Research Paper

Study on the supply of urban public service facilities and the path of cracking based on public health emergencies

A case study of Wuhan in China

Hong Geng, Huazhong University of Science & Technology, China

Long Yang, Huazhong University of Science & Technology, China (Corresponding author)

Abstract

The public service system in public health emergencies indicates the problems of hierarchical mismatch and conducted downward Invalidation in response to explosive demand shocks. This article clarified the fragility of the public service system in response to emergencies, constructed a hierarchical facility supply system of "upper control, middle flexibility, lower feedback" as the core, "evaluation, supply, and management " from the whole process of the facility supply ,emphasizes the framework of "full-link vulnerability assessment, full-coverage hierarchical supply, and full-cycle operation management", based on the overlay analysis of the spatio-temporal dynamics of the magor epidemic's initiation, outbreak, spread ,control and the type, level , spatial distribution characteristics of public service facility system. This article explored the transformation of the supply path of public service facilities under public health emergencies combining with Wuhan to conduct empirical verification.The assessment link should focus on the fragility of public service facilities, and construct a public service system and facility assessment system to ensure the effectiveness of space supply; the supply link should focus on community residents' needs as the main body, clarify the needs and spatial layout, and ensure the fairness of the supply of public service facilities; The operation and management link should strengthen the construction of the community planner system, establish an operation management mechanism that pays equal attention to supervision and communication between the system and life subjects, and improve the efficiency of matching the supply and demand of community facilities.Further research found that the factors includes the failure in response to community prevention and control positions, imbalances in the configuration of the public service system, significant gaps in public service levels, and lagging online emergency supply are the major causes of the failure of the temporal and spatial correlation between public health emergencies and the supply of public service facilities. Based on these issues, this article proposed a solution to the supply of urban public service facilities to respond to explosive demand shocks: (1) differentiated supply combining centralized and decentralized supply; (2) strengthening service entities to focus on residents' demand orientation; (3) multi-sectoral coordination Implementation process management; (4) planning the operation guidance mechanism of in-depth intervention. Finally, based on these cracking paths a corresponding spatio-temporal emergency prevention and control network strategy is proposed to alleviate the supply crisis of urban public service facilities caused by the strong negative effects of public health emergencies.

Keywords

2019-nCoV ,major public health emergencies, public service facilities ,path of cracking, emergency response

1. Introduction

Looking back at the 2003 SARS, 2009 "H1N1", 2012 "MERS" and 2019 "2019-nCoV", we found that large-scale public health incidents with strong, sustained, easy to spread and high-risk risks have become global problems threatening city public safety and residents' life and health, seriously disrupting City daily life and economic production. The normal order of tourism services and other activities greatly tests the system level and response ability of urban public health and public management.

Under public health emergencies, the public service system shows a certain degree of inadaptability, low resistance and weak toughness in different spatial scales such as cities, districts and communities, and different service supply dimensions such as online and offline, thus deeply blocking the rapid response and service output of urban emergency service system, It has a serious impact on Residents' living environment and urban production and life. Under the impact of unbalanced and explosive public service demand, the urban public service system presents structural and functional problems such as lagging service, lack of supply, insufficient function and improper management. Therefore, with the increasing frequency of public health emergencies, comprehensively improving the hierarchical configuration, service mechanism and management system of urban public service system and improving the emergency response ability of "peacetime and wartime combination" of public service system may become a new functional target to adapt to the healthy development of big cities in the new era.

2. Supply of urban public service facilities and response to public health emergencies

2.1. Analysis on the temporal and spatial correlation between public services and major public health emergencies

As the world's major public health emergencies occur frequently and affect a wide range, scholars at home and abroad have carried out retrospective research on the whole process from disaster, pathology, spatial geography, sociology, management and other disciplines. Relevant studies show that major public health emergencies are not limited to "medical" prevention and control events, It is a comprehensive work of special social governance involving urban public services, and has a close temporal and spatial correlation with public services, mainly as follows:

During the latent and transmission period of the epidemic, high-density and high flow public service facilities provide a pregnant disaster environment for the virus, which is the key factor affecting the transmission and diffusion of the epidemic. Especially urban community is a very important disaster pregnant environment. For example, in 2003 SARS, Hongkong's Amoy garden was infected by less than 329 people in January. With the implementation of community environmental improvement and isolation measures, the epidemic situation was effectively controlled. The same is true in Wuhan. Before the outbreak of the epidemic, the way of closed isolation was adopted for the first time, so that the spread of the virus can be further controlled (Figure 1).

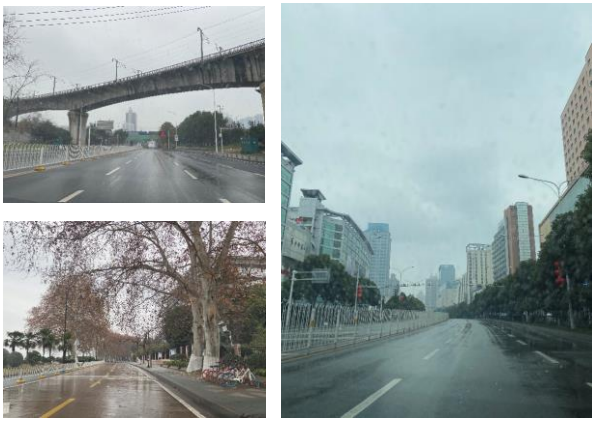


Figure 1. The first day of Wuhan City closure. Source: self photographing by the author.

