

Parent Perceptions of Neighborhood: Relationships with US Youth Physical Activity and Weight Status

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Abstract Context is important for understanding and making change to improve health outcomes. The purpose of this study was to examine the relationship between parent perceptions of neighborhood and youth aerobic physical activity and weight. This study is a secondary data analysis of 64,076 parents and guardians of children and adolescents (6–17 years) participating in the 2007 National Survey of Children’s Health. Logistic regression models were used to evaluate the relationship between neighborhood characteristics, including constructs for social capital, physical condition, resource availability, and safety, and youth likelihood of meeting healthy standards for physical activity and weight. Neighborhood characteristics, including social capital, resource availability, and safety were significantly associated with increased likelihood of youth achieving healthy physical activity and normal weight parameters even with adjustment for individual and family-level demographic and behavioral characteristics. Findings support neighborhood assessment during behavioral counseling and continued exploration of neighborhood context as a means to positively impact youth physical activity and weight outcomes.

Keywords Aerobic activity · Body mass index · Cardiovascular health indicator · Neighborhood context

Introduction

The trend of increasing rates of overweight and obesity among youth in the United States is a national public health crisis. From 2003 to 2007, the obesity prevalence for youth ages 10–17 years in the United States increased by 10% [1]. Currently, more than 50% of overweight children and adolescents ages 5–17 years have a risk factor for heart disease, such as high blood pressure or elevated insulin levels, which are the hallmark of insulin resistance seen in adult-onset Type 2 Diabetes [2]. Unfortunately, overweight and obesity in childhood and adolescence are associated with these conditions in adulthood [3]. In the context of increasing risk for chronic disease related to excess weight among youth, some health advocates estimate that current generations of young people may be the first to have a shorter life span than their parents.

To date, most attempts to improve cardiovascular health indicators such as excess weight and physical activity levels among youth have focused on individual-level and some family-level interventions. More recent approaches to understanding individual health behaviors and health outcomes include measures of the social and structural environment, such as neighborhood context. However, defining the relationship between neighborhood context, including perceived neighborhood qualities and individual assessment of the built environment as well as census indices and regional measurement of community design, and cardiovascular health status among individuals remains a source of significant debate with contrasting findings [4–6].

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Using data from the Project on Human Development in Chicago Neighborhoods, Molnar and colleagues found that neighborhood social disorder and community member assessment of a neighborhood as unsafe for play were significantly negatively associated with youth physical activity after controlling for individual factors and average neighborhood education level [7]. In follow-up analyses using the same data set, Cradock et al. found that increased neighborhood social cohesion was positively associated with youth being active in recreational programs and youth frequency of self-reported general physical activity [8]. Lee and Cubbin noted low neighborhood socioeconomic status and high neighborhood social disorganization to be independently associated with poor dietary habits among youth; however, neighborhood characteristics were not associated with youth physical activity [9]. Using data from the National Longitudinal Study of Adolescent Health, Gordon-Larsen and colleagues found that high neighborhood serious crime was associated with a 23% reduction in the likelihood of youth reporting high levels of moderate to vigorous physical activity [10].

With respect to youth weight outcomes, recent focus has been on examining the relationship between weight status and characteristics of the built environment. In a recent study among Massachusetts youth, Oreskovic and colleagues evaluated features of the built environment theorized to be associated with body mass index (BMI), including distance to nearest fast-food restaurants, subway stations, and school; quantity of fast-food restaurants; amount of open space; crime; and population density [11]. After adjustment for sociodemographics, only living near a greater density of subway stations was significantly inversely associated with youth BMI [11]. Using data from the National Longitudinal Study of Youth (NLSY79) and the children of NLS79, Sen and colleagues found that neighborhood quality was not significantly related to children's weight, with the exception of maternal perceptions of inadequate police protection which was associated with increased BMI-percentile and risk of obesity [12]. Gordon-Larsen and colleagues implicate inequalities in the built environment, namely access to physical activity and recreation facilities, as contributing to disparities in physical activity and overweight status in a nationally representative sample of adolescents [13]. Using predicted probability models in a sample from the Monitoring the Future study, Slater and colleagues estimate that changes in the built environment could have the greatest impact on reductions in adolescent obesity, thus affecting youth most at risk [14].

