

# Current Status and Prospects Towards the Road of Universal Health Coverage (UHC) in China: a Systematic Review

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**Abstract: Background:** Over the past decade, China has successfully extended its basic healthcare safety net to more than 95% of the population. The Chinese government aims to provide universal health coverage for all citizens by 2030. However, China still suffers from an inadequate tiered medical care system, lack of information sharing on hospital visits, and medical staff with low salaries and excessive overtime. This paper will further discuss China's current status and prospects in six building blocks of the WHO health system framework. **Methods:** We used various popular search engines, such as PubMed, Google, Google Scholar, etc., to identify studies on achieving universal health in China. The purpose of the search was to understand the state of the existing health system in China, especially in mobile health (mhealth), mental health, and medical personnel protection. **Findings:** We found nine articles related to health service delivery, three articles related to the medical workforce, four articles related to health information systems, three articles related to medical products, vaccines, and technologies, five articles related to health financing, and five articles related to health system management. **Discussion:** The findings based on the six health system building blocks are summarized in conjunction with other literature.

**Keywords:** Universal Health Coverage; Current Status and Prospects; Health System; China

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## 1. Background

Health was declared a fundamental human right by the World Health Organization (WHO) in 1948, and the 1978 Alma-Ata Declaration identified "health for all". Health for All cuts across all health-related Sustainable Development Goals (SDG) and is considered the foundation for achieving most of the others. Universal Health Coverage (UHC) is a broad concept that aims to: firstly, everyone has equitable access to health services. Secondly, the quality of health services should be good enough. Thirdly people are protected from financial risks. UHC included 17 indicators in four categories (reproductive, maternal, newborn, and child health; infectious diseases; non-communicable diseases; and service capacity and access) <sup>[1]</sup>. Thus, UHC implies providing adequate quality health promotion, prevention, assistance, rehabilitation, and palliative care services <sup>[2]</sup>.

Health for all involves three dimensions of coverage: population, financing, and health services, and it is a dynamic and continuous process that changes with demographic, epidemiological, technological trends, and people's expectations <sup>[3]</sup>. Quality health care, financial management, and ensuring equity and accessibility of health care are equally important <sup>[4]</sup>. In practice, universal health coverage is defined as coverage greater than 90% and prepaid health insurance with legal guarantees <sup>[5]</sup>. According to this criterion, more than 58 countries (30.41%) have achieved UHC, and most of them are Organization for Economic Cooperation and Development (OECD) countries, including some developed and developing countries as well <sup>[6]</sup>.

The 2017 monitoring report of the World Bank and the WHO summarized the status of UHC, including service coverage and financial protection in each country <sup>[7]</sup>. In economic respect, out-of-pocket expenditures and catastrophic medical expenditure assessments were indicators <sup>[8]</sup>. To counter the entire population's financial burden during illness and access quality health services without discrimination, the UN emphasized the need to achieve UHC in the Sustainable Development Goals (SDGs) in health <sup>[9]</sup>.

Health for All programs contribute to the population, health service, and financial protection coverage and significantly increase life expectancy <sup>[10]</sup> and reduce adult mortality <sup>[11, 12]</sup>. All 193 Member States of the United Nations (UN) aim to

achieve a safer, more equitable, and healthier world by 2030. However, the current global burden of non-communicable diseases increases while facing pandemics and severe climate change. Overall, achieving SDG-3.8 requires health systems that are resilient and able to take a cross-sectoral "integrated health" approach to prepare for and respond to emergencies.

The People's Republic of China (PRC) covers an area of approximately 9.6 million km<sup>[14]</sup> and has 1.42 billion people. Today, China is the most populous country<sup>[15]</sup>. The urban population accounts for 58.0% of the total population<sup>[16]</sup>. On October 1, 1949, the founding of New China was one of the world's poorest health care delivery systems due to the recent end of the war<sup>[17]</sup>. Today, China has become the second-largest economy, with a GDP that has grown at an average annual rate of 9.5% over the past 40 years. In addition, China has lifted more than 850 million people out of poverty<sup>[18]</sup>.

Along with its rapid economic growth, China has made great efforts to achieve universal health. Socioeconomic and health indicators in China have improved significantly from 1990 to 2017. Compared to other Emerging 7 countries (India, Brazil, Mexico, Russia, Indonesia, and Turkey), China has performed well in economic and population health<sup>[19]</sup>.

