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Neighborhood Poverty, Park Use, and Park-Based Physical Activity in a Southern California City

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Abstract

A rich literature indicates that individuals of lower socio-economic status engage in less leisure time physical activity than individuals of higher socio-economic status. However, the source of the difference is believed to be, in part, due to differential access to resources that support physical activity. However, it has not been shown as to whether equal access to parks can mitigate differences in leisure time physical activity. Using systematic direct observation, we quantified physical activity in neighborhood parks in a large Southern California city located in areas with high, medium, and a low percentage of households in poverty. We documented how neighborhood parks are managed and programmed and also interviewed both a sample of park users and a random sample of households within a mile radius of the parks. We found that parks are used less in high-poverty areas compared to medium- and low-poverty area parks, even after accounting for differences in size, staffing, and programming. The strongest correlates of park use were the number of part time staff, the number of supervised and organized programs, and knowing the park staff. Perceptions of safety were not relevant to park use among those interviewed in the park, however it had a small relationship with reported frequency of park use among local residents. Among park users, time spent watching electronic media was negatively correlated with the frequency of visiting the park. Future research should test whether increasing park staffing and programming will lead to increased park use in high-poverty neighborhoods.

Keywords

Physical activity; parks; Southern California; socio-economic status; poverty; park management

Among a wide variety of health risk factors, including diet, obesity, smoking, hypertension, high cholesterol, and diabetes, the largest attributable fraction for all-cause mortality is due to physical inactivity, accounting for 16% of all-cause deaths (Blair, 2009). This is somewhat surprising, because compared with most other health behaviors, physical activity requires minimal financial cost, since people can walk, jog, or run in the streets and recreate in public parks without charge. Nonetheless, many studies document substantial disparities in leisure time physical activity between low- and high income groups (Boone-Heinonen, Evenson et al., 2010; Cerin & Leslie, 2008; Drenowatz, Eisenmann et al., 2010; Kamphuis, van Lenthe et al., 2009; McNeill, Kreuter et al., 2006; McNeill, Wyrwich et al., 2006; Wilson, Kirtland et al., 2004).

The urban public parks movement was born partly in response to the crowded and substandard housing and working conditions of the urban poor in the late 19th century. This was in the midst of the Sanitary Revolution, a time when it became increasingly clear that the conditions in which people lived explained disparities in morbidity and mortality between the rich and the poor. New legislation mandated systems for clean water, disposal of sewage, and upgrades of substandard housing. As an adjunct to these efforts, parks were intended for people of all classes, so they could breathe air purified by sun and trees (Olmstead FL, 1870). Frederick Olmstead, the designer of New York City's Central Park, wrote extensively about the benefits of parks and envisioned them as oases in the midst of the industrialized urban landscape in which the lower classes, in particular, might find respite from the crowding, filth, and incivilities of city life.

Olmstead's belief that parks would ameliorate health problems was prescient, as we now understand that a variety of chronic diseases are associated with a lack of time spent outdoors. Heart disease and diabetes, for example, are associated with insufficient physical activity (Lee, Paffenbarger et al., 1997; Oldridge, 2008; Yu, Yarnell et al., 2003). Additionally, deficits of Vitamin D, manufactured by the body as a byproduct of sun exposure, are associated with poor health; in African Americans lower levels of Vitamin D have been associated with higher rates of cardiovascular disease (Fiscella & Franks, 2010; Harris, 2011), kidney disease (Diaz, Mainous et al., 2009; Williams, Malatesta et al., 2009), low birth-weight (Bodnar & Simhan, 2010; Leffelaar, Vrijkotte et al., 2010), and pediatric asthma (Hill, Graham et al., 2011). Indeed, beyond having reduced exposure to the sun, staying indoors has been found to exacerbate asthma from exposure to indoor pollution (Ahluwalia & Matsui, 2011; Rabito, Carlson et al., 2011). Moreover, high levels of television viewing are associated with obesity (Crespo, Smit et al., 2001; Robinson, 1999).

In the 1950's, as American society prospered after WWII and cities expanded beyond their core, more parks were built with facilities for sports, especially because land on the periphery was less expensive. City departments of recreation and parks were created to staff, manage, and run these facilities for the benefit of local citizenry. Today, parks throughout the US are extensively supported with infrastructure and are a major venue for physical activity. According to the National Recreation and Parks Association (NRPA), approximately 75% of all Americans live within two miles of a park (ICMA & NaCO, 2006).

Although parks have become a standard infrastructure in most American cities and populations have unfettered access, many obstacles to park use have developed. The development of rigorous housing standards has led to the building of attractive indoor home environments, reducing the motivation for many to spend time outdoors. As well, low-income groups often hold unpleasant perceptions of neighborhood conditions, high perceptions of crime, and unleashed dogs (Cerin & Leslie, 2008; Kamphuis, van Lenthe, Giskes et al., 2009; Wilson, Kirtland, Ainsworth et al., 2004) naming them as factors

reducing their park use. Individual factors have also been identified as restricting park use, including low self-efficacy for physical activity and limited perceived benefits and social support for physical activity. In one study, these subjective factors were shown to be key mediators that explained virtually all the differences in leisure time physical activity between persons of higher and lower socio-economic status (Cerin & Leslie, 2008). However, a limitation of these studies of leisure time physical activity has been the reliance on self-reported physical activity, which has been shown to have poor validity when compared to more objective measures (Fogelholm, Malmberg et al., 2006; Hagströmer, Oja et al., 2006).

