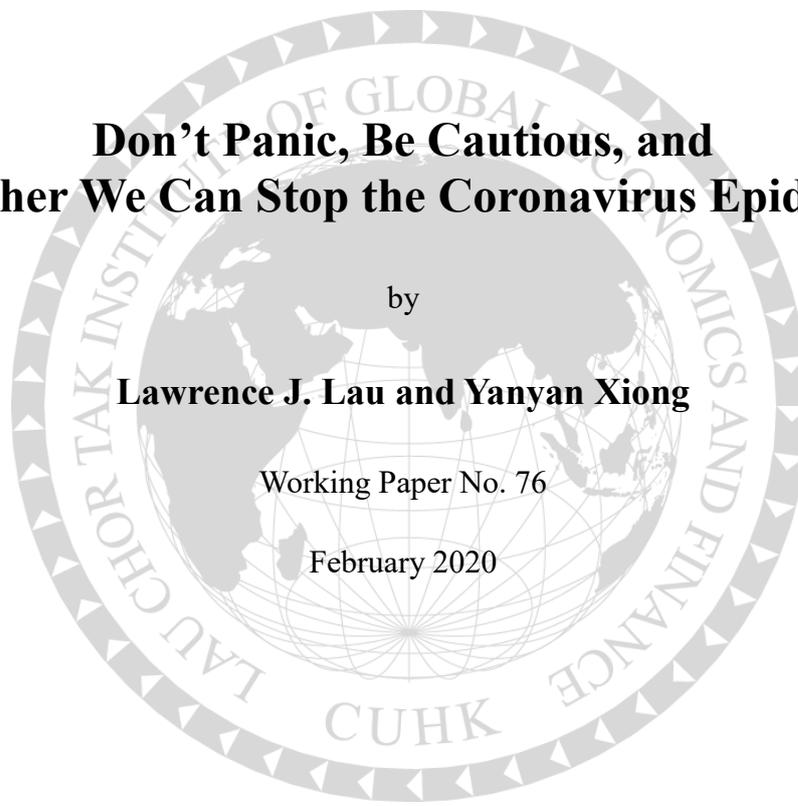# Don't Panic, Be Cautious, and
Together We Can Stop the Coronavirus Epidemic!

by

Lawrence J. Lau and Yanyan Xiong

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Don't Panic, Be Cautious, and
Together We Can Stop the Coronavirus Epidemic![§]

Lawrence J. Lau and Yanyan Xiong[1]

February 2020

Abstract: China is currently in the midst of the COVID-2019 coronavirus epidemic, which originated in Wuhan, the capital of the Province of Hubei, in early December 2019. The cumulative total number of confirmed coronavirus cases on the Mainland of China reached 68,500 as of midnight of 15 February, out of which 56,249 cases, or 82 percent, were in Hubei. Thus far, the cumulative total number of deaths attributable to the coronavirus reached 1,665 for the Mainland as a whole, but with the overwhelming bulk, 1,596, or 96 percent, in Hubei. In the meantime, the coronavirus has also spread to Hong Kong, Macau and Taiwan, as well as twenty-five foreign countries. The urgent questions are: (1) Can the coronavirus epidemic be controlled? (2) What measures should be taken? And (3) When will it all end? We attempt to provide tentative answers to these questions in this paper.

Introduction

China is currently in the midst of the COVID-2019 coronavirus[2] epidemic, which originated in Wuhan, the capital of the Province of Hubei, in early December 2019. Hubei had a permanent resident population of 59 million and Wuhan 11 million at year-end 2018.[3] Huanggang, a neighbouring city of Wuhan with a permanent resident population of 6.3 million, has also been seriously affected by the coronavirus. The cumulative total number of confirmed coronavirus cases on the Mainland of China reached 68,500 as of midnight of 15 February, out of which 56,249 cases, or 82 percent, were in Hubei, with over 70 percent, 39,462 cases, in Wuhan alone. Thus far, the cumulative total number of deaths attributable to the coronavirus reached 1,665 for the Mainland as a whole,[4] but with the overwhelming bulk, 1,596, or 96 percent, in Hubei.

China has been doing all it can to try to contain the spread of the coronavirus. Several cities in Hubei, including Wuhan and Huanggang, have been sealed off completely since 23 January 2020. Their residents are not allowed to leave these cities and many of them are required to stay at home. All regular inbound and outbound flights and trains, both domestic and international, have been cancelled. All ordinary highway traffic has been blocked. New hospitals, including special isolation hospitals, have been set up at record speed in and around Wuhan and quite a few of them have just been put into service within the last couple of days.

However, just when the daily number of newly confirmed COVID-2019 coronavirus cases seemed to have levelled off on the Mainland, it had an unexpected steep jump on 12 February, from 2,015 to 15,152, or more than 750%. The overwhelming bulk of the increase came from the Province of Hubei, where the number of newly confirmed cases increased from 1,638 to 14,840. Similarly, the number of newly confirmed cases in Wuhan increased from 1,104 to 13,436. However, the numbers for Hubei and Wuhan did fall back to 1,843 and 1,548 respectively on 15 February, lower than 2,618 and 1,921, the corresponding numbers for Hubei and Wuhan on 9 February. It therefore appears that the generally downward trends of the numbers of newly confirmed cases have not been substantively interrupted (see Chart 1 below).

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[2] Previously referred to as the (2019-nCoV) virus.
[3] These and other population figures are all taken from the National Bureau of Statistics of China and relevant provincial and local bureaux of statistics.
[4] This number already exceeds 774, the total number of deaths caused by the SARS virus worldwide in 2003.

In the meantime, the coronavirus has also spread to Hong Kong, Macau and Taiwan, as well as twenty-five foreign countries.

The urgent questions are: (1) Can the coronavirus epidemic be controlled? (2) What measures should be taken? And (3) When will it all end? We attempt to provide tentative answers to these questions below.

The Daily Numbers of Newly Confirmed Cases of the Coronavirus

The key variable to focus on in the fight against the coronavirus epidemic is the daily number of newly confirmed cases. At the beginning of an epidemic, after the initial incubation period, the daily number of newly confirmed cases will undergo a very rapid and accelerating rise, as the first patient infects others and the infected others in turn infect still others, all the while unknowingly, as no symptoms are yet apparent. However, once the initial incubation period is over (estimated to be approximately 14 days for the coronavirus and approximately 7 days for the "Severe Acute Respiratory Syndrome (SARS)" virus) infected patients will become identified, and then can be isolated and treated. The public will also become more fully aware of the virus, and will either voluntarily seek testing and/or treatment (perhaps even before the end of the incubation period), or take the proper precautions to avoid infection. Thus, while the daily number of newly confirmed cases will continue to increase for a while, it will decelerate and eventually reach a peak. When the daily number of newly confirmed cases reaches a peak, the cumulative total number of confirmed cases will continue to increase, but at a slower and slower rate as the daily number of new cases falls. If and when it drops to zero, the cumulative total number of confirmed cases will no longer increase, that is, there will be no more new transmission of the virus, then the epidemic is under control, even though there may still be a large number of identified and confirmed patients waiting to be treated.

