The Emergence of Omicron and Its Impact

SUTRA Consortium

SUTRA Model

Key Parameters: Contact Rate β

- Measures how fast pandemic spreads in a region
  - Increases due to people not following safety protocols and more infectious mutants
  - Decreases due to lockdowns, people following safety protocols
- Closely related to Basic Reproduction Number $R_0 \approx 10\beta$

Key Parameters: Detection Factor ϵ

- Measures ratio between detected (tested +ve) and actual cases
  - Decreases when number of asymptomatic patients increase, pandemic reaches inaccessible regions, and testing reduces
  - Increases when testing rate goes up significantly

Key Parameters: Reach ρ

- Measures fraction of population over which the pandemic is active
  - It is very small initially and typically increases with time
  - Increases rapidly when there is a lot of movement across regions, many people come out of isolation
  - Captures loss of immunity and vaccination-induced immunity

Key Factors for Omicron

Loss of Immunity

- It is the most critical factor in rise of Omicron cases
- Vaccine immunity is almost completely bypassed
- Estimates for natural immunity bypass vary

Data for India is indicating 10%-20% immunity loss

- Even a 5% change in estimation causes major change in peak value!
  - Hence, predicting peak value is error-prone
- Timing of peak does not depend much on immunity loss and so can be predicted with better precision

High Contact Rate

- Value of β has gone up significantly:

Data from multiple places is indicating an increase by a factor of 2-4

Predicted Trajectories

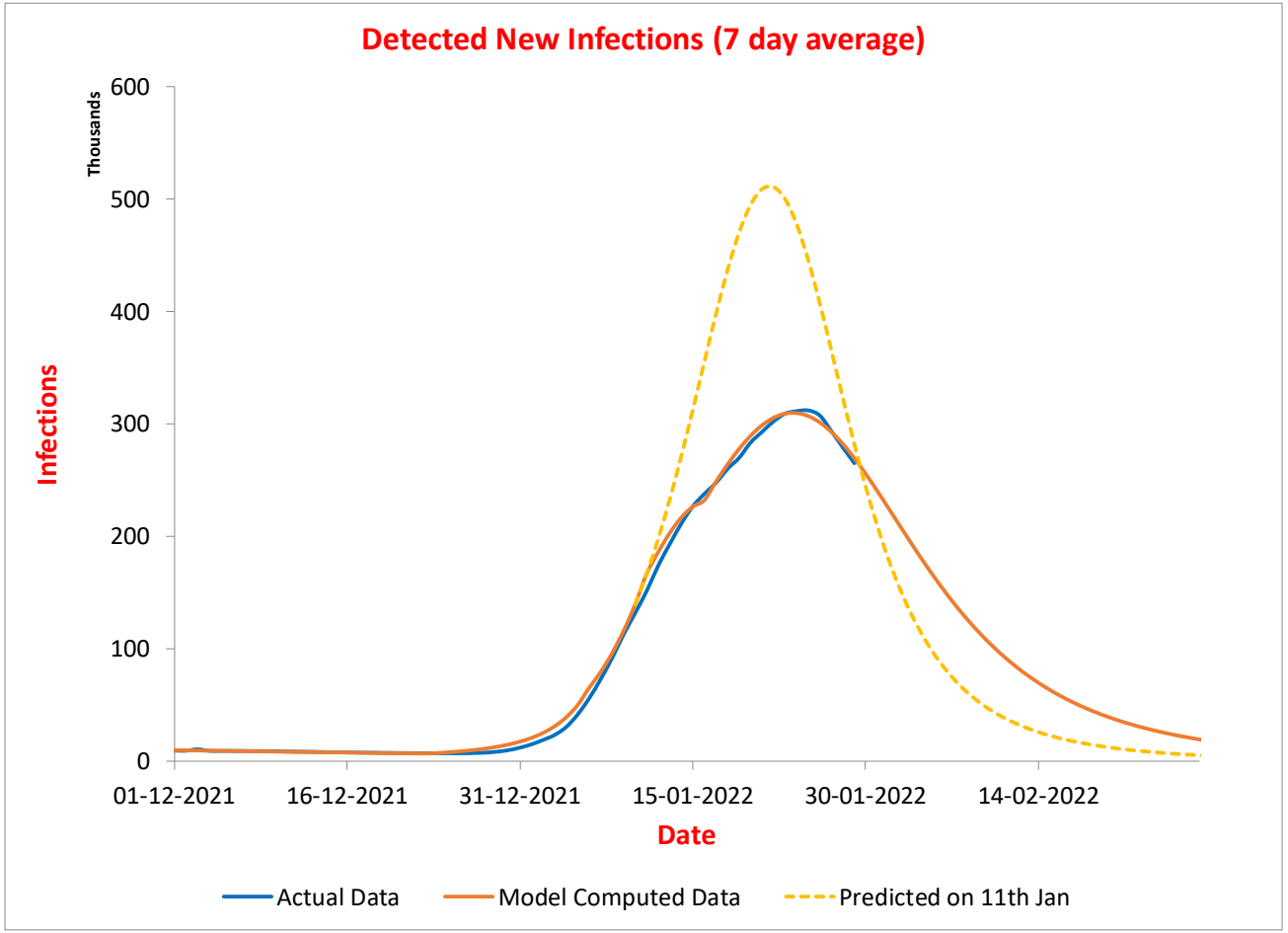
Phase Change in January

- All plots show trajectory for the period Dec 2021 to Feb 2022
- A phase change is indicative of significant change in one or more parameter values
- Nearly all the regions are showing a phase change during Jan 9-15
- Data is suggesting that this phase change is due to a reduction in Contact Rate

Phase Change in January

- New phase has started stabilizing in some places.
- At present, following show some stability:
  - India
  - Assam
  - Himachal Pradesh
  - Karnataka
  - Madhya Pradesh
  - Maharashtra
  - Rajasthan

India

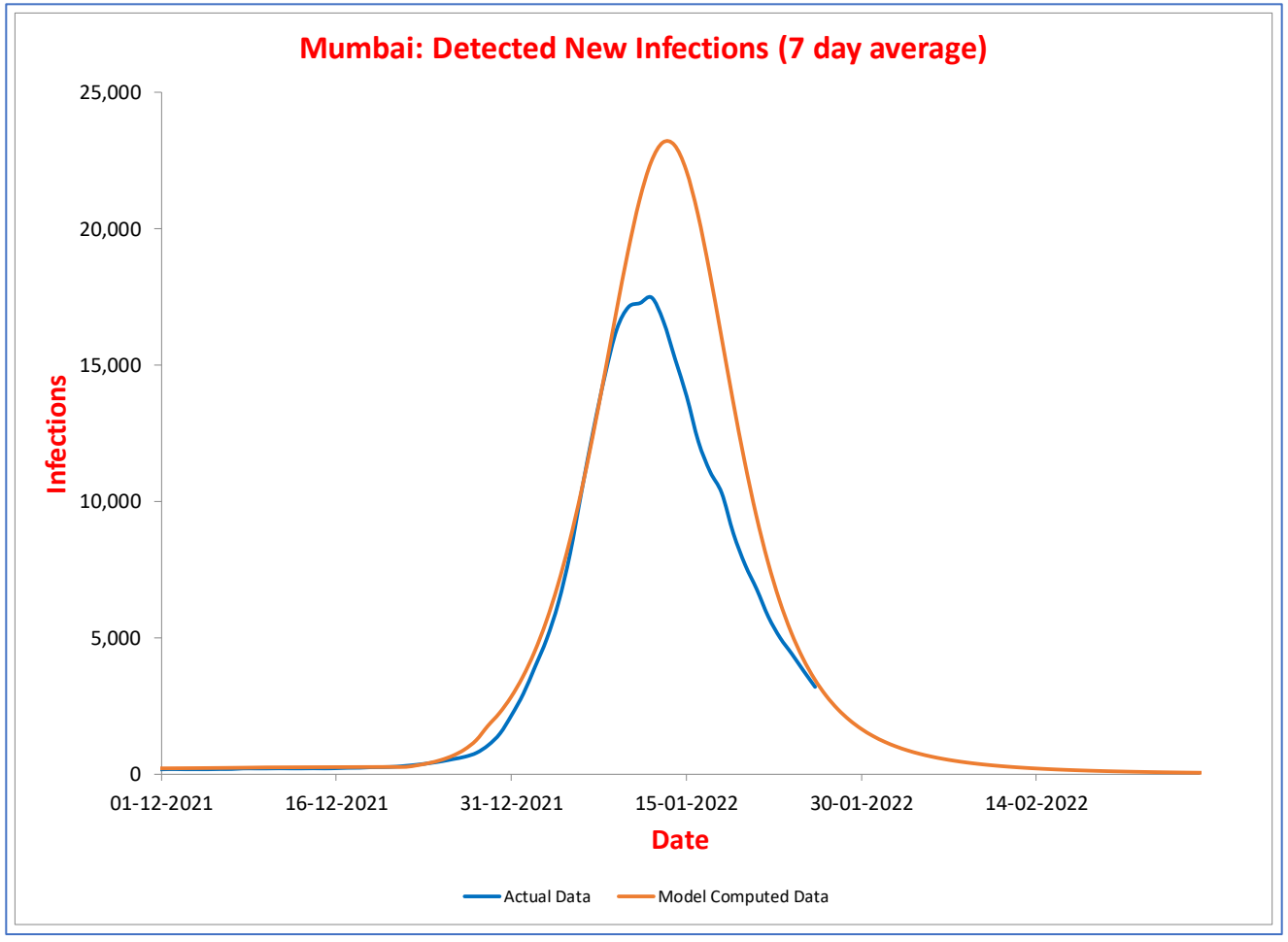


- Peaked on 25th Jan (predicted: 23rd Jan)
- New phase not fully stable yet

- ρ increased by $\sim 10\%$
- β went up from 0.54 ± 0.02 to 1.54 ± 1.12 and then came down to 1.12 ± 0.42

