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Coming out of the pandemic: What have we learned and what should we learn?

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ABSTRACT

In this editorial, we reviewed the articles collected in the special issue "*Economics of Pandemic Disease*" along with other relevant literature. We found that the pandemic has had a devastating impact on the economy as a whole and on small and medium-sized enterprises (SMEs) and private firms in particular, which may have deepened the economic inequality and impeded poverty reduction in China. The pandemic also resulted in substantial damage to the mental health and well-being of the Chinese population, with a disproportionate impact on minorities, including the female and the illiterate. We also examined the available evidence regarding the effectiveness of China's policy response to the COVID pandemic, which suggested that China's zero-Covid policy succeeded in stabilizing its economy and maintaining a safe environment in earlier phases of the pandemic, but hardly achieved a balance between disease control and economic growth in the later stage when less fatal but more transmissive coronavirus variants emerged. Lastly, we discussed policy options that China may take to protect the health of its people and avoid a potentially substantial loss of lives during the transition toward the post-pandemic new normal, which include prioritizing the timely administration of effective vaccines among the elderly and vulnerable populations, improving public communications regarding when and how to seek medical help, and strengthening the surge capacity of the healthcare systems, especially in less developed regions.

1. Introduction

The ongoing COVID-19 pandemic has been considered the greatest threat to human society since the Second World War.[1] Since its outbreak, there have been 651 million confirmed cases and 6.6 million deaths reported by the WHO.[2] As pointed out in the *Lancet* Commission on lessons for the future from the COVID-19 pandemic, the catastrophic situation was largely due to massive global failures at the institutional, societal, and individual levels, including slow response to the pandemic, neglect toward the most vulnerable populations, low public trust, widespread misinformation and disinformation, and unequal access to preventive medicine

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[1] See the following webpage for details of Secretary-General's remarks to the Security Council on the COVID-19 Pandemic. https://www.un.org/sg/en/content/sg/statement/2020-04-09/secretary-generals-remarks-the-security-council-the-covid-19-pandemic-delivered.

[2] See https://covid19.who.int/?gclid=EAIaIQobChMIno2Olqae_AIVUKqWCh24qQ4cEAAYASABEgKowvD_BwE for more information.

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and treatments, particularly vaccines (Sachs et al., 2022).

As the first country to experience a COVID-19 outbreak, China was severely hit in the early phase of the pandemic: over one quarter of a million people were infected nationwide and approximately 4600 died during the first three months of the pandemic before it was rapidly brought under control with strict control measures, including lockdowns (Liu et al., 2021). Compared to most global regions, China managed to maintain substantially lower rates of infection and death as of November 2022 (Fig. 1). From a historical point of view, curbing a massive pandemic in the nation with the world's largest population has never been easy. In the past 2000 years, there have been about 300 recorded pandemics, most of which ended up with devastating death tolls (Fig. 2).

Sources: Chen (1939) and Zheng (2020).

However, the full impact of COVID-19 should not be overlooked; thus, as we approach the turning point of the post-pandemic new normal, the timing is right to ask what we have learned from the pandemic and what we should learn for the future. Questions include how the pandemic may have affected the economy and welfare of the population and what the good strategies are to maximize the protection of human health while minimizing the social and economic costs during the transformation phase. In this review, we seek answers from the collection of articles in this special issue and the relevant literature. We focus this review largely on the case of China and extend our discussion to the global context when necessary. Rather than aim to undertake an optimal control study of policies for practical recommendations, we hope this special issue facilitates a discussion of the important principles for achieving a balance between disease prevention, economic growth, and social development.

