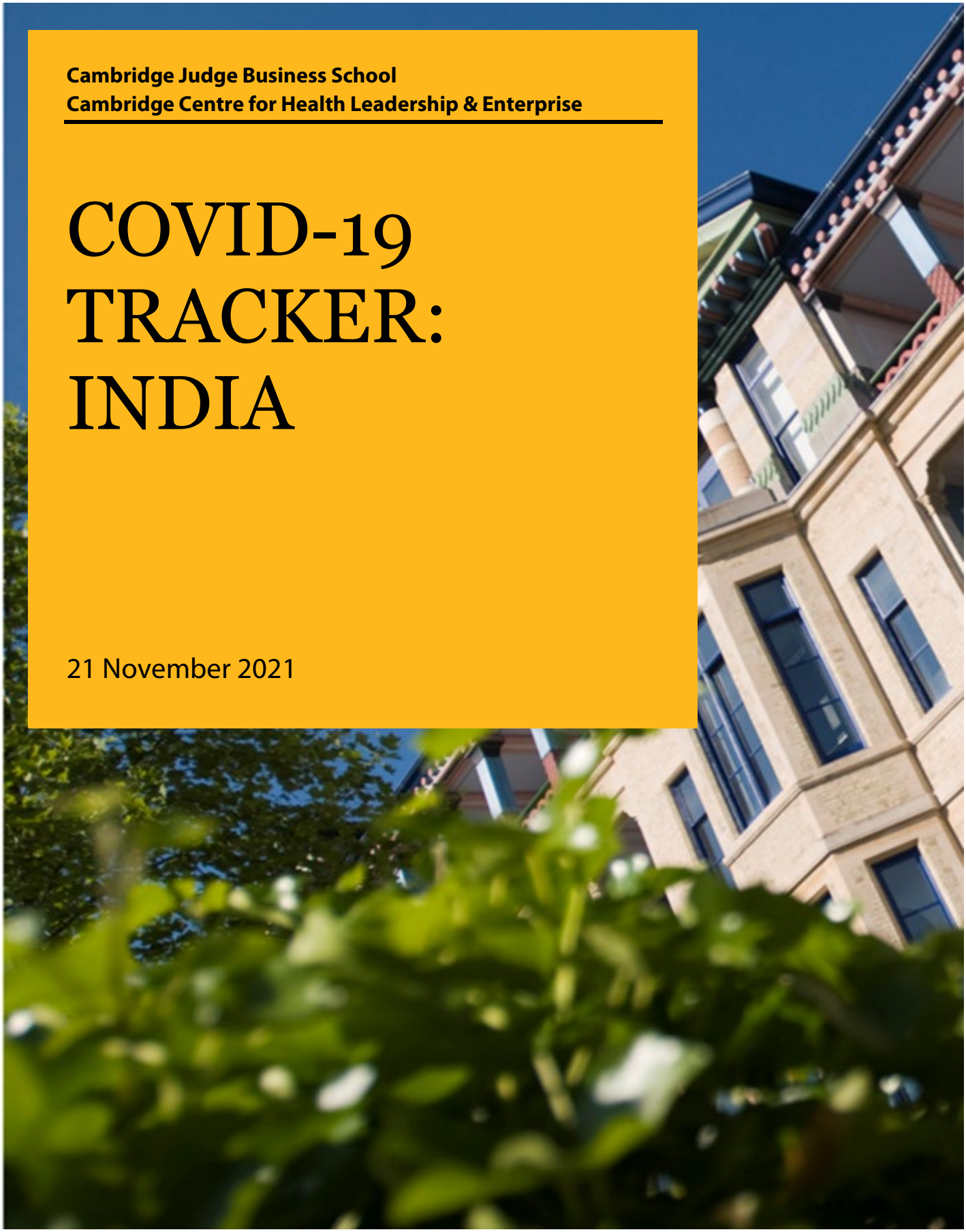
Cambridge Judge Business School
Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

21 November 2021



Centre for **Health Leadership & Enterprise**
UNIVERSITY OF CAMBRIDGE Judge Business School

HSTP Health Systems Transformation Platform

National Institute of Economic and Social Research

Meghalaya and Sikkim are currently witnessing flare ups, with their filtered daily growth rates exceeding 5% and trending upwards.

