



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



# Public perception of urban companion animals during the COVID-19 outbreak in China

Duo Yin<sup>a</sup>, Quan Gao<sup>b</sup>, Hong Zhu<sup>a,\*</sup>, Jie Li<sup>a</sup>

<sup>a</sup> School of Geographical Sciences, Guangzhou University, Higher Education Mega Center, Guangzhou, 510006, China

<sup>b</sup> Department of Geography, Newcastle University, Newcastle, NE1 7RU, United Kingdom

## ARTICLE INFO

### Keywords:

Urban resident  
Companion animals  
Animal ethics  
Public health  
Emerging infectious diseases

## ABSTRACT

This paper responds to the increasing concern regarding the role of non-human life in shaping urban space by exploring the public perception of urban companion animals during the coronavirus disease 2019 (COVID-19) outbreak in China. We argue that the public's perception of urban companion animals during emerging infectious disease outbreaks is related to medical and life science issues and reflects the political, economic, and emotional struggles involved in human-animal multispecies cohabitation. We find that the public has mainly followed and reconstructed medical discourses about the risk of companion animal-to-human transmission and discussed sustainable ethical animal practices in urban public health emergency management during the COVID-19 outbreak. Concerns regarding the risk of companion animal-related infection reflect the increasing prominence of more-than-human families, the pet industry, and multispecies leisure conflicts in public space in Chinese cities. The public's attention to animal ethics has prompted Chinese policy makers to adopt a more morally acceptable model for urban public health emergency management that can be sustained and supported by responsible non-governmental organizations and ethical urban residents.

## 1. Introduction

In December 2019, a novel coronavirus named 2019-nCoV, which can infect humans, was first discovered in Wuhan, China. On 29 January 2020, 31 provinces launched the highest level of public health emergency response. As of 21 May 2020, the National Health Commission of the People's Republic of China had reported 84520 confirmed cases and 4645 cases of death. In total, there had been 5,125,832 confirmed cases in 215 countries and regions around the globe.

On 26 January 2020, the Chinese Center for Disease Control and Prevention (China CDC) confirmed that the virus originated from wildlife. The early confirmed cases of the new coronavirus in Wuhan were closely related to a South China seafood wholesale market. Although the market is called a "seafood" market, it sells a wide variety of wild animals and manufactured products, sometimes illegally. On 27 December 2019, a hospital in Wuhan admitted three adults with severe pneumonia symptoms due to 2019-nCoV infection. Two of them were shop owners selling game animals in the market, and one was a regular customer (Li et al., 2020). Wildlife trade and game consumption break the species barrier of virus transmission and geographical isolation, causing viruses to spread from wild animals to humans (Karesh et al.,

2005; Pavlin et al., 2009; Smith et al., 2009). Some studies have suggested that the most logical, convenient explanation is that bats were the native host of 2019-nCoV, but it is likely that there was an intermediate host(s) in the transmission cascade from bats to humans (Xu et al., 2020). Other studies have speculated that snakes are the most likely wildlife animal reservoir for 2019-nCoV (Ji et al., 2020). Although the aetiology of 2019-nCoV is not fully clear, it is highly suspected and possible that it is of zoonotic origin and that the market was one of the early sources of infection. This understanding has triggered fear of wildlife among the general public. For example, the public began to demand the expulsion of wild animals living near the community that had migrated from other areas to overwinter to reduce the chance of contact with wild animals. The reputation of bats as coronavirus carriers has even led to extreme recommendations for mass killings to ensure public health (Wang et al., 2020; Zhao, 2020).

As assembled spaces of high-density population and goods, cities provide important channels for the transmission of infectious diseases and become an unpredictable factor that alters vector dynamics, as illustrated by recent pandemics (Hassell et al., 2017). Urbanization promotes spatial overlap between hosts in vector ranges, which facilitates the rapid spread of pathogens (Alirol et al., 2011; Keil and Ali,

\* Corresponding author.

E-mail addresses: [yinduo@m.scnu.edu.cn](mailto:yinduo@m.scnu.edu.cn) (D. Yin), [q.gao2@newcastle.ac.uk](mailto:q.gao2@newcastle.ac.uk) (Q. Gao), [zhuhong@gzhu.edu.cn](mailto:zhuhong@gzhu.edu.cn) (H. Zhu), [lijie@reis.ac.cn](mailto:lijie@reis.ac.cn) (J. Li).

2011). It is estimated that at least seventy percent of emerging infectious diseases are spread from wildlife to human beings and domestic animals (Hassell et al., 2017). In the complex urban system, urban livestock and pet-keeping practices, the mobility of animal products in urban spaces and the direct effects of urbanization on the physical environment act as driving forces that may create a diverse transmission chain of wildlife-domestic animal-human interfaces (Hassell et al., 2017; Soulsbury and White, 2016). These interfaces are becoming key points for cross-species transmission and the emergence of pathogens into new host populations.

Urban companion animals, as the main domestic animal species in urban spaces, have important connections and pivotal functions in these interfaces. In contrast to rural areas, in urban areas, companion animals have been fully integrated into family life, and their living conditions, such as their free range and regular outdoor activities, lead to the possibility of close contact with urban wildlife (Braun, 2005; Johnston, 2008). As of 2018, 73.55 million households in Chinese cities kept companion animals, of which 56.48 million kept cats and dogs. A total of 40.64 million cats and 50.85 million dogs live in Chinese urban spaces. The inevitable public exposure to such a large number of companion animals leads to public concern about the possibility of COVID-19 transmission caused by companion animals. The issue of whether companion animals can be kept during large-scale public health emergencies has received public attention and discussion.

