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Neighborhood Incivilities, Perceived Neighborhood Safety, and Walking to School Among Urban-Dwelling Children

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Abstract

Background—Walking to school is an important source of physical activity among children. There is a paucity of research exploring environmental determinants of walking to school among children in urban areas.

Methods—A cross-sectional secondary analysis of baseline data (2007) from 365 children in the “Multiple Opportunities to Reach Excellence” (MORE) Study (8 to 13 years; Mean 9.60 years, SD 1.04). Children and caregivers were asked about walking to school and perceived safety. Objective measures of the environment were obtained using a validated environmental neighborhood assessment.

Results—Over half (55.83%) of children reported walking to school most of the time. High levels of neighborhood incivilities were associated with lower levels of perceived safety (OR: 0.39, 95% CI: 0.21 to 0.72). Living on a block above the median in incivilities was associated with a 353% increase in odds of walking to school (OR: 3.53; 95% CI: 1.68 to 7.39).

Conclusions—Children residing in neighborhoods high in incivilities are more likely to walk to school, in spite of lower levels of perceived safety. As a high proportion of children residing in disadvantaged neighborhoods walk to school, efforts should be directed at minimizing exposure to neighborhood hazards by ensuring safe routes to and from school.

Keywords

physical activity; environment; physical and social disorder; active transportation; community

Background

Walking to school has been identified as an important source of physical activity among children.^{1–3} Physical activity during childhood and adolescence has been associated with numerous benefits to health including lower adiposity, improved cardiovascular health and fitness, reduced symptoms of depression and anxiety, greater global self-concept and esteem, and better academic performance.⁴

Healthy People 2010 included increasing the percentage of children who walk to school as a national health priority.⁵ Research has demonstrated that walking to school among school-aged children is associated with higher levels of overall physical activity compared with

children who travel to school by bus or car.⁶ Unfortunately, children spend less time in active transport than in decades past;⁴ this decline is greater for low socioeconomic areas.⁷ These declines may be related to concerns about safety, which are often cited as a barrier to physical activity among children and their parents.^{7–10}

Perceived and objective measures of neighborhood safety (related to traffic, environmental hazards, crime, and incivilities) have been associated with reduced levels of physical activity in many,^{8–12} but not all studies.^{13–16} Safety of parks and play areas has also been positively associated with increased physical activity levels,¹⁷ as has neighborhood aesthetics and tidiness.^{18,19} Negative relationships have been documented between neighborhood area deprivation,²⁰ crime density,¹¹ urban residence,^{21,22} and measures of social and physical disorder.¹²

Most studies of neighborhood safety and physical activity or walking behavior have assessed parent and child perception rather than objective risk.^{8,14,19} Few studies to date have examined both perceived and objective measures of neighborhood safety as they pertain to outdoor physical activity among children, particularly among those in urban settings.

The purpose of this study was to determine if neighborhood incivilities (eg, indicators of physical disorder, social disorder, violence, alcohol and drug indicators) and perceived neighborhood safety are associated with the likelihood of walking to school among children living in an urban setting.

Methods

This cross-sectional study is a secondary analysis of baseline (2007) data from the “Multiple Opportunities to Reach Excellence” (MORE) Project,²³ a prospective, observational, 3-year cohort study. The MORE Project was designed to examine the impact of urban children's exposure to community violence on their emotional and behavioral health, substance use, and academic functioning.

Following institutional review board approval, child assent and written informed consent was obtained from parents/caregivers. The MORE Project team recruited the first cohort in 2007, comprised of 427 children from the 3rd, 4th, and 5th grades in 6 urban public elementary schools located in 3 Baltimore, Maryland communities with low, moderate, and high levels of neighborhood crime. Three separate assessments were conducted to obtain information during interviews with children, teachers, and caregivers. All questions included in this substudy of the MORE Project were self-report.

Study Sample

The present analysis includes all children participating in the MORE Project who had baseline data and parent/caregiver surveys. The sample was further narrowed by including data only from children whose street blocks of residence were linkable to objective measures of the environment, also measured at the street level. Because block data were scheduled to be collected before the completion of interviews for some children in the first cohort, these data were available for 365 of the 427 (86%) children participating in the MORE Project at baseline. There were no statistically significant differences between the children with linkable block data and those without on sociodemographic characteristics or likelihood of walking to school.

