

Commentary

Cite this article: Zhang X, Wang Y (2020). Prevention and control mechanism for coronavirus disease 2019 epidemic at the primary level: perspective from China. *Epidemiology and Infection* **148**, e161, 1–4. <https://doi.org/10.1017/S0950268820001636>

Received: 15 April 2020

Revised: 9 May 2020

Accepted: 20 July 2020



Key words:

COVID-19; epidemic prevention and control mechanism; primary-level emergency; public health

Author for correspondence:

Xiao-yan Zhang, E-mail: 24420054@qq.com

Prevention and control mechanism for coronavirus disease 2019 epidemic at the primary level: perspective from China

Xiaoyan Zhang¹  and Yuxuan Wang² 

¹School of Politics & Law and Public Administration, Hubei University, Wuhan, China and ²Department of Sociology, Huazhong University of Science and Technology, Wuhan, China

Abstract

After the 2003 SARS epidemic, China started constructing a primary-level emergency response system and focused on strengthening and implementation of policies, resource allocation. After 17 years of restructuring, China's primary-level response capabilities towards public health emergencies have greatly improved. During the coronavirus disease 2019 epidemic, primary-level administrative and medical personnel, social organisations, volunteers, etc. have played a significant role in providing professional services utilising the primary-level emergency response system of 17 years. However, China's organisations did not learn their lesson from the SARS epidemic, and certain problems are exposed in the system. By analysing the experience and shortcomings of China's disease prevention and control system at the primary level, we can focus on the development of disease control systems for major epidemics in the future.

Introduction

In December 2019, the coronavirus disease (COVID-19) epidemic began; it rapidly spread globally and has become a global public health emergency that severely threatens human health and social development. As the origin of the epidemic, China adopted epidemic prevention and control measures for several months before achieving phased results and effectively controlling the epidemic. The WHO–China Joint Mission on COVID-19 found that China had employed unprecedented public health response measures [1]; it achieved a cure rate exceeding 93% and prevented at least 100 000 COVID-19 cases [2]. Primary-level organisations played an important role in the prevention and control of the epidemic as personnel from these organisations conducted data screening, material distribution and dissemination of knowledge on disease prevention and control and played a positive role in maintaining social stability and reducing social and economic losses. Primary-level epidemic control is the first line of epidemic control and is an effective barrier for the prevention of the spread of coronavirus within the city/region or beyond. Hence, China's primary-level epidemic control experience is worth learning from.

Policy review

After the 2003 SARS epidemic, the Chinese government realised the severe deficiency in the primary level and recognised the failure in controlling the epidemic at the source. Since then, a great deal of attention is given to primary-level emergency responses in public health emergencies. In May 2003, the first official document, the Regulation on the Urgent Handling of Public Health Emergencies [3], was issued. Relevant policies were gradually refined during the 17 years of development. Regarding organisational systems, the General Office of the State Council issued the Opinions on Strengthening Primary-level Emergency Management in July 2007 [4] that clarified the division of responsibilities for primary-level emergency management. According to this policy, districts and counties were required to set up emergency committees, and subdistrict offices and township governments were made responsible for preventing and responding to various public emergencies within their respective administrative areas. Primary-level autonomous organisations such as neighbourhood committees and village committees were made responsible for mobilisation of resources. Regarding operational mechanisms, China launched the Contagious Disease National Direct Reporting System in early 2004 [5] to monitor epidemics. In December 2016, the General Office of the State Council issued the Guidelines for the Formulation of Community (Village and Town) Emergency Plans for Public Health Emergencies (Interim Edition) [6], stipulating that the primary-level organisations shall formulate emergency plans that conform to their local conditions. Regarding emergency assurance, the Law of the People's Republic of China on

© The Author(s), 2020. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives licence (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited. The written permission of Cambridge University Press must be obtained for commercial re-use or in order to create a derivative work.

