Exponential Growth and Mitigating Strategies in Responding to COVID-19 Pandemic[1]

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> *"with exponential, when you feel you should do something to stop it, it's probably too late... that's the surprise factor of exponential"* (@tsetiady)

Literacy and technical-analytic comprehension in addressing pandemic are highly necessary to make an accurate decision in responding to the COVID-19. I assume that, besides political factors, the lack of exponential growth literacy also contributes to pandemic treatment slowness.

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[1] This article is first published in English, see Aswicahyono, H., 2020. Pertumbuhan Eksponensial dan Mitigasi COVID-19: Hindari Framing Dikotomis. *CSIS Commentaries*, [online] DMRU-003-ID. Available at: <https://csis.or.id/publications/tepatkah-lockdown-dalam-menghadapi-covid-19>

The exponential growth has certain characteristics. It might look flat initially, but then, it will grow dramatically. Furthermore, the question about when the curve will culminate or flatten is determined by the speed and the effectivity of executed responses. Consequently, the policymakers and society will tend to be complacent and underestimate the initial spreading of the pandemic, before they realize that the number of cases start to rapidly increase.

The velocity of the response is also important as the graph below shows. According to the model, a day difference in deciding to implement social distancing will result in seriously damaging effect, approximately 40%.

Table 1. Model of cumulative cases of coronavirus with social distancing measures taken one day apart


Sumber: https://medium.com/@tomaspueyo/coronavirus-act-today-or-people-will-die-f4d3d9cd99ca
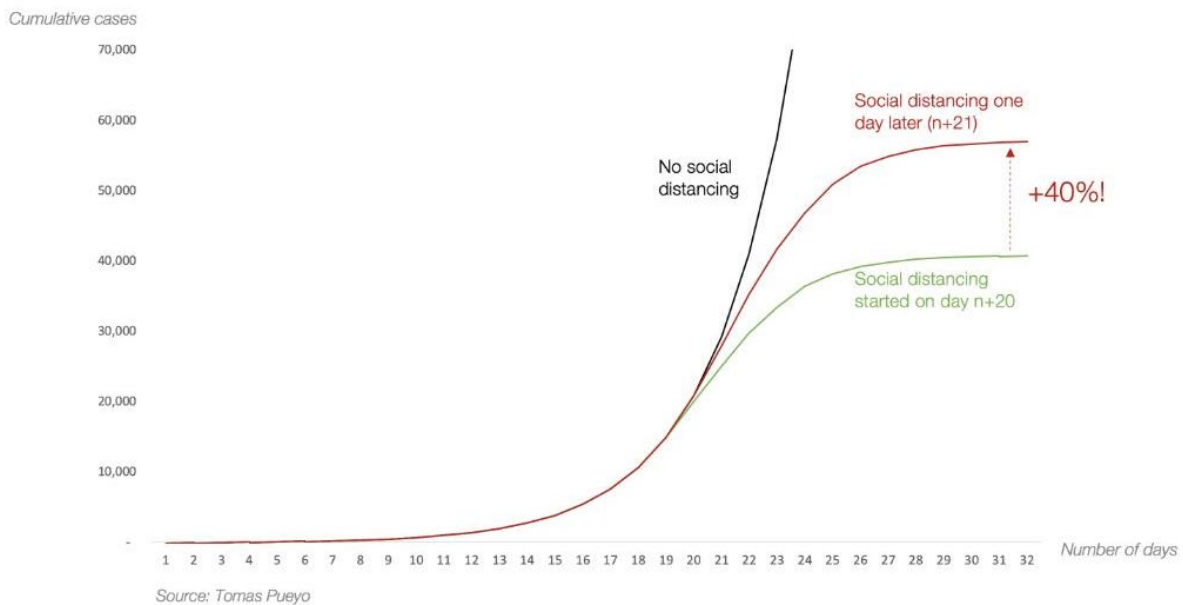
The COVID-19 trend in Indonesia

According to the limited data (15 days observation), the growth of COVID-19 in Indonesia is following the exponential pattern, and potentially will keep growing exponentially like Italy's and Iran's patterns.

