Socioeconomic Status and Perceptions of Access and Safety for Physical Activity

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ABSTRACT

Background: *Environmental factors may play an important role on influencing physical activity (PA) behaviors.* ***Purpose:*** *Perceptions of access and safety for PA were compared among residents who were stratified as low or high in socioeconomic status (SES).* ***Methods:*** *Residents of a U.S. southeastern county (N = 1,194, 18–96 years of age) were contacted using a random-digit-dial method and asked about neighborhood and community environmental supports for PA. A Geographic Information System (GIS) was used to identify trails, sidewalks, public recreation facilities, and violent crime incidents.* ***Results:*** *A cluster analysis identified 10 census tracts as low SES and 11 census tracts as high SES (median household income, owner-occupied houses). More African Americans (66.5%) than Whites (33.5%) were classified as living in low-SES areas. Respondents from low-SES areas also reported engaging in less PA based on Centers for Disease Control and Prevention and American College of Sports Medicine recommendations than respondents from high-SES areas ($p < .05$). Respondents from low-SES (vs. high-SES) areas reported higher perceptions of neighborhood crime, unattended dogs, unpleasantness of neighborhoods, untrustworthy neighbors, and less access to public recreation facilities (ps < .05). GIS data for presence of sidewalks, recreation facilities, and crime did not support these differences in perceptions; however, respondents from low-SES (vs. high-SES) areas had substantially fewer trails. Having and using trails in one's community predicted sufficient PA and walking for 150 min/week for low-SES respondents but not for high SES respondents (ps = .05, adjusted for covariates).* ***Conclusions:*** *Having access to trails is an important environmental feature among low-SES communities and should be the focus of future community-based PA interventions.*

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INTRODUCTION

The important influence of physical activity (PA) on chronic disease reduction and increased longevity has been well established (1,2). In 1995, the Centers for Disease Control and Prevention and the American College of Sports Medicine (CDC–ACSM) concluded that moderate-intensity activity equivalent to a brisk walk confers enough benefit to prevent a milieu of poor health outcomes and death (1). A recent study performed by Dunn et al. (3) showed that similar fitness levels can be obtained by people performing lifestyle activities compared with structured exercise. Moderate-intensity activity consistently incorporated into routine activities of daily living can improve fitness and prevent leading causes of death and disability (1,2). Despite the positive relationship between PA and health, more than half the U.S. population is not regularly active at recommended levels of 30 min/day, most days of the week (1,4). Recent national studies also show that inactivity is more prevalent among African American (35%) than White (18%) adults (4). This has led to national interest in gaining more knowledge about the determinants and mediating factors of inactive behaviors, especially among minority and underserved communities (5–8).

Recent evidence suggests that environmental factors may play an important role in shaping health behaviors, such as increasing PA (9). A social–ecological perspective of health em-

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phasizes an interaction between individuals and their environment (9). It further suggests that environmental factors may increase our understanding of and ability to predict health behaviors such as PA. A number of investigators have conducted focus group studies to further an understanding of environmental perceptions about access and safety for PA in underserved populations. For example, Henderson and Ainsworth (10) reported that African American and Native American women reported that weather (heat), lack of safety, and not having a walking partner as common environmental constraints to walking. In another study, Henderson et al. (11) reported that not having close access to places to exercise and concerns about safety for exercise after dark were key barriers to walking. Participants also felt that socioeconomic status (SES) affected access to and safety for PA because of fewer facilities, poorer condition of these facilities, and unsafe conditions due to stray dogs and criminal activities in the poorer areas of town. Ainsworth and Wilcox and their colleagues (12,13) recently reported that safety (related to crime and stray dogs), access/facilities, sidewalks, cost, and weather were among the most frequently mentioned factors that influenced minority women's choice to be physically active. Other investigators have reported similar findings (14–18).

