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# COVID-19 pandemic in China: Context, experience and lessons

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## ARTICLE INFO

### Article history:

Available online 27 August 2020

### Keywords:

COVID-19

China

Policy

Technology

Impact

## ABSTRACT

The first cluster of COVID-19 cases was reported in Wuhan, China on December 29th, 2019. Since then, China has experienced a pandemic of COVID-19. Objective: This study aims to present the context in which the pandemic has evolved, the government's response and the pandemic's impact on public health and national economy. Methods: A review was conducted to collect relevant data from press releases and government reports. Results: COVID-19 poses a major public health threat on China with a cumulative number of cases over 89,000 (data cut-off date: August 9th, 2020). Between January and February 2020, China implemented a series of escalating policies (including a stringent nation-wide lockdown) to combat the pandemic. Therefore, it has been to a large extent limited to the Wuhan region. Social media such as WeChat and SinaWeibo played a crucial role in disseminating government information and public campaigns during the pandemic. Technologies were adopted to enable contact tracing and population travel patterns. The Chinese central government mobilized healthcare resources including healthcare personnel and medical materials to Wuhan in a highly effective way. Both central and regional governments launched financial policies to stimulate the economy, including special loans, tax extension, reduction or waiver. Nevertheless, the economy in China was significantly impacted especially during the lockdown period. Conclusions: China has responded to the COVID-19 epidemic in a highly centralized and effective way. Balancing the needs to prevent a future pandemic and to boost economic recovery remains a challenge.

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## Introduction

On December 29th 2019, a cluster of four novel coronavirus-infected pneumonia cases were reported in Wuhan, China [1]. The World Health Organization (WHO) officially named this disease COVID-19. Within a few weeks, China experienced an exponential development in the number of infections with a peak of 3893 new cases reported on February 5th 2020 [2]. On January 23rd 2020, the Chinese government implemented a stringent lockdown of Wuhan city, followed shortly after by other areas. Since mid-March the incidence of COVID-19 has been below 100 cases per day, with the majority of such cases being “imported” from other countries [3]. Today, China has gradually relaxed the measures within the country but has kept its borders shut. In the meantime, COVID-19 has developed into a global pandemic with a tremendous impact. Before the availability of an effective vaccine(s), COVID-19 would most likely coexist with the human society.

There is no single global strategy against this pandemic. For example, some countries rely on “Hammer” measures such as (almost) complete lockdown, mandatory school closure, among other measures; other countries adopt “Dance” strategies by promoting social distance, wearing face masks, etc. Since we still are in the middle of this pandemic, it is crucial to view these measures in the context of each country.

The objective of this study is to present, in the context of China, how the pandemic evolved, the government's response over time, and its impact on population health and national economy. In Section 2, we give a description of the Chinese society from a population and healthcare system point of view; Section 3 summarizes the COVID-19 epidemiological dynamics in China, followed by an overview of policy and technology roadmap in Section 4 and the healthcare system response in Section 5. In Section 6, we examine the economic and financial fluctuations in China during the pandemic. At the end we draw conclusions and provide policy implications.

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## Country description

### Economy and society

China is the world's second-largest economy with a nominal gross domestic product (GDP) of 99 trillion CNY (14.15 trillion USD, exchange rate on July 16th, 2020) in 2019 [4]. It has a population of 1.4 billion, which represents almost 20% of the world's population [4]. As a result of rapid urbanization in the past decades, 0.85 billion (60.60%) of the Chinese population reside in urban areas [4]. Population density in China is high (148.35/km<sup>2</sup>), especially in urban areas [5].

China is aging faster than most of the low- and middle-income countries, with 12.6% of its population above 65 years old in 2019 [4]. Old-age-dependency ratio was reported to be 16.8% in 2018 [6]. Multigenerational life is common among Chinese households, largely due to cultural and financial reasons [7].

### Health

Life expectancy at birth was 76.7 years old in 2018, which was lower than the Organisation for Economic Co-operation and Development (OECD) average of 80.7 years. [8,9] Certain unhealthy life-style behaviours such as alcohol and tobacco consumption are still prevalent. It was reported in 2017 that on average an adult consumed more than 7 litres of alcoholic drinks throughout the year [10]. According to the 2018 Chinese Adults Tobacco Survey Report, approximately 26.6% of Chinese adults were “current smokers” [11].

Chronic diseases accounted for 86.6% of all deaths in China in 2019 [12]. Cardiovascular disease, cancer and chronic respiratory disease were the three leading causes of death [12]. Life-style diseases are widespread: the prevalence of diabetes was estimated to be 12.8% (equal to 129.8 million population) in mainland China in 2019. Associated with outdoor air pollution, respiratory disease has become an enormous threat to the Chinese. Chronic obstructive pulmonary disease and asthma have a prevalence rate of 13.6% and 4.2%, respectively [13]. Lung cancer is the most common cancer type (with age-standardized incidence rate of 36.71 per 100,000 population in 2014 [14]) and the leading cause of cancer mortality in China [15].

### Health system overview

China is a highly centralized country. The central government is empowered to enable country-wide resource re-allocation in various circumstances. On the national level, the health authority, namely the National Health Commission (NHC), has a broad scope of responsibilities including national health policy, public health, healthcare service provision and health emergency management. Other ministerial authorities, such as National Development and Reform Commission, Ministry of Civil Affairs and National Healthcare Security Administration, collaborate with the NHC by fulfilling their duties in planning, funding and insurance management in the health system. The Chinese health system consists of four levels, including national, provincial, municipal and county-level authorities [16].

