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ORIGINAL RESEARCH

Associations Between Parental Perceptions of the Neighborhood Environment and Childhood Physical Activity: Results from ISCOLE-Kenya

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***Background*:** A physical activity transition to declining activity levels, even among children, now poses a serious public health concern because of its contribution to a rising prevalence of noncommunicable diseases. Childhood physical activity levels are associated with parental perceptions of the neighborhood; however, these relationships have not been explored in sub-Saharan Africa (SSA). The objective was to investigate relationships between parental perceptions of the neighborhood and physical activity indicators among Kenyan children. ***Methods*:** Data were collected from children 9 to 11 years old in Nairobi as part of the International Study of Childhood Obesity, Lifestyle and Environment. Child physical activity was assessed by accelerometry, and information on obtaining sufficient physical activity, active transport, and parental perceptions of the neighborhood collected using questionnaires. ***Results*:** Of 563 participating children, 45.7%, 12.6%, and 11.4% used active school transportation, met physical activity guidelines, and were sufficiently active, respectively. Parental perception of positive neighborhood social cohesion, positive environs and connectivity, and negative child safety concerns, were associated with child physical activity outcomes. ***Conclusions*:** Aspects of parental perceptions of the neighborhood were associated with child physical activity outcomes and should be further explored to appropriately inform policy and practice in curbing declining physical activity levels among children in SSA.

***Keywords*:** father and mother opinions, built environment, social surroundings, child, movement

Although the health benefits of maintaining an active lifestyle are well known, research has shown that a physical activity transition, described as declining physical activity levels, now poses a growing public health burden globally.[1] This has ultimately led to a rising prevalence of noncommunicable diseases, including heart disease, diabetes, hypertension, and certain forms of cancer, around the world.[2] Children and youth, who have also not been spared from the effects of such behavioral transitions, are particularly disadvantaged because of the potential for lifelong ill-health consequences.[3] It has been suggested that advances in the measurement of physical activity at home, work, and for transport, in a wide variety of populations will be integral to advancing the understanding of how these behavioral transitions shape physical activity patterns.[1] Many children spend much of their time in and around their immediate neighborhoods, and parental perceptions of the neighborhood environment are correlated with various aspects of children's activity.[4] Indeed, the associations between parental perceptions of the neighborhood environment and active transportation or physical activity among children have been investigated in several higher income countries[5–9]; however, these relationships have been largely overlooked in studies conducted in developing countries, particularly within sub-Saharan Africa (SSA).[10]

Systematic review evidence reveals that active transportation, particularly to and from school, is associated with increases in physical activity and cardiovascular fitness.[11] Children who walk or cycle to school have higher daily levels of physical activity and are more likely to meet physical activity guidelines than children who use motorized transport, and these effects are noted with both self-report and objective measures of physical activity.[11–13] Children's active transportation and physical activity levels are also associated with parental perceptions of the neighborhood physical and social environment.[14] Active transportation among children is positively associated with parental active transportation to work and other locations.[7] Older children are more likely to use active transportation than their younger counterparts due to lower parental safety concerns and a reduced need for parental supervision,[7] although children of all ages are more likely to use active transportation if the distance from home to school is shorter and the route is easily accessible.[6,9,15,16] Higher levels of parental perceived social safety (eg, child-friendly communities), social cohesion, and traffic safety are also positively associated with active transportation among children.[5,7–9] Children whose parents know many people in their neighborhood and who are satisfied with the number of pedestrian crossings are more likely to increase their active transportation, whereas children with parents perceiving that there are insufficient traffic lights and pedestrian crossings in the neighborhood are less likely to increase their active transportation.[17] More generally, parents perceiving shorter distances to school, higher residential density, higher neighborhood aesthetics, more land-use-mix diversity, availability of adequate walking/cycling infrastructure, proximity to recreational facilities, and more safety from traffic and crime have been associated with higher total childhood physical activity.[4,15]

Despite this rich body of evidence, few studies have investigated these relationships in SSA. A cross-sectional analysis of self-reported data examining the associations between perceptions of the neighborhood environment and physical activity or walking among Nigerian young adults revealed that traffic, the proximity of a transit stop, and absence of 4-way intersections were significantly associated with physical activity, whereas

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low crime rate at night, interesting things to look at, and seeing many people active were significantly associated with sufficient walking.[18] In a different study on Nigerian adolescents, access to destinations was positively associated with active transportation to school; more generally, however, few environmental attributes were associated with physical activity among the adolescents.[19] Among Nigerian adults, perceived safety from crime and traffic were positively associated with physical activity.[10] These indiscriminate patterns may be emerging evidence that environmental correlates of physical activity conducted in higher income countries may not be generalizable to Africa.

