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Neighborhood Design and Perceptions: Relationship with Active Commuting

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Abstract

Purpose—Walking to and from school contributes to total physical activity levels. This study investigated whether perceived and actual neighborhood features were associated with walking to or from school among adolescent girls.

Methods—A sample of geographically diverse 8th grade girls (N=890) from the Trial for Activity in Adolescent Girls (TAAG) study living within 1.5 miles of their middle school were recruited. Participants completed a self-administered survey on their neighborhood and walking behavior. Geographic information system (GIS) data were used to assess objective neighborhood features. Nested multivariable logistic regression analyses were conducted to determine the contribution of perceived and objective measures of walking to or from school.

Results—Fifty-six percent (N=500) of the girls walked to or from school at least one day of the week. White (42%) girls walked more frequently than Hispanic (25%) and African American (21%) girls. Girls were nearly twice as likely to walk to or from school if they perceived their neighborhoods as safe and perceived they had places they liked to walk, controlling for other potential confounders. Additionally, girls who lived closer to school, had more active destinations in their neighborhood, and smaller sized blocks were more likely to walk to or from school than those who did not.

Conclusion—Safety, land use, and school location issues need to be considered together when designing interventions to increase walking to and from school.

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Keywords

Physical Activity; Adolescents; GIS; Walking; School; Environment; Neighborhood

INTRODUCTION

Recent reviews have shown the potential of active transport, such as walking and bicycling to and from school, to contribute to overall physical activity levels in elementary and middle school youth (5,6).

Transportation-related activity, accumulated along with other forms of physical activity throughout the day, has the potential to reduce the chronic health risks associated with an inactive lifestyle and obesity. However, little is known about specific community design attributes that influence the likelihood that students walk to school.

Krizek et al (13) proposed a conceptual model of community design attributes that may be unique to youth, such as issues related to opportunity, time constraints, and parental permissiveness. It is unclear whether neighborhood features are different for youth related to walking to school compared to adults walking for utilitarian, or leisure purposes. Three recent reviews discuss hypothetical factors relating to children's trips to school (18) and environmental determinants of active travel in youth (1,25). Panter et al (25) present a novel framework that incorporates multilevel physical environment factors, both existing and hypothesized that may either directly or indirectly relate to walking outcomes in youth. These include attributes of the travel route such as directness, safety, urban form, and destinations. Sirard and Slater (30) also present a conceptual framework for children's travel behavior that hypothesizes that the perceived physical environment directly impacts frequency of active commuting. However, much of the empirical research in this area (11,21,22) relates to features that make neighborhoods more walkable for adults, including such measures as land use mix or convenient walking destinations, existence and quality of sidewalks, block size, street connectivity, population density, pedestrian safety, and crime (28).

More than one-third of U.S. children ages 9 to 15 years live within a mile of school, and less than half walk or bike to school once a week (15). Additionally, the long-term trends show that the distances children must travel to school are increasing over time, while their active transportation rates are decreasing (10,16). A national U.S. survey (17) and a multicenter trial ancillary study (6), as well as large Canadian (14) and Irish studies (23) showed distance and safety concerns were major barriers to children walking to school.

Features related to walking behavior have been measured in a variety of ways, using surveys of individual's perceptions, audit instruments, and geographic information systems (GIS). Few studies of active transportation to school include both objective and perceived measures (8, 12,17,29). Thus, it is important to consider a comprehensive set of neighborhood design features that may relate to other forms of activity such as walking to school. The current study assesses the associations between perceived and objectively measured neighborhood variables, including safety and environmental features and walking to and from school in adolescent girls living close to school. Because participants were 8th grade girls from a large, geographically and ethnically diverse cohort,(36) this study could have implications for community design features that facilitate walking to or from school for adolescents.