Several investigators have examined the relationship between SES and PA levels. For example, Giles-Corti and Donovan (19) showed that those living in low-SES (vs. high-SES) areas of western Australia were less likely to engage in vigorous activity and less likely to use supports such as recreational facilities for PA. Parks, Housemann, and Brownson (20) also reported, in a large U.S. sample of adults, that lower income residents were less likely than higher income residents to meet PA recommendations. Other investigators have also shown similar positive associations between other SES factors, such as educational level (21) and occupational status (22), and likelihood of engaging in regular PA. Previous studies controlling for race have shown the relationship between SES and PA is not significantly diminished, suggesting that the effects may be independent of race (19–22).

The results of previous studies within minority and underserved communities indicate that key environmental barriers to PA include a lack of available facilities, structured exercise programs, and sidewalks. Environmental features of safety are also clear barriers to PA in underserved communities and include concerns about crime, victimization, traffic, stray dogs, and lack of group participation. The purpose of this study was to examine the relationship between SES and perceptions of access and safety for PA in residents of a U.S. southeastern county.

METHOD

Participants

Residents of a rural U.S. southeastern county (N = 1,194, 18–96 years of age) were surveyed from January 2001 to February 2001. The participants interviewed for this study were selected from a stratified random sample of households with listed telephone numbers. Thirty-eight interviewers at the Survey Research Laboratory at the University of South Carolina conducted the telephone survey. The interviews took place from 9:00 a.m. to 9:30 p.m. Monday through Friday, from 10:00 a.m. to 4:00 p.m. on Saturday, and from 3:00 p.m. to 8:00 p.m. on Sunday. The interviews were conducted using Sawtooth Ci3 computer-aided telephone interviewing software (Sawtooth Software, Sequim, WA) at the Survey Research Laboratory's interviewing facilities. A specific number of residents proportional to the total population and racial distribution of the population were randomly selected from each census tract to guarantee a balance in the racial profile and the geographic distribution of the study sample and to facilitate Geographic Information System (GIS) mapping (geocoding) of the household addresses. The phone numbers were purchased by census tracts from Survey Sampling Incorporated (Fairfield, CT). Because of the geographical restrictions of the sampling design, a listed sample was used. A listed sample includes telephone numbers that would be located in a phone book or other directories that allow the phone numbers to be connected to identifiable addresses. Each telephone number in the sample was called up to 20 times. Once a household was contacted and the interview started, a respondent age 18 or older was randomly selected from all of the adults (age 18 or older) living in the household using the next-birthday method; that is, when more than one adult was in the household, the initial contact was asked to identify the person with the next birthday, and that person was interviewed.

Twenty-one census tracts were surveyed, with 2 to 80 respondents per tract (Mdn = 61; 25th–75th interquartile range = 53–76). The survey response rate was 54%. At the end of the survey, respondents were asked to provide their home address to match their residential location with existing supports for PA.

Perceptions of Environmental Supports Questionnaire

Items for the questionnaire were developed from an extensive literature review (23–27), expert input, and focus groups conducted with residents living in the southeastern county where this study took place (11). Respondents provided their home address, length of residency, age, race, education level, and income level. Respondents completed 13 items pertaining to neighborhood-level PA supports. Items pertaining to environmental supports for access to PA included having sidewalks and public recreation facilities available. Environmental supports concerning safety for PA included assessing the presence of traffic, streetlighting, unattended dogs, safe neighborhoods, pleasant neighborhoods, and neighbors that could be trusted. A Likert-type scale was used to assess neighborhood characteristics concerning access and safety for PA, with the lowest value indicating stronger endorsement. The respondents were told that neighborhood was defined as a 0.5-mile radius or a 10-min walk from the respondent's home based on "as the crow flies" distances.

Respondents also completed 13 items pertaining to community-level PA supports. Items pertaining to environmental supports for access to PA included having walking or bicycling

trails, public pools, recreation facilities, schools, malls, places of worship, and waterways. Environmental supports concerning safety for PA included assessing whether recreational facilities were perceived as safe and whether safety concerns influenced the use of recreational facilities. Respondents indicated whether they used, did not use, or did not have the environmental support for PA. The respondents were told that the community was defined as a 10-mile radius or a 20-min drive from the respondent's home based on road network distances.

The test–retest reliability of these measures ranges between $r = .42$ and $r = .74$ for the neighborhood-level variables and between $r = .28$ and $r = .56$ for the community-level variables (28). Modest kappa coefficients have also been demonstrated between GIS objective data and self-perception questions for neighborhood and community items (28). Respondents reported having fewer community facilities and supports than indicated by GIS.

