

Development of China's health care system in the time of COVID-19: Challenges, opportunities, and call for actions

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1 | INTRODUCTION

China has a population of over 1.4 billion. Although the domestic expenditure made up only 8.8% of the general government expenditure in China (less than half of 19.7% in United Kingdom and 22.4% in the United States), and 22.3 medical doctors per 10,000 population in 2020, China's life expectancy at birth has been increased to 77.4 years, and neonatal mortality rate has been reduced to 3 per 1000 live births [1]. After the founding of the People's Republic of China, a socialist healthcare system with Chinese characteristics was established and has made remarkable achievements.

COVID-19, the infectious disease caused by the novel coronavirus SARS-CoV-2, was first identified in December 2019 and has become the worst global health pandemic in the 21st century. COVID-19 presents significant social, economic, and medical challenges to China and other countries to wreak havoc across the world. China was the first country to identify COVID-19

cases, yet has reported only less than 0.7% of total number of global cases despite making up 19% of the world's population [1,2]. Why could China's healthcare system achieve such good results in responding to COVID-19? What can we learn from this "war" against COVID-19? Here, we report the development history of health care in China, analyze the challenges and opportunities of COVID-19 pandemic to the healthcare system, and enlighten the development direction of health care in the future.

2 | HISTORY OF HEALTHCARE DEVELOPMENT IN CHINA

2.1 | Definition of health care

Health Care, which is not limited to medical care, is the provision of healthcare services that promote, maintain, monitor, or restore health to individuals or

Abbreviations: COVID-19, Coronavirus disease 2019; Outline, Outline of the Healthy China 2030 Plan; SARS-CoV, severe acute respiratory syndrome coronavirus; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; UK, The United Kingdom of Great Britain and Northern Ireland.

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communities by health services or professionals [3]. Basic healthcare services that are affordable in countries and regions are called primary health care, and they rely on practical, academically reliable, and socially acceptable methods and technologies. Primary health care is available to individuals and families through active participation at a reasonable cost that can be afforded by the community or country with a spirit of self-reliance [4, 5].

2.2 | Healthcare system in China

Traditional Chinese medical practice has a history spanning thousands of years, in which master-apprentice was the mainstream mode of medical education. From late Qing dynasty (1644–1912), western medicine, university or medical school education was largely introduced into China. After the founding of the People's Republic of China, China's medical education

and health care entered a period of rapid development. Learning from the model of the former Soviet Union, medical schools were separated from general universities and centralized polyclinics were established with associated hospitals or universities including the general focus on public health. A top-down and vertical management healthcare system was built until now: the Ministry of Health was established in the central government, health departments (bureaus) were established in the provinces (municipalities and autonomous regions), and health bureaus were established in prefectures (city) and counties (district, county-level city). At the county level and above, health service institutions were established to provide and manage various services including medical treatment, disease prevention and control, maternal and child health care, provision of essential medicines, and traditional medicine. Below the county level, township health centers or urban community health service centers were established and rural clinics were opened to provide primary healthcare services [6] (Figure 1).

