

# Community Services and Social Involvement in COVID-19 Governance in Urban China

**JianWen Ding**

Hohai University

**Jia Xu** (✉ [xujia0550@hotmail.com](mailto:xujia0550@hotmail.com))

Anhui Normal University

**Thomas Weise**

Hefei University

**Huan Wang**

Hefei University

---

## Research Article

**Keywords:** community service, COVID-19, social involvement, comparative research, China

**Posted Date:** April 25th, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-1550236/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Background:** This study explores how the services provided by different types of Chinese communities varied in their impact on the social involvement of their residents during the COVID-19 pandemic. Previous research has shown that services in traditional Chinese communities have supported pandemic governance because of their human resource advantages. However, we argue that the services provided by intelligent communities not only adhered to COVID-19 pandemic governance but also promoted the social involvement of the residents.

**Methods:** Using a case study approach of the intelligent community Fang Xing and the traditional community Qili Tang, both located in Hefei city in Anhui, China, this article compares traditional and intelligent Chinese community services. We conducted 42 in-person interviews (21 residents, 10 volunteers, 11 staff members), 30 telephone interviews (10 residents, 10 volunteers, 10 staff members), and 50 online video interviews (30 residents, 10 volunteers, 10 staff members) from June to August 2020.

**Results:** The findings suggest that while the traditional community decreased its residents' social involvement by restricting certain services during the pandemic, the intelligent community was able to apply COVID-19 governance measures without restricting its residents' social involvement. In the traditional community, family members were obliged to take responsibility for daily living services and family care tasks. This community often responded slowly when providing required services compared to intelligent communities. The intelligent community contributed greatly to its residents' social involvement in the process of pandemic governance. It offered an attractive option for residents to act as community service managers and prepared its residents for local-level pandemic governance.

**Conclusions:** This study provides a better understanding of the relationship between community services and residents' social involvement in terms of the different dimensions of community services. The intelligent community model can act as a reference for international community development during health emergencies.

## Introduction

The World Health Organization (WHO) has recorded 383,509,779 confirmed cases of the coronavirus disease (COVID-19), including 5,693,824 deaths, as of February 2022 [1]. Governing during the COVID-19 pandemic has been a critical task for countries. As a global leader regarding pandemic recovery [2], China has made remarkable advances domestically, particularly with the use of new technologies. Smart community services, for instance, were developed to control the spread of the virus and to improve social involvement [3]. Chinese communities have provided residents with various services to help them persevere during the pandemic period, such as offering food and package delivery services to quarantined apartments [4]. Thus, communities have enhanced pandemic governance measures while simultaneously offering distinct services that increase social involvement, (i.e., residents' degree of community participation) [5].

The Chinese experience of local-level pandemic governance has proven that governance measures depend highly on communities' human resource advantages [6, 7]. However, our study challenges the common assumption that COVID-19-related governance measures were effectively implemented mainly due to the wide availability of human resources and the severe restrictions on mobility. In fact, such governance measures may have decreased the residents' social involvement in their communities. We examine how two types of Chinese communities, traditional and intelligent, differed regarding the impact of their community services on residents' social involvement in the context of pandemic governance.

In recent years, China has introduced the "intelligent community," a new type of advanced community which organizes, delivers, and monitors most of its services through online platforms. Instead of relying on personal contact, like in traditional communities, intelligent communities provide services, such as arranging home deliveries, through the use of information technology. Online platforms function as information processors that receive messages from residents through their registered personal IDs and relay this information to community staff for further action. They also function as information terminals that analyze data collected from residents, such as their travel and medical records, to identify the services that certain residents might need. Online platforms also help to organize online medical services for residents. They can, for example, book online video consultations with doctors who will either prescribe medications the patient can order online for home delivery, or transfer the patient to a clinic or hospital. The platforms can also analyze the match between residents' requirements and the received services and use the residents' feedback to improve services. Residents can access online platforms through their personal computers, mobile applications, quick response (QR) codes, and WeChat. Although the platforms are developed and supported by software companies, they are managed by the communities themselves.

IBM's "Smarter Planet" initiative, introduced in 2008, was the inspiration behind China's intelligent community concept. In 2014, China's Ministry of Housing and Urban-Rural Development proposed guidelines for the development of intelligent communities [8]. These guidelines include eligibility criteria for becoming an intelligent community and assessment criteria, which state that any intelligent community resident should be able to receive proper, timely service at an appropriate location in the community [9-11]. Furthermore, China's Software Evaluation Department created an intelligent community service evaluation system based on four dimensions: offers smart services, provides smart management and maintenance, applies smart application platforms, and collects smart resources [12]. The intelligent community concept is becoming an increasingly popular community development trend in China, especially in regions with adequate budgets. Cities such as Beijing, Shanghai, Ningbo, Shenyang, and Changsha have attempted to develop intelligent community pilot projects since 2013 with support from their municipalities [13, 14]. At the time of this writing, over 80% of Chinese cities have at least one intelligent community [15]. Thus, many municipalities are attempting to increase the support the community receives by applying the intelligent community concept. We argue that this novel community model may have greatly impacted residents' social involvement during the

pandemic by helping to reduce their dependence on human resources, thereby decreasing direct personal contact and infection risk.

Using a multidimensional approach, this study measured the performance (including community services and pandemic governance measurements) of intelligent and traditional communities and how this performance affected residents' social involvement to understand the relationship between pandemic governance and community services provided during the pandemic, at both the institutional and empirical levels. The comparative analysis is based on a case study of the intelligent community Fang Xing (Community F) and the traditional community Qili Tang (Community Q). Both are located in Hefei city in Anhui province, China [16]. Anhui was one of the provinces least affected by COVID-19 in China, mainly due to its highly successful community-based COVID-19 governance measures, which is why we selected this province for analysis.

