

Adolescents' Perspectives of Home, School and Neighborhood Environmental Influences on Physical Activity and Dietary Behaviors

Patricia Tucker

*Public Health Research, Education & Development Program
Middlesex-London Health Unit
London, Ontario, Canada*

Jennifer D. Irwin

*Faculty of Health Sciences, University of Western Ontario
London, Ontario, Canada*

Jason Gilliland

*Department of Geography, University of Western Ontario
London, Ontario, Canada*

Meizi He

*Department of Health & Kinesiology, University of Texas at San Antonio
San Antonio, Texas*

Citation: Tucker, Patricia, Jennifer D. Irwin, Jason Gilliland, and Meizi He (2008). "Adolescents' Perspectives of Home, School and Neighborhood Environmental Influences on Physical Activity and Dietary Behaviors." *Children, Youth and Environments* 18(2): 12-35. Retrieved [date] from <http://www.colorado.edu/journals/cye>.

Abstract

This investigation sought to gain an understanding of how youth perceive neighborhood environmental influences on their physical activity and eating behaviors. This qualitative study targeted a heterogeneous sample of 12- to 14-year-olds in London, Ontario, Canada. Using a semi-structured interview guide, we conducted nine focus groups (n = 60) and used inductive content analysis to investigate their discussions. Most participants discussed their school, parks, and opportunity structures around their homes as influencing their physical activity, and overwhelmingly reported the availability of fast-food restaurants, convenience stores, and slow-food restaurants in their neighborhoods as influencing their eating practices. The descriptive information collected through this study is potentially significant for the efforts of city planners, policy makers, health professionals, school officials, and parents to promote and support healthier youth behaviors.

Keywords: [physical activity](#), [eating habits](#), [youth](#), [environmental influences](#)

Introduction

Physical Activity and Nutrition Opportunities in Context

Adolescence represents a vital time for health promoters and educators to intervene to promote healthy lifestyles prior to the development of certain health-compromising behaviors, which may be established by the end of the teenage years (Epstein, Rice and Wallace 1989; Walker and Townsend 1999). Healthy eating has been correlated with lower risk of disease, healthy body weight, stronger muscles and bones, and increased energy; regular physical activity has been associated with improved growth and development, bone mineral density, self-esteem, body image, and academic performance, as well as levels of anxiety and depression (Kirkcaldy, Shephard and Siefen 2002; Health Canada 2007; Shephard 1997; Sibley and Etnier 2003; Sothorn et al. 1999; Sundberg et al. 2002; Tremblay, Inman and Willms 2000). Together, physical activity and healthy eating provide a powerful combination to both enhance health and reduce short-term and longer-term health problems (Health Canada 2007; Mokdad et al. 2003; U.S. Department of Health and Human Services 1997). As has been noted by many researchers, the health-promoting behaviors of healthy eating and active lifestyles are particularly important during youth (Sothorn et al. 1999; Health Canada 2007).

Unfortunately, Canada's youth are not engaging in either behavior adequately. Approximately three out of five youth are not active at the level necessary for health benefits (Craig et al. 2001), and a 26 to 37 percent decrease in total physical activity over the course of adolescence can be expected (Dovey, Reeder and Chalmers 1998; Kim et al. 2000). Furthermore, over the last few decades, there have been drastic changes in adolescents' eating behaviors. Although availability of fruits and vegetables in the home has been correlated with their consumption among adolescents (Hanson et al. 2005), the availability of unhealthy foods also prompts unhealthy choices (Hanson et al. 2005; Weber Cullen et al. 2000). That is, the abundance of unhealthy options in the home is likely tempting youth away from more nutritious options. According to the Food Standards Agency (2004), teens' food consumption is typically composed of high fat, high sugar and high salt foods (Food Standards Agency 2004). To further illustrate this concern, He (2003) found that less than half of 5th and 6th grade children ate vegetables regularly, 77 percent reported an aversion to vegetables, and nearly 40 percent consumed soft drinks on a daily basis.

Neighborhood

Researchers have recently increased their focus on the role of the physical environment on activity, with special attention on neighborhood recreation opportunities. Specifically, researchers are finding the number, quality, and proximity of recreation facilities to homes, as well as adolescents' and parents' *perceptions* of the availability of and accessibility to these facilities as influencing their activity levels (Dunton, Jamner and Cooper 2003; Frank et al. 2007; Gilliland et al. 2006; Gordon-Larsen, McMurray and Popkin 2000; Gordon-Larsen et al. 2006; Hume, Salmon and Ball 2005; Jago, Baranowski and Baranowski 2006; Kerr et al. 2007; Norman et al. 2006; Sallis et al. 2001; Scott et al. 2007, Scott, Evenson and Cohen 2007; Tucker, Gilliland and Irwin 2007; Tucker et al. 2009;

Utter et al. 2006). For example, Tucker and colleagues found that those children who had two or more recreation facilities within 500m of their home to be 16.49 minutes more active after school per day than those who had fewer amenities. Norman et al. (2006) identified both recreation facilities and neighborhood parks as positive correlates of physical activity. Similarly, Dunton and associates (2003) noted that perceived availability of community facilities was related to cardiovascular fitness in youth, and Burke (2005) revealed that children are vividly aware of the play opportunities in their neighborhoods.

Compared to adults, youth have more unstructured time, fewer transportation options, and are generally more vulnerable to the "opportunity structures" in their local environments. Opportunity structures are features of the social and physical environment which may support or hinder people's abilities to choose healthy behaviors (Macintyre, Ellaway and Cummins 2002; Macintyre and Ellaway 2000). Youth are often restricted to recreation opportunities available within the distance they can walk or bike (Cohen et al. 2006; Macintyre and Ellaway 2000). Therefore, the physical activity opportunities in the local neighborhood, and youths' perceptions of those opportunities, are important considerations.

With regard to food, adolescents now purchase their own food at neighborhood stores and restaurants, and more is consumed outside of the home (French, Story and Jeffery 2001; Kraak and Pelletier 1998; Nielsen, Siega-Riz and Popkin 2002). Researchers have concluded that the availability of junk food opportunities is an important influence on adolescents' food choices (Story, Neumark-Sztainer and French 2002). The average American adolescent has been reported to frequent fast food restaurants twice a week (or 104 times per year), accounting for approximately one-third of his or her away-from-home meals (Lin, Guthrie and Frazao 1999; Thompson et al. 2004). Not surprisingly, adolescents who consume fast food have poorer nutritional quality than those who less regularly eat at these venues (French, Story and Jeffery 2001).

Adolescents may not notice immediate problems related to these poor nutritional habits and sedentary behaviors, and therefore are likely to be unconcerned about their nutritional profile or activity level. Furthermore, similar to a sedentary lifestyle, frequent fast-food consumption can be habit-forming and lead to the development of long-term unhealthy behaviors (Kelder et al. 1994; Schmitz and Jeffery 2000; Steinbeck 2001; Stolley et al. 2003). Previous research by Kipke and colleagues (2007) and Sallis and associates (2001) noted that to help curb these problematic behaviors, increasing the availability of healthy options in youths' surrounding environments is necessary.