In the period of epidemic spread and outbreak, the disease itself and social system are important diffusion driving forces. Public service has become an important supporting element of emergency response. The response speed, service capacity, regulation level and adaptability of public service are the key elements to control the spread of epidemic and reduce secondary disasters caused by epidemic. The orderly supply of medical and health services, the response speed of government prevention and control measures, the regulation ability according to epidemic development measures, material reserves, transportation security level, the evolution of social public psychology and behavior, and the timing and degree of epidemic information disclosure and sharing are closely related to public services. The vulnerability of public service system determines the evolution direction of public events to a certain extent.

During the epidemic control period, urban public services, especially grass-roots (community) public services, have become the key elements to ensure the daily supply of isolation units and social stability (Figure 2). Community is the basic unit of pneumonia virus tracking and control. Under abnormal extreme conditions, community has become the core unit of the operation of the whole city (Li Zhigang, 2020).

Figure 2. Closed community management. Source: self photographing by the author.

In the recovery period, the social system and its public services have become an important means to maintain the "post-war" achievements and repair the impact of disasters. Establish orderly traffic and restore order; Guide enterprises to return to work in an orderly manner in different areas and levels; The establishment of post disaster security system needs to provide corresponding social services.

Based on the above discussion, it is not difficult to find that there is a close temporal and spatial correlation between major public health emergencies and public services. However, it is still necessary to further accurately identify the coupling relationship between public services at all stages and the evolution direction of major public events at the levels of type, facility configuration and service content, as well as the positive correspondence to event rescue, so as to build a public service response mechanism to deal with major public emergencies.

In the recovery period, the social system and its public services have become an important means to maintain the "post-war" achievements and repair the impact of disasters. Establish orderly traffic and restore order; Guide enterprises to return to work in an orderly manner in different areas and levels; The establishment of post disaster security system needs to provide corresponding social services.

Based on the above discussion, it is not difficult to find that there is a close temporal and spatial correlation between major public health emergencies and public services. However, it is still necessary to further accurately identify the coupling relationship between public services at all stages and the evolution direction of major public events at the levels of type, facility configuration and service content, as well as the positive correspondence to event rescue, so as to build a public service response mechanism to deal with major public emergencies.

2.2. Analysis on the supply of urban public service facilities under major public health emergencies

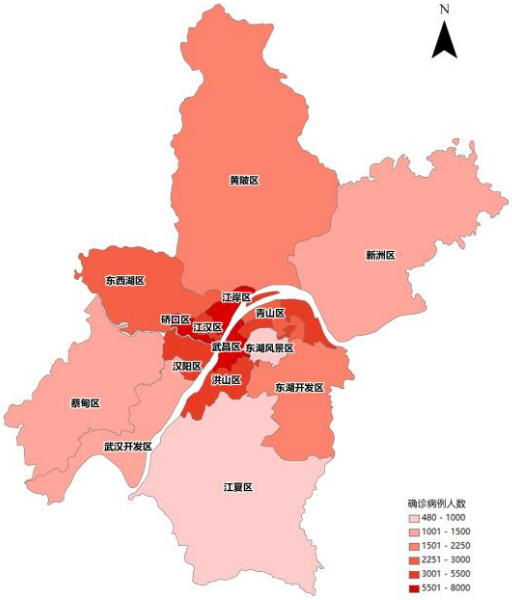
(1) Response failure of urban public service system in community prevention and control position

As an important carrier, organization and implementation subject of urban public service system construction, urban grid community has become the most effective spatial adaptation unit for isolated prevention and control. In 2019, COVID-19's experience in prevention and control showed that the community's prevention and control position is the most effective defense for external defense, internal defense and joint defense, and is also the last line of defense for city public administration. However, according to the results of community prevention and control in Wuhan in 2019, although 79 "epidemic free communities" (accounting for 5.6%) and 2076 "epidemic free communities" (accounting for 29.2%) were successfully realized under the closed management mode, in the actual epidemic prevention process, due to the failure to consider the factors of high-density population mobility and the risk of contingency and uncertainty of emergencies, There is also a lack of planning, pre judgment and emergency reserve operation plan for responding to public health emergencies. The vast majority of community public services still show multi-dimensional response failures such as facility configuration, service capacity and operation management. In terms of facility allocation, the number of community health institutions is relatively insufficient, and the level of 10000 people is only 0.46 (compared with 1.41 in Hangzhou in the same period). At the same time, the allocation of professional equipment, equipment and medical staff in community hospitals is missing, which leads to the inability of community grass-roots medical services to meet the needs of prevention and control. In terms of service capacity, due to the large scale of community population (the average size of the central urban area is 7000-9000, compared with only 4000 in Shanghai in the same period), the community service load is overloaded, and more than 45% of the community's basic living and medical materials cannot achieve functional self-sufficiency. In terms of operation management, due to the lack of vigilance of managers and self confusion of service personnel, epidemic prevention in some communities has become a mere formality, and the transportation and distribution of living and medical materials are chaotic.