GIS Measures

We collected objective measures of environmental supports for PA using established databases, global positioning system units, telephone interviews, and in-person audits. Databases used in this study were collected from state agencies, city and county offices, and private companies. Coordinates for public recreation facilities, shopping malls, and walking/biking trails were collected with global positioning system units. Telephone contacts were made in the study community to determine opportunities for PA at schools and places of worship. Respondents' home addresses, places of worship, school addresses, violent crime incidents, and locations of unattended dogs were geocoded or mapped in GIS software using a South Carolina 911-road file.

We identified neighborhood and community boundaries around each participant's residence using GIS software, using the same definition for boundaries as defined during the survey interview. Presence or absence of each environmental support, such as recreation facilities, sidewalks, and trails, was identified at the neighborhood and community levels for each respondent. The number of violent crimes was also estimated at the neighborhood and community levels.

PA Measures

We measured PA using the 2001 Behavioral Risk Factor Surveillance System PA module (see http://www.cdc.gov/brfss/). This module has been used in several national studies (12,29,30). PA was categorized according to the CDC–ACSM as meeting the recommendations (≥ 30 min/day for ≥ 5 days/week of moderate intensity PA or ≥ 20 min/session for ≥ 3 days/week of vigorous-intensity PA) or as not meeting the recommendations (some PA but not enough to meet the CDC–ACSM recommendations or no moderate- or vigorous-intensity PA). Three additional questions assessed the respondents' daily walking behavior. Respondents were asked if they walked for at least 10 min at a time for recreation, exercise, transportation, or while at work; those who responded affirmatively were asked how many days per week and how much time per day they walked. From these data, respondents were categorized as walking ≥ 30 min/day for ≥ 5 days/week or as not walking regularly (doing some walking but less than amounts indicated for regular walking, or no walking reported).

Data Analyses

Because the sampling rates varied by census tract and race, analysis weights were constructed so that results were generalizable to the population. The weights had two multiplicative components, following the protocol of the Behavioral Risk Factor Surveillance System (http://www.cdc.gov/brfss/). The first factor adjusted for the number of adults and the number of voice telephone lines in the households. The second factor adjusted for the census population by age–race–sex group to account for the differential sampling and response rates. The second factor was constructed within each census tract, although the sample was treated as nonstratified for analysis. We incorporated these weights into all descriptive and inferential statistical analyses using the SUDAAN version 8.0 software (31).

All descriptive statistics were calculated in SUDAAN's CROSSTAB and DESCRIPT procedures. In the primary analyses, we used generalized logistic regression to account for the two levels of the dependent variables. Respondents who meet CDC–ACSM recommendations were compared to those not meeting recommendations. Those who were insufficiently active were categorized as not meeting the CDC–ACSM recommendations. For walking behavior, respondents who were regular walkers were compared to those who were irregular walkers (including nonwalkers). An odds ratio greater than unity reflects an increased likelihood of PA or walking at the recommended level.

RESULTS

Calculation of SES Classifications

Data from the 2000 U.S. Census data for SES were obtained for each census tract represented in the sample. In this study population, 21 census tracts were represented. For each participant's census tract, the following data were included: percentage of owner-occupied housing, percentage of vacant housing, average number of persons per household, and median household income. The indicators selected in this study are consistent with those used in other studies of neighborhood effects (32–35). The cluster analysis did not include SES data from individual-, neighborhood-, or community-level variables from the survey.

We used a cluster analysis procedure in SAS with the preceding four indicators to derive neighborhood SES types (see Table 1). The advantage of using a cluster approach rather than treating neighborhood factors individually is that the combined contextual effects of these factors may be captured more effectively. A hierarchical agglomerative method (36) with squared Euclidean distance as the distance measure was used to cluster participants on the basis of census tract variables. On the basis of inspection of the dendogram and the coefficients in the ag-

TABLE 1
Census Tract Descriptive Information for Neighborhood SES Classifications

Variable	*Low SES Neighborhood*[a]	*High SES Neighborhood*[b]
% vacant housing units	2 ± 1	2 ± 1
% owner-occupied housing*	19 ± 4	27 ± 2
Average three or more in house	3 ± 1	3 ± 1
Median household income*	15,599 ± 2,981	27,646 ± 6,628

Note. Values are expressed as $M \pm SD$. SES = socioeconomic status.
[a]$n = 10$. [b]$n = 11$.
*$p < .05$.

glomeration schedule, we identified a two-group solution (low SES vs. high SES).

