MULTIDISCIPLINARY SCIENCE JOURNAL

CONFERENCE PAPER
Published Online: September 26, 2025
https://doi.org/10.31893/multiscience.2025ss0319

Social Entrepreneurship: Innovations for Sustainable Development

Analyzing the influence of urban green spaces on promoting health and social well-being

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Abstract Parks, gardens, and places for relaxation are the examples of urban greenery vital to contemporary cities. These areas are essential for improving the standard of living in cities, as they provide residents with opportunities to spend time outdoor, stay active, and socialize. Global urbanization is accelerating, and cities are confronted with problems, including mental health, environmental deterioration, and population congestion. The research objective is to analyze how urban green space might support social and health well-being. The system uses data from a quantitative questionnaire survey that was conducted with 156 participants. Using a large dataset of park visiting trends, demographic data, and social network dynamics, researchers investigate the variables affecting the use of green spaces. The data is analyzed using statistical methods and SPSS software. The results indicate that individual with stronger social networks and healthier self-perceptions use urban parks more frequently, benefitting from the social and physical advantages these spaces offer. The findings examining from the perspective of socioenvironmental justice, taking into consideration distributive, interactional, ecological, economic, and procedural elements. This finding clearly shows sociodemographic characteristics greatly influence the use of urban green spaces. Although health status and geographical disparities have a major impact on access, older people and those with higher education levels are likely to frequent green spaces. ANOVA ensures that these differences are not random by affirming that they are statistically significant. By using the results of logistic regression, the following predictors are important and correlate with UGS use: Age ($p < 0.0001$), Health Status ($p < 0.0001$), Education Level ($p = 0.001$), and Region ($p < 0.0001$). Based on these results, urban planners can design greener areas to be more accessible and inclusive and meet the requirements of a vast number of different demographics. These results highlight that inclusive green space design is vital for fostering both communal and physical well-being.

Keywords: urban green spaces, health and social well-being, socio-environmental justice, urban parks, statistical analysis

1. Introduction

Urban green spaces (UGSs) are a very important component of increasing quality of life (QoL) in today's cities. These areas, including parks, gardens, and spaces for recreation, are crucial for social and physical wellness in the lives of people in urban centers (Jabbar et al., 2024). When urban territories are extended and the pace of urbanization is increased, the availability of open green spaces becomes a critical concern, providing residents with a break from high-density construction (Delgado-Serrano et al., 2024). Research also shows that green spaces are connected to different physical and mental health advantages. It is generally observed that rates of physical activity increase with proximity to readily accessible, well-maintained parks. Conversely, risks associated with sedentary behaviors tend to increase in areas lacking such amenities (Naghibi et al., 2024). People also have the opportunity to interact with natural environments, which can help reduce stress, increase mood, and improve overall demeanor. These benefits are not only personal, as they also improve relations between members of the community and encourage socialization (Gong et al., 2024). UG spaces also allow functions of social integration, where individuals from different spheres of life are allowed to intermingle in the same domain. They increase the level of social contact and shared feelings that foster improved social cohesiveness and group health (Klompmaker et al., 2023). In addition, the designed aesthetics and ecological roles of these areas contribute to enhancing the excellence of the life of city dwellers, increasing the level of biodiversity, cleaning the air and furthering the cause of the green environment (Vargas-Hernández et al., 2024). Given the growing population densities and environmental pressures in many cities and towns, the creation and stewardship of physical green space is assuming even greater importance in urban development (Bai et al., 2024). They are not merely recreational areas but also social utilities with significant value for people and their health.

This may provide insight into how they can support wellness, helping to advance the planning of healthier and more inclusive cities (Su et al., 2024). The discovery of the connection between UGSs and the capacity to enhance human experience is made possible by analyzing these elements. The coordination of policies is necessary to ensure the integration of green space at the forefront of future cityscapes, creating robust, healthy communities within cities (Arifwidodo et al., 2024). Research on population characteristics, socioenvironmental justice, and park visitation trends is needed to examine the effects of UGSs on social and health well-being. Furthermore, this particular research will incorporate the use of statistical techniques by allowing for relationships and patterns concerning more inclusive concepts toward the holistic approach of constructing green areas to bring about this aspect.

