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Resident Preferences for Urban Green Spaces in Response to Pandemic Public Health Emergency: A Case Study of Shanghai

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Abstract: The COVID-19 pandemic represents a quintessential public health crisis, profoundly impacting the utilization patterns of urban green spaces through stringent quarantine and lockdown measures. However, existing research inadequately addresses specific concerns regarding future urban green spaces and tends to oversimplify population divisions. This study delves into the needs and preferences of Shanghai residents affected by the pandemic and quarantine measures, focusing on various aspects such as specific types of green spaces, facilities, landscape elements, and landscape and spatial types. Multifactorial population clustering was also performed. This study delineates the following conclusions: (1) It is imperative to afford residents access to green spaces at least once a week, even during quarantine periods. (2) Residents exhibited a preference for accessible green spaces equipped with essential amenities, favoring unobstructed vistas and plant-centric ecological landscapes during the pandemic. Additionally, there is a notable preference for private green spaces among residents. (3) Post-pandemic, the "affluent" group displays a heightened overall demand for green spaces, the "middle-class" group shows a conspicuous inclination towards specific green space landscape elements, while the "low-income" group consistently exhibits a low preference for green spaces during and after the pandemic. This study underscores the necessity of developing human-centric green spaces to promote equity and resilience in the face of future emergencies, rooted in residents' preferences amidst public health crises.

Keywords: urban green space; landscape preferences; COVID-19; public health emergencies; cognitive salience index; urban sustainability

Citation: Xiong, Y.; Xu, M.; Zhao, Y. Resident Preferences for Urban Green Spaces in Response to Pandemic Public Health Emergency: A Case Study of Shanghai. *Sustainability* **2024**, *16*, 3738. https://doi.org/10.3390/su16093738

Academic Editor: Daniel Diaz

Received: 14 March 2024
Revised: 23 April 2024
Accepted: 26 April 2024
Published: 29 April 2024

1. Introduction

Pandemic public health emergencies (PHEs) are particularly amplified in urban settings characterized by dense and spatially confined populations [1]. The COVID-19 pandemic, as a transformative force in public life, notably imprinted its influence on the perception and utilization of urban green spaces [2]. The enforcement of social distancing measures and lockdowns has radically disrupted conventional usage patterns of green space [3,4]. Urban green spaces play a pivotal role by providing convenient and secure spaces for leisure, exercise, and social interaction, thus addressing the challenges posed by unexpected pandemic public health emergencies and enhancing community well-being.

Well-designed urban green spaces (UGSs) enhance a city's ecological vitality and provide many ecosystem services that contribute to public health, thereby fortifying urban resilience against public health emergencies. The undeniable symbiotic relationship between humans and the natural environment [5] is fortified by green spaces, ensuring ecological preservation while championing health benefits [6]. The importance of green spaces extends to human well-being [7], particularly concerning psychological dimensions [8,9]. Notably, during the COVID-19 outbreak, residents residing near green areas experienced a less pronounced reduction in physical activity than those in less green locales [10]. The

aromas of flora have been found to diminish stress, combat depression, and alleviate fatigue [7]. During the COVID-19 pandemic, residents predominantly frequented urban green spaces for activities such as exercising, unwinding, and nature appreciation [11]. This underscores the integral role of green spaces in safeguarding residents' physical and psychological health. Moreover, implementing flexible quarantine strategies that incorporate moderate green space exposure is often more judicious than imposing absolute quarantines. While rigorous quarantine protocols effectively curtail viral spread, they can inadvertently intensify feelings of depression and anxiety among the populace [12]. Green space adeptly modulates such emotions. For instance, in Hong Kong, allowing controlled access to suburban parks during relative pandemic tranquility demonstrated more advantages than the detriments posed by total quarantine measures [13]. Indeed, green space profoundly influences residents during a PHE, mitigating its adverse effects. Residents in Beijing and Wuhan held notably positive perceptions of green spaces amid the COVID-19 pandemic. In contrast to restrictive indoor environments, green space provides a more expansive, open, and less densely populated refuge [14]. Fundamentally, green spaces underscore residents' daily well-being by enhancing environmental quality and mitigating health adversities—such as decreased physical activity, confinement, and heightened stress—during pandemic public health emergencies.

Previous cholera outbreaks have spurred the transformation and enhancement of UGS, including the construction of numerous parks and boulevards. The recent COVID-19 outbreak may similarly influence UGS design, contingent upon the landscape preferences exhibited by the populace [15]. Incorporating residents' preferences is paramount during pandemics, focusing on accentuating the creation of "green qualities" [16]. The COVID-19 pandemic provides a distinctive opportunity to scrutinize residents' engagement with nature as a coping mechanism during stressful events, particularly when routine opportunities or practices face disruption or inaccessibility. The literature investigating the time spent in nature responding to COVID-19 has produced diverse results. Residents utilize green spaces in varied manners influenced by age, gender, education, and career [17]. Families with higher education or better conditions tend to frequent green spaces more often [18], while the opposite holds for the general population and even those with lower economic levels [19]. Younger individuals prefer open social zones to their older counterparts, whereas younger children are drawn to more interactive spaces [20]. Urban green spaces also have a hugely positive effect on children's development [21]. Regarding residents' choice of green space, studies indicate that low-quality UGS results in low usage rates. This is attributed to residents' preferences and choices concerning the maintenance, cleanliness, and amenities provided in green spaces [22]. Different cities have different characteristics of greening patterns and vegetation cover [23]. But the study shows that people favored parks near the city center, characterized by considerable size and abundant natural features [24].

As the COVID-19 pandemic gradually abated, most studies focused on the pandemic's overall impact on humanity, with limited exploration into specific elements of green space. Additionally, many studies investigating residents' preferences for green spaces categorize respondents based on single factors, such as gender, age, or income [20,25–28], seldom combining multiple factors to delineate population profiles comprehensively. Moreover, there is scarce research on how policies influence people's preferences for the use of green spaces and a little exploration of how individuals' choices of green space areas can inform policymaking. Therefore, there is a gap in research during public health emergencies incorporating these resident preferences into green space planning frameworks and policy formulation to prevent future similar pandemic events. Understanding diverse perspectives, preferences, and experiences is crucial for those involved in urban green space design and management. Insight into user preferences can guide planning adjustments, proactively address potential public health issues to enhance urban green space systems' attractiveness and efficiency, and advocate for a sustainable and people-oriented urban environment [28–30].

In response to identified gaps in the literature, this study endeavors to conduct a comparative analysis of residents' green space demands pre- and post-pandemic onset. The overarching objective is to discern the landscape preferences of residents amid the pandemic and elucidate the post-pandemic trajectory of green space utilization patterns. Public perceptions of urban green spaces changed during the epidemic, with greater emphasis on the role of these spaces in improving quality of life [31]. This change reflects a new understanding of health, sustainability, and community connectedness, and provides important guidance for future urban planning and policy development. This study uses COVID-19 as a research case to provide a realistic basis for the future construction of urban green spaces with the ability to respond to pandemic PHEs, and in the future construction of urban green spaces, emphasis should be placed on considering the needs of the residents themselves, which will help to build a more human-centered city and green spaces. Increased levels of urban green space construction will also further enhance human well-being [32], increase urban resilience and adaptability [33], and promote environmental justice [34].

Shanghai, China, chosen as this study's locale due to its historical, geographical, natural, and cultural significance, serves as a prominent global metropolis that underwent an extensive two-month lockdown in response to the COVID-19 pandemic. The profound significance of Shanghai's urban development is underscored by its strategic positioning within the framework of globalization [35] and its pioneering efforts in sustainable urban planning [36]. This not only establishes a robust foundation for Shanghai's own progress but also offers invaluable insights and inspiration for other urban centers. Serving as a pivotal nexus within the global context of urbanization, major cities such as Shanghai harbor distinct spatial dynamics and population mobility patterns that wield substantial influence on the propagation of pandemic [37]. By scrutinizing the intricacies of these metropolises, urban planners and policymakers can glean valuable insights to inform decision-making processes, thereby facilitating the creation of healthier and safer urban environments [38].

The investigation is particularly geared towards addressing the following three inquiries: (a) What are the preferences of residents regarding green spaces during the pandemic? (b) In what manner has residents' demand for green spaces evolved in the periods before and after the pandemic? (c) How do the green space demands of diverse social groups diverge in the context of public health emergencies?

2. Methods

2.1. Study Area

Shanghai, positioned geographically between 120°51′–122°12′ E and 30°40′–31°53′ N, serves as a critical nexus for China's economic, financial, trade, shipping, and scientific and technological innovation, boasting a population exceeding 24 million (Figure 1). As the world's largest trade port city, Shanghai is pivotal in the international supply chain [39], exerting profound influence nationally and globally.

