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# Disparities in Physical Activity Resource Availability in Six US Regions

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## Abstract

We conducted an ecologic study to determine physical activity resource availability overall and by sociodemographic groups in parts of six states (CA, IL, MD, MN, NC, NY). Data on parks and recreational facilities were collected from 3 sources in 2009–2012. Three measures characterized park and recreational facility availability at the census tract level: presence of ≥1 resource, number of resources, and resource kernel density. Associations between resource availability and census tract characteristics (predominant racial/ethnic group, median income, and proportion of children and older adults) were estimated using linear, binomial, and zero-inflated negative binomial regression in 2014. Pooled and stratified analyses were conducted. The study included 7,139 census tracts, comprising 9.5% of the 2010 US population. Overall the availability of parks and recreational facilities was lower in predominantly minority relative to non-Hispanic white census tracts. Low-income census tracts and those with a higher proportion of children had an equal or greater availability of park resources but fewer recreational facilities. Stratification revealed substantial variation in resource availability by state. The availability of physical activity resources varied by sociodemographic characteristics and across regions. Improved knowledge of resource distribution can inform strategies to provide equitable access to parks and recreational facilities.

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### Keywords

parks and recreation; physical activity; geographic information systems (GIS); policy; environment

## INTRODUCTION

Many Americans do not participate in regular physical activity, especially low-income, minority, and older adults (Carlson et al., 2010; Tucker et al., 2011). In the United States (US), physical inactivity contributes to 7% of the burden of cardiovascular disease and 11% of premature mortality (Lee et al., 2012). Proximity to physical activity resources, such as public parks and commercial recreational facilities, is associated with higher prevalence of physical activity (Coombes et al., 2010; Coutts et al., 2013; Gordon-Larsen et al., 2006; Hanibuchi et al., 2011; Kaczynski and Henderson, 2007; West et al., 2012).

Access to and the diversity of features offered by a physical activity resource may affect both the decision to use resources and the intensity of physical activity undertaken during visits (Bedimo-Rung et al., 2005). Access includes availability (quantity of physical activity resources), while feature diversity refers to the different types of features available, such as courts and fields. Though rarely studied, feature diversity may be as important as proximity for determining how physically active individuals are during visits (Cohen et al., 2013; Kaczynski et al., 2008), and may encourage use throughout the year (Bedimo-Rung et al., 2005) and by more people (Godbey and Mowen, 2010).

Systematic variation in access to and diversity of resources may contribute to disparities in physical activity. For those living in a geographical location, access to physical activity resources may vary by the sociodemographic characteristics of that location, such as the predominant race/ethnic group, median income, or the prevalence of children or older adults (Abercrombie et al., 2008; Cohen et al., 2013; Estabrooks et al., 2003; Godbey et al., 2005; Kamel et al., 2014; Maroko et al., 2009; Moore et al., 2008; Nicholls, 2001; Roubal et al., 2015; Talen and Anselin, 1998; Vaughan et al., 2013; Weiss et al., 2011; Wolch et al., 2005). However, much of prior research concentrated on small geographical areas and considered only public or commercial resources, which may be differently distributed with respect to sociodemographic characteristics (Diez Roux et al., 2007; Smiley et al., 2010).

We conducted an ecologic analysis of the distribution of physical activity resources in six large areas using data collected as part of the Multi-Ethnic Study of Atherosclerosis (MESA). Our aim was to determine the availability of parks and recreational facilities overall and by race/ethnicity, income, and age using three different measures: presence of parks and facilities, counts of both, and kernel densities. Kernel density measures were advantageous because they were unconstrained by census tract boundaries, yielding continuous estimates of resource availability (Maroko et al., 2009; Moore et al., 2008). Thus, these measures avoided the assumption that people only use resources located within their home census tract.