The remainder of this paper is organized as follows. The next section presents an overview of the literature pertaining to the role of both local and intelligent communities in terms of COVID-19 governance in China, and thoroughly examines the intelligent community concept. The third section introduces the analytical framework in terms of the dimensions of community services and their integration with COVID-19 governance measures, followed by an analysis of residents' social involvement and the costs and savings of the two types of communities. The fourth section presents the findings of the empirical case study and interviews. Finally, the fifth section concludes the study and presents study implications.

## **State-of-the Art: Communities And Covid-19 Governance**

### ***COVID-19 governance by local Chinese communities***

Local communities' COVID-19 governance has been analyzed and discussed in public health and pandemic research. While most studies have focused on pandemic governance effectiveness [7, 17, 18], others have compared different community service dimensions [19, 20]. In the Chinese context, studies have highlighted the advantages of local communities in COVID-19 governance by tracking residents' travel history. For instance, the Chinese COVID-19 online information platform includes Chinese "close circle" management records, which provide the medical records of infected patients. The platform also assist in supervising infected individuals' physical isolation, which can help to decrease the spread of the virus [3, 21]. However, other studies argue that the governance of traditional communities during COVID-19 was limited because many community services were suspended without a long-term plan or comprehensive service management system [18, 22]. For example, home care services were suspended due to the lack of human resources available for their provision [18, 23].

### ***COVID-19 governance by intelligent communities***

Intelligent communities utilize intelligent technology to efficiently provide services while maintaining a safe physical distance between residents and service providers [3, 24]. For example, using the community's online platform, adult children can order meal services for their elderly parents, make

payments online, and offer feedback. In addition, young children can receive free online classes, such as singing and dancing instruction, which provide parents some respite [3]. The intelligent community covers both public service spaces and residential areas, and monitors the service provisioning process in real-time. Residents' satisfaction levels are analyzed after services are provided [25]. Some studies have shown that an intelligent community can provide not only services that enhance daily living activities but also measures for pandemic control, such as digital detection of residents' body temperature [24].

In comparisons of pandemic governance of traditional and intelligent communities, researchers have proposed that intelligent communities are more effective in governing during pandemics without restricting service scope or downgrading quality, as they take advantage of advanced digital technologies [4, 26]. Intelligent communities can also be considered dynamic databases for municipalities [4]. Since the COVID-19 pandemic began, they have collected and analyzed health conditions, clinical diagnoses, treatment records, virus infection histories, and vaccination records of their residents to support municipalities with verifiable evidence, facilitating the localization of potential virus-spreading risks for governments [26-28].

### ***Community services' impact on social involvement during COVID-19***

Social involvement in community services is defined as participation in any part of a service-providing process, that meets residents' requirements and contributes to service management in the community [29-31]. Previous research has classified community social involvement into different models, such as the voluntary and non-voluntary models and institutional and practical models, arguing that community social involvement is a powerful impetus for community development [32, 33].

During the last two decades, researchers have debated the assessment of conditions for social involvement for offering community services. Some studies have proposed specific indicators that should be included in assessment procedures (Ashton and Thorns 2007), such as efficiency, frequency, and consequences of social involvement, including changes in residents' unmet needs [34, 35]. However, other studies have argued that specific indicators are inadequate to assess social involvement conditions, and that the actual outcomes must be examined through public crises [27, 36].

Compared to traditional communities, intelligent communities can increase residents' social involvement via digital intelligent technology [37]. Chinese intelligent communities establish their information platforms to involve residents online as a primary step, through which they collect user-generated information, create personal identities in the system for each resident, connect to residents' social network accounts, and analyze their preference for social contact in the community [38-40]. The existing literature defines an intelligent community as a "dual system" that encourages residents to not only post their service requirements but also offer services that have been requested, thereby allowing residents to involve themselves in the community service process and increase their contact with service providers in multiple ways [41, 42]. Therefore, the digital platform identifies each resident's living conditions, general needs for daily living, and family relationship in the system, and offers targeted services to different people. This may help residents develop a better sense of participation and identification in the

community [43, 44]. These intelligent communities are expected to improve their social involvement conditions and their residents' quality of life, while also promoting local-level community development [45].

### ***Research gap***

While previous studies have focused on the impact of the technological applications of intelligent community services [27, 41, 42, 44], a systematic analysis of the relationship between multi-dimensional community services and social involvement during health emergencies, as well as comparative research between different types of communities, is lacking.

## **Analytical Framework**

Our study analyzes the distinct impact of traditional and intelligent communities' COVID-19 governance on their residents' social involvement. We argue that pandemic governance necessitates implementation of physical isolation measures without socially excluding people. We propose that, although Chinese communities have contributed greatly to controlling the spread of the virus, thus helping residents return to normal relatively quickly compared to most other countries [46, 47], their residents still suffered due to restricted social involvement. We also argue that traditional and intelligent communities differ in terms of pandemic governance, and thus, the social involvement of their residents also differs, through a greater reliance on either human resources or technology, respectively, in offering community services.

Community F, a pilot intelligent community since 2015, covers an area of 11.8 square kilometers, with 11 residential regions and 36,000 apartments. At the time of the study was conducted, it has a population of 74,000 residents, including 340 individuals over 80 years old, 295 social assistance benefit (DiBao) recipients, 342 individuals with disabilities, and nine individuals with mental or psychological disorders. The provincial-level local government office is located inside the community [22]. Community services are provided by approximately 30 formally employed staff members and several volunteers and part-time workers. In 2020, Community F had one suspected COVID-19 case. Over 300 residents living in the same building as the identified case were required to self-isolate in their apartments. No other residents in the surrounding buildings were infected, and the restrictive measures prevented the virus from spreading in the community.

Community Q, a traditional community, covers an area of 21 square kilometers with 40 residential regions. At the time of the study was conducted, it has a population of 210,000 residents, with 1,009 individuals over 80 years old, 201 social assistance benefit recipients, and approximately 800 individuals with disabilities. Approximately 50 staff members had formal contracts to work in the community. In 2020, Community Q had one COVID-19 case, and approximately 350 residents who lived in the same building were required to self-isolate in their apartments. No other residents in the surrounding buildings were infected.

