

Disparities in Built and Natural Features of Urban Parks: Comparisons by Neighborhood Level Race/Ethnicity and Income

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Abstract:

Known associations between the built environment and health outcomes have accelerated research examining racial/ethnic and income disparities in access to parks and other community features that support physical activity. Currently, it cannot be concluded that park characteristics are equal in quantity or condition across areas of disparate race/ethnicity and income composition. This study examined natural and built park characteristics across areas of different race/ethnicity and income composition to identify potential disparities. Twenty-one parks in Greensboro, NC (USA), located in minority or non-minority areas and in low or medium-high income areas were inventoried using a park audit tool and GIS. Parks were compared on number of activity areas, features, amenities, size, percent tree canopy, cleanliness, and condition. Independent sample *t* tests and Mann–Whitney tests were used to compare means of outcome variables. Fisher’s exact tests were applied for categorical variables. Fewer wooded areas and more trash cans were found in low-income and minority areas as compared to medium-high income and non-minority areas. Low-income areas were found to have more picnic areas than their counterparts. Sitting and resting features in non-minority areas were found to be cleaner than those in minority areas. Results showed some evidence of disparities in park characteristics. Findings can inform park policy and design as well as renovations and maintenance procedures, particularly in specific areas where existing disparities were identified.

Keywords: Disparities | Park characteristics | Built environment

Article:

Introduction

Public parks are increasingly recognized for their potential to enhance human health and well-being.¹ National health organizations such as the Institute of Medicine and Healthy People 2020^{2,3} have identified parks as important community settings for obesity prevention because they are subject to public policies and therefore can be modified to promote physical activity. Accumulating research indicates that parks and recreation facilities are associated with physical activity among children and adults.^{4–8} However, multiple studies suggest that parks and recreation facilities were unevenly distributed geographically among areas composed of different socio-economic status (SES) and racial/ethnic characteristics.^{9–12} Other studies report that minority and lower SES populations have equal or greater access to physical activity opportunities, parks, and open space than higher SES populations.^{11–15}

Inconsistent findings can be partly attributed to widely varying methods and study settings. This mirrors the broader literature that has examined associations between the built environment and obesity. Recent systematic reviews^{16–18} concluded that generalizing across studies is not possible. In response, focus has shifted to disparities in quality and condition of parks in addition to their availability and distribution.^{10,11,19,20} Until recently, studies focusing on race/ethnic and income disparities in the number and types of parks and recreation facilities have treated characteristics of park settings as largely homogenous, although park attributes vary widely.²¹

Consideration of park characteristics is important for conceptual and practical reasons. Smaller-scale elements within parks can be quickly modified at relatively low costs to promote park use and physical activity. This potential is particularly salient in low-income and minority communities with greatest risk of inactivity and obesity. Thus, they represent specific targets for environmental interventions. Conceptually, smaller scale elements constitute micro-level environments that comprise behavioral settings and affordances²² that facilitate and constrain behavior in specific settings.^{22,23} Focusing attention on park characteristics can help illuminate the nature of disparities related to parks and recreation facilities. Coupled with deprivation amplification²⁴ and environmental justice perspectives,²⁵ such an approach brings attention to the role environmental conditions like quality and condition can play in amplifying or ameliorating individual disadvantages.

Greater neighborhood physical activity resources, amenities, and higher quality have been found to be negatively associated with obesity prevalence and inactivity among residents of public housing.^{26–28} An Australian study found that high SES neighborhoods had significantly more open space amenities such as drinking fountains and picnic tables; trees; and facilities such as walking paths, lighting, and signage.²⁹

Studies that have unpacked park settings to examine quantity and quality of specific park characteristics associated with physical activity have found that built features of parks such as courts, playgrounds, open spaces, and paths promote park use and park-based activity.^{20,30–35} Natural areas, rather than more developed areas,³⁶ such as trees, water features, bird life, and

park landscaping have been found to be the most desirable elements of parks or those that influenced use for physical activity.³⁷