(2) The public service system configuration of urban high-density space unit is unbalanced

In fact, the basic framework and functions of China's urban public service system are relatively sound. Since the founding of the people's Republic of China, China's urban public service system has experienced three stages: "average supply system allocation in the period of planned economy", "market free allocation in the early stage of market economy" and "government purchase of services in the mature stage of market economy". The public service supply mode has also changed from government blanket supply to the co construction form of "government leading, social participation and enterprise management". At the specific implementation level, it generally takes the administrative region and population density as the allocation standard and adopts the "inverted pyramid" allocation mode of "core public services + basic public services + supporting public services". It can basically meet the growing public service demand of the city (including basic public health demand). However, in recent years, with the agglomeration and expansion of metropolitan areas, there are a large number of urban high-density spatial units with high concentration of population, transportation and services in the city, and there are some problems of maladjustment, synchronization and mismatch between the systematic construction of urban public service system and the unbalanced public service demand of urban high-density spatial units. The public service system configuration does not take into account the possible unbalanced and explosive public service demand impact within the high-density space unit under the environment of high-frequency population mobility. It lacks neither the corresponding elastic response mechanism nor the self-sufficient supply function of emergency isolated zoning public services, which generally presents the regional supply imbalance of public services. However, according to the epidemic dynamics model of infectious diseases and the data of Wuhan new crown epidemic situation, it is found that the spread and

spread coefficient of city high density space unit is relatively high, which is a high-risk area of epidemic spread and spread (Figure 3, Figure 4). Under the unbalanced configuration pattern of public service system, urban high-density space units are generally facing problems such as insufficient supply of supporting public services, incomplete functions and ineffective response.



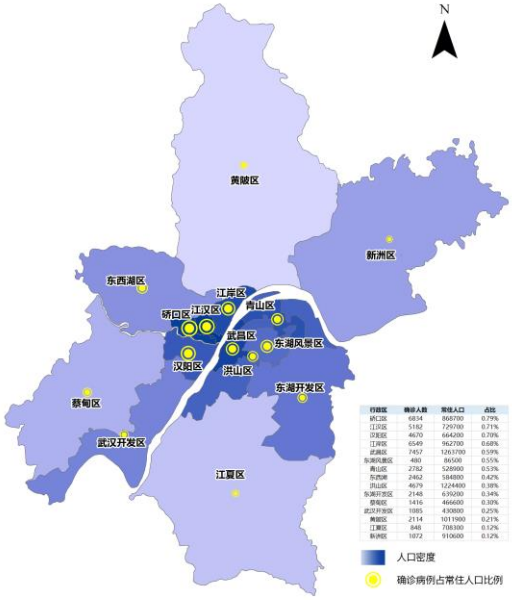


Figure 3.epidemic map of Wuhan Figure 4: distribution of confirmed epidemic cases and population density in Wuhan

source: drawn according to the data of Wuhan Municipal Health Commission (as of 24:00 on March 16, 2020 Beijing time)

(3) The hierarchical rationing gap of urban public health services is significant

In terms of urban public medical and health services, Wuhan has a certain level rationing gap in service facilities, scale and management system. On the one hand, there is a gap in the reserve of emergency facilities for public health emergencies such as infectious diseases, including the lack of orderly allocation of specific isolation hospitals, medical beds, medical and service personnel, medical and living materials and their delivery channels. Statistics show that at the peak of the epidemic, the gap of medical materials such as special beds, medical masks and protective clothing in Wuhan is as high as more than 30000, 60000 / day and 40000 pieces / day respectively (official data have not been found), resulting in a serious instantaneous explosive gap of medical resources under the space-time compression pattern of "people's beds" and "people's medicine". On the other hand, under the closed epidemic prevention mode, the urban public services shared by citizens can not sink into the community, and the community level public service supply can not meet the super scale demands in the emergency management cycle, nor can it meet the grade standard of public health and epidemic prevention, resulting in the distribution gap of hierarchical public services. In addition, due to the imperfect hierarchical diagnosis and treatment system, the explosive phenomenon of citizens flocking to large urban hospitals increases the infection risk of medical staff and other patients, and also increases the workload of medical staff.

(4) Online public service supply lag based on digital emergency system

Along with the rapid development of new electronic media in the Internet era, besides substantive public services, online public services such as epidemic data disclosure, intelligent epidemic prevention teaching, social public opinion and psychological easing under the support of big data platform have also played a huge role in COVID-19's prevention and control. However, although Wuhan disclosed relevant

information about designated isolation hospitals, fever clinics and new diseases in a timely manner after the outbreak of the epidemic, due to the lack of a relatively accurate digital emergency system, there are still some problems of delayed online public services such as untimely, opaque and detailed information disclosure in key stages such as the incubation period and precursor period of the epidemic, It also indirectly increases the pressure on epidemic prevention and control. On the one hand, the early information disclosure did not squeeze the time for urban public services to realize the rapid transformation of emergency functions, which also led to the city, community and residents missing the best window for epidemic prevention and control. After the outbreak of the epidemic, the information is not transparent and detailed, which intensifies the sense of panic of urban residents and increases the factors of social instability. According to an incomplete survey, more than 40% of community grid members, 55% of volunteers and 68% of community residents said that there was a lag in the disclosure of epidemic data in Wuhan.