School

Adolescents spend a substantial portion of their day in school and most youth have at least one meal on site each weekday. The opportunities available in the school environment, including easy access to food in vending machines and through fast food sales on campus and nearby, can impact choices and contribute to the dietary habits of students (Dietz and Gortmaker 2001). Similarly, schools lacking environmental supports for physical activity, such as those with insufficient space or

infrastructure for activity (e.g., basketball nets, tennis courts, soccer nets) have been associated with low levels of physical activity among youth (Sallis et al. 2001). By providing adequate structural supports (in addition to qualified and eager teaching staff), schools can provide an ideal and important setting to positively influence adolescents' diet and physical activity behaviors (Neumark-Sztainer and Hannan 2000; Story, Neumark-Sztainer and French 2002; Veugelers and Fitzgerald 2005). The critical challenge of preventing childhood obesity has led some researchers and policy-makers to suggest that laws are needed to require schools to adhere to dietary guidelines regarding the availability of (un)healthy foods and portion sizes, and to increase classes on nutrition and physical education (Gostin 2007).

Home

In addition to the neighborhood and school environments, adolescents' homes have been identified as strong influences on physical activity and food consumption (Dunton, Jamner and Cooper 2003; Haerens et al. 2008; Hume, Salmon and Ball 2005; Trost et al. 1999). Previous research among adolescents has noted that the majority of youth have fresh fruits and vegetables available in the home, but those who have soft drinks in their homes consume one less serving of dairy foods per day (Hanson et al. 2005; Weber Cullen et al. 2000). Moreover, those parents who purchase fast food for family meals at least three times per week are also likely to have soft drinks and potato chips available in their home for their adolescents (Boutelle et al. 2007). Clearly, providing youth with healthy food choices and reducing the unhealthy options available in the home is important for facilitating more nutritional selections on a regular basis.

Physical activity opportunities and resources in the home (e.g., bicycles, trampolines, basketball nets, or weights) are also important, as noted by Dunton and colleagues (2003) who found that adolescents' perception of equipment is associated positively with cardiovascular fitness. These researchers also found the use of home resources to be correlated positively with both vigorous physical activity and low intensity or lifestyle activity. In particular, adolescent girls were found to be more likely to use home resources than community facilities (Dunton, Jamner and Cooper 2003). In a study with Australian children, Hume and colleagues (2005) revealed that children who had few physical activity opportunities at home (e.g., bicycle, basketball net, or the like) demonstrated lower levels of daily physical activity. The importance of supportive opportunities and equipment in the home environment has also been confirmed by Whitehead and colleagues (2006), who found home equipment use to be higher among more active adolescent females.

Given the impact home, school and neighborhood environments can have on the physical activity and food consumption behaviors of adolescents, it is important to consider all three environments both individually and collectively to gain a fuller picture of their impact on obesogenic and leptogenic behaviors (i.e., factors that contribute to fatness or leanness) (Estabrooks, Lee and Gyurcsik 2003; Frumkin, Frank and Jackson 2004; Giles-Corti and Donovan 2002). Ball and colleagues

(2006) identified the need to explore environmental influences (home, school, and neighborhood) on health behaviors as a priority area for future research.

Current State of Research and Purpose of the Study

A substantial body of research exists documenting the home and school environments' objective and subjective influences on physical activity and dietary intake (Dietz and Gortmaker 2001; Dunton, Jamner and Cooper 2003; Haerens et al. 2008; Hume, Salmon and Ball 2005; Sallis et al. 2001; Trost et al. 1999; Whitehead et al. 2006). Few studies have assessed adolescents' *perceptions* of their local environments, and how youths' perspectives of their home and school environments influence their physical activity and food consumption behaviors (Carver et al. 2005). Similarly, most research assessing neighborhood environmental influences on physical activity and dietary behavior has been quantitative, and there is a paucity of qualitative research in this area (Bryn Austin et al. 2005; Cohen et al. 2006; Gordon-Larsen, McMurray and Popkin 2000; Gordon-Larsen et al. 2006; Norman et al. 2006; Sallis et al. 2001; Scott et al. 2007; Scott, Evenson and Cohen 2007; Tucker et al. 2009). Two previously published studies qualitatively assessed the neighborhood impact on *children's* physical activity (Holt et al. 2008; Hume, Salmon, and Ball 2005), and one qualitatively studied their diets (Weber Cullen et al. 2000). However, to our knowledge, no studies have focused on *Canadian adolescents* and their perspectives on their home, school or neighborhoods' influence on both their physical activity and dietary behaviors. Therefore, this study sought to review current literature and conduct an exploratory qualitative analysis to understand London, Ontario 7th and 8th grade students' awareness of home, school and neighborhood environmental influences on their physical activity and dietary choices.¹

Method

A heterogeneous sample, based on school location, of 60 7th and 8th grade students (aged 12-14; 46.7 percent female) from the London District Catholic School Board and the Thames Valley District School Board participated in this study's nine focus groups (see Table 1). The schools from which our focus group participants were recruited were located in census tracts with median household incomes ranging from \$49,329 to \$94,733. Five schools were in neighborhoods categorized as middle income, three were in higher income neighborhoods and one was in a lower income neighborhood (median household income for the city of London is \$58,261 with the range from \$32,427 to \$102,397).

We determined that focus groups were an effective means through which to understand students' perspectives about their neighborhood's influence on their physical activity and dietary intake behaviors. Additionally, focus groups are an

¹ For the purpose of this manuscript, the descriptors adolescent, youth and student are used interchangeably.

efficient option for gathering insights from a large number of people in a short period of time (Patton 2002).²

Table 1. Demographic Characteristics of Focus Group Participants (n=60)

Demographics	n*	%
Gender		
Male	32	53.3
Female	28	46.7
Age		
12	27	51.9
13	24	46.2
14	1	1.9
Grade		
7	23	38.3
8	37	61.7
Ethnicity		
White	40	69.0
Black	2	3.4
Asian	6	10.3
Hispanic/Latino	4	6.9
Other	6	10.3

*Numbers in table may total less than total n's because of non-reporting

The researchers contacted a total of 24 school principals, and 12 agreed to let us conduct focus groups at their school. The researchers sent home letters of information and consent forms for parents/guardians to sign to provide approval of their child's participation. Of the 1,070 potential students contacted through letters of information, 83 students signed up to participate in a focus group.

We scheduled 12 focus groups to be held at the schools over the lunch hour in the spring and fall of 2007. Three focus groups had to be cancelled due to a lack of participation (e.g., students forgot and went home for lunch, parents forgot and picked up kids to go home for lunch, or insufficient consent forms were returned). As a result, we conducted nine focus groups containing four to ten youth each.