2. Related Work

Zong et al. (2024) developed an innovative UGS organization, emphasizing fair resource distribution, which is proposed in this study. The modified resistive model and entertainment consumption model were presented, along with an analysis of the impact of clustering on the level of social activity. Research has shown that Changsha city has uneven access to resources. Zhao et al. (2024) provided the associations between UG organizations, such as parks, neighborhood-secluded gardens, and green landscapes, and individual well-being in the Netherlands, which revealed a positive direct-to-indirect relationship, thus further opening opportunities for optimization in planning green spaces. Cardinali et al. (2024) suggested that accessibility, connectedness, variety of usage, and proximity are important influencing factors. The connection between community-unity green spaces and psychological wellness was investigated. According to the research, to promote social cohesion and enhance mental health, urban planners should consider these variables while creating green areas.

Lencastre et al. (2024) researched the association between biodiversity and well-being in Porto's urban green areas and reported that self-perceived wellness improved with the satisfaction of these spaces. Wan et al. (2024) analyzed Park Cities Idea, which includes a mix of methods at the macro and micro levels; this research investigates how blue–green spaces can be integrated into urban settings. The results indicate that the metropolitan region has limited linear unused river-adjacent spaces, green and blue spaces, and poor functionality.

Cao et al. (2024) investigated geographical differences in residential neighborhoods and assessed urban green equity (UGE). The findings indicate that green gardens (GGs) impact greens equity discrepancy and greening differentiation, with accessibility, proximity to mountains, and water bodies being important determinants. Ciesielski et al. (2024) highlighted the significance of green areas in tackling global public health concerns caused by the COVID-19 pandemic. With an emphasis on both rural and urban environments, the present investigation examined worldwide research on greenery conducted between 2020 and 2023. It draws attention to issues with fair access, community involvement, urban forestry, ecologically sound management, and recreation development. Wang et al. (2024) investigated the connection between middle-aged and older people's melancholy and green space. According to the findings, there is a negative correlation between loneliness risk and home green space, but there are protective connections for men, older persons, and those with lower incomes. Zhang et al. (2024) assessed reducing greenery in cities as the goal of the National Fire Code Consolidation (NFCC) strategy; nevertheless, modifications were made in response to the government's emphasis on environmental equity. Inequalities in UGS resources were strongly associated with variables influencing the geographic distribution of NFCCs.

3. Materials and methods

UGS provides health and social benefits to the aging population in India. It is about learning how users of green spaces such as parks and community gardens impact physical activities, health, and social relationships in various cities. India, characterized by its rapidly urbanizing population and rich cultural diversity, provides a unique context for exploring these dynamics. Data were collected in urban areas across multiple regions, referred to as many states in India, and represented a mix of metropolitan and smaller cities. These areas were chosen to include sites with different levels of urbanization and proximity to green areas. Cohort participants were selected on the basis of age, mostly 50 years and above, from different neighborhoods with different socioeconomic and cultural characteristics. This strategy aims to understand how green areas are perceived and used in different segments of society. Socioenvironmental justice analyses focus not only on the physical distribution of parks and green areas but also on their accessibility and free availability. Moreover, emphasis was placed on demographic characteristics, social contacts, and perceived general health. This inclusive urban design and development for aging well in India relies on prioritizing accessible urban contexts tailored to the needs of an aging population.

3.1. Data collection

The data are gathered via a quantitative questionnaire survey administered to 156 participants across various regions in India. The participants targeted people 50 years of age and above because, on the basis of past research, this population, especially those from diverse sociocultural backgrounds, could be experiencing health and social issues peculiar to them. Since the Indian population is multilingual, the survey was translated into many of the languages used in India. These were intended to encourage fairness and/or make the understanding of participation easier. For this reason, pretests on the

bilingual participants were conducted to acknowledge the correctness and comprehensibility of the translated versions. This survey was conducted through several avenues to increase the sample size's response rate. Physical copies were distributed at community centers, senior citizen clubs, and cultural organizations. These settings were selected on the basis of their significance as gathering points for older adults, facilitating direct interaction and trust-building within the communities. Table 1 presents the questionnaire review. This digital version was shared through mailing lists of local nongovernmental organizations (NGOs), senior interest groups, and associations advocating for older adults' welfare. The use of such a comprehensive approach made the sample of older adults much more diverse in terms of socioeconomic status and cultural background. The collected data provide more profound insight into what drives and hinders the utilization of and perceived benefits from UGSs and their potential to promote healthy and social aging in India.

