



# Research on Collaborative Governance of Public Crisis Events Based on Big Data Information Processing Technology

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**Abstract.** This paper adopts a quantitative approach to the study of collaborative public crisis management in the context of big data. Quantitative analysis is conducted on the data of population movement and epidemic distribution, production and deployment of epidemic prevention resources and public service provision during the epidemic. The results show that information processing technology based on big data can uncover the development pattern of the epidemic, implement precise prevention and control, carry out information-based deployment of epidemic prevention resources and realise digital citizen-friendly services. On this basis, a collaborative public crisis management model based on big data information processing technology is proposed.

**Keywords:** big data · information processing · public crisis · collaborative governance

## 1 Introduction

### 1.1 Research Background

The outbreak of pneumonia in the New Crown epidemic during the 2020's Chinese New Year brought an unprecedented test of China's public crisis management system and governance capacity. In the prevention, control and response to the new pneumonia epidemic, the traditional public crisis management model was transformed due to the intervention of big data, artificial intelligence and internet digital technology. The model of collaborative social crisis management is integrated at the front-end and back-end<sup>2</sup>. The model of collaborative management of social crises has been transformed from a single government management to a collaborative participation of government, social groups, enterprises and citizens, with simultaneous online information transmission and offline management, and integrated front-end and back-end.

Big Data has broken through the traditional framework of governance, enabling the transformation of national governance to be intelligent, modernized and data-driven, and has led to groundbreaking changes in government governance in different areas of social governance, such as public services, public crisis management and public crisis

decision-making<sup>2</sup>. Big Data's excellent data interconnection, information sharing and information processing capabilities can be used to build user-friendly public services and form tracking and intelligent application platforms, forming a new model of public crisis governance that "uses data to speak, uses data to make decisions, uses data to manage and uses data to innovate".

## 1.2 Research Methodology

This paper adopts a quantitative approach to the study of collaborative public crisis management in the context of big data. Quantitative analysis is carried out on data from three areas: population movement and epidemic distribution, production and deployment of epidemic prevention resources, and public service provision during the epidemic. The results show that the information processing technology based on big data can uncover the development pattern of the epidemic, implement precise prevention and control, carry out information-based deployment of epidemic prevention resources and realize digital citizen-friendly services. The aim is to build a risk prevention and control mechanism and emergency handling mechanism based on big data information processing technology.

## 2 Review of the Literature

The theory of collaborative governance is one of the most important theories that have emerged in the field of public administration in recent years, and is derived from the theory of synergism proposed by the German physicist H. Hacken. Synergism is the idea that the social environment is a whole system, and that within the whole environment there are systems that interact with each other. Social phenomena such as the cooperation and collaboration between different units, the coordination of intersectoral relations, the role of competing enterprises, and the mutual interference and constraints in the system all have an impact on the larger social system [3].

At present, domestic and international theoretical circles have paid extensive attention to the application of big data in collaborative governance of public crises. Li Wei'an (2020) et al. pointed out that a government-led collaborative governance mechanism with multiple subjects should be established during an epidemic<sup>2</sup>. The government should pay attention to the importance of big data technology in responding to public crises in terms of emergency decision-making capacity and efficiency<sup>2</sup>. The government should pay attention to the role of big data technology in responding to public crises in order to improve data utilisation and improve the emergency management system<sup>2</sup>. The government should pay attention to the importance of big data technology in responding to public crises in terms of emergency decision-making capacity and efficiency, improving data utilization and improving emergency management systems. Reconstructing the collaborative governance structure of social risks and disasters in the context of big data<sup>2</sup>. By using digital government applications, the public will have access to professional information on epidemics, which will further enhance trust in government information and capabilities<sup>2</sup>. The use of digital government applications will further enhance public trust in government information and capabilities.