We propose that intelligent community services can, in principle, promote both isolation and social involvement since this novel type of community can provide different categories of autonomous services. Through utilizing their technology and online information platforms, intelligent communities can help to reconceptualize governance measures during health emergencies and maintain social involvement. We analyze three dimensions that affected how community services were provided during COVID-19: 1) COVID-19-related governance measures, 2) social involvement-oriented community services, and 3) budget costs. For the first dimension, we differentiate between four indicators implemented during the pandemic from 2019 to 2020: distance supervision, health condition governance and residents' isolation, public opinion guidance, and restrictive measures on basic daily living activities. For the second dimension, we analyze services to support pandemic isolation and care services in the community. For the last dimension, we explored community costs and budgets for COVID-19 governance equipment and human resources and their savings from utilizing either human resources or technology in the process.

### ***Effective pandemic governance measures and adequate social involvement services: technology use in service provision***

To overcome the negative effects of lockdowns, local communities attempted to offer residents the necessary social involvement services, such as home care services. However, empirical research has shown that despite the extensive spread of COVID-19, some residents may still be unwilling to follow strict lockdown measures because they prefer to have "normal" community services [20]. Stricter COVID-19 governance measures combined with limited social involvement might even prompt residents to seek social contact, particularly when measures are implemented for a long period.

Therefore, communities that have implemented effective pandemic governance measures while also providing adequate social involvement services for residents may discourage residents' incompassionate attitudes toward COVID-19 governance measures. Problems associated with pandemic governance measures could in part be mitigated if residents' normal daily living needs are met and if they receive adequate community services to compensate for lockdown-related inconveniences. If services are primarily provided through digital technologies with human personnel providing auxiliary support in some services, residents may have a greater incentive to embrace these services since this strategy both lowers infection risk and meets their daily living and social needs. Thus, we assume that intelligent communities, such as Community F, provide effective pandemic control and promote adequate social involvement.

### ***Effective pandemic governance measures but fewer social involvement services: human resource use in service provision***

Pandemic governance and social involvement may be at odds; for instance, a community may close social interaction spaces during lockdown. Communities might become more conservative when offering community services because of the lack of effective measures or technologies to provide such services, as they rely heavily on human staff. However, when infected cases appear in a community (as in Community Q), traditional human resources may be insufficient. More people are needed to perform even basic living services, such as food delivery and garbage disposal. Such a community might disregard

residents' need to maintain social contact, which could lead residents to meet their social needs in other ways and, thus, increase virus infection risks. Therefore, we assume communities like Community Q may provide effective pandemic control but insufficient socialization.

We conducted a comparative empirical study to analyze the relationship between COVID-19 governance and social involvement of residents in both community types. We conducted 42 in-person interviews (21 residents, 10 volunteers, and 11 staff members), 30 telephone interviews (10 residents, 10 volunteers, and 10 staff members), and 50 online video interviews (30 residents, 10 volunteers, and 10 staff members) from June to August 2020 in both communities. The age of the interviewees ranged from 18 to 85 years, and 55% were female. The resident interviewees included the care-dependent elderly, mothers of young children, individuals with disabilities, social assistance benefit recipients, and ordinary residents. Each interview lasted at least 30 minutes. In-person interviews were held in meeting rooms and audio was recorded. Similarly, online interviews were conducted and recorded via online platforms. Phone interviews were also audio recorded. Consent was obtained from all interviewees prior to recording, and an interview manual was used for the interviewing process. The questions to the residents included two categories: effectiveness of COVID-19 governance measures, and degree of residents' social involvement in communities or community services. These questions were also posed to service personnel and managers, along with questions regarding the costs and budget of pandemic governance. The interview results are presented in Table 1. Apart from interview data, the basis of our empirical analysis includes institutional regulations from the Chinese Center for Disease Control and Prevention, the Chinese National Health Commission, the Chinese National Healthcare Security Administration, and the Chinese COVID-19 online information platforms.

### **Table 1. Interview responses**

	Community F	Community Q
Residents felt safe during the pandemic	91.0%	90.5%
Residents felt well-informed	93.7%	74.0%
Residents found the imposed restrictions acceptable	89.8%	72.5%
Residents felt that their needs were met	95.0%	79.3%
Residents felt bored during the isolation period	40.5%	65.0%
Residents' daily living needs were protected	95.0%	75.0%
Residents tended to ignore measures and tried to secretly break rules	5.0%	9.0%
Residents felt involved in community services	80.0%	43.7%
Service personnel felt that their recommendations were secretly ignored by residents	19.8%	33.5%
Service personnel and managers found the budget to be limited and that intelligent devices and online systems/programs were prohibitive	25.0%	83.0%

Source: Interviews conducted in 2020; table by authors.

## Findings: Comparative impact of pandemic governance and social involvement

### *COVID-19 governance measures in the community*

#### *Health condition governance and residents' isolation*

*Intelligent Community F.* This community took measures to supervise people's health conditions and isolate infected patients according to three steps. First, digital technologies, such as online platforms and chat groups, provided residents with updated virus infection information, including the exact location of local isolated apartments, where residents had to stay at home and observe any changes in their health conditions. Second, the community asked all residents to record their travel history on the online platform so that it could supervise and analyze infection risks for all residents. We argue this action was effective since most infection cases result from traveling. When travel history can be supervised in a timely manner, without face-to-face contact, communities may achieve positive pandemic governance outcomes, as mentioned by one interviewee.