Given that emerging evidence of a physical activity transition among school-aged children has also been observed in countries within SSA,[20–22] it is crucial that reliable and culturally sensitive measures of the neighborhood built and social environment, and assessment of environmental perceptions related to physical activity, be developed to accurately capture the correlates of physical activity among children in low-income countries.[23,24] This will require efforts in adapting neighborhood monitoring tools for the African context, allowing data collection to better inform evidence-based policies and programs for the reversal of declines in children's physical activity and active transportation, and promotion of healthy active lifestyles. Consequently, the purpose of this work was to explore the associations between parental perceptions of the neighborhood physical and social environment and children's self-reported and directly measured physical activity and active school transportation in Kenya.

Methods

The ISCOLE Project

The International Study of Childhood Obesity, Lifestyle and Environment (ISCOLE) project was designed to investigate the influence of behavioral settings and the physical, social, and policy environments on the observed relationship between lifestyle and weight status among school-aged children from 12 countries around the world.[25] Although previous multicountry childhood obesity studies have focused on specific geographic regions (eg, Europe), this study was designed to have global representation, including both developing and developed countries. The study design also incorporated comprehensive and robust indicators of lifestyle behaviors (eg, physical activity, food consumption, sedentary behavior, and sleep) and directly measured adiposity and physical activity. More details on the ISCOLE study protocol are provided elsewhere.[25] In Kenya, data collection was conducted in Nairobi after ethical approval from Kenyatta University Ethics Review Committee (the local organizing institution), the Nairobi City Council, and the National Council for Science and Technology.[26]

ISCOLE-Kenya Study Design

A sex-balanced sample of approximately 500 children was conveniently recruited from nonboarding public (lower socioeconomic status [SES]) and private (higher SES) primary schools in Nairobi. In these schools, classrooms with the highest number of children about 10 years old were then sampled. Typically, 30 to 50 children per school were invited to participate and were sent home with information on the study along with a consent form for their parent(s)/guardian(s) to review and sign. Children were also asked to provide assent to participate in the study. Physical activity of the participating children was directly measured using accelerometry, and they completed a questionnaire related to their diet and lifestyle. School administrators and parent(s)/guardian(s) of participating children also completed questionnaires on the school and neighborhood environments. Data collection was conducted for a full school year in 2012, excluding the month-long holiday breaks in April, August, and December.

Accelerometry

Physical activity of the participating children was directly measured using accelerometers (GT3X+; ActiGraph, Pensacola, FL) at a 1-second epoch setting. Accelerometers were attached firmly to belts, and appropriate wearing of the devices on the right side of the waist was demonstrated to the children by the research team. Participating children were instructed to wear the devices 24 hours per day for at least 7 consecutive days (at all times except when bathing or swimming), including an initial familiarization day, maximizing the number of children providing at least 4 days of wear of 10 hours or more, with at least one valid weekend day. Nonwear time within a day was classified as 60 consecutive minutes of 0 counts.[25] Reminders to children from class teachers and reminder calls to their parent(s)/guardian(s) were helpful in ensuring that children wore and returned the devices as required. Data from the accelerometers were downloaded and reviewed for completeness, and data reduction was conducted using cut-points validated in children and youth; moderate-to-vigorous physical activity (MVPA) was classified as ≥ 3000 counts per minute.[27] We then calculated the number of children meeting the World Health Organization (WHO) physical activity guidelines of at least 60 minutes of MVPA daily.[28]