2. COVID-19 has had a severe and uneven impact on China's economy

Several articles in this issue warned about the possibility of the devastating impacts of COVID-19 on the economy as early as the pandemic broke out in 2020. Duan et al. (2021) estimated the economic impact of COVID-19 using a quarterly computable general equilibrium (CGE) model, and the simulation results predicted a decrease in China's growth rate by 3.5% in 2020 and 2% in 2021. The actual data confirmed this projection. The statistics on China's GDP growth documented a decrease of 3.7% from 2019 to 2020, slightly

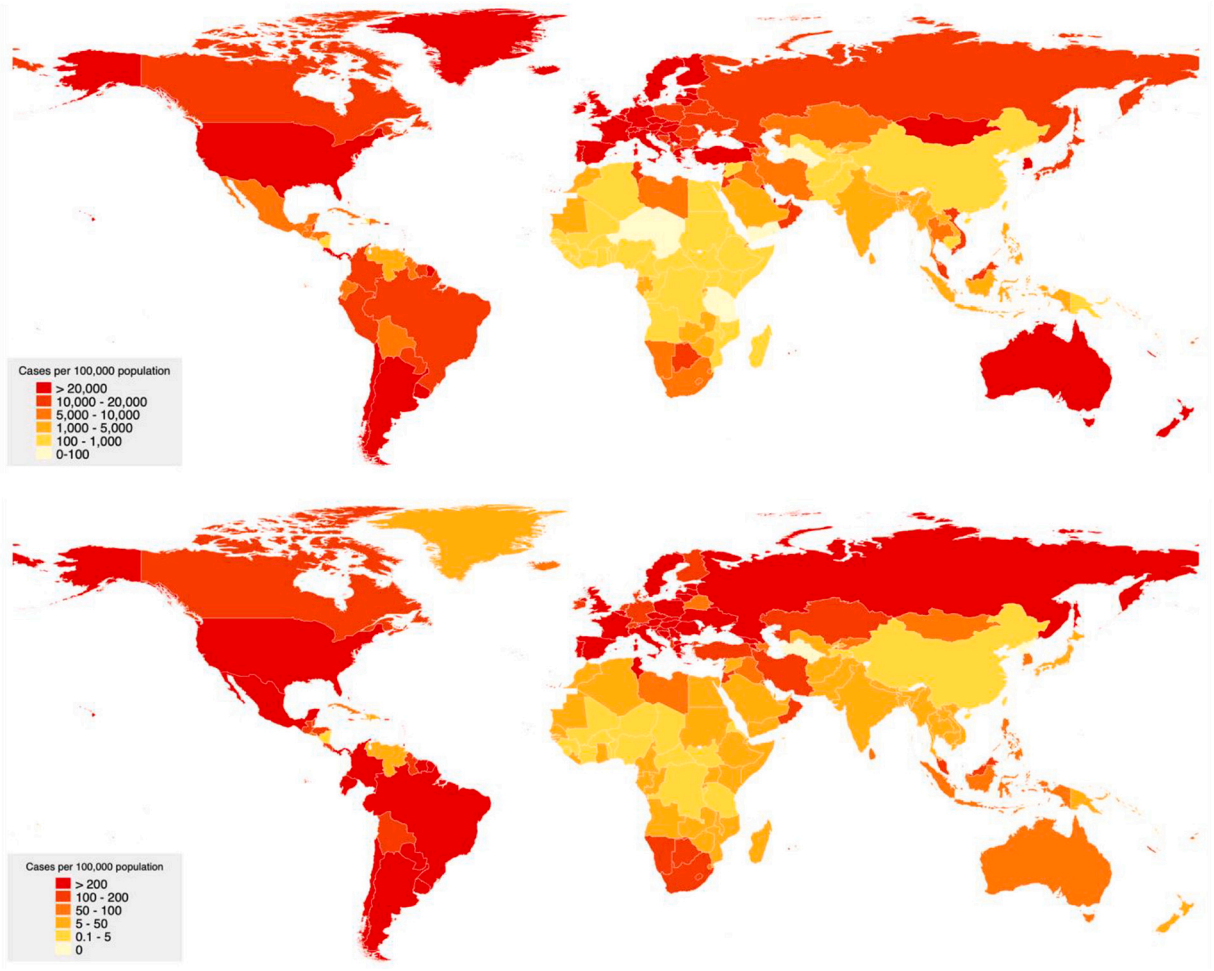

Fig. 1. A. Confirmed COVID-19 cases per 100,000 population. B. COVID-19 deaths per 100,000 population.

