

# COVID-19 prevention and control in China: grid governance

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## ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic has spread worldwide and caused negative economic and health effects. China is one of the most seriously affected countries, and it has adopted grid governance measures at the basic level of society, which include city lockdown, household survey and resident quarantine. By the end of April, China had basically brought the pandemic under control within its own borders, and residents' lives and factory production gradually began to return to normal. In referring to the specific cases of different communities, schools, and enterprises in the four cities of Anhui, Beijing, Shenzhen and Zibo, we analyze grid-based governance measures and we summarize the effectiveness and shortcomings of these measures and discuss foundations and future challenges of grid governance. We do so in the expectation (and hope) that the world will gain a comprehensive understanding of China's situation and introduce effective measures that enable the prevention and control of COVID-19.

**Keywords** basic level of society, COVID-19, grid governance, pandemic prevention and control

## Introduction

Coronavirus disease 2019 (COVID-19) broke out and spread rapidly across the world, impacting with severity on the economy, normal life and production. Many countries and regions have adopted lockdown measures and many international events have also been postponed or canceled, such as (respectively) the Tokyo Olympic Games<sup>1</sup> and the Hannover Messe.<sup>2</sup> By the end of April 2020, there were more than 3.6 million cases across the globe,<sup>3</sup> and Italy, Spain and the USA have been hit particularly hard. China has, in contrast, introduced strict control measures that brought confirmed cases down to single digits, and most new confirmed cases are imported from abroad. The Chinese are gradually and cautiously resuming work and study.

The identification and application of effective measures that combat COVID-19 has now become a global concern. The quarantine of infected patients and related contacts has been identified as the key measure.<sup>4</sup> The USA, which had more than 1 million cases at the end of April, has imposed stay-at-home orders with varying degrees of severity in California, Connecticut, Illinois, New Jersey and New York State.<sup>5</sup> The number of unemployed in the country continues to rise

and by the end of April more than 30 million US citizens had applied for unemployment benefit.<sup>6</sup> Japan's situation began to deteriorate in late March, and its government decided to declare a nationwide State of Emergency.<sup>7</sup> The implementation of large-scale anti-contagion policies by China, France, Iran, Italy, South Korea and the USA have prevented or delayed about 62 million infections.<sup>8</sup> China's lockdown of Wuhan and nationwide emergency response postponed the spread of the pandemic at an early stage, and avoided more than 70 million infection cases,<sup>9</sup> and the spread of the virus in the country dropped by over half.<sup>10</sup>

China responded with a series of strict lockdown measures, which included extending the Spring Festival holiday, curbing population flows, stopping production and postponing the resumption of work and school. Although the strict restrictions have negatively affected the lives of many residents, the pandemic has gradually been brought under control in

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the country and different industries have gradually resumed production. This study focuses on grid governance practice at the basic level of Chinese society in the period from January to April. We propose to analyze prevention and control measures in different situation, and management effects in four different regions.

## Grid governance

Grid is derived from the concept of power grid. The term 'grid' takes on different connotations in different fields, including geographic,<sup>11,12</sup> grid computing,<sup>13,14</sup> and basic management grid.<sup>15</sup> This study's 'grid' is formed by the fine division of responsibility between existing urban or rural communities. In China, grid-based governance seeks to divide the basic level of society into many responsible grids, and accordingly it inserts affairs, organizations and people into particular grids, and also uses modern technology to comprehensively and quickly complete basic information collection. Grid governance is a key measure that helps to promote decentralization at the grassroots level, and it is applied in both urban and rural communities in China. The question of how this model can be applied to a public experiencing strong transformation during crisis is a long-standing research concern.<sup>16,17</sup> Western countries instead mainly focus on the study of seamless government<sup>18</sup> and the digital and information management of communities<sup>19–21</sup>, rather than grid governance.

