

Availability of Physical Activity–Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: A National Study

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The positive health benefits associated with regular physical activity include reduced risks of coronary heart disease, diabetes, colon cancer, hip fractures, high blood pressure, and obesity.^{1,2} Despite such evidence, recent research has shown that more than 50% of adults do not engage in enough physical activity to meet public health recommendations and that 26% report no leisure-time physical activity.³ Also, a significant proportion of American youths do not participate in sufficient vigorous or moderate exercise. According to data from the 2003 Youth Risk Behavior Survey, 33.4% of high-school students do not engage in either sufficient (at least 20 minutes on 3 or more of the past 7 days) vigorous physical activity or sufficient (at least 30 minutes on 5 or more of the past 7 days) moderate physical activity.⁴

Patterns of physical inactivity are not equivalent according to race, ethnicity, or socioeconomic status (SES). Included among the adult populations most at risk for leisure-time inactivity are those at low levels of income and education, those living in poverty, those who are members of racial/ethnic minority groups, and those with disabilities.^{1,5,6} Among youths, data also reveal significant race/ethnicity-specific differences in prevalence rates of insufficient physical activity (41.2% among Black youths, 36.5% among Hispanic youths, and 31.9% among White youths).⁴ In the Youth Media Campaign Longitudinal Survey focusing on children aged 9 to 13 years, for example, rates of participation in organized sports differed substantially according to race and parental income and education levels.⁷ Also, drawing on the National Longitudinal Study of Adolescent Health, Gordon-Larsen et al. found that physical activity and inactivity patterns varied significantly according to ethnicity among youths in grades 7 through 12.⁸

Objectives. We examined associations between neighborhood demographic characteristics and the availability of commercial physical activity–related outlets by zip code across the United States.

Methods. Multivariate analyses were conducted to assess the availability of 4 types of outlets: (1) physical fitness facilities, (2) membership sports and recreation clubs, (3) dance facilities, and (4) public golf courses. Commercial outlet data were linked by zip code to US Census Bureau population and socioeconomic data.

Results. Results showed that commercial physical activity–related facilities were less likely to be present in lower-income neighborhoods and in neighborhoods with higher proportions of African American residents, residents with Hispanic ethnicity, and residents of other racial minority backgrounds. In addition, these neighborhoods had fewer such facilities available.

Conclusions. Lack of availability of facilities that enable and promote physical activity may, in part, underpin the lower levels of activity observed among populations of low socioeconomic status and minority backgrounds. (*Am J Public Health*. 2006;96:1676–1680. doi:10.2105/AJPH.2005.065573)

In an attempt to explain determinants of physical activity behavior, recent models have broadened beyond demographic, psychological, and social explanatory variables to include the importance of environmental factors.^{9–11} Ecological models are based on the notions that physical activity takes place in specific physical environments designed for or conducive to activity (e.g., sports fields, gyms, health clubs, bicycle trails) and that these settings are likely to influence types and amounts of activity.⁹ Several studies involving the use of self-reported perceived measures have shown that there is a positive correlation between the availability of physical activity–related facilities and settings and various exercise behaviors.^{12–17}

A limited body of research has examined associations between the availability of facilities and settings, as assessed through objective (rather than self-reported) measures, and physical activity behavior. Sallis et al.¹⁸ found that, after control for individual characteristics, closer proximity and higher density of exercise facilities were significantly associated with increased frequency of exercise. An

environmental intervention aimed at reducing barriers to physical activity (including increasing the availability of physical activity–related equipment and facilities) revealed statistically significant positive changes in overall fitness measures within the intervention community.¹⁹

Recent research has begun to assess the extent to which the availability of physical activity–related facilities or settings varies across neighborhoods on the basis of racial/ethnic or SES characteristics. Self-report data suggest that perceived environmental barriers to physical activity vary significantly according to race and SES. The Youth Media Campaign Longitudinal Survey showed that parents of non-Hispanic Black versus White children and parents at relatively lower income and education levels perceived significantly higher activity barriers, including transportation problems, lack of opportunities to participate in physical activity, expense, and concerns about neighborhood safety.⁷

Examining the association between SES and perceived opportunities for physical activity (in terms of facilities available, such as

playgrounds and parks or gyms close to home) in 56 neighborhoods of a city located in the Pacific Northwest, Duncan found that residents of neighborhoods with lower poverty levels perceived significantly more such opportunities.²⁰ Another study that assessed perceived neighborhood characteristics and access to physical activity spaces among 1796 adults residing in 6 counties in North Carolina revealed that access to physical activity spaces and trails increased with increasing levels of education and income.¹⁷