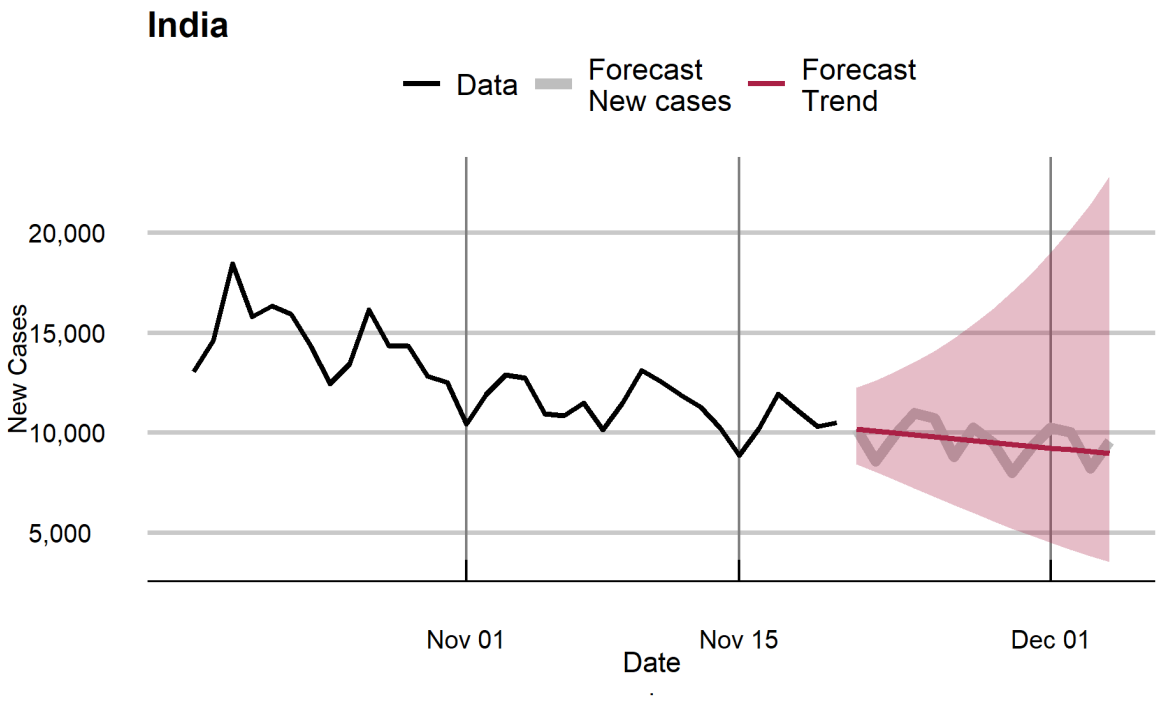
Ladakh and Rajasthan currently have daily growth rates over 5%, but are on downward trends.

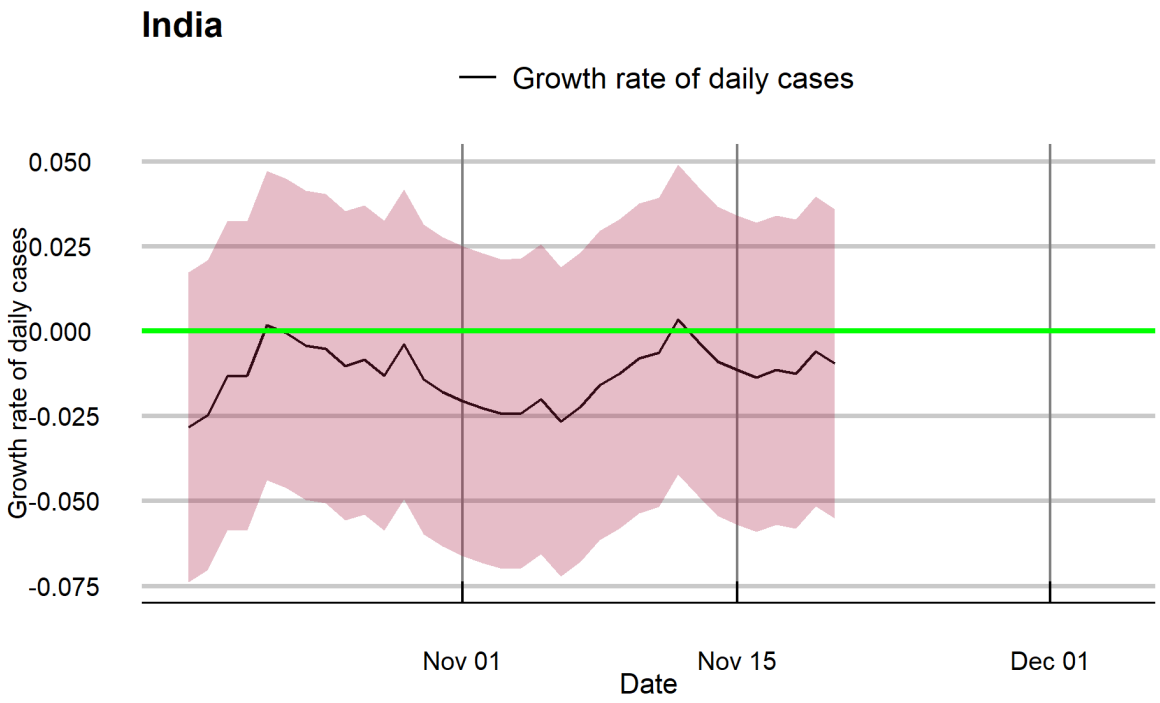
The surges seen last week in Chhattisgarh, Delhi, Punjab, and Uttarakhand have settled, with their current growth rates zero or negative. The daily growth rate for Jammu and Kashmir is also lower, but remains positive at 2.7% as of 20 November.

For India as a whole, the trend value of new COVID-19 cases is likely to be about 9,000 per day in two week's time, by 4 December.