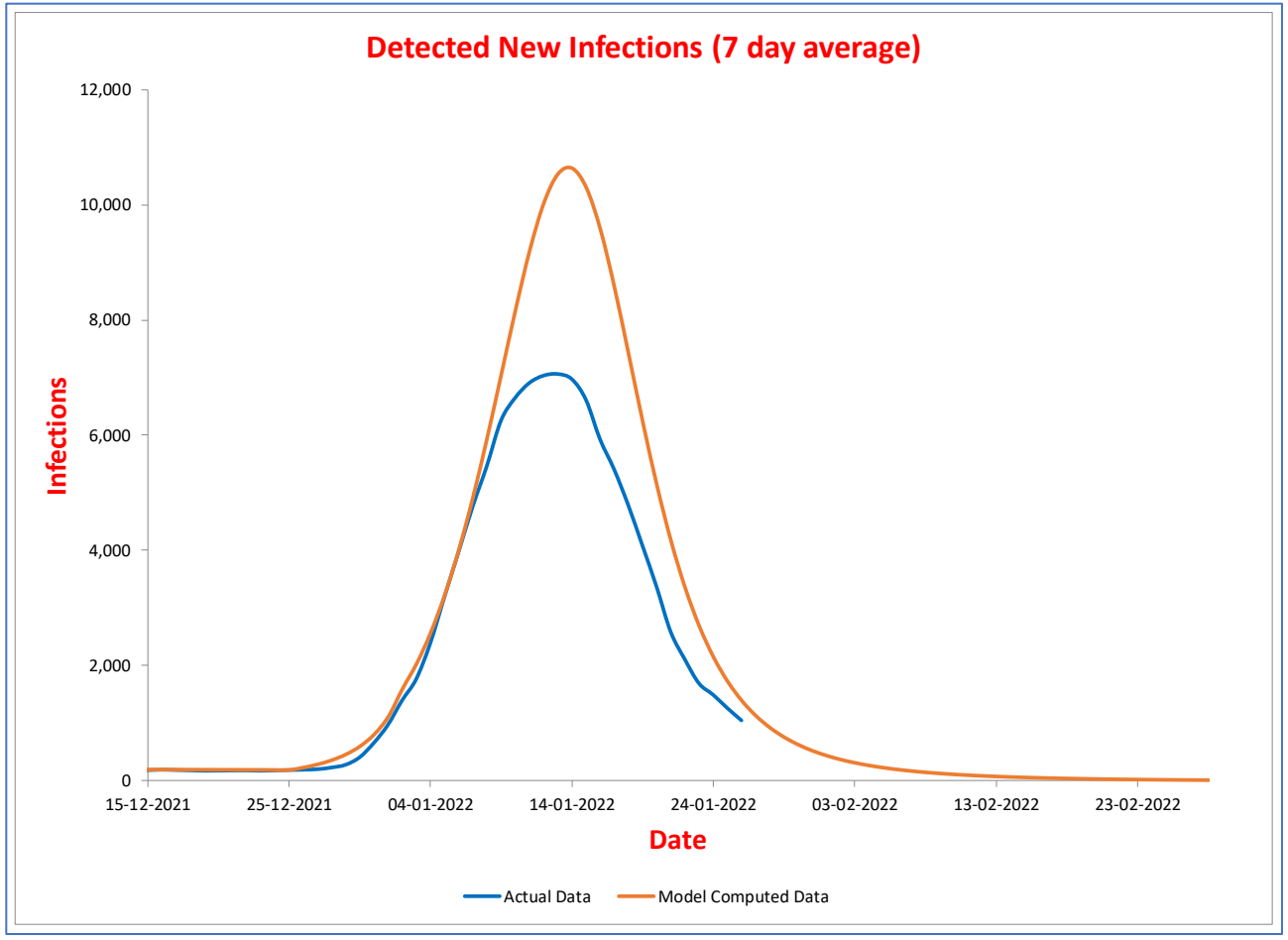
Cities

Mumbai



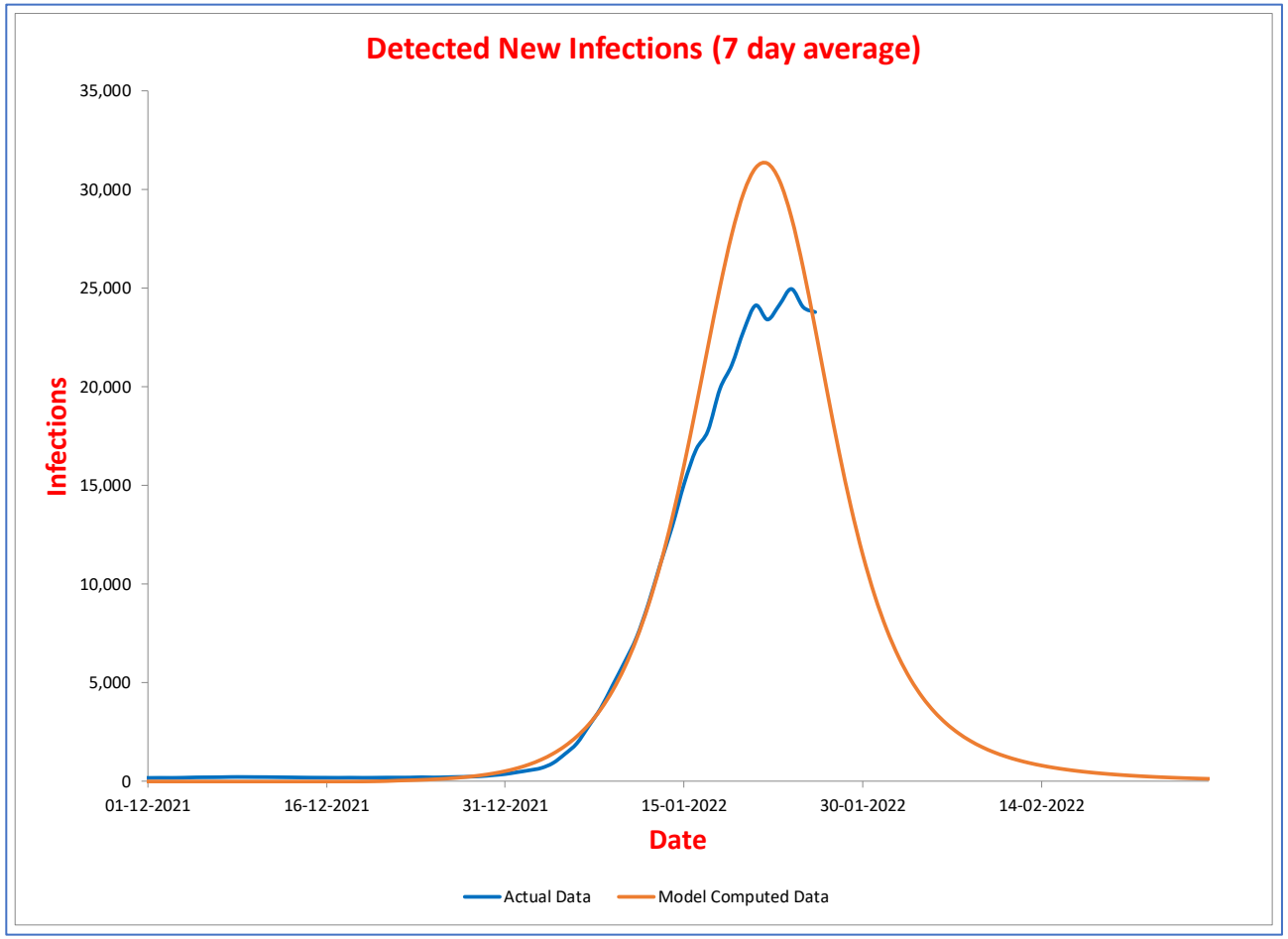
- Peaked 12th Jan (predicted: 14th Jan)
- Phase change from 10th Jan

Kolkata



- Peaked 14th Jan (predicted: 15th Jan)
- Phase change from 10th Jan

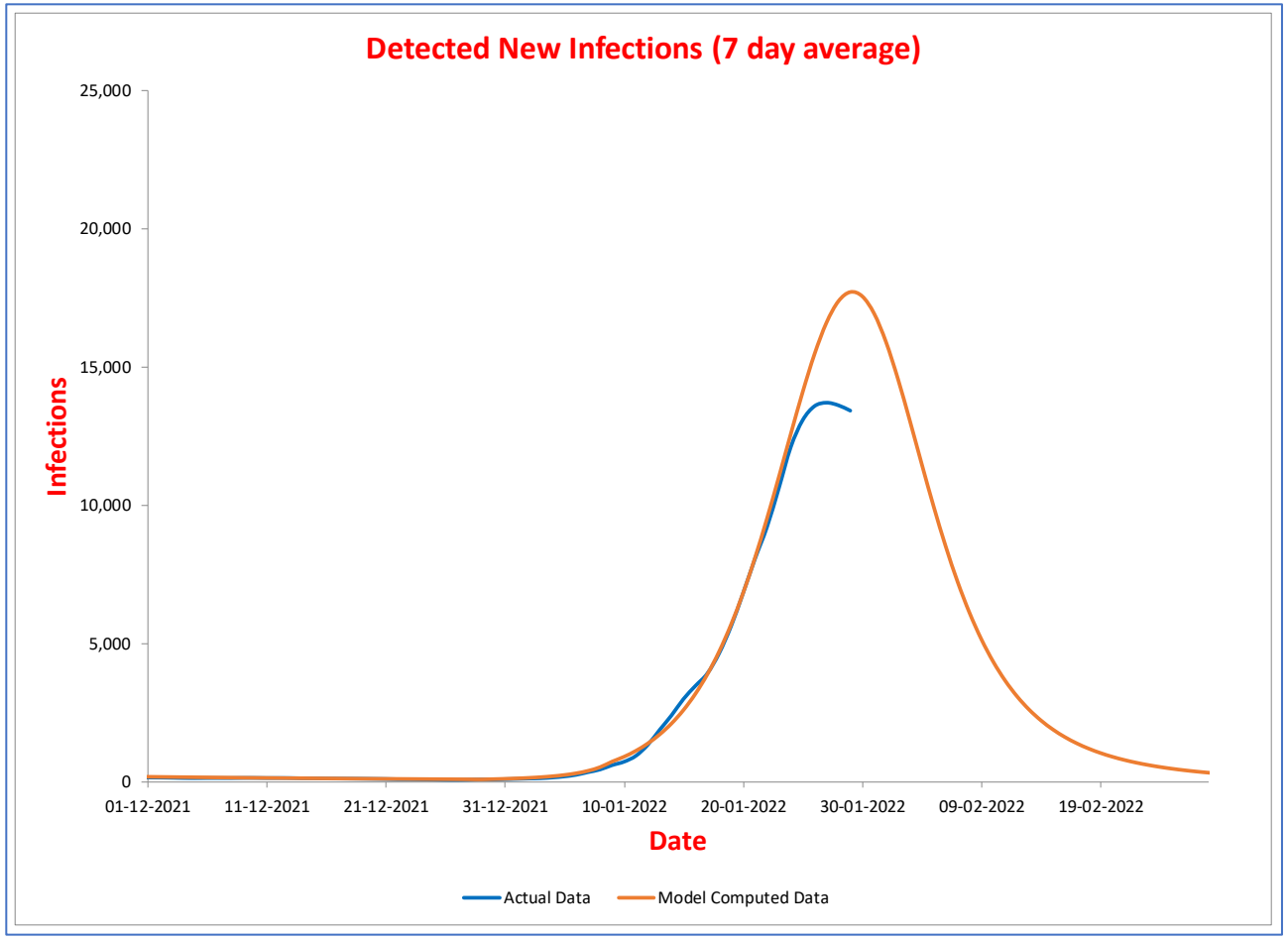
Bengaluru



- Peaked on 24th Jan (predicted: 22nd Jan)
- Phase change from 13th Jan

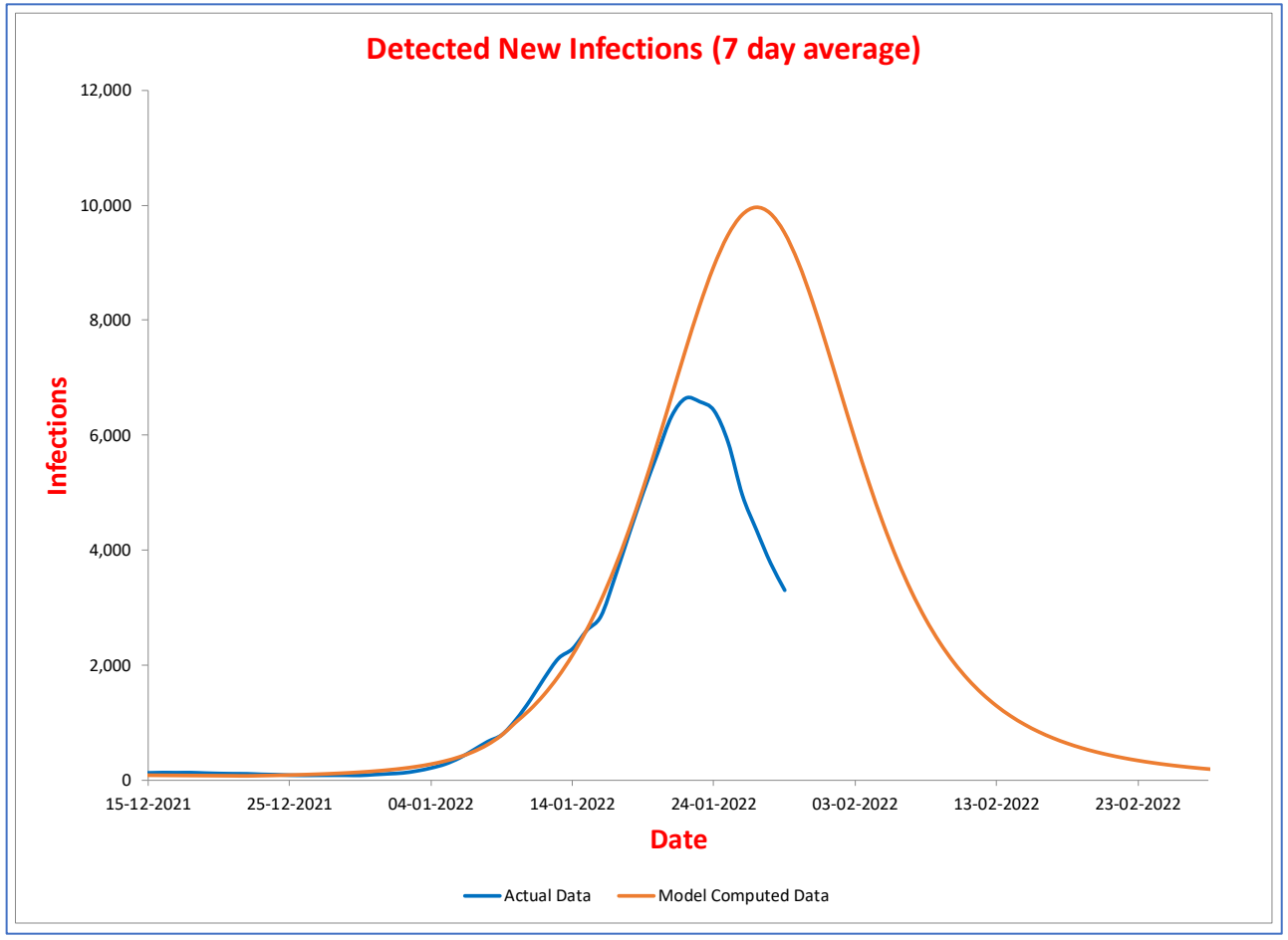
States

Andhra Pradesh



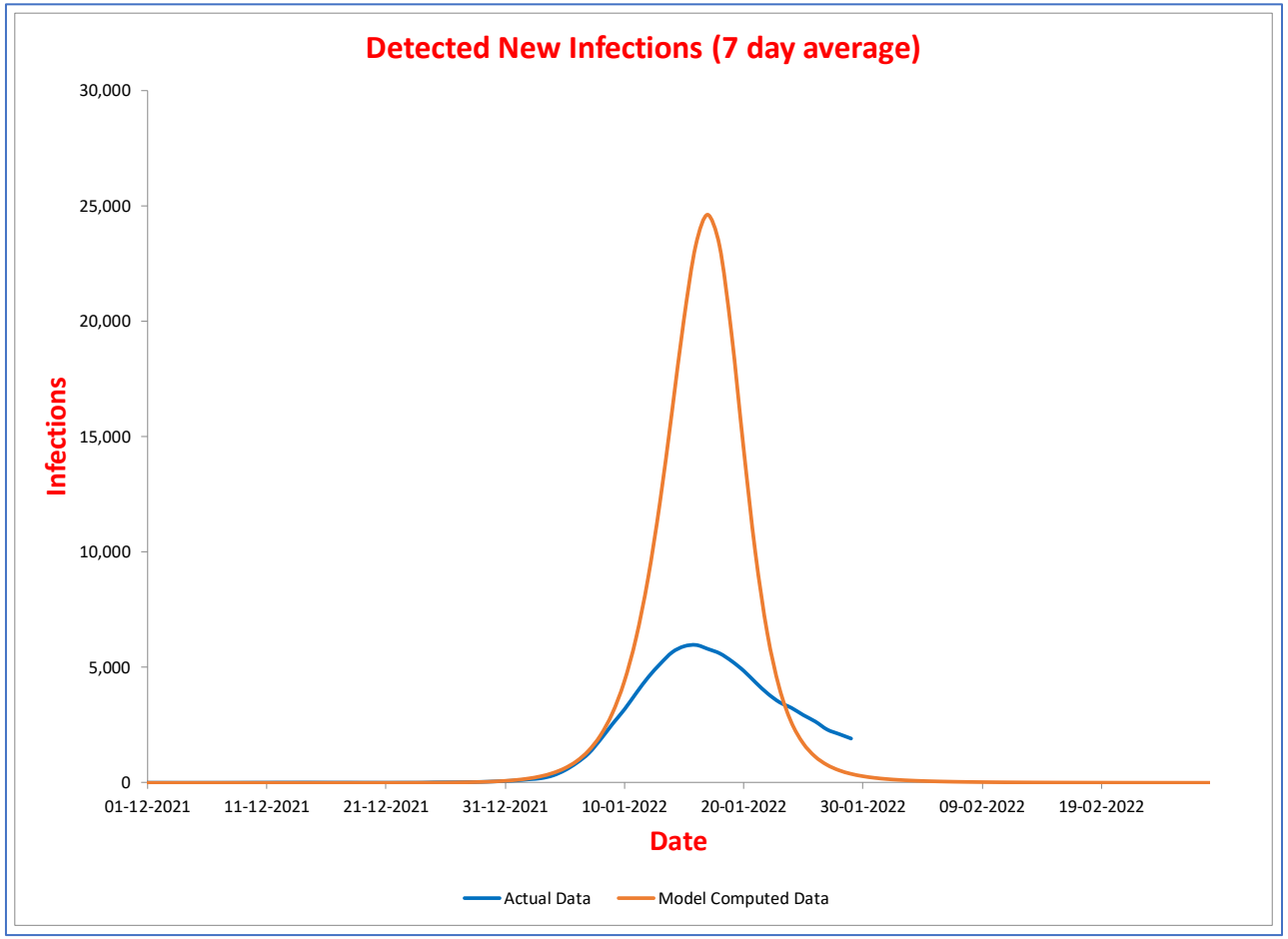
- Peaked on 27th Jan (predicted: 29th Jan)
- Phase change from 16th Jan