Using data from the 2007 National Survey of Children's Health (NSCH), the purpose of this study is to examine the relationship between youth physical activity levels, weight status, and neighborhood context, using multiple measures of perceived neighborhood social and physical condition.

We hypothesized significant relationships would exist between constructs for neighborhood context and youth health above individual and family-level demographic characteristics. Identifying a relationship between neighborhood characteristics and cardiovascular health indicators, such as youth physical activity and weight status, may be instrumental in developing innovative public health interventions and policies effective in facilitating improved youth health.

Methods

Study Design and Population

This is a secondary data analysis of parent and guardian respondents participating in the 2007 NSCH. Respondents in the current study were parents and guardians (hereafter referred to as parents) of youth between the ages of 6–17 years ($n = 64,076$).

The NSCH is a United States telephone-based survey, given in English and Spanish to adults with one or more children under the age of 18 years in the home, across the 50 states and the District of Columbia. It is a nationally representative, cross-sectional survey of indicators and contexts for child and adolescent health. The survey is conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention on behalf of the Maternal and Child Health Bureau. The NSCH uses a random-digit dial procedure to identify households with children; in households with more than one child under the age of 18 years, one child was randomly chosen to be the focus of the interview. Respondents are parents who self-identify as being the most knowledgeable of the representative child's health status, health behaviors, and health care needs and utilization. A total of 91,642 surveys were completed for youth between the ages of 0–17 years; the overall response rate was 46.7%.

Parent respondents participated in a 25 min interview and answered questions about sociodemographics, health care access and utilization, experiences with a medical home, youth and parent health and functional status, and environmental context. Interviews were administered using a computer-assisted telephone interview system. All protocols, including the current study received Human Subjects Institutional Review Board approval. More information on study methodology, survey administration, and data management has been published elsewhere [15, 16].

Measures

Outcome variables include two measures of cardiovascular health: aerobic physical activity and weight status

Table 1 Neighborhood context and youth cardiovascular health outcomes

Variables	Descriptors of variables	No. of items constituting variables
<i>Neighborhood characteristics</i>		
Neighborhood social capital, trust	Respondent level of agreement or disagreement with the following statements: people in neighborhood help each other out; we watch out for each other’s children in this neighborhood; there are people I can count on in this neighborhood; if my child were outside playing and got hurt or scared, there are adults nearby I can trust to help my child (4-level Likert scale)	4 ($\alpha = 0.86$) ^a
Neighborhood condition	Presence or absence of the following adverse conditions: litter or garbage on street or sidewalk; poorly kept or dilapidated housing; vandalism such as broken windows or graffiti (summed, range 0–3) ^b	3
Neighborhood resources	Availability of the following resources in the neighborhood even if respondent’s child does not use them: sidewalks or walking paths; park or playground area; a recreation center, community center, or Boy’s and Girl’s club; a library or bookmobile (summed, range 0–4) ^b	4
Neighborhood safety	How often feel child is safe in your community or neighborhood (“never,” “sometimes,” “usually,” “always”)	1
<i>Youth physical activity outcome^c</i>		
Aerobic physical activity (dichotomous)	Aerobic activity was assessed with the question: “During the past week, on how many days did [child] exercise, play a sport, or participate in physical activity for at least 20 min that made him/her sweat and breathe hard [includes active sports such as baseball, softball, basketball, swimming, soccer, tennis, or football; riding a bike or roller skating; walking or jogging; jumping rope; gymnastics; and active dance such as ballet]?” An activity variable representing 5 or more days of activity vs. less than 5 days of activity in the past week was created, reflecting recommendations that individuals be physically active everyday or nearly every day on most days of the week for maximal health benefits	1
<i>Youth weight outcome^d</i>		
Body mass index (BMI) percentile (dichotomous)	Parents reported weight and height for each child based on the questions: “How much does [child] weight now?” and “How tall is [child] now?” An ordinal variable was derived by survey administrators to represent BMI categories of underweight (<5%), healthy weight (5–84%), overweight (85–94%), and obese ($\geq 95\%$). A variable reflecting healthy weight (5–84%) vs. weight excess (overweight and obese defined as BMI $\geq 85\%$ for age and gender specific growth charts) was created based on the ordinal variable	1