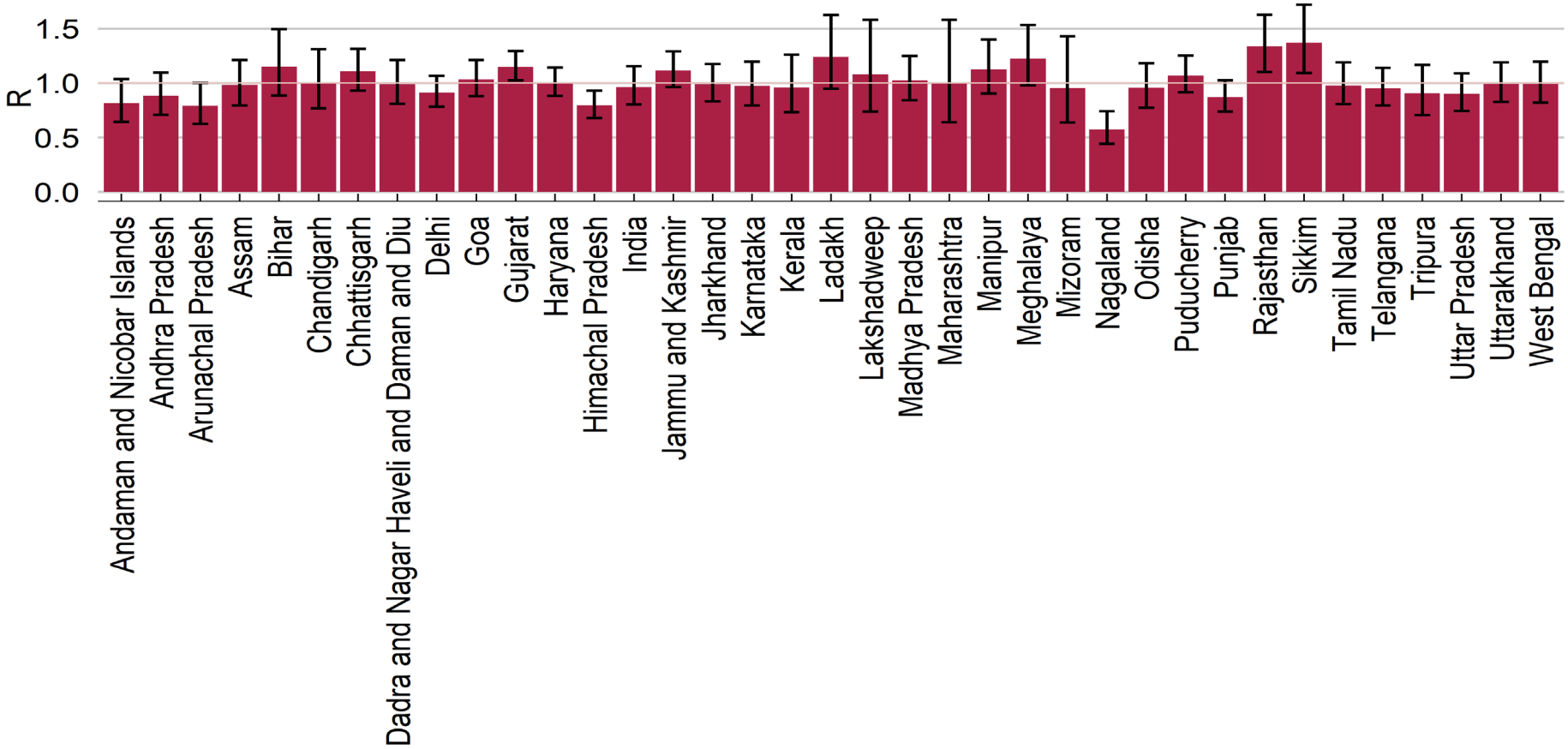
Daily COVID-19 cases in India: Forecast

Forecasts of daily new cases for the period 21 November to 4 December 2021, based on data till 20 November 2021. The trend value of new COVID-19 cases is likely be about 9,000 per day by 4 December.





R_t: 20 November 2021



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

Note: Estimates are reliable for: Andhra Pradesh, Assam, Delhi, Goa, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram, Odisha, Puducherry, Tamil Nadu, Telangana, West Bengal. Small numbers make the estimates and forecasts of other states and union territories imprecise.

Filtered daily growth rates of daily cases for States and Union territories currently seeing flare ups

20 November 2021

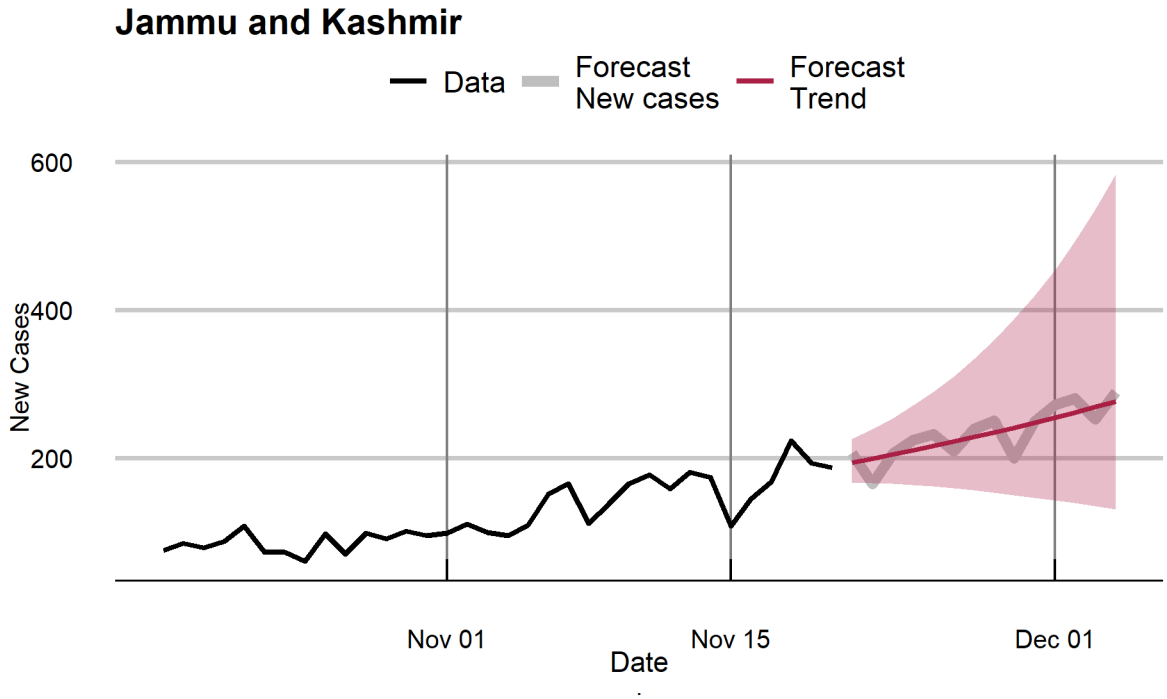
Date	Ladakh	Meghalaya	Rajasthan	Sikkim
07/11/2021	-1.5%	-1.5%	-5.6%	-10.0%
08/11/2021	2.6%	-1.7%	-2.5%	-7.6%
09/11/2021	4.9%	-1.0%	5.5%	-4.6%
10/11/2021	6.5%	-1.6%	0.7%	-1.0%
11/11/2021	4.2%	-4.1%	1.6%	-3.1%
12/11/2021	12.7%	-0.4%	11.0%	-0.7%
13/11/2021	14.0%	-8.7%	13.3%	-3.7%
14/11/2021	13.2%	-10.9%	17.2%	-5.1%
15/11/2021	14.3%	-7.0%	11.8%	-10.5%
16/11/2021	12.7%	-1.9%	14.6%	-8.2%
17/11/2021	10.2%	1.3%	13.0%	-3.7%
18/11/2021	5.7%	2.6%	14.0%	-0.7%
19/11/2021	6.8%	4.5%	10.2%	5.2%
20/11/2021	5.4%	5.0%	7.3%	7.9%