All focus group meetings were facilitated by an experienced moderator and lasted between 30 and 60 minutes. The focus group moderator used a semi-structured

² The Canadian Institutes of Health Research funded this project, and we obtained ethical approval for the project through the Office of Research Ethics at The University of Western Ontario.

interview guide that was created and pilot-tested by the research team to elicit youths' perspectives about what, in their surrounding neighborhoods, influenced their physical activity and food behaviors. Sample questions included: "what in your neighborhood makes it easy/hard to be active?," "what type of physical activity facilities or places are in your neighborhood?" and, "what in your neighborhood influences your eating behaviors?" At the completion of the focus group discussion, participants completed a demographic questionnaire.

The researchers digitally recorded the focus group meetings, and transcribed the recordings verbatim. Collection and analysis of data took place simultaneously using the template and editing organizing styles as outlined by Miller and Crabtree (1999). To code and classify emerging themes, we used inductive content analysis, as described by Patton (2002), and NVivo software. Two researchers independently analyzed the focus group transcripts prior to comparing their findings. Following the guidelines outlined by Guba and Lincoln (1989), we integrated a number of strategies throughout the study to ensure the trustworthiness of the data (see Table 2). We reached data saturation by the ninth and final focus group.

Table 2. Measures to Ensure Data Trustworthiness

Credibility–	Member checking was conducted between each focus group question and at the end of each focus group to make certain that the researchers accurately understood the answers provided by participants.
Confirmability–	Two researchers separately and concurrently performed inductive content analysis, and later met to compare their findings. We scrutinized data for similarities and differences across the interviews, and acknowledged emerging themes. The researchers discussed and prepared a summary of the analysis.
Dependability–	Upon the completion of each focus group, two researchers met to debrief and summarize. Also, the researchers expressed any biases, which were then recorded and considered to ensure that the analyses were not partial to researcher bias. We documented focus group respondents' demographic information, and focus group location and participation rate for the purpose of an audit trail.
Transferability–	We have explained the research process in detail, thus allowing interested researchers the ability to establish whether our results are transferable to their study and participants.

(adapted from Irwin et al. 2005; Tucker, Gilliland and Irwin 2007)

Results

When asked to describe what in the students' physical environment influenced their physical activity, most focus group participants discussed their school (playground

and resources), nearby parks and recreation facilities, and other structural opportunities around their homes.

School Ground

The school ground was commonly identified as both a facilitator and barrier to youths' physical activity. It was on the school playground where many students reported having the space to play soccer, baseball, basketball and football. Not all perceived their school grounds as supportive however, and some felt this space made it more challenging to engage in active pursuits. For example, one participant stated,

They put our school in a nice area. Beautiful homes everywhere, but we have an open field full of nothing, and the back, the grass is seriously welfare.

Another described her school ground in lacking structural opportunities for youth her age:

There really isn't much to do for the older kids. Because the little kids are all using like the equipment and the hopscotch squares so there isn't anything to do.

School Resources

A number of students commented on their frustration with having a school gym and activity equipment that students were not able to access as often as they would like. One student, whose statement exemplified the sentiments of a small group of participants, explained that there were a number of soccer balls and footballs in the gym, but the students were not allowed to use them:

We are the richest school ever and they never let us use the balls in the gym....Well half of them haven't been used in the last four years we've been here. We have so many balls in our gym it's not even funny.

Many participants explained that they knew they were not allowed to use these resources, but they did not understand why and found it frustrating. Students at other schools were also frustrated, but mostly due to a lack of equipment that they enjoyed using at their schools. One youth explained,

Our school doesn't have very many volleyballs. They got stolen...over the summer.

Parks and Recreation Opportunities

When students were asked about what neighborhood or environmental influences *facilitated* their physical activity, the most commonly cited areas were parks. Other environmental opportunities students noted for facilitating activity were:

- their driveway
- parking lots

- hockey arenas
- swimming pools
- soccer fields
- skateboarding park
- water park/splashpad
- baseball diamonds
- tennis courts
- school playgrounds
- recreation/community centers

The majority of students used these facilities often, with parks being the most frequented (ranging from "once in a while" to "basically everyday," with an increased use in the summer). Students reported that they frequent these areas because they allow for "fun" and because they are "easy to access." A few students identified parks as

...a good place to get physical activity...I usually play soccer there so I stay fit...

[A place] for everyone...

Students appreciated having parks and other opportunities in their neighborhoods because, for example,

I like to stay active and I don't want to be bigger.

I hate just sitting around doing nothing...so I [go there] to occupy myself [and to] stay active and have fun.

However, some aspects of the parks and recreation options available to youth hindered their opportunities for being active. Specifically, youth commented on the small size and resultant crowding in parks close to them, which made it difficult to play (e.g., not having access to a full soccer field). Others felt that parks did not provide for the needs of kids of all ages. One student explained that,

The parks are designed for the older kids and the younger kids, they're not designed for us.

Further, because of the presence of some of the older youth and adults, some focus group participants did not use parks in their neighborhoods:

There are a lot of bad people [in them].

...there's druggies and pyros there...

Also, a number of participants identified that they were not content with the quality of the parks and that improvements needed to be made in order for parks to be

attractive to youth and therefore supportive of promoting their physical activity. For example,

There's graffiti all over the park.

The playground is boring...

There's beer bottles....

The park I use is too small.

One student, whose comment illustrated the majority's view about park equipment, said,

All of the equipment in the park, it's like really small and it's really...crappy....

Finally, garbage was identified as a negative environmental influence on the students' physical activity. Students were disgusted by the amount of litter and garbage in the parks:

Everywhere you look there's garbage. Sometimes there's stacks of it, just laying on the ground....

Some people need to clean up around, like don't litter because there's a lot of garbage

I don't really like to use the parks that often because there's a lot of garbage around. There's a lot of garbage cans, but like, no one uses them....

Participants were emphatic that garbage was a major issue and that it reduced their use of these recreation facilities. These unattractive features of neighborhood parks may be discouraging physical activity among London youth.

Yards, Streets, Kids, and Safety

While none of the focus group participants commented on not having a yard to play in as a deterrent to their physical activity, respondents identified their yard at home and the streets around their home as particularly valuable for their activity pursuits:

I play sports in the park or in my backyard with my brothers

...on streets you can play, like if you're on a quiet street.

Most participating youth were concerned with the amount and speed of traffic on their streets, and noted that this reduced their time playing outside. One participant plainly noted that the "busy streets" were of concern.

The neighborhood size and availability of other kids also supported youths' activity:

The thing about our neighborhood, it's really big so if we want to go to a friend's house, we like bike there or walk, so we get physical activity that way.

