Chamber of Thrift Banks Vaccine Rollout Modeling

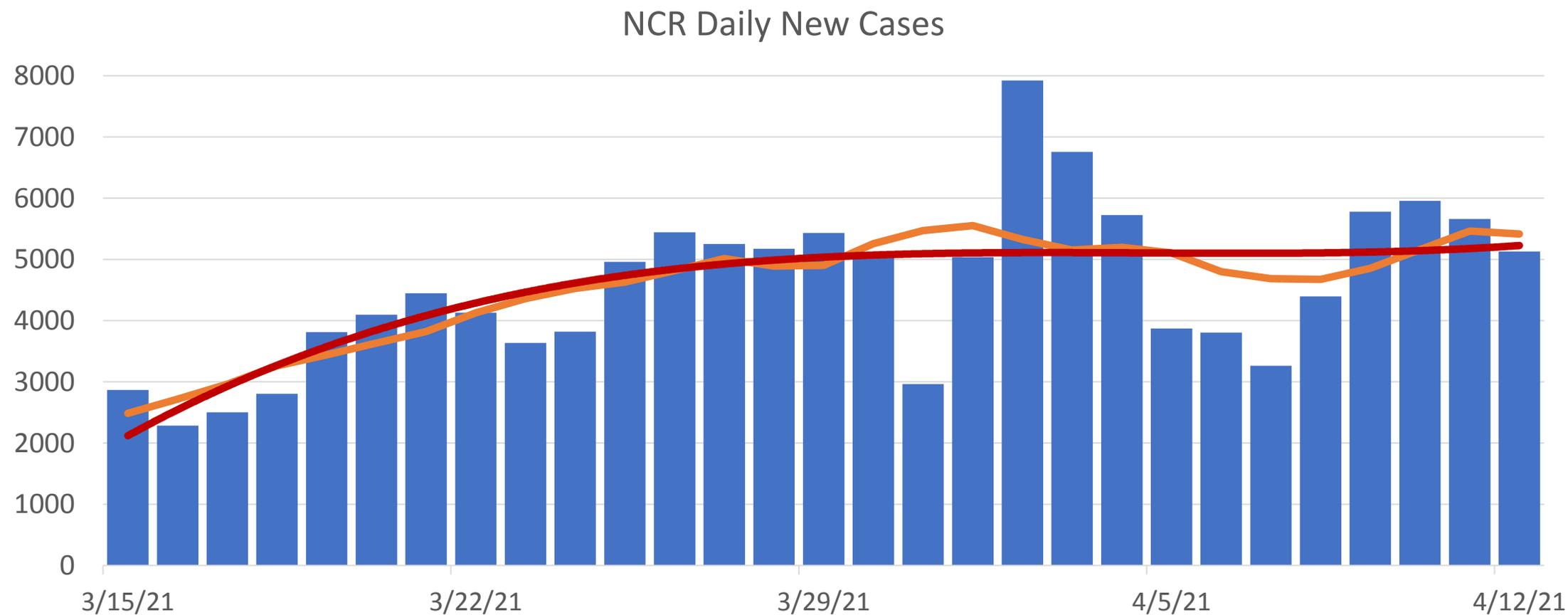By: Guido David
Institute of Mathematics
University of the Philippines
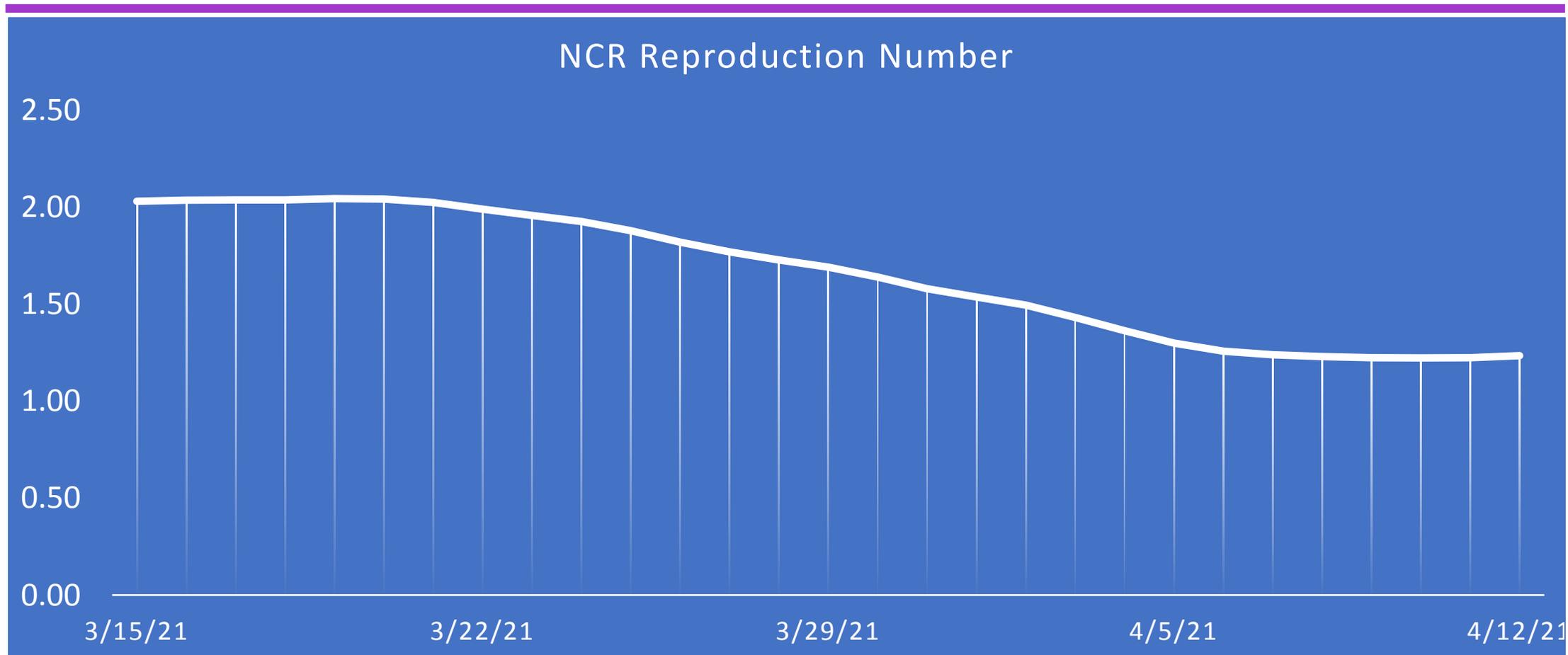Fellow, OCTA Research