China has undergone three phases of health care reform since its inception. In the first phase in the health sector, the government managed a centrally directed health service system and identified four principles to guide health and medical work: (1) service to workers, peasants, and soldiers; (2) prevention-oriented, primarily through patriotic health campaigns; (3) integration of Chinese and Western medicine; and (4) integration of health work with mass movements<sup>[20,21]</sup>. The second phase began in 1978 when China began its "reform and opening up" policy. As privatization and marketization progressed, the health care system changed: financing mode from total public financing to partial private funding to reduce the government's financial burden; public hospitals and clinics earned part of their revenues by selling drugs and taking test orders to replace the reduction in government finances; medical management began to be devolved from state to local governments; and incomplete pricing strategies were implemented to allow medical institutions to earn a certain amount of profit<sup>[22, 23]</sup>. In the third phase, the Chinese government launched a new round of healthcare reform in 2009<sup>[24]</sup>. This comprehensive reform plan can be summarized as "one goal, four beams, and eight columns"<sup>[25, 26]</sup>. To achieve the goal of universal health, China has focused on establishing four systems (i.e., public health service system, medical service system, health insurance system, and drug supply guarantee system). The four systems are based on eight functional mechanisms that can provide the necessary support<sup>[23,27]</sup>.

Over the past decade, China has successfully extended its basic healthcare safety net to more than 95% of the population<sup>[23]</sup>. In October 2016, the Chinese government announced the "Healthy China 2030" blueprint, aiming to provide universal health coverage for all citizens by 2030<sup>[27]</sup>. Although China has made many significant achievements in universal health insurance, it still suffers from an inadequate tiered medical care system, lack of information sharing on hospital visits, and medical staff with low salaries and excessive overtime. To achieve universal health coverage, this paper will further discuss China's current status and prospects in six building blocks of the WHO health system framework, including 1. service delivery, 2. health workforce, 3. information, 4. medical products, vaccines and technology, 5. financing, 6. leadership/governance.

## 2. Methods

### 2.1 Search strategy to acquire the sources

The search strategy to identify UHC studies in China included searching Google, Google Scholar, Baidu, PubMed, the WHO research portal, and the web pages of the China Health Economics Association, the National Health Commission of the People's Republic of China, the Chinese Center for Disease Control and Prevention, and the Chinese Preventive Medicine Association. We used all the following keywords: 'UHC', 'SDG-3.8', 'health system', 'health services coverage', 'financing', 'insurance', 'China's healthcare system and reform', 'China' in PubMed with Boolean operators (AND, OR) linking ((health system [Title/Abstract]) OR (UHC [Title/Abstract])) AND (China [Title/Abstract]).

As public policy documents are neither included in PubMed/Medline nor published electronically elsewhere, we further expanded the search to the web pages of the Ministry of Health and related departments. For Google Scholar, we used the above terms and fixed searches based on date (selection of post-2016) and relevance (proximity to the term). On the web

page of UHC 2030, we found UHC 2030 Strategic focus (Global compact for progress towards universal health coverage). We also used the WHO website and fixed the search by WHO regional website (Western Pacific), content type (publications and guidelines), and all available formats. The reference lists of the selected articles were potential sources for this study as a bibliographic search. The remaining sources were obtained from Google and Baidu searches as gray materials. This search targeted the latest health-related policies of the Chinese government, such as the 14th Five-Year Plan and the new health care reform, etc.

In the first phase, we identified 2193 records that met the inclusion criteria from Google Scholar, PubMed/Medline, the web pages of the World Health Organization, the Ministry of Health and Population and its affiliates, and Baidu and Google search. In the first screening stage, we removed 2135 sources due to duplication of records and title distortion. In the second phase, we evaluated 58 full-text articles. we excluded 29 sources (due to incomplete matches to the six system building blocks in the Health Systems Integrated Framework - 16, duplicate content deletions - 6, unavailable - 2, outdated - 3, and controversial results - 2). Finally, we identified 29 exact matches of sources for this study.

## 2.2 Inclusion and exclusion criteria

The data search inclusion criteria were relevant to China, with universal health coverage (broad and operational definition), and usually published since 2016. Relevant domains were the six health system building blocks. At this stage, the final selection of articles was based on the following criteria: i) content related to the topic of the source (health service delivery systems, health workers, health information systems, health medicine vaccines and technologies, health financing, health government management), and ii) detailed scope of China. Items unrelated to China, meaningless political discourse, and sources with unpublished data were excluded from the study.

