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Neighborhood Perceptions and Active School Commuting in Low-Income Cities

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Abstract

Background—Few children accumulate the recommended ≥60 minutes of physical activity each day. Active travel to and from school (ATS) is a potential source of increased activity for children, accounting for 22% of total trips and time spent traveling by school-aged children.

Purpose—This study identifies the association of parents' perceptions of the neighborhood, geospatial variables, and demographic characteristics with ATS among students in four low-income, densely populated urban communities with predominantly minority populations.

Methods—Data were collected in 2009–2010 from households with school-attending children in four low-income New Jersey cities. Multivariate logistic regression analyses (*n*=765) identified predictors of ATS. Analyses were conducted in 2012.

Results—In all, 54% of students actively commuted to school. Students whose parents perceived the neighborhood as very unpleasant for activity were less likely (OR=0.39) to actively commute, as were students living farther from school, with a 6% reduction in ATS for every 0.10 mile increase in distance to school. Perceptions of crime, traffic, and sidewalk conditions were not predictors of ATS.

Conclusions—Parents' perceptions of the pleasantness of the neighborhood, independent of the effects of distance from school, may outweigh concerns about crime, traffic, or conditions of sidewalks in predicting active commuting to school in the low-income urban communities studied. Efforts such as cleaning up graffiti, taking care of abandoned buildings, and providing shade trees to improve neighborhood environments are likely to increase ATS, as are efforts that encourage locating schools closer to the populations they serve.

Background

Physical activity is a key factor in maintaining a healthy lifestyle in children. It is associated with improvements in blood pressure,[1–3] metabolic syndrome,[4–7] cholesterol, blood

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lipids[5,8–10] and health into adulthood.[2,11–13] The recommendation for youth is an accumulation of ≥60 minutes of moderate or vigorous activity daily.[14] However, only 42% of children aged 6–11 years, and 8% of adolescents (aged 12–19 years) meet this goal.[15]

The daily commute to school is a potential source of physical activity for children, accounting for 22% of total trips and time spent traveling by children aged 5–18 years.[16] However, active travel to and from school (ATS) (e.g., walking or bicycling) decreased from 47.7% in 1969 to 12.7% in 2009.[16] Children who engage in ATS have higher levels of daily physical activity and are more likely to meet the recommendations than those who do not.[17–25]

Several studies have examined various factors associated with ATS. Higher income[19,20] and access to a car[16,21,22] decrease the likelihood of ATS. Before reaching adolescence, older children are more likely to walk than are younger ones.[16,20,21,24,25] The built environment[26,27] and parents' and children's assessments of various environmental attributes related to safety[16,18,21–23,28] also play a role. Distance from home to school is the strongest predictor of ATS[16,19–22,24,27,29,30] and should therefore be controlled in analyses of the contribution of other factors.

Most studies in the literature are limited by confining consideration to particular subgroups, focusing on perceptions of a narrow spectrum of neighborhood characteristics, and few adjust for distance to school. The present study addresses several of these limitations by using data from children aged 3–18 years living in low-income, densely populated diverse communities; including measurements of parental perceptions of a wide range of neighborhood characteristics; and controlling for proximity to school based on objectively measured roadway network distance. The aim of the study was to assess the independent association between parental perceptions of neighborhood characteristics and ATS among students.

Methods

Data Sources: Household Survey

The data for this study were collected in 2009–2010 from a random-digit-dial sample of 1408 households with landline telephones in four low-income cities in New Jersey (Camden, Newark, New Brunswick, and Trenton) that had at least one child aged 3–18 years. Survey questions focused on a randomly selected child (index child) from each household, referred to here as "student." The respondent was the adult who made most of the decisions about food shopping and is referred to here as "parent."

A 22-call design strategy with an extended field period was used to ensure that households were contacted at various times of the day and across all days of the week. Telephone interviews were incentivized and conducted in English or Spanish with an overall response rate[31] of 49%. The survey items were derived from previous research and included parent-reported ATS for the index child,[20,32,33] parental perceptions of neighborhood environments,[34–37] and parent and child demographics. The locations of participating households and schools attended by index children were geocoded. This study was approved

by the IRBs of Rutgers University and Arizona State University. Participants provided informed consent prior to the start of the study.

Outcome Measure

Parents were asked: On how many days during a typical week does the index child walk, bicycle, or skateboard to or from school? Similar questions have been used by others[20,33] and have moderate test–retest reliability (Kappa=0.60). The distribution of responses was bimodal, with the majority answering either 0 or 5 days/week. Therefore, as in other studies,[20,33,38–43] active-traveling students (coded as 1) were defined as those who engaged in ATS ≥1 days per week; those who never engaged in ATS were coded as 0.