Most studies on the relationship between urban companion animals and infectious diseases have focused on companion animal zoonoses from a medical perspective. Medical researchers have mainly focused on the nature of the virus (Delwart, 2012; Seiler et al., 2010; Tack and Reynolds, 2011), the transmission mode and pathogenic mechanism (Guay, 2001; Lloyd-Smith et al., 2009) and the development of vaccines (Delwart, 2012; Paul-Pierre, 2009) to promote effective prevention measures to reduce the incidence and global spread of zoonotic pathogens. On the one hand, for common zoonoses caused by companion animals, pathogens have adapted for long-term survival within multiple host species over millennia, and there is extensive research on and understanding of these viruses in the medical field. For example, *Toxoplasma gondii*, a typical zoonosis, has been well controlled through the intervention of preventive medicine (Hill and Dubey, 2002). Due to proper food preparation and water sanitization, raising cats does not have a significant impact on families with pregnant women (Aspöck and Pollak, 1992). However, the abandonment of cats by pregnant owners still occurs. On the other hand, with regard to the emerging zoonoses in wildlife, many medical studies have shown that there is no evidence that companion animals can spread these new viruses (Pfefferle et al., 2011). Some studies of SARS, which ravaged the world in 2003, showed that owners of companion animals did not exhibit a higher risk of clinical SARS and that Beijing inhabitants' concerns about domestic companion animals' ability to increase disease transmission were unnecessary (Wu et al., 2004). However, when new infectious diseases emerge, the issue of whether urban companion animals can be kept is often a focus of social debate.

We argue that the public's perception of urban companion animals in the context of emerging infectious disease outbreaks not only is related to medical and life science issues but also reflects the political, economic, and emotional struggles involved in human-animal multispecies urban cohabitation. To understand how the public perception of urban companion animals is related to the human-animal relationship in everyday urban space and how this relationship transforms in public health emergencies, this paper takes the COVID-19 outbreak in China as a case study and uses the content analysis method to analyse the public perception of urban companion animals based on comment data from Weibo, a major social media platform in China.

Before presenting the empirical analysis, we first provide an overview of the multispecies relationship between humans and animals in cities to provide a base for understanding the narratives about urban companion animals in China.

## 2. Urban and companion animals

Since the late 1980s, the binary between cities and nature has been conceived as increasingly blurred, suggesting that cities interact with and indeed are composed of and penetrated by nature (Keil, 2005). In the late 1990s, a new approach to animal geography began to emerge. Unlike zoography, which examines the characteristics, mechanisms and effects of wildlife distribution (Chalfoun et al., 2002; Dijk and Thompson, 2000), animal geographers recognize non-human selfhood and subjectivities and analyse human-animal multispecies relationships in specific places and spaces (Buller, 2016; Greenhough and Roe, 2011; Margulies and Karanth, 2018; Yeo and Neo, 2010). Animals are essential to the construction of human identity, and specific human social forms also shape the semiotic significance and economic role of animals (Wolch and Emel, 1998). In addition to wildlife, scholars have begun to focus on livestock (Blecha and Leitner, 2014) and companion animals (Fox, 2006) in the city. The issues of human-animal interaction in the city and how different urban spaces shape the complex, mutually constructed human-companion animal relationship have become important research topics (Barua, 2014; Emel and Urbanik, 2010). As important urban animals, companion animals have attracted the attention of many scholars. Some of these scholars have examined companion animals that become a part of human families, such as dogs, cats and even reptiles (McKeithen, 2017; Srinivasan, 2013, 2019; Stallins and Kelley, 2013).

In the city, human relationships with companion animals (especially cats and dogs) evoke and involve an entirely new kind of sociality and love. Compared to children, companion animals are more suitable for busy and highly unstable urban family life in the context of modernity and mobility (Nast, 2006). Whether owners treat their companion animals as children or as "others" that must obey dominance and submission rules, companion animals are integrated into urban families (Power, 2008). They become family members with their own names and even their own furniture and rooms. However, even if companion animals are trained, their difficult-to-conceal tastes, defecation, and fur shedding force humans to engage with the bestial nature of their companion animals (Power, 2008). The performance of animals' subjectivity deviates from the order and tidiness pursued by human families and often makes owners angry and annoyed (Instone and Sweeney, 2014; Power, 2012). Therefore, as stated by Tuan (1984), pet-keeping is based upon a combination of domination and affection, and owners always have an ambivalent attitude towards their companion animals.

Beyond private spaces, scholars have begun to focus on human-companion animal interactions in urban public spaces (Urbanik and Morgan, 2013). Dogs have been a central area of inquiry within this literature, particularly in the increasing debates focusing on the experience of walking with dogs (Koohsari et al., 2019). For example Cutt et al. (2007), found that owners' daily dog-walking activities are designed to build emotional bonds between them and their dogs. Walking outside not only contributes to dogs' and people's health but also allows dogs to be more "doglike" (Fletcher and Platt, 2018). On the other hand, the government controls the presence of dogs in cities through various social regulations (e.g., access to public places and identification requirements) and even specific laws (e.g., laws for dog size and quantity control) (Gaunet et al., 2014). There is a schism between efforts to integrate dogs into urban life and the legal framework that regulates the presence of dogs in urban life through the creation of separate places for dogs or the implementation of disciplinary practices.

In addition to urban daily life, scholars have paid attention to the transformation of human-animal relations during disasters and have rethought the way people formulate and implement urban emergency management policies. When faced with disaster, many companion animal owners intend to evacuate their pets, but in practice, the methods of evacuation and shelter for pets are limited or unattainable (Chadwin, 2017). In many countries, animals are often excluded from urban emergency management (Kapucu, 2012). This disregard for companion animals during a disaster may lead to public health consequences. For

example, residents may refuse evacuation and rescue by local authorities because of concerns about the safety of their pets (Day, 2017; Trigg et al., 2016). Forced separation from pets in disasters may cause post-traumatic stress disorder and mental illness (Brackenridge et al., 2012; Hudson et al., 2001; Hunt et al., 2008). When companion animals leave their owners and become stray animals, they may become a mobile source of zoonosis and a new public health risk in cities (Heath and Linnabary, 2015). Therefore, there is a global need for emergency planning for companion animals during disasters to improve urban resilience and public health (Chadwin, 2017). Many Western countries have begun to attach importance to the close relationship between people and companion animals and to incorporate companion animals into urban emergency management policies. For example, after Hurricane Katrina in 2005, the United States passed the Pets Evacuation and Transportation Standards Act. This policy requires state and local urban emergency management to consider and provide services for companion animals, which directly reduced the harm to people and companion animals when Hurricane Harvey occurred 12 years later (Glasse, 2018).