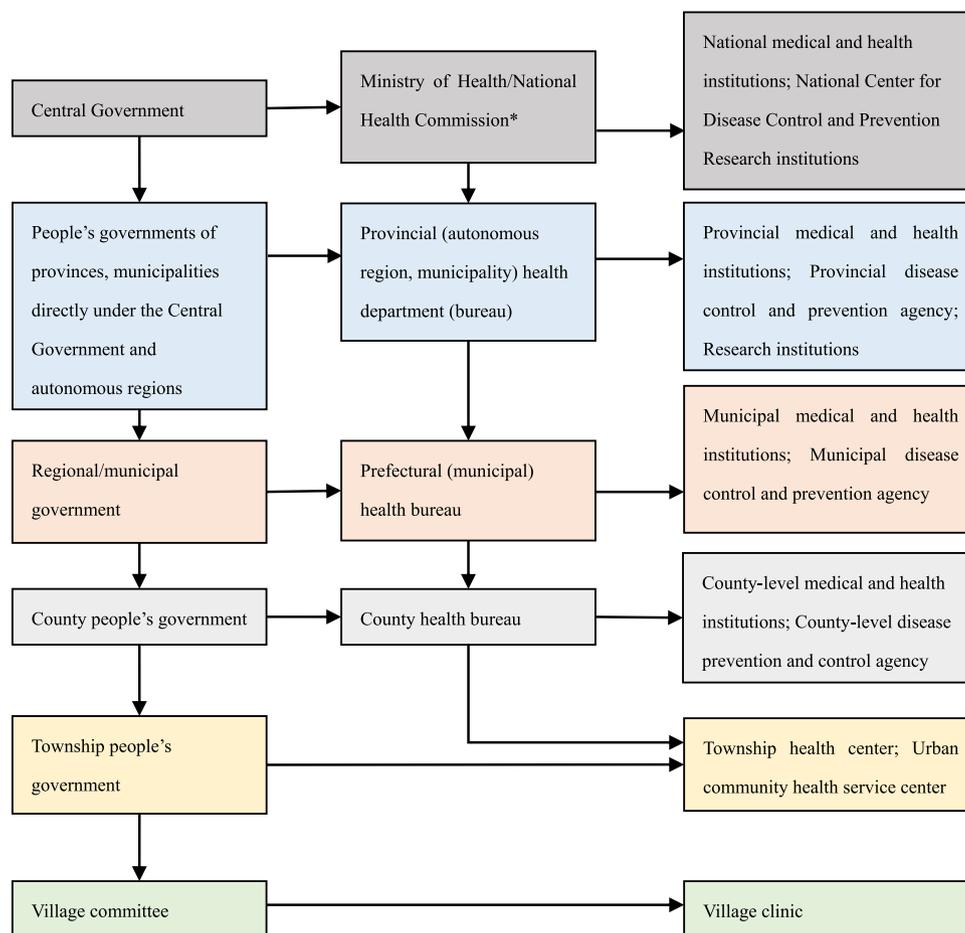


FIGURE 1 China's healthcare system. *China inaugurated a national administration of disease prevention and control in May 2021. Its establishment marked a key step toward deepening reform of the country's system of disease prevention and control. At present, the reform is still ongoing.

2.3 | Early practice of health care in China

In the 1930s, the healthcare model of Dingxian County, Hebei Province played a role in demonstrating and promoting the development of rural health services in China. After careful investigation and analysis of the local basic health conditions, Lan Ansheng and Chen Zhiqian of Peking Union Medical College cooperated with Yan Yangchu, a civilian educator from Peking University, to establish a rural health care experimental demonstration area. The idea of the demonstration area is to establish a three-level county–township–village rural healthcare service system. In addition to providing basic medical services, Dingxian's healthcare model also began to incorporate public health services, such as health education, environmental sanitation, vaccination, maternal and child health, nutritional health, and birth control. Dingxian's healthcare model is the earliest example of community-led primary health care in China dedicated to the world. In 1978, just over 40 years after Dingxian's experiment, the World Health Organization (WHO) issued the famous *Declaration of Alma-Ata*, proposing the concept of “primary health care”. Healthcare practices in Dingxian County have served as a foundation for primary health care [7, 8].

2.4 | The role of primary health care

Primary health care is the crux of the healthcare system and an important part of how people avail of health services. Effective primary health care can promote equity in health care and the efficient use of health care resources, resulting in higher quality of health services [9]. The development of primary health care modeled from Dingxian has given birth to the establishment of a country–township–village health care network in China's rural area. The major achievement of the three-level healthcare network is the coverage of primary health care, which helps to effectively solve the difficulties in the allocation of medical resources for rural residents. For complex hospital services, the main contribution of the rural healthcare network is “medical treatment–prevention integration” and timely referral. The concept of country–township–village healthcare network emphasizes that healthcare institutions at different levels have adequate manpower and medical equipment according to their needs. In the context of China's large population and underdeveloped economic conditions, the grassroots doctors (barefoot doctors and village doctors) in the county–township–village healthcare network integrate six functions to provide the general population with prevention, medical treatment, health care, rehabilitation, health education, and technical services in family planning. In 2020, 747,000 village doctors in China [10] were closely connected with the

500 million rural population in the vast rural areas [11]. Village doctors are an important part of China's healthcare service team as they help develop rural health care and ensure residents' access to primary healthcare services. By providing basic medical treatment and public health services, they have become health “guardians” to the hundreds of millions of rural residents.