METHODS

Study Design

TAAG (Trial of Activity in Adolescent Girls) is a multi-center cluster-randomized trial, funded by the National Heart, Lung, and Blood Institute (NHLBI), to test the effectiveness of a school and community-linked intervention to reduce the usual decline in moderate to vigorous physical activity (MVPA) among adolescent girls (31). In collaboration with NHLBI staff, and coordinated by the University of North Carolina, Chapel Hill, healthy 6th grade girls, age 11–12 years, were recruited from 36 schools participating in TAAG at field centers located in Baltimore, MD, Minneapolis/St. Paul, MN, Columbia, SC, Tucson, AZ, San Diego, CA, and New Orleans, LA, in the fall/winter of 2003. A random sample of 60 girls was targeted for recruitment from each of the 36 schools. Girls in the sample, who were unable to read and understand English, had been told by a physician to avoid physical activity, or had other medical contraindications, were considered ineligible and replaced by another eligible girl in the school. Each participating institution's human subjects review board approved the study protocol. Written consent to participate was obtained from one parent, and assent was obtained from each participant. Parental consent and student assent were obtained for eligible girls for an average recruitment rate of 80% for the baseline sixth grade sample, and 89% of the original 6th grade cohort consented for 8th grade measurement (38). We could not investigate walking to or from school in the 6th grade cohort or examine change in walking status longitudinally, because these particular questions were only included on the 8th grade questionnaire. Therefore this study examines 8th grade girls (N=3443). From this original sample we were able to geo-code 2952 addresses; from these 2952 girls only those living ≤ 1.5 miles from school were included in the final analyses (n=890). Girls living more than 1.5 miles from school were deemed to live too far to have the “opportunity” to walk to or from school and were excluded. The distance between girls' homes and their schools was calculated using ArcGIS.

Survey Instrument

Data collectors participated in a centralized training to ensure standardization of survey administration procedures across all 36 study schools in the six field sites.

Any Walking to or From School During Weekday Variable Description

The mode of transportation to and from school was assessed by asking the following question: During the last 7 days not including today, how many days did you walk A) to school?, B) from school? Response options for both questions ranged from 0–5 days. These answers were reduced to a variable representing any weekday walking trips to or from school. Frequency of biking was also assessed; however, less than 1% of participants reported biking, so this was not included in our definition.

Perceived Neighborhood Variable Descriptions

Perceived neighborhood environment questions were taken from a ten-item questionnaire that asked about safety (e.g., safe to walk or jog in neighborhood, see walkers/bicyclists from homes on street, traffic, crime, other children playing outdoors, lighting), aesthetics (i.e., having many interesting things to look at in the neighborhood), and access to facilities near home (e.g., places to walk to from home, sidewalks, trails)[6]. Response options for each item were on a five point scale (disagree a lot, disagree a little, neither agree or disagree, agree a little, or agree a lot). Two-week test-retest reliabilities, using the five-level responses with a separate sample of middle school girls ranged from 0.37 to 0.58 (weighted k coefficients) for these items (6). For these analyses, five-level responses were collapsed into three categories: disagree, neither, and agree. One indicator was set equal to one for girls who “agreed” or “strongly agreed” with perception and for girls who “neither agreed nor disagreed” with each statement. The baseline comparison was girls who “disagreed” or “disagreed strongly”. Traffic and crime items were reverse coded.

Perception of facilities (perceived active destinations) located near home was measured by asking girls to respond to a list of 14 facilities, which had been identified during formative work to be active recreation places common to middle school girls in these 36 communities (9). The questions asked: “Is it easy to get to and from this place from home or school?” (yes or no). In order to match the perceived destinations to the objectively measured destinations, only eight of the original 14 destinations were used in our perceived destinations measure. Facilities listed included: basketball courts, golf courses, martial arts studios, parks, tracks, swimming pools, walking/biking trails, and dance studios. These were scored by adding the total number of facilities or destinations to which the participant could easily get to (range 0–9), (7). The reliability of these measures is reported elsewhere (6,7).

Objective Neighborhood Variable Descriptions

We geocoded the TAAG participants' addresses using ArcGIS software and created a neighborhood, defined as the area within a 1/2 mile street network buffer surrounding each girl's home. By combining secondary data sources, we created several objective measures for each neighborhood.