*I traveled through a place with relatively high risk of virus infection. I remember I was advised to stay at home for 14 days of home health condition supervision immediately after I returned home. I needed to upload updated information on my body temperature and the nucleic acid amplification test (NAAT) results to the online platform in the following days. But it was amazing that I got responses on the platform to my updates as someone online replied to my questions quickly. (Appendix, Interview 2020a)*

Third, Community F tracked residents' health status through pharmacies, and, unlike traditional communities, conducted this supervision online. When residents purchase medicine online or in person, they must complete an online form (When people purchase medicine in person, is the form also online) to report their personal information and purchase details. These measures have been shown to effectively help supervise changes in residents' health conditions without increasing the infection risk to staff.

*Traditional Community Q.* We found over half of the residents did not know the location of the isolated apartment. Due to limited human resources, personnel could only inform and supervise those who had to be isolated. Furthermore, the service personnel updated the travel history of Community Q residents through door-to-door visits and WeChat. However, some residents were not at home, and others could not be reached via phone. Residents were responsible for reporting their travel history, but we found not all of them followed this guideline in practice. One staff member expressed her experience as follows:

*It's very hard to supervise residents' movements in the community. We have to knock door-to-door or call them one by one, and we advise them to not meet with other people unless it's necessary. But some act against our advice, despite saying 'yes' to us. We don't have that many colleagues to do this job. We've already been working over 10 hours a day during the first wave of the pandemic, it was really exhausting. (Appendix, Interview 2020e)*

Additionally, compared to Community F, Community Q residents still obtained medicine in stores, even antibiotics, through transactions on paper. Thus, it was difficult for the community to obtain an overall picture of residents' medicine purchases.

### *Public opinion guidance*

Both Communities F and Q performed well in guiding public opinion by organizing chat groups in applications such as WeChat and QQ to deliver messages on how residents could support pandemic control measures. These online chat groups covered approximately 99% of residents, or at least one member in all families in both communities. However, we noted there were 300–500 people in each chat group, generally only one group manager, and 3–5 staff members from the community who could answer questions. Many residents commented simultaneously in the chat window; thus, most of the questions were not answered in a timely manner. Many were left unnoticed or were covered by new questions, despite the efforts of staff who worked overtime, sometimes until midnight and through the weekends. Community Q residents often complained during our interviews that their questions were left unanswered and problems remained unresolved since these chat groups were the main way to express their needs (see Appendix, Interview 2020h/2020i).

Other than chat groups, Community Q focused more on traditional measures to guide public opinion, such as using broadcast vehicles to deliver urgent information and posting lockdown notices at building entrances. A community manager said:

*We realize it's really hard to guide public opinion by only talking to residents during the pandemic. My colleagues spent hours per day providing information on pandemic governance measures, which is something hard to understand for residents, and we have no idea how the residents think and what they need. (Appendix, Interview 2020f).*

*Intelligent Community F.* We found Community F performed better in guiding public opinion by uploading residents' questions and problems from chat groups to their online platform. First, the platform classified messages into different types, marked them as tasks, and then sent them to the work calendars of the relevant staff. Subsequently, the staff managed these tasks, while reminders for pending tasks were continuously sent. Consequently, resident messages were not easily lost, messages and questions were responded to quickly, and residents' problems were resolved faster, compared to Community Q. Residents could also use their individual IDs to log into the platform and post questions (through text or voice messages) to the staff directly, which were then transferred to work calendars. Moreover, to present updated information on pandemic governance, Community F installed equipment across the community, such as 15 electronic screens and 100 public information boards. These intelligent measures positively impacted the guidance of public opinion, particularly during the first wave (Dong and Ye 2020), as residents were closely connected online.

#### *Restrictive measures on basic daily living activities*

Restrictive measures on daily living activities are essential for pandemic governance, especially when a community has verified or suspected COVID-19 cases. Here, we discuss the extent to which residents followed these restrictions, leading to changes in their normal living patterns and unmet daily living needs, and how well community services met residents' needs.

*Intelligent Community F.* Intelligent communities encourage residents to follow restrictive measures to promote a balance between residents' daily living needs and the necessity of pandemic governance [17]. We found that basic daily living needs, including food shopping, package delivery, and garbage disposal, among others, received a prompt response. The system avoided missing messages by creating system backups of feedback during the isolation period.

As a result, few residents complained about unmet basic daily living needs. Meanwhile, volunteers who offered services to support restrictive measures could reduce working hours by 20% compared to those in Community Q (see Appendix, Interview 2020p). Community F residents understood the restrictive measures and developed a sense of intuitive cooperation. We also found that, while residents had complaints and bad service experiences, they could present them as feedback on the system. Most of these complaints were resolved quickly with the help of the platform. Thus, residents were more likely to be integrated into the community's management. One resident expressed this as follows:

*My family felt frustrated when we were notified that we couldn't leave the building for two weeks. It seemed like we needed everything suddenly, and we were locked there. Even my cat needed food. We called the community center, but no one could be reached. I guess there were just too many people calling*

*them. Luckily, we contacted staff online, and it was amazing how quickly they replied. I could upload what I needed to the system, and then I received my items at the building entrance. Although I felt sad when I saw the security guards protecting the entrance wearing horrible white protective clothing. It felt like we were all sick. But I felt better when community staff reached out to me via a video call from the online system to comfort me and give me some peace. (Appendix, Interview 2020j).*

According to the records of the restrictive measures implemented in the isolated building, two residents from different apartments had fevers during isolation in Community F. These residents received online medical services from the platform and medicine was delivered to their apartments. Medical staff administered NAATs to these residents every two days for two weeks, instead of one NAAT every three days as was administered to the other residents (see Appendix, Interview 2020m). None of the family members living in the same apartment as the suspected infected individuals were permitted to leave the apartment or go to the main entrance. However, a delivery of daily living support package was delivered to their apartment door. We investigated whether the other residents in the isolated building had a cough or cold during this period; however, the results show this was not the case. A community staff member believed that wearing face masks for in-person interactions was the main reason for preventing spread of the virus (see Appendix, Interview 2020n).

