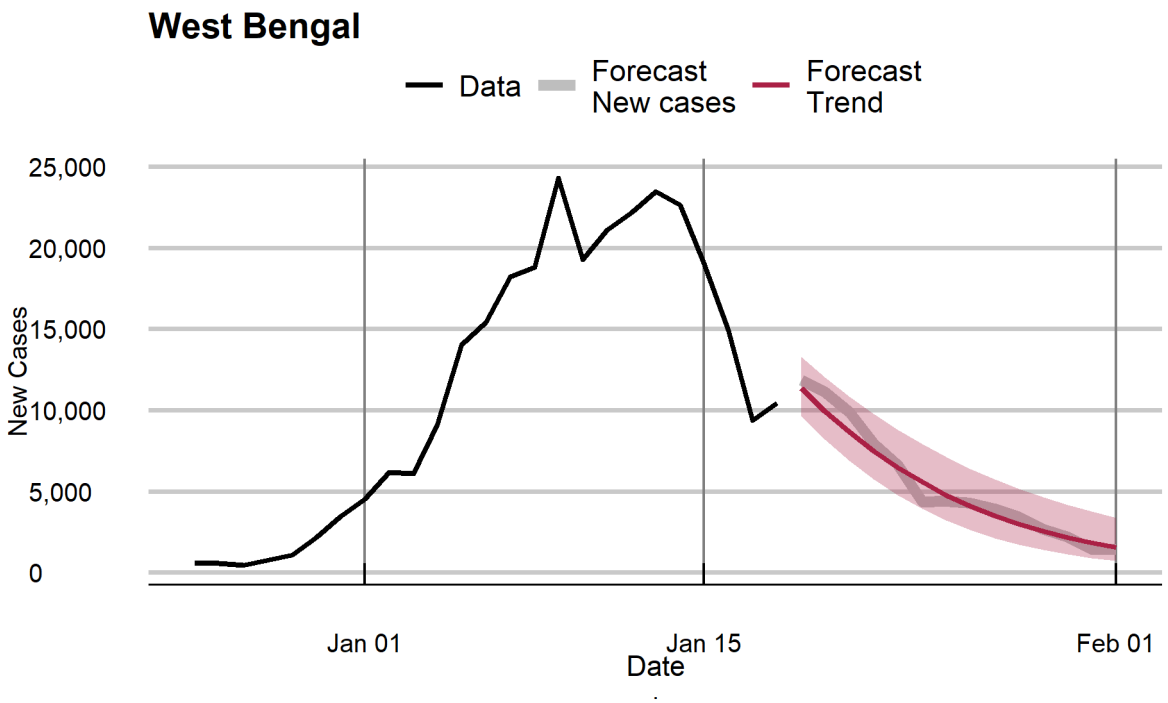

Data
Forecast
New cases
Forecast
Trend
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

Jharkhand



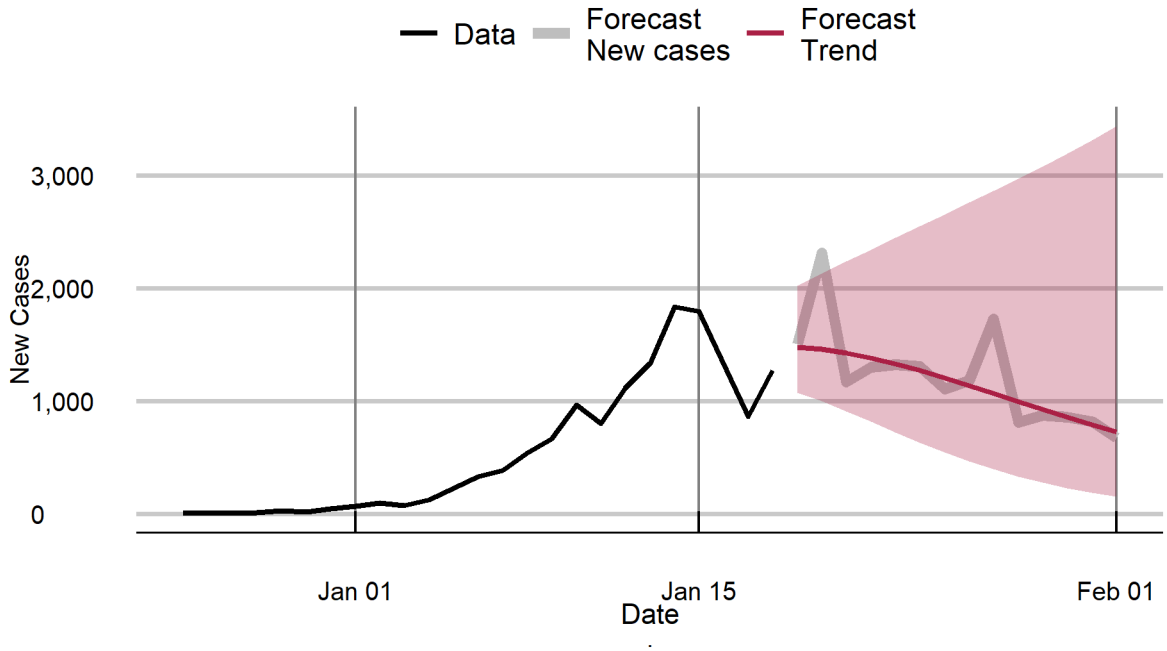
Maharashtra



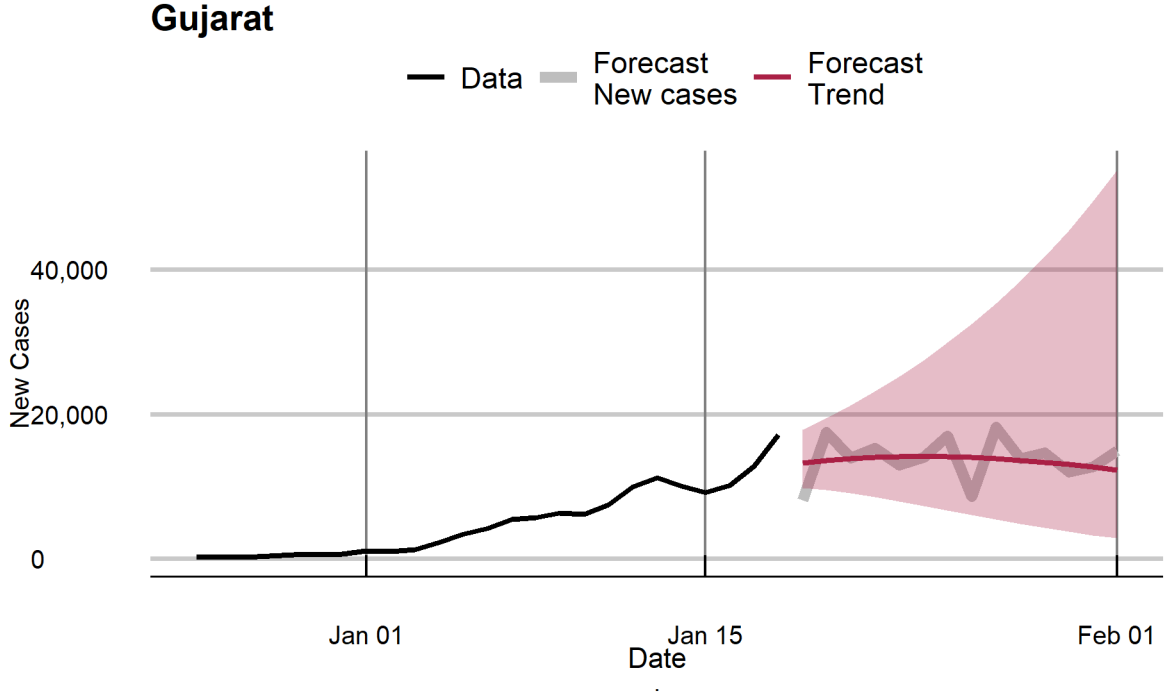

West Bengal
Data
Forecast
New cases
Forecast
Trend
25,000
20,000
15,000
10,000
5,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

Forecasts of daily cases for states and union territories whose peaks are imminent