Park facilities and scheduled, supervised activities are important resources for physical activity, particularly in urban, minority communities (Babey, Brown et al., 2005). Parks are also destinations to which people can walk – even though they may be sedentary after arriving there (MacDonald, Stokes et al., 2010). In some states, parks have been found to be more equitably distributed across neighborhoods of different socioeconomic status and racial-ethnic composition than commercial recreational facilities (Moore, Diez Roux et al., 2008). What is not known, however, is to what extent parks are used equitably across various communities, particularly for physical activity.

The mere existence of a park does not guarantee its use. Jane Jacobs recognized that parks could be harmful to safety and well-being as well as being helpful and that they did not automatically confer a boon on deprived urban populations (Jacobs, 1961). In her view, parks would only be well used if they were located in areas that supported heavy traffic and multiple uses. They would also more likely attract users if they provided “demand goods,” specialized features such as facilities like baseball fields and events such as concerts that draw people with unique interests. Jacobs noted that magnificent views and handsome landscaping alone are seldom sufficient to capture people’s leisure time, but they could be adjuncts to unique and attractive activities that add excitement and variety to an otherwise dull or inconvenient location.

This paper examines the use of 50 community parks, which we documented using systematic, direct observation and by surveying park users and local residents in neighborhoods of diverse socio-economic status and race/ethnicity. We conceptualized three different sets of factors affecting park use and park-based physical activity, including individual, park, and neighborhood characteristics. We examined the importance of neighborhood poverty in relationship to park-based physical activity.

Methods

We selected a sample of 50 neighborhood parks (27%) from 183 of those eligible in a large Southern California city. Eligible parks included those with recreation centers, at least one full time staff member and no excessive security concerns that limited park use, such as the local police precinct placing it under a gang injunction. (We excluded 3 for this reason.) Parks were selected to represent varied geographic areas in the city, and we sorted them based on the race/ethnicity composition of neighborhood census tracts (2000 US Census). Leisure time activities are likely influenced by cultural backgrounds and acculturation (Abraido-Lanza, Chao et al., 2005), and we wanted to observe park based activities among the diverse populations in the city. Given a predominantly Latino and non-Hispanic white populace, we oversampled parks in neighborhoods with higher percentages of Asians and African Americans. We also included parks where the population was diverse, where neither Whites, Latinos, African American, or Asians constituted a majority. We calculated the percentage of households living under the poverty level within a 1-mile radius around the park, interpolating block group data from the 2000 US Census. The percentage of

households in poverty was calculated by the US Census Bureau, based upon the Federal poverty level. We also categorized the location of a park as commercial if it had a 4 lane commercial street and/or bordered on at least one retail establishment; other parks were categorized as residential.

Observation Instrument

We inventoried park facilities and directly observed park use using the System for Observing Play and Recreation in Communities (SOPARC) for 7 days, 4 times/day in each park over a two-year period, between April 2008 and March 2010. If weather was inclement, we rescheduled park visits during the same time on the next matching clement day to ensure observations were conducted on each day of the week. SOPARC provides data on each individual (i.e., gender, age-grouping; race/ethnicity grouping, and physical activity) observed in a park activity area. During an area scan (i.e., an observation sweep moving from left to right) of the area, the physical activity of each individual present is coded using momentary time sampling as sedentary (i.e., lying down, sitting, or standing), walking, or vigorous (e.g., jogging, running). These activity codes have been validated using heart rate monitoring and by accelerometry in physical education classes and leisure time with children and youths in kindergarten through twelfth grade.(McKenzie, Sallis et al., 1991; Sallis, McKenzie et al., 2003) We counted females and males (all ages) during separate scans and recorded the predominant activity for each gender.

In addition to recording information on people in an activity area, during each visit to an activity area entries were made to describe whether the space was accessible, usable, equipped, supervised, and provided organized activities. An area was coded as accessible when there were no locked doors, gates, or fences to impede entry. It was coded as supervised when park or adjunct personnel (e.g., park rangers, playground supervisors, volunteers, sport officials, teachers) are present and appeared to be available to direct park users or respond to emergencies. It was coded as providing organized physical activity when a scheduled physical activity, exercise class, or sport practice or competition was being lead by park staff or adjunct personnel.

Survey data

In addition to collecting observational data in each park, we also aimed to survey 75 park users recruited from the most busy and least busy target areas and 75 local residents, stratified by the distance they lived from the park: 1/3 from each of 3 buffers: within ¼ mile, ¼–½ mile, and ½–1 mile. We selected these two different groups of people because residents are representative of the local population that could potentially use the park and the park users are the subpopulation that actually uses the park. An important goal was to see how these two groups differed. Households were selected randomly from the universe of addresses within the three buffers. In neighborhoods where access to homes was constrained due to security (e.g., gates, locked apartment complexes) or when residents were repeatedly not at home (and thus we were not able to complete the 75 resident surveys), we conducted intercept interviews in front of busy locations (e.g., shop, bus stops), interviewing only those who reported residing within the park one-mile buffer. We asked people about their use and perceptions of the park and about their health and exercise routines.