As noted above, there was a sudden steep jump in the number of newly confirmed cases in Hubei on 12 February. What happened was not a serious escalation of the epidemic, but a change in the definition of a "confirmed case" adopted by Hubei on that date so that it would conform to the definition used in the rest of the Mainland, enabling the data to be comparable nationally. There was no change in the criteria for a confirmed case in the rest of the Mainland. As a result, the data before and after 12 February on Hubei are not directly comparable.
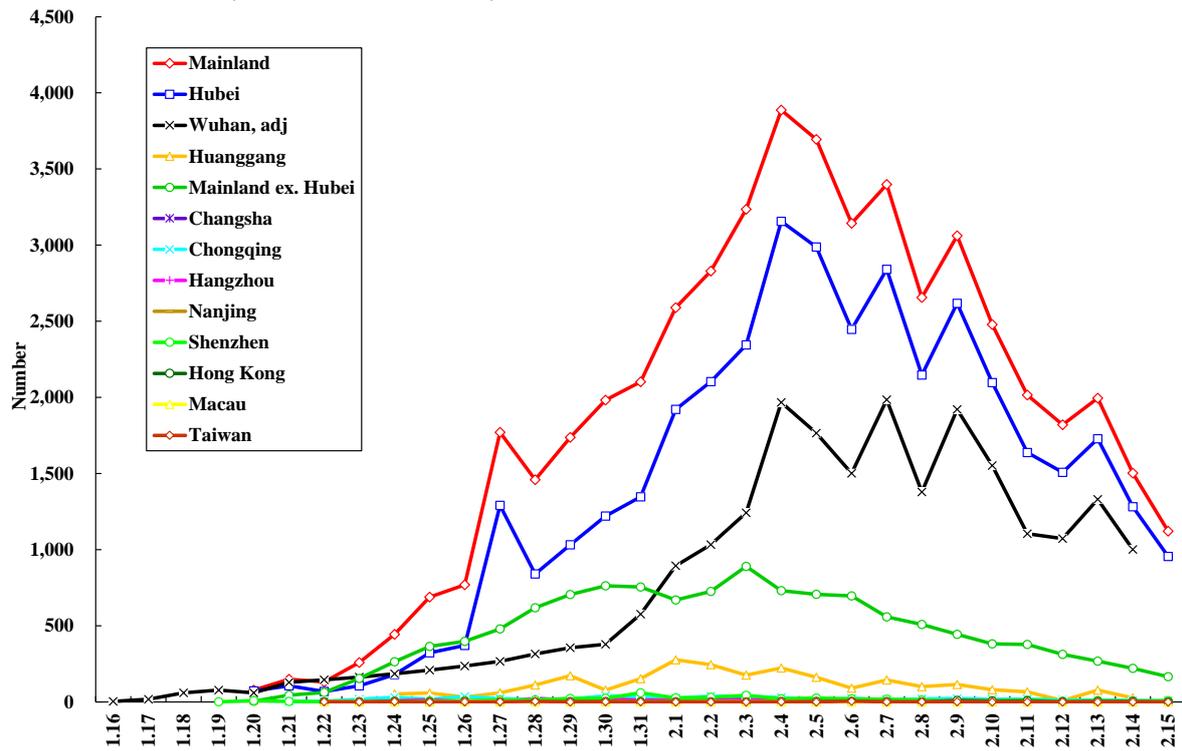
Before 12 February, Hubei had maintained a stricter set of criteria for a confirmed coronavirus case than the rest of the Mainland. Among the three or four criteria for the determination of a confirmed case in Hubei, it was necessary for a patient to be tested positive by a specific blood test for the coronavirus virus. Even if a patient satisfied all of the other criteria, and despite observed clinical symptoms, he or she would not be classified as a confirmed case in the absence of this positive test. Under the new definition adopted by Hubei on 12 February, which has been and continues to be used in the rest of the Mainland, this condition is no longer absolutely necessary, as long as the other criteria are satisfied. This change in the definition led to the reclassification of some previously unconfirmed cases as confirmed cases, resulting in a steep one-time increase in the number of confirmed cases in Hubei on 12 February. However, the underlying situation remained the same.

We first attempt to reconstruct the numbers of the newly confirmed cases for Hubei and its cities since 12 February under the old definition, using the geographically disaggregated data published by the Chinese government. The daily numbers of newly confirmed cases (under the old definition) on the Mainland, Mainland ex Hubei, Hubei, Wuhan[5] and Huanggang (cities inside Hubei), a broadly representative selection of major Chinese cities outside Hubei (Changsha, Chongqing, Hangzhou, Nanjing and Shenzhen) and areas outside the Mainland (Hong Kong, Macau and Taiwan) are presented in Chart 1. The Chinese cities have been selected because they all have large permanent resident (as opposed to household registration) populations.[6] Hong Kong, Macau and Taiwan provide information on what may happen at newly infected areas. Because of the huge variations in the daily numbers of newly confirmed cases between areas in Hubei and areas outside Hubei, data for the latter are also separately presented in Chart 2 so that they are more easily legible.

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[5] The data for Wuhan between 21 and 27 January 2020, inclusive, have been adjusted by redistributing the reported newly confirmed cases on 27 January of 892 to the days of the prior week, 21-26 January. The jump from a reported 80 newly confirmed cases on 26 January to 892 on 27 January does not appear plausible.

[6] Their permanent resident populations as of year-end 2018 were, respectively, Changsha, 8.2 million, Chongqing, 31.0 million, Hangzhou, 9.8 million, Nanjing, 8.4 million, and Shenzhen, 13.0 million. These population numbers would have been even larger if the mobile populations were also included.