In my neighborhood there's a lot of kids on the street, so they normally call the house and tell me to go outside and play.

However, not all neighborhoods allowed for the same freedom for young people to be outside after school and during the evenings. A number of participants talked about lack of safety in their neighborhoods. For instance, one mentioned,

Sometimes at night you can't stay up longer to like, finish hockey or something because there's a rough neighborhood down the street from me. There's been drug busts there and stuff.

Dietary Behaviors

When asked to describe what in their neighborhoods influenced their eating habits, the students overwhelmingly reported numerous fast-food restaurants, convenience stores, and slow-food restaurants.³ A remarkable number of restaurants (24 fast food restaurants and 27 slow food restaurants) were described as being located in participants' neighborhoods (major food chains included Kelsey's, East Side Mario's, Jack Astor's, McDonalds, Harvey's, Wendy's, Subway, Burger King, Taco Bell, Tim Horton's, etc.). Youth explained that the restaurants were within a 2 to 20 minute walk of their homes, which made them a convenient dinner option. Some participants identified eating at these restaurants often with their family, "three or four times a week" while others noted eating out less regularly, but "at least once every weekend."

With regard to snacking, one student, whose comment reflected about half of participants, said,

Well, I am not allowed to have unhealthy snacks. [So,]...whatever junk food I get, like usually it comes from Mac's [convenience store] so whatever you see in Mac's, I've probably had before, like, at least once....

Another participant explained that he visits the fast food and convenience stores on his way home from school

because I usually go home and just eat apples or melons and stuff, so I may not get it [junk food] in the house, and I can kind of afford to eat crap.

Similarly, others said,

³ In the context of this study, slow-food restaurants are those that provide meal service at a table, rather than fast-food restaurants where food items are ordered from a counter.

At home I can eat all those fruits and vegetables and stuff, the candy I can't really get

[Candy tastes] better than home made food.

...it's a treat.

When asked when they typically visit convenience stores, the typical responses were on the way home from school and during weekends. However, several emphasized that they passed up the convenience store on their way home:

Sometimes [I go to] Mac's Milk, but usually I go right home [from school].

I never eat after school until supper.

While the majority of students did not stop at fast food restaurants or convenience stores on a regular basis on their way home from school, they did frequent these establishments more often during the weekends. Focus group participants' eating and snacking behaviors varied, and some were reportedly consuming foods with high energy-density from fast food restaurants and sugar-filled foods from convenience stores quite often.

For those students who did stop in at various convenience stores to buy a snack, the lack of healthy options was evident to them. For example, one female participant illustrated the difficulty in purchasing a "healthy" snack when she said,

Well, if you stop somewhere, just like for a snack, candy is more [available] to you. You can't just buy a single apple, so there's like little bags of candy, so it's easier.

Consequently, the most commonly purchased food at the convenience stores included soda, candy, chips, bubble gum, ice cream and chocolate, and nearly all students reported taste and lack of availability at home as the reasons for purchasing these foods.

Participants revealed their awareness that certain elements of their physical environment, particularly convenience stores and fast/slow food restaurants, influence their dietary intake habits. The high level of availability and accessibility is seemingly promoting consumption of these energy-dense foods among adolescents and their families.

Discussion and Conclusions

The purpose of the current study was to review the field's current literature and to gain an understanding of 7th and 8th grade students' awareness of the influence of their home, school and neighborhood environments on their physical activity and dietary choices. Specifically, we sought to comprehend adolescents' perceptions of the physical structures in their environment that influence these behaviors.

Participating adolescents reported a number of features in their home, school and neighborhood environments that impact their activity and eating behaviors. Specifically, neighborhood parks and recreation facilities, the school ground and school resources, and participants' yards and streets were all reported as impacting focus group participants' physical activity behaviors. Interestingly, the youth in this study recognized the value of their local parks and recreation facilities in providing a place for physical activity, but see several barriers that limit their use. With regard to eating habits, respondents mentioned they were influenced by the proximity of fast food restaurants and convenience stores. Youth identified the difficulty in accessing healthy foods in their school and neighborhood environments. Overall, it is clear that participants recognized the sway that their school and neighborhood environments have on their options and choices for physical activity and dietary consumption. Although students recognized certain characteristics of their environments as supportive of activity (e.g., parks), the majority of influences mentioned by participants were presented as barriers to their activity and healthy eating.

Our focus group participants identified the school environment as lacking the equipment and space necessary for activity. This finding is supported by previous research that has identified the importance of a supportive school environment for physical activity among youth (Sallis et al. 2001). Modifications to the school environment (e.g., adding basketball courts, baseball diamonds, volleyball nets, tennis courts and sufficient play space) may result in changes in behaviors among youth, and may provide an ideal venue for health professionals to target Canadian 12- to 14-year-olds.

Within the neighborhood, a number of participants perceived their access (or lack of access) to desirable parks and recreation facilities to be a facilitator or barrier to physical activity. This finding is supported by previous quantitative studies that found *perceived* access to parks to be significantly associated with *actual* physical activity in youth (Motl et al. 2005; Tucker et al. 2009). Similarly, Kirtland and colleagues (2003, 329) found that the "accuracy of people's perception of the environment is correlated with their physical activity behaviors." Previous research has also identified a link between perceived accessibility to equipment in the neighborhood and physical activity among adolescents (Fein et al. 2004; Hume, Salmon Ball 2005; Motl et al. 2007; Utter et al. 2006).

In addition to the presence and availability of parks, the *quality* of this infrastructure is an important factor. The perception of poorer quality facilities has been associated with lower levels of physical activity among adolescents (Romero 2005).

Participants in the current study had mixed reviews of their neighborhood parks; many recognized the value of the parks, while others were concerned about the amount of graffiti and trash in the area. Additionally, many respondents were troubled by the safety of their neighborhood parks, as they lacked lighting and hosted crime and illegal activity. Moreover, travel to and from the parks was an issue as participants were concerned about heavy traffic levels. These safety and

cleanliness findings have been confirmed elsewhere (Alton et al. 2007; Carver, Timperio and Crawford 2008; Carver et al. 2005; de Vries et al. 2007; Gordon-Larsen, McMurray and Popkin 2000; Mota et al. 2006; Mullan 2003).

Two previous studies reported poor use of neighborhood parks by children and youth (Kipke et al. 2007; Tucker, Gilliland and Irwin 2007). Significantly, however, students in the current study indicated that they *want* to use parks, yet often avoid them because of their undesirable qualities, such as garbage, safety issues or lack of lighting. It is essential to understand what makes these facilities attractive to adolescents so that they can be built and upgraded to maximize use and promote youths' physical activity (Tucker, Gilliland and Irwin 2007).