Research has indicated that the quality and condition of park features is unequal across areas comprised of varying race/ethnicity and income characteristics. For example, parks in areas with higher minority populations had poorer quality amenities and facilities.³⁸ Higher quality physical activity resources within neighborhoods have been found to translate to higher levels of physical activity among minority women.³⁹ Studies have documented significantly greater numbers of quality issues⁴⁰ and fewer amenities²⁹ in parks located in low-income areas. Vaughan and colleagues observed fewer playgrounds and lower quality in parks in low-income census tracts and more basketball courts and fewer trails in high minority areas.⁴⁰

Although research on disparities in park conditions has increased, to date, few studies have focused on neighborhood parks and have more often compared areas based on income rather than by race/ethnicity composition. Therefore, this study aimed to (1) compare the extent of built and natural park characteristics across areas varying by race/ethnicity and income composition and (2) examine whether or not disparities exist in the condition and cleanliness of park features across areas varying by different race/ethnicity and income composition.

Methods

Study Sample

Data were collected in 21 neighborhood parks in Greensboro, NC. Parks were purposively selected to reflect desired area income and race/ethnicity characteristics. Using ArcGIS 9.3.1, census tract data were obtained to create minority and non-minority tract categories. Tracts were determined to be minority or non-minority based on the predominant race/ethnic composition of each tract, defined as a concentration of greater than 50 % or more of one racial/ethnic group.^{41,42} No tracts were found to be predominantly Hispanic or Latino. Therefore, tracts were either predominantly White, non-Hispanic (non-minority, $n = 7$), or non-Hispanic black (minority, $n = 14$). Census tract income was obtained from annual median household income estimates from the American Community Survey.⁴³ Income levels were grouped by tertiles resulting in low (\$13,041 to 28,764), medium (\$29,489–41,088), and high income tracts (\$42,023–133,304). The medium and high income categories were combined to form a medium-high (\$29,489–133,304) income level. Area race/ethnicity and income attributes for study parks are reported in Table 1.

TABLE 1 Study parks by area race/ethnicity and income ($N = 21$)

Area income	Area race/ethnicity	
	Minority ($n = 14$)	Non-minority ($n = 7$)
Low ($n = 7$)		
\$13,041–28,764	7	0

Medium-high (<i>n</i> = 14)		
\$29,489–133,304	7	7

Measurement and Procedures

The Environmental Assessment of Public Recreation Spaces (EAPRS) audit tool was used to measure park characteristics. EAPRS was developed to evaluate park settings in order to examine their relationship with health behaviors.⁴⁴ It was designed to collect data on character, condition, and size of specific use areas (e.g., open space, wooded areas) and other amenities and facilities (e.g., restrooms, shelters). Among measurement tools available to assess park environments, EAPRS includes items to assess natural features (e.g., trees, topography, shrubs) as well as human-made features (e.g., trails, playgrounds, picnic shelters). At the time of this study, it was the most comprehensive tool available. Inter-rater reliability (kappa) for EAPRS has been found to be highest (≥ 0.60) for items assessing the presence and number of elements. Character items (e.g., condition) have modest but acceptable reliability ratings (≥ 0.40 – 0.59). Cleanliness and esthetic items have the lowest reliability (< 0.40).⁴³

Trained volunteers (graduate students and public health professionals) audited study parks between mid-July and early August, on weekdays and weekends between the hours of 8 a.m. and 5 p.m. The audit assessed the presence or absence, condition (poor, fair, excellent), and cleanliness (not at all, somewhat, mostly to extremely) of park features. Outcome variables were (1) number of open spaces, courts, fields, trails, paths, drinking fountains, picnic areas, restrooms, shelters, benches, and trashcans; (2) presence or absence of wooded areas, flowers, shrubs, landscaping beds, play sets, park size, and percent tree canopy cover; and (3) their condition (poor, fair, excellent) and cleanliness (not at all, somewhat, mostly to extremely). Cleanliness of sitting and resting features included tables, seat walls, and benches. Due to low numbers of observations in some categories, condition variables were recoded to “poor–fair” and “excellent.” Cleanliness variables were recoded to “not at all” and “somewhat–mostly to extremely.”

Measures of park size (acres) and percent tree canopy cover were obtained from local government GIS databases. Percent canopy cover in each park was derived by dividing canopy acres in each park by the park’s total acres.