Glossary box

Barefoot doctor

Barefoot doctors [12] were first used when a mobile service team formed by urban medical workers began to provide medical services in rural areas in 1965. They trained some young peasants to function as “barefoot doctors.” Barefoot doctors were the backbone of the rural cooperative medical service.

Village doctor

In 1985, the Chinese government stopped using the term “barefoot doctor” and replaced it with “village doctor.” Barefoot doctors need to pass an exam to get a village doctor's certificate. The initial training level for village doctors was only a few months, but now they must receive 2–3 years of professional training, which is equivalent to a high school diploma [13].

Community blockchain

The blockchain technology (decentralized database that maintains an uninterrupted, growing list of data records that are established by the nodes involved) was applied in community management [14].

3 | COVID-19 CHALLENGES TO HEALTH CARE

The idea of emphasizing treatment over prevention has always persisted, but the COVID-19 pandemic has made this problem more prominent. The concept of medical treatment and prevention integration emphasized by the country–township–village health care-network has not been well implemented. This paper mainly discusses the challenges faced by the healthcare system from the perspective of public health.

3.1 | Lack of attention of public health

The COVID-19 pandemic presents major challenges to health care, national security, and international politics.

Public health services are an important part of healthcare services and are the first to be affected by the pandemic. During the COVID-19 pandemic, the importance of building a strong public health system has once again been emphasized and prioritized.

- a. Public health is the guardian of national health and the cornerstone of the construction of the Healthy China program.
- b. Public health plays a fundamental, strategic, and overall role in economic and social development.
- c. Public health is an important guarantee for national security and social stability.
- d. The comprehensive ability of public health is an important representation of the construction of the government's modern disease control system and the refined management of society [15].

3.2 | Insufficiency of medical treatment–prevention integration

Both medical treatment and prevention are indispensable parts of health care, and their integration is emphasized in the rural three-level healthcare network. However, the COVID-19 pandemic has exposed the problems of the neglected combination of prevention and treatment and separation of medical treatment and prevention due to rapid economic development and fine social division of labor in China. Therefore, we should focus on promoting the improvement of the medical treatment and prevention coordination mechanism, and establish a mechanism for mutual communication of personnel, information, resource, and supervision. Moreover, we should further clarify the responsibilities of disease control institutions and medical and health institutions in disease prevention and control; strengthen the supervision, inspection, and assessment of medical and health institutions by disease control and prevention institutions; promote the integration of medical treatment and prevention training; and promote smooth communication and cooperation between disease control and prevention institutions and medical and health institutions [16].

3.3 | Beyond the original functions of community health care

Some scholars have proposed that the concept of Health 1.0, which emerged at the end of the 19th century until the 20th century, is based on preventive healthcare services. During this period, the public health function of

the government is to establish the prevention and healthcare service system, improve food and drinking water safety, vaccination, and infectious disease prevention and control. From the middle of the 20th century to the beginning of the 21st century, the concept of Health 2.0 became prevalent. Health 2.0 focuses on public health services, and the public health function of the government is evaluation, policy formulation, and protection. During this period, the government's specialized public health institutions were formed. From the early 21st century to the present, the concept of Health 3.0 dominated. It is based on community health service with the government working to improve the social determinants of health [15].

In the process of prevention and control of the COVID-19 pandemic, community-based nature of health protection, health promotion and disease prevention and control, and emergency response to public health emergencies have been highlighted. Traditional community healthcare services are facing the challenge of balancing medical treatment and public health work [17] as they have been given new functions. The concept of community blockchain has been applied to effectively control the source of infection, cutting off transmission routes, and protecting susceptible people at the community level. One of the more positive outcomes of the COVID-19 pandemic is that interventions can now be conducted in communities [15].