^a Cronbach’s α coefficient was used to assess internal consistency of the neighborhood social capital/trust scale

^b Parents had to have a valid answer for at least 75% of the items to be included in the analysis

^c Questions asked of respondents with child 6–17 years of age, $n = 64,076$

^d Questions only asked of respondents with child 10–17 years of age, $n = 45,897$

(Table 1). Independent variables included four categories for neighborhood context: social capital, physical condition, resource availability, safety (Table 1).

Demographic variables used as covariates in multivariate analyses were youth age, gender, race (4-category: white only, black only, multiracial, and other—Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander), and ethnicity; household poverty status; parent highest education achieved; and family structure (Tables 2, 3). Additional independent variables, previously hypothesized to be related to youth physical activity [17], were entered into the regression model as control variables including, parent report of youth health (5-level variable: poor to excellent), parent physical activity in the past week (dichotomous), and the presence of a television in the youth’s bedroom [18, 19]. Variables reflecting family meal

frequency [20, 21], presence of a television in the youth’s bedroom [18, 19], and youth physical activity (continuous) were included in models examining weight status.

Data Analysis

Univariate statistics were performed on unweighted data and used to describe sample demographics and health indicator characteristics. To evaluate relationships between the measures for neighborhood context, Pearson correlations between each neighborhood construct were examined. To assess the relationship between neighborhood factors and measures of youth cardiovascular health, unadjusted and adjusted logistic regression analyses were performed. Each neighborhood characteristic was tested in a separate regression model with aerobic activity and weight status. In the first regression

Table 2 Characteristics of study sample, relationships with physical activity

Characteristic	Frequency (%)	Unadjusted Odds Ratio (95% CI) ^a	Adjusted Odds Ratio (95% CI) ^b
Aerobic Physical Activity^c			
<i>Demographics</i>			
Gender			
Female	30,693 (48.0)	0.63 (0.58–0.68)***	0.62 (0.57–0.67)***
Race, Ethnicity			
Hispanic	7,357 (11.6)	0.58 (0.51–0.66)***	0.64 (0.54–0.75)***
White	47,639 (78.9)	1.08 (0.99–1.19)	1.0 (referent)
Black	6,782 (11.2)	0.87 (0.78–0.97)*	0.88 (0.77–0.99)*
Multi-racial	3,053 (5.1)	1.36 (1.11–1.66)**	1.25 (1.00–1.58)
Other	2,915 (4.8)	0.82 (0.66–1.02)	0.73 (0.59–0.92)**
Age (years: mean, SD)	12.01 (3.5)	0.92 (0.91–0.93)***	0.92 (0.91–0.93)***
Lives in 2-parent household			
Yes	48,110 (75.6)	1.07 (0.98–1.18)	0.94 (0.85–1.05)
Household at or below poverty level			
Yes	6,113 (10.4)	0.69 (0.61–0.77)***	0.95 (0.83–1.09)
Parent highest education achieved			
Less than high school degree	3,978 (6.3)	0.48 (0.40–0.56)***	0.60 (0.49–0.73)***
High school graduate	10,668 (16.9)	0.85 (0.77–0.94)**	0.81 (0.73–0.90)***
Coursework and/or degree beyond high school	48,674 (76.9)	1.50 (1.37–1.64)***	1.0 (referent)

SD standard deviation, CI confidence interval

^a Demographic bivariate relationships with ≥ 5 days of aerobic activity in past week

^b Demographic relationships with ≥ 5 days of aerobic activity in past week, adjusting for all other demographic variables in the table