Demographic and Baseline Characteristics

Demographic and baseline characteristics for the entire sample separated by SES levels are presented in Table 2. A series of *t* tests and chi-square analyses indicated that the residents differed on race, household income, education level, and PA level. Respondents from high-SES areas were more likely to be White, have higher household incomes, and have higher education levels than those from low-SES areas (ps < .05). Respondents form high-SES areas also reported greater PA based on the CDC–ACSM recommendations than those from low-SES areas ($p < .05$). There were no significant group differences for gender, age, body mass index (BMI), number of poor health days, or length of residency.

Associations Between SES and Perceptions of Safety and Access for PA

We performed a series of simple logistic regression models to determine the associations between SES level and social and environmental supports for PA (see Tables 3 and 4). In Table 3 are presented descriptive information concerning perceptions of safety and access for PA for the neighborhood variables stratified by SES. Respondents from low-SES (vs. high-SES) areas reported higher perceptions of unpleasantness of neighborhoods, unattended dogs, neighborhood crime, and untrustworthy neighbors (ps < .01). Respondents from low-SES areas also reported lower perceptions of access to public recreation facilities ($p < .01$) but higher perceptions of access to sidewalks in their neighborhoods than those from high-SES areas ($p < .01$).

Univariate associations between SES and perceptions of safety and access for PA for the community variables are presented in Table 4. Respondents from low-SES areas reported having lower perceptions of having access to waterways and public facilities for PA than respondents from high-SES areas ($p < .01$). No other group differences were significant.

Table 5 shows the multivariate model results for perceptions stratified by low and high SES for participants meeting the CDC–ACSM PA recommendations for neighborhood and community variables. For all multivariate analyses, race, education, age, sex, and BMI were entered into the model. Higher perceptions of having and using walking/bicycling trails were significantly associated with meeting the CDC–ACSM recommendations for PA among low-SES respondents ($p = .05$) but not for high-SES respondents. Age and BMI were associated with meeting the CDC–ACSM recommendations for PA among high-SES respondents ($p < .01$). Younger respondents were more likely to be physically active than older respondents, and obese respondents were less likely to be physically active than nonobese respondents (ps < .01).

Table 6 depicts the multivariate model results for perceptions stratified by low and high SES for participants who reported

TABLE 2
Demographic Variables for Low and High SES Neighborhoods

Variable	*Low SES*	*High SES*
Sex		
Male	42.7%	44.3%
Female	57.3%	55.7%
Race*		
African American	66.5%	26.1%
White	33.5%	73.9%
Age group (years)		
18–29	28.6%	21.5%
30–44	30.1%	34.8%
45–64	22.8%	28.1%
65–74	11.8%	10.5%
75+	6.6%	5.1%
Annual household income*		
< $25,000	56.6%	28.6%
$25,000–$50,000	33.9%	37.7%
> $50,000	9.4%	33.7%
Education*		
< high school	18.8%	9.8%
High school graduate	36.6%	30.1%
Some college	31.1%	32.4%
College graduate	13.5%	27.7%
BMI group		
< 25 kg/m^2	38.3%	39.7%
25–29.9 kg/m^2	32.4%	37.4%
> 29.9 kg/m^2	29.3%	22.8%
Physical activity level*		
Sufficiently active	34.5%	39.4%
Insufficiently active	42.9%	45.6%
Inactive	22.6%	15.0%
Walking 150 min/week		
Yes	38.0%	40.4%
No	62.0%	59.6%
Poor health		
No. days/month ($M \pm SD$)	3.4 ± 0.5	4.2 ± 0.5
Average length of residency (years; $M \pm SD$)	13.2 ± 0.8	13.0 ± 0.7

Note. SES = socioeconomic status; BMI = body mass index.
*$p < .05$.