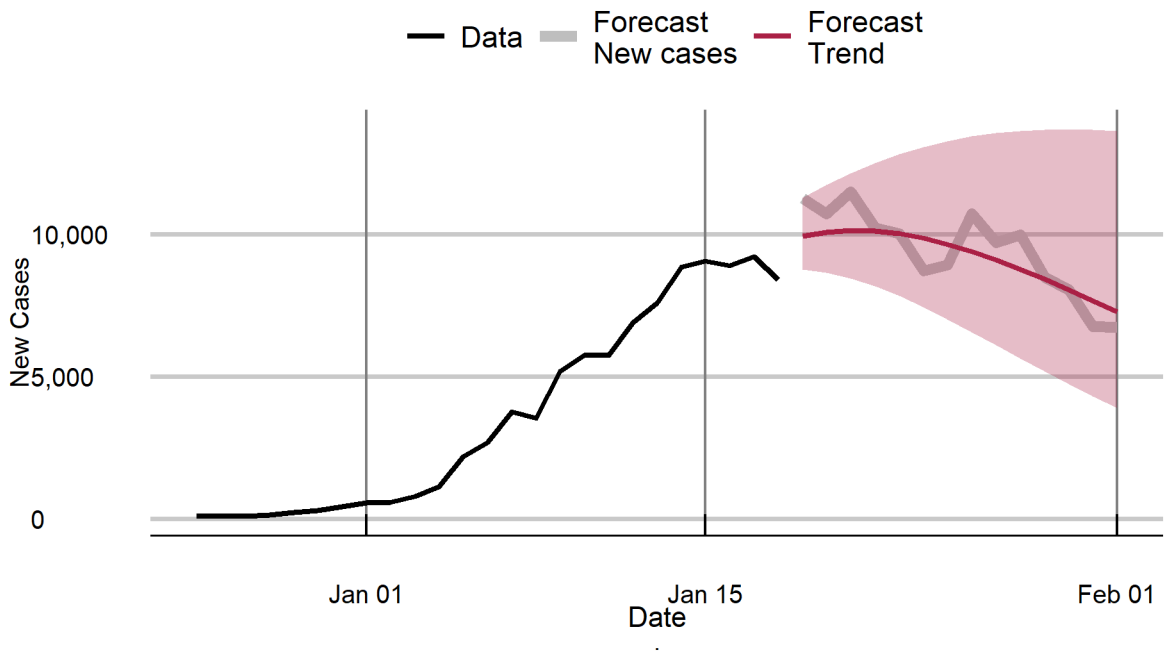
Chandigarh



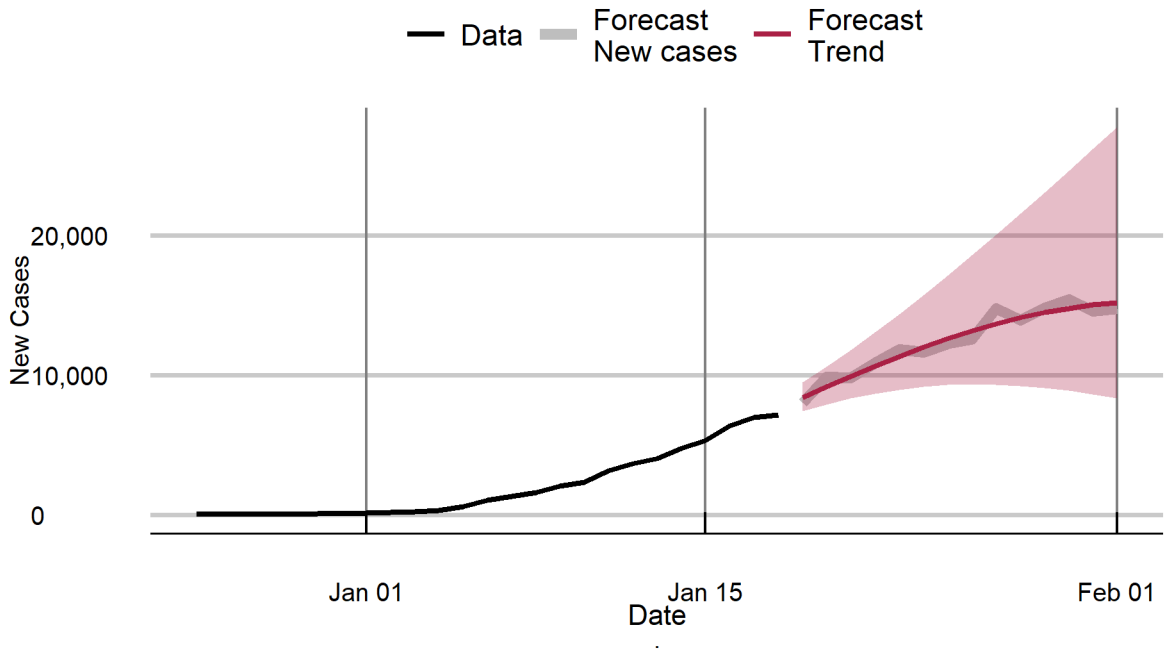
Gujarat

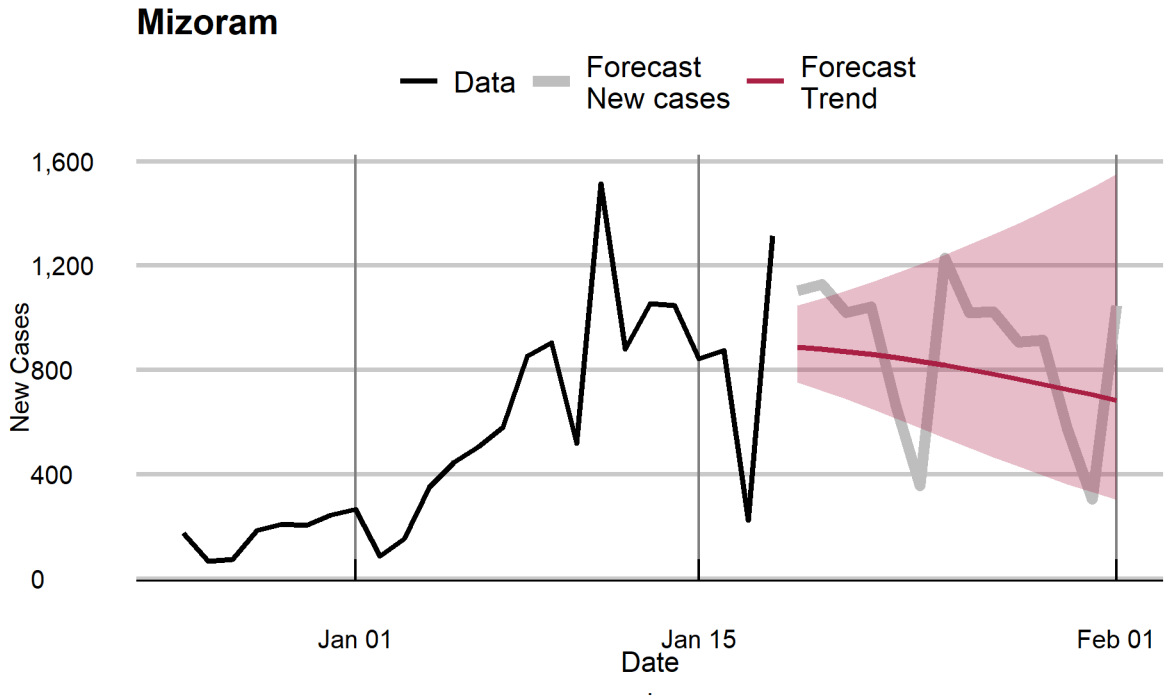


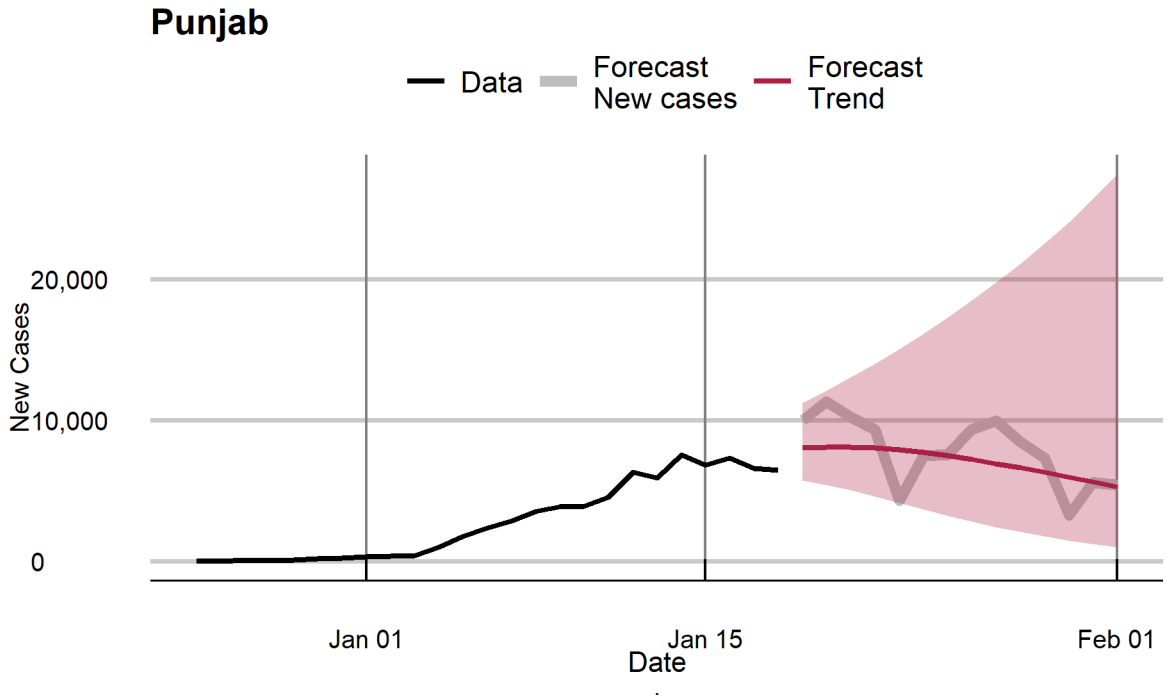
Haryana



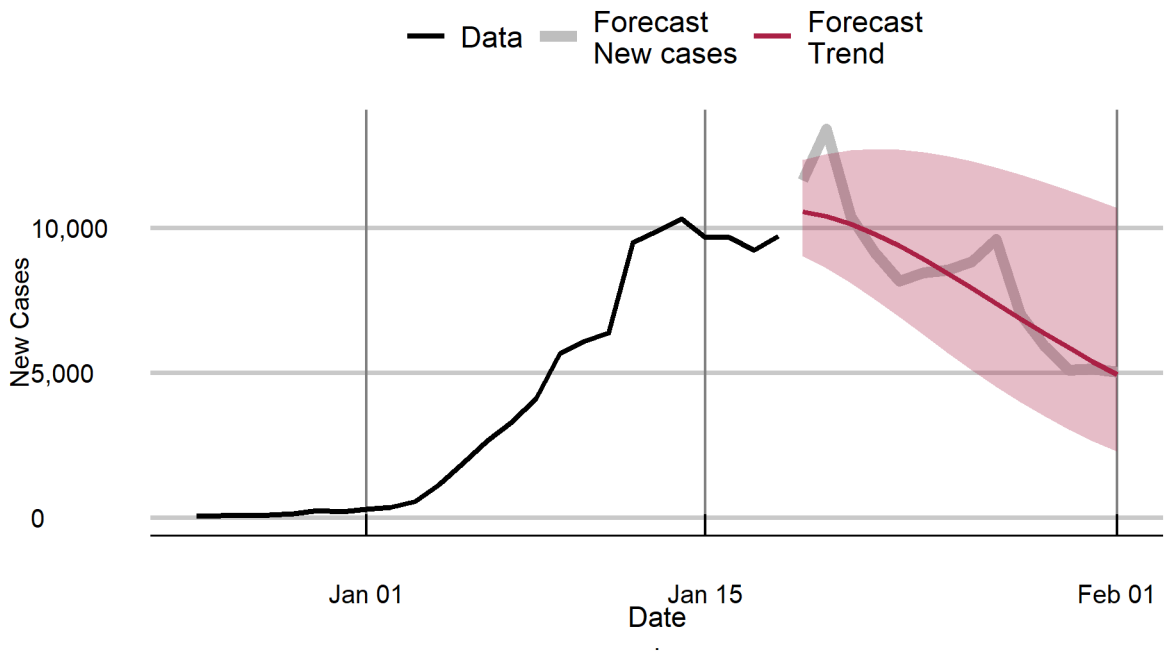
Madhya Pradesh



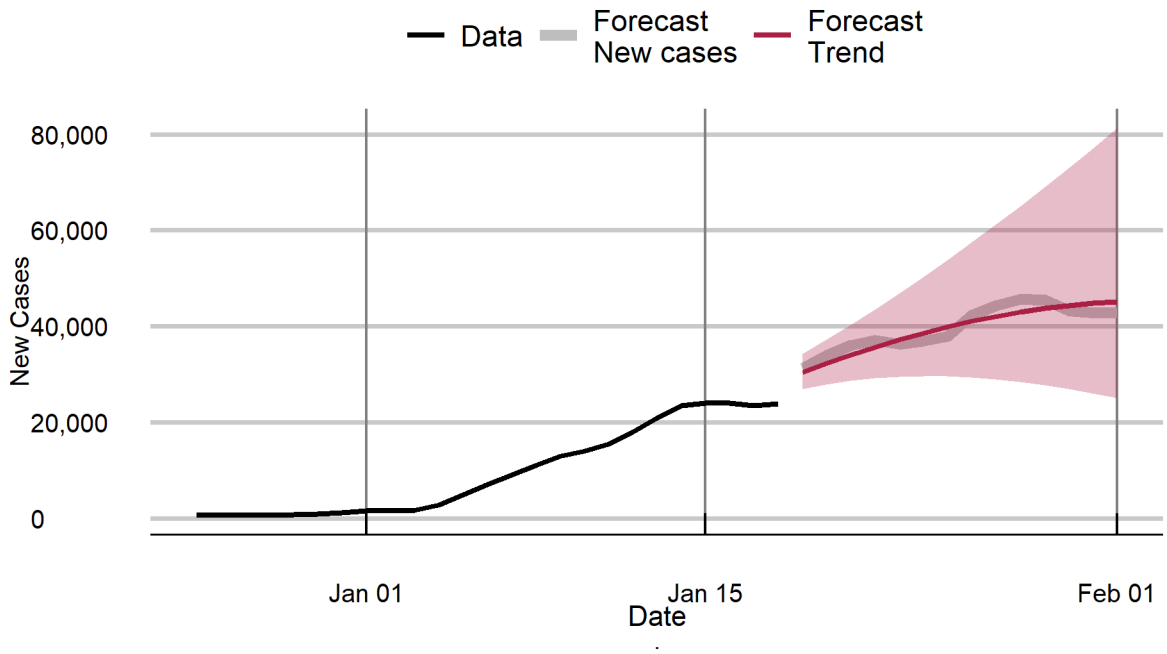

Mizoram
Data
Forecast
New cases
Forecast
Trend
1,600
1,200
800
400
0
New Cases
Jan 01
Jan 15
Feb 01
Date

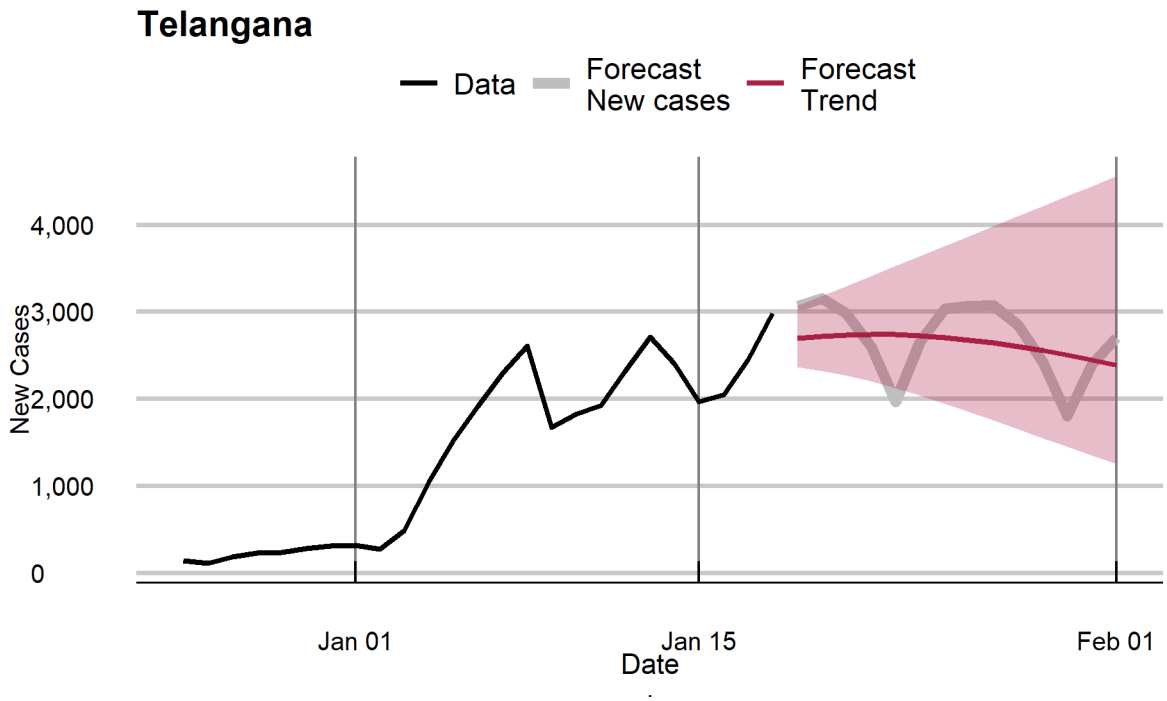

Punjab
Data
Forecast
New cases
Forecast
Trend
20,000
10,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