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What we do

- Since April 8, 2020, we have been engaged in data analytics, trend analysis and projections for Covid-19, supported by policy recommendations, as public service in the form of weekly reports

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Trends in NCR: Daily New Cases
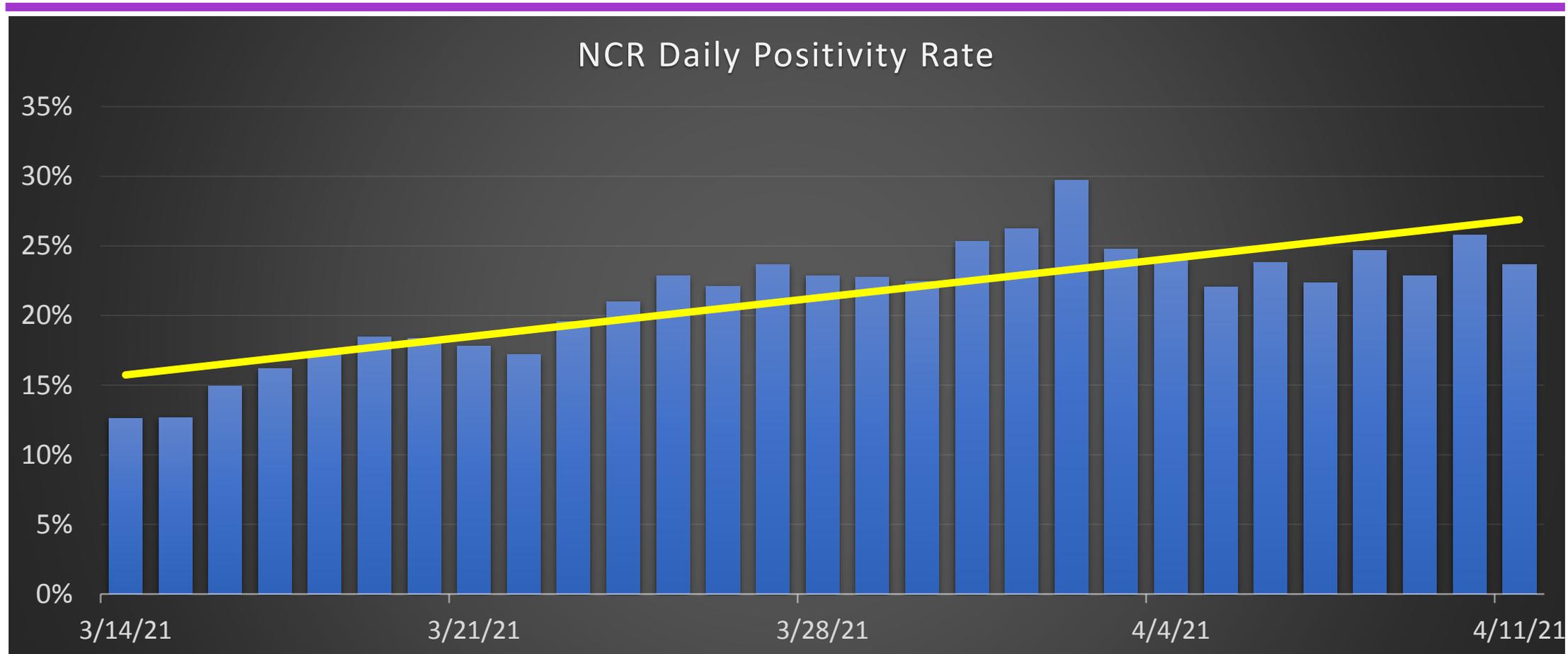
