



The socio-demographic and spatial dynamics of green space use in Guangzhou, China



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A B S T R A C T

Keywords:

Age
On-site survey
Participatory decision making
Socio-demographic variation
Urban park
Visit pattern

Understanding the use and users of urban green spaces (UGSs) is necessary for effective planning, management, and design. However, most studies focus on developed cities; only a few focus on developing cities. This research aims to investigate the visit patterns of UGSs and the related socio-demographic associations in Guangzhou, China. A face-to-face survey was conducted in 24 UGSs by stratified random sampling. A total of 595 valid questionnaires were obtained and analyzed. Descriptive statistics presented the visit patterns of UGSs, and multivariate logistic regression revealed the socio-demographic associations. Results indicated that walking dominated the multiple-activity pattern in UGSs, with more than 80% of the respondents visiting UGSs at least once a week or more. Residential green spaces and parks were the most visited areas, whereas greenbelts and small gardens were less favored. Walking was the common mode of travel, with very few individuals driving and cycling. Friends and family were the major visit companions, and one-third of the respondents visited UGSs alone. The visit patterns significantly varied with socio-demographic variables, particularly the activity patterns in UGSs and visit companions. For example, 20 min walking distance is a critical divide in determining whether the respondents walked to UGSs. Socio-demographic variations must be considered in the decision-making process of UGSs, and this condition justifies the adoption of a participatory approach. The findings can help managers operate UGSs effectively and target improvement strategies strategically and thus provide important implications for other developing cities. Future studies should consider non-users and UGS use (activity patterns) of the older population and further examine the associations of activity patterns and visit frequency with place of residence using consistent methodologies.

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Introduction

Urban green spaces (UGSs) typically refer to public or collective outdoor areas with amenities, including human-modified places and vegetated natural spaces (Wright Wendel, Zarger, & Mihelcic, 2012) within city limits. These spaces offer social, environmental, ecological, aesthetic, and health benefits as well as recreational opportunities to urban communities or visitors (Cohen, Potchter, & Schnell, 2014; Dwivedi, Rathore, & Dubey, 2009; Gatrell & Jensen, 2002) and thus contribute positively to urban quality of life. In this study, UGSs specifically include parks, squares and plazas, residential and institutional green spaces, sports places, riverside and roadside greenbelts, small gardens, and other spaces within the study area (Table 2).

However, with rapid urbanization, diversification of the society, and burgeoning city densification, the effective management and furnishing of UGSs have become a universal challenge. A rapid increase in urban population requires the provision of additional UGSs, whereas burgeoning city densification frequently limits such possibility. Furthermore, the diversification of urban societies produces various needs and expectations on UGSs and calls for diversified and targeted provision. All these factors create a strong need for informed planning and effective management of UGSs. Understanding the current use of UGSs, the associated variations, and the underlying factors can provide decision makers with a knowledge base for effective management and precise provision.

UGS use and user profiles in developed cities have elicited considerable research attention (Peschardt, Schipperijn, & Stigsdotter, 2012; Reed, Price, Grost, & Mantinan, 2012). Studies have identified several commonalities across cities. For example, studies have indicated that walking is a popular activity in UGSs (Roovers, Hermy, & Gulinck, 2002) and that a negative relationship exists between UGS use and age (Payne, Mowen, & Orsega-Smith,

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2002; Pincetl & Gearin, 2005; Raymore & Scott, 1998) and between UGS use and distance (Peschardt et al., 2012; Schipperijn, Stigsdotter, Randrup, & Troelsen, 2010; Ward Thompson, Aspinall, Bell, & Findlay, 2005). However, considerable variations among cities induced by socio-cultural differences have likewise been revealed (Elmendorf, Willits, & Sasidharan, 2005). For example, walking is the common mode of travel to UGSs in Hong Kong (Wong, 2009), whereas driving is the common mode of travel in Western cities because of high private car ownership (Pincetl & Gearin, 2005; Roovers et al., 2002). High frequency of visits to UGSs is typically observed in compact cities, such as Singapore and Hong Kong, because of the cramped living environment (Lo & Jim, 2010a; Yuen, 1996), and low frequency of visits is observed in several Western cities, such as Los Angeles (Pincetl & Gearin, 2005). These findings demonstrate that certain use patterns are city specific and thus justify the research undertaken in different cities to investigate the local decision making of UGSs.