Chart 1: The Daily Number of Newly Confirmed Cases under the Old Definition: The Mainland, Mainland ex Hubei, Hubei and Selected Areas Inside and Outside Hubei
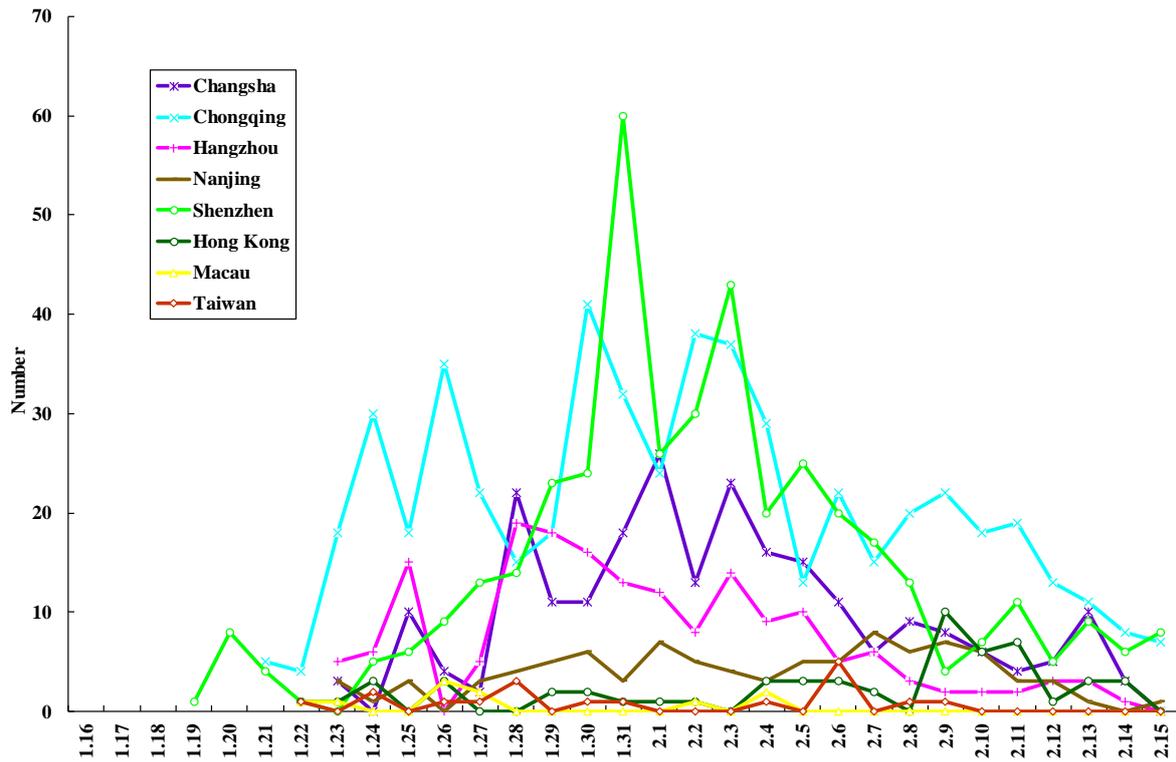

Sources: National Health Commission of the People's Republic China and relevant provincial and local health commissions, bureaux and departments

It is clear from Chart 1 that after an initial rapid rise beginning around 20 January 2020, the daily number of newly confirmed cases appears to have peaked for both the Mainland as a whole and Hubei, as well as for Wuhan and Huanggang. However, even though the general trend is downward, it has also continued to fluctuate up and down. The number of newly confirmed cases (under the old definition) was still positive and large for both the Mainland (1,121) and Hubei (955) as of mid-night of 15 February.

Chart 1 also shows that the bulk of the newly confirmed cases on the Mainland is found in Hubei (over 85 percent), and within Hubei, in Wuhan (1,001 out of 1,282, or 78 percent[7]). The daily number of newly confirmed cases in Mainland ex Hubei already peaked on 3 February and has been falling steadily since.

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[7] Based on data as of midnight of 14 February. The number of confirmed cases in Wuhan under the old definition for 15 February is not available.

Chart 2: The Daily Number of Newly Confirmed Cases in Selected Areas outside Hubei
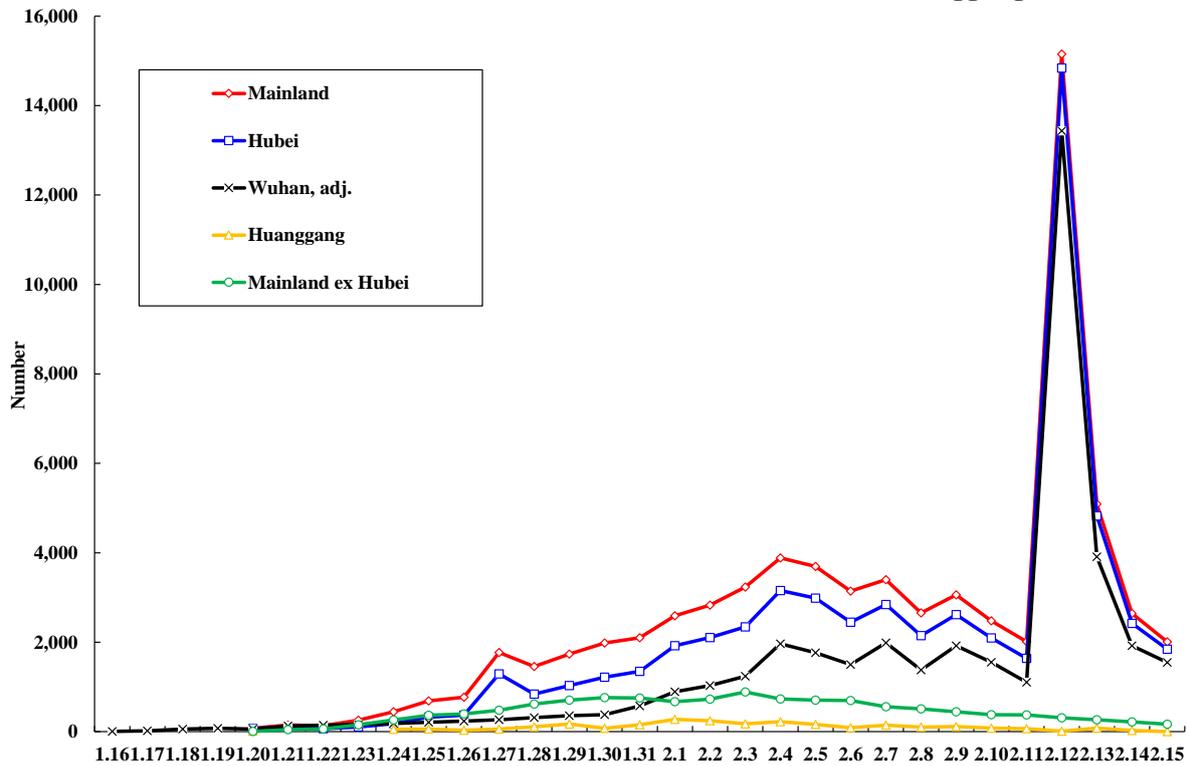
Chart 2 confirms that in Mainland ex Hubei, the incidence of the coronavirus epidemic has actually been relatively mild and generally declining over time. For Mainland cities outside Hubei, such as Changsha, Chongqing, Hangchou, Nanjing and Shenzhen, the daily numbers of newly identified cases have already begun to show a declining trend since the beginning of February, even though they also continue to fluctuate up and down. They are currently on the order of single digits. For Hong Kong, Macau and Taiwan, the daily numbers of newly confirmed cases have all fallen to zero on 15 February. Given all the precautionary measures taken at these three areas, a steep rise of the daily numbers of new confirmed cases appears unlikely. The overall picture suggests that the spread of the coronavirus to areas other than Hubei can be largely contained.

