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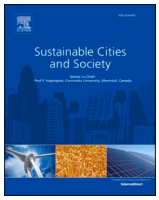

Community resilience in city emergency: Exploring the roles of environmental perception, social justice and community attachment in subjective well-being of vulnerable residents

Qian-Cheng Wang [a], Xuan Liu [b,*], Izzy Yi Jian [c], En-Jia Zhang [d], Yu-Ting Hou [e], Kin Wai Michael Siu [c], Yi-Bin Li [a]

[a] Department of Land Economy, University of Cambridge, Cambridge CB3 9EP, United Kingdom
[b] Department of the Built Environment, Eindhoven University of Technology, Eindhoven 5600 MB, the Netherlands
[c] School of Design, The Hong Kong Polytechnic University, Hong Kong 999077, PR China
[d] School of Architecture, Tsinghua University, Beijing 100084, PR China
[e] Department of Building and Real Estate, The Hong Kong Polytechnic University, Hong Kong 999077, PR China

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ABSTRACT

Despite the importance of social justice and community attachment for subjective well-being (SWB), the existing research fails to adequately examine these factors in urban emergencies. This study develops a theoretical framework to elucidate the roles of environment perception, social justice, and community attachment in SWB during urban emergencies, with a focus on vulnerable populations. Drawing on the context of COVID-19 lockdown in Shanghai, the research expands the definition of vulnerable groups, considering the factors including gender, income, immigrant, housing ownership, and the infection/exposure history. We examine the proposed framework with structural equation modelling and compare the vulnerable groups with multiple-group analysis. The analysis evidences the direct contribution of social justice and community attachment to SWB, and community attachment intermediates environmental perception and justice to SWB. These factors present heterogeneity amongst the vulnerable groups: community identity only affects the perceived health of residents with infection history, housing ownership and high income. This research revisits the interaction between residents and community environment in urban emergencies from a vulnerability perspective. The discussions provide novel insights for devising strategies for community service and infrastructure development aimed at enhancing community resilience. Also, the findings can benefit urban emergency planning at both community and city scale.

1. Introduction

Cities are becoming increasingly exposed to threats from uncertainties such as climate change, geopolitical tensions, and energy shortages. These uncertainties have resulted in recurrent urban emergencies, which can be caused by a variety of reasons, ranging from disrupted food supply chains (Liang & Zhong, 2023) to regional power outages (Zhao, Hao, Chang, & Wang, 2023). For example, cities have been particularly influenced by the global COVID-19 pandemic, which brought with it widespread urban lockdowns and social distancing policies (Abdul, 2020; Sibley et al., 2020; Yamamoto, Uchiumi, Suzuki, Yoshimoto, & Murillo-Rodriguez, 2020). Public emergencies pose severe challenges to urban resilience: they are usually unpredictable and can disrupt the daily functioning of cities and the supply of vital resources (Ma, Huang, & Liu, 2022). For instance, COVID-19 has drastically affected the operations of community service organisations such as food banks in UK, Canada and Germany (Beck & Gwilym, 2022; Simmet & Stroebele-Benschop, 2021). These factors potentially jeopardise the safety, property, and social order of urban residents. In addition, the implementation of emergency management strategies in cities, which may involve restrictions on material distribution and mobility, can further increase the mental stress levels of residents and affect their subjective well-being (SWB) (Sibley et al., 2020). A though understanding of the interplay and interconnectedness between individuals,

* Coresponding author.
E-mail address: x.liu1@tue.nl (X. Liu).

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their immediate physical and social environment, and the built infrastructure within a community during an urban emergency is crucial to inform the development of inclusive urban environment that serves all residents. Therefore, it is imperative for decision-makers to comprehend the crucial factors that impact the SWB of urban residents during emergencies and the mechanisms, in order to minimise the adverse effects on residents through the implementation of optimised emergency management strategies.

Place attachment is frequently considered a critical factor linking the living environment to well-being (Afshar, Foroughan, Vedadhir, & Tabatabaei, 2017; Basu, Hashimoto, & Dasgupta, 2020; Rollero & De Piccoli, 2010a; Scannell & Gifford, 2017). At a community level, place attachment refers to an affective bond between a resident and her/his community, known as community attachment (Cross, 2003). Numerous studies have evidenced that community attachment plays a significant role in residents' SWB (Sun, Ng, Chao, He, & Mok, 2022; G. L. Theodori, 2001). It increases the likelihood of residents developing close ties with their communities in terms of thoughts, feelings, values, and behaviours (Pretty, Chipuer, & Bramston, 2003). These preferences and behaviours positively influence the formation of identity consistency, leading to a more positive life perception and increased self-confidence (Afshar et al., 2017; Suh, 2002; Sun, Ng, Chao, He, & Mok, 2022). The belief of receiving support and resources from communities can inspire residents to participate in environmental initiatives and community affairs, and drive self-actualisation, thus contributing to their happiness, contentment, and prosperity (Anton & Lawrence, 2014). Although community attachment has received limited attention in previous urban emergency studies, the aforementioned evidence suggests that fostering community attachment is a potential strategy to reduce the impact of the emergency management, and contribute to community sustainability and resilience (Yang, Shi, & Runeson, 2023).

Justice has a pivotal role in the SWB of residents. As a universal, rational and external demand (Popke, 2006), justice often associates urban governance with the well-being amongst the inhabitants (Baker, Azzari, Thomas, & Bennett, 2020; Gross, 2007; Sharifi, Levin, Stone, & Nygaard, 2021). The residents expect fair regulations and resource allocation during the process of urban governance, along with the provision of transparent information and channels to voice their opinions. Justice governance can elevate place attachment of residents. Nevertheless, in city emergencies, it is arduous for temporary management strategies to fulfil these requirements. Policymakers might overlook the requirements of vulnerable and minority groups of inhabitants when devising emergency plans, making it challenging to offer them justice urban services. The recent cases of COVID-19 pandemic have served as evidence for this argument (Cox, 2020). People with disabilities and chronic diseases have received fewer medical resources (Andrews, Ayers, Brown, Dunn, & Pilarski, 2021). Minority ethnic groups and immigrants are prone to lose their jobs and income (Hu, 2020). Additionally, residents living in remote locations may find it challenging to access doorstep services such as procuring necessities and medical services during the pandemic (Figliozzi & Unnikrishnan, 2021). Inclusivity and justice are crucial for sustainable and resilient urban development (Amirzadeh, Sobhaninia, Buckman, & Sharifi, 2022; Greiving & Fleischhauer, 2022). Nonetheless, the existing research seldom establishes a theoretical framework to compare the SWB of different vulnerable groups during crises and discuss the underlying reasons for this heterogeneity (Kashem, Baker, González, & Lee, 2021).

Urban emergencies are becoming increasingly frequent and pose a significant risk to the SWB of city residents. The community-level interactions amongst members, environment, and facilities are crucial for establishing community resilience and mitigating the impact of such emergencies on SWB. However, this area remains underexplored. This study aims to explore the roles of physical infrastructure and human environment of community in SWB of people during urban emergencies. The objective of this study is twofold: (1) to develop and validate a theoretical framework that elucidates the relationship between neighbourhood environment, social justice and community attachment in influencing residents' SWB during urban emergencies, and (2) to employ the proposed framework to examine the impact of these factors on vulnerable groups. As mentioned, comprehending the role of justice and local attachment in driving residents' happiness is crucial for building well-being and enhancing community sustainability and resilience. Such a theoretical framework offers new insights into scholarly discussions on vulnerable and marginalised communities. This study draws on the case of Shanghai, China, when the city suffered a lockdown due to the outbreak of COVID-19 during the spring of 2022. Previous studies have documented numerous social challenges in city lockdowns associated with lockdowns, including social isolation (Wu, Yao, Deng, Marsiglia, & Duan, 2021), shortages of social services and supplies (Cox, 2020; Liang & Zhong, 2023), and income depletion (Martin, Markhvida, Hallegatte, & Walsh, 2020). This research offers a fresh theoretical framework to examine the interplay between various resident groups, community infrastructure and environment from a vulnerability perspective, and how these dynamics influence the SWB of community members. These discussions can serve as a theoretical framework for formulating strategies aimed at improving community resilience through the provision of daily community services and long-term infrastructure planning. Moreover, these reflections can contribute to the development of urban emergency response plans.

The rest of this article is structured as follows: The second section conducts a literature review and elaborates on the theoretical model with hypotheses. The third section outlines the measures and analysis procedures employed. The fourth section presents the analysis results. The fifth section further discusses the results and their implications for enhancing community resilience and well-being. Then, the sixth section addresses the limitations and future research directions. The concluding section summarises the main findings of the study and highlights its significance for informing policy and practice in promoting the SWB of residents in city emergencies.