Dependent Variables

The primary outcome was the likelihood of walking to school. Children were asked “how do you usually get to and from school?” and reported whether they usually walk alone, walk with a parent or other adult, walk with other children, ride the bus, ride in a car, or other. Children who walked alone (12%), with other children (33%), or with adults (11%) were combined to form an “active transportation” group. Children who traveled by bus or car were categorized as “non-active transportation.” Parents also reported whether their child walked to school (“how does your child usually get to and from school?”). The secondary outcome was perceived neighborhood safety, as assessed the following question: “I feel safe in my neighborhood,” measured on a 4-point Likert scale (“disagree a lot,” “disagree,” “agree,” “agree a lot”). Perceived safety was then dichotomized by grouping the 2 “disagree” response categories and the 2 “agree” response categories.

Independent Variables

Street Block-Residence Characteristics—The street blocks of residence of 365 children in the MORE Project were assessed using the Neighborhood Inventory of Environmental Typology (NifETy) Method. The NifETy Method is an objective structured inventory that includes 78 items assessing neighborhood incivilities and disorder.²⁴ Trained evaluators traveled to blocks of Baltimore to systematically assess various neighborhood characteristics. These characteristics included the physical layout of the block (eg, length/width of block, alleys present), types of structures present (eg, single family/detached homes, liquor stores, churches), adult activity (eg, adults in work uniforms, adults sitting on steps), youth activity (eg, youth playing), physical disorder and order (eg, abandoned/vacant structures, new construction), social disorder and order (eg, homeless people, outdoor community recreation), and violence/alcohol and other drug indicators (eg, drug paraphernalia, memorials). Items related to neighborhood incivilities (ie, physical disorder, social disorder, violence, alcohol and drug indicators) were assessed as present (denoted by the indicator 1) or absent (denoted by the indicator 0). The sum of the binary items (see Table 1 for a list of included items) was calculated to form a summary score of neighborhood incivilities (ranging from 1 to 27). As the scores for this neighborhood incivilities index deviated significantly from normality, analyses were run on dichotomous scores that were split at the median value of 13 into “high incivilities” and “low incivilities” groups.

The psychometric properties of the NifETy Instrument, including validity (convergent, divergent, and criterion) as well as interrater reliability, internal consistency reliability, and test-retest reliability have been evaluated and reported as acceptable.²⁴

Individual-Level Characteristics—Individual-level characteristics included child age (months), gender, self-reported race (African American, Caucasian, Asian American, Hispanic, Native American, or Biracial), parent or guardian's highest level of education attainment, parent-reported household yearly income, parent employment (yes/no), parent marital status (single, living with someone, married, divorced, widowed), how much the parent/caregiver works per week (ie, 1 full time job, 1 part time job, full time and part time job, occasional or temporary work), and how many children the parent/caregiver has. An indicator variable was created for each child's school to account for unmeasured school-related variables. The percentage of children qualifying for free or reduced price lunch was included as a measure of school SES. Straight line distance to school in miles was calculated from geocoded address data using ArcGIS and Batch Geocode online distance calculator.^{25,26}

Census Tract-Level Characteristics—Median household income, percent of residents with high school or greater education, and percentage of residents living below the federal poverty level (FPL) at the census tract level were obtained from the 2000 U.S. Census Data.²⁷ These variables were included in the analyses to account for neighborhood (census tract) socioeconomic status, which may be associated with both the level of street block incivilities and the likelihood of walking to school among residents.

Statistical Analyses

Logistic regression models were used to examine the association between child-reported likelihood of walking to school and street block incivilities, controlling for a variety of child and parent sociodemographic characteristics. Univariate logistic regression models of child-reported likelihood of walking to school on each of the predictor variables were run to obtain unadjusted estimates of association. Control variables and other covariates of substantive interest were then included in multiple logistic regression models. Generalized estimating equation (GEE) models were used for inference. This provided more efficient estimates of the odds ratios and standard errors while accounting for the nested structure of the dataset where children were clustered within 54 census tracts.²⁸ Investigation of variance inflation factors (VIF) supported a lack of multicollinearity among the predictors, with the exception of the census tract-level percent of residents with a high school or greater education and percent of residents living below FPL.²⁹

Secondary analyses included univariate logistic regressions of perceived neighborhood safety on individual-level and census tract-level characteristics.