The daily numbers of newly confirmed cases under the current (new) definition for the Mainland, Mainland ex Hubei, Hubei, Wuhan and Huanggang are presented in Chart 3. Chart 3 shows the huge impact of the change in the definition of a confirmed case on the numbers in Hubei and its cities, and hence on the Mainland as a whole. However, it also shows that the impact is transitory, and that after a couple of days of large increases as additional existing

unconfirmed cases are reclassified as confirmed, the numbers have settled down to pre-definitional-change levels. As of 15 February, the numbers were 2,009, 1,843 and 1,548 for the Mainland, Hubei and Wuhan respectively, all lower than the corresponding numbers on 9 February of 3,062, 2,618 and 1,921.

Chart 3: The Daily Number of Newly Confirmed Cases under the Current Definition: The Mainland, Mainland ex Hubei, Hubei, Wuhan and Huanggang
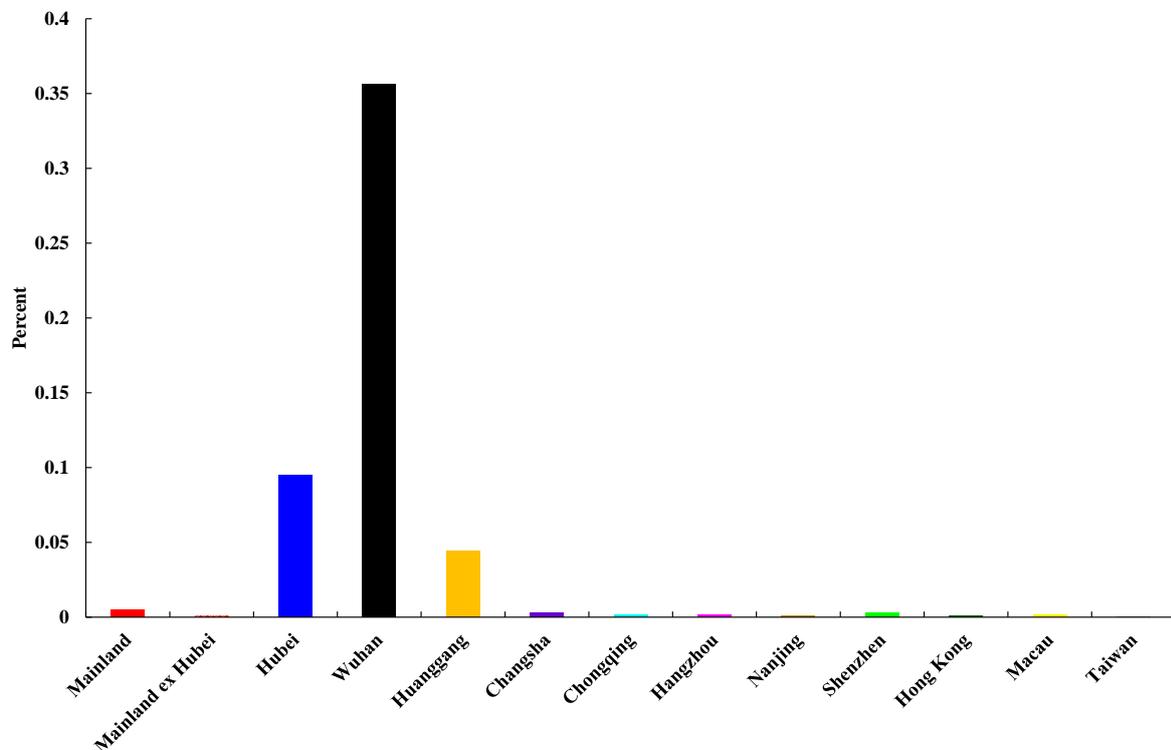

Sources: Same as Chart 1

A large daily number of newly confirmed cases in Hubei (and Wuhan) at this phase of the epidemic is to be expected because there have not been sufficient medical facilities and personnel there to test the patients for the coronavirus, let alone treat them. The epidemic has been going on in Hubei for more than two months by this time, which means secondary infection by infected patients has gone into the fifth round (assuming that one round is 14 days, the incubation period), creating a large pool of as yet unidentified infected patients who can continue to infect additional others. However, the availability of medical care in Hubei appears to have vastly improved recently, which should begin to reduce secondary transmission through the early identification and isolation of the infected patients. The large jump in the daily number of newly confirmed cases on 12 February is actually a welcome development, because

it means more and more previously unidentified cases are being identified, isolated and treated, limiting further transmission of the coronavirus.

The cumulative total numbers of confirmed cases on the Mainland, in Mainland ex Hubei, Hubei, Wuhan, Huanggang, our five selected major Chinese cities, and Hong Kong, Macau and Taiwan as percentages of the respective permanent resident populations as of 15 February, are presented in Chart 4. Chart 4 shows that except for the cities in Hubei, especially Wuhan (where it was 3,561 persons per million), the prevalence of the coronavirus elsewhere has been very low. Among the areas outside Hubei, Shenzhen has the highest incidence of the coronavirus, at 0.0032%, or approximately 32 persons per million, in contrast to Taiwan, which has the lowest, at 0.8 person per million. The prevalence in Hong Kong is 7.5 persons per million. What this means is that randomly, a resident of Hong Kong may come into contact with one as yet unidentified coronavirus-infected patient for approximately every 130,000 persons that he or she meets.

**Chart 4: The Cumulative Total Number of Confirmed Cases on 15 February 2020
as a Percentage of the 2018 Permanent Resident Population:
The Mainland, Mainland ex Hubei, Hubei and Selected Areas Inside and Outside Hubei**

Sources: Numbers for confirmed cases are collected from the National Health Commission of the People's Republic China and relevant provincial and local Health Commissions; population figures are taken from the National Bureau of Statistics of China and relevant provincial and local bureaux of statistics.