# METHODS

## Study population

MESA is a cohort study of subclinical cardiovascular disease (Bild et al., 2002). Participants were recruited from Los Angeles, CA; Chicago, IL; Baltimore and Baltimore County, MD; St. Paul, MN; Forsyth County, NC; and New York City, NY.

Data on parks and recreational facilities were collected for ZIP codes located within 5 miles (8,047 m) of the homes of ≥5 MESA participants. This area included all or part of 7,910 census tracts. Census tracts are generally county subdivisions with a population of 1,200–8,000 people (US Census Bureau, 2012). We limited our study to census tracts with complete physical activity resource information by excluding census tracts with >1% of their area outside of the study boundaries (N=668) or lacking data on recreational facilities (N=24). We further excluded census tracts with zero population (N=36) and missing median household income data (N=43). The final sample comprised 7,139 census tracts in 37 counties in six states, corresponding to 9.5% of the 2010 US population.

## Measures

Data on parks were collected from local governments (2009–2012) and a commercial source (Esri, Redlands, CA, 2010). Park locations and features (Table A1) were verified by online searches, contacting recreation departments, or visiting the park. Additional details on the collection of parks data are in (Evenson and Wen, 2013). We excluded locations not primarily intended for physical activity by the general public (e.g. cemeteries, zoos), trails not within parks, and parks containing only walking trails, dog parks, ornamental features, or playgrounds. Stand-alone trails and playgrounds were excluded because complete data were not available for all sites and because playgrounds were often in private parks, which were not part of our study.

Locations of commercial recreational facilities were purchased from the National Establishment Time Series (NETS, 2010) (Walls & Associates, 2010). The NETS database was constructed from Dun and Bradstreet data and included facilities such as conditioning, dance, bowling, and racquet sport establishments (Table A2) (Gordon-Larsen et al., 2006; Powell et al., 2007; Walls & Associates, 2010). Facilities used only by children (e.g., youth center, day camp), only for weight reduction or spa treatment, or that were not significant sources of physical activity for adults (e.g., lifeguard services) were excluded because the MESA cohort is comprised of adults and data accuracy was questionable due to undercounting and seasonal operation. Most NETS facilities were geocoded to the street level/block face with few geocoded to ZIP code centroids.

Three measures of availability were constructed for parks and recreational facilities: presence of ≥1 resource, count of resources, and kernel density. Presence of a park or recreational facility was a binary indicator of ≥1 park/facility intersecting the census tract. The count of resources was the number of parks/facilities intersecting the census tract. We also measured the diversity of park features as a count of unique types of features within parks per census tract (Moore et al., 2008). For instance, a census tract containing one park with two pools and a baseball diamond and a second park with a pool had two feature types (pool and baseball diamond) for the census tract.

Kernel densities of parks and recreational facilities were calculated in ArcGIS version 10.1 after portioning the study area into 100 × 100 m grid-cells. We can conceptualize kernel density estimation as placing a cone over each point representing a park or recreational facility. Cones had a 1.0-mile (1609 m) kernel radius with a bivariate normal decay to represent less access to resources with increasing distance because adults in the study area reported being physically active within a mile of home (Diez Roux et al., 2007). The grid-cell density was the sum of all kernels intersecting that cell. The census tract density was the mean for all cells within a census tract.

Census tract population, racial/ethnic, and age composition were defined from the 2010 Census (US Census Bureau, 2010). Predominant racial/ethnic group was defined by ≥60% of residents identifying as Hispanic, non-Hispanic black, Hispanic and/or black, or non-Hispanic white. Census tracts without a predominant group were classified as multi. For each census tract we also calculated the proportion of children <18 years (≤15%, >15–22.5%, >22.5–30%, >30%) and adults ≥65 years (≤5%, >5–10%, >10–15%, >15%). Median household income was categorized into site-specific tertiles from the 2007–2011 American Community Survey 5-year summary file (US Census Bureau, 2011). Predominant racial/ethnic group and median household income categorizations were consistent with categories used by (Moore et al., 2008). Categories for the proportion of children and older adults were selected empirically to ensure interpretability and stability of coefficients while capturing diversity across sites.