^c Age range 6–17 years, $n = 64,076$

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

model, the bivariate relationship between neighborhood context and health indicator was evaluated. In a second step, individual and family-level demographic characteristics were entered into the model. In a third step, additional independent variables were included in models examining physical activity and weight status as documented above. In a final regression model, all neighborhood measures were entered into the same model to evaluate for a unique contribution of neighborhood context associated with each outcome. Correlations for neighborhood variables did not reach a level indicating multicollinearity (Table 4) [22]. To ensure results were nationally representative with accurate estimates, all multivariate analyses were completed on weighted data using Stata 10.1 IC (StataCorp LP, College Station, Texas) to account for the complex sampling design [15].

Results

Characteristics of the Study Sample

Just under half of the study sample was female; the majority of youth were white (Tables 2, 3). The mean age

of youth was 12 years (SD 3.5 years) in the physical activity subsample; the mean age of youth was 13 years (SD 2.3) in the subsample for which height and weight information was obtained. In both groups, approximately three-fourths of youth lived in a 2-parent household and had a parent who had attained education beyond a high school degree. In both groups, approximately 10% of youth lived in a household at or below the federal poverty level.

Most youth were described as being healthy (mean 0.87, SD 0.20, range 0–1). On average, youth participated in physical activity on 4.4 days in the last week (SD 2.3, range 0–7). Just over half of youth met the requirement of ≥ 5 days of activity in the past week (54.2%). The mean BMI for all youth 10–17 years was 21.6 (SD 4.8). Two-thirds of youth were in the healthy category for BMI-percentile. Just about equal proportions of youth were overweight and obese (15.3% and 13.7%, respectively). Just under half of youth had a television in their bedroom (47.9%). The majority of parents reported participating in some physical activity in the last week (87.2%; mean days reported for mother: 2.8, SD 2.2, range 0–7; mean days reported for father: 3.4, SD 2.4, range 0–7). For youth 10–17 years, on average families ate meals together 4.7 days in the last week (SD 2.1, range 0–7).

Table 3 Characteristics of study sample, relationships with weight status

Characteristic	Frequency (%)	Unadjusted odds ratio (95% CI) ^a	Adjusted odds ratio (95% CI) ^b
Body mass index ^c			
<i>Demographics</i>			
Gender			
Female	21,975 (48.0)	1.34 (1.21–1.50)***	1.44 (1.28–1.60)***
Race, Ethnicity			
Hispanic	4,935 (10.9)	0.61 (0.51–0.73)***	0.75 (0.58–0.96)*
White	34,451 (79.4)	1.47 (1.30–1.65)***	1.0 (referent)
Black	4,853 (11.2)	0.57 (0.50–0.65)***	0.63 (0.54–0.75)***
Multi-racial	2,081 (4.8)	0.88 (0.70–1.11)	0.87 (0.68–1.12)
Other	1,981 (4.6)	1.33 (0.99–1.80)	1.28 (0.93–1.76)
Age (years: mean, SD)	13.80 (2.3)	1.13 (1.10–1.16)***	1.14 (1.11–1.17)***
Lives in 2-parent household			
Yes	34,151 (74.9)	1.47 (1.31–1.65)***	1.14 (0.99–1.32)
Household at or below poverty level			
Yes	4,194 (10.0)	0.48 (0.41–0.56)***	0.74 (0.61–0.88)**
Parent highest education achieved			
Less than high school degree	2,822 (6.2)	0.48 (0.39–0.60)***	0.56 (0.44–0.73)***
High school graduate	7,895 (17.4)	0.68 (0.60–0.78)***	0.66 (0.57–0.77)***
Coursework and/or degree beyond high school	34,640 (76.4)	1.79 (1.59–2.10)***	1.0 (referent)

SD standard deviation, CI confidence interval

^a Demographic bivariate relationships with healthy weight status (BMI-percentile 5–84% according to age and gender specific growth charts)