3.Great changes in supply and demand of urban public service facilities under public health emergencies

3.1. Sinking of center of gravity of facility supply structure under public health emergencies

With the frequent occurrence and significant impact of major public health emergencies, the vulnerability of public services in the initial response to major public health emergencies has attracted the attention of the government and relevant scholars. Medical and health service system, transportation system and emergency early warning system have become the focus of attention. With the normalization of epidemic prevention and control, public service functions began to sink to urban communities, towns and villages and other grass-roots organizations with weak foundation, resulting in structural transformation and reorganization of the supply subjects and supply standards of public service facilities: （1）The adjustment of administrative divisions promotes the reorganization of fragmented supply. In recent years, in consideration of regional development, cities have adjusted their administrative divisions in the aspects of township merger, Town Street withdrawal, village to community transformation, etc., resulting in the coexistence of hierarchical administrative management and grass-roots functional management units, resulting in unclear division of functions and complex governance subjects, so that the effective supply of facilities can not be achieved at the first time in case of public emergencies. （2）Multi level and multi-level demand drives the transformation of supply mode. At present, the supply of public service facilities is mostly dominated by the government, which belongs to the top-down supply oriented mode. It is difficult to realize the micro level operation of urban communities, towns and villages. Therefore, due to the focus on the accessibility and differences of grass-roots communities, towns and villages, we can realize the demand-oriented grass-roots facility supply mode. （3） Different scale types need to coordinate the configuration level and content. The allocation of public service facilities involves macro and micro levels. At the macro level, we should emphasize the balance and fairness of facility supply, focusing on government regulation and control; At the micro level, we should emphasize the localized management of grass-roots supply, based on the allocation of planning system and guided by market construction. Therefore, the universal allocation of public service facilities is difficult to meet the needs of different spatial levels, types and differences. The supply system and allocation standards of public service facilities under different structures should be formulated to sink the supply focus and realize the equalization demand of facility service supply.

3.2. Reconstruction of facility demand structure under public health emergencies

Whether it is 2003 SARS or the new epidemic prevention and control of the new type of coronary heart disease, it shows that the community and even village group are the key defense lines for the joint prevention and control of epidemic situation and the group control. The big data + community grid management has realized the technology to empower and strengthen the existing governance methods, providing diversified, refined and personalized services for the grassroots in the community to achieve mass prevention and control, joint defense and joint governance. It provides important support for accurate governance. At the same time, establish a multi-level space operation plan under extreme conditions (Li Zhigang, 2020), reasonably plan and allocate regional medical and health resources, so as to jointly create and restart the community self-organization function (Zhang Jingxiang, 2020), improve the community resilience (material resilience and social resilience) (Wang Chenghui, 2020), and take the construction of "15 minute life circle" as an opportunity, Expanding the community into a basic space unit for epidemic prevention and control (Yang Baojun, 2020) and other research and suggestions on improving the grass-roots public service system in major public health emergencies from the perspective of community and grass-roots services have become a hot topic. On the other hand, urban big data platforms such as big data, artificial intelligence, cloud computing and the Internet of things have become sharp tools for future urban epidemic prevention and control (Yan Shu, Liu Siyuan, 2020). Trial, scenario and systematic management tools have become an indispensable part of the public service system in the new era. With the support of information-based and intelligent data, The demand structure of public service facilities has been reconstructed.

At the same time, another cause of the reconstruction of the demand structure of public service facilities is the migration and urbanization of the local population and the local urbanization of the migrant working population, which leads to the alienation of the spatial distribution of demand. Therefore, in the face of the governance needs of the new era and the rapid diffusion of modern urban values, the construction and improvement of the public service system under major public health emergencies should also be extended to the level of community, town and village public services, and new technologies should be used to establish a visual, instructive and operable public service system that supports up and down, Realize the demand and supply of public service facilities for the last kilometer.

3.3 Breaking the management level model under public health emergencies

After the public health emergency, the spatial layout and scale standards of public service facilities have been directly affected, and the top-down supply facility management mode has been broken. In the complex urban system, the "one-way" traditional community facility management ignores the effective allocation of supply and demand, while in the process of emergencies, the public service facilities are crossed and reconstructed by the "supply and demand" structure, which is bound to break the management level mode in the process of supply and demand of public service facilities and change to the "interactive" management mode.

Therefore, focus on the accuracy of hierarchical management: (1) the allocation of traditional grass-roots service facilities is based on land use and population scale (thousand person index), and the area and proportion of facilities are the basic control content. It seems that "equalization" actually sacrifices the effectiveness of facility supply. We should explore the refined management mode based on the demand orientation of grass-roots groups （2) The management of planning approval needs to be strengthened. In the process of breaking the management level, we must pay attention to a footnote, that is, the implementation of loose control after the preparation of the plan, such as unclear functional positioning, no specific requirements for neighborhood distribution, extensive implementation process, etc., and then there are problems in the operation link. Therefore, the traditional one-way management of facility supply should extend to grass-roots organizations and give full play to the role of resource allocation in

the process of accurate management, which is also one of the transformation directions of public service facility supply under the normalization of epidemic prevention in the future.