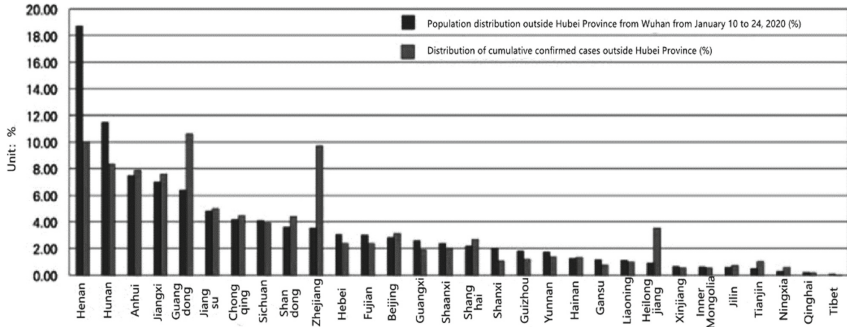


Fig. 1. Distribution of population outflow from Wuhan outside Hubei Province versus national (except Hubei) epidemic distribution in the 2020. Data source: National Statistical Office

### 3 Big Data Technology in Public Crisis Management

#### 3.1 Big Data Fuels a Multi-Participant Epidemic Prevention System

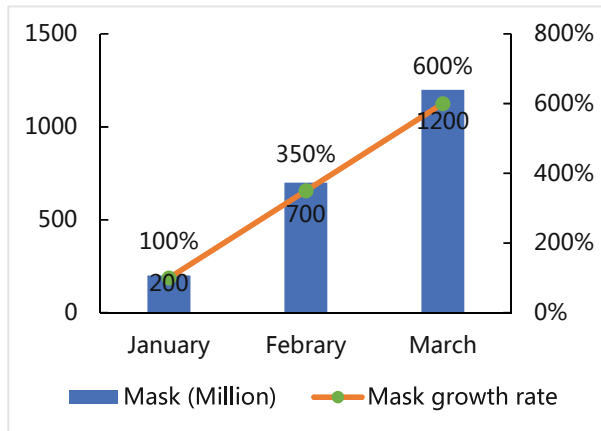
The epidemic prevention and control system is a complex social system that relies on the whole society, and the Newcastle pneumonia epidemic prevention and control system not only involves the administrative system, medical institutions, enterprises and community residents, but also involves the complex interaction between the subjects, which is not a simple linear relationship. The system of social prevention is a comprehensive one.

In the overall strategic deployment of this epidemic prevention and control, the Wuhan Municipal Government in Hubei Province has followed the collaborative governance of big data to trace the roots of the epidemic and promptly compared the distribution of the population out of Hubei Province with the national distribution of the epidemic, as shown in the Fig. 1. The big data analysis concluded that there was a correlation between the outflow and the number of confirmed cases, with areas closer to Wuhan being more vulnerable to the impact of the epidemic and areas with high population mobility being more affected, with more confirmed cases in provinces and cities with greater population mobility. The information on the pattern of the epidemic was mined from the data, laying a solid scientific foundation for winning the battle against the epidemic [9].

#### 3.2 Big Data Helps to Produce and Deploy Resources for Epidemic Prevention

In the fight against the Newcastle pneumonia epidemic, thanks to the intervention of digital technology in market supply, material deployment and emergency relief, the government, Internet companies and voluntary organisations were able to collaborate to support the production, co-ordination, supply and use of various resources to meet the various social needs in a crisis environment<sup>2</sup>.

In terms of material production, for the production of medical and prevention and control materials, which are the most important and most in short supply in the “war on epidemic”, the Ministry of Industry and Information Technology used the national key medical material security scheduling platform to achieve information-based scheduling

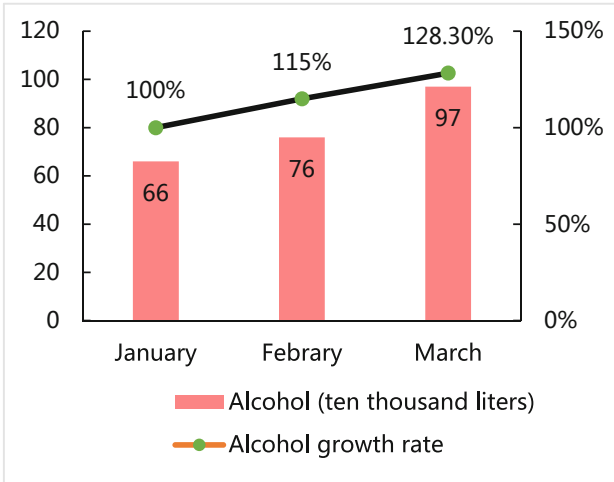


**Fig. 2.** Production value and production growth rate of masks in the context of big data-assisted production of prevention. Resources, January–March 2020year