Essential Control Measures

In order to achieve the goal of a daily number of newly confirmed cases of zero, two essential measures must be undertaken. First, there must be total isolation and treatment of all identified and confirmed patients. Once a new infected patient is identified and isolated, and with the medical personnel taking all proper precautions, he or she will no longer be able to transmit the virus and further infect other people. Second, there must be precautionary preventive measures against potential transmission from the as yet unidentified infected patients. When transmission can be effectively prevented, there will be no new unidentified or as yet unidentified infected patients. All of the existing unidentified infected patients will eventually be identified, certainly after the expiration of the incubation period, and can be appropriately isolated for treatment. Of course, in the interim, these as yet unidentified infected patients could still infect others, but if the general public is vigilant and maintains the proper precautions, the probability of further transmission can be kept very low. If transmission of the virus can be limited, the total number of unidentified cases will decline over time, falling to zero eventually, and the epidemic will be under control.

It is necessary to identify all infected patients as soon as possible, and isolate and treat them, so that they can no longer infect others. Moreover, once a new patient is identified and confirmed, other people with whom he or she has had direct or indirect physical contact should also be pro-actively tested for possible infection, and isolated and treated if necessary. The early identification of newly infected patients, perhaps even before they display symptoms, can further reduce the probability of transmission and enhance the probability of successful treatment.

Preventing transmission by the as yet unidentified infected patients is therefore extremely important; otherwise, the number of new and as yet unidentified infected patients will continue to rise. The transmission of the coronavirus, like the SARs virus, actually requires either direct or indirect physical contact, typically with exchange of body fluids, between an infected patient and a potential patient. Direct physical contacts, including hand-shaking, hand-holding, kissing, hugging, or simply touching, can all result in transmission. Indirect physical contact can also lead to transmission. For example, if an infected patient touches an inanimate object such as a door knob or an elevator button, and the potential patient

does the same afterwards,[8] infection can occur. It can also happen if the infected patient hands a gift to a potential patient, without either one of them wearing gloves.

For us, the public, we also need to minimise the probability of the virus being transmitted to us, and this means taking proper precautions not to have either direct or indirect physical contact with any other person, friend or stranger. If we succeed in doing so, we shall be able to reduce the transmission of the virus to virtually zero. This is possible if we are willing to adopt and maintain good hygienic behaviour and practices. For example, we should give up the Western custom of shaking hands, or kissing and hugging. Instead, we should revert to the traditional Chinese way of greeting, "gongshou (拱手)", that is, cupping one hand in the other before one's chest and moving them up and down all the while looking at each other's eyes. It does not require physical contact, and can be done efficiently groupwise in a circular manner as well as pairwise. We should wear face masks, use disposable gloves when touching things in public areas, wash our hands with disinfectants or wipe them with alcohol regularly, and refrain from touching our eyes, nose and mouth with our hands. We should minimise physical meetings, and to the extent possible use telephone-conferencing and video-conferencing instead.[9] We should avoid going to places with a large number of people. In time, we can also introduce sensor-operated doors and voice-activated elevators so that even indirect physical contacts can be minimised.

The transmission of the virus will stop if everyone takes proper precautions for his or her own self-protection. With all of us taking measures to protect our individual selves, we also protect all others by helping to reduce the probability of secondary transmission to zero.

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[8] In principle, the virus can survive on an inanimate object for 24 hours.
[9] The costs of telephone-conferencing and video-conferencing are nowadays almost zero.

Comparison with the SARS Epidemic in 2003

In 2003, during the SARS crisis, one of the authors (Lau) was still living in the U.S. In March of that year, based on data on the daily numbers of newly confirmed cases since the first SARS case was identified in Guangdong in December 2002, and taking into account the isolation and quarantine measures then in place, Lau was able to predict that the epidemic would end in June, which it actually did.

Lau's prediction was based on the empirical evidence on the incidence of the SARS virus. A critical parameter that had to be estimated from the data was the number of new patients that a SARS patient would likely infect each day after he or she was infected but before he or she could be identified and isolated, that is, for approximately the duration of the incubation period, in an ordinary, everyday environment.[10] Let us refer to this parameter as the probability of transmission. Obviously, this probability also depended on the "natural" infectiousness of the virus itself, the conditions of the general environment, and the degree of precautions exercised in the avoidance of direct and indirect physical contacts by the general public, if any. Of course, initially, since the SARS virus was not yet known or identified, there was little or no precaution, so that the initial transmission probability would be entirely driven by its "natural" infectiousness, given the prevailing environmental conditions.

Working backwards from the then daily newly confirmed SARS patient data, and assuming an incubation period of seven days, such a parameter was estimated by an iterative trial-and-error method. It turned out that the empirically estimated probability of an unknowing infected patient infecting a potential patient was quite low, approximately 0.1025.[11] One way to understand this apparently low probability is that a SARS patient was unlikely to infect every person that he or she would meet each day. In fact, roughly speaking, he or she would likely infect one such person approximately every ten days. Another way to understand this low probability is to observe that the SARS epidemic started in Guangdong in December 2002, and by March 2003, more than 100 days had elapsed, enough time for approximately fourteen rounds of secondary and higher-order infections (assuming an incubation period of 7 days).

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[10] It is important to emphasise that this probability applies only to an ordinary, everyday environment. The probability is obviously going to be different in a hospital setting.

[11] This is the output from a computer simulation model. However, we do not wish to convey a false sense of accuracy. We shall use 0.1 as an approximation.

The number of infections would grow in a combinatorial manner because of secondary, tertiary and higher-order infections. If the SARS virus were infectious to the degree that an infected SARS patient would infect one potential patient a day after the incubation period, and the patients he or she infected would in turn infect one potential patient a day after the incubation period, and so on, there would have been an astronomically large number of SARS patients, including the entire population of China, by March 2003. Since this was not the case—the ultimate cumulative total number of SARS cases was 8,098 worldwide[12]—the transmission probability must be significantly less than one per day.

It turned out that 0.1 per day was the estimated "natural" transmission probability for the SARS virus that managed to fit the empirical data on newly confirmed SARS cases at the beginning of the SARS epidemic satisfactorily. On this basis, Lau was able to predict that the transmission of the SARS virus would be limited, and that the number of newly identified cases would fall to zero with proper precautions, which would then signal the beginning of the end of the SARS epidemic.