Neighborhood Socioeconomic Status—Socioeconomic status (SES) of the neighborhood was defined with the Townsend index (34), using data from the 2000 US Census. The components of the Townsend index are the percentage of the workforce that is unemployed, average persons per household, percentage of houses not owner-occupied, and percentage of households with no vehicle. The component values for a specific girl were interpolated proportionally from the block group data (weighted average of the component values across the block groups within a 1/2 mile street network buffer around the girl's home, with weights proportional to the block group's area in the buffer). Each of the four component scores was standardized (z scores) and summed to form the Townsend index, with higher values of the index representing greater levels of material deprivation (e.g., lower neighborhood SES).

Street Connectivity—Using street centerline data from the US Census Bureau (TIGER), we created three network connectivity indices for each girl's neighborhood. The neighborhood buffers were overlaid on the street centerline data, and we selected the streets and intersections that fell within the street network buffer to compute the individual indices. There are several measures of street connectivity that are based on ratios of street segments and intersections (4). We computed three types of measures. The alpha index measures the proportion of circuits or loops within a network relative to the maximum number of routes possible, given the number of intersections. The beta index is a simple ratio of intersections to street segments. The gamma index is the proportion of street segments relative to the maximum possible given the number of intersections. All three of these indices are measures for how connected a network is (2,4, 37). Since the individual indices were strongly correlated, but measure slightly different aspects of connectivity, we standardized and combined them together into a single factor (Cronbach's alpha = 0.99).

Block Size—In addition to the connectivity of the street network within a neighborhood, block size was also computed. Using the street centerline data, three measures of block size were computed and combined together into a single factor. The measures were average street length, the average area within a block, and the average block perimeter (3,4). The block size factor combined these three measures (Cronbach's alpha = 0.95). Block size was hypothesized to measure different characteristics than street connectivity as smaller block sizes may be more appealing for walkers versus larger block sizes.

Population Density—Using the US Census block groups, the total population within each neighborhood was computed from year 2000 census data by taking the weighted average of the component populations across the block groups within a 1/2 mile buffer around the girl's home, with weights proportional to the block group's area in the street network buffer. We calculated the density by dividing this total by the area of the street network buffer (~1.57 miles^2).

Percent African American and Hispanic—In addition to computing the total population within each neighborhood, we also computed the total African-American and Hispanic populations from the 2000 US Census block group data. These were used to calculate the percent African American and percent Hispanic within each ½ mile street network buffer.

Land Use Mix—A land use mix measure was computed for each neighborhood from national land use and land cover classified satellite imagery. The measure used was the Simpson's Index of Diversity which captures the diversity of land use and land cover within the neighborhood. This index is commonly used in ecological studies as well as in economic studies, where it is also called the Herfindahl Index (27). It was calculated as 1 minus the chance that 2 plots of land have the same land use value for each buffer. Thus, higher values correspond to greater diversity.

Active Destinations—To identify physical activity destinations within a neighborhood, both InfoUSA, as well as an online yellow page site (www.smartpages.com) were used to identify possible businesses appropriate for physical activity within zip codes near a girl's address. Both sources were then compared and businesses that appeared in only one of the two sources were called for verification. Both sources provided address data that were used to geocode the businesses and identify those that fell within 1 mile of each girl's address. Eight types of destinations were common to both lists and the perceived measure: basketball courts, golf courses, martial arts studios, parks, tracks, swimming pools, walking/biking trails, and dance studios. A composite variable was created for each girl that was the sum of the nine destinations (from Info USA or Yellow Pages) that matched the perceived destinations from the student survey.

Analytic Approach—The data in these analyses had a hierarchical structure, with girls nested within schools, and schools nested within sites. As such, mixed effects logistic models were used to analyze the relationships between individual perceptions and measures of neighborhood characteristics and binary walking to school outcomes, while accounting for the correlations at each level of nesting by treating school and site as random effects. The neighborhood was not treated as an additional level of nesting, because there was only one observation for each neighborhood defined as the ½ mile street network buffer around each girl's home. Treatment (intervention) effects were accounted for in all analytic models, as this cohort participated in the group randomized intervention trial. All analyses were conducted using the xtmelogit procedure in Stata version 10.