4. Construction of public service facilities supply system under public health emergencies

4.1. Actively carry out vulnerability assessment of public service system

(1) Construction of vulnerability assessment index system

The officially released epidemic related data are obtained through the official website of the Health Commission, baidu app and relevant news reports. The data collection period is from the first case of the epidemic to basic control. The data statistical dimension includes the number of confirmed cases, suspected cases and deaths in each district, street and community every day. The basic information of each case includes gender Age, place of residence, flow path, etc. Statistical methods, system analysis methods, GIS, ESDA and other spatial information visualization technologies are used to analyze the basic characteristics of epidemic characteristics, disease process characteristics and aggregated epidemic situation, including incidence curve, evolution node, spatial distribution of epidemic situation with community / street as statistical unit, etc. Collect the type, content, scale and other data of unbalanced demand for public services through big data such as Baidu heat map and service information data released by relevant communities.

Based on the theoretical framework of vulnerability assessment, a vulnerability assessment index system representing the three dimensions of exposure (E), sensitivity (s) and adaptability (a) is constructed to evaluate the facility allocation, resource allocation, service performance and guarantee mechanism of the public service system. The formulation of the index system is comprehensively determined by expert consultation method and field investigation method. It is preliminarily determined to construct from three aspects: epidemic factor vulnerability, response effect vulnerability and service capacity vulnerability. The epidemic factor vulnerability index system includes the accessibility of service channels, the use of public service facilities, the density of cases and patients, the status of urban population, etc. The vulnerability of response effect includes the social impact of public service facilities, the total asset value of public service facilities, and the maximum service scale and load of public service facilities. Service capacity vulnerability includes the formulation and implementation of emergency plans, the physical condition of users of public service facilities, the control of epidemic situation by public service facilities, the ability of diagnosis, treatment and barrier, the ability of community public service support, etc.

(2) Spatial characteristic analysis of vulnerability

The comprehensive index method and fuzzy matter-element evaluation method are used to comprehensively evaluate the vulnerability of the public service system during the epidemic period. The vulnerability is divided into five levels between (0, 1). According to the vulnerability value from small to large, it is divided into five levels: not fragile, not very fragile, fragile, relatively fragile and very fragile. The vulnerability assessment results of public service facilities are statistically and spatially located from the four spatial levels of city, county, District, street and community, and rasterized into 1km * 1km grid units. GIS spatial analysis is used to classify the agglomeration, density and other characteristics of vulnerability.

4.2. Establish classification facility standards for full coverage supply

From the perspective of facility supply mode under the current normalization of epidemic prevention and control, its supply standard is dominated by the government and objectively determined. According to the demand standard, one-way and broad supply is not suitable for the supply law of public service

facilities under current prevention and control. Therefore, it is necessary to comprehensively consider how to turn the complex facility demand composition of the basic organization to subjective and bottom-up supply.

When establishing the classified facilities standard of full coverage supply, it emphasizes the integration of facilities supply guided by the needs of urban grass-roots residents, and deeply understand the composition and demand differences of different types of residents through household investigation, interview and visit, so as to update the supporting standards of public service facilities under public health emergencies. Starting from the structural matching degree of residents' demand type and spatial distribution of facilities, the bridging of demand and supply mode, we adopt differentiated facilities supply, and fully cover classified and hierarchical supply standards, scale, spatial location, etc. At the same time, establish a coordination mechanism integrating government power, market power and social power, so as to realize the combination of top-down planning guidance and bottom-up demand and supply, and form an effective interaction among participants, investors, operators and users by strengthening operation supply and demand feedback.

4.3. Build a dynamic and updated full cycle operation mechanism

Land and space planning focuses on the control of land use indicators rather than the management of building space itself. Therefore, the supply of facilities only stays at the upper planning level, which is difficult to effectively cover the later operation management of public services. In the face of the occurrence of public emergencies, the diversification of market formats and the decentralization of suppliers and users, the most important thing is to activate the later operation mechanism in the state of "sleep" and give play to the long-term conductive facility service ability. At the same time, promote the extension of planned land control to grass-roots organizations, emphasize the combination of planning guidance and grass-roots community and even town and village governance, and establish a demand dynamic feedback mechanism. In the later stage of operation and management, we should strengthen the construction of community planner system, build a full cycle and dynamically updated operation and management mechanism with equal emphasis on supervision and communication between system subjects and life subjects, and improve the matching efficiency of supply and demand of community facilities.

5. Supply path of public service facilities under public health emergencies

5.1. Establish spatiotemporal prevention and control network and verification platform

It is classified according to the corresponding spatial governance pattern characteristics of decreasing circle and shrinking footprint of "City- District- Community-Town Village" as the administrative division of Wuhan. Then, 18 basic public services in eight categories in the reform plan for the division of central and local common financial powers and expenditure responsibilities in the field of basic public services were selected to investigate the demand and satisfaction of different groups such as medical staff and urban residents, and the Kano model was used to conduct a questionnaire survey to divide the demand for public services in terms of structure and function (Figure 5).Finally, it is divided into districts according to the location and level of community and town and village management units.