Questionnaires

The Diet and Lifestyle Questionnaire completed by participating children contained questions related to obtaining adequate amounts of physical activity and active transport to/from school, as shown in Figure 1. Self-reported sufficient activity was defined as time spent being physically active for at least 60 minutes on 6 to 7 days during the past week. These questions were taken from the United States Youth Risk Behavior Surveillance System (http://www.cdc.gov/HealthyYouth/yrbs/index.htm) and the Health Behavior in School-aged Children Survey (http://www.hbsc.org/) respectively, and adapted for the Kenyan context.[25] The Neighborhood and Home Environment Questionnaire completed by parent(s)/guardian(s) of participating children was used to assess their perceptions of the neighborhood social, built, food, and physical activity environment. Questions related to neighborhood cohesion (social constructs) included in Figure 1 have been validated in the Project on Human Development in Chicago Neighborhoods (http://www.icpsr.umich.edu/icpsrweb/PHDCN/) and are also included in the Neighborhood Impact on Kids Survey (http://www.nikproject.org/). Questions assessing parental/guardian perceptions of their neighborhood environment, including proximity and access to facilities, street connectivity, infrastructure for getting around, aesthetics, and safety from traffic and crime, as shown in Figure 1, were taken from the Neighborhood Environment Walkability Scale instrument (http://sallis.ucsd.edu/measure_news.html). More generally, ISCOLE's adapted questionnaires were a compilation of several validated items obtained from existing questionnaires as discussed, and where no suitable previous alternatives were found, new questions were designed by content experts from the ISCOLE investigator team. Technicians were trained to administer the questionnaires in a standardized fashion to minimize bias and

to ensure maximal external validity, and provisions were made to administer the questionnaire via an interview for participants with low levels of literacy. In few cases, regional and cultural variation necessitated further adaptations of some of the items and examples. Intercountry variability of the reliability and validity of the adapted questionnaires is possible given the scale of the ISCOLE project.

Statistical Analysis

The statistical analyses presented in this article were computed using SAS (version 9.3; SAS Institute, Cary, NC). Sample sizes and percentages of child-level and parental-level factors, including parental perceptions of the neighborhood environment, are reported in Table 1. Univariable analysis was used to investigate associations between parental perceptions of the neighborhood environment and child active school transportation (self-reported), sufficient activity levels (self-reported), and meeting MVPA guidelines (directly measured) as reported in Table 2. Multivariable modeling using a forward selection approach was completed using variables that were significantly associated with child physical activity outcomes but yielded no significant results.

Results

Participant and Parent Characteristics

As shown in Table 1, a total of 563 participants (53.5% girls), 9.0 to 11.9 years of age, were included in the analyses. Less than half of the children (45.7%) reported that they used active transportation (eg, walking, running) to/from school. Sixty-four children (11.4%) reported being sufficiently active (physically active for at least 60 minutes on 6 to 7 days during the past week), and 71 children (12.6%) met the MVPA guideline of ≥ 60 minutes of directly measured daily MVPA. A higher percentage of mothers (16.3%) than fathers (8.4%) of the participating children had a primary or lower education level, and only 12.0% of mothers had a graduate or professional degree, whereas this percentage was 21.9% among fathers.

Parental Perceptions of the Neighborhood Environment

Assessment of parental perceptions of the neighborhood environment revealed that over half of the parents agreed that people in their neighborhood were willing to help their neighbors (60.7%) and could be trusted (54.5%). When asked about the ease of getting around in the neighborhood, a large percentage (85.2%) indicated that shopping areas were within easy walking distance, whereas slightly fewer respondents agreed that that there was a transit stop (76.6%) and many places to go within easy walking distance of their home (60.9%). A total of 247 (45.2%) agreed that the speed of traffic on most streets was usually slow, yet 65.1% indicated that most drivers go faster than the posted speed limits and 48.0% reported that the traffic makes it difficult for their children to walk. When asked about fear of their children being taken or hurt by a stranger, 72.8% of parents indicated that this was a danger on local streets; 49.3% that this was a danger in their yard, driveway, or common area; and 65.4% that this was a danger in a local park. A total of 304 respondents (55.6%) reported that they were afraid of their child being taken or hurt by a known bad person in the neighborhood.

