
A qualitative GIS approach to mapping urban neighborhoods with children to promote physical activity and child-friendly community planning

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Received 9 January 2008; in revised form 7 February 2009

Abstract. As the obesity epidemic in children increases, it is important to consider the role of neighborhoods in supporting children's physical activity and healthy development, especially in low-income communities where obesity levels among children are higher than for their middle-income counterparts. I present a participatory and qualitative GIS approach to mapping children's own perceptions and use of their neighborhood for physical activity with ten and eleven year-olds growing up in a diverse low-income community in Denver, CO. Girls walk shorter distances to and use different types of community spaces for play and recreation from boys, some of which is explained by the differing environmental-socialization approaches employed by parents and carers. Children's perceptions of risk align spatially with features of the built environment, but do not correlate with reported crime. Results illustrate the utility of qualitative spatial analysis to understand relationships between children's perception, the built environment, and social factors that shape children's active transport, leisure, and recreation in their neighborhood. Children's local knowledge should be valued and solicited in community-level health and planning interventions to promote physical activity.

Introduction

The aim of this research is to understand the role of the neighborhood context in shaping children's perceptions, access, and use of community spaces that have the potential to increase their physical-activity levels outside of the school day *from the perspectives of children themselves*. Methodologies that engage children in dialogue about this topic have the potential to provide insights into effective planning, design, and health interventions that may previously have been overlooked or unknown to adult professionals. I offer evidence for the use of qualitative and participatory GIS *with* children to understand the role of the neighborhood context in supporting or hindering opportunities for physical activity. What do children think, feel, value, know, and care about in their neighborhood, and how do these perceptions and behaviors relate to their physical-activity levels? By layering children's perceptual cartographies with other databases available to neighborhood planners, one can begin to visualize connections between individual behaviors and larger metastructures shaping local environments that have the potential to impact physical activity. In particular, qualitative GIS can help to engage children and their families in shaping urban design and health-education interventions that are socially and culturally appropriate, and which are grounded in their lived realities.

Literature review

Increasing levels of obesity among children and youth in the United States in the last three decades has led social scientists and public-health researchers to explore the role of the built environment in promoting or hindering physical activity in young people's daily routines, particularly in economically impoverished communities where the risk for childhood obesity is greatest (for reviews see Delva et al, 2006; McMillan, 2005; Sallis et al, 2000). After the home and the school environments, neighborhoods

constitute the most significant spaces in which children can be physically active, especially in poorer urban communities where families lack resources to access other spaces in the city for leisure and recreation (Gordon-Larsen et al, 2006; van Vliet, 1983). Physical activity is defined as any activity that leads to energy expenditure, which in the case of children and the neighborhood context can include *active play*—such as running, jumping, and climbing, *active transport*—such as walking or biking to school, and *organized recreation*—such as participating in sports leagues or being a member of a recreation center (Krizek et al, 2004). Research suggests that young people growing up in impoverished neighborhoods are less likely to be physically active, thus contributing to higher levels of obesity among children, especially poor children of color (Burton et al, 2003; Gomez et al, 2004; Humbert et al, 2006; Lopez, 2006; Molnar et al, 2004; Winkler et al, 2005).

The social and built environment of many children living in impoverished neighborhoods frequently fails to support their healthy development (Gordon-Larsen et al, 2006; McLoyd, 1998). In many cities in the United States, poverty and discrimination have shaped significantly the obesogenic environments in which children grow and develop (Bullard, 2000; Landrigan et al, 1998). One factor influencing the health of children in poor neighborhoods includes historical trends of public disinvestment in community spaces, such as parks and playgrounds, which contributes to fewer and lower quality facilities (Estabrooks et al, 2003; Katz, 1995). There is also a burgeoning literature within active-living research examining how the concentration of ‘crime generating’ land uses, such as liquor stores, abandoned buildings, and pawn shops in poor neighborhoods can influence the perceived and real safety of individuals, contributing to physical inactivity (Gomez et al, 2004; Loukaitou-Sideris, 2007; Molnar et al, 2004). Equally significant is the location of many poor neighborhoods adjacent to sources of major arterials and to factories that are primary sources of air pollution, toxins, and heavy traffic flows (Bae et al, 2007; Bullard, 2000; Landrigan et al, 1998; Pastor et al, 2004; Pulido, 2000). Others have shown how neighborhoods of concentrated poverty offer fewer supermarkets than their wealthier counterparts, and that the poor sometimes pay more for their food (Chung and Myers, 1999; Helling and Sawicki, 2003; Winkler et al, 2005).