In 2022, Shanghai, a key Chinese city, encountered substantial challenges due to the profound repercussions of the COVID-19 pandemic, necessitating the implementation of rigorous lockdown measures. This not only impacted the socioeconomic landscape [40] but also had severe implications for the day-to-day lives of its residents. Throughout the lockdown and quarantine phases, essential services such as express delivery, food establishments, and hospital operations came to an abrupt halt, causing a paralysis in residents' daily routines. Medical facilities prioritizing COVID-19 patients unfortunately marginalized individuals with other medical conditions, disrupting routine care. Furthermore, the lockdown significantly impeded the operations of global conglomerates and supply chains. The sudden intensification of the pandemic and the ensuing citywide lockdown brought to light underlying challenges, contributing to a discernible surge in negative sentiment among Shanghai's residents [41].

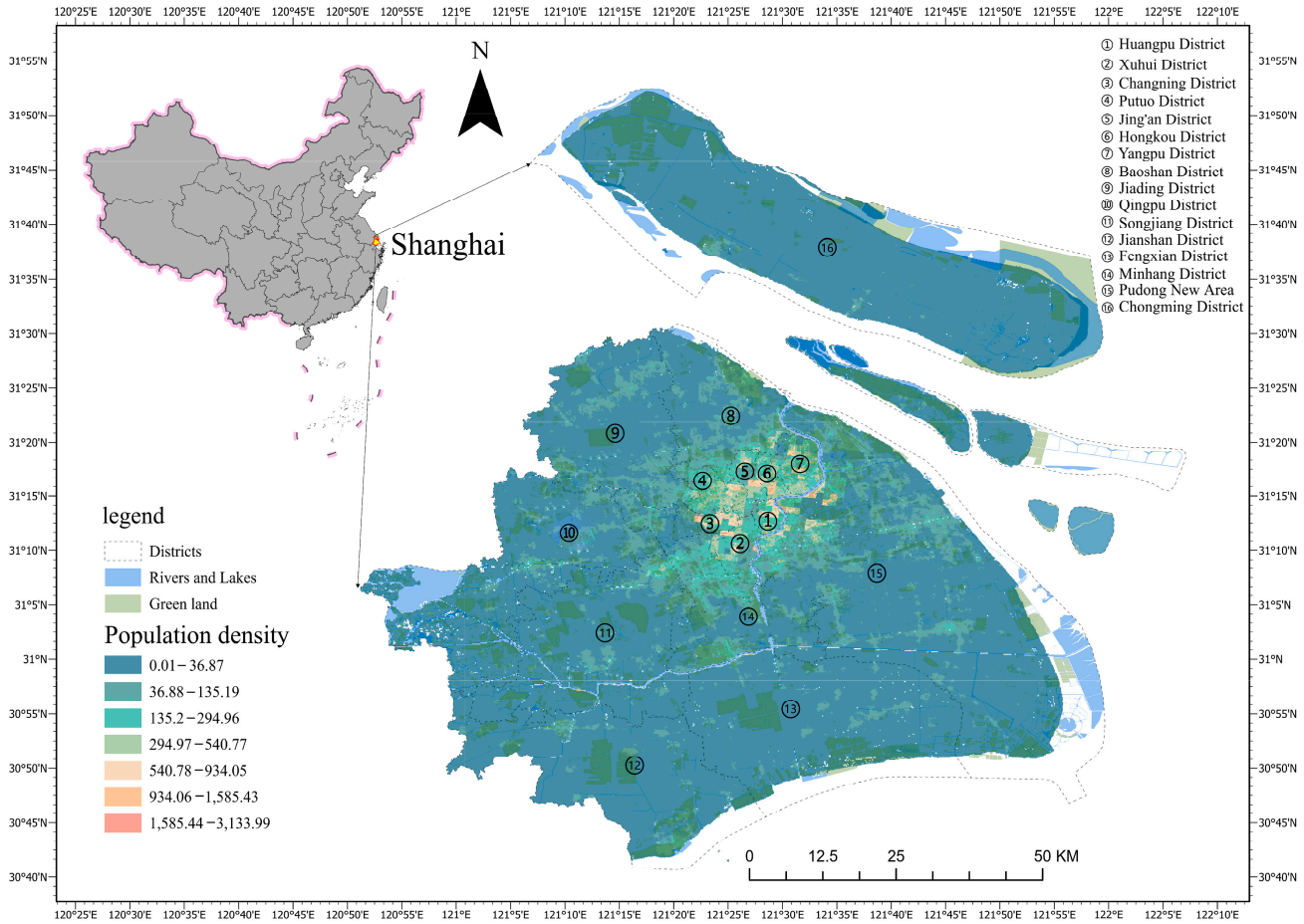


Figure 1. Map of Shanghai, China.

By 2022, the expanse of urban green spaces in Shanghai has burgeoned to 172,646.36 hectares [42]. Despite the pivotal role of urban greenery in augmenting residents' quality of life, a staggering 70% of street greening within the city's central precincts falls below the recommended standard for fostering a visually pleasing environment [43]. This discrepancy suggests that while the quantity of urban green space is considerable, its quality and tangible impact on residents may fall short of expectations.

In addition, leveraging some of the nation's most stringent greening and maintenance standards, Shanghai's urban green space initiatives will transform the city into a veritable "City of a Thousand Gardens" [44]. The advanced development of urban green spaces in Shanghai played a pivotal role in meeting residents' green space needs during the pandemic [45]. Simultaneously, Shanghai residents exhibited a conspicuous inclination toward public urban green spaces, demonstrating a high level of participation [46]. Shanghai has a typical and exemplary significance due to its domestic and international influence and advanced level of urban construction, and the study of green space construction in Shanghai can provide experience for other regions.

2.2. Survey Instruments and Procedure

This investigation, centered on residents' green space needs amid the COVID-19 pandemic, conducted an extensive questionnaire survey across Shanghai. This study aimed to profile users and discern their specific space needs and variations. The survey specifically targeted individuals with a long-term work or residency history in Shanghai. Distribution was facilitated through the Questionnaire Star platform, ensuring anonymous data collection. Questionnaire Star is the premier questionnaire platform in China, boasting the most extensive user base, widespread coverage, and robust promotional capabilities. To

identify eligible respondents, three primary steps were undertaken. Initially, Shanghai was designated using the Questionnaire Star platform, and the system subsequently confining the target population within the city boundaries of Shanghai. Subsequently, the first inquiry in the questionnaire pertained to whether respondents reside or work in Shanghai for an extended period; those selecting "No" were excluded from this study. Finally, respondents were prompted to select their geographical location within the questionnaire, with the available options limited to the vicinity of their current location, precluding selection of more distant locales. The final sample was determined through the aforementioned steps.

To ensure a balanced representation of population and spatial distribution, the "Questionnaire Star" platform was commissioned to disseminate the questionnaires under stipulated conditions, and the data collection period for the questionnaire spanned from 10 October 2022 to 25 November 2022. During this time, Shanghai was in a state of slow resumption of work but still in semi-lockdown. Out of the 2048 questionnaires amassed, 2029 were deemed valid. Before its official launch, the questionnaire underwent three rounds of optimization following pre-testing with 50 samples [47]. The questions in the questionnaire are concise and easy to understand, which facilitates successful responses from both lay and less educated groups [48]. Throughout this process, the feedback of Shanghai residents was thoroughly considered to refine the questionnaire, ensuring its questions closely mirrored real-life circumstances and were easily comprehensible [49]. Reliability analysis revealed Cronbach's Alpha at 0.923, Kaiser–Meyer–Olkin measure of sampling adequacy at 0.912, and Bartlett's test of sphericity sig. < 0.05. These metrics underscore the robustness and reliability of the questionnaire and the collected data [50].

The questionnaire was structured into four primary sections:

(1) Information of Respondents: This encompasses place of residence, geographic distribution, gender, age, occupation, and annual household income. Collecting demographic information is instrumental in comprehending the fundamental profile of surveyed residents, and it will be utilized in subsequent population clustering [42].

(2) Residents' Attitudes Towards the Pandemic and Quarantine: This section encompasses inquiries concerning the impact of the pandemic and quarantine measures on Shanghai residents, the role of green spaces in mitigating anxiety during quarantine, and residents' acceptance of pandemic-related quarantine policies. These questions aim to gauge the extent of anxiety and stress experienced by residents during this period, as well as to ascertain whether UGSs can alleviate residents' negative emotions to some degree. The foundational significance of the entire study is thereby established.

(3) Residents' Demand for UGSs: This section scrutinizes shifts in the demand for the frequency of interaction with green spaces before and after the outbreak. Respondents were queried about their visitation frequency to green spaces both pre- and post-outbreak, as well as their anticipated visitation frequency post-outbreak. The findings will illuminate the pandemic's impact on urban residents' utilization of green spaces and discern any disparities between the actual and anticipated visitation rates to green spaces.

(4) Residents' Preferences for the Specific Characteristics of UGSs: This section commences by examining alterations in residents' selection of green space types and distances both before and after the outbreak. These findings elucidate shifts in residents' preferences and changes in green space type and accessibility pre- and post-outbreak. Additionally, this section delves into residents' inclinations towards specific green space elements, landscape typologies, and spatial configurations during the outbreak, thus addressing residents' precise preferences for urban green spaces amidst the outbreak. These encompass aspects such as "roadside experiences", "ecological landscapes", "infrastructure", as well as "landscape elements", "landscape types", and "space types".