Asian countries such as China, Singapore and South Korea conversely apply a strong government-based community governance model, and this is shown by the extent to which the governments intervene in the management of communities.<sup>22,23</sup> This means that pandemic prevention and control can link management resources from top to bottom. Once prevention measures are introduced, they can be implemented quickly, and mandatory measures can then sink down to urban and rural communities.

## Grid-based governance applied to the basic level of China's society

After the lockdown of Wuhan (30 January 2020), many large cities in China issued regulatory policies that included population flow curb and production suspension. These measures were launched by all administrative systems, and then extended from the central government to provinces and cities and then onto communities and villages. This pandemic tests the efficiency and penetration of governments at all levels and it also tests the grid governance model that China has executed for many years. The early stages of the outbreak

coincided with the Spring Festival, and it was therefore essential to introduce early quarantine and treatment measures that would effectively control the spread.<sup>24</sup> Strict lockdown and quarantine measures made it possible to control the risk of imported cases and this made it possible to reduce continued affected transmission to five-thousandths.<sup>25</sup>

## Management of public places

In the early pandemic, several of China's provinces and cities initiated the first-level public health emergency response. Mass cultural activities were canceled, and public entertainment venues were closed. Communities were placed under lockdown. Strict restrictions were imposed on external vehicles and home returnees especially in high-risk areas. Residents were encouraged to wear masks, check their body temperatures, and present valid certificates when visiting public places. All colleges and universities issued relevant notices to students and students were forbidden to return to school in advance; the campus went into lockdown, and outside vehicles and personnel were prohibited from entering.

## Quarantine measures

In China, there are two types of quarantine measures—those that apply at home and others that apply to assembly sites. Close contacts of confirmed or suspected patients are required to complete a 14-day medical observation in quarantine at assembly sites (usually local hotels) and take nucleic acid testing. Quarantine staffs organize the daily diet and meet the basic needs of the quarantine personnel. Common fever patients who can be certificated are quarantined at home for 14 days, where they undergo medical observation such as the taking of body temperature. For the foreign returnees, they are required to immediately enter quarantine.

## Management sink

Particular staffs of communities are required to 'sink' to the communities to carry out household surveys and acquire residents' health information. They organize health surveys, and report suspected infections to the supervisor, and then assist a medical examination. The government hires particular grid members to clean and disinfect high-risk places to prevent the spread of COVID-19. Grid members need to collect statistical data on a daily basis. This includes information about the pandemic situation (the number of suspected cases, diagnoses and cleared cases/deaths) and pandemic control work (tracing, screening and disinfect). Pandemic prevention knowledge, health tips and medical guidelines are widely disseminated.

### **Working forms changed by new technology**

In extending the Spring Festival holidays, governments required companies to flexibly arrange working hours, and also encouraged employees to telework at home. Many companies used online office software for daily office work. In order to reduce the impact of suspended classes, enterprises and the government cooperated to adopt online courses and lectures. For example, China's Ministry of Education launched the 'National Network Cloud Classroom', which provided online on-demand courses to all students. Local governments also sought to achieve the high-efficiency management of crowd flow by providing citizens with digital 'health code'. It is based on real data, and connects to relevant databases. The healthy with the 'green code' are able to normally resume work and school, while those with the 'yellow' and 'red' code are required to seek quarantine and treatment.

### **Case study of grid governance at the basic level of China's society**

Typical cases were selected for grid-based governance analysis that refers to the prevention and control of the COVID-19 pandemic and were selected on the basis of the authors' location and experience (Figure 1).

#### **Case 1: Community in Shenzhen: a gathering area of non-local people**

Shenzhen, which was the first megalopolis to participate in China's reform and opening, had 4.95 million registered permanent residents in 2019, and 8.49 non-resident registered permanent residents.<sup>26</sup> Shenzhen recorded its first case on 8 January 2020 and Shenzhen Center for Disease Control and Prevention (CDC) immediately took measures to start detecting related suspected cases; it also took a household survey of fever personnel in the community, and tracked all the close contacts of suspected cases. After the Lunar New Year, a large number of people returned to Shenzhen and resumed work. A series of measures were then implemented to reduce risk. All communities went into lockdown and community grid members conducted surveys of everyone coming back especially those from high-risk areas. Statistics were collected, and restrictions were imposed on the entry of outsiders and vehicles.