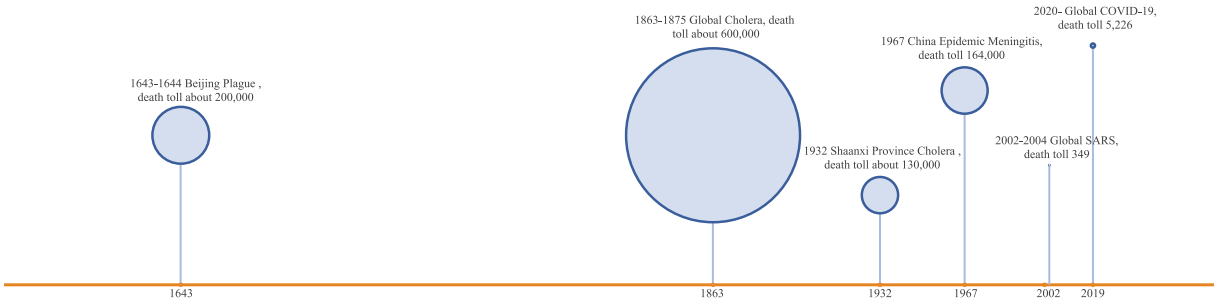

Fig. 2. Recorded pandemics in the history of China (1600-present).

higher than Duan et al. (2021) estimates. In the following period, China's economy experienced an even more severe downturn and its GDP grew only 0.4% in the second quarter of 2022 when the new variant Omicron broke out. In particular, Shanghai's GDP shrank by 13.7% in this period when a two-month strict lockdown severely disrupted economic and social activities.

While COVID-19 has stricken the economy nationwide, its economic consequences have been found to be highly heterogeneous across industrial sectors and firm types. Duan et al. (2021) found that the service industry is most adversely affected. Guo, Huang, Wang, and Wang (2022) found that China's informal economy, mainly consisting of offline micro businesses (OMBs), has been disproportionately affected during the pandemic. Between January 31 and February 20, 2020, China's OMB activities experienced an immediate and dramatic drop of 50%. In contrast, industries with high levels of online business suffered less from the outbreak (Ding, Fan, & Lin, 2022). In fact, the digital economy has played an important role in China during the ongoing COVID-19 period (Huang, Qiu, & Wang, 2021). Digital technology not only helped to control the spreading of the virus but also transformed many offline economic activities into online platforms, which mitigated the negative shocks of COVID-19 (Cong, Yang, & Zhang, 2021). Nevertheless, a large number of vulnerable people who are engaged in manual work can hardly switch from offline to online work (Dai et al., 2021; Guo et al., 2022). In addition, it was found that firms in industrial clusters are more resilient to the COVID-19 shock compared to their less agglomerated counterparts, which may be due to the higher density of entrepreneur hometown-based network and closer proximity to both suppliers and customers (Dai, Mookherjee, Quan, & Zhang, 2021).

Dai, Feng, et al. (2021) also found that COVID-19 had detrimental effects on small and medium-sized enterprises (SMEs). From February 2020 to May 2020, approximately 19% of incorporated enterprises and 25% of self-employed businesses had permanently closed. Although most SMEs had reopened in May 2020 (Zhang, Zhan, Diao, Chen, & Robinson, 2021), many of these firms, particularly export firms, were unable to restore their full capacity primarily due to inadequate demand. The lockdown of Wuhan city during the early stage of the pandemic had a nationwide impact on SMEs, and only about 20% of SMEs resumed production after the virus control regulations were lifted. In addition, the pandemic substantially shook entrepreneurs' confidence in their businesses. Using a nationally representative survey of SMEs in China, Chen, Cheng, Gong, and Li (2022) found that lockdown policies substantially decreased the probability of the reopening of SMEs and that approximately half of SMEs expected their businesses would have to be shut down again in the future. Based on the Online Survey of Micro- and Small-Enterprises (OSOME) in March 2021, a study found that drop in demand and unpredictable restrictions are among the major challenges facing the SMEs, which severely hinder entrepreneurial activities and result in poor performances of the SMEs (Kong et al., 2022).

To counter such downturns, the government carried out a variety of remedies, but to mixed results. Chen et al. (2022) found that the policy interventions in the form of payment deferrals and exemptions stimulated SMEs' operational recovery, but financial support policies were not effective in easing SMEs' cash constraints or encouraging the reopening of small businesses. Li, Chen, and Wang (2022) also found that the policies implemented in Wuhan city after COVID-19 resulted in a rapid recovery of infrastructure investment but a weak recovery in the case of small businesses and grassroots consumption.

