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COVID-19 incidence and the timing of quarantine measures and travel restrictions: A cross-country analysis

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**COVID-19 incidence and the timing of quarantine measures
and travel restrictions: A cross-country analysis**

by

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**COVID-19 incidence and the timing of quarantine measures and travel restrictions:
A cross-country analysis ¹**

Marjorie C. Pajaron

June 22, 2020

Abstract

Recent data on COVID-19 would suggest that no country is inured to the adverse effects of this disease. Although experts somehow agree on the virulence of the COVID-19 virus (SARS-CoV-2), it is puzzling why some countries have experienced the full brunt of the virus while others appear to have been totally spared. This paper examines one possible reason for the seemingly capricious nature of this virus. We compare the timing of the government response (travel restrictions and social distancing measures) of the ten ASEAN member countries and the incidence of COVID-19. Our preliminary results suggest that countries that responded relatively late (Indonesia, Philippines, Malaysia, and Thailand), when the local human-to-human transmission was already intense, have experienced a relatively high incidence of COVID-19 with the exception of Singapore and Cambodia. Further and more rigorous (regression) analysis is planned, conditional on data availability.

JEL classification: H12, I15, I18

¹ This paper is also issued as a working paper (#58) at Stanford University Asia Health Policy Program.
(<https://aparc.fsi.stanford.edu/asiahealthpolicy/publication/covid-19-incidence-and-timing-quarantine-measures-and-travel-restrictions-cross-country>).

COVID-19 incidence and the timing of quarantine measures and travel restrictions: A cross-country analysis ¹

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1. Introduction

COVID-19 presents humanity with not just a health crisis but also a governance crisis as leaders around the globe confront the challenges of stemming the spread of the virus. Various governments have responded in various ways to slow the transmission of the virus. Ideally, the leaders of a country should approach the crisis with a two-pronged attack. The first is to flatten the epidemic curve (epi curve), which is simply a graphical representation of the number of cases and date of onset of the illness, and the second is to raise or strengthen the capacity of the health system.

Flattening the epi curve includes mass testing for COVID-19, which has been done in South Korea, for example. Decreasing the incidence also includes quarantine, isolation, and other social distancing strategies, which have been done by various countries in varying degrees. For example, in China, total lockdown (*cordon sanitaire*) was implemented in Wuhan, of the Hubei province, while in the Philippines, the entire Luzon, which consists of eight administrative regions, including the national capital region (NCR), was in total lockdown (enhanced community quarantine, or ECQ) since March 16 (World Health Organization [WHO] 2020a). Other parts of the Philippines were under different degrees of quarantine at different periods since the appearance of local transmission.

Raising the health care system capacity of a country may include, but is not limited to, training of health care workers, increasing facilities or hospitals that receive COVID patients, and providing adequate personal protective equipment (PPE).

This paper offers a brief epidemiological review of COVID-19 since its first case in China and how the hotspots for this disease evolved and changed over a relatively short period. This

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paper also aims to provide a short descriptive review of the existing data on COVID-19 in the Association of Southeast Asian Nations (ASEAN) region and the government response of its ten member countries, so that we can somehow draw lessons and learn from these myriad experiences as we continue to combat the spread of this dangerous pathogen. The findings in this paper are preliminary, and more rigorous analysis is expected to be performed as the data becomes more extensive and available.

2. Epidemiological review of COVID-19

This section crudely traces the spread of the COVID-19 virus (severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2) from China and then to other countries that eventually became new hotspots.

2.1 China outbreak

On December 31, 2019, cases of pneumonia of unknown etiology from Wuhan, which is the capital city of Hubei Province in China, were reported to the World Health Organization (WHO) China Country Office (WHO 2020b). On January 3, 2020, there were 44 of these pneumonia cases, with 11 identified as severely ill. At this point of early and inconclusive investigation, WHO advised against travel or trade restrictions on China.

On January 7, Chinese authorities isolated and identified a new type of coronavirus (novel coronavirus, or nCov) as the cause of outbreak, which reportedly originated from a seafood market (Huanan Seafood Wholesale Market) in Wuhan. As of January 12, there were 41 confirmed cases of nCov in China with onset of symptoms (including fever, difficulty in breathing, and pneumonia) from December 8, 2019, to January 2, 2020. An initial epidemiological investigation suggested that most nCov confirmed cases had frequented the Wuhan seafood market, which was closed on January 1, 2020 (WHO 2020c).

On January 30, 2020, WHO reported that in China there were already 7,711 confirmed 2019-nCov cases (1,370 severe cases, 170 who had died, and 124 who had recovered).

2.2. International cases

On January 8, the first case of nCov infection outside China was identified in Thailand. The patient was reportedly a traveler from Wuhan, China. This case was officially shared by Thailand's public health minister to WHO on January 13, 2020 (WHO 2020d).