2. Literature review and theory development

2.1. Subjective well-being in urban emergency

The consequences of urban emergencies can profoundly affect the well-being and livelihoods of urban residents, often accompanied by challenges like food and medicine shortages (Tsuboyama-Kasaoka, Hoshi, Onodera, Mizuno, & Sako, 2014), damage to community services (Higgins, Páez, Kim, & Wang, 2021; Sohrabi et al., 2020), and the spread of rumours (Sohrabi et al., 2020; Wilkinson et al., 2020). Several management measures, like lockdowns and evacuation, are frequently implemented in response to urban emergencies (Wilkinson et al., 2020). These measures have the potential to disrupt daily routines, social interactions, and livelihoods of residents, ultimately leading to a negative impact on their SWB.

Perceived health, also called physical well-being, is an important factor in SWB (Emmons & King, 1988; Røysamb, Tambs, Reichborn-Kjennerud, Neale, & Harris, 2003; Scheier & Carver, 1992). Residents usually experience high anxiety and stress level during urban emergencies (Rehman et al., 2021), which negatively impact their perceived health. For example, several studies reported that residents in lockdowns presented significantly lower perceived health than others (Colucci et al., 2022). This is in line with several empirical studies that have found a negative association between city emergencies and perceived health (e.g., Makizako et al., 2021).

Hedonic well-being is another important part of SWB (Joshanloo, Jovanović, & Park, 2021; Landmann & Rohmann, 2022; Paleari, Pivetti, Galati, & Fincham, 2021). This item refers to the subjective experience of pleasure and happiness (Diener, Lucas, & Oishi, 2018), covering both cognitive and affective aspects (Diener, 2000). The cognitive components focus on the satisfaction with life and environment, while the affective aspect emphasises the abundance of positive emotions

(Bojanowska, Kaczmarek, Koscielniak, & Urbańska, 2021). Landmann and Rohmann (2022) report that the contact restrictions during the COVID-19 lockdowns impaired hedonic well-being via loneliness and stress. Paleari et al. (2021)) also suggest the contribution of perceived social avoidance to hedonic well-being during the lockdowns in Italy.

Eudaimonic well-being is defined as "the subjective experiences associated with eudaimonia or living a life of virtue in pursuit of human excellence" (Niemiec, 2014). Different from hedonic well-being, eudaimonic well-being focuses on self-discovery and self-achievement through learning, involvement and growth (Bojanowska et al., 2021). Bojanowska et al. (2021)) observed a decrease in eudaimonic well-being of residents during the lockdown in Poland. Paleari et al. (2021)) and Pellerin and Raufaste (2020) suggested that several external factors, such as social media, community supports, psychological resources influenced this process.

2.2. Community attachment

Place attachment refers to the emotional and cognitive connections that individuals form with their environment, which is influenced by their interactions with the place and their personal experiences (Hidalgo & Hernandez, 2001). By providing residents with safety and tranquillity, communities usually play a significant role in shaping their emotional connection, which in turn is linked to life satisfaction and well-being (Rollero & De Piccoli, 2010a, 2010b). Community attachment explores the relationship between an individual's experiences, behaviour, and connection to the community (Cross, 2003) and neighbourhood (Chan & Li, 2022), and has two dimensions: community identity and community dependence. Through these two dimensions, the concept of community attachment captures the complex nature of the connection between people and their living environment (Chan & Li, 2022; Masterson et al., 2017).

Community identity is a phenomenon shaped by individuals' cognition, preferences, and emotions towards their community, resulting in people's sense of belonging and attachment to a place. It reflects the intensity of residents' identification and emotional connection with the community. Additionally, community identity is intricately linked to personal identity, as it arises from the complex interplay between individuals' beliefs, behavioural tendencies, and environmental factors. By recalling experiences in particular locations, individuals can enhance their well-being (Knez, Eliasson, & Gustavsson, 2020), as place identity facilitates the development of positive personal and social identity (Rollero & De Piccoli, 2010b; Sun, Ng, Chao, He, & Mok, 2022).

Place dependence refers to the physical characteristics of a certain place, including its resources, facilities, and functionality (Qian & Zhu, 2014). At the community level, these attributes play crucial roles in influencing experiences and behaviour of residents, enhancing their quality of life, and shaping their emotional connection to the community. By assisting people in achieving their goals, community dependence promotes sense of security and social participation, which contributes to both global life satisfaction and SWB (Cheung & Hui, 2018; Scannell & Gifford, 2017). Decreased place dependence could potentially lead to heightened feelings of insecurity and distrust amongst community residents, resulting in increased psychological burden and adverse impacts on their SWB.

Many studies have connected place attachment with well-being (Basu et al., 2020; Junot, Paquet, & Fenouillet, 2018; Sun, Ng, Chao, He, & Mok, 2022). For example, Junot et al. (2018) reported a direct relationship between place attachment and well-being of residents. A few previous works also show that place attachment can improve the perceived health and physical well-being of residents (Lindén-Boström et al., 2010). However, some recent studies argued against this statement (Lovell, Gray, & Boucher, 2017; Veenstra et al., 2005). The study develops the following hypotheses:

H1: Community identity has a positive influence on physical well-being significantly
H2: Community identity has a positive influence on hedonic well-being significantly
H3: Community identity has a positive influence on eudaimonic well-being significantly
H4: Community dependence has a positive influence on physical well-being significantly
H5: Community dependence has a positive influence on hedonic well-being significantly
H6: Community dependence has a positive influence on eudaimonic well-being significantly

2.3. Social justice

Social justice is a multidimensional construct that recognises and values the inherent dignity of every human being and strives to create societies and systems that ensure the equitable distribution of resources, opportunities, and responsibilities within a given context (Enssle & Kabisch, 2020; Low, 2013; Miller, 2001). Social justice has several dimensions, including distributive justice, which concerns the equity of outcome distribution, such as rewards and opportunities (Cook & Hegtvedt, 1983; Skarlicki & Folger, 1997), and reflects people's concerns for fair allocation of resources, opportunities, and benefits in comparison to others regardless of their diverse backgrounds. Interactional justice, on the other hand, pertains to individuals' perceptions of the fairness of treatment they receive from others, especially those in positions of authority (Skarlicki & Folger, 1997). It emphasises interpersonal treatment, including transparency and information-sharing in communication processes. Another critical aspect of social justice is procedural justice, which emphasises the perceived fairness and rationality of the decision-making process, in addition to outcomes (Skarlicki & Folger, 1997). This aspect claims that people consider various factors such as consistency, transparency, and impartiality of the procedures that were used to determine if a decision-making process is fair. It stresses equity in the process, such as the opportunity to express opinions, consistency in the procedures used, and impartiality of the decision-maker (Bradley & Sparks, 2002). There exists ample evidence indicating that social justice has a noteworthy impact on SWB (Jennings, Floyd, Shanahan, Coutts, & Sinykin, 2017; Jian et al., 2020). For instance, accessible resources such as healthcare, and clean water, as well as a reduction in income inequality, have been linked to improved physical well-being (Levy & Patz, 2015; Sanchez et al., 2000), as easy and equitable access to health-related resources helps individuals prioritise their health (Benfer & Wiley, 2020). On the other hand, unjust and intolerant living conditions may heighten the mental stress experienced by marginalised groups, thereby impacting their overall well-being (Le, Iwamoto, & Burke, 2021). The pursuit of social justice not only fosters a sense of fairness and equality, but also enhances subjective experiences of pleasure and happiness (Edwards, Reid, & Hunter, 2016; Jankowski, Sandage, Wang, & Crabtree, 2022). There is efficient evidence shows that social justice is positively associated with higher levels of positive emotions and life satisfaction (Di Martino & Prilleltensky, 2020; Jian et al., 2020), whereas experiences of social injustice, such as marginalisation and discrimination, are linked with lower levels of SWB (Gostin & Powers, 2006).

Social justice is also linked to place attachment. By promoting fairness, respect, and equal treatment, social justice creates a welcoming environment where individuals feel included, valued, fairly treated and respected (Anguelovski, 2013). This inclusive environment can significantly enhance individual's sense of belonging and attachment to the community, ultimately leading to a stronger place identity (Marques, Lima, Moreira, & Reis, 2015; Ross, Van Alstine, Cotton, & Middlemiss, 2021).

Social justice can also improve access to resources and promote social inclusion. A social-justice-orientated environment creates a sense of

trust and safety in the community (Jian et al., 2020), which can contribute to a stronger sense of place dependence. A community with functional amenities and services provides individuals with opportunities to extend their social activities and strengthen their place dependence (Jian et al., 2020). Social justice can positively influence place identity and place dependence by promoting inclusivity and equality, improving resources, and creating a supportive community environment. It enhances people's sense of belonging and reliance on the community and ultimately contributes to their SWB (Jian, Chan, Xu, & Owusu, 2021).