*Traditional Community Q.* Some Community Q residents also experienced restrictive measures due to a COVID-19 infection case. Over 300 people in the building where the case was identified were isolated for two weeks. Similar to Community F, basic living services, such as vegetable purchases, were provided by staff and volunteers. Residents contacted service personnel daily and communicated their needs via telephone and WeChat messages. Volunteers recalled they went shopping more than 10 times per day, delivered goods to residents, and called residents to pick up deliveries at the building entrance. Sometimes residents' needs could not be met due to misunderstandings or lack of timely contact with staff/volunteers (see Appendix, Interview 2020o). Over 40 disputes occurred with the isolated residents during this period, which the community director and her team had to resolve in person. Consequently, human resources played a key role in pandemic governance measures in Community Q.

Similar to Community F, four residents from different apartments in the isolated building had fevers and headaches during the isolation period. They also received NAATs every two days from the medical staff. However, they did not have access to online medical services, and medical staff needed to check their condition every two days in person instead of online (see Appendix, Interview 2020f). Family members living in the same apartment were not allowed to leave the apartment, and their garbage was removed by staff. There were also no additional cases of coughs or viral colds during this period.

We conclude that both communities relied on human resources in this period; however, Community F could better organize services due to its online platform. Although both communities had a similar percentage of volunteers and staff, those in Community Q had 20% longer working hours. Over 30% of its volunteers and staff complained about feeling exhausted in this period (see Appendix, Interview 2020f/2020p).

## Social involvement-oriented community services

### *Services supporting distance supervision*

*Intelligent Community F.* Community F utilized its digital services as preventive measures to decrease spread of the virus. For example, the online information platform controlled entry/exit by identifying vehicles and people that passed through the entrance and analyzing whether they complied with isolation guidelines (see Figure 1). Infrared body temperature measurement equipment placed in different areas of the community could trigger alerts as soon as high body temperatures were detected. Community staff then responded to handle this risk. This increased the social involvement of both residents and staff, as expressed by a manager:

*I'm very confident in this online platform because our staff can precisely locate residents' movements in public places with the help of the platform. We were online for 24 hours, taking turns in 8 hour shifts during the pandemic. Additionally, the platform supervises sanitation information of buildings. For example, it tells me whether the supermarket is too crowded. (Appendix, Interview 2020a).*

*Insert Figure 1 here*

Community F residents were required to register their health condition, travel records, and vaccination records using QR codes positioned in public places. While this was similar to what was done in most communities, Community F did not need staff to individually check the QR code results in person. Its online platform received the QR code results as soon as people scanned the codes. When the results indicated virus infection risk, the platform alerted staff. Thus, Community F was able to reduce its on-the-ground staff by approximately 80% and implement more online services.

*Traditional Community Q.* Here, many volunteers assumed temporary duties related to pandemic governance services, such as body temperature checks at entrances of most public places. Community Q also placed QR codes at almost all places requiring people to reveal their health status. However, staff—either wearing face masks or protective clothing—checked the results and residents one by one. Therefore, Community Q had more staff in the field. Instead of supervising residents' activities, it also closed some public spaces used for parties or dancing by older residents or as playgrounds for children, as well as stores that sold flowers, snacks, and accessories, to restrict residents' opportunities to gather. Although these measures decreased the risk of spreading the virus, they also increased social exclusion by restricting social contact.

### *Community care services*

It is important to explore the extent of care services received by care-dependent older residents and the degree to which their care needs were met while COVID-19 pandemic governance measures were in place. In principle, these people depend on either community care services provided by care homes, home service deliveries, or family care work, which is mostly performed by female family members [15]. However, both communities closed care homes and decreased home care delivery owing to pandemic

governance requirements. Moreover, family caregiving was inaccessible to older people without family members or whose family members lived far away [5].

*Intelligent Community F.* Community F identified 79 care-dependent older adults who did not have family care services, and offered them an “intelligent bracelet.” This bracelet was connected to the online information platform and transferred information about the older residents’ location and movement. Thereafter, staff could contact them when necessary. For instance, a 76-year-old resident living alone showed a sudden increase in his daily movements; however, according to information from the platform, he had difficulties with physical movement (see Appendix, Interview 2020r). Community staff visited him immediately and found he had been so bored that he forced himself to go outside and got lost. After this incident, community staff sent him videos and news broadcast channels through the information platform, and called him regularly to check on his condition (see the online platform in Figure 2).

The intelligent bracelet could also send emergency calls to the platform on behalf of older residents, after which services could be offered to them as needed. Home services and delivery-specific care services could also be provided through the bracelet when necessary. As expressed by one staff member:

*Thanks to our intelligent bracelet and information platform, we noticed some poor and care-dependent older people stayed at home without consuming electricity for days or without using water, which meant they might be facing problems in their daily living and/or have deteriorating health conditions. We offered them help and services soon after we received notice through the platform. Sometimes we would deliver bread, rice, oil, vegetables, and medicine for free to their homes. These people cannot ask for help since some of them have serious physical disabilities and others have mental health problems, so we have to determine their needs. (Appendix, Interview 2020g)*

Therefore, the care services in Community F contributed to the maintenance of social involvement of care-dependent older people and helped to fulfill their care needs autonomously. Although isolation measures restricted these people to their homes, smart digital technology connected them to social networks.

*Insert Figure 2 here*

Another crucial issue revealed in our interviews was the boredom and loneliness experienced by older residents with disabilities. Their concerns were reported through the information platform. The staff offered them detailed information on the nearest real-world spaces, online chat rooms, and timelines where they could interact with other people (see Appendix, Interview 2020q). Furthermore, Community F offered residents free online courses for mental health development. Doctors specializing in psychological disorders helped residents resolve their negative feelings and reduce fear of COVID-19. Other courses were offered to students of different ages and teachers. Therefore, we believe Community F greatly improved residents’ social involvement by offering daily living services during the pandemic.