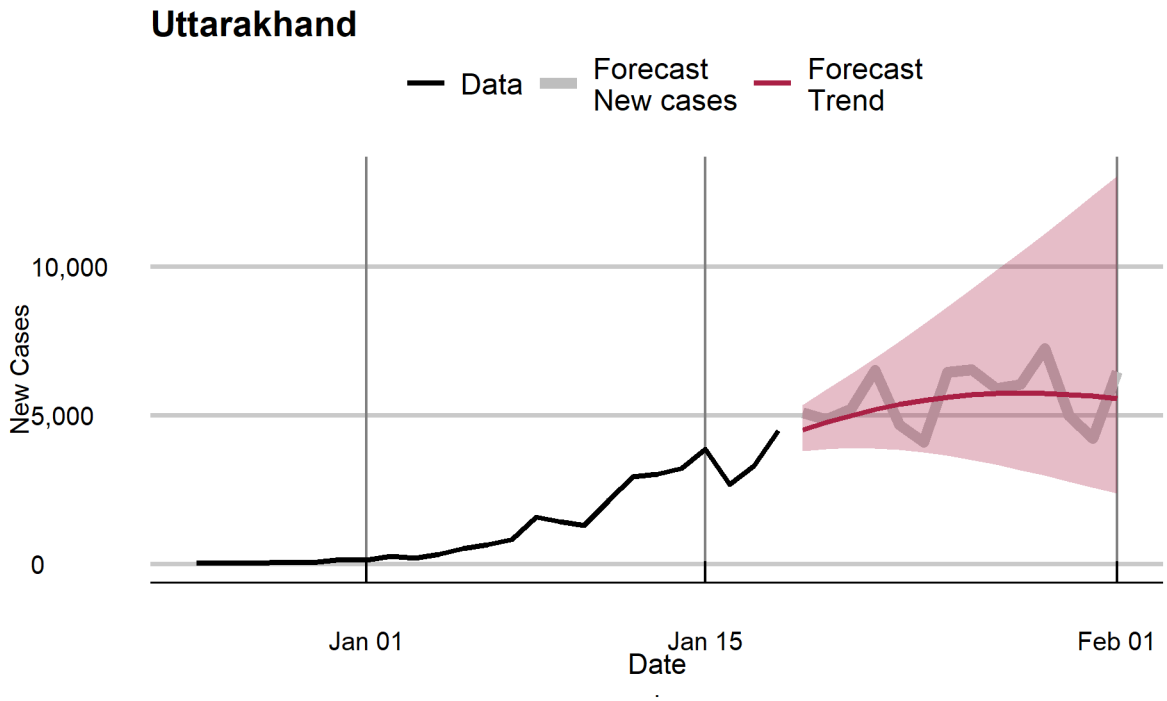
Rajasthan

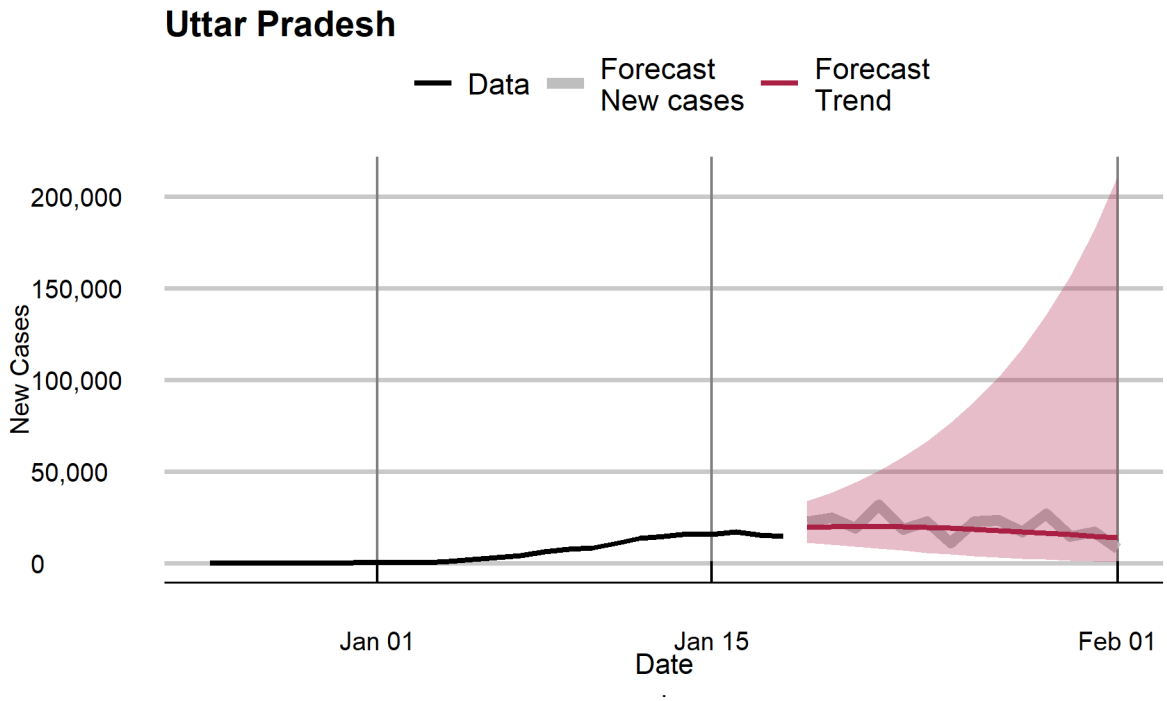


Tamil Nadu

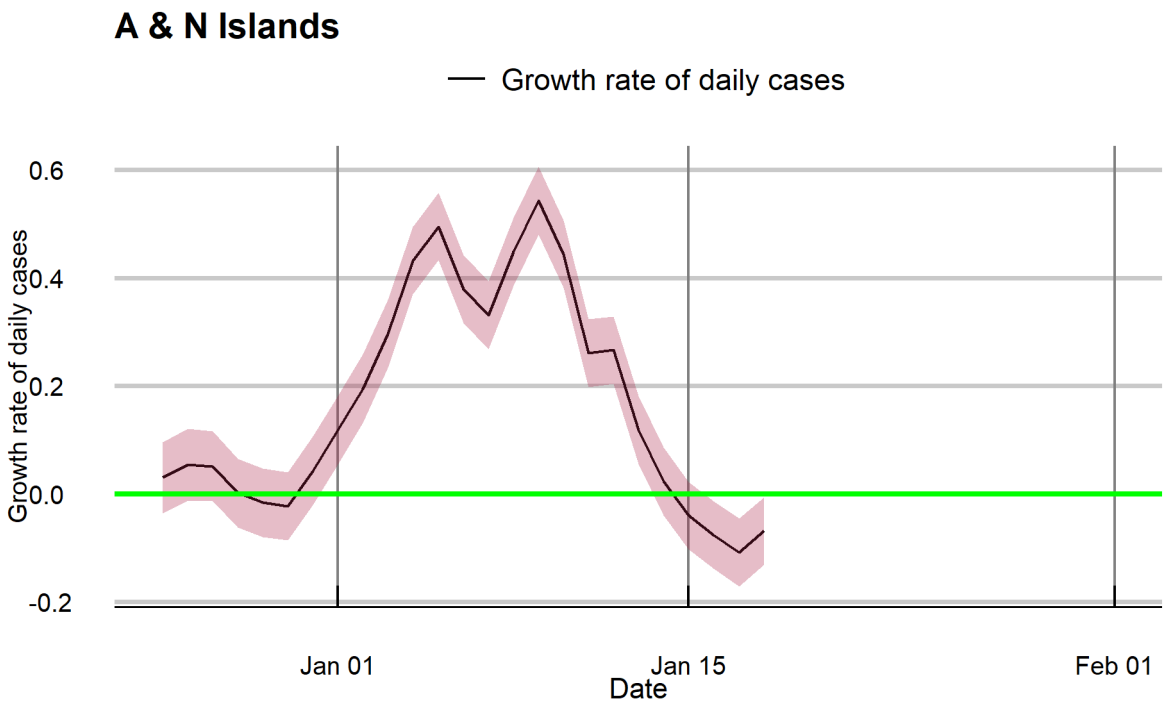


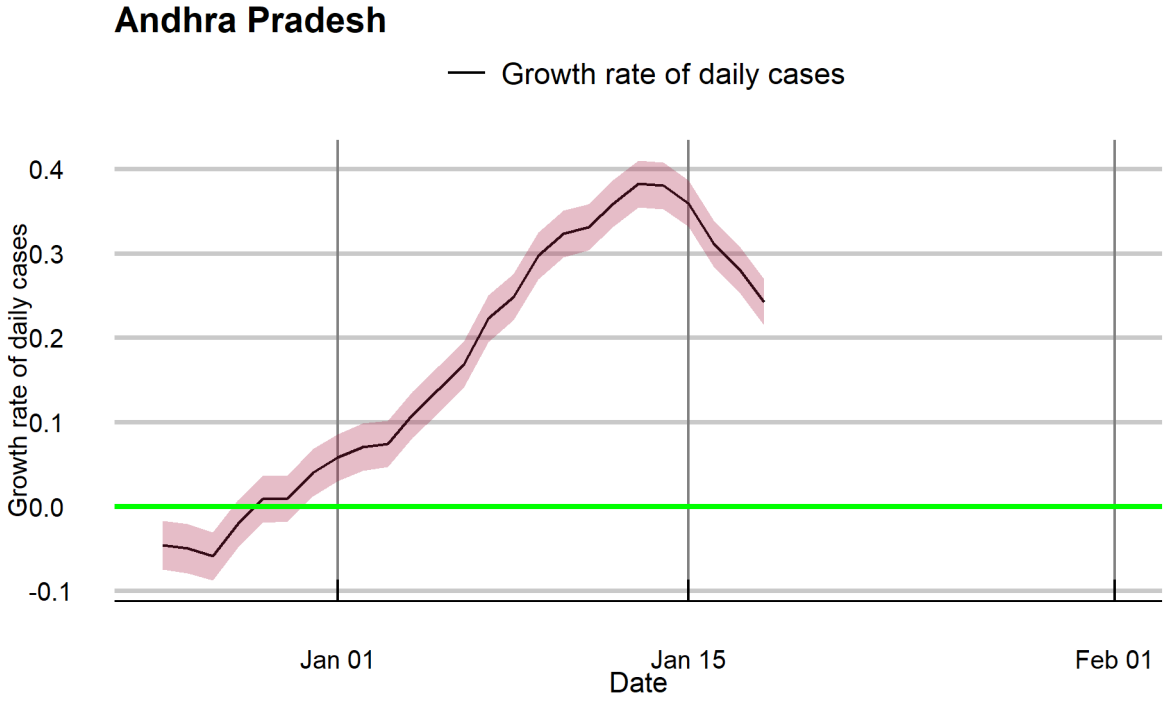

Telangana
Data
Forecast
New cases
Forecast
Trend
4,000
3,000
2,000
1,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date


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

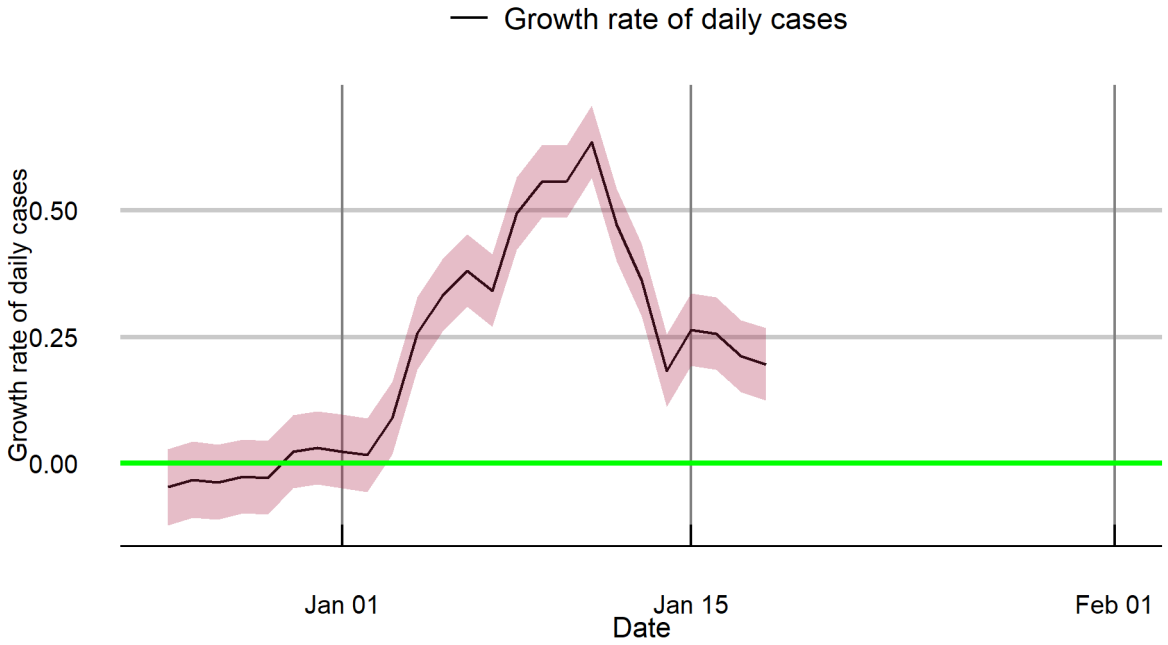

Uttar Pradesh
Data
Forecast
New cases
Forecast
Trend
200,000
150,000
100,000
50,000
0
New Cases
Jan 01
Jan 15
Feb 01
Date

<u>Filtered daily growth rates of new cases</u> for all states and union territories: days leading up to 18 January 2022