We analyzed the relationship between each of our measures individually and walking to school. In addition, we combined perceived, objective, and sociodemographic variables into a single multivariate model to determine the contribution of each of the perceived and objective variables to any active commuting (walking to or from school) during the weekday for girls living within 1.5 miles of school. Of the 890 girls living within 1.5 miles of school, 500 (56.2%) walked to or from school at some point during the past week. The Wald Chi-squared test and the percent correctly predicted were analyzed as fit indices for the combined model. In addition to the destination measures, the models included controls for the neighborhood perception measures as well as the objective neighborhood measures and race/ethnicity of the girls.

RESULTS

The primary outcome for these analyses was self-reported walking to or from school on any weekday (56% of the sample reported "Yes"; Table 1). Most girls agreed that they have places they like to walk (65%), sidewalks (68%), safe places to walk to (70%), see walkers/bikers from home (65%), often see kids playing (63%), and disagreed that there is too much traffic (69%) or a lot of crime (70%). Biking/walking trails (48%), interesting things to look at (44%), and well-lit streets (43%) were less common. The total perceived and actual active destinations were similar (mean 4.62, 4.06 respectively). Most girls lived about one mile (.92 mile) from school.

For girls who lived within 1.5 miles of their school, the average surrounding neighborhood was 16.9% African American and 6.3% Hispanic, with a population density of 2,265.8 people per square mile (Table 1). The average land use index was 0.45, meaning that these neighborhoods were relatively diverse, with a 45% chance that two randomly sampled plots will have the same land use value. The sample of girls was racially and ethnically diverse with 42% white, 21% African American, and 25% Hispanic.

Walking to/from school was associated with several perceived and objective neighborhood variables in the unadjusted analysis comparing those that walk to/from school and those that do not (Table 2). Perceived measures related to walking to/from school included students' reporting they agreed that there were "places they like to walk" and disagreed that there was "a lot of crime" in their neighborhood. Objective neighborhood measures related to walking to/from school included more actual activity destinations, shorter distance to school, less neighborhood deprivation (higher SES) measured by the Townsend index, higher percent Hispanic residents, lower population density, higher street connectivity, and smaller block size.

When combining both perceived, objective, and sociodemographic variables in a nested mixed effects logistic regression model (Table 3), several measures remained as significant predictors of weekday walking to or from school. Girls who perceived that they had places to walk and perceived their neighborhood was safe were nearly twice as likely to walk to or from school compared to girls who did not. For the objective measures, girls with more total destinations available in their neighborhood were almost 1.4 times as likely to walk to or from school. Girls from neighborhoods with larger block sizes were 20% less likely to walk. Girls from neighborhoods with a higher percentage of Hispanics were slightly more likely to walk to or from school.

In addition to estimates of the relationship between our measures and the probability of walking to or from school, Table 3 includes information on the structure and fit of our model. The random effects estimates at the bottom of the table provide information on whether the model specification is appropriate. These are estimates of the variation around the intercept that can be explained by each of the nesting levels. When the population was restricted to girls who live within 1.5 miles of school, that variation is estimated to be zero. Variation due to school is still significant, however, suggesting that a model with random effects for school (but not site) is necessary. There is also evidence that the models fit the data well. The Wald chi-square statistic indicates that our model is a significant improvement over a model with just an intercept. Furthermore, comparing predicted and actual choices suggests that the model fits the data well. There is slightly more than 75% agreement between a girl's predicted choice to walk to or from school and her actual choice.