^b Demographic relationships with healthy weight status (BMI-percentile 5–84% according to age and gender specific growth charts), adjusting for all other demographic variables in the table

^c Age range 10–17 years, *n* = 45,897

* *P* < 0.05; ** *P* < 0.01; *** *P* < 0.001

Table 4 Pearson correlations between neighborhood constructs

	Social capital	Resource availability	Adverse condition	Safety
Social capital	1.0	0.06***	−0.26***	0.38***
Resource availability	0.06***	1.0	0.001	−0.04*
Adverse condition	−0.26***	0.001	1.0	−0.28***
Safety	0.38***	−0.04*	−0.28***	1.0

* *P* < 0.05; ** *P* < 0.01; *** *P* < 0.001

Youth and family-level demographic characteristics were significantly related to youth physical activity and weight status (Tables 2, 3).

Neighborhood Constructs and Cardiovascular Health Indicators

Neighborhood constructs exhibited modest correlation with each other (Table 4). Parents reported high levels of neighborhood social capital (mean = 0.83, SD 0.21, range 0–1). Approximately one-fourth of respondents reported at least one adverse neighborhood condition (26.5%). Nine percent of respondents reported the presence of two or

three of the adverse physical conditions. Most parents reported availability of at least three of the four neighborhood resources (71.4%). Few parents reported no assets in their neighborhood (5.0%). Respondents endorsed high levels of neighborhood safety for children (mean = 0.81, SD 0.24, range 0–1).

The odds of meeting healthy standards for physical activity and weight were significantly related to neighborhood context (Table 5). In adjusted models, increasing perception of neighborhood social capital was associated with 55% greater odds of youth exercising 5 or more days in the past week and 45% greater odds of being normal weight. For each additional neighborhood resource

Table 5 Youth physical activity and healthy weight status, odds of meeting healthy standards by neighborhood characteristic

Neighborhood characteristic	Youth physical activity ≥ 5 days in past week Unadjusted Odds Ratio (95% CI) ^{a,d}	Youth physical activity ≥ 5 days in past week Adjusted Odds Ratio (95% CI) ^{b,d}	Healthy Weight Status Unadjusted Odds Ratio (95% CI) ^{a,c}	Healthy Weight Status Adjusted Odds Ratio (95% CI) ^{c,e}
Neighborhood social capital, trust	2.09 (1.72–2.54)***	1.55 (1.24–1.92)***	2.30 (1.77–2.98)***	1.45 (1.08–1.95)*
Neighborhood condition	0.95 (0.90–0.99)*	1.02 (0.95–1.08)	0.87 (0.81–0.93)***	0.94 (0.86–1.02)
Neighborhood resources	1.06 (1.02–1.09)**	1.01 (0.98–1.05)	1.09 (1.04–1.14)***	1.11 (1.05–1.16)***
Neighborhood safety	1.55 (1.32–1.82)***	1.28 (1.07–1.53)**	1.32 (1.05–1.66)*	0.99 (0.77–1.28)

CI confidence interval

^a Bivariate relationship between neighborhood characteristic and cardiovascular health indicator

^b Relationship between neighborhood characteristic and ≥ 5 days of aerobic activity in past week, adjusting for gender, race/ethnicity, age, family structure, household poverty status, parent highest education achieved, health status of youth, parent physical activity level in past week, presence of television in youth's bedroom

^c Relationship between neighborhood characteristic and healthy weight status (BMI-percentile 5–84% according to age and gender specific growth charts), adjusting for gender, race/ethnicity, age, family structure, household poverty status, parent highest education achieved, family meal frequency, youth physical activity, presence of television in youth's bedroom

^d Age range 6–17 years, $n = 64,076$

^e Age range 10–17 years, $n = 45,897$

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

identified, the odds of youth meeting healthy weight standards increased by 11%. Increasing perception of child neighborhood safety was associated with increased odds of youth participating in aerobic activity at least 5 days in the past week.