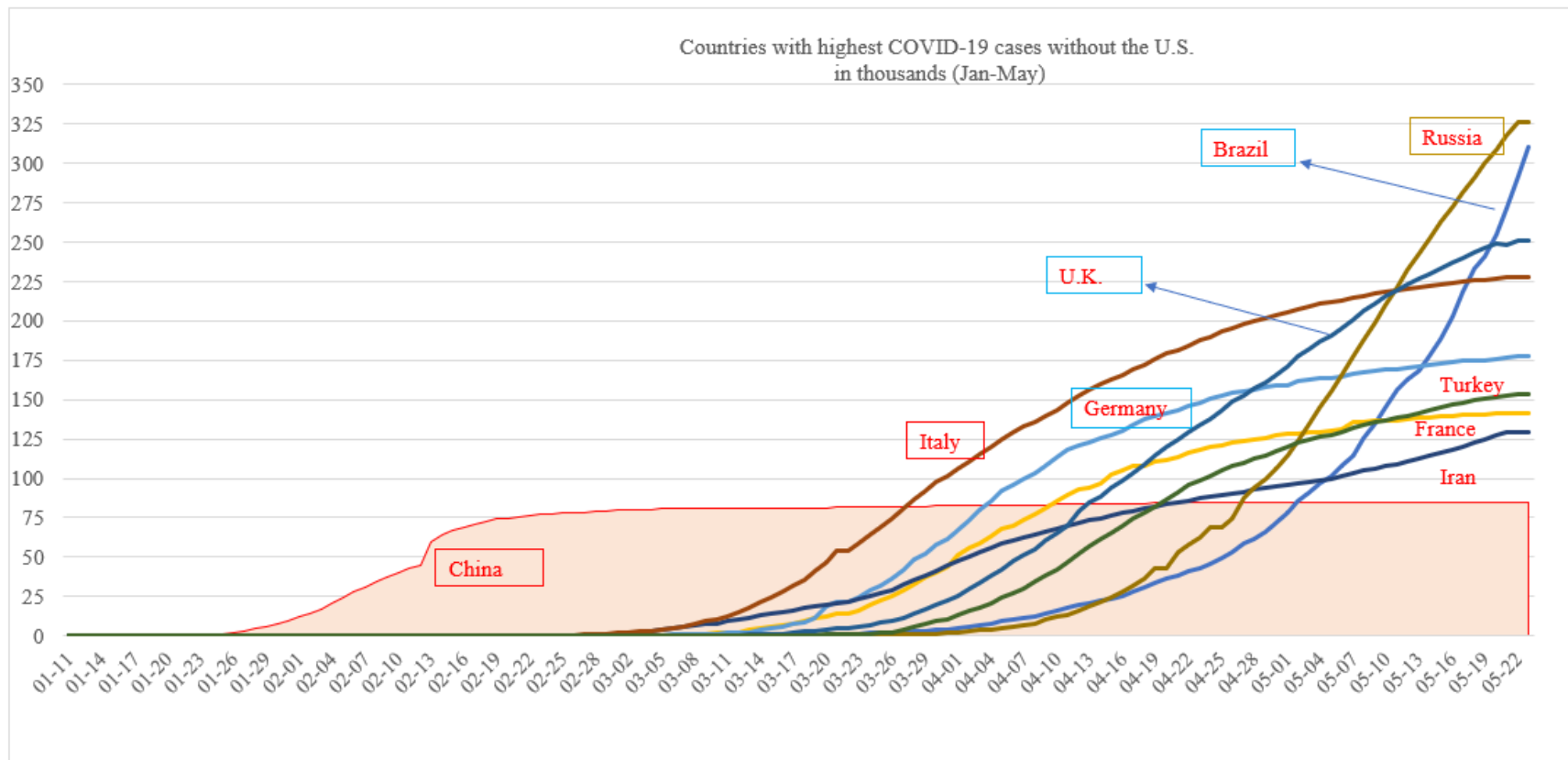
The start of international cases was not unexpected, and WHO had already prepared guidelines on January 9 for monitoring and treating nCov cases, as well as for reviewing the national capacities of various countries for a possible outbreak.

On January 30, WHO reported that there were 83 confirmed 2019-nCov cases, mostly because of a travel history in China, in eighteen countries. Although there were no reported deaths in these countries, human-to-human transmission was confirmed in three countries outside China (WHO 2020e). WHO continued to caution the international community against travel restrictions and discrimination while it emphasized containment measures (monitoring, early detection, isolation, and prevention) and active participation through communication and collaboration.

On February 11, the novel coronavirus disease was called COVID-19, and a month later, on March 11, WHO declared COVID-19 as a pandemic (WHO 2020f).