Explanatory Variables: Demographics and Neighborhood Perceptions

Demographic variables included student's age, gender, and race; mother's education; family income as a ratio of the U.S. federal poverty level (FPL; ≤200% or >200% of FPL); number of years the parent has resided in the U.S. as a measure of acculturation; and city of residence. City of residence was included only to control for city-specific effects including policies (not captured in these data) associated with ATS. Household access to a car was measured by a question that asked if a car was available for the family's food shopping.

Safety from traffic and crime—Parents were asked: Thinking about traffic, how safe is it to walk, run, bike, or play in your neighborhood? Responses were captured on a 4-point Likert-type scale ranging from *very safe* to *very unsafe*. The variable was dichotomized, with respondents perceiving their neighborhood as *very unsafe* with regard to traffic coded as 1, and every other response coded as 0. A parallel question was asked with regard to crime and coded in the same manner.

Unpleasantness for walking—Parents were asked: How pleasant is it to walk, run, bike, or play in your neighborhood? For example, are there trees and proper lighting, no graffiti or abandoned buildings? Responses were provided on a 4-point Likert-type scale ranging from *very unpleasant* to *very pleasant*. The variable was dichotomized, with those perceiving their neighborhood as *very unpleasant* coded as 1, and other responses coded as 0.

Sidewalk condition—A total of 97% of the parents reported having sidewalks in their neighborhoods. These parents were further asked: Are the sidewalks generally in good, fair, or poor condition? The variable was dichotomized, with *poor* coded as 1, and other responses coded as 0.

Survey questions on parental perceptions were derived from the REACH 2010 St. Louis Healthy Heart Survey[36] and have been used in previous studies, mainly as a composite variable.[34,35] This study used perceptions of crime, traffic, and pleasantness in their individual forms because preliminary analysis indicated that these variables performed differently with respect to the outcome measure, ATS (Table 2). Other research using similar items found that perception of crime ("there is too much crime in my neighborhood")[41] was negatively predictive of ATS among adolescent girls, and pleasantness (rating of pleasantness of community as a place to be physically active)[44,45]

was negatively associated with obesity among adults. All perception variables were dichotomized to investigate whether the most-negative parental perceptions of the neighborhood were associated with differences in ATS among students.

Social cohesion—Neighborhood social cohesion was measured using the Sampson scale,[37] which included five items about the neighborhood: close-knit or unified; neighbors are helpful; people get along; trust people; people share similar values. Responses were obtained on a 4-point Likert-type scale, with lower scores representing higher neighborhood social cohesion. Possible values ranged from 5 to 20. Cronbach's α for the scale was 0.86, and the 2-week test–retest intracorrelation coefficient was 0.90.[46]

Distance to school—Distance to school was calculated in roadway network miles based on the geocoded address of each child's home and school using ArcGIS software. Descriptive and bivariate statistics are presented using distance in miles. For multivariate models, distance was computed in units representing 0.10 miles.

Data Analysis

Descriptive and bivariate statistics were run for 901 children (86% of the original sample) after excluding those who were homeschooled, did not currently attend a school, or were missing geocodable data. Multivariate logistic regression analysis included 765 cases (54% of original sample) with nonmissing values for all variables included in the models. Students classified in the “other” race/ethnicity category were removed from the multivariate analysis because of their small numbers (n=49; 3.5% of original sample). Clustering at the geographic or school level was not anticipated because of the sampling design. This was confirmed by the fact that the sample represented 354 of the total 409 census block groups in the four cities, and students in the sample attended 153 different schools, with the vast majority of schools attended by only 1–10 students. Data were weighted to be representative of the population of the four cities, and adjusted for the complex survey design using the svy command in Stata (version 12.0), taking into account clustering at the city level. Separate models were run for children aged 6–11 years versus 12–18 years. A separate model could not be run for those aged 3–5 years because of small numbers (n=93). Significance was set at the p <0.05 level. Analyses were conducted in 2012.

Results

The average age of students in the sample was 10.26 years (Table 1). In all, 19% of parents perceived the neighborhood as very unsafe in regard to traffic; 24% as very unsafe in regard to crime; and 14% as very unpleasant for walking, bicycling, and playing. The condition of sidewalks was perceived to be poor by 12%. The mean distance between home and school was 1.32±1.20 miles.