2.3. Data Analysis

The initial segment focuses on the overall profile of the interviewees. Demographic information from respondents is employed for a quantitative analysis utilizing measures such as mean, median, mode, etc.

The subsequent section examines residents' green space demands during quarantine and their preferences for green space selection during the epidemic. For questions utilizing Likert's five-level scale, an independent sample test of non-parametric tests and a mean comparison method are applied to articulate residents' specific preferences through mean size. An additional comparison of change rates is incorporated to enhance the clarity of the results.

The third section analyzes alterations in residents' demand for features related to green space before and after the outbreak. Cognitive salience analysis is employed to analyze ranking-type questions in the questionnaire concerning the distance to green spaces and the types of green spaces, with subsequent comparison of their respective cognitive salience indexes. The cognitive salience index, a widely accepted method, is instrumental. The specific steps for calculating cognitive salience indexes are as follows [51–54]:

$$S = F/(N * mP), \quad (1)$$

$0 \leq S \leq 1$, with larger values indicating that the option is more important in people's minds, and F is the term frequency.

$$mP = \sum ji/n, \quad (2)$$

mP is weight of the mean position, i is the index position of the term, j is the list, n is the frequency of the term, and N is the number of respondents.

The final section involves crowd clustering. Demographic information is employed for correspondence analysis to ascertain the optimal number of classification groups. Subsequently, the class to which each sample belongs is determined through a two-step cluster with a fixed number of groups. The variables considered include "age", "education", "income", and "occupation". Age data, presented as a continuous variable in the questionnaire, have been segmented into five distinct groups: "<20 years old", "20–34 years old", "35–49 years old", "50–64 years old", and "≥65 years old". Following the acquisition of crowd clustering results, a meticulous comparative analysis of different groups is undertaken using the aforementioned data.

Moreover, the scope of green space demand in this investigation relates to the intensity of residents' preferences for specific green space features, rated on a scale ranging from 1 ("very unnecessary") to 5 ("very necessary"). The assessment of changes in green space demand encompasses evaluating shifts in the demand for identical green space attributes before and after the pandemic. Conversely, green space preference contrasts with the demand for diverse green space characteristics during the pandemic.

3. Results

3.1. Information of Respondents

The demographic analysis of respondents reveals noteworthy trends, as delineated in Table 1. The male respondents outnumbered their female counterparts with a ratio of 3:2. Overall, respondents tended to be of a younger demographic, with the highest number falling within the 20–34 age bracket. A substantial proportion of respondents had attained higher education, with 66.8% holding at least a bachelor's degree. Most respondents, constituting 67.6%, were affiliated with enterprises or institutions. Regarding income, most fell within the middle to high-income bracket, earning between CNY 100,000 to CNY 500,000 annually. These observed patterns in education and occupation align consistently with existing demographic data for Shanghai [55].

Table 1. Basic information of the respondents.

Basic Information		Number of People	Percentage (%)
Gender	Male	1275	62.84
	Female	754	37.16
Age	<20 years old	89	4.39
	20–34 years old	1486	73.24
	35–49 years old	388	19.12
	50–64 years old	50	2.46
	≥65 years old	16	0.79
Education	Junior high school and below	56	2.76
	High school or junior college	232	11.43
	Three-year college	385	18.98
	Bachelor's degree	1199	59.09
	Master's degree and above	157	7.74
Occupation	Company employees	1097	54.07
	Career employees	274	13.50
	Freelancer	204	10.05
	Self-employed household	193	9.51
	Students	133	6.56
	Party and government workers	54	2.66
	Person awaiting employment	44	2.17
	Retiree	30	1.48
Annual income	<CNY 50,000	74	3.65
	CNY 50,000–100,000	339	16.71
	CNY 100,000–200,000	727	35.83
	CNY 200,000–300,000	552	27.21
	CNY 300,000–500,000	242	11.93
	>CNY 500,000	95	4.68

3.2. Residents' Behavior Amidst the Influence of the COVID-19 Pandemic and Portrayal of Urban Green Space (UGS) Preferences

3.2.1. Resident Perspectives on Urban Green Spaces (UGSs) during Quarantine

The emergence of the pandemic and the subsequent implementation of extended quarantine and lockdown measures have significantly disrupted the daily lives of residents (mean impact rating of 4.076), indicating a substantial effect. Notably, approximately 85.70% of respondents asserted that urban green spaces (UGSs) play a crucial role in mitigating negative emotions arising from the pandemic. Additionally, residents preferred "Moderate access to green spaces", receiving an acceptance mean rating of 4.074 (indicating high acceptance or above). Significantly higher ($p < 0.05$) than the acceptance for "Complete home quarantine", which received a rating of 3.418. These data underscore the alignment between residents' perceptions and behaviors concerning UGSs during public health emergencies (PHEs) and underscores the therapeutic potential of UGSs in alleviating adverse emotional responses during PHEs [56].

3.2.2. Transformations in Residents' Urban Green Space Demands during the Quarantine Period

The prolonged quarantine notably diminished residents' frequency of interactions with urban green spaces (UGSs). Additionally, it resulted in a conspicuous decline in residents' aspirations to visit green spaces, as indicated by an average wish score of 2.038 (Table 2). Compared to the pre-pandemic phase, the reduction in green space utilization during the pandemic can be attributed to the decreased access to UGS, a consequence of the stringent quarantine measures [57]. Other influencing factors include various prevention and control campaigns discouraging public gatherings, which may have diminished residents' inclination to frequent these green areas. This trend likely endured throughout the entirety of the pandemic [58]. Nevertheless, despite the reduced individual aspirations for

visitation post-outbreak, residents still expressed a need for at least one green space visit per week during the pandemic (the numerical scale is as follows: 1 denotes less than once, 2 denotes once, and this pattern increases accordingly; the value 2.038 signifies a minimum of one time in green space).

Table 2. Comparison of residents' engagement with green spaces pre- and post-outbreak.

Title			Mean ($p < 0.001$ ***)
Average number of exposures to green spaces per week	Pre-outbreak		5.201
	Post-outbreak	Actual	4.205
		Desire	2.038

Statistical significance is denoted by asterisks: *** $p < 0.001$.

3.2.3. Residents' Urban Green Space Preferences Amidst the Impact of COVID-19

Residents demonstrate a strong predilection for easily accessible sites, with a particular emphasis on robust public service facilities and the immediate visual aesthetics of the streets. The prevailing choice leans towards plant-centric, ecological, and natural landscapes combined with open views.

Accessibility Preferences: Concerning accessibility preferences, the rankings for "distance", "scenery", and "functional facilities" consistently reveal that "distance" held the highest cognitive salience index both before and after the outbreak. Notably, this index experienced an increase post-outbreak (refer to Table 3), emphasizing that "distance" remains the primary determinant for residents in selecting UGS. This observation aligns with the elevated number of residents ranking "distance" as their top criterion post-outbreak, as illustrated in Table 3. A detailed examination of this data underscores that residents' favorable accessibility to green spaces was crucial before and after the pandemic. Post-outbreak, this preference for nearby green spaces became even more pronounced, as evidenced in Table 3.

Table 3. Residents' ranked preferences for urban green space distance before and after the outbreak.

	Cognitive Significance Index (S)	
	Pre-Outbreak	**Post-Outbreak**
Distance	0.557	0.597
Scenery	0.529	0.494
Functional Facility	0.354	0.367
Close Distance	0.605	0.661
Medium Distance	0.451	0.439
Long Distance	0.384	0.370

Facility Preferences: Among the amenities, residents exhibited a robust preference for "trash cans" (mean 4.088), followed by "dense trees" (mean 4.033), "seats" (mean 4.026), and "colorful plants" (mean 4.001). In contrast, there was less interest in "bird nesting" (mean 3.540). This pattern indicates that residents prioritize public service facilities and the immediate visual appeal of the streetscape. When considering park amenities, the highest preference was for "public restrooms" (mean 4.266), followed by "lighting" (mean 4.108), "trash cans" (mean 4.088), and "seats" (mean 4.057). These findings suggest a greater inclination towards emergency or basic public facilities. Conversely, recreational amenities like "gym equipment" (mean 3.883) and "bulletin boards/newspaper columns" (mean 3.545) were less favored by residents. Detailed findings are available in Table 4.

Landscape Preferences: (1) Landscape elements: There is a significant preference for "grassland" (mean 4.218) and "flowers" (mean 4.121) over other categories, suggesting residents have a predilection for plant-centric landscapes offering unobstructed views. (2) Street greening: When considering the types of greenery along streets, there is a marked

preference for "natural and wild landscapes" (mean 4.010) over "artificial landscapes" (mean 3.735). (3) Landscape ecology: The inclination toward "natural and ecological landscapes" (mean 4.106) is significantly higher than that for "artificial landscapes" (mean 3.735). These preferences underscore that residents value ecological integrity in streets and green spaces, demonstrating a clear tendency for landscapes that resonate with natural elements. Refer to Table 4 for details.

Table 4. Residents' preferences for urban green space characteristics.