of medical materials and increased its efforts to start resuming work and production. 2020In the month of January 1, demand for epidemic prevention products such as masks, alcohol and medical equipment increased significantly, and production grew with the help of big data scheduling of production raw materials. 2In the month, some enterprises have started to produce scarce materials, and the production of medical masks in that month increased by 3.5times year-on-year. In addition, alcohol and other disinfection products production growth are 15%. 3In the month, the production of masks grew by more6 than times year-on-year, and alcohol grew by 28.3%, as shown in the chart 2 and graph 3. The major logistics reverse direction, become Wuhan and the surrounding areas of emergency supplies to raise, coordination, transport and distribution of the most core forces, open up the country and Hubei, and Wuhan between the material “lifeline” (Figs. 2 and 3).

### 3.3 Big Data Helps Public Service Provision

With the help of digital technology, the “mobile government” of the government, the “platform economy” of Internet companies and the “grid governance” of communities are working together to respond to the people’s service needs and requests needs and requests for prevention<sup>2</sup>. The government is also working with the community to provide services to the public. Relying on the national integrated government services platform, the health codes of most provinces across the country have achieved information sharing and mutual recognition in a relatively short period of time, providing strong support for “one code for all”. By the end of this1 year, the platform had provided more than 100 600million exchanges of epidemic prevention data to various regions and departments, and more than 200100 million times of comprehensive information sharing of health codes, providing strong support for accurate epidemic prevention and control. Since its launch and operation until January31 this year, the total number of views on the national government services platform reached133 100 million, with a total of 100



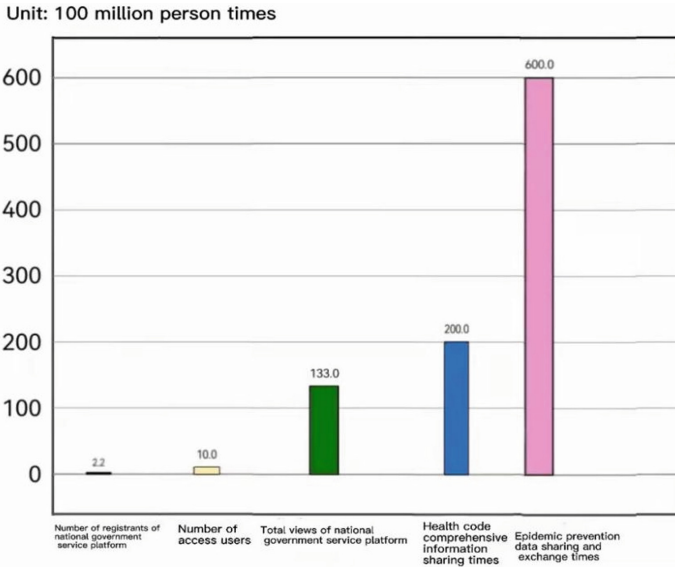
**Fig. 3.** Big data to help prevent the production of resources in the context of alcohol production value and production growth rate in January–March of the 2020 year. Data source: China Statistics Bureau

2.02 million registrations and over 100 million users visiting the platform, as shown in the Fig. 4. Local governments have also launched convenient services related to epidemic prevention and control through service portals such as APP, WeChat and Alipay mini-programs, involving epidemic updates, protection knowledge, epidemic disinformation, online charity clinics, fever clinic enquiries and other services, helping the public to keep abreast of the current prevention and control situation without leaving home, solving confusion and answering doubts, and relieving social emotions during extraordinary times.