Community grid members played an important role in health screening. In the Longhai Home (LHH) community, for example, community grid members asked each person to provide details of their residence, travel, and contact experience over the past 14 days. Those who had lived in affected areas in the previous 14 days were required to enter

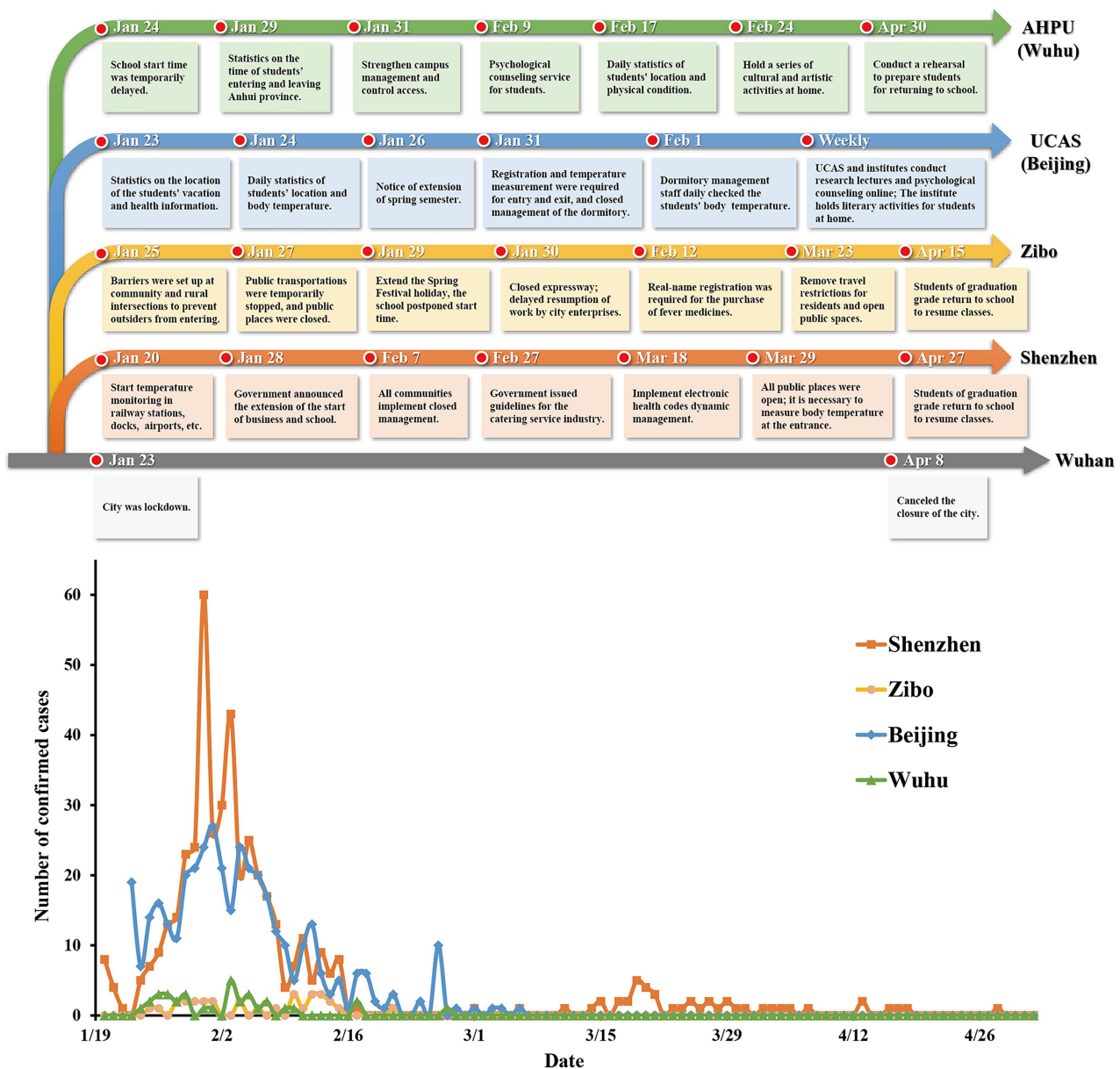
self-monitored quarantine at home; in addition, the residential buildings housing those confirmed to have been infected were entirely isolated. Home quarantine residents are required to undergo medical observation and have their temperature checked twice each day. Those who present with symptoms such as a fever and/or cough are then asked to promptly report to CDC. The daily food necessities for home quarantine residents, such as eggs, meat, rice and vegetables, are delivered by grid members without physical contact. Particular staffs are arranged to sterilize those public spaces that remain accessible, such as corridors and elevators, twice a day.