However, most previous studies have focused on natural disasters such as fires, floods, and hurricanes, while few studies have analysed the urban crisis caused by emerging infectious diseases. Along with the process of globalization, the repeated emergence of infectious diseases has increased the vulnerability of cities and raised concerns about urban safety (Keil and Ali, 2007). The original contribution of this paper lies in its analysis of the transformation of the relationship between humans and urban companion animals in the emerging infectious disease crisis and the embeddedness of this phenomenon within the urban framework in the Chinese context.

### 3. Methodology

To collect data for the study, we used web crawlers to search original text published by Weibo users from 1 January 2020 to 3 February 2020 based on two Chinese keywords: “2019-nCoV (新型冠状病毒)” and “urban companion animal (城市宠物).” We saved the crawled blog data to a local server as our main data source. Weibo (a microblogging website) is one of the most important social media platforms in China. It is similar to Twitter in terms of its powerful interactive functions and timely information updates, which significantly influence the organization of social life and public opinion. In Weibo’s text resources, key and frequently used words can reflect various public narratives and the degree of public concern about these narratives (Zhang et al., 2019). Our next step was to clean the data by deleting duplicate content and advertisements. We obtained 1160 valid sample comments published by Weibo bloggers, which totalled more than 200000 words.

We used a Python-based program to perform natural language processing (NLP) analysis on the obtained text materials. The primary natural language analysis we conducted was word frequency analysis, and we produced a word cloud of the 100 most frequently used words in our corpus. After carefully reading the details of the valid sample comments, we analysed the relevance between the high-frequency words and then sorted topics related to urban companion animals during the outbreak of COVID-19. After determining the research topics, we used the detailed comment data to explain the social dynamics in Chinese cities reflected by the public perception of the relationship between urban companion animals and COVID-19.

Our selected methodology had three advantages. First, our comprehensive research methods allowed us to collect rich data. Social media data mining enables the collection of a much larger amount of data than manual searching, and computational analysis of the data helped us clarify the focus of public perception. Our analysis was still based on word-by-word reading and manual coding of the texts, which allowed us to fully reflect the mediascape centred around the theme of urban companion animals and multispecies interactions and relations in cities.

Second, the study data were reliable and versatile. Through

continuous development in recent years, the Internet has become an indispensable part of people’s lives. The rapid development of social media and the popularization of smartphones have provided people with increasingly popular platforms to express their opinions. The large amount of data generated on social media provides new tools to understand the characteristics of social behaviour. Textual information from social media constitutes a large public perception database containing data that are difficult to collect via traditional surveys. Compared with interview and questionnaire data, information provided in the social media context more closely reflects the real ideas of respondents. Because conversation on the Internet is more relaxed than social surveys, respondents are less affected by social expectations, ethics and the atmosphere.

Third, the use of social media data allowed us to more accurately reflect public perception during the outbreak. After the COVID-19 outbreak, the Chinese central government advised the public to minimize exposure to public space. In order to further prevent the spread of the virus, based on the central government’s epidemic prevention policies, provincial and local governments had continued to formulate more strict community access management policies to require the public to stay at home. Therefore, people chose to stop going out and to remain at home. Popular social media has become the most important platform for people to obtain information on the progress of epidemics and to express their views. Therefore, obtaining textual information from social media is the best way to understand public perceptions and attitudes during an outbreak. Furthermore, data from Weibo are highly time sensitive (instant data) and can therefore effectively and quickly provide feedback on the changes in perception as the epidemic develops.

However, the limitations of our selected methodology also should be acknowledged. The textual data collected for this study did not allow us to sufficiently unpack the specificities of different cities, communities, and neighbourhoods. The representativeness of social media data for analysis is limited, and highly sophisticated social media users sometimes guide and manipulate the views of the wider public.

### 4. Public perception of urban companion animals during the outbreak of COVID-19

The starting point for content analysis is to identify the semantic units that appear most often in all textual materials to provide an overview of potential research topics. We filtered and segmented the Weibo text data after crawling. We deleted auxiliary words (e.g., “due to,” “this”) and merged repeated words (e.g., “don’t” and “can’t,” “cats and dogs” and “companion animal cats”) and identified high-frequency words about the public perception of urban companion animals through word frequency analysis. In the perception word cloud map shown in Fig. 1, the frequency of words in Weibo text was directly proportional to their size. During the outbreak of COVID-19, the most commonly used terms about urban companion animals were “coronavirus,” “media,” “TV,” “at present” and “cats and dogs”, which suggests that public perception mainly focused on instant reports of the progression of the epidemic by various media.

Table 1 presents more information about important public perception issues. For example, reports of companion animals that received extensive public attention were mainly from official media (e.g., “People’s Daily,” “interviews,” “academics”) and social media (e.g., “posts,” “videos”). The information that the public received from these media included epidemic prevention knowledge related to companion animals (e.g., “2019-nCoV,” “virus,” “animal,” “contact,” “avoid,” “epidemic situation”) as well as instant (e.g., “today,” “yesterday”) social news related to companion animals (e.g., “behaviour,” “offensive,” “panic,” “fall to death,” “downstairs,” “cats and dogs,” “tragic death,” “come on”) in specific places (e.g., “Shanghai,” “Tianjin,” “community”).

To further explore the issues related to public perception, after reading all the comments, we identified a strong correlation between words such as “panic,” “infection,” “evidence,” “academician,”



of Engineering named Nanshan Zhong became an authority in the field of infectious diseases in China. The Chinese public has great trust in the professionalism of Nanshan Zhong. In May 2018, Nanshan Zhong and his research team were invited to record a programme for a Guangzhou TV station. In the programme, Nanshan Zhong's research team said that the incidence of allergic respiratory diseases in urban children was on the rise and that the cause of allergies was that the urban environment is too clean, so urban residents lack opportunities to come in contact with and adapt to various allergens. Therefore, his team suggested that parents should consider raising companion animals at home, which could help their children adapt to allergens. However, at that time, this show and expert advice did not attract much attention.