Assam



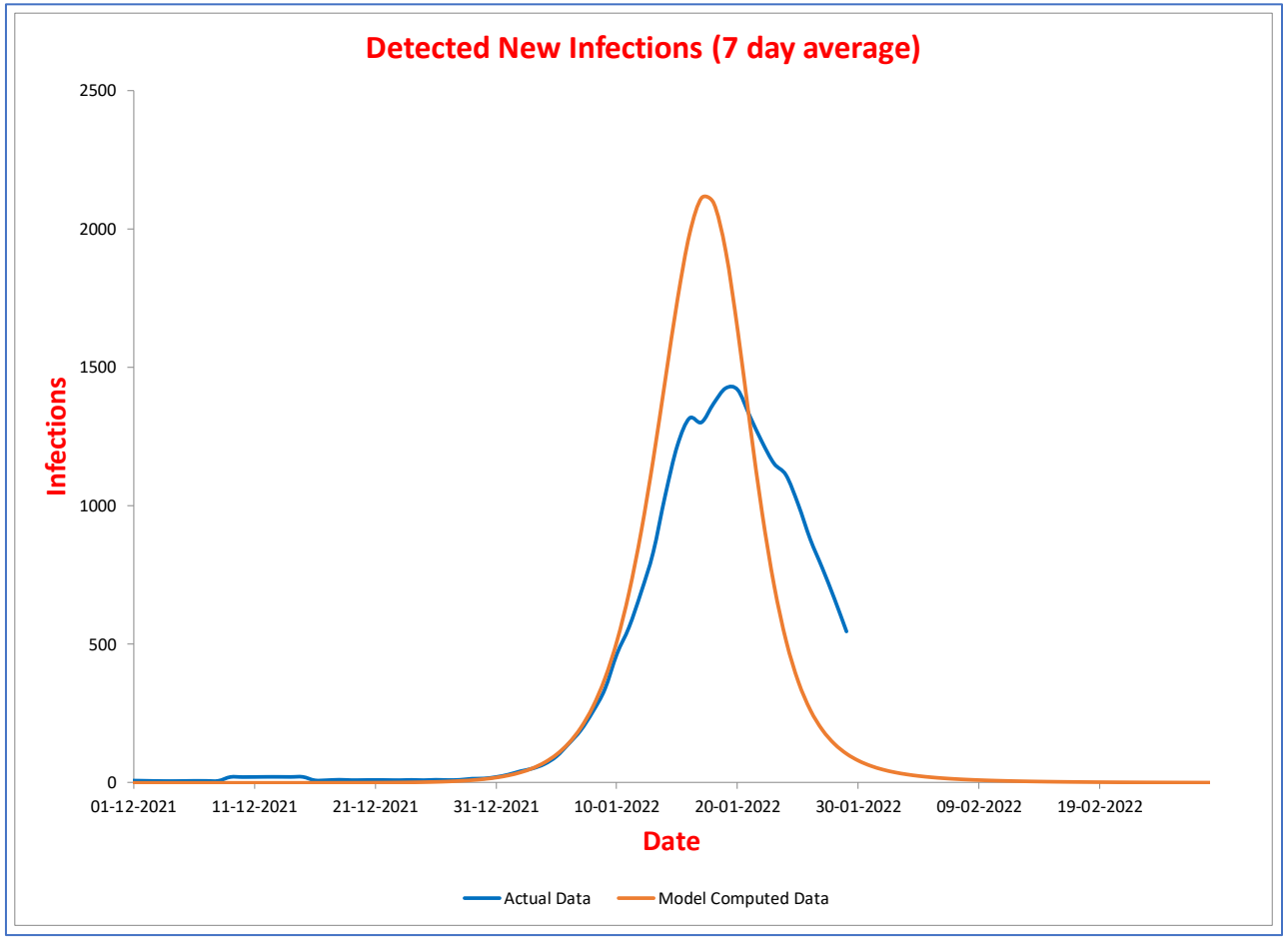
- Peaked on 22nd Jan (predicted: 27th Jan)
- New phase from 16th Jan

Bihar



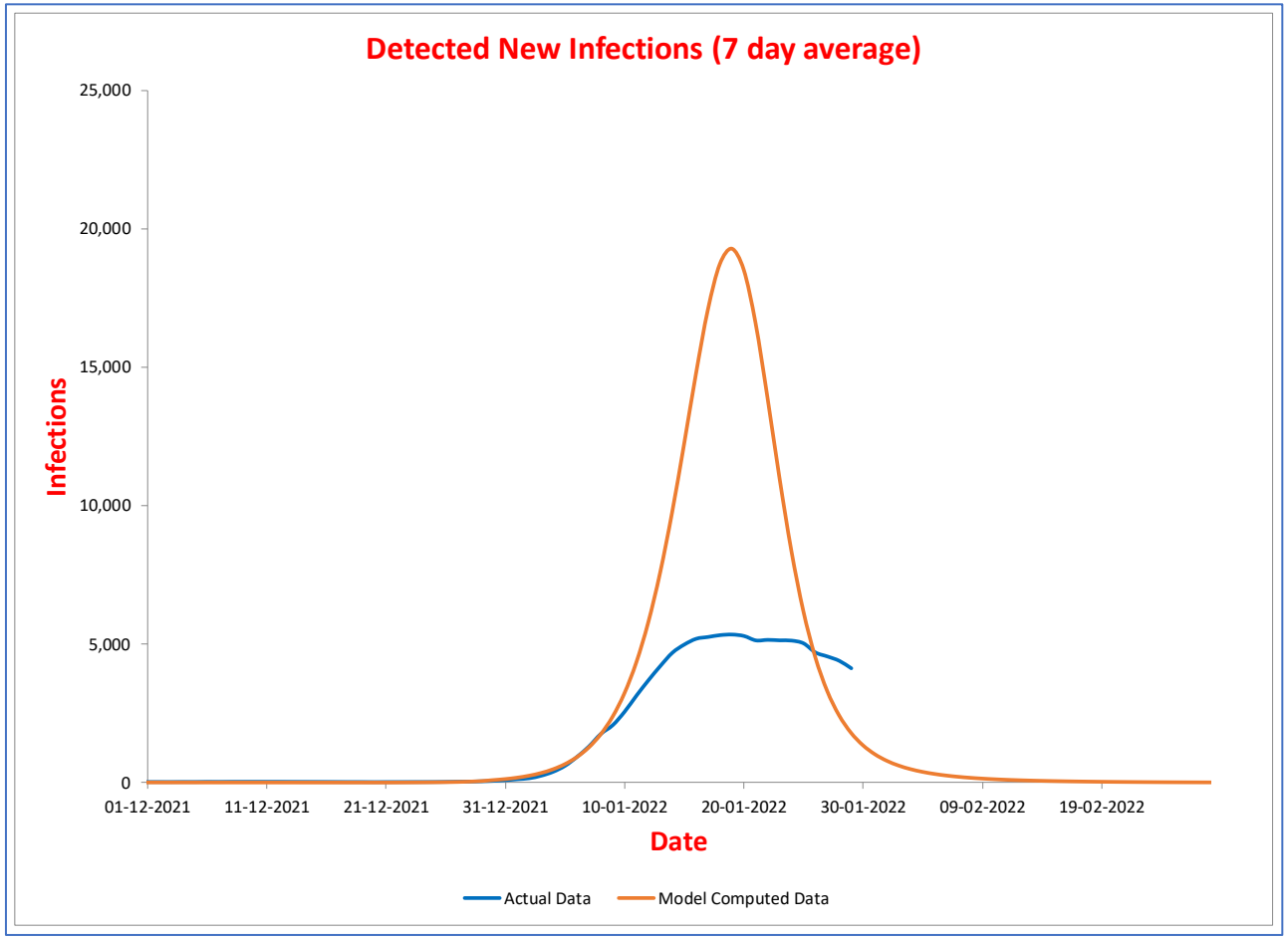
- Peaked 16th Jan (predicted: 16th Jan)
- Phase change from 10th Jan

Chandigarh



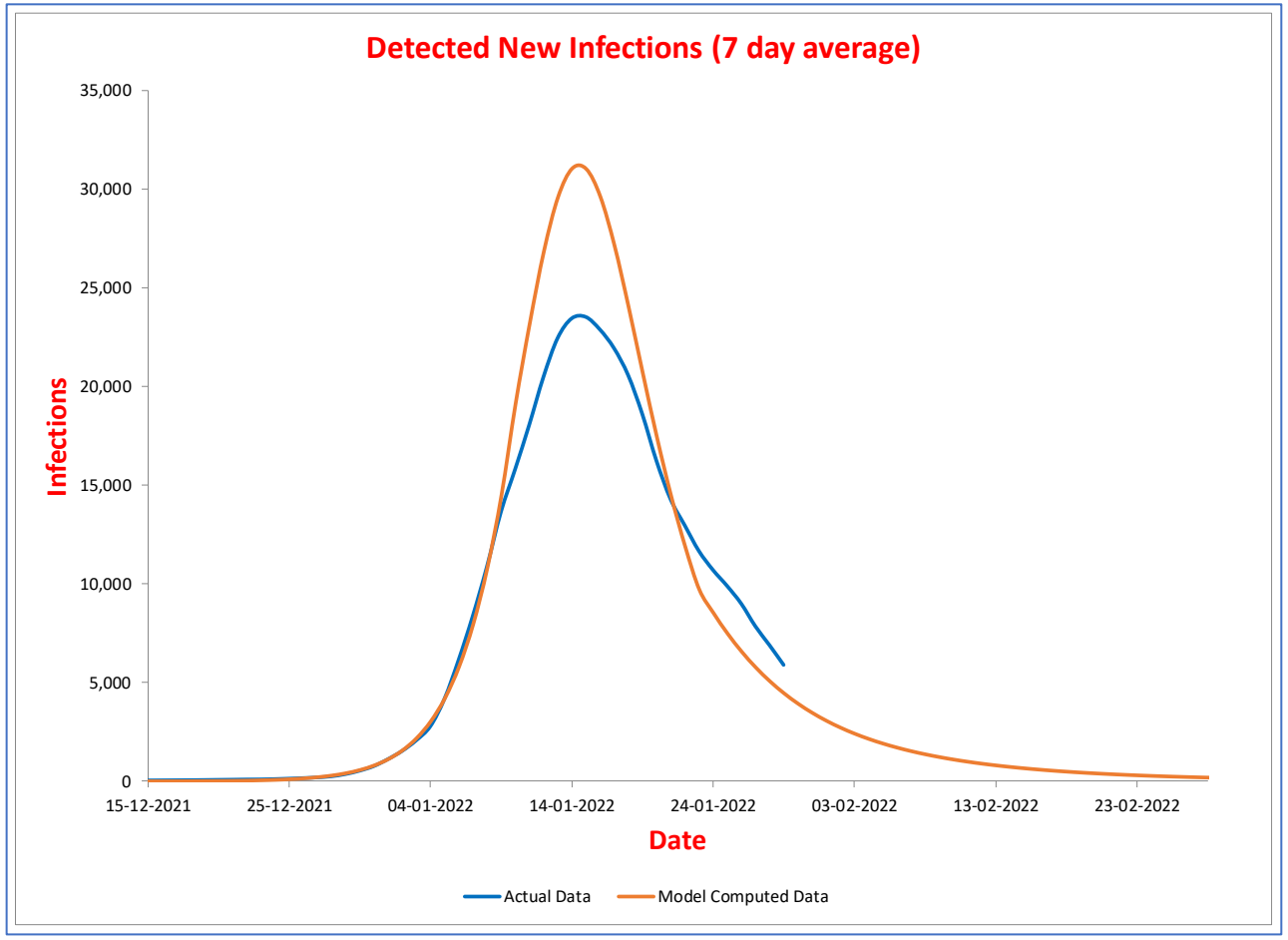
- Peaked on 19th (predicted: 17th Jan)
- Phase change from 9th Jan