Based on the same model used by Lau during the SARS epidemic, the number of additional patients that an <u>unidentified</u> coronavirus-infected patient is likely to infect each day, in an ordinary everyday environment, may be estimated to be approximately 0.45, assuming that the potential patients do not take any special precautions.[13] A value of 0.45 implies that an unidentified coronavirus patient would infect, on average, 0.45 person each day. If the infected patient remains unidentified until the end of the 14-day incubation period, he or she would be expected to have infected directly 6.3 persons over the 14 days (0.45 times 14). It is not a small number. In addition, there is also the possibility of secondary infection, that is, the 0.45 newly infected individual each day would infect in turn another 0.45 individual each day, resulting in a net additional infection of an expected 0.20 (=0.45 times 0.45) individual, each day. This is an even smaller number, but multiplied by 13,[14] it gives an expected 2.6 secondarily infected patients, each of whom would in turn, infect another 0.45 patient per day.

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[12] According to the World Health Organization.

[13] These probabilities were approximately estimated using iterative, trial and error methods and based on data on actual city-specific daily numbers of newly confirmed cases.

[14] Since the newly infected patient can start infecting only on the second day.

The total number infected will continue to grow as long as the infected individuals are not identified and isolated.[15]

However, despite the challenging "natural" transmission probability, control efforts and proper precautions on the part of the general public appear to be steadily and successfully reducing actual transmission rates to a manageable level. We hasten to add that neither one of the authors has any medical knowledge and this tentative finding is based entirely on a statistical analysis of the empirical data on newly confirmed cases within specific areas such as Wuhan.

We believe that the daily numbers of newly confirmed cases in Hubei and Wuhan are large because many infected patients there were not identified for two months or longer, during which they were free to infect others, and the infected others would infect still others after their respective incubation periods continuously. The numbers are large not so much because of a large probability of transmission of the coronavirus but because of a very large pool of existing unidentified infected patients who have been free to infect others.
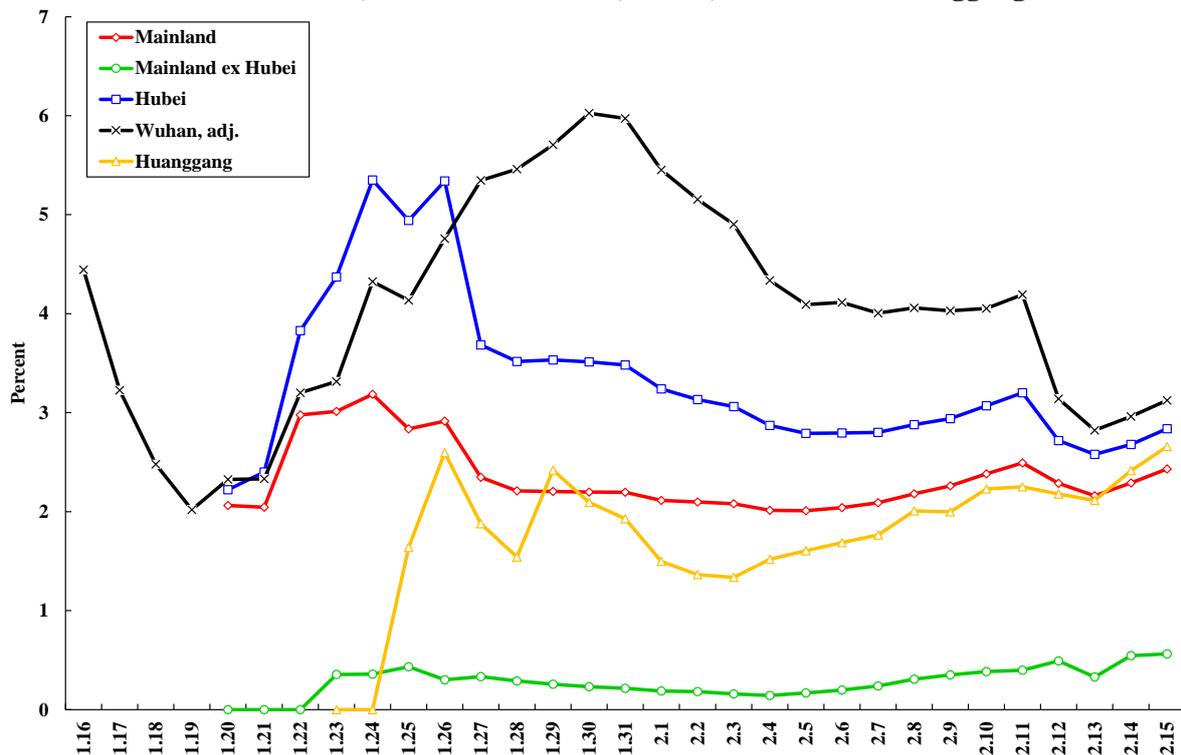
However, there are several major differences between the SARS epidemic and the COVID-2019 coronavirus epidemic. First, the incubation period of the coronavirus is approximately 14 days, compared to the 7 days of the SARS virus. Second, the mortality rate of the coronavirus seems to be much lower, less than 3 percent, compared to the 10 percent of the SARS virus (see below). Third, the COVID-2019 coronavirus appears to be more easily transmissible than the SARS virus, with the current cumulative total number of confirmed cases worldwide of approximately 70,000 already exceeding eight times of the total number of SARS cases of 8,098. What this means is that while the coronavirus is less deadly, it will be much more widespread. This is also borne out by our empirically estimated probabilities of transmission of the SARS virus of 0.1 and the COVID-2019 coronavirus of 0.45. Ultimately, the cumulative total number of confirmed cases of the coronavirus may rise to around 100,000 before the epidemic is over.

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[15] But the next round will result in a relatively small net addition of infected patients, of approximately 0.09 (0.20 times 0.45) each day.

The Mortality Rate of the COVID-2019 Coronavirus is Low

The mortality rate of the coronavirus is actually not that high, and that is another reason for not needing to panic. Thus far, the deaths caused by the virus are concentrated among high-risk groups such as older people and people with pre-existing health conditions. In Chart 5, the instantaneous cumulative mortality rates, defined as the cumulative number of deaths attributable to the coronavirus to date divided by the cumulative total number of confirmed cases to date, are presented for the Mainland as a whole, Mainland ex Hubei, Hubei, Wuhan and Huanggang over time.[16] It is readily apparent that there is an order of magnitude difference between the mortality rates of Hubei and its cities on the one hand and the rest of Mainland China, represented by Mainland ex Hubei, on the other. At its peak, Wuhan has a mortality rate of over 6 percent; in contrast, the highest mortality rate for Mainland ex Hubei was 0.56% on 15 February 2020, compared to 2.84% for Hubei on the same date.