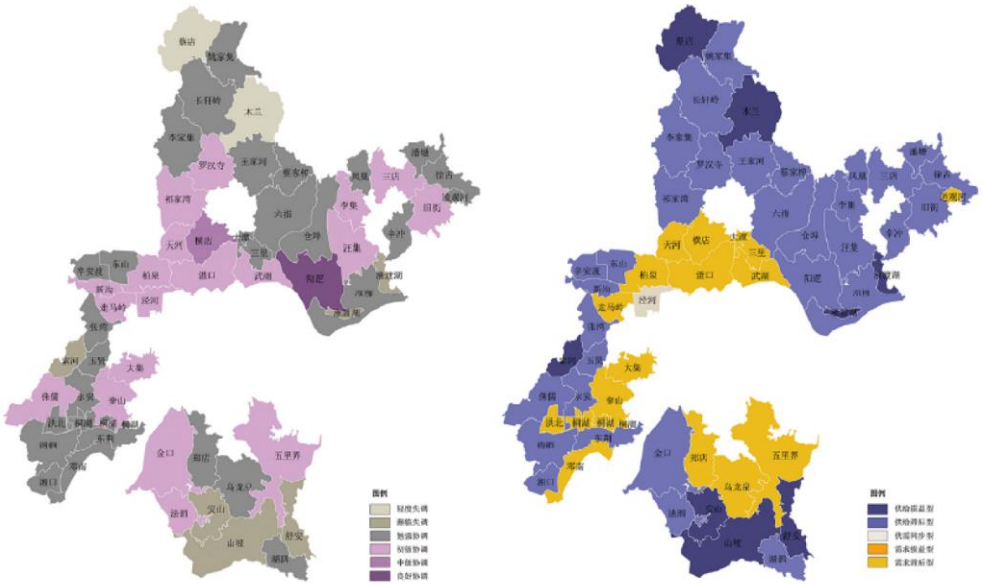


Figure 5. coordination level and type of supply and demand of medical service facilities in towns and villages in Wuhan. Source: drawn by the author.

Secondly, considering the spatial spread trend of epidemic situation, a scale-free network is constructed to simulate the spread of infectious diseases based on the basic characteristics of information such as administrative boundary, natural boundary, road, public service allocation pattern and community in Wuhan.

Through the above simulation, fit the change trend of susceptibility, healing and infection, map the results on the spatial level by using the mobile phone signaling data of people in different warehouses, conduct spatio-temporal overlay analysis with the public service emergency network, and make an interactive verification platform with the help of ArcGIS and R.

5.2. Differentiated supply combined with centralization and decentralization

The characteristics of outbreak and spread of public health emergencies, the spatial distribution data of public service system and the vulnerability assessment results of public service system are overlapped spatially and spatially based on GIS platform, and the time extension, spatial distribution and Conflict point (area) and coincidence point (area) in terms of service level. Using ESDA spatial analysis method, this paper analyzes the spatial characteristics of conflict point (area) and coincidence point (area), and obtains the supply-demand gap between the actual supply of public service system and the actual demand of patients. Based on the spatial superposition analysis of emergencies and public service system, clarify the types of infrastructure support facilities supported by the government, so as to realize the improvement of facility supply quality under the guidance of the market and the government. Experience

shows that the combination of centralized supply and decentralized supply mode is helpful to realize the fairness and efficiency of facility supply.

At the same time, further identify the key elements of the conflict point (area) and coincidence point (area) of the overlay analysis, and conduct online electronic interviews with residents and experts in relevant fields within the metropolitan area on the key elements of the public service system during public health emergencies by using the methods of questionnaire survey and expert consultation, And classify the attributes of residents' characteristics, and adopt different degrees of "set + dispersion" differentiated supply guidance according to local conditions.

5.3. Strengthen service subjects and pay attention to residents' demand orientation

Actively mobilize the participation of society and the market, especially at the community, town and village unit levels. Analyze and define residents' needs and problems based on the problems arising from public health events. In response to major public health emergencies, community leaders take the lead in providing direct services and drive volunteers to provide services. Form a set of efficient community organization forms, improve the thinking and action of community residents, and enhance the ability of emergency switching to emergency organization. According to the reserve system, a reserve of volunteers for major social events composed of Party and League members, advanced youth and caring people shall be established, and a hierarchical emergency response mechanism shall be established.

Table 1 emergency mobilization mechanism of community grass-roots management units

Classification of community residents	Mobilization content	Participation level
Leaders of community neighborhood committees and community social organizations	The role of community leadership should be brought into play, and the functions of community organizations should be brought into play, supported and trained	Participation in community decision-making
Volunteers, activists / residents supporting community work	Establish various types of community social organizations, strengthen internal unity, and excavate and train the backbone of community residents	Provide community services and assist in community work
Ordinary residents	Build residents' confidence in participation and enhance residents' attention to community issues	Learning and giving advice
Silent and unresponsive residents in the community	Provision of services, community education	Receiving services

At the same time, the rigid and elastic boundary of the supply content of public service facilities should be clarified from the perspective of social justice, because at this stage, land and space planning should adhere to the service concept of "people-oriented", pay attention to the public's health needs, and serve to meet the people's needs for a better life. Therefore, for all kinds of land and space planning at all levels, it should not only serve land resources, but also take the people as an important service subject. In the process of planning preparation, implementation and management, the attention to public health needs

should be implemented into the control indicators of land and space planning to ensure that the planning results serve the people.

