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Exploring Urban Green Space Visitation Patterns in Informal Settlement. A Case of Dandora, Nairobi County

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Abstract

The utilization and visitation patterns of Urban Green Spaces (UGS) by users and visitors are inextricably tied to the satisfaction and willingness derived from these spaces. In essence, the positive experiences and levels of satisfaction individuals garner from UGS significantly influence their patterns of usage and frequency of visits. However, few details of this relationship have been studied on matters UGS in Sub-Saharan Africa. This study investigates the relationship between demographic characteristics and visitation patterns of residents to UGS in slum dwelling areas using Dandora as case study. Survey research design was adopted as a method of investigation using a sample frame of 100. Stratified and simple random sampling technique was used in issuing the household questionnaires. The demographic information analysis reveals a gender-balanced respondent pool, with a predominant youth population of thirty to forty years (30-40 years old), largely educated up to secondary level, and primarily self-employed. The majority of respondents have been residents for one to ten years (1-10 years), mainly in Phase two (II) and four (IV) of Dandora. A significant proportion eighty-four percent (84%) of respondents visit UGS, citing weekly visits forty-one percent (41%) and daily visits thirty-four percent (34%) as the most common frequencies. In contrast, sixteen percent 16% do not visit UGS primarily due to concerns about insecurity and other reasons. The study employs a multinomial regression model to examine the relationship between socio-demographic characteristics and frequency of UGS visitation. The results indicate a significant relationship, with place of residence being a key factor influencing visitation frequency. Specifically, residents in Phase II show a significant impact on daily and weekly visitation, while residents in Phases III and IV influence monthly visitation. The findings suggest that socio-demographic factors especially place of residence where there are accessible UGS and also resident's occupation, play a crucial role in influencing residents' UGS visitation patterns. Understanding these relationships can inform urban planning strategies to enhance accessibility and engagement with green spaces in Dandora..

Keywords: Urban Green Spaces, Socio-Demographic Characteristics, Visitation Patterns, Multinomial Regression, Slum Dwelling Areas, Dandora, Kenya

Introduction

Rapid urbanization has become a global phenomenon, reshaping landscapes and posing challenges to the ecological balance of urban areas. With more than half of the world's people already living in cities (UN, 2010; WHO, 2012), problems related to city life are getting worse. These include not having enough nature nearby, spending too much time sitting down without exercise and growing number of obesity cases as well as bad health issues like diabetes. This can also add on social in response to these problems, city parks become very important. They give a wide range of help with social issues and everything natural that are needed for healing the pains in cities (Karin, et al., 2010; Gavin et al., 2010; Konijnendijk et al., 2013; Lin et al., 2019).

But, creating and using city green areas or Urban Green Spaces (UGS) is not easy. Even with a lot of money from the government spent on building and taking care of parks, these places are not used as much in many situations (Dino et al., 2013). This isn't just a problem in certain areas. For example, 40% of people living in Victoria, Australia never go to parks (Anon., 2004). Also there was research on Guangzhou about how many people near specific parks didn't ever visit them (Huang and Xue, 2013); it found that big percent did so, getting more people to visit urban green spaces has become a big worry for city leaders, planners and experts in the study of nature in cities. It's very important to know the main reasons people visit parks through scientific research. This helps in creating good plans and rules (Dino et al., 2013).

The idea of studying leisure limits has always been a focus. It wants to learn and help reduce the things that stop people from enjoying free time activities like visiting parks. Studies have found that many people feel they don't have enough time. They also worry about their other activities and family duties holding them back from the park (Dino et al., 2013; Andrew, 2005). However, it is thought these issues like too much stuff at parks, costs going up or not easy access are less important than before. It is important to know these limits for increasing involvement in fun activities.

In the last few years, people who build places and care about health have paid more attention to how going to parks relates with our overall well-being. UGS helps to make people move more and it's good for their mind. This has gotten a lot of interest (Zhang, 2014). People who make park visits share reasons based on personal feelings, interactions with others and buildings related factors. This is what a model showed in 2005 (Ariane et al., 2005). These models have shown that some groups are more likely to not use parks. These include older people, minorities in race and ethnicity, women and families with lower income (Cordell et al., 1999; Mowen et al., 2005; Payne et al., 2002; Scott and Munson, 1994 Also, things others do in the park can make a big difference. For example, people are more likely to use the park if their friends and family go there too (Amy et all., 2009; Donna, 2001). What makes up our surroundings - from features of the place itself to where we live around it- is an important part as well.