Evaluation of Missing Data—As there was a high level of missing data on the parent-reported education and income variables (38%), a dummy variable for missingness was logistically regressed on the other predictors in the model to determine if data were missing at random with respect to these predictors. Missingness was marginally related to the odds of walking to school (those with missing data were less likely to walk to school; OR 0.65, 95% CI: 0.40 to 1.05), and child age (where older children were slightly more likely to have missing parent sociodemographic data than younger children; OR 1.03, 95% CI: 1.01 to 1.05). As the missing at random assumption was violated, 2 analyses were conducted: one with missing values unaccounted for, and a second where missing values for parent SES variables were imputed using linear regression models. To impute the missing values, parent SES variables (eg, yearly income, employment, education) were linearly regressed on the other covariates (eg, child demographic characteristics, neighborhood variables). Missing values for parent SES variables were replaced with the predicted values from these regressions.

Sensitivity Analyses—Several sensitivity analyses were conducted. First, models were run without imputed missing values for parent socioeconomic characteristics (n = 218). Second, models were run using parent reported walking to school (as opposed to child report), as there was only moderate agreement between parent- and child-reported walking to school (the Kappa statistic comparing parent versus child reported walking to school was 48.7%). Third, propensity-score matching was used to adjust for the propensity to live on a street block that was above the median in neighborhood incivilities. Logistic regressions using propensity score matching and produced results similar to the adjusted GEE models. Finally, multilevel models with random intercepts for school and census tract were run to explore school as a potential source of correlated data. Results of these multilevel models were similar to GEE models; and the random intercept for school was not statistically significant, indicating that school was not a significant source of correlation in the data. Consequently, we report the more straightforward GEE approach to account for the

clustering within neighborhoods, while still controlling for school attended by including it as a dummy variable.

Data were analyzed using STATA 10.0.³⁰ Maps were generated in ArcGIS 9.3.²⁵

Results

Overall, 56% of children reported walking to school most of the time ($n = 201$). Children ranged in age from 8 to 13 years (Mean = 9.60 years, SD 1.04). Approximately half were female (54%), and the majority were African American (86%) (Table 2). The majority of children (87%) resided within 1 mile of their respective schools.

Maps depicting the primary outcome (walking status) and the primary predictor of interest (level of incivilities) for participants attending a pair of schools can be seen in Figure 1. Locator maps highlight the location of the 2 schools in the context of the total study area.

Primary Outcome: Likelihood of Walking to School

Using univariate logistic regressions, the odds of walking to school were statistically significantly associated with child age, parent education level, parent employment, number of kids, annual household income, distance to school, proportion of students qualifying for free or reduced price lunch, percent of census tract residents with at least a high school education, percent of census tract residents living below FPL, and level of street-block incivilities. Odds of walking to school were unrelated to perceived neighborhood safety, parent marital status, hours working, race and ethnicity as well as gender. They were marginally related to neighborhood median income (Table 3).

In adjusted GEE models, distance to school and level of incivilities were statistically significantly associated with the odds of walking to school. Working a part time job compared with a full time job was also statistically significantly associated with the odds of walking to school. None of the other covariates (eg, age, sex, race or ethnicity, perceived neighborhood safety, parent education, number of kids, employment status, percent of kids qualifying for free or reduced price lunch, neighborhood education, neighborhood poverty rate, neighborhood income) were statistically significantly associated with odds of walking to school. Living on a street block that was above the median in incivilities was associated with a 3.53 factor increase in odds of walking to school, controlling for other covariates in the model (OR: 3.53; 95% CI: 1.68 to 7.39, $P = .001$). For each additional 0.25 mile to school, the odds of walking decreased by 95% (OR: 0.05; 95% CI: 0.01 to 0.40, $P = .005$), holding other variables constant.

Secondary Outcome: Perceived Neighborhood Safety

For children who resided on street blocks that were above the median in neighborhood incivilities, odds of perceiving their neighborhood as safe were reduced by 61% (OR: 0.39, 95% CI: 0.21 to 0.72, $P = .003$). The other covariates were not statistically significantly associated with perceived safety (ie, age, sex, race or ethnicity, parent education, parent income, parent employment, hours working, number of kids, distance to school, neighborhood education level, neighborhood poverty rate, neighborhood median income, or percentage of students qualifying for free or reduced price lunch).