Prevention and Treatment of Infectious Diseases was promulgated in December 2004 [7]; it stipulated that various levels of local governments shall guarantee funds for the prevention of infectious diseases in urban communities and rural units. Regarding healthcare support, the former Ministry of Health issued Several Provisions on the Construction of the Disease Prevention and Control System in January 2005 [8], requiring medical institutions in townships to conduct regular training and to establish long-term collaborative relationships with urban medical institutions. Regarding manpower support, the State Council issued Opinions on Strengthening the Construction of Primary-level Emergency Response Teams in October 2009 [9], proposing the mobilisation of volunteers, community organisations and other social agents to improve the socialisation of primary-level emergency response teams.

Construction status of primary-level emergency response system

During 2003–2009, the primary-level epidemic prevention and control system received strong institutional support; however, substantial measures began with the launch of a new healthcare reform (a new phase of reform of the healthcare system). The main achievements of this new reform were in three areas: first, investment in primary healthcare was increased, and prevention and treatment measures were combined. In most regions, the standardised construction of primary medical institutions was completed, and the per capita government subsidy for basic health insurance was increased from 15 RMB in 2009 to 69 RMB in 2019 [10]. The medical facilities available were further increased, 12 facilities being mainly provided by primary medical institutions, allowing early detection, early diagnosis and early treatment of diseases. Second, primary health service systems were continuously improved, and the infrastructure of the primary medical network was expanded. At present, there are 15 000 county-level hospitals, 36 000 township hospitals, 622 000 village clinics, 9352 community health service centres and 26 000 community health service stations in China; 90% of the national residents can reach the nearest medical facility within 15 min [11]. Third, the primary medical service capacity has been strengthened. A system of initial medical consultation at primary medical institutions was promoted, the services of general practitioners (GPs) were contracted, the performance-based income allocation system for medical staff was improved and primary medical institutions were integrated with urban medical institutions through four alliance models, urban medical alliance, medical community, specialised medical association and remote medical collaborative networks. In 2019, 3.66 billion people visited primary medical institutions, accounting for 52% of the total number of people who visited medical institutions in China. Thus, the demand of the residents for effective primary medical care was basically guaranteed.

Due to the continuous improvement, China's primary-level emergency response system played a significant role in control of the previous infectious disease outbreaks. In 2005, during the *Streptococcus suis* epidemic in humans, many township (subdistrict) level divisions were responsible for investigating small livestock farms within their area of jurisdiction, while the primary medical institutions monitored the symptoms of *S. suis* infection in human workers in livestock farms [12]. During the 2009 H1N1 outbreak, all districts and counties in China initiated the emergency response for public health emergencies within a short

span of 5 days, and eight temporary organisations, including the emergency response headquarters, medical teams and epidemiological survey teams, were established at the primary level [13]. During the 2013 H7N9 epidemic, township hospitals were responsible for pre-screening and triage of patients and setting up standardised and relatively independent fever outpatient clinics with entrances and exits that were separate from the general outpatient clinics, containing obvious signs and equipped with relevant resuscitation drugs as well as protection and disinfection facilities [14], which effectively aided the buffering role of the primary medical institutions.