It's interesting that lots of research has been done in North America and Australia about the problems and good things from visits to UGS, but there isn't much study on this topic in Africa and especially not when it comes to poorer countries. Zhang and Yang (2014) point out the problem faced by poorer countries when it comes to meeting increasing demands for outdoor activities in big cities. They stress the importance of knowing what causes these recreational experiences. In fast-growing cities in Africa, there is a big need for places to recreate and find peace from crowded life. But we don't have much information on how best to manage outdoor activities when living close together in the city.

In the wider study of people visiting UGS, there is a big gap. It doesn't pay much attention to how things like age and income affect when people visit these places. Studies in Europe and North America say that things like age, race, income and family structure can affect how much people use parks. (Scott and Munson, 1994; Scott and Jackson, 1996; Cordell et al., 1999; Payne et al., 2002; Mowen et al., 2005) But these findings have not been looked at very much in Africa. We might need new studies for African city planning because social and cultural differences can stop us from using existing leisure and health research directly.

This shows we should do fresh researches to cover this gap. Again, the existing literature for the most part focuses on well-established urban areas in developed world and fails to adequately address the specific challenges and potential of green spaces within informal residence in Sub-Saharan Africa (Sen & Nagendra., 2022; Diep, Charles, & Proust, 2019). Studies often overlook the unique socio-environmental dynamics and community perceptions that influence green space visitation and use in these marginalized settings (Farahani & MacMillan, 2018; Rupprecht & Byrne, 2017). Subsequently, there is a dire need in understanding how residents of informal settlements interact with and benefit from urban green spaces within their vicinity. (Kamalipour & Dovey, 2023).

This paper focuses on filling the identified dearth in literature by investigating the relationship between demographic characteristics and UGS visitation patterns of residents to UGS in Dandora Estates of Nairobi County, Kenya, a slum dwelling residence. The research aims to provide a nuanced understanding of how factors such as gender of the respondent, age of respondent, level of education, place of residence, occupation and length of stay influence the frequency and motivations behind residents' visits to UGS. By conducting an in-depth exploration in the context of Beijing, a rapidly urbanizing city facing a severe conflict between economist/developers and environmental conservationists, this paper aims to generate comprehensions applicable to other urban centers, especially in the African context where such research is remarkably limited.

This study's results are expected to help protect, preserve and manage UGS in Dandora and other areas just like it. This research will inform targeted urban planning, ensuring equitable access and tailored amenities for diverse community needs. It also guides the development of health-promoting strategies and culturally inclusive programming within UGS in Kenya. The study results will also aid in the development of strategies to ensure appropriate location and activities for UGS in urban towns. The Nairobi County's Urban Planning and Design department could use these findings to inform and design suitable plans for green spaces in other growing towns within the county to achieve Sustainable Development Goal 11, which pertains to sustainable settlements of cities and communities. Furthermore, the study aims to encourage institutions such as the National Environmental Management Authority (NEMA), the United Nations (UN), and other Non-Governmental Organizations (NGOs) to uphold the necessary policies and legal frameworks for the establishment and maintenance of UGS.

In the subsequent sections, the methodology section will outline our approach to data collection and analysis, while the findings will be presented in subsequent sections. The conclusion will summarize the implications of our research and provide recommendations and further directions for future studies in this underexplored domain.

Materials and Methods

The study was conducted in Dandora estates. Dandora is an eastern suburb in Nairobi, Kenya. It is part of the Embakasi North Division. Surrounding neighborhoods include Kariobangi, Baba Ndogo, Gitare Marigo and Korogocho. It lies 1.2483°S, 36.9026°E (LATITUDE, 2018)