In unadjusted logistic regression models, for children who perceived their residential neighborhoods as safe, odds of walking to school were reduced by 25% (OR 0.75, 95% CI: 0.49 to 1.14, $P = .188$), but this association was not statistically significant. In adjusted models, perceived safety was unrelated to likelihood of walking to school (OR: 1.20, 95% CI: 0.70 to 2.05, $P = .511$).

Sensitivity Analyses

Estimated odds ratios from models without imputed missing values ($n = 216$) were similar in magnitude to results from models using imputed parent data. Age, number of kids, parent income, neighborhood median income and distance to school were statistically significant predictors of walking to school. Level of neighborhood incivilities was also statistically significantly related to the odds of walking to school, though the point estimate was slightly reduced (OR: 3.00; 95% CI: 1.08 to 8.34, $P = .035$).

There was moderate agreement between parent- and child-reported walking to school (the Kappa statistic comparing parent versus child reported walking to school was 48.7%). Results of GEE models using parent-reported walking to school were similar to models of child-reported walking to school. Using parent-reported walking to school, living on street blocks above the median in incivilities was associated with a 3.55 factor increase in the odds of walking to school (OR: 3.55; 95% CI: 1.20 to 10.52, $P = .022$), holding other variables constant. Logistic regressions using propensity score matching and multilevel models produced results similar to the adjusted GEE models.

Conclusions

Walking to school among school-aged children is associated with higher levels of overall physical activity compared with children who travel to school by bus or car.⁶ In this secondary analysis of cross-sectional data from 365 elementary school children in Baltimore City, for those who resided on street blocks above the median in neighborhood incivilities, the odds of walking to school were increased by 353% compared with children residing on street blocks low in incivilities (OR: 3.53; 95% CI: 1.68 to 7.39, $P = .001$), controlling for a variety of individual-level and neighborhood-level (ie, census tract level) factors. Although high levels of street block incivilities were associated with lower perceived safety among these children, perceived safety was not related to likelihood of walking to school after adjusting for other covariates in the model.

Results suggest that level of incivilities is not a barrier to active transportation to school in this sample, in contrast to our hypothesis. Previous research in this area has demonstrated mixed findings. At least 3 studies have shown that rates of active transportation to school are higher in low-income areas as compared with higher-income areas.^{31–33} Other research has shown higher levels of physical activity among youth who reside in neighborhoods with few incivilities and high levels of perceived safety. A study of a multiethnic sample of 1378 children and adolescents in Chicago examined resident perceptions of neighborhood safety and opportunities to play as well as objective measures of neighborhood social (eg, public intoxication, people selling drugs, gangs present) and physical disorder (eg, graffiti, abandoned cars, condoms, needles, empty beer bottles) in relation to caregiver report of youth physical activity levels.¹² In multilevel analyses, perceived neighborhood safety was positively associated with physical activity and neighborhood social disorder was negatively associated with physical activity, controlling for individual and community level age, sex, race, socioeconomic status, and body mass index. In the current study, by contrast, children residing on street blocks high in incivilities were more likely to walk to school. One possible explanation is that street blocks high in incivilities are those of particularly concentrated disadvantage. Four of the six schools from which the sample was obtained were Title 1 public schools, indicative of disadvantage. Children residing in these areas are likely to walk to and from school out of necessity, as their households do not have the resources (ie, cars, time, adults at home immediately before and after school) to drive or otherwise transport their children. While previous research has found that lack of perceived neighborhood safety is a barrier to active transportation,¹² perceived lack of safety was not associated with walking to school in this study. The finding that the children residing on street blocks high

in incivilities were more likely to perceive their neighborhoods to be unsafe, but also more likely to walk to school provides support for the notion that children were walking to school out of necessity.

Another possible explanation is that neighborhoods with high levels of incivilities also demonstrate other characteristics that are positively associated with the likelihood of walking to school such as high levels of street-connectivity or the presence of sidewalks. As we did not include measures of aspects of the built environment in our analyses, we were unable to assess this possibility.

In addition, neighborhoods high in incivilities may also have high levels of residential density. If children live in closer proximity to each other, they may be more likely to walk to school as they have several other children to walk with. The majority of children in this study sample walked with either other children or with adults. Additional analyses looking at children who walked with others vs. all other modes of travel to school indicated that residing on a block above the median in incivilities was statistically significantly associated with a 2.28 factor increase in the odds of walking with others compared with other travel modalities (OR: 2.28; 95% CI: 1.31 to 3.98, $P = .004$). Children (or their parents or caregivers) may be more likely to walk with others if they live in an area with high levels of incivilities, due to safety concerns. Though we did not assess residential density, future directions include concurrently assessing the built and social environments and their relationship with walking to school.