*Traditional Community Q.* Care-dependent older people were sent to live with their families because care resources at care homes were limited, and home service delivery was suspended. In other words, the delivery of emergency care services from the community was not guaranteed, effectively making family members responsible for the delivery of services for care-dependent older adults. We argue, therefore, that during the pandemic, care services in traditional communities not only decreased care recipients' social inclusion but also increased family members' care burden [15]. However, family members could not always provide the timely delivery of care services, as in the case of family members who did not live with the care-dependent elderly individuals. As expressed by an adult daughter:

*I should have delivered lunch and dinner every day to my mother, who lives in a neighboring sector in our community. Normally, it takes me five minutes to do so, but I couldn't reach her any more due to the restrictive pandemic control measures. [The community care homes] stopped food delivery services, as well. I couldn't leave her there alone unless I moved to her apartment, but I also have a young boy to take care of. We got no help, and we had to handle this problem by ourselves, which I'm still working on. (Appendix, Interview 2020h)*

In summary, our findings indicate Community Q contributed weakly to social involvement in terms of the two measured indicators. In particular, its care services almost completely depended on family care regardless of family care availability. Conversely, Community F effectively promoted social involvement through its intelligent services, and the smart platform substantially contributed to providing services to residents. Furthermore, Community F invested time and money to establish the technological platform and change community management patterns; it took approximately three years to create the online platform, at a cost of nearly RMB 2 million (about USD 315,000). However, the community saved on human resources investment. In contrast, Community Q did not spend its budget on technology investment but instead on traditional resources, such as recruiting and training staff, and took full advantage of volunteers' contribution to its pandemic governance. In the next section, we explore the differences between the two communities in terms of pandemic governance costs and savings.

### **Community costs, savings, and budgets for COVID-19 governance**

One of the most important intelligent infrastructure costs for Community F was the online platform. The software to support the platform cost around RMB 950,000 (about USD 150,000), and received financial support from the Civil Affairs Bureau of Hefei. The software allows the online platform to analyze residents' information, such as by tracing travel records and analyzing health conditions, and connects the platform with central institutions' data systems. The Civil Affairs Bureau of Anhui province allocated RMB 900,000 (about USD 140,000) to Community F to improve the platform. However, the community is responsible for organizing resident services, receiving information regarding residents' needs and feedback, and improving service quality. Costs of other equipment, such as video equipment, automatic temperature measuring equipment, automatic charging equipment, and intelligent bracelets, was approximately RMB 200,000 (about USD 31,500). Furthermore, the community's yearly maintenance fee for the intelligent software is around RMB 60,000 (about USD 9,450). Additionally, the municipality

provides the community with RMB 50,000 (about USD 7,900) per year to hire temporary staff (including volunteers' daily support fee) to conduct community services, especially during the pandemic.

One of the main reasons Community F had a sufficient budget to develop its intelligent equipment and online platform is that the local government identified it as a model intelligent community. Therefore, both city- and provincial-level governments included its intelligent infrastructure development costs in the central institution's budget. As a result, Community F had more governmental financial support than other communities. In addition, Community F was able to match residents' needs with provided services through the online platform. This allowed it to offer better services and collect better feedback, which is the most important indicator for obtaining continued governmental financial support. It should be noted that both communities offer resident services for free; in particular, no extra fees were charged during the pandemic.

Conversely, as it did not have a central platform where residents could communicate their needs and provide relevant feedback, Community Q allocated most of its budget to human resources. It established 67% more community management offices to handle resident services and had 37% more staff than Community F. The average annual per capita income level in Hefei is approximately RMB 95,000 (about USD 14,960) [48]. This implies that if Community Q eliminated 10 staff positions for two years, it could theoretically afford the online platform, and the system would continue to save on personnel costs. The municipality and other government bodies regularly provide basic financial support to Community Q, as well as to other communities in the city.

Community Q accumulates savings by taking advantage of support from its many volunteers—79% more than those supporting Community F. From our analyses, we argue that Community F lowers costs because it needs fewer temporary personnel and volunteers, but its intelligent equipment and equipment maintenance fees are expensive. This investment can be an obstacle for other communities. Community F residents receive better support, whereas those in Community Q have to rely on patterns of traditional services, such as manual temperature measurement. Our interviews revealed many residents would prefer to pay for some kind of intelligent service system similar to what Community F offers. Residents also expressed their confusion as to why Community Q does not apply the online intelligent platform (see Appendix, Interview 2020o/2020b/2020e). However, building a comprehensive intelligent system is expensive and time-consuming. It is also difficult for governments to support such projects in regions with limited financial budgets. Nevertheless, this type of system could be a community development trend in the future, especially in regions with adequate socioeconomic development. It should also be pointed out that once the intelligent system software is developed and tested in a sufficient number of communities, the per-community development cost could likely be significantly reduced. This makes pilot projects such as Community F very valuable for provinces and municipalities.

## Conclusions

This study explores the differences between traditional and intelligent communities in China in terms of pandemic governance and social involvement of residents during the COVID-19 pandemic. Previous studies have assumed that traditional Chinese communities very effectively controlled the pandemic because of their human resource advantages [49]. Accordingly, it has been presumed that Chinese communities support COVID-19 governance either by focusing on preventive and governance measures or by decreasing their residents' social involvement.

Our study challenges this common assumption. Our findings indicate that communities can both apply COVID-19 governance measures and promote their residents' socialization. We found that traditional communities decreased their residents' social involvement because they often restricted services during the pandemic. In these communities, family members were obliged to take on both daily living services and family care tasks under pandemic restrictions. Compared to intelligent communities, traditional communities were often slow to respond when providing required services.