At the end of March, Shenzhen was certificated as a low-risk area, and public places gradually reopened. LHH added multiple entrances to facilitate resident entry but retained the temperature check measures. Shenzhen's pandemic prevention and control has shifted away from the screening of those who traveled in Wuhan and the Hubei region, and is now instead focused on those who have recently traveled abroad.

#### **Case 2: Community in Zibo: local people gathering area**

In contrast to Shenzhen, Zibo City's population is mainly made up of the local population. In 2019, the permanent population was 4.7 million, and the registered population was 4.34 million.<sup>27</sup> The focus of its pandemic prevention and control was on the screening of returnees during the Spring Festival and the control of large-scale gathering. On 25 January 2020, the city's first case was confirmed. The local government took strict measures, and imposed lockdowns on all communities. Grid resource sinking was also used to screen suspected cases for quarantine, and this effectively prevented the spread of the virus.

The Zijiang Garden (ZJG) community implement grid-based governance and household-to-grid member rule, and each household resident is designated a grid member who takes charge of the survey. All personnel returning conduct community screening and register one-by-one. Those who have a history of living or traveling in affected areas, will undergo home quarantine. Those who have come into contact with suspected patients and diagnosed patients should be quarantined assembly. Grid volunteers provide services for families in quarantine, such as delivering daily necessities. Public places in the ZJG are cleaned, disinfected and ventilated during lockdown. The grid member suggests that the residents takes fewer trips outside and also suggests the wearing of masks. ZJG set up persuasion stations at the entrances, and these encourage visitors to return. The community screening team fills in the health declaration form every day and reports it to authorities higher in the decision-chain. On 7 March 2020, the emergency response level in Zibo was adjusted from



**Fig. 1** Changes in grid governance measures and changes in the number of confirmed cases of COVID-19 from January to April 2020. Shenzhen, Zibo, UCAS and AHPU had adopted different countermeasures for the pandemic, and adjusted the measures according to the changes in the number of confirmed cases in the local and national areas.

level 1 to level 2. Accordingly, ZJG loosens the lockdown and called on residents to take protective measures when they go out, including the keeping of social distance and wearing masks. On 23 March 2020, travel restrictions on residents were completely lifted.

### Cases 3 and 4: University dormitory in Beijing and Wuhu: students' gathering area

During the Spring Festival, a small number of postgraduates remained in The Olympic Village dormitory of University of Chinese Academy of Sciences (UCAS). So it is necessary to

carry out pandemic prevention in accordance with the state of student aggregation. Since the Wuhan lockdown, UCAS has strengthened management, and has collected statistics of student location. UCAS collected daily statistics on the health of all students and pay attention to each student's mobility. Meanwhile, UCAS issued a notice that extended the holiday and advised teachers and students not to return early.

Since 31 January 2020, the dormitory area has gone into lockdown, and students are required to register when entering the dormitory. The dormitory management staff checked the body temperature of each student every day. In attempting to

alleviate student anxieties, UCAS holds anti-pandemic home-themed activities, which include manual cooking shows, psychological counseling and home fitness. In working to provide students with more accurate psychological support, UCAS regularly organizes online psychological questionnaire surveys and counseling lectures. UCAS also meets their learning and scientific research needs by inviting many excellent scientists to give web lecture.