TABLE 3
Neighborhood Access and Safety Characteristics by Low and High SES

	Low SES		*High SES*	
Characteristic	*No.*	*Weighted %*	*No.*	*Weighted %*
Pleasant neighborhood*				
Pleasant	393	81.6	601	89.8
Not pleasant	97	18.4	91	10.2
Missing	6		6	
Traffic in neighborhood				
Heavy	123	20.6	131	15.3
Moderate	203	39.0	245	42.0
Light	170	40.4	320	42.7
Missing	0		2	
Sidewalks in neighborhood*				
Yes	133	24.0	103	14.1
No	362	76.0	594	85.9
Missing	1		1	
Streetlighting in neighborhood				
Good	147	27.0	165	24.0
Fair	125	27.2	178	29.2
Poor	216	45.8	343	46.8
Missing	8		12	
Unattended dogs in neighborhood*				
Big problem	191	39.0	217	28.2
Not much of a problem	122	24.9	197	32.7
Not a problem	177	36.1	275	39.1
Missing	6		9	
Neighborhood safe from crime*				
Safe	274	55.4	548	79.1
Not safe	208	44.6	146	20.9
Missing	14		4	
Neighbors can be trusted*				
Yes	348	76.3	621	95.0
No	93	23.7	37	5.0
Missing	55		40	
Public recreation facilities in neighborhood*				
Yes	140	1.9	103	15.4
No	344	68.1	590	84.6
Missing	12		5	

Note. SES = socioeconomic status.
*$p < .01$.

TABLE 4
Community Access and Safety Characteristics by Low and High SES

	Low SES		*High SES*	
Characteristic	*No.*	*Weighted %*	*No.*	*Weighted %*
Walking or bike trails				
Respondent uses trails	89	20.3	131	21.5
Respondent does not use	171	40.0	270	39.2
No trails reported	195	39.7	245	39.3
Missing	41		52	
Public pools				
Respondent uses pools	32	7.3	36	4.7
Respondent does not use	189	39.5	243	34.8
No pools reported	261	53.2	390	60.5
Missing	14		29	
Recreation facilities				
Respondent uses facilities	105	24.5	123	18.2
Respondent does not use	198	37.2	282	44.5
No facilities reported	180	38.3	271	37.3
Missing	13		22	
Schools available for PA				
Respondent uses schools	78	21.9	73	14.3
Respondent does not use	154	36.7	206	39.5
No schools reported	186	41.4	272	46.2
Missing	78		147	
Malls available for PA				
Respondent uses malls	161	33.4	196	28.5
Respondent does not use	227	46.3	351	51.6
No malls reported	103	20.3	145	19.8
Missing	5		6	
Worship facilities for PA				
Respondent uses facilities	122	30.2	117	21.9
Respondent does not use	188	42.2	296	47.5
No facilities reported	145	27.6	211	30.6
Missing	41		74	
Waterways*				
Respondent uses waterways	38	7.4	91	15.9
Respondent does not use	120	25.7	198	27.9
No waterways reported	331	66.9	395	56.2
Missing	7		14	
Equal access to public facilities*				
Yes	325	79.8	506	86.0
No	89	20.2	93	14.0
Missing	82		99	
Recreation facilities				
Safe	331	90.1	482	90.5
Not safe	49	9.9	58	9.5
Missing	116		158	
Safety concerns influence use of recreation facilities				
Yes	197	50.9	255	47.2
No	204	49.1	325	52.8
Missing	95		118	

Note. SES = socioeconomic status; PA = physical activity.
*$p < .01$.

walking 150 min/week for neighborhood- and community-level variables. In the low-SES group, higher perceptions of having and using walking/bicycling trails were significantly associated with walking 150 min/week ($p = .052$). In the low-SES group, younger respondents were more likely to be physically active than older respondents. Obese residents were less likely to walk 150 min/week than nonobese residents in the high-SES group ($p < .05$). For high-SES respondents, having and using places of wor-