In terms of implications, our study suggests that the intelligent services in intelligent communities promote their residents' social involvement when pandemic restrictions are in place. This community type depends highly on technology platforms and digital equipment to include residents in the service provisioning process. It, thus, also offers an attractive option for residents to act as community service managers. Moreover, intelligent communities prepare residents for local-level pandemic governance and resolve service problems more quickly than do traditional communities. However, presently, intelligent communities have only been developed as pilot projects in China. The high cost of digital infrastructure could pose a challenge to building such communities, especially to local governments and communities in socioeconomically underdeveloped regions.

This study provides new insights regarding local communities' contribution to COVID-19 governance. It clarifies the relationship between pandemic governance and the social involvement of residents. It also provides evidence for enhancing community services and social involvement. Moreover, it suggests that the intelligent technology used for effective COVID-19 governance may be interesting for other countries to explore, since it can decrease the high dependence on in-person human resources. Future research should analyze the pandemic governance and social involvement in more Chinese communities. In particular, it would be valuable to focus on communities that are in the process of becoming intelligent communities. We would also like to analyze historical changes in community pandemic governance to identify patterns in Chinese history.

## **Declarations**

Ethics approval and consent to participate: The study protocol was approved by Ethic Committee of Anhui Normal University of China (approval no. AHNU-ET2022039) and conducted in accordance with the ethical principles regarding human experimentation in the Declaration of Helsinki. All participants provided informed consent prior to study participation and were able to discontinue participation at any time for any reason.

Consent for publication: Not applicable.

Availability of data and materials: The datasets generated and/or analysed during the current study are not publicly available. The anonymized data can be obtained from three sources. Firstly, the anonymized data are available from the Fangxing community and Qili Tang community directly. Secondly, access to the anonymized data is available from the local government which provided financial support for the current study. Thirdly, the anonymized data are available from the corresponding author upon reasonable request and with permission of the Fangxing community and Qili Tang community and the Hefei municipality. The dataset list (anonymized interview lists) supporting the conclusions of this article is included in the Appendix.

Competing interests: The authors declare that they have no competing interests.

Funding: This paper was made possible by funding from the Social Science Innovative Development Project (2019CX932), granted by the Council for Social Science of Anhui province in China. The role of the funding body is to support the design of the study and collection of data.

Authors' contributions: Jianwen Ding collected interview data regarding community services. Jia Xu was a major contributor in writing the manuscript. Thomas Weise contributed to the writing, structure, and design of the manuscript. Huan Wang analyzed and interpreted the interviews. All authors read and approved the final manuscript.

Acknowledgements: We would like to thank our interviewees for their contributions in the interviews. We thank Editage for language editing services.

## References

1. WHO. WHO Coronavirus (COVID-19) Dashboard. 2022. <http://covid19.who.int>. Accessed 4 May 2022.
2. WHO. Global COVID-19 Vaccination – Strategic Vision for 2022: Technical Document. 2021. [https://cdn.who.int/media/docs/default-source/immunization/sage/covid/global-covid-19-vaccination-strategic-vision-for-2022\\_sage-yellow-book.pdf](https://cdn.who.int/media/docs/default-source/immunization/sage/covid/global-covid-19-vaccination-strategic-vision-for-2022_sage-yellow-book.pdf). Accessed 15 Sept 2021.
3. Deng LB, Wang J, Chen C. Increase the development of community after pandemic and build future communities. *China Internet*. 2020;6:44–7.
4. Bian J. The impact of intelligent community on fighting public health pandemic. *China Security Protection Technology and Application*. 2020;3:46–8.
5. Zhan H, Feng Z, Chen Z, Feng X. The role of the family in institutional long-term care – cultural management of filial piety in China. *Int J Soc Welfare*. 2011;20:S121–34. doi:10.1111/j.1468-2397.2011.00808.x
6. Tang Y. Challenges and responses of community governance in the prevention and control of novel coronary pneumonia: from perspectives of urban–rural planning and public health. *Nanjing Social Sciences*. 2020;8–14.

7. Liu C. Re-examination of grid management in community prevention and control of COVID-19. *Theory Monthly*. 2020;6:69–79.
8. Palmisano SJ. A smarter planet: the next leadership agenda. IBM Business Leadership Forum in Istanbul, Turkey, 12 November 2008. Accessed 12 Nov 2008. [https://www.ibm.com/ibm/cioleadershipexchange/us/en/pdfs/SJP\\_Smarter\\_Planet.pdf](https://www.ibm.com/ibm/cioleadershipexchange/us/en/pdfs/SJP_Smarter_Planet.pdf).
9. Chinese Housing and Urban-rural Development Department. Chinese Construction Report. *Construction*. 2019;11:52 – 3.
10. State Information Center Smarter City Development and Research Center. 2021. Guidelines for the Construction and Operation of Smart Communities (2021). <http://scdrc.sic.gov.cn/News/339/11118.htm>.
11. Beijing Social Development Department. Beijing intelligent community development guideline. *Urban Dev*. 2013;17:36 – 7.
12. Chinese Software Evaluation Department. Intelligent community evaluation system report. 2021. [https://www.smartcity.team/reports/Intelligent community evaluation system report](https://www.smartcity.team/reports/Intelligent%20community%20evaluation%20system%20report).
13. Zhang S. Research on intelligent community service evaluation. *SME Management and Technology*. 2016;10:72 – 3.
14. Lu X, Liu S, Li G. Research on intelligent community development of Shenyang City. *Journal of Shenyang Construction University (Social Science)*. 2017;19(4):404-9.
15. Huang G, Guo F, Chen G. The role and wellbeing of female family caregivers in the provision of aged care in China. *Soc Indic Res*. 2022;159:707 – 31. doi:10.1007/s11205-021-02769-6.
16. Ministry of Civil Affairs Department. Development of Statistics Bulletin of Ministry of Civil Affairs in China in 2020. 2020. <http://images3.mca.gov.cn/www2017/file/202109/1631265147970.pdf>.
17. Wen J. The outbreak of COVID-19 and community prevention and control—an analysis from the perspective of risk sociology. *Wuhan University Journal (Philosophy & Social Science)*. 2020;73(3):5–14.
18. Lei Q, Yu W. Logic of pandemic governance: logic, dilemma and way out. *Journal of the Party University of Shijiazhuang City Committee of CPC*. 2020; 22(12):27–31.
19. Ma Z, Shang Q. Research on public participation in the fight against new pneumonia. *Academic Journal of Zhongzhou*. 2020;3:1–6.
20. Yi W, Fang F, Cheng X. Observation and reflection on the effectiveness of community governance in the prevention and control of major epidemics. *Jiangxi Social Sci*. 2020;40(3):16–24.
21. State Department. Notice to Govern the COVID-19 Epidemic in the Community (5). Beijing. 2020.
22. Manley A, Silk M. Remembering the city: changing conceptions of community in urban China. *City Community*. 2019;18(4):1240–66. doi:10.1111/cico.12466.
23. Chen Y, Wu F, Wu Y, Li J, Yue P, Deng Y, et al. Development of interventions for an intelligent and individualized mobile health care system to promote healthy diet and physical activity: using an