Youth in the current study were aware of the influence of parks on their physical activity. This awareness, combined with previous correlation data between *perception* and *behavior* leads us to recommend strongly that neighborhood parks be made more accessible for youth (e.g., increase lighting, include age-appropriate play structures, add security measures) and that these features be made known to youth. These fairly simple strategies may provide a relatively easy and potentially cost-effective method for enhancing youth activity.

In addition to their physical activity choices and options, participants in the current study also perceived their neighborhood environment to be an influence on their eating choices. Our findings are important as, to date, limited research exists on healthy eating environments (Glanz et al. 2005). However, the presence of fast-food restaurants has been recognized as a possible contributor to the increasing prevalence of obesity (Brownell 2004). Consumption of fast foods has increased, and the large portion sizes and soft drinks offered at these venues are energy-dense and offer little nutritional value (Nielsen and Popkin 2003; Young and Nestle 2002; Paeratakul et al. 2003; Saelens et al. 2007). Moreover, fast-food restaurants have been found in clusters around schools (Austin et al. 2005; Kipke et al. 2007). One recent study evaluating adolescents' perceptions of their neighborhood environment identified that 65.5 percent of male and 78 percent of female adolescents identified a fast food restaurant near their home, and 55 percent of male and 68 percent of female adolescents reported the presence of convenience stores in their neighborhood (Carver et al. 2005). Although we did not numerically assess focus group participants' responses regarding the number and availability of fast food restaurants and convenience stores in their neighborhoods, nearly all participants indicated these local vendors influence their food options and choices.

Given youths' awareness that fast food restaurants impact their choices, and given previous research findings that adolescents who eat more fast food are more likely to be overweight (Ding and Parks 2007), actions must be taken to target this problem. Based on the findings of the present study, policy and environmental changes are necessary to support healthier and safer community environments for adolescents. Specifically, we recommend community members lobby for healthier food options, especially within walking distance of schools. Similarly we urge communities to encourage their city planners and officials to ensure that recreation facilities of good quality and with sufficient lighting to ensure safety are available to

children and youth. These changes may require zoning restrictions and other planning strategies to encourage health-promoting businesses and services to locate within school areas. Gaining the buy-in and support of parents, school boards, community businesses, local partners and city officials will be key for the successful implementation of environmental and policy changes that support healthy eating and physical activity among children and youth.

Given what is known about the profound impact that school, home, and neighborhood environments have on health-related behaviors among youth, health promoters must take a multi-location approach and focus on the healthy eating and physical activity behaviors of youth in all three of these environments. The social-ecological model (Stokols 1992; 2000) suggests that it is important that students receive the same food and physical activity messages and supports in all three locations. Otherwise, location-specific interventions may have only a limited effect. For example, previous research has shown that school policies can reduce soda consumption and unhealthy snacking during school hours, but the majority of the students studied reported no changes in their consumption at home (Vecchiarelli, Takayanagi and Neumann 2006). Policies that impact individuals but also target environmental change can have a greater influence on the larger population as a whole (Vecchiarelli, Takayanagi and Neumann 2006).

Limitations

Although the current study provides important information, the investigation faced a number of challenges and limitations. First, the poor participation rate by students was a concern. A reason for the low response might have been the social stigma associated with overweight and obesity, leading parents to be resistant to their child participating in a healthy bodyweight study (as was noted on the letter of information and consent form). Also, participants were asked to give up their lunch period to participate in the focus group (so principals would not be concerned about students missing class time). Given that high numbers of students left school for the lunch hour, and given the likely higher interest in participating if the focus group was conducted during class time, we would suggest future researchers collect data during class time in order to increase participation.

Additionally, due to the nature of qualitative research and the sampling method utilized, the students who volunteered (and the parents who provided their permission) to participate in the current study are not necessarily representative of 7th and 8th grade students in London, Ontario. Although a maximum-variation sample (based on school location) was recruited, the self-identified students and parents in this study may have been particularly receptive to research on physical activity and eating habits. By conducting data collection during class time and thereby expanding participation, or by providing children and parents with a token of appreciation, we may have been able to target a more representative sample of students.

To our knowledge, there is only one other Canadian study that examines youths' awareness of the physical environment's influence on their physical activity (Fein et al. 2004). Fein and colleagues' study was survey-based and focused on the

perceived *availability* and *importance* of environmental resources in relation to high school students' physical activity behaviors. Consequently, the present study offers the first Canadian qualitative assessment of the neighborhood environment's influence on younger youths' physical activity *and* food consumption behaviors.

The current study provides contextual and descriptive information with potentially significant implications for city planners, policy makers, health professionals, school officials, and parents to promote and support physical activity participation and healthy eating habits among youth (Karsten and van Vliet 2006). The findings from the present study suggest that modifications to the school and neighborhood environment are necessary to effectively promote healthier behaviors among youth. Modifications to the neighborhood environment may be a logical starting place, with promise to affect a larger number of people. Further research on environmental influences on physical activity and food consumption among youth is warranted to foster healthy behaviors in adolescents' schools and neighborhoods.

Acknowledgements

Support for this project was provided by the Canadian Institutes of Health Research. We would like to thank Ana Ivanic, David Farnell, Grace Ma, Kristian Larsen, Janet Loebach, and Julia Gurau for their assistance throughout the project. Lastly, we would like to thank the principals, teachers and students for their cooperation and participation in this project.

Patricia Tucker, Ph.D., completed her doctoral degree in 2008 at the University of Western Ontario. Trish now works as a Researcher/Educator for the Middlesex-London Health Unit. Trish's research focuses on health promotion efforts to reduce childhood and youth obesity. Specifically, her research focuses on physical activity patterns and behaviors among children and youth, and environmental influences on physical activity and food consumption practices.

Jennifer Irwin, Ph.D., is an Associate Professor in the Faculty of Health Sciences at the University of Western Ontario. Dr. Irwin's current area of research focuses on obesity prevention and reduction across ages.

Dr. Jason Gilliland is Director of the Urban Development Program and Associate Professor in the Department of Geography at the University of Western Ontario. He is an Associate Scientist with the Children's Health Research Institute and the Lawson Health Research Institute, a Public Associate of the Ontario Professional Planners Institute and Canadian Institute of Planners, and a member of the City of London's newly appointed Urban Design Steering Committee. His ongoing research examines environmental influences on critical health issues, such as childhood obesity, food security, physical activity, mobility and aging, and pediatric trauma.

Dr. Meizi He has been working in the field of child nutrition for over 20 years. Her current research interest is addressing the problems of childhood obesity, in particular, studying the factors influencing obesity and developing effective treatment and prevention programs for children and youth.