The total health expenditure (THE) of China has increased dramatically in the past decades, with a 27.4 folds increase from 1995 (215.51 billion CNY, equals to 30.79 billion USD) to 2018 (5912.2 billion CNY, equals to 844.59 billion USD). In the meantime, THE as a percentage of GDP has increased from 3.51% to 6.57% [17]. In 2018, health expenditure per capita was 4237 CNY (605.6 USD) [17]. Tax-based governmental funding, social health insurance and private out-of-pocket payment are the three main

**Table 1**  
Healthcare resource in China (per 1000 population) [17].

	Number of hospital beds	Number of doctors	Number of nurses
Urban area	8.70	4.00	5.08
Rural area	4.56	1.80	1.80

sources of healthcare financing, representing a contribution of 27.7%, 43.7%, and 28.6%, respectively [16].

The Chinese healthcare insurance system has the main characteristics of social health insurance. In the past two decades, China has established an universal health insurance system with social health insurance as the basis, supplemented by private health insurance and other social schemes for specific vulnerable groups (e.g. low-income population, disabilities, etc.). The three social health insurance schemes, namely Urban Employee Basic Medical Insurance (UEBMI, representing 23.56% of the covered population), Urban and Rural Residents Basic Medical Insurance (URRBMI, representing 66.74% of the covered population) and New Rural Cooperative Medical Scheme (NRCMS, representing 9.67% of the covered population) are jointly financed by individuals, employers (if relevant), and the government. The three schemes covered more than 95% of the population in 2018 with an average reimbursement rate of 70% [18,19].

Healthcare facilities in China consist mainly of hospitals (providing emergency care and in- and outpatient services), clinics (providing outpatient services) and public health institutes (infectious disease control). Hospitals, even public ones, were funded by a mixture of government subsidies (10%) and service-based revenues (90%) in 2018 [20]. Since the outbreak of severe acute respiratory syndrome (SARS) in 2003, the Chinese government has strengthened financial support to public health institutes in terms of infrastructure, capacity building, and public health service delivery. Nowadays, all public health institutes are fully funded by the government. Private investment in the healthcare market is encouraged and supported by the government. In 2018, private hospitals took a share of 60.4% among all hospitals in China [17]. However, public hospitals were overall larger in scale and provided 79% of sickbeds in the country [17].

In 2018 there were 997,433 healthcare facilities, 6519,700 hospital beds, 3607,156 doctors and 4098,630 nurses in China [17]. According to a survey conducted by the Chinese Society of Critical Care Medicine, intensive care unit (ICU) beds took a share of only 1.65% of all hospital beds nationwide, which meant 3.43 ICU beds per 100,000 population [21]. Healthcare resources are concentrated in urban areas and scarce in rural ones. Overall, the healthcare resource level (excluding nurses) in urban areas is comparable to that of OECD countries (Table 1)[9,17].

A general practitioner system has been gradually set up in the past few years. The number of general practitioners reached 308,740 at the end of 2018 [17].

## COVID-19 trends

### Overview of data and data availability

Since January 23rd 2020, the COVID-19 epidemiological data has been released daily by the NHC and by some regional health authorities with relatively high incidence (e.g. Wuhan and a few other cities in the Hubei Province). Daily provincial data release by some provincial health authorities followed shortly after since the majority of cities in China launched Public Health Emergency Response Level II and/or above. Municipal-level data release was not consistent across the country: the decisions on whether data was to be released as well as on the frequency of data release were

largely made at a city-level. Data was published on government websites and widely disseminated by various social media channels such as WeChat (similar to Facebook) and SinaWeibo (similar to Twitter).

Published data generally included the number of suspected cases, confirmed cases, COVID-19 related deceased cases, cured cases and active cases (the latter is the number of cured and deceased cases subtracted from that of confirmed cases). Information regarding ventilator use, hospitalization and ICU use was not reported.

So far, there have been three data correction rounds (on February 13th, February 23rd and April 16th) to remove double counting, missed reporting, and statistical errors. For example, on April 16th, the number of cumulative confirmed cases was corrected to 50,333 (instead of 50,008 as originally reported), the number of cumulative deceased cases was corrected to 3869 (instead of 2579) and the number of recovered cases was corrected to 46,335 (instead of 47,300) in Wuhan. Details of data correction were not published.

According to all seven versions of clinical guidelines published by the NHC, suspected cases were defined based on contact history and symptoms (with minor variations across different versions). Confirmed cases were defined based on confirmed pathogen among suspected cases. When interpreting the epidemiological data, it is important to note a major change in the definition of confirmed case, which took place in the week between February 12th and 19th. During this week, suspected cases with image-confirmed pneumonia were reported as confirmed cases regardless of the results of pathogen tests [22–24].

There has been no official definition of COVID-19 related death in the reported data so far. It is not known whether the definition was a death resulting directly or indirectly (or both) from an infection of COVID-19. Furthermore, it is also unclear what data correction procedures took place to deal with the data during the week when the definition of confirmed cases changed.

### Epidemiological data

Fig. 1A shows the daily number of newly confirmed cases in China since Jan 23rd 2020. Due to the above mentioned reasons, the peak of this curve (the period between February 12th and 19th) was mainly driven by the different diagnostic criteria and cannot be directly compared with the other data points. On February 5th, 14 days after lockdown in Wuhan, the number of daily new confirmed cases reached its peak, followed by a slow but steady decrease [24,25]. Since mid-June, a few local outbreaks were reported in various cities, including Beijing [Xinfadi outbreak]. These outbreaks were controlled in a timely manner with relatively small number of daily newly diagnosed cases.