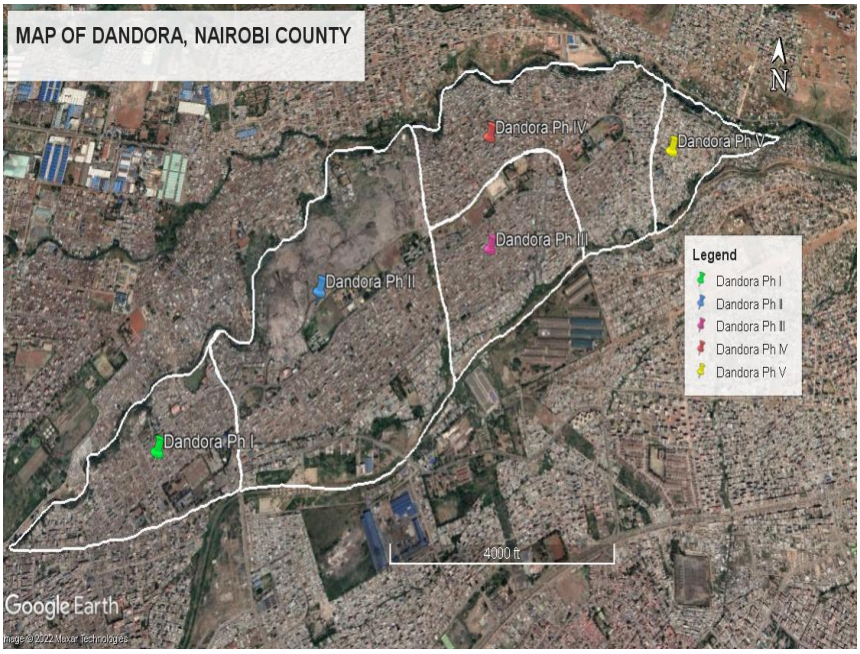

Figure 1: Map of Dandora Estates, Nairobi County
Source: Mgunda, N. S., Omollo, M., & Konana, C. (2022)

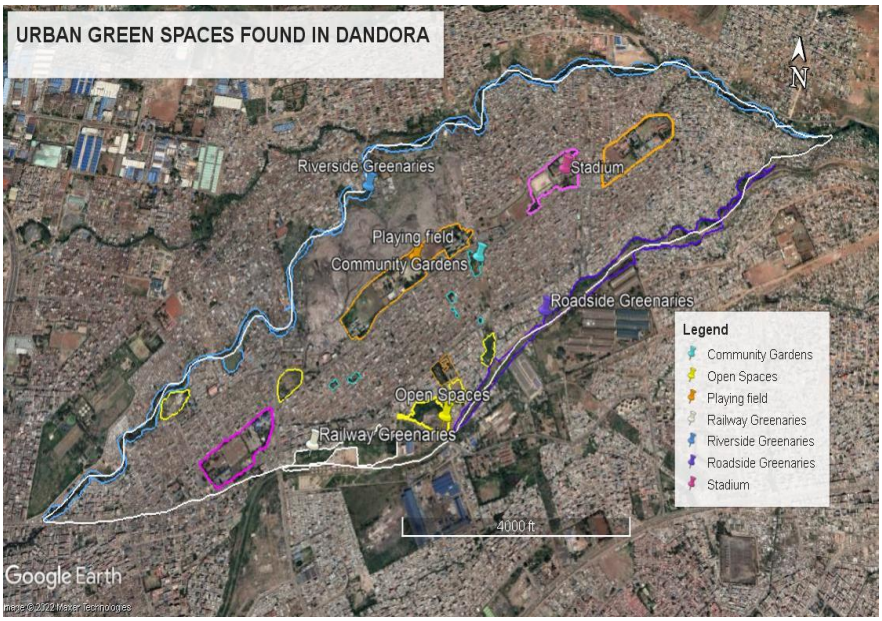

Figure 2: Map of UGS found in Dandora Estates
Source: Namalwa, S., Omollo, M., & Konana, C. (2024)

The study employed both qualitative and quantitative research methods to investigate the relationship between demographic characteristics and visitation patterns of residents to UGS. Qualitative analysis explored and described the social demographics (gender of the respondent, age of respondent, level of education, place of residence, occupation and length of stay), percentage of residents who use and visits the UGS, while quantitative data quantified various actions and opinions, and checked the Relationship

between social demographic characteristics and frequency of UGS usage and visitation. Using a sample survey design, observation and questionnaires were conducted.