UGS Characteristics			Mean Value of Needs	*p*
Street situation		Trash cans	4.088	$p < 0.001$ ***
		Dense trees	4.033	
		Seats	4.026	
		Colorful plants	4.001	
		Sun protection	3.993	
		Bird nesting	3.540	
Park facilities		Public restrooms	4.266	$p < 0.001$ ***
		Lighting	4.108	
		Trash cans	4.088	
		Seats	4.057	
		Guide sign	4.015	
		Gym equipment	3.883	
		Bulletin/Newspaper Board	3.545	
Landscape elements		Grassland	4.218	$p < 0.001$ ***
		Flowers	4.121	
		Woodland	4.015	
		Pavilions	3.986	
		Waterscape	3.958	
		Nice paving	3.649	
		Sculpture	3.511	
Street greening		Artificial landscapes	3.735	$p < 0.001$ ***
		Natural and wild landscapes	4.010	
Landscape ecology		Artificial landscapes	3.715	$p < 0.001$ ***
		Natural and ecological landscapes	4.106	
Landscape type	Waterscape	Wide lakes	4.018	$p < 0.001$ ***
		River stream	3.930	
		Wetland and pond	3.873	
		Fountain	3.701	
	Plant landscape	Wide lawn	4.283	
		Woodland pasture	3.981	
		Sea of flowers	3.941	
		Forest meadows	3.933	
	Hardlandscape	Open squares	3.964	
		Exquisite Garden	3.851	

Statistical significance is denoted by asterisks: *** $p < 0.001$.

Space Preferences: Within various landscape categories, (1) Water landscapes: Residents displayed a pronounced preference for "wide lakes" with a mean score of 4.018. (2) Plant landscapes: In the plant landscapes category, the "wide lawn" emerged as a favorite, scoring an average of 4.283. (3) Hard landscapes: "open squares" were favored for hard landscapes, registering a mean of 3.964. These preferences suggest that residents lean towards green space landscape types with expansive spatial dimensions and unobstructed views. Further details are available in Table 4.

3.3. Transformations in Residents' Urban Green Space Needs before and after the COVID-19 Outbreak

3.3.1. Shifts in Urban Green Space Type Preferences

Following the outbreak, there is a noteworthy increase in residents' preferences for various types of green spaces (refer to Table 5). Remarkably, street parks experienced the most significant surge, succeeded by community green areas and residential landscapes. Although there was also heightened demand for the suburban countryside, urban, comprehensive parks, and natural forests, the increase was moderate. Importantly, green spaces near residential areas, ensuring high daily accessibility, exhibited the most prominent growth rates. This reaffirms the notion that, during the pandemic, residents placed particular value on green spaces close to their living areas.

Table 5. Intensity of preferences for various urban green space types before and after the outbreak.

UGS Types	Mean Value of Needs			Rate of Increase
	Pre-Outbreak	Post-Outbreak	*p*	
Street parks	3.789	4.058	$p < 0.001$ ***	7.12%↑
Community Green Spaces	3.891	4.165	$p < 0.001$ ***	6.94%↑
Residential landscapes	3.923	4.174	$p < 0.001$ ***	6.48%↑
Suburban countryside	3.760	3.915	$p < 0.001$ ***	4.26%↑
Urban comprehensive park	3.861	4.011	$p < 0.001$ ***	3.89%↑
Natura forests	3.824	3.947	$p < 0.001$ ***	3.40%↑

Statistical significance is denoted by asterisks: *** $p < 0.001$.

3.3.2. Transformations in Urban Green Spaces' Space Type Preferences

After the outbreak, a noticeable discrepancy arose in residents' preferences for UGS space type (refer to Table 6). Pre-outbreak data indicated nearly identical preferences for private and open spaces (with means of 3.843 and 3.834, respectively). Post-outbreak, although there was an increase in the demand for both types of spaces, the preference for private spaces experienced a more significant rise compared to open spaces. This trend implies that the outbreak heightened residents' inclination towards private areas.

Table 6. Comparison of the intensity of preferences for space types before and after the outbreak.

Type of Spaces	Mean Value of Needs		*p*	Rate of Increase
	Pre-Outbreak	Post-Outbreak		
Private space	3.843	4.038	$p < 0.001$ ***	5.21%↑
Open space	3.834	3.956	$p < 0.001$ ***	3.40%↑

Statistical significance is denoted by asterisks: *** $p < 0.001$.

3.4. Population Disparities in Changes in Urban Green Space Needs and Preferences

3.4.1. Population Segmentation

This study was grounded in five variables: "gender", "age group", "education", "occupation", and "annual income". An initial correspondence analysis was conducted to determine the optimal scale. However, the correspondence analysis revealed a weak differentiation for the "gender" category (see Figure 2). Consequently, "gender" was excluded from further analysis. Subsequent correspondence analysis of the remaining four variables unveiled that respondents could be broadly categorized into three distinct groups (refer to Figure 3a,b).

Based on these findings, a two-step clustering approach was applied to the four variables: "age group", "education", "occupation", and "annual income". This two-step clustering, specifying the cluster number as three, yielded well-defined clusters with satisfactory cluster quality (average silhouette = 0.2).

Table 7 meticulously delineates the distinctive attributes of the populations within the three designated groups. Group A, comprising 598 individuals, is characterized by low income and educational attainment, thereby labeled as the "low-income" group. Group B, consisting of 675 individuals, predominantly encompasses middle-income office workers with moderate educational backgrounds, denoted as the "middle-class" group. Meanwhile, Group C, comprising 756 individuals, encompasses individuals with high educational and income levels, thus identified as the "affluent" group. According to the Shanghai Statistical Yearbook [59], the per capita annual income (including expenses) of Shanghai's urban residents in 2022 was around 150,000 yuan. Taking this standard as a measure of "middle income", it corresponds to the group with an annual income of 100,000–200,000 yuan for the purpose of this study. Group A is generally below this standard, while many in Group C are above it. It is noteworthy that while the subgroups are designated based on the salient characteristic of "income" for clarity, the attributes of each group are multifaceted,

encompassing factors such as educational attainment and occupation, as meticulously expounded in the respective tables.

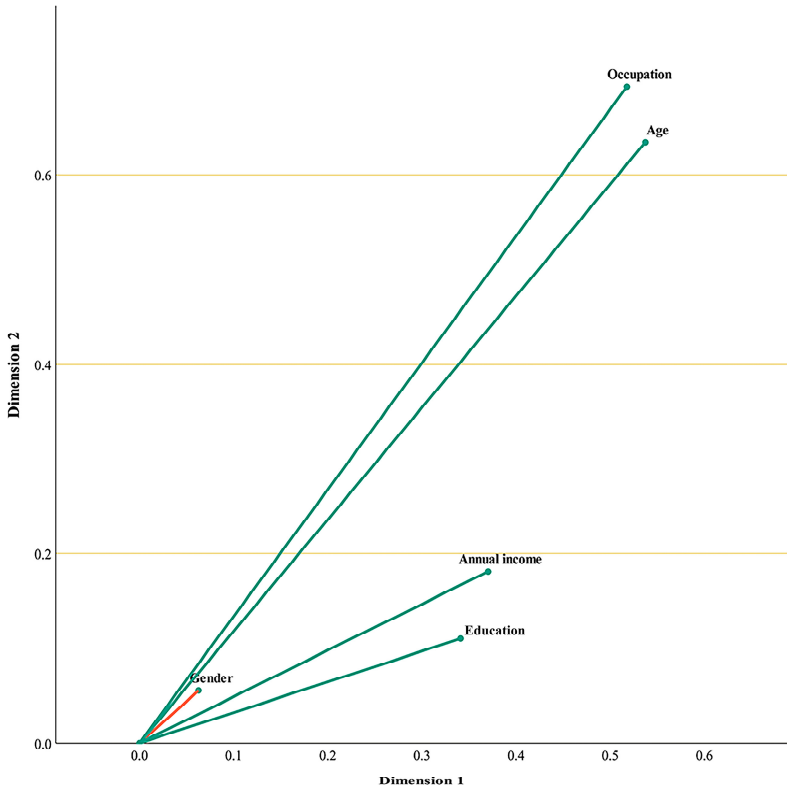


Figure 2. Initial outcomes of correspondence analysis.

Table 7. Attributes of the population in Groups A–C.