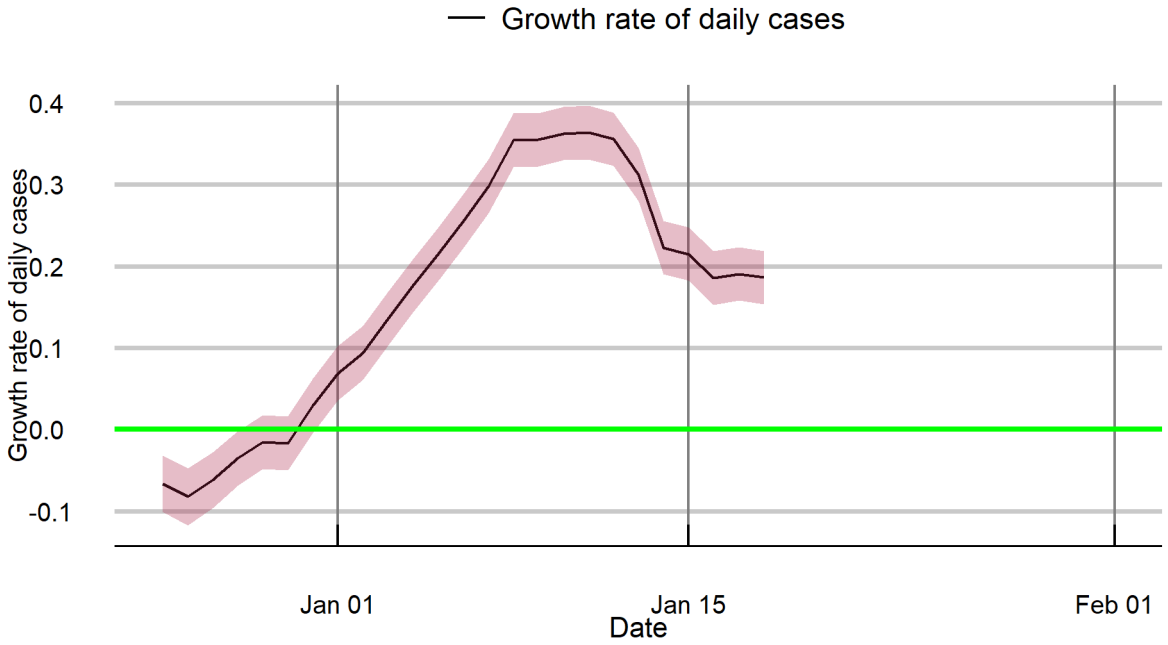




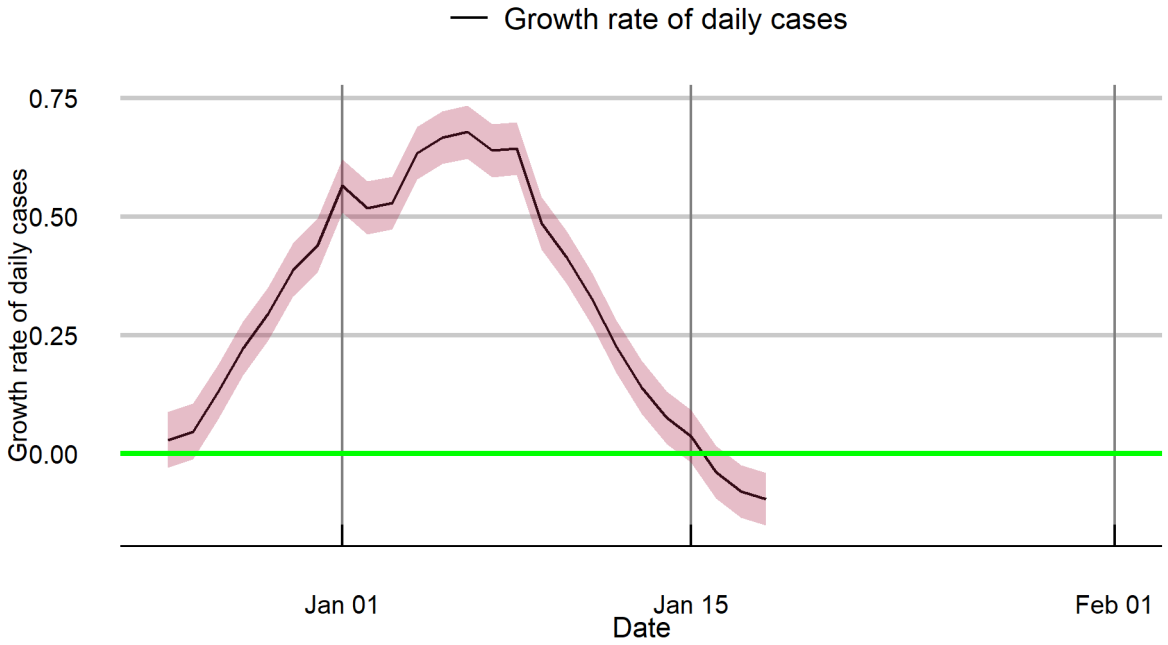
Arunachal Pradesh



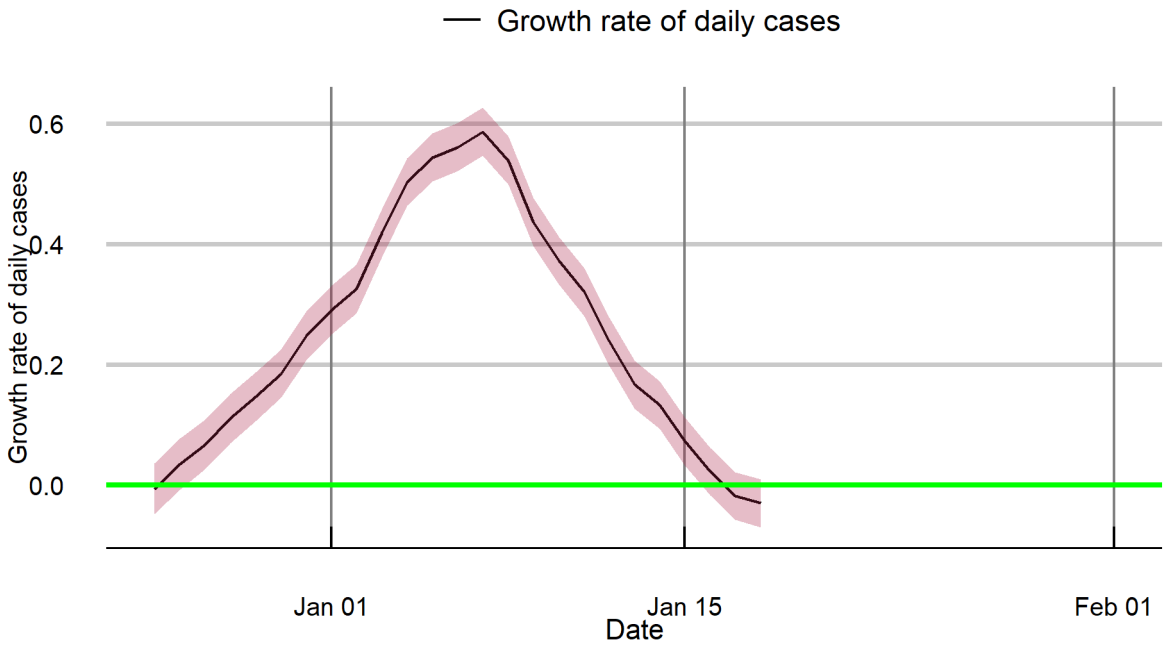
Assam



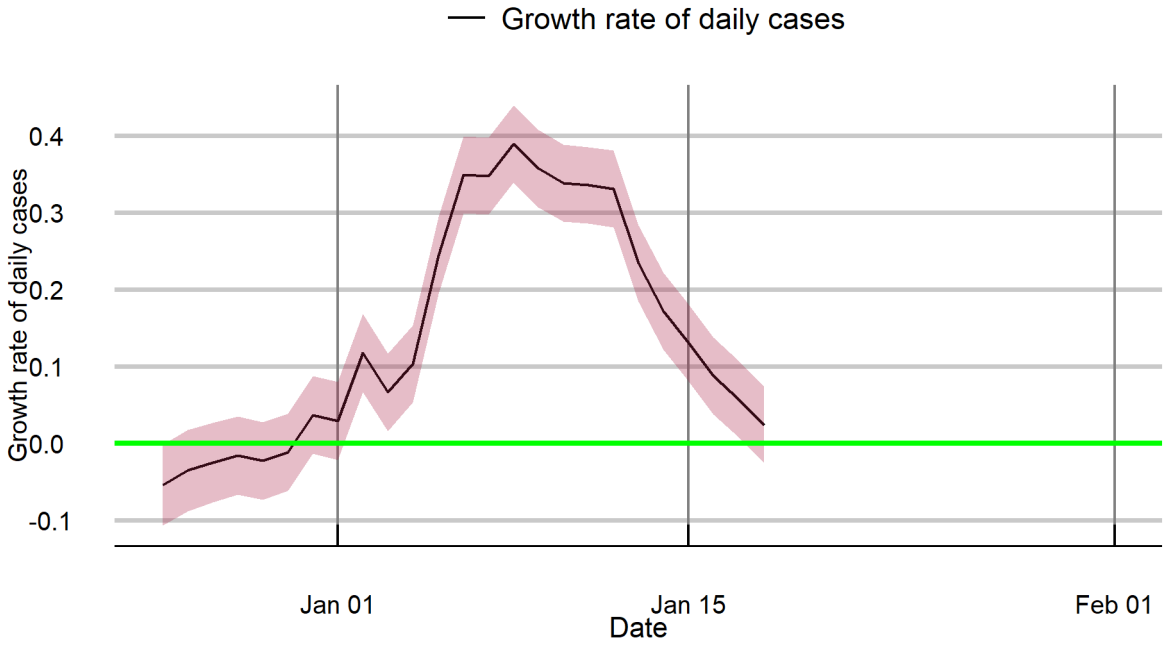
Bihar



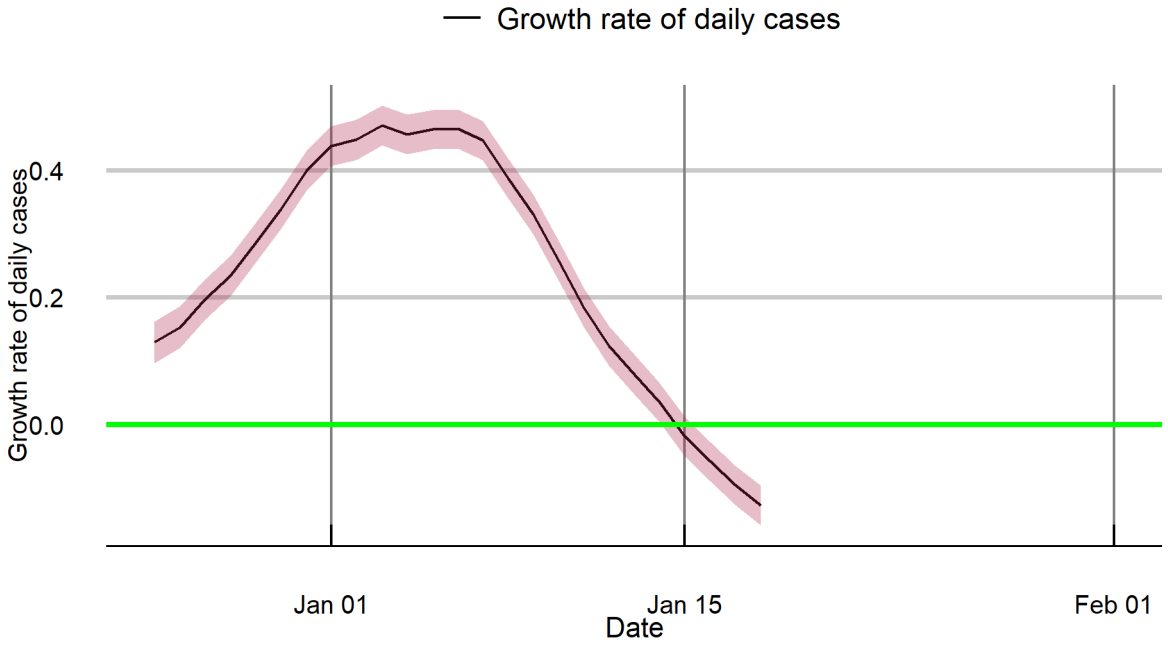
Chhattisgarh



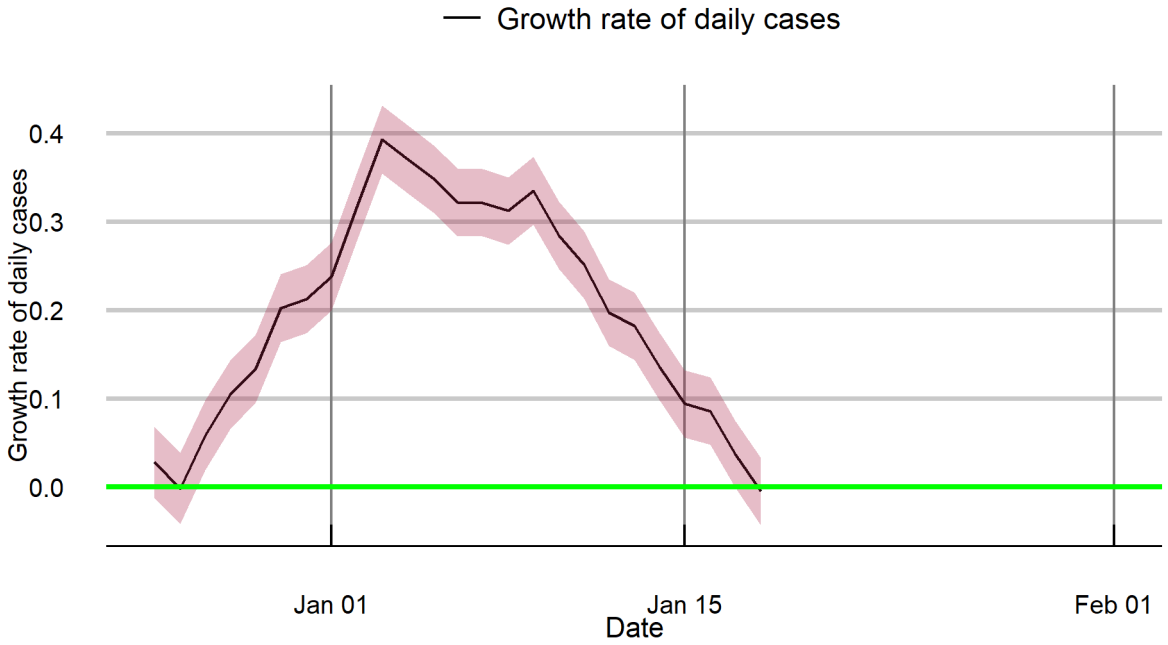
D & N H


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

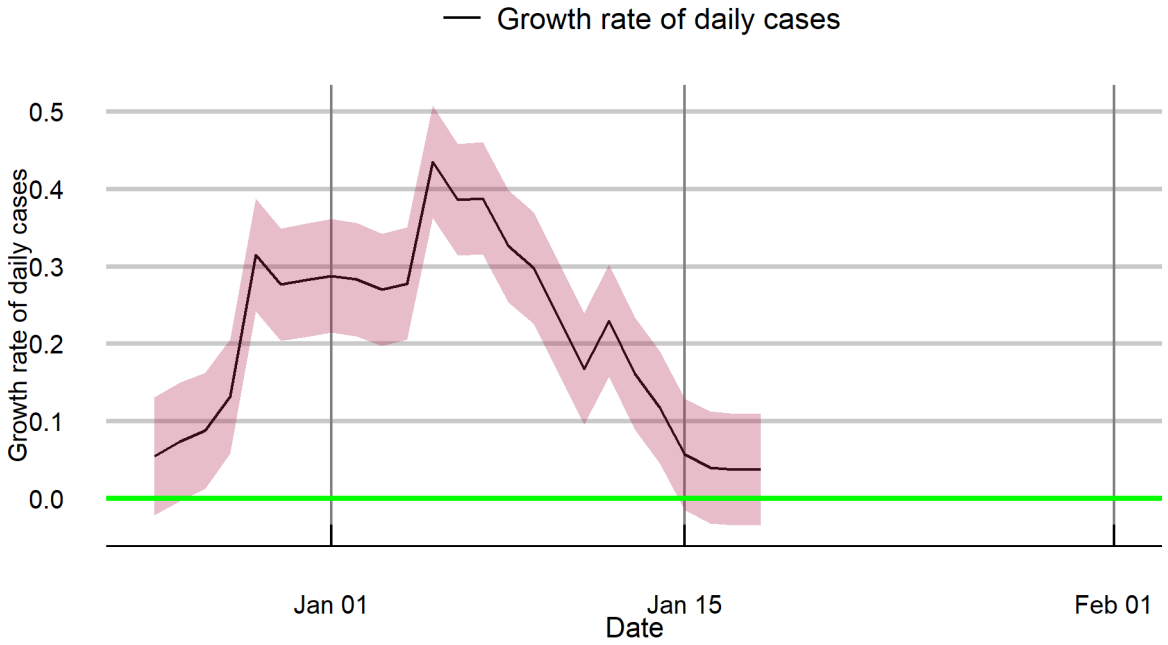
Delhi


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