DISCUSSION

While conceptual models have hypothesized direct relationships with active commuting for perception variables, this study provides evidence that some individual perceptions and objective design features were associated with walking to or from school in this sample of adolescent girls. For this study, girls who lived in closer proximity to school were selected, because they were more likely to have a choice in whether to commute to school actively or not. The SES measure (Townsend deprivation index) used in this study showed in the multivariate model that girls from higher SES (lower deprivation) neighborhoods were more likely to walk to or from school on weekdays. Neighborhood ethnic composition was significantly associated with walking to or from school. Girls from neighborhoods that contained a higher percentage of Hispanic residents were slightly more likely to walk to or from school. This may be related to unmeasured variables such as fewer transportation resources, and social or cultural factors like family approval or peer group perceptions (17, 20). Future studies have the opportunity to investigate the impact of these unmeasured variables. Other studies investigating neighborhood SES and active commuting to school have had either null or positive results depending on the population (12,33).

Our findings that perceived safety was an independent predictor of walking to/from school is consistent with recent reviews (5,7,35). Another study suggests that “concerns about strangers” are a major barrier for parents and may have particular salience for adolescent girls, as was recently found in an urban sample of older male and female adolescents (27). A recent study in Australian adolescents confirms similar findings to our study (1). Similarly neighborhood SES also relates to safety in that parents that live in higher SES neighborhoods that are perceived to be safe may be more likely to allow their child to walk to school. Neighborhood resources and block size were also related to active commuting in our study where girls with more physical activity destinations in close proximity to home and those from neighborhoods with smaller block sizes were nearly twice as likely to walk to or from school, compared to girls with few destinations and larger block sizes. In addition, participants' perceptions of “places they like to walk” was also a significant independent predictor and consistent with the findings for total destinations. The objective measure of total active destinations and the perceived measure of places girls like to walk may be similar, but capturing different things as the objective measure includes business establishments, and the perceived measure may include places such as friends' houses. The girls who were more likely to actively commute to school also lived in neighborhoods with smaller street blocks (shorter street segments, smaller total area within the block, and shorter perimeters) in their neighborhood, which is supported in the urban planning literature as a desirable design feature for walking (35). Distance to school was also a significant deterrent to walking to or from school in this study, and as a previous TAAG study showed, reduces the potential for moderate-vigorous physical activity (2).

Strengths and Limitations

This is one of the first studies to report on multiple level factors assessed both from the adolescents' perspective and objective factors in the neighborhood environment related to walking to or from school, in a large, geographically diverse sample of adolescents. The geographic and racial/ethnic diversity and the low dropout rate of the cohort add to the generalizability of our results and reduces possible selection bias. However our final sample included only girls that live close to school and may be considered a limitation. The sample includes girls that had the “opportunity” to walk. Beyond the objectively measured environmental features we relied on self-reported walking behavior and perceptions of the neighborhood or environment. Other studies have reported or hypothesized some of these factors as supportive of walking in adult populations; (5,22,24) however, few have reported on these objective and perceived relationships in adolescents, specifically related to walking behavior (1,12). The factors we investigated, such as safety, aesthetics and neighborhood design features, have particular salience for walking to and from school. Many of these environmental features may not have any relationship to higher intensity levels of weekday “out of school” physical activity, which may be performed at a specific location (e.g., playing fields, indoor gyms) rather than in close proximity to home or school. This impact may be an underestimate, as all of our independent GIS variables (e.g. street connectivity, density, SES etc) were calculated within 1 mile of home missing a portion of the total distance for girls in some schools that may have walked more than one mile. The reason for this is the majority of school busing policies relate to students who live greater than one mile from school; those who live within one mile or less are expected to find private transportation (walk or parent/guardian transport).

Further could specify, using GIS methods, destinations that are on the travel route to school. Also, there may be other perceived or objective variables not measured, as well as stronger measures of individual or family SES. Longitudinal studies are needed to explore temporal relationships, and other studies could include bicycling separately, as other neighborhood design features may relate specifically to bicycling versus walking to and from school.

Conclusions—Although this study is cross-sectional, and findings from this study will need to be confirmed in larger, longitudinal studies, we nonetheless found several important measures associated with walking to or from school. The findings, once confirmed, may have policy implications similar to those recently discussed by McMillan (19) and Tester (32), such as expanding initiatives already underway to create and maintain safe routes to school, as well as consideration of new construction that incorporates features of neighborhood design by limiting block size in new housing developments, considering local policies that encourage higher density residential development close to schools, or building schools in the middle of neighborhoods. Additionally policy efforts are underway to increase mixed use development in residential neighborhoods to facilitate walking for utilitarian purposes or pleasure. Despite the built environment initiatives underway, safety, land use, and school location issues could be considered together since intervening on one without the other will not be likely to change walking behavior.