### Statistical analyses

Regression models were used to explore resource availability by census tract sociodemographic characteristics (predominant race/ethnicity, income, proportion of children and older adults). We conducted pooled and site stratified analyses. Site-specific results are presented in supplementary tables. Binomial regression with robust variance was used for two of eight dependent variables: presence of ≥1 park or recreational facility. Zero-inflated negative binomial (ZINB) regression was used for three dependent variables: count of parks, feature types, and recreational facilities. ZINB models accounted for excess zeros because 54% of census tracts contained no parks and 48% contained no recreational facilities. Binomial and ZINB models were adjusted for census tract area (site-specific quintiles) because larger census tracts may contain more resources by virtue of encompassing more space. We also explored adjusting for population density, which is correlated with census tract size. Results were generally similar to models not adjusting for population density, and thus are not presented. Coefficients from binomial models are interpretable as relative probabilities: the percentage change in probability of having ≥1 park or recreational facility associated with differences in sociodemographics. ZINB model coefficients are interpretable as relative ratios, i.e., ratios of the mean number of resources per census tract comparing tracts with different sociodemographic characteristics.

Kernel density measures for parks, recreational facilities, and total resources (parks + recreational facilities) were log transformed and modeled using linear regression fit by quasi-likelihood estimation for robust standard errors. These models were adjusted for population density using restricted quadratic splines. Exponentiated model coefficients represent relative differences in kernel density associated with differences in sociodemographic characteristics. A relative difference of 1.5 indicated a 50% higher mean density while a relative difference of 0.9 indicated a 10% lower mean density. To address potential spatial dependency, we estimated the Moran's I statistic for residuals from site-stratified kernel density models (Geoda, Tempe, AZ). Autocorrelation was low to moderate (Moran's I range 0.01 to 0.33), and we decided to present ordinary least square regression results. Correlation between the eight dependent variables was assessed by Spearman correlation coefficient. Statistical analyses conducted in SAS, version 9.3 (Cary, NC).

## RESULTS

A total of 6,028 parks (256 $mi^2$) and 8,174 recreational facilities were included (Table 1). The median number of resources per census tract was 0 parks, 0 types of park features, and 1 recreational facility.

Overall, 34% of census tracts were predominantly non-Hispanic white and the median household income was $54,007 (Table S1). The median proportions of children and older adults were 24% and 11%, respectively. On average, predominantly non-Hispanic white census tracts (N=2,453) had the highest median household income ($75,098) and percentage of older adults (14%). There were no predominantly Hispanic census tracts in MD, MN, or NC.

### Correlation between resource availability measures

Count measures were correlated more with the presence of ≥1 resources (Spearman correlation range 0.93–0.96) than with kernel densities (range 0.24–0.26, Table S2). Park kernel densities were moderately correlated with recreational facility (0.42) and total (0.70) densities. Recreational facility and total kernel densities were highly correlated (0.92).

### Presence of a park or recreational facility

In total, 46% of census tracts contained ≥1 park and 52% contained ≥1 recreational facility. The relative probability of having ≥1 park was 23% lower (0.77, 95% confidence interval (CI): 0.71, 0.84) for predominantly Hispanic compared to non-Hispanic white census tracts (Table 2). The probability of having ≥1 park did not differ by median household income or proportion of children, but census tracts with more older adults were more likely to contain a park.

These patterns varied significantly by site (p-values <0.001 for interaction by site and sociodemographic characteristics in models). For instance, compared to non-Hispanic white census tracts, predominantly minority census tracts were 1.40 to 1.81 times as likely to contain ≥1 park in CA, but 0.69 to 0.82 times as likely in IL (Table S3).

With respect to recreational facilities, predominantly minority and low-income census tracts were 0.55 to 0.62 times as likely to have ≥1 facility (Table 2). The relative probability of ≥1 facility was lower in census tracts with a higher proportion of children but was not associated with the proportion of older adults. Results from site-stratified models were similar (Table S4). Results did not change when models were adjusted for population density (data not shown).