NCR Daily New Cases

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NCR Reproduction Number

NCR Reproduction Number

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NCR Daily Testing

NCR Daily Testing

19 January 2026

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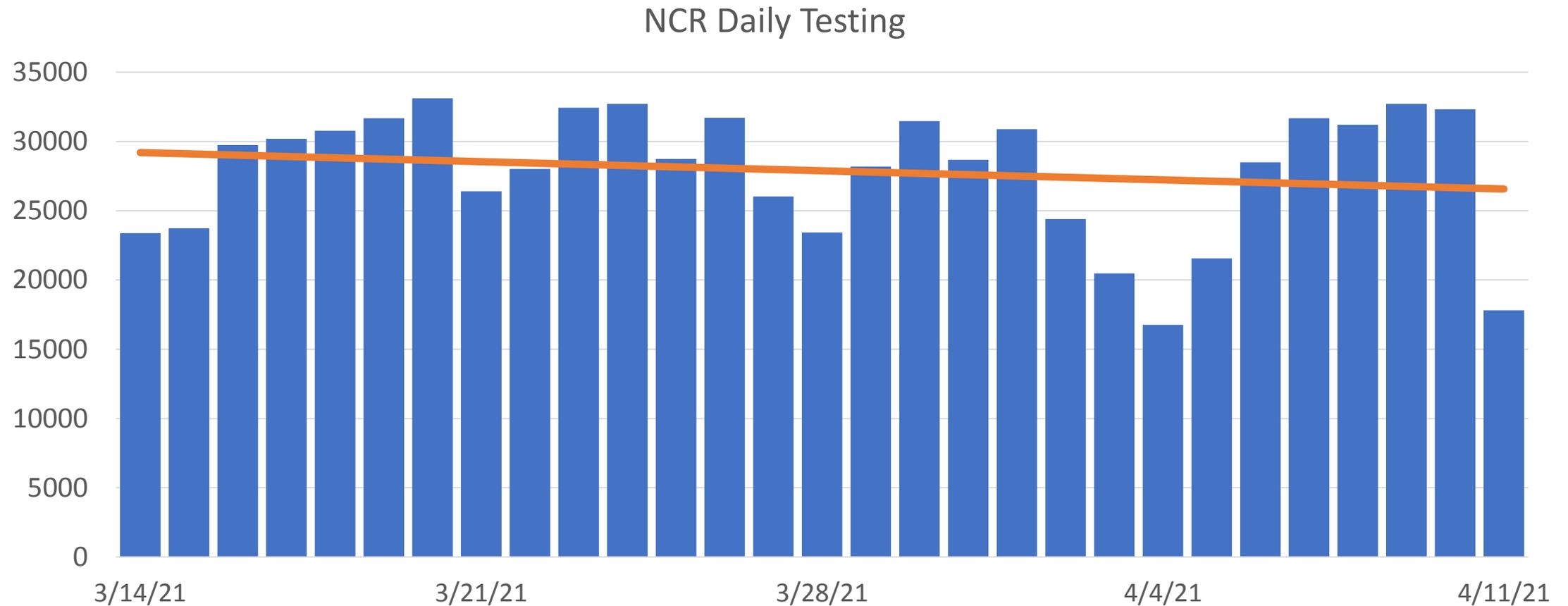
NCR Daily Positivity Rate