In contrast, large firms maintained a relatively stable economic performance. Using a sample of Chinese listed firms in 2020 Ding et al. (2022), found that the Chinese stock market responded negatively to the lockdown of Hubei Province but positively to the outbreak in other provinces in China and overseas. Further heterogeneity analysis shows that state-owned firms have been more resilient compared to private firms during the pandemic. Not surprisingly, the pharmaceutical industry is also among the few industries that have benefitted from the COVID-19 pandemic in China.

3. The pandemic substantially slowed poverty reduction and deepened economic inequality in China

In addition to its severe and uneven damage to the economy, the COVID-19 pandemic also hampered the progress on poverty reduction and exacerbated economic inequality in China. Using data from the China Family Panel Studies (CFPS), Liu (2022) estimated that the pandemic may have pushed 14.12 million people below the absolute poverty line and pushed nearly 42.36 million below the relative poverty line. The COVID-19 pandemic increased the overall unemployment rate and exacerbated structural inequalities of employment. According to the National Bureau of Statistics of China for October 2022, the national unemployment rate reached 17.9%

for the 16–24 age group and 4.7% for the urban population in the 25–59 age group,[3] with many migrant workers failing to re-enter the city for work. Long, Zeng, and Sun (2021) found that the COVID-19 pandemic significantly decreased wage income for migrant workers and workers in manufacturing, especially for households relying on small businesses. Such employment inequalities caused by the pandemic may have substantial impact on the livelihood of vulnerable groups who lack financial resources, especially in less developed regions. Liu (2022) used an interprovincial analysis to show that the lower the GDP per capita, the higher the risk of a large-scale return to poverty for vulnerable groups such as low-income and low-education groups due to the loss of income from the pandemic.

4. The pandemic poses a high risk of mental disease and loss in wellbeing

Findings from this special issue, along with evidence from other studies, also point to a significant impact of COVID-19 on mental health, which has started to manifest itself and may last for decades to come. According to a nationwide large-scale survey of psychological distress in China conducted from January 31, 2020 to February 10, 2020, the period of the early COVID-19 breakout, about 35% of respondents had already experienced psychological distress, including panic disorder, anxiety, and depression (Qiu et al., 2020). Particularly low-income, older, female, and uneducated respondents tended to have more deteriorated mental health outcomes. Based on the 2020 China COVID-19 survey, Nie et al. (2021) found that income is the leading contributor to inequality in mental health in China during the COVID-19 pandemic. Other evidence also suggested that pandemic exposure has mental consequences, which may, in turn, negatively affect job performance. Using large-scale annual surveys that cover the periods before and after the outbreak of COVID-19 in rural China, Li, Ma, and Liu (2022) found that rural teachers experienced more teaching stress and career development stress during the pandemic, and consequently, their enthusiasm for teaching fell. In the special issue, Fang and Feng (2021) also documented the long-term mental health consequences of exposure to the severe acute respiratory syndrome (SARS) epidemic that occurred around the new century. They found that old people in provinces with intense SARS exposure experienced more psychological distress, including anxiety, fearfulness, loneliness, isolation and uselessness than their counterparts living in provinces with low exposure. In addition, female and illiterate groups suffered more from SARS exposure, although the introduction of social health insurance programs seemed to help mitigate such adverse effects. Another study in this special issue revealed how the interplay between health perception biases and pandemic exposure might affect mental health in a complex manner. Using data from the internet-based Social Attitudes and Psychological Health in COVID-19 Pandemic Survey, Nie et al. (2022) found that 34% of respondents exhibited some overconfidence in their own health and that those people are more likely to be depressed, less happy and less satisfied with life. The negative effects of health overconfidence were amplified in areas with high COVID-19 exposure in 2020.