Table 2 shows bivariate associations between ATS and demographic characteristics and parents’ perceptions. Overall, 54% of the students engaged in ATS ≥1 days per week. Age and being under 200% of the FPL were directly associated with ATS, whereas higher maternal education, car access, and perception of the neighborhood as unpleasant for

activity were inversely associated with ATS. Mean distance from home to school was greater among non-active commuters compared to active commuters.

Table 3 displays results of multivariate logistic regression analyses for students of all ages, as well as for the subgroups aged 6–11 years and 12–18 years. Overall, age was associated with ATS, with older students more likely to engage in ATS. In the subgroup of those aged 12–18 years, age approached significance and was inversely associated with ATS. In the subgroup analysis of those aged 6–11 years, Hispanics and students whose mothers had some college education were less likely to engage in ATS than were white students or students whose mothers had a high school education or less, respectively. Car ownership was negatively associated with ATS in the overall sample and in those aged 6–11 years.

After adjusting for all demographic variables and distance to school, among perception variables, only viewing the neighborhood as unpleasant for activity was associated with ATS in the full model, and it approached significance in models for those aged 12–18 years and 6–11 years. Distance from home to school was associated with ATS in all models.

Discussion

This study found that after adjusting for demographic characteristics and distance to school, parental perception of the neighborhood as unpleasant for activity was associated with a lower likelihood of ATS. Notably, other perceptions—crime, traffic, neighborhood cohesion, and condition of sidewalks—were not related. Although crime and traffic were considered very unsafe by a higher percentage of parents than was unpleasantness (24%, 19%, and 14%, respectively), neither crime nor traffic predicted ATS; nevertheless, unpleasantness was a powerful predictor. Pleasantness of the neighborhood was a strong predictor of ATS for students in all age groups combined. Although the examples included in the question on neighborhood pleasantness (Are there trees and proper lighting, no graffiti, or abandoned buildings?) afford substantiation of what is meant by pleasantness, future attention to refining this variable is warranted in view of its importance.

Perceptions about neighborhood safety with regard to traffic and crime have yielded mixed results in previous studies, with some showing decreased ATS with a higher perception of traffic and crime,[16,22] but others showing no association or even increased ATS.[16,39–41] Neither measure was associated with active commuting to school in this urban low-income sample. In areas with greater disadvantage, a lack of association with ATS and crime has been observed by others[47] and may suggest a lack of other options for traveling to school.

Other investigators have assessed associations between ATS and perceptions of neighborhood features such as sidewalk conditions and neighborhood aesthetics (e.g., presence of trees and other features[40,41]). Kerr et al.[40] found that neighborhood aesthetics was associated with ATS, although the authors did not adjust for distance to school. In another study of predominantly white girls aged 11–12 years, Voorhees et al.[41] found a significant association between walking and living in an aesthetically pleasing neighborhood after adjusting for distance to school. To our knowledge, the present study is the first to investigate an association between perceptions of a variety of dimensions of an urban

neighborhood with ATS among predominantly Hispanic and black students across the full school-age spectrum and accounting for distance to school.

Students in this study engaged in ATS at a substantially higher rate than that of the national average (54% vs 12%).[16] These results are similar to those conducted in urban clusters[16,20] and in areas with higher population density.[19] New Jersey is the second most densely populated state in the country, and the four study cities are 7–10 times more densely populated than is the state as a whole.[48] Data from the 2001 National Household Travel Survey showed an inverse correlation between density and distance to school,[19] which is evidenced in the current study where the median distance to school was <1 mile.

Most research finds that Hispanic and black children are more likely than white children to engage in ATS.[49] The present study did not find associations between race/ethnicity and ATS except among those aged 6–11 years, and Hispanic children were less likely than white children to actively commute to school. Mendoza et al.[24] found similarly negative associations in their sample of fourth-graders. These authors attribute lower ATS among Hispanic children to higher levels of acculturation in their sample.[50] In the present sample, the vast majority of foreign-born parents had lived in the U.S. for more than 10 years, suggesting a higher level of acculturation. Similar to the results for the full model, other studies examining a wider age range did not find race/ethnicity associations with ATS,[16,19,23,30] suggesting that race/ethnicity might affect ATS differently among age groups.

The high prevalence of ATS among students from lower-income households is consistent with previous literature.[20,30,49] However, this bivariate association did not hold after adjusting for other demographic variables and parental perceptions. This could be attributed to the fact that the sample overall was low-income, with a median census block group household income of $37,000.[48] The negative association between car ownership and ATS in the full sample and among those aged 6–11 years is similar to that found in other studies.[16,21,22] The present study did not find an association between gender and ATS in any of the models. These results are similar to those of others[22,39] who also studied students in diverse low-income communities with a higher prevalence of ATS.