During the intense period of COVID-19, Nanshan Zhong was once again ordered by the Chinese government to conduct emergency scientific research and popularize epidemic prevention knowledge. Nanshan Zhong's discourse on COVID-19 prevention and treatment has become a symbol of medical discourse that is highly recognized by the government and trusted by the public. Although Nanshan Zhong did not directly express any views on the role of companion animals in the transmission of COVID-19, businesspeople working in the companion animal industry shared the previous video of Nanshan Zhong's academic team discussing the relationship between companion animals and allergic respiratory diseases to demonstrate the correctness of keeping and purchasing companion animals.

The owner of a kennel named Huihui (慧慧) said excitedly, "*See? There are many benefits to raising a dog or cat, so do not be foolish! Take them home if you like!*" Inoetphoto (英宠摄影), a professional photographer of companion animals, said, "*I collected this news ("Nanshan Zhong proving the benefits of keeping a companion animal") more than a year ago. At that time, some people opposed me and said, 'Who is Nanshan Zhong? Is he absolutely authoritative?' Today, do you know who Nanshan Zhong is?!"*

In addition to mentioning the previous news about Nanshan Zhong, businesspeople have also intentionally misinterpreted the suggestions of Nanshan Zhong's research team. For example, a pet groomer named "Abandon de Xiaowo" (abandon的小窝) said, "*At present, there are tens of thousands of pet industry practitioners in Hubei (Wuhan is the capital city of Hubei Province), but no one is infected with COVID-19! Nanshan Zhong also said that raising companion animals can prevent all kinds of respiratory diseases!"*

These statements show that allergic and infectious diseases have been deliberately confused for the purpose of promoting the companion animal economy. A large number of businesspeople participated in the discussion on the relationship between companion animals and diseases, reflecting the emerging companion animal industry in Chinese cities. From the specific work performed by these merchants, it can be observed that in addition to pet sales, various subdivided pet consumption spaces, such as pet grooming and photography studios, have emerged in Chinese cities. Companion animals are both commodities and investment targets that are highly commoditized under the market economy system. Medical knowledge and discourse have become tools and boosters for pet market promotion and capital accumulation.

In mid-to-late January 2020, COVID-19 began to spread rapidly across China, and the number of infections and deaths increased continuously. Starting at 10:00 a.m. on 23 January 2020, the Chinese government adopted a series of strict epidemic intervention measures, including the suspension of public transportation in Wuhan and the closure of departure lanes at the airport and railway station in Wuhan, to reduce the spread of infection throughout China. At the same time, the public began to consciously stay home as much as possible to reduce their exposure to sources of infection. The Chinese government began to organize medical experts to publicize the latest progress of the epidemic and to teach the public preventive methods through CCTV, People's Daily and other official media. In the midst of this effort, the issue of whether companion animals could be infected and spread COVID-19 became one of the core topics of public concern. For example, in response to a question raised on 29 January by a netizen on Weibo about

whether domestic companion animals could spread the novel coronavirus, the World Health Organization answered as follows: "At present, there is no evidence that companion animals such as dogs and cats can be infected with the virus. However, it is always a good idea to wash your hands with soap and water after contact with companion animals."

We found that the medical experts of the World Health Organization used very cautious words to describe the possibility of pets transmitting the virus, such as "current" and "no evidence." The Chinese CDC also recommended that companion animals stay at home and avoid exposure to contaminated environments. As one of the two main companion animal species, cats are easier to isolate from the outside world. Dogs, however, need more outdoor exercise, and most have an established daily habit of having outdoor interactions with people. Many dog owners in the city see their dogs explicitly as family members. In their view, more-than-human families have the right to claim parts of public space as their own to improve their health and subjective well-being (Cheesbrough et al., 2019; Instone and Sweeney, 2014).

In the United States, dog parks are common in cities across the country as more-than-human public spaces (Urbanik and Morgan, 2013). Most cities in China, however, lack a dedicated companion animal park for human-companion dog interaction. In the limited public spaces, such as gated communities and parks, pet owners, dogs and other urban residents inevitably meet frequently in everyday life. The impolite behaviour of some dog owners in public spaces (for example, failing to pick up dog faeces or allowing their dogs to frighten surrounding wildlife or bark at people) makes non-dog-owning and anti-dog residents feel uncomfortable (Mouton et al., 2019). Quarrels and even fights about companion dogs occur from time to time. During the epidemic, conflicts in the public space have become apparent and have intensified. For example, Zenme Quge Mingzi Zheme Nan (怎么取个名字这么难), a resident of a gated community, complained, "*The old lady walks her dog in our community every day! She never considers other residents of the community! Her dog strolling around would increase our risk of getting the virus!*" In addition to concerns about the virus being transmitted by dogs, some residents expressed their anger at dog owners who do not pay attention to epidemic prevention. Wo Buguo Shi Feng (我不过是个风) said, "*An old man walks his dog in our community every day, but he never wears a mask! Who knows if he is a suspected patient? Such a selfish and immoral person!*"

Faced with these complaints, dog owners chose to reconstruct the discourses of medical workers to demonstrate that daily contact and encounters with companion animals are absolutely safe. They utilized obscure biological terms combined with virological characteristics to frame their reconstructed discourse as "scientific" and "professional." For example, some of them mimicked the rigorous and cautious language of the World Health Organization, saying, "*The 2019-nCoV belongs to  $\beta$  type, and the canine coronavirus (CCoV) and feline coronavirus (FCoV) belong to a type, so there is no cross-infection. Cats and dogs lack the ACE2 enzyme, and the s-protein of the strain cannot bind, so cats and dogs will never become poisonous organisms of the novel coronavirus. Be sure to spread the right facts to the masses!*"

In a sense, medical discourses were restructured to negotiate multi-species leisure conflicts. The possibility of companion animals transmitting disease, as a public perception issue, reflects the increasing prominence of more-than-human families, the pet industry and the social issues related to these factors in Chinese cities.