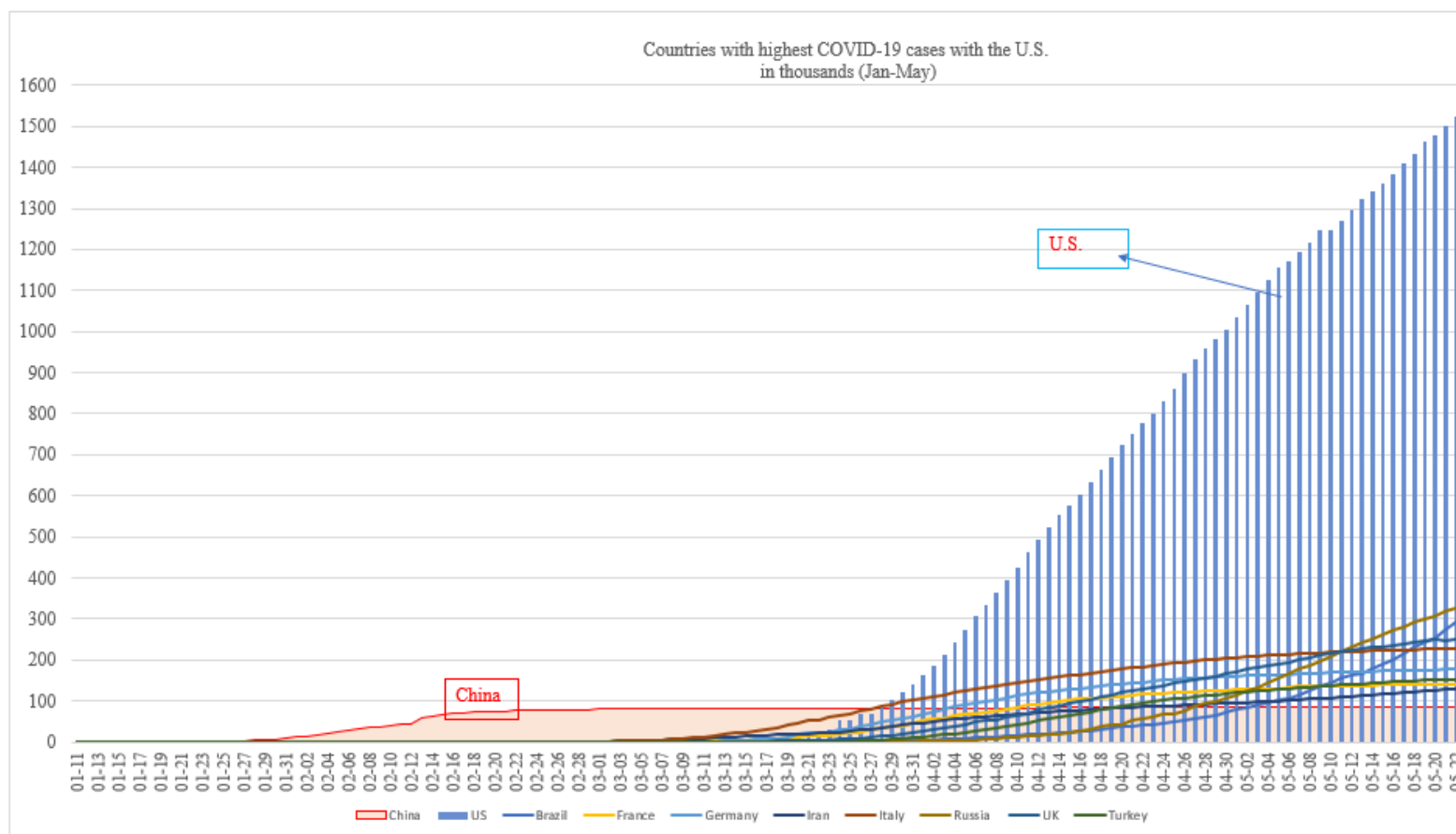
Figure 1 shows that, from January until late March, China had the highest cumulative COVID-19 cases. However, by March 28, Italy had the highest COVID-19 cases (at about 86,500). Starting March 29, the number of COVID-19 cases in the United States (U.S.) exceeded those of any other countries, and this trend continued to increase until May 23 (Figure 2). In fact, as of May 23, even if one adds all the COVID-19 cases of the four other countries with the highest total incidence next to the U.S., the sum would still be less than that of the U.S. (Table 1). Of course, inherent in the COVID-19 incidence is the capacity of a country to conduct tests given the available resources (labor, physical, and financial), meaning that there should be sufficient testing kits, trained health workers, and enough financial resources to fund the conduct of tests.

Figure 1. Countries with the highest total COVID-19 cases without the U.S. (in thousands), January–May 2020



Note: Author's construction from WHO Dashboard (2020), <https://covid19.who.int/>.

Figure 2. Countries with the highest total COVID-19 cases with the U.S. (in thousands), January–May 2020



Note: Author's construction from WHO Dashboard (2020) <https://covid19.who.int/>.

Table 1. Countries with the most COVID-19 cases (as of May 23, 2020)

	Country	Cumulative cases
1.	United States	1,547,973
2.	Russian Federation	326,448
3.	Brazil	310,087
4.	The United Kingdom	250,912
5.	Spain	233,037
6.	Italy	228,006
7.	Germany	177,212
8.	Turkey	153,548
9.	France	141,590
10.	Iran (Islamic Republic of)	129,341
11.	India	118,447
12.	Peru	108,769
13.	China	84,522
14.	Canada	81,765

If we examine daily COVID-19 cases, China had the highest number of cases from January until about the first week of March. Then, as the number of cases started to decrease in that country, Europe became the new hotspot, with both Italy and Germany experiencing an upward trend in the number of cases. Iran also experienced a sudden increase in COVID-19 cases at around the same period, and by March 2, both Iran and Italy had overtaken China in the number of daily cases. However, by March 23, the U.S. had experienced a sharp increase in the number of COVID-19 cases, which continued to increase until May 23. At around the same period, as both Italy and Germany experienced a downward trend, the new hotspot shifted to North and South America (U.S., Canada, Brazil, and Peru); Russia and the UK also experienced an upward trend.

If we examine COVID-19 in the lens of another measure of disease frequency, Table 2 reveals that the U.S. has the highest crude mortality, at 92,923 as of May 23. The other countries with high mortality are the United Kingdom, Italy, and France. However, if we focus on mortality rate, measured as total deaths relative to total incidence, Iran has the highest death rate (20%) followed by France and Brazil, both at 14%.

Table 2. Countries with the most COVID-19 mortality (as of May 23, 2020)

	Country	Cumulative deaths	Mortality rate
1.	United States	92,923	6%
2.	The United Kingdom	36,042	1%
3.	Italy	32,486	6%
4.	France	28,164	14%
5.	Spain	27,940	12%
6.	Brazil	20,047	14%
7.	Belgium	9,186	5%
8.	Germany	8,174	3%
9.	Iran (Islamic Republic of)	7,249	20%
10.	Mexico	6,510	6%
11.	Canada	6,180	3%
12.	Netherlands	5,775	3%
13.	China	4,645	5%
14.	Turkey	4,249	8%

Note: Tables 1 and 2 are constructed using WHO data <https://covid19.who.int/>.