### Park and recreational facility kernel densities

The mean kernel density of parks was 30% higher in predominantly non-Hispanic black and 31% lower in predominantly Hispanic compared to non-Hispanic white census tracts (Table 3). However, mean park kernel density was higher in all predominantly minority census tracts in CA, NC, and NY (Table S5). Mean park kernel density also was highest for low-income census tracts overall, but was not associated with income in CA, IL, or MN. The kernel density of parks was not associated with the proportion of children or older adults overall but was positively associated with a higher proportion of older adults in IL and MN.

The mean kernel density of recreational facilities was lower in predominantly minority, low-income, and census tracts with a higher proportion of children, but was not associated with the proportion of older adults overall (Table 3). However, recreational facility kernel density differed little by race/ethnicity or income in MD and MN (Table S6). Mean recreational facility kernel density was higher in census tracts with a larger proportion of older adults in NC, but lower in IL. Patterns in the kernel density of total resources were similar to those for recreational facilities (Tables 3 and S7).

### Number of parks, park feature types, and recreational facilities per census tract

There were 25–50% fewer parks and 14–33% fewer unique park feature types in predominantly minority compared to non-Hispanic white census tracts, but 15% more parks in low- compared to high-income census tracts (Table 4). However, predominantly non-Hispanic black census tracts in CA and Hispanic census tracts in NY had a higher number of parks (Table S8). Also, there were fewer parks in low-income census tracts in CA and IL, but the number of feature types differed little by income (Table S9). A higher proportion of children was associated with a larger number of parks but fewer park feature types (Table 4).

Predominantly minority race/ethnicity, low-income, and a higher proportion of children were associated with a lower number of recreational facilities per census tract (Table 4), with few differences by site (Table S10). There was little difference by proportion of older adults.

## DISCUSSION

We described the availability of public parks and commercial recreational facilities by sociodemographic characteristics across 7,139 census tracts comprising nearly 10% of the US population. The availability of parks and recreational facilities was lower in some predominantly minority compared to non-Hispanic white census tracts. Low-income census tracts and those with a higher percentage of children had an equal or greater availability of park resources but fewer recreational facilities. Further stratification by site revealed substantial variation from this overall pattern.

Parks were more available in predominantly minority compared to non-Hispanic white census tracts in CA, NC, and NY. A higher number of parks and park features previously were identified in predominantly minority neighborhoods in urban centers (Cutts et al., 2009; Moore et al., 2008; Weiss et al., 2011). However, unlike a previous study (Wolch et al., 2005), we identified greater availability of parks in predominantly minority Los Angeles census tracts. This discrepancy may be due to different metrics (the prior study explored park acreage per 1,000 population) and study boundaries.

In most areas, the number of park feature types was similar regardless of predominant racial/ethnic group, as reported previously (Vaughan et al., 2013). However, park feature diversity may be especially important in predominantly minority areas because of lower availability of recreational facilities. A lack of recreational facilities in minority areas is concerning because the availability of physical activity resources may have a larger impact on physical activity among minority populations (Diez Roux et al., 2007).

Regional variation may contribute to inconsistent findings regarding park availability to low-income neighborhoods. Although the number and size of parks (Cohen et al., 2013), and number of park features (Vaughan et al., 2013) varied little by income in some cities, parks were less prevalent (Powell et al., 2004; Wolch et al., 2005), smaller (Cohen et al., 2012a), or had fewer features (Kamel et al., 2014; Weiss et al., 2011) in other low-income areas. In our study, low-income was associated with greater availability of parks in MD, NC, and NY but in CA and IL, the kernel density of parks and number of feature types were similar by income. In contrast, low-income was associated with lower availability of recreational facilities (except in MN and CA), congruent with national studies (Gordon-Larsen et al., 2006; Powell et al., 2006). However, the density of total resources was similar in low- and high-income census tracts, except in MD and IL.