Statistical Analysis

Descriptive statistics were used to analyze characteristics and distribution of built and natural features overall and by area race/ethnicity and income. Outcome variables were compared across area race/ethnicity (minority and non-minority) and income composition (low versus medium-high). Student’s *t* tests for independent samples were used to compare means for normally distributed variables with homogenous variances (percent canopy, benches, and trash cans). Mann–Whitney tests were used to test means for variables not meeting these assumptions.

Fisher's exact tests were used to test associations between the presence or absence, cleanliness, and condition of park characteristics.

Results

Inter-Rater Reliability

The EAPRS protocol required pairs of trained volunteers to audit each study park. Kappa values among presence or absence items ranged from substantial to perfect agreement ($\kappa = 0.756–1.0$). Agreement among raters for condition ($\kappa = 0.537–0.921$) and cleanliness ($\kappa = 0.462–0.917$) items was moderate to nearly perfect. These values exceeded published ranges (i.e., good to excellent, moderate, and poor) for EAPRS inter-rater reliability⁴⁴ in the presence/absence items, condition, and cleanliness items.

Park Characteristics

All Study Parks

Descriptive statistics for quantities and the presence/absence of park characteristics and features are reported in Table 2. Park sizes ($N = 21$) ranged from 4 to 46 acres ($M = 13.14$ acres, $SD = 11.58$). Percent canopy cover ranged from 13.33 to 88.57 % ($M = 48.48$, $SD = 20.88$). The number of open spaces across all parks ranged from 0 to 6 ($M = 2.48$, $SD = 2.00$). Benches and trash cans were present in every park. A play set was present in over 95 % of parks. The majority of parks had at least one court ($M = 1.00$, $SD = 0.775$) available. Picnic areas ($M = 0.29$, $SD = 0.463$), shelters ($M = 0.24$, $SD = 0.436$), restrooms ($M = 0.24$, $SD = 0.436$), and trails ($M = 0.43$, $SD = 0.598$) were less common across parks. Wooded areas were present in nearly 62 % of parks. Shrubs (28.6 %), landscaping beds (28.6 %), and flowers (9.5 %) were less present.

TABLE 2 Park characteristics by area race/ethnicity and income

Characteristics	Tract race/ethnicity			Tract income	
	All parks (n = 21)	Minority (n = 14)	Non-minority (n = 7)	Low (n = 7)	Medium-high (n = 14)
Acres					
Range	4–46	4–30	5–46	4–13	4–46
Mean	13.14	11.71	16	7.57	15.93
SD	11.58	8.80	16.27	3.51	13.25
Open spaces					
Range	0–6	1–6	0–5	1–6	0–5
Mean	2.48	2.93	1.57	2.93	1.57
SD	2.00	1.94	1.90	1.94	1.90
Benches					
Range	1–11	1–7	1–11	1–7	1–11
Mean	3.81	3.86	3.71	3.86	3.71

SD	2.66	2.28	3.50	2.28	3.50
Courts					
Range	0–3	0–2	0–3	0–2	0–3
Mean	1.00	0.86	1.29	0.86	1.29
SD	0.775	0.535	1.11	0.535	1.11
Drinking fountains					
Range	0–1	0–1	0–1	0–1	0–1
Mean	0.38	0.50	0.14	0.50	0.14
SD	0.498	0.519	0.378	0.519	0.378
Fields					
Range	0–2	0–1	0–2	0–1	0–2
Mean	0.19	0.14	0.29	0.14	0.29
SD	0.512	0.363	0.756	0.363	0.756
Picnic areas					
Range	0–1	0–1	0–1	0–1	0–1
Mean	0.29	0.36	0.14	0.36*	0.14
SD	0.463	0.497	0.378	0.497	0.378
Restrooms					
Range	0–2	0–2	0.0	0–2	0.0
Mean	0.24	0.36	0.0	0.36	0.0
SD	0.436	0.745	0.0	0.745	0.0
Shelters					
Range	0–1	0–1	0–1	0–1	0–1
Mean	0.24	0.29	0.14	0.29	0.14
SD	0.436	0.469	0.378	0.469	0.378
Trails					
Range	0–2	0–1	0–2	0–1	0–2
Mean	0.43	0.29	0.71	0.29	0.71
SD	0.598	0.469	0.756	0.469	0.756
Trash cans					
Range	1–6	1–6	1–4	1–6	1–4
Mean	2.76	3.21*	1.86	3.21*	1.86
SD	1.51	1.48	1.22	1.48	1.22
Tree canopy					
Range	13.33–88.57	13.33–80.00	20.00–88.57	13.33–64.00	20.0–88.57
Mean	48.48	43.215	59.02	35.74*	54.85
SD	20.88	18.49	22.74	16.35	20.40
Play sets					
Presence (%)	95.2	100	85.7	100	92.9
Absence (%)	4.8	0	14.3	0	7.1
Wooded areas					
Presence (%)	61.9	42.9	100	100	78.6
Absence (%)	38.1	57.1*	0.0	0.0*	21.4
Flowers					