Parental Perceptions of the Neighborhood Associated With Childhood Physical Activity

It is noteworthy that the analyses included in Table 2 are pooled data (n = 380), combining public and private school children. However, analysis of public (n = 269) and private (n = 111) school children separately showed that in private schools, there were largely no significant findings (see Tables 3 and 4). This is possibly due to the lower sample size. The sole significant finding was parents' fear of their child being taken or hurt by a stranger in a local park was associated with children's report of being sufficiently active. Consequently, the significant findings in these pooled analyses are largely driven by public school children. Univariable analysis showed that parents' perception that people in their neighborhood could be trusted was positively associated with child active transportation and meeting MVPA guidelines; that is, 49.0% and 43.7% of the total number of children who used active transportation or who met MVPA guidelines, respectively, had parents who agreed that people in their neighborhood could be trusted. There was a positive association between (1) parents reporting that there was a transit stop within walking distance from their home, that there were not many dead-end streets in their neighborhood, that there were crosswalks and signals on busy streets and (2) children using active transportation or meeting MVPA guidelines. There was also a positive association between (1) parents' agreement that streets had good lighting at night and that there were many places to go within easy walking distance of their home and (2) child active transportation. Parents' report that there were many different routes for getting from place to place was positively associated with child self-reported sufficient activity. Finally, parents' indication that they were afraid of their child being taken or hurt by a known bad person in their neighborhood was positively associated with child active transportation, whereas parents' fear of their child being taken or hurt by a stranger on local streets or in a local park was positively associated with child self-reported sufficient activity. There were no significant results in multivariable analyses using variables that were significantly associated with child physical activity outcomes in univariable analysis.

Discussion

The results from this study revealed significant associations between various aspects of parental perceptions of the neighborhood physical and social environment, and child self-reported active transportation, self-reported sufficient activity, and meeting the MVPA guidelines.

Less than half of children reported that they used active transportation to/from school. Parental perception of positive neighborhood social cohesion (that people in their neighborhood could be trusted), positive neighborhood physical environs and connectivity (that there was a bus or transit stage/stop within walking distance of the home, that there were not many dead-end streets, that streets had good lighting at night, that there were crosswalks and signals on busy streets, and that there were many places to go within easy walking distance of the home), and negative child safety concerns (fear of their children being taken or hurt by a known bad person in the neighborhood) were associated active school transportation among the children. The finding that negative child safety concerns were associated with active school transportation may be due to a heightened awareness of the potential risks associated with walking or running to/from school among parents whose children use active transportation. Further, given that that these findings are largely

ISCOLE Diet and Lifestyle Questions (filled by the child)

Q. During the past week (7 days), on how many days were you physically active for a total of at least 60 minutes per day?

(All the time you spent in activities that increased your heart rate and made you breathe hard)

☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

Q. In the last week you were in school, the **MAIN** part of your journey to school was by:

Walking

Bicycle, roller-blade, skateboard or scooter

Bus, train, tram, underground or boat

Car, motorcycle or moped

Other _____

ISCOLE Neighbourhood and Home Environment Questions (filled by the parent/guardian)

NEIGHBOURHOOD COHESION

Do you agree or disagree with the following statements?	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
People around my neighbourhood are willing to help their neighbours.	○	○	○	○	○
People in my neighbourhood can be trusted.	○	○	○	○	○

GETTING AROUND IN YOUR NEIGHBOURHOOD

Please select the answer that best applies to you and your neighbourhood. Within walking distance means within a 10-15 minute walk from your home.

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
There are shops, stores, markets, and places to buy things I need within easy walking distance of my home/house.	○	○	○	○

Figure 1 — Self-report questions and the list of possible answers.

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
There is a bus, transit/stage, or train stop within walking distance from my home	○	○	○	○
There are sidewalks on most streets.	○	○	○	○
There are NOT many dead end streets.	○	○	○	○
There are many different routes for getting from place to place.	○	○	○	○
There is a high crime rate.	○	○	○	○
The speed of traffic on most streets is usually slow (30 mph or less).	○	○	○	○
Most drivers go faster than the posted speed limits.	○	○	○	○
There are many interesting things to look at while walking in my neighbourhood.	○	○	○	○
The traffic makes it difficult or unpleasant for my child to walk.	○	○	○	○
Streets have good lighting at night.	○	○	○	○
There are crosswalks and signals on busy streets.	○	○	○	○
There are many places to go within easy walking distance of my home.	○	○	○	○
I'm afraid of my child being taken or hurt by a stranger on local streets.	○	○	○	○
I'm afraid of my child being taken or hurt by a stranger in my yard, driveway, or common area.	○	○	○	○
I'm afraid of my child being taken or hurt by a stranger in a local park.	○	○	○	○
I'm afraid of my child being taken or hurt by a known "bad" person (adult or child) in my neighbourhood.	○	○	○	○