References

- Alton, D., L. Abad, L. Roberts, and T. Barrett** (2007). "Relationships between Walking Levels and Perceptions of the Local Neighborhood Environment." *Archives of Disease in Childhood* 92: 29-33.
- Austin, S.B., S.J. Melly, B.N. Sanchez, A. Patel, S. Buka, and S.L. Gortmaker** (2005). "Clustering of Fast-Food Restaurants around Schools: A Novel Application of Spatial Statistics to the Study of Food environments." *American Journal of Public Health* 95(9): 1575-1581.
- Ball, K., A.F. Timperio, and D.A. Crawford** (2006). "Understanding Environmental Influences on Nutrition and Physical Activity Behaviors: Where Should We Look and What Should We Count?" *International Journal of Behavioral Nutrition and Physical Activity* 3: 33.
- Boutelle, K.N., J.A. Fulkerson, D. Neumark-Sztainer, M. Story, and S.A. French** (2007). "Fast Food for Family Meals: Relationships with Parent and Adolescent Food Intake, Home Food Availability and Weight Status." *Public Health Nutrition* 10(1): 16-23.
- Brownell, K.D.** (2004). "Fast Food and Obesity in Children." *Pediatrics* 113: 132.
- Bryn Austin S., S.J. Melly, B.N. Sanchez, A. Patel, S. Buka, and S.L. Gortmaker** (2005). "Clustering of Fast-Food Restaurants around Schools: A Novel Application of Spatial Statistics to the Study of Food Environments." *American Journal of Public Health* 95(9): 1575–1581.
- Burke, C.** (2005). "Play in Focus: Children Researching Their Own Spaces and Places for Play." *Children, Youth and Environments* 15(1): 27-53. Available from: www.colorado.edu/journals/cye.
- Carver, A., J. Salmon, K. Campbell, L. Baur, S. Garnett, and D. Crawford** (2005). "How Do Perceptions of Local Neighborhood Relate to Adolescents' Walking and Cycling?" *American Journal of Health Promotion* 20(2): 139-147.
- Carver, A., A. Timperio, and S. Crawford** (2008). "Playing It Safe: The Influence of Neighborhood Safety on Children's Physical Activity – A Review." *Health and Place* 14(2): 217-227.
- Cohen, D.A., J.S. Ashwood, M.M Scott, A. Overton, K.R. Evenson, L.K. Staten, et al.** (2006). "Public Parks and Physical Activity among Adolescent Girls." *Pediatrics* 118(5): e1381-e1389.
- Craig, C.L., C. Cameron, S.J. Russell, and A. Bealieu** (2001). *Increasing Physical Activity: Supporting Children's Participation*. Ottawa, Ontario: Canadian Fitness and Lifestyle Research Institute.

de Vries, S.I., I. Bakker, W. van Mechelen, and M. Hopman-Rock (2007). "Determinants of Activity-Friendly Neighborhoods for Children: Results from the SPACE Study." *American Journal of Health Promotion* 21(4): 312-316.

Dietz, W.H. and S.L. Gortmaker (2001). "Preventing Obesity in Children and Adolescents." *Annual Review of Public Health* 22: 337-353

Ding C. and S. Parks (2007). "**Fast Food** and Body Weight among Adolescents." *International Electronic Journal of Health Education* 10: 65-77.

Dovey, S.M., A.I. Reeder, and D.K. Chalmers (1998). "Continuity and Change in Sporting and Leisure Time Physical Activities during Adolescence." *British Journal of Sports Medicine* 32: 53-57.

Dunton, G.F., M.S. Jamner, and D.M. Cooper (2003). "Assessing the Perceived Environment among Minimally Active Adolescent Girls: Validity and Relations to Physical Activity Outcomes." *American Journal of Health Promotion* 18(1): 70-73.

Estabrooks, P.A., R.E. Lee, and N.C. Gyurcsik (2003). "Resources for Physical Activity Participation: Does Availability and Accessibility Differ by Neighborhood Socioeconomic Status?" *Annals of Behavioral Medicine* 25(2): 100-104.

Epstein, R., P. Rice, and P. Wallace (1989). "Teenagers' Health Concerns: Implications for Primary Health Care Professionals." *Journal of the Royal College of General Practitioners* 39: 247-249.

Fein, A.J., R.C. Plotnikoff, T.C. Wild, and J.C. Spence (2004). "Perceived Environment and Physical Activity in Youth." *International Journal of Behavioral Medicine* 11(3): 135-142.

Foods Standards Agency (2004). *Evaluation of Food and Nutrition Competencies amongst 14-16 Year Olds*. London: FSA.

Frank, L.D., J. Kerr, J. Chapman and J.F. Sallis (2007). "Urban Form Relationships with Walk Trip Frequency and Distance among Youth." *American Journal of Health Promotion* 21(4-S): 305-311.

French, S., M. Story, and R. Jeffery (2001). "Environmental Influences on Eating and Physical Activity." *Annual Review of Public Health* 22: 309-335.

Frumkin, H., L. Frank, and R. Jackson (2004). "Urban Sprawl and Public Health: Designing, Planning, and Building for Healthy Communities" (Washington, D.C.: Island Press).

Giles-Corti, B. and R.J. Donovan (2002). "Socioeconomic Status Differences in Recreational Physical Activity Levels and Real and Perceived Access to a Supportive Physical Environment." *Preventative Medicine* 35(6): 610-611.

Gilliland, J., Holmes, M., Irwin, J.D., and P. Tucker (2006). "Environmental Equity Is Child's Play: Mapping Public Provision of Recreation Opportunities in Urban Neighbourhoods." *Vulnerable Children & Youth Studies* 1(3): 256-268.

Glanz, K., J.F. Sallis, B.E. Saelens, and L.D. Frank (2005). "Healthy Nutrition Environments: Concepts and Measures." *American Journal of Health Promotion* 19(5): 330-333.

Gordon-Larsen, P., R.G McMurray, and B.M. Popkin (2000). "Determinants of Adolescent Physical Activity and Inactivity Patterns." *Pediatrics* 105: e83.

Gordon-Larsen, P., M.C. Nelson, P. Page, and B.M. Popkin (2006). "Inequality in the Built Environment Underlies Key Health Disparities in Physical Activity and Obesity." *Pediatrics* 117(2): 417-424.

Gostin, L.O. (2007). "Law as a Tool to Facilitate Healthier Lifestyles and Prevent Obesity." *Journal of the American Medical Association* 297(1): 87-90.

Guba, E.G. and Y.S. Lincoln (1989). *Fourth Generation Evaluation*. London: Sage.

Haerens, L., M. Craeynest, B. Deforche, L. Maes, G. Cardon, and I. De Boureaudhuij (2008). "The Contribution of Psychosocial and Home Environmental Factors in Explaining Eating Behaviors in Adolescents." *European Journal of Clinical Nutrition* 62: 51-59.

Hanson, N.I., D. Neumark-Sztainer, M.E. Eisenberg, M. Story, and M. Wall (2005). "Associations between Parental Report of the Home Food Environment and Adolescent Intakes of Fruits, Vegetables and Dairy Foods." *Public Health Nutrition* 8(1): 77-85.