Group A

Total Education Annual income Occupation Age

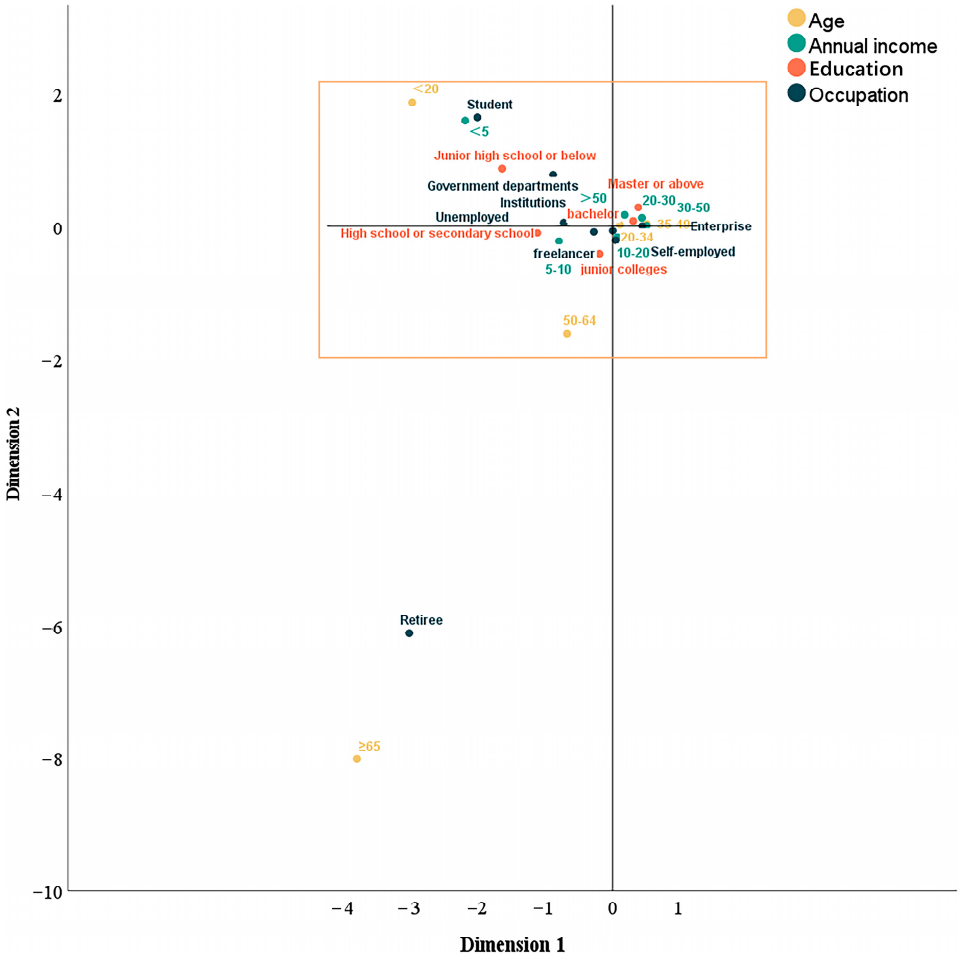
Table 7. *Cont.*

Group B

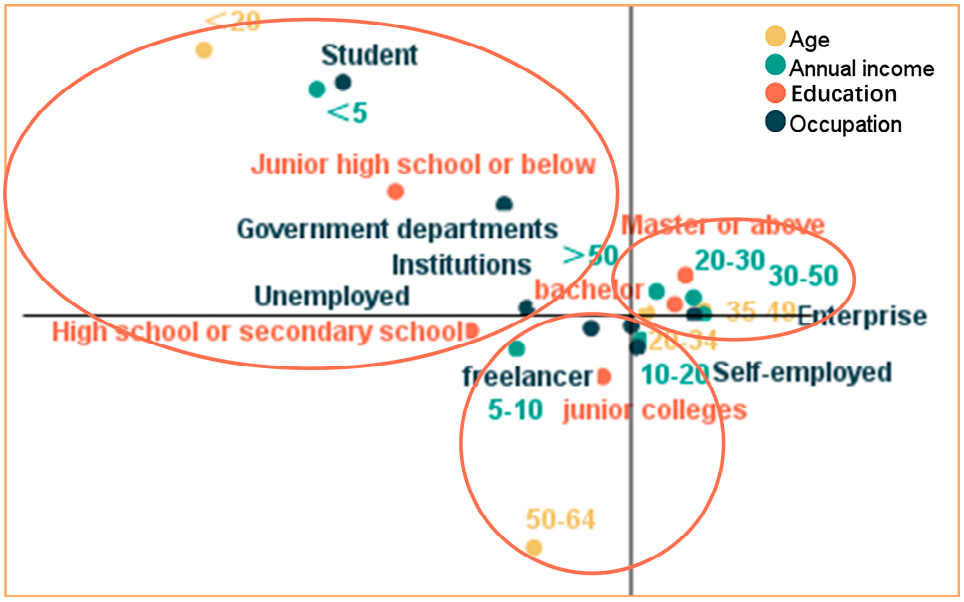
Total Education Annual income Occupation Age

Group C

Total Education Annual income Occupation Age



(**a**)



(**b**)

Figure 3. (**a**) Results of correspondence analysis. (**b**) Results of correspondence analysis (local amplification).

3.4.2. Transformation in the Urban Green Space Requirements across Different Groups

In the aftermath of the outbreak, all three groups exhibited a reduction in the frequency of exposure to UGS and the inclination for visits, as delineated in Table 8. This pattern corresponds with overarching trends. Notably, Group C displayed the most substantial decline in the frequency of green space visits, followed by Group B and, subsequently, Group A. This implies that the behavior of Group C regarding visits to green spaces experienced the most notable impact during the pandemic, followed sequentially by Group B and Group A.

Table 8. Frequency of interactions with urban green spaces among different groups before and after the outbreak.

Average Frequency of Visits to Green Spaces per Week ($p < 0.001$ *)**			
	Group A	**Group B**	**Group C**
Pre-outbreak	5.726	5.216	4.772
Post-outbreak	5.015	4.234	3.538
Rate of increase	−12.40%	−18.80%	−25.90%
Desire	3.000	3.299	3.439

Statistical significance is denoted by asterisks: *** $p < 0.001$.

Moreover, even before the outbreak, Group C had the least frequent engagements with green spaces among the three groups. However, their post-outbreak aspiration for green spaces surged to become the highest. This outcome reveals a dissonance in Group C, indicating a marked incongruity between their heightened needs and accessibility to green spaces. Conversely, Group A consistently exhibited the most frequent interactions with green spaces pre- and post-outbreak. Consequently, their post-pandemic expectations for UGS were the lowest among the groups.

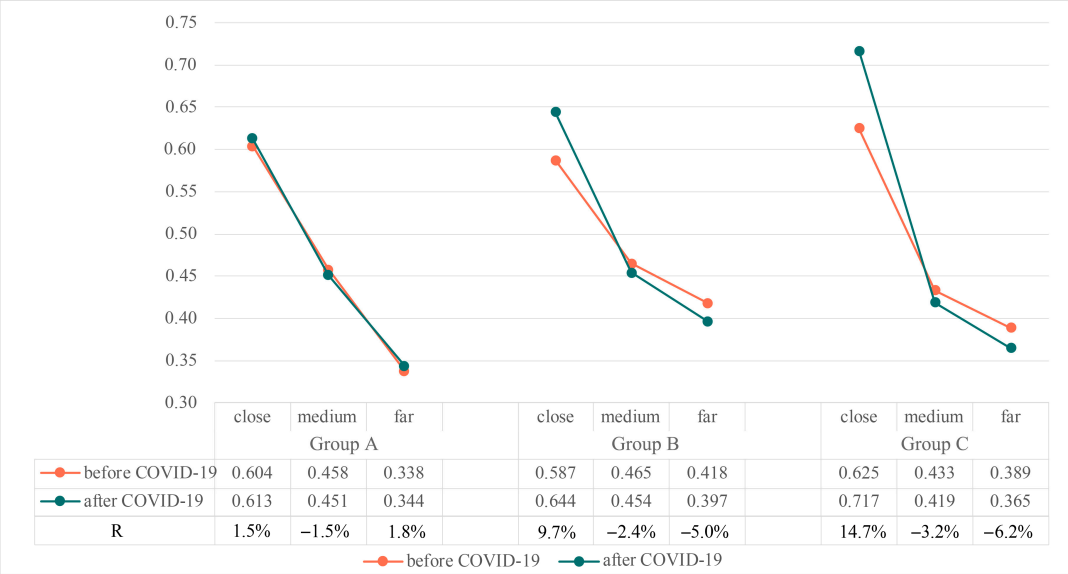
All this suggests that while the pandemic significantly altered the UGS needs of Group C, the needs of Group A remained relatively stable.

3.4.3. Variations in Preferences for Urban Green Spaces among Different Groups

Accessibility Preferences: As illustrated in Figure 4, all groups consistently prioritized good accessibility to Urban Green Spaces (UGS). Post-pandemic, this preference experienced further intensification. Group C witnessed the most substantial increase in this preference, while Group A had the slightest increment. The significance index indicates a decline in residents' perceptions of greenspaces as the distance from them grows. This trend remained consistent both pre- and post-outbreak. Remarkably, the pandemic acted as a catalyst, magnifying the need for nearby green spaces across all groups. In-depth analysis reveals differential reactions among the groups: (1) Group A displayed almost negligible change in UGS accessibility preferences before and after the outbreak. (2) Group B presented a notable shift in their preferences. (3) Group C significantly transformed their UGS accessibility needs. This trend delineates varying sensitivity levels among the groups regarding UGS accessibility. Group C emerged as the most responsive, while Group A appeared the least affected.