The study develops the following hypotheses:

H7: Social justice has a positive influence on physical well-being significantly
H8: Social justice has a positive influence on hedonic well-being significantly
H9: Social justice has a positive influence on eudaimonic well-being significantly
H10: Social justice has a positive influence on community identity significantly
H11: Social justice has a positive influence on community dependence significantly

2.4. Community environmental perceptions

Environmental perception proposed that the environment in which people live has a significant impact on their culture, values, and impressions of their surroundings (De Dominicis, Fornara, Cancellieri, Twigger-Ross, & Bonaiuto, 2015; Raymond, Brown, & Weber, 2010). The environmental perception of a community is influenced by multiple factors. A satisfactory community should meet the various living and social needs of the residents. The support that residents feel in the community increases their satisfaction, sense of belonging and safety in the community. Moreover, the quality, diversity and richness of community facilities attract residents to participate in community activities, leading to an enhancement of community environmental perception (Florida et al., 2011).

The natural and built features of the community, such as public spaces and architectural design, have been shown to evoke positive emotions which can enhance an individual's place identity (Joshi & Wende, 2022). A sense of belonging and attachment to a place is enhanced by positive social interactions and community involvement, which contribute to a sense of place identity (Bernardo & Palma-Oliveira, 2016; De Dominicis et al., 2015; White, Virden, & Van Riper, 2008). Environmental perception also plays a role in shaping place dependence, as individuals may depend on a community due to its perceived accessibility, safety, or convenience (G. L. Theodori, 2001). A well-designed and easily accessible community with a variety of amenities can provide people with opportunities to extend social activities, and contribute to a sense of place dependence (Jian et al., 2021; White et al., 2008). The relationship between environmental perception, place identity and place dependence are complex and multifaceted. Community environmental characteristics play a significant role in shaping an individual's emotional relationship with their physical surroundings, and understanding this relationship is critical in designing and managing environments that promote positive place attachment and SWB.

The study develops the following hypotheses:

H12: Community environmental perception has a positive environmental perception influence on community identity significantly.
H13: Community environmental perception has a positive influence on community dependence significantly.

Fig. 1 illustrates the theoretical framework and the hypotheses.

2.5. Vulnerable groups in urban lockdowns

The COVID-19 pandemic has led to widespread lockdowns in various countries and areas to control the spread of the virus (Armbruster & Klotzbücher, 2020; Ayanlade & Radeny, 2020; Quach et al., 2021). Some countries implemented strict lockdown measures, such as travel and social distance restrictions and mandatory quarantine (Gan et al., 2022; Giardino, Huck-Iriart, Riddick, & Garay, 2020; Lau et al., 2020; Quach et al., 2021). These measures usually presented critical effects to reduce the virus spread rate (Lau et al., 2020) and protected residents in high-density urban area (Sun, Zhang, Yang, Wan, & Wang, 2020). However, these measures can disturb the daily functioning of cities and the lives of the residents: several research reports the shortage of food and medicine (Benker, 2021; S. Das et al., 2020; Smith et al., 2020), mental diseases (Panchal et al., 2021; Pieh et al., 2021), and financial pressure (Posel, Oyenubi, & Kollamparambil, 2021) caused by the city lockdowns. In the spring of 2022, the SARS-CoV-2 Omicron virus attacked the world and caused millions of positive cases in a short time (Fan et al., 2022). In this process, many cities have re-adopted the strict lockdown measures to reduce the effects of the Omicron virus. While these measures can speed up the city recover from the epidemic, the city emergency might disproportionately affect certain vulnerable groups (Crouzet et al., 2022), such as females, non-local people and migrants, low-income families, people with no housing ownership, and COVID-19-infected persons and their close contacts.

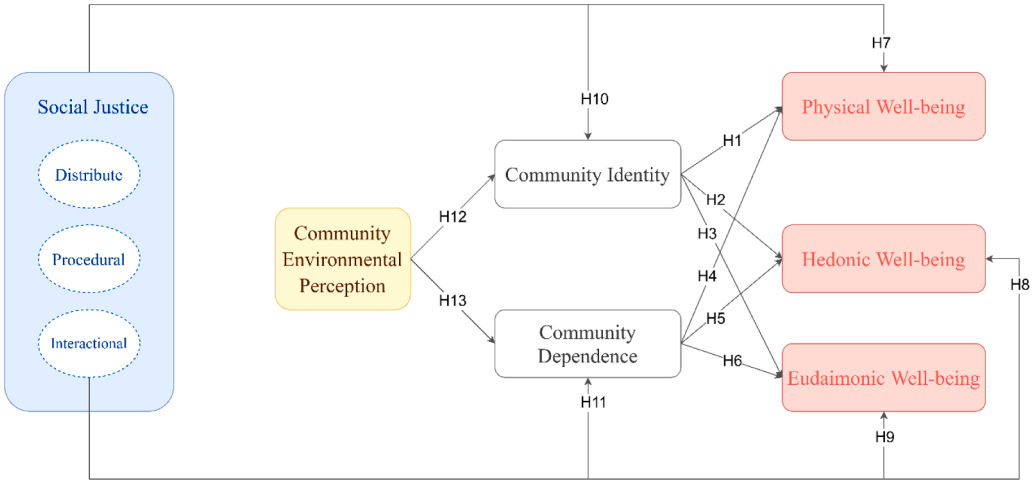

Fig. 1. The theoretical framework.

With reports of increased domestic violence (Das, Roy, & Roy, 2021; Malathesh, Das, & Chatterjee, 2020; Usta, Murr, & El-Jarrah, 2021) and decreased economic opportunities (Nanda, 2020), female residents have been more significantly affected by the pandemic (Indu, Vijayan, Tharayil, Ayirolimeethal, & Vidyadharan, 2021). During the lockdowns, women were more likely to bear the burden of childcare and household duties, leading to increased stress and fatigue (Andrew et al., 2022; Hjálmsdóttir & Bjarnadóttir, 2021; Walters, Mehl, Piraino, Jansen, & Kriger, 2022). Also, females are overrepresented in industries most affected by the pandemic, such as hospitality, leading to more job losses and financial insecurity (Nanda, 2020).

Non-local residents and migrants face significant barriers in accessing healthcare and social services (Aragona, Barbato, Cavani, Costanzo, & Mirisola, 2020; Burton-Jeangros et al., 2020). Due to the mobility restriction, many migrants were unable to return to their home cities during the lockdowns (Ullah, Nawaz, & Chattoraj, 2021) and were left without sufficient support or resources (Xu, Crush, & Zhong, 2022). For example, Xu, Crush, & Zhong, 2022) found that residents without local hukou (household registration) were more food insecure than others during the lockdowns in Nanjing, China. The lack of access to healthcare has also put these individuals at increased risk of contracting and spreading COVID-19.

Low-income families are also vulnerable in lockdowns. The lockdowns threat financial and job security of the low-income groups, especially those workers without formal contract or with a daily settlement (Allas, Canal, & Hunt, 2020; Xu, Crush, & Zhong, 2022). The lockdowns also disrupted the supply chain, leading to increased prices for basic necessities, further exacerbating the financial strain on low-income households (Karim & Tasnim, 2022; Singh et al., 2021).

Individuals who do not own their homes faced increased housing insecurity during the COVID-19 pandemic (Nolan, 2021). The lockdowns and economic slowdown made it difficult for these individuals to pay rent, leading to evictions and homelessness.

People who tested positive in COVID-19 or were in close contact with an infected person faced stigmatisation and discrimination (Bhanot, Singh, Verma, & Sharad, 2021; Chaturvedi, Susmitha, Nayak, Digal, & Singh, 2022). They were often isolated from their communities and experienced job loss or other negative consequences (Chaturvedi et al., 2022). Additionally, the mandatory quarantine measures made it difficult for these individuals to access healthcare or other necessary resources (Singh & Subedi, 2020).

During city lockdowns, vulnerable groups with diverse social attributes often encounter distinct challenges that impact their emotional and cognitive experiences. Hence, some influencing factors may have more acute effect on thoughts and feelings of certain vulnerable groups. For example, Ali et al. (2021) discovered that female and low-income individuals' intention to use online food ordering services was more likely to be influenced by feelings of insecurity and discomfort than others during the COVID-19 pandemic (Ali, Khalid, Javed, & Islam, 2020). Furthermore, the impact of critical factors affecting SWB on different vulnerable groups may be heterogeneous. Nevertheless, the existing research in this area remains inadequate.