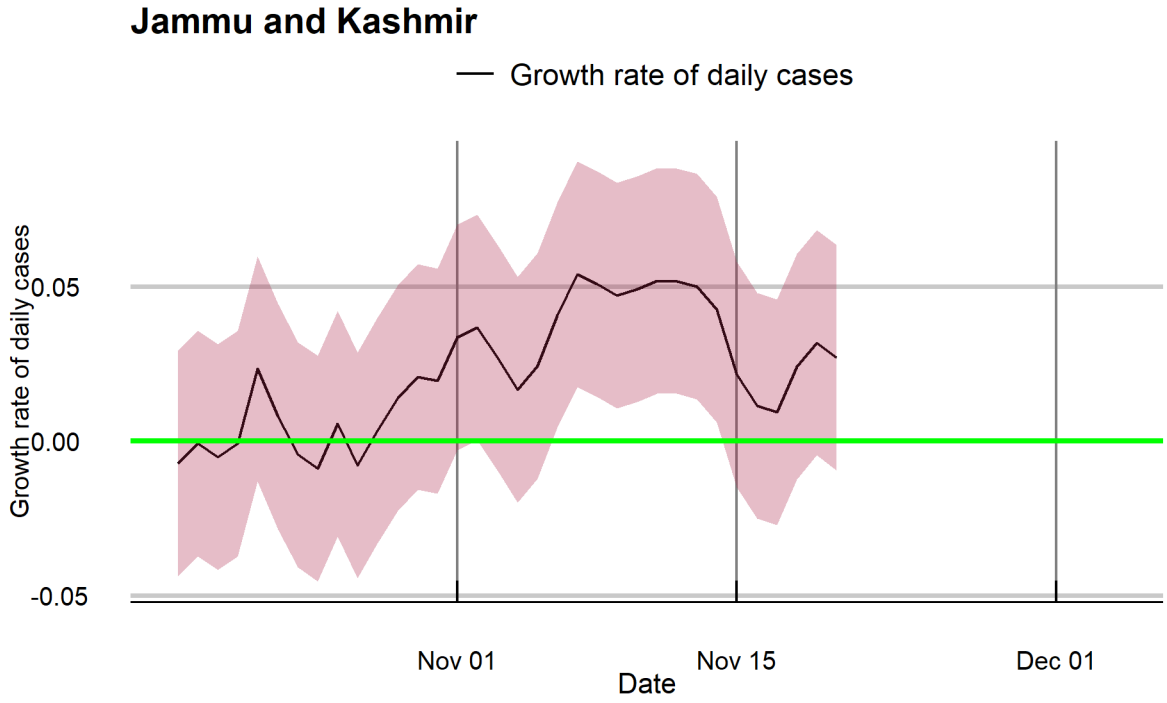
Forecasts of daily cases for States and Union territories currently seeing flare ups

