POLICY BRIEF

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COVID-19 Modelling: Points to Consider in Removing the ECQ

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The Enhanced Community Quarantine (ECQ) is several weeks old, and yet no one knows when it will end. In the meantime, the damage to our economy and society, in general, has been considerable. Even as the infections continue to surge, many people in government fear that the economic losses caused by ECQ may be larger than the disease itself, and propose the end (or at least a phased lifting) of the ECQ, as scheduled by law on April 15.

The aim of this policy brief is to explain the factors that contribute to these increases in the incidence of confirmed cases and in the process to consider the risks involved in ending the ECQ. The Philippine population is quite large, making it possible to have thousands and even millions of infections. Hence, we may just be seeing the tip of a huge iceberg, and the current lockdown seems necessary in the absence of a vaccine.

Three main actors comprise an epidemic environment: the Susceptible (S), the Infectives (I) and the Removed (R). The susceptible group is a subset of the population that can be infected, while the infectives are those who had caught the disease also from other infectives. The last group pertains to those who have experienced the disease and have either recovered or died. The presumption is that once infected by any virus, as in COVID-19, one is able to produce immunity and thus no longer belongs to the susceptible group. The sum of these three groups comprises the total susceptible population which is presumed to be constant.

Based on the well-established SIR epidemiological theory, the cases of infections increase because of two main factors (Kermack and McKendrick, 1927). First, the infection is transmitted from the infected to the larger group of susceptibles. The exponential rise in infections results from the fact each infected person transfers the disease to a susceptible. Second, the infection cases can only be reduced if those in this group recover or die from the illness. Since death is unacceptable though maybe more probable for people with pre-existing conditions, reducing these cases will involve either limiting the transmission or increasing the recovery rates. Dividing the transmission rate with the recovery rate gives us the contact ratio which shows the number of infections produced by an infected person during the days of infection. A contact ratio greater than 1 accounts for the observed surge in the infection cases.

The measurement of the contact ratio is difficult since the available data may be affected by the degree of testing that the government conducts and the efficiency of the hospitals to heal the infected patients. Previously, unlike other countries, our transmission rate here is observed to be low because of the shortage of testing kits. However, over the last several days with greater availability of testing kits, a better picture of the transmission rate of the Philippines is coming out, albeit one higher than those observed in other countries. Also, in the case of the recovery rate, a similar peculiarity may prevail as the quality of the country's health care system remains distressed.

Based on WHO (2020) reports, the median time from onset of symptoms to clinical recovery for mild cases is approximately 2 weeks or fourteen days, indicating a recovery rate of 0.07. It notes that based on international experience, the contact ratio is roughly 2 to 2.5 persons per infected person. Taking the product of the higher number to the recovery rate, the transmission rate is about 0.175.

Data from the Department of Health (DOH) manifest that the transmission rate may be higher in the Philippines. In the daily account of the confirmed cases and number of deaths and recoveries, the average increase after several days of intense testing was 20 percent per day. Using the formula for estimating the declines in the susceptible in the SIR model, this indicates a transmission rate of 0.20. Furthermore, interviews with Health Secretary Francisco Duque suggests that the recovery of infected persons takes 2 to 3 weeks or roughly 20 days (World Asia Gulf News Report, 2020). This means that the recovery rate is about 0.05. In effect, the contact ratio in the Philippines is about 4.09 persons per infected person. Since this ratio is higher than the WHO international figures, the institutions that implement health policies and programs before and after the lockdown seem to have performed below international standards.

Using the SIR model in estimating the change of infections, Figure 1 shows the proportion for each compartment. According to the model, the peak number of infections depends on the total number of susceptibles. Since there is no consensus as to who is susceptible to the disease, the proportion of susceptibles likely to be affected is more important. Based on these rough estimates, this will be about 60 percent of the susceptibles, pointing to a very substantial risk. Moreover, the infection rate is estimated to peak about 2 and a half

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months after March 31, roughly by the middle of June. It is likely that this figure may be biased by the previously limited supply of test kits. Hence, it is possible that peak may be coming earlier by at least two weeks, the established period between the time of contact and actual infection. Hence, the peak of infections can happen between the end of May or early June.