The study was conducted among residents of Dandora and targeted the households as special respondent group in the study because they have high likelihood of possessing past and present knowledge of activities carried in and out of the green spaces which surrounds them. Dandora has a population of 295,5670 residents (KNBS, 2019). The sample size for this research was calculated using the formula by Naissuma (2000) below:

$$n = \frac{N \times Cv^2}{Cv^2 + (N-1)(e)^2}$$

Where;
n = sample size
CV = coefficient and variance 50%
N = population size
e = allowed error +5%
1=the desired level of precision

$$n = \frac{(295{,}670)(0.5)^2}{(0.5)^2+(295{,}670-1)(0.05)^2} = 99.999665 = \mathbf{100}$$

The research collected data using a random structured questionnaire distributed to 100 household heads from the 5 wards in proportion. The questionnaire comprised two main sections: i) collecting sociodemographic data and ii) measuring UGS usage and visitation frequency. Data was collected for a period of one month in August 2022. A total time of 20 minutes was provided for each respondent during which they had to fill the questionnaire. Secondly, there were 30 interviews done on businesspeople who witnessed UGS visits. Observation checklists and photography were used as additional sources to improve on the questionnaire information.

The data collected was analyzed and presented using descriptive statistics and qualitative method depending on their nature. The data was first subjected to computation of descriptive statistics which include; frequencies, averages, percentages, tabulations and ranking. Hypothesis was tested using the Multinomial Regression Analysis done at 5% level of significance. This analysis study uses multinomial regression which is suited to investigate categorical dependent variables with more than two levels, for instance visitation patterns and bring together multiple independent demographic variables. The methodology allows to obtain probabilistic results and produces a complete framework for analyzing the role of demographics on UGS visitation in slum areas. MS Excel and SPSS were used for these purposes. Data was presented in the forms of comprehensive reports, tables, pie-charts, bar graphs, and table

Table 1: Summary of data matrix (sources, collection methods, analysis and presentation) for the objective.

RESEARCH OBJECTIVE/HYPOTHESIS	**DATA NEEDS (VARIABLE)**	**DATA SOURCES**	**DATA COLLECTION METHODS**	**DATA ANALYSIS METHOD**	**DATA PRESENTATION METHODS**	**EXPECTED OUTCOMES**
Establish a relationship between social demographics characteristics and the frequency of ugs usage and visitation in dandora.	Social demographics (*gender of the respondent, age of respondent, level of education, place of residence, occupation and length of stay*) Percentage of residents who use and visits the ugs.	Field Survey	Observation Questionnaires	Descriptive Analysis (Spss & Ms Excel)	Descriptive Report	A detailed descriptive report indicating the social demographics characteristics and the percentage of frequency residents' usage and visitation to ugs.
H0; there is no relationship between social demographic characteristics and frequency of ugs usage and visitation in dandora.	Relationship between social demographic characteristics and frequency of ugs usage and visitation.	Field Survey	Questionnaires	Multinomial Regression Model (SPSS & Ms Excel)	Tables	Comprehensive inferential report to disapprove or to agree with this null hypothesis.

Results and Discussion

Demographic Information

Gender of Respondent: Gender balance was taken into consideration with the number of male and female respondents who filled the questionnaires with a slightly higher figure for the female (52%).

Age of the respondents: From the findings it was seen that most respondents were between ages of 30-40 at 41% followed by those between the ages of 20-30 at 32%, then those between ages of 40-50 and below 20 had percentages of 13% and 12% and the remaining 2% were those aged above 51 years. This demonstrated that majority of the respondents were youth.

Level of education: Twenty-one percent (21%) of the respondents had gone through primary education. 62% had gone through secondary. 17% of the respondents had reached tertiary level of education, as shown in. The result demonstrated that most of the inhabitants do not have education beyond the secondary level.

Occupational Status: Majority (56%) of the respondents were self-employed while 24% were employed. 20% were unemployed. This shows that majority of the residents are self-employed commonly known as 'Jua Kali' sector.

Period of stay: Fifty percent (50%) of the respondents who participated in the study had stayed in Dandora for a period between 1-10 yrs. 32% had stayed for a period between 11-20 yrs. 10% had stayed for a period of 21 yrs. and above. Lastly 8% of the respondents had stayed below 1year as shown in

The locality/place of the respondents: 12% of the respondents who participated in the study were from Phase I, 24% were from Phase II, 14% were from Phase III, 29% were from Phase IV. Lastly 21% of the respondents were from V. Majority of the respondent were from Phase II and IV because these areas host high populations than the rest of the other localities.