We also surveyed and interviewed the park directors of each park to collect data on staffing and park-based programming. All methods were approved by the RAND Human Subjects Protection Committee.

Data analyses

About 2% of the planned observations in the park were missing data, and about 10% of survey respondents missed one or more survey items needed in our main analysis, including distance living from parks, knowing the staff, frequency visiting other parks, and perception of safety. To impute missing observations, we used a single round of imputation based on the mean-imputation or model-based strategy (Gelman & Hill, 2007). First, we examined the raw park observations at each target area of a park and in four observation periods. If the missing observation was in the middle of the day, and the condition of the target area (accessibility and activities) did not change before and after the missing period, the missing observation was imputed by interpolating adjacent observations. In all other cases, the missing observation was imputed by the sample mean at the same period across all days (weekend and weekdays processed separately). To impute missing survey data we used a set of GLM models that relied on highly correlated non-missing survey items and park-level characteristics to predict the missing data. For example, the distance living from the park was predicted mainly by the transportation mode and relative difficulty of getting to parks. Perception of safety was predicted mainly by local poverty level, frequency of visiting the park, and whether one knows the park staff. For each park we ran two imputation models for park users and residents separately. There were still 3% of respondents whose missing information could not be imputed by the model-based strategy due to missing information in the auxiliary variables. These cases were imputed by the sample means (for continuous variables) or mode (for discrete variables) in each park and for park users and residents separately.

Tables 1–3 present descriptive statistics with the missing data imputed and provide unadjusted comparisons among parks. To explore the data, we divided parks into tertiles based upon the percentage of households below the federal poverty level in the 1-mile radius around each park, categorizing their poverty levels as high, medium, and low. In our models, however, we used the percentage of households in poverty as a continuous variable. We ran all model analyses based on the subset of data with no missing information and the imputed data. There were no notable differences in results. Results presented in Tables 4 and 5 are based on the imputed data.

We estimated energy expended in the park by using METs, the ratio of work metabolic rate to standard resting metabolic rate. (One MET is equivalent to 1 hour at rest or about 20 minutes walking briskly.) We assigned MET levels as 1.5 for sedentary, 3 for walking, and 6 for vigorous activity as listed in Ainsworth et al. (Ainsworth, Haskell et al., 2000). We fitted statistical models to compare the three categories of parks while adjusting for observed covariates. First, we fitted the park observations (# users and total METs) by mixed-effect models. We examined park use by place and time, with day as the unit of analysis, and aggregated the two outcomes to generate a longitudinal data set with 50 parks and 7 days of observations per park. We implemented robust standard errors to account for potential model misspecifications in drawing the formal statistical inference. Because the preliminary analysis indicated there was a nonlinear relationship between the observational outcomes and predictors, we used the log transformation for the raw outcome to handle nonlinearity as well as to stabilize error variances. Among several alternative means to modeling nonlinearity (i.e., various polynomial regressions and the Poisson regression), we found that the log transformation had the most ideal performance.

To account for the distinct park-level trajectories observed in exploratory analysis, we further used the random intercept, seasonal and weekend effects within each park, where the two random effects were assumed to be correlated. In these models we adjusted for fixed time effect (season and weekend), a rich list of park characteristics including the number of full and part-time staff, facilities for sports and other types of physical activity, areas that

were open to the public, the number of observed organized or supervised activities, and location in a residential vs. commercial area. We entered two predictors from survey data separately for park users and residents: the percentage who said the park is safe or very safe and the percentage of users and residents who reported engaging in physical activity at work. We ran two models, one with all the predictors and one excluding potentially modifiable characteristics, which we defined as the number of supervised/organized activities that occurred during the observations, the number of park target areas that were accessible, the number of full and part-time staff, and the number of facilities in the park (like basketball and tennis courts). We considered them modifiable since their levels can be altered with reasonable efforts.

Second, we used a set of repeated-measure logit models to fit the survey responses. These survey responses are binomial counts (e.g., number visiting parks in the past 7 days) or Bernoulli trials (feeling the park is safe/unsafe). To account for the intra-class correlation among survey respondents within each park, we used the repeated measure approach accounting for clustering at the level of the park. The repeated-measure logit model is fit by the generalized estimating equation method. In these models we controlled for the same set of park characteristics as we did for analyzing the park observations. In addition, in order to control for oversampling based upon race/ethnicity we further controlled for the person-level characteristics, including gender, race/ethnicity, distance respondents lived from park, whether they know the park staff, self-rated health, time spent watching electronic media, frequency of visiting other parks, and whether they engaged in physical activity at work. Because the sample recruited from the park was very different than the household sample, we analyzed them separately. (Park users reported using parks at much higher rates than residents, but residents comprised a more representative sample of the general neighborhood population). The differences between the two groups are notable in the results of our statistical models.

Results

Park Characteristics, Park Management and Park Use (Table 1)

Of the 50 parks, 19 were in neighborhoods with >30% of households in poverty, 16 were from neighborhoods with 15–30% of households in poverty, and 15 were in neighborhoods with < 15% of households in poverty. Parks in the higher poverty neighborhoods were smaller (mean=9 acres) than those in medium and lower poverty neighborhoods (mean=16 acres) and they had fewer sport facilities. Parks in the higher poverty communities, for example, had about one-third as many sports fields as those in the lowest poverty areas.

