

Resources for Physical Activity Participation: Does Availability and Accessibility Differ by Neighborhood Socioeconomic Status?

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ABSTRACT

The purpose of this study was to determine whether the availability and accessibility of physical activity resources differed by neighborhood socioeconomic status (SES) in a small U.S. city (population = 133,046). U.S. census tracts (N = 32) were used to represent neighborhoods and categorized into high, medium, or low SES on the basis of the percentage of unemployed individuals, per capita income, and percentage of the population below the poverty threshold. We developed a geographic information system to generate a comprehensive list of physical activity resources available within each census tract in the city. We identified 112 parks, 33 sport facilities, 15 fitness clubs, 11 community centers, and 5 walking/biking trails. The total number of physical activity resources varied by neighborhood SES ($p < .05$); low-SES ($M = 4.5 \pm 2.3$) and medium-SES ($M = 4.9 \pm 2.6$) neighborhoods had significantly fewer resources than high-SES ($M = 8.4 \pm 3.5$) neighborhoods. Low-, medium-, and high-SES neighborhoods did not differ on the number of pay-for-use facilities; however, low-SES ($M = 3.1 \pm 1.5$) and medium-SES ($M = 3.8 \pm 1.6$) neighborhoods had significantly fewer free-for-use resources than high- ($M = 6.1 \pm 2.4$) SES neighborhoods ($p < .01$). Data suggest that individuals from lower SES neighborhoods may have limited ability to control their physical activity in the face of inaccessible environments. Community research and promotion efforts should include assessment and targeting of available and accessible physical activity resources.

(Ann Behav Med 2003, 25(2):100–104)

INTRODUCTION

Regular physical activity has been shown to prevent numerous health maladies, including cardiovascular disease (1), obe-

We thank Dr. David Dziewaltowski and the Kansas State University Office of Community Health for providing intellectual and financial support for this study. We also acknowledge the KONZA Physical Activity Work Group, of which we are members, for its support.

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sity, diabetes (2), and some cancers (3,4). Understanding neighborhood factors that influence physical activity may be important in explaining why two thirds of the U.S. population (2) does not meet physical activity prescriptions despite widespread information about the numerous benefits of physical activity. For example, greater distance to physical activity facilities has been associated with less exercise (5), and greater distance to a bikeway is associated with less bikeway use (6). Several studies have begun to assess the relation between neighborhood factors and physical activity; however, studies have been limited by incomplete assessment and understanding of neighborhood factors.

Two strategies are typically used to assess neighborhoods: (a) participant self-reports (7,8) and (b) objective neighborhood assessments based on direct observation or existing records of built environments (5,6). Participant reports represent the *perceived* environment, reflecting a person's impressions or subjective perceptions of the environment that may be biased by experiential knowledge of the environment (9). In contrast, objective neighborhood geographic coded databases represent the *actual* environment that include specific topographical points in the physical neighborhood such as schools, bikeways, physical activity facilities, or parks (5,6,9), as well as geographic areas, such as neighborhood census tract boundaries. Geographic coded databases are also useful for incorporating descriptive information about points or areas such as cost to use physical activity resources via data links. Until the recent development and dissemination of computerized geographic information systems technology, research using environmental data has been challenging and limited.

Despite the challenges, a study of four neighborhoods in Scotland showed that neighborhood physical activity resources appear to vary by neighborhood social or economic context (e.g., poverty [10]). This finding might explain why residence in poorer neighborhoods has been independently associated with significant decreases in physical activity among adults after adjusting for individual characteristics (11,12). Theorists have suggested that fewer physical activity resources in one's neighborhood might limit physical activity opportunities and subsequent physical activity behavior (e.g., 13). Another limiting factor may lie in the accessibility of existing resources. Having a fitness facility in the neighborhood might not provide a physical

activity opportunity if it costs too much to use, suggesting that the issue of access to physical activity resources may be more complicated than merely relative proximity.