Since 2022, COVID-19 outbreaks have occurred more frequently in China and lockdowns have been imposed in many cities to control virus transmission. Nearly 400 million people are estimated to have been restricted by some form of lockdown policy in China by April 2022.[4] Such measures may generate long-lasting mental health impacts on residents. A recent report by the WHO suggested that there has been a 25% increase in mental health diseases since the outbreak of COVID-19 worldwide.[5]

5. Seeking optimal policy response: How can China achieve a balance between disease control and economic growth?

After the COVID-19 pandemic spread rapidly to most countries, how to optimize disease control while minimizing the socioeconomic costs of prevention and control became unprecedented challenges for each affected nation. Both developed and developing countries were confronted with a dilemma. Without effective disease containment, the spread of the virus may result in a large number of severe infection cases and overwhelm the medical systems, which may impose a mortality cost (Islam et al., 2021; Pifarré i Arolas et al., 2021; Williams, Spencer, Farragher, Gittins, & Verma, 2022). At the same time, the stringent measures to contain the pandemic may disrupt social and economic activities and increase unemployment, which may disproportionally impact poor people's livelihoods and, therefore, induce poverty costs (Buheji et al., 2020; Whitehead, Taylor-Robinson, & Barr, 2021). The optimal policy response to the pandemic should consider both mortality costs and poverty costs (Decerf, Ferreira, Mahler, & Sterck, 2021). In general, poverty costs are much higher than mortality costs in developing countries, while mortality costs exceed poverty costs in developed countries (Decerf et al., 2021). Consequently, poor countries tend to implement less strict lockdowns, while developed countries may pursue more stringent policies (Hausmann & Schetter, 2022).

China has implemented stringent measures to contain the spread of COVID-19 since its early outbreak. Specifically, the government has used a combination of various public health measures, including a mask mandate, social distancing, mass testing, and lockdowns, to stop mass transmission of COVID-19, which is briefly described as zero-Covid policy, a distinct model from those employed in many western counties that rely on combinations of vaccinations and voluntary measures.[6] As shown in Fig. 3, in the early phase of the pandemic, China succeeded in maintaining a safe environment for business and socioeconomic activities, and stabilized the economy at a higher growth rate than other major economic entities, including the US, the UK, France, and Japan, where the outbreaks of the

[3] See https://data.stats.gov.cn/easyquery.htm?cn=A01&zb=A0E01&sj=202211 for more information.

[4] See https://www.nytimes.com/2022/04/14/business/china-lockdowns-economy.html for more information.

[5] See https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide for more information.

[6] Many countries such as Australia, New Zealand, Singapore and Vietnam pursued a zero-COVID-like strategy in 2020 and 2021 but have suspended this strategy since late 2021.

Fig. 3. A. Quarterly GDP growth rate during the pandemic. See https://data.oecd.org/gdp/quarterly-gdp.htm for more information. B. Quarterly new cases per 100,000 population. C. Quarterly new deaths per 100,000 population.

pandemic resulted in a surge of severe cases and even a collapse of medical systems in many affected regions, which damaged the economy with shocks on both the demand and supply sides.

Several studies in this special issue examined China's zero-Covid policy with data collected at the early stage of the pandemic and confirmed the effectiveness of the policy in containing diseases and/or maintaining economic stability. Specifically, Chan (2022) applied a susceptible-infected-removed dynamic stochastic general equilibrium (SIR-DSGE) model to estimate the impact of the pandemic outbreak and found that a combination of quarantine policy with random nucleic testing was effective in slowing the virus spreading after the earliest outbreak of COVID-19 in 2020. The study also found that although such measures decreased economic output in the short term, they facilitated a faster economic recovery in the long run compared to other passive measures for containing the pandemic. Interestingly, an article in this special issue also found that cities governed by top officials with public health or medical backgrounds implemented lockdown policies more rapidly than cities governed by officials with other backgrounds (Li, Lai, Wan, & Chen, 2022).