Researchers have documented a variety of factors that influence how children use their neighborhood for play, recreation, and socialization. These include: (1) their access or residential proximity to a neighborhood resource (Gaster, 1991; Gordon-Larsen et al, 2006; Hillsdon et al, 2006; Norman et al, 2006); (2) the quality of such resources (Browning and Cagney, 2003); (3) their ability to travel independently or with friends in the neighborhood (Hart, 1979; Wridt, 2004a); (4) the perceived safety of a community (Gomez et al, 2004; Molnar et al, 2004); (5) a child’s gender, race, and age (Cahill, 2000; Gaster, 1991; Wridt, 1999); (6) parenting norms (Hart, 1979; Valentine and McKendrick, 1997; Veitch et al, 2005; 2006), and (7) children’s free-time leisure preferences (Camstra, 1997; Spidel and Signer, 2004). How these variables intersect in a particular place, time, and cultural setting to contribute to children’s physical activity or inactivity is less understood.

How children perceive, use, and attach importance to places such as neighborhoods is important for understanding the influence of the built and social environment on children’s well-being (for a review see Talen and Coffindaffer, 1999). The diversity and quality of environments in which children’s activities take place are important for a young person’s physical, social, cognitive, and emotional development (Aitken, 1994; Bartlett et al, 1999; Bunge and Bordessa, 1975; Cunningham et al, 1996; Francis, 1984; Hart, 1979; Lynch, 1973; 1979; Matthews et al, 1997; Moore, 1990; Moore and Young, 1978). Very little is known about children’s *own* use and perceptions of

neighborhoods as a space in which they can be physically active, relying instead on parental reports of children's health behaviors, which are considered more reliable (for example, see Veitch et al, 2006; Weir et al, 2006).⁽¹⁾ While nascent, recent developments to obtain children's perceptions of neighborhood environments as they relate to physical activity via surveys are promising for quantitative studies (Krizek et al, 2004; Timperio et al, 2004). *Engaging children themselves* in the process of data collection, and furthermore, including them in the analysis of their own data has yet to be explored for the potential that such qualitative and participatory inquiry can offer to studies on neighborhoods and physical activity.

Research design, participants, and setting

This study employed a participatory action research (PAR) design based on the work of individuals such as Davidoff (1965), Driskell (2002), and others (for example, Freire, 1970/1993) who recognize the value of engaging individuals in the research and practice of planning and design. PAR has proven effective in engaging communities in research, particularly groups that, historically, have been misrepresented or taken advantage of, such as communities of color, homeless individuals, and children and youth (Hart, 1997).

The research reported here was conducted in collaboration with one elementary school in a culturally diverse community in Denver, CO (figure 1). Columbine Elementary School is located north of Denver's largest regional urban park, City Park, and services students from the neighborhoods of Skyland, Clayton, Cole, and Whittier. Historically, the neighborhoods surrounding the school have been comprised primarily of African-American and Latino families, many living at or below the poverty level. In 2007 the composition of the school's student population was 51% African-American, 46% Latino, and 3% white, with 97% of students receiving a free or reduced-cost lunch (Denver Public Schools, 2007).

Participants consisted of fifth-grade students (aged 10–11 years), their daytime school teacher, paraprofessional staff, and the school principal, as well as caretakers and community residents. The research was conducted with these students and their teacher because of their willingness and interest in the project, but also because studies suggest that the period of middle childhood (ages 10–12 years) is a time when children actively and autonomously begin to explore their local environment, therefore making the neighborhood setting an important context for physical activity (de Vries et al, 2007; Harloff et al, 1998; Hart, 1979). The research team visited the classroom to share the aims of the study and engage the children in a dialogue about their participation.⁽²⁾ Informed consent forms were obtained from students and their parents or guardians. Thirty-two children volunteered for the study (twenty girls and twelve boys) of which sixteen were African-American, fourteen Hispanic, and two white. The research team visited the classroom for two hours per week, for a total of twenty-four hours. Researchers maintained contact with the school and children for two years, to continue working with the communities to implement neighborhood change.