Consistent with the results of other studies that examine correlates of ATS,[16,19–22,24,27,29,30,39,51,52] distance between home and school predicted active commuting across all models. Following World War II, a trend developed to build bigger schools on larger sites, encouraging communities to locate these schools on the outskirts of towns rather than building within neighborhoods.[53] The distance from home to school thus increased for most students and the area around schools became less pedestrian-friendly, likely contributing to a decrease in ATS.

The White House Task Force on Childhood Obesity calls for a 50% increase by 2015 in the percentage of children engaging in ATS.[54] Although changing school-siting policies is an often-recommended policy for improving ATS,[53,55,56] it is not a viable option for established communities that are not building schools. Identifying additional strategies that can increase the likelihood of ATS is needed.

Strengths and Limitations

Major strengths of this study include using a comprehensive array of demographic and perception variables, objectively measured distance to school, and the full age spectrum of school children in a racially/ethnically diverse urban sample. Reliance on parent self-report of the number of days students engaged in ATS, though commonly used in research on this issue, is a limitation. Compared to single-item questions used to assess perception of neighborhood environments, multi-item scales[22,40,57] may be more robust for capturing these constructs. Interpretation of the findings is limited by the cross-sectional design of the study. Longitudinal and intervention studies are needed to further refine the associations between ATS and potential predictors.

Conclusion

In low-income communities, living in proximity to school is associated with ATS among children aged 3–18 years. In these communities, although perceptions of crime, traffic, and condition of sidewalks are not predictors, perception of the neighborhood as unpleasant is associated with lower prevalence of ATS. Changes that improve neighborhood environments to make them more pleasant, such as providing shade trees, cleaning up graffiti, and addressing issues related to abandoned buildings, as well as locating schools close to residents, are likely to increase ATS.

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Table 1

Student demographics, parental perceptions of neighborhood environment, and distance to school, % or M (SD)

	Full sample N=901[a]	Active commuters *n*=447	Inactive commuters *n*=450
DEMOGRAPHIC CHARACTERISTICS			
Age, years			
M	10.26 (4.08) [0.20]	10.46 (3.96) [0.28]	10.02 (4.20) [0.28]
3-5	13	9	18
6-11	49	50	48
12-18	38	41	34
Gender			
Female	50	52	48
Race/ethnicity			
Non-Hispanic black	52	51	52
Non-Hispanic white	5	6	5
Hispanic	39	39	39
Other	4	4	4
Household income			
≤200% FPL	82	87	77
Car access			
No car	19	23	13
City			
Newark	58	60	55
Camden	18	18	19
New Brunswick	9	8	10
Trenton	15	14	16
Education of mother			
High school or less	65	71	58
Some college	22	18	27
College and advanced	13	11	15
Acculturation			
Born in U.S.	71	68	73
In U.S. < 10 years	6	6	5
In U.S. ≥10 years	23	26	21
PERCEPTIONS			
Traffic			
Very unsafe	19	19	18
Crime			
Very unsafe	24	24	23
Unpleasantness of walking			
Very unpleasant	14	10	18
Sidewalk condition			

	Full sample N=901[a]	Active commuters *n*=447	Inactive commuters *n*=450
Poor	12	12	12
Neighborhood cohesion scale[b]	12.46 (3.77) [0.19]	12.35 (3.75) [0.27]	12.58 (3.79) [0.26]
DISTANCE			
Mean distance home to school (miles)	1.32 (1.20) [0.06]	1.00 (1.14) [0.09]	1.70 (1.16) [0.08]

Note: SE is given in square brackets.

FPL, federal poverty level; USDA, U.S. Department of Agriculture; WIC, U.S. Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children

[a] Unweighted *n*; reported frequencies weighted to be representative of the population of the four cities

[b] Scale from 5 to 20; lower values represent higher social cohesion.

