LETTER OF APPRECIATION

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The Uttar Pradesh State Disaster Management Authority (UP SDMA) appreciates the efforts of above authors for the report submitted to the authority entitled ‘Effects of Saturday and Sunday Lockdown on Cumulative COVID-19 Cases in Uttar Pradesh During 1ST July to 31ST August 2020’ on 07 July 2020. The scientific analysis by the team has been very significant in various policy decisions of state.

The authority conveys its best wishes for a bright future for researchers.

(Lt. General R P Sahi)  
Vice Chairperson  
UP State Disaster Management Authority
Report on

EFFECTS OF SATURDAY AND SUNDAY LOCKDOWN ON CUMULATIVE COVID-19 CASES IN UTTAR PRADESH DURING 1ST JULY TO 31ST AUGUST 2020

Team of Researchers

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Submitted to,

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GOVERNMENT OF UTTAR PRADESH
EFFECTS OF SATURDAY AND SUNDAY LOCKDOWN ON CUMULATIVE COVID-19 CASES IN UTTAR PRADESH DURING 1ST JULY TO 31ST AUGUST 2020

Background

COVID-19 infection started in India by the end of January 2020 and spread across all the state by April 2020. As on July 7, 2020, the total number of active cases was 9514, cured and discharged were 19627 and deaths were 827 in Uttar Pradesh. Despite the daily rise in the burden of COVID-19 infections in the country, there is limited scientific work on projecting the future trajectory of COVID-19 infections.

Assumptions/Limitations of the Study

1. The simulation is based on number of COVID19 cases of fifteen days from 16 June to 30 June 2020 in Uttar Pradesh.
2. Simulation assumes that trend of COVID19 cases will continue to grow with same increasing rate as experienced between 15 June to 30 June 2020.
3. Simulation assumes that number of COVID19 cases will continuously grow with no peek and decline.

Objective

This report aims to examine the future trajectory of COVID-19 in Uttar Pradesh with assumption of Saturday and Sunday lockdown. The report attempts to assist policy makers in taking decision for containing spread of COVID19 cases. The limitations of the study have already been discussed above.

Brief Methods:

The R₀ represents the reproduction rate of COVID-19. It indicates that one infected person transmit the disease to a number of person. For instance, R₀ 1 implies that one infected person infects another person during his/her period of illness. Generally, one infected person can spread the virus between 5 days and 13 days and the incubation period is between 0 and 5 days (Kumar et al., 2020). At the national level, the basic reproduction number R₀ before the lockdown was 1.862. The R₀ declined to 1.455 and 1.200 during the first and second lockdown periods respectively (Kumar et al., 2020). The projected number of cases is estimated using the following formula.

\[ I_{t+n} = I_t * R_0 \]

Where;

\[ I_{t+n} \] is the projected number of new cases in for a particular time. The cumulative cases are the summation of new cases and existing old infected cases.
\( I_t \) denotes the number of present infected cases. The reproduction rate \((R_0)\) can be presented in the following formula.

\[
R_0 = \frac{I_t}{I_{t-n}}
\]

Where;

\( I_{t-n} \) denotes the number of infected cases before the incubation period of five days. The incubation period is assumed five days (Yadav and Yadav, 2020).

\( I_t \) denotes the number of infected cases is presented by

For the projection of the number of infected cases till 31st August 2020, the average of \( R_0 \) between 16th June 2020 and 30th, June 2020 is used. **The average reproduction rate \( R_0 \) was 1.15 with no lockdown scenario and average reproduction rate \( R_0 \) went down to 1.12 in case of Saturday and Sunday lockdown between 1st July and 31st August 2020.**

**Result and Discussion**

With the application of average reproduction rate \((R_0)\) in no lockdown scenario and lockdown scenario on Saturday and Sunday following trajectory of COVID19 cases has been derived. The following figure 1 indicates considerable fall in COVID19 cases with Saturday and Sunday lockdown scenario.

![Figure 1: Trajectory of no lockdown and lockdown on Saturday and Sunday on Cumulative COVID-19 cases in Uttar Pradesh during 1st July to 31st August 2020.](image)
Other three variant of projection has been also been carried out if lockdown is implemented on Saturday and Sunday during 1st July – 31st August 2020. It was simulated that if the Saturday and Sunday lockdown reduce the current R₀ level by 20%, 10%, and 5% in every two days in a week, the number of cumulative cases may be declined to different levels. The existing literature suggested that the lockdown can be easily reduced between 10% and 20% in India (Kumar et al., 2020, Yadav and Yadav, 2020). Figure 2 represents number of cases in Uttar Pradesh between 14th March and 1st July 2020 and projected cases with different scenarios (Saturday and Sunday Lockdown) between 1st July 2020 and 31st August 2020. Figure 3 also represents same pattern but it only represent different scenarios between 1st July 2020 and 31st August 2020. Both the figures also imply same assumptions/limitations as mentioned above.

Figure 2: Number of cases in Uttar Pradesh between 14th March 2020 and 1st July 2020 and projected cases with different scenarios between 1st July 2020 and 31st August 2020.
Figure 3: Projected cases with different scenarios between 1st July 2020 and 31st August 2020.

**Recommendation**

1. The mathematical significance of the idea of implanting Saturday and Sunday lockdown was investigated by above method.
2. The results indicated significant decline in COVID-19 cases in next two months with Saturday and Sunday lockdown situation compared to no lockdown scenario.
3. Saturday and Sunday lockdown can be implanted statewide with careful evaluation of other economic and social issues.
4. The report must be externally evaluated by other experts for peer review and consensus.

**References:**