All parks had a similar number of full-time staff, but those in higher poverty neighborhoods had fewer part-time staff and they offered fewer programs than those in lower poverty neighborhoods. Although all parks were required to have Park Advisory Boards (PABs) comprising local stakeholders to provide input into park activities, higher poverty area parks had fewer PAB members, although the difference was not statistically significant. Higher poverty parks were also less likely to use email to market their programs, but they were more likely to offer after school programs and snacks for youth.

On average we observed fewer park users in the higher poverty neighborhoods than in lower poverty neighborhoods, but there were more people per acre indicating the space is more densely used. Parks in high poverty neighborhoods had fewer organized and supervised activities per park compared to medium and low poverty parks, with almost a two-fold difference between the highest and lowest poverty area parks. In addition, high poverty area parks were more likely to have areas that were inaccessible, due to locked doors, fences or facilities.

The types of activities that park users engaged in differed substantially by gender, with females more likely to be sitting or using the playground area, while males were much more likely to be participating in sports like basketball, soccer or baseball. Among females, there were few differences between the type and prevalence of activities across neighborhood poverty levels. However, males in high poverty area parks were observed sitting more often than males in middle or high-income parks. In high poverty area parks, fewer played baseball, but more played soccer (Table 1).

There were no differences among observed park user characteristics in the highest, medium, and lowest poverty area parks: on average 62% were male, 32.5% were children, 15.2% teens, 48.1% adults, and 4.2% seniors. The proportions of observed park users engaging in the three activity levels were also similar in high, medium and low poverty parks (68% sedentary, 17% walking, and 14% vigorous).

Reports of Park Use and Physical Activity

We surveyed 3,654 park users and 3,249 residents. Compared to residents, park users were more likely to be Latino (74.8% vs. 62.0%, $p < .0001$), younger (median age 38 yrs vs. 42 yrs, $p < .0001$), reporting more visits to the park in the past 7 days (2.8 vs. 0.9, $p < .0001$) and living further from the parks (1.16 miles vs. 0.5 miles).

Park Users (Table 2)

Although there were no differences across different poverty levels in terms of the proportion reporting usual visits to the park of at least once a week, park users in higher poverty areas reported having visited the park more in the last seven days than those in low poverty areas ($p < .0003$). Compared to park users in low and medium poverty areas combined, those in higher poverty neighborhoods tended to live much closer to the park (0.8 miles vs. 1.4 miles, $p < 0.0001$). The median distance from the parks was .33 miles in high poverty parks, .42 miles in medium poverty parks and .62 miles in low poverty area parks. Accordingly, park users in high poverty areas were more likely to walk to the park than in medium and low poverty areas combined (54% vs. 34.7%, $p < 0.0001$). Additionally, they were more likely to report seeing people they know often or sometimes (67% vs. 60% $p < 0.0003$). They also were more likely to report exercising at the park but were less likely to exercise in a health club.

High poverty area park users rated park staff less favorably than those from medium and low poverty areas. High poverty area park users also perceived parks as less safe and were more likely to say that user fees presented barriers to their participation in park programs. There was no difference among high, medium, and low poverty area park users on the average amount of time they reported watching television or other visual electronic media.

Residents (Table 3)

Residents in low poverty neighborhoods were more likely to report usual visits to the park at least once a week or more than those in high poverty neighborhoods (32% vs. 25%, $p < .0001$), yet there were no differences in their reports of the number of visits in the previous seven days. Similar to the park users, residents in high poverty neighborhoods were more likely to report walking to the park, but no more likely to see people they knew when visiting there. Residents in high poverty areas were less likely to exercise in general, and especially at a private health club. Compared to low poverty area residents, those in high poverty area residents were less likely to find out what is happening in their park and to know the park staff. They also rated the performance of park staff lower. Additionally, high poverty area residents reported spending more time watching electronic media and were less likely to perceive their local parks to be safe than those from low poverty neighborhoods.

Models of Park Use (Table 4)

Neighborhood poverty level was a strong negative correlate of the number of park users and park-based energy expenditure. After controlling for other non-modifiable factors such as season, park size, population density, and average park user/resident perception of safety, we found that for every additional 10% of households in poverty, there was a 34% decline in the number of park users observed and a 37% decline in the METs expended in the park. Our model also estimated that a typical park in the high poverty category (9 acres, 37% poverty, and 58,000 people in 1-mile radius) had 40% fewer users ($p=.01$) and 45% fewer METs ($p<.01$) expended than a typical park in medium poverty category (16 acres, 22% poverty, and 36,000 people in 1-mile radius). However, the relationship between poverty and park use and energy expenditure was attenuated when considering the modifiable factors, including the staff, the number of facilities, the number of organized/supervised activities, as well as when accounting for areas of the parks that were accessible or not during the measurement periods. When these potentially modifiable factors were also controlled, the impact of additional 10% of households in poverty was associated with a reduction in park use and METs expended by 21% and 22%, respectively.

Each accessible area accounted for an additional 0.5% more park users and each inaccessible area was associated with 1% fewer park users per day. Each additional part-time park staff member was associated with 1% increase in the number of park users. On average, lower poverty parks had 8 more part-time staff, which if allocated to a high poverty park might translate to an additional 124 users counted during the 4 observation periods per day over 7 days. Each organized and supervised activity was associated with 4% and 7% more users per week, respectively. If the same number of organized and supervised activities were scheduled in the higher poverty area parks as in the low poverty area parks, this might translate to observing an additional 495 and 868 park users per week under the same setting as above, respectively.