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NCR 1-Week Growth Rate by Age

NCR 1-Week Growth Rate (as of Apr 4) by Age Group

0 to 17	18 to 55	55 to 59	60 to 64	65 up	Average
28%	19%	23%	20%	35%	21%

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NCR Case Fatality Rate

NCR Case Fatality Rate as of April 10

0 to 17	18 to 55	55 to 59	60 to 64	65 up	Average
0.36%	0.66%	3.54%	6.34%	12.82%	2.02%

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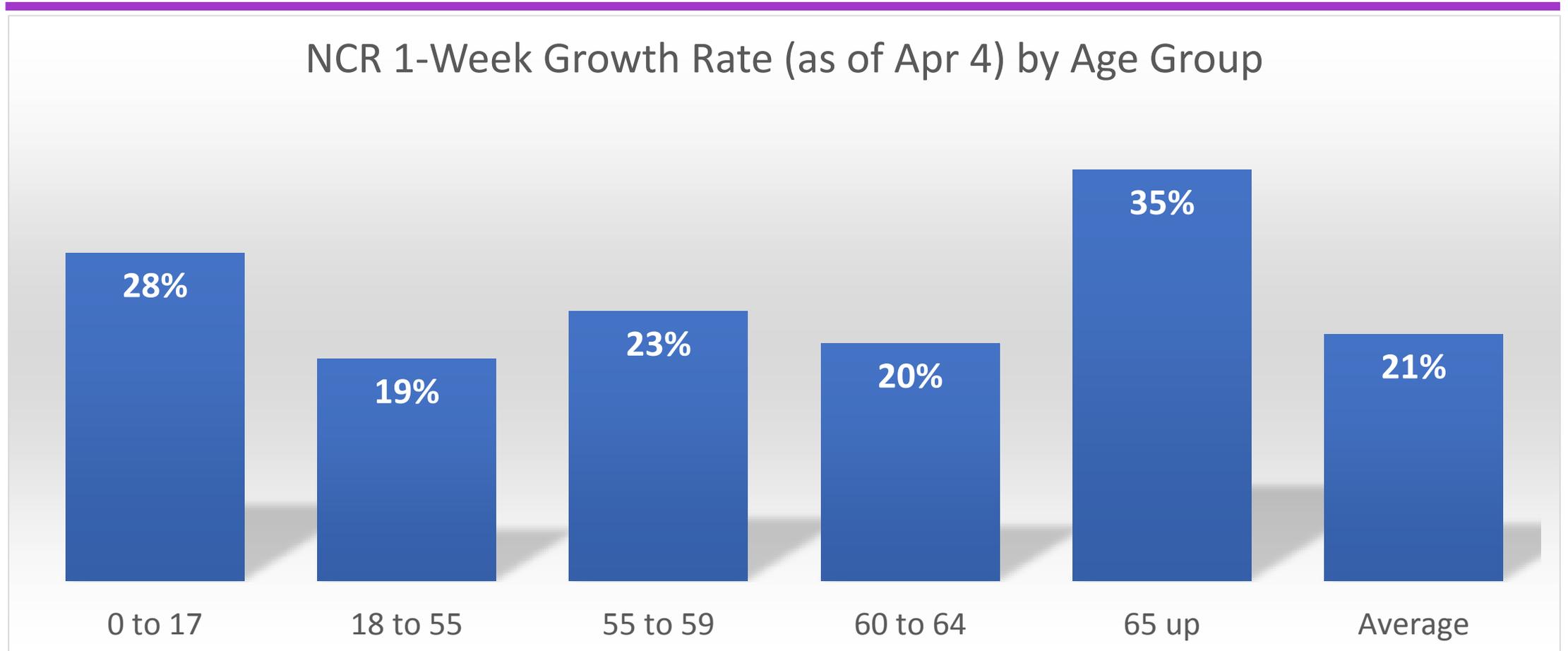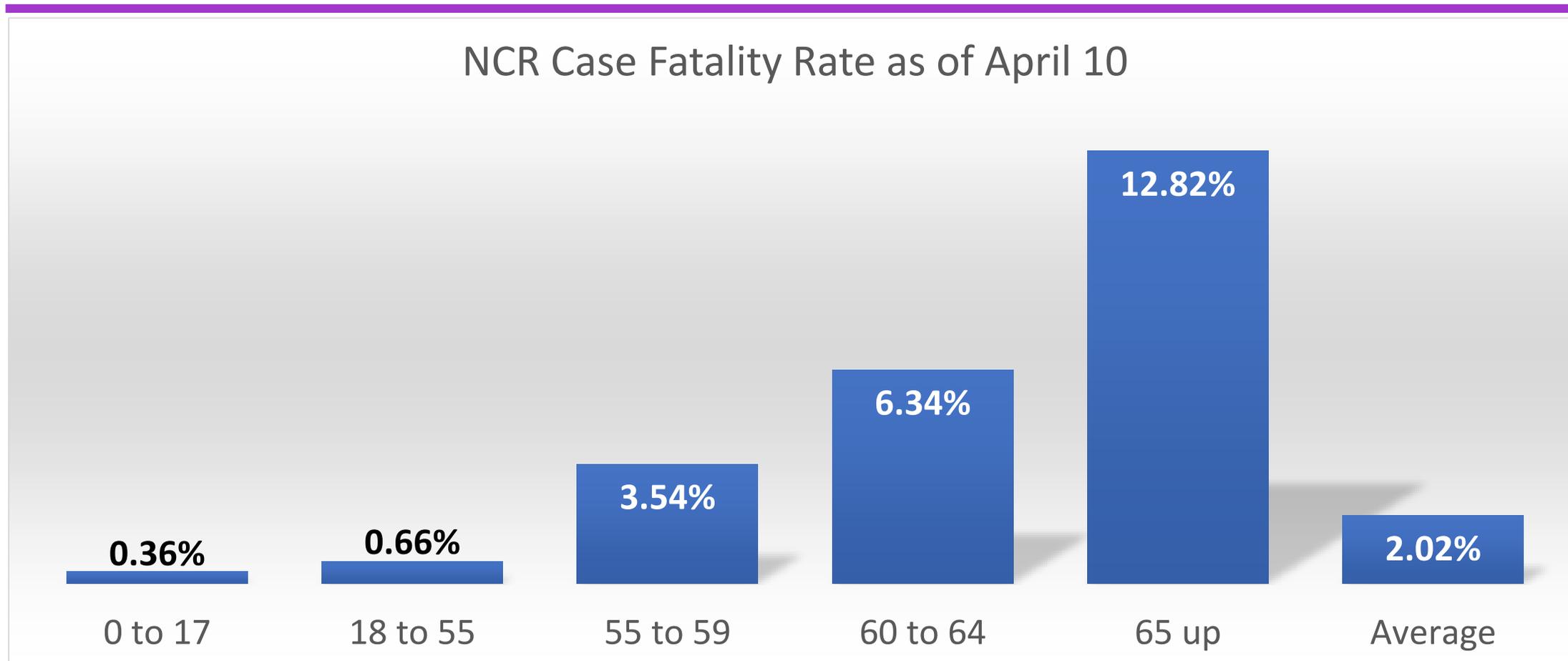
Herd Immunity Threshold

$$HIT = 1 - \frac{1}{R_{eff}}$$

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Basic Reproduction Number (SIR)

Parameters:

β – transmission rate

γ – recovery rate

$$R_o = \frac{\beta}{\gamma}$$

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Reproduction Number (SIR)

The observed reproduction number R is the observed R_t given interventions and health protocols, e.g.

