

TRANSPORT FINDINGS

Beyond Frequency: Examining Travel Behavior and Visit Habits of Park Users

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Findings

Urban park use is typically measured by frequency, yet individuals differ in travel behavior and visit habits. Using a survey of Montréal (Canada) residents representative by gender and age, this study identifies six park-visitor profiles through cluster analysis and examines relationships with sociodemographic characteristics and park accessibility. Findings reveal profiles with similar visit frequencies differ substantially in travel behavior, and number and types of parks visited. Age and park importance are significantly associated with profiles, and perceived, but not calculated accessibility measures vary across profiles. Findings highlight limitations of relying on calculated accessibility and frequency alone to understand park use.

1. Questions

Parks and green spaces are highly valued in urban contexts, given their health, social, and environmental benefits (Ugolini et al. 2022). Accordingly, municipalities are developing strategies to understand factors driving park use to ultimately promote it. A substantive body of research has studied park use (Endalew Terefe and Hou 2024), with most approaching the question through the lens of visit frequency. We argue that park use is inherently more complex than visit frequency alone, as individuals differ in not only the frequency, but also their travel behaviors and visit habits (e.g. type and number of parks visited).

In this context, we pose two research questions:

1. Are there identifiable visitor behavior profiles among adult park users?
2. Do these visit-based profiles differ by socio-demographic characteristics or accessibility to parks?

2. Methods

Data used in this study comes from a survey disseminated through an online market research panel in 2021 based on a representative sample of respondents (gender and age) from the City of Montréal, Canada. The final sample included 638 adults aged 18 and older. The survey included questions about socio-demographics, travel behavior, and park use. Respondents were

Table 1. Description of variables included in the clustering analysis

Variable	Description	Type	Units / Categories
Minimum distance	Network distance between the respondent's home and the closest reported park	Continuous	Meters
Maximum distance	Network distance between the respondent's home and the farthest reported park	Continuous	Meters
Park visit frequency	Self-reported frequency of park visits	Ordinal*	1 = almost never; 2 = a few times during the last three months; 3 = a few times per month; 4 = a few times per week; 5 = daily or almost daily
Number of different parks visited	Number of distinct parks reported as visited by the respondent	Ordinal*	1 park; 2 parks; 3 parks
Main transport mode	Main transport mode used to reach parks	Categorical	Walking; cycling; public transport; car
Visit behavior	Derived from frequencies of visiting alone, with pets, in groups, and with children	Categorical	Alone; with pet and without children; with children; in group; alone or in group without pet, no predominant behavior
Type(s) of visited park(s)	Type(s) of park(s) visited by the respondent	Categorical	Large park; neighborhood park; both; neither

* Treated as continuous in the analyses

asked to report the parks that they most frequently visited in Montreal, up to a maximum of three. More survey details are available in previous studies (Cournoyer et al. 2026; El Murr et al. 2023; 2025).

To answer our research questions, we used k-prototype clustering (Szepannek 2019), which can consider both numerical and categorical variables. We included variables related to park visit behavior, accessibility and transport characteristics ([Table 1](#)). Visit behavior was derived using k-means clustering based on the frequencies (1 to 5) of the four visit contexts (alone, pets, groups, and children), each centered relative to the respondent's mean frequency across the four contexts. The final k-prototype clustering process was run five times using different random seeds and results were compared to assess stability and repeatability.

[Table 2](#) presents descriptive statistics. Variables treated as continuous in the clustering analysis (minimum distance, maximum distance, park visit frequency, and number of different parks visited) were standardised (z-scores) prior to clustering. All remaining variables were treated as categorical. The k-prototype analysis used clustMixType's default estimated lambda. The elbow method (Szepannek 2019), together with profile interpretability, was used to select the number of clusters.

An exploratory analysis was then conducted to assess how socio-demographic and accessibility variables vary across clusters. Statistical tests including ANOVA, Tukey's HSD, and chi-squared were applied to identify significant inter-cluster differences for sociodemographic and accessibility variables.

