Ask Tough Questions, Learn

Why did the severity of India's second wave take modellers by surprise?

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The country is currently reeling under the second wave of Covid-19 pandemic. Our health infrastructure is stretched beyond limits resulting in many avoidable deaths. It is natural to ask if our scientific community could have contributed more in prediction and mitigation of this wave. Pertinent questions need to be asked, with the hope that these may help in dispassionate analysis and provide learnings for future.

For the scientists within the government: Could the decision-making on allocation of resources have been different? Specifically, could decisions on beds, oxygen and other health infrastructure have been made with foresight by utilising the guidance provided by various inputs including models for predicting future trajectory of the pandemic? While it is true that the inputs provided did not indicate severity of the wave, the key question is whether, even under the assumption of less severe wave, the resource allocation was done in a scientific manner.

Here, it is important to distinguish between necessity and sufficiency of models for decision-making. Models are necessary because the directional guidance they provide is invaluable in making forward-looking decisions on allocation of resources. Models, however, are not sufficient as such directional guidance must be vetted by the wisdom of policy makers, more so with extremely uncertain phenomena such as the pandemic.

The onset of second wave was detected by many: Virologists started noticing the spread of a new mutant by March. Many in the modelling community observed divergence from expected trajectory by early March, and were predicting a significant second wave by the end of the month. While the severity of the second wave when compared to the first wave has

caught everyone by surprise, a second wave that was at least as severe as the first wave was predicted by many scientists in March.

The scientists outside of government fold must also ask the question: Why is it that no one anticipated the severity of the second wave? Modellers capture the behaviour of a pandemic through certain equations, estimate the values of parameters governing the equations, and use them to compute future trajectory.

This is also useful for medium-term predictions if future values of parameters are correctly estimated. Typically, these estimates are done by epidemiologists based on their domain knowledge. More recently, data-centric approaches are also being used to estimate parameter values – the author was part of a group that devised a model named SUTRA, which estimated parameter values using data.

Why could the intensity of second wave not be predicted by the models? Because the future parameter values could not be correctly estimated, either by domainknowledge-based or data-based models. For SUTRA, we got the timing of the peak approximately correct but not the height.

This was due to rapidly changing behaviour of the pandemic in early April. It stabilised in the third week and on April 25 we predicted a peak during May 5-8 between 3.4 to 4.4 lakh cases per day; the actual peak appears to have come on May 8 at 3.9 lakh cases. These numbers are 7-day moving averages of new cases.

For any model, one critical input required for estimating future values is the fraction of population that is currently immune. To understand the importance of this data, take the evidence for Mumbai where 58% of the individuals living in the slums had acquired antibodies by December 2020 while this number was only18% for those living in the high-rise buildings. In the second wave, about 90% of the infected in Mumbai have been in the high-rise buildings.

Thus, the smaller the immune population, the higher will be the intensity of the next wave since more people will be susceptible to infection. To estimate this number correctly, one needs to continuously track the immunity level in the population of different regions since people lose immunity over time. Unfortunately, this information was not available. In the month of February, this author requested the PSA office for such a survey but probably could not make a convincing case.

Going forward, it is important that regular sero-surveys are conducted at national, state and even major district levels. This will allow the decision-makers to quickly identify regions where immunity levels are dropping and thereby initiate appropriate action. There is a lot of talk these days about third wave. However, without a proper analysis, we may again be left guessing at its magnitude. It requires proper scientific analysis with sero-surveys being a crucial input.

As these sero-surveys need to be done regularly and provide results quickly, many countries have opted to use blood samples collected from a region over a short period of time, and perform sero-tests on them to estimate immunity levels. Such surveys are adequate to provide a decent estimate. The same methodology must be adopted in India too to track the susceptibility of population in different regions.

In sum, the key learning for policy makers is to rely on evidence-driven scientific models as a necessary tool – but not sufficient – for decision making under uncertainty, and enable availability of crucial data so that the uncertainty could be minimised.

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