5.4. Multi department collaborative implementation process management

Formulate emergency plans for major public health emergencies, establish a public health security system, and connect it with the urban comprehensive disaster prevention and reduction planning system. Timely adjust and improve the rescue policies for public health events, formulate perfect personnel rescue standards, and ensure the efficient utilization of space resources at all levels. On the basis of strengthening superior support and municipal investment, expand the coverage of public services, optimize the layout of facilities, improve the service system, optimize the service content, and improve the flexibility of public service emergency response. According to the civil air defense project construction system combining peacetime and wartime, establish a peacetime construction system for public service system and facility construction needs, build private hospitals and institutions according to the wartime transfer and requisition standards, and carry out flexible conversion and temporary requisition according to the principles of classification, classification and zoning in wartime.

Form municipal and district emergency management institutions and community emergency service institutions. The emergency command department shall formulate health emergency strategies at the corresponding level and implement leadership, allocate major public health emergencies to emergency response departments, formal analysis departments, planning and evaluation departments and logistics and finance departments, and decompose them level by level, so as to improve the emergency response capacity of major public health emergencies at the organizational structure level. Strengthen the relationship between departments, establish and improve the legal guarantee, management system and operation mechanism of emergency management.

5.5. Operation guidance mechanism for planning in-depth intervention

For normalization prevention and control, we should establish "service function mode guidance" for the needs of grass-roots residents, and supplement the business mode guidance of flexible control in the planning control content. At the same time, the planning should establish and improve the monitoring and reporting system, timely organize the delivery of policy grain, and ensure the processing needs of grain and oil, feed, medical alcohol and so on. We will build a personnel mobilization system and institutional arrangements to deal with major public health emergencies, and appropriately increase hard isolation measures to block the input and output path of the epidemic and soft isolation measures for policy public service adjustment. In addition, it is also necessary to strengthen the information technology support system in operation and supply, lead the management reform of public services with informatization, strengthen the deep integration of informatization system and management, and improve management efficiency. Enhance the role of artificial intelligence, big data, Internet of things, blockchain, cloud platform and 5g in front-line disaster prevention and control. For major public health emergencies, use mobile terminals to quickly report the information on the scene of health events, shorten the time for managers' decision-making and evaluation, and realize the operation guidance mechanism of planning in-depth intervention.

6. Conclusion

Based on the hierarchical structure, spatial layout, community service inadaptability and vulnerability of Wuhan public service system during public health emergencies, combined with the corresponding spatio-temporal data, epidemic retrospective investigation and forward-looking simulation, scientifically summarize the relationship between epidemic spread control and urban spatial structure, population density, mobility law, citizen psychology, community construction This paper analyzes and explains the

institutional and structural problems of the hierarchical structure and spatial layout of the traditional urban public service system in the face of the impact of unbalanced and explosive demand. In the evaluation of urban public service facilities supply under public health emergencies, we should pay attention to the brittleness of public service facilities, build a public service system and facility evaluation system, and ensure the effectiveness of space supply; The supply link should take the needs of community residents as the main body, clarify the demand and spatial layout, and ensure the fairness of the supply of public service facilities; In the operation and management link, we should strengthen the system construction of community planners, build an operation and management mechanism that pays equal attention to supervision and communication between system subjects and life subjects, improve the matching efficiency of supply and demand of community facilities, and then explore an urban public service system that can be timely, dynamic and flexibly adjusted in response to public health emergencies in the future, Establish a set of urban emergency operation support system that can quickly respond to public health emergencies for the urban government, provide feasible time-space separated response tools for government management and decision-making, and provide a set of community emergency public service system suitable for different development stages of infectious diseases for community organizations, so as to ensure the stable and effective construction of the national public service system.

7. Acknowledgments

This research was supported by the National Science Foundation of China (51878306).

8. References

Park C. Chernobyl: the long shadow. London: Rout ledge,1989.

Turner B A. The Organization and Inter Organization Development of Disasters. Administrative Science Quarterly.1976,21(3):378.

Turmer BA. Engineering Safety. The sociology of safety in Blockley,Maidenhead: McGraw-Hill International,1992.

Ibrahim M S, Fakharu'L-Razi A, Aini M S.A review of disaster and crisis.Disaster Prevention and Management.2003,12(1):24.

Frances K. Keeping PEDLATRICS in Pediatric Disaster Management: Before, During, and in the Aftermath of Complex Emergencies. Critical Care Nursing Clinics of North America.2010(22):465-480

DOM BROWSKY , W. R. . Again and again:is a disaster w hatw e call "Disas ter" Some concept ual n otes on concept uali zingt he object of disast er sociology . Int ernational Journal ofM ass Emergen cies and Disas ters , 2003(13):241 - 254.

Liu Miao. Study on the diffusion path of sudden infectious disease outbreaks. Dalian University of technology, 2010.

Chen Zhiqiang. Study on diffusion evolution mechanism and collaborative emergency management mechanism of public health emergencies . Southwest Jiaotong University, 2011.