There was a substantial difference between the Wuhan region and the rest of China in terms of the pandemic's severity. Wuhan, a city with a population of 11 million [26], was without doubt the center of the pandemic and a key driver to the total number of new confirmed cases nationwide (Fig. 1B). During the peak period, Wuhan reported 1985 (7.7/100,000 population) daily new confirmed cases on February 7th 2020. The rest of China reported 1993 (0.14/100,000 population) on February 3th 2020 (Fig. 1B and 1C) [24,25].

Fig. 2 shows the cumulative number of deceased, recovered and confirmed cases in China since Jan 23rd 2020. The number of cumulative confirmed cases has reached over 89,000 with 50,344 cases in Wuhan alone (Fig. 2B, cut-off date August 9th, 2020) [24,25].

The number of new confirmed cases has been low in China since mid-March. In the meantime, COVID-19 has become a global pandemic. Import of active cases from abroad has been a threat to China since March 4th (Fig. 3). Stringent measures have been

implemented both to restrict the inflow or by overseas cases and to control the spreading. Imported cases were first identified mainly in port cities such as Beijing and Shanghai. Then later in a few northern cities on the Russia-China border.

COVID-19 related hospitalization, ventilator use, and ICU use were only reported in a few scattered reports in China. It was reported that COVID-19 caused 19,425 hospitalizations (24.5 per 10,000 adults) in Wuhan by mid-February, among which 9689 (12.2 per 10,000 adults) were in serious condition and 2087 (2.6 per 10,000 adults) with intensive care use [27].

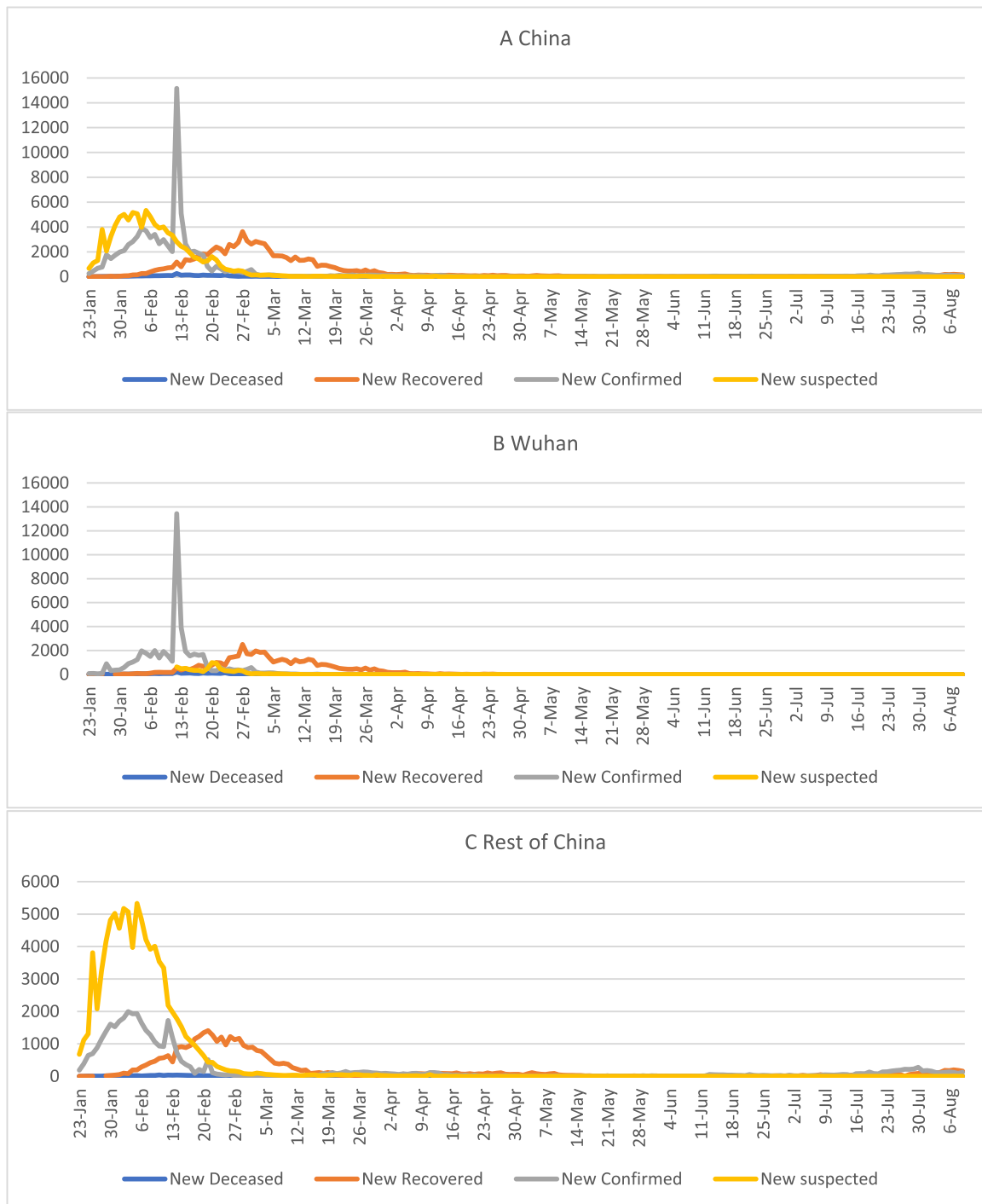
Stratified epidemiological data by age or by occupation was not routinely reported. According to a retrospective study published by the Chinese center for Disease Control and Prevention (CDC), 31.2% of cases were above 60 years old [28]. Compared with other age groups, patients between 50 and 60 years old reported the largest share of confirmed cases (22.4%). Patients in the age group of 70 – 80 reported the highest mortality (30.5% of all deceased cases). Healthcare personnel was also reported as a high risk group [28].