Table 2. No of total cases (log) in days since 1st reported cases
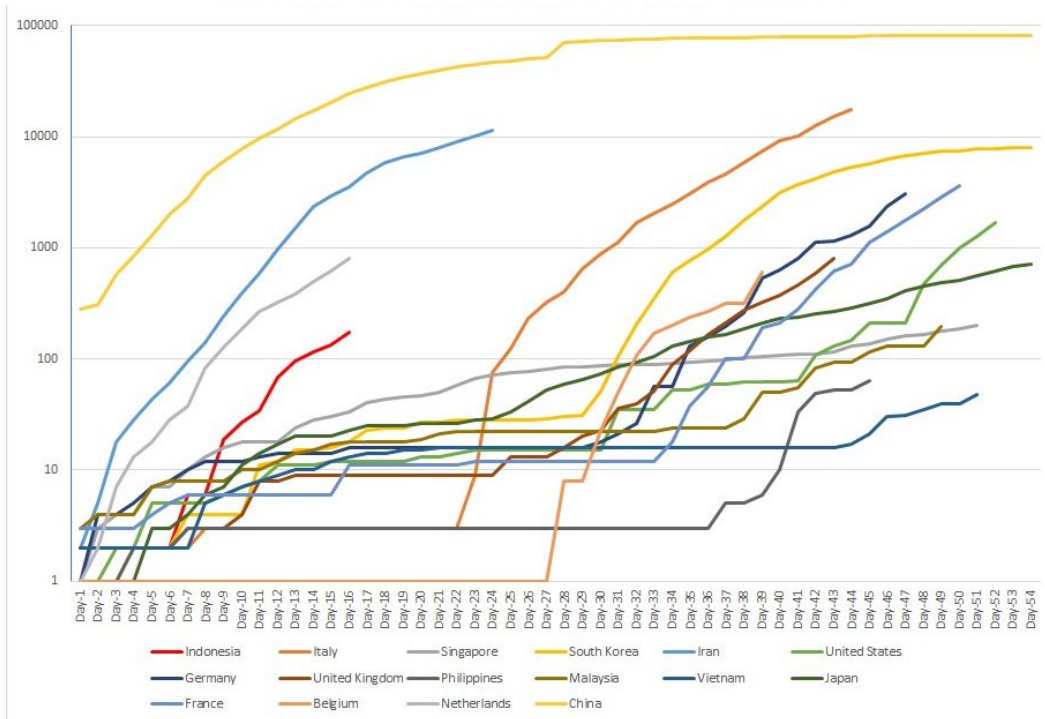
Looking at the similarity of Iran's and Indonesia's pattern, I attempt to conduct regression to estimate the slopes of both countries' curves.

Tabel 3. Regression pattern, similarity between Indonesia and Iran

Kemiripan Indonesia dan Iran

$y = 0,2171x + 0,4098...$

$y = 0,2176x - 0,8438...$
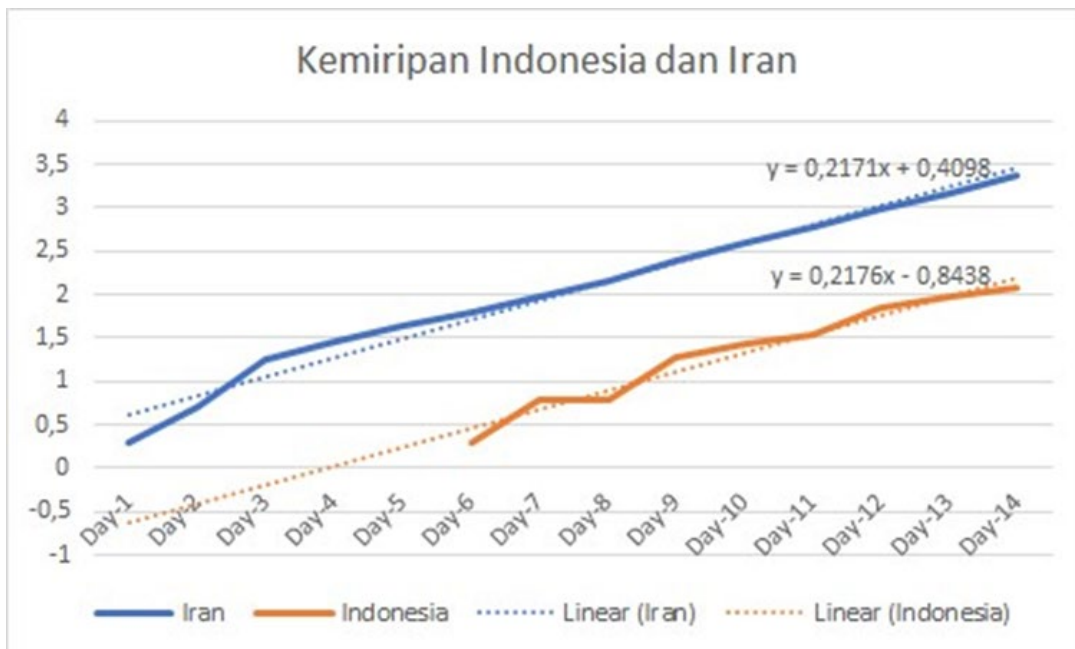
The curve's slope, represented by the parameter α which shows the incremental case speed (reported cases) is:

For Iran: α = 0.2171

For Indonesia: α = 0.2176

What do these numbers mean?

In average, the number of reported cases in Iran and Indonesia grows 21,7% per day. This calculation, moreover, also estimates that the cases grow by 21,7%, which means the cases will double every two to three days.

Let's take into account another argument that grows among the public, that "the number of the infected ones is higher than in what is reported."

This may be true. However, in the case of exponential growth, it would not significantly affect the calculation of trend/growth. For illustration: Let say that in every single detected case, a thousand undetected case would present. Thus:

Day-1 if 2 cases are detected, then the undetected infected cases will be 2000

Day-2 if 3 cases are detected, then the undetected infected cases will be 3000

Then, the undetected growth = (3-2)/2*100=50%

The infected cases = (3000-2000)/2000*100=50%

In other words, there is no difference in the percentage, unless the assumed factor 1000 is also changing. For Indonesia and Iran, I assume that the multiplying factor will not be different that much. Unlike in China, South Korea, and others that can mobilize the test kits production quickly.

Ideally, knowing the exact number of cases is important. Prepare hospitals and the facilities will need this data. However, this is can be done by two stages. First, keep estimating the growth according to the reported cases; and second, estimating the multiplying factors along with avoiding the estimation bias, meaning that to increase the number of tests by distributing the test facilities evenly.

The Economy and COVID-19: Framing that Should Be Avoided

The existing debates about the handling of Covid-19 are generally polarized into two extremes. Whether to sacrifice people's lives or the economy; and whether to allow spreading with the hope to create herd immunity (in other words for Darwinism?) like in the United Kingdom or to enact draconian policy like in China. Thus far, experiences of countries applying more targeted policies between the two extremes, such as South Korea, Singapore, and Taiwan, show a considerable success in controlling the impacts of corona virus.

On economic impacts and policy formulation during pandemic, Professor Mankiw suggested that "A recession is likely and perhaps optimal (not in the sense of desirable but in the sense of the best we can do under the circumstances)."

Specifically, for Indonesia, another factor must be added, which is the likelihood of a systemic crisis like in 1998. One of the rarely discussed phenomena is the probability of a financial crisis generated by non-

performing loans from companies. This type of systemic crisis would affect all stakeholders and eventually aggravate the efforts in controlling the virus.

A year ago, McKinsey published a report (https://tinyurl.com/mckinsey-finstress) stating that most Asian companies are having enormous financial burdens to pay interests and their monthly debt repayments. This includes Indonesia, especially the predominantly state-owned utilities sector. In relation to this, we must ask how the effect of Covid-19 would be, if so many Indonesian companies are really experiencing default in servicing their debts? Would this provoke a financial crisis? A thorough analysis is imperative to make comprehensive conclusions.

The second suggestion is that "Mitigating the health crisis is the first priority." However, this should not mean total neglect of the economy. In a condition where supplies are scarce, which will be highly likely, an evidence-based cost-and-benefit estimation for different scenarios is crucial.

On available options, recent analysis from Imperial College Covid-19 Response Team regarding the effectiveness of several mitigation and suppression policies is quite appealing (https://tinyurl.com/imperial-college-NPI). The analysis divides types of government intervention into five categories as shown in table below. Starting from voluntary home quarantine until social distancing of entire population.