Figure 1 *(Continued)*

Table 1 Descriptive Characteristics of Participating Children, Parents, and Parental Perceptions of the Neighborhood Environment

Characteristic	n (%)
Child factors	
Sex	
Boys	262 (46.5)
Girls	301 (53.5)
Attendance by type of school	
Public (lower SES)	295 (52.4)
Private (higher SES)	268 (47.6)
Transport to school—self-reported	
Active (walking, bicycle, roller blade, skate board)	245 (45.7)
Motorized (bus, van, car)	291 (54.3)
Days child was physical active for at least 60 minutes—self-reported	
0–5 days (insufficiently active)	499 (88.6)
6–7 days (sufficiently active)	64 (11.4)
Met MVPA guidelines (mean of ≥60 minutes of daily MVPA)—directly measured	71 (12.6)
Parental factors	
Maternal education level	
Primary or less	91 (16.3)
High school or less	163 (29.2)
Diploma/higher diploma/degree	237 (42.5)
Graduate/professional degree	67 (12.0)
Paternal education level	
Primary or less	43 (8.4)
High school or less	159 (31.1)
Diploma/higher diploma/degree	197 (38.6)
Graduate/professional degree	112 (21.9)
Parental perceptions of the neighborhood environment[a]	
People around my neighborhood are willing to help their neighbors.	336 (60.7)
People in my neighborhood can be trusted	301 (54.5)
There are shops, stores, markets, and places to buy things I need within easy walking distance of my home/house.	467 (85.2)
There is a bus, transit/stage, or train stop within walking distance from my home	420 (76.6)
There are sidewalks on most streets.	366 (66.9)
There are NOT many dead end streets.	347 (64.0)
There are many different routes for getting from place to place.	422 (77.4)
There is a high crime rate.	232 (42.5)
The speed of traffic on most streets is usually slow (30 mph or less).	247 (45.2)
Most drivers go faster than the posted speed limits.	355 (65.1)
There are many interesting things to look at while walking in my neighborhood.	319 (58.3)
The traffic makes it difficult or unpleasant for my child to walk.	263 (48.0)
Streets have good lighting at night.	258 (47.1)
There are crosswalks and signals on busy streets.	184 (33.7)
There are many places to go within easy walking distance of my home.	332 (60.9)
I'm afraid of my child being taken or hurt by a stranger on local streets.	399 (72.8)
I'm afraid of my child being taken or hurt by a stranger in my yard, driveway, or common area.	270 (49.3)
I'm afraid of my child being taken or hurt by a stranger in a local park.	357 (65.4)
I'm afraid of my child being taken or hurt by a known "bad" person (adult or child) in my neighborhood.	304 (55.6)

Abbreviations: SES, socioeconomic status; MVPA, moderate-to-vigorous physical activity.

[a] The number and percentages reported are for respondents who agree or strongly agree with the statements.

Table 2 Associations Between Parental Perceptions of the Neighborhood Environment and Childhood Physical Activity

