Cambridge Judge Business School Cambridge Centre for Health Leadership & Enterprise

COVID-19 TRACKER: INDIA

12 September 2021

Centre for Health Leadership & Enterprise







This tracker¹ 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. 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.

The effective reproduction number (R_t) for India plunged to **0.88** as of 12 September (from 1.02 a week ago, and 1.12 two weeks ago)). The filtered value of the daily growth rate plummeted to **-3.3%** (from 0.6% a week ago, and 2.8% two weeks ago). The trend value of reported cases in India can be expected to fall under 20,000 per day by 26 September.

The basis for the much more positive national prognosis is the rapid decline in the daily growth rate of cases in Kerala (-3.8% as of 12 September, down from 1.2% a week ago, and 5.1% at the end of August). The state now accounts for 65% of the cases in country, down from 70% at the end of August.

Eight states show tendencies of increases in infection. Among these, Jammu and Kashmir, Tamil Nadu and West Bengal have sizeable incidences and are concerning.

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.

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Daily Covid-19 cases in India: Forecast

Forecasts of daily new cases for the period 13 to 26 September 2021, based on data till 12 September 2021. The trend value of new COVID-19 cases is likely to fall under 20,000 per day by 26 September 2021.



The filtered trend in the growth rate of daily new cases had stabilized at about -0.033 (3.3 %) by 12 September 2021.



1.5 1.0 Ľ 0.5 0.0 Pradesh -Haryana Assam Odisha Sikkim Tripura Bihar Gujarat India Ladakh Punjab Andaman and Nicobar Islands Andhra Pradesh Dadra and Nagar Haveli Delhi Goa Jharkhand Karnataka Rajasthan Tamil Nadu Uttar Pradesh Chandigarh Chhattisgarh Himachal Pradesh Jammu and Kashmir Kerala Lakshadweep Madhya Pradesh Maharashtra Manipur Meghalaya Mizoram Nagaland Puducherry Telangana Uttarakhand West Bengal Arunachal

R_t: 12 September 2021

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

Note: Small daily numbers (less than 30) currently seen in Arunachal Pradesh, Bihar, Chandigarh, Chhattisgarh, Delhi, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Rajasthan, Tripura, Uttar Pradesh and Uttarakhand make their estimates and forecasts less precise.





Case forecasts and growth rates: States and Union territories







Sep 01 Date Sep 15

Aug 15



Sep 01 Date

Sep 15

-0.2

Aug 15









Goa































Odisha

















Sep 01 Date

Sep 15

Aug 15









Tripura









Probability that daily cases are accelerating

State with cases exceeding 100 and probability of acceleration greater than 0.5





Sep 06 2021 Sep 07 2021 Sep 08 2021 Sep 09 2021 Sep 10 2021 Sep 11 2021 Sep 12 2021





Note: Actual cases in the period 6-12 September fell below predictions for that period based on data till 5 September. This provides strong evidences for transmission rate having dropped relative to the past. This is largely attributable to the decline in cases in Kerala thanks to social restraint and containment policies.

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/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.

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 (2021). A farewell to R: Time series models for tracking and forecasting epidemics. *Journal of the Royal Society Interface* (forthcoming). 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.

Mobility: All types of mobility other than work place mobility declined in the days leading to 31 August 2021, the last day for which mobility data is available.

Google community mobility reports show movement trends by region, across different categories of places. The data are created with aggregated, anonymized sets of data from users who have turned on the Location History setting in google devices. Categories group some of the places with similar characteristics for purposes of social distancing guidance, the available categories that are considered reliable for India are Grocery and Pharmacy, Retail and

recreation, Transit stations and Workplaces. Mobility trends hold useful information on the risk of increased transmission.

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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