- Wearing face masks
- Wearing face shields
- Social distancing
- Avoiding crowded places
- Mobility restrictions
- Certain establishments not allowed to operate
- Reduced capacity in establishments (offices, malls, churches)

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Herd Immunity in the Philippines

- $HIT = 1 - 1/R$

- With the D614G variant, the basic reproduction number is from R = 2.5 to 3.0. Thus HIT = 60 to 70%

- With the UK and SA variants, R = 4.0. Thus HIT = 75%

- Given vaccine efficacy of 80%, then HIT = 75%/0.8 = 93.75%

- With many other uncertainties such as possibilities of reinfection, new variants, etc. even these figures will still need to be subject to reevaluation and further scrutiny

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Herd Immunity in the Philippines

- The 0 to 15 age group comprises about 28% of the population in the NCR

- This means that at best we can only vaccinate 72% of the NCR population until minors become eligible for vaccines

- This does not even factor in vaccine hesitancy and people who may not be eligible for vaccination due to certain risks

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Herd Immunity in the Philippines

- Given limited vaccines and the uncertainty of herd immunity, the goal then is to vaccinate a sufficient fraction of the population while retaining ample restrictions so that we may accelerate the full reopening of the economy

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Herd Immunity in the Philippines

- Example: suppose we can only vaccinate 50% of the population in the NCR. What can 50% vaccination give us?

- Using the formula for HIT, this corresponds to an observed reproduction number of R = 2

- If no variants present, we get herd immunity (with face masks)

- If variants are present, we can prevent outbreaks if people wore face masks and we have sufficient health restrictions and some mobility restrictions

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Vaccinating Strategy for the Philippines

- The NCR, being the trade and economic center of the country, the most populated and most densely populated region, the airport and seaport hub and geographic center of Luzon, is the region with the highest risk of an outbreak.

- Protecting the NCR is important. Preventing an outbreak in the NCR helps prevent outbreaks in other regions

- Priority should also be given to Calabarzon, Central Luzon, Cebu City, Davao City, CAR, Cagayan Valley

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Province/Region	Population (2020)	Fraction of Pop	Vaccines
NCR	**13,804,656**	**75%**	**10,353,492**
Ilocos	5,026,128	20%	1,005,226
CAR	1,722,006	30%	516,602
Cagayan Valley	3,657,741	30%	1,097,322
Central Luzon	12,313,718	35%	4,309,801
CALABARZON	16,057,299	50%	8,028,650
MIMAROPA	3,174,859	15%	476,229
Bicol	6,133,836	15%	920,075
Western Visayas	7,904,899	15%	1,185,735
Central Visayas	7,957,046	30%	2,387,114
Eastern Visayas	4,742,337	15%	711,351
Zamboanga	3,782,761	15%	567,414
Northern Mindanao	5,017,051	15%	752,558
Davao	5,290,869	30%	1,587,261
Soccsksargen	4,919,936	15%	737,990
CARAGA	2,753,109	15%	412,966
BARMM	4,183,316	15%	627,497
PHILIPPINES	**108,441,567**	**33%**	**35,677,283**