Chhattisgarh



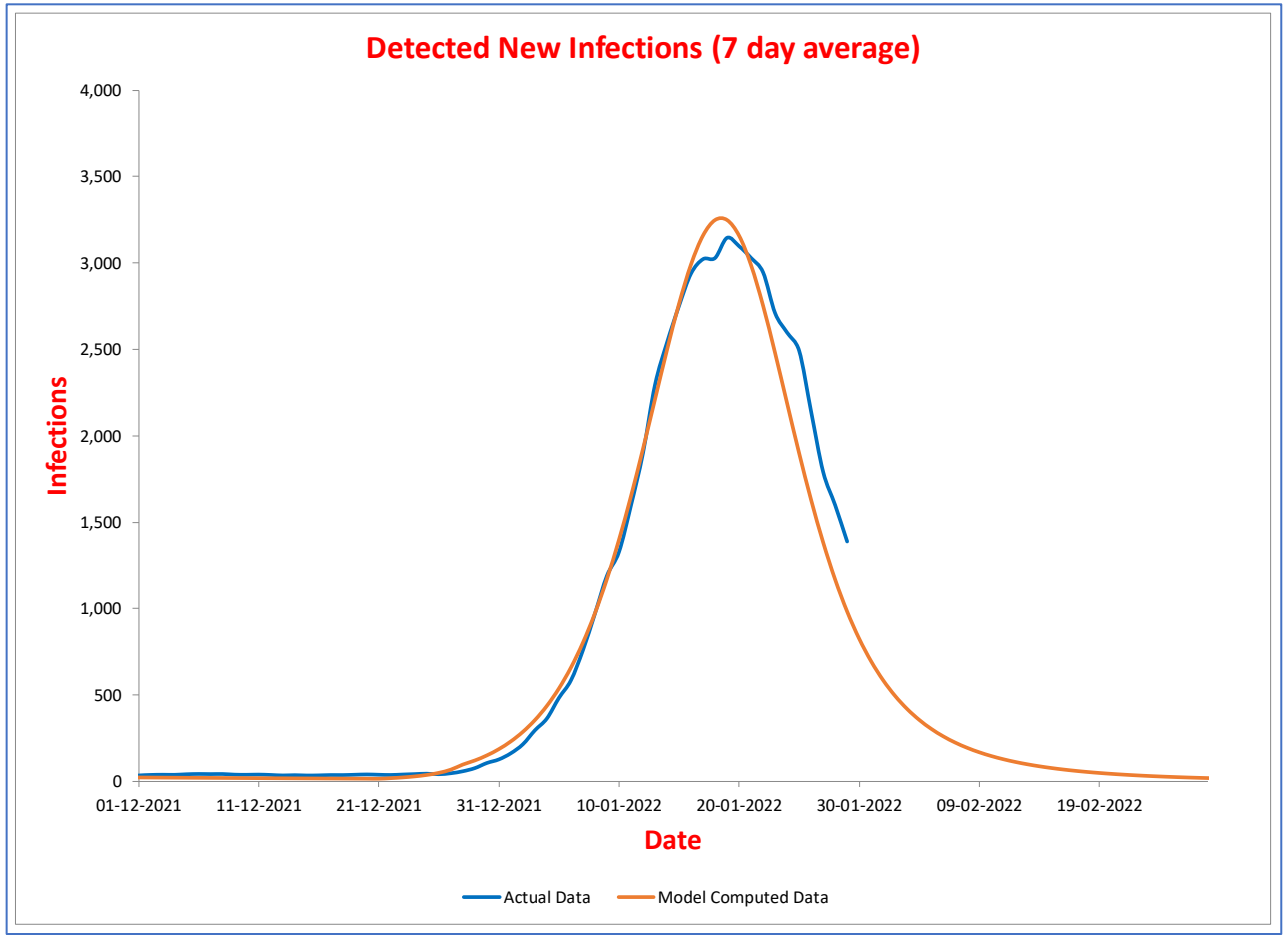
- Peaked on 19th (Predicted: 19th Jan)
- Phase change from 9th Jan

Delhi



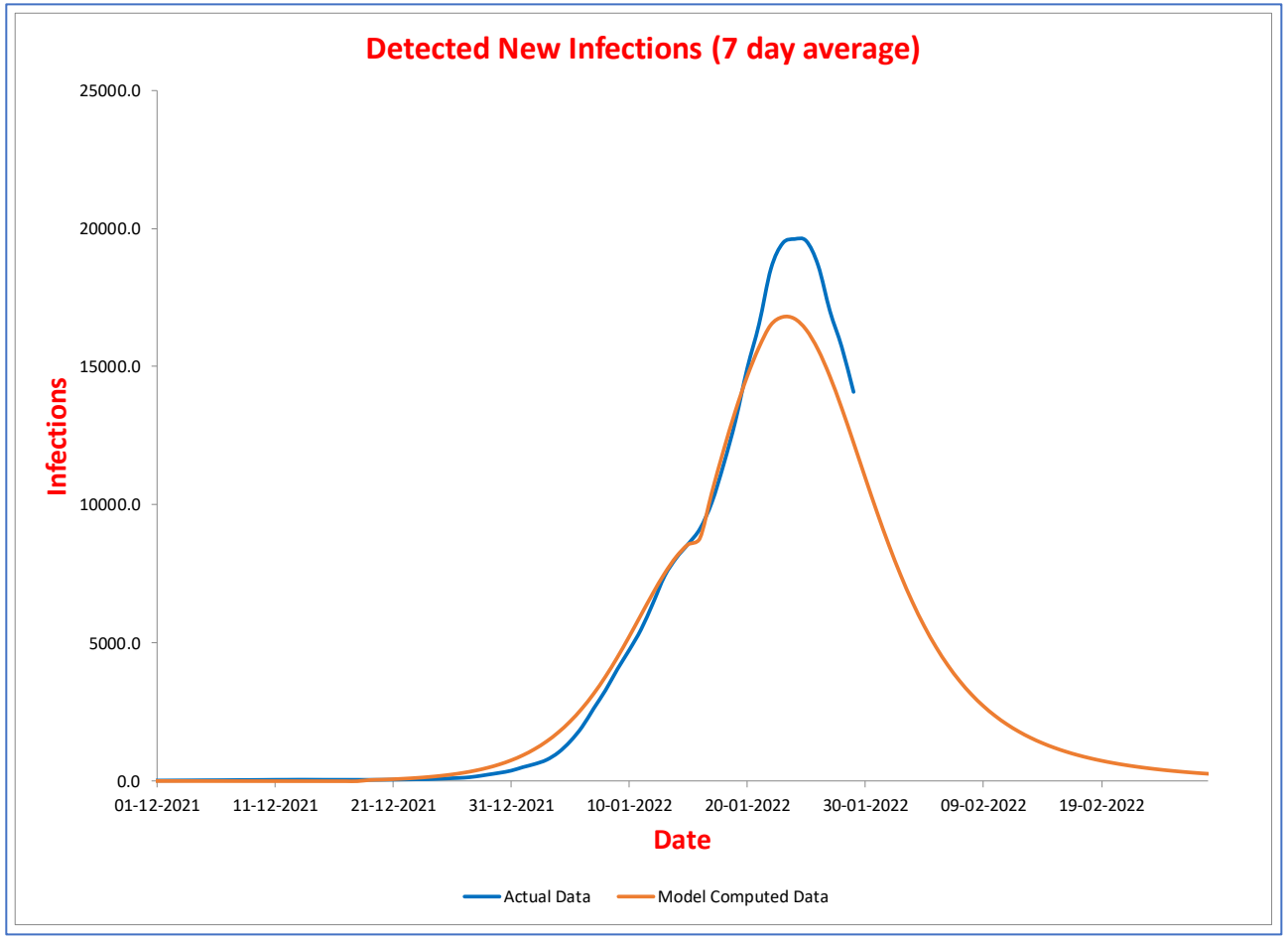
- Peaked 15th Jan (predicted: 15th Jan)
- Phase change from 10th Jan

Goa



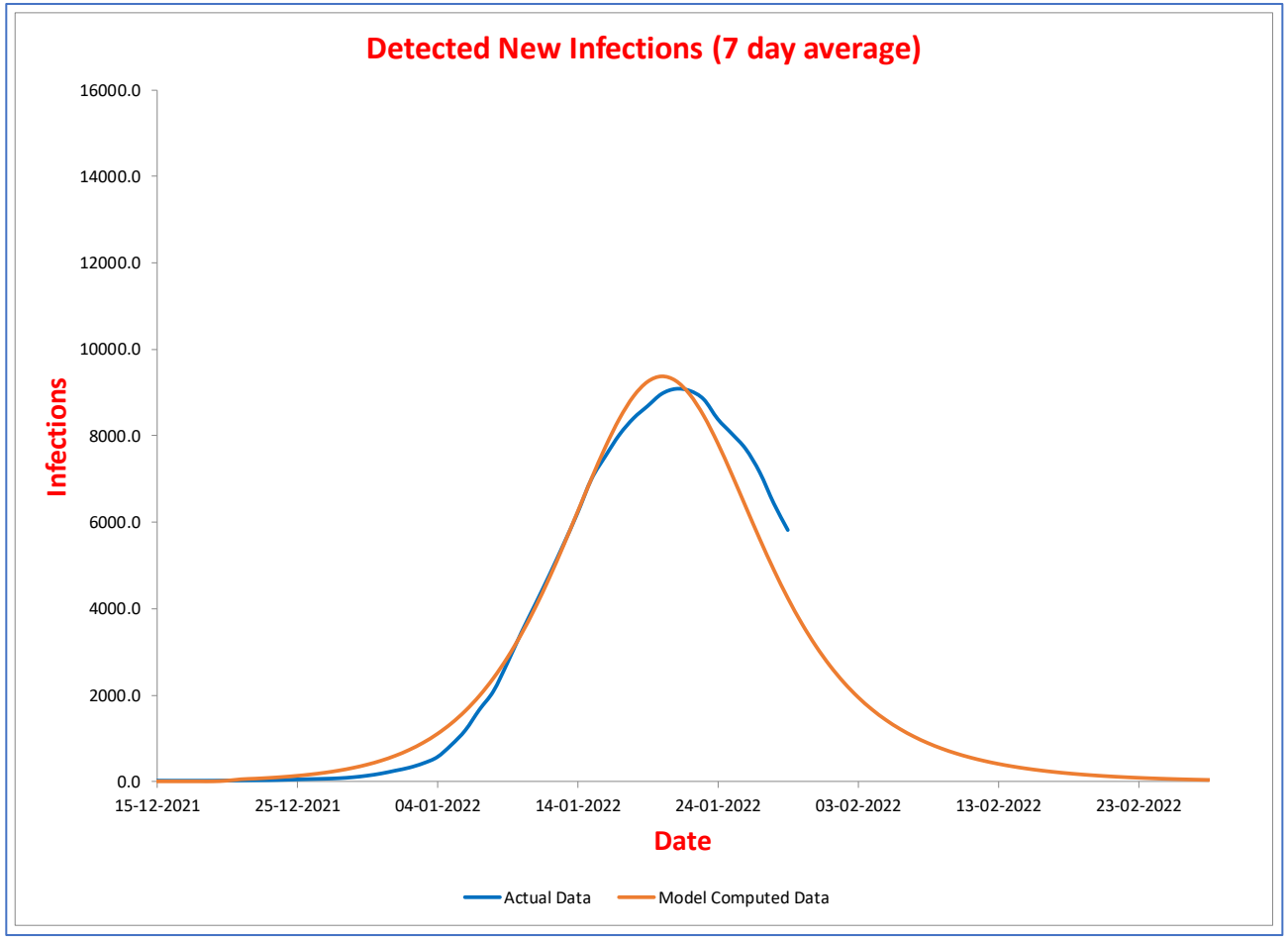
- Peaked on 19th (predicted: 18th Jan)
- No phase change yet

Gujarat



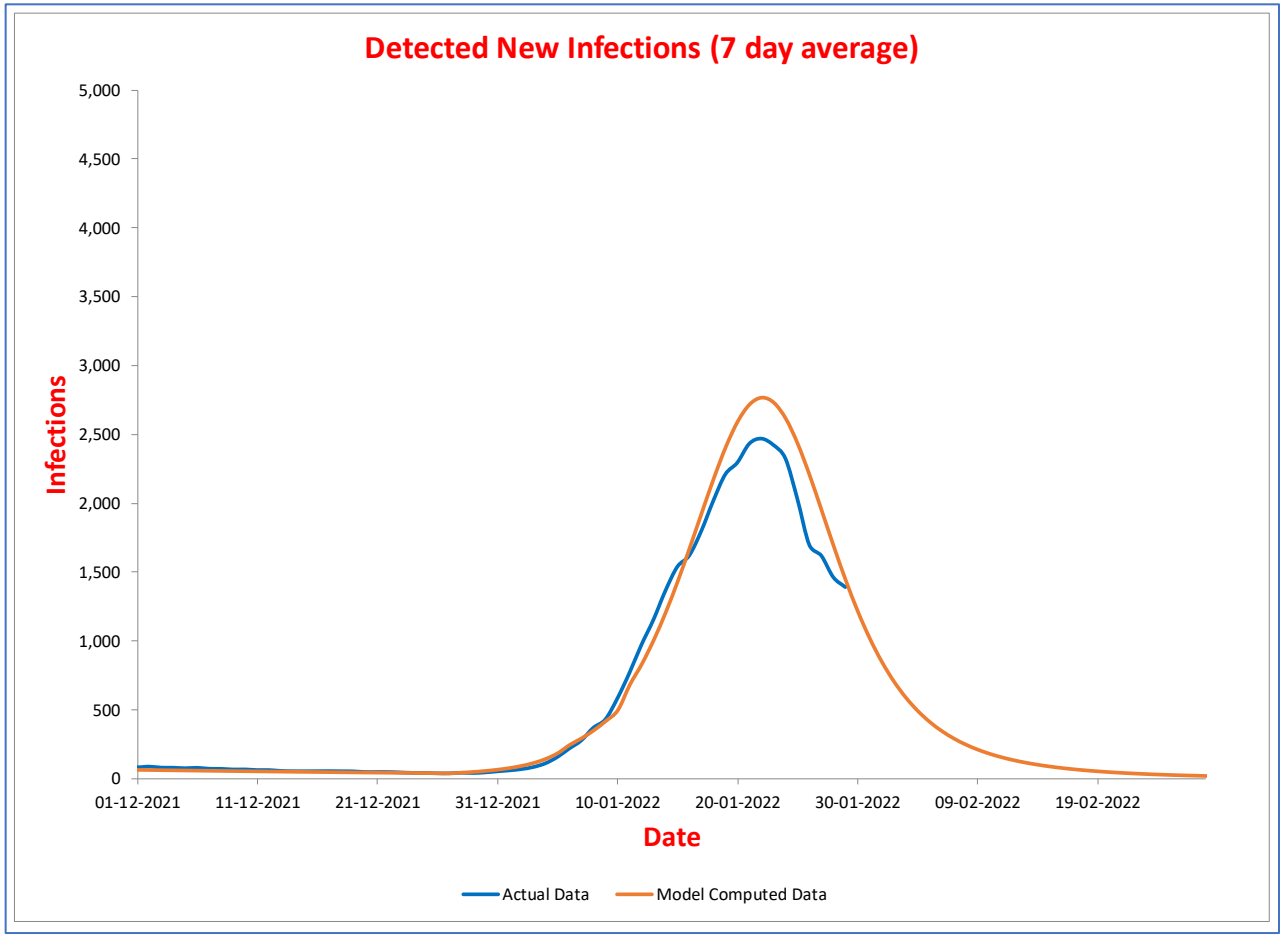
- Phase change on 14th Jan caused trajectory to rise faster that predicted
- New trajectory nearly captured now
- Peaked on 25th Jan (predicted: 25th Jan, earlier prediction: 19th Jan)