## 3. Findings:

### 3.1 Service Delivery (9 Articles)

First, China is currently facing an aging population. As the population ages, the need for hospital beds and medical staff will increase. The elderly has no source of income, which requires Medicare to increase reimbursement rates to improve healthcare utilization <sup>[28]</sup>.

Not only is aging an issue, but mental health is also gaining attention in the country. Mental health services are also lacking in the country <sup>[29]</sup>. In addition, health services for maternal and child health and oral health are still inadequate <sup>[30,31]</sup>.

Second, the efficiency and productivity of the Chinese health system regarding non-communicable diseases (e.g., disability, chronic diseases) declined from 2008 to 2015. For non-communicable diseases (NCDs), there is a need to strengthen relevant financial guarantees, optimize health resources (especially between human resources for health and hospital beds), and promote cost-effective technologies within the health sector to improve their efficiency and productivity <sup>[32]</sup>. In addition, the inefficiency of China's healthcare delivery system is primarily due to the weakness of the primary healthcare system <sup>[33]</sup>.

Third, since the 2009 health system reform, China has made significant improvements in health care access and financial security: 1) The utilization of both inpatient and outpatient services has increased significantly. 2) People have begun to receive better financial security through health insurance, hospital reimbursement, support for catastrophic medical expenditures, and poverty subsidies. 3) Inequality in financial protection has been significantly reduced. However, people are more likely to seek care in hospitals than in primary care facilities. China's health system reform should establish a tiered health service system <sup>[34]</sup>.

Fourth, most elderly patients skipped primary care centers in favor of higher-level hospital care. Urban patients produced such behavior twice as often as rural patients. Reducing the cost of primary health center visits was not known to be very helpful. Only improving the quality of services, providing integrated person-centered care, focusing on family health care needs, and providing critical preventive services could help improve the utilization of primary health care facilities and the effectiveness and efficiency of the health system <sup>[35]</sup>.

Fifth, studies have shown that public health resources in China are mainly concentrated in the western region. This region also has more skilled personnel and bed allocations [36]. Similarly, highly sophisticated hospitals are focused on the area of the west. Thus, China needs to pay attention to the rational layout of quality medical resources and medical elites [37].

### **3.2 Health Workforce (3 Articles)**

First, China's rural areas are relatively backward, and the health care system is also slow to develop. Medical students are generally reluctant to seek employment in rural areas. With policy guidance, China has trained about 1.5 million barefoot doctors since 1968, providing essential health services to 800 million rural people. The development of rural doctors in China has been divided into two phases: the barefoot doctor phase (1968-1985) and the rural doctor phase (1985-present.) After 1985, rural doctors relied mainly on drug sales for their income and thus required continuous and stable financial compensation from the government. In addition to this, there is still a significant gap between the medical level of urban and rural doctors [38].

Second, Chinese regions currently face an unequal distribution of public health personnel, with the workforce concentrated in western China. The Guangdong-Fujian region has a severe workforce shortage in the public health system [39].

Third, Chinese medical workers are frequently subjected to violent attacks. A survey in Zhejiang Province, China, noted that 17.4% of people were physically assaulted in the past year. Level II hospitals would be more likely to be attacked [40]. This phenomenon, known as "medical disturbance" in China, has even resulted in the death of doctors. It suggests that China needs to improve its laws to protect the safety of medical personnel.

### **3.3 Information (4 Articles)**

First, among the problems contributing to the low quality of primary health care in China is poor clinical care integration with essential public health services, and poor coordination between primary health care and hospitals. China should consider modernizing its primary health care system by learning new technologies to create a unified database to address communication problems [41,42].

Furthermore, mobile health (mHealth) is currently in an exploratory phase in China. Since mHealth is an emerging field in China, many laws and regulations have not yet been implemented. In general, mHealth is now only used in a particular hospital, and there is no unified digital system [43].

Finally, the integrated delivery system is the way forward for China. In some areas, diabetes management has already been integrated and has achieved some results. The integration of services has enabled the implementation of a tertiary care system, saving medical costs, reducing the financial pressure on patients, and reducing the burden on health workers in elite hospitals [44].