He, M. (2003). "Eating Habits, Physical Inactivity Patterns and Overweight of Children in Four London Elementary Schools." *Public Health and Epidemiology Report Ontario* 14(1): 10-16.

Health Canada (2007). *Maintaining Healthy Habits*. Available from: http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/maintain-adopt/index_e.html. Retrieved January 19, 2008.

Holt, N.L., J.C. Spence, Z.L. Sehn, and N. Cutumisu (2008). "Neighborhood and Developmental Differences in Children's Perceptions of Opportunities for Play and Physical Activity." *Health and Place* 14: 2-14.

Hume, C., J. Salmon, and K. Ball (2005). "Children's Perceptions of Their Homes and Neighborhood Environments, and Their Association with Objectively Measured Physical Activity: A Qualitative and Quantitative Study." *Health Education Research* 20(1): 1-13.

- Irwin, J.D., M. He, L.M. Sangster Bouck, P. Tucker, and G.L. Pollett** (2005). "Preschoolers' Physical Activity Behaviors: Parents' Perspectives." *Canadian Journal of Public Health* 96(4): 299-303.
- Jago, R., T. Baranowski, and J.C. Baranowski** (2006). "Observed, GIS, and Self-Reported Environmental Features and Adolescent Physical Activity." *American Journal of Health Promotion* 20(6): 422-428.
- Karsten, L. and W. van Vliet--** (2006). "Children in the City: Reclaiming the Street." *Children, Youth and Environments* 16(1): 151-167. Available from: www.colorado.edu/journals/cye.
- Kelder, S., C. Perry, K. Klepp, and L. Lytle** (1994). "Longitudinal Tracking of Adolescent Smoking, Physical Activity, and Food Choice Behaviors." *American Journal of Public Health* 84: 1121-1126.
- Kerr, J., L.D. Frank, J.F. Sallis, and J. Chapman** (2007). "Urban Form Correlates of Pedestrian Travel in Youth: Differences by Gender, Race-Ethnicity and Household Attributes." *Transportation Research Part D* 12(3): 177-182.
- Kim, S.Y.S, N.W. Glynn, A.M. Kriska, S.L. Fitzgerald, D.J. Aaron, S.L. Similo, et al.** (2000) "Longitudinal Changes in Physical Activity in a Biracial Cohort During Adolescence." *Medicine and Science in Sports and Exercise* 32: 1445-1454.
- Kipke, M.D., E. Iverson, D. Moore, C. Booker, V. Ruelas, A.L. Peters, et al.** (2007). "Food and Park Environments: Neighborhood-Level Risks for Childhood Obesity in East Los Angeles." *Journal of Adolescent Health* 40: 325-333.
- Kirkcaldy, B.D., R.J. Shephard, and R.G. Siefen** (2002). "The Relationship between Physical Activity and Self-Image and Problem Behavior among Adolescents." *Social Psychiatry and Psychiatric Epidemiology* 37(11): 544-50.
- Kirtland, K.A., S. Porter, C.L. Addy, M.J. Neet, J.F. Williams, P.A. Sharpe, et al.** (2003). "Environmental Measures of Physical Activity Supports: Perception versus Reality." *American Journal of Preventive Medicine* 24: 323-331.
- Kraak, V. and D.L. Pelletier** (1998). "How Marketers Reach Young Consumers: Implications for Nutrition Education and Health Promotion Campaigns." *Family Economics and Nutrition Review* 11: 31-41.
- Lin, B.H., J. Guthrie, and E. Frazao** (1999). "Quality of Children's Diet at and away from Home: 1994-96." *Food Review*: 2-10.
- Macintyre, S. and A. Ellaway** (2000). "Ecological Approaches: Rediscovering the Role of the Physical and Social Environment." In Berkman, L.F. and I. Kawachi, eds. *Social Epidemiology*. New York: Oxford University Press, 332-348.

Macintyre, S., A. Ellaway, and S. Cummins (2002). "Place Effects on Health: How Can We Conceptualize, Operationalize, and Measure Them?" *Social Science and Medicine* 55(1): 125-139.

Miller, W.L. and B.F. Crabtree (1999). "Clinical Research: A Multimethod Typology and Qualitative Roadmap." In Crabtree, B.F. and W.L. Miller, eds. *Doing Qualitative Research*. Thousand Oaks, CA: Sage Publications, 3-30.

Mokdad, A.H., E.S. Ford, B.A. Bowman, W.H. Dietz, F. Vinicor, V.S. Bales, et al. (2003). "Prevalence of Obesity, Diabetes, and Obesity-Related Health Risk Factors, 2001." *Journal of the American Medical Association* 289(1): 76-79.

Mota, J., N. Delgado, M. Almeida, J.C. Ribeiro, and M.P. Santos (2006). "Physical Activity, Overweight and Perceptions of Neighborhood Environments among Portuguese Girls." *Journal of Physical Activity and Health* 3: 314-322.

Motl, R.W., R.K. Dishman, R.P. Saunders, M. Dowda, and R.R. Pate (2007). "Perceptions of Physical and Social Environment Variables and Self-Efficacy as Correlates of Self-Reported Physical Activity among Adolescent Girls." *Journal of Pediatric Psychology* 32: 12.

Motl, R.W., R.K. Dishman, D.S. Ward, R.P. Saunders, M. Dowda, G. Felton, et al. (2005). "Perceived Physical Environment and Physical Activity across One Year among Adolescent Girls: Self-Efficacy as a Possible Mediator?" *Journal of Adolescent Health* 37: 403-408.

Mullan, E. (2003). "Do You Think that Your Local Area Is a Good Place for Young People to Grow Up? The Effects of Traffic and Car Parking on Young People's Views." *Health and Place* 9(4): 351-360.

Neumark-Sztainer, D. and P.J. Hannan (2000). "Weight-Related Behaviors among Adolescent Girls and Boys: Results from a National Survey." *Archives of Pediatric and Adolescent Medicine* 154(6): 569-577.

Nielsen, S.J. and B.M. Popkin (2003). "Patterns and Trends in Food Portion Sizes, 1977-1998." *Journal of the American Medical Association* 289(4): 140-150.

Nielsen, S.J., A.M. Siega-Riz, and B.M. Popkin (2002). "Trends in Energy Intake in U.S. between 1977 and 1996: Similar Shifts Seen across Age Groups." *Obesity* 10: 370-378

Norman, G.J., S.K. Nutter, S. Ryan, J.F. Sallis, K.J. Calfas, and K. Patrick (2006). "Community Design and Access to Recreational Facilities as Correlates of Adolescent Physical Activity and Body-Mass Index." *Journal of Physical Activity and Health* 3: S118-S128.

Paeratakul, S., D.P. Ferdinaund, C.M. Champagne, D.H. Ryan, and G.A. Bray (2003). "Fast-Food Consumption among U.S. Adults and Children: Dietary and

Nutrient Intake Profile." *Journal of the American Dietetic Association* 103(10): 1332-1338.

