

## Impact of Lockdown Due to Spread of Covid-19 in India

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### Abstract

*A pandemic like Coronavirus can be confusing. Often it starts without anyone noticing anything. It creeps into people's life unexpectedly and brings the world to a halt. This is what happened at the beginning of the year 2020. With no vaccine on the horizon, the whole world decided to go into lockdown to save human lives. The unexpected nationwide lockdown in India on 24th March was a controversial decision. Our project tries to analyze how each state fared in combating Coronavirus using data available publicly. Followed by predicting cases after each phase of lockdown (Till phase 4).*

*Keywords: COVID-19, Lockdown, India, Data Science, FBProphet.*

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### 1. Introduction

A disease similar to pneumonia cases began to emerge in Wuhan City, Hubei Province, China in December 2019 [1,2]. The studies revealed that the cases that emerged were a new type of coronavirus that was not previously described. This form of the virus was called Coronavirus 2019, or COVID-19, since it appeared in 2019 [3]. The source of this virus is thought to be the Huanan seafood market in Wuhan, China. It was understood in time that the virus, which is transmitted from animal to human, can spread from human to human.

The COVID-19 outbreak is spreading very fast every day and more than 4 million people have been actively infected by this virus so COVID-19 restrictions are applied in almost all areas of life [4]. The most basic measure to reduce the spread of coronavirus or to prevent infection is to follow hygiene rules [5]. The most important of these is washing hands. For this reason, the spread of this virus is slower in societies that have the habit of washing hands and pay attention to the general hygiene rules [6]. There is a high level of participation in the "stay at home" call by official institutions. Scientists warn that the COVID-19 virus can reach any age group quickly [6,7].

To prevent this pandemic, Indian governments have started to apply bans under many social restrictions. Lockdown is at the forefront of these restrictions. The aim of this study is to analyze statistically that the lockdown plays an important role in preventing COVID-19 and to show its psychological effect on people. This study used COVID-19 data from 28 states to analyze the impact of the lockdown to slow down the COVID-19 outbreak.

### 2. Related Work

In this article [8] we saw that how lockdown effects on the number of cases by day in India. India starts lockdown the evening of March 24, India's Prime Minister Narendra Modi announced a three-week nationwide central lockdown — starting Wednesday, March 25 at midnight, to slow the spread of the novel coronavirus. This is the biggest lockdown in the history of the world happening in a democracy of 1.34 billion people. In this article also the author compare that how early and effective lockdown can slow the transmission rate between people

The health care services and systems in India are still developing and have challenges of workforce shortages, absenteeism, poor infrastructure, and quality of care. The health care system is not

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adequate or prepared to contain COVID19 transmission in many areas, especially in many northern Indian States because of the shortage of doctors, hospital beds, and equipment, especially in densely populated underserved states. In this article [9] the author points us how important lockdown is to us to slow the rate of transmission and give time to the Indian Health system to build infrastructure to fight this pandemic.

### **3. Proposed Work**

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in December 2019 in Wuhan, China, and has since spread globally, resulting in an ongoing pandemic. As of May 31st, 2020, more than 6.25 million cases have been reported across 187 countries and territories, resulting in more than 377,007 deaths. More than 2.89 million people have recovered. So, our proposed work is to analyse data on COVID-19 effects in India. We will try to understand which states in India were hit worst and how the government has been able to fight back. Alongside that, we will be trying to predict how the Coronavirus will spread across the country in upcoming months and if imposing lockdown back in March was a good initiative.

#### **3.1. Experimental Work**

##### **Tools Used:**

- Python - Python is a cross-functional, maximally interpreted language that has lots of advantages to offer. The object-oriented programming language is commonly used to streamline large complex data sets. Over and above, having a dynamic semantics plus unmeasured capacities of RAD (rapid application development), Python is heavily utilized to script as well.
- Jupyter Notebook - Jupyter is a free, open-source, interactive web tool known as a computational notebook, which researchers can use to combine software code, computational output, explanatory text and multimedia resources in a single document.
- Google Colaboratory - Colaboratory, or Colab for short, is a Google Research product, which allows developers to write and execute Python code through their browser. It is a hosted Jupyter notebook that requires no setup and has an excellent free version, which gives free access to Google computing resources such as GPUs and TPUs.

