

<b>Magazine</b>	<b>Page No.</b>	<b>Edition</b>
Future Medicine	26 - 29	June 2021

# HOW DATA CAN HELP GENERATE A PUBLIC HEALTH RESPONSE

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The third wave of COVID 19 is imminent in India. In an article published in Nature in September 2020, it was mentioned that a typical SARS-CoV-2 virus accumulates only two single-letter mutations per month in its genome – a rate of change that is half that of influenza and one-quarter that of HIV. Despite the virus's sluggish mutation rate, researchers have catalogued more than 12,000 mutations in SARS-CoV-2 genomes so far.

Scientists can spot mutations faster than they can make sense of them. Many mutations will have no consequence for the virus's ability to spread or cause disease, because they do not alter the shape of a protein. Scientists have claimed that a steady trickle of immune-evading mutations could help SARS-CoV-2 to develop a new power to infect a human body. Our immune responses to coronavirus infections, including to SARS-CoV-2, aren't strong or long-lived enough to generate selection pressure that leads

to significantly altered virus strains.

Manaus, a Brazilian city of more than two million populations, was one of the world's leading COVID hotspots in the first wave. Brazil's president Jair Bolsonaro had promoted the idea of letting the pathogen move throughout the population until most people had been infected to attain herd immunity. Manaus was the first city in the world to reach a point at which enough people were considered immune to a virus, as they had already been infected by it. Preliminary preprint study of researchers at the University of São Paulo estimated that 66 percent of the population had been infected with SARS-CoV-2 (they later revised their figure to 76 percent as of October).

## Manaus -A Cautionary Message

In December 2020 a second wave hit the city of Manaus. By January, the city's health system had collapsed. ICUs were full to bursting, and oxygen supplies had been exhausted. Some patients were airlifted to other regions of Brazil, and many died of asphyxiation on makeshift beds in hospital corridors or their home.

More severe than the first one, the new wave took Manaus by surprise. The discipline of masks and social distancing practise had been discarded in the belief that the city had reached herd immunity. The month of January saw a surge of caseloads and death rate.

The Manaus variant, or more formally P.1, caused re-infections in people who had earlier bouts with the virus, while at the same time transmitting infection to those who had been spared in the first wave. William Hanage, an epidemiologist at the Harvard T. H. Chan School of Public Health, points out that herd immunity through infection, instead of a vaccine, only comes at the cost of an enormous amount of illness and death.

The Manaus experience holds a cautionary message for the rest of the world about preparing basic public health structures even as vaccination campaigns progress. Manaus got hit really hard because it dropped all its mitigation measures, and didn't have the level of herd immunity they expected. In fact, the more the virus spreads, the more it is able to find vulnerable groups in which mutations can arise. This fact also

## FATALITY FOREWARNED

Daily death rates in India will rise soon, predicts Health Metrics and Evaluation (IHME) at University of Washington

**5,600**

people could die of COVID-19 in a day in India, as per IHME predictions

**665,000**

COVID-19 deaths are projected by August 1, 2021

season in India, i.e., towards the end of November or early December 2021. This is also going to be the festive season in the country. According to a review published in International Journal of Environmental Research and Public Health, 5 August 2020, it is very unlikely that the present pace of vaccination can cover the entire vulnerable population of India within this short window of time before the festive season.

Even though the inoculation with the current vaccines provides the much needed protection at least from disease severity as incidence of reinfection has now become pretty common in India, the challenging part is how to cover the significantly large still unprotected population across the country within this short period.



underlines why only a global approach to immunizations will work.

The P.1 mutation is believed to have emerged in Manaus in early November 2020, but by January, it made up three quarters of all variants detected in the city and had spread to Japan. It has since been detected in at least 34 other countries and regions, including the U.S. and the U.K. Like other variants first detected in the U.K. and South Africa, P.1's 17 mutations occurred unusually quickly, and many of them are in the spike protein, which is used to penetrate the cells of an infected person. Fiocruz researchers discovered that the level of SARS-CoV-2, or the viral load, in patients infected with the variant was 10 times higher than with the earlier variant. CADDE study estimated that P1 dodges 25 to 61 percent of protective immunity gained from infection with earlier variants.