4 | FUTURE DIRECTION OF GLOBAL HEALTH CARE IN A POST-COVID ERA

4.1 | Integration of health into all strategies

In 1978, the *Declaration of Alma-Ata* [8] adopted at the International Conference on Primary Health Care pointed out the importance of health as a worldwide social goal. The realization of this goal requires not only the efforts of the health sector but also the participation of other social and economic sectors. In 2018, the 197 member states of the World Health Organization unanimously adopted the new *Declaration of Astana* [18] at the Global Conference on Primary Health Care, proposing that any sector may have an impact on population health when formulating public policies. Response to the COVID-19 pandemic has once again proved that population health cannot rely solely on the health sectors but requires a social atmosphere that is government-led, multidepartmental collaboration, whole-of-society participation, mass and joint prevention

and control, and the promotion and maintenance of a healthy environment.

4.2 | Global health

In the era of economic globalization, global public health governance has become a major survival issue of general concern for all countries. Its importance has been further emphasized by the rapid spread of the COVID-19 pandemic around the world [19]. The COVID-19 pandemic has exacerbated existing health inequity among countries. Taking vaccine as an example, three characteristics are prominent. First, is inequity in vaccines a symptom of greater inequity in health, economic, or social systems? Second, what would constitute an acceptably equitable response? How would progress be measured without a unified direction? Third, what is the true consensus on the fair allocation of vaccines across countries [20]? The concept of community of common health for mankind was born to address these questions.

Global health refers to the concept and practice of paying attention to the health of all human beings from different countries, races, cultures, and systems in the world. It pertains to promoting and ensuring health equity and highlighting other issues that transcend national borders and regions; promoting multidisciplinary collaboration within and outside the health sciences; and the organic integration of group prevention and individual diagnosis and treatment. The focus of global health work is the creation, cooperation, and development of a community of common health for mankind [15, 21].

4.3 | “One Health” approach

About 75% of emerging infectious diseases are zoonotic due to various anthropogenic, genetic, ecological, socio-economic, or climatic factors. Therefore, understanding these interactions and developing effective mitigation strategies require joint efforts of multiple disciplines and sectors at the human–animal–environment level [22]. “One Health” refers to the harmonious development of humans and animals, and that of humans and nature. It is an approach that emphasizes the interdisciplinary collaboration and exchanges on the relationship between humans, animals, and the natural environment, and the joint response to the sustainable development of the environment. The goal of One Health is to improve the health conditions of all life on Earth—humans, animals, and ecosystems—which are interdependent and

inseparable. It aims to protect the ecological environment, call attention to animal diseases and pathogenic variations, emphasize the coordinated development of humans, animals, and nature, strengthen monitoring at the intersection of human–animal–ecosystems, and prevent all kinds of health-threatening risks.

4.4 | Health care throughout the life course

The main health problems and risk factors in different life stages of human beings are different, and various risk factors will have an impact on the health of the whole life stage. Therefore, healthcare measures should vary according to different life stages and places to ensure people in different stages can obtain targeted preventive and healthcare services while avoiding duplication and omission, so as to achieve the purpose of improving the health of the population with high efficiency and savings. The life-course approach means that all people, especially high-risk populations, can achieve the best possible health status at every stage of life, including

- a. *A good start*: protect the health of infants and young children (including the gestation period of life), and lay a good foundation for life (infants and young children: 0–3 years old).
- b. *Safe growth*: protect children's health and make them grow up safely, to prepare them for entrance education (children: 4–11 years old).
- c. *Healthy teenagers*: help teenagers prepare to enter society and make them healthily, safely, and independently become useful talents (adolescents: 12–17 years old).
- d. *Healthy, meaningful, and satisfying life*: protect the health of adults so they can fully participate in various life activities and enter the next stage of life (adults) with an ideal health status.
- e. *Healthy longevity*: improve the quality of life of the elderly, so they can care for themselves and become more active in their old age (the elderly).