Zhu Jiangbin, Wang Chao, Feng bin. Study on micro mechanism of urban major emergency diffusion. Journal of Wuhan University of Technology (SOCIAL SCIENCE EDITION), 2006 (05): 710-713.

Zhu Jiangbin. Study on the response ability of local governments to major infectious disease outbreaks. Wuhan University of technology, 2011.

Xue LAN, Zhu Qin. International reference of crisis management: Taking the response system of public health emergencies in the United States as an example. China Administration, 2003 (08): 51-56.

Xue LAN, Zhong Kaibin. Classification, classification and staging of public emergencies: management basis of emergency system. China Administration, 2005 (02): 102-107.

talk about the reference and Enlightenment of emergency treatment system for public health emergencies in Xiang, Wu Songting, Han Xiaoping, USA and Japan -- Also on New Coronavirus's pneumonia epidemic in China to deal with [J/OL].'s health economics research, 2020 (03): 11-16[2020-03-12].

Xue LAN, Zhang Qiang, Zhong Kaibin, "crisis management - challenges facing China in transition", Tsinghua University Press, 2003.

Zhang Xiaoling, response and management of public health emergencies. Sichuan University Press, 2017.

Wang Ling. Research on the construction and evaluation of public health emergency crisis management system. Tianjin University, 2004.

Tong Xing, Zhang Haibo. Analysis framework of disaster management based on Chinese problems. China Social Sciences, 2010 (01): 132-146 + 223-224

Gao Xiaoping. Achievements and development of emergency management system with Chinese characteristics. China Administration, 2008 (11): 18-24.

Sun Tongda. Reflection and Countermeasures Caused by public health emergencies. Zhejiang University, 2004.

Jennifer W, Arthur Oyola-Yemaicl. The evolution of cmergency management and the advancement towards a profession in the United States and Florida. Safety Science.2001(39):117-131.

Gong Jianhua, Zhou Jieping, Xu Shan, Wang Weihong.SARS propagation dynamics model and its multi-agent simulation study. Journal of remote sensing, 2006 (06): 829-835.

Zhu Biliu SARS research on the epidemic factors [D]. Shantou University, 2007.

Cao Zhidong, Zeng Da Jun, Zheng Xiaolong, Wang Quanyi, Wang Fei Yue, Wang Jinfeng, Wang Xiaoli. Characteristics and space-time propagation rule of SARS in Beijing city. China Science: Earth Science, 2010,40 (06): 776-788.

Cao Zhidong, Wang Jinfeng, Gao Yi pigeon, Han Weiguo, Feng Xiaolei, Zeng Guang. Spatial risk factors and spatial correlation characteristics of popular SARS in Guangzhou. Acta geographica Sinica, 2008 (09): 981-993.

Wang Jinfeng, Meng Bin, Zheng Xiaoying, Liu Jiyuan, Han Weiguo, Wu Jilei, Liu Xuhua, Liu Xuhua, song Xinming. Multidimensional distribution of SARS epidemic in Beijing city in 2003 and its influencing factors. Chinese Journal of epidemiology, 2005 (03): 16-20.

Riley S, Fraser C, Donnelly CA, et al. Transmission dynamics of the etiological agent of SARS in Hong Kong: impact of public health interventions. Science,2003,300:1961-1966.

Wang Jun, Chen Shiliang, Tian Youhong, Xiao Qiao, Fang pengqian, Liu Zhiyong. Study on the fairness of medical resource allocation in Wuhan from 2005 to 2013. Chinese Journal of social medicine, 2016,33 (05): 484-487

Qin Bo, Jiao Yongli. Discussion on urban disaster prevention and reduction planning from the perspective of Public Policy -- Taking eliminating the threat of infectious diseases as an example. Planner, 2011, 27 (6): 105-109

Li Yanxia, Ding Zhihua, Ouyang Bin, Zhou Aiyan, Tu Mei Chao. The influence of new crown pneumonia epidemic on the construction of traffic laws and regulations system and Countermeasures. transportation research, 2020,6 (01): 58-66+80.

Mai Yuanyuan, Li Yanhong. Experience of traffic response to public health emergencies in developed countries and Its Enlightenment to China. Transportation research, 2020,6 (01): 97-102

Zhang Mingyuan. Research on urban disaster bearing capacity and comprehensive disaster risk assessment. Dalian University of technology, 2008

A J M, L S M, W K, et al. Scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. Global Environmental Change, 2006,3(16):240-252.

Yun Ren Zhu. Vulnerability analysis of social and economic system in Qingdao facing rainstorm disaster. East China University of political science and law, 2019 .

Swart R, Fons J, Geertsema W. Urban Vulnerability Indicators A joint report of ETC-CCA and ETC-SIA[EB/OL]. [2020]. http://nora.nerc.ac.uk/20215/1/ETC_CCA_ICM-Floods-final.pdf.

I. S, S. S, A. H. Urban Regions: Vulnerabilities, Vulnerability Assessments by Indicators and Adaptation Options for Climate Change Impacts, December[EB/OL]. http://acm.eionet.europa.eu/reports/docs/ETCACC_TP_2010_12_Urban_CC_Vuln_Adapt.pdf.