3. COVID-19 and governance in the ASEAN region

In this section, we explore the experience of the ASEAN region of COVID-19 and the nonpharmaceutical public health measures used by the governments in mitigating the transmission of the virus, such as the various social distancing protocols. We also examine the role of the early responses of the governments (in the form of quarantine and travel bans) to the COVID-19 threat and whether those responses somehow precluded the systemic spread of this new pathogen. We start with the Philippine case and then compare it with the other nine countries in the ASEAN region.

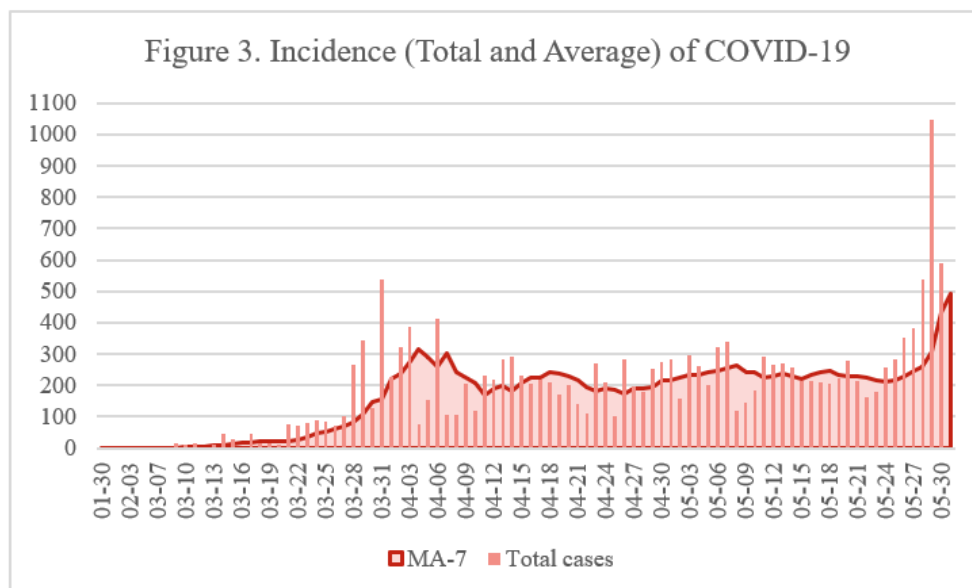
3.1 The Philippine case

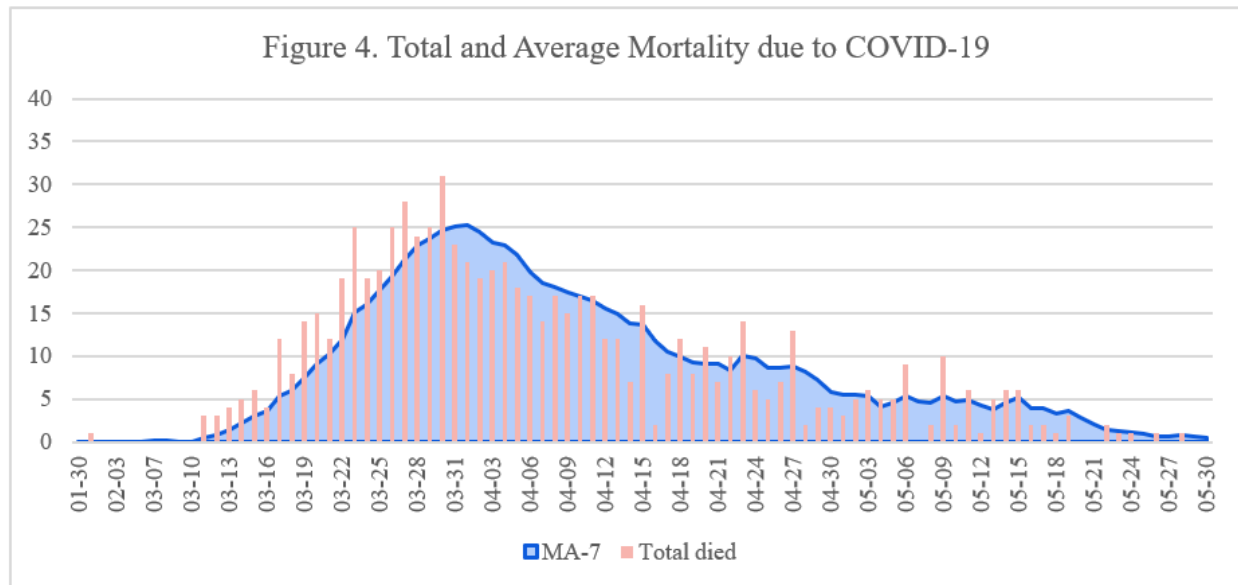
In the Philippines, on January 21, while there was an investigation of a pneumonia case of a five-year old who traveled from Wuhan, it was not until January 30, 2020, that the first case of COVID-19 in the country was confirmed. The Department of Health (DOH) reported that this first

case was a 38-year old female Chinese patient who arrived in the country from Wuhan, China, on January 21, 2020 (DOH 2020).

On January 31, the Philippine government issued a temporary travel ban for all travelers coming from the Hubei province in China. Further travel bans were imposed and became stricter, particularly after the first ECQ took effect on March 16. On April 30, Executive Order 112 was signed to further extend the ECQ in identified high-risk areas while a general community quarantine (GCQ) was imposed for the rest of the country. ECQ is defined by the interagency task force for the management of emerging infectious diseases as the implementation of temporary restrictions on the mobility of people, strict regulations of industries, and heightened presence of uniformed personnel, while GCQ is a less strict version of ECQ.