Unlike UCAS, Anhui Polytechnic University (AHPU) in Wuhu City of Anhui Province is an ordinary university with a majority of undergraduates. AHPU issued a notice on the temporary delay of the start of school on January 24 and surveyed the time that it took students to enter and leave Anhui Province by screening their history of travel. AHPU strengthened the control of personnel entrance. Residential quarters in the school went into lockdown, and only one entrance was left and residents were allowed to pass after their body temperature was taken. A series of online cultural and artistic activities were also used to fight against the pandemic, and online psychological counseling for students helped to alleviate psychological distress. AHPU constantly adjusts the return time and prepares for the return of students.

### **Foundations and problems in grid governance for pandemic prevention and control**

The grid-based governance of China's pandemic prevention and control can achieve good results because of the vertical management of the entire bureaucracy, the government's rapid decision-making, the comprehensive launch of the public health system and full public participation. The community is the cornerstone of national governance and the most basic unit of prevention and control. China's grid governance provides an important model of community governance, and it has played an important role in combating the outbreak. Most of the grid-based governance process is achieved through government promotion and direct intervention, and in many respects, it shows an extraordinarily strong level of administrative performance. When responding to a severe outbreak, the central government is able to integrate the power of various regions and departments, consolidate the strength of the majority of medical workers, and mobilize pandemic prevention and scientific research personnel, in addition to grid members, to form a joint prevention and control mechanism to respond to the crisis.

Of the factors that determine the impact of pandemic prevention and control, preventive measures, science and technology and medical standards are crucial, but due consideration should also be given to cultural and social

factors. In traditional East Asian national culture, the family is the basic cell of society and it underpins wider society. Collectivism and patriotism are the roots of mass cohesion. In this outbreak, the Chinese people have repeatedly expressed strong national sentiments. The outbreak exactly coincided with massive population flow during the Spring Festival, and many local governments therefore introduced movement control orders. Many families put the national interest in front of their own and the vast majority of residents recognized that, while they had the right to travel, they should not exercise this right under certain circumstances. The Spring Festival holiday was extended, school reopening was postponed, the date of the resumption of work was left open and online offices were promoted. There was no confusion or disorder, and the entire society was at peace.

Active and conscious participation is a key factor that helps to determine the success of pandemic prevention and control. Since the start of the outbreak, government knowledge and expertise has been circulated through the media and the basic public knowledge of the virus and outbreak has grown as a result. Masks are increasingly worn and hands are washed frequently; windows are frequently opened, sneezing into elbows has become common. Thinking and actions of residents have changed considerably, and this has made an important contribution to the prevention and control of the outbreak.

Although quarantine control is still the most important and effective system response, various shortcomings have been exposed. The most frequent example is the repeated completion of the health declaration form. Agricultural, education, emergency, health and rural bureaus, in addition to government offices, produce one or several forms, which grid staff have to quickly complete. The content is almost the same; in some cases, bunch, repeated and multiple inspections have unnecessarily preoccupied the time and energy of grid members.

### **Summary**

China's effective prevention and control of COVID-19 has shown how grid governance can effectively help to reduce and even stop virus outbreaks. The community has a leading role in the implementation of lockdown and its personnel travel between houses in order to identify infections. Pandemic prevention and control is rehearsed during the college suspension and this establishes a basis for resumption. These are all examples of grid governance that are addressed to the outbreak at the basic level of society. However, China is still confronted by a number of problems that include the unnecessarily refilling of forms. There is



accordingly still scope for measures addressed to overly rigid implementation and efforts can also be made to address the problems associated with multiple actor leadership. In a large number of other respects, China's prevention and control measures have achieved impressive results, and they can directly contribute to the ongoing global effort to contain the pandemic.

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## Conflict of interest

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