To our knowledge, only a few studies have examined differences across neighborhoods according to objective rather than self-reported measures of available physical activity-related opportunities. Estabrooks et al. examined the availability and accessibility of physical activity resources across 32 different census tracts in a small midwestern city according to neighborhood SES.²¹ They found, on the basis of a list of 177 physical activity resources (including parks, sports facilities, fitness clubs, community centers, and walking/bike trails), that low- and medium-SES neighborhoods had significantly fewer resources available than their high-SES counterparts. In terms of accessibility, differences across low-, medium-, and high-SES census tracts were not observed for pay-for-use resources, but low- and medium-SES neighborhoods were found to have significantly fewer no-cost resources.

In a recent study, Powell et al. linked census data on race/ethnicity and SES to observational data on public physical activity settings (e.g., sports areas, parks and green spaces, public pools and beaches, bike paths/lanes) collected from 409 communities across the United States in an attempt to assess how availability varies with respect to the socioeconomic and demographic compositions of local populations.²² Results revealed that communities with higher percentages of African American residents were likely to have fewer available sports areas, parks and green spaces, and public pools and beaches. Also, communities with lower median household incomes, higher poverty rates, and higher percentages of African American and other minority residents were shown to have fewer overall total physical activity-related settings of those assessed.

In the present comprehensive, multivariate national study (comprising a population of

280675874 people living in 28050 zip code areas with 52751 available physical activity-related outlets as of the year 2000), we assessed the availability of commercial physical activity-related outlets by zip code across the United States, along with the associations between the availability of such facilities and neighborhood demographic characteristics such as race/ethnicity and SES. We examined both the presence and extent of availability (i.e., number present) of 4 broad types of physical activity-related settings: (1) physical fitness facilities; (2) membership sports and recreation clubs; (3) dance studios, schools, and halls; and (4) public golf courses. These commercial outlet data were linked by zip code to US Census Bureau population and SES data.

METHODS

Data

Physical activity-related outlet measures. Data on physical activity-related outlets were obtained from a business list developed by Dun and Bradstreet (Waltham, Mass).²³ Dun and Bradstreet's MarketPlace software program, which we used to obtain this list, contains information on more than 14 million businesses in the United States, and the company compiles and updates records quarterly through interviews, public documents, and directories.

Dun and Bradstreet has a number of quality assurance protocols in place to ensure data accuracy. For instance, Dun and Bradstreet uses "match grade" technology to consolidate multiple business listings into a single complete record. The company assigns each business a unique numerical identifier to ensure validity of its data over time. This 9-digit number, which is never recycled, allows Dun and Bradstreet to easily track changes and updates for all businesses contained in its database.

MarketPlace permits sorting by multiple criteria such as location (zip code, metropolitan area, county, and state), company size, and Standard Industry Classification (SIC) codes. SIC codes allow for searching and selection of specific types of businesses. The database permits SIC code searches at varying levels of detail and specificity. Facilities may appear on the MarketPlace list by means of both "primary" and "secondary" SIC codes. Thus, there is initially a certain level of duplication in the listings. To eliminate such duplication, we drew on the primary SIC code listing in creating the list of outlets used in this analysis.

We obtained information on physical activity-related outlets available in the Dun and Bradstreet data set by zip code for the year 2000. We gathered data on specific numbers of these physical activity-related facilities at the 4-digit SIC code level for 4 primary categories: (1) physical fitness facilities (SIC code 7991; n=14259; primarily health clubs, spas, and similar facilities featuring exercise and other types of active physical fitness conditioning, including aerobic and exercise classes); (2) membership sports and recreation clubs (SIC code 7997; n=20359; sports and membership clubs restricted to members and their guests, such as country, golf, tennis, yacht, and amateur sports and recreation clubs); (3) dance studios, schools, and halls (SIC code 7911; n=11168; including public dance halls and ballrooms); and (4) public golf courses (SIC code 7992; n=6965; open to the public on a contract or fee basis).

It can be seen from Table 1 that 26% of zip codes had at least 1 physical fitness facility, 36% had a membership sports or recreation club, 23% had a dance facility, and 19% had a public golf course. Average numbers of outlets per zip code ranged from 0.25 to 0.73 across the 4 different types of facilities.