Table 1 Questionnaire survey.

Question	Reply
How often do you visit urban parks or green spaces?	Every day, one to three times a week, one to three times a month, only once a month, and rarely
Which kinds of urban green areas are you most likely to visit?	Parks, Gardens, Recreational areas, Other (please specify)
What is the average duration of your visits to UGS?	30 minutes or less, 30 a few seconds to one hour, one to two hours, or over two hours.
Do you visit UGS alone or with others?	Alone, With family, With friends, With neighbors, Other (please specify)
How frequently do you socialize with others in urban green areas?	Very often, Occasionally, Rarely, Never
Do you think that going to urban green areas fosters or improves interactions with others?	Yes, significantly, Yes, somewhat, No, not truly, No, not at all
Do you participate in community programs or events at UGS?	Yes, regularly, Occasionally, No, never
What might you say about your general state of well-being?	Excellent, Good, Equitable, and Poor
Do you think that being located near green places improves your bodily well-being?	Yes, significantly, Yes, to some extent, No, not much, No, not at all
Do you think that having access to city green spaces improves your psychological well-being?	Yes, significantly, Yes, somewhat, No, not truly, No, not at all
Do you engage in physical activities at UGS?	Yes, regularly, Occasionally, Rarely, Never
Have you noticed improvements in your mental well-being after visiting UGS?	Yes, always, Yes, sometimes, No, rarely, No, never
How do you rate the accessibility of UGS in your neighborhood?	Very accessible, Accessible, Somewhat accessible, Not accessible
Do you think there are enough green spaces in your neighborhood?	Yes, there are plenty, Yes, but more would be helpful, No, there are not enough, No, there are none.
In your opinion, are UGS sufficiently tailored to the needs of elderly individuals?	Completely, Somewhat, Not much, Not at all

Sociodemographic data for 156 participants across four regions (South, West, North, and East) are presented in Table 2. The participants were categorized by age, with 45% under 60 years, 35% between 60 and 69 years, and 20% over 70 years. The majority (55%) are male, 60% are married, and 50% are retired. In terms of education, 35% of the respondents had postgraduate degrees. In terms of self-assessed health status, 50% of the participants were in good health, and 70% lived in owned houses.

3.2. Utilization and Perceptions of Green Spaces

Figure 1 displays the spatial distribution of public UGSs in India, which can be divided into four regions: North China, East China, West China, and South China. Each region is depicted in varying shades of color, as indicated by the key on the far right. This legend includes a large range of greens, ranging from dark greens to lighter greens, orange greens, and brown greens. These colors probably indicate the amount and concentration of green areas based on the darkness of the green area, whereas dark green indicates that there are many green areas and orange/brown indicates that there are few green areas.

North Region: This region displays a mixture of dark greens and lighter shades of green. The dark green tones designate regions with condensed UGSs, suggesting areas where public parks, gardens, or green belts are more prominent. However, patches of lighter greens and browns indicate areas with less green coverage, indicating an unequal distribution. This variation suggests that while some cities or areas have well-developed public green spaces, others lack significant green organization.

East Region: The map reveals a dominance of lighter greens mixed with infrequent orange and brown tones. These findings indicate that UGSs are comparatively less dense than those in other regions. The presence of more orange and brown highlights areas where green space is scarce or fragmented. The East seems to reproduce a need for better planning and development of green space.

West Region: The western region shows notable dark green patches in certain areas, representing regions with high-density UGSs. However, these dark areas are scattered with lighter greens and grays, indicating uneven green space coverage. The mix of colors suggests that while some cities or zones have a sufficient green presence, others experience limited availability or degraded green spaces.