The purpose of this investigation was twofold. The first purpose was to objectively document the availability and accessibility of all physical activity resources available within a small Midwestern U.S. city. The second purpose was to determine whether availability and accessibility of physical activity resources differed by neighborhood socioeconomic status (SES). For the purposes of this study, availability was operationalized as the presence of resources within a given neighborhood. Accessibility was operationalized as pay-for-use (less accessible) or free-for-use (more accessible) resources. Physical activity resources were operationalized as any area used primarily for physical activity. This included, but was not limited to, school parks, community parks, health clubs, community centers, dance studios, and martial arts clubs. Based on MacIntyre's work (10), we hypothesized that physical activity resource availability would vary by neighborhood SES.

METHOD

Population

A single Midwestern U.S. city was selected on the basis of size and proximity to researchers. The city's population was 133,046 and comprised 32 census tracts (see Table 1 for city characteristics).

Procedure

Identifying resource availability. We used three strategies to develop a geographic information system of physical activity resources within the city. First, we identified physical activity resources through manual searches of the World Wide Web and the yellow pages of the city's telephone directory. The Web search was limited to the Web sites of the city's government, chamber of commerce, convention and visitors bureau, and area guide. Within each Web site and the yellow pages search we used the following key terms: *health, health club, athletics, athletic club, dance, dance studios, fitness, fitness centers, martial*

arts, parks, running, sports, and walking. All resources were entered into a Microsoft Excel database that included the name, address, postal code, and telephone contact of each resource.

The second strategy was to identify physical activity resources related to schools within the city. Every school district within the city was contacted and asked to provide physical activity resource information regarding their elementary, middle, and high schools. The school districts each provided a detailed list of schools with associated parks and fields. The name, address, postal code, and telephone contact of each school-based physical activity resource was added to the database.

Last, we contacted the city Department of Parks and Recreation for descriptive information on the physical activity resources located through the first two strategies. City Parks and Recreation also provided information regarding parks and walking/bicycling paths. Resource names, addresses, postal codes, and telephone contacts were added to the database.

Identifying resource accessibility. A representative for each physical activity resource was contacted by telephone to determine whether the resource was a pay-for-use or free-for-use facility. This information was added to the database.

Identifying neighborhood characteristics. Census tracts ($N = 32$) were used to represent neighborhoods because tracts are a good approximation of a neighborhood environment with reliable social and economic data available from the U.S. Bureau of the Census. Census tracts include approximately 4,000 people, and boundaries are delineated to encompass a relatively homogenous population (14,15). The city's Metropolitan Planning Department provided demographic information for each of the city's census tracts.

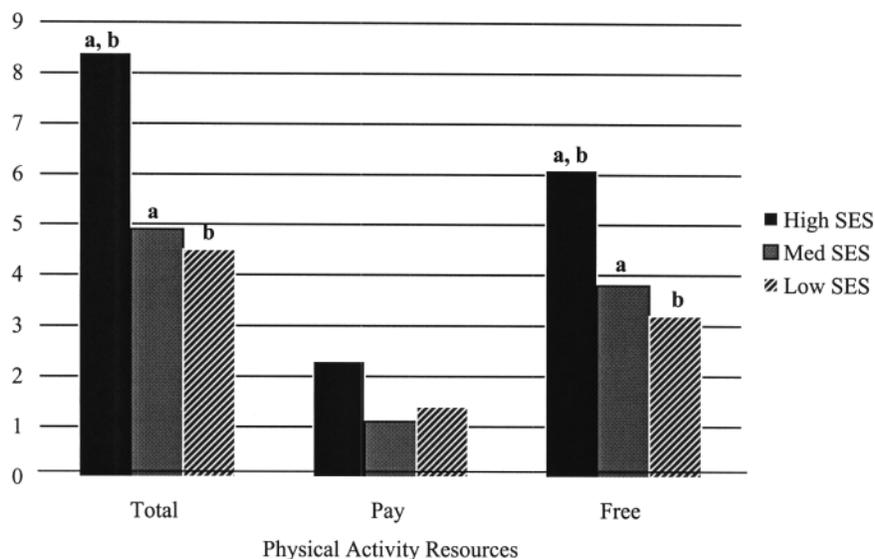
We categorized neighborhoods into low, medium, and high SES on the basis of the percentage of unemployed individuals, per capita income, and percentage of the population below the poverty threshold. Individuals were considered unemployed if they currently did not have a job. Per capita income was calcu-