A further examination of economic performance at later stages of the pandemic, however, tells a mixed story. As shown in Fig. 3A,

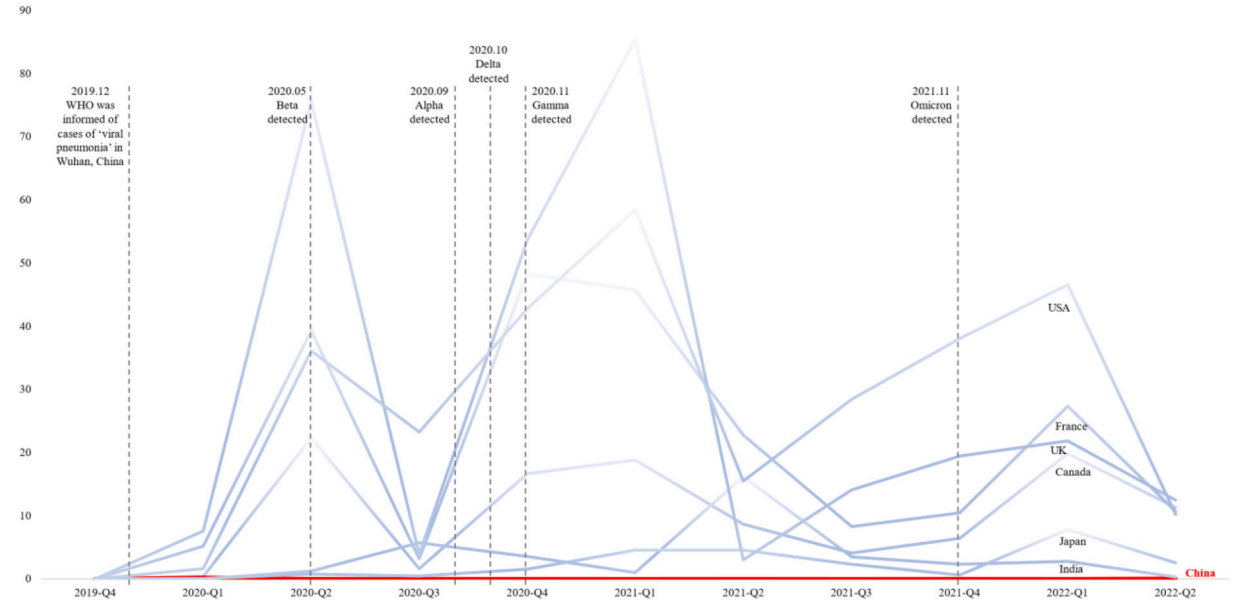

Fig. 3. (*continued*).

after China's economic growth achieved a peak in the second quarter of 2021, it turned down rapidly and hit a record low in the second quarter of 2022; during the same stage, other major economic entities managed to maintain a growth rate comparable to those in normal years.[7] This change of relative economic growth rate is accompanied by the emergence of new variants, including the most recent Omicron variant, which are characterized by high transmissibility but low fatality (see Fig. 3B and Fig. 3C). The new variants substantially increased the cost to contain the spread of the virus, and in order to continue its zero-Covid strategy, China was forced to adopt increasingly extreme means, including imposing complete and prolonged lockdowns, which disrupted socioeconomic activities and caused severe economic losses. In contrast, many other developed countries opted for more passive and voluntary prevention means. Although these countries experienced spikes of infections (see Fig. 3B), they maintained relatively low death rates because of vaccination and boosters widely administered among residents (see Fig. 3C), which substantially mitigated the economic impact of the pandemic and the containment measures.

6. Coming out of the pandemic: What China should do for a successful transformation to the post-pandemic new normal

On September 15, 2022, the World Health Organization Director-General Tedros Adhanom Ghebreyesus announced that the end of the COVID-19 pandemic was in sight, which concurs with a view that the current Omicron variant may provide a window of opportunity for a strategic shift in prevention and control strategies from containing the spread of the virus to treating severe cases. Such an optimistic perspective is inspirational, while different voices urge remaining vigilant about COVID-19 given the uncertainties of its future evolution.

China indeed adjusted its COVID-19 control strategy, as evident by its newly released the "20 New Measures", which aims at effectively containing the virus while minimizing its impact on economic and social activities. For China, a concern for substantially lifting its strict prevention policy partially relates to a possibility that although the new Omicron variants have low case fatality rates, their highly transmissibility may still lead to a large number of death tolls in such a populous country, in particular among the vulnerable populations, including the elderly, the patients with severe chronic diseases, and people unvaccinated for medical and other reasons.