### Policy and technology road map

China has launched a series of measures to control the epidemic since mid-January 2020. The measures were somewhat distinguished between Wuhan (and Hubei Province, of which Wuhan is the capital city) and the rest of China. We select Shanghai as a representative city for the rest of China because it is one of the largest cities in the country and it has been traditionally a leading city in many public health emergencies. An overview of nationwide measures, measures in Wuhan, measures in Shanghai, together with some key epidemic events and milestones, is presented in Fig. 4.

So far, China has experienced three major stages in dealing with COVID-19:

- Stage 1: Public health recommendations to contain COVID-19 transmission. On January 20th, the Chinese CDC and its local branches launched a series of public campaigns promoting hand washing (when and how to wash hands), face mask outside home and stay at home. At this stage, all measures were recommendations only.
- Stage 2: Stringent interventions. Since January 22nd, China has implemented many hard measures, which were escalated quickly during the week of the Chinese New Year (January 24th to 31st) and the following weeks. These measures were initiated and enforced by national, provincial and municipal cross-functional public health coordination workforces, which consisted of health authorities, local CDCs, traffic authorities, community workers, police and even the army (especially in Wuhan). All measures were announced in the format of government announcement and mandated with legal consequences in case of violation.
- Wuhan: On January 22nd, Hubei Province launched Public Health Emergency Response Level II (for major public health event). Contact trace was mandated on the same day with door-to-door visits and enquiries of community workers. Within two days, on January 24th, the Public Health Emergency Response Level II was escalated to Level I (the highest level for extreme public health events). This means that measures against this epidemic were coordinated on the central level and cross-regional health resource reallocation was legitimized. One of the major measures was to impose a mandatory lockdown of Wuhan on January 23rd. Both entering and exiting the city were forbidden. All public transport was shut down within the city. All public facilities were closed, except supermarkets, hospitals, and petrol stations. Use of the available public facilities was strictly controlled as well. During the most stringent



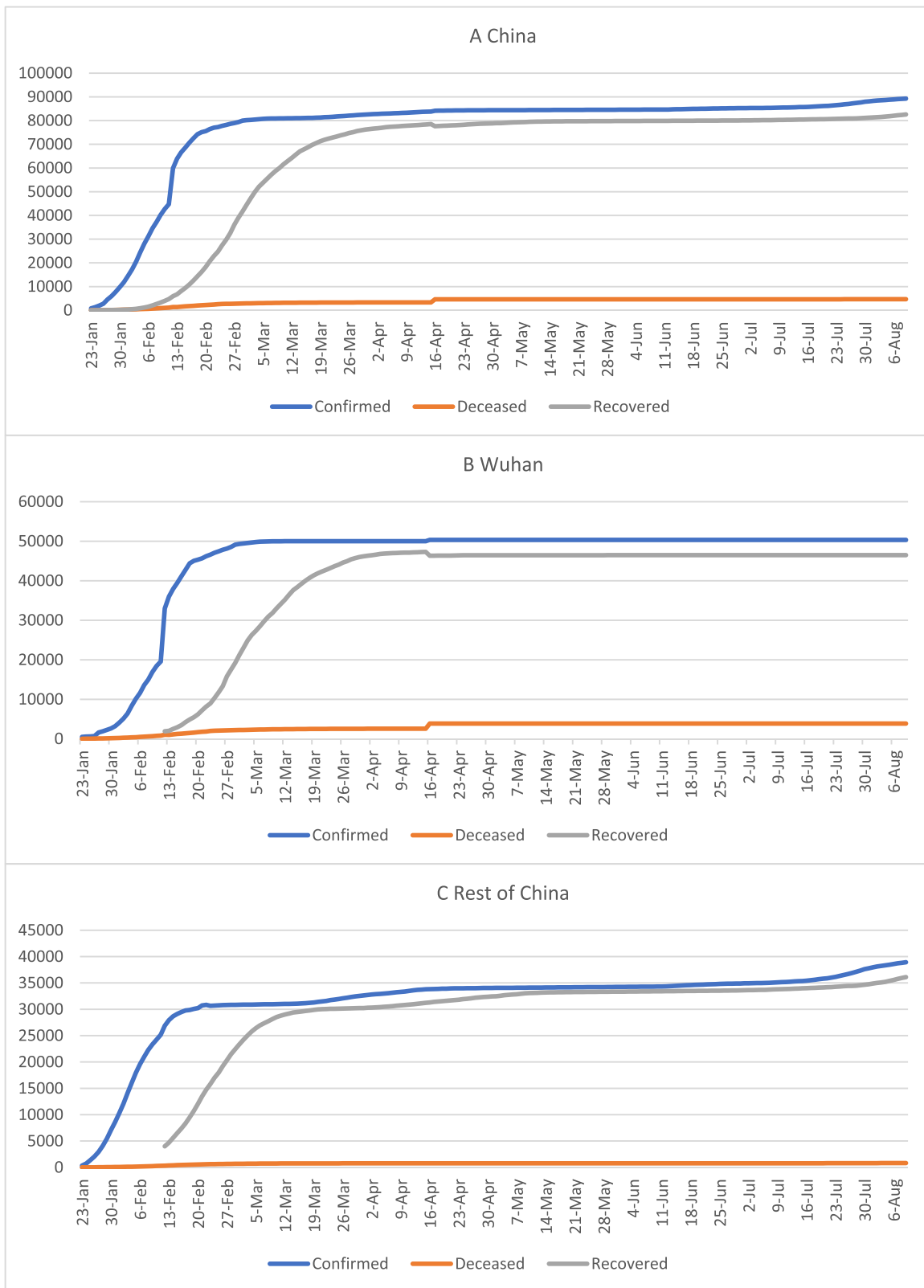
**Fig. 1.** Number of newly decreased, recovered, confirmed cases per day in China [24,25] and by region [27].