Differential availability of resources by income is important. Access to fitness equipment is associated with greater physical activity, but low-income individuals are less likely to be able to purchase equipment and to have access to indoor facilities (Brownson et al., 2000) or private outdoor space (Shores and West, 2008). Moreover, free public resources may be essential for low-income populations that cannot afford to pay commercial facilities fees.

Similarly, local availability may be especially important for children and older adults who spend more time near home with limited transportation (Van Cauwenberg et al., 2011; Yen et al., 2009). Less than one third of children and older adults meet physical activity guidelines (Carlson et al., 2010; Centers for Disease Control and Prevention (CDC), 2014). However, park proximity is associated with greater physical activity in both subgroups (Cohen et al., 2006; Hanibuchi et al., 2011; Payne et al., 2005; White et al., 2010). Consistent with prior studies (Abercrombie et al., 2008; Cutts et al., 2009; Nicholls, 2001; Wolch et al., 2005), resources were equally or more available in census tracts with a larger proportion of older adults while census tracts with a larger proportion of children had fewer recreational facilities at all sites and fewer parks in MD, NC, and NY. These findings may be influenced by exclusion of some child-specific commercial recreational facilities. If excluded resources were located primarily in census tracts with more children, their exclusion may have biased our estimates of the association between commercial facility availability and proportion of children.

## Strengths and Limitations

Strengths of this study include comprehensive description of public parks and commercial recreational facilities over a large area and employing count and kernel density measures of availability. Few prior studies considered the distribution of both parks and recreational facilities to provide a more complete understanding of resource availability (Abercrombie et al., 2008; Estabrooks et al., 2003; Gordon-Larsen et al., 2006; Moore et al., 2008; Roubal et al., 2015). Additionally, most were conducted mostly in small geographic areas (Maroko et al., 2009; Vaughan et al., 2013; Weiss et al., 2011). Interestingly, count and kernel density metrics yielded comparable results for resource availability by sociodemographic characteristics.

A limitation of this study was using census tracts as the analysis unit, which may not reflect true neighborhood boundaries (Coutts et al., 2013). However, kernel densities measured availability of resources across geographic boundaries that helped overcome this limitation.

Another limitation was that the extent of development, attractiveness, and quality of physical activity resources were unmeasured. The extent of park development may vary by site and size, with more undeveloped land (e.g., forest) in NC and larger parks (Cohen et al., 2011; Maroko et al., 2009). Additionally, park features may not be appropriate for all people due to regional and demographic differences in preferences (Loukaitou-Sideris and Sideris, 2010; Payne et al., 2005; Spengler et al., 2011). Moreover, poor condition of features and hazards like broken glass may limit the use of resources in a way that is distinct from proximity (Loukaitou-Sideris and Stieglitz, 2002) and may be more common in low-income and predominately minority areas (Kamel et al., 2014). Future research also should include rural areas, as our study area was urban and suburban.

Further, trails and child-specific recreational facilities were excluded, and some recreational facilities may have been missing from the NETS data (Boone et al., 2008; Hoehner and Schootman, 2010). However, park data were carefully validated (Evenson and Wen, 2013), and we were able to geocode most NETS facilities to the block group level. Previously, 98% of geocoded NETS facilities were in the same block group compared to a field census (Boone et al., 2008). However, the combined effects of undercounting and geocoding errors are unknown, so associations must be interpreted cautiously. Finally, this ecologic analysis did not account for individual usage of or perceived access to resources, or the number of people using each resource.