##### **Libraries Used:**

- Pandas - In computer programming, pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series. It is free software released under the three-clause BSD license. The name is derived from the term "panel data", an econometrics term for data sets that include observations over multiple time periods for the same individuals.
- Plotly - plotly.py is an interactive, open-source, and browser-based graphing library for Python. Built on top of plotly.js, plotly.py is a high-level, declarative charting library. plotly.js ships with over 30 chart types, including scientific charts, 3D graphs, statistical charts, SVG maps, financial charts, and more. plotly.py is MIT Licensed. Plotly graphs can be viewed in Jupyter notebooks, standalone HTML files, or hosted online using Chart Studio Cloud.
- Folium - folium builds on the data wrangling strengths of the Python ecosystem and the mapping strengths of the leaflet.js library. Manipulate your data in Python, then visualize it in on a Leaflet map via folium.

- Prophet- Prophet is a procedure for forecasting time series data based on an additive model where non-linear trends are fit with yearly, weekly, and daily seasonality, plus holiday effects. It works best with time series that have strong seasonal effects and several seasons of historical data. Prophet is robust to missing data and shifts in the trend, and typically handles outliers well.

### 3.2. Implementation of The Proposed System

#### Total Number of Confirmed cases in India till 31<sup>st</sup> May

Currently Maharashtra is leading the list with 67,655 cases. It is more than double the number of the next state which is Tamil Nadu with 22,333 cases. Followed by Delhi – 19,844 cases, Gujrat – 16,794 cases, and Rajasthan – 8,831 cases. Lakshadweep and Daman and Diu have the lowest number of cases. 0, followed by Sikkim and Mizoram with 1 case.

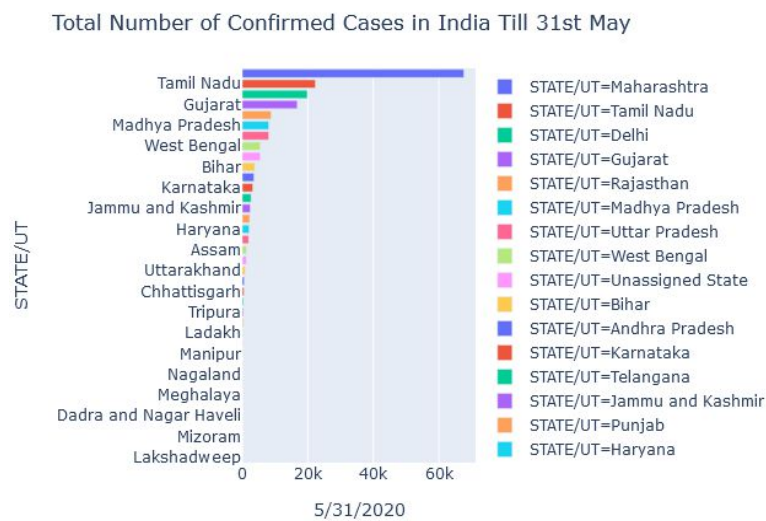


Figure 1: Total Number of Confirmed cases in India till 31<sup>st</sup> May

#### Total Number of Death Cases in India till 31st May

Currently Maharashtra is leading the list with 2,285 cases. It is more than double the number of the next state which is Gujrat with 1,038 cases. Followed by Delhi – 473 cases, Madhya Pradesh – 351 cases, and West Bengal – 317 cases.

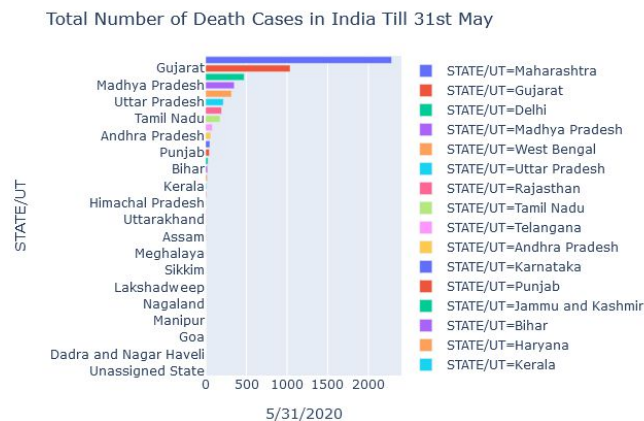


Figure 2: Total Number of Death Cases in India till 31<sup>st</sup> May

### Total Number of Recovered Cases in India till 31st May –

Currently Maharashtra is leading the list with 29,329 cases. It is more than double the number of the next state which is Tamil Nadu with 12,757 cases. Followed by Gujrat – 9,919 cases, Delhi – 8,478 cases, and Rajasthan – 6,032 cases.