TABLE 5
Associations With Meeting CDC–ACSM PA Recommendation by Low and High SES

	Low SES CDC–ACSM PA Recommendation		*High SES CDC–ACSM PA Recommendation*	
Variable	*OR (CI) for Meets Recommendation vs. Does Not Meet Recommendation*	*Overall p*	*OR (CI) for Meets Recommendation vs. Does Not Meet Recommendation*	*Overall p*
Age				.008
18–34			2.53 (1.29, 4.98)	
35–54			1.10 (0.60, 2.04)	
≥ 55			1.00	
Body mass index				.007
Regular			1.94 (1.00, 3.91)	
Overweight			3.05 (1.51, 6.14)	
Obese			1.00	
Walking or bicycling trails		.050		
Respondent uses trails	2.81 (1.38, 7.93)			
Respondent does not use	1.17 (0.53, 2.55)			
No trails reported	1.00			

Note. Values are adjusted for race and sex. CDC–ACSM = Centers for Disease Control – American College of Sports Medicine; PA = physical activity; SES = socioeconomic status; OR = odds ratio; CI = confidence interval.

TABLE 6
Associations With Walking at Least 150 Min/Week by Low and High SES

	Low SES Walking Behavior		*High SES Walking Behavior*	
Variable	*OR (CI) for ≥ 150 Min Walking vs. < 150 Min Walking*	*Overall p*	*OR (CI) for ≥ 150 Min Walking vs. < 150 Min Walking*	*Overall p*
Age		.030		
18–34	2.54 (1.16, 5.56)			
35–54	2.41 (1.07, 4.44)			
≥ 55	1.00			
Body mass index				.038
Regular			2.17 (1.13, 4.18)	
Overweight			1.25 (0.64, 2.43)	
Obese			1.00	
Walking or bicycling trails		.052		
Respondent uses trails	3.04 (1.24, 7.48)			
Respondent does not use	1.54 (0.73, 3.23)			
No trails reported	1.00			
Waterways		.010		
Respondent uses waterways	0.24 (0.08, 0.71)			
Respondent does not use	0.44 (0.21, 0.94)			
No waterways reported	1.00			
Parks				.034
Respondent uses parks			0.83 (0.35, 1.97)	
Respondent does not use			0.44 (0.21, 0.92)	
No parks reported			1.00	
Places of worship with physical activity opportunity				.013
Respondent uses places of worship			1.77 (0.86, 3.65)	
Respondent does not use			0.65 (0.36, 1.17)	
No places of worship reported			1.00	

Note. Values are adjusted for race and sex. SES = socioeconomic status; OR = odds ratio; CI = confidence interval.

ship that offered PA opportunities was significantly associated with being more likely to walk 150 min/week ($p < .05$).

Associations Between GIS Measures and SES

The objective data for recreational facilities, sidewalks, and violent crimes showed relatively similar rates of access and violent crime across the low- and high-SES areas. There were 22 (vs. 18) recreation facilities, 52 (vs. 48) miles of sidewalks, and 2.5% (vs. 1.8%) of recorded crimes that were classified as violent for the low-SES (vs. high-SES) group. However, low-SES respondents had only 2 miles of walking and bicycling trails as compared to high-SES respondents, who had 37 miles of walking and bicycling trails.

DISCUSSION

The data from this study indicate that low-SES respondents were less likely to meet the CDC–ACSM recommendations for PA and reported higher perceptions of unpleasantness of neighborhoods, unattended dogs, neighborhood crime, and untrustworthy neighbors than did high-SES respondents. Furthermore, although low-SES respondents reported lower access to recreation facilities, they reported higher perceptions of available sidewalks than did high-SES respondents. GIS data confirmed that the availability of recreation facilities and sidewalks was similar across the two levels of SES but that the number of violent crimes was slightly higher for the low-SES respondents. However, low-SES respondents did have substantially fewer walking/bicycling trails than did high-SES respondents, based on GIS. Separate multiple regression analyses also revealed that having and using trails predicted sufficient PA and walking 150 min/week among low-SES respondents but not for high-SES respondents.