There are limitations of this research that warrant discussion. First, the MORE project was not designed to primarily assess walking behavior, thus walking to school was assessed by only 1 question that has not been validated. While this approach was not ideal, the question used in the current study is similar to an item used in the National Household Transportation Survey inquiring about transportation to and from school, which has established validity.³⁴ Our use of self-reported walking is similar to other studies in the extant literature that have described associations between self-reported walking to school and physical activity levels among children.^{35,36} Additionally, previous studies of self-reported daily travel surveys among elementary school-aged children have reported good test-retest reliability and criterion validity compared with parental report.^{37,38}

Second, we did not have information on other potential confounders including household car ownership. Variables such as car ownership or bus availability may be an important factor in explaining why children residing on blocks high in incivilities may be more likely to walk to school, as individuals residing on blocks high in incivilities may be less likely to own a car, or less likely to have ready access to school buses or other types of public transportation. This limitation notwithstanding, the finding that a high proportion of children are walking to school despite the presence of numerous neighborhood incivilities or hazards is important for public safety efforts, regardless of the underlying causal pathway.

Third, the extent to which results might generalize to other locations that have lower levels of neighborhood incivilities and hazards is unknown. However, these results are likely generalizable to other urban environments with a similar sociodemographic composition and measures of neighborhood incivilities and hazards. Fourth, straight-line distance between home and school was used as we did not have data on the exact paths by which children traveled to and from school. An alternate approach would have been to use the shortest distance along streets. However, children may not take the shortest path along roads, they may take different paths according to whether they are walking with other children, whether there are 'short-cuts' through alleys or parks, or whether they prefer to walk along major roads. To avoid making the assumption that children always take the shortest path along

streets, we decided to use the simpler measure of straight-line distance as opposed to 'walking distance' along roads. Future studies in this area would benefit from obtaining data on actual paths traveled to school.

Finally, the 2000 Census data were collected several years before NIFeTy or MORE project data. Measurement error may therefore have been introduced as a consequence of changes in neighborhood sociodemographic characteristics over time. If this bias was introduced, we believed that it would have been nondifferential and thus underestimated the true impact of sociodemographic factors on the odds of walking to school.

Despite these limitations, this is still one of the first studies that used both objective and perceived measures of the environment to explore walking to school among urban-dwelling children. Our results indicate that children residing in neighborhoods particularly high in disorder and decay are *more* likely to walk to school than children who live in neighborhoods with fewer incivilities. These unexpected findings suggest that children residing in areas of extremely concentrated disadvantage are more likely to walk to school, likely out of necessity, in spite of lower levels of perceived safety. The types of incivilities assessed in this study (eg, drug paraphernalia, people using drugs, evidence of vandalism or violence, damaged sidewalks, vacant houses and abandoned buildings) are indicators of unsafe environments for children to walk. Students, their parents or caregivers, teachers, and principals may not be aware of the hazards the children face, or may lack the resources to ensure safe walking routes to and from school. As a high proportion of children residing in disadvantaged neighborhoods are currently walking to school, efforts need to be directed at protecting children from continued exposure to these environmental hazards and risk of concomitant negative outcomes such as injury and victimization. Subsequently, policies and community interventions should focus on minimizing children's exposure to neighborhood hazards by ensuring safe routes to and from school.

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Figure 1.
Maps of the study area depicting walking behavior, perceived neighborhood safety, and level of street-block incivilities.