### Table 3: Summary of NPI Interventions Considered

Label	Policy	Description
CI	Case isolation in the home	Symptomatic cases stay at home for 7 days, reducing non-household contacts by 75% for this period. Household contacts remain unchanged. Assume 70% of household comply with the policy.
HQ	Voluntary home quarantine	Following identification of a symptomatic case in the household, all household members remain at home for 14 days. Household contact rates double during this quarantine period, contacts in the community reduce by 75%. Assume 50% of household comply with the policy.
SDO	Social distancing of those over 70 years of age	Reduce contacts by 50% in workplaces, increase household contacts by 25% and reduce other contacts by 75%. Assume 75% compliance with policy.
SD	Social distancing of entire population	All households reduce contact outside household, school or workplace by 75%. School contact rates unchanged, workplace contact rates reduced by 25%. Household contact rates assumed to increase by 25%.
PC	Closure of schools and universities	Closure of all schools, 25% of universities remain open. Household contact rates for student families increase by 50% during closure. Contacts in the community increase by 25% during closure.

Source: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand https://tinyurl.com/imperial-college-NPI

For the UK and the US, simulation result shows that mitigative policy per se is not adequate, due to the immense pressure arising from limited hospital capacity. This is a critic on UK's initial minimal intervention policy, which had aimed at creating herd immunity.

A suppressive policy is also necessary. A combination of tight quarantine to those having a positive Covid-19 test result, home quarantine, and social distancing mainly to elderly, is the most effective way to suppress the spread of the virus. There are lot of counter-intuitive findings. For example, the temporary closing of schools and universities are found to be ineffective, due to a trade-off between the possibility of getting the virus at school which is tinier than having it inside one's home. This is also the case in public gathering event: "Stopping mass gatherings is predicted to have relatively little impact (results not shown) because the contact-time at such events is relatively small compared to the time spent at home, in schools or workplaces and in other community locations such as bars and restaurants."

Tabel 4: Critical beds occupied per 100.000 of population
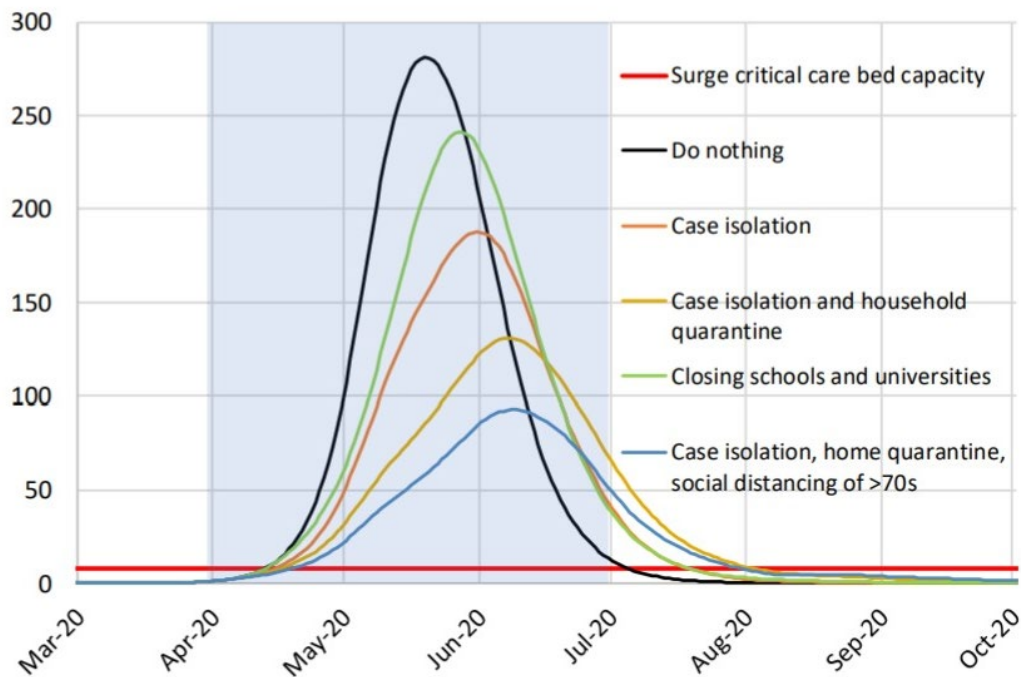
Source: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand https://tinyurl.com/imperial-college-NPI

Of course, differences in socio-cultural as well as economic condition could result in different conclusions. Nevertheless, data-supported rational studies like these should be augmented, so that we are not going to be trapped in unproductive framings.