## Conclusion

The availability of physical activity resources by census tract sociodemograhic characteristics varied substantially across sites. This may be due to differences in the policies governing the development and management of parks and zoning regulations for commercial facilities. Variation in resource availability may contribute to worse risk factor profiles (Mujahid et al., 2011; Winston et al., 2009), less physical activity (Diez Roux et al., 2007), and earlier onset of cardiovascular disease (Feinstein et al., 2012) among minority and low-income MESA participants. Indeed, MESA participants living in neighborhoods with more resources were more likely to be physically active (Diez Roux et al., 2007) and to maintain activity as they aged (Ranchod et al., 2014).

Knowledge of physical activity resource distribution can inform efforts to foster equitable access. Where physical activity resources are scarce, developing new parks or opening school facilities to the community after hours may increase opportunities for physical activity (Mowen and Baker, 2009). Where parks exist, the focus could be on understanding how parks can better support physical activity among vulnerable populations (Cohen et al., 2012b; Veitch et al., 2014).

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## Abbreviations

| | |
|---|---|
| **MESA** | Multi-Ethnic Study of Atherosclerosis |
| **NETS** | National Establishment Time Series |
| **ZINB** | zero-inflated negative binomial |

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## Highlights

- We explored the distribution of physical activity resources in 7319 US census tracts
- Parks and recreational facility distribution varied by site and sociodemographics
- There were fewer physical activity resources in some predominantly minority areas
- Fewer recreational facilities were in tracts with more children or lower income
- Kernel density and count measures of resource availability yielded similar results

## Table 1

2010 census tract area, population, parks and recreational facilities, overall and by study site

| | | Site | | | | | |
|---|---|---|---|---|---|---|---|
| | **Overall (n=7139)** | **CA (n=2491)** | **IL (n=1417)** | **MD (n=501)** | **MN (n=544)** | **NC (n=316)** | **NY (n=1870)** |
| Total population | 29,568,669 | 11,378,352 | 5,537,253 | 1,871,529 | 2,109,740 | 1,322,955 | 7,348,840 |
| Total area, $mi^2$ | 9,506 | 2,118 | 1,081 | 952 | 1080 | 4035 | 240 |
| Mean census tract area, $mi^{2a}$ | 1.33 (0.52) | 0.85 (2.45) | 0.76 (1.08) | 1.90 (3.46) | 1.99 (4.02) | 12.77 (19.43) | 0.13 (0.21) |
| Population density[a,b] | 21,510 (27,712) | 12,331 (10,155) | 13,100 (17,763) | 6,975 (6,299) | 4,776 (3,800) | 1,407 (1,306) | 52,271 (34,960) |
| **Park Measures** | | | | | | | |
| Total park area ($mi^2$) | 256 | 34 | 45 | 61 | 61 | 39 | 16 |
| Parkland as % of census tract area[c] | 0 (0, 2.29) | 0 (0, 0.69) | 0.06 (0, 3.04) | 0.39 (0,3.94) | 3.10 (0.80, 6.67) | 0.12 (0, 1.73) | 0 (0, 2.27) |
| Parks per census tract[c] | 0 (0, 1) | 0 (0, 1) | 1 (0, 1) | 1 (0, 1) | 2 (1, 3) | 1 (0, 1) | 0 (0, 1) |
| Features types per census tract[c] | 0 (0, 3) | 0 (0, 2) | 1 (0, 4) | 1 (0, 4) | 5 (2, 7) | 1 (0, 4) | 0 (0, 2) |
| Park kernel density[c] | 1.01 (0.39, 2.01) | 0.48 (0.10, 0.86) | 1.18 (0.66, 1.80) | 0.61 (0.15, 1.50) | 1.56 (1.03, 2.26) | 0.09 (0.01, 0.55) | 2.64 (1.70, 4.46) |
| **Recreational Facility Measures** | | | | | | | |
| Total recreational facilities | 8,174 | 3,058 | 1,634 | 642 | 814 | 474 | 1,552 |
| Recreational facilities per census tract[c] | 1 (0, 3) | 1 (0,3) | 1 (0, 3) | 1 (0,3) | 2 (1, 3) | 2 (1, 3) | 1 (0, 2) |
| Recreational facility kernel density[c] | 1.88 (0.87, 4.02) | 1.53 (0.79, 2.95) | 1.51 (0.81, 2.71) | 1.24 (0.65, 2.01) | 1.18 (0.63, 1.93) | 0.26 (0.05, 0.77) | 4.74 (2.93, 7.84) |
| **Total kernel density[c,d]** | 3.13 (1.67, 6.20) | 2.17 (1.29, 3.65) | 2.85 (1.80, 4.37) | 2.03 (1.06, 3.65) | 2.93 (2.00, 3.91) | 0.48 (0.10, 1.43) | 8.09 (5.46, 12.58) |