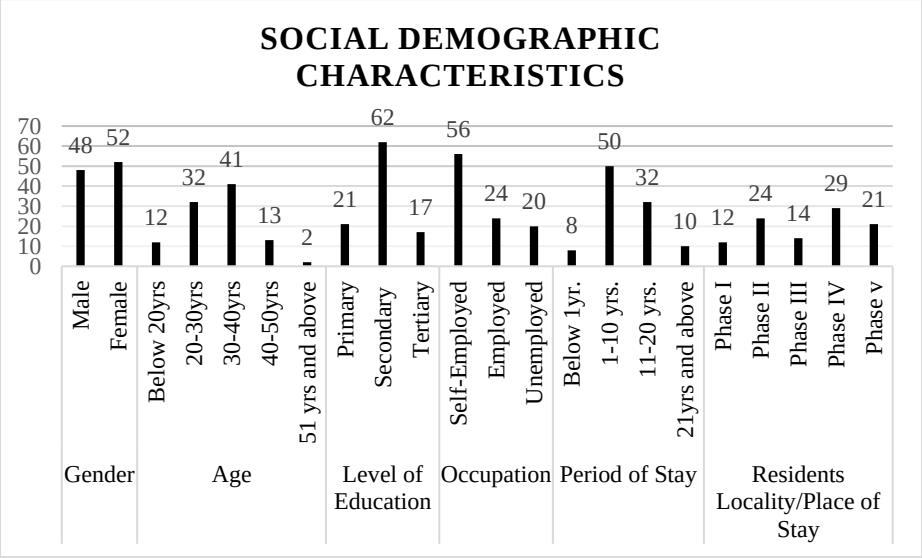

Figure 3: Social demographic characteristics

Percentage of Residents Who Utilize/Visit UGS in Dandora and Frequency of Their Use/Visits to These Spaces

From the findings, 84% of the respondents said that they visit the UGS, on the other hand 16% of the respondents said that they do not visit UGS majorly because of issues of insecurity, unkemptness and non-appealing look, inadequacy of available spaces, amongst other reasons.

The table below shows the residents frequency of visitation to UGS in Dandora. Majority of the respondents (41%) visit UGS on weekly basis (once or twice mostly on weekends). 34% visit on daily basis. 9% visit UGS on monthly basis due to the fact that they are employed or busy running business. Lastly 16% of the respondents said they never visit UGS at all at any point in time.

Relationship Between Socio Demographic Characteristics and Frequency Of Visitations

H0 There is no significant relationship between demographic characteristics and frequency of visitations and UGS

Table 2: Multinomial logistic regression to check significant effect of socio demographic characteristics on frequency of visitation on UGS

Model Fitting Information				
Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	234.933			
Final	144.362	90.571	42	.000

Goodness-of-Fit			
	Chi-Square	df	Sig.
Spearman's	164.158	210	.992
Deviance	132.564	210	1.000

Pseudo R-Square	
Cox and Snell	.596
Nagelkerke	.650
McFadden	.365

Likelihood Ratio Tests				
Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	144.362a	.000	0	.
Place of Residence	168.153	23.792	12	.022
Gender of the Respondent	148.060	3.699	3	.296
Age of Respondent	163.855	19.493	12	.077

Level of Education	150.922	6.560	6	.363
Occupation	146.508	2.146	3	.543
Length of Stay	148.073	3.712	3	.294

Parameter Estimates

Frequency of visitation a		B	Std. Error	Wald	df	Sig.
Daily	Intercept	17.028	4104.751	.000	1	.997
	[Place of Residence=1]	2.439	1.522	2.567	1	.109
	[Place of Residence=2]	2.321	1.326	3.064	1	.040
	[Place of Residence=3]	2.394	1.616	2.195	1	.138
	[Place of Residence=4]	-.358	1.096	.107	1	.744
	[Place of Residence=5]	0b	.	.	0	.
	[Gender of the Respondent=1]	1.287	.928	1.925	1	.165
	[Gender of the Respondent =2]	0b	.	.	0	.
	[Age of Respondent=1]	-2.292	4615.023	.000	1	1.000
	[Age of Respondent=2]	-18.267	4104.750	.000	1	.996
	[Age of Respondent=3]	-18.209	4104.750	.000	1	.996
	[Age of Respondent=4]	-18.405	4104.750	.000	1	.996
	[Age of Respondent=5]	0b	.	.	0	.
	[Level of Education=1]	.489	1.293	.143	1	.705
	[Level of Education=2]	1.806	1.230	2.154	1	.142
	[Level of Education=3]	0b	.	.	0	.
	[Occupation=1]	-2.315	1.678	1.903	1	.168
	[Occupation=2]	3.413	1.363	6.273	1	.012
	[Occupation=3]	0b	.	.	0	.