3. Methodology

3.1. Measures

The present study investigates the entire territory of Shanghai, China, encompassing both its urban and suburban areas. Shanghai is amongst the most densely populated and economically developed cities in mainland China. In early 2022, the city experienced a significant outbreak of SARS-CoV-2 Omicron, leading to a large number of confirmed cases. To prevent the further spread of the epidemic, Shanghai implemented emergency measures. These measures include mass COVID-19 testing and a strict city-wide lockdown covering 25 million residents from March to May 2022. To collect data for the study while ensuring the safety of participants, an online questionnaire was employed. Given that Shanghai is one of the most developed cities in China, its residents exhibit a higher rate of internet penetration than the national average (i.e., 74.4%). Additionally, most Shanghai residents have access to mainstream social software in China such as WeChat and Weibo. Prior studies have demonstrated the feasibility of using online questionnaires in Shanghai during and before the lockdown (Wang et al., 2023; Wang, Ren, Liu, Chang, & Zuo, 2023; Wu et al., 2023; Zhang et al., 2023). The study team recruited participants through a local online platform between April 20 and May 13, inviting individuals who had been living primarily in Shanghai for the past two months. Respondents were prevented from completing the questionnaire a second time if their Internet Protocol (IP) address was found to be a duplicate.

This study employed a five-part questionnaire to collect data. The first part canters on SWB, consisting of 4 items related to eudaimonic well-being, 3 items on hedonic well-being, and 2 items on physical well-being. The eudaimonic well-being items included self-acceptance, purpose in life, environmental mastery, and autonomy. The hedonic well-being items considered cognitive and affective factors. The questionnaire design of this part incorporated local social environment factors and several widely-used SWB scales, including BBC well-being scale (Kinderman, Schwannauer, Pontin, & Tai, 2011), PWBS (Diener et al., 2009), Warwick-Edinburgh mental well-being scale (WEMWBS) (Tennant et al., 2007), Oxford Happiness Questionnaire (OHQ) (Hills & Argyle, 2002), and WHO-10 (Bech, Gudex, & Johansen, 1996). The second part examines community attachment through ten questions investigating respondents' place identity and place dependence on their communities. The third part tests social justice perception through six items, while the fourth part explored community environmental perception, including functional diversity, public open space, and community enjoyment. Finally, the questionnaire recorded the socio-economic information of both the respondents and their families. Appendix I details the items in the employed questionnaire.

The survey received 459 valid responses. Table 1 presents the respondent profiles. The demographic structure of the sample is roughly consistent with the statistical characteristics of Shanghai's population. However, the lower rates of internet use amongst elderly, young students, and residents with lower educational attainment resulted in a smaller representation of these groups in the survey responses. Amongst the respondents, 258 were female. For the purposes of this study, respondents who reside in shared apartments or dormitories, or whose average household per capita income (household income divided by household size) falls below per capita disposable income in Shanghai, were classified as relatively low-income groups. Based on the criteria, there are 255 respondents in the relatively low-income category. Furthermore, 160 (i.e., 34.84%) do not hold a Shanghai local hukou and are identified as migrants, while 311 (i.e., 67.76%) own their homes. Lastly, 65 respondents (i.e., 14.16%) reported either having tested positive for COVID-19 or having been in contact with positive cases.

3.2. Data analysis

The study used structural equation modelling (SEM) to analyse the complex relationships between variables. SEM is a multivariate statistical analysis method which is widely used in social sciences, psychology, and urban research. By using the method, the study can model the relationship between latent variables and examine the impact of variables and the relationship between indicators (Hair, Ringle, & Sarstedt, 2011). The partial least squares structural equation modelling (PLS-SEM) technique is one of the main SEM approaches, which has the advantage in apply in various samples, non-normal distributions, multivariate complex models, and formative measurement models (Hair et al., 2011; Hair, Risher, Sarstedt, & Ringle, 2019). The study aims to analyse the relationships between the different variables in the proposed research model and investigate the differences between the

Table 1
Respondent profiles.

Category	Item	Number	Percentage
Gender	Male	201	43.79%
	Female	258	56.21%
Age	<18	19	4.14%
	18–25	79	17.21%
	26–30	136	29.63%
	31–40	151	32.90%
	41–50	51	11.11%
	51–60	14	3.05%
	61–70	7	1.53%
	>70	2	0.44%
Education	Below high school	51	11.11%
	Diploma's degree	65	14.16%
	Undergraduate degree	279	60.78%
	Master's degree	56	12.20%
	Doctoral and above	8	1.74%
Household size	1	46	10.02%
	2	89	19.39%
	3	197	42.92%
	4	65	14.16%
	5 or above	8	1.74%
	Other (e.g., shared room/dorm)	54	11.76%
Household annul income	<10k	12	2.61%
	10–20k	22	4.79%
	20–50k	30	6.54%
	50–100k	58	12.64%
	100–200k	129	28.10%
	200–300k	83	18.08%
	300–500k	79	17.21%
	500k-1m	35	7.63%
	>1m	11	2.40%
Local hukou	Yes	299	65.14%
	No	160	34.84%
Household ownership	Yes	311	67.76%
	No	148	32.24%
Tested positive in COVID-19 or a close contact	Yes	65	14.16%
	No	394	85.84%

different groups. This technique allowed the researchers to examine the model's validity and reliability and make sound explanations about the relationships between the variables. The data analysis is achieved by SmartPLS 3.0. The detailed data analysis is illustrated in Fig. 2.

The PLS-SEM consists of two sub-models: a measurement model and a structural model. The measurement model aims to discover the regression relationship between observed and latent variables and evaluate the construct validity of the proposed research model and the structural models represent relationships between latent variables. By using measurement modelling, a study can examine the quality of the model and collected data. Construct validity in the measurement model comprises two components: convergent validity (CV) and discriminant validity (DV) Fornell & Larcker, 1981). The degree of effectiveness of CV can be demonstrated from Cronbach's alpha, Composite Reliability (CR) and Average Variance Extracted (AVE) while the DV can be examined by distinguishing the items from different constructs which can be checked by Fornell and Larcker's Criterion. The CR and AVE equations are given in Eqs. (1), ((2) and (3) Fornell & Larcker, 1981; Henseler & Sarstedt, 2013) and the Eqs. (4) and ((5) shows the Fornell and Larcker's Criterion (Fornell & Larcker, 1981; Henseler & Sarstedt, 2013):

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \varepsilon_i} \tag{1}$$

$$\varepsilon_i = 1 - \lambda_i^2 \tag{2}$$

λ is the factor loading of indicator i.
ε is the respective error variance for item i.

$$AVE = \frac{\sum_{i=1}^{p} \lambda_i^2}{\sum_{i=1}^{p} \lambda_i^2 + \sum_{i=1}^{p} Var(e_i)} \tag{3}$$

p is the number of indicators of a construct.
$Var(e_i)$ is the variance of the error of indicator i.

$$AVE > max r_{ij}^2 \ \forall_i \neq j \tag{4}$$

$$\sqrt{AVE} > max|r_{ij}| \ \forall_i \neq j \tag{5}$$

r_{ij}: the correlation coefficient between the construct scores of constructs
r_{ij}^2: squared inter-construct correlation

In addition, considering the model validation measure provided by the tool is insufficient, the study examines the goodness of fit (GoF), to assess how well an observed data set fits with the theoretical model. Meanwhile, the study employed standardised root mean square residual (SRMR) to measure the fit of the proposed model. The formula of GoF is provided below:

$$GoF = \sqrt{AVE_{avg} \times R_{avg}^2} \tag{6}$$

R^2: the R-squared value.

Next, the study tests the structural model by bootstrapping (5000 resamples) and determines the significance of hypotheses in the proposed research model.

Additionally, one of the purposes of the study is to gain insight into the variations between distinct groups of vulnerable. Since combining a single data group fail to assess whether there are significant differences between two or more subgroups in the data, some studies propose the application of multigroup analysis (MGA) to address this problem (Cheah, Amaro, & Roldán, 2023; Sarstedt, Henseler, & Ringle, 2011). PLS-MGA is an extension of the PLS-SEM method that aims to examine if the relationships between latent variables and observed indicators differ significantly across different subgroups of the population (Cheah et al., 2023; Sarstedt et al., 2011). It is widely used in social sciences, marketing, and management research to investigate group differences and the method better help researchers find out the difference between groups, especially the underlying mechanisms that might influence the relationship between variables. Thus, the study applied PLS-SEM multigroup analysis (PLS-MGA) to test whether there is a significant difference in the estimation of a particular parameter between the vulnerable group and the non-vulnerable group in the final step.

4. Results

4.1. Measurement model

The aim of a measurement model is to assess whether the observed variables are appropriate indicators of the underlying latent variable, which can be determined by construct validity (CV) and discriminant validity (DV). This section presents the test results of the CV and DV. The study uses the results of Cronbach's alpha, CR and AVE to assess CV. Effective CV can be shown as Cronbach's alpha greater than 0.5 (Leontitsis & Pagge, 2007), CR greater than 0.7 as well as AVE results for each construct larger than 0.5 (Afthanorhan, 2013). Moreover, factor loading for each item should exceed 0.5 (Afthanorhan, 2013). Table 2 presents the CV estimation results.

