COVID-19 TRACKER: INDIA

1 August 2021
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.

Daily cases have now begun to increase in India, as was predicted in the previous edition of this tracker. The effective reproduction number (Rt) has risen to 1.04. The trend value of the growth rate of new cases has turned positive (0.9%). Reported cases are likely to increase to 46,500 per day by 15th August. While this increase is relatively modest, it is very likely that the growth rate of cases is increasing at present (page 4).

Reported cases are expected to increase in 13 states across the country by varying extents. Growth rates of cases appear to be increasing at the present time in Delhi, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh and Uttarakhand (pages 38-43).

The large differences between Indian states in infection trajectories underline to the importance of local management of the epidemic. Yet the marked increase in the number of states facing contemporaneous flare-ups points to a national level shift to the rising phase of the epidemic curve again (pages 6 and 7).

Mean absolute percentage error of the forecasts of daily cases in India given in the July 25 tracker, for the period July 26 to August 1, was 12.98%. Forecasts become less accurate when growth is super-exponential as is the case now. 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>
Forecasts of daily new cases for the period 2nd to 15th August 2021, based on data till 1st August 2021. New COVID-19 cases is likely to be about 46,500 per day by 15th August 2021.

The filtered trend in the growth rate of daily new cases is 0.9% as on 1 August 2021.
India: Probability that cases are accelerating
as on 2021-08-01: 0.75

2021-07-19 / 2021-08-01
Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals.
Daily growth rates of cases (%)  
Trend values as on 01 August 2021
Case forecasts and growth rates: States and Union territories

Andhra Pradesh

New Cases

- Data
- Forecast
- New cases
- Forecast Trend

Date

Jul 01  Jul 15  Aug 01  Aug 15

Growth rate of daily cases

Date

Jul 01  Jul 15  Aug 01  Aug 15
Delhi

- Data
- Forecast
- New cases
- Trend

New Cases

Jul 01 | Jul 15 | Aug 01 | Aug 15

Growth rate of daily cases

Jul 01 | Jul 15 | Aug 01 | Aug 15
Jharkhand

New Cases

Date

Jharkhand

Growth rate of daily cases

Growth rate of daily cases

Date
Maharashtra

![Graph showing new cases and growth rate of daily cases in Maharashtra.](image)

- **Data** line indicates actual new cases.
- **Forecast New cases** line shows predicted cases.
- **Trend** line depicts the trend in new cases over time.

**Growth rate of daily cases**

- The growth rate is shown with a shaded area indicating variability.
- The green line represents the average growth rate.

**Axes:**
- **Y-axis:** New Cases and Growth rate of daily cases.
- **X-axis:** Date from Jul 01 to Aug 15.
The nature of growth in new cases:
States with accelerating case numbers (increasing growth rates of cases)
Jharkhand: Probability that cases are accelerating as on 2021-08-01: 0.57

Karnataka: Probability that cases are accelerating as on 2021-08-01: 0.92
Kerala: Probability that cases are accelerating as on 2021-08-01: 0.88

Madhya Pradesh: Probability that cases are accelerating as on 2021-08-01: 0.89
Tamil Nadu: Probability that cases are accelerating as on 2021-08-01: 0.67

Uttar Pradesh: Probability that cases are accelerating as on 2021-08-01: 0.56
Uttarakhand: Probability that cases are accelerating as on 2021-08-01: 0.87
India: Accuracy of last week's forecasts
Mean Absolute Percentage Error: 12.98%

2021-07-26 / 2021-08-01
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.


**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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