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TABLE 1

Descriptive Statistics for Dependent and Independent Variables 8th Grade Girls w/in 1.5 miles of school (n = 890)

Measure	Units	Percentage/Mean†
Any weekday walking to or from school	%	56.2
Perception of Neighborhood Variables(survey) *		
There are places I like to walk in my neighborhood	% Agree	65.4
There are sidewalks in my neighborhood	% Agree	68.3
There are biking/walking trails in my neighborhood	% Agree	47.5
It is safe to walk in my neighborhood	% Agree	70.1
I see walkers/bikers from my home	% Agree	64.7
There is too much traffic in my neighborhood	% Disagree	68.5
There is a lot of crime in my neighborhood	% Disagree	70.1
I often see kids playing in my neighborhood	% Agree	62.5
There are interesting things to look at in my neighborhood	% Agree	43.5
The streets are well lit in my neighborhood	% Agree	42.5
Total perceived destinations ~	mean	4.6 (2.4)
Objective Environment/Neighborhood Variables (GIS calculated)		(Mean†)
Total Actual Active Destinations	mean	4.06 (1.96)
Distance to School	miles	0.92 (0.38)
Townsend Index	#	−0.14 (0.97)
% African American	%	16.9 (0.23)
% Hispanic	%	6.3 (0.08)
Total Population	Per sq mile	2,265.80 (812.8)
Street Connectivity Index	#	0.41 (2.92)
Block Size Index	#	−0.83 (1.31)
Land Use Mix (diversity) index	#	0.47 (0.12)
Individual Race/Ethnicity (survey)		
Nonhispanic White	%	41.6
Nonhispanic African American	%	21.1
Hispanic	%	25.3
Nonhispanic Other	%	12.0

† = Standard deviation in parenthesis where applicable

* % agree/strongly agree and % disagree/strongly disagree were combined

Street connectivity, block size and Townsend indices: each component in index standardized by subtracting means and dividing by standard deviation; standardized components then added for scale values; Land use mix (diversity) index ranges from 0–1.

~ Perception of facilities (perceived active destinations) located near home was measured by asking girls to respond checklist of 14 facilities. The questions asked: “Is it easy to get to and from this place from home or school?” (yes or no). In order to match the perceived destinations to the objectively measured destinations, only eight of the original 14 destinations were used in our perceived destinations measure. Facilities listed included: basketball courts, golf courses, martial arts studios, parks, tracks, swimming pools, walking/biking trails, and dance studios. These were scored by adding the total number of facilities or destinations to which the participant could easily get to (range 0–9).

TABLE 2

Unadjusted Comparison of Individual Perceived and Objective Neighborhood Environment variables by Weekday Walking to or from School