⁽¹⁾ Although some research has examined youth perceptions, see Dwyer et al (2006) and Hohepa et al (2006).

⁽²⁾ Under my leadership and collaboration, four doctoral students were hired to carry out specific research tasks for this project, including GIS analysis and the facilitation of methods within the schools. In addition, three undergraduate students participated in an independent study for this research, conducting research in local newspapers and assisting with project methods in the schools. All students were provided with training and mentorship in human subjects, children's participation, mapping, active-living research, and community analysis.

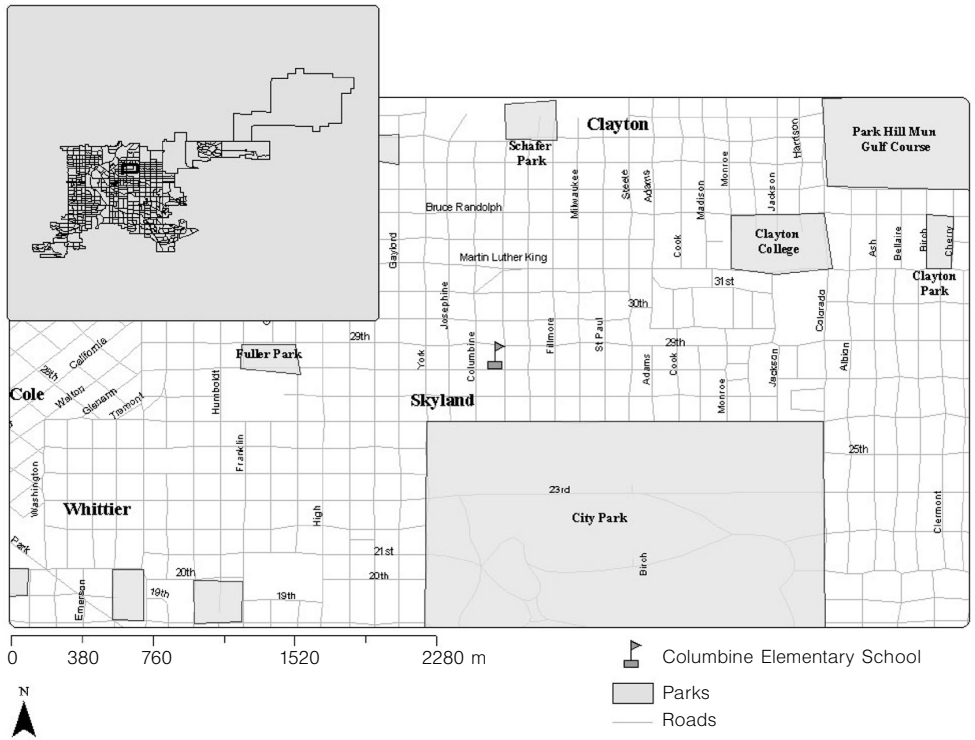


Figure 1. Study site area.

Methods and data analysis

A multimethod approach was most suitable to enable the children to articulate their knowledge of the neighborhood through a range of sensory means. A variety of participatory and qualitative methods was employed including photography, drawing, time diaries, focus groups, and cognitive mapping (Chawla, 2002; Driskell, 2002; Hart, 1997; Lynch, 1979). As a participatory project, children worked with researchers to produce a bilingual (English and Spanish) children's guide to the neighborhood (see <http://umapthecommunity.org>). The aim of the guidebook, entitled by the children "Columbine Cougars in the Community", was to showcase the children's research in a way that promoted community awareness about barriers and supports to children's physical activity in the neighborhood. This guidebook was shared with community members, parents, school officials, neighborhood civic associations, and the mayor of Denver.