Chart 5: The Instantaneous Cumulative Mortality Rates:
The Mainland, Mainland ex Hubei, Hubei, Wuhan and Huanggang
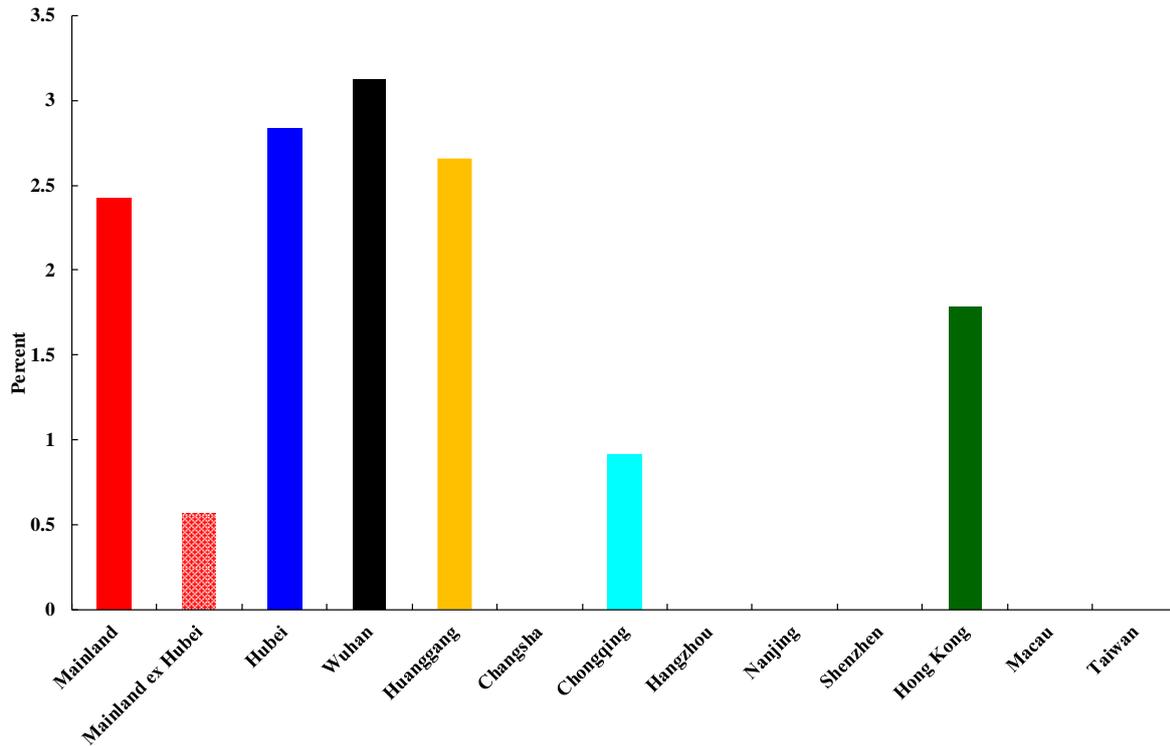

Sources: Same as Chart 1

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[16] This mortality rate may under-estimate the true mortality rate since there is a time lag between the confirmation of a case and the death of the patient. Thus, when the number of newly confirmed cases stops growing, the instantaneous cumulative mortality rate is likely to rise for a period of time.

Chart 5 shows that the mortality rates of the coronavirus have been declining from their peaks after initial steep rises, even for Wuhan. However, the steep drop in the mortality rates on 12 February in Hubei, and in Wuhan in particular, can be attributed exclusively to the steep rise in the cumulative total number of confirmed cases in Hubei and Wuhan on that same date discussed earlier. It is expected that the mortality rates of Hubei and Wuhan will rise gradually over time but should fall short of its previous highs. As the daily numbers of newly confirmed cases begin to fall, the mortality rates may rise again. But the availability of medical care in Hubei and in Wuhan has also vastly improved recently so that the cure rates should be expected to go up, keeping the mortality rates down.

In Chart 6, the instantaneous cumulative mortality rates of Mainland China, Hubei, and selected areas inside and outside Hubei as of midnight of 15 February 2020 are presented. Nationwide, cumulatively as of midnight of 15 February, there have been 1,665 deaths out of 68,500 total confirmed cases, resulting in a national mortality rate of 2.4%. However, the overwhelming bulk of the deaths attributable to the coronavirus has occurred in Hubei, with 1,596 deaths out of 56,249 total confirmed cases, resulting in a provincial mortality rate of 2.8%. In the whole of the rest of Mainland China, the cumulative total number of deaths is 69, out of 12,251 confirmed cases, implying a mortality rate of 0.56%, or approximately one-fifth of the mortality rate of Hubei. Among our five selected major cities, five deaths due to the coronavirus have been reported in Chongqing. In the other four cities, no death has been reported. There have been only four reported deaths outside of the Mainland, one each in Hong Kong, France, Japan and the Philippines, out of a cumulative total of 686 confirmed cases outside of the Mainland (Hong Kong: 56; Macau:10; Taiwan:18; and foreign countries: 602), resulting in a mortality rate of 0.6%. These rates are all much lower than the 10 percent mortality rate of the SARS virus. As a comparison, the mortality rate of flu-like illnesses and pneumonia in the U.S. in the current season is around 7 percent.[17]

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[17] According to Charles C. Bailey, M.D., reported in https://www.healthline.com/health-news/dont-freak-out-about-the-coronavirus-just-yet, 06/02/2020.