Presence (%)	9.5	14.3	0.0	28.6	0.0
Absence (%)	90.5	85.7	100	71.4	100
Shrubs					
Presence (%)	28.6	35.7	14.3	57.1	14.3
Absence (%)	71.4	64.3	85.7	42.9	85.7
Landscaping beds					
Presence (%)	28.6	35.7	14.3	57.1	14.3
Absence (%)	71.4	64.3	85.7	42.9	85.7

* $p < 0.05$

Features across all parks in excellent condition (Table 3) included places to sit and rest (63.2 %), trail benches (71.4 %), fields (66.7 %), playsets (80.0 %), trails (85.7 %), and trash cans (76.2 %). Courts (71.4 %), drinking fountains (88.9 %), shelters (60.0 %), flowers (100 %), shrubs (66.7 %), and landscaping beds (100 %) were primarily in poor to fair condition.

TABLE 3 Comparison of condition of park features by race/Ethnicity and income

Conditions	Tract race/ethnicity			Tract income	
	All parks <i>N</i> = 21	Minority (<i>n</i> = 14)	Non-minority (<i>n</i> = 7)	Low (<i>n</i> = 7)	Medium-high (<i>n</i> = 14)
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Sitting and resting					
Poor-fair	7 (36.8)	6 (42.9)	1 (20.0)	2 (28.6)	5 (41.7)
Excellent	12 (63.2)	8 (57.1)	4 (80.0)	5 (71.4)	7 (58.3)
Benches (trail)					
Poor-fair	2 (28.6)	1 (33.3)	1 (25.0)	1 (100)	1 (16.7)
Excellent	5 (71.4)	2 (66.7)	3 (75.0)	0 (0)	5 (83.3)
Courts					
Poor-fair	10 (71.4)	8 (72.7)	2 (66.6)	3 (60.0)	7 (77.8)
Excellent	4 (28.6)	3 (27.3)	1 (33.3)	2 (40.0)	2 (22.2)
Drink fountains					
Poor-fair	8 (88.9)	8 (100)	0 (0)	5 (100.0)	3 (75.0)
Excellent	1 (11.1)	0 (0)	1 (100)	0 (0)	1 (25.0)
Fields					
Poor-fair	1 (33.3)	0 (0)	1 (100)	0 (0)	1 (100)