Measure		Mean/Percentage: Any walking to or from school (n=500)	Mean/Percentage: No Walking to or from school (n=390)	p-value (significance test + or ^)
Perception of Neighborhood Variables (survey)				
There are places I like to walk in my neighborhood	% Agree	69.6	60.0	0.0028+*
There are sidewalks in my neighborhood	% Agree	70.6	65.4	0.0971+
There are biking/walking trails in my neighborhood	% Agree	50.0	44.4	0.0945+
It is safe to walk in my neighborhood	% Agree	71.2	68.7	0.4222+
I see walkers/bikers from my home	% Agree	66.0	63.1	0.3652+
There is too much traffic in my neighborhood	% Disagree	67.8	69.5	0.5907+
There is a lot of crime in my neighborhood	% Disagree	66.4	74.9	0.0062+*
I often see kids playing in my neighborhood	% Agree	63.0	61.8	0.7126+
There are interesting things to look at in my neighborhood	% Agree	45.6	40.8	0.1492+
The streets are well lit in my neighborhood	% Agree	41.2	44.1	0.3847+
Total Perceived Destinations	mean	4.5	4.7	0.3323^
Objective Environment/Neighborhood Variables (GIS calculated)				
Total Destinations	mean	4.5	3.5	<.0001^*
Distance to School	miles	0.82	1.0	<.0001^*
Townsend Index	#	−0.29	0.1	<.0001^*
% African American	%	16.8%	17.0%	0.8835^
% Hispanic	%	7.9%	4.4%	<.0001^*
Total Population	Per sq mile	2189.1	2364.1	0.0018^*
Street Connectivity Index	#	0.7	−0.0	<.0001^*
Block Size Index	#	−1.1	−0.5	<.0001^*
Land Use Mix (diversity) Index	#	0.5	0.5	0.2393^
Individual Race/Ethnicity (survey)				
Nonhispanic White	%	37.8%	46.4%	0.0097+*
Nonhispanic African American	%	20.8%	21.5%	0.7889+
Hispanic	%	30.2%	19.0%	0.0001+*
Nonhispanic Other	%	11.2%	13.1%	0.393+

†: treatment (intervention effects were adjusted for in model

Significance Test:

NIH-PA Author Manuscript

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[#] Street connectivity, block size and Townsend indices: each component in index standardized by subtracting means and dividing by standard deviation; standardized components then added for scale values; the resulting scales range in the data from: street connectivity (−5.50 to 15.81), block size (−2.12 to 10.25), Townsend index (−3.66 to 1.22)); Land use mix (diversity) index ranges from 0–1.

[+] Chi-Square

[^] T-Test

[*] = significant at the 0.05 level

TABLE 3

Nested, Combined Model of Multivariable Neighborhood Predictors of Weekday Walking to or from School (8th Grade Girls Living 1.5 miles or less from school)

Measure	Odds Ratio	95% Confidence Interval	
Intercept			
Perception of Neighborhood Variables (survey)			
There are places I like to walk in my neighborhood	1.82*	1.16	2.85
There are sidewalks in my neighborhood	0.93	0.59	1.45
There are biking/walking trails in my neighborhood	1.179	0.79	1.74
It is safe to walk in my neighborhood	1.84*	1.09	3.10
I see walkers/bikers from my home	1.02	0.6	1.72
There is too much traffic in my neighborhood	0.93	0.59	1.46
There is a lot of crime in my neighborhood	0.73	0.44	1.20
I often see kids playing in my neighborhood	0.79	0.51	1.22
There are interesting things to look at in my neighborhood	1.01	0.66	1.55
The streets are well lit in my neighborhood	0.67	0.44	1.03
Total Perceived Active Places to go in my neighborhood	0.95	0.88	1.03
Objective Environmental/Neighborhood Variables (GIS Calculated)			
Distance to School	0.14*	0.09	0.22
Total Active Destinations	1.38*	1.24	1.54
Townsend Index	0.87	0.56	1.36
% African American	0.99	0.97	1.01
% Hispanic	1.05*	1.01	1.10
Total Population	0.99	0.99	1.00
Street Connectivity Index	1.002	0.92	1.09
Block Size Index	0.80*	0.67	0.97
Land Use Mix (diversity) Index	0.36	0.05	2.50
Individual Race/Ethnicity			
Nonhispanic African American	1.05	0.59	1.84
Hispanic	1.09	0.67	1.79
Nonhispanic Other	1.09	0.64	1.84

Random Effects (Intercepts Only): Site: 0.00, School: 0.47*

Model Fit Indices: % Correctly Predicted: 75.73: Wald Chi-square (34 d.f.): 144.79*

†: treatment (intervention effects were adjusted for in model

#Street connectivity, block size and Townsend indices: each component in index standardized by subtracting means and dividing by standard deviation; standardized components then added for scale values; the resulting scales range in the data from: street connectivity (−5.50 to 15.81), block size (−2.12 to 10.25), Townsend index (−3.66 to 1.22)); Land use mix (diversity) index ranges from 0–1.

*significant at the 0.05 level