Patton, M.Q. (2002). *Qualitative Research Evaluation Methods*. London: Sage.

Powell, K.E. (2005). "Land Use, the Built Environment, and Physical Activity: A Public Health Mixture, A Public Health Solution." *American Journal of Preventive Medicine* 28(2): 216-217.

Romero, A.J. (2005). "Low-Income Neighborhood Barriers and Resources for Adolescents' Physical Activity." *Journal of Adolescent Health* 36: 253-259.

Saelens, B.E., K. Glanz, J.F. Sallis, and L.D. Frank (2007). "Nutrition environment measures study in restaurants (NEMS-R): Development and evaluation." *American Journal of Preventive Medicine* 32(4): 273-281.

Sallis, J. F., T.L. Conway, J.J. Prochaska, T.L. McKenzie, S.J. Marshall, and M. Brown (2001). "The Association of School Environments with Youth Physical Activity." *American Journal of Public Health* 91(4): 618-620.

Schmitz, M.K. and R.W. Jeffery (2000). "Public Health Interventions for the Prevention and Treatment of Obesity." *Medical Clinics of North America* 84: 491-512.

Scott, M.M., D.A. Cohen, K.R. Evenson, J. Elder, D. Catellier, J.S. Ashwood, et al. (2007). "Weekend Schoolyard Accessibility, Physical Activity, and Obesity: The Trial of Activity in Adolescent Girls (TAAG) Study." *Preventive Medicine* 44: 398-403.

Scott, M.M., K.R. Evenson, and D.A. Cohen (2007). "Comparing Perceived and Objectively Measured Access to Recreational Facilities as Predictors of Physical Activity in Adolescent Girls." *Journal of Urban Health* 84: 346-359.

Shephard, R.J. (1997). "Curricular Physical Activity and Academic Performance." *Pediatric Exercise Science* 9(2): 113-126.

Sibley, B.A. and J. Etnier (2003). "The Relationship between Physical Activity and Cognition in Children: A Meta-Analysis." *Pediatric Exercise Science* 15(3): 243-256.

Sothorn, M.S., M. Loftin, R.M. Suskind, J.N. Udall, and U. Blecker (1999). "The Health Benefits of Physical Activity in Children and Adolescents: Implications for Chronic Disease Prevention." *European Journal of Pediatrics* 158(4): 271-274.

Steinbeck, K.S. (2001). "The Importance of Physical Activity in the Prevention of Overweight and Obesity in Childhood: A Review and an Opinion." *Obesity Reviews* 2: 117-130.

Stokols, D. (1992). "Establishing and Maintaining Healthy Environments: Toward a Social Ecology of Health Promotion." *American Psychologist* 47(1): 6-22.

----- (2000). "Social Ecology and Behavioral Medicine: Implications for Training, Practice, and Policy." *Behavioral Medicine* 26(3): 129-138.

Stolley, M.R., M.L. Fitzgibbon, A. Dyer, L. VanHorn, K. KauferChristoffel, and L. Schiffer (2003). "Hip-Hop to Health Jr., an Obesity Prevention Program for Minority Preschool Children: Baseline Characteristics of Participants." *Preventive Medicine* 36: 320-329.

Story, M., D. Neumark-Sztainer, and S. French (2002). "Individual and Environmental Influences on Adolescents' Eating Behaviors." *Journal of the American Dietetic Association* 102(3): S40-S50.

Sundberg, M., P. Gardsell, O. Johnell, M.K. Karlsson, E. Ornstein, B. Sandstedt, et al. (2002). "Physical Activity Increases Bone Size in Prepubertal Boys and Bone Mass in Prepubertal Girls: A Combined Cross-Sectional and 3-Year Longitudinal Study." *Calcified Tissue International* 71(5): 406-15.

Thompson, O.M., C. Ballew, K. Resnicow, A. Must, L.G. Bandini, H. Cyr, et al. (2004). "Food Purchased away from Home as a Predictor of Change in BMI Z-Score among Girls." *International Journal of Obesity* 28: 282-289.

Tremblay, M.S., J.W. Inman, and J.D. Willms (2000). "The Relationship between Physical Activity, Self-Esteem, and Academic Achievement in 12 Year-Old Children." *Pediatric Exercise Science* 12(3): 312-323.

Trost, S.G., R.R. Pate, D.S. Ward, R. Saunders, and W. Riner (1999). "Determinants of Physical Activity in Active and Low-Active, Sixth-Grade African American Youth." *Journal of School Health* 69: 29-34.

Tucker, P., J. Gilliland, and J.D. Irwin (2007). "Splashpads, Swings, and Shade: Parents' Preferences for Neighbourhood Parks." *Canadian Journal of Public Health* 98(3): 198-202.

Tucker, P., J.D. Irwin, J. Gilliland, M. He, K. Larsen, and P. Hess (2009). "Prevalence of and Environmental Influences on Physical Activity Behaviors in Youth." *Health and Place* 15: 357-363.

U.S. Department of Health and Human Services. (1997). *Nutrition and the Health of Young People: Fact Sheet*. Atlanta, GA: Centers for Disease Control and Prevention; National Center for Chronic Disease Prevention and Health Promotion.

Utter, J., S. Denny, E.M. Robinson, S. Ameratunga, and P. Watson (2006). "Perceived Access to Community Facilities, Social Motivation, and Physical Activity among New Zealand Youth." *Journal of Adolescent Health* 39(5): 770-773.

Vecchiarelli, S., S. Takayanagi, and C. Neumann (2006). "Students' Perceptions of the Impact of Nutrition Policies on Dietary Behaviors." *Journal of School Health* 76(10): 525-531.

Veugeliers, P.J., and A.L. Fitzgerald (2005). "Effectiveness of School Programs in Preventing Childhood Obesity." *American Journal of Public Health* 95: 432-435.

Walker, Z., and J. Townsend (1999). "The Role of General Practice in Promoting Teenage Health: A Review of the Literature." *Family Practice* 16(2): 164-172.

Weber Cullen, K., T. Baranowski, L. Rittenberry, and N. Olvera (2000). "Social-Environmental Influences on Children's Diets: Results from Focus Groups with African-, Euro-, and Mexican-American Children and Their Parents." *Health Education Research* 15(5): 581-590.

Whitehead, S.H., S.J.H. Biddle, T.M. O'Donovan, and M.F. Nevill (2006). "Social-Psychological and Physical Environmental Factors in Groups Differing by Levels of Physical Activity: A Study of Scottish Adolescent Girls." *Pediatric Exercise Science* 18: 226-239.

Young, L.R. and M. Nestle (2002). "The Contribution of the Expanding Portion Sizes to the U.S. Obesity Epidemic." *American Journal of Public Health* 92(2): 246-249.