	2 (66.7)	2 (100)	0 (0)	2 (100)	0 (0)
Excellent					
Play set					
Poor–fair	4 (20.0)	3 (21.4)	1 (16.7)	3 (42.9)	1 (7.7)
Excellent	16 (80.0)	11 (78.6)	5 (83.3)	4 (57.1)	12 (92.3)
Shelters					
Poor–fair	3 (60.0)	3 (75.0)	0 (0)	2 (66.6)	5 (41.7)
Excellent	2 (40.0)	1 (25.0)	1 (100)	1 (33.3)	7 (58.3)
Trails					
Poor–fair	1 (14.3)	1 (33.3)	0 (0)	0 (0)	1 (16.7)
Excellent	6 (85.7)	2 (66.7)	4 (100)	1 (100)	5 (83.3)
Trash cans					
Poor–fair	5 (23.8)	5 (35.7)	0 (0)	2 (28.6)	3 (21.4)
Excellent	16 (76.2)	9 (64.3)	7 (100)	5 (71.4)	11 (78.6)
Flower condition					
Poor–fair	2 (100.0)	2 (100)	0 (0)	2 (100)	0 (0)
Excellent	0 (0.0)	0 (0)	0 (0)	0 (0)	0 (0)
Shrub condition					
Poor–fair	4 (66.7)	3 (60.0)	1 (100)	3 (75.0)	1 (50.0)
Excellent	2 (33.3)	2 (40.0)	0 (0)	1 (25.0)	1 (50.0)
Landscaping beds					
Poor–fair	6 (100)	5 (100)	1 (100)	4 (100)	2 (100)
Excellent	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Frequencies for the cleanliness of features for all study parks are reported in Table 4. The majority of park features were found to be mostly to extremely clean. However, places to sit and rest were nearly evenly split between not at all to somewhat clean (47.4 %) and mostly to extremely clean (52.6 %). Picnic areas were evenly split between not at all to somewhat clean and mostly to extremely clean.

TABLE 4 Comparison of cleanliness of park features by race/ethnicity and income

Cleanliness	Tract race/ethnicity			Tract area income	
	All parks (N = 21)	Minority (n = 14)	Non-minority (n = 7)	Low (n = 7)	Medium-high (n = 14)
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Sitting and resting					
Not at all–somewhat	9 (47.4)	9 (64.3)*	0 (0)	3 (42.9)	6 (50.0)
Mostly–extremely	10 (52.6)	5 (35.7)*	5 (100)	4 (57.1)	6 (50.0)
Benches (trail)					
Not at all–somewhat	1 (14.3)	1 (33.3)	1 (25.0)	0 (0)	1 (16.7)
Mostly–extremely	6 (85.7)	2 (66.7)	3 (75.0)	1 (100)	5 (83.3)
Open space					
Not at all–somewhat	1 (5.6)	1 (7.1)	0 (0)	1 (14.3)	0 (0)
Mostly–extremely	17 (94.4)	13 (92.9)	4 (100)	6 (85.7)	11 (100)
Picnic areas					
Not at all–somewhat	3 (50.0)	2 (40.0)	1 (100)	2 (50.0)	1 (50.0)
Mostly–extremely	3 (50.0)	3 (60.0)	0 (0)	2 (50.0)	1 (50.0)
Fields					
Not at all–somewhat	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mostly–extremely	3 (100)	2 (100)	1 (00)	2 (100)	1 (100)
Wooded area					
Not at all–somewhat	3 (23.1)	3 (50.0)	0 (0)	1 (50.0)	2 (18.2)
Mostly–extremely	10 (76.9)	3 (50.0)	7 (100)	1 (50.0)	9 (81.8)
Shelters					
Not at all–somewhat	1 (20.0)	1 (25.0)	0 (0)	1 (33.3)	0 (0)
Mostly–extremely	4 (80.0)	3 (75.0)	1 (100)	2 (66.7)	2 (100)
Trails					
Not at all–somewhat	1 (14.3)	1 (33.3)	0 (0)	0 (0)	1 (16.7)
Mostly–	6 (85.7)	2 (66.7)	4 (100)	0 (0)	5 (83.3)

extremely					
Trash cans					
Not at all–somewhat	3 (14.3)	3 (21.4)	0 (0)	2 (28.6)	1 (7.1)
Mostly–extremely	18 (85.7)	11 (78.6)	7 (100)	5 (71.4)	13 (92.9)
Landscaping beds					
Not at all–somewhat	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mostly–extremely	6 (100)	5 (100)	1 (100)	4 (100)	2 (100)

* $p < 0.05$

Comparisons by Area Racial Composition

Table 2 shows the comparisons of quantities and presence/absence of park characteristics and features in minority and non-minority areas. Park sizes in minority areas ranged from 4 to 30 acres ($M = 11.71$). A wider range and greater acreage of parks was observed in non-minority areas (5–46 acres, $M = 16.0$). Mean number of park acres, courts, fields, restrooms, trails, drinking fountains, picnic areas, shelters, percent canopy, benches, and trash cans were compared across parks located in minority and non-minority areas. A marginally significant difference was observed between the number of trash cans in parks located in non-minority and minority areas ($t = -2.10$, $df = 19$, $p = 0.050$). No differences between non-minority and minority park areas were found for other count variables. Wooded areas were significantly more likely to be located in parks in non-minority areas rather than in parks in minority areas ($p = 0.015$). Presence of flowers, landscaping beds, and shrubs was too scarce to test for significant associations.