### **3.4 Medical Products, Vaccines, and Technology (3 Articles)**

First, China offers two types of vaccines: expanded Program on Immunization (EPI) vaccines, government-sponsored and non-EPI vaccines, voluntary and self-paying. The government plans to convert some non-EPI vaccines to EPI in the next few years. Recommended candidate EPI vaccines are varicella, mumps, and hand, foot, and mouth disease vaccines. However, HPV vaccines are in short supply in China and are age-restricted. Only Chinese women under 26 years of age can receive the nine-valent vaccine. Since China does not have its own nine-valent HVP vaccine, the nine-valent can only be imported from abroad. Most Chinese women are eager to solve this problem [45].

Second, by implementing the three policies of stopping the collection of immunization fees or immunization insurance, managing the immunization certificates well, and strengthening the immunization of special children, including mobile children, the latest and age-appropriate immunization rate of mobile children has increased significantly [46].

The Chinese pharmaceutical industry currently faces barriers to accessing new drugs. These barriers include drug regulation and financing, intellectual property protection, and innovation capacity development. However, China is implementing several policies to gradually remove multiple barriers to access, and medicines have shifted from primary

generic drugs to drugs with world-class breakthrough technologies [47].

### **3.5 Financing (5 Articles)**

First, with an aging population, China has an increasing number of patients with multiple physical illnesses. Multimorbidity is significantly associated with healthcare service use and catastrophic medical expenditures. Health inequalities caused by multimorbidity have a negative economic impact on the Chinese economy. Therefore, social health insurance must reduce the out-of-pocket costs of multimorbid patients and provide them with more excellent financial risk protection [48]. In addition, multimorbid patients may have physical and mental illnesses. To manage multimorbid patients effectively, healthcare systems need to shift from a single disease model to a new service model [49].

Second, the health care reform since 2009 has increased the coverage of essential health insurance, but the average health care cost per patient has shown a continuous increase [50]. It indicates that people's healthcare needs have increased in recent years. In addition, the incidence of catastrophic medical expenditure (CHE) in China decreased from 19.37% to 15.11% after the 2009 health care reform. The poverty rate in rural areas has declined less than in urban areas, and the poverty gap is widening. Therefore, more attention needs to be given to low-income families with members with chronic diseases to optimize integrated urban and rural health insurance and enhance poverty alleviation [51]. Finally, a study has shown that China's potential health expenditure is 13.4% compared to the current 4.8%, so China is severely underspending on health care [52].

Third, current health expenditures in China are projected to increase by 8.4% per year. By 2035, spending on circulatory diseases will increase to 23.4% of health spending. A 25% reduction in the prevalence of hypertension could reduce health spending by 3.4% in 2035, and a halving of smoking could reduce it by 3.5%. Targeted risk interventions could help control future health expenditure growth in China [53].

### **3.6 Leadership/Governance (5 Articles)**

First, public health crises have recently taken on a new systemic, cross-border character and uncertainty [54]. During the COVID-19 pandemic, non-medical measures (quarantine and masks) effectively contained and controlled the novel coronavirus epidemic, thanks to a unified leadership structure of the Chinese government [55]. However, the Chinese health system management system still suffered from unbalanced attention to health care and resources, untimely information disclosure, and inadequate grassroots public health efforts and control capacity [56].

Second, during both the Patriotic Health Movement (PHC) in China in the 1950s and the New Cooperative Medical Scheme (NCMS) in the 2000s, the Chinese government adopted a model in which each city explored and accumulated experience on its own, encouraging local governments to pilot innovative measures. Valuable lessons were learned from each other, and there was clear accountability and oversight at all levels. Higher-level government departments set policy goals and targets for lower-level governments, and the lower classes were responsible for implementation and enforcement [57]. However, these policies have drawbacks, as the decentralization of power to local governments has led to the prevalence of corruption, and some local governments are only superficial and do not do real work. Each locality has its own set of local laws, a complexity that makes government accountability implementation difficult [58].

## **4. Discussion**

The results of this study were analyzed and summarized together with other articles. For service delivery, primary health care still needs to be improved to narrow the gap between urban and rural areas and strive to develop integrated services. For health workforce, even distribution of health personnel and improvement of relevant laws to protect the safety of medical personnel. For information, the Chinese health information system lacks uniformity and transparency and needs to promote cooperation among multiple parties and improve a unified information platform. For medical products, vaccines, and technologies, Chinese hospitals and providers rely on prescription drugs for revenue, leading to severe drug over-prescription and poor antibiotic management. In addition, China needs to accelerate the development of its vaccines and overcome the difficulties of developing new drugs. For financing, the Chinese health care payment system is based on

fee-for-service, which can incentivize excessive health care delivery. Furthermore, Chinese health spending remains grossly inadequate and needs to increase primary health insurance coverage further and reduce catastrophic healthcare spending. For leadership/governance, there is a lack of coordination among multiple relevant government agencies. Moreover, the Chinese government should gradually summarize the experience of each local exploration and slowly develop unified health laws and regulations [59-60].