TABLE 1
City and Neighborhood Characteristics by Neighborhood SES

Characteristic	Neighborhoods			
	City ^a	High SES ^b	Medium SES ^c	Low SES ^d
Unemployment (%)	6.5	2.9 _{a,b}	5.0 _a	9.9 _b
Per capita income	12,445	18,342 _a	12,830 _a	8,914 _a
Below poverty threshold (%)	15.0	4.0 _a	10.5 _a	23.8 _a
Ethnic composition (%)				
White	81	95 _a	88 _a	68 _a
African American	13	3 _a	7 _a	25 _a
Hispanic	6	2 _{a,b}	7 _a	9 _b
Education (< high school) (%)	21	9 _a	17 _b	31 _{a,b}
Average tract size (square miles)	2.34	2.38	2.48	2.17

Note. Values with corresponding subscripts reflect a significant difference ($p < .01$) between conditions. SES = socioeconomic status.

^a $n = 32$. ^b $n = 7$. ^c $n = 12$. ^d $n = 13$.



Note: Corresponding letters reflect a significant difference ($p < .05$) between conditions.

FIGURE 1 Frequency of pay-for-use and free-for-use physical activity resources by neighborhood socioeconomic status (SES).

lated as the total income of the census tract population divided by the total census tract population regardless of age or earning potential. Finally, poverty threshold was defined as a household income that is considered insufficient to cope with the costs of daily living. The threshold is based on the number of individuals within a household and the total household annual income. For example, in the state where this research was conducted, two adults living with one child under the age of 18 are considered to be living below the poverty threshold if the total household annual income is less than \$11,869.

Analyses. Physical activity resources and their descriptive characteristics were linked to census tract geography, and raw counts of number of resources within neighborhoods were calculated. We used multivariate analyses of variance (MANOVAs) to determine whether resource availability and accessibility varied by neighborhood SES (low, medium, or high). We conducted univariate analyses of variance to determine whether low-, medium-, and high-SES tracts differed on the number of pay-for-use and free-for-use facilities.

RESULTS

SES and Neighborhood Characteristics

As expected, low-, medium-, and high-SES neighborhoods (tracts) differed significantly on per capita income, percentage unemployment, and percentage of population below the poverty line, $F(6, 54) = 14.56, p < .001$. Details of the follow-up univariate tests and Tukey's post hoc test are presented in Table 1. A second MANOVA revealed that low-, medium-, and high-SES tracts differed significantly on ethnic makeup and percentage of the population that had completed high school. Data are presented in Table 1.

Resource Availability

Within the city, 177 resources for physical activity were identified. Of these, 112 were city or school parks; 33 were sport facilities, such as baseball parks, basketball courts, and tennis courts; 15 were fitness clubs; 11 were community centers; and 5 were walking or biking trails. The total number of resources varied by neighborhood SES, $F(2, 29) = 5.16, p < .05$; low-SES ($M = 4.5 \pm 2.3, p < .05$) and medium-SES ($M = 4.9 \pm 2.6, p < .05$) neighborhoods had significantly fewer resources than high-SES neighborhoods ($M = 8.4 \pm 3.5$; see Figure 1). Low- and medium-SES neighborhoods did not differ from one another on total resources.

Resource Accessibility

Approximately 36% of all physical activity resources were pay for use ($n = 47$), whereas the remaining resources were free for use ($n = 130$). Low-, medium-, and high-SES tracts did not differ on the number of pay-for-use facilities; however, low-SES ($M = 3.1 \pm 1.5, p < .01$) and medium-SES ($M = 3.8 \pm 1.6, p < .05$) neighborhoods had significantly fewer free-for-use resources than did high-SES neighborhoods ($M = 6.1 \pm 2.4$), $F(2, 29) = 6.85, p < .01$. Low- and medium-SES tracts did not differ from one another on accessibility (see Figure 1).