	Child Self-Report of Active Transportation (n = 245)		Child Self-Report of Being Sufficiently Active (n = 64)		Child Directly Measured Met MVPA Guidelines (n = 71)	
Statement	**n (%)**	***P***	**n (%)**	***P***	**n (%)**	***P***
People around my neighborhood are willing to help their neighbors.	134 (55.6)	.0502	43 (68.3)	.1894	37 (52.1)	.1148
People in my neighborhood can be trusted.	118 (49.0)*	.0406	40 (63.5)	.1290	31 (43.7)*	.0488
There are shops, stores, markets, and places to buy things I need within easy walking distance of my home/house.	207 (87.0)	.4139	55 (88.7)	.4109	61 (87.1)	.6272
There is a bus, transit/stage, or train stop within walking distance from my home	171 (71.9)*	.0109	48 (77.4)	.8780	42 (60.0)*	.0004
There are sidewalks on most streets.	160 (67.0)	.7896	44 (72.1)	.3579	45 (64.3)	.6172
There are NOT many dead end streets.	137 (58.1)*	.0287	39 (66.1)	.7244	34 (48.6)*	.0039
There are many different routes for getting from place to place.	190 (80.2)	.0985	54 (88.5)*	.0279	58 (82.9)	.2447
There is a high crime rate.	107 (45.2)	.3165	28 (45.2)	.6514	33 (47.1)	.3991
The speed of traffic on most streets is usually slow (30 mph or less).	111 (46.8)	.6819	27 (44.3)	.8709	30 (42.9)	.6682
Most drivers go faster than the posted speed limits.	154 (65.3)	.9989	36 (59.0)	.2871	48 (68.6)	.5184
There are many interesting things to look at while walking in my neighborhood.	146 (61.3)	.2875	33 (53.2)	.3878	38 (54.3)	.4637
The traffic makes it difficult or unpleasant for my child to walk.	113 (47.3)	.7670	30 (48.4)	.9474	36 (51.4)	.5378
Streets have good lighting at night.	123 (51.7)*	.0345	24 (38.7)	.1609	36 (51.4)	.4352
There are crosswalks and signals on busy streets.	98 (41.2)*	.0013	14 (23.0)	.0595	31 (44.3)*	.0448
There are many places to go within easy walking distance of my home.	157 (66.0)*	.0281	32 (51.6)	.1248	48 (68.6)	.1431
I'm afraid of my child being taken or hurt by a stranger on local streets.	172 (72.0)	.7134	53 (85.5)*	.0172	52 (74.3)	.7664
I'm afraid of my child being taken or hurt by a stranger in my yard, driveway, or common area.	122 (51.1)	.8119	37 (59.7)	.0818	42 (60.0)	.0545
I'm afraid of my child being taken or hurt by a stranger in a local park.	152 (63.9)	.7012	48 (78.7)*	.0205	48 (68.6)	.5483
I'm afraid of my child being taken or hurt by a known "bad" person (adult or child) in my neighborhood.	144 (60.5)*	.0458	41 (66.1)	.0757	42 (60.0)	.4250

Note. The percentages reported are for respondents who agree or strongly agree with the statements. c^2 test results reported (all associations reported are positive). Percentages may exclude missing parental level data.

Abbreviations: MVPA, moderate-to-vigorous physical activity.

*$P < .05$.

Table 3 Associations Between Parental Perceptions of the Neighborhood Environment and Childhood Physical Activity (Public Schools)