Table 2. Summary statistics for variables used in the clustering analysis

Continuous variables						
	Min	Median	Max	Mean	Std dev.	
Minimum distance (m)	0	833	37,415	2,490.66	4,405.25	
Maximum distance (m)	0	5,333	39,915	7,679.43	7,465.07	
Park visit frequency	1	3	5	3.06	1.16	
Number of different parks visited	1	3	3	2.55	0.7	
Categorical variables - Number of observations (%)						
	Walking	Cycling	Public transport	Car		
Main transport mode	341 (53)	66 (10)	80 (13)	151 (24)		
	Alone	Alone or in group without pet	In group	No predominant behavior	With children	With pet and without children
Visit behavior	105 (16)	129 (20)	60 (9)	243 (38)	44 (7)	57 (9)
	Both	Large park	Neighborhood park	Neither		
Type of parks visited	269 (42)	157 (25)	184 (29)	28 (4)		

[Table 3](#) presents the variables that were considered. Three calculated accessibility measures were based on a 15-minute walk: (1) quality (CIPQAY index), (2) number, and (3) park surface area. The CIPQAY index considers 17 features of all parks accessible within a 15-minute walk from the individual's residence. Although it was initially developed for youth, it has been positively associated with adults' perceived accessibility and satisfaction (El Murr et al. 2023). Respondents also declared their perceived accessibility to parks based on four distinct statements.

3. Findings

[Figure 1](#) presents the variables' standardized values (z-scores) for the six identified visitor profiles. For the categorical variables, scores for derived variables are presented to facilitate interpretation (see [Figure 1](#) legend). Also, it is important to note that a negative z-score does not indicate a negative variable value, given that all variable means are above 0. For example, a negative z-score for the number of different parks visited (mean of 2.55; [Table 2](#)) indicates that the corresponding profile mean is below the overall sample mean.

Results are compared by pairs of clusters based on frequencies (above average, average, and below average). Clusters A and B (above average) tend to visit parks close to their residential location, by active and public transport modes (low car use), and exhibit a predominant behavior. However, findings reveal

Table 3. Descriptive characteristics of respondents and accessibility variables

Sociodemographic characteristics - Number of observations (%)						
Gender	Men	Women				
	316 (50)	322 (50)				
Age	Min	Median	Max	Mean	Std dev.	
	18	44	99	45.62	16.46	
Number of children	0	1	2	3+		
	520 (82)	68 (11)	39 (6)	11 (2)		
Number of cars	1 car	2+ cars	None			
	325 (51)	123 (19)	190 (30)			
Household income	High	Low	Medium	No answer		
	111 (17)	255 (40)	206 (32)	66 (10)		
Education level	CEGEP	High school	NA	Professional program	University	
	163 (26)	85 (13)	5 (1)	44 (7)	341 (53)	
Ethnic background	Majority group	Visible minority				
	490 (81)	113 (19)				
Importance of parks and green spaces - Number of observations (%)						
Self-declared park importance: "Parks and green spaces are important to me since they connect me to nature"	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
	9 (1)	14 (2)	69 (11)	257 (40)	289 (45)	
Calculated accessibility*						
Combined Index of Park Quality and Accessibility for Youth (CIPQAY)	Min	Median	Max	Mean	Std dev.	
	4.23	13.3	22.59	13.2	3.08	
Number of accessible parks	1	8.13	66.79	11.63	10.29	
Accessible park area (km^2^)	0	0.23	3.07	0.44	0.52	
Perceived accessibility - Number of observations (%)						
Easy park access: I have access to parks and green spaces that meet my needs within 5 minutes of walking from my house.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
	20 (3)	92 (14)	65 (10)	234 (37)	227 (36)	
Perceived number of parks accessible: There is a high number of parks and green spaces in my neighborhood.	10 (2)	47 (7)	66 (10)	335 (53)	180 (28)	
Satisfied with park access: I am satisfied with my access to parks and green spaces.	10 (2)	50 (8)	73 (11)	317 (50)	188 (29)	
Overall evaluation of park access: How would you rate your overall access to parks and greenspaces from your home?	None	Very low	Low	Moderate	High	Very high
	1 (0)	11 (2)	25 (4)	160 (25)	273 (43)	168 (26)

* See (El-Murr et al. 2021) and (El Murr et al. 2025) for more details about the calculated park accessibility indicators

an important distinction in terms of habits: individuals in Cluster B typically visit a single park (always the same), whereas Cluster A visit different parks. Clusters C and D, with an average frequency, are different in most respects.