Parks were used 73% more on the weekends than the weekdays, and those in residential areas were used 35% more than those in commercial areas.

Poverty's influence on self-reported park use, exercise and perception of park safety

The strongest correlate of park use for both residents and park users was knowing the park staff (Table 5). For a local resident who hypothetically had a 0.10 chance of visiting the park, knowing the park staff was associated with a substantial increase in the probability of visiting the park (i.e., to 0.57). However, for a park user whose hypothetical chance of visiting the park was 0.10, knowing the park staff was associated with a much smaller increase in the probability of visiting the park (to just 0.18). Among both residents and users, there was strong negative association between neighborhood poverty levels and perception of safety. There was a moderately weak association between perception of safety and park use among residents; however, this association did not exist among park users. For residents with a hypothetical 0.10 probability of visiting the park, a higher perception of safety would increase the probability to 0.13, a relatively small impact.

While it appears that being in a high poverty neighborhood was associated with a greater probability of going to the park for both residents and park users, the magnitude of the association was quite small (increasing the probability of use by only 0.01 for a resident or user whose hypothetical probability of use was 0.10). Among residents, the negative effect of perception of safety nullified the positive effect of poverty level on park use. Hence, when we consider the effect of perception of safety, our model suggests that a resident in a high poverty neighborhood still likely visits the park less often than those in low poverty neighborhood, providing the difference in poverty level is not excessively large.

Among residents, women and non-whites reported using parks less and exercising less frequently than males and whites. Those who did not engage in physical activity at work and spent more time watching electronic media were more likely to rate their health status as poor and less likely to use parks and to exercise. Among park users there was also a significant negative relationship between distance from home to the park and frequency of park use. However, this relationship was not significant among residents, as all residents sampled lived within a 1 mile radius of the parks.

Discussion

Neighborhood poverty level has a strong association with park use and park-based physical activity in this large Southern California city. The local environment and/or park characteristics could be primary determinants of park use, with fewer park resources and staffing leading to lower park use, or perhaps residents in high poverty areas choose to use park-based resources less. Additional possibilities are that a) both relationships are true, b) neither is true, or c) one or more unmeasured variables are responsible.

The evidence that the availability or characteristics of parks influence leisure time physical activity is limited. Only a few longitudinal studies of parks and playgrounds have measured park-based physical activity before and after elements of the park facilities have changed. Some very careful school-based studies using objective measures of physical activity have shown that children are more active when the characteristics of playgrounds and equipment are improved (Ridgers, Fairclough et al., 2010; Ridgers, Stratton et al., 2007; Stratton & Mullan, 2005). Other studies documented increases in physical activity (Cohen, Sehgal et al., 2009; Tester J & Baker R, 2009), but one study did not (Cohen, Golinelli D et al., 2009). In the latter study, the lack of increased physical activity following improvements in park facilities such as gymnasiums and indoor recreational space were accompanied by decreases in programming and other “demand” goods at parks. Meanwhile studies of school-based physical activity show that improved supervision of physical education classes (along with better curricula) and improved supervision of recess can result in increased physical activity (Connolly P & McKenzie T., 1995; McKenzie, Stone et al., 2001).

Part-time staff and supervised and organized activities were the modifiable factors most strongly associated with increased park use and energy expenditure. This finding is mirrored by the models based upon parks users and residents, which showed that knowing the staff was an important predictor of residents visiting parks in the past 7 days. Part-time staff may be more publicly visible than full time staff, since they generally are the people who direct or lead sports practices and special classes, which may constitute the “demand” goods that attract users. Individuals who reported knowing the park staff mostly rated these staff as performing at an “A” or “B” level, indicating they were generally liked and respected.

An important limitation of our study was its’ cross-sectional nature, in that we cannot determine the direction of relationships among our variables. For example, we found that knowing the park staff who are at the park on a regular basis was associated with an increased perception of park safety. However, we cannot say with certainty whether this is because getting to know the staff makes people feel that the park is safer or whether people who go to the park also think it is safe and thus get to know the park staff. Our experience with parks in this geographic area is that staff turnover is greater in parks in high poverty areas, so it may be more difficult for local residents who use the park to get to know the staff. In addition, the reduced number of park staff and programming in high poverty parks could be either a reflection of demand and/or a reflection of the lack of ability of local residents to pay program fees that residents in higher income neighborhoods can afford.

The disparity in resources, staffing, and organized and supervised activities in high poverty area parks is also likely to be driven in part by their smaller acreage and fewer park facilities. However, this study indicates that lower use of parks in high poverty areas is proportional across all existing facilities, in other words, even when high poverty area parks have a gymnasium, classroom, or basketball court, they are still used less than parks in low poverty areas with similar facilities. The lower use may also be a manifestation of the reported greater time residents spend watching electronic media.