Haryana



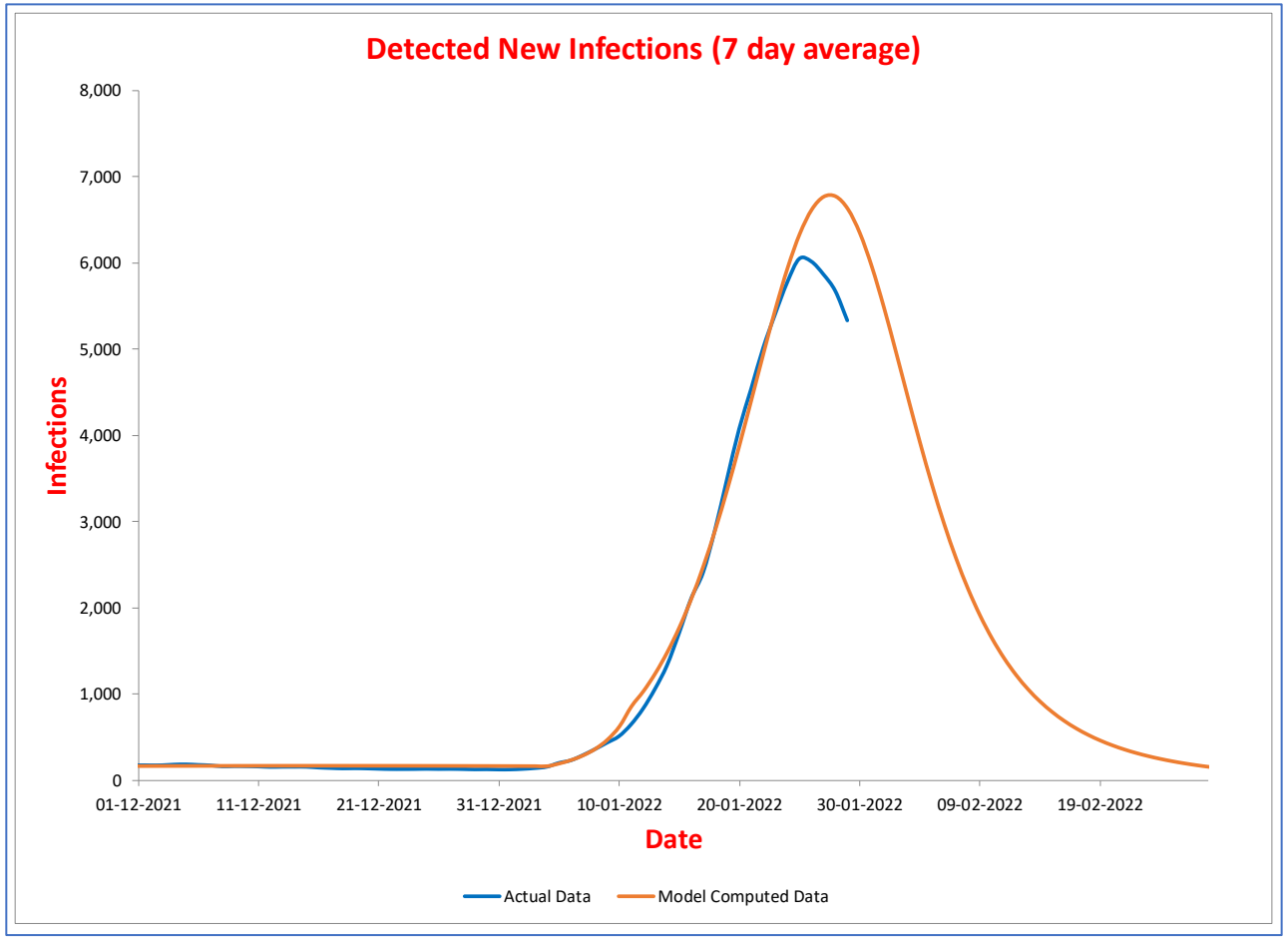
- Peaked on 21th (predicted: 20th Jan)
- Phase change from 10th Jan

Himachal Pradesh



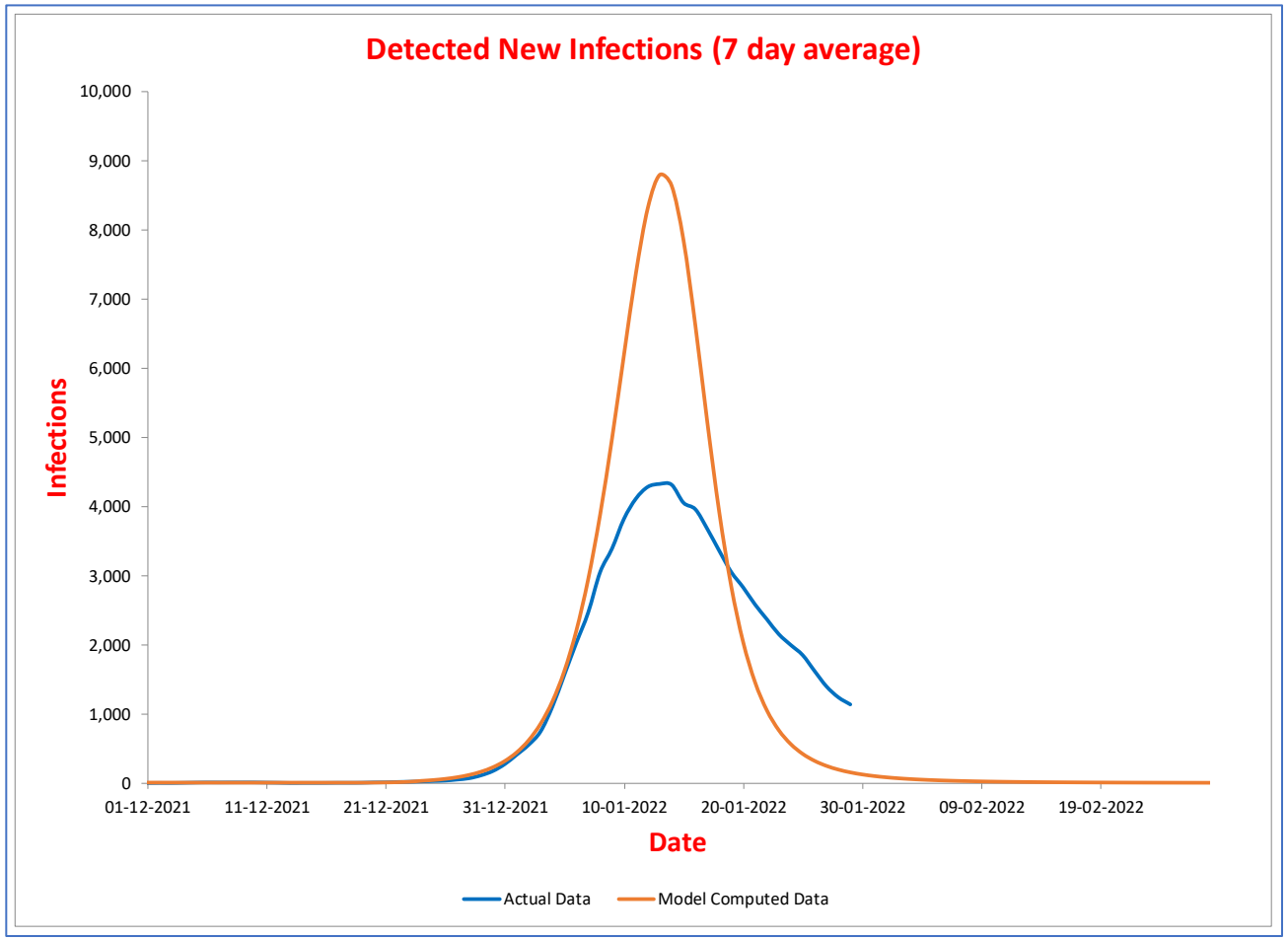
- Peaked on 22nd Jan (predicted: 22nd Jan)
- New phase is not yet stable

Jammu and Kashmir



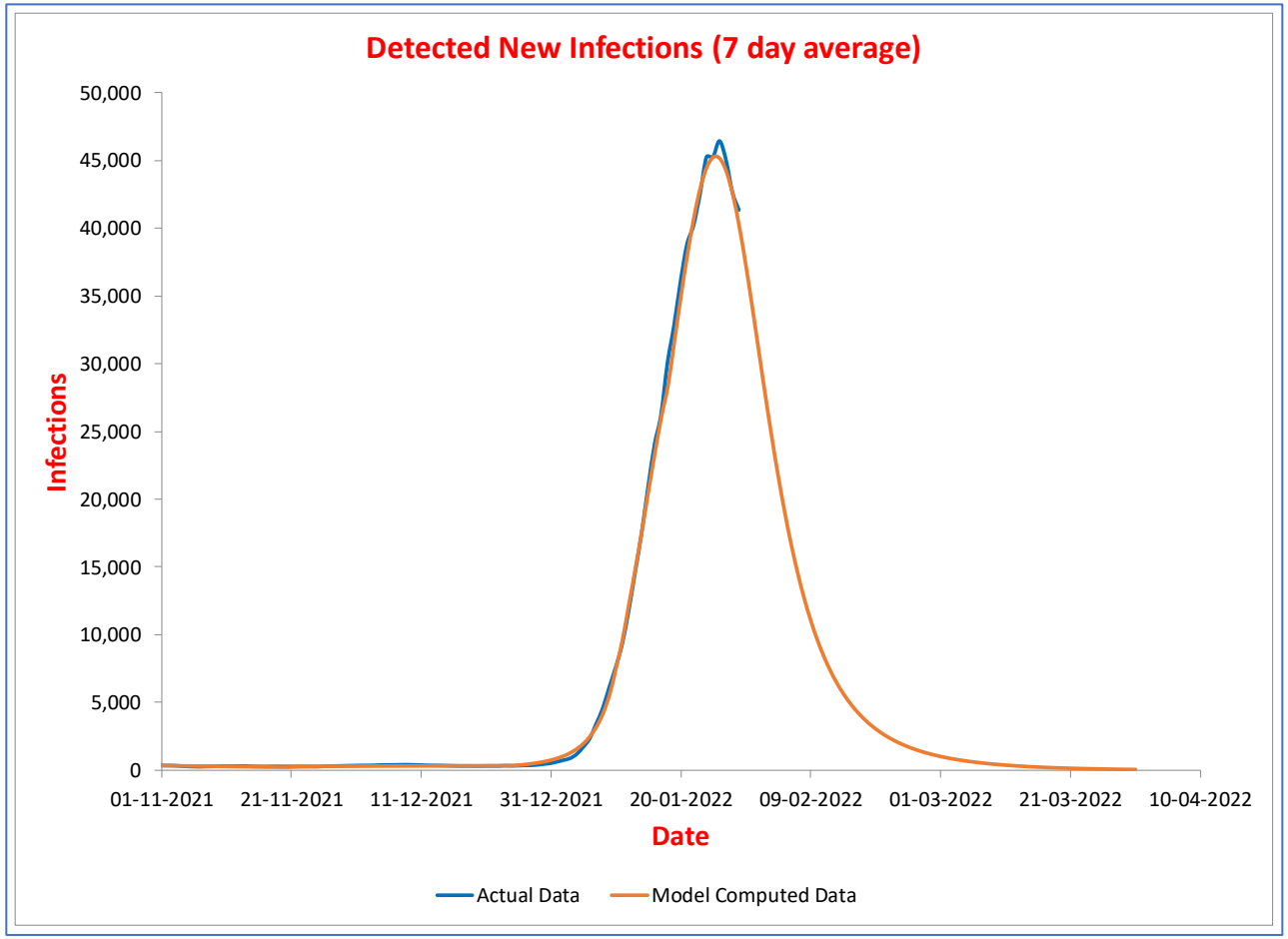
- Peaked on 26th Jan (predicted: 28th Jan)
- No phase change