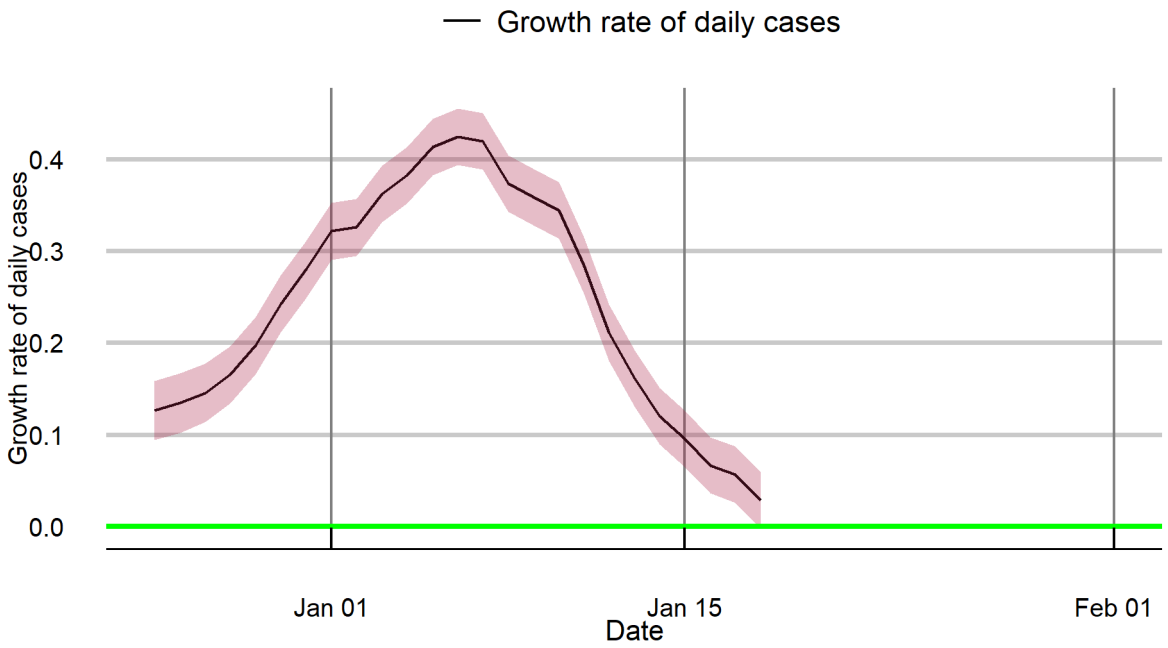
Goa


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

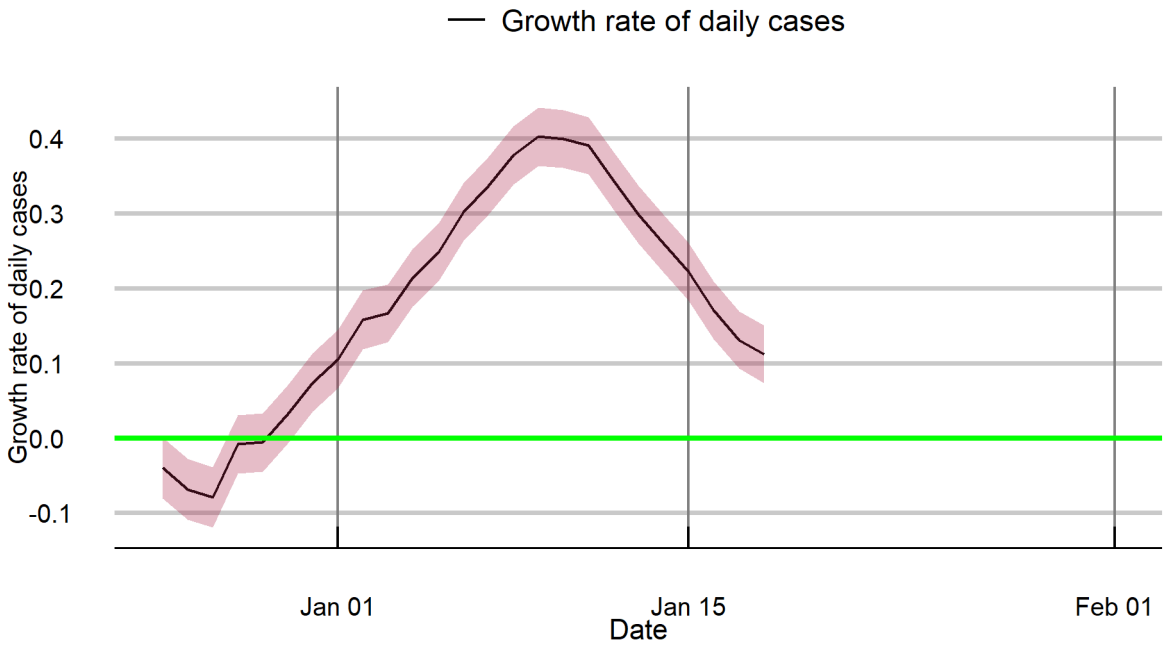
Gujarat


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

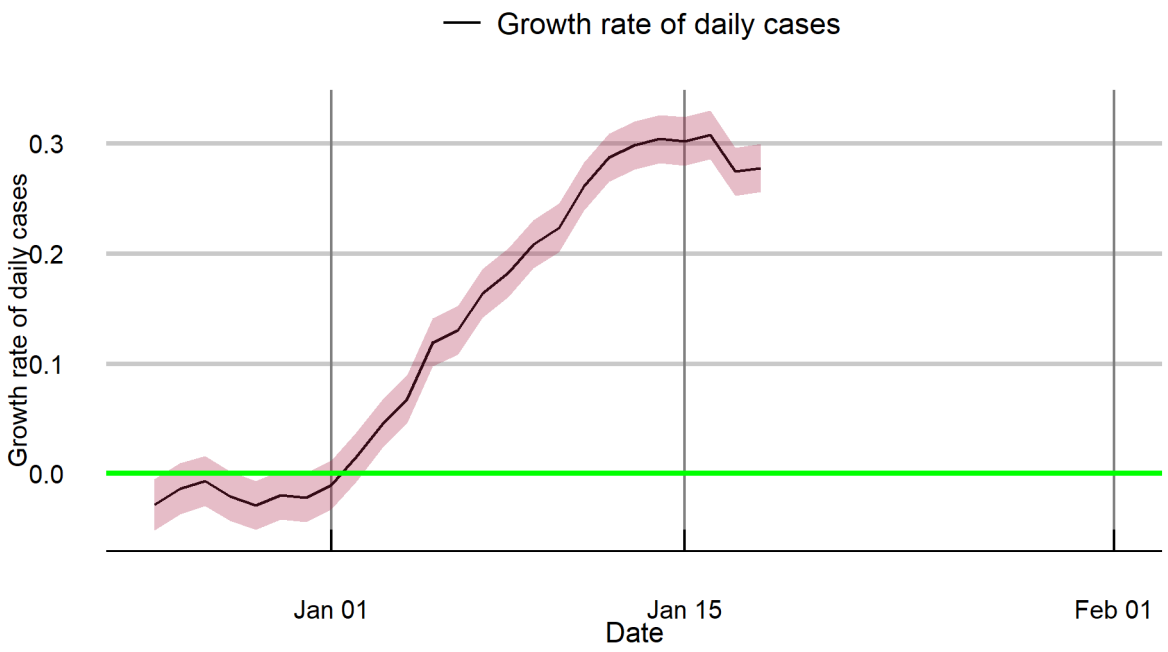
Haryana



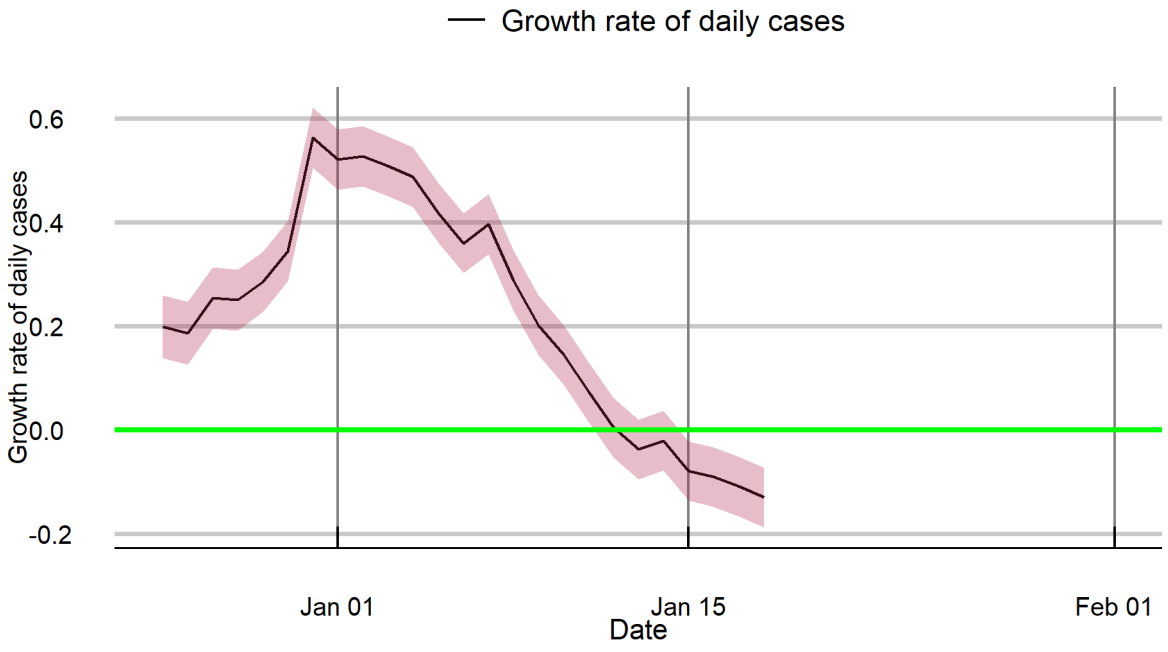
Himachal Pradesh



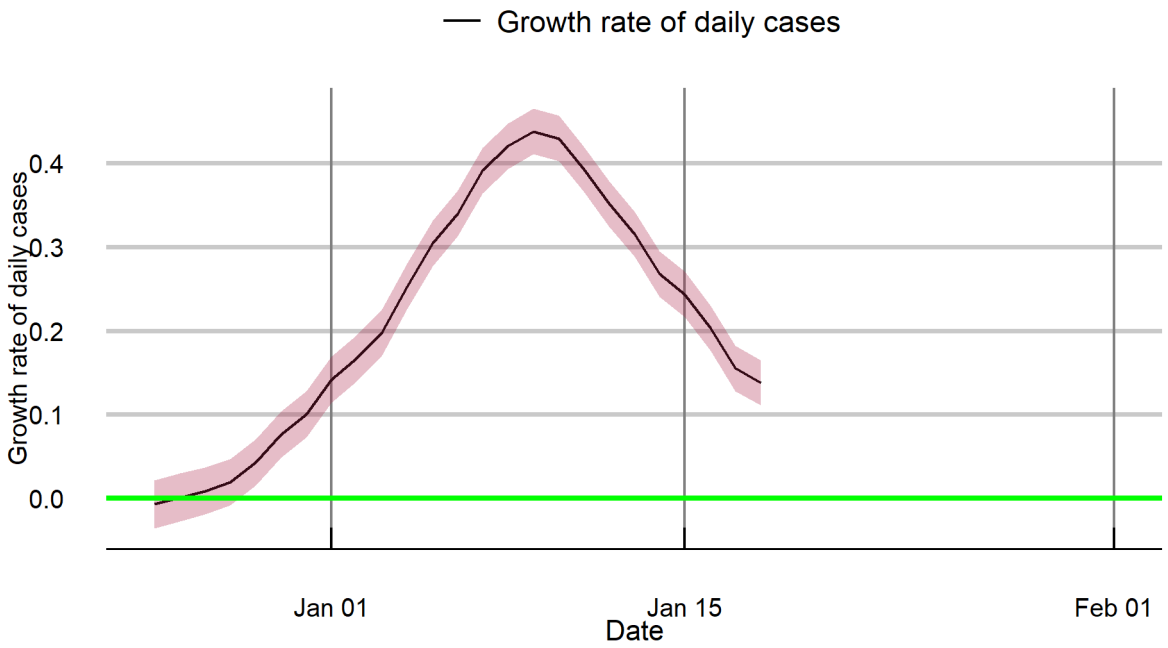
Jammu & Kashmir



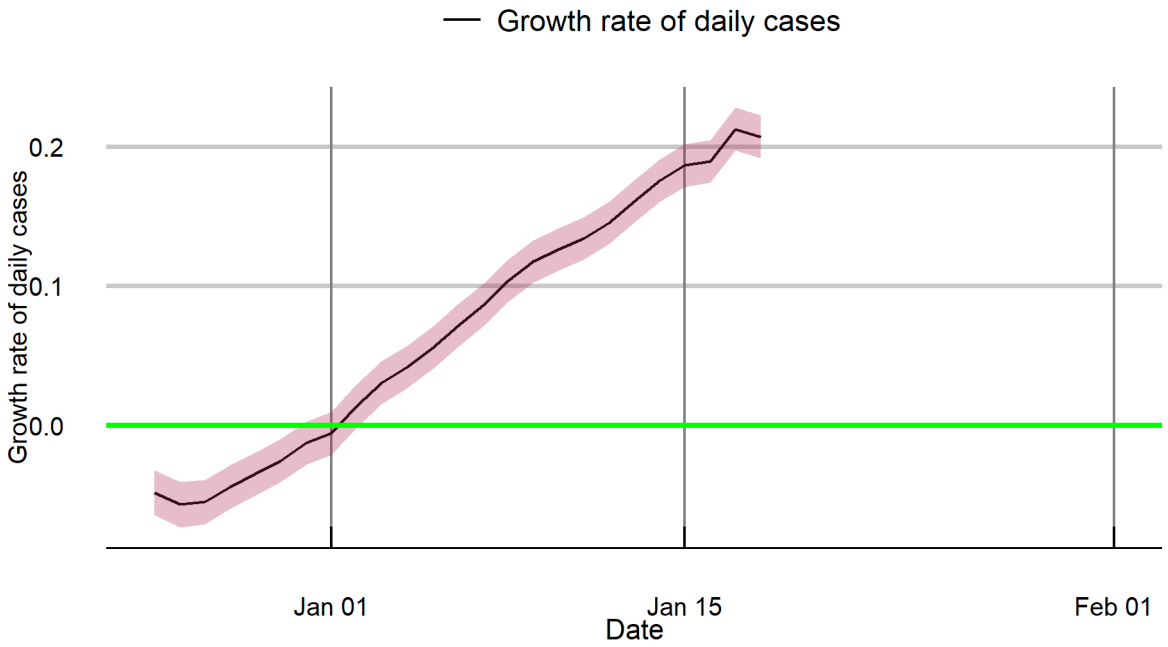
Jharkhand



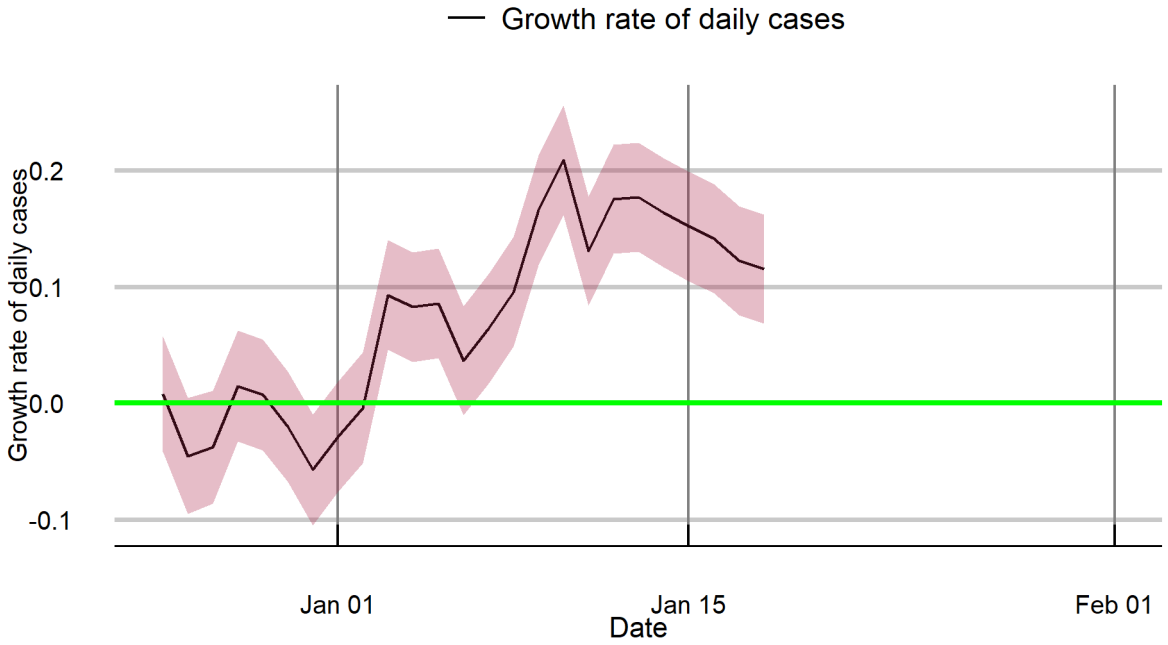
Karnataka



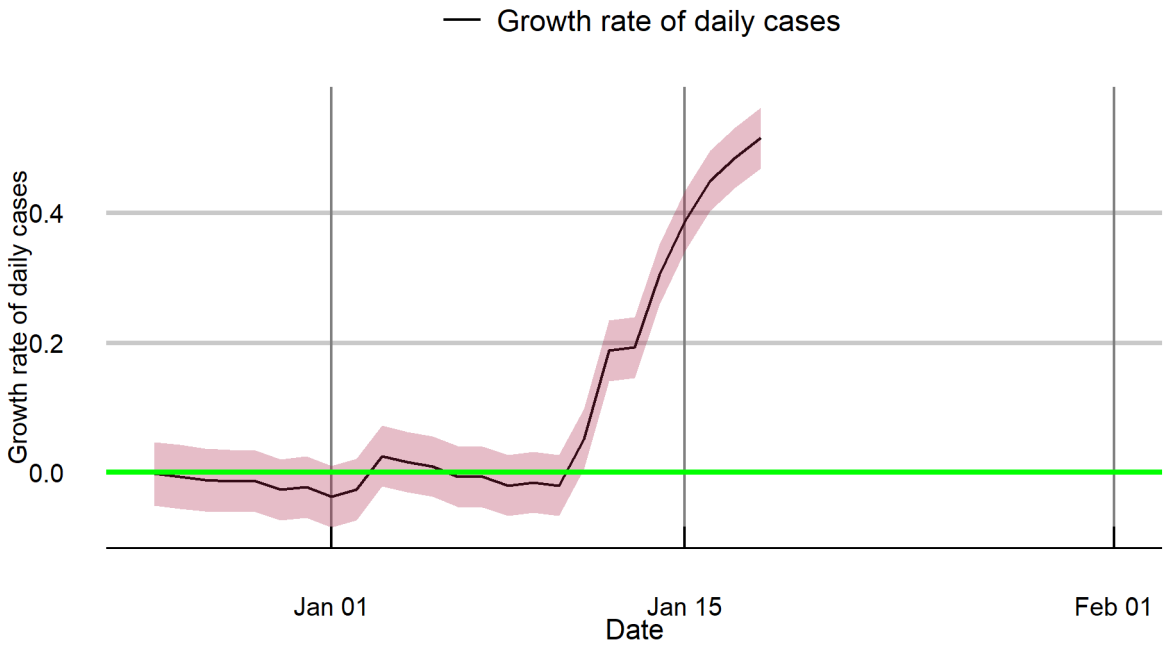