In addition to the variations in general use patterns, studies have reported significant variations in UGS visits among different social groups (Oguz, 2000). Gender (Schipperijn et al., 2010; Wright Wendel et al., 2012), marital status (Pincetl & Gearin, 2005), education and occupation (Zhang & Gobster, 1998), age (Kemperman & Timmermans, 2006; Lee, Scott, & Floyd, 2001), economic class (Shinew, Floyd, & McGuire, 1995), residential location (Payne et al., 2002; Roovers et al., 2002), and distance (Peschardt et al., 2012) are associated with the use patterns of UGSs. Females are generally less likely to use urban parks because of care ethics (Day, 2000) and safety concerns (Scott & Jackson, 1996). Married people visit UGSs frequently because of children needs (Sanesi & Chiarello, 2006). Highly educated or paid individuals cite family members as their companions when visiting UGSs, whereas less educated individuals are likely to visit UGSs alone (Kemperman & Timmermans, 2006; Lo & Jim, 2010b). Visit frequency also varies depending on residential location (Lo & Jim, 2010a; Sanesi & Chiarello, 2006). These variations should be fully considered in the decision-making process if effective planning and management of UGSs are desired.

Only a few studies have focused on UGS use in developing cities, including Chinese cities, where the provision of UGSs frequently encounters strong competition pressure in land designation. This study focused on the use patterns of UGSs in general and related socio-demographic associations in urban China. Specifically, this study aims to identify the patterns that exist in UGS use and the socio-demographic variables (selected based on previous studies) associated with these patterns. The empirical findings of this study can provide a foundation for the effective planning, management, and design of UGSs in China and other developing countries. Guangzhou, the capital of Guangdong Province and a rapidly developing municipality in China, was selected in this study as the study location. Rapid urbanization and industrialization in recent decades have resulted in poor environmental quality in the city.

Methods

The study area includes the urban areas of the eight central districts of Guangzhou, the largest municipality in south China. It covers almost 335 km² and constitutes 23.4% of the city area, with a high population density of more than 13,000/km² (Guangzhou Statistical Bureau, 2006). UGSs comprised one-third of the land area in 2005, with a public UGS area per capita of 11.3 m² (Guangzhou Statistical Bureau, 2006). Both UGS ratio and per capita level, the two main official assessment indicators of UGSs in China, exceeded the corresponding national standards of 30% and 10 m², respectively. Each park had more than 30,000 residents, and each resident occupied a park area of nearly 4 m² (Han, Jin, & Chen,

2008). This condition mirrors the limited provision of UGSs, particularly park spaces, in the study area.

The questionnaire in this research was designed with reference to similar studies (Bell et al., 2004; Gobster, 2002; Ho et al., 2005; Lindsey, 1999; Oguz, 2000; Yuen, 1996) and the opinions of local UGS officials and experts. These related studies and opinions were mainly utilized to select the use patterns of UGSs and socio-demographic variables, with the latter based on their associations with the use patterns identified in previous studies. The first section presents five key use patterns with single or multiple responses; these patterns include recreational activities in UGSs, visit frequency (including reasons for low use), preferred types of UGSs, mode of travel, and visit companionship (Appendix). The second section focuses on the socio-demographic profiles of visitors, including their gender, age, marital status, education level, household monthly income per capita, occupation, place of residence, and walking distance from their home to the proximity of UGSs.

Stratified random sampling and the target sample size (600) were utilized to determine the number of respondents to be sampled in each district, which is proportional to the ratio of each district's population to the total population of the study area in 2000. The calculations were based on latest census data (Guangzhou Census Office, 2002). After a preliminary test, the main survey was conducted on December 2005 by on-site in-person interviews with the assistance of four trained undergraduate students. A total of 24 green sites, representing the main types of UGSs in the city, were selected with the involvement of local UGS managers and experts. For each district, three green sites were selected; these typically included a park and other types of places (Table 2). Visitors aged 15 and above were selected as respondents at two consecutive intervals during the survey.

Descriptive statistics were utilized to identify the general visit patterns of UGSs, and multivariate logistic regression was implemented to examine the associations of the use patterns with the socio-demographic variables. According to the statistical requirement for logistic regression (Jin & Cao, 2003: 332), the smallest frequency of all categories of a dependent variable should be five to ten times more than the number of independent variables included. For a large sample size, the current study analyzed only those categories of visit patterns with a frequency of more than 90.

A multi-collinearity test of independent variables was performed before each regression model run. The test results indicated low multiple correlations among the variables in all cases (all tolerance values are >0.9). The Hosmer–Lemeshow goodness-of-fit test revealed the good fit of all the models with the data. The (significant) results were reported with odds ratios (OR) and *p* values. Statistical analyses were conducted with SPSS version 17.

Results

Sample profile

A total of 606 respondents participated in the survey; a response rate of 85% was achieved. After eliminating 11 incomplete questionnaires, 595 valid ones remained for use in the analysis.

The sample included a higher number of males (56%) than females. The 30–49 age group accounted for the majority of the respondents (31.4%), followed by the 15–24 (29.6%), 25–29 (23.2%), and ≥50 (15.8%) age groups. A total of 42.8% of the interviewees had a university or higher degree, and only 20.4% obtained secondary education; this condition suggests a relatively high education level in the sample. With regard to income, the middle group earning RMB 1000–3000/month comprised 54.1% of the respondents, followed by those earning < RMB 1000/month and ≥RMB 3000/month. For the place of residence (compared with the census data),

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