	Child Self-Report of Active Transportation (n = 165)		Child Self-Report of Being Sufficiently Active (n = 35)		Child Directly Measured Met MVPA Guidelines (n = 69)	
Statement	**n (%)**	***P***	**n (%)**	***P***	**n (%)**	***P***
People around my neighborhood are willing to help their neighbors.	84 (51.8)	.1923	20 (58.8)	.7149	36 (52.2)	.4744
People in my neighborhood can be trusted.	77 (47.5)	.7430	21 (61.8)	.1067	30 (43.5)	.3120
There are shops, stores, markets, and places to buy things I need within easy walking distance of my home/house.	135 (84.4)	.5057	31 (91.2)	.3209	59 (86.8)	.7465
There are NOT many dead end streets.	86 (53.4)	.1902	20 (58.8)	.9625	32 (47.1)	.0344
There are many different routes for getting from place to place.	125 (78.1)	.1774	31 (91.2)	.0309	56 (82.3)	.1630
There is a high crime rate.	85 (53.4)	.3184	20 (58.8)	.3025	33 (48.5)	.7050
The speed of traffic on most streets is usually slow (30 mph or less).	79 (49.4)	.4760	13 (39.4)	.3518	29 (42.6)	.4097
Most drivers go faster than the posted speed limits.	96 (60.4)	.5888	18 (52.9)	.2550	48 (70.6)	.0883
There are many interesting things to look at while walking in my neighborhood.	101 (63.13)	.0639	17 (50.0)	.3077	37 (54.4)	.4798
The traffic makes it difficult or unpleasant for my child to walk.	76 (47.2)	.2353	15 (44.1)	.4516	34 (50.0)	.9735
Streets have good lighting at night.	91 (56.9)	.0259	13 (38.2)	.1109	35 (51.5)	.9375
There are crosswalks and signals on busy streets.	75 (46.9)	.0331	10 (29.4)	.1483	31 (45.6)	.3616
There are many places to go within easy walking distance of my home.	106 (65.8)	.2583	17 (50.0)	.1100	47 (69.1)	.1936
I'm afraid of my child being taken or hurt by a stranger on local streets.	115 (71.4)	.8888	28 (82.3)	.1460	50 (73.5)	.7211
I'm afraid of my child being taken or hurt by a stranger in my yard, driveway, or common area.	94 (58.4)	.5309	24 (70.6)	.0528	41 (60.3)	.3226
I'm afraid of my child being taken or hurt by a stranger in a local park.	102 (63.4)	.8411	25 (73.5)	.2271	47 (69.1)	.3334
I'm afraid of my child being taken or hurt by a known "bad" person (adult or child) in my neighborhood.	100 (62.1)	.2731	25 (73.5)	.0788	41 (60.3)	.9011
There is a bus, transit/stage, or train stop within walking distance from my home	102 (63.7)	.0044	26 (76.5)	.4636	41 (60.3)	.0313
There are sidewalks on most streets.	106 (65.8)	.6686	25 (73.5)	.2934	43 (63.2)	.6534

Note. The percentages reported are for respondents who agree or strongly agree with the statements. c^2 test results reported (all associations reported are positive). Percentages may exclude missing parental level data.

Abbreviations: MVPA, moderate-to-vigorous physical activity.

* $P < .05$.

Table 4 Associations Between Parental Perceptions of the Neighborhood Environment and Childhood Physical Activity (Private Schools)

	Child Self-Report of Active Transportation (n = 80)		Child Self-Report of Being Sufficiently Active (n = 29)		Child Directly Measured Met MVPA Guidelines (n = 2)	
Statement	**n (%)**	***P***	**n (%)**	***P***	**n (%)**	***P***
People around my neighborhood are willing to help their neighbors.	50 (63.3)	.6004	23 (79.3)	.1040	1 (50.0)	.6366
People in my neighborhood can be trusted.	41 (51.9)	.0890	19 (65.5)	.5778	1 (50.0)	.7545
There are shops, stores, markets, and places to buy things I need within easy walking distance of my home/house.	72 (92.3)	.0515	24 (85.7)	.8925	2 (100.0)	.5486
There are NOT many dead end streets.	51 (68.0)	.6164	19 (76.0)	.5015	2 (100.0)	.3544
There are many different routes for getting from place to place.	65 (84.4)	.1358	23 (85.2)	.3997	2 (100.0)	.4632
There is a high crime rate.	22 (28.2)	.1927	8 (28.6)	.5331	0 (0)	.3100
The speed of traffic on most streets is usually slow (30 mph or less).	32 (41.6)	.6039	14 (50.0)	.4523	1 (50.0)	.8488
Most drivers go faster than the posted speed limits.	58 (75.3)	.1535	18 (66.7)	.8097	0 (0)	.0954
There are many interesting things to look at while walking in my neighborhood.	45 (57.7)	.7439	16 (57.1)	.8725	1 (50.0)	.8053
The traffic makes it difficult or unpleasant for my child to walk.	37 (47.4)	.6947	15 (53.6)	.3720	2 (100.0)	.1212
Streets have good lighting at night.	32 (41.0)	.8618	11 (39.3)	.6907	1 (50.0)	.8364
There are crosswalks and signals on busy streets.	23 (29.5)	.3560	4 (14.8)	.1633	0 (0)	.4006
There are many places to go within easy walking distance of my home.	51 (66.2)	.0936	15 (53.6)	.5712	1 (50.0)	.8053
I'm afraid of my child being taken or hurt by a stranger on local streets.	57 (73.1)	.7280	25 (89.3)	.0667	2 (100.0)	.3984
I'm afraid of my child being taken or hurt by a stranger in my yard, driveway, or common area.	28 (35.9)	.0982	13 (46.4)	.6954	1 (50.0)	.8401
I'm afraid of my child being taken or hurt by a stranger in a local park.	50 (64.9)	.8602	23 (85.2)	.0320	1 (50.0)	.6157
I'm afraid of my child being taken or hurt by a known "bad" person (adult or child) in my neighborhood.	44 (57.1)	.2596	16 (57.1)	.5017	1 (50.0)	.9741
There is a bus, transit/stage, or train stop within walking distance from my home	69 (88.5)	.2012	22 (78.6)	.5546	1 (50.0)	.2228
There are sidewalks on most streets.	54 (69.2)	.7788	19 (70.4)	.8199	2 (100.0)	.3350