Kerala



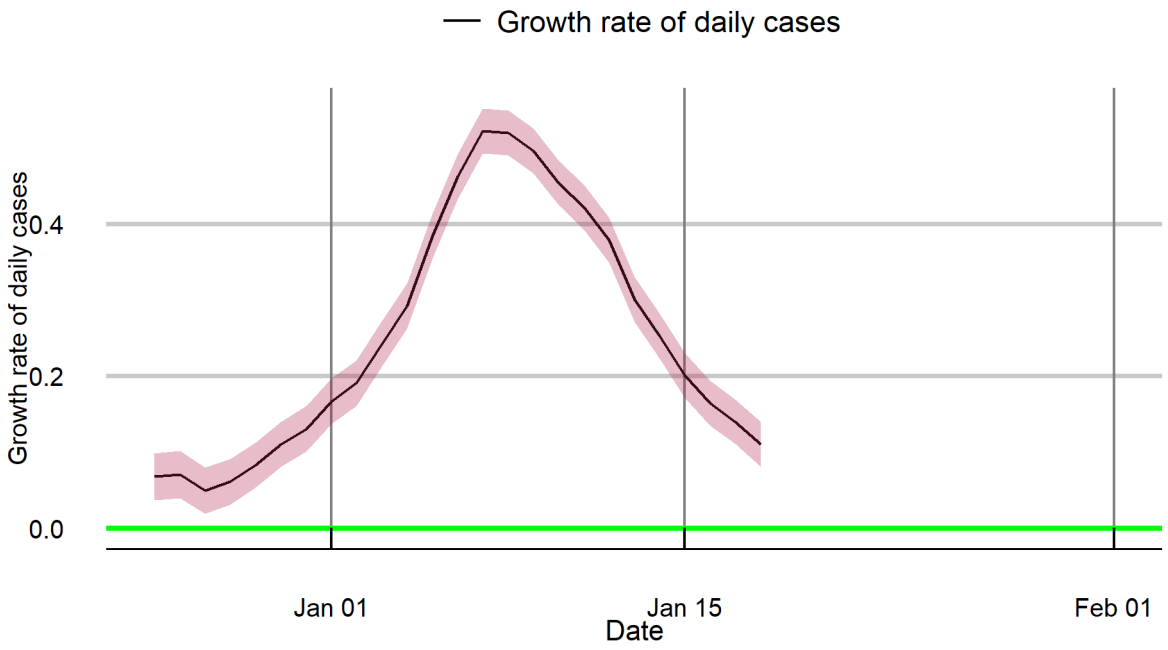
Ladakh



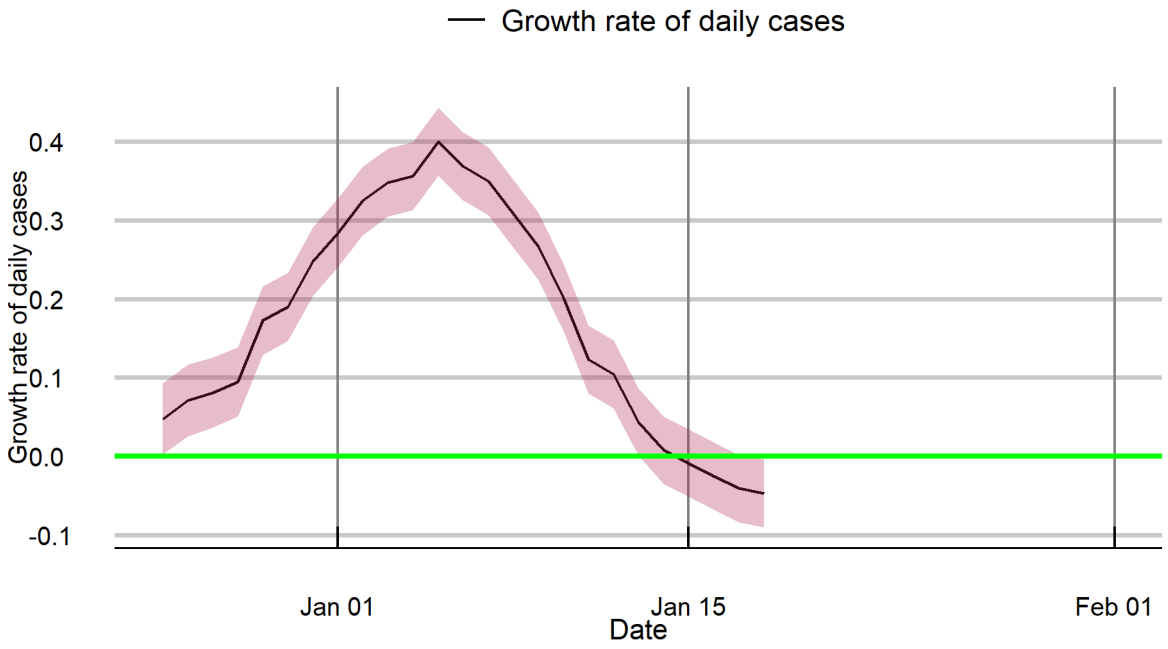
Lakshadweep



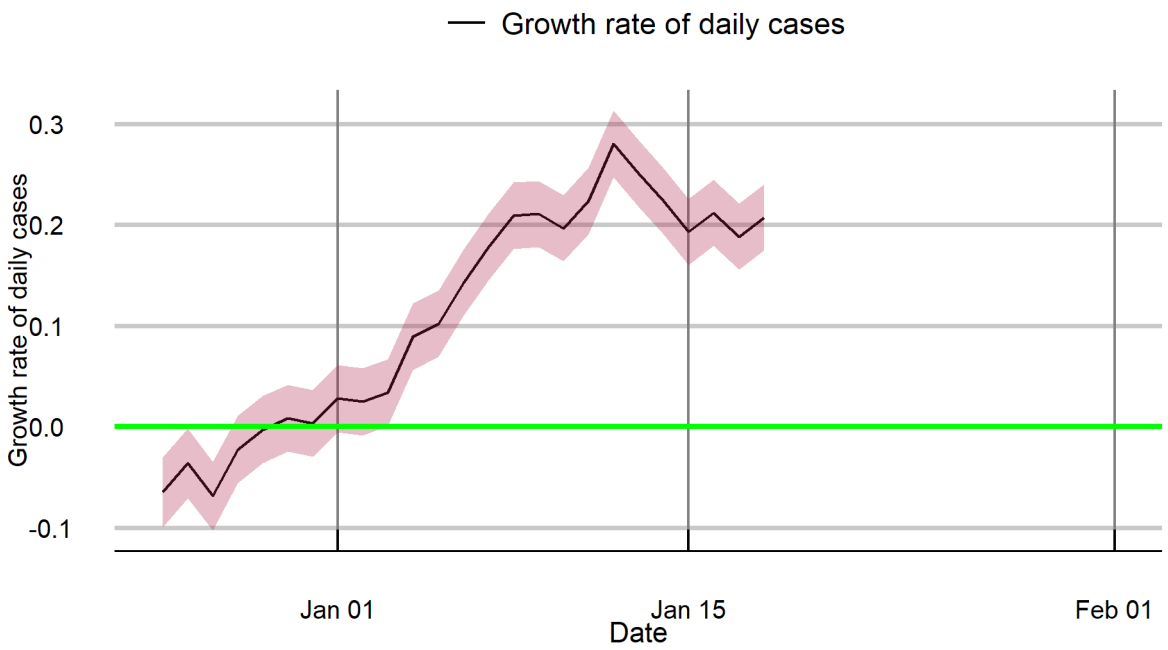
Madhya Pradesh



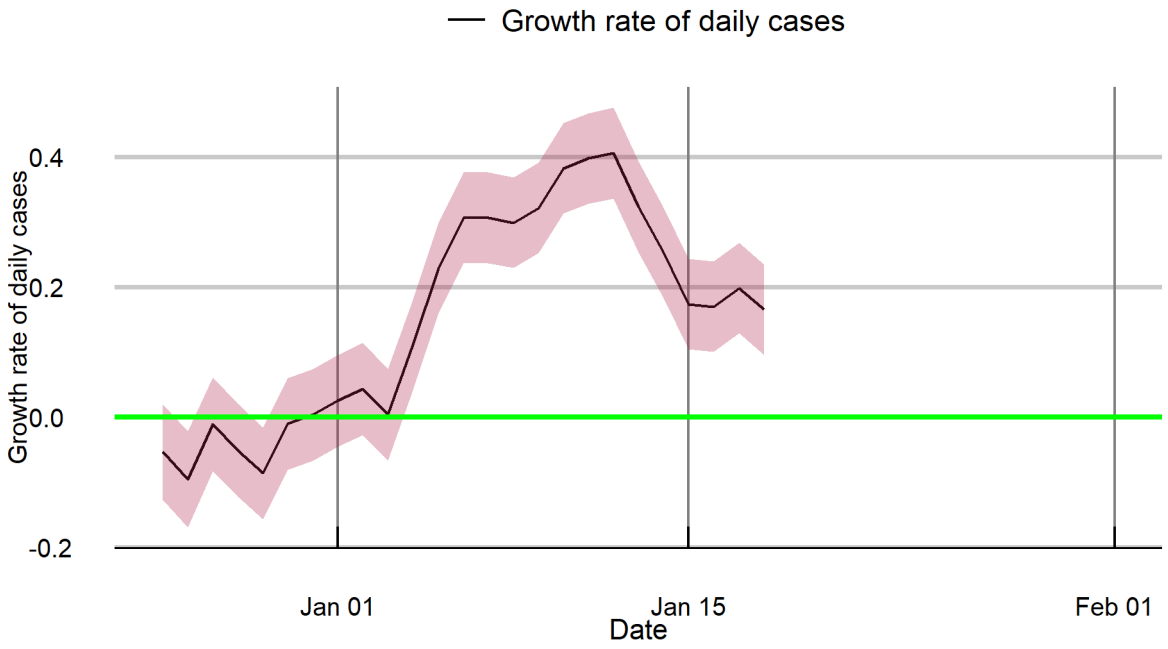
Maharashtra



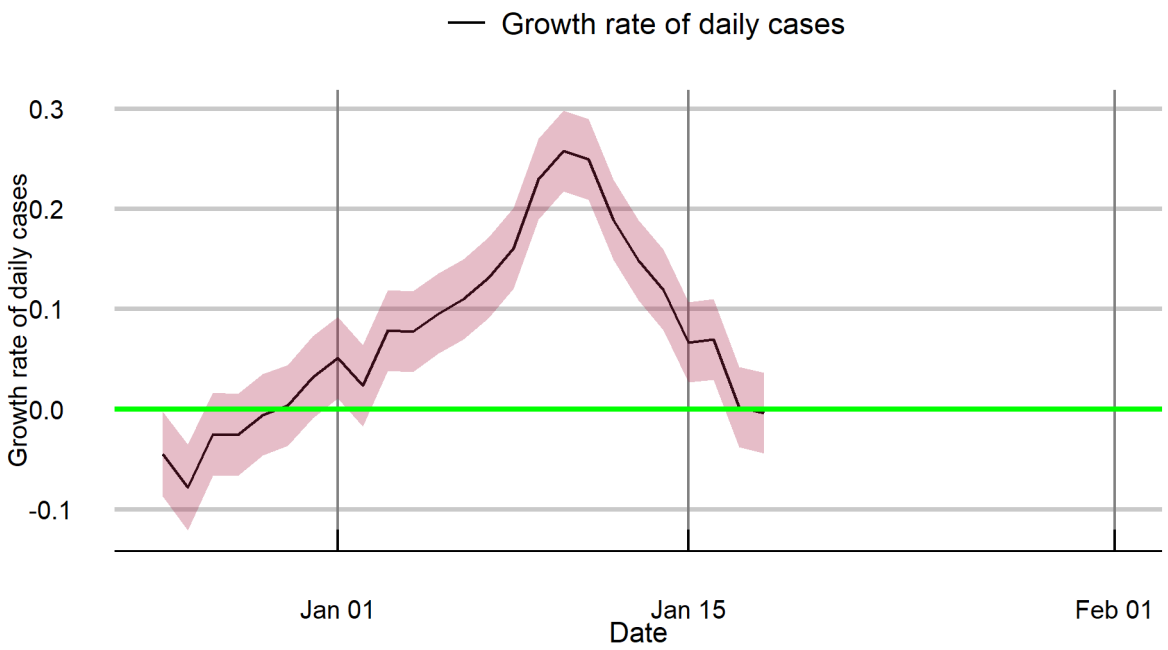
Manipur



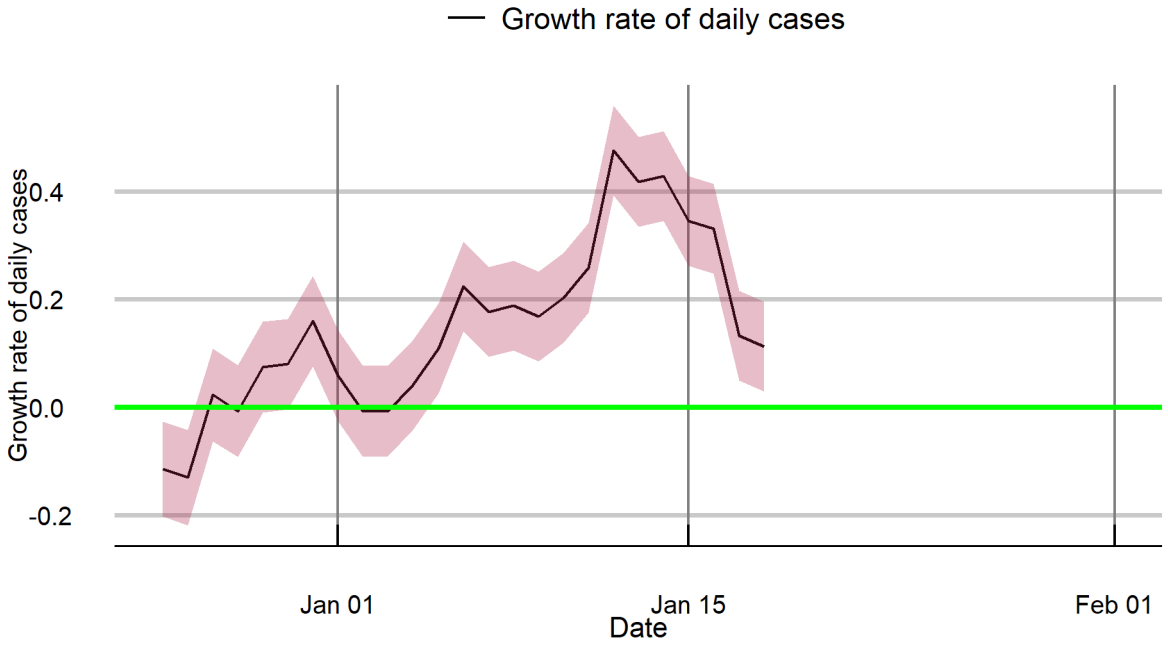
Meghalaya



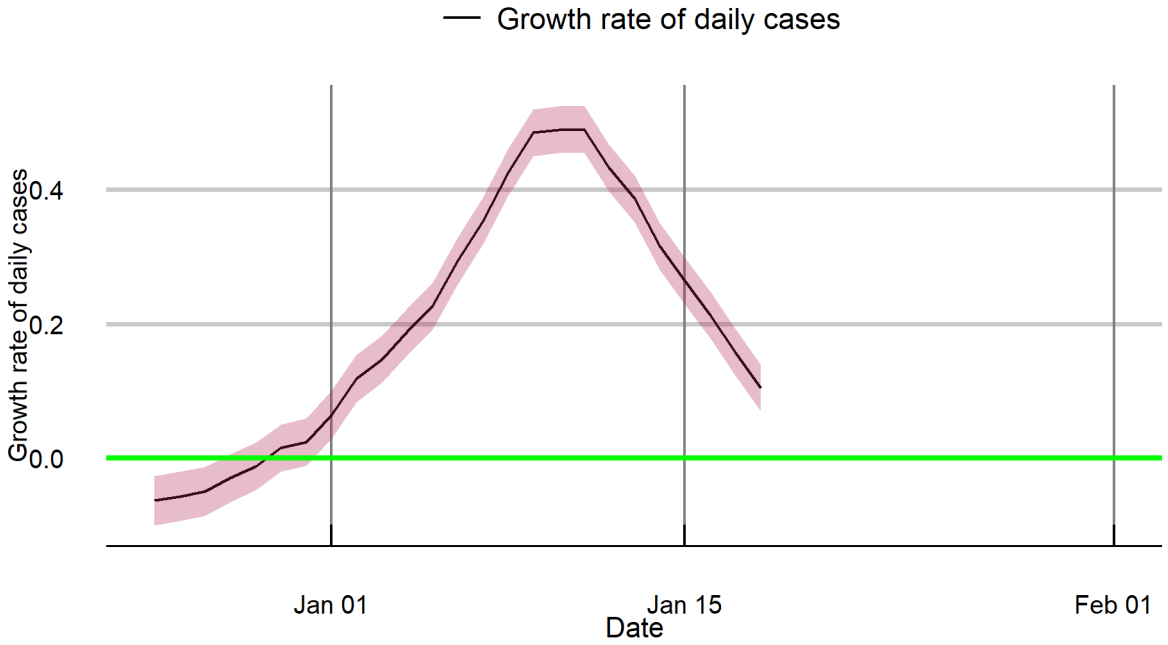
Mizoram



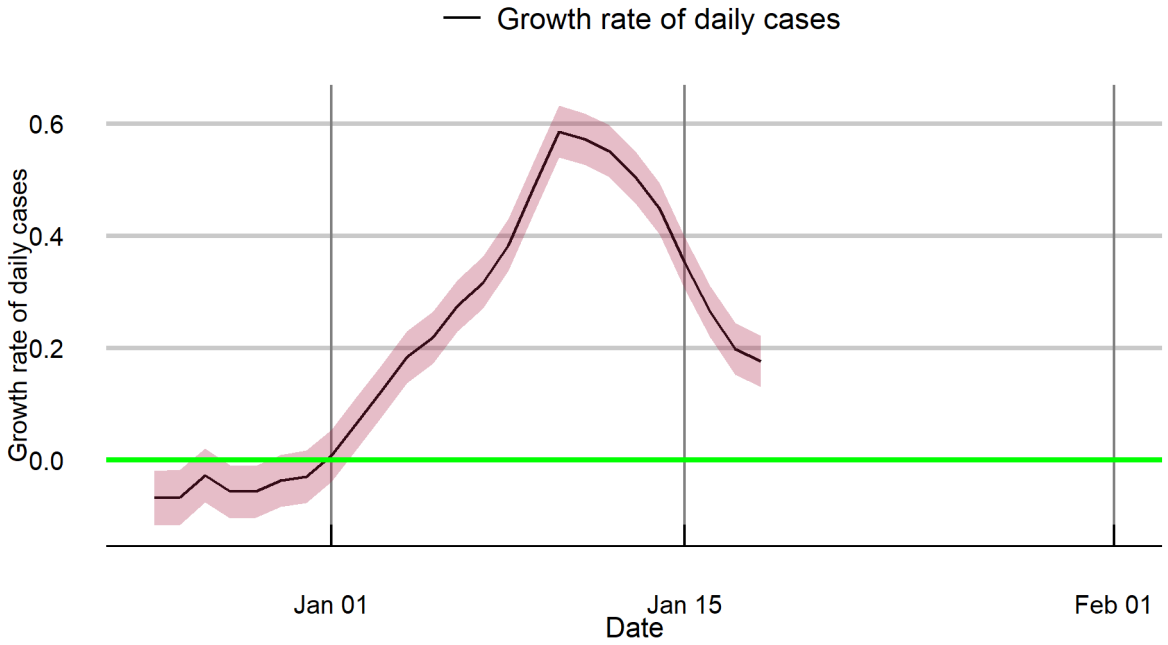
Nagaland



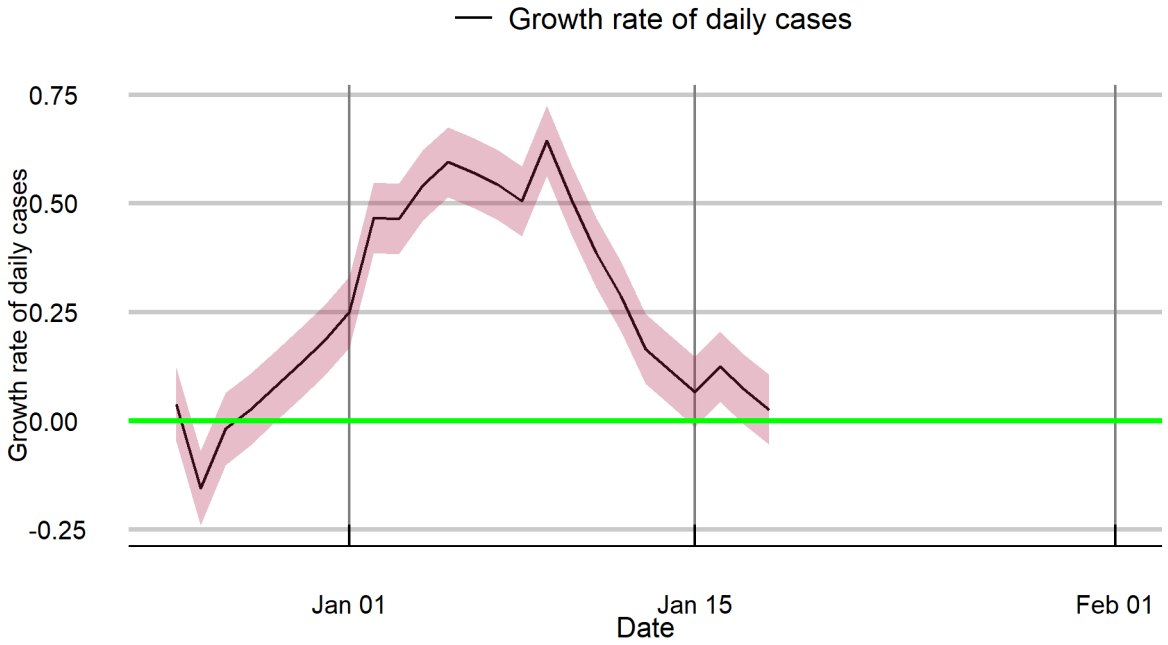