## 6. Grassroots discussion and the experiences of companion animals during the epidemic

The public perception of pets is strongly influenced by media discourses and representations (van Stipriaan and Kearns, 2009). Normally, pet owners often post and share photos and videos of their companion animals doing funny things on social media to delight and cheer up others. However, as an emerging infectious disease began to spread and the association between companion animals and health became

unknown or even negative (although most arguments about a negative association were based on prejudice, species discrimination and rumours that have not been scientifically verified), the public began to have the pathological fear of companion animals. It was this fear that led to a complex mediascape during the outbreak that was different from the positive mediascapes observed in the past. Practices such as the abandonment and slaughter of companion animals began to occur in some gated communities. On 30 January 2020, a companion animal owner in Tianjin who believed that raising companion dogs would increase the risk of infection threw his dog from a high-rise building. On the same day, five cats were also dropped and killed in Jiading District, Shanghai. The Weibo blogger Companion Animal Mengchong Xingqiu (伴侣动物萌星球), who has 3.73 million followers, reported these two extreme cruel events. This post received 82,000 public retweets and 29,000 comments.

On 1 February, the blog Global Companion Animal Trip (环球伴侣动物之旅) reported on Weibo that in a community in Wuxi, Jiangsu Province, a resident was quarantined in a hospital for suspected infection. Under the pretext of ensuring the health of other residents, the community management staff entered his home without permission and killed his companion cat. The report quickly sparked outrage, and the public began to expose various extreme epidemic preventive actions, such as banning and culling companion animals in their own cities.

The cruel treatment of companion animals and the act of abandoning or even killing animals to prevent human beings from being infected reflected strong anthropocentrism. Strong anthropocentrism reduces animals to resources for human development and lacks an ethical consideration of whether human needs and desires are reasonable (Norton, 1984; Thompson, 2010). With regard to this strong anthropocentrism, some people think that the treatment and shelter of companion animals in emerging infectious disease outbreaks should be taken seriously but that human safety is the top priority. People who hold this view suggest that if necessary, companion animals that may transmit the virus can be executed but that the execution method must be humanitarian. Others believe that companion animals are just as important as humans and that they should never be executed, even if they are at risk of infection or are already infected.

Consistent with Cui and Xu's (2019) views on animal ethics, we can summarize two types of animal ethics from these public discussions. The first is animal welfare ethics. This view acknowledges the moral significance of animals but does not exclude the use of animals for the sake of human development (Fennell, 2013). For example, this view holds that animals can be used in medical experiments, raised as food, and imprisoned in cages for tourists. However, when animals are used in such ways, their well-being must be ethically considered; for example, their suffering must be minimized (Cui and Xu, 2019; Dawkins, 2012). Siyu Zuori Zhongzhong (死于昨日种种) said, "If the companion animal's fur carries the virus, it should be isolated as soon as possible or executed without pain." Henailv (禾奶绿) said, "Look at the corpse of the cat killed by the community management staff. The tail hairs all stood up, which shows that it must have been in pain before death. No one can brutally kill animals! But of course, if they are really infected, they should also be quarantined or euthanized, and they should not be allowed to infect people."

The second type of animal ethics is animal rights ethics. Taking a non-anthropocentric perspective, animal rights supporters contend that animals have pre-given rights and intrinsic value and therefore need to be treated as the subjects-of-a-life (Cui and Xu, 2019; Regan, 2004 [1983]). Animal rights supporters argue that animal rights must be fully addressed in the same way that human rights are (Cohen and Regan, 2001; Cui and Xu, 2019). For example, Shaonv Dapei (少女搭配) said, "Don't raise them if you don't like it! Raising a companion animal is the same as raising a child! Animals are not your toys. If you raise them, you should be responsible for them! If your child is sick, will you throw it down from upstairs?!" Kaixin Jiuhao de Ms (开心就好的Ms) exclaimed, "These people (community management staff) are simply inhuman monsters! Animals, like us, are alive. Instead of protecting them, they unexpectedly buried them alive!

*Are these people still human?"*

Although the Chinese central government and local authorities have not directly proposed emergency plans for companion animals, public discussion on animal ethics has raised official awareness of the importance of considering animals in urban public health emergency management. Chinese policy makers have begun to actively correct excessive epidemic prevention measures and educate the public to protect animals. As the mouthpiece of the government, China Central Television and People's Daily began to explicitly call on citizens to take care of companion animals during the epidemic rather than abandoning or harming them. Local authorities, such as the Xi'an Public Security Bureau, have issued notices warning community management agencies to cancel the prohibition order on companion animal breeding, pay attention to animal care in epidemic prevention measures, and not arbitrarily kill companion animals.

In addition to the debate on animal ethics, we found that the high-frequency words used by the public to describe the experiences of companion animals represented not only negative emotions such as "misery" and "falling to death" but also positive emotions such as "cheer" and "warmth." This finding shows that companion animals also experienced effective social care and shelter during the epidemic. The COVID-19 outbreak coincided with China's most important festival, the Spring Festival. During the Spring Festival, people usually leave their workplaces and return to their hometowns. However, this year, traffic controls implemented to prevent the spread of the virus caused many people working in Wuhan to not return to Wuhan after visiting their hometowns for the Spring Festival. Their companion animals raised in Wuhan were in danger of food shortages or even death. Due to the limited capacity of the government for epidemic prevention and rescue, and in light of the dangerous epidemic situation with anxious pet owners and helpless companion animals, the Wuhan Small Animal Protection Association, a non-governmental organization (NGO), cooperated with pet owners throughout Wuhan to provide door-to-door assistance to companion animals that remained at home. The spontaneous rescue and shelter of companion animals by NGOs and ethical residents became a powerful supplement to the government's emergency response plan.

Therefore, we found that the public's attention to animal ethics and care prompted Chinese policy makers to adopt a more morally acceptable model for urban public health emergency management that can be sustained and supported by responsible NGOs and ethical urban residents.