This previously constructed primary-level disease prevention and control mechanism was utilised in the COVID-19 epidemic control. With regards to the prevention and control system, the primary-level units have established a joint prevention and control mechanism (a multi-ministerial coordination platform that was launched in response to the epidemic) to achieve disease prevention and control through multi-departmental involvement. For example, a community in Futian District of Shenzhen City established the ACT community prevention and control model ('A, administration', 'C, community health service centre', 'T, trinity mechanism') and constructed a community-wide joint prevention and control system. Regarding financial support, the central government allocated 60.33 billion RMB to fund basic public health services and primary-level epidemic prevention and control [15]. Regarding preventive and control measures, primary-level units implemented a grid-like prevention and control mechanism and community closure management and divided counties into low-, medium- and high-risk levels to prevent the coronavirus from spreading within the city/region or beyond [16]. The prevention and control risk levels were dynamically adjusted according to the epidemic, and workers and volunteers conducted data registration, procurement of materials and conflict mediation [17]. Regarding health services, GPs were responsible for screening close contacts of confirmed cases and conducting home or centralised medical observation. Residents who required a physical examination were asked to make prior appointments at the hospitals at fixed time periods, so as to reduce patients from aggregating in hospitals leading to a risk of contact with infected patients. Simultaneously, primary medical institutions included the care of all cured patients with COVID-19 into the scope of GP services and implemented the '14 + 14 management' for them (i.e. 14 days of centralised quarantine and rehabilitation management at a rehabilitation centre and 14 days of home rehabilitation management if no problems occurred). Regarding information management, various communities conducted prevention and control advocacy through push notifications in public WeChat official accounts [18, 19]. The 'Health Code' system was implemented through the Alipay app, and primary staff determined whether residents were allowed to enter or leave the area according to their 'Health Code' status [20].

Discussion

We believe that the primary-level disease prevention and control measures adopted in China for COVID-19, such as multi-department cooperation, precise prevention and control by epidemic level and area, and monitoring through informatised methods, have substantial implications. However, China's primary-level mandatory closure measures may not be suitable for all countries as the local situations in different countries vary.

This epidemic demonstrated the challenges faced in primary-level disease prevention and control. First, the primary-level early warning and detection mechanism is not sound, and the Contagious Disease National Direct Reporting System for public health emergencies did not effectively perform its functions. Second, there are great differences in planning and functions among various communities, making control difficult. In addition, primary-level organisations have limited public resources at their disposal, have insufficient capability for performing emergency responses and administrative staff lack professional guidance on epidemic prevention and control. Third, the primary medical institutions did not play the role of safeguarding the social welfare of the people, as fewer outpatient clinics in some institutions did not meet requirements, pre-screening and triage awareness was low and there were insufficient personal protective equipment, resulting in large gatherings of patients at hospitals at the early stages of the epidemic. In addition to gaps and deficiencies in epidemic control measures, the long-term effects of these shortcomings are also worthy of our consideration. The closed-off community management policies adopted by primary-level organisations in China resulted in severe inconvenience to residents, particularly among the elderly, handicapped and other special populations; additionally, it hindered the daily work of relevant service industries. In order to overcome the shortcomings of the primary-level prevention and control mechanism, we have proposed a few universal recommendations to guide future epidemic prevention and control:

- (1) Determining the responsible entities for the establishment of primary-level plans. During development of primary-level emergency response plans, focus should be at the county and township levels, communities (villages) and industries should be relied upon and the development of plans for communities, villages, schools and companies should be strengthened. Attention should be focused on the participation of experts and autonomous organisations in the development of emergency response plans and advocacy, and education on primary-level response to emergencies among residents should be strengthened to achieve positive effects.
- (2) Reconstruction of the joint prevention and control mechanism. The primary-level public health emergency command teams should include the leaders of neighbourhood committees, business associations, property management companies, government agencies in communities and various resident autonomous organisations as team members. Simultaneously, the responsibilities and tasks of all personnel in emergency response should be defined. We should have a deep grasp of the situation and the characteristics of different regions, actively establish partnerships with various parties, establish a comprehensive regional emergency material reserve system and strengthen emergency support.
- (3) Strengthening the infrastructure of the primary health service system. A system of initial visits at primary medical institutions should be effectively established to function on the long-term, that include pre-screening triage and construction of fever outpatient clinics. We should include the maintenance of protective gear reserves in the jurisdiction areas in the procurement and reserve plan of primary medical institutions. In order to increase the utilisation of health insurance policies, the construction of 'hospital alliances' and 'medical cooperatives' in China can be used as a reference [21, 22], the roles and responsibilities of each medical unit in public health

emergencies and routine health services in medical cooperatives should be defined, the division of labour and cooperative mechanism in medical units should be improved, a risk-bearing insurance system with full prepayment, surplus retention and reasonable above-quota sharing facilities should be established, and the proactiveness of primary medical personnel should be utilised.