**Chart 6: The Mortality Rates of the Coronavirus as of midnight of 15 February 2020:
The Mainland, Mainland ex Hubei, Hubei and Selected Areas Inside and Outside Hubei**
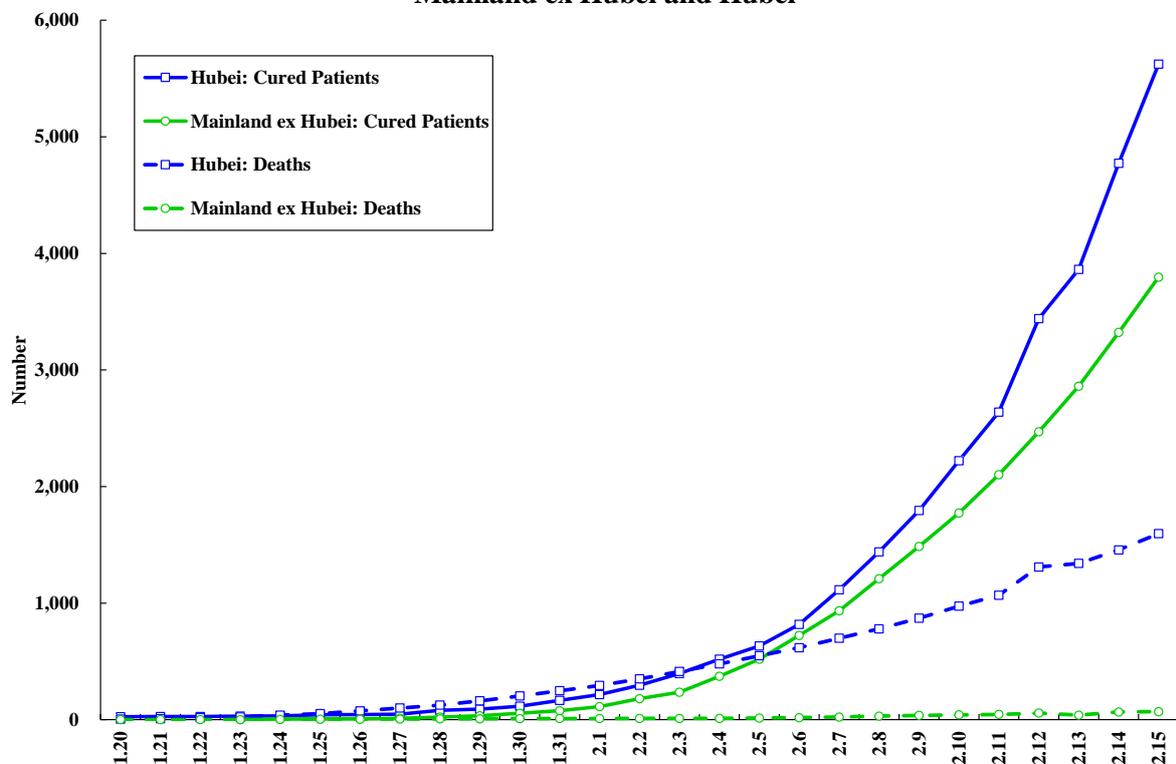

Sources: Same as Chart 1

Moreover, the large disparity between the Hubei mortality rate of 2.8% and the Mainland ex Hubei mortality rate of 0.56%, as well as the relatively low mortality rate outside the Mainland of 0.6%, show that with proper medical care, the mortality rate of the coronavirus is quite manageable and most coronavirus patients can be successfully treated. Proper medical care has been generally available on the Mainland and elsewhere except in Hubei because of its very large number of both confirmed and as yet unidentified cases. The mortality rate of Hubei is expected to come down significantly in the next couple of weeks as medical care becomes much more available and new hospitals have come into service there. Hong Kong has a relatively high mortality rate of 1.8 percent because of its relatively small number of cumulative total confirmed cases (56 as of midnight of 15 February) and only one death. There is definitely no need to over-react and panic if proper medical care is available.

The Rise in the Daily Number of Cured Cases

In Chart 7, the cumulative total numbers of coronavirus patients cured and deaths due to the coronavirus are presented separately for Mainland ex Hubei and Hubei. It is clear that the cumulative total numbers of cured patients have been rising rapidly, and much more so than the cumulative total number of deaths. The cumulative total number of coronavirus patients cured on the Mainland as a whole has risen to 9,419, and far exceeds the cumulative total number of deaths caused by the coronavirus, 1,665, as of midnight of 15 February.

Chart 7: The Cumulative Total Numbers of Cured Coronavirus Patients and Deaths: Mainland ex Hubei and Hubei

Sources: Same as Chart 1.

Chart 7 shows that even though the numbers of cured patients in Mainland ex Hubei and Hubei follow more or less the same trajectory, the numbers of deaths due to the virus are strikingly different, reflecting the different conditions between Hubei and the rest of the Mainland. With the improved availability of medical care in Hubei, the increases in the daily number of deaths attributable to the coronavirus in Hubei should begin to moderate and decline, but it will take some time.

Different cures from Germany, Thailand and the U.S., including "remdesivir" of Gilead Sciences, and of course from China itself, have proved to be effective against the coronavirus. When there is a known effective treatment, there is really no need to panic. The tide has turned.

Concluding Remarks

Can the COVID-2019 coronavirus epidemic be controlled? The answer is a qualified yes. As we have shown, the probability of transmission of the coronavirus is not high, especially with potential patients taking proper precautions. Moreover, the mortality rate is low, given proper medical care and the availability of special drugs and treatments. Thus, in Mainland ex Hubei, and outside of Mainland China, the epidemic should be quite controllable, through identification, isolation and treatment of the infected patients and through the exercise of proper precautions to avoid infection by others, especially given the lock-down and sealing-off of the cities in Hubei since 23 January 2020. This includes Hong Kong, Macau and Taiwan and the twenty-five foreign countries to which the coronavirus has spread.

However, for Hubei, the situation is slightly more problematic, because there may still be a large number of as yet unidentified infected coronavirus patients. The first coronavirus case in Wuhan was reported in early December 2019 and the pool of infected patients grew unchecked through repeated secondary infections for almost two months. However, the closing of the cities in Hubei and the lockdown, coupled with vastly improved availability of medical care should help to reduce the new infection significantly in a relatively short period of time.

What measures should be taken? The answer is identification, isolation and treatment of all of the infected patients as soon as possible and for the public to take every precaution to avoid secondary transmission. The key is to minimise and prevent the occurrence of new infection.

When will it all end? The daily number of newly confirmed cases for the Mainland and for Hubei (including Wuhan) has begun to decline, even under the new expanded definition. It is expected to be in the hundreds by the end of February and essentially reach zero some time before the end of March. However, reaching zero newly confirmed cases alone does not imply that the epidemic is completely over. It simply means that the cumulative total number of confirmed cases is no longer growing, but there will still be tens of thousands of coronavirus

patients that have to be treated. Yet it is a huge step forward. It means the coronavirus will no longer be spreading. We are reasonably confident that effective treatment will be found and that the vast majority of the coronavirus patients will eventually be cured.

Now that the virus has spread beyond China, potential unidentified patients can in principle come from almost anywhere, and not just from the Mainland. Even if the whole of the rest of the world closes its border completely to China, it will not by itself stop the increase of new coronavirus patients in the respective areas because of the possible existence of as yet unidentified patients there. The proper way to deal with the possible spread of the coronavirus is for all people to take precautionary hygienic measures to make it impossible for transmission from unidentified patients to occur. We cannot over-emphasise the importance of all of us taking all necessary precautions to avoid infection--if and only if everyone can be properly cautious, there should be no new infected patients, and we would be able to stop the epidemic.

In time, hopefully soon, vaccines will be developed for the coronavirus and its variants. However, perhaps we should continue with our new behavioral and hygienic norms so as to avoid other similar infectious outbreaks in the future. And the Chinese Government and other governments around the world should take decisive actions to ban wild life markets, the source of both the SARS virus and the COVID-2019 coronavirus, permanently.[18]

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[18] As President Xi Jinping of China urged in a recent speech.