Note: 1. On January 27th and 28th, data regarding newly recovered in Wuhan and the rest of China is unavailable. 2. Between February 12th and 19th, the authority adopted a loose definition for confirmed case compared to the other time points. This leads to a sudden increase of newly confirmed cases in Wuhan during this week. 3. The number of suspected cases was reported in Wuhan starting from February 12th.

weeks, only one person per household was allowed to do grocery shopping once every three days. Similar restrictions were quickly mandated in all 15 cities of Hubei Province within 2 days, affecting a total of 57 million population. The Chinese New Year's holiday was transformed into a quarantined period and was extended according to the government's orders. Under those instructions, all non-essential companies, retails, parks and schools remained closed until mid-March. A more stringent community-level (Xiaoqu) lockdown was enforced in

Wuhan on February 11th in the urban area and later extended to the rural area on the village-level on February 16th. During the lockdown, residents could enter and/or exit the communities/villages only in case of absolute necessity and health inspections were mandatory.

- In other areas, similar measures were enforced but to a less extent and for a shorter period. For example, no mandatory lockdown was enforced in Shanghai. Instead, health declaration and body temperature inspections were mandated at all



**Fig. 2.** Cumulative number of decreased, recovered and confirmed cases in China [24,25] and by region [27].  
 Note: 1. Before February 12nd, data regarding recovered cases in Wuhan and the rest of China is unavailable; 2. On April 16th, confirmed, deceased and recovered cases were revised in Wuhan.



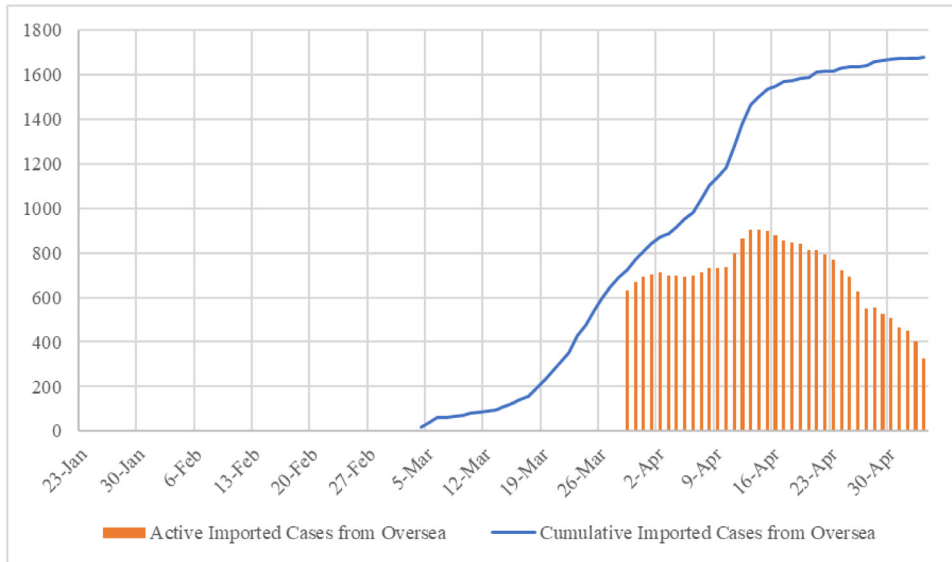


Fig. 3. The number of cumulative and daily imported cases from overseas in China [25].