In final analyses with all neighborhood constructs included in the models and adjusting for sociodemographic, individual, and family characteristics (not shown), parent perceived neighborhood social capital emerged as a significant associate of youth participating in at least 5 days of aerobic physical activity in the past week. Increasing perceived neighborhood social capital was associated with 52% increased odds of youth physical activity participation (Odds ratio: 1.52, 95% CI: 1.20–1.92, $P = 0.001$). Perceived neighborhood social capital and neighborhood resources were significantly associated with youth meeting healthy standards for weight (Odds ratio: 1.43, 95% CI: 1.02–2.00, $P = 0.037$; Odds ratio: 1.10, 95% CI: 1.05–1.16, $P < 0.001$). Increasing parent perceived neighborhood social capital was associated with 43% greater odds of youth being physically active at least 5 days in the past week. For each additional neighborhood resource, the odds of youth being normal weight increased by 10%.

Discussion

This study used a nationally representative sample of parents and adult guardians with children to estimate the relationship between adult perceptions of neighborhood

context and youth cardiovascular health, as measured by weight status and physical activity levels. Results indicate that neighborhood characteristics are significantly associated with youth weight and physical activity outcomes. Constructs for neighborhood context exhibited little overlap, suggesting the importance of assessing multiple aspects of neighborhood in relation to impact on youth behavioral and health outcomes. In multivariate regression models that included demographic, individual, family, and neighborhood factors, there was a unique relationship of perceived neighborhood social capital to increased odds of youth physical activity and achieving healthy weight status. In addition, there is evidence for a unique relationship between neighborhood resource availability and youth meeting normal weight standards.

Neighborhood Social Capital and Health

While formal mechanisms linking social capital to specific health outcomes remain a source of debate, potential mechanisms have been proposed. Low social capital is linked to social isolation, which may have definitive impact on the ability to access resources and health information for healthier decision-making and emotional support [23, 24]. Examples of proposed social capital contextual effects include group influences on positive health behaviors of neighborhood residents and control over deviant health-related behaviors [24, 25]. Social capital may also increase the ability of neighbors to unite for causes of community benefit [24, 25], such as walking groups or community weigh-ins, to reduce local morbidity and mortality rates.

Low neighborhood social capital has been correlated with youth physical inactivity levels [26].

Related concepts of social cohesion and collective efficacy are linked to youth physical activity and weight status. Lower levels of social cohesion are associated with less frequent youth participation in recreational and general forms of exercise [8]. Decreasing social disorder among urban neighborhoods is noted to increase youth physical activity by almost 30 min per week [7]. Collective efficacy has been found to be negatively associated with BMI and overweight status in adolescents [27]. A favorable social environment, measured by higher collective efficacy, more collective socialization, more exchange of social ties among neighbors, and higher perceived neighborhood safety, has been found to correlate positively with physical activity among fifth graders, which in turn has been found to correlate negatively with youth BMI [28].

Neighborhood Safety and Health

The link between increased perception of neighborhood safety and an almost 30% increase in the odds of youth meeting recommendations of aerobic physical activity on most days of a week may represent a greater presence of structures facilitating safety and adult monitoring. Neighborhood safety is hypothesized to impact youth physical activity through potential exposure to criminal activity while in transit to recreational activities as well as placing limitations on safe space for engagement in sports or games [7]. Parental perception of their neighborhood to be in the lowest quartile of safety is associated with four times the odds of risk for overweight status among children as early as 7 years of age when compared to weight status of youth whose parents perceive their neighborhood to be in the highest quartile of safety [29]. Increasing urban neighborhood safety has been associated with an increase of 49 min per week of physical activity for 11–16 year olds [7]. Safety requisites identified by youth include the absence of fighting, intimidation and bullying, and vandalism in addition to the presence of adequate lighting in the immediate area surrounding facilities and adult supervision [30]. A recent pilot intervention for inner-city children involving the provision of a safe play space for kindergarten through eighth graders resulted in a relative increase in the physical activity of youth in the intervention area when compared to youth in the control area [31].