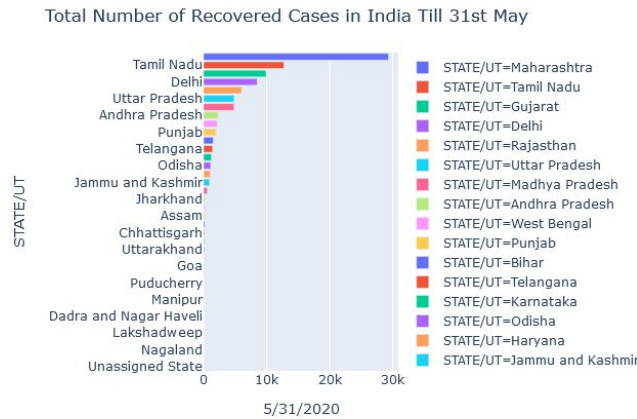


Figure 3: Total Number of Recovered Cases in India till 31st May

### Cases of Covid-19 in India in last 4 months

Covid-19 cases have been steadily rising since the first case on January 30th, 2020. From the above chart we can conclude that rate of recovered cases and rate of confirmed cases are close to each other while the rate of death is low. But if the number of confirmed cases keeps on increasing, equal rate of recovery won't help as hospitals will soon run out of beds to provide for the patients suffering from Coronavirus. As for 31st May 2020, there are 93,359 active cases, 91,855 recovered cases and 5407 people have died.

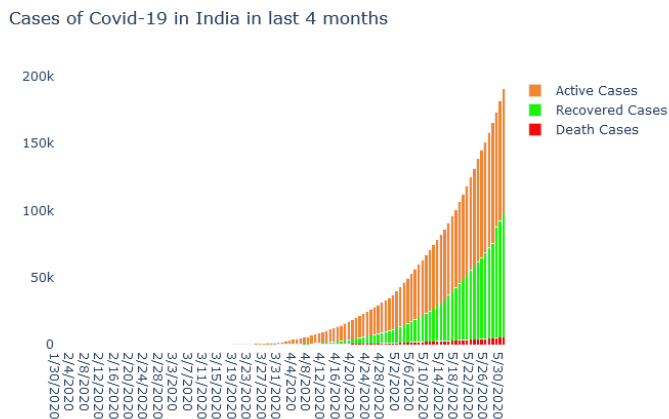
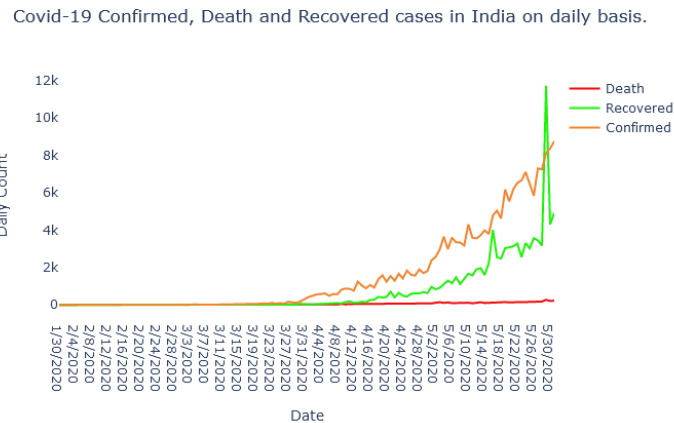


Figure 4: Cases of Covid-19 in India in last 4 months

### Covid-19 Confirmed, Death and Recover cases in India

The daily rate of confirmed cases has been increasing slowly but in an alarming rate. The highest surge in confirmed cases was seen by India on the 31st May 2020, with a number of 8763 cases. The highest surge in recovered cases was seen by India on the 29th May 2020, with a number of 11,729

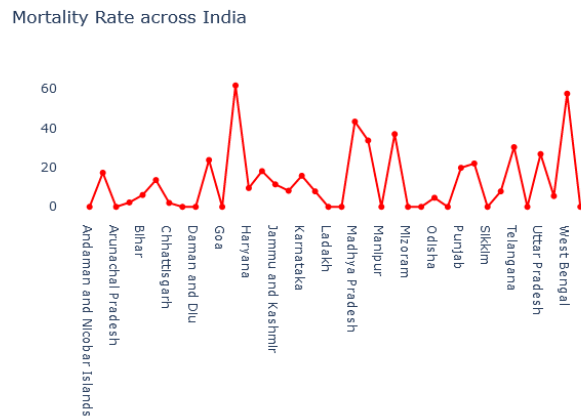
cases. The highest surge in number of deaths was seen by India on the 29th May 2020, with a number of 269 cases.