The central method of the research reported here was a form of community mapping, or a qualitative GIS approach that responds to Talen's call for "chanel[ing] intellectual energy into developing an approach and methodology for *resident-generated GIS* ... [and] ... to exploit GIS in the investigation of residents' perceptions of local neighborhood environments" (Talen, 1999, page 553). As Dennis points out, "GIS is the language of planning power" (Dennis, 2006, page 2043), and as such it constitutes the primary and legitimized data source in which decision making and capital investment allocation is determined. The voice, feelings, perceptions, and behaviors of residents themselves is often overlooked due to the difficulty of integrating and translating qualitative data into GIS analysis, "privileging institutional rationality over other ways of knowing" (Dennis, 2006, page 2043).

This community-mapping method enabled children to articulate their use and perception of their neighborhood in a way that was translated into a GIS database for spatial analysis and for comparison with conventional planning datasets. Specifically, students worked in small groups of four or five using 1:1000 resolution 1.3 m × 1.5 m aerial photographs of their neighborhood to map a number of themes related to physical activity (figure 2). Aerial photographs were labeled with street names, school names, and other identifiable landmarks, such as parks and cultural institutions, to enable orientation. Photographs were laminated and covered with acetate so the children could use markers and stickers to map locations and areas without damaging the map and allowing multiple uses.

The aim was to map themes important to the study of physical activity, as related to the literature, including access to community resources, transportation methods to community spaces, social networks, and perceived safety issues. Topics that were mapped included: children's homes; their perceived neighborhood boundaries; places where they play and 'hang out'; places where they get food; bad places; people they know; and their routes to school. Locations were mapped as points (play places, bad places, places they get food, children's homes, and homes of people they know), lines or vectors (including their routes to school), and areas (perceived neighborhood boundaries). Different colored stickers were used to represent a particular map theme (for example, green for play places). In addition, different colored markers were used to symbolize particular variables, such as a red line to represent a route to school by automobile.

In order to analyze data by student profiles, each student was assigned a random mapping number ID, which was linked to demographic information such as the child's age and gender in a Microsoft Excel database spreadsheet. Students were instructed to write their mapping number ID on each sticker they placed on the map and to write a one-word or two-word description of the place adjacent to the sticker—for example, zoo or friend's house. In addition, students were instructed on how to keep a detailed log for each map point. For example, for every sticker a child placed on the map showing a location where he or she played, the student created an entry in their log



Figure 2. Pupils using the mapping method tools and process.

to indicate how and with whom they, typically, traveled to this place (method of transportation and travel companies), and what they, typically, did at this place (type of play). Similarly, students entered data about bad places and food places they mapped, such as why they considered the place was bad, and the types of food they obtained at a particular retail location. Each entry in the student log was labeled with the student's mapping number ID and the one-word or two-word description of the location so that the log data could be connected with the demographic and mapped data. Table 1 summarizes the variables students annotated for each map theme, table 2 shows a sample map entry and log.

Layers of acetate representing small-group datasets were positioned on top of an aerial photograph so researchers could show the children how a composite map output would be made in GIS. For example, researchers compiled all group work onto one map to show the children the play locations for everyone in the class. Such layering enabled the children to see spatial clusters and allowed researchers to help children speculate about trends in the data. The mapping process was facilitated by research assistants and school teachers to ensure reliable data entry. In addition, researchers took field notes on the dialogue and discussion generated during the mapping process, in which probing follow-up questions were asked about particular locations. For example, when asked to map where children play, one girl stated she did not have any places to map because her mother did not let her play outside anywhere in the neighborhood for fear of kidnapping.

Student map data were digitized with reference to the aerial photograph used by the children during the paper mapping process and the Denver roads layer, which is georeferenced to a coordinate system. Using the editing tool in Arc Map, different themes marked on student maps were digitized using points, lines, and polygons, and new feature classes were created in the database, such as a point ID, student mapping ID and place name. The creation of a point ID, or a unique number for each point mapped by students, enabled the joining of spatial data with nonspatial data collected

Table 1. Map themes and variables.

Map themes	Variables
Map 1. Getting oriented (home, school, routes to school, neighborhood boundaries)	Child's home, school, routes to school, transportation methods, neighborhood boundary
Map 2. Places to play and 'hang out'	Child's home, play or 'hang out' places, transportation methods, travel companions, type of play
Map 3. Friends and family we know in the neighborhood	Child's home, social networks, transportation methods, social activities, travel companions
Map 4. Places to get food	Child's home, food places, transportation methods, travel companions, types of food obtained at location
Map 5. Bad places	Child's home, bad places, why the place is bad

Table 2. Sample map entry and student log.