Note. The percentages reported are for respondents who agree or strongly agree with the statements. c^2 test results reported (all associations reported are positive). Percentages may exclude missing parental level data.

Abbreviations: MVPA, moderate-to-vigorous physical activity.

* $P < .05$.

driven by those in public school, their lower SES may limit their access to and use of motorized transport.

These results closely matched associations found between aspects of parental perceptions of the neighborhood and the percentage of children meeting MVPA guidelines. Parental perception of positive neighborhood social cohesion (that people in their neighborhood could be trusted) and positive neighborhood physical environs and connectivity (that there was a bus or transit stage/stop within walking distance of the home, that there were not many dead end streets, and that there were crosswalks and signals on busy streets) were associated with children meeting MVPA guidelines. Closely aligned results for factors associated with active transportation and meeting MVPA guidelines may be supported by previous work showing that children who use active transportation are more likely to accumulate higher MVPA levels and/or meet MVPA guidelines, even in the Kenyan context.[11–13,26] Further, these findings provide emerging evidence that children's active transportation and physical activity levels are associated with parental perceptions of the neighborhood environment, similar to previous findings from studies conducted in higher income countries, particularly related to perceived safety and social cohesion, ease of getting around because of shorter distance and route accessibility, adequate pedestrian crossings, and sufficient traffic lights.[4–9,14–17]

A small percentage of children reported that they were sufficiently active on at least 6 to 7 days during the week. Parental perception of positive neighborhood connectivity (that there were many different routes of getting from place to place) and negative child safety concerns (fear of their children being taken or hurt by a stranger on local streets and fear of their children being taken or hurt by a stranger in a local park) were associated with children being sufficiently active. The parental perception factors that were significantly associated with self-reported sufficient activity were different from those related to active transportation and meeting MVPA guidelines; however, weak correlations between self-reported and directly measured physical activity have previously been found in this setting.[29]

There were no significant results in multivariable modeling using variables that were significantly associated with child physical activity outcomes because of high collinearity between parental perceptions of the neighborhood environment variables (ie, a high likelihood that a large percentage of parents were responding very similarly to questions on their perceptions of the environment). This research study has several limitations, including a cross-sectional design, with all of the inherent weaknesses. The sampling was nonrepresentative; rather, it was designed to capture sampling variation in socioeconomic status, which may limit the generalizability of the findings. Finally, self-reported information introduces several response biases. The study does, however, have several strengths, including robust objective measures of anthropometric data and accelerometry from children, rigorous training of the research team, and quality control. The study therefore provides an excellent opportunity to increase our understanding of the correlates of child physical activity patterns.

Conclusion

In summary, parental perception of positive neighborhood social cohesion was associated with child active transportation (self-reported) and meeting MVPA guidelines (directly measured); parental perception of positive neighborhood physical environs and connectivity was associated with active transportation, meeting MVPA guidelines, and sufficient activity (self-reported); and parental perception of negative child safety concerns was associated with active transportation and sufficient activity among children. These results are largely driven by public school (lower SES) children, pointing to an SES difference in parental perceptions of the neighborhood and, consequently, physical activity patterns among their children. The findings provide preliminary evidence of, and highlight the need for, further investigation into parental perceptions of the neighborhood physical and social factors that may affect physical activity of school-aged children in the African context.

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