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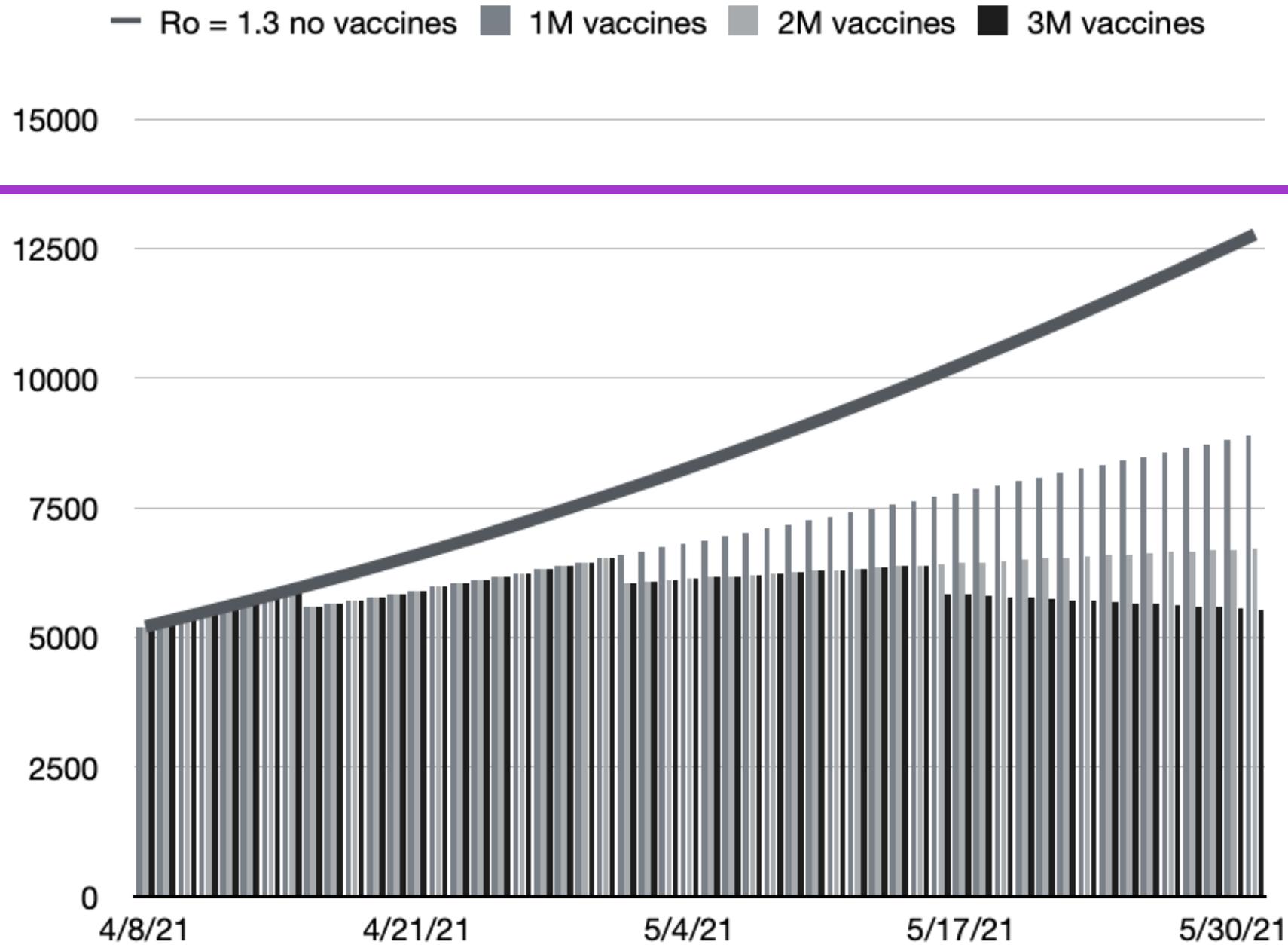
Remarks

- Vaccinating 1 Million people in the NCR (13.805M pop) has the effect of reducing the effective reproduction number R by about 0.1 (from 1.3 to 1.2)

- Vaccinating 2 Million people in the NCR has the effect of reducing the effective reproduction number R by 0.2 (to 1.1)

- Vaccinating 3 Million people in the NCR has the effect of reducing the effective reproduction number R by 0.3 (to 1.0)

- Note: if vaccine efficacy is 80%, then vaccinating 1.25M people is equivalent to 1M protected (see bullet 1 above)

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Recommendations

1. Herd immunity, if attainable, will require vaccinating at least 75% of the population.

2. With limited vaccine supplies, accelerated economic recovery will be achieved by vaccinating a lower fraction of the population in low risk areas while priority is given to NCR, Calabarzon, Central Luzon, Cebu City, Davao City, etc.

3. An initial outlay of vaccinating 33% of the Philippine population is presented for accelerated economic recovery

4. An immediate rollout of the vaccine in the NCR and parts of NCR Plus will help decrease the reproduction number

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Thank you

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