Towards a Covid-Free World

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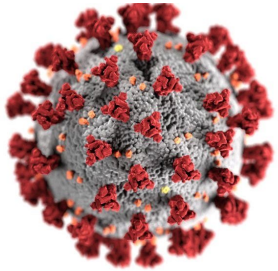
Covid19 is ravaging all corners of the world

To name a few…

Disrupted global mobility

Overwhelming health systems and high hospitalization rates

Unemployment and contracting economies



Variants

Unvaccinated groups and vaccination disparity

How can we contain Covid?

1 Learn from ample existing experience

- There is abundant data collected in the last 20 months showing how covid has spread in different countries & cities
- Countries have applied multitude of strategies to mitigate the impact of corona virus (lockdowns, travel restrictions, masks and hygiene mandates)
- Some countries have started reaching high vaccination rates

2 Charter a path for a covid free world

- What factors predict the reproduction of covid across different communities?
- How can we apply mitigating levers to contain the impact of Covid?

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Methodology

1 SIR model to calculate reproduction rate

Using a compartmental model base on Susceptible, Infected, Recovered (SIR)

$$N = S(t) + I(t) + R(t)$$

S(t), I(t) and R(t) are Susceptible, Infected, Recovered cases at time t, and N is total population

Reproduction rate is the expected rate at which an infected person infect per day

D: number of days an infected person has and can spread the disease

γ: the proportion of infected recovering per day (γ = 1/D)

R_0: the total number of people an infected person infects ($R_0 = \beta / \gamma$)

Reproduction rate is calculated for different periods by fitting the actual to SIR curve

Used ordinary differential equations (ODEs) to solve for this equation

2 Predictive Model to forecast reproduction rate

Reproduction rate is calculated for 30-day periods

Dependent variable:

- Reproduction rate

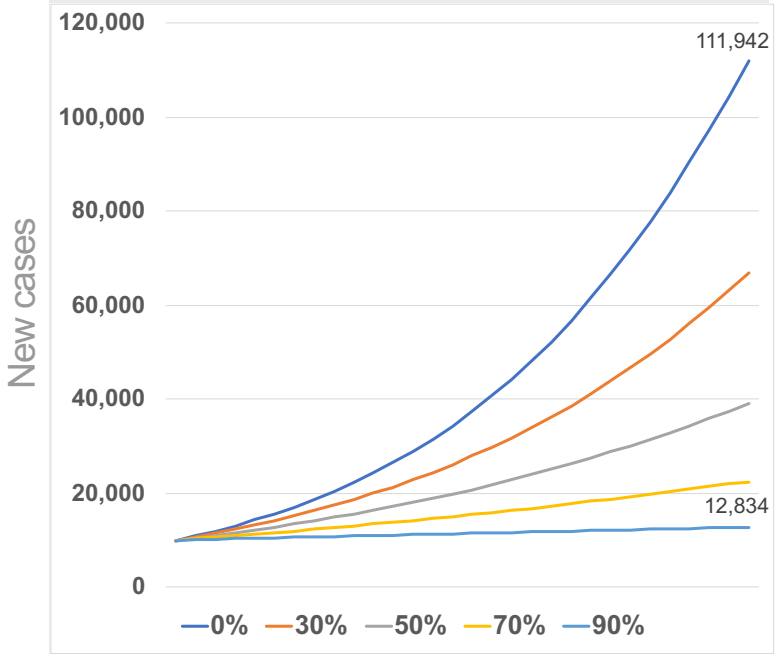
Independent Variables:

- Vaccination rate
- Variant (Alpha, Beta, Delta)
- Restrictions (soft, moderate or hard)

What Happens if …

City of 5 million population with 10,000 daily cases; how does daily new cases change in the next 30 days given various scenarios