Map data	Log data				
	student mapping ID	place	travel companion	transportation method	type of play
③ Friend's house	3	Friend's house	Mother	Car	Playing tag

in student logs. Student logs were typed into Microsoft Excel with this point ID to correlate with tables and to have the ability to create graduated symbols for the number of students identifying the same location.

A variety of mapping outputs and visualizations were explored using the literature as a guide. For example, mapped layers were sorted by gender, method of transportation, and travel companions. Mapped layers were added and removed to visualize bad places in relation to play places, and distance calculations were created for routes to school by walking versus automobile use. In addition, datasets available from the city authorities and other organizations, such as reported crime data and the location of community risks (liquor stores, abandoned buildings, check cashing facilities, correctional facilities, and pawnshops) were explored. Finally, the nonspatial student-log data were analyzed using Microsoft Excel to examine trends in student travel. Field notes were examined with the aid of NVivo, a qualitative software program that allowed researchers to sort through large amounts of text to develop themes, codes, and conceptual relationships among the children's narratives and the study topic.

Results

Opportunities for active play

The neighborhoods that service the school offer a number of public spaces that potentially could be accessed by children for active play and recreation. Figure 3 demonstrates the types of play places in their community that the children use for active play, including public spaces such as school playgrounds and playing fields, a large regional park called City Park, and several small neighborhood parks. However, not all the potential public play spaces are actually used by the children. Figure 3

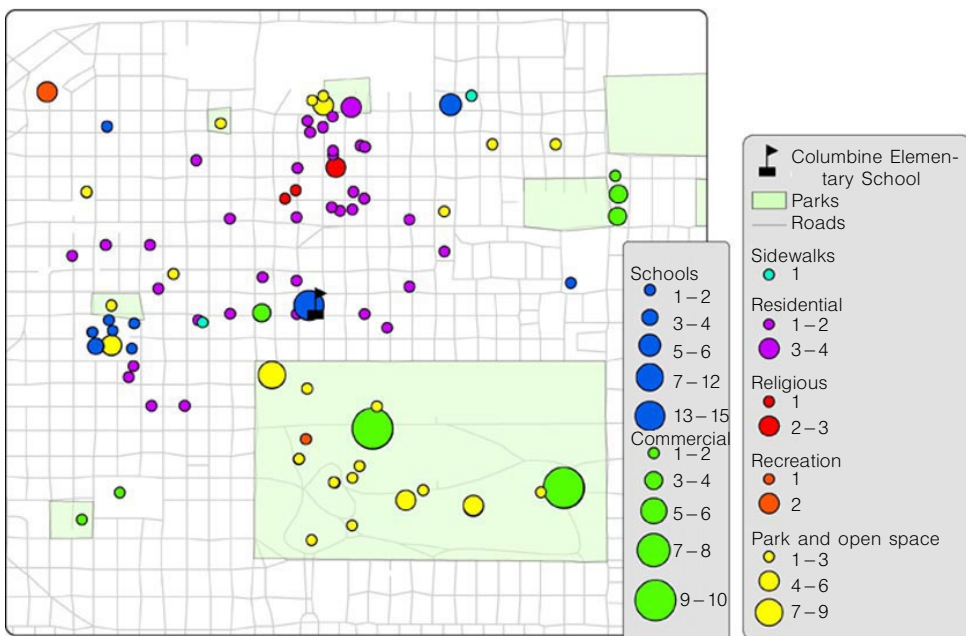


Figure 3. [In color online, see <http://dx.doi.org/10.1068/b35002>] Use of play spaces in their community by children in the study group.

demonstrates that children in this study do not use some green spaces in the community because they are not granted access, as in the case of the private golf course located in the northeast corner of the neighborhood, or because a particular park lacks amenities that attract children and families. While the children did not report active play in City Park, their travels to this park consisted primarily of infrequent picnics with family members or school field trips to the zoo and museum, rather than using the park as an everyday play space. In addition, the children often go to private spaces for play, including McDonald's where they travel with their family to eat and to play on the indoor playground, one of three playgrounds in the study area (and the most favored by the children). The type of play activities the children engaged in at particular locations within the study area varied by gender. Girls more often engaged in socializing with friends or family members and informal active play [such as jump roping (skipping)] while in residential locations. On the other hand, boys were more engaged in activities such as informal basketball and baseball games in school grounds and neighborhood parks.