Jharkhand



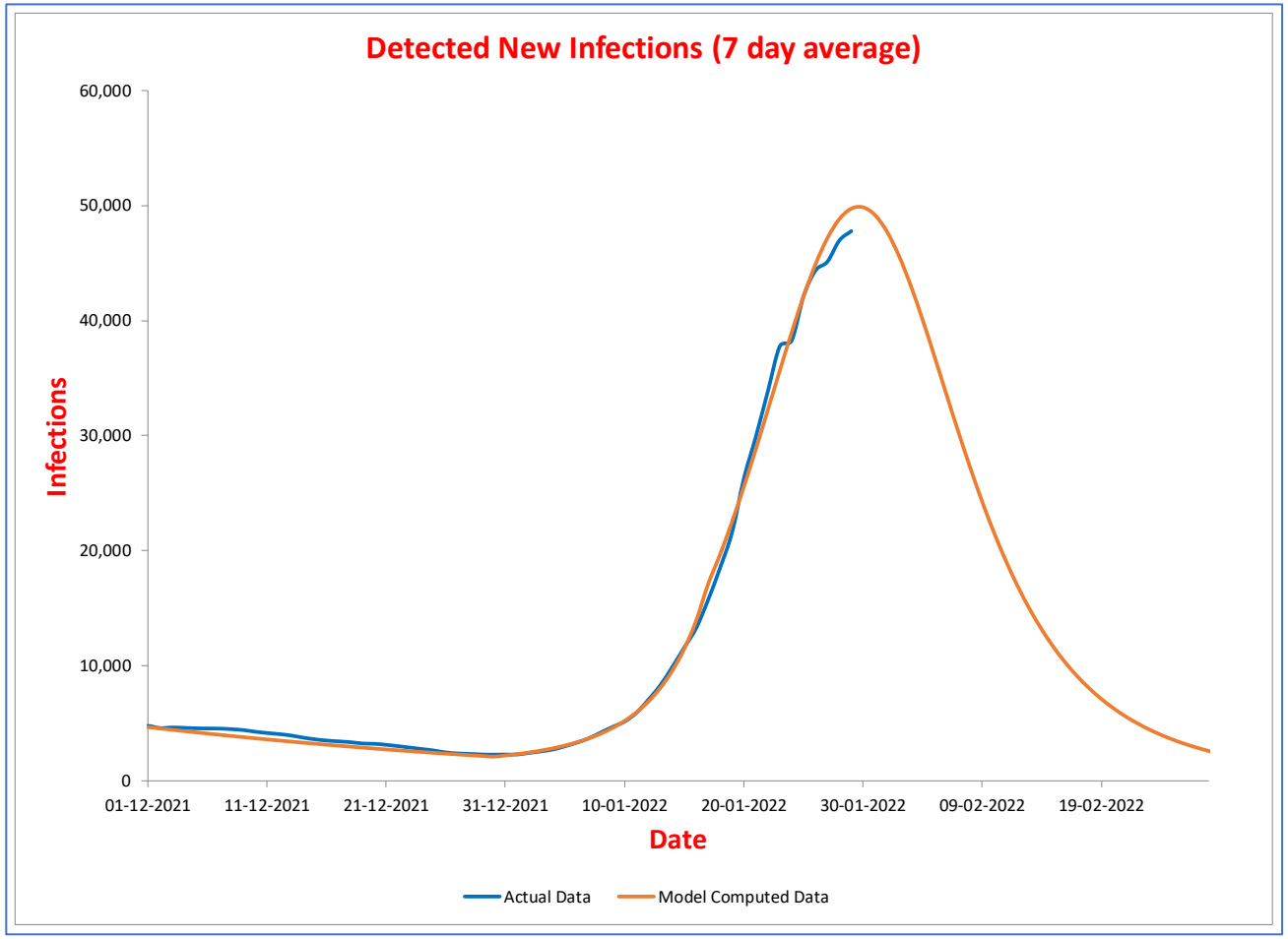
- Peaked 13th Jan (predicted: 13th Jan)
- Phase change from 6th Jan

Karnataka



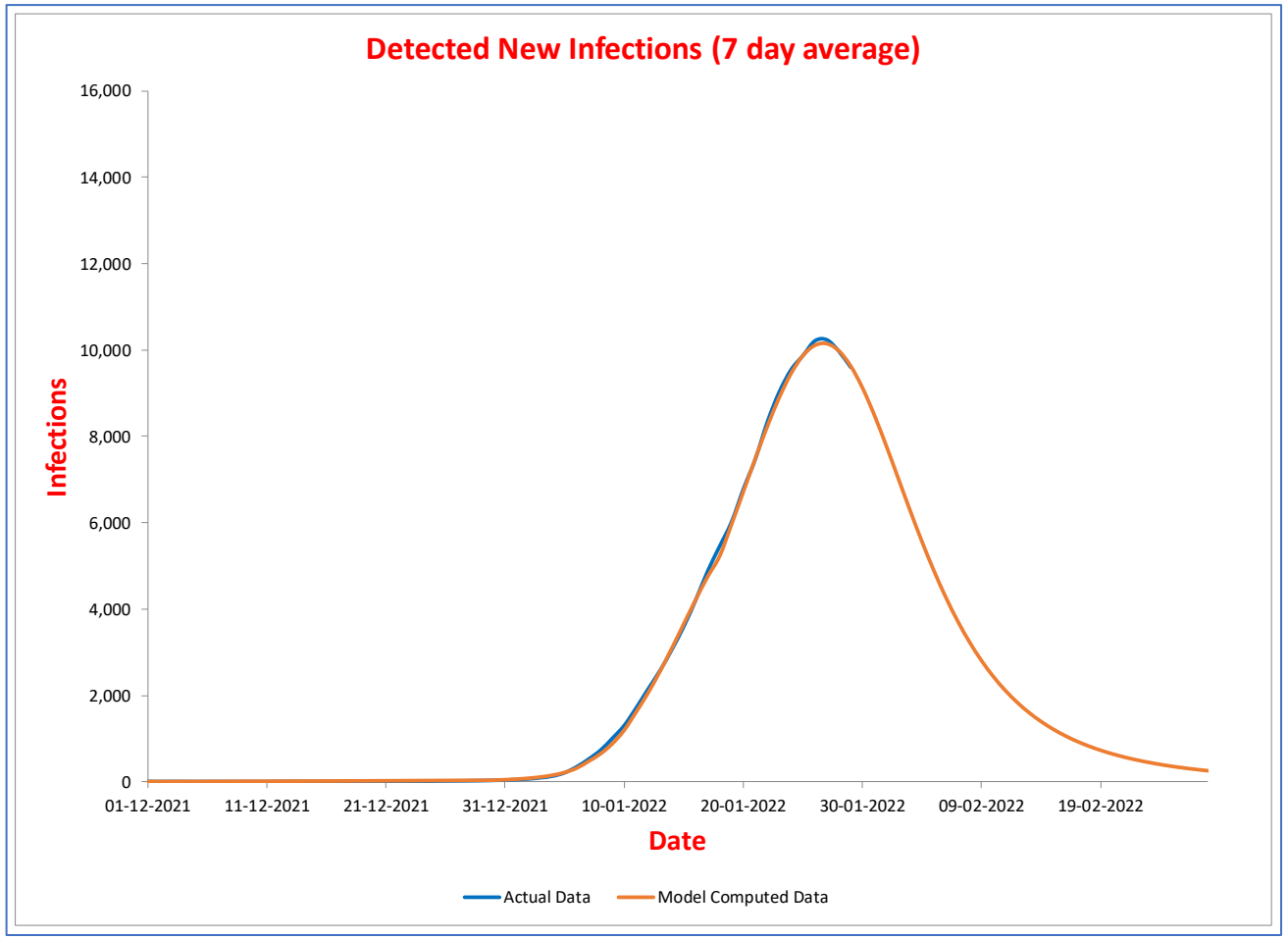
- Peaked on 26th Jan (predicted: 25th Jan, earlier prediction: 23rd Jan)
- New phase not fully stable yet

Kerala



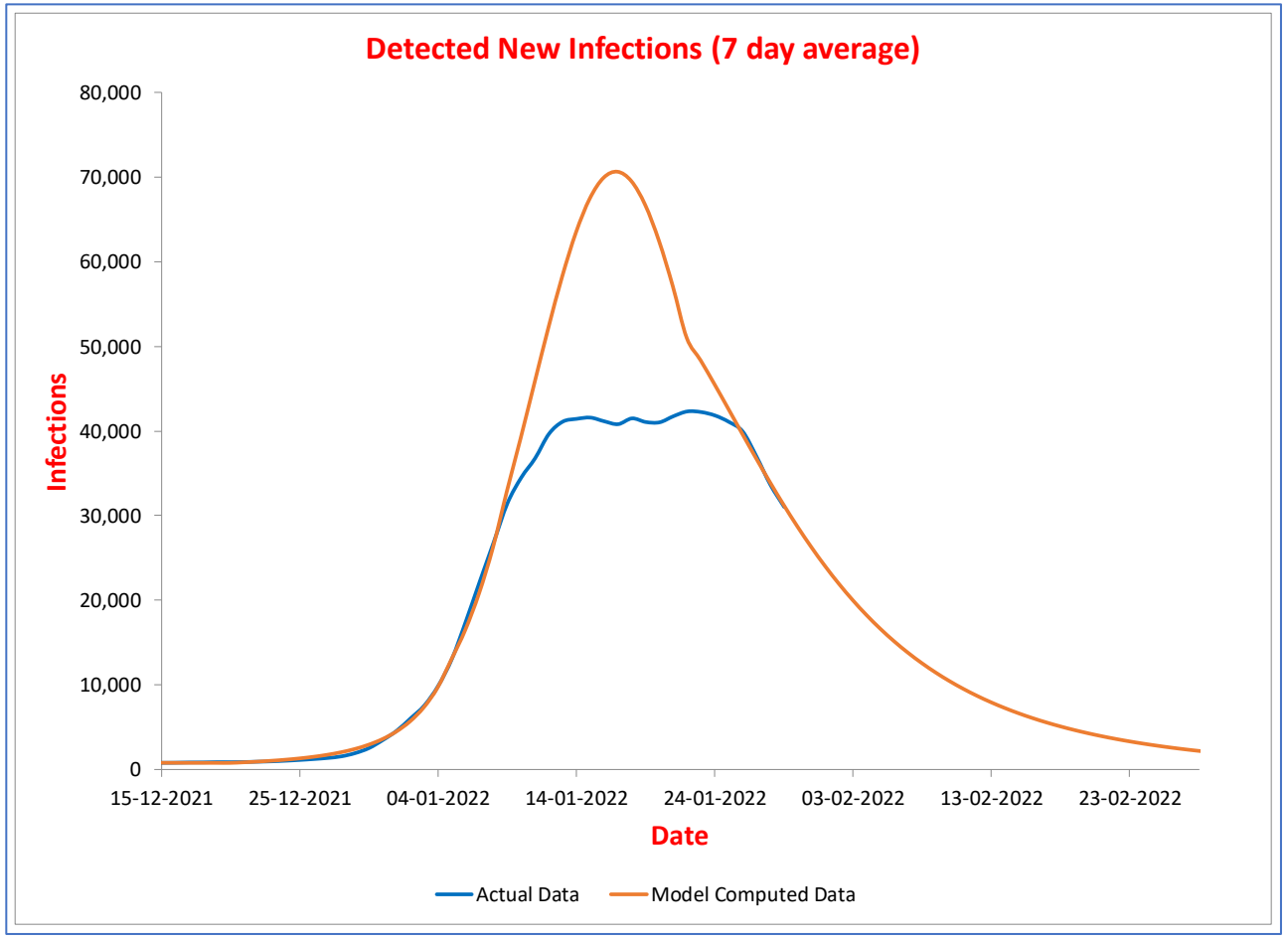
- Predicted to peak on 30th Jan
- No phase change yet

Madhya Pradesh



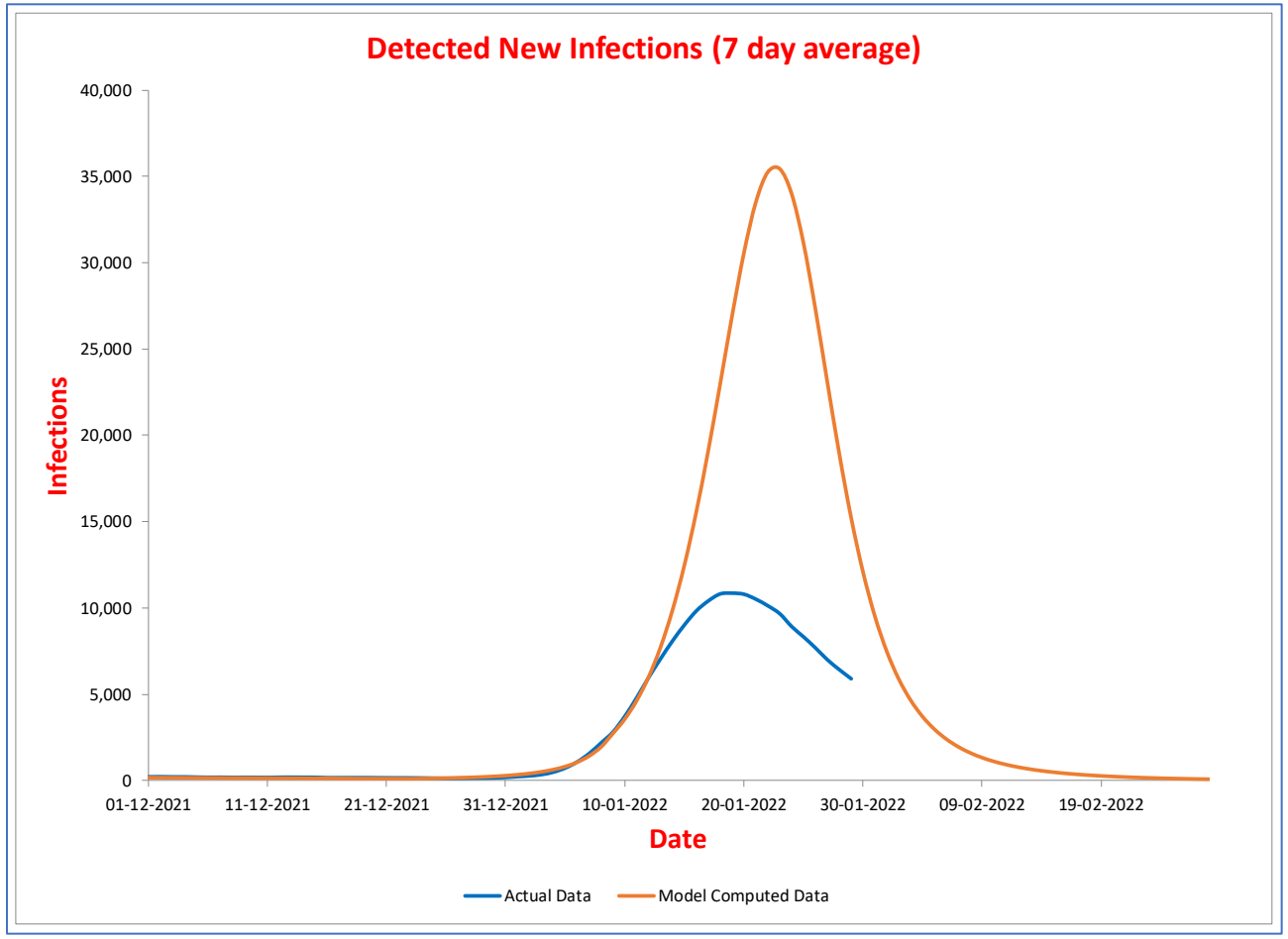
- Peaked on 27th Jan (Predicted: 27th Jan, earlier prediction: 23rd Jan
- New phase not fully stable yet