Table 1
Neighborhood Incivilities From the Neighborhood Inventory of Environmental Typology (NifETy)

Total Broken Windows	People Swearing
Structures with Broken Windows	People in Physical Fights
Eviction Signs	People Loitering
Boarded Abandoned Buildings	Intoxicated People
Un-Boarded Abandoned Buildings	Evidence of Prostitution
Vacant Houses	Drug Paraphernalia
Vacant Commercial Buildings	Syringes
Un-Maintained Property	Baggies
Trash in Street	Vials
Trash in Alley	Blunt Guts/Wrappers
Trash in Other Open Spaces	Marijuana (Pot) Roaches
Vacant Lots	Crack Pipes
Broken Bottles	Other Drug Paraphernalia
Potholes	People Smoking Tobacco
Graffiti	Cigarette Butts
Damaged Sidewalks	People Consuming Alcohol
Warning Signs	Alcohol Bottles
Signs with Negative Messages	Liquor Stores & Bars
Evidence of Vandalism	People Using Drugs
Inoperable Vehicles	Obvious Signs of Drug Selling
Used Condoms	Blood in Street or Sidewalks
Noisy	Shell Casings in Street
Homeless People	Police Tape/Outlines in Street
People Yelling	Memorials

Table 2
Baseline Characteristics of Children in the MORE Project (n = 365); for Nonnormally Distributed Data, Medians, and Interquartile Ranges (IQR) Are Presented

	Walks to school* (n= 201)	Drives/bus to school* (n = 159)	Total* (n = 365)
Race and ethnicity [n (%)]			
African American	177 (88.06)	134 (84.28)	314 (86.03)
Caucasian	5 (2.49)	9 (5.66)	14 (3.84)
Asian American	0 (0.00)	1 (0.63)	1 (0.27)
Hispanic	0 (0.00)	3 (1.89)	3 (0.82)
Native American	4 (0.00)	1 (0.63)	5 (1.37)
Bi-Racial	15 (7.46)	11 (6.92)	26 (7.12)
Male	98 (48.76)	69 (43.40)	168 (46.03)
Age (years) [Mean (SD)]	9.72 (1.07)	9.42 (0.95)	9.60 (1.04)
Parent education [n (%)]			
High school or less	88 (43.78)	40 (25.16)	129 (35.34)
Some college	35 (17.41)	33 (20.75)	69 (18.90)
College or greater	10 (4.98)	16 (10.06)	26 (7.12)
Missing	68 (33.83)	70 (44.03)	141 (38.63)
Annual household income [n (%)]			
Less than \$5k	21 (10.45)	9 (5.66)	30 (8.22)
\$5k to \$9,999	17 (8.46)	4 (2.52)	22 (6.03)
\$10k to \$19,999	22 (10.95)	15 (9.43)	37 (10.14)
\$20k to \$29,999	24 (11.94)	19 (11.95)	43 (11.78)
\$30k to \$49,999	26 (12.94)	25 (15.72)	52 (14.25)
\$50k to \$99,999	23 (11.44)	16 (10.06)	39 (10.68)
\$100,000 or more	1 (0.50)	6 (3.77)	7 (1.92)
Missing	67 (33.33)	65 (40.88)	135 (36.99)
Marital status [n (%)]			
Single	46 (22.89)	32 (20.13)	80 (21.92)
Living with someone	11 (5.47)	1 (0.63)	12 (3.29)
Married	29 (14.43)	36 (22.64)	65 (17.81)
Divorced	10 (4.98)	15 (9.43)	25 (6.85)
Widowed	3 (1.49)	0 (0.00)	3 (0.82)
Missing	102 (50.75)	75 (47.17)	180 (49.32)
Number of children	3.53 (1.90)	3.02 (1.92)	3.34 (1.92)
Employed	88 (43.78)	71 (44.65)	161 (44.11)
Missing	67 (33.33)	70 (44.03)	140 (38.36)
How much worked? [n (%)]			
1 full time job	65 (32.34)	45 (28.30)	110 (30.14)
1 part time job	15 (7.46)	13 (8.18)	28 (7.67)
Full time and part time	5 (2.49)	11 (6.92)	17 (4.66)
Occasional or temp	3 (1.49)	2 (1.26)	6 (1.64)

	Walks to school* (n= 201)	Drives/bus to school* (n = 159)	Total* (n = 365)
Missing	113 (56.22)	88 (55.35)	204 (55.89)
Street block incivilities [Median (IQR)]	14 (8–20)	9 (5–15)	13 (6–18)
Median income (\$)	29,943	32,500	31,917
Census tract (\$)	18,974–42,130	22,065–42,130	19,868–42,130
% with ≥ HS education	74.98 (64.59–80.02)	65.60 (54.84–76.80)	71.08 (57.40–80.02)
% below FPL	18.20 (14.60–29.80)	14.60 (8.50–22.70)	17.50 (10.40–26.70)
Distance to school (miles)	0.24 (0.15–0.42)	0.43 (0.27–0.91)	0.32 (0.18–0.51)

* Five children did not report how they traveled to and from school, and are thus not included in the walk to school or drive/bus to school columns. Percentages for the total sample sum to 99.5% for some variables, as 2 children did not report demographic characteristics.