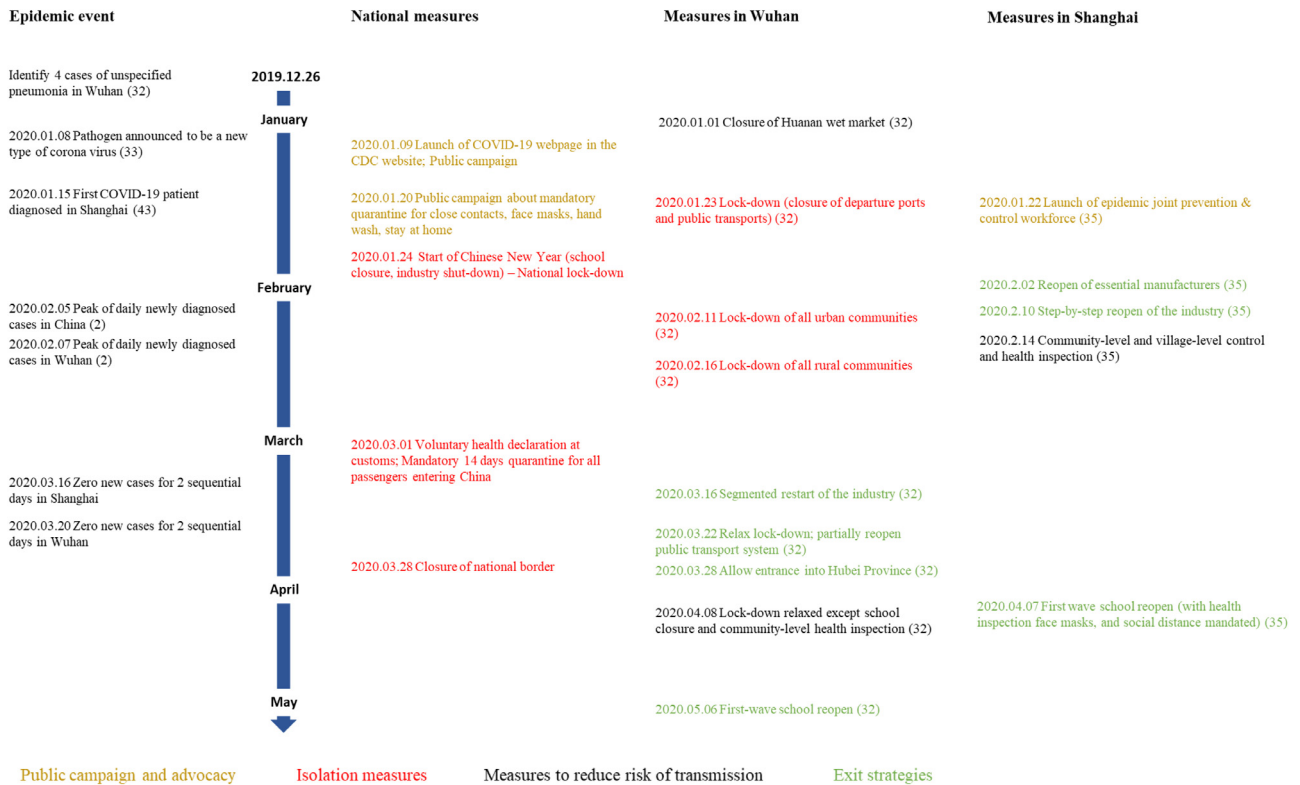


Fig. 4. Measures against COVID-19 pandemic in China.

major transportation ports (e.g. airport, railway station, coach station, high-way entrance port). A real-name system in public transport (except bus, metro and taxi) has been implemented in China for decades. Together with information dissemination on social media, contact tracing of travelers was enabled and implemented even before the report of the first case in Shanghai. As a mandatory measure, exits and entrances to communities and villages were under control (to a less extent compared to those in Wuhan). Similar to Wuhan, the government announced closure of schools and all non-

essential companies, non-essential public transports, retails and parks.

- Stage 3: Careful exit. China has removed the restrictions step by step since the second half of March, starting from areas with low incidence rate during the pandemic and later in the Wuhan area. Implementation of minimal social distance in China has been recommended, but not mandated largely due to the high population density in the urban areas.

The above-mentioned measures were enforced/implemented with the support of technologies:

- Information dissemination via social media, such as WeChat and SinaWeibo. The majority of the Chinese are active users of WeChat (1.1 billion active users [29]) and SinaWeibo (0.47 billion active users [30]). These platforms, especially WeChat, not only allow users (individuals and public/private organizations) to communicate and disseminate information, but also carry functions as mobile pay. China is currently almost a cash-free country with the widely use of such mobile payment methods [31]. With the large number of active users, WeChat is one of the main information portals in China. The majority of public campaigns were launched on these two platforms. All government orders were announced through official accounts on these platforms. In addition, Baidu launched a COVID-19 epidemic map that released daily updates of the epidemiological data in China and in each province, based on data from the NHC.
- Use of big data to track and disseminate population mobility information. For example, one of the major navigation service providers, Baidu map, launched a function named “immigration monitor”, which is a live monitor of the number of commuters between cities. This data played an alerting role to the local CDCs. Baidu map and Tenggong map launched “COVID-19 around you” - a function allowing users to check the epidemical data in their own communities and those around them using real-time location identifier. Gaode map launched “Metro passengers traffic load” function in Beijing. Supported by the Transportation Committee of Beijing, this function provides real-time traffic load information (with color index) so that metro passengers could choose to take a less busy metro line or cabin.
- Use of “Health code” (a mobile app) to categorize people with different levels of COVID-19 transmission risk based on their health status, residence, travel history, and contact history. This technology is used to enhance the efficiency of conventional health inspections. “Health code” is mandatory application, which is requested at almost all public areas.
- Remote consultation. Telehealth and online consultation have experienced an explosive growth during the past few months. On February 28th, 2020, the central government issued a directive entitled “Guideline on Expanding Internet Plus Healthcare Services in Response to COVID-19” [32]. According to the Guideline, online follow-up consultations performed by qualified online healthcare providers could be reimbursed by the basic health insurance. Online payment and door-to-door delivery of prescribed medications were also encouraged by the guideline. In January and February 2020, there were more than 10 telehealth or online healthcare providers and more than 200 public hospitals providing this service. More than 10 million consultations took place during this period [33]. In addition to online healthcare service providers, a large amount of healthcare services were provided via multiple healthcare platforms. For example, in the first half of February, AliHealth (an application provided by Alibaba) reported a daily online consultation of over 700,000 [34].

Testing has a crucial role in the control of COVID-19. Since the second half of January, NHC has published seven versions of COVID-19 Treatment Guidelines and six versions of COVID-19 Prevention Protocols [35,36]. Detection of COVID-19 nucleic acids on all suspect cases (based on travel/contact history and symptoms) has been consistently recommended. Since early April, it has been reported that the general population is allowed (but not recommended) to receive COVID-19 nucleic acids test on an out of pocket basis [37]. NHC required a maximum time lag of 24 h between testing time and the availability of testing results [38]. Unfortunately, few information was published regarding the number of tests and testing results such as the percentage of positive

testing etc. On May 10th, Wuhan government announced a campaign in the city to have all the 11 million residents tested within 10 days [39]. On June 2nd, the result of this city-wide testing was announced. Between May 14th and June 1st, 9899,828 people were tested, with zero confirmed diagnosed patient and 300 (0.303/10,000 population) infected people with no symptoms [40].