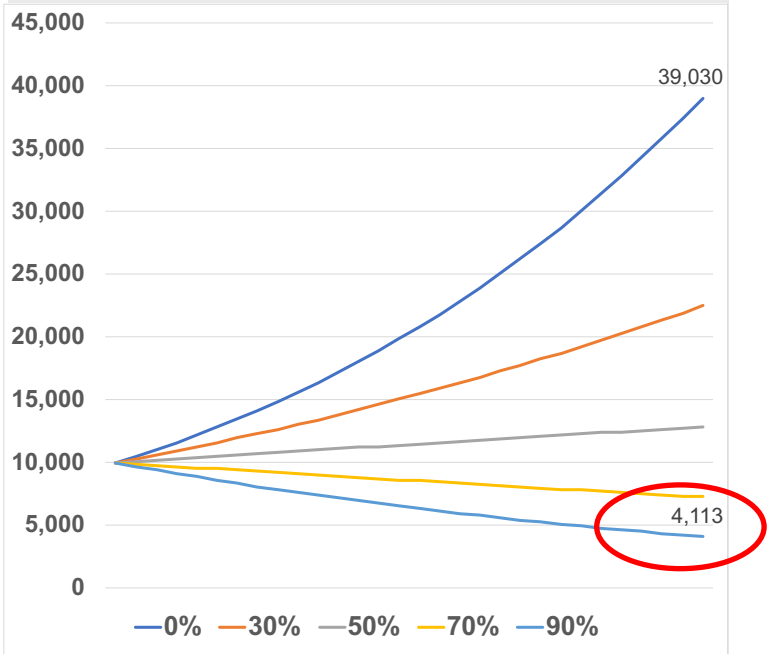
No restrictions (open borders, moderate hygiene, all businesses open)



Vaccination rate

No increase in new cases

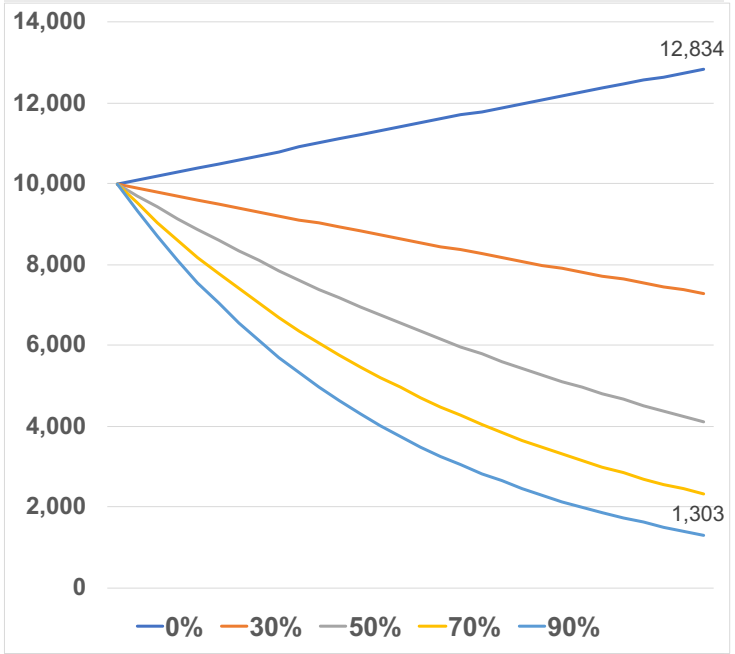
Moderate restrictions (Remote work, limit some business activity, self quarantine advice)



Vaccination rate

59% decline in 30 days @90% vax rate

Hard restrictions (lockdown, essential face-to-face business, enforced quarantine)



Vaccination rate

87% decline in 30 days @90% vax rate

All scenarios assume delta variant will be the dominant variant

Insights & Recommendations

Insights

- No restriction policy with 90% vax rate fails to contain the number of daily new cases when delta is the dominant variant
- Increase in cases and sustained levels of infection in the population can lead to further outbreaks and risk of resistant variants
- 90% vax rate with moderate restriction policy can decrease cases by almost 60% in 30 days (ideal scenario given no strict restriction is required and case numbers can be contained in a short period of time)

Recommendations

- Global marshal plan to vaccinate at least 90% of world population in a short period of time – opportunity for global cooperation, need for affluent countries to subsidize and support vax programs around the world as open travel is dependent on all countries containing Covid spread in their own community
- Countries who have reached high vax rate should still require soft restrictions (self quarantine, mask mandates) to lower their existing community reproduction rate to a level where they can lower cases at a high pace
- Given these measure will lower cases in a few months, countries can start introducing Covid-free bubbles