TABLE 1—Availability of Physical Activity-Related Outlets in the United States, by Zip Code (n = 28 050), in 2000

	Physical Fitness Facilities	Membership Sports and Recreation Clubs	Dance Studios, Schools, and Halls	Public Golf Courses
At least 1 outlet available, %	25.59	36.40	22.57	18.90
Mean no. of outlets (SD)	0.51 (1.14)	0.73 (1.32)	0.40 (0.93)	0.25 (0.59)
Total no. of outlets	14 259	20 359	11 168	6 965

Census Bureau population, SES, and control measures. Census Bureau neighborhood population and socioeconomic data,²⁴ along with measures of urbanization and region, were matched for the year 2000 to outlet density data for 28 050 zip code areas. The zip code sample represented in this study did not include zip codes reflecting post office box addresses or zip codes with populations of less than 300 people. Population and SES data consisted of information on total population, race, ethnicity, and median household income. “Race” was assessed according to the percentages of residents in a zip code area classified in the following categories: White, African American, Asian, or “other” (including American Indian, Alaska Native, Native Hawaiian, other Pacific Islander, and 2 or more races). “Ethnicity” was assessed according to the percentage of Hispanic (vs non-Hispanic) residents in a zip code area.

Additional variables were included in the analysis to describe each zip code’s degree of urbanization. Recent changes in the US census allow for greater specificity in determining the degree of urbanization of a given area. In the

2000 census, urban areas were grouped into 2 categories: urbanized areas (nucleus of 50 000 or more residents and a population density of 1000 residents per square mile) and urban clusters (densely settled areas with a population density of between 2500 and 50 000 residents). Remaining nonurban areas were categorized as rural nonfarm and rural farm as per the US census farm definition. We used these definitions to create 4 “urbanization” categories: urban (urbanized area), suburban (urban cluster), rural (rural nonfarm), and farm (rural farm). The percentage of the zip code’s population (based on aggregations of block groups and census blocks) falling into each category was used in making these determinations. Finally, we controlled for region of the country (South, West, Midwest, Northeast).²⁵

It can be seen from Table 2 that the zip codes included were populated, on average, by about 10 000 people. The majority (75%) of the US population base in 2000 was White, whereas African Americans made up about 12% and 12.5% of the population base is of Hispanic ethnicity. The median household income was approximately \$45 000. Most of the US population (68%) resided in an urban area, whereas just under a third of the zip code

areas assessed were located in urban areas, and more than half were located in rural areas.

Analysis

We used multivariate analyses to examine associations between the availability of the 4 types of physical activity–related outlets and demographic characteristics (race, ethnicity, and SES). We also controlled for population size, degree of urbanization, and region. Specifically, in the case of each of our individual physical activity–related measures, we estimated a probit model based on a dichotomous indicator for available outlets to examine the associations of race, ethnicity, and SES with the probability of the presence of at least 1 available outlet. In addition, to assess overall availability, we estimated a Poisson count model in which we examined similar associations with the number of available outlets.

RESULTS

Table 3 presents estimation results, based on our probit model, of the probability that at least 1 outlet was available for each of the 4 types of physical activity–related facilities. Results showed that higher median household income

TABLE 2—Summary Statistics for Variables From the 2000 US Census

	Zip Code Sample
Population, mean (SD)	10 006.27 (13 423.91)
Race, % ^a	
White	75.07
Black	12.23
Asian American	3.62
Other	9.08
Hispanic, % ^a	12.54
Median household income, ^a	4.4833 (1.7119)
\$10 000s (SD)	
Urbanization category, %	
Urban	29.92
Suburban	9.71
Rural	56.07
Farm	4.30
Region, %	
Northeast	18.25
Midwest	30.67
South	35.22
West	15.85
No. of zip codes	28 050

^aPopulation-weighted.

TABLE 3—Probability of Available Physical Activity–Related Facilities, by Facility Type: Marginal Effects (SE) From Multivariate Probit Model (n = 28 050)