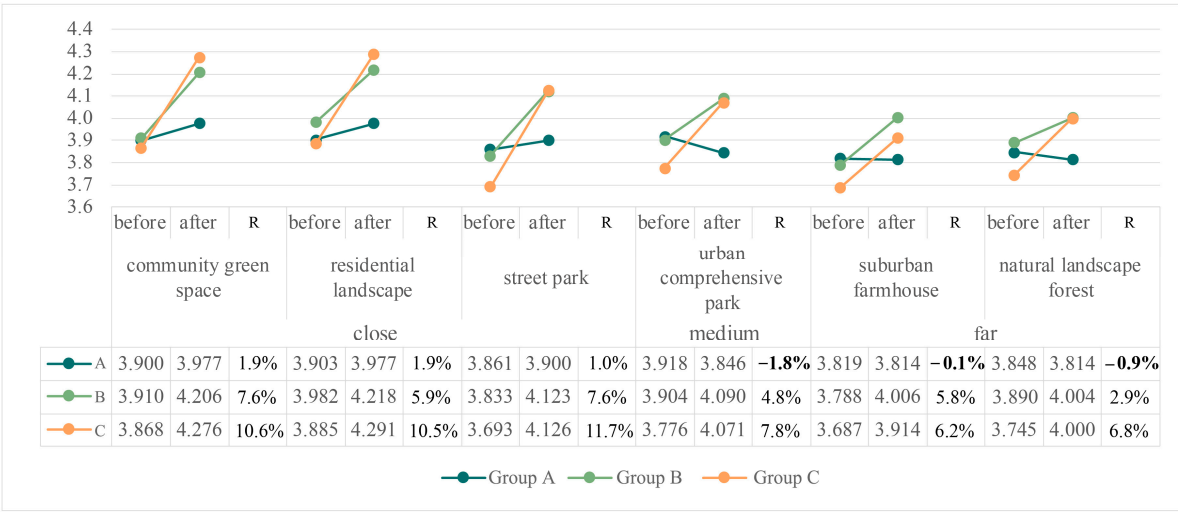
Green Space Types: The pandemic has notably influenced the demand for various green spaces among residents, revealing a distinct pattern: the closer the green space, the greater the need, as depicted in Figure 5. Several vital observations emerge: (1) The chart illustrates a declining trend, indicating that residents' needs for that space diminish as the distance to a particular green space type increases. (2) When comparing pre- and post-outbreak data, Group A exhibited an increased need for nearby green spaces while demonstrating reduced interest in distant ones. In contrast, Groups B and C demonstrated an amplified need across all green space types post-outbreak. (3) Group A's shift in green space demand post-outbreak was the most subtle among the groups. Group B underwent a more noticeable change, while Group C experienced the most pronounced

shift. (4) Intriguingly, before the outbreak, Group A's demand for various green spaces was already high but diminished to the lowest level afterward. Group C showed an inverse trend, starting with low demand pre-outbreak but escalating to a higher level post-outbreak.



	close	medium	far	close	medium	far	close	medium	far
	Group A			Group B			Group C		
before COVID-19	0.604	0.458	0.338	0.587	0.465	0.418	0.625	0.433	0.389
after COVID-19	0.613	0.451	0.344	0.644	0.454	0.397	0.717	0.419	0.365
R	1.5%	−1.5%	1.8%	9.7%	−2.4%	−5.0%	14.7%	−3.2%	−6.2%

Figure 4. Comparison of cognitive salience index of green space accessibility needs among three groups.



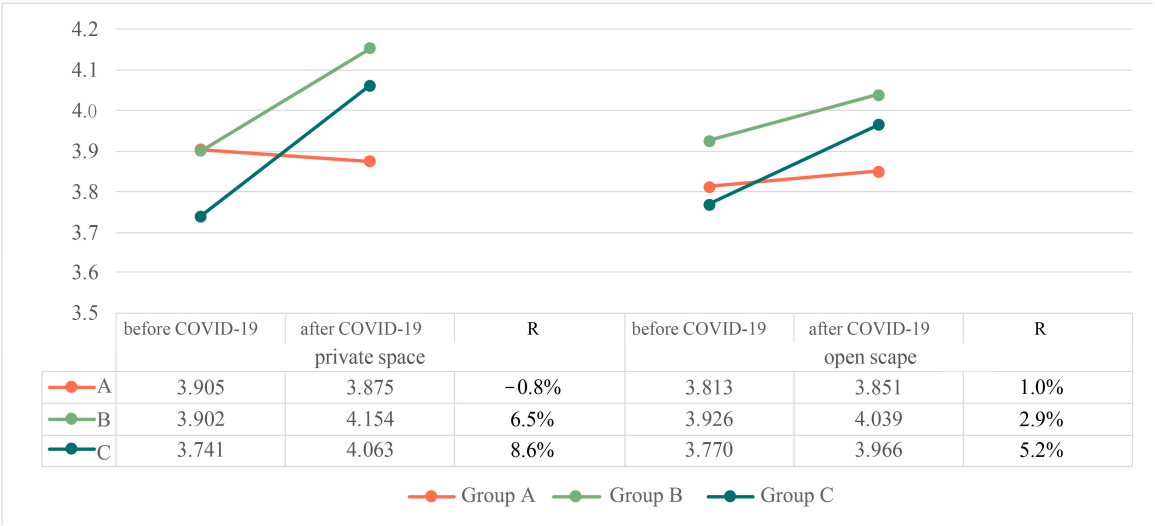
	before	after	R	before	after	R	before	after	R	before	after	R	before	after	R	before	after	R
	community green space			residential landscape			street park			urban comprehensive park			suburban farmhouse			natural landscape forest		
	close									medium			far					
A	3.900	3.977	1.9%	3.903	3.977	1.9%	3.861	3.900	1.0%	3.918	3.846	**−1.8%**	3.819	3.814	**−0.1%**	3.848	3.814	**−0.9%**
B	3.910	4.206	7.6%	3.982	4.218	5.9%	3.833	4.123	7.6%	3.904	4.090	4.8%	3.788	4.006	5.8%	3.890	4.004	2.9%
C	3.868	4.276	10.6%	3.885	4.291	10.5%	3.693	4.126	11.7%	3.776	4.071	7.8%	3.687	3.914	6.2%	3.745	4.000	6.8%

Figure 5. Green space accessibility preferences among three demographic groups.

In summary, while the pandemic did not profoundly affect each group's UGS needs, it significantly heightened their demand for such spaces.

In the aftermath of the pandemic, a notable transformation in residents' preferences for space types was observed, particularly in the dynamics between private and open spaces. Key observations elucidate these shifts: (1) Consistency in Group A's Preferences: Group A maintained a relatively stable preference for green spaces pre- and post-outbreak. The impact of the pandemic on their UGS preferences was minimal, reflecting a steadfast inclination toward a balanced mix of private and open spaces. (2) Dynamic Shifts in Groups B and C: Groups B and C underwent significant shifts in their preferences, with Group C exhibiting the most substantial surge in UGS needs. This highlights the pandemic's profound influence on these groups' preferences, underscoring the heightened importance of private spaces. (3) Consistent Dominance of Group B: Regardless of the temporal

frame—pre- or post-outbreak—Group B consistently demonstrated the highest demand for private and open spaces. This suggests a persistent and robust preference for diverse UGS types within this demographic. (4) Diametric Contrast in Preferences: An intriguing pattern emerged in the preferences of Groups A and C, showcasing a stark contrast before and after the pandemic. Figure 6 visually captures this divergence, emphasizing the nuanced and evolving nature of residents' spatial preferences in the post-outbreak landscape.



	before COVID-19	after COVID-19	R	before COVID-19	after COVID-19	R
	private space			open scape		
A	3.905	3.875	−0.8%	3.813	3.851	1.0%
B	3.902	4.154	6.5%	3.926	4.039	2.9%
C	3.741	4.063	8.6%	3.770	3.966	5.2%

Figure 6. Space type preferences among three demographic groups.

These findings underscore the intricate interplay of external factors, such as public health emergencies, in shaping residents' preferences for private and open green spaces.

Landscape elements preference: To evaluate the disparities between Group A, Group B, and Group C regarding landscape elements, the differences (A–B) and (A–C) were calculated, employing Group A's mean value for the degree of need as the benchmark. In the presented results:

A positive value accentuates that Group A exhibits a higher measure. A taller bar in the visual representation indicates a significantly more pronounced need in Group A.

Conversely, a negative value signifies that Group A's measure is the least. In this context, a more excellent absolute value, depicted by a lower bar, indicates that the subtracted group (B or C) possesses a more substantial need than Group A.

This analysis, illustrated in Figure 7, comprehensively depicts the landscape element variations across the groups, elucidating the nuanced distinctions in their perceived needs.

(1) The positive values predominantly underscore the preferences of Group A towards specific elements. These preferences are notably shaped by life experiences and lean toward artificial features. Examples encompass bird nesting, artificial green streets, gym equipment, bulletin/newspaper boards, nice paving, sculptures, and artificially created green spaces.