Our findings are consistent with a number of other studies that indicate that residents living in low-SES areas are less likely to engage in sufficient PA levels than residents living in high-SES areas (19–22,37,38). For example, Giles-Corti and Donovan (19) showed that people living in low-SES (vs. high-SES) areas of western Australia were less likely to engage in vigorous activity. Parks et al. (20) also reported, in a large U.S. sample of adults, that lower income residents were less likely than higher income residents to meet PA recommendations. Other investigators have also shown similar positive associations between other SES measures and PA levels (21,22).

The results of this study are consistent with other studies that have shown that having access to trails is an important environmental support for PA among low-SES rural communities. For example, Brownson et al. (24) investigated trail use behavior in communities that lacked other resources for walking, such as shopping malls and sidewalks. In this study, one third of the rural residents had access to the walking trail, and use of the trail increased as a function of trail availability. Moreover, concerns about safety did not appear to be a barrier to trail use, because 86.9% of trail users reported feeling very safe when using the trails. Low-SES residents were more likely to report an increase in walking when the trails became available as compared to higher SES residents. One limitation of our study is that there is some blurring of distinction between trail availability and use. The finding that having and using walking/bicycling trails is related to more PA is not as compelling an environmental argument than if access and use had separate response categories.

Although environmental perceptions of access and safety were different across the low- and high-SES respondents in this study, only perceptions of having and using trails was predictive of meeting PA recommendations in the low-SES (vs. high-SES) group. Other investigators have shown that access and availability of environmental supports for walking in safe environments are important for people living in low-SES environments. Giles-Corti and Donovan (19) reported that although those living in low-SES (vs. high-SES) areas were more likely to perceive that they had access to sidewalks and shops, they were 36% less likely to engage in vigorous activity, because they perceived their neighborhoods as unattractive, busier with traffic, and less supportive for walking. Thus, although attractive and safe neighborhood environments with sidewalks may be important for encouraging PA, our study does not show a direct relationship between perceptions of safety and increased levels of PA in low-SES residents.

The GIS data obtained in this study did not support the reported differences in perceptions of PA supports across low- versus high-SES respondents for miles of sidewalks and number of recreation facilities available to them. Furthermore, although the percentage of violent crimes was slightly higher for the low-SES residents, this difference was not substantial. However, low-SES respondents did have substantially fewer trails available at the community level than did high-SES respondents. Thus, our results suggest that although residents of low-SES areas may perceive themselves as having less access to PA and unsafe environments, it may be that their perceptions are somewhat unsubstantiated by objective data. It is interesting that trail availability did substantially differ but was not perceived as being different. Further studies are needed to replicate these findings using GIS data across a variety of environmental indicators.

There are several limitations to this study. The survey response was modest; however, this rate is consistent with previously published studies (19,20). Another limitation of this study is that the sampling frame used may limit generalizability. Not all telephone numbers were listed, and thus certain populations, including African Americans, very poor residents, and very wealthy residents, who are more likely to have an unlisted phone number, may have been underrepresented. These limitations decrease the number of phone numbers available for random selection within any census tract. In a few instances, such as in the more rural areas of the county, the number of listed phone numbers was also quite low. Generalizability may also be somewhat limited because the survey was conducted during the winter months in a predominantly rural county with only one small metropolitan area. Another limitation of this study is that some of the measures demonstrated rather low reliability. One problem could be that respondents may not have accurately recognized distances from their residences used to define neighborhood- and community-level variables. In particular, respondents' answers to community variables were compared to GIS measures of community covering a 10-mile area or 20-min

drive. The community area was probably too large for the respondent to accurately identify community-level environmental supports for PA and, thus, the reliabilities tended to be lower for community-level variables than for neighborhood-level variables.

This study adds to a growing body of literature examining the relationship between PA and environmental characteristics. In particular, our findings demonstrate that low-SES respondents perceive having less access and safe environments for PA as compared to high-SES respondents, although GIS data did not tend to support these perceptually differences. Furthermore, environmental supports, such having and using walking/bicycling trails, was positively associated with PA and walking behavior in low-SES residents. Thus, increasing awareness of environmental supports for walking paths and trails among underserved populations may be an important strategy for future community-based PA interventions.

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