Table 3
Crude and Adjusted (Using Generalized Estimating Equations) Relative Odds of Walking to School (N = 360)

	Crude			Adjusted*		
	OR	95% CI	P	OR	95% CI	P
Male	1.24	(0.82–1.89)	0.311	1.22	(0.71–2.12)	0.474
Age (months)	1.02	(1.00–1.04)	0.015	1.01	(0.990–1.03)	0.294
Perceived safe neighborhood	0.75	(0.49–1.14)	0.188	1.20	(0.70–2.05)	0.511
Race and ethnicity						
African American	1.00			1.20	(0.44–3.26)	0.722
Caucasian	0.42	(0.14–1.28)	0.128	1.00		
Native American	3.03	(0.33–27.41)	0.324	1.00		
Biracial	1.03	(0.46–2.32)	0.939	1.00		
Parent education						
HS or less	1.00			1.00		
Some college	0.48	(0.26–0.88)	0.018	0.65	(0.34–1.23)	0.189
College or higher	0.28	(0.11–0.68)	0.005	0.74	(0.29–1.90)	0.536
Parent marital status						
Single	1.00			1.00		
Living with someone	1.03	(0.60–1.79)	0.908	1.36	(0.45–4.09)	0.579
Married	0.67	(0.36–1.23)	0.192	1.03	(0.36–3.01)	0.950
Divorced	0.46	(0.19–1.16)	0.101	0.47	(0.11–2.05)	0.316
Parent employed	2.51	(1.41–4.45)	0.002	1.21	(0.48–3.02)	0.687
Number of kids	1.17	(1.01–1.35)	0.039	1.12	(0.98–1.28)	0.102
Hours working						
One full time job	1.00			1.00		
One part time job	0.91	(0.59–1.40)	0.656	0.50	(0.28–0.92)	0.206
Full and part time job	3.35	(0.70–16.00)	0.129	0.81	(0.14–4.84)	0.820
Occasional or temp	0.46	(0.18–1.17)	0.101	0.45	(0.11–1.84)	0.269
Household yearly income						
Less than \$5k	1.00			1.00		
\$5k to \$9,999	1.82	(0.47–6.96)	0.381	2.01	(0.50–8.17)	0.327

	Crude			Adjusted*		
	OR	95% CI	P	OR	95% CI	P
\$10k to \$19,999	0.63	(0.23–1.74)	0.372	0.88	(0.33–2.37)	0.798
\$20k to \$29,999	0.54	(0.20–1.45)	0.222	0.59	(0.22–1.57)	0.293
\$30k to \$49,999	0.44	(0.17–1.15)	0.097	0.51	(0.16–1.61)	0.252
\$50k to \$99,999	0.62	(0.22–1.68)	0.346	1.20	(0.33–4.31)	0.779
\$100,000 or more	0.07	(0.01–0.68)	0.022	0.12	(0.01–1.59)	0.107
Street-block incivilities						
Below median	1.00			1.00		
Above median	2.88	(1.87–4.44)	<0.001	3.53	(1.68–7.39)	0.001
Neighborhood characteristics						
Median household income (per \$10,000)	0.93	(0.85–1.01)	0.100	0.87	(0.75–1.02)	0.086
Percent with HS education	0.97	(0.94–0.99)	0.001	1.01	(0.94–1.08)	0.822
Percent living below FPL	1.03	(1.01–1.06)	0.002	1.01	(0.94–1.08)	0.839
Distance to School (0.25 miles)	0.03	(0.01–0.15)	<0.001	0.05	(0.01–0.41)	0.005
Percent of kids qualifying for free or reduced-price lunch	1.02	(1.00–1.04)	0.020	0.99	(0.95–1.04)	0.760

* Adjusted model includes race, age, gender, parent education, marital status, household income, number of kids, parent employment, hours worked, perceived neighborhood safety, census tract median income, percent of census tract residents with at least a high school education, percent of census tract residents living below FPL, street-block incivilities (above or below the median), school, proportion of students qualifying for free or reduced price lunch, and distance to school.