Odisha



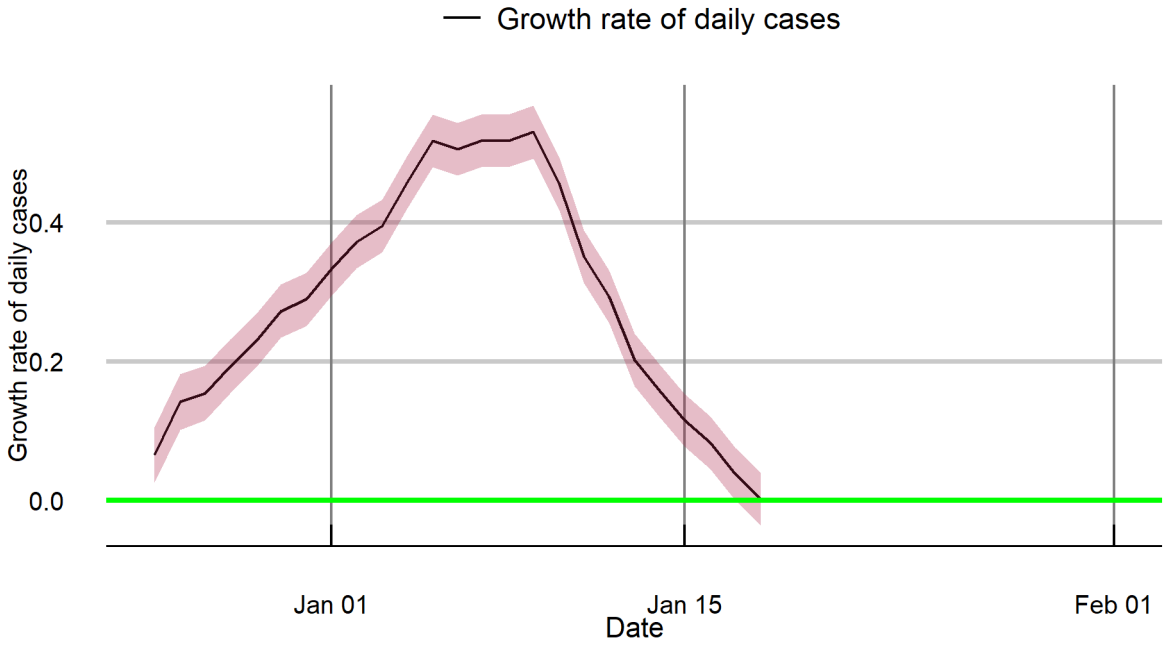
Puducherry



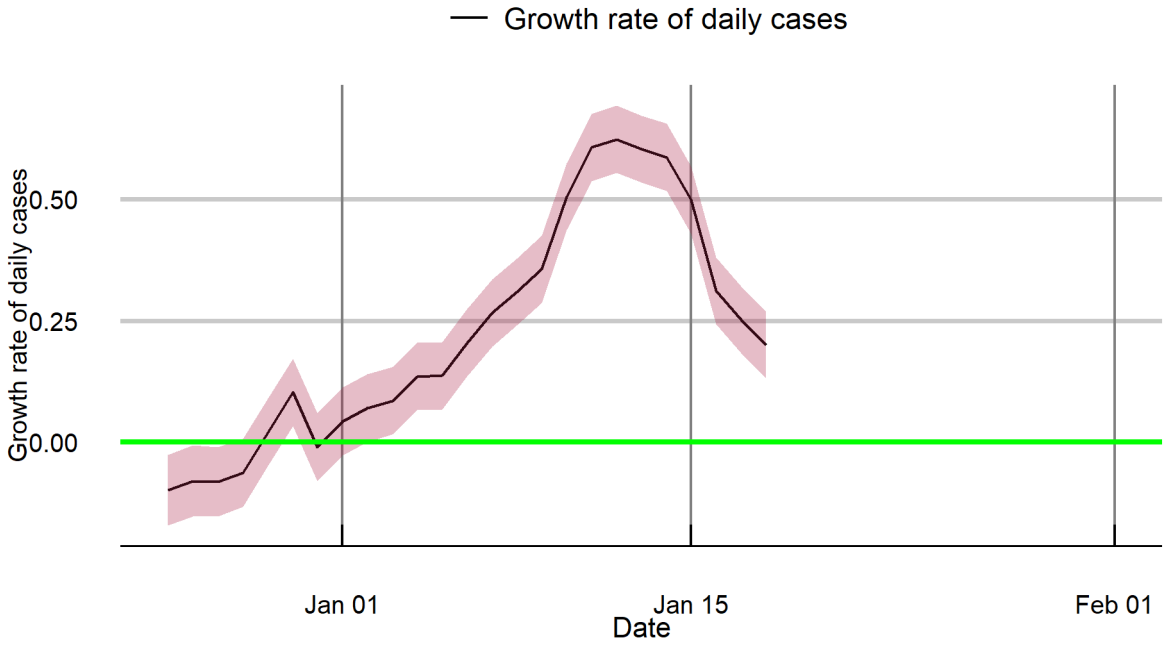
Punjab



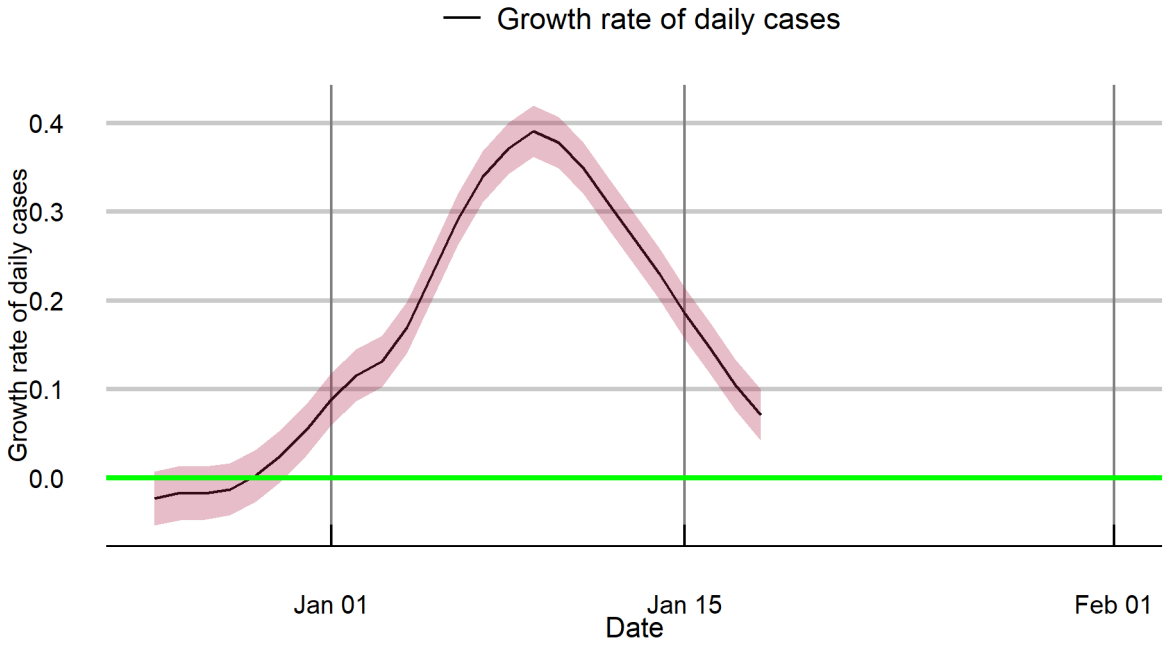
Rajasthan



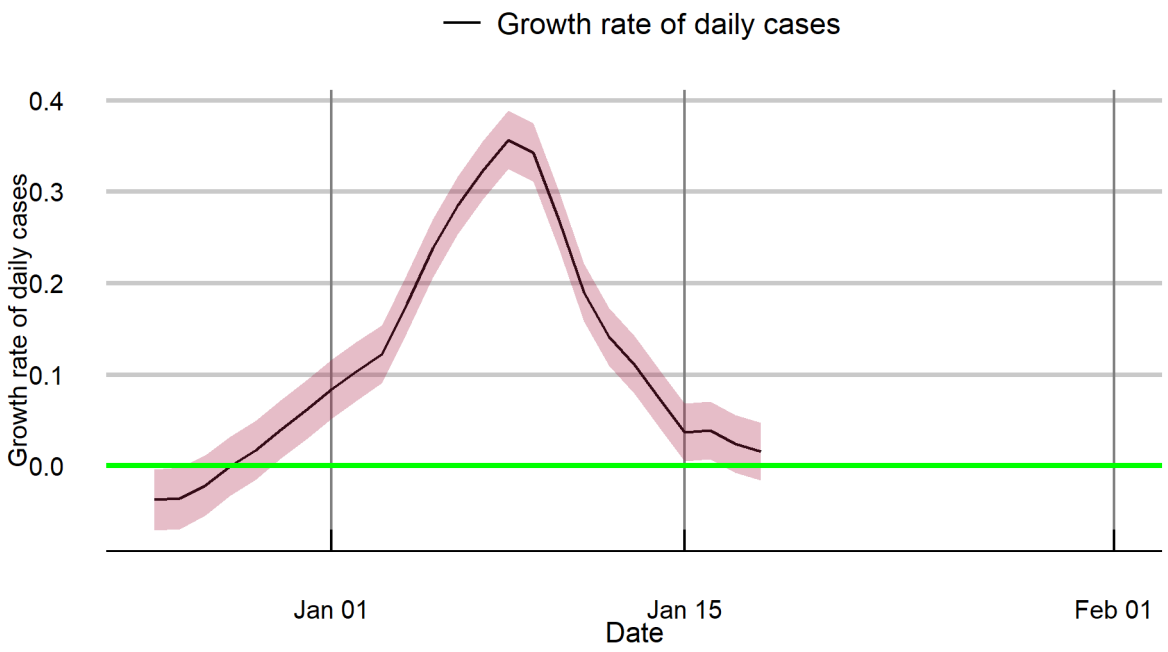
Sikkim



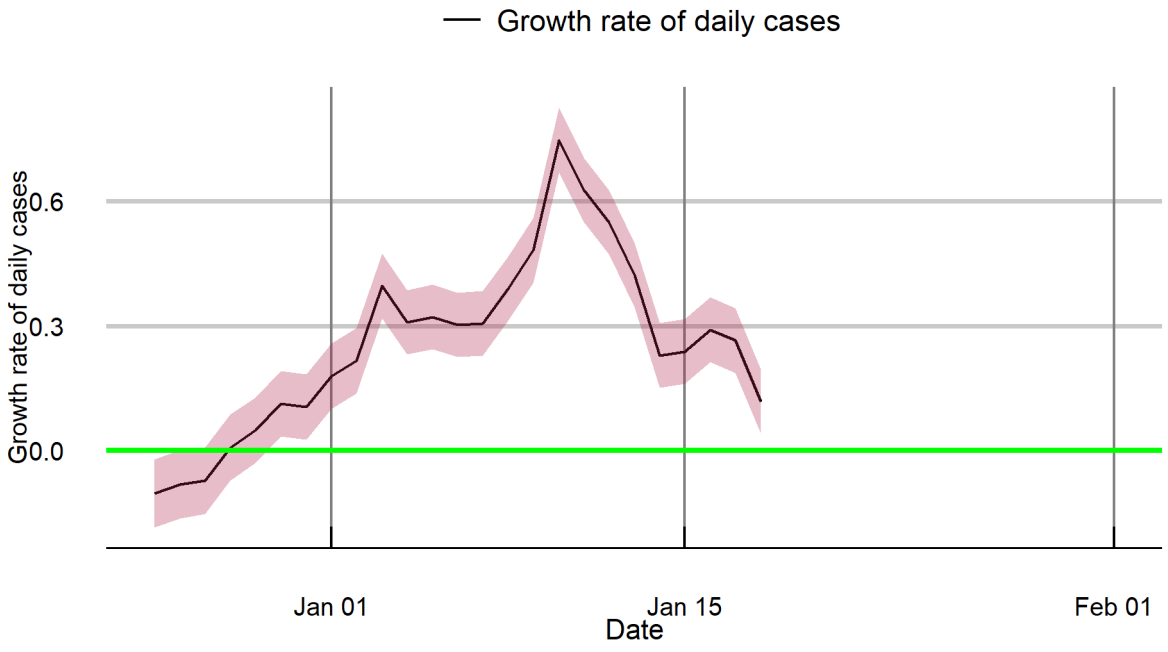
Tamil Nadu



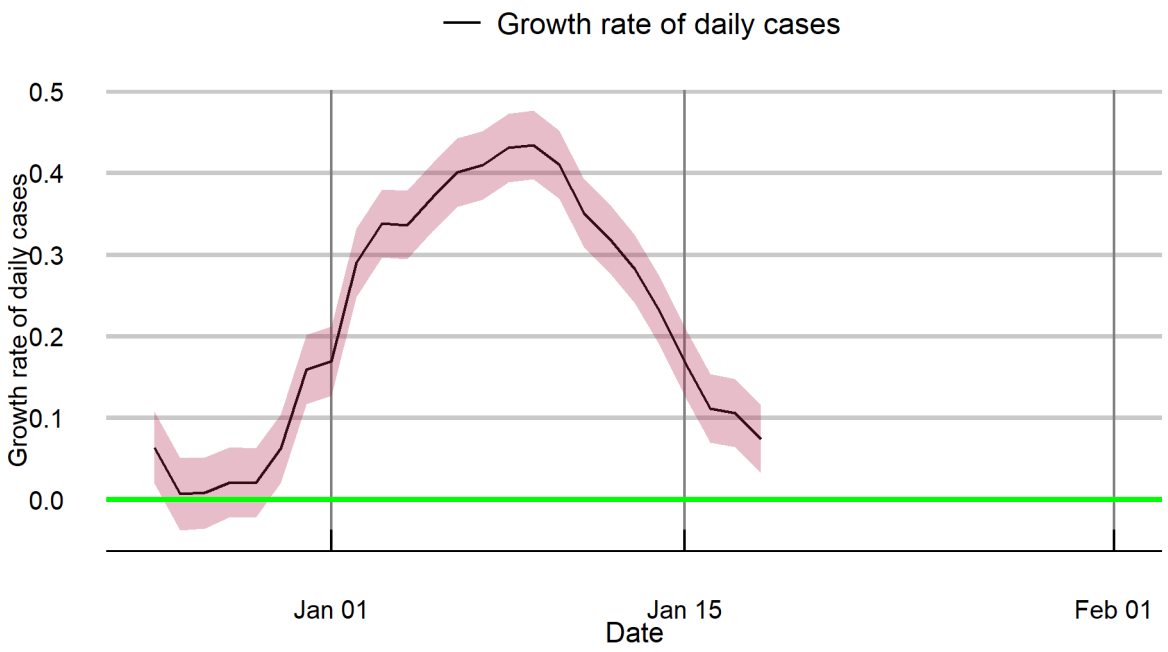
Telangana



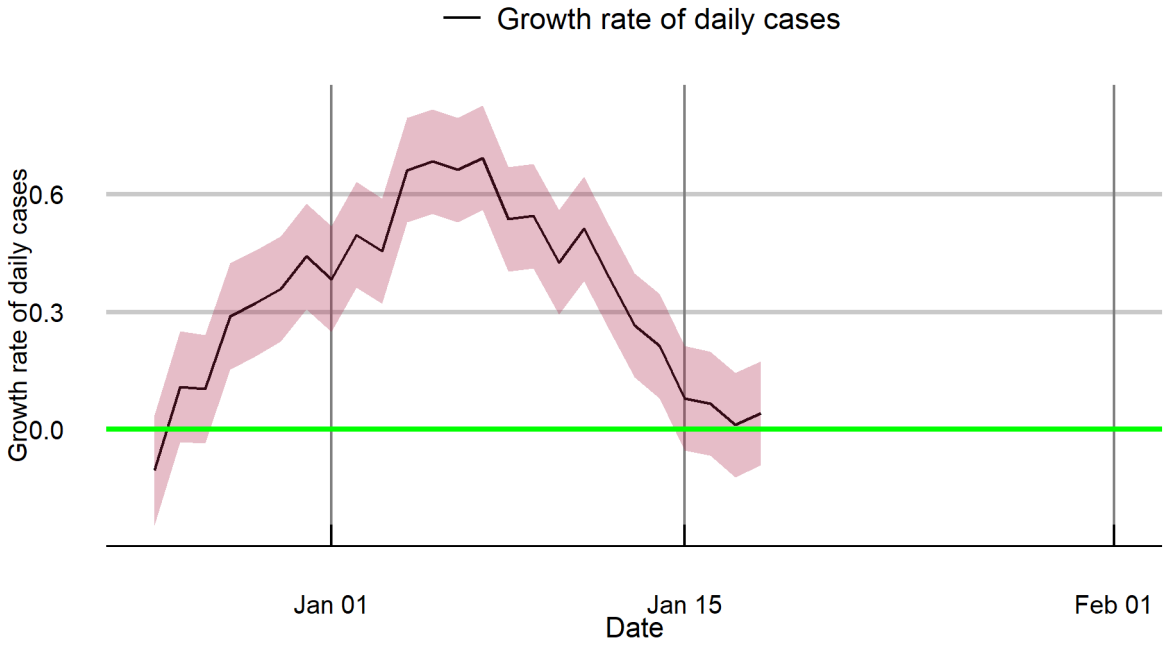
Tripura

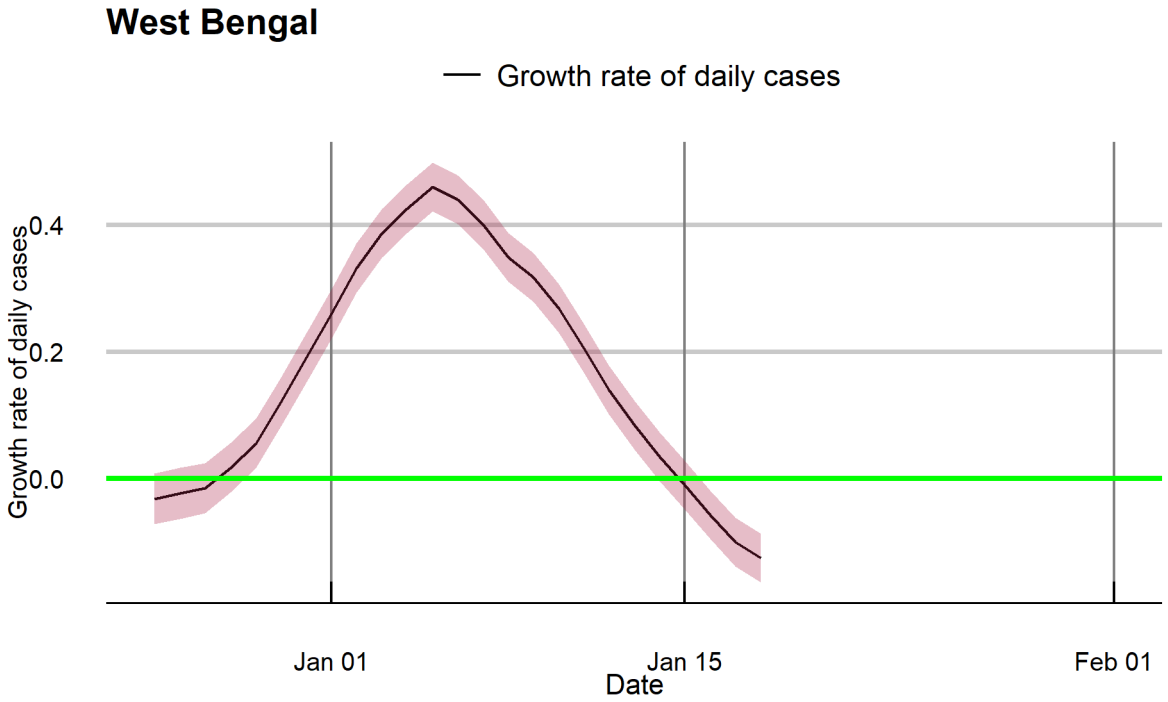


Uttarakhand



Uttar Pradesh




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

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.

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

[*]University of Cambridge.
[#]Health Systems Transformation Platform.
[+]National Institute of Economic and Social Research

Cambridge Centre for Health Leadership & Enterprise
Cambridge Judge Business School
University of Cambridge
Trumpington Street
Cambridge
CB2 1AG
United Kingdom

T +44(0)1223 339700
health@jbs.cam.ac.uk
www.jbs.cam.ac.uk/health