Such concerns, which are certainly legitimate, can be addressed by taking timely and effective measures to avoid a potentially substantial loss of lives. First, China can substantially improve the coverage and effectiveness of vaccinations. Timely administration of vaccines is most effective to stop the spread of infectious diseases and to prevent mortality in most age groups (Bloom, Nowak, & Orenstein, 2020) Although the efficacy of COVID-19 vaccines against recent new variants seems to diminish, all these vaccines have proven to be effective against severe illness and death across all variants to date.[8] China should reallocate its instrumental and financial resources from COVID-19 testing to vaccinating people, especially the most vulnerable populations, including those aged 80 and over.

[7] See http://www.stats.gov.cn/tjsj/sjjd/202207/t20220715_1886475.html for more information.

[8] See https://www.gavi.org/vaccineswork/how-effective-are-covid-19-vaccines-real-world?gclid=EAIaIQobChMIntq0sdfK-gIVl1pgCh1bXgMKEAAYASAAEgKfWPD_BwE for more information.

According to a recent survey, nearly 50% of this group have not been vaccinated and more than 80% of have not received a booster dose,[9] which is partially due to resistance and hesitancy among the elderly who are concerned about potential side effects. China may prioritize actions to improve the vaccination rates among its vulnerable populations by a combination of means, including financial incentives and health education campaigns.

To facilitate its reopening and reconnection to the world in the near future, China should also continue to play an active role in increasing the supply of vaccines to developing countries and improving global vaccine equality. Though it is acknowledged that high levels of population immunity via vaccination are required globally for the containment of COVID-19, the current distribution of vaccines is very unequal. To date, more than two-thirds of the world population have received at least one dose of a COVID-19 vaccine, but in low-resource countries, only one-third of people have received their first vaccine dose.[10] Because of the substantial vaccine inequality across countries, even if advanced economies are universally vaccinated, they still may burden up to 49% of the global economic cost of the pandemic stemming from trade linkages with unvaccinated countries (Çakmaklı, Demiralp, Kalemli-Özcan, Yeşiltaş, & Yıldırım, 2021). Therefore, the unity of all the countries to fight as one against the pandemic is an indispensable task. China has played an important role in international vaccine cooperation. It has committed to making the Covid-19 vaccine a global public good and has provided vaccines to more than 100 countries, in Asia Pacific, Latin America, Europe and Africa (Liu, Huang, & Jin, 2022). In the future, China may also increase its production through joint production facilities and the transfer of technologies to other developing countries in need.[11] It can work closely with international organizations to help strengthen global mechanisms for fair and efficient vaccine distribution and administration through multilateral streams including the WHO-backed global COVID-19 vaccine initiative, COVAX.[12]

To pursue a successful transformation to the post-pandemic "new normal", it is also essential to strengthen the capacity of the healthcare system. In recent decades, China has made substantial progress with a series of reforms of its public health and healthcare systems (Yip et al., 2019). In particular, the SARS pandemic urged the government to substantially upgraded its preventive systems and healthcare facilities (Yin et al., 2020). However, China still lags far behind most developed countries in terms of medical resources per capita. For example, China's health spending per capita for 2019 was about $535.13, substantially lower than the mean value of $1175.59 worldwide.[13] In addition, the allocation of quality healthcare resources is very unequal geographically, with the western region lagging far behind the central and especially the eastern regions of China (Zheng, Zhang, Chen, & He, 2022).

With a rapidly growing elderly population, upgrading the healthcare system, especially critical medicine, should be a priority for China to ensure safe and timely care in response to severe COVID-19 infection of patients with other health conditions. Large public hospitals are expected to serve as safety nets during crises. However, large hospitals in China, already operating near capacity even in pandemic-free scenarios, have limited resources to serve an additional influx of critical patients during the pandemic without a timely enhancement of surge capacity, especially those in less developed areas with limited medical resources (Schintler, Wu, & McNeely, 2020). At the same time, a large number of smaller hospitals and community health centers are subject to limited resources and outdated medical facilities, including medical transport units, as well as a lack of outside support for staff training and resources (Jiang & Pan, 2020). Therefore, hospitals of all size need an urgent upgrade of their staff, information system, medical supplies, equipment, and resources for a more effective response to medical emergencies likely to occur in most regions.