The results demonstrate that the factor loading, Cronbach's alpha, CR, and AVE values meet the requirements for CV. In detail, table 2 reveals that the factor loading ranged between 0.694 and 0.905 for all items, exceeding the threshold of 0.5. The values of Cronbach's alpha are all above 0.5 and the results of CR all exceed 0.8. The AVE values are from 0.570 to 0.760, which exceeds the cut-off of 0.5. As a result, the constructs accurately reflect the construct's reliability and validity.

The study employed Fornell and Larcker's Criterion to assess DV. According to this criterion, the square root of the average variance extracted (AVE) for a construct should exceed the correlation coefficients between that construct and other constructs. Appendix II

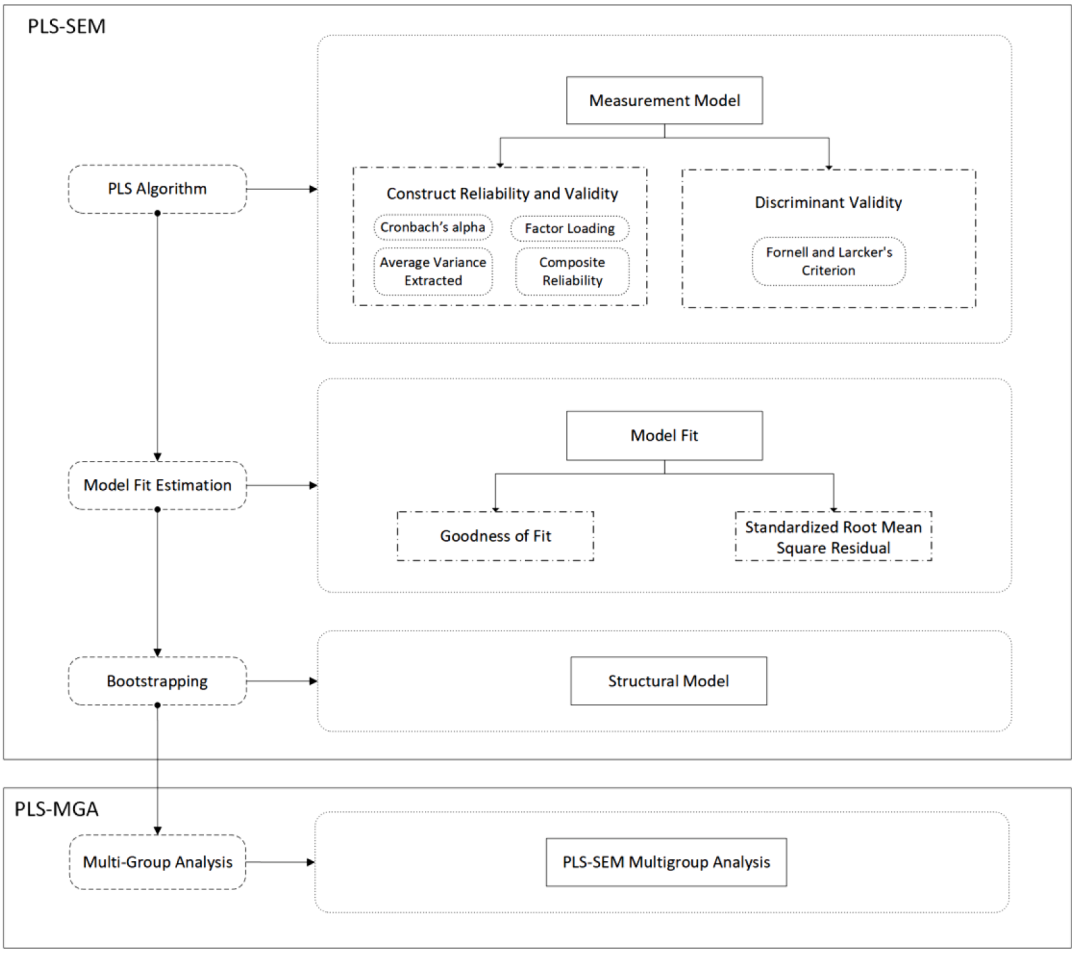

Fig. 2. Data analysis flow.

Table 2
the result of CV test.

Constructs	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
Social Justice	0.693–0.816	0.849	0.888	0.570
Community Environmental Perception	0.842–0.903	0.843	0.906	0.762
Community Identity	0.819–0.906	0.891	0.925	0.754
Community Dependence	0.801–0.898	0.925	0.941	0.727
Physical Well-being	0.826–0.831	0.543	0.814	0.686
Hedonic Well-being	0.751–0.843	0.722	0.843	0.642
Eudaimonic Well-being	0.812–0.872	0.810	0.875	0.636

presents the results of Fornell and Larcker's Criterion, demonstrating that the criterion's requirements were met and providing evidence of DV.

4.2. Model fit estimation

Assessing model fit is crucial to understanding model accuracy. In this study, the goodness of fit (GoF) and standardised root mean square residual (SRMR) indices were used to evaluate the proposed model's fit. The cut-off values for GoF at 0.1, 0.25, and 0.36 indicates small, medium, and large goodness of fit, respectively (Mital et al., 2018). SRMR measures the mean of the standardised residuals between the observed and hypothesized covariances, with a value below 0.08 indicating a good model fit. The study employed Eq. (6) to calculate GoF, resulting in a value of 0.534, indicating a large goodness of fit of the proposed model. Similarly, the SRMR value of 0.059 indicates a good model fit as it is smaller than the cut-off of 0.08. Thus, the results of both model fit indices indicate that the proposed model is adequate.

4.3. Structural model

One of the aims of the study is to assess the hypotheses of the proposed model and find out the relationship between constructs. Therefore, this step tested the structural equation model by employing the bootstrap method. Table 3 shows the hypotheses result of the structural equation model.

The findings suggest that community identity has the strongest association with hedonic well-being amongst all the indicators ($\beta = 0.309$, $p<0.001$). At the same time, it plays a positive and significant role in influencing eudaimonic well-being ($\beta = 0.202$, $p<0.001$). Differently, community identity does not seem to affect physical well-being significantly. Community identity ($\beta = 0.126$, $p=0.071$) also have a positive role in predicting hedonic well-being, while its impact on physical and eudaimonic well-being is not significant.

In terms of social justice, it plays the most important role in predicting physical well-being ($\beta = 0.338$, $p<0.001$) as well as eudaimonic well-being ($\beta = 0.390$, $p<0.001$). The effect of social justice on hedonic well-being is also positive and significant ($\beta = 0.245$, $p<0.001$). Meanwhile, social justice has a positive effect on community identity ($\beta = 0.251$, $p<0.001$) and community dependence ($\beta = 0.192$, $p<0.001$).

Furthermore, community environmental perception appears to have a stronger positive influence on community attachment than social

Table 3
Hypotheses Results of the Structural Equation Model.

Hypotheses	Path Coefficient	STDEV	T Statistics	P Values
Community Identity -> PWB	0.117	0.075	1.557	0.120
Community Identity -> HWB	0.309	0.061	5.089	0.000***
Community Identity -> EWB	0.202	0.060	3.390	0.001**
Community Dependence -> PWB	0.073	0.066	1.099	0.272
Community Dependence -> HWB	0.126	0.070	1.804	0.071#
Community Dependence -> EWB	0.137	0.066	2.081	0.038
Social Justice -> PWB	0.338	0.053	6.397	0.000***
Social Justice -> HWB	0.245	0.060	4.070	0.000***
Social Justice -> EWB	0.390	0.055	7.086	0.000***
Social Justice -> Community Identity	0.251	0.049	5.115	0.000***
Social Justice -> Community Dependence	0.192	0.040	4.853	0.000***
CEP -> Community Identity	0.479	0.049	9.863	0.000***
CEP -> Community Dependence	0.705	0.033	21.474	0.000***

Note: CEP is Community Environmental Perception, PWB is Physical Well-being, HWB is Hedonic Well-being, EWB is Eudaimonic Well-being.
# p<0.1.
*p<0.05.
** p<0.01.
*** p<0.001.

justice. Specifically, community environmental perception has the strongest impact on community dependence, with a value of 0.705 (p<0.001). It also has a highly positive and significant effect on community identity (β = 0.479, p<0.001).

4.4. Indirect effect

The study also investigated the mediating effects of community identity and community dependence on the relationship between social justice, community environmental perception, and three types of SWB:

Table 4
Result of indirect effect.