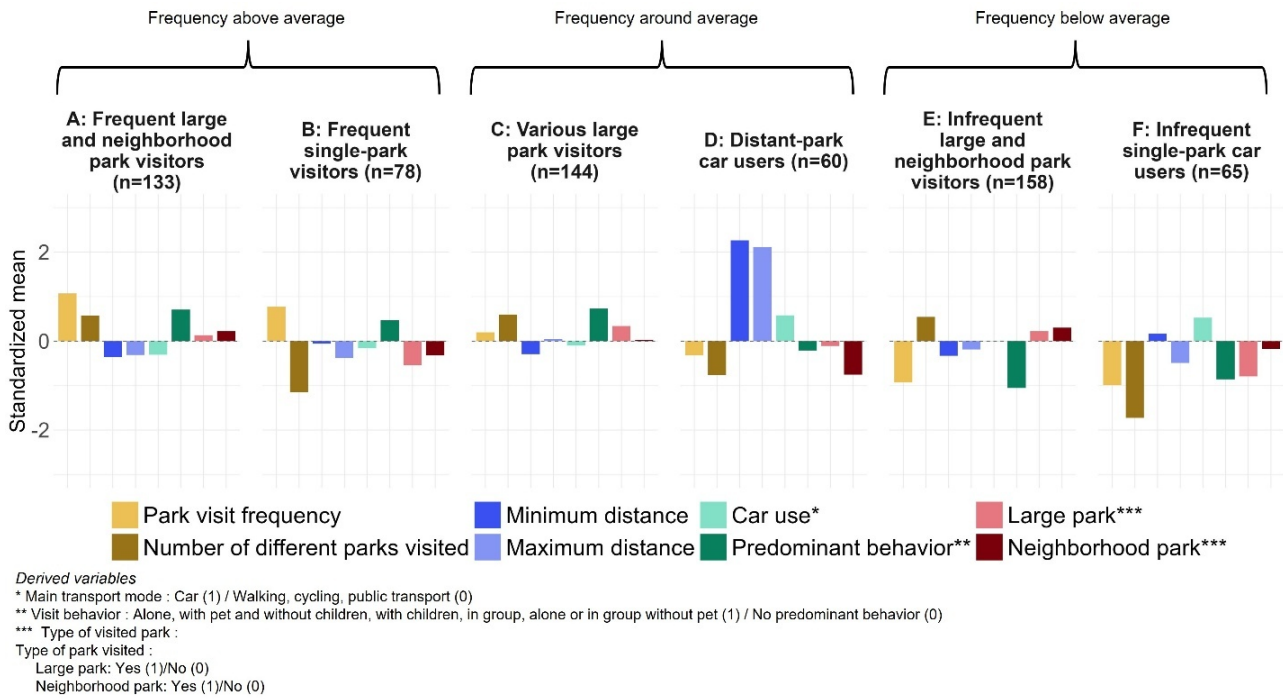


Figure 1. Standardized values for the six visit-based profiles (clusters)

Individuals in Cluster C visit large parks, close to their residential location, using active and public transport modes. Conversely, Cluster D reflects car users that visit distant parks. Finally, Clusters E and F exhibit the lowest park visit frequency with the latter including a larger share of car users. Another difference is the types and number of different parks visited: individuals in Cluster F typically visit only one park, while those in Cluster E visit multiple different parks, including both large and neighborhood parks.

We then explore the relationship between visitor profiles and socio-demographic and attitude variables, with statistically significant results presented in [Figure 2](#). Of eight variables tested, two are statistically significant: age and self-declared park importance. Clusters C and E exhibit a statistically lower age than Clusters A, B and D. As for the self-declared importance of parks, we observe significant discrepancies between clusters, with agreement dropping from the highest-frequency cluster (A) to the lowest-frequency cluster (F).

In exploring the relationship between our visitor profiles and both calculated and perceived accessibility levels, two (of four) perceived accessibility variables show statistically significant coefficients ([Figure 3](#)), whereas the three calculated accessibility measures do not reveal statistically significant differences. The two perceived measures shown follow similar trends ([Figure 3](#)). Globally, perceived accessibility decreases as frequency decreases (from A to F), apart from Cluster D. Notably, Clusters D and F follow similar patterns, in that they both display the lowest perceived accessibility levels and highest car use ([Figure 1](#)).