CA: California; IL: Illinois; MD: Maryland; MN: Minnesota; NC: North Carolina; NY: New York

[a] Mean (standard deviation)

[b] Mean census tract population density: persons/$mi^2$

[c] Median (inter-quartile range)

[d] Total kernel density = kernel density of parks + kernel density of recreational facilities

## Table 2

Adjusted relative probability (95% CI)[a] of ≥1 park or recreational facility per census tract (N=7,139) by 2010 sociodemographic characteristics

| | ≥1 Park | ≥1 Recreational Facility |
|---|---|---|
| **Predominant race/ethnicity** | | |
| Hispanic | 0.77 (0.71, 0.83) | 0.55 (0.51, 0.60) |
| Non-Hispanic black | 0.98 (0.90, 1.06) | 0.61 (0.55, 0.67) |
| Hispanic / black | 1.01 (0.92, 1.11) | 0.62 (0.55, 0.69) |
| Multi | 0.87 (0.82, 0.92) | 0.91 (0.87, 0.95) |
| Non-Hispanic white | 1 | 1 |
| **Median income** | | |
| Low | 1.00 (0.94, 1.06) | 0.66 (0.62, 0.70) |
| Moderate | 0.95 (0.90, 1.00) | 0.83 (0.79, 0.87) |
| High | 1 | 1 |
| **% < 18 years** | | |
| >30% | 0.98 (0.88, 1.09) | 0.55 (0.50, 0.60) |
| >22.5– ≤30% | 1.06 (0.97, 1.17) | 0.72 (0.67, 0.78) |
| >15– ≤22.5% | 1.01 (0.92, 1.11) | 0.84 (0.78, 0.90) |
| ≤15% | 1 | 1 |
| **% ≥ 65 years** | | |
| >15% | 1.21 (1.08, 1.35) | 1.08 (0.99, 1.18) |
| >10– ≤15% | 1.16 (1.03, 1.30) | 1.01 (0.92, 1.10) |
| >5– ≤10% | 1.10 (0.98, 1.23) | 0.89 (0.81, 0.97) |
| ≤5% | 1 | 1 |

CI: confidence interval

[a]Adjusted for census tract area

## Table 3

Adjusted relative difference (95% CI)[a,b] in kernel densities by 2010 census tract (N=7,139) sociodemographic characteristics