5 | PROSPECTS FOR CHINA'S HEALTHCARE PRACTICE

5.1 | Healthy China construction strategy

Since the founding of the People's Republic of China, the central government has held two health conferences, with the first in December 1996. Due to the urban–rural

structure and the long-term differences between the eastern, middle, and western regions, it was proposed that in the primary stage of socialism in China, China's healthcare work should adhere to the principle of "low level, wide coverage." This principle has led to the development of China's health service in a specific historical period. After a lapse of 20 years, the National Health Conference (August 2016) held by the central government put forward the "Healthy China" strategy that prosperity for all is impossible without health for all, and issued the *Outline of the Healthy China 2030 Plan* (hereinafter referred to as the *Outline*). The outline put health in the strategic position of priority development and included health indicators into the objective of building a well-off society, which shows that the Chinese government has made great progress in its understanding of the construction of the Healthy China strategy. In the future, China can popularize a healthy life, optimize health services, improve health security, build a healthy environment, and develop a healthy industry to further advance its health undertakings [15, 23].

5.2 | Primary healthcare strategy

The key to the implementation of the "Healthy China" strategy is to establish a strong primary medical and health service system, that is, "to strengthen community-level health services." The *Outline* emphasizes the need to "focus on people's health, focus on the community-level health services, and take reform and innovation as the driving force," highlighting the strategic position of the supply-side reform of community-level health services in the goal of Healthy China. The *Outline* further clarifies the strategic points of "strengthen community-level health services," that is, "To establish a cooperation mechanism with clear goals and clear powers and responsibilities among medical and health institutions at different levels, different categories and run by different ownerships, and constantly improve service networks, operating mechanisms and incentive mechanism. Community-level medical institutions generally have the ability to guard the health of residents." [24]

5.3 | Health promotion strategies

The idea of health promotion actually comes from the patriotic health campaign of China, which is a socialist healthcare work model with Chinese characteristics born and developed under specific historical conditions in the early days of the founding of the People's Republic of China. This working model is

summarized as the concept of health promotion by the World Health Organization, and its core essence is the "mobilization of the whole society, participation of the whole people, multisectoral collaboration, and creating an environment for promoting and maintaining health." The prevention and control of the COVID-19 pandemic in China is based on the strategy of health promotion. The *Outline* pointed out that it is necessary to carry out in-depth patriotic health campaigns, strengthen comprehensive improvement of urban and rural environmental sanitation, and take the construction of healthy cities and healthy villages and towns as the main starting point for promoting the construction of the Healthy China program. The development of health promotion has provided a rich theoretical basis for the implementation of the construction of Healthy China. Health promotion has also become an important strategy for China to deal with major public's health problems, and occupies an important position in the strategic action in the "Healthy China" program.

5.4 | Develop general practice

General practice is a community-oriented, active, applied, and comprehensive service discipline integrating medical treatment, rehabilitation, prevention, and health care [25]. General practitioners who have been systematically trained in this discipline provide high-quality, convenient, cost-effective basic medical services to individuals, families, and communities. Aging and lifestyles changes increase the risk of chronic diseases. The establishment and improvement of the general practice system and the healthcare ability of general practitioners will help improve the quality of monitoring, prevention, and treatment of chronic diseases and provide full-scale and life-course health services [26]. The "main battlefield" of chronic disease prevention and control is at the grass-roots level. The *Outline of the Healthy China 2030 Plan* clearly focuses on general practitioners and strengthens the mobilization of a grass-roots talent team.

5.5 | Scientific research capacity building

Compared with the prevention and control of SARS-CoV in 2003, China's scientific and technological level have been significantly improved. SARS-CoV-2 identification and whole-genome sequencing were completed within 1 week and shared with WHO in the shortest

time. These efforts made the rapid development of SARS-CoV-2 diagnostic techniques and vaccines possible. Health care must rely on the guidance and promotion of scientific and technological innovation. China will continue to push science and technology forward via improving scientific research layout, mechanisms, funding, and capacity building.

6 | CONCLUSION

The practice and development of China's healthcare industry has provided valuable practical experience for global health care, especially the formation of the concepts of "primary health care" and "health promotion". Primary health care and the philosophy of the patriotic health campaign continue to play an active role in the response to the COVID-19 pandemic. China will continue to uphold the concept of health promotion and promote the construction of a Healthy China by strengthening primary health care, integrating health into all strategies, adhering to the harmonious development of humans and nature, and promoting health care throughout the life cycle. The development of health care in China in a post-COVID era will continue to provide useful insight for global health care.

AUTHOR CONTRIBUTIONS

Liming Li: writing—original draft (lead).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

None.

INFORMED CONSENT

None.

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