The immunity gained through vaccination appears to be more robust than the immunity achieved from infection. Johnson & Johnson's jab proved 85 percent effective against severe disease in trials in Brazil—no less than it did in the US. Still, experts say that the situation is worrying because of the virus's track-record of acquiring mutations in areas where it abounds.

The above facts, derived from a number of studies done internationally, hold three lessons in the Indian context-

The probability of a third wave increases if the virus cannot be controlled

According to a recent media report citing the views of M Vidyasagar, senior professor at IIT, Hyderabad, and a mathematical modeling expert under the government of Karnataka, even if the government could vaccinate the entire population, the possibility of a 'Third Wave' of COVID-19 can't be avoided. This is because the vaccines currently form part of the National COVID-19 Vaccination Programme will lose their immunity within 6 months. So, even those people who are vaccinated will begin to lose immunity towards the festive period.

What can make things even worse, according to Dr. Giridhar Babu, Epidemiologist and Professor at Indian Institute of Public Health in Bengaluru,

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is the fact that children are likely to be the most affected and vulnerable in the new wave. This is due to two reasons: First, the vaccine naive children can easily become hosts to the virus, which is looking for unprotected hosts, and secondly, the vaccination of children is still a question mark, given that the clinical trials for child immunisation with existing vaccines have just started and will take another six to eight months to generate their primary data. Moreover, manufacturing the required doses too will take time.

Experts are also of the opinion that even if the government could vaccinate the entire population, the possibility of a third wave can't be ruled out as those who get vaccinated now are likely to lose much of

quickly in the second wave as it will get more opportunity to mutate.

Immunity gained through vaccination will provide a better security against a mutating virus but vaccinating a large population is difficult.

Public Health measures like masks, social distancing and lockdowns seem to control the spread of the virus, and indirectly control the processes of development of viral variants which are more infectious and fatal.

In addition, an international understanding on vaccination is required. Accelerating the vaccination campaign throughout the world will be helpful in controlling the pandemic. If COVID is somewhere, it has the potential to be everywhere. Thus, vaccination of the entire population in the world is required.

In addition to vaccination, immediate attention should be focused on another aspect – public health. The success of public health measures depend entirely on data. Restricting viral spreads to limited geographies would be much easier if data related to the disease is provided to researchers, epidemiologists and statisticians.

Let us take an example. Data related to patients who have been hospitalised and those who have died – disaggregated on the basis of those who have or have not received a vaccine, the number of doses of vaccine received, comorbidities, age, gender, rural-urban and place of residence, collected on a real



time that immunity over the next six months.

### Rapid transmission

In a series of papers published in the *Journal of the American Medical Association* entitled; Temperature, Humidity, and Latitude Analysis to Estimate Potential Spread and Seasonality of Coronavirus Disease-2019, authors Mohammad M Sajadi and others have observed certain links to the peak of infection and the climatic variations.

They base their conclusions on insights gleaned from the experience with the COVID-19 pandemic so far. The impact of the weather on the progression of the pandemic was highlighted through a comparison of the experience of the southern and northern hemispheres of the earth. The authors point out that the COVID-19 situation in the southern hemisphere was different from that of the north. While the southern hemisphere was moving out of the winter at the peak of infections, the southern hemisphere was moving into winter.

They point out that in the case of novel viruses, the prevailing

climate has a crucial role to play because they have enough time to get established in the new environment. If there is a suitable climatic slot for the virus to flourish, there is a chance for a 'third or fourth wave', when the same season returns.

Another study entitled—Severe Acute Respiratory Syndrome (SARS): A Year in Review, published in *Annual Review of Medicine*, observed that SARS and MERS are reported to be more related to climatological factors than secondary circulation dynamics. This makes novel viruses much less predictable than established viruses with respect to their persistence and re-emergence in the following years or seasons. Sometimes they can be more virulent in their later outbreaks.

time basis and flashed on a dashboard – would be highly helpful in developing targeted vaccination drives, testing for affected populations, taking public health measures and creating awareness.