Table 2

Frequency of active commuting to school by demographic characteristics and parents' perceptions of neighborhood environment

Characteristics	% of students[a]	*p*-value
Overall	54	
Age, years		
3-5	38	
6-11	55	< 0.001
12-18	58	
Gender		
Female	56	
Male	52	0.333
Race/ethnicity		
Non-Hispanic black	54	
Non-Hispanic white	61	0.052
Hispanic	53	
Other	48	
Household income		
≤200% FPL	57	0.019
> 200% FPL	40	
City		
Newark	56	
Camden	52	0.377
New Brunswick	49	
Trenton	49	
Education of mother		
High school or less	58	
Some college	43	0.005
College and advanced	44	
Acculturation		
Born in U.S.	52	
In U.S. < 10 years	59	
In U.S. ≥10 years	59	
Car access		
No car access	68	0.006
Car access	51	
PERCEPTIONS		
Traffic		
Not very unsafe	54	
Very unsafe	55	
Crime		
Not very unsafe	53	0.107

Characteristics	% of students[a]	*p*-value
Very unsafe	56	
Unpleasantness of walking		
Not very unpleasant	56	0.002
Very unpleasant	40	
Sidewalk condition		
Good/fair	54	0.982
Poor	54	

FPL, federal poverty level

[a] Actively commuting to schools, *n*=901; unweighted *n*; reported frequencies weighted to be representative of the population of the four cities

Table 3

Multivariate logistic regression analysis of predictors of ATS for all children and age subgroups, AOR (95% CI)

	Full sample (N=765)[a]	*p*-value	Aged 6-11 years (*n*=327)[a]	*p*-value	Aged 12-18 years (*n*=345)[a]	*p*-value
DEMOGRAPHIC						
Age, years	1.08 (1.02, 1.15)	0.006	1.00 (0.83, 1.21)	0.997	0.83 (0.69, 1.01)	0.059
Race (ref: white)						
Black	0.77 (0.37, 1.61)	0.489	0.55 (0.20, 1.47)	0.230	2.02 (0.56, 7.24)	0.281
Hispanic	0.63 (0.30, 1.33)	0.222	0.29 (0.11, 0.79)	0.016	2.98 (0.78, 11.32)	0.109
Poverty category (ref: ≤200% FPL)						
> 200% FPL	0.61 (0.34, 1.08)	0.091	0.65 (0.25, 1.74)	0.394	0.53 (0.22, 1.26)	0.153
Car access (ref: no)						
Yes	0.55 (0.31, 0.98)	0.042	0.43 (0.20, 0.95)	0.038	0.80 (0.31, 2.09)	0.650
Gender (ref: female)						
Male	0.70 (0.45, 1.09)	0.111	0.80 (0.41, 1.54)	0.498	0.80 (0.42, 1.55)	0.511
Education of mother (ref: high school or less)						
Some college	0.60 (0.35, 1.04)	0.067	0.38 (0.17, 0.87)	0.022	0.99 (0.44, 2.22)	0.975
College and advanced	0.63 (0.28, 1.42)	0.269	0.58 (0.17, 1.96)	0.381	0.53 (0.14, 2.06)	0.362
Acculturation (ref: born in U.S.)						
< 10 years in U.S.	1.12 (0.70, 1.79)	0.623	1.19 (0.58, 2.44)	0.633	1.02 (0.51, 2.04)	0.964
≥10 years in U.S.	0.89 (0.56, 1.41)	0.614	0.83 (0.41, 1.70)	0.616	0.99 (0.49, 1.99)	0.977
NEIGHBORHOOD PERCEPTION						
Traffic (ref: not very unsafe)						
Very unsafe	1.30 (0.68, 2.47)	0.423	2.11 (0.80, 5.56)	0.132	0.99 (0.35, 2.75)	0.981
Crime (ref: not very unsafe)						
Very unsafe	1.44 (0.78, 2.67)	0.241	1.27 (0.51, 3.18)	0.610	1.30 (0.44, 3.79)	0.635
Unpleasantness of walking (ref: not very unpleasant)						
Very unpleasant	0.39 (0.19, 0.80)	0.011	0.37 (0.13, 1.02)	0.056	0.32 (0.10, 1.01)	0.052
Sidewalk condition (ref: good/fair)						
Poor	1.07 (0.52, 2.21)	0.848	0.68 (0.24, 1.90)	0.459	1.45 (0.49, 4.33)	0.503
Neighborhood cohesion scale	0.98 (0.93, 1.04)	0.553	1.05 (0.96, 1.15)	0.268	0.92 (0.84, 1.00)	0.060
DISTANCE FROM HOME TO SCHOOL (0.10 miles)	0.94 (0.92, 0.97)	< 0.001	0.93 (0.89, 0.98)	0.004	0.95 (0.92, 0.98)	0.001

FPL, federal poverty level

[a]Unweighted *n*; analysis weighted to be representative of the population of the four cities and adjusted for complex survey design; the mode controlled for city of residence to account for city-specific characteristics