On March 7, the DOH confirmed local transmission, and the average incidence continued to rise (Figure 3). Mortality (total and moving average) also increased, with fatality recorded on March 31 (at 31 deaths). While the number of deaths then decreased on average (Figure 4), the incidence dramatically increased when the government started easing the quarantine measures at the end of May.





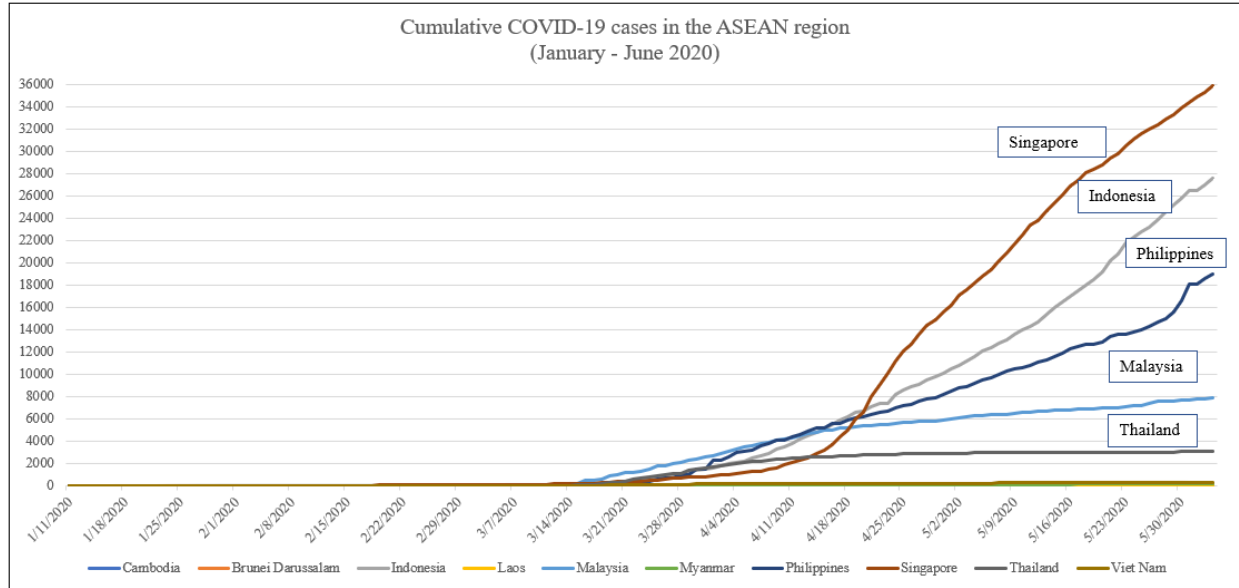
Note: Figures 3 and 4 are constructed using DOH data (<https://www.doh.gov.ph/covid19tracker>).

3.2. COVID-19 in the ASEAN region

The ASEAN region has already been in the limelight even before WHO declared COVID-19 as a pandemic, which can be attributed to its proximity to China, where the first case of COVID-19 was reported. This geographical proximity should have forewarned the various states of the real and urgent threat of international transmission.

The first COVID-19 case outside China was officially reported from Thailand on January 13, while the first COVID-19 death, again outside China, was confirmed by the Philippine government on February 2. Figure 5 shows the cumulative COVID-19 incidence in each of the ten ASEAN countries—Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. It can be gleaned that Singapore had a relatively low incidence of COVID-19 until early April, owing to its effective and model response to the outbreak (mass testing and contact tracing). However, Singapore was blindsided and failed to take into consideration one of its vulnerable sectors—the low-paid migrant workers, mostly from India and Bangladesh, who live in dormitories. The surge in COVID-19 cases among these migrant workers contributed to the continued increase in incidence in Singapore. Indonesia, the Philippines, and Malaysia followed Singapore in terms of the highest number of COVID-19 cases in the region.

Figure 5. Cumulative COVID-19 cases in the ASEAN region (January–June 2020)



Note: Constructed using WHO dashboard (<https://covid19.who.int/>).

A more serious indicator of the danger of the COVID-19 is the various measures of mortality due to the virus. Table 3 shows that Indonesia had the highest crude death (1,663) and mortality rate (cumulative deaths relative to cumulative confirmed cases), at 6%, followed by the Philippines (966 deaths and 5% mortality rate), as of June 3, 2020.

Table 3. COVID-19 crude mortality and mortality rate in the ASEAN region (June 3, 2020)

	Country	Cumulative deaths	Mortality rate
1.	Indonesia	1,663	6%
2.	Philippines	966	5%
3.	Malaysia	115	1%
4.	Thailand	58	2%
5.	Singapore	24	0.1%
6.	Myanmar	6	3%
7.	Brunei Darussalam	2	1%
8.	Cambodia	0	0%
9.	Lao People's Democratic Republic	0	0%
10.	Vietnam	0	0%

Note: Constructed using WHO dashboard (<https://covid19.who.int/>).

3.3. Government response in the ASEAN region

In this section, we will review and discuss whether the timing of the national government response to the COVID-19 outbreak in each of the ten ASEAN member countries have contributed to, among other things, the COVID-19 incidence. We are interested in examining whether early travel restrictions and strict social distancing protocols somehow precluded the widespread of COVID-19 virus in the country.

3.3.1 The response to COVID-19 outbreak in Indonesia, the Philippines, and Singapore

We learn from the preceding discussion that, while Singapore has the highest COVID-19 confirmed cases and Indonesia has the highest mortality (in absolute and relative terms) among the ten countries in the ASEAN region, the Philippines has the third-highest COVID-19 incidence and the second-highest mortality (both crude death and mortality rate).