## 7. Conclusions

This paper utilized a case study of the COVID-19 outbreak in China to analyse the public's perception of urban companion animals in the context of a public health emergency. This emerging infectious disease, acting as a mirror and a catalyst, has exposed various human-animal multispecies urban cohabitation situations and problems in Chinese cities. We found that the public mainly followed and reconstructed medical discourses about the infection risk caused by companion animals and discussed sustainable and ethical animal practices in urban public health emergency management during the COVID-19 outbreak. First, discourses about the risk of companion animal-to-human transmission were mainly distributed by medical workers in official media. This professional medical knowledge was not only employed by the public to prevent diseases but also reconstructed and misinterpreted by specific social groups to promote the increasingly prosperous pet economy and to negotiate leisure conflicts in urban public space. Second, discourses about companion animal experiences were mainly revealed by the public on social media. Both the tragic and caring experiences of these animals reflect the lack of attention to animals in urban public health emergency plans and the efforts of ethical organizations and individuals to rescue companion animals during the outbreak.

This study contributes to the existing literature in several ways. Our research demonstrates "the vulnerability of pets' positions as human

belongings" (Fox and Walsh, 2011, p. 114) and indicates that companion animals represent "significant otherness" (Power, 2012) in the modern urban home-making process. Pet-oriented goods and services are not unique to Western countries. In Asia's high-growth economies, especially in China, pet investment in urban space is increasing at an extremely rapid rate. Pets figure as both commodities and as sites of intensely commodified investment under the market economy system. By reconstructing the relationship between companion animals and diseases, businesspeople attempt to prove that keeping companion animals does not harm human health to eliminate people's hesitation to integrate companion animals into their families. On the other hand, during the COVID-19 epidemic, owners abandoned and killed their companion animals because of their fear of infection. The excessive response to companion animals in Chinese cities does not seem to be reflected in the Western countries. Therefore, why there is such a difference should be the topic of future research. At the same time, more research is necessary to determine how to comprehensively analyse the dynamics of the two-sided, complex human-companion animal relationships and how this relationship is represented on social media.

In addition, this study advances the understanding of the relationship between companion animals and Chinese cities. In recent years, companion animals have entered the homes of Chinese urban residents and have become family members and even furry children. The conception of home in more-than-human families not only involves the private sphere but also has come to include public spaces such as neighbourhood parks and the city itself. Therefore, Chinese urban planners should consider incorporating nonhumans, especially dogs, in land use decisions. Constructing pet parks, providing places for companion animals to exercise and socialize, and providing professional equipment such as waste cans, water supplies, and shade in public spaces can reduce multispecies leisure conflicts in the city.

Furthermore, this article contributes new knowledge about urban public health emergency management. When natural disasters such as earthquakes and tsunamis occur, the safety of human and animal life is simultaneously threatened. As a result, urban emergency management decision makers have begun to value companion animals and their owners and have attempted to develop special companion animal emergency plans to promote public health and safety. However, due to species barriers, human-to-human emerging infectious diseases, as public health crises, are considered to threaten only human health, so most of the corresponding emergency plans provide treatment and shelter only for human beings while ignoring the companion animals that live with them. Our research suggests that humans and companion animals are mutually integrated, constituted and penetrated in the urban everyday life space. Human infection, abandonment and cross-species infection can make companion animals a new public security risk. Therefore, future research and policy should consider how to integrate non-human actors and animal welfare into the domains of urban public health emergency management, including reflections on the inclusion of animals, as a type of moral and political subject, into a wider range of political decisions and practice, as well as how to develop plans for the shelter and care of companion animals in response to crises.

In the face of COVID-19, China, a country with 1.4 billion inhabitants, has already shown great coordination and solidarity, which effectively slowed the speed and limited the extent of the transmission. Although human hygiene and biosecurity are the first options for disease prevention and management, Chinese policy makers are increasingly aware that communication plays a key role in maintaining public health during outbreaks. The public's advocacy and attention to sustainable animal ethical practices has encouraged Chinese policy makers to continuously adjust their public health emergency plans in communication with the public and to attach greater importance to companion animals. Therefore, future attention to the ethical practices through which government, ethical actors and corporations can come together to provide protection for animals is needed.

## Acknowledgements

This work was supported by National Natural Science Foundation of China [grant numbers 41901173, 41971184], China Postdoctoral Science Foundation (2019M662835) and the Natural Science foundation of Guangdong Province (2018b030312004). We declare no competing interests.