Comparisons between minority and non-minority areas yielded no significant associations for the condition of park features. Park features in minority areas were largely mostly to extremely clean (Table 4). However, all picnic areas were rated as not at all to somewhat clean in non-minority areas. Places to sit and rest were also less clean (e.g., litter surrounding tables) in parks in minority areas compared to those in parks in non-minority areas ($p = 0.022$).

Comparisons by Area Income

As shown in Table 2, park sizes in low-income areas ranged from 4 to 13 acres ($M = 7.57$). Parks in medium-high income areas ranged from 4 to 46 acres in size ($M = 15.93$). Low-income parks had significantly greater number of trash cans compared to medium-high income parks ($t = -2.68$, $df = 19$, $p = 0.015$). Extent of tree canopy varied across groups, with a higher percentage observed in medium-high income park areas versus low-income park areas ($t = 2.15$, $df = 19$, $p = 0.045$). Fisher's Exact test indicated that wooded areas were significantly more likely to be located in parks in medium-high income areas rather than in parks in low-

income areas ($p = 0.041$). The number of picnic areas was also significantly different ($U = 70.0, p = 0.046$) between the medium-high and low-income park areas. More picnic areas were observed in parks located in low-income areas as compared to those located in medium-high income areas. No differences between park areas were found for other count variables.

The condition of all landscaping beds, drinking fountains, trail benches, and flowers in low-income area parks were rated poor to fair (Table 3). No associations were observed between condition of park characteristics and area income composition. The cleanliness of medium-high income area parks was similar to that of low-income area parks. Most features in both areas were rated as mostly to extremely clean with the exception of picnic areas and sitting and resting features. In both areas, these features were nearly evenly split between mostly to extremely clean and not at all to somewhat clean.

Discussion

This study compared built and natural park features and their condition by area racial and income composition. It contributes to an emerging literature on disparities in specific park characteristics that associate with physical activity and weight status.^{27,28,39} Several differences between the number, presence or absence, conditions, and cleanliness of park features were found. For example, more trash cans were present in parks in minority areas, but sitting and resting amenities were less clean than those in non-minority area parks. In addition, fewer wooded areas were founded in minority area parks. Low-income area parks, which were also minority status, had more trash cans and picnic areas but less tree canopy cover and fewer wooded areas than medium-high income parks. These results extend the literature on park disparities and have several practical implications.

First, finding fewer wooded areas in minority areas and less tree cover in low-income areas aligns with a previous study that found that urban trees were unevenly distributed by race/ethnicity and income in Baltimore, MD.⁴⁵ Our findings also align with studies that found fewer street trees in poor and minority areas in Tampa, FL⁴⁶ and New York, NY.⁴⁷

The presence of wooded areas and trees are significant because esthetic preferences for trees and other natural characteristics are related to greater park use and walking for physical activity.^{31,37,48,49} Urban trees have also been linked to improved cognitive functioning and psychological well-being.⁵⁰⁻⁵² Fewer wooded areas in minority and low-income areas suggest that residents of low-income and minority neighborhoods may lack the health benefits that these natural park features convey. Such disparities could be remedied in part by planting and managing trees in at-risk areas as well as by ordinances that preserve and protect urban trees.