China’s Ministry of Finance (MoF) has implemented a series of measures to support the healthcare sector and other industries during this epidemic. The main measures can be categorised into two groups:

- Designated subsidies to support the healthcare sector during the pandemic. Between Jan 23rd and February 2nd 2020, a total amount of 15.7 billion CNY (2.24 billion USD) subsidy was transferred from the central government to Hubei Province [41]. This designated subsidy was used to cover costs of treatment of COVID-19 patients, procurement of medical equipment and materials, construction of new hospitals and financing community-level public health services related to the pandemic. On the regional level, a total amount of 145.2 billion CNY (20.8 billion USD) was reserved for dealing with COVID-19 since the beginning of the pandemic, with around 70% released by the end of April [41].
- Financial support to other industries
- Between January 29th and February 7th 2020, MoF published four announcements regarding the availability of a special loan (300 billion CNY, equals to 42.9 billion USD) for manufacturers of medical equipment and materials [41].
- Tax benefit for the industries in general. These benefits include tax extension, reduction (VAT from 3% to 1%) or even waiver (for small companies in Hubei Province), and reduction or waiver of social welfare contribution of employers [41]. It is estimated that all of these benefits would add up to around 800 billion CNY (114.3 billion USD) [41].

### Health care system response

As mentioned above, China is a highly centralized country in many aspects. With the launch of Public Health Emergency Response Level I, the central government is legitimized to respond to this pandemic in a timely and powerful way by mobilizing healthcare and other relevant resources across different regions within the whole country.

#### Healthcare service provision

Routine healthcare service was with no doubt disrupted by the COVID-19 pandemic. Reasons for the disruption varied between Wuhan (and Hubei Province) and the rest of China. Sitting at the center of the pandemic, Wuhan and Hubei Province experienced in the beginning an abrupt, heavy demand in healthcare resources, which over-loaded the healthcare system within a few weeks. In other regions, healthcare disruption was mainly caused by measures taken to prevent and control the epidemic, such as lockdown and social distancing. Between the end of January and mid-March, healthcare services (except emergency care) were largely paused.

With the development of the pandemic over time, healthcare service provision has gradually recovered. By May 15th, overall healthcare service provision reached 85% compared to the same period in 2019 (with some regions reaching 100%)[42]. Since March 20th, routine healthcare services were officially resumed in different regions according to their risk categories.

### Healthcare resources

All patients with confirmed COVID-19 diagnosis were institutionalized in China. This led to high pressure being applied on

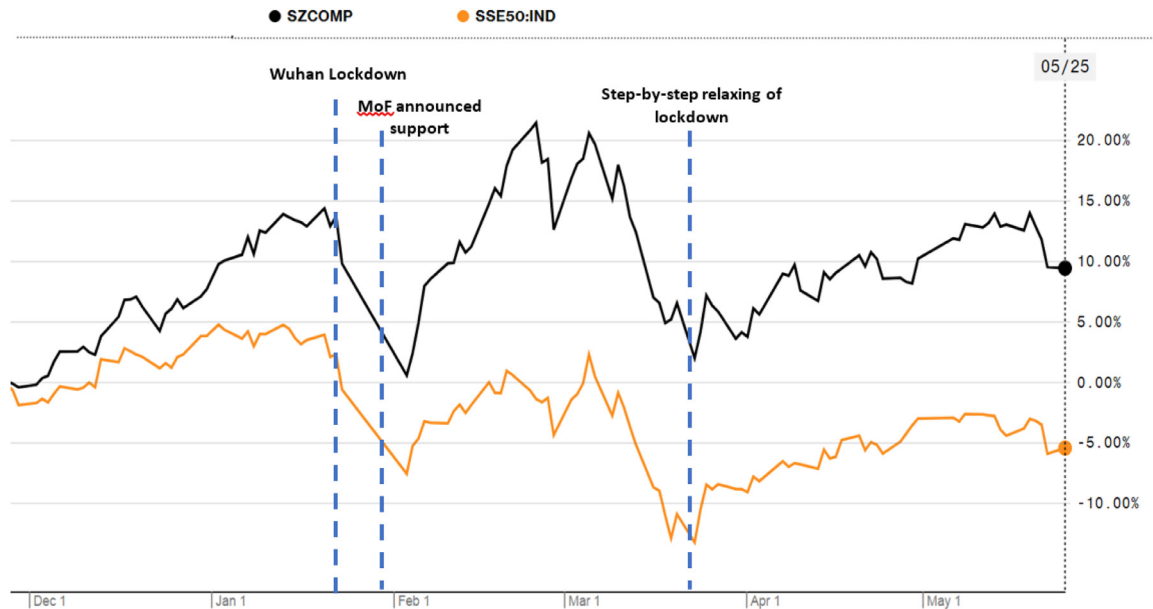


**Table 2**  
Economy fluctuation in China, first quarter of 2020 vs. 2019.

	First quarter of 2020	Vs. first quarter of 2019
Total import and export of goods[50]	6574.2 billion CNY	−6.4%
National consumer price index (CPI) <sup>a</sup> [50]	n.a.	+4.9%
Unemployment rate[50]	6.2%	+0.9%
Disposable income per capita[51]	8561 CNY	−3.9%
Consumer confidence index (CCI) <sup>b</sup> [52]	101.8 points	−1.3 <sup>b</sup>

<sup>a</sup> The price increase of food was a key driver of the increase of CPI [50].