(2) The negative values primarily illuminate the elemental inclinations of Groups B and C. Both groups manifest comparable intensities of preferences, displaying either high or low preferences. Group B demonstrates the most robust needs across various aspects of urban green spaces, such as sun protection, trash cans for maintaining public cleanliness, public restrooms, expanses of flowers, and woodlands. In contrast, Group C inclines more towards natural and ecological preferences, encompassing natural and wild street greenery, grasslands, and naturally occurring green landscapes.

Notably, specific needs remain relatively consistent across all three groups, as shorter bars in the chart indicate. These include dense trees, seating areas, pavilions, wetland ponds, and intricately designed gardens.

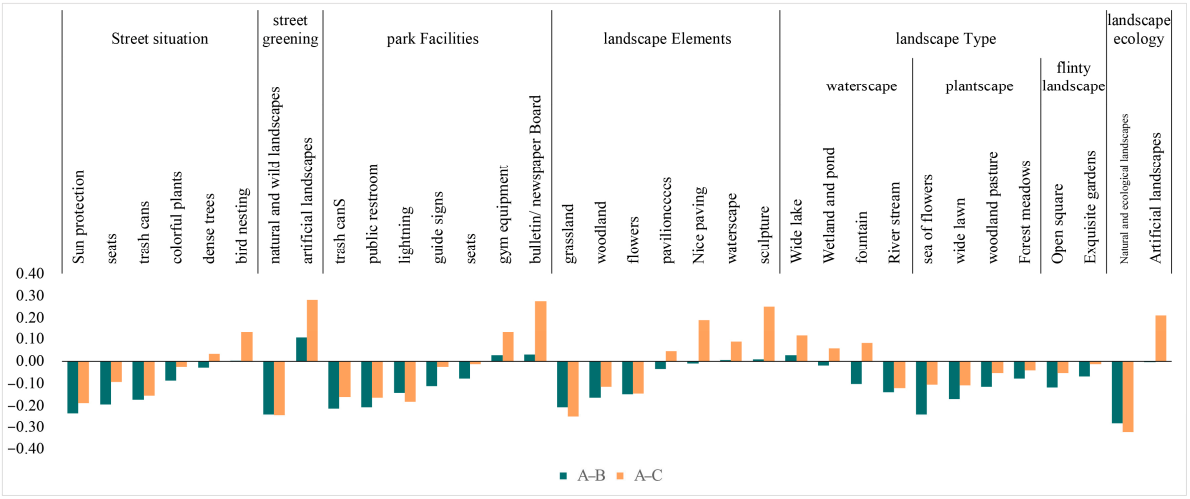


Figure 7. Assessment of elemental needs for urban green spaces across three groups.

4. Discussion

Urban green space serves a dual purpose: it contributes not only to regular urban public health but also acts as an adaptive response during pandemic PHEs when effectively pre-planned. This study delves into residents' UGS needs before and after outbreaks, alterations in residents' preferences for green spaces during mandatory quarantine regulations, and divergences in UGS preferences across different demographic groups. It establishes a theoretical framework advocating for a "people-centered" approach to UGS planning, particularly in anticipation of potential frequent pandemic PHEs in the years ahead [60]. Such an approach is crucial for maximizing the advantages of UGS in sustaining everyday health, offering comfort and emotional equilibrium to residents during crises, advancing proactive UGS planning, and formulating well-informed policies amid PHE circumstances.

4.1. Adaptable Quarantine Policies Considering Urban Green Spaces

In the realm of public health policy, a protracted adherence to a "one size fits all" approach of complete quarantine may inadvertently contribute to adverse outcomes such as alcohol abuse [61], self-harm [62], and other associated issues. These actions, in turn, have been linked to the development of anxiety, depression [63], suicidal tendencies [64], and, in some instances, violent behavior [65]. Notably, the acceptance of quarantine measures experiences a noteworthy upturn when residents are afforded moderate access to green spaces during periods of confinement. Unilateral enforcement of total home isolation encounters resistance; instead, residents prefer a model that allows for measured access to UGS. Empirical research validates the substantial capacity of green spaces to mitigate residents' psychological stress, irrespective of the duration of quarantine [66]. Notably, limited contact with UGS does not significantly escalate the risk of virus transmission, especially when juxtaposed with other densely populated areas [67]. Consequently, a quarantine model centered around UGS emerges as a more effective strategy for pandemic management.

Visits to green spaces witnessed significant fluctuations during the epidemic. On one hand, stringent lockdown measures and social distancing requirements imposed in response to the epidemic curtailed outdoor activities, potentially leading to a decline in green space visitation frequency [68]. Conversely, green space visits surged following the relaxation of closure measures in later stages [69], yet it remains unclear whether this surge surpassed pre-outbreak levels. Nonetheless, notable limitations persist within the research status. Firstly, there is a dearth of discussion regarding whether the reduction in green space visitation frequency stems from objective policy constraints or individuals' subjective choices aimed at mitigating health risks. Secondly, these studies omit an exploration of the optimal frequency of green space visits during pandemic public health emergencies, balancing the imperative of curbing virus transmission with safeguarding

the populace's psychological well-being. Within this study, a recommended frequency for visiting green spaces is around two times per week, derived from the desired post-outbreak frequency outlined in Table 2. Meanwhile, the actual post-outbreak visitation frequency tends to hover around three to four times weekly, attributable to a mix of regular and controlled periods. Emphasizing the overarching goal of curbing viral spread, this study advocates for a minimum weekly allowance for UGS access. This equilibrium not only addresses residents' psychological needs but also serves to curb the transmission of the virus. Illustrative instances from Hong Kong, China underscore the feasibility of regulating park visit frequencies under non-stringent control conditions, with widespread resident approval [13].

4.2. Green Space Preferences across Diverse Social Groups Amidst Public Health Emergencies

There was a significant difference in the frequency of access to green space during the epidemic across income levels, and inequality in access to green space across communities with different economic levels [70]. This suggests that high-income neighborhoods have a significant advantage in green space access compared to low-income neighborhoods, while middle-income neighborhoods do not have such an advantage. On the other hand, low-education groups may face additional barriers, including economic, social, and cultural factors that limit their ability to access and enjoy green space [71,72]. In the current study, different population profiles including categorization criteria such as gender, age, and occupation have also been addressed [72,73]. However, categorizing the population only through a single criterion is limited in guiding the reality, and the three groups obtained in this study integrated a variety of factors such as economy, education, age, and occupation, and this categorization made the image of the group closer to the reality and more precise. Residential compounds in China are closed, which means that some green space resources are privately owned [74]. Higher social status groups live in higher-quality compounds, which also means they enjoy higher-quality green space landscaping, resources that are not shared by disadvantaged groups. Shanghai is a model for cities in China and the world, and in this context, it is even more necessary to explore the preferences of different groups. In addition, due to the specificity of the policy, once blocked in PHEs, the disadvantaged groups have to accept low-quality green space landscape, which is unfair to them. This study has provided a detailed interpretation based on the preferences of the three main groups of people in Shanghai society, and future urban green space planning should focus on referencing residents' needs and preferences for urban public green space, as this is a valuable resource that can be enjoyed by all.

Overall, there was increased sensitivity and demand for green space during the pandemic [75], but categorizing the population revealed that not all groups had positive attitudes towards urban green spaces. According to demographic data, the population was categorized into three distinct segments: the "low-income" group, the "middle-class" group, and the "affluent" group, primarily based on income and educational qualifications. Each of these cohorts exhibited unique UGS needs during the pandemic. The "low-income" group, characterized by lower income and educational levels, engaged most frequently with UGS, displaying a preference for artificial landscapes and a higher tolerance for quarantine. The pandemic had minimal influence on this group's UGS needs and preferences. They preferred life-experiential, artificial elements such as bird nesting, artificial streetscapes, gym equipment, and bulletin boards. Their apathetic response towards UGS changes reflects a reduced sensitivity to alterations, as Ma X et al. suggested, positing that such individuals are usually unwilling to follow the rules [76], and even with enforced quarantine policies, their daily habits remain unaffected. Pipitone J M et al. argue that this is attributed to a lower sense of belonging, causing lower-income groups to view UGS merely as infrastructure rather than a necessity, resulting in less prominent changes in their UGS preferences [77]. Less developed areas have poorer UGS conditions [78]. Nesbitt L et al. propose that the lack of proximate green spaces in their residential environments diminishes their environmental appraisal sensitivity [79].