## References

- [1] (ADDCN) AoDDCoN. State restructuring and issues of local self governance in Nepal; 2008.
- [2] World Health Organization. Health financing for universal health coverage. Geneva: World Health Organization; 2016.
- [3] World Health Organization. Tracking universal health coverage: first global monitoring report. Geneva: World Health Organization; 2015.
- [4] Clark J. Medicalization of global health 4: the universal health coverage campaign and the medicalization of global health. *Glob Health Action*. 2014; 7:24004.
- [5] Stuckler D, Feigl AB, Basu S, McKee M. The political economy of universal health coverage. Background paper for the global symposium on health systems research. Geneva: World Health Organization; 2010.
- [6] Bärnighausen T, Sauerborn R. One hundred and eighteen years of the German health insurance system: are there any lessons for middle-and low-income countries? *Soc Sci Med*. 2002; 54:1559–87.
- [7] World Health Organization. Tracking universal health coverage: 2017 global monitoring report. Geneva: World Health Organization; 2017.
- [8] Hogan DR, Stevens GA, Hosseinpoor AR, Boerma T. Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services. *Lancet Glob Health*. 2018; 6:e152–68.
- [9] Sustainable Development Goals [Internet]. 2022 [cited 2022 6 Jun]. Available from: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- [10] Ranabhat CL, Atkinson J, Park MB, Kim CB, Jakovljevic M. The influence of universal health coverage on life expectancy at Birth (LEAB) and healthy life expectancy (HALE): a multi-country cross-sectional study. *Front Pharmacol*. 2018; 9:960.
- [11] Ranabhat CL, Park MB, Kim CB, Kim CS, Jeong HS, Koh SB, et al. Influence of key health related indicators on adult mortality: result from UN member countries. *Iran J Public Health*. 2018; 47:794–802.
- [12] Ranabhat CL, Kim CB, Park MB, Acharaya S. Multiple disparities in adult mortality in relation to social and health care perspective: results from different data sources. *Global Health*. 2017; 13:57.
- [13] UHC2030\_Global\_Compact\_WEB.pdf [Internet]. [cited 2022 Jun 7]. Available from: [https://www.uhc2030.org/fileadmin/uploads/uhc2030/Documents/About\\_UHC2030/mgt\\_arrangemts\\_\\_\\_docs/UHC2030\\_Official\\_documents/UHC2030\\_Global\\_Compact\\_WEB.pdf](https://www.uhc2030.org/fileadmin/uploads/uhc2030/Documents/About_UHC2030/mgt_arrangemts___docs/UHC2030_Official_documents/UHC2030_Global_Compact_WEB.pdf)
- [14] World Health Organization. The world health report 2013: research for universal health coverage. Geneva: World Health Organization; 2013.
- [15] United Nations Population Fund. World population dashboard-China [Internet]. New York: UNFPA; 2022 [cited 2022 6 Jun]. Available from: <https://www.unfpa.org/data/world-population/CN>
- [16] United Nations Development Programme. China: human development indicator [Internet]. New York: UNDP; 2020 [cited 2022 6 Jun]. Available from: <https://hdr.undp.org/en/countries/profiles/CHN#>
- [17] Brown RE, Piriz DG, Liu Y, Moore J. Reforming health care in China: historical, economic, and comparative perspectives [Internet]. Ford School of Public Policy; 2012 [cited 2022 6 Jun]. Available from: [http://sites.fordschool.umich.edu/china-policy/files/2012/07/PP\\_716\\_Final\\_Policy\\_Paper\\_Health-Final.pdf](http://sites.fordschool.umich.edu/china-policy/files/2012/07/PP_716_Final_Policy_Paper_Health-Final.pdf)
- [18] The World Bank. The World Bank in China [Internet]. Washington DC: The World Bank; 2022 [cited 2022 6 Jun]. Available from: <https://www.worldbank.org/en/country/china>
- [19] Tao W, Zeng Z, Dang H, Lu B, Chuong L, Yue D, et al. Towards universal health coverage: lessons from 10 years of