Other than average age and race/ethnicity, there were small differences among park users across neighborhoods. In high poverty neighborhoods, there were fewer regular park users, but those using the park lived closer and went more often. Parks in high poverty neighborhoods may function more as an extension of residents' backyard. In contrast, park users in wealthier neighborhoods traveled further to their parks and were more sporadic users. As a result, they may be less likely to meet others they know in the park. There were no differences among park users in the three socio-economic neighborhoods as to their exercise frequency and whether they knew the park staff. Although our focus was on the neighborhood, we did not have information about the socio-economic status of the park users and residents that were surveyed, which could vary considerably from the neighborhood average, which is another limitation.

Self-rated health was not associated with the frequency of park visits by residents, although it was for park users. Surprisingly, reports of better health were associated with perceptions of park safety, a finding that has been shown in another study (Tucker-Seeley, Subramanian et al., 2009). Perhaps there is a tendency for individuals to generalize how they feel about their neighborhoods to how they feel about their own well-being.

In contrast to Jane Jacobs' theory that a mixed use area attracts more park users (Jacobs, 1961), we found that parks in residential areas attracted more users than in commercial areas. Jacobs' theories were developed based upon experience primarily with the East coast urban areas, which have more mixed use. There are few mixed-use areas in the city and people seldom use public transportation, so parks in residential areas may be more conveniently located for regular use and have more parking available than those in commercial settings.

The disparities in park use and park-based physical activity associated with neighborhood levels of poverty might be addressed through policy interventions, if they are truly due to differences in resources rather than individual preferences. For example, it has been suggested that a reasonable policy goal would be to focus public resources on providing parks in high poverty areas with quality programs and activities (Abercrombie LC, Sallis JF et al., 2008; Babey, Brown, & Hastert, 2005; Godbey, Caldwell et al., 2005; Moore, Diez Roux, Evenson et al., 2008). Perhaps interventions focusing on making sure staff are more visible, such as wearing name tags and easily recognizable uniforms, might be useful. However, if people who live in high poverty areas are substituting park-based leisure time with time spent viewing electronic media, it may be very difficult to realize any changes, regardless of the efforts to improve parks. Research is needed to determine what specifically will attract residents in high poverty areas to parks and support more physical activity in park settings. Given that local public parks can serve the majority of Americans, the potential impact of effective park-based interventions could be substantial.

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Table 1

Park Characteristics(N=50), Management Practices, and Observed Users

Variable	High Poverty 30% n=19	Medium Poverty 15%–<30% n=16	Low poverty <15% n=15	P value
Average park acres	8.7	15.9	15.4	0.26
Average # of sports fields	2.2	4.2	6	0.001
Mean # full time staff *	2.5	2.2	2.1	0.11
Mean # part-time staff *	10	13	18.	0.02
Average # PAB members *	5.9	6.6	7.2	0.74
Mean # unique programs *	8.4	11.3	10.3	0.02
Mean # of participants *	800	1360	2823	0.30
% offering snacks for youth *	73.7%	75.0%	26.7%	0.007
% offering snacks for seniors *	0.0%	12.5%	6.67%	0.30
% with after school program *	88.2%	75.0%	26.7%	0.001 ^I
Banners *	57.9%	43.7%	33.3%	0.35
Website/email	5.3%	12.5%	46.7%	0.007 ^I
% parks in residential areas	42.11%	56.25%	66.67%	0.35
Park Observations				
Average number observed/park	1710	2382	2234	0.21
Average number per acre	303	281	194	0.25
Avg # of organized activities	9.7 (range: 2–21)	17.3 (range: 1–31)	17.9 (range: 5–54)	0.046
Average # supervised activities	15.7	25.6	30.7	0.03
Average # (% areas accessible	85.7%	90.7%	93.3%	0.0008
Average areas empty	63.9%	61.0%	56.7%	0.23
Primary Activity by Gender				
Types of activities, Female				
Sitting	36.8%	35.9%	33.7%	0.89
Playground activities	14.4%	14.7%	13.7%	0.98
Walking	10.1%	8.3%	10.2%	0.88
Standing	10.9%	11.8%	10.0%	0.92
Types of activities, Male				
Sitting	28.0%	20.5%	19.0%	0.26
Basketball	11.0%	13.2%	13.1%	0.87
Baseball/Softball	4.0%	12.0%	12.1%	0.08
Soccer	14.9%	7.4%	9.3%	0.20
Standing	10.7%	11.1%	7.8%	0.69

* Only 17 High poverty area parks provided this data

^I chi-square might not be valid due to small cell size

Table 2

Differences among Park Users' Reports by Neighborhood Poverty (unadjusted) (N=3654)