#### 4 The Establishment of a Public Crisis Management Mechanism Based on Big Data

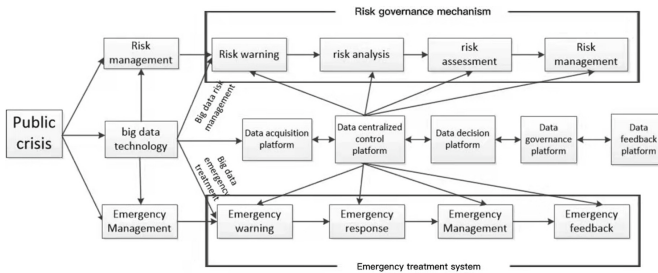
During the epidemic, big data was used to help prevent and control the epidemic, and valuable experience was gained in public crisis management through big data, on the basis of which a modern public crisis management model was built, as shown in the Fig. 5.

This governance framework model uses big data as the basis for a modern collaborative governance framework to establish a system for sharing data and information in public emergencies, risk management and emergency response as a collaborative social governance system<sup>12</sup>. The system is based on big data technology to enable public safety. This system uses big data technology as the basis to facilitate a rapid response chain for public safety issues, to collect and scientifically analyse holographic system data on risk and emergency response to public emergencies with the help of big data technology penetration characteristics, to measure and make decisions on risk and emergency response measures, and to provide feedback on risk and emergency response management afterwards, to build a perfect chain for public emergencies management, and to improve the



**Fig. 4.** As of January 31, 2021, the user data and information sharing service data provided by the national government service platform. Data source: China Statistics Bureau

overall risk prevention and control of public emergencies and emergency response. The system also provides feedback on risk and emergency management afterwards, building a perfect chain of public emergency management and improving the relevance and effectiveness of risk prevention and control and emergency management.



**Fig. 5.** A framework for public crisis governance based on big data information processing technology

## **5 Insights from Big Data to Drive Collaborative Management of Public Crisis Events**

### **5.1 Improving a Collaborative Governance System Based on Big Data**

Accelerate the integration of the resources of various emergency platforms, improve the corresponding supporting legal system and technical standards and norms, properly arrange and coordinate the exchange of data and information, and strengthen the data governance system and emergency mechanism guarantee while ensuring the full use of big data. Build a digital integration platform centre for government affairs, and promote the docking of data resources from various industries and fields on the platform to achieve collaborative management of public crises<sup>2</sup>. And we must continue to strengthen the protection of intelligent security systems for big data. The rules and regulations on data exchange, interaction and sharing, and governance in accordance with the law should be widely implemented, and the safety protection of individual data of the public should be increased while making full use of the technology and functions of big data, and the rights and responsibilities of all parties involved in data sharing and application should be scientifically clarified to ensure the orderly promotion and scientific and efficient operation of the governance of public emergencies.

### **5.2 Optimising the Allocation of Intelligent Emergency Information Resources**

The emergency response to the risk of public emergencies is constrained by both the urgency of time and resource constraints, which makes it particularly important to have intelligent emergency information resources to work together<sup>2</sup>. This is why it is important to collaborate on the provision of intelligent emergency information resources. In view of the inconsistency or duplication of the information supplied by intelligent resources for the same or similar risk emergency tasks, intelligent information resources are re-optimised and re-combined to establish a key mechanism for the allocation of intelligent information resources for risk emergencies. Intelligent information resource allocation solutions are given according to the characteristics and laws of specific public emergencies. At the same time, it is necessary to further sequence big data intelligent organisation and multi-source fusion information resources according to the occurrence process of sudden public events, and seek the optimal solution.

### **5.3 A New Mechanism for Improving Emergency Response to Big Data**

It is particularly important to accelerate the improvement of a modern framework model of public crisis governance based on big data technology. On the one hand, it is important to establish an integrated and collaborative governance decision-making and implementation system, to achieve the goal of linking governance decisions from a single subject to multiple groups, and to improve the accuracy and synergy of risk prevention and emergency response in public emergencies. On the other hand, it is necessary to further optimise and enhance the big data-driven response mechanism for the governance of public emergencies, and to realise the positive interaction between the use of data technology and the emergency management of public emergency risks. At the same time, a

big data governance framework for public emergencies should be constructed as soon as possible, with relevant data and information organically integrated to form a unified data system, enabling one-stop search, one-stop analysis and one-stop decision-making, and improving the effectiveness and level of response to risk emergencies<sup>2</sup>. This will improve the effectiveness and level of response to risk and emergency situations.

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