- intervention mapping framework. *BMC Public Health*. 2019;19:1311. doi:10.1186/s12889-019-7639-7.
24. Zhang X, Sun F, Fang P. Studying on the fundamental role of urban community in prevention and control of the epidemics of corona virus disease 2019. *Chinese Health Service Management*. 2020;37(5):321–4.
  25. Chen W. Application of smart community system in epidemic prevention and control. *Value Engineering*. 2020;39(12):216–7.
  26. He X, Li J. Analysis on reconstruction of community information governance system in the data age ——based on COVID-19 prevention and control of grassroot communities. *Journal of Hubei University (Philosophy and Social Sciences)*. 2020;4(3):14–20.
  27. Mei X, Zhao L. Application and prospect of big-data in prevention and control of major epidemics. *Journal of Hohai University (Philosophy and Social Sciences)*. 2020;22(2):39–47.
  28. Greaney ML, Wallington SF, Rampa S, Vigliotti VS, Cummings CA. Assessing health professionals' perception of health literacy in Rhode Island community health centers: a qualitative study. *BMC Public Health*. 2020;20:1289. doi:10.1186/s12889-020-09382-1.
  29. Lei J, Wang S, editors. *Local social organization in the transformation research on development of local social organization in Beijing*. Beijing: Beijing University Press; 2001. p. 165–87.
  30. Yang R. Research on community involvement in China. *Probe*. 2003;1:55–8.
  31. Zanbar L. Sense of belonging and commitment as mediators of the effect of community features on active involvement in the community. *City Community*. 2020;19(3):617 – 37. doi:10.1111/cico.12420.
  32. Kadushin C, Lindholm M, Ryan D, Brodsky A, Saxe L. Why it is so difficult to form effective community coalitions. *City Community*. 2005;4(3):225 – 75. doi:10.1111/j.1540-6040.2005.00116.x.
  33. Zhang S. Analysis of resident involvement in the community under the perspective of planned behavior theory. *Journal of Shi Jiazhuang College*. 2018;20(1):124–30.
  34. Gui Y, Huang R. Measuring community social capital: an empirical study. *Sociological Studies*. 2008;3:122–42.
  35. He H. The status quo and deepening route of urban community participation by residents. *Shanghai Urban Management*. 2008;3:61–3.
  36. Cheng F, Wang Y. Research on dilemma and solutions of community governance. *Social Science Front*. 2014;11:207–14.
  37. Feng X, Jiang G. An analysis of the public oriented communication mechanism of government in public crises management. *Information and Documentation Services*. 2010;31(6):41–4.
  38. O'Reilly T. What is Web 2.0: design patterns and business models for the next generation of software. *Communications & Strategies*. 2007;1:17–37.
  39. Xie J. In theory and in reality: interaction between community from the internet and from cities. *Journal of Communication University of China*. 2010;12:107–11.

40. Chen S, Sun G, Cen X, Liu J, Ye J, Chen J, et al. Characteristics and requirements of hypertensive patients willing to use digital health tools in the Chinese community: a multicentre cross-sectional survey. *BMC Public Health*. 2020;20:1333. doi:10.1186/s12889-020-09462-2.
41. Chen F, Li R. A straw shows which way the wind blows: new media in the context of community governance. *Journal of Sociological Studies*. 2019;34(3):170–93.
42. Johnson BJ, Haleboua GR. Potential and challenges for social media in the neighborhood context. *J Urban Technol*. 2014;21(4):51–75. doi:10.1080/10630732.2014.971528.
43. Bingham-Hall J, Law S. Connected or informed?: local Twitter networking in a London neighborhood. *Big Data Soc*. 2015;2(2):447–54.
44. Zhang Z, Fan H, Liu Y. Social integration and residents' participation of community governance—sample study of Luohu community in Shenzhen City. *Social Governance Review*. 2015;3:111–9.
45. Deng L, Wang J, Chen C. Increase the development of community after pandemic and build future communities. *China Internet*. 2020;6:44–7.
46. WHO Regional Office for Europe. COVID-19 Operationalization of the Global Response Strategy in the WHO European Region. Copenhagen. 2020.  
<https://apps.who.int/iris/bitstream/handle/10665/334167/WHO-EURO-2020-1073-408190-55167-eng.pdf>.
47. WHO. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). Copenhagen, 16–24 February 2020. <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>.
48. State Statistical National Bureau of Statistics of China. *China Statistical Yearbook*. 2021.  
<http://www.stats.gov.cn/tjsj/ndsj/2021/indexch.htm>.
49. Tian Y. Development of pandemic governing system in cities in perspective of public governance. *Soc Sci J*. 2020;1:19–27.

## Figures



Figure 1

An intelligent face recognition system



**Figure 2**

**The online platform of Community F presenting service information (including care services)**

## **Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix.docx](#)