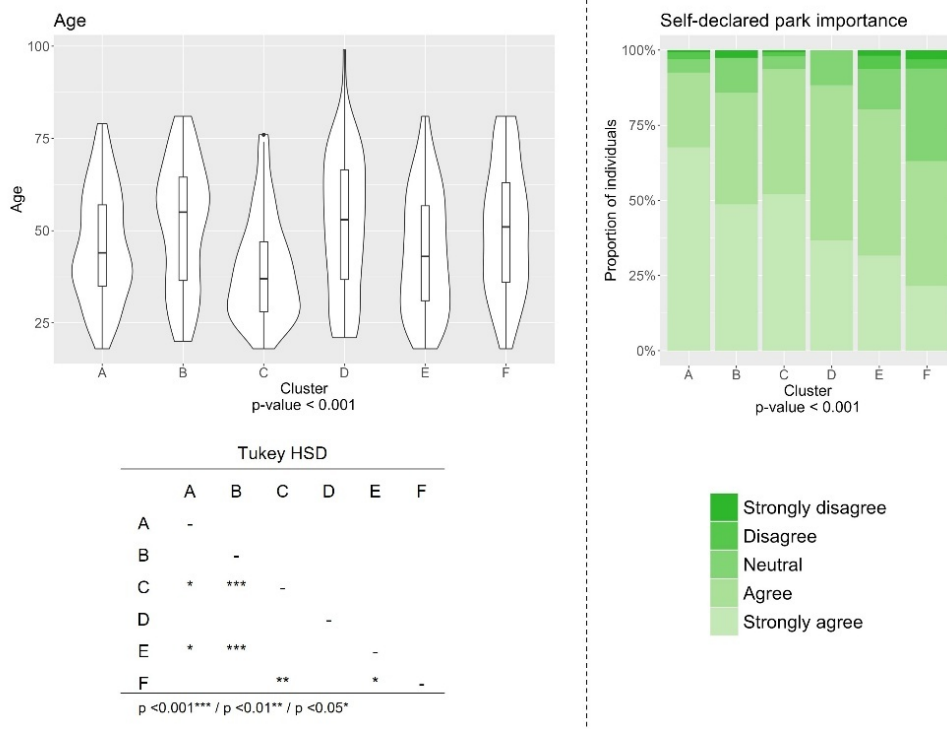


Figure 2. Statistically significant socio-demographic variables

We conclude that distinct visit-based profiles exist among adult park users, even when considering similar park visit frequency. Two cluster pairs (A-B and E-F) display similar visit frequencies but differ in terms of travel distance, number and types of parks visited, and perceived accessibility. Further, among the socio-demographic variables examined, only age showed a statistically significant association with clusters, while the calculated accessibility measures did not differ significantly across the six profiles. These observations demonstrate that park use is inherently multi-dimensional, as individuals with similar visit frequencies may exhibit markedly different travel and visit

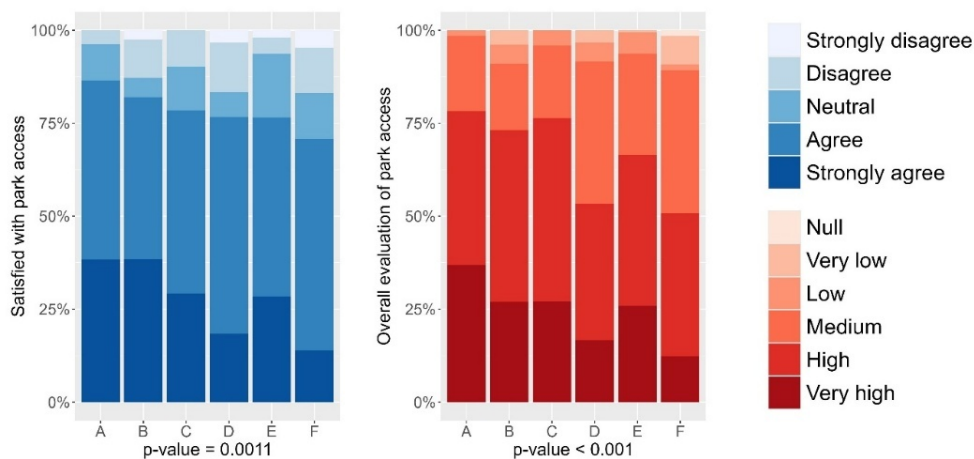


Figure 3. Perceived accessibility variables with statistically significant differences across visitor profiles

patterns. To study park use behavior, future research should go beyond park visit frequency alone and look into perceptions, preferences, and needs of park users.

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SUPPLEMENTARY MATERIALS

Code

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