The "middle-class" group, characterized by medium income and university education, exhibited an augmented inclination for individual service facilities within UGS, such as sun protection, garbage cans for public hygiene, and toilets, while demonstrating the least tolerance for quarantine. In contrast, the "affluent" group, distinguished by elevated income and education, accessed UGS most frequently, showing a pronounced pandemic impact with a notable preference for natural ecological landscapes. Individuals of higher social status groups manifested distinct UGS perceptions, expressing unique preferences for urban green spaces [80] and providing insightful recommendations for green space development [77]. Notably, the UGS requirements of the "middle class" consistently surpassed those of the other groups both pre- and post-outbreak (Figure 6), indicating that planners and designers should emphatically consider this group, which is also the largest in the social hierarchy, with careful consideration. Prioritizing one group may inadvertently marginalize the others; hence, a balanced approach is crucial. Given the "low-income" group's diminished sensitivity to pandemics and UGS, green space planning predominantly caters to the preferences of the "middle-class" and "affluent" groups, guiding the experience of green spaces for "low-income" groups. During the pandemic, disparities in access to green spaces were exacerbated, particularly impacting disadvantaged groups who experienced reduced accessibility to these spaces [81]. This underscores the imperative of incorporating the needs and preferences of individuals from diverse socioeconomic backgrounds when designing and planning green spaces, thereby fostering a more equitable and inclusive green environment. The results of this study on the green space preferences of different groups put more emphasis on their adaptability to the urban characteristics of Shanghai as well as China, and at the same time emphasize the need to make full use of the valuable public green space resources to maximize the satisfaction of the residents' needs, which can truly promote the equity of green space. UGS planning should aim to construct ecologically sound spaces that enrich individual experiences while addressing fundamental needs.

4.3. Recommendations for People-Centered Urban Green Space Improvements

(1) Improved Ecological Planning of Local Green Spaces:

Residents stand to derive substantial benefits from the improved ecological planning of local green spaces that are easily accessible on foot. Prioritizing the development and enhancement of community parks, neighborhood green zones, and street parks close to residential areas is crucial, given their high ranking in resident preferences. Targeted enhancements can address residents' essential needs within a confined area, minimizing the need for extensive travel. This strategic approach not only has the potential to mitigate viral transmission but also provides an additional method for pandemic prevention and control.

The pandemic has heightened the demand for green spaces within walking distance. However, the reality is that there is an obvious spatial imbalance in the distribution of green space resources, making it difficult to meet the needs of community residents [82]. There are two main challenges impede the efficient utilization of these spaces in Shanghai: the uneven distribution of UGS in the city requires many residents to drive instead of walk to access green spaces [83]; restrictive measures during outbreaks, such as lockdowns and quarantines, limit the use of these spaces to prevent mass gatherings and transportation constraints [84]. These constraints have resulted in a pronounced need for more public access to green spaces, as detailed in Section 3.4.2. Furthermore, the cognitive salience index diminishes with increased distance from green spaces, as highlighted in Table 3 and Figure 4, making distant green spaces even less utilized. Given these challenges and insights, it is imperative to progressively enhance the ecological planning of green spaces within walking distance of residents. This approach aligns with a people-centered philosophy, ensuring local green infrastructures are optimized for public welfare and health.

(2) Promoting Ecological Construction with a Focus on Individual Spatial Experience:

Promoting ecological construction focusing on individual spatial experience is essential for residents' well-being, especially during emergencies like pandemics. The construction of UGS should prioritize ecological landscapes that offer both communal and individual spatial experiences.

Prioritizing Openness or Privacy: The recent pandemic heightened the public's appetite for green spaces, emphasizing the significance of both communal and individual areas. Although the demand for both open and private spaces grew, the inclination toward private spaces was evident (refer to Table 6 and Figure 6). Future UGS plans should thoughtfully incorporate spaces for individual solace, whether for neighborhood parks or promenade park-like streets and riverbanks. While public green spaces are predominantly designed as social hubs, they should be versatile, catering to residents' varying needs, including a flexible shift between socializing and seeking solitude [85]. It is important to note that open areas will not necessarily result in crowding, as individuals will naturally adjust behaviors during extraordinary times, forming distinct social "bubbles" to maintain safe distances [86].

Embracing Open Landscapes: The populace's preference for certain open landscapes like "open lakes", "open lawns", and "open squares" surpasses that for other landscape types (Table 4). These open spaces are pivotal for mental well-being during frequent public health emergencies [87] and offer flexibility in function. Open spaces can swiftly adapt to serve different needs during public health emergencies, transforming into areas like temporary quarantine zones or makeshift hospitals [88,89].

Preferences of the "Middle-Class" and "Affluent" Groups as the Main Criteria: The "middle-class" and "affluent" groups, significantly impacted by the pandemic, clearly prefer natural, plant-based ecological landscapes. Therefore, when formulating UGS strategies, there should be a pronounced focus on enhancing the ecological value of these spaces with minimal human interference [90].

In essence, for a city to be resilient and adaptive, especially in emergencies, its green spaces must be ecologically rich and cater to the diverse needs of its inhabitants, balancing communal interaction and individual respite.

4.4. Shortcomings and Prospects

COVID-19 has caused immeasurable damage around the world, including loss of life and economic decline [91]. Urban planning and management models have also been challenged as never before, and while COVID-19 is fading, we must learn from it and prepare for another pandemic in the future. This research provides valuable insights into the role of urban green spaces during public health emergencies and residents' behaviors and preferences in such contexts. This study comprehensively addresses the unique context of China, the world's second most populous nation, facing heightened pressure to allocate resources and devise policies amidst pandemic PHEs. Focusing on Shanghai, a densely populated megacity, this research furnishes valuable empirical data and insights applicable to densely inhabited regions globally. Furthermore, the classification of groups in this study reflects a more nuanced depiction of real-world populations, surpassing singular indicators like gender or income. Such a multidimensional categorization not only enhances realism but also advances equity in understanding disparities among various groups concerning green spaces. Moreover, this study transcends mere general descriptions by delving into specifics, including changes in green space utilization pre- and post-epidemic, comparisons between actual and anticipated green space conditions, and the intricate details of amenities, landscape typologies, and spatial configurations within green spaces. However, like any study, it is subject to certain limitations, opening avenues for further exploration:

Sample Representativeness: Due to the frequent lockdown conditions, this study relied on online questionnaire dissemination, potentially introducing sample bias. The skewed representation towards a younger demographic, along with gender disparity, does not accurately reflect the demographic distribution of Shanghai. These biases may impact the generalizability of the findings. Future studies should strive for a more diverse and

representative sample by employing online and offline data collection methods. This approach would ensure a comprehensive understanding of societal needs and preferences.

Focus on Traditional Urban Green Spaces: While this study emphasized traditional UGSs, such as urban parks and street spaces, it omitted newer forms of UGSs, such as roof gardens and vertical greening. These emerging models play a vital role in urban ecological systems, particularly in densely populated cities with limited space. Subsequent research should delve deeper into these newer UGSs, exploring residents' needs and potential to enhance urban well-being during pandemics.

Timing of Data Collection: This study was conducted during a partial lockdown in Shanghai. Consequently, the UGS needs and behaviors of residents post-lockdown remain speculative. Verification of whether residents' post-pandemic demand for green space aligns with our expectations is essential. Scholars with an inclination toward this subject matter are encouraged to persist in monitoring residents' green space preferences in subsequent studies—an endeavor that aligns with our intended research trajectory. Understanding if post-pandemic UGS needs align with current findings is crucial for forming a comprehensive, adaptive, and resilient strategy, ensuring cities are better prepared for future public health emergencies.

5. Conclusions

This study, centered on Shanghai, serves as an exemplary model for nations, regions, and cities grappling with concentrated populations and resources. It underscores the pivotal role of urban green spaces in mitigating the physical and mental health impacts during pandemic public health emergencies. Providing residents with access to green spaces during prolonged quarantines alleviates the stress induced by lockdown measures. Notably, integrating green spaces into epidemic prevention policies enhances their acceptance during implementation, thereby bolstering the resilience of cities and societies against pandemic PHEs.

Urban green spaces wield significant positive impacts on residents, both in ordinary circumstances and amid pandemic public health emergencies. This study employs an innovative social crowd approach, facilitating a nuanced discussion of urban residents' preferences in Shanghai during an epidemic. It underscores the critical role of crowd categorization within the Chinese context, emphasizing that genuine promotion of green space equity hinges upon understanding the diverse needs of individuals with varying social attributes. Preemptive planning and the enhancement of urban green spaces before future pandemics are imperative to facilitate swift responses during pandemic public health emergencies. Following the outbreak, residents' inclination towards green spaces proximal to their residential areas became more pronounced. This study yielded detailed green space preferences of residents, including landscape and space types, and even basic public amenities, signifying that the public actually pays significant attention to the details of green spaces. During the outbreak, residents exhibited heightened interest in the ecological aspects and privacy of green spaces, while favoring well-structured and nature-oriented landscapes. Future urban green space planning should prioritize accessible green spaces and bolster the development of green spaces in residential vicinities, thereby maximizing benefits for residents. Through discerning the differing needs of various groups of people and the green space requirements of residents, the future of urban green space design needs further refinement.

Author Contributions: Conceptualization, Y.X. and M.X.; methodology, Y.X. and M.X.; validation, Y.X.; data analysis, Y.X.; investigation, Y.X. and Y.Z.; data curation, Y.X.; writing—original draft preparation, Y.X.; writing—review and editing, Y.X., M.X. and Y.Z.; visualization, Y.X. and M.X.; supervision, M.X. and Y.Z.; project administration, Y.Z.; funding acquisition, Y.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National Natural Science Foundation of China (32171859) and the Youth Fund for Humanities and Social Sciences Research, Ministry of Education (21YJCZH187).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Nanjing Forestry University (protocol code 2024031, March 25, 2024).

Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical restrictions.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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