<sup>b</sup> Compared to the 4th quarter of 2019.



**Fig. 5.** Stock market reactions to major events.

the Chinese healthcare system, especially at the beginning of the pandemic and in regions with a high number of cases (such as Wuhan).

At the beginning of February, there were 28 designated hospitals for treating COVID-19 patients in Wuhan, providing 8000 to 10,000 sickbeds. By mid-March, 42,600 healthcare professionals from other regions in China were “relocated” to Wuhan to support the local health staff [43].

By the end of February, 48 hospitals (including two newly-built hospitals specifically for COVID-19) with over 26,000 beds were designated for COVID-19 treatment [44,45]. Furthermore, temporary hospitals (Fangcang) with over 13,000 beds were setup to isolate confirmed patients with mild symptoms [45].

Over 18,000 ventilators, including 3000 invasive ones have been produced and delivered to the Wuhan region between January and early April [46]. However, the utilization of the ventilators was not reported.

Capacity to produce essential protective medical materials (face masks, protective eyeglasses etc.) substantially increased in the past months. On April 8th, China had capacity for producing 3.4 million medical N95 masks, 0.29 million medical isolation face masks and 1.5 million sets of disposable medical protective suits per day [46].

### Economic and financial fluctuation

According to a preliminary estimation of the National Bureau of Statistics (NBS) of China, the GDP in China was 20,650.4 billion CNY (2951.9 billion USD) in the first quarter of 2020, repre-

senting a decrease of 6.8% compared to the same period in 2019 [47]. The pandemic predominantly impacted traditional industries, such as tourism (−35.3%), manufacturing (−26.0%), retail/wholesale (−17.8%) and transportation/storage (−14.0%) [48]. There were also areas that experienced a growth during the pandemic, for example internet/digital-related business (+10.1%), online shopping (+5.9%), and delivery services (+3.2%) [48].

A summary of indices suggesting the macro-economic fluctuation in the first quarter of 2020 compared to the same period in 2019 is presented in Table 2.

Investor confidence dropped substantially [49]. Fig. 5 reflects the reactions of two major stock market indices in China (SSE50 and SZCOMP) to the COVID-19 epidemic.

### Conclusions and policy implications

COVID-19 posed a tremendous public health threat on China with a cumulative number of cases over 89,000 (data cut-off date on August 9th). Between January and March 2020, China took a series of escalating measures (including stringent nationwide lockdown) to combat the pandemic. As a result, this pandemic has been to a large extent limited to Wuhan and its surrounding areas. According to a model-based estimation of Prem et al., the lockdown measures implemented in Wuhan reduced the median number of infections by more than 92% (IQR 66 – 97) and 24% (13 – 90) in mid-2020 and end-2020 [50]. Based on a calculation using fatality rate and case distribution by age groups presented by Statista [51], together with an estimated life expectancy of 76.7 years at

birth in China [52], the lockdown measures avoided a lost of life years of 8291 years in Wuhan city alone.

The Chinese central government mobilized healthcare resources including healthcare personnel, medical materials and other needed resource to Wuhan in a highly effective way. There are three specific characteristics in China's approach against the COVID-19 pandemic.

- Timely and highly stringent measures. The Chinese government was able to mandate measures with huge impacts on the society in a short notice at the beginning of the pandemic and revise the measures in a relatively flexible way as the pandemic evolved. People showed high level of compliance to these measures. No single protest took place in China against the COVID-19 measures since the outbreak in January 2020. This is mainly caused by the intense public campaigns and advocacies via social media led by the government. Compliance to the measures is one of the keys to controlling the pandemic. Other countries can learn from this experience to smoothen the implementation of especially stringent measures.
- Mandatory use of tracing technologies without much restrictions. In western countries, privacy has been a major issue surrounding the implementation of tracing technologies, which has led to many debates. However, few debates regarding privacy took place in China, at least in the public domain. In the Chinese culture, life weights more over privacy. This allowed a smooth implementation of mandatory tracing. When looking at this experience, each country needs to investigate its own political and societal culture and environment to assess the potential of such measures.
- Intense use of healthcare resources in disease treatment. In principle, all patients who are diagnosed with COVID-19 are institutionalized, regardless of severity of the disease. From a clinical perspective, this is waste of healthcare resources compared to home isolation of patients with minor symptoms. However, home isolation is in practice not feasible in most urban areas of China due to people's housing conditions. In the long run, China might need to consider a more cost-effective way of treatment.

The lack of data transparency posed a major issue to data analysis and comparison with other countries. For example, none of the following information was published, including data correction procedures, definition of COVID-19 related death, utilization of ventilators and ICU beds.

For a contagious disease as COVID-19, breaking the chain of infection is without doubt the way to control the pandemic. However, measures aiming at this are not without a price. The true question is how to control the pandemic in a smart and efficient way.

Both the central and regional governments launched financial policies to stimulate the economy, including special loans, tax extension, reduction or waiver. Nevertheless, the economy in China was significantly impacted especially during the lockdown period. How to balance the needs to prevent a future pandemic and to boost economic recovery is a challenge.

#### Author Statements

#### Funding

None

#### Declaration of Competing Interest

None declared

#### Ethical approval

Not required

#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.hlpt.2020.08.006](https://doi.org/10.1016/j.hlpt.2020.08.006).

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