- healthcare reform in China. *BMJ Glob Health*. 2020; 5:e002086.
- [20] Hesketh T, Zhu WX. Health in China: from Mao to market reform. *BMJ*. 1997; 314:1543–5.
- [21] Dobson A. Health care in China after Mao. *Health Care Financ Rev*. 1981; 2:41–53.
- [22] Burns LR, Liu GG, editors. *China's Healthcare System and Reform*. Cambridge: Cambridge University Press; 2017.
- [23] Hsiao W, Li M, Zhang S. China's Universal Health Care Coverage. In: Yi I, editor. *Towards Universal Health Care in Emerging Economies: Opportunities and Challenges* [Internet]. London: Palgrave Macmillan UK; 2017 [cited 2022 Jun 7]. p. 239–66.
- [24] Zhu C. China's latest health reforms: a conversation with Chinese health minister Chen Zhu. Interview by Tsung-Mei Cheng. *Health Aff (Millwood)*. 2008;27(4):1103-10.
- [25] 111202\_Freeman\_ImplementingChinaHealthReform\_Web.pdf [Internet]. [cited 2022 Jun 7]. Available from: [http://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy\\_files/files/publication/111202\\_Freeman\\_ImplementingChinaHealthReform\\_Web.pdf](http://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/111202_Freeman_ImplementingChinaHealthReform_Web.pdf).
- [26] Tu J. *Health Care Transformation in Contemporary China* [Internet]. Singapore: Springer Singapore; 2019 [cited 2022 Jun 7]. Available from: <http://link.springer.com/10.1007/978-981-13-0788-1>
- [27] Li L, Fu H. China's health care system reform: Progress and prospects. *Int J Health Plann Manage*. 2017;32(3):240-53.
- [28] Li C, Tang C, Wang H. Investigating the association of health system characteristics and health care utilization: a multilevel model in China's ageing population. *J Glob Health*. 2020;10(2):020802.
- [29] Liang D, Mays VM, Hwang WC. Integrated mental health services in China: challenges and planning for the future. *Health Policy Plan*. 2018;33(1):107-22.
- [30] Jiang F. [From survive to thrive: advancing early childhood development in China's maternal and child health system]. *Zhonghua Er Ke Za Zhi*. 2021;59(3):161-4.
- [31] Zeng XJ, Zhou XD, Chen WX. [Development and improvement of Chinese oral public health system]. *Zhonghua Kou Qiang Yi Xue Za Zhi*. 2020;55(6):361-6.
- [32] Chai P, Wan Q, Kinfu Y. Efficiency and productivity of health systems in prevention and control of non-communicable diseases in China, 2008-2015. *Eur J Health Econ*. 2021;22(2):267-79.
- [33] Zhang L, Cheng G, Song S, Yuan B, Zhu W, He L, et al. Efficiency performance of China's health care delivery system. *Int J Health Plann Manage*. 2017;32(3):254-63.
- [34] Ta Y, Zhu Y, Fu H. Trends in access to health services, financial protection and satisfaction between 2010 and 2016: Has China achieved the goals of its health system reform? *Soc Sci Med*. 2020;245:112715.
- [35] Li C, Chen Z, Khan MM. Bypassing primary care facilities: health-seeking behavior of middle age and older adults in China. *BMC Health Serv Res*. 2021;21(1):895.
- [36] Yao H, Zhan C, Sha X. Current situation and distribution equality of public health resource in China. *Arch Public Health*. 2020;78:86.
- [37] Shi B, Fu Y, Bai X, Zhang X, Zheng J, Wang Y, et al. Spatial Pattern and Spatial Heterogeneity of Chinese Elite Hospitals: A Country-Level Analysis. *Front Public Health*. 2021;9:710810.
- [38] Hu D, Zhu W, Fu Y, Zhang M, Zhao Y, Hanson K, et al. Development of village doctors in China: financial compensation and health system support. *Int J Equity Health*. 2017;16(1):9.
- [39] Li YQ, Chen H, Guo HY. Examining Inequality in the Public Health Workforce Distribution in the Centers for Disease Control and Prevention (CDCs) System in China, 2008-2017. *Biomed Environ Sci*. 2020;33(5):374-83.
- [40] Yang SZ, Wu D, Wang N, Hesketh T, Sun KS, Li L, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *BMJ Open*. 2019;9(9):e031513.
- [41] Li X, Krumholz HM, Yip W, Cheng KK, De Maeseneer J, Meng Q, et al. Quality of primary health care in China: challenges and recommendations. *Lancet*. 2020; 395 (10239):1802-12.
- [42] Wang L, Wang Z, Ma Q, Fang G, Yang J. The development and reform of public health in China from 1949 to 2019. *Global Health*. 2019;15(1):45.
- [43] Tian M, Zhang X, Zhang J. mHealth as a health system strengthening tool in China. *Int J Nurs Sci*. 2020;7(Suppl