Maharashtra



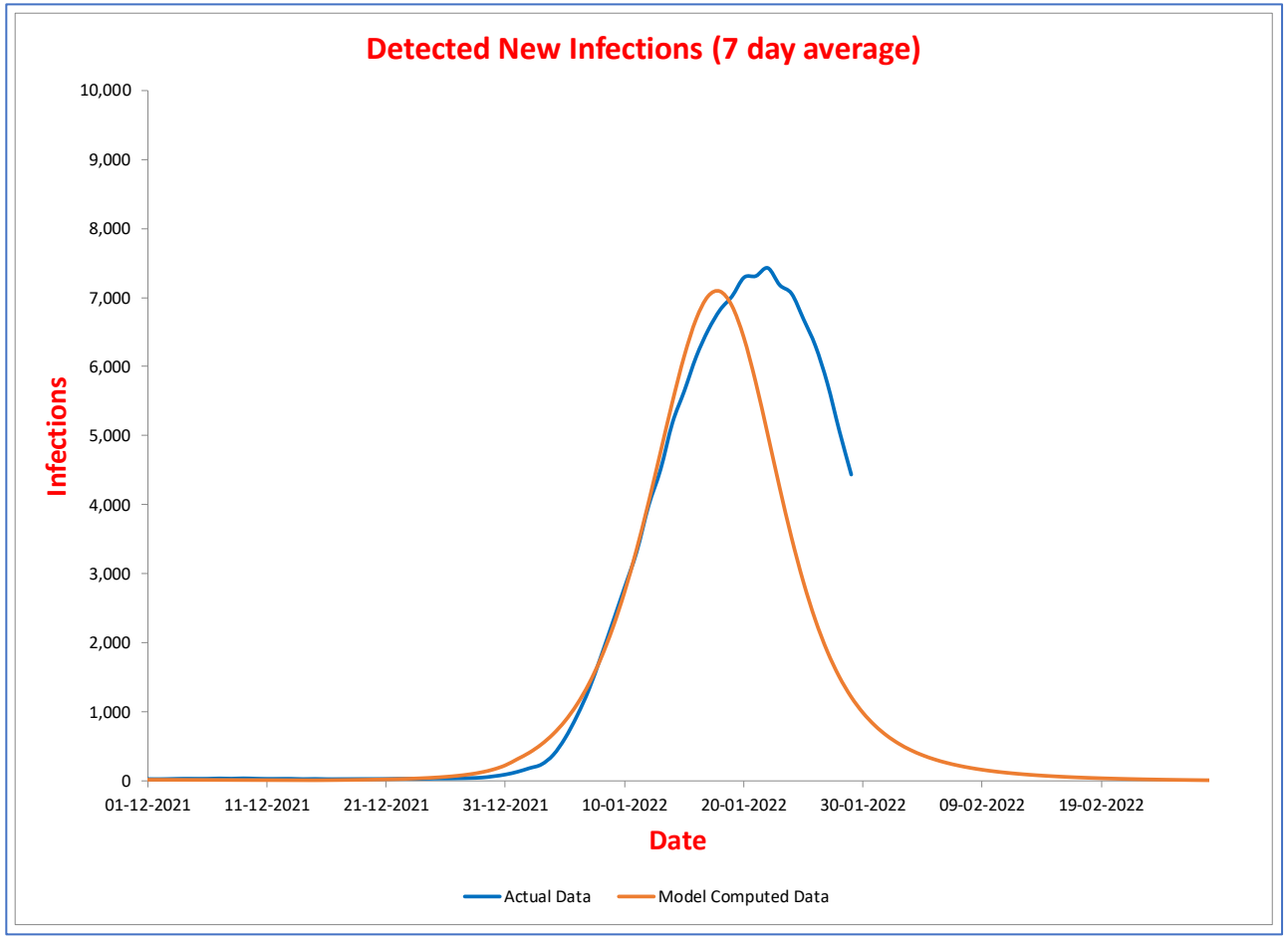
- Peaked on 22nd Jan (predicted: 20th Jan)
- New phase not fully stable yet

Odisha



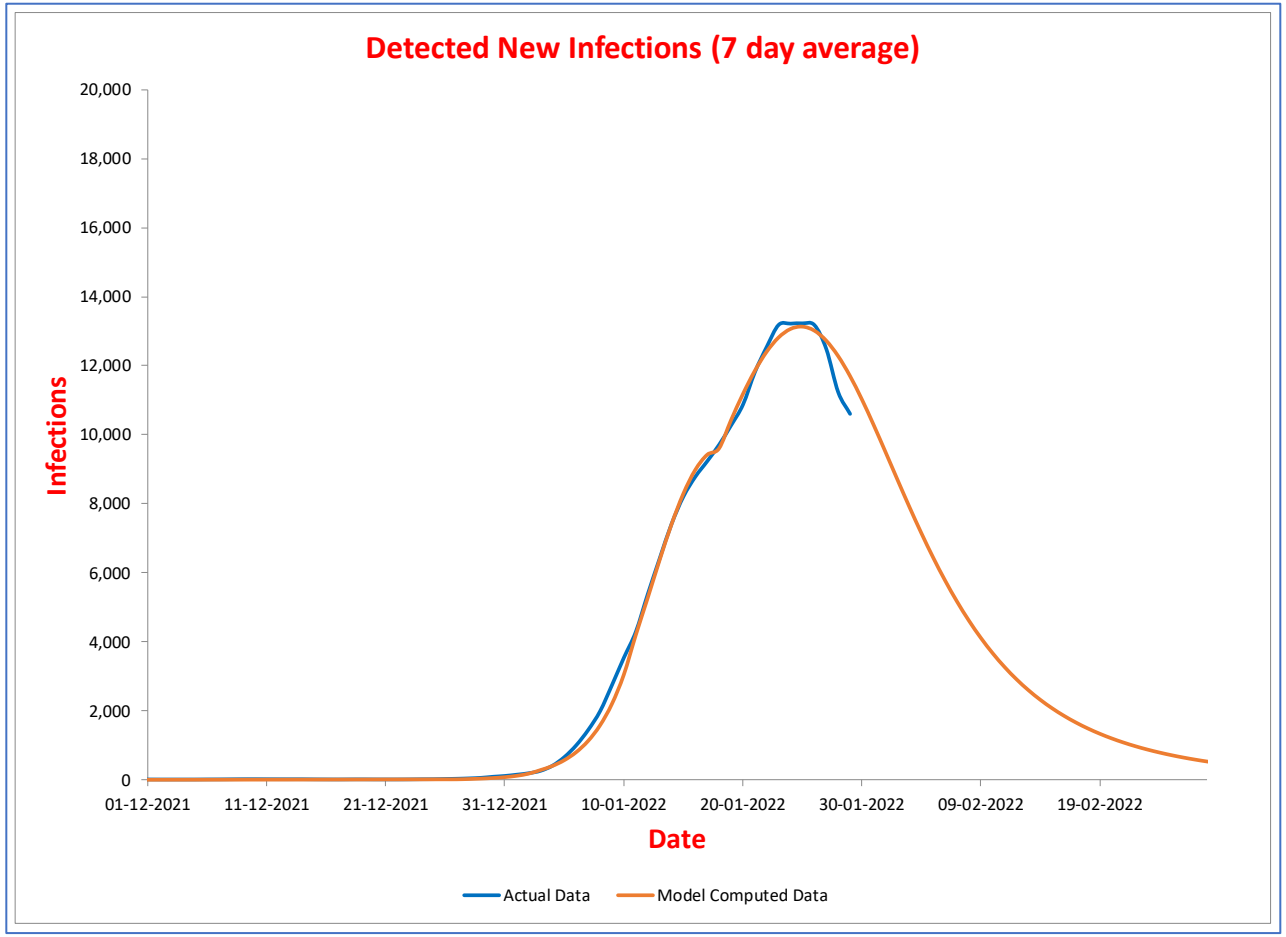
- Peaked on 19th (Predicted: 22th Jan)
- Phase change from 14th Jan

Punjab



- Peaked on 22nd Jan (Predicted: 18th Jan)
- Phase change from 12th Jan

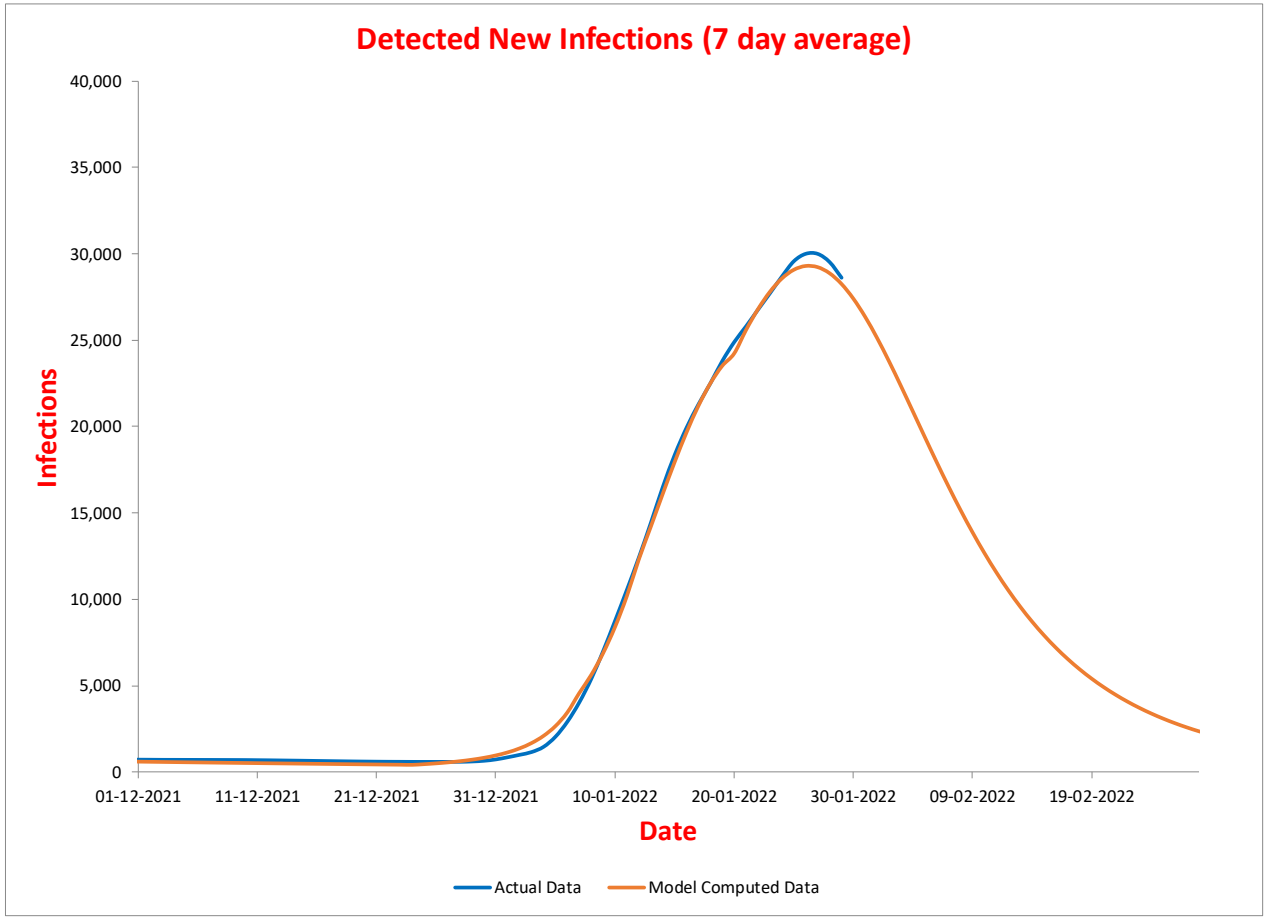
Rajasthan



- Peaked on 26^{th} Jan (Predicted: 26^{th} Jan, earlier prediction: 20^{th} Jan)
- New phase not fully stabilized yet

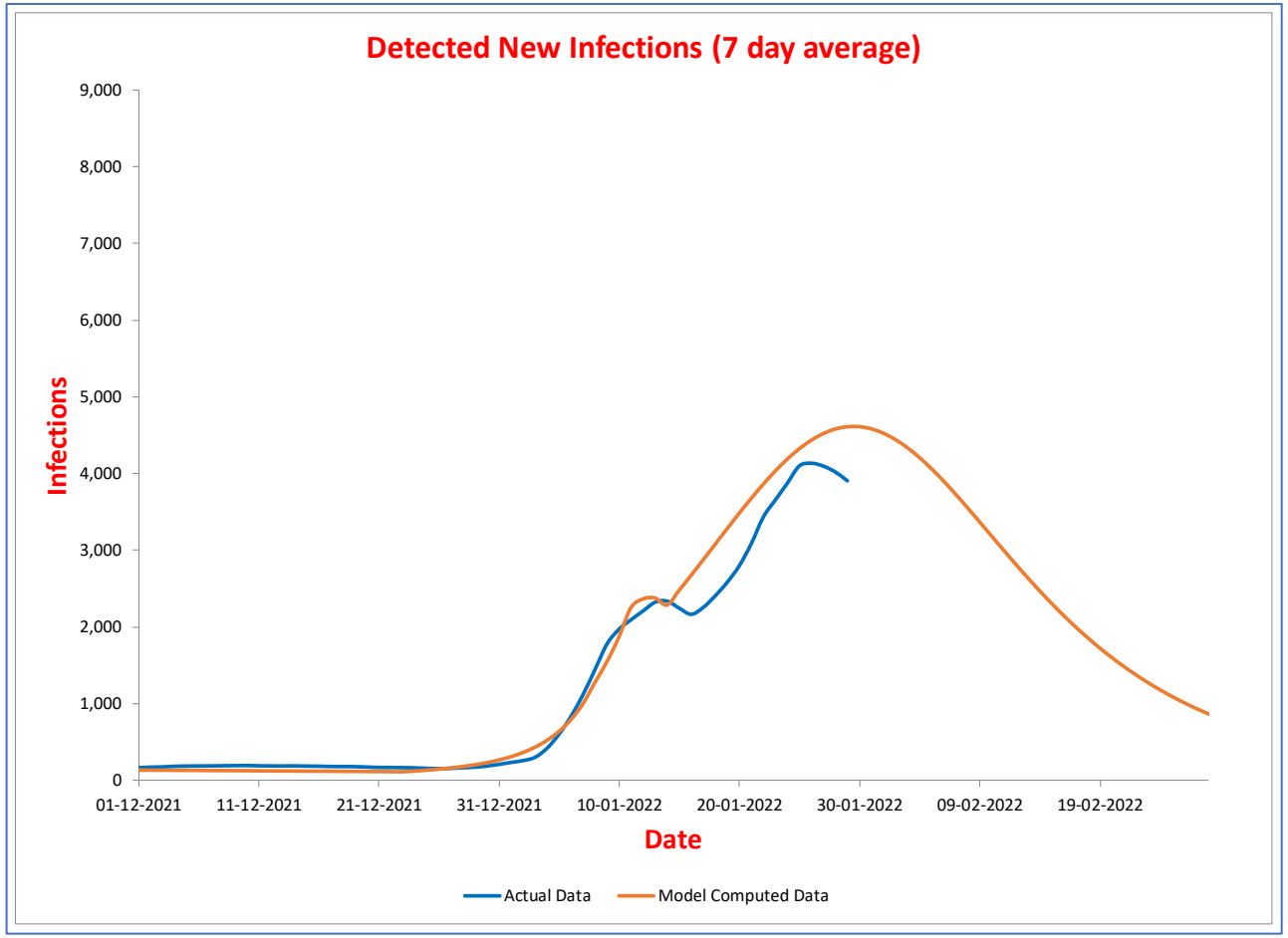
- ρ went up by $\sim 20\%$
- β went up from 0.59 ± 0.05 to 2.61 ± 0.78 and then came down to 0.93 ± 0.20