Neighborhood Resources and Health

Neighborhoods with greater resources may offer a climate that is standardized to developmental opportunities for youth by providing alternate sources for pursuit of physical activity interests as well as other engagement. Having the

means for youth to become involved has the potential to counteract the deficit metabolic physiology characteristic of television and video viewing. Youth use of a community recreation center has been associated with increased levels of moderate to vigorous physical activity compared to youth who do not use such facilities [10]. Incorporating a qualitative ecological framework, Humbert et al. report that youth identify the importance of being able to access facilities that are in close proximity, of low to no cost, aesthetically pleasing, and in proper maintenance and repair in their neighborhood as an intervention needed to increase physical activity behaviors of youth [30].

Neighborhood Physical Condition and Health

The present analysis did not find evidence for significant relationships between neighborhood physical condition and youth cardiovascular health outcomes after adjustment for sociodemographic factors and individual and family characteristics and behaviors. Although in the expected direction, previous study of neighborhood physical disorder in relationship to reduced youth physical activity did not reach statistical significance [7]. Despite this, conditions of graffiti and litter in neighborhoods are hypothesized to discourage physical activity by increasing perceptions of physical danger and decreasing a sense of social cohesion and resultant group activities [28].

Implications for Clinical Practice and Advocacy

The present findings support the relevance of including neighborhood context when trying to have positive impact on youth physical activity and weight outcomes. Neighborhood characteristics are related to youth physical and social development. As such, health services models and interdisciplinary models for preventive and public health may benefit by more deliberate inclusion of an ecological framework that includes neighborhood context in screening assessments. For example, knowledge of neighborhood context may help providers understand limitations of anticipatory guidance strategies that propose changes in health behavior without including consideration of youth opportunity and family access to healthy resources, as well as parent perceptions of community trust and reciprocity. Greater understanding of the role of neighborhood context in youth and family health outcomes may stimulate a more active role for practitioners, care team members, and other health advocates in helping families to identify opportunities for active engagement and healthy lifestyle modifications. On a systems level, more resource allocation and investment in strategies to improve safety of the built environment may facilitate improved youth cardiovascular health.

Limitations

Outcome variables were based on parent report. Parent report of height and weight for 10–17 year olds has been found to be a reliable indicator of childhood overweight and obesity [1]. Parent report may not reflect the full extent of youth activity, particularly for adolescents whose outlets for involvement may increase as they become more independent.

The study design did not include objective measures of neighborhood, and did not allow for an ecologically defined unit of neighborhood analysis; as such, the data could not be integrated with geographic information systems coding. The current study was not able to account for the length of time respondents lived in their neighborhood, which likely impacts knowledge and perceptions of neighborhood quality. As well, record of the presence of parks and recreation or community centers within neighborhoods did not account for distance from home or the attractiveness and quality of facilities which likely impacts their usage. The data do not contain measures of dietary intake; however, this analysis included family meal frequency, a proxy for dietary quality [20, 21], in models evaluating weight status.

Neighborhood measures were not able to account for complexities of neighborhood context. Perceived safety is likely composed of multiple factors, including motor vehicle traffic as well as crime-related activity, each of which may have differential impact. This complexity may also be reflected in the observation of a weak negative association between neighborhood resource and perceived child safety noted in this analysis (e.g. greater traffic flow may be found in neighborhoods with greater resource availability).

Although the NSCH uses a random sample design, the survey process does not ensure that all types of neighborhoods were represented or that a specified number of individuals residing in each type of neighborhood were included in the data. As well, given data structure, factors impacting selection into neighborhood residence were not able to be addressed in the current analyses. The data are cross-sectional; thus the study design does not allow for establishment of cause and effect relationships. The overall response rate for the survey was 46.7%. Weighting of data facilitated adjustment for the potential bias of differential response rate and interview completion [15].

Conclusion

Multiple aspects of neighborhood impact youth physical activity levels and youth weight status. Further research evaluating mechanisms and contributions from family

context, school food environment and physical education policy, and neighborhood characteristics, their interactions and potential synergy, in facilitating youth cardiovascular health is warranted.

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