As mentioned earlier, one of the first responses of the Philippine government to the first confirmed case of COVID-19 in the country was to impose travel restrictions to all those coming from Hubei, China (the epicenter of the disease at that time), but the more stringent measures like ECQ and travel restrictions to both inbound and outbound travelers were put in place more than a week after the first local transmission was confirmed and more than a month after the first case of COVID-19 in the country (Department of Foreign Affairs 2020).

Singapore, however, was successful at the beginning of the outbreak, due to its early aggressive response. For example, on January 31, against the advice of WHO, Singapore, along with Taiwan and Hongkong, imposed travel restrictions on passengers from mainland China. In addition, the health system in those three countries was well prepared due to previous experience of a SARS outbreak and had sufficient capacity to conduct rigorous tests on all cases of pneumonia and influenza (Time 2020). However, as mentioned, mass testing and contact tracing were insufficient if a certain segment of the population was inadvertently neglected, especially if that sector belonged to the high-risk and vulnerable group. By the time Singapore authorities had imposed social distancing restrictions on migrant workers living in dormitories, the community transmission was already intense, thereby dramatically increasing the COVID-19 incidence.

The Indonesian government, however, acted only on the twenty-ninth day after the first case of COVID-19 in the country, as opposed to the Singaporean government, which first acted on the ninth day. Figure 6 shows the various epi curves (daily COVID-19 cases and the number of days since the onset of the disease in the country) of ASEAN member countries and the timing of the responses of their respective governments in terms of flight restrictions and strict social distancing measures in attempts to preclude the spread of the COVID-19 virus.

It would appear that what is common in these three countries (Singapore, Indonesia, and the Philippines) with high incidence or high mortality of COVID-19 is the timing of government response. As WHO has repeatedly stressed, once an extensive community transmission is in place, a comprehensive approach to mitigate the spread of the virus is required, because the rise in incidence is inevitable.

3.3.2 The response to COVID-19 outbreaks in Malaysia and Thailand

Malaysia and Thailand are the next countries with the highest COVID-19 incidence in the ASEAN region. As mentioned earlier, although Thailand was the first country outside China to have the first case of COVID-19, as reported to WHO on January 13, it only closed all its borders on March 22, more than two months after the first case was confirmed. Figure 6 also shows that a state of emergency was imposed by Thailand's prime minister on March 25 (The Straits Times 2020). This nationwide emergency included travel restrictions, closures of high-risk establishments such as gym, spa, and sports venues, and restrictions on the mobility of those vulnerable to the disease (adults older than 70 and those with pre-existing conditions, for example).

Malaysia, however, experienced its first case of COVID-19 on January 25 and decided to shut its borders only on March 16, almost two months after the first COVID-19 incident, which was also when the daily COVID-19 incidence peaked in the country. On March 18, Malaysian Prime Minister Muhyiddin Yassin imposed a "Movement Control Order" (MCO), which meant closures of schools and nonessential businesses and travel restrictions (Center for Strategic and International Studies [CSIS] 2020).

3.3.3 The response to COVID-19 outbreaks in Vietnam and Laos

Vietnam is one of the countries in the ASEAN region with few daily and cumulative COVID-19 cases (a total of 328 confirmed cases as of June 3). Vietnam was lauded for its quick response to the outbreak despite its limited resources. It had its first case of COVID-19 on January 23, and about a week later, on February 1, it banned all flights from China. But perhaps the more important factor that stemmed the spread of the virus in that country was its preparedness even prior to the emergence of the disease in the country. On January 16, a week before the first COVID-19 incidence in the country, the Ministry of Health dispatched outbreak prevention guidelines to relevant government agencies, and then to hospitals and clinics nationwide on January 21 (The Diplomat 2020). This prompt response and readiness of Vietnam to handle the outbreak somehow contributed to the low incidence in the country.

Laos, despite its geographic proximity to China, has experienced few COVID-19 cases. It was the last country in the ASEAN region to confirm a case on March 24. A week later, it imposed travel restrictions and a national stay-at-home order on March 30. On March 17, a week before the first case of COVID-19 in the country, the Prime Minister Thongloun Sisoulith announced school closures, and on March 16, the government also implemented post-entry travel restrictions (GardaWorld 2020).

3.3.4 The response to COVID-19 outbreaks in Cambodia, Myanmar, and Brunei

The first case of COVID-19 in Cambodia was reported on January 27 and since then it has had very few daily COVID-19 cases. It imposed a travel ban in mid-March and declared a state of emergency on March 31 (CSIS 2020). Several experts were alarmed by the relative complacency of the Cambodian government at the beginning of the outbreak, but so far, it is one of the countries in the ASEAN region with few cases of COVID-19.

Myanmar, like its neighbor Laos, shares a border with China. However, it reported its first case of COVID-19 on March 23. Figure 6 shows that Myanmar's highest daily average of COVID-19 cases was less than 10 (using a 7-day moving average). Experts claim that this late outbreak

and low incidence could be attributed to insufficient testing rather than the absence of the virus. It can be gleaned from Figure 6 that Myanmar consequently imposed travel restrictions on land borders on March 19 and on international flights on March 30 (The New York Times 2020). It also imposed curfews and stay-at-home orders in some areas of the country.