Table 2 Sociodemographic data.

Sociodemographic Characteristic	Category	Frequency (n)	Percentage (%)
	Under 60 years	70	45%
Age	60-69 years	55	35%
	70+ years	31	20%
	Male	86	55%
Gender	Female	70	45%
	Married	94	60%
Marital Status	Single	39	25%
	Divorced/Widowed	23	15%
	Employed	47	30%
Employment Status	Retired	78	50%
	Unemployed	31	20%
	Not Educated	16	10%
	School Level	39	25%
Educational Level	UG	47	30%
	PG	54	35%
	Low	62	40%
Income Level	Medium	55	35%
	High	39	25%
	Good	78	50%
Health Status (Self-assessed)	Average	55	35%
	Poor	23	15%
Housing Type	Own house	109	70%
	Rented house	31	20%
	Living with family	16	10%
	South	62	40%
Region	West	47	30%
	North	24	30%
	East	23	15%

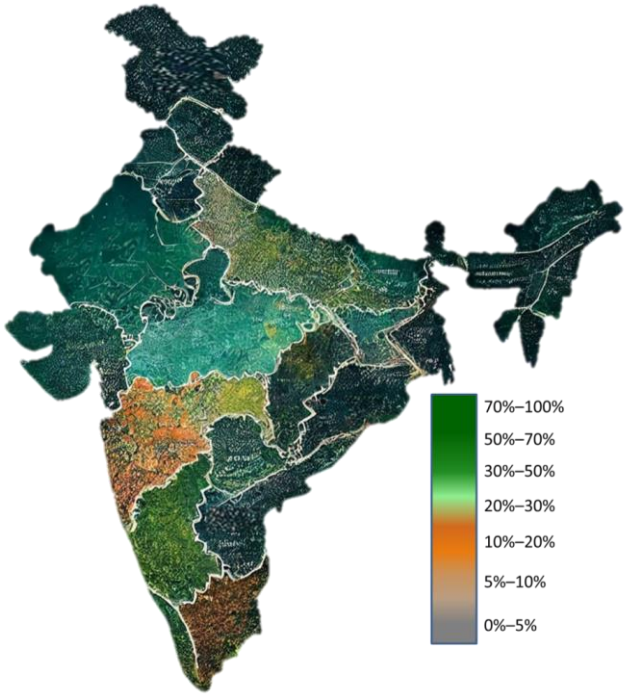

Figure 1 Spatial distribution of public urban green space.

South Region: South China stands out for its uniform spread of dark and medium green shades, reflecting a relatively high density of UGSs. The consistent green tones suggest that this region has made significant strides in maintaining and developing public green spaces. Unlike other regions, South China appears to have more balanced and accessible urban green coverage, with fewer brown or orange areas indicating sparse greenery.

3.3. Statistical analysis

SPSS version 28.0 techniques, such as correlation analysis, ANOVA, and logistic regression, are used to examine the relationships between sociodemographic factors and UGS utilization. These methods identify key variables influencing park usage, helping to assess the impact of UGSs on social and health well-being. The analysis provides valuable insights for developing inclusive urban design strategies that promote accessibility and equity for all demographic groups, particularly older individuals.

4. Results

The critical importance of UGSs in enhancing health and social well-being in older adults. Analysis of the survey data for 156 participants revealed significant relationships between park usage, demographic factors, and self-perceived health. Strong social networks, accessible infrastructure, and inclusive designs are key factors that contribute to frequent park visits. These findings outline how crucial it is to design and develop equitable, well-planned green spaces for improving the social and physical health of these communities. Table 3 Correlation matrix showing the correlations between the sociodemographic variables, including age, region, gender, level of education, health status, and urban green space use. By understanding these relationships, the matrix can be used to determine which sociodemographic factors most strongly correlate with green space use. For example, a high positive correlation between Age and Green Space Use can lead to the inference that older respondents visit parks more frequently. This matrix forms a good basis for subsequent statistical analysis, leading to the selection of key variables for intervention in urban planning.

Table 3 Correlation matrix of demographic and park visit variables.