Tamil Nadu



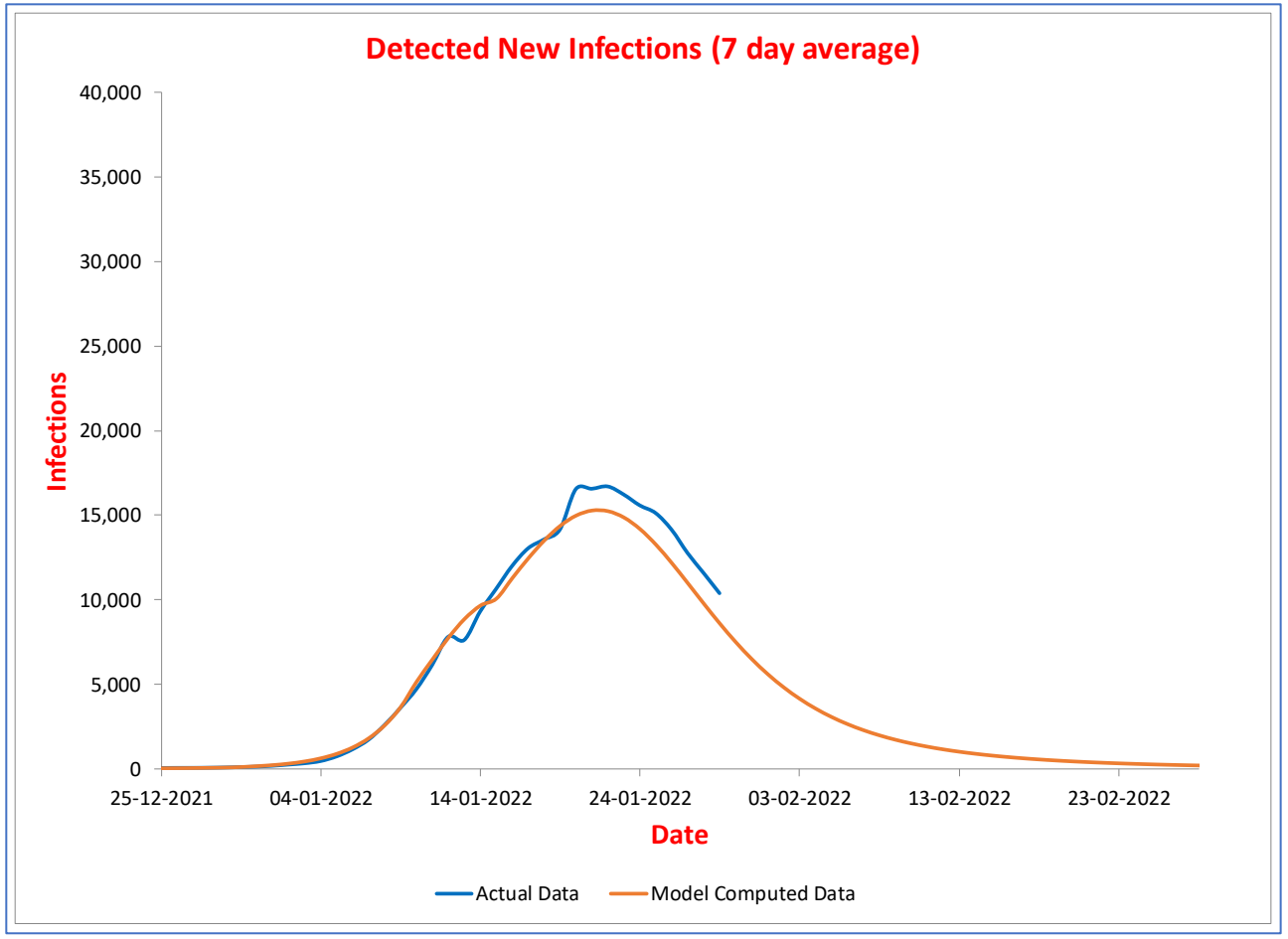
- Peaked on 26th Jan (Predicted: 26th Jan)
- New phase not fully stabilized yet

Telangana



- Peaked on 26th Jan? (predicted: 30th Jan)
- New phase not fully stabilized yet

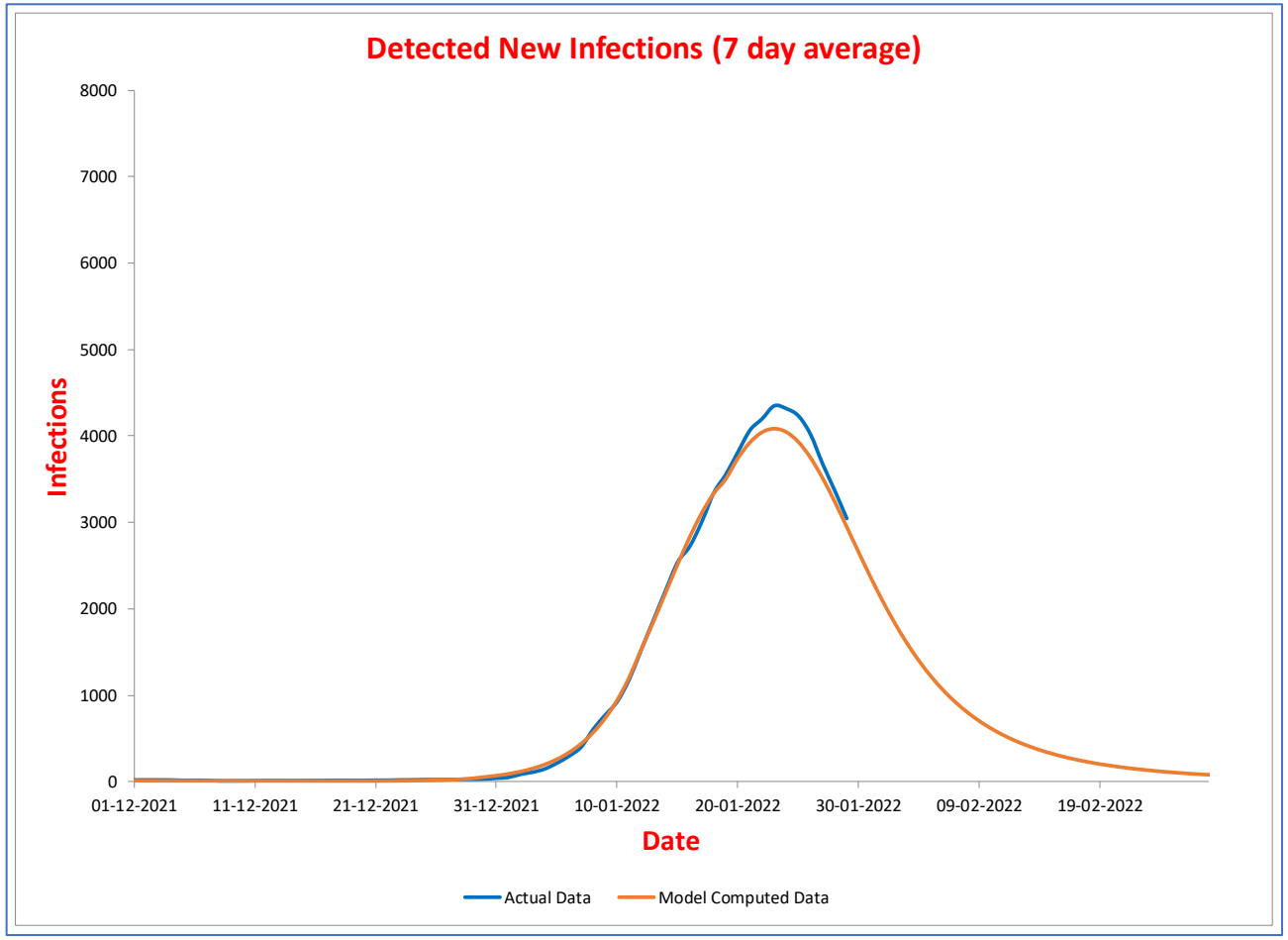
UP



- Peaked on 22^{nd} Jan (Predicted: 22^{nd} Jan, earlier predicted: 19^{th} Jan)
- New phase not fully stabilized yet

- ρ went up by $\sim 10\%$
- β went up from 0.54 ± 0.02 to 3.25 ± 1.71 and then came down to 2.10 ± 1.16

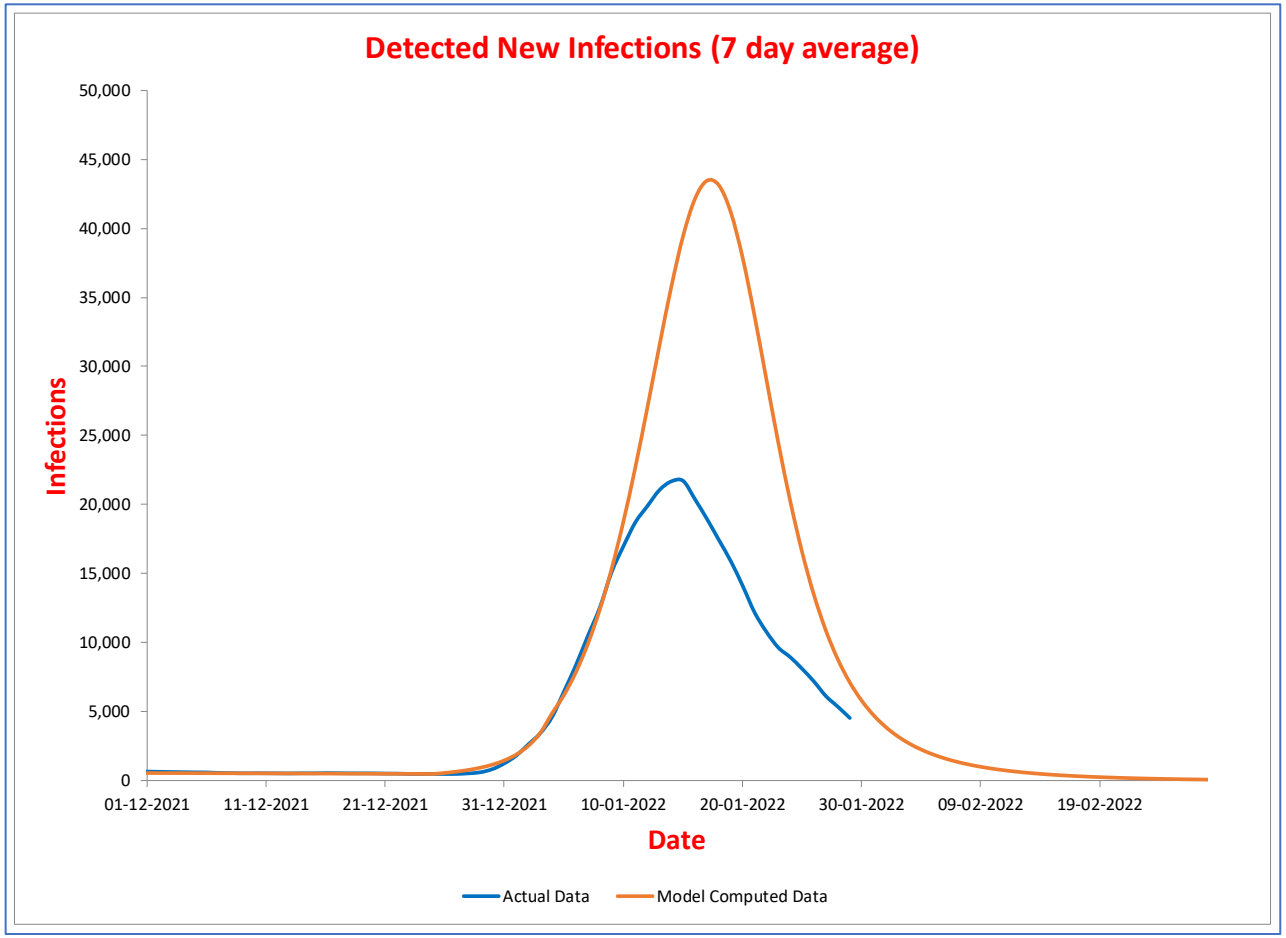
Uttarakhand



- Peaked on 23rd Jan (predicted: 23rd Jan, earlier prediction: 21st Jan)
- New phase not fully stabilized yet

- Almost no change in ρ
- β went up from 0.69 ± 0.19 to 2.37 ± 1.28 and then came down to 1.61 ± 1.01

West Bengal



- Peaked 15th Jan (predicted: 17th Jan)
- Phase change from 10th Jan