	Length of Stay	.786	.721	1.187	1	.276
Weekly	Intercept	-4.889	3.041	2.585	1	.108
	[Place of Residence=1]	.117	1.573	.006	1	.940
	[Place of Residence=2]	2.413	1.203	4.026	1	.045
	[Place of Residence=3]	1.232	1.545	.635	1	.425
	[Place of Residence=4]	-.748	.981	.582	1	.446
	[Place of Residence=5]	0b	.	.	0	.
	[Gender of the Respondent=1]	1.289	.853	2.283	1	.131
	[Gender of the Respondent =2]	0b	.	.	0	.
	[Age of Respondent=1]	18.399	2109.375	.000	1	.993
	[Age of Respondent=2]	1.802	1.605	1.260	1	.262
	[Age of Respondent=3]	.582	1.408	.171	1	.679
	[Age of Respondent=4]	.658	.000	.	1	.
	[Age of Respondent=5]	0b	.	.	0	.
	[Level of Education=1]	-.906	1.196	.574	1	.449
	[Level of Education=2]	1.122	1.128	.990	1	.320
	[Level of Education=3]	0b	.	.	0	.
	[Occupation=1]	1.798	1.818	.978	1	.323
	[Occupation=2]	.340	1.562	.047	1	.828
	[Occupation=3]	0b	.	.	0	.
	Length of Stay	1.138	.688	2.738	1	.098
Monthly	Intercept	-24.596	2411.365	.000	1	.992
	[Place of Residence=1]	2.766	2.182	1.606	1	.205
	[Place of Residence=2]	-12.791	1811.615	.000	1	.994

	[Place of Residence=3]	4.083	2.034	4.030	1	.045
	[Place of Residence=4]	.911	1.482	.378	1	.049
	[Place of Residence=5]	0b	.	.	0	.
	[Gender of the Respondent=1]	1.971	1.205	2.676	1	.102
	[Gender of the Respondent =2]	0b	.	.	0	.
	[Age of Respondent=1]	3.252	3215.836	.000	1	.999
	[Age of Respondent=2]	2.228	2.179	1.045	1	.307
	[Age of Respondent=3]	2.786	1.980	1.981	1	.159
	[Age of Respondent=4]	.872	.000	.	1	.
	[Age of Respondent=5]	0b	.	.	0	.
	[Level of Education=1]	.919	1.948	.223	1	.637
	[Level of Education=2]	1.945	1.832	1.127	1	.288
	[Level of Education=3]	0b	.	.	0	.
	[Occupation=1]	14.632	2411.361	.000	1	.995
	[Occupation=2]	14.103	2411.361	.000	1	.995
	[Occupation=3]	0b	.	.	0	.
	Length of Stay	1.526	.997	2.343	1	.126
a. The reference category is: Never.						
b. This parameter is set to zero because it is redundant.						
c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.						

The hypothesis tests if there exist a significant effect of socio demographic characteristics on frequency of visitation on UGS. Using multinomial regression model, the dependent variable frequency of visitation was regressed on predicting variables; (place of residence, gender of respondents, age of the respondents, level of education, occupation, length of stay) to test the H_0 in table 4.3 below. The model fitness was assessed using the Chi-square statistic. The Chi-square value was 90.571 and the p-value was less than 0.05 indicating a significant relationship between the dependent variable and independent variable in the model, that the social demographic characteristics has an influence on frequency of visitation.