Figure 1. Covid-19 Time Path in the Philippines
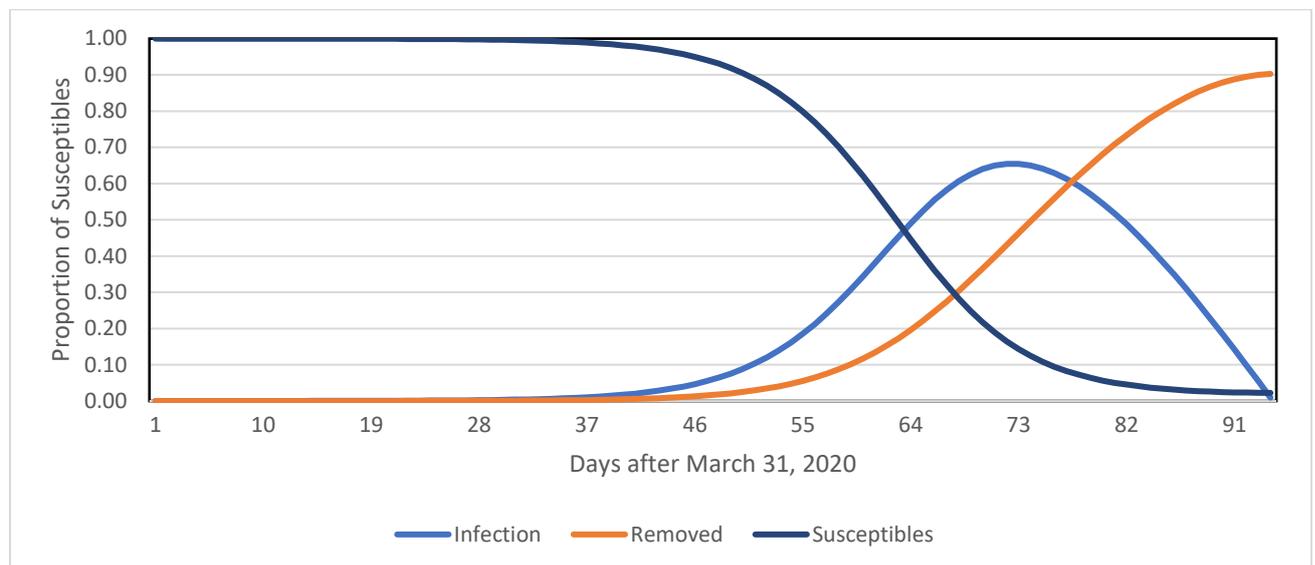
Source: Author's calculations

Three points are thus important in considering the possible ending of the ECQ. First, ending the ECQ on April 15 will be very risky since the surge has not occurred yet. Without the lockdown, the number of susceptibles will increase, thereby endangering the lives of many people. Through the ECQ, we may not be able to reduce the proportion of susceptibles that will be infected, but we can reduce the total number of infections.   Second, if we allow for a milder version of the ECQ, then the testing, the contact tracing and the quarantine of confirmed cases will have to be intensified in order to reduce the rate of transmission. Third, it is crucial as we contemplate a premature lifting of the ECQ for the hospitals to given enough facilities and equipment to enhance the rate of recovery. It is particularly alarming that the number of deaths exceeds the number of recovered patients.

Even with their conservative estimates of the contact ratio, the WHO recommends that we extend the quarantine period. As economists, we understand the significant cost to the economy that the ECQ creates, but really have very limited expertise about the epidemiologic implications of lifting the ECQ. Nevertheless, as the data indicate, unless our institutions can ensure an intensified program that reduces transmission rate and increases the recovery, a lockdown for at least two more months remains as our only defense against this deadly virus.

References
Kermack, W.O., and A.G. McKendrick. 1927. "A Contribution to the Mathematical Theory of Epidemics." *Proceedings of the Royal Society of London. Series A, Containing Papers of a Mathematical and Physical Character, Vol. 115, No. 772* 700-721.

World Asia Gulf News Web Report. 2020. *Philippines: 5 COVID-19 patients have recovered, says health chief.* March 15. Accessed April 2, 2020. https://gulfnews.com/world/asia/philippines/philippines-5-covid-19-patients-have-recovered-says-health-chief-1.1584258655992.

World Health Organization. 2020. *Coronavirus disease 2019 (COVID-19)-Situation Report 46.* March 6. Accessed April 2, 2020. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200306-sitrep-46-covid-19.pdf?sfvrsn=96b04adf_2.