If it is found that hospitalisation of patients from nearby areas is increasing in one city, care could be taken closer by establishing makeshift COVID centres or care units. If vaccine hesitancy or casual attitudes towards social distancing measures are found, targeted awareness campaigns could be launched. In a country which has robust IT infrastructure, it is not difficult to create dashboards and easily accessible databases. If data can save lives, doctors and data scientists should work together.

While the Indian Council of Medical Research has granular data on all residents who've been tested so far, it restricts access to this database. 300 scientists have asked PM Modi to give access to the data for charting COVID-19 spread. Their petition says - "The ICMR database is inaccessible to anyone outside of the government and perhaps also to many within the government.. While new pandemics can have unpredictable features, our inability to adequately manage the spread of infections has, to a large extent, resulted from epidemiological data not being systematically collected and released in a timely manner to the scientific community."

State governments too should

heed the request for data on an urgent basis. Recording of real time data at the hospitals and vaccination centers and transferring it to a centralised database which is made publicly available would help researchers analyse it and derive useful inference about the spread of the disease, the effectiveness of vaccination and correlation of disease outcomes with comorbidities. Digitising patient data at the hospitals would not take much time with the help of technological tools like scanners and spreadsheets.

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### IN THE WAKE OF A NEW WAVE, DATA FROM THE EARLIER WAVES CAN BE EXTRAPOLATED FOR THE PURPOSE OF PREDICTION

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#### Declining hesitancy

Vaccine hesitancy is on the decline in the cities where the COVID second wave has happened. But it is still prevalent in smaller towns and villages. In the early stage of vaccination, even in major cities, vaccines were wasted because people did not show up in adequate numbers for vaccination. A data check on foot-falls at vaccination centers would

eliminate the wastage of vaccines, which is almost criminal in the present scenario. Only with vaccination will we be able to control the pandemic and stop the emergence of new viral variants. For a densely populated country like India, a third, fourth or fifth wave may occur. In the second wave, the virus has moved to small towns and villages and tracking is urgent and essential.

Numerous examples can be given where systemic data management and analytics can help make hospital supply chains robust and the prediction of demand for resources like equipment, medicines and beds possible. In the wake of a new wave, data from the earlier waves can be extrapolated for the purpose of prediction and that would help in controlling the pandemic better, if only the government responds to the call of providing the data. Of course, there is a possibility that the virus weakens itself during multiple mutations. In spite of the anguish, pain and agony that is prevalent all around, there is the hope of the virus dying its own death. Nevertheless, data collected during the current pandemic can go a long way in managing future ones. ■



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The CIDRAP Viewpoint Working Group on COVID-19 at the University of Minnesota have presented their conclusions in Part I of their report: "The Future of the COVID-19 Pandemic: Lessons Learned from Pandemic Influenza". This study observes that until a novel virus becomes endemic and recycles from its existing form to other mutated forms, its seasonal prevalence would be difficult to predict. At the same time, they confirm an extended period of persistence for the current SARS-CoV-2 pandemic.

Among the various climatic factors, humidity seems to occupy a prominent role, as it is related to the amount of water vapour held by the air. It must be noted that atmospheric pressure and temperature also can modulate the humidity of the air.

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### EPIDEMIOLOGISTS THEORISE THAT THE CURRENT RESURGENCE OF COVID-19 IN INDIA IS CAUSED TO A LARGE EXTENT BY A DOUBLE MUTANT SARS-COV-2 VARIANT

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A relatively small amount of water vapour is able to saturate cold air, whereas more water vapour is required to bring warm air to saturation. Moreover, the viability of pathogens in exhaled aerosol droplets is crucial as a potential driver of COVID-19 transmission, according to the paper published by Tellier, R. in the Journal of Royal Society Interface, 2009: (Aerosol transmission of influenza virus: A review of new studies). So, winter season is considered as the most ideal time for the third resurgence of COVID-19 in India.

#### Double and triple mutants

Epidemiologists theorise that the current resurgence of COVID-19 in India is caused to a large extent by the double mutant.