## References

- Alirol, E., Getaz, L., Stoll, B., Chappuis, F., Loutan, L., 2011. Urbanisation and infectious diseases in a globalised world. *Lancet Infect. Dis.* 11, 131–141.
- Aspöck, H., Pollak, A., 1992. Prevention of prenatal toxoplasmosis by serological screening of pregnant women in Austria. *Scand. J. Infect. Dis. Suppl.* 84, 32–32.
- Barua, M., 2014. Volatile ecologies: towards a material politics of human—animal relations. *Environ. Plann.: Econ. Space* 46, 1462–1478.
- Blecha, J., Leitner, H., 2014. Reimagining the food system, the economy, and urban life: new urban chicken-keepers in US cities. *Urban Geogr.* 35, 86–108.
- Brackenridge, S., Zottarelli, L.K., Rider, E., Carlsen-Landy, B., 2012. Dimensions of the human—animal bond and evacuation decisions among pet owners during Hurricane Ike. *Anthrozoös* 25, 229–238.
- Braun, B., 2005. Environmental issues: writing a more-than-human urban geography. *Prog. Hum. Geogr.* 29, 635–650.
- Buller, H., 2016. Animal geographies III: ethics. *Prog. Hum. Geogr.* 40, 422–430.
- Chadwin, R., 2017. Evacuation of pets during disasters: a public health intervention to increase resilience. *Am. J. Publ. Health* 107, 1413–1417.
- Chalfoun, A.D., Thompson, F.R., Ratnaswamy, M.J., 2002. Nest predators and fragmentation: a review and meta-analysis. *Conserv. Biol.* 16, 306–318.
- Cheesbrough, A.E., Garvin, T., Nykiforuk, C.I., 2019. Everyday wild: urban natural areas, health, and well-being. *Health Place* 56, 43–52.
- Cohen, C., Regan, T., 2001. *The Animal Rights Debate*. Rowman and Littlefield, Lanham, MD.
- Cui, Q., Xu, H., 2019. Situating animal ethics in Thai elephant tourism. *Asia Pac. Viewp.* 60, 267–279.
- Cutt, H., Giles-Corti, B., Knuijan, M., Burke, V., 2007. Dog ownership, health and physical activity: a critical review of the literature. *Health Place* 13, 261–272.
- Dawkins, M., 2012. *Animal Suffering: the Science of Animal Welfare*. Springer Science and Business Media, Netherlands.
- Day, A.M., 2017. Companion animals and natural disasters: a systematic review of literature. *Int. J. Disaster Risk Reduct.* 24, 81–90.
- Delwart, E., 2012. Animal virus discovery: improving animal health, understanding zoonoses, and opportunities for vaccine development. *Curr. Opin. Virol.* 2, 344–352.
- Dijk, W.D., Thompson, F.R., 2000. Landscape and edge effects on the distribution of mammalian predators in Missouri. *J. Wildl. Manag.* 64, 209–216.
- Emel, J., Urbanik, J., 2010. *Animal Geographies: Exploring the Spaces and Places of Human-Animal Encounters*. Lantern Books, New York, NY.
- Fang, X., 2012. *Barefoot Doctors and Western Medicine in China*. University of Rochester Press, Rochester.
- Fennell, D.A., 2013. Tourism and animal welfare. *Tour. Recreat. Res.* 38, 325–340.
- Fletcher, T., Platt, L., 2018. (Just) a walk with the dog? Animal geographies and negotiating walking spaces. *Soc. Cult. Geogr.* 19, 211–229.
- Fox, R., 2006. Animal behaviours, post-human lives: everyday negotiations of the animal—human divide in pet-keeping. *Soc. Cult. Geogr.* 7, 525–537.
- Fox, R., Walsh, K., 2011. Furry belongings: pets, migration and home. In: Bull, J. (Ed.), *Animal Movements: Moving Animals*. Uppsala University Press, Uppsala, Sweden, pp. 97–118.
- Gaunet, F., Pari-Perrin, E., Bernardin, G., 2014. Description of dogs and owners in outdoor built-up areas and their more-than-human issues. *Environ. Manag.* 54, 383–401.
- Glassey, S., 2018. Did harvey learn from Katrina? Initial observations of the response to companion animals during Hurricane Harvey. *Animals* 8, 47.
- Greenhough, B., Roe, E., 2011. Ethics, space, and somatic sensibilities: comparing relationships between scientific researchers and their human and animal experimental subjects. *Environ. Plann. Soc. Space* 29, 47–66.
- Guay, D.R.P., 2001. Pet-assisted therapy in the nursing home setting: potential for zoonosis. *Am. J. Infect. Contr.* 29, 178–186.
- Hassell, J.M., Begon, M., Ward, M.J., Fèvre, E.M., 2017. Urbanization and disease emergence: dynamics at the wildlife-livestock-human interface. *Trends Ecol. Evol.* 32, 55–67.
- Heath, S.E., Linnabary, R.D., 2015. Challenges of managing animals in disasters in the U.S. *Animals* 5, 173–192.
- Hill, D., Dubey, J.P., 2002. *Toxoplasma gondii*: transmission, diagnosis and prevention. *Clin. Microbiol. Infect.* 8, 634–640.
- Hudson, L.C., Berschneider, H.M., Ferris, K.K., Vivrette, S.L., 2001. Disaster relief management of companion animals affected by the floods of Hurricane Floyd. *J. Am. Vet. Med. Assoc.* 218, 354–359.
- Hunt, M., Al-Awadi, H., Johnson, M., 2008. Psychological sequelae of pet loss following Hurricane Katrina. *Anthrozoös* 21, 109–121.
- Instone, L., Sweeney, J., 2014. Dog waste, wasted dogs: the contribution of human-dog relations to the political ecology of Australian urban space. *Geogr. Res.* 52, 355–364.
- Ji, W., Wang, W., Zhao, X., Zai, J., Li, X., 2020. Cross-species transmission of the newly identified coronavirus 2019-nCoV. *J. Med. Virol.* 92, 433–440.