	Park Users			
	High poverty n=1363	Medium Poverty n=1143	Low poverty n=1148	P value
Gender (% male)	40.3	36.8	35.9	0.05
Average age	37.8	37.0	39.3	<.0001
% Hispanic	90.5%	83.1%	47.9%	<.0001
% African American	4.0%	9.1%	4.1%	<.0001
% White	0.7%	6.2%	40.4%	<.0001
% Asian	3.5%	0.8%	1.9%	<.0001
Distance living from the park (miles) (median)	0.83 (0.33)	0.77 (0.42)	2.0 (0.62)	<.0001
Frequency of park use (at least once/week)	82.3%	83.8%	80.1%	0.14
Average # of visits in past 7 days	2.9	2.8	2.6	0.0003
Average length of stay (hours)	1.8	1.8	1.9	0.07
% walking to the park	54.0%	42.4%	27.0%	<.0001
% seeing people they know often/sometimes	66.5%	63.6%	57.27%	<.0001
% participating in park sponsored program	10.2%	9.6%	10.1%	0.84
% user fees prohibit participation	11.4%	8.8%	7.0%	0.0007
% perceive park safe/very safe	84.1%	90.9%	97.6%	<.0001
% visiting other parks (at least once/week)	10.4%	7.5%	11.5%	<.0001
% who exercise at park	40.5%	43.4%	34.4%	<.0001
% exercise at home	10.1%	8.5%	10.4%	0.26
% exercise at health club	2.9%	4.0%	9.3%	<.0001
% don't exercise	35.8%	36.2%	35.1%	0.86
Mean Frequency of exercise (sessions/week)	2.7	2.7	2.7	0.95
Mean screen time	2.7	2.6	2.6	0.14
Engage in physical activity at work	33.3	27.1	19.5	<.0001
Doesn't know park staff	34.8%	31.2%	31.3%	0.07
% of individuals who don't find out what is happening in the park	25.5%	30.0%	21.7%	0.006
Average grade for park staff	3.7	3.7	3.9	<.0001
Average BMI	26.4	26.3	25	<.0001
% overweight	49.7%	49.0%	37.2%	<.0001
% obese	13.8%	13.5%	8.0%	<.0001

Table 3

Differences Among Residents ' Reports by Neighborhood Poverty (unadjusted) (N=3249)

	Residents			
	High poverty n=1308	Medium Poverty n=1063	Low poverty n=878	P value
Gender (% male)	36.8	32.6	33.6	0.08
Average age	42.3	42.0	43.0	0.29
% Hispanic	82.6%	71.3%	19.9%	<.0001
% African American	12.1%	13.9%	3.3%	<.0001
% White	1.3%	11.3%	61.6%	<.0001
% Asian	2.8%	0.5%	3.2%	<.0001
Distance living from the park (miles) (median)	0.5 (0.4)	0.5 (0.4)	0.4 (0.4)	<.0005
Frequency of park use (at least once/week)	24.6%	30.7%	32.3%	<.0001
Average # of visits in past 7 days	1.8	1.7	1.9	0.36
Average length of stay (hours)	1.6	1.7	1.6	0.30
% walking to the park	47.3%	39.8%	32.6%	<.0001
% seeing people they know often/sometimes	64.2%	58.1%	60.1%	0.10
% participating in park sponsored program	5.0%	7.8%	6.2%	0.02
% user fees prohibit participation	6.8%	5.7%	3.8%	0.01
% perceive park safe/very safe	72.2%	83.3%	95.2%	<.0001
% visiting other parks (at least once/week)	11.9%	6.7%	8.8%	<.0001
% who exercise at park	13.7%	19.2%	17.9%	0.0008
% exercise at home	18.3%	15.3%	16.2%	0.13
% exercise at health club	5.0%	8.4%	17.4%	<.0001
% don't exercise	48.9%	48.0%	38.2%	<.0001
Mean Frequency of exercise (sessions/week)	2.1	2.1	2.5	<.0001
Mean screen time	3.0	2.9	2.7	<.0001
Engage in physical activity at work	25.4	24.4	14.3	<.0001
Doesn't know park staff	64.3%	52.6%	54.3%	<.0001
Average grade for park staff	3.6	3.6	3.8	<.0001
% of individuals who don't find out what is happening in the park	55.9%	48.0%	46.2%	0.0017
Never goes to local park	56.7%	44.4%	47.6%	<.0001
Never goes to local park or any other park	38.0%	35.8%	38.0%	0.49
Average BMI	26.1	25.8	24.3	<.0001
% overweight	44.8%	47.4%	35.1%	<.0001
% obese	13.8%	10.3%	4.0%	<.0001

Table 4

Mixed-effect Model Estimates for Log of Park Use and Park based Energy Expenditure (METs). Significance levels are at .001 (***), .01 (**), and .05 (*).

Predictors	log(# park users)		log(METs)	
	With modifiable factors Estimate (SE)	Without modifiable factors Estimate (SE)	With modifiable factors Estimate (SE)	Without modifiable factors Estimate (SE)
Intercept	4.99 (1.05)***	6.92 (1.18)***	5.71 (1.06)***	7.95 (1.17)***
Season (Fall)	-0.13 (0.28)	0.11 (0.28)	-0.10 (0.27)	0.08 (0.28)
Season (Spring)	-0.04 (0.30)	0.12 (0.29)	-0.02 (0.27)	0.10 (0.27)
Season (Summer)	0.34 (0.26)	0.63 (0.29)*	0.37 (0.24)	0.59 (0.28)*
Size of park (acres)	0.01 (0.01)	0.03 (0.01)***	0.01 (0.01)&	0.03 (0.01)***
Park in residential (as opposed to commercial) areas	0.30 (0.13)*	0.15 (0.18)	0.31 (0.13)*	0.20 (0.17)
#full time staff	0.06 (0.10)		0.03 (0.10)	
#part time staff	0.01 (0.01)*		0.02 (0.01)**	
#facilities for team sports	-0.04 (0.04)		-0.02 (0.04)	
#other facilities	0.01 (0.02)		0.02 (0.02)	
#accessible areas	0.005(0.002)***		0.005(0.001)***	
#inaccessible areas	-0.01 (0.01)*		-0.01 (0.01)	
#organized activities	0.04 (0.01)**		0.03 (0.02)*	
#supervised activities	0.07 (0.02)***		0.07 (0.02)***	
Total population within 1 mile radius (in 10,000)	0.10 (0.03)***	0.13 (0.03)**	0.11 (0.03)***	0.13 (0.03)***
Proportion of poverty in the park's neighborhood	-2.40 (0.95)*	-4.12 (1.35)**	-2.44 (0.92)**	-4.62 (1.28)***
Proportion of residents doing physical activities at work	-0.17 (0.71)	-0.10 (0.77)	0.13 (0.71)	0.19 (0.78)
Proportion of residents who feel park is safe	0.21 (0.53)	0.10 (0.76)	-0.03 (0.57)	-0.19 (0.83)
Proportion of users doing physical activities at work	1.08 (0.66)	0.59 (0.85)	0.80 (0.69)	0.50 (0.91)
Proportion of users who feel park is safe	-1.94 (1.05)	-2.45 (1.35)	-1.70 (1.08)	-2.39 (1.39)
Weekend	0.55 (0.07)***	0.48 (0.08)***	0.55 (0.06)***	0.48 (0.08)***