1):S19-s22.

- [44] Feng X, Feng W, Shen P, Wang Z, Shen J, Wang B. The effect of the integrated delivery system in rural areas of China. *Ann Palliat Med*. 2021;10(3):3018-27.
- [45] Gong D, Jiang Q, Chantler T, Sun FY, Zou J, Cheng J, et al. Health System Barriers and Facilitators to Delivering Additional Vaccines through the National Immunisation Programme in China: A Qualitative Study of Provider and Service-User Perspectives. *Vaccines (Basel)*. 2021;9(5).
- [46] Fang H, Yang L, Zhang H, Li C, Wen L, Sun L, et al. Strengthening health system to improve immunization for migrants in China. *Int J Equity Health*. 2017;16(1):19.
- [47] Diao Y, Li M, Huang Z, Sun J, Chee YL, Liu Y. Unlocking Access To Novel Medicines In China-A Review From A Health System Perspective. *Risk Manag Healthc Policy*. 2019;12:357-67.
- [48] Zhao Y, Atun R, Oldenburg B, McPake B, Tang S, Mercer SW, et al. Physical multimorbidity, health service use, and catastrophic health expenditure by socioeconomic groups in China: an analysis of population-based panel data. *Lancet Glob Health*. 2020;8(6):e840-e9.
- [49] Zhao Y, Zhang P, Oldenburg B, Hall T, Lu S, Haregu TN, et al. The impact of mental and physical multimorbidity on healthcare utilization and health spending in China: A nationwide longitudinal population-based study. *Int J Geriatr Psychiatry*. 2021;36(4):500-10.
- [50] Shu Z, Liu Y, Li M, Li J. The effects of health system reform on medical services utilization and expenditures in China in 2004-2015. *Int Health*. 2021;13(6):640-7.
- [51] Zhao Y, Oldenburg B, Mahal A, Lin Y, Tang S, Liu X. Trends and socio-economic disparities in catastrophic health expenditure and health impoverishment in China: 2010 to 2016. *Trop Med Int Health*. 2020;25(2):236-47.
- [52] Chen S, Kuhn M, Prettner K, Bloom DE, Wang C. Macro-level efficiency of health expenditure: Estimates for 15 major economies. *Soc Sci Med*. 2021;287:114270.
- [53] Zhai T, Goss J, Dmytraczenko T, Zhang Y, Li J, Chai P. China's Health Expenditure Projections To 2035: Future Trajectory And The Estimated Impact Of Reforms. *Health Aff (Millwood)*. 2019;38(5):835-43.
- [54] Xing C, Zhang R. COVID-19 in China: Responses, Challenges and Implications for the Health System. *Healthcare (Basel)*. 2021;9(1).
- [55] Baru RV. Health systems preparedness during COVID-19 pandemic: China and India. *Indian J Public Health*. 2020;64(Supplement):S96-s8.
- [56] Zhang P, Gao J. Evaluation of China's public health system response to COVID-19. *J Glob Health*. 2021;11:05004.
- [57] Yuan B, Jian W, Martinez-Alvarez M, McKee M, Balabanova D. Health system reforms in China a half century apart: Continuity but adaptation. *Soc Sci Med*. 2020;265:113421.
- [58] Hort K, Jayasuriya R, Dayal P. The link between UHC reforms and health system governance: lessons from Asia. *J Health Organ Manag*. 2017;31(3):270-85.
- [60] Xu J, Shi Y, Cheng F, Liang W. China's public health system: time for improvement. *Lancet Public Health*. 2021;6(12):e869-e70.
- [61] Tian M, Zhang X, Zhang J. mHealth as a health system strengthening tool in China. *Int J Nurs Sci*. 2020;7(Suppl 1):S19-s22.