- Johnston, C., 2008. Beyond the clearing: towards a dwelt animal geography. *Prog. Hum. Geogr.* 32, 633–649.
- Kapucu, N., 2012. Disaster and emergency management systems in urban areas. *Cities* 29, S41–S49.
- Karesh, W.B., Cook, R.A., Bennett, E.L., Newcomb, J., 2005. Wildlife trade and global disease emergence. *Emerg. Infect. Dis.* 11, 1000–1002.
- Keil, R., 2005. Progress report—urban political ecology. *Urban Geogr.* 26, 640–651.
- Keil, R., Ali, H., 2007. Governing the sick city: urban governance in the age of emerging infectious disease. *Antipode* 39, 846–873.
- Keil, R., Ali, S.H., 2011. The urban political pathology of emerging infectious disease in the age of the global city. In: McCann, E., Ward, K. (Eds.), *Mobile Urbanism: Cities and Policymaking in the Global Age*. University of Minnesota Press, Minneapolis, MN, pp. 123–145.
- Koohsari, M.J., Nakaya, T., McCormack, G.R., Shibata, A., Ishii, K., Yasunaga, A., Liao, Y., Oka, K., 2019. Dog-walking in dense compact areas: the role of neighbourhood built environment. *Health Place* 61, 102242.
- Li, J., Li, J.J., Xie, X., Cai, X., Huang, J., Tian, X., Zhu, H., 2020. Game consumption and the 2019 novel coronavirus. *Lancet Infect. Dis.* 20, 275–276.
- Lloyd-Smith, J.O., George, D., Pepin, K.M., Pitzer, V.E., Pulliam, J.R.C., Dobson, A.P., Hudson, P.J., Grenfell, B.T., 2009. Epidemic dynamics at the human-animal interface. *Science* 326, 1362–1367.
- Margulies, J.D., Karanth, K.K., 2018. The production of human-wildlife conflict: a political animal geography of encounter. *Geoforum* 95, 153–164.
- Mason, K., 2016. *Infectious Change: Reinventing Chinese Public Health after an Epidemic*. Stanford University Press, California, CA.
- McKeithen, W., 2017. Queer ecologies of home: heteronormativity, speciesism, and the strange intimacies of crazy cat ladies. *Gend. Place Cult.* 24, 122–134.
- Mouton, M., Boulton, A., Solomon, O., Rock, M.J., 2019. ‘When the dog bites’: what can we learn about health geography from newspaper coverage in a ‘model city’ for dog-bite prevention? *Health Place* 57, 70–73.
- Nast, H., 2006. Critical pet studies? *Antipode* 38, 894–906.
- Norton, B.G., 1984. Environmental ethics and weak anthropocentrism. *Environ. Ethics* 6, 131–148.
- Paul-Pierre, P., 2009. Emerging diseases, zoonoses and vaccines to control them. *Vaccine* 27, 6435–6438.
- Pavlin, B.I., Schloegel, L.M., Daszak, P., 2009. Risk of importing zoonotic diseases through wildlife trade, United States. *Emerg. Infect. Dis.* 15, 1721–1726.
- Pfefferle, S., Schöpf, J., Kögl, M., Friedel, C.C., Müller, M.A., Carbajo-Lozoya, J., Stellberger, T., von Dall’Armi, E., Herzog, P., Kallies, S., Niemeyer, D., Ditt, V., Kuri, T., Züst, R., Pumpor, K., Hilgenfeld, R., Schwarz, F., Zimmer, R., Steffen, I., Weber, F., Thiel, V., Herrler, G., Thiel, H.-J., Schwegmann-Wessels, C., Pöhlmann, S., Haas, J., Drosten, C., von Brunn, A., 2011. The SARS-coronavirus-host interactome: identification of cyclophilins as target for pan-coronavirus inhibitors. *PLoS Pathog.* 7, e1002331.
- Power, E., 2008. Furry families: making a human–dog family through home. *Soc. Cult. Geogr.* 9, 535–555.
- Power, E.R., 2012. Domestication and the dog: embodying home. *Area* 44, 371–378.
- Regan, T., 2004. *The Case for Animal Rights*. University of California Press, Berkeley, CA.
- Seiler, B.M., Yoon, K.J., Andreasen, C.B., Block, S.M., Marsden, S., Blitvich, B.J., 2010. Antibodies to influenza A virus (H1 and H3) in companion animals in Iowa, USA. *Vet. Rec.* 167, 705–707.
- Smith, K.F., Behrens, M., Schloegel, L.M., Marano, N., Burgiel, S., Daszak, P., 2009. Reducing the risks of the wildlife trade. *Science* 324, 594–595.
- Soulsbury, C.D., White, P.C.L., 2016. Human–wildlife interactions in urban areas: a review of conflicts, benefits and opportunities. *Wildl. Res.* 42, 541–553.
- Srinivasan, K., 2013. The biopolitics of animal being and welfare: dog control and care in the UK and India. *Trans. Inst. Br. Geogr.* 38, 106–119.
- Srinivasan, K., 2019. Remaking more-than-human society: thought experiments on street dogs as “nature”. *Trans. Inst. Br. Geogr.* 44, 376–391.
- Stallins, J.A., Kelley, L., 2013. The embeddedness of a North American snake in the wildlife pet trade and the production of assemblage biogeographies. *Ann. Assoc. Am. Geogr.* 103, 417–436.
- Tack, D.M., Reynolds, M.G., 2011. Zoonotic poxviruses associated with companion animals. *Animals* 1, 377–395.
- Thompson, P.B., 2010. *The Agrarian Vision Sustainability and Environmental Ethics*. University Press of Kentucky, Lexington, Kentucky.
- Trigg, J., Thompson, K., Smith, B., Bennett, P., 2016. A moveable beast: subjective influence of human-animal relationships on risk perception, and risk behaviour during bushfire threat. *Qual. Rep.* 21, 1881–1903.
- Tuan, Y.-F., 1984. *Dominance and Affection the Making of Pets*. Yale University Press, Connecticut, CT.
- Urbanik, J., Morgan, M., 2013. A tale of tails: the place of dog parks in the urban imaginary. *Geoforum* 44, 292–302.
- van Stipriaan, B., Kearns, R.A., 2009. Bitching about a billboard: advertising, gender and canine (re)presentations. *N. Z. Geogr.* 65, 126–138.
- Wang, H., Shao, J., Luo, X., Chuai, Z., Xu, S., Geng, M., Gao, Z., 2020. Wildlife consumption ban is insufficient. *Science* 367, 1435–1435.
- Wolch, J., Emel, J., 1998. *Animal Geographies: Place, Politics, and Identity in the Nature-Culture Borderlands*. Verso, London & New York.
- Wu, J., Xu, F., Zhou, W., Feikin, D.R., Lin, C.-Y., He, X., Zhu, Z., Liang, W., Chin, D.P., Schuchat, A., 2004. Risk factors for SARS among persons without known contact with SARS patients, Beijing, China. *Emerg. Infect. Dis.* 10, 210–216.
- Xu, X., Chen, P., Wang, J., Feng, J., Zhou, H., Li, X., Zhong, W., Hao, P., 2020. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. *Sci. China Life Sci.* 63, 457–460.
- Yeo, J.-H., Neo, H., 2010. Monkey business: human–animal conflicts in urban Singapore. *Soc. Cult. Geogr.* 11, 681–699.
- Zhang, Q., Chen, J., Liu, X., 2019. Public perception of haze weather based on Weibo comments. *Int. J. Environ. Res. Publ. Health* 16, E4767.
- Zhao, H., 2020. COVID-19 drives new threat to bats in China. *Science* 367, 1436.