Use for physical activity and access to these neighborhood public play spaces are dependent upon many factors, such as how well parks and playgrounds are maintained by the City, whether or not children can travel there safely (Hillsdon et al, 2006; Molnar and Gortmaker, 2004; Norman et al, 2006; Zakarian et al, 1994). Figure 4 illustrates which method of transportation the children use to travel to play spaces. Straight-line distance measures were created from each child's home to a play space by gender and method of transportation. While the children do walk to play spaces in their neighborhood, for those spaces further from their homes boys tended to walk to them more so than girls. On average, girls walked a distance of 722 m to play places, while boys averaged 923 m. Walking destinations included a wide range of settings, such as to friends' and family homes, neighborhood parks, and playgrounds. Girls were more

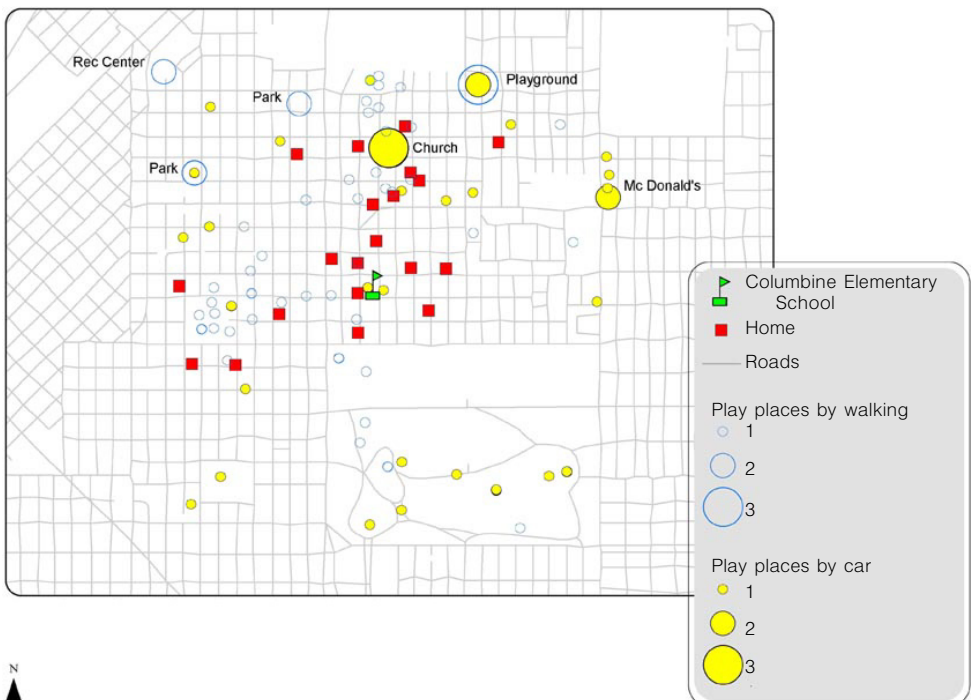


Figure 4. [In color online.] Transport to play places used by children in the study group.

likely to walk to play spaces when traveling with siblings and cousins or an adult, while boys were more likely to walk to play places when traveling with friends or by themselves. Very few children identified play places they walked to with family members, in part because of the absence of sidewalks on certain streets, or because the width of sidewalks cannot accommodate strollers and large families. Play places traveled to by car tended to be for family outings, such as playing at the McDonald's indoor playground or to visit friends and family members in their homes. This finding suggests the need for an urban design intervention to improve sidewalk presence, width, and connectivity to family-friendly locations in the neighborhood.