**Figure 5: Covid-19 Confirmed, Death and Recover cases in India**

### Mortality Rate across India

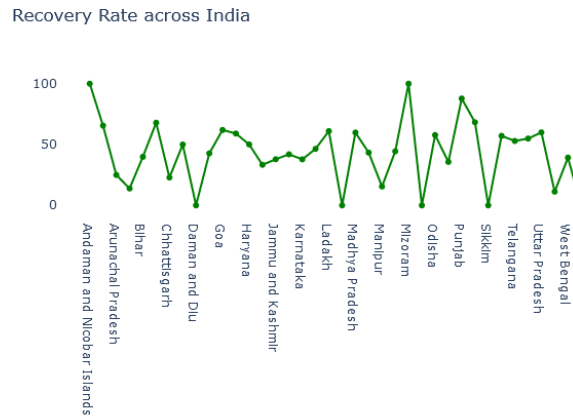
Gujrat leads the list with a rate of 61.8 deaths per thousand cases. Followed closely by West Bengal with a rate of 57.6 deaths per thousand cases. Out of all the states where patients have died, Chhattisgarh doing the best with only 2 death per thousand cases, followed by Assam which has a rate of 2.2 deaths per thousand cases. Some states also reported zero deaths such as, Andaman and Nicobar, Arunachal Pradesh, Dadra and Nagar Haveli, Daman and Diu, Goa, Lakshadweep, Manipur, Mizoram, Nagaland, Puducherry, Sikkim, and Tripura for now.



**Figure 6: Mortality Rate across India**

### Recovery Rate across India

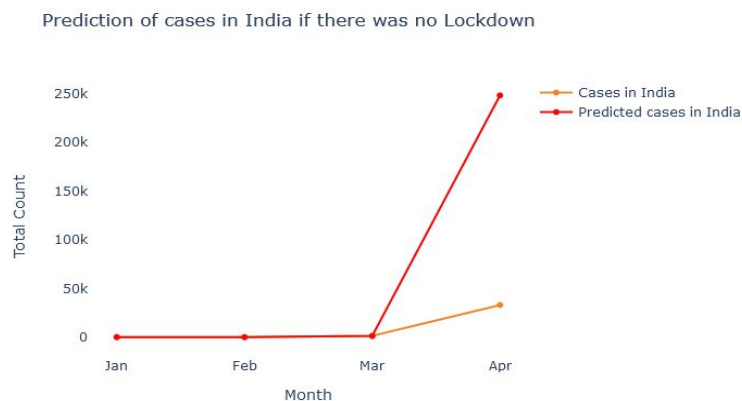
Andaman and Nicobar lead the list with a 100% recovery rate. Followed closely by Punjab with an 87.8% recovery rate. However, states like Nagaland and Sikkim yet to have any patient recovered.



**Figure 7: Recovery Rate across India**

### Predicting Cases if there was no Lockdown in India

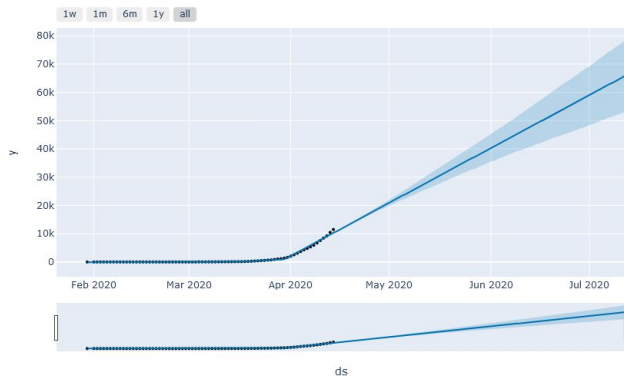
If the Indian Government did not order nationwide lockdown on 24 March 2020 then the nation would have been affected by Corona way worse than any other nation thanks to its population. According to our prediction, total number of confirmed cases would have risen to 2,48,495 cases near the end of the month of April if there was no lockdown. Thanks to lockdown the number was limited to 33,000 cases.