	Physical Fitness Facilities	Membership Sports and Recreation Clubs	Dance Studios, Schools, and Halls	Public Golf Courses
Race				
Black	-0.2636*** (0.0177)	-0.1425*** (0.0221)	-0.2383*** (0.0160)	-0.2453*** (0.0179)
Asian	-0.0535 (0.0587)	-0.1596* (0.0820)	-0.1622*** (0.0516)	-0.4995*** (0.0589)
Other	-0.3619*** (0.0477)	-0.3458*** (0.0513)	-0.4125*** (0.0528)	-0.1539*** (0.0317)
Hispanic ethnicity	-0.2978*** (0.0305)	-0.2282*** (0.0354)	-0.1442*** (0.0303)	-0.1936*** (0.0247)
Median household income	0.0052*** (0.0017)	0.0222*** (0.0023)	0.0071*** (0.0015)	0.0141*** (0.0016)
Population	0.0121*** (0.0003)	0.0143*** (0.0004)	0.0099*** (0.0003)	0.0067*** (0.0002)
Urbanization category				
Suburban	0.1238*** (0.0096)	0.2023*** (0.0135)	0.0444*** (0.0085)	0.1542*** (0.0094)
Rural	-0.2738*** (0.0095)	-0.2530*** (0.0117)	-0.2523*** (0.0085)	-0.0151* (0.0086)
Farm	-0.8702*** (0.0757)	-0.9919*** (0.0690)	-0.6231*** (0.0659)	-0.8117*** (0.0521)
Region				
Midwest	-0.0393*** (0.0073)	-0.0085 (0.0098)	-0.0512*** (0.0061)	0.1058*** (0.0079)
South	0.0166** (0.0073)	-0.0405*** (0.0093)	-0.0234*** (0.0061)	0.0191*** (0.0070)
West	0.0173* (0.0095)	-0.1116*** (0.0106)	-0.0207*** (0.0075)	0.0544*** (0.0094)

*P < .10; **P < .05; ***P < .01.

levels were significantly associated with an increased likelihood of the presence of all 4 types of facilities. These income results were strongest in the case of membership sports and recreation clubs and public golf courses.

After control for other covariates, physical activity–related facilities were significantly less likely to be present in neighborhoods with higher proportions of African American residents and residents of other minority racial backgrounds. The reduced prevalence observed in communities with higher proportions of African Americans was relatively smaller in terms of membership sports and recreation clubs relative to the other 3 types of facilities.

Also, physical activity–related facilities were less likely to be present in communities with higher proportions of Hispanic residents. Each type of facility was significantly more likely to be found in suburban than urban areas. All 4 types of facilities were less likely to be found in rural or farm areas, although the negative association between rural areas and the availability of public golf courses was only marginally significant.

On the basis of our regression results, we undertook a series of simulations in which we examined differences in the likelihood of the presence of the various types of facilities across zip codes according to different income and racial/ethnic characteristics. For example, in terms of income differences, moving from a community with a median household income level of \$25 000 to one with a median income level of \$75 000 would increase the likelihood of the presence of physical fitness facilities, membership sports clubs, dance facilities, and public golf courses by 17%, 38%, 30%, and 54%, respectively.

Simulations of the extreme of moving from a community in which all residents were African Americans to a community in which all residents were White showed that the likelihood of at least 1 physical fitness facility or public golf course being available would increase approximately 5-fold, the likelihood of at least 1 dance facility being available would increase 7-fold, and the likelihood of at least 1 membership sports or recreation club being available would increase by 58%. Relative to neighborhoods composed of 50% Hispanic residents, non-Hispanic neighborhoods would be 172%, 45%, 77%, and 93% more likely,

TABLE 4—Availability of Physical Activity–Related Facilities, by Facility Type: Incidence Rate Ratios (SE) From Multivariate Poisson Model (n = 28 050)

	Physical Fitness Facilities	Membership Sports and Recreation Clubs ^a	Dance Studios, Schools, and Halls	Public Golf Courses
Race				
Black	0.2616*** (0.0159)	0.5202*** (0.0323)	0.2392*** (0.0166)	0.2024*** (0.0219)
Asian	0.6677*** (0.0946)	0.3350*** (0.0675)	0.5480*** (0.0898)	0.0531*** (0.0183)
Other	0.0609*** (0.0127)	0.2571*** (0.0473)	0.0905*** (0.0214)	0.3550*** (0.0745)
Hispanic ethnicity	0.4874*** (0.0530)	0.4739*** (0.0535)	0.4545*** (0.0573)	0.2482*** (0.0384)
Median household income	1.0135*** (0.0053)	1.0619*** (0.0060)	1.0102* (0.0059)	1.0873*** (0.0085)
Population	1.0354*** (0.0005)	1.0352*** (0.0008)	1.0361*** (0.0006)	1.0345*** (0.0010)
Urbanization category				
Suburban	1.5920*** (0.0515)	1.8127*** (0.0620)	1.2627*** (0.0491)	2.2832*** (0.1012)
Rural	0.1062*** (0.0048)	0.2943*** (0.0105)	0.1096*** (0.0056)	0.8547*** (0.0404)
Farm	0.0004*** (0.0002)	0.0062*** (0.0019)	0.0003*** (0.0002)	0.0010*** (0.0004)
Region				
Midwest	0.8040*** (0.0214)	0.8008*** (0.0211)	0.7194*** (0.0204)	1.8161*** (0.0657)
South	1.2345*** (0.0290)	0.8011*** (0.0197)	0.9278*** (0.0239)	1.1466*** (0.0439)
Northeast	1.2414*** (0.0337)	0.6095*** (0.0196)	0.9019*** (0.0274)	1.3391*** (0.0591)