Variables	Age	Gender	Health Status	Education Level	Frequency of Visits
Age	1	0.12	0.15	0.30	-0.05
Gender	0.12	1	-0.10	0.05	0.10
Health Status	0.15	-0.10	1	0.20	0.35
Education Level	0.30	0.05	0.20	1	0.25
Frequency of Visits	-0.05	0.10	0.35	0.25	1

Table 4 can be used to determine whether there are significant differences in UGSs. Different sociodemographic factors, such as region, age, sex, education level, and health status, are used. For example, if the p value for the region variable is significant, then people from other regions visit green spaces at different frequencies. This finding indicates that demographic or regional trends can be used for developing urban policy or green space design. The ANOVA test ensures that any observed differences are not due to change and can guide targeted interventions.

Table 4 ANOVA impact of sociodemographic variables on green space utilization.

Source of Variation	Category	Sum of Squares (SS)	Degrees of Freedom (pdf)	Mean Square (MS)	F value	p value
Region	South	2.15	1	2.15	8.32	0.0003
	West	1.30	3	0.43	1.65	0.18
	North	1.10	3	0.37	1.35	0.26
	East	0.77	3	0.26	0.97	0.41
Age	60-69 years	4.00	1	4.00	19.56	0.00001
	70+ years	3.50	1	3.50	17.12	0.00002
Gender	Male	0.90	1	0.90	6.70	0.01
	Female	0.55	1	0.55	4.12	0.045
Education Level	UG	3.50	1	3.50	21.32	0.00001
	PG	1.12	1	1.12	7.50	0.01
Marital Status	Married	3.60	1	3.60	15.22	0.0001
	Single	0.75	1	0.75	5.60	0.02
	Divorced/Widowed	0.25	1	0.25	2.40	0.12

Note: P values < 0.05 indicate major differences in green space use; the other values are not significant.

Table 5 Logistic regression of sociodemographic variables on the use of UGS findings. Important relationships are highlighted by significant p values (< 0.05). There is evidence that neither health status nor geography significantly influences the use of UGSs ($p < 0.0001$), which could indicate both "health-driven participation and regional differences". Positive associations were found between Age ($p < 0.0001$) and Education Level ($p = 0.001$), indicating that it is used more among

older and educated people. In this context, the results could provide practical guidelines for urban planners on how to promote equitable access to green space.

Table 5 Logistic regression.

Variable	Category	Coefficient (B)	Standard Error (SE)	Odds Ratio (Exp(B))	z value	p value
Age	60-69 years	0.045	0.010	1.046	4.50	< 0.0001
	70+ years	0.050	0.012	1.051	4.20	< 0.0001
Gender (Male)	Male	0.120	0.055	1.128	2.18	0.029
	Female	-0.100	0.060	0.904	-1.67	0.094
Health Status	Good	0.330	0.080	1.391	4.13	< 0.0001
	Average	0.220	0.075	1.246	2.93	0.003
	Poor	-0.140	0.100	0.870	-1.40	0.161
Education Level	UG	0.220	0.065	1.246	3.38	0.001
	PG	0.250	0.070	1.285	3.57	< 0.0001
Region (Urban)	South	0.290	0.075	1.337	3.87	< 0.0001
	West	0.210	0.080	1.234	2.63	0.009
	North	0.120	0.085	1.127	1.41	0.159
	East	0.080	0.090	1.083	0.89	0.373

Note: p values < 0.05 indicate significant associations, with odds ratios indicating the likelihood of outcomes.

4.1. Justice Dimensions for Social and Health Benefits in Green Spaces

Indian elderly people's health and social well-being are improved through urban green areas by combining three related, procedural, and equitable components of justice. These include distributive justice, a component that establishes the fair allotment of available green spaces such that all residents, especially seniors, have fair access to the physical and social utilization of these amenities. Procedural justice includes the participation of older adults in the design and decision-making process of UGSs, thus meeting their needs and allowing them to be heard. Interactional justice involves the quality of interpersonal interactions occurring within these arenas, which can be crucial during the socialization process. Greatly designed parks and greenery spaces should present the opportunity for social interaction where the isolation process among older persons can be eradicated. Opportunities might include access paths, designated areas for various community groups, and ADA-accessible seating to increase active participation or interaction. Applied within the framework of the three dimensions of justice, urban design can provide equitable, inclusive, and socially cohesive environments for older adults to improve their quality of life as a whole. The integration of these perspectives ensures that UGSs contribute positively to the mental and physical health of older adults, addressing not only physical accessibility but also social and emotional well-being.