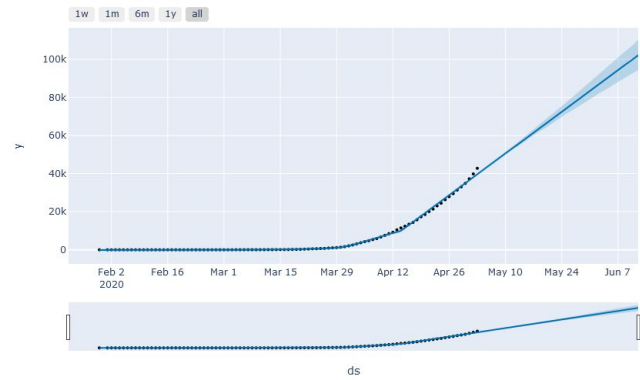
**Figure 8: Predicting Cases if there was no Lockdown in India**

### Predicting New Cases in India

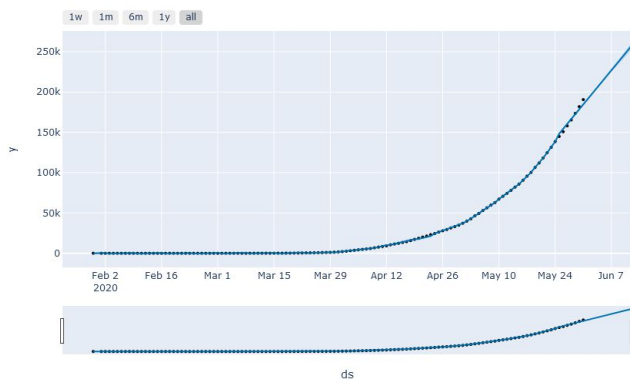
Our initial attempts at predicting did not yield good results as Facebook’s Prophet library provides better accuracy as we provide more time series data. But as more phases passed, we were able to get more data and thereby producing better model with fb prophet. On the graph of Phase 4, we can see the predicted deep blue line almost aligns itself on top of the real number of cases (which are the black dots) and the uncertainty intervals of our forecasts (the blue shaded regions) is almost non-existent, therefore predicting with better accuracy. According to our model, on June 12th total number of confirmed cases in India should be somewhere near 2,57,200 cases.



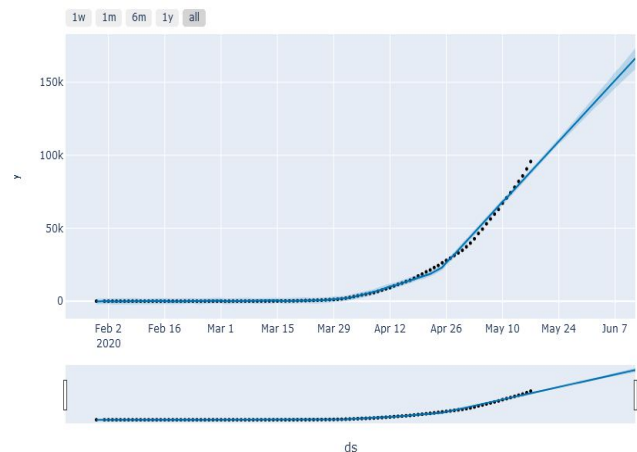
**Figure 9: Phase 1 (25 March – 14 April)**



**Figure 10: Phase 2 (15 April – 3 May)**



**Figure 11: Phase 3 (4 May – 17 May)**



**Figure 12: Phase 4 (18 May – 31 May)**

#### 4. Conclusion

As our project is based on analysis of data of COVID-19. We found that that India's initial lockdown will significantly slow the spread of COVID-19 hospitalizations and moderate infections compared to a lack of interventions. The temporary lockdowns will buy time for health systems to prepare for the peak of the outbreak by building temporary healthcare facilities and obtaining additional personnel, hospital beds, and equipment. It is vital to build up healthcare infrastructure quickly to prepare for an increase in hospitalized cases. Even though the rate of recovery is doing well in India, the numbers of confirmed cases however have been growing steadily. Big states like Maharashtra, Tamil Nadu, Delhi, Gujarat has been heavily contributing to the number of cases in India. While states like Sikkim and Mizoram had only one case each. Out of every state, Punjab has a high recovery rate but states like Gujarat and West Bengal has been leading the list with highest mortality rate in the country. We have found out in our prediction that Indian government has done a good job imposing lockdown sooner. However, people across the country have not followed proper social distancing rules and norms after the third phase of lockdown. That's why the number has been increasing steadily. We are trying to make this prediction model and the visualization more accurate and more informative. We cannot claim this model as perfect. As for future scope this data analysis can be used to fetch more information from it and the predictive model can also be made more accurate and better.

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