21 November to 4 December 2021

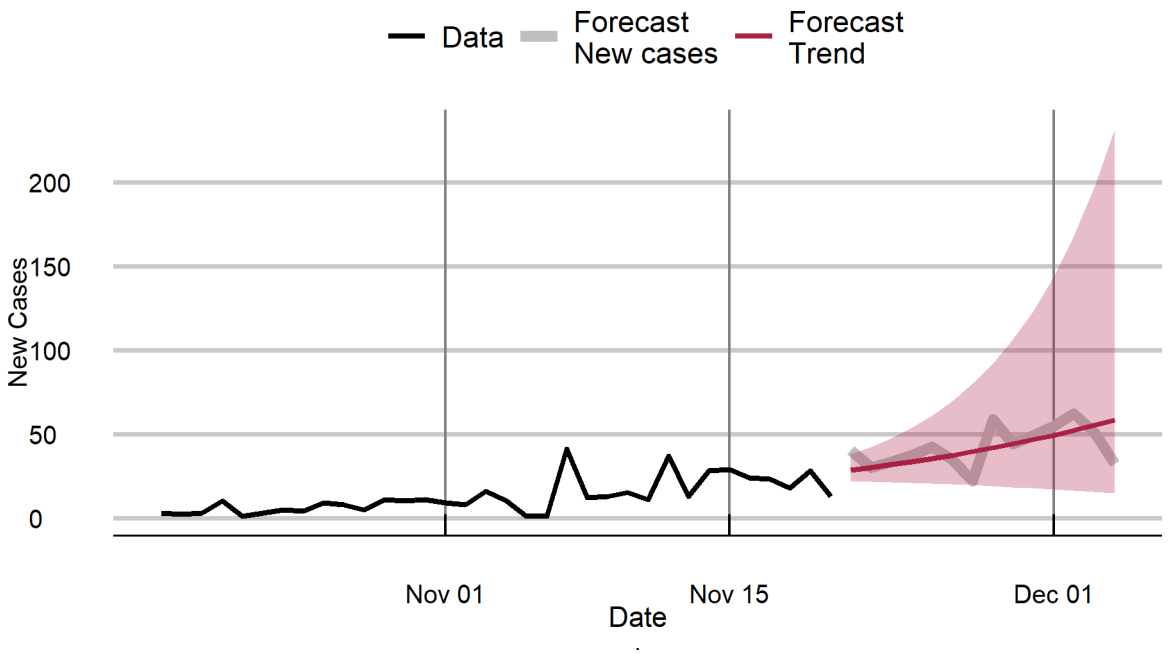
Date	Ladakh: Forecast of new cases	Ladakh: Forecast trend	Meghalaya: Forecast of new cases	Meghalaya: Forecast trend	Rajasthan: Forecast of new cases	Rajasthan: Forecast trend	Sikkim: Forecast of new cases	Sikkim: Forecast trend
21/11/2021	40	**29**	30	**32**	14	**15**	10	**10**
22/11/2021	30	**30**	29	**34**	16	**16**	5	**11**
23/11/2021	34	**32**	34	**36**	15	**17**	15	**12**
24/11/2021	37	**34**	42	**37**	19	**18**	18	**13**
25/11/2021	42	**35**	44	**39**	21	**20**	15	**14**
26/11/2021	35	**37**	45	**41**	21	**21**	18	**15**
27/11/2021	22	**40**	43	**44**	26	**23**	18	**16**
28/11/2021	59	**42**	42	**46**	24	**25**	18	**18**
29/11/2021	44	**44**	41	**48**	27	**27**	8	**19**
30/11/2021	49	**47**	48	**51**	25	**29**	25	**21**
01/12/2021	55	**49**	60	**53**	32	**31**	31	**22**
02/12/2021	62	**52**	63	**56**	34	**33**	27	**24**
03/12/2021	51	**55**	64	**59**	34	**36**	31	**26**
04/12/2021	32	**58**	61	**62**	43	**38**	32	**29**

New cases forecasts and daily growth rates for States and Union territories currently of concern