With P-values greater than .05, both the Spearman's (164.158) and deviance (132.564) statistic test proves that the model is fit. The Pseudo R-square measures are .596 (Cox and Snell), .650 (Nagelkerke) and .365 (Mc Fadden) demonstrating that the model accounts for 36.5% to 65.0% of variance on frequency of visitation from predicting variables. The likelihood ratio test proved only Place of resident being significant to the study while the others are not significant to the final model.

From the parametric estimator results, among residents who visit the UGS on a daily basis, living in Phase 2 had a significant impact on the frequency of visitation. This suggests that Phase 2 residents are more likely to incorporate daily visits to UGS into their routine, possibly indicating a higher appreciation for or accessibility to these green spaces. Any resident in Phase 2 will prefer visiting UGS 2.321 times more on a daily basis to never visiting. Residents who visit the UGS on a weekly basis, living in Phase 2 had a significant impact on the frequency of visitation. Any resident in Phase 2 will prefer visiting UGS 2.413 times more on a weekly basis to never visiting. This further supports the idea that the abundance or quality of UGS in Phase 2 contributes to a higher engagement with these spaces among the residents.

Residents who visit the UGS on monthly basis, living in Phase 3 and Phase 4 had a significant impact on the frequency of visitation. Any resident in Phase 3 and 4 will prefer visiting UGS 4.083 and .911 times more on a monthly basis to never visiting. The lower availability of UGS in Phases 3 and 4, combined with a high state of insecurity, may have implications for residents' willingness to visit these spaces, even on a monthly basis. This brings forth the importance of addressing security concerns alongside the development and maintenance of green spaces in urban planning.

From the parametric estimator results, among residents who visit the UGS on a daily basis, unemployed living had a significant impact on the frequency of visitation. Any resident unemployed will prefer visiting UGS 3.413 times more on a daily basis to never visiting.

This association highlights the potential role of UGS as a resource or outlet for individuals facing unemployment. It suggests that unemployed residents may turn to UGS as a means of recreation, relaxation, or engagement with the natural environment. Understanding this relationship could have implications for urban planning and policy-making, emphasizing the importance of providing accessible and well-maintained UGS, particularly in areas with higher unemployment rates.

Conclusion and Recommendations

Conclusion

In conclusion, this research highlights the significance of place of residence in influencing the frequency of UGS visitation among residents. Phase 2 emerges as a focal point with the highest impact, emphasizing the need for further investigation into the factors contributing to this trend. Additionally, the study highlights the importance of addressing UGS distribution and security concerns in urban planning to promote equitable access and enhance the well-being of residents. The research suggests a significant correlation between unemployment and the frequency of visitation to UGS among daily visitors. These findings contribute to our understanding of the complex interplay between socio-economic factors and the utilization of urban green spaces. Further research and a holistic approach to urban planning may help harness the potential benefits of UGS in supporting the mental health and general well-being of residents, especially those facing unemployment in slum dwelling areas.

Recommendation

Based on the research findings, here are several recommendations:

- *Phased UGS Development:* Think about taking steps to build more UGS, especially in places where there is not much of it available. If you can, put money and work into making more green areas better in Phase 3 and Phase 4. This could be about talking with the community to find good places and what people like.
- *Security Measures:* Since there is a safety problem, work with local leaders to put security actions in place at and near UGS. This should be done mostly where it's not safe. Better safety rules might make more people want to go and have fun in those places.
- *Promotion of Phase 2 UGS:* Make the most of how Phase 2 increases visits to UGS. Create special marketing and useful campaigns that show the good things of UGS in Phase 2. This will make people from other areas want to visit and use these green areas more often.
- *Maintenance Plans:* Nairobi County Council (NCC) together with the community to develop a sustainable maintenance plan for green spaces to ensure they remain well-kept and attractive. Regular maintenance, including landscaping, waste management, and infrastructure upkeep, is crucial for sustaining the appeal and functionality of these spaces.
- *Inclusive Planning:* The Urban Planning and Design department should make sure city planning and growth plans include everyone's needs. These should help the whole community in different ways. Listen to what everyone has to say and use it all when making public spaces that match the likes and beliefs of every person.
- *Mental Health Awareness Camps:* NCC, CBOs and NGOs available in Dandora dealing with health and peoples' general wellbeing matters should conduct regular mental health awareness camps in designated green spaces to educate unemployed residents about the importance of mental well-being, destigmatize mental health issues, and provide information on available support service.

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