^aAs a result of overdispersion of the data, a negative binomial model was estimated for membership sports and recreation clubs. *P < .10; **P < .05; ***P < .01.

respectively, to have a physical fitness facility, membership sports or recreation club, dance facility, or public golf course available.

Table 4 presents the results of Poisson models examining numbers of available outlets in zip code areas. Similar to the findings on prevalence reported earlier, we found that significantly fewer numbers of all 4 types of facilities were present in neighborhoods with higher proportions of African American residents, residents classified in the “other minority” category, and Hispanic residents. For example, the availability of facilities in Black neighborhoods was 20% to 52% of that in White neighborhoods, according to facility type. Again similar to the prevalence findings, higher neighborhood median household income was associated with a higher rate of availability of facilities, although this effect was only marginally significant in the case of dance facilities. In rural and farm area zip codes, fewer numbers of all 4 types of physical activity–related facilities were available.

DISCUSSION

Ecological models suggest that environmental barriers to physical activity may be

an important factor that can be modified to facilitate behaviors such as walking, biking, sports, and other forms of exercise. Recent research has begun to examine the importance of a series of different types of environmental factors, including aesthetic attributes, safety, traffic, hills, trails, and the availability of physical activity–related facilities and outdoor spaces, primarily on the basis of self-report measures. To our knowledge, there has been no nationwide examination to date, based on objective measures, of how communities might differ in terms of availability of commercial physical activity–related outlets. The results of our national study show clear associations between availability of physical activity–related facilities and community SES and racial/ethnic composition. Commercial physical activity–related facilities were less likely to be present in low-SES neighborhoods and those with higher proportions of African American residents, residents of other racial backgrounds, and residents of Hispanic ethnicity. Moreover, when such facilities were present in these neighborhoods, they were typically present in fewer numbers.

Our nationally based results confirm evidence from studies^{17,20} involving self-report

data of perceived differences in barriers to physical activity—related facilities according to SES and race. Our results diverge from those of a recent study in which no significant differences were revealed in availability of pay-for-use facilities (based on a sample of 47 such facilities) across neighborhood SES levels.²¹ The findings of our study indicate that, in addition to the barriers to available outdoor public physical activity—related settings shown to exist in previous studies,^{21,22} barriers to commercial facilities exist in low-SES neighborhoods and those with high proportions of minority populations.

Previous research has shown that people living in rural areas engage in physical activity less frequently than do those living in more urbanized areas.^{26,27} Given our finding that physical activity—related facilities were limited in availability in these less densely populated areas, our findings offer one possible explanation for this situation.

Future steps will include examining the relationships between our objective measures of available physical activity—related facilities and individual physical activity behaviors after controlling for individual-level socio-demographic characteristics and other neighborhood factors. Our results suggest that barriers to facilities that enable and promote activity may account in part for the lower levels of physical activity observed among low-SES and minority groups. Increasing the availability of such facilities among underserved populations may help to increase activity levels and reduce health disparities. Enhanced availability of proximal commercial facilities is likely to be particularly important among low-SES populations given that such groups are less likely to have private means of transportation to reach facilities outside of their immediate community.²⁸

It should be noted that improving availability is only the first step in ensuring accessibility of neighborhood facilities. We did not address facility user costs in this study. Increased provision of commercial facilities may not change behaviors if newly available facilities demand expensive membership or high user fees. Hence, to improve access among low-SES and minority populations to facilities that promote physical activity, policymakers must be committed to improving the availability

of public facilities charging low or moderate user fees. ■

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Contributors

L.M. Powell originated the study and led the data preparation, empirical analyses, and writing of the article. S. Slater assisted with the data preparation and writing of the article. F. Chaloupka helped to conceptualize the study, interpret the findings, and review the article. D. Harper assisted with the data preparation.

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