As an important lesson learned from the early outbreak in Wuhan city, surge capacity, or the ability to expand care capabilities in response to surging demand of critical patients with COVID-19, is of vital importance. In particular, intensive care units play a critical role in lowering COVID-19 caused morality (Ji, Ma, Peppelenbosch, & Pan, 2020). However, China still has a large gap with developed countries in terms of quantity and quality of ICU beds and critical care devices, clinician staffing, and critical care technicians (Li et al., 2022). While China today has more hospital beds per 100,000 population than many developed countries, including Canada, Spain, the United Kingdom, and the United States, its ICU capacity per 100,000 people is only 3.4, lower than most of the OECD countries and at a similar rate of Mexico's (see Fig. 4). In fact, the ICU-to-hospital bed ratio for most hospitals in China is below the recommended ratio of 2–8% by the Guidelines for the Construction and Management of Critical Care Medicine (Yin et al., 2020). Expecting a surge of COVID-19 infections after the stringent containment measures were lifted at the early stage of transition, the government should boost investment in critical care services and facilities and reduce the disparities in critical care education, training, and resources between developed and less developed regions, as well as increase supply of quality healthcare via multi channels, including online health platforms care in response to surging demand. In addition, the government should employ a combination of strategic approaches, including improving communication and engagement with the public, providing a clear and effective practical guide for patients regarding how to seek appropriate medical help according to the severity of their illness, as well as promoting hierarchical medical system and strengthening primary care to prevent overwhelming hospitals, which are also keys to a successful transition toward the post-pandemic new normal.

COVID-19 is not the first and won't be the last pandemic. The world should not waste the crisis but rather take forward the lessons we have learned for tackling future threats. In most countries, the COVID-19 pandemic has been substantially hampering the progress toward the sustainable development goals (SDGs) established in 2015 by the UN General Assembly, which comprise 17 interlinked international goals to be achieved by 2030 to end extreme poverty and ensure that "no one is left behind" (United Nations, 2015). A

[9] See China: elderly people COVID-19 vaccination rate 2022 | Statista for more information.
[10] See https://www.nytimes.com/interactive/2021/world/covid-vaccinations-tracker.html for more information.
[11] See bridgebeijing.com for more information.
[12] See https://www.who.int/news/item/20-05-2022-covax-calls-for-urgent-action-to-close-vaccine-equity-gap for more information.
[13] The data by the World Bank, https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD?locations=CN.

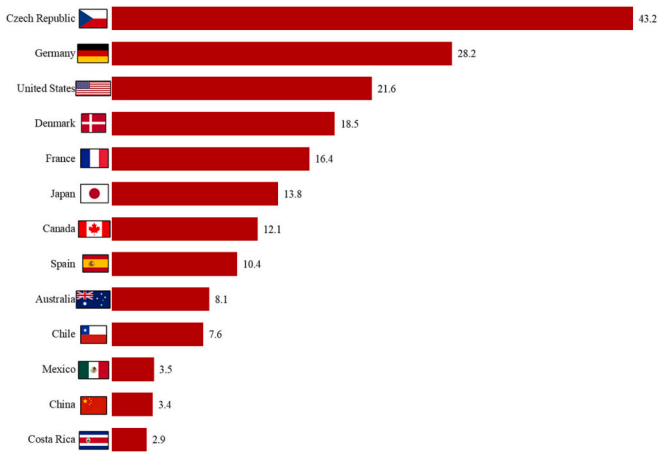

Fig. 4. Intensive care beds per 100,000 people by country.
Data source: Li, Gong, and Yan (2020) and OECD (2021).

recent report by the World Bank warned that up to 70 million people would be pushed into extreme poverty by the economic consequences of the pandemic, and pandemic-caused poverty resulted in larger welfare losses than pandemic-associated mortality, especially in developing countries (World Bank, 2022). It comes to a critical moment to refocus resources and policy attention on long-term targets, including ending extreme poverty and promoting shared prosperity. Coming out of the pandemic, China and the rest of the world face an urgent need for actions to restart economic and social development, fight poverty to safeguard people's livelihood, and promote a more equal world.

Declaration of Competing Interest

The authors claim that they have no conflict of interest.

Data availability

No data was used for the research described in the article.

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