Relationship	Indirect Coefficient	T Statistics	P Values
Social Justice -> Community Identity -> PWB	0.056	1.599	0.111
Social Justice -> Community Identity -> HWB	0.028	1.529	0.127
Social Justice -> Community Identity -> EWB	0.051	2.631	0.009**
Social Justice -> Community Dependence -> HWB	0.035	2.381	0.018*
Social Justice -> Community Dependence -> PWB	0.014	1.088	0.277
Social Justice -> Community Dependence -> EWB	0.026	1.951	0.052#
CEP -> Community Identity -> PWB	0.029	1.406	0.160
CEP -> Community Identity -> HWB	0.053	1.700	0.090#
CEP -> Community Identity -> EWB	0.097	3.241	0.001**
CEP -> Community Dependence -> PWB	0.052	1.122	0.262
CEP -> Community Dependence -> HWB	0.128	2.584	0.010*
CEP -> Community Dependence -> EWB	0.097	2.061	0.040*

Note: CEP is Community Environmental Perception, PWB is Physical Well-being, HWB is Hedonic Well-being, EWB is Eudaimonic Well-being
# *p<0.1.*
* p<0.05.
** p<0.01.
***p<0.001.

physical, hedonic, and eudaimonic. Table 4 displays the results observed in this step.

The findings of the study indicate that social justice has a significant indirect impact on eudaimonic well-being (β = 0.051, p = 0.009), which is mediated by community identity. However, the community identity not fully mediated the association between social justice and hedonic well-being as well as physical well-being. Conversely, the study finds that community dependence displays an indirect effect on mediating social justice and hedonic well-being (β = 0.035, p = 0.018) as well as eudaimonic well-being (β = 0.026, p = 0.052). However, community dependence does not have a significant impact on the link between social justice and physical well-being.

Also, the study discovers a noteworthy indirect effect of community environmental perception on eudaimonic well-being (β = 0.097, p = 0.001) and hedonic well-being (β = 0.053, p = 0.090) through community identity. However, community identity does not have a significant mediating effect on the relationship between community environmental perception and physical well-being. The findings indicate that community dependence had the strongest indirect effect in mediating the link between community environmental perception and hedonic well-being (β = 0.128, p = 0.010). Through community dependence, community environmental perception has an indirect effect on eudaimonic well-being (β = 0.097, p = 0.040). Nevertheless, the indirect effect of community environmental perception on physical well-being through community dependence is insignificant.

4.5. Multi group analysis

In order to identify and compare the relationships between latent variables and observed variables in vulnerable groups, the study employs PLS-MGA to conduct analysis. Table 5 presents the result of PLS-MGA.

The study found that community identity has a positive effect on the physical well-being of individuals who were affected by the virus (β = 0.478, p = 0.012), but this effect was not significant for those in the non-covid vulnerable group.

It also found significant gender differences in the relationship between social justice and physical well-being. While both males and females experienced a positive effect on physical well-being from social justice, the effect was stronger for females (β = 0.244, p = 0.001) than for males (β = 0.452, p < 0.001). In contrast, community identity had a positive and significant impact on hedonic well-being in the male group (β = 0.209, p = 0.016), but no significant effect on hedonic well-being was observed for females.

The difference relationship between local and migrants were also determined. The hedonic well-being of local residents was found to be influenced by community identity (β = 0.232, p = 0.003), while the community identity plays no significant role in affecting migrants. When comparing local to immigrants, community identity was found to have a significant relationship with eudaimonic well-being of local residents (β = 0.285, p < 0.001). However, no significant effect was observed for immigrants.

Some differences were observed between low income and non-low income people. For instance, while community identity did not significantly affect the physical well-being of low-income individuals, it had a significant positive effect on the physical well-being of non-low-income groups (β = 0.354, p < 0.001). Also, community environmental perception had a greater impact on community identity for individuals in the non-low-income group (β = 0.621, p < 0.001) compared to those in the low-income group (β = 0.369, p < 0.001).

Three differences were observed between homeowners and tenants. Firstly, community identity was found to be a predictor of physical well-being for homeowners (β = 0.232, p = 0.005), but not for individuals who do not own property. Secondly, homeowners' hedonic well-being was found to be positively influenced by community identity (β = 0.186, p = 0.007), whereas no significant effect was observed for

Table 5
PLS-MGA results.

Hypotheses	Group	Comparison Coefficients	WST P Value	Path Coefficients	P Value
Social Justice -> Community Identity	Covid-vulnerable	0.041	0.268	0.294	0.045*
	Non Covid-vulnerable			0.252	0.000***
	Male	-0.048	0.624	0.225	0.000***
	Female			0.273	0.000***
	Local Hukou	0.052	0.610	0.274	0.000***
	Non-Local Hukou			0.222	0.009**
	Low Income	0.115	0.246	0.300	0.000***
	Non-Low Income			0.185	0.010*
	Household Owner	0.165	0.124	0.319	0.000***
	Non-Owner			0.154	0.082#
Social Justice -> Community Dependence	Covid-vulnerable	0.005	0.967	0.199	0.098#
	Non Covid-vulnerable			0.193	0.000***
	Male	-0.001	0.991	0.191	0.000***
	Female			0.191	0.001**
	Local Hukou	0.059	0.520	0.215	0.000***
	Non-Local Hukou			0.157	0.051#
	Low Income	0.019	0.810	0.202	0.000***
	Non-Low Income			0.183	0.002**
	Household Owner	0.084	0.414	0.223	0.000***
	Non-Owner			0.139	0.138
Social Justice -> PWB	Covid-vulnerable	-0.138	0.714	0.228	0.221
	Non Covid-vulnerable			0.366	0.000***
	Male	-0.207	0.043#	0.244	0.001**
	Female			0.452	0.000***
	Local Hukou	0.026	0.824	0.350	0.000***
	Non-Local Hukou			0.324	0.001**
	Low Income	0.087	0.399	0.378	0.000***
	Non-Low Income			0.291	0.000***
	Household Owner	-0.052	0.644	0.309	0.000***
	Non-Owner			0.360	0.000***
Social Justice -> HWB	Covid-vulnerable	0.200	0.114	0.589	0.000***
	Non Covid-vulnerable			0.388	0.000***
	Male	-0.146	0.158	0.346	0.000***
	Female			0.491	0.000***
	Local Hukou	0.047	0.651	0.436	0.000***
	Non-Local Hukou			0.389	0.000***
	Low Income	0.134	0.223	0.463	0.000***
	Non-Low Income			0.330	0.000***
	Household Owner	0.042	0.725	0.419	0.000***
	Non-Owner			0.377	0.051#
Social Justice -> EWB	Covid-vulnerable	0.119	0.318	0.500	0.000***
	Non Covid-vulnerable			0.381	0.000***
	Male	-0.132	0.212	0.329	0.000***
	Female			0.460	0.000***
	Local Hukou	-0.075	0.492	0.375	0.000***
	Non-Local Hukou			0.450	0.000***
	Low Income	0.129	0.129	0.451	0.000***
	Non-Low Income			0.321	0.000***
	Household Owner	0.057	0.644	0.402	0.000***
	Non-Owner			0.345	0.001**
CEP -> Community Identity	Covid-vulnerable	-0.182	0.273	0.319	0.043*
	Non Covid-vulnerable			0.501	0.000***
	Male	0.092	0.355	0.524	0.000***
	Female			0.433	0.000***
	Local Hukou	0.021	0.848	0.481	0.000***
	Non-Local Hukou			0.460	0.000***
	Low Income	-0.252	0.010*	0.369	0.000***
	Non-Low Income			0.621	0.000***
	Household Owner	-0.092	0.395	0.440	0.000***
	Non-Owner			0.532	0.000***
CEP -> Community Dependence	Covid-vulnerable	-0.094	0.431	0.624	0.000***
	Non Covid-vulnerable			0.718	0.000***
	Male	0.014	0.832	0.712	0.000***
	Female			0.699	0.000***
	Local Hukou	0.008	0.923	0.705	0.000***
	Non-Local Hukou			0.697	0.000***
	Low Income	-0.051	0.443	0.679	0.000***
	Non-Low Income			0.731	0.000***
	Household Owner	-0.009	0.909	0.698	0.000***
	Non-Owner			0.707	0.000***
Community Identity -> PWB	Covid-vulnerable	0.419	0.044*	0.478	0.012*
	Non Covid-vulnerable			0.059	0.472
	Male	0.099	0.527	0.159	0.141

(*continued on next page*)

Table 5 (*continued*)