Brunei experienced its first COVID-19 case on March 9, which was officially recorded in the WHO database one day later. The total number of COVID-19 cases in the country as of June 3 was only 141, and there were no new cases after May 8. Brunei, like the rest of the ASEAN member countries, imposed travel bans, social distancing, and self-isolation protocols. For example, starting March 17, all individuals arriving in the country have been required to self-isolate for 14 days, according to the Ministry of Health (2020).

4. Conclusion

Recent data on COVID-19 would suggest that no country is inured to the adverse effects of this disease. WHO estimated that about 216 countries, areas, and territories have had COVID-19 cases as of June 8. In addition, a staggering 6.93 million cases have been recorded and about 401,000 confirmed deaths due to this pandemic, suggesting a 5.8% mortality rate (WHO 2020g). Although experts somehow agree on the virulence of the COVID-19 virus (SARS-CoV-2), it is puzzling why some countries have experienced the full brunt of the virus while others appear to have been totally spared. There are several theories (or factors) why this virus appears to be “selective.”

Some countries appear to be able to preclude the spread of the virus because cultural distancing is already ingrained in their respective society, while other countries are successful because they have a “younger population.” Other experts argue that an aggressive and early response to the outbreak, such as lockdowns, spells the difference.

WHO (2020h) recognizes that, once a community transmission is intense, it is difficult to uproot the problem and that it will take a comprehensive, committed, and sustained approach in handling the outbreak, which makes early detection and response all the more crucial. This paper aims to examine the timing of government response to COVID-19 in the ASEAN region and whether it contributes to the spread of the virus.

The method and findings used in this paper are preliminary. Further and more rigorous regression analysis is planned, conditional on data availability. For now, in this paper, we basically examine the relationship of early (or late) imposition of travel restrictions and lockdown measures on the COVID-19 daily incidence. Our descriptive and graphical analysis reveals that countries that responded relatively late (Indonesia, Philippines, Malaysia, and Thailand), when the local human-to-human transmission was already intense, have experienced a relatively high incidence of COVID-19. These countries, at the minimum, responded about a month later, after the first case of COVID-19.

In contrast, countries that were prepared and had adopted preventive measures before the COVID-19 outbreak were more or less successful in stopping the spread of this new pathogen. Those countries include Vietnam and Laos, both of which imposed measures such as school closures and distribution of outbreak prevention guidelines, and Myanmar and Brunei. The two countries that are exceptions are Singapore and Cambodia. Singapore, despite responding early and having sufficient health capacity to conduct mass testing and contact tracing, experienced a spike in incidence three months after the first case, due to an oversight. The living conditions of a key vulnerable segment of the population, migrant workers, were overlooked during the first three months of the outbreak. Cambodia, however, responded late in combating the virus, although it had only a few cases. Critics actually attribute the paucity in number of cases in some countries to the health system's lack of capacity in testing and monitoring.

As mentioned, the results and discussion in this paper are preliminary. We have examined only the data on COVID-19 incidence, strict social distancing measures (lockdown and quarantine), and travel bans. Other factors must be considered, such as the capacity of the health system of a country, and the various cultural predilection and sociodemographic characteristics. Also, each country has a unique fragility, and the spread of the virus is not necessarily the same across the countries.

Nonetheless, there are basic lessons to be learned from our analysis. One is the importance of identifying key vulnerable groups and ensuring that they are protected from the spread of the virus. Another is the importance of preparedness and preventive measures even before the outbreak, especially if neighboring countries have already experienced firsthand the danger of the virus. A prompt response at the beginning of the outbreak will also make a huge difference.

It is understandable, however, that countries with a weak health system to start with is more likely to experience the full brunt of this novel pathogen. Many aspects of the virus and its characteristics are still unknown, and as experts have claimed, it is far from over. It is important to remain vigilant and to continuously learn from our own, as well as others', experiences. It is equally important that the government stay committed in eradicating the virus. Some of the measures that can help stem the further spread of the virus include, but are not limited to, clear communication, a science-driven and prompt response, continued testing and tracing of contacts, quarantine measures for every contact, and the lifting of social distancing measures only when cases have significantly decreased.

Figure 6. Epidemic curve for countries in the ASEAN region, and the timing of travel restrictions and lockdown measures