- (4) Improving the information disclosure system. During public health emergency management, primary-level units should focus attention on information collection, management and interpretation, and disseminate relevant information to residents through bulletin boards, leaflets, telephone calls, social media and other media in a timely manner to prevent panic in residents.
- (5) Encouraging social agencies to participate in epidemic control and prevention. The setting up of volunteer teams should be improved so that volunteers are integrated to various aspects of emergency management. Emergency awareness should be integrated into the daily work of the government from the primary-level to the higher levels, and the efficiency of primary-level emergency response mechanism should be continuously improved.
- (6) Utilising information technology to provide primary-level support and assurance. Primary-level units should utilise information technology to construct data platforms for epidemic prevention and control and perform epidemic monitoring and management of key populations, enable access to epidemic management measures, perform information delivery, promote advocacy and education, promote environmental remediation, provide difficulty assistance, etc. [23]. We recommend developing and using early warning technology that are better suited for villages and townships, so that the primary-level units can conduct real-time monitoring of the risks and hidden threats of public health emergencies and issue warning information such as warning level in a timely manner.
- (7) Establishing a sound care system for vulnerable populations. During public health emergencies, while providing rescue services, psychological intervention and counselling services to the affected residents, primary-level units should also provide special care services to patients with refractory and complicated diseases, patients with mental illness, bedridden patients, the elderly, the disabled, women and children according to relevant information obtained during daily work of these units to provide targeted humanistic care.

Conclusion

The epidemic knows no borders. After the outbreak of COVID-19, new public health emergencies may occur in any country or region at any time. A comprehensive primary-level epidemic prevention and control mechanism is a basic measure to safeguard people's health. How can our primary-level control mechanism be deployed in advance in the next epidemic? Only by summarising experiences and learning our lessons can we minimise the social and economic impact of public health emergencies.

Acknowledgements. This work is funded by the National Natural Science Foundation of China (No. 71704048). We acknowledge all healthcare workers involved in the diagnosis and treatment of patients all around China.

Conflict of interest. Xiaoyan Zhang and Yuxuan Wang declare no conflicts of interest.

Ethical standards. This manuscript does not involve a research protocol requiring approval by the relevant institutional review board or ethics committee.

Data availability. Data were not used in this article.