Hypotheses	Group	Comparison Coefficients	WST P Value	Path Coefficients	P Value
	Female			0.059	0.604
	Local Hukou	0.254	0.109	0.219	0.024*
	Non-Local Hukou			-0.035	0.779
	Low Income	-0.351	0.013*	0.003	0.977
	Non-Low Income			0.354	0.001**
	Household Owner	0.385	0.027*	0.232	0.005**
	Non-Owner			-0.152	0.319
Community Identity -> HWB	Covid-vulnerable	-0.022	0.876	0.088	0.477
	Non Covid-vulnerable			0.111	0.130
	Male	0.211	0.087#	0.209	0.016*
	Female			-0.002	0.980
	Local Hukou	0.317	0.020*	0.232	0.003**
	Non-Local Hukou			-0.085	0.441
	Low Income	0.028	0.825	0.114	0.147
	Non-Low Income			0.086	0.383
	Household Owner	0.292	0.031*	0.186	0.007**
	Non-Owner			-0.106	0.360
Community Identity -> EWB	Covid-vulnerable	0.077	0.598	0.268	0.037*
	Non Covid-vulnerable			0.191	0.006**
	Male	0.079	0.499	0.241	0.002**
	Female			0.162	0.066#
	Local Hukou	0.223	0.091#	0.285	0.000***
	Non-Local Hukou			0.061	0.580
	Low Income	-0.041	0.735	0.181	0.013*
	Non-Low Income			0.222	0.023*
	Household Owner	0.258	0.065#	0.271	0.000***
	Non-Owner			0.013	0.916
Community Dependence -> PWB	Covid-vulnerable	-0.227	0.312	-0.127	0.549
	Non Covid-vulnerable			0.100	0.173
	Male	-0.047	0.732	0.059	0.546
	Female			0.106	0.282
	Local Hukou	-0.060	0.666	0.034	0.676
	Non-Local Hukou			0.094	0.407
	Low Income	0.209	0.109	0.123	0.119
	Non-Low Income			-0.087	0.404
	Household Owner	-0.200	0.208	0.028	0.735
	Non-Owner			0.228	0.092#
Community Dependence -> HWB	Covid-vulnerable	-0.403	0.803	0.143	0.362
	Non Covid-vulnerable			0.186	0.018*
	Male	-0.158	0.214	0.107	0.257
	Female			0.265	0.002**
	Local Hukou	-0.174	0.206	0.099	0.280
	Non-Local Hukou			0.273	0.008**
	Low Income	-0.160	0.242	0.126	0.117
	Non-Low Income			0.286	0.010*
	Household Owner	-0.198	0.201	0.142	0.073#
	Non-Owner			0.340	0.011*
Community Dependence -> EWB	Covid-vulnerable	-0.007	0.658	0.074	0.595
	Non Covid-vulnerable			0.144	0.053#
	Male	-0.050	0.697	0.115	0.201
	Female			0.164	0.072#
	Local Hukou	-0.048	0.718	0.103	0.222
	Non-Local Hukou			0.151	0.147
	Low Income	-0.098	0.480	0.096	0.238
	Non-Low Income			0.194	0.083#
	Household Owner	-0.148	0.353	0.108	0.131
	Non-Owner			0.257	0.073#

Note: CEP is Community Environmental Perception, PWB is Physical Well-being, HWB is Hedonic Well-being, EWB is Eudaimonic Well-being. WST is Welch-Satterthwait Test

# $p<0.1$.
* $p<0.05$.
** $p<0.01$.
*** $p<0.001$.

tenants. Thirdly, community identity was significantly associated with eudaimonic well-being for homeowners ($\beta = 0.271$, $p < 0.001$), but no significant relationship was observed for tenants.

5. Discussion

This study constructs a novel theoretical framework for measuring residents' SWB under urban emergencies and disasters. While interdisciplinary research maintains a long-standing interest in community resilience in urban disasters, discussions focused on an SWB perspective have not been adequately captured. In particular, previous studies rarely compared the heterogeneity of different vulnerable groups. This has led to critical gaps in understanding of changes in residents' psychological risk and well-being during urban emergencies. In this study, we identify three important dimensions of interaction: community attachment, environmental perception, and social justice.

The analysis examines the impact of community attachment on residents' SWB during urban emergencies. Our analysis indicates that community attachment is related to both eudaimonic and hedonic well-being, as resident's hedonic well-being and perceptions of personal growth and society development can be adversely affected due to challenges such as limited food and medicine supplies and the spread of rumours. The analysis suggests that community identity can significantly impact SWB. Community identity can forecast community empathy and participation, thereby reducing residents' sensitivity to personal loss and mitigating the harm caused by such challenges. Additionally, community dependence plays a significant role in maintaining residents' hedonic well-being by enabling them to effectively use community resources to meet their needs. The uniqueness, continuity, and self-esteem associated with community dependence also strengthen residents' eudaimonic well-being. Community attachment also links environmental perceptions and well-being factors. Thus, during an urban emergency, maintaining a clean and aesthetically pleasing environment and offering diverse and enjoyable community services can enhance residents' well-being and resilience by strengthening community identity and dependence.

The research also paid attention to the impact of social justice on the three dimensions of SWB. Focusing on its direct effects, the study reveals that social justice plays a significant role in mitigating the negative impact of emergency management measures, such as city lockdowns, on residents' life satisfaction. Conversely, in city emergencies, injustice with respect to material supplies and social services exacerbates the negative impact on residents' hedonic well-being. For instance, residents who are impacted by mobility restrictions during the COVID-19 urban lockdown may experience heightened anxiety and feelings of loss when compared to those with normal travel privileges. This can lead to negative emotions that ultimately impact how residents perceive their social environment and self-realisation, which may have lasting consequences. Additionally, community dependence serves as an intermediary variable linking social justice and SWB. Enhancing social justice can engender a sense of security and satisfaction amongst residents, and contribute to improved community attachment. Fair material distribution, transparent information release, and effective feedback channels are promising methods for improving social justice during emergencies. These methods can promote community attachment and encourage community participation, ultimately leading to long-term benefits for community development.

We also conduct a comparison of several typical vulnerable groups. The overall SEM analysis indicates that community attachment has a limited impact on physical well-being, which is consistent with previous research by Lovell et al. (2017)) and Veenstra et al. (2005) conducted in communities in New Zealand and Germany, respectively. However, our MGA analysis revealed that place identity has a significant impact on the perceived health of individuals (1) those who used to be infected with COVID-19 and their close contacts, (2) those who have property ownership, and (3) relatively high-income groups. It is noteworthy that homeowners and individuals with relatively higher incomes are typically not considered vulnerable during emergencies. However, exaggerated or sensationalised media coverage and discrimination towards those who have contracted COVID-19 and their immediate contacts can cause significant distress for these groups as well (Bhanot et al., 2021; Chaturvedi et al., 2022). The implementation of city-wide lockdown measures has resulted in significant economic hardship for many high-income residents, particularly those employed in the retail, catering, and hospitality sectors. Moreover, residents who have outstanding mortgage payments may face additional financial challenges (Hiremath, Kowshik, Manjunath, & Shettar, 2020). Consequently, these three demographics have encountered mental stress during the COVID-19 lockdown period (Hiremath et al., 2020). Community identity plays a positive role in alleviating this stress and boost residents' confidence in their community. For those with lower community identity, additional external support such as social welfare may be necessary to improve their SWB. The MGA results expand upon the findings of Lovell et al. (2017)) by providing a different perspective on the experiences of vulnerable groups in the context of city emergencies.

The social justice presents a heavy influence on physical well-being of female residents. As females tend to bear a greater burden of domestic responsibilities such as cooking and cleaning, they are disproportionately affected by food and material shortages. Numerous female residents are required to juggle both domestic and professional responsibilities within the same environment, potentially leading to considerable mental strain (Hjálmsdóttir & Bjarnadóttir, 2021; Walters et al., 2022). Besides, the lockdown period has seen a surge in domestic violence against female residents, making it crucial to provide community services and resources impartially during urban emergencies to promote the mental and physical health of female residents. Conversely, while the hedonic well-being of male residents is linked to community identify, this relationship is not observed amongst female respondents. Enhancing community identity could potentially foster the hedonic well-being resilience of males to urban emergencies. As thus, it is of great importance to consider the unique challenges faced by female residents and ensure that urban emergency response plans are gender-inclusive so as to benefit all members of the society. The results of this study have significant implications for community resilience practices and emergency management measures. Improving attachment is an important strategy to enhance community resilience. Community workers can also promote community culture to enforce a sense of community identity. For example, by issuing community newspapers and organising community activities to enhance communication amongst residents and emphasise community identity. The community workers should be attentive to the needs of vulnerable members and provide them with customised services. They should also ensure service quality and efficiency to promote their community dependence. The decision-makers can proactively invite vulnerable members, such as women and tenants without housing ownership, to contribute to the community emergency strategies. During urban emergencies, city managers should ensure that measures reflect justice and inclusiveness. For example, the supply of daily necessities and energy should be strictly regulated to minimise corruption and injustice. Moreover, community managers and workers should prioritise maintaining the community environment, such as ensuring the accessibility of public open spaces and building a social and community service platform for residents. These measures can enhance residents' environmental perception.