Table 5

Generalized Mixed-effect Model Estimates for Self-report of Park Visit, Safety Perception and Exercise. Significance levels are at .001 (***), .01 (**), and .05 (*). All effects are on the logit scale.

RESIDENTS	Frequency of visiting neighborhood park in the past 7 days Estimate (SE)	Consider neighborhood park safe Estimate (SE)	# Exercise sessions in the past 7 days Estimate (SE)
Intercept	-3.96 (0.30)***	3.42 (0.67)***	-0.64 (0.22)**
Survey season (Fall)	0.19 (0.17)	0.27 (0.39)	-0.01 (0.15)
Survey season (Spring)	0.38 (0.18)*	-0.66 (0.39)	-0.16 (0.13)
Survey season (Summer)	0.32 (0.17)	-0.09 (0.32)	-0.32 (0.11)**
Survey on weekend	0.03 (0.09)	0.40 (0.16)*	-0.09 (0.06)
Gender (female)	-0.19 (0.09)*	-0.29 (0.15)*	-0.21 (0.06)***
Race (Hispanic)	-0.35 (0.21)	0.56 (0.34)	-0.42 (0.15)**
Race (Black)	-0.30 (0.15)	-0.35 (0.28)	-0.43 (0.11)***
Visiting other parks 1x/wk	0.22 (0.08)**	0.21 (0.21)	0.25 (0.10)**
Doing physical activities at work	0.13 (0.09)	-0.37 (0.14)**	0.71 (0.09)***
Time watching screen(hours/day)	-0.03 (0.04)	0.04 (0.05)	-0.22 (0.03)***
Distance live from park (miles)	-0.20 (0.14)	0.08 (0.16)	0.19 (0.07)**
Know the park staff	2.48 (0.12)***	1.01 (0.15)***	-0.13 (0.08)
Self-rated health	0.19 (0.11)	0.34 (0.13)**	0.71 (0.11)***
% households in poverty	1.14 (0.52)*	-7.20 (1.43)***	-0.23 (0.48)
Consider park safe	0.31 (0.14)*	-----	0.08 (0.11)
# park visits in past 7 days	-----	-----	0.14 (0.02)***
PARK USERS			
Intercept	-1.02 (0.21)***	3.95 (0.57)***	-0.33 (0.21)
Survey season (Fall)	0.17 (0.11)	0.05 (0.34)	-0.08 (0.13)
Survey season (Spring)	0.22 (0.11)	-0.71 (0.33)*	-0.08 (0.14)
Survey season (Summer)	0.30 (0.10)**	-0.12 (0.34)	-0.13 (0.12)
Survey on weekend	-0.35 (0.05)***	0.19 (0.17)	-0.07 (0.05)
Gender (female)	0.01 (0.05)	-0.35 (0.15)*	-0.24 (0.06)***
Race (Hispanic)	-0.13 (0.16)	1.43 (0.59)*	-0.07 (0.14)
Race (Black)	-0.27 (0.12)*	-0.39 (0.41)	-0.53 (0.09)***
Visiting other parks 1x/wk	-0.01 (0.07)	0.07 (0.17)	0.08 (0.07)
Doing physical activities at work	0.09 (0.06)	0.13 (0.17)	0.48 (0.07)***
Time watching screen(hours/day)	-0.04 (0.02)*	0.17 (0.06)**	-0.20 (0.02)***
Distance live from park (miles)	-0.01 (0.01)	-0.06 (0.05)	-0.02 (0.01)*
Know the park staff	0.69 (0.05)***	0.44 (0.16)**	-0.01 (0.05)
Self-rated health	0.14 (0.07)*	0.66 (0.16)***	0.39 (0.12)***
% households in poverty	1.03 (0.33)**	-8.07 (1.26)***	0.25 (0.38)
Consider park safe	-0.05 (0.07)	-----	-0.11 (0.11)

RESIDENTS	Frequency of visiting neighborhood park in the past 7 days Estimate (SE)	Consider neighborhood park safe Estimate (SE)	# Exercise sessions in the past 7 days Estimate (SE)
# park visits in past 7 days	-----	-----	0.17 (0.02)***