5. Discussion

Lencastre et al. (2024) emphasized the benefits of urban green and blue spaces for well-being and how these spaces positively contribute to self-perceived wellness and environmental satisfaction. Focusing on Porto green areas also demonstrates how increased satisfaction with urban green areas can lead to improved wellness. Wan et al. (2024) emphasized the challenges faced by metropolitan areas in providing green and blue spaces adjacent to rivers, which can limit their potential. These investigations suggest that the availability of accessible and functioning green and blue spaces can lead to improved physical and psychological well-being in urban environments and that urban planners should prioritize those spaces more for long-term health benefits.

The emphasis is on the manner in which green spaces in urban areas are equitably allocated, specifically in terms of accessibility, distance of residences from natural features, and distribution of green areas according to socioeconomic status. Ciesielski et al. (2024) highlighted the increased relevance of green spaces for mental and physical health during the COVID-19 pandemic. These investigations indicate a growing awareness of the importance of incorporating nature into urban planning for healthy communities. Research is needed on how to optimize green spaces to address environmental and health disparities.

Wang et al. (2024) reported a significant relationship between green space and mental wellness, especially among middle-aged and older adults. The finding that home green space is related to a lower risk of loneliness underscores the importance of environmental determinants for mental health. Interestingly, men, older adults, and individuals with lower incomes appeared to benefit the most from increased access to green space, suggesting that green space can further support these groups. This can stem from social and environmental components, creating a sense of safety and connection to others. They assess how urban planning and access to green space are related to mental health indicators across different demographics.

The existing research on UGSs by Zhao et al. (2024) could not consider sociodemographic factors. Wan et al. (2024) identified issues that could not provide solutions to these problems and lacked statistical support. Cao et al. (2024) developed standard evaluation frameworks, which ignore sociospatial differences and cannot pay enough attention to green

spaces, by tying green space differentiation to the SDORA. This research approach overcomes the above existing issues and provides better outcomes.

They reported a strong positive correlation between age and the frequency of green space visits, with older adults (60--69 years and 70+ years) being significantly more likely to visit UGSs ($p < 0.0001$). Additionally, education level showed a significant association, with those with higher education levels (UG and PG) being more likely to use green spaces ($p = 0.001$). They examined the impact of sociodemographic factors on older Indians' use of UGSs for social and health improvement. The results show that healthy and educated older adults frequently use urban parks. The study also revealed a positive relationship between green space-supportive social networks and park use. The findings suggest that urban planning should consider these disparities and enhance public green areas for social inclusion and age-friendly design. This research provides practical advice for urban planners in designing accessible, inclusive green areas.

6. Conclusions

The UGS in India is gaining popularity among older adults, particularly those over 60 years old, who are healthier and have higher education levels. Age, gender, health status, and education significantly influence visit frequency to these green spaces, enhancing social and health-related QOL. The study revealed that social support, favorable physical environments, and high-quality green spaces increase park attendance. This suggests that city designs should incorporate green spaces in areas where people socialize, experience low solitude, and engage in active life for their benefit. Green spaces enrich well-being, and individuals with favorable self-perceptions and stronger social networks are more likely to visit parks. As Indian cities expand, it is crucial to prioritize accessible, inclusive, and health-oriented green spaces. Policymakers and urban planners can use these findings to ensure that green infrastructure promotes environmental sustainability and social harmony.

Limitations and Future Scope: The limitations include selecting the appropriate age group and geographical area for respondents and the potential for biases due to self-reporting. Further research could expand the sample size and consider variations in age, race, and location. They also explored the concept of UGSs for longitudinal QOL and the physical status of aged adults.

Ethical considerations

Ethical review and approval were not required for the study of human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

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