DISCUSSION

The goals of this study were to systematically document and describe the physical activity resources available in a small Midwestern U.S. city and to examine whether availability and accessibility of resources differed by neighborhood (census tracts) SES. In support of our primary hypothesis, we found that low- and medium-SES neighborhoods had fewer physical activity resources available than high-SES neighborhoods. Further-

more, there were fewer free physical activity resources in low- and medium-SES neighborhoods when compared to high-SES neighborhoods.

Resource availability has been identified as a critical antecedent to behavior (13). Empirical, laboratory-based research has demonstrated that the relative proximity of physical activity resources is related to physical activity participation (16). It is plausible that similar relations exist outside the laboratory. Physical activity resources were substantially less available to individuals who reside in low- and medium-SES neighborhoods in this study. The current data represent only one U.S. city; however, they appear to be consistent with studies from other industrialized nations (10) that report fewer physical activity resources in more deprived areas. MacIntyre (10) pointed to a phenomenon called *deprivation amplification*—places where people who have fewer personal resources reside often have fewer public resources that might buffer individual deprivation. It follows that the lack of physical activity resource availability in low- and medium-SES neighborhoods may contribute to the frequently reported difference in physical activity that exists between high- and low-SES individuals (e.g., 17).

Even when resources are abundant, proximity to them will result in physical activity behavioral outcomes only if they are accessible to the targeted population. Free facilities are more accessible than pay facilities, because anyone can freely use them, regardless of economic means. The data herein suggest that there are not only fewer physical activity resources available in lower SES neighborhoods, but of those resources that are available, fewer are accessible. There is a need for city planning agencies and leaders to address not only the availability but also the accessibility of municipal physical activity resources. Discrepancies among neighborhoods that affect availability and accessibility of physical activity resources may result from complex sociological and historical cycles (e.g., high residential turnover and social disorganization) (18). These issues in turn create inability to direct city planning and capital resources toward municipal projects that enhance quality of life (e.g., public facilities, green spaces, and walking/biking paths). Physical activity researchers and promoters may need to partner with local communities, private organizations, and government agencies to ameliorate this complex problem (10,11).

Strengths of this study include a comprehensive assessment of the availability and accessibility of physical activity resources in a representative Midwestern U.S. city. There may be many other neighborhood social and physical structural factors (e.g., safety, sidewalks) that are associated with physical activity; however, those were beyond the goals of this study, which were to determine whether physical activity resource availability and accessibility varied by neighborhood SES. Future work is also needed to assess the quality of individual resources. Perhaps pay-for-use resources are maintained better and are more attractive than free-for-use resources, such that building more free-for-use facilities might not affect physical activity behavior.

Although these findings provide novel information related to the availability and accessibility of physical activity resources

across neighborhood SES, there are some issues related to the scope of the study that should be considered. First, we did not examine whether availability or accessibility of resources was related to actual physical activity or whether these differences provided a potential explanation for SES differences in physical activity. Our findings suggest that it would be fruitful to progress to this next level of investigation. Second, we defined resources as those that are developed primarily for physical activity. Some resources that may provide opportunities for physical activity as a secondary role were beyond the scope of the study. For example, in some communities churches may provide opportunities for physical activity (19). An exploration of the availability and accessibility of secondary resources for physical activity provides an additional avenue for future research. Third, this study relied on census boundaries to represent neighborhoods, a widely used strategy in neighborhood-level research (14,15,20,21); however, census tracts may not reflect true neighborhood boundaries. Research is needed to understand variations in neighborhood definitions and how resources are distributed among them.

Our data suggest that individuals who reside in lower SES neighborhoods may have little ability to control their physical activity in the face of inaccessible environments. Lower SES neighborhoods have fewer physical activity resources and, of the resources available, a lower proportion is free for use. To date, physical activity promotion interventions have typically relied on individual-level approaches, frequently showing limited success in promoting sustained behavior change (22). Taken together, these findings and existing research suggest that individual approaches need to be expanded to include environmental strategies that accommodate or influence the availability and accessibility of physical activity resources to enhance intervention sustainability.

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