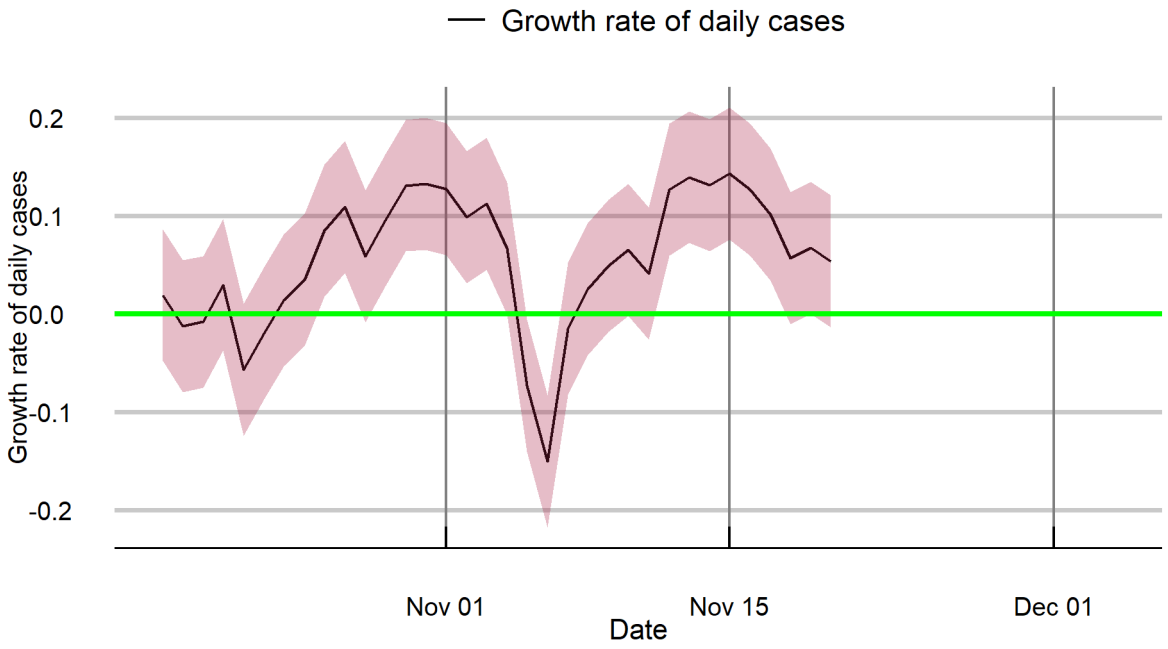


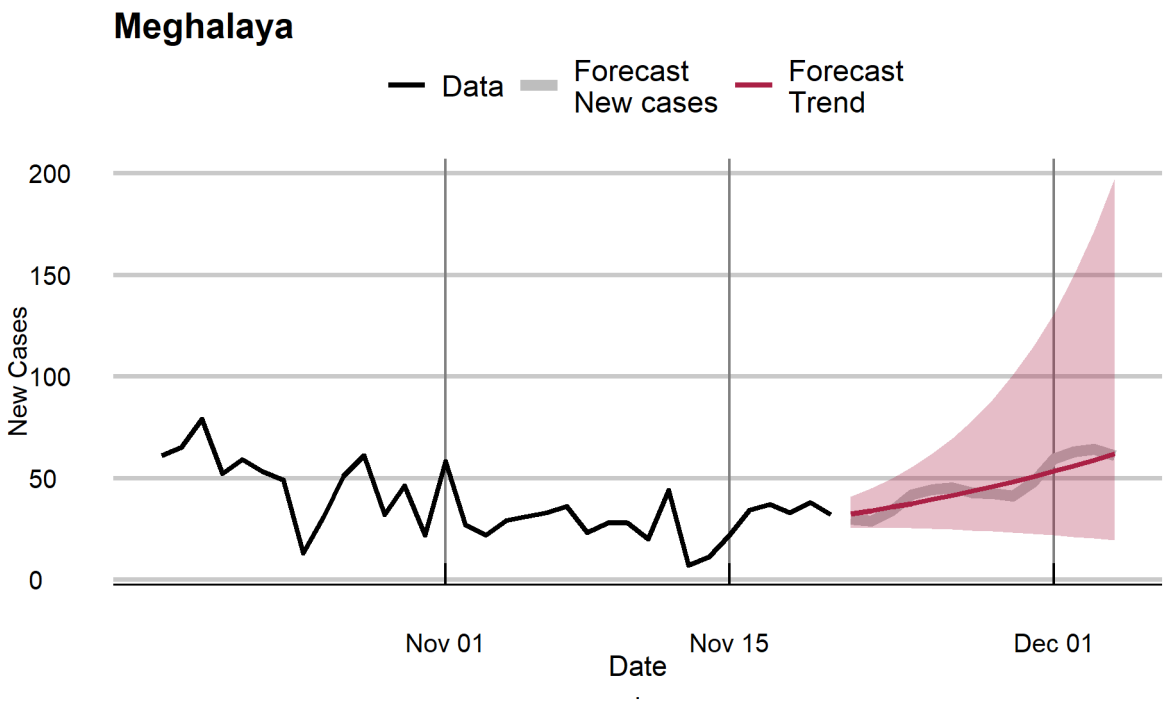


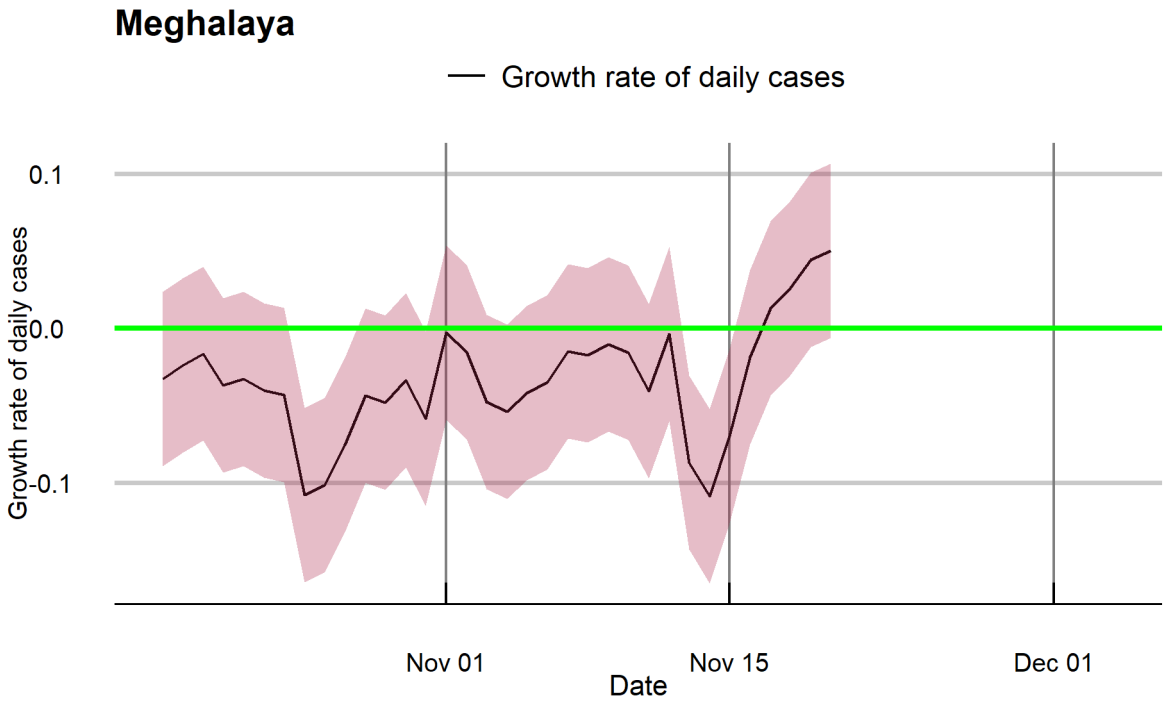
Ladakh

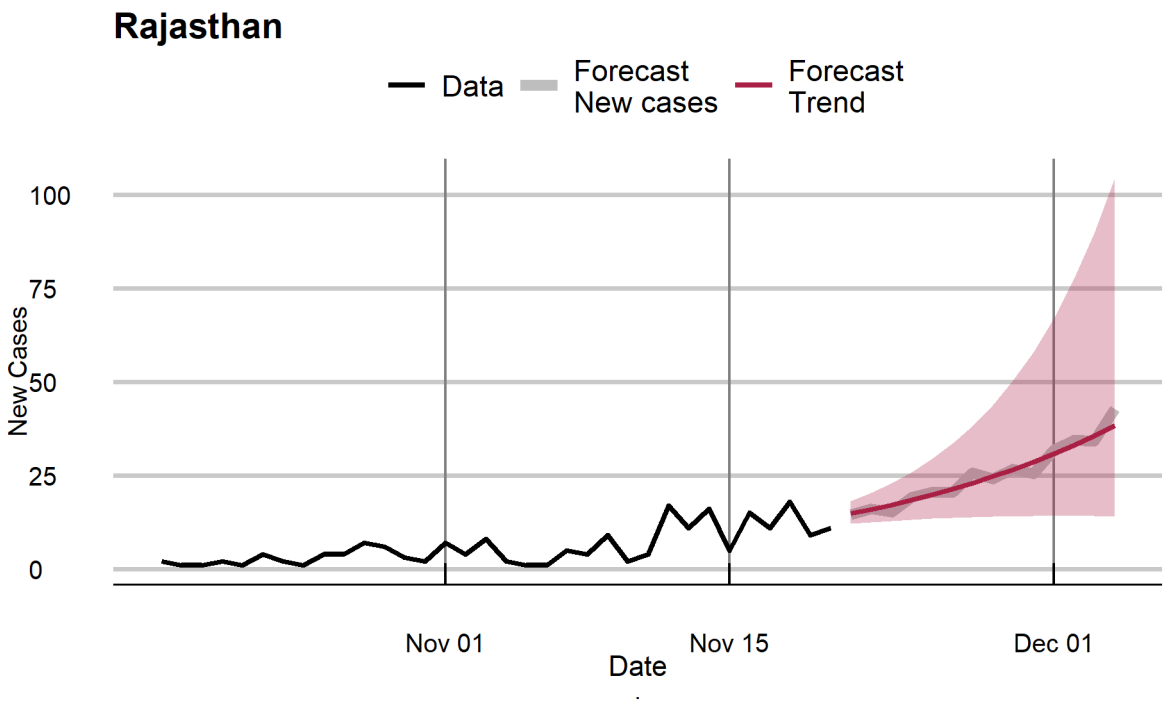


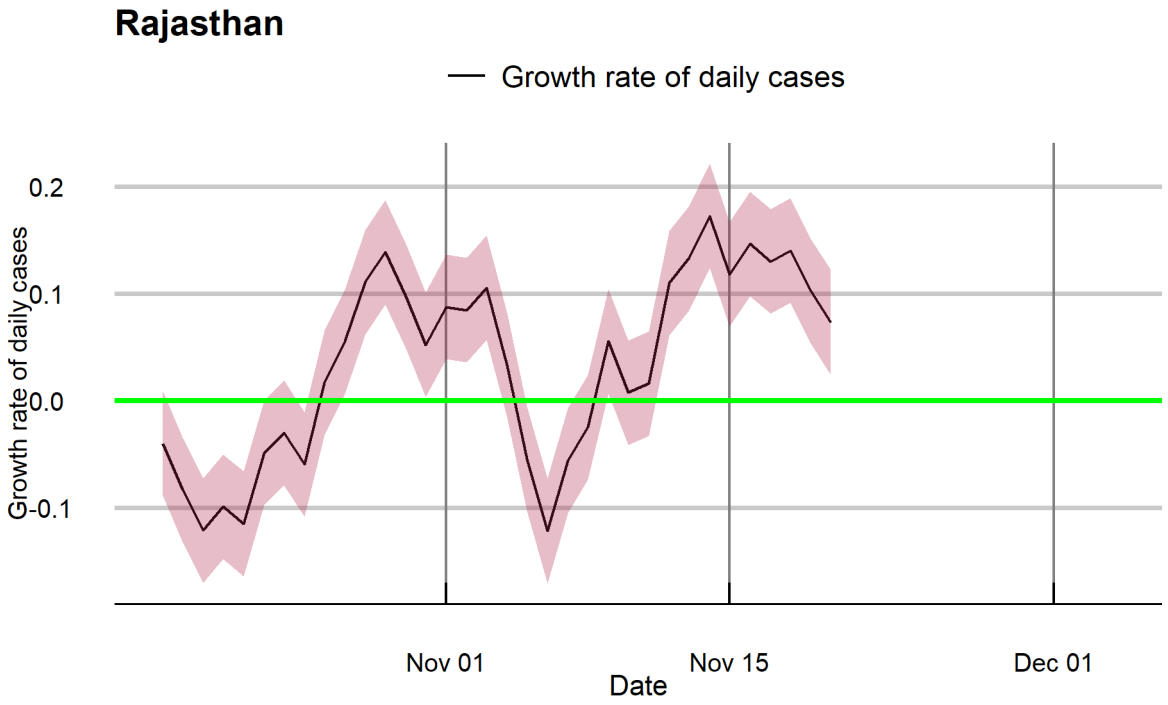
Ladakh

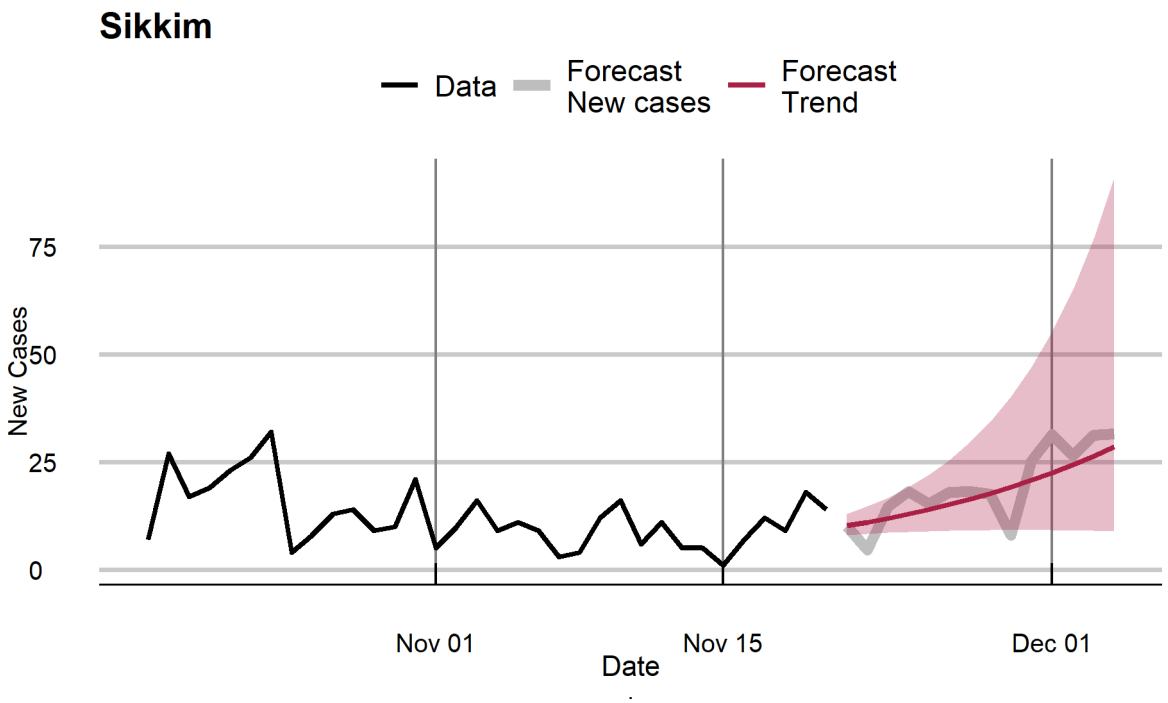


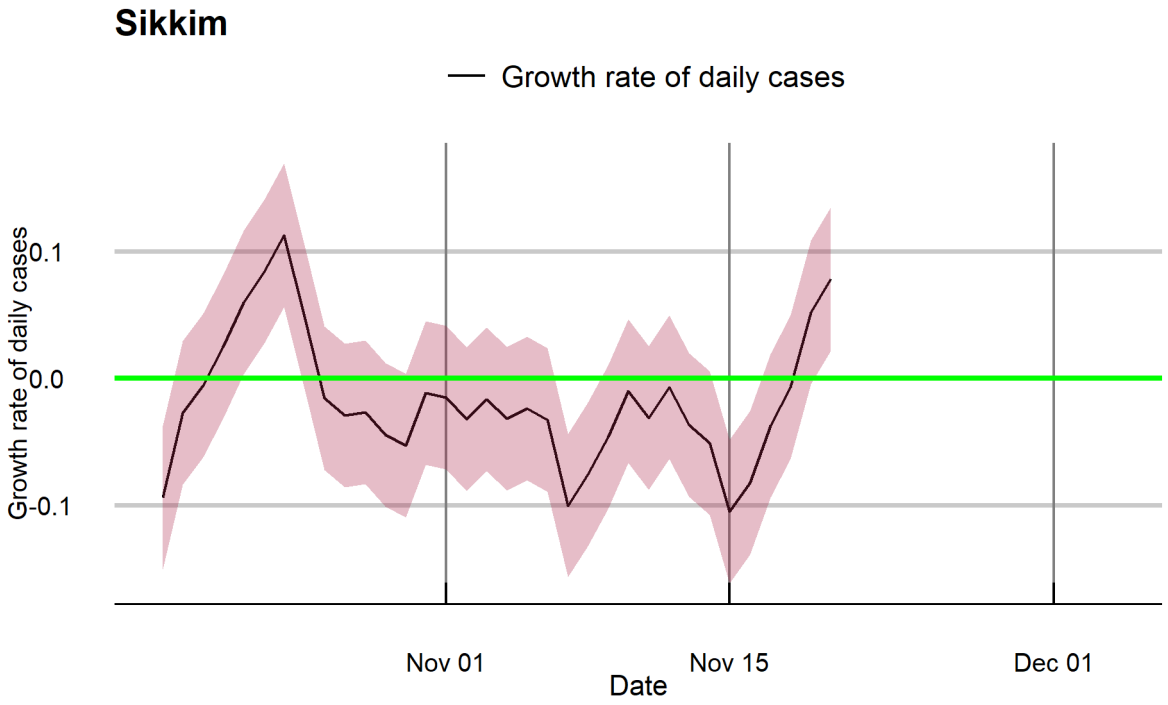

Meghalaya
Data
Forecast
New cases
Forecast
Trend
200
150
100
50
0
New Cases
Nov 01
Nov 15
Dec 01
Date


Meghalaya
Growth rate of daily cases
0.1
0.0
-0.1
Growth rate of daily cases
Nov 01
Nov 15
Dec 01
Date


Rajasthan
Data
Forecast
New cases
Forecast
Trend
100
75
50
25
0
New Cases
Nov 01
Nov 15
Dec 01
Date


Rajasthan
Growth rate of daily cases
0.2
0.1
0.0
-0.1
Growth rate of daily cases
Nov 01
Nov 15
Dec 01
Date


Sikkim
Data
Forecast
New cases
Forecast
Trend
75
50
25
0
New Cases
Nov 01
Nov 15
Dec 01
Date


Sikkim
Growth rate of daily cases
0.1
0.0
-0.1
Growth rate of daily cases
Nov 01
Nov 15
Dec 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 and deaths data are sourced from Johns Hopkins University (JHU), Center for Systems Science and Engineering (CSSE).

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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