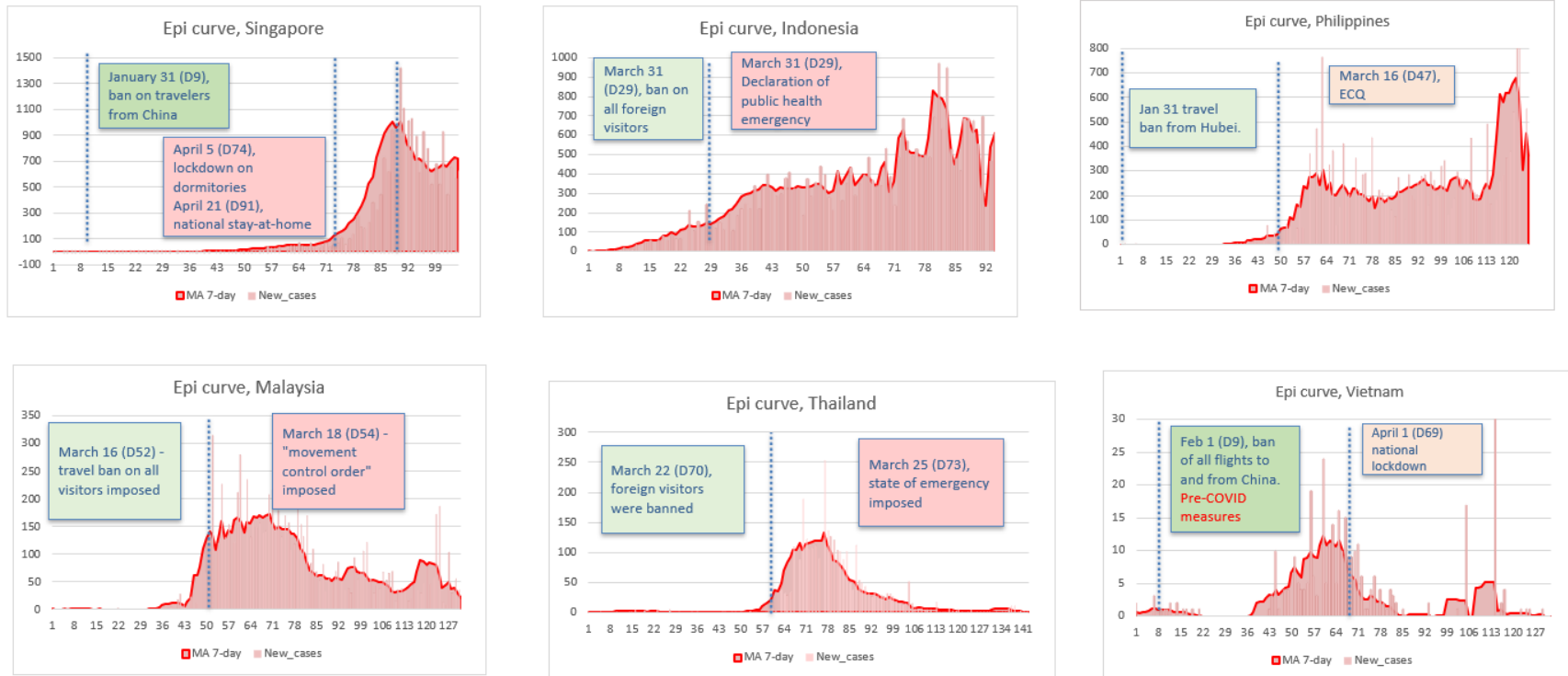
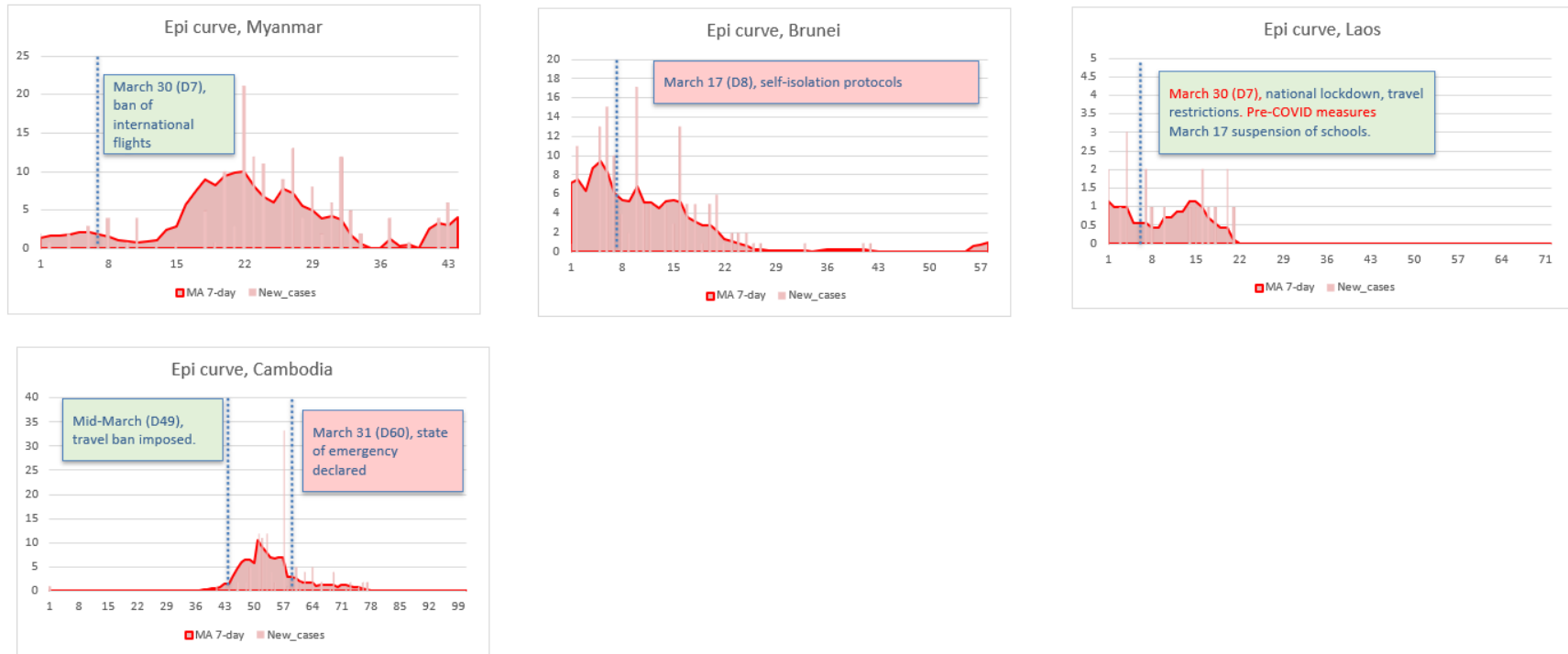


Figure 6. Epidemic curve for countries in the ASEAN region, and the timing of travel restrictions and lockdown measures, continued



Note: Author construction from various sources, including WHO (2020), CSIS (2020), and newspaper outlets.

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