Second, results indicating that parks in minority areas had less clean sitting and resting areas compared to parks in non-minority areas mirrors research that found more incivilities present in parks surrounded by neighborhoods with greater percentages of racial/ethnic minorities.³⁸ Disparities in quality have also been observed at the neighborhood level, with more

physical disorder (e.g., trash) present in predominantly African-American areas⁵³ and in neighborhoods characterized by lower income and higher ethnic minority concentrations.⁵⁴ Our results seemed to contradict the presence of more trash cans in these low-income and minority parks. This could be explained by larger park sizes in these areas (i.e., larger parks need more trash cans). Nevertheless, our findings may indicate that park maintenance in these areas was lacking. They could also indicate a greater intensity of park use in minority areas than intensity of park use in non-minority areas. Negative characteristics of built environments have been associated with lower physical activity levels.^{27,55} Poor quality park environments may be barriers to park-based physical activity. The perception of better quality parks has been shown to increase the likelihood of park use for physical activity among a sample of predominantly African-American adolescents.⁵⁶ Studies have demonstrated that litter can reduce perceptions of safety.⁵⁷ Perceived safety contributes to increased physical activity in neighborhoods and parks.^{7,37} Therefore, park maintenance routines that keep parks clean and operational could increase park use and physical activity.⁵⁸ This can be particularly important in areas at highest risk for inactivity. Further research is needed to examine how park maintenance routines are executed in parks across areas of differing income and race/ethnicity composition and other variables that could help explain why cleanliness varied across these areas.

Third, more picnic areas found in low-income area parks compared to medium-high income area parks is contrary to a previous study that found more picnic tables in public open spaces in higher SES areas as compared to lower SES areas.²⁹ At first glance, the finding in the current study is encouraging as a larger diversity of park elements and features can promote park use. However, picnic areas have been found to afford primarily sedentary uses.⁴² Therefore, they may draw people to parks and provide positive social benefits (e.g., socialization, family togetherness), but these areas may not conduce higher intensity (e.g., moderate to vigorous) physical activities. Because parks serve multiple purposes, careful consideration must be given to balancing provision of features that both promote active and passive park uses.

Two main theoretical implications emerge from this study. First, findings are consistent with environmental justice and deprivation amplification frameworks that contend that the availability of health-promoting resources and their quality and condition vary across areas of disparate demographic composition.^{25,59} Second, findings suggested a link between micro-level features and how they may amplify area advantages and disadvantages. For example, disparities in the number and or condition of park features may prevent use and therefore indirectly compound area health disparities. Future research framed by social ecological models should examine interactions of policy and environments to better understand how disparities in park features emerge and how they relate to park use and physical activity. For example, studies should examine the role of historical allocation of resources directed to parks across disparate racial and SES areas to understand disparities in park features and conditions.

Conclusion

This study extended beyond disparities in the availability and counts of parks and recreation facilities across areas of differing demographic characteristics. Few studies have examined natural characteristics (i.e., wooded areas, open spaces, percent tree canopy) and the condition and cleanliness of park features and characteristics across areas of differing race/ethnicity and income composition. This unique contribution is important, given the role that these features and characteristics play in encouraging park use and physical activity. There were several limitations of this study. First, the use of cross-sectional data prevented examination of causal relationships. For example, the analysis cannot establish whether low-income and minority residents migrate to areas in the city with a particular quantity and quality of parks or whether parks are developed and maintained in response to income and racial composition of surrounding neighborhoods. The inclusion of historical analysis⁶⁴ and inter-neighborhood residential migration patterns⁶⁰ can be used to address such issues in future research. Second, in this relatively small sample of parks, findings are not broadly generalizable to all municipal park systems. Third, subdividing parks into activity zones or target areas⁶¹ could have yielded more detailed data about specific behavior settings and how they vary by area race and income.⁶² Further research is also needed to not only make comparisons of availability, condition, and cleanliness but to also examine whether disparities in these park attributes contribute to disparities in park use and physical activity.

Overall, relatively few differences were found in the number and character of natural and built park features across areas of different race/ethnicity and income characteristics. However, because parks are modifiable, findings related to wooded areas, cleanliness, trash cans, and picnic areas can inform policy, design, and maintenance. Tree planting policies and maintenance standards for pruning and refuse collection could be established or revisited to insure that services and amenities are equitably provided. Such actions could enhance the positive influence parks can have in promoting physical activity and associated health benefits, particularly for communities at-risk.

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