This study examines the interplay between residents, the environment, and facilities within communities during urban emergencies. The results indicate that both the physical and social environments of a community are crucial for SWB of residents in such situations. Incorporating the needs of a broader range of vulnerable populations into the planning and design of community facilities can significantly enhance community resilience. Additionally, a justice community environment and inclusive community services can mitigate the impact of emergencies. Moreover, these discussions suggest that various factors affect different vulnerable groups in heterogeneous ways during emergencies. In urban emergencies, residents' vulnerability is relative: in some instances, people that were not previously considered vulnerable may become more influenced. The insights gained from this study can inform more justice community facility planning and help communities address the mental needs of diverse vulnerable groups in their emergency plans, thereby increasing community resilience in the face of emergencies.

6. Limitation and future direction

While this research provides valuable insights into the relationship between social justice, community identity, and SWB in city emergencies, there are some important limitations that must be acknowledged. First, cultural differences exist across various regions and countries. Moreover, distinct urban emergencies may possess unique characteristics and cultural variations that were not accounted for in this study. The

focus of this research was on large-scale city lockdowns resulting from an infectious disease outbreak in the spring of 2022. As such, it is recommended that future research investigate the applicability of these findings to other emergency situations and cultural settings. Secondly, as the data was collected through an online questionnaire, it may have limited the inclusion of populations who are less likely to use the internet, such as the elderly and children. Third, it should be noted that this study only considers five typical groups of vulnerable populations. However, the assessment of resident vulnerability should not be confined to the five dimensions proposed herein. For instance, attention should also be given to residents with chronic illnesses requiring regular treatment, those with psychological disorders, individuals with disabilities, and the unemployed. Thus, future research should consider using multiple data collection methods and recruiting more diverse participants to enhance the wide applicability of the study.

7. Conclusion

This article examines the impact of key factors in urban emergencies on the SWB of community residents, with a particular focus on vulnerable groups. The paper proposes a theoretical framework that links environmental perception, social justice, and community attachment to residents' SWB during city emergencies. The analysis indicates that social justice, community identity, and community dependence have a direct impact on residents' eudaimonic and hedonic well-being, while only social justice is significantly correlated with physical well-being. Both dimensions of community attachment serve as intermediary factors that connect environmental perception and social justice to SWB. These findings suggest that justice governance, including equitable regulation and resource allocation in urban governance processes, is essential for maintaining place attachment and enhancing community resilience. However, emergency management strategies often overlook vulnerable and marginalised groups, such as female residents, immigrants, low-income populations, those without property rights, people with infectious diseases, and close contacts. The analysis shows that male residents' SWB is more sensitive to social justice, while people without property rights, relatively high-income groups, and COVID-19 patients (and close contacts) are subject to community identity. Additionally, community identity has a more significant effect on the eudaimonic well-being of tenants without property rights or immigrants without local household registration. These discussions underscore the significance of just and inclusive community facility planning and the provision of community services. It is crucial to take into account the requirements of vulnerable groups in the design and planning of community facilities. The influence of the community on residents (in terms of both infrastructure and the human environment) and residents' emotional attachment to the community (community identity and dependence) are both indispensable in community resilience. This article stresses the need for inclusivity and justice in the development of urban emergency response strategies for building well-being and enhancing community resilience. The proposed framework offers new insights into scholarly discussions on vulnerable and marginalised communities and can guide policymakers in the development of optimised emergency management strategies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix I

Eudaimonic Well-being		
EWB-1	I am satisfied with myself and my achievements.	(Kinderman et al., 2011)
EWB-2	I have a sense of direction and purpose in life.	(Ryff & Keyes, 1995)
EWB-3	In general, I feel I am in charge of the situation in which I live.	(Ryff & Keyes, 1995)
EWB-4	I have been feeling optimistic about the future.	(Tennant et al., 2007)
Hedonic Well-being		
HWB-1	The condition of my life is excellent.	(Hills & Argyle, 2002)
HWB-2	My daily life has been filled with things that interest me.	(Bech et al., 1996; World Health Organization, 1998)
HWB-3	I feel cheerful and in good spirits.	(Hills & Argyle, 2002)
Physical Well-being		
PWB-1	I wake up feeling fresh and rested.	(Bech et al., 1996)
PWB-2	In general, I am as healthy as anybody I know	(Ware & Sherbourne, 1992)
Place Identity		
PI-1	The community where I live means a lot to me.	(J. Chang et al., 2019a; K. C. Chang, Chen, & Hsieh, 2022a; Kyle, Graefe, Manning, & Bacon, 2004; M. Xu et al., 2015a)
PI-2	I consider myself part of the community.	(Adewale et al., 2020; Cheung & Hui, 2018; De Dominicis et al., 2015; Kyle et al., 2004; Mao et al., 2022; M. Xu et al., 2015b)
PI-3	I identify with this community.	(Adewale et al., 2020; Kyle et al., 2004; M. Xu et al., 2015b)

(continued on next page)

(*continued*)

PI-4	I have a strong connection to my community and the people here.	(Adewale et al., 2020; Kyle et al., 2004; Scannell & Gifford, 2017; Toikko & Pehkonen, 2018)
Place Dependence		
PD-1	The neighbourhood I live in is beautiful compared to other places.	(Cheung & Hui, 2018; Scannell & Gifford, 2017)
PD-2	Living in this community makes me feel healthy and safe.	(Adewale, Ibem, Amole, & Adeboye, 2020; K. C. Chang et al., 2022b; Cheung & Hui, 2018; Scannell & Gifford, 2017)
PD-3	I'm proud to live in this community.	(J. Chang et al., 2019b; Cheung & Hui, 2018)
PD-4	I live in a community that makes me more fulfilled and happy than in any other community.	(Cheung & Hui, 2018; Kyle et al., 2004; Piyapong, Riruengrong, Wipawee, Siriphan, & Passanan, 2019; Scannell & Gifford, 2017)
PD-5	There is no other community that can replace the one I live in now.	(Adewale et al., 2020; K. C. Chang et al., 2022b; Kyle et al., 2004; Piyapong et al., 2019; Scannell & Gifford, 2017)
PD-6	Compared with other communities, living in this community is more conducive to accomplishing the things I want to do.	(Cheung & Hui, 2018; Scannell & Gifford, 2017)
Social Justice		
SJ-1	The amount of supplies (such as food and daily necessities) I received is sufficient to meet my basic needs.	(Anderson, 2008; Gleick, 1996; Gostin & Powers, 2006)
SJ-2	Others in the city receive sufficient quantities of goods (such as food and daily necessities) to meet their basic needs.	(Anderson, 2008; Cai, 2008; Langhelle, 2000)
SJ-3	The supplies I received, such as food and daily necessities, were of good quality and variety.	(Anderson, 2008; Langhelle, 2000)
SJ-4	Others in the city receive goods of good quality and variety, such as food and daily necessities.	(Anderson, 2008; Langhelle, 2000)
SJ-5	The city where I live has sufficient medical resources, and everyone has the same opportunity to receive timely treatment.	(Gostin & Powers, 2006; Langhelle, 2000)
SJ-6	I believe the current epidemic prevention strategy is reasonable and feasible, and I support and are willing to cooperate.	(Cai, 2008; Gostin & Powers, 2006; Gostin, Friedman, & Wetter, 2020)
Community Environmental Perception		
CEP-1	I can meet my various needs (such as dining, shopping, entertainment, socialising, etc.) in the community where I live than in other communities.	(Etzioni, 1996; Jacobs, 1961)
CEP-2	Compared with other communities, I like and often use the public spaces provided by my community (such as greenery, sports fields, promenades, etc.)	(Jacobs, 1961; Jian et al., 2020, 2021; Joshi & Wende, 2022)
CEP-3	Compared with other communities, my community environment is rich, interesting and diverse.	(Florida, Mellander, & Stolarick, 2011; Jacobs, 1961)

Appendix II

Constructs	SJ	CEP	CD	CI	PWB	HWB	EWB
SJ	0.755						
CEP	0.576	0.873					
CD	0.598	0.815	0.853				
CI	0.526	0.623	0.771	0.869			
PWB	0.443	0.350	0.366	0.352	0.828		
HWB	0.575	0.510	0.511	0.466	0.674	0.850	
EWB	0.578	0.502	0.527	0.513	0.645	0.813	0.798

Note: SJ is social justice; CEP is community environmental perception; CD is community dependence; CI is community identity; PWB is physical well-being; HWB is hedonic well-being; EWB is Eudaimonic Well-being.

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