| | Kernel Density Measure | | |
|---|---|---|---|
| | **Parks** | **Recreational Facilities** | **Total Physical Activity Resources**[c] |
| **Predominant race/ethnicity** | | | |
| Hispanic | 0.69 (0.63, 0.75) | 0.58 (0.54, 0.63) | 0.59 (0.56, 0.63) |
| Non-Hispanic black | 1.30 (1.20, 1.41) | 0.72 (0.67, 0.77) | 0.87 (0.82, 0.92) |
| Hispanic / black | 0.98 (0.89, 1.08) | 0.78 (0.72, 0.85) | 0.81 (0.76, 0.87) |
| Multi | 0.81 (0.77, 0.87) | 0.86 (0.82, 0.90) | 0.81 (0.77, 0.85) |
| Non-Hispanic white | 1 | 1 | 1 |
| **Median household income** | | | |
| Low | 1.20 (1.12, 1.28) | 0.79 (0.74, 0.84) | 0.91 (0.86, 0.95) |
| Moderate | 0.99 (0.94, 1.05) | 0.80 (0.77, 0.84) | 0.84 (0.81, 0.88) |
| High | 1 | 1 | 1 |
| **% <18 years** | | | |
| >30% | 0.93 (0.84, 1.03) | 0.29 (0.26, 0.32) | 0.40 (0.37, 0.44) |
| >22.5– ≤30% | 1.02 (0.93, 1.12) | 0.39 (0.36, 0.42) | 0.49 (0.46, 0.53) |
| >15– ≤22.5% | 1.00 (0.92, 1.09) | 0.52 (0.48, 0.56) | 0.59 (0.56, 0.63) |
| ≤15% | 1 | 1 | 1 |
| **% ≥65 years** | | | |
| >15% | 1.10 (0.93, 1.22) | 0.96 (0.87, 1.05) | 0.97 (0.90, 1.06) |
| >10– ≤15% | 1.11 (1.00, 1.24) | 0.96 (0.88, 1.05) | 0.98 (0.90, 1.06) |
| >5– ≤10% | 1.17 (1.06, 1.30) | 1.02 (0.94, 1.11) | 1.06 (0.98, 1.14) |
| ≤5% | 1 | 1 | 1 |

CI: confidence interval

[a] Adjusted for population density

[b] A relative difference of 1.5 indicates a 50% higher mean density; a relative difference of 0.9 indicates a 10% lower mean density

[c] Total physical activity resources = parks + recreational facilities

## Table 4

Adjusted relative ratio (95% CI)[a] of number of resources by 2010 census tract (N=7,139) sociodemographic characteristics

| | # Parks | # Park Feature Types | # Recreational Facilities |
|---|---|---|---|
| **Predominant race/ethnicity** | | | |
| Hispanic | 0.50 (0.44, 0.57) | 0.67 (0. 60, 0.76) | 0.67 (0.5 9, 0.76) |
| Non-Hispanic black | 0.67 (0.59, 0.76) | 0.86 (0.77, 0.96) | 0.59 (0.52, 0.68) |
| Hispanic / black | 0.75 (0.65, 0.86) | 0.86 (0.76, 0.98) | 0.62 (0.53, 0.73) |
| Multi | 0.67 (0.62, 0.73) | 0.81 (0.75, 0.87) | 0.88 (0.82, 0.95) |
| Non-Hispanic white | 1 | 1 | 1 |
| **Median household income** | | | |
| Low | 1.15 (1.05, 1.26) | 1.08 (0. 99, 1.18) | 0.66 (0.6 1, 0.73) |
| Moderate | 0.95 (0.88, 1.02) | 0.99 (0.92, 1.06) | 0.79 (0.73, 0.85) |
| High | 1 | 1 | 1 |
| **% <18 years** | | | |
| >30% | 1.34 (1.1 6, 1.56) | 0.85 (0. 74, 0.97) | 0.30 (0.2 6, 0.35) |
| >22.5– ≤30% | 1.37 (1.21, 1.55) | 0.85 (0.76, 0.95) | 0.39 (0.35, 0.43) |
| >15– ≤22.5% | 1.18 (1.05, 1.34) | 0.88 (0.79, 0.98) | 0.49 (0.45, 0.54) |
| ≤15% | 1 | 1 | 1 |
| **% ≥65 years** | | | |
| >15% | 1.16 (1.0 0, 1.36) | 1.07 (0. 93, 1.24) | 0.88 (0.7 7, 1.02) |
| >10– ≤15% | 1.14 (0.98, 1.32) | 1.08 (0.94, 1.24) | 0.92 (0.81, 1.06) |
| >5– ≤10% | 1.11 (0.96, 1.28) | 1.06 (0.93, 1.22) | 0.94 (0.83, 1.07) |
| ≤5% | 1 | 1 | 1 |

CI: confidence interval

[a]Adjusted for census tract area