References

1. Adhikari SP, *et al.* (2020) Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infectious Diseases of Poverty* 9, 29. Published online: 17 March 2020.
2. Sohrabi C *et al.* (2020) World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). Published online: 26 February 2020. *International Journal of Surgery* 76, 71–76.
3. Central People's Government of the People's Republic of China. Regulation on the Urgent Handling of Public Health Emergencies. Available at http://www.gov.cn/zwggk/2005-05/20/content_145.htm (Accessed 25 April 2020).
4. General Office of the State Council of the People's Republic of China. Opinions of the General Office of the State Council on Strengthening Primary-level Emergency Management. Available at http://www.gov.cn/xgk/pub/govpublic/mrlm/200803/t20080328_32585.html (Accessed 25 April 2020).
5. Sohu News. China's epidemic direct network reporting system has been launched, establishing a public health information network platform. Available at <http://news.sohu.com/2004/01/02/45/news217744513.shtml> (Accessed 25 April 2020).
6. General Office of the Ministry of Health. Notice of the General Office of the Ministry of Health on Issuing the Guidelines for the Formulation of Community (Village and Town) Emergency Plans for Public Health Emergencies (Trial Edition). Available at <http://www.nhc.gov.cn/bgt/pw10701/200703/e6754867919344f3b74bf59b4c80f235.shtml> (Accessed 26 April 2020).
7. Department of Laws and Regulations. Law of the People's Republic of China on Prevention and Treatment of Infectious Diseases (Decree No. 17 of the President of the People's Republic of China). Available at <http://www.nhc.gov.cn/fzs/pfl/200804/5d63e0e212764588b-fe925425b1b19c9.shtml> (Accessed 26 April 2020).
8. Central People's Government of the People's Republic of China. Several Provisions on the Construction of the Disease Prevention and Control System. Available at http://www.gov.cn/gongbao/content/2005/content_75219.htm (Accessed 28 April 2020).
9. Central People's Government of the People's Republic of China. Opinions of the General Office of the State Council on Strengthening the Construction of Primary-level Emergency Response Teams. Available at http://www.gov.cn/zwggk/2009-10/22/content_1446576.htm (Accessed 28 April 2020).
10. People's Health Network. National Health Commission: The per capita subsidy standard for basic public health services in 2019 was 69 yuan. Available at <http://health.people.com.cn/n1/2019/0905/c14739-31338559.html> (Accessed 3 May 2020).
11. Department of Primary Healthcare. Basic Development Status of Primary-level Healthcare System. Available at <http://www.nhc.gov.cn/jws/s3578/202002/59310c05e27944dabfe68bcc405561d.shtml> (Accessed 3 May 2020).
12. Medical Administration and Hospital Authority. Notice of the Ministry of Health on Issuing the Diagnosis and Treatment Plan for Human Infection with *Streptococcus suis* Disease. Available at <http://www.nhc.gov.cn/zyygj/s3585u/200804/41435fc7efaa405dbd9d37a28919dab0.shtml> (Accessed 5 May 2020).
13. Medical Administration and Hospital Authority. Notice of the General Office of the Ministry of Health on Strengthening Medical Treatment Work for Influenza A (H1N1). Available at <http://www.nhc.gov.cn/zyygj/s3585u/200911/7084a4b9d9c04e3cb2dbfd25384ffc76.shtml> (Accessed 5 May 2020).
14. Medical Administration and Hospital Authority. Notice on Further Improving Medical Treatment of Human Infection with H7N9 Avian Influenza. Available at <http://www.nhc.gov.cn/zyygj/s3586/201304/3f91f67a301c4a2785c39e7bcd3c91a4.shtml> (Accessed 5 May 2020).
15. Ministry of Finance of the People's Republic of China. The Ministry of Finance and National Health Commission allocated RMB 60.33 billion yuan this year to support basic public health services and primary-level epidemic prevention and control work. Available at http://www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/202001/t20200127_3464061.htm (Accessed 5 May 2020).
16. Wilder-Smith A *et al.* (2020) Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *Journal of Travel Medicine* 27, taaa020.
17. Ebrahim SH *et al.* (2020) COVID-19 and community mitigation strategies in a pandemic. *British Medical Journal* 368, m1066. Published online: 17 March 2020.
18. Wang C *et al.* (2020) Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health* 7, 1729. Published online: 6 March 2020.
19. Dickerson D (2020) Seven tips to manage your mental health and well-being during the COVID-19 outbreak. *Nature*. Published online: 26 March 2020. doi: 10.1038/d41586-020-00933-5.
20. Colbourn T (2020) COVID-19: extending or relaxing distancing control measures. *The Lancet Public Health* 5, e236–e237. doi: 10.1016/S2468-2667(20)30072-4.
21. Mahase E (2020) COVID-19: out-of-hours providers are drafted in to manage non-urgent patients in community. *British Medical Journal* 368, m959. Published online: 9 March 2020.
22. Prem K *et al.* (2020) The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: a modelling study. *The Lancet Public Health* 5, e261–e270. doi: 10.1016/S2468-2667(20)30073-6.
23. Jiang R (2020) Inside China and COVID-19: questions and answers. *Travel Medicine and Infectious Disease* 34, 101640. Published online: 23 March 2020. doi: 10.1016/j.tmaid.2020.101640.