The Emergence of Omicron and Its Impact

SUTRA Consortium
Key SUTRA Parameters: Contact Rate $\beta$

- 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 SUTRA Parameters: Detection Factor $\epsilon$

- 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 SUTRA Parameters: Reach $\rho$

- 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
Post-Omicron Scenarios
Omicron in South Africa

Detected New Infections (7 day average)

26\textsuperscript{th} Jul – 22\textsuperscript{nd} Aug:
Unexpected tapering off

19\textsuperscript{th} Nov: Sharp rise
1. Why did trajectory level-off at > 50% of third-wave peak for one whole month in August?
2. When did the mutant become active in SA?
3. What impact did it have?
4. Does it bypass natural immunity?
SUTRA Simulation of South Africa

Detected New Infections (7 day average)

- $\beta = 0.45$ on 26th Jul
- $\beta = 1.01$ on 22nd Aug

Actual Data
Model Computed Data
Observations

• Contact rate $\beta$ went up by a factor of 2.2 in August
  • Only part of this rise can be explained by relaxations of restrictions
  • It is not clear what else contributed to the rise
• Numbers continued coming down despite $\beta \approx 1$ due to high immunity
  • Natural immunity in September was $\approx 77\%$
• Rise in November is due to increase in $\rho$
  • It was $\approx 85\%$ until October and is $\approx 110\%$ now
  • Reach at $100+x\%$ means at least $x\%$ of population has lost immunity
Delayed Increase in $\rho$

- $\rho$ started increasing in South Africa about 110 days after $\beta$ started increasing.

- This phenomenon was observed for delta variant too:
  - $\rho$ started increasing in India about 50 days after $\beta$ started increasing.
  - Gap was smaller since susceptible fraction in India was $\approx 0.45$ as opposed to $\approx 0.08$ in South Africa.
  - For different states in India, the gap varied between 40 to 110 days.
Implications for India
Current Status

\[ \beta \approx 0.60 \]

\[ \epsilon \approx 1/33 \]

\[ \rho \approx 0.95 \]

Natural immunity \( \approx 83\% \)
Assumptions: $\beta$

- Omicron increases $\beta$ by a factor of $2.2$ to:

\[ \beta \approx 1.33 \]

over the Dec-Jan period.

- There are no lockdowns or any other restrictions
Assumptions: $\rho$

- $\rho$ increases from current $\approx 0.95$ to $\rho = 1$ during Feb
Assumptions: $\epsilon$

- $\epsilon$ remains the same:

$$\epsilon = \frac{1}{33}$$
Assumptions: Immunity Loss

• Natural immunity is not bypassed.
  • And that natural immunity is lost at the rate of 6% per month
• Vaccinated people, on getting infected, spread infection for half the period of unvaccinated people

Optimistic Scenario: vaccine immunity remains at 60%

Intermediate Scenario: vaccine immunity is halved to 30%

Pessimistic Scenario: vaccine immunity is completely lost

Pessimistic + NIE Scenario: vaccine immunity is completely lost, and natural immunity is lost at 15% per month
Future Projections

India: Daily New Infections

- Model Computed upto Nov
- Actual
- Omicron Pessimistic Scenario
- Omicron Intermediate Scenario
- Omicron Optimistic Scenario
- Pessimistic + NIE Scenario
Updates from South Africa

- Mix of Delta and Omicron has changed dramatically in SA:
  - October: 596/706 (84.4%) Delta, zero Omicron
  - November: 493/630 (78%) Omicron; Delta 21 and 21A: 113/630
  - Up to 10th December: 61/61 (100%) Omicron
- Cases rising sharply and already higher than previous peak
- Hospitalizations: 5-fold increase in two weeks
- Severity of disease is still unfolding
Recommendations

- Omicron has likely already spread worldwide; so no point in blanket ban on incoming air traffic.
- Screening of incoming air passengers to be 100%; positive test outcomes to be sequenced for Omicron.
- Avoid knee-jerk reactions for Indian public, e.g., shutting down schools, imposing lockdowns etc.
  - They are not needed at the current state of the pandemic, even after the advent of Omicron.