Opportunities for healthy foods

The neighborhoods servicing the school could be characterized as food deserts, a term used to indicate a lack of places to purchase healthy foods (MGRC, 2006). The food establishments within the community tend to be fast-food restaurants and corner stores. There are no grocery stores within the study area. According to active-living researchers and public-health officials, lower profits and fear of crime keep large supermarkets from locating in inner cities, and smaller markets such as corner stores charge higher prices and offer limited options for healthy foods such as fresh fruits and vegetables (Inagami et al, 2006). Not surprisingly, when asked where they obtained food in the neighborhood, 59% of food places mapped by the children were fast-food restaurants, 15% were corner stores, and 5% were gas stations. Children reported purchasing a range of fast-food items and junk food at these locations, which were mostly traveled to with family members or other adults, rather than with friends.

Access to healthy food options, or a lack thereof, is one way of examining the role of a neighborhood setting in supporting a healthy lifestyle, but another is to consider how active children are in the type of transportation methods they use to get to retail

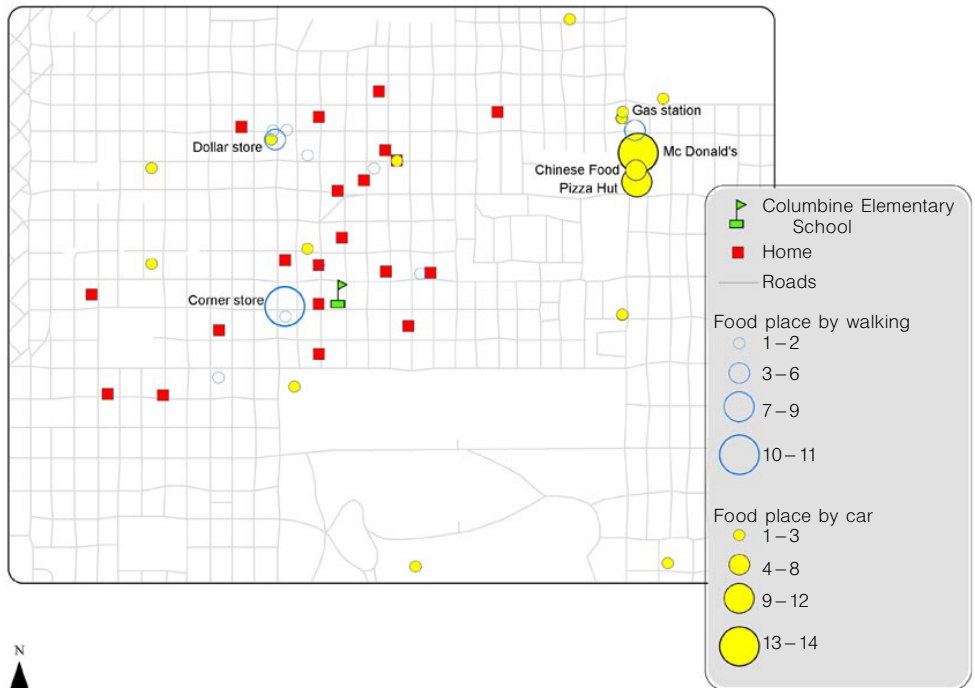


Figure 5. [In color online.] Use of, and transport to, food establishments by children in the study group.

establishments and other destinations within their community. Planners, typically, use a 200–800 m radius around retail establishments to estimate the number of potential walkers a commercial location may attract (Krizek and Johnson, 2006). This research found that the further away food establishments are from the home, the less likely children are to walk there (figure 5). Interestingly, the girls walked an average of 474 m to food destinations, while the boys walked an average of 263 m and 47% of the food places identified by the girls were walked to, compared with 7% for the boys. Field notes revealed that the girls walked to some corner stores to run errands for the family (for example, to buy milk), perhaps contributing to a greater average walking distance to such establishments. These findings, supported by additional research, may suggest the need for investment in healthy-food options within the community and the potential that running errands has for girls to obtain physical activity in their daily routines.

Opportunities for active transport

There are a number of factors influencing children's opportunities for active transport (walking or biking) to a destination point in their neighborhood. Figure 6 demonstrates the influence of gender on the children's perceptions of bad places in their neighborhood and on their routes to school. The bad places identified by the girls are located in close proximity to the school and tended to be along their routes to school. On the other hand, the boys identified bad places located a greater distance from school that tended to be disconnected from their routes to school. Not coincidentally, the girls reported traveling to school by automobile more frequently than the boys, in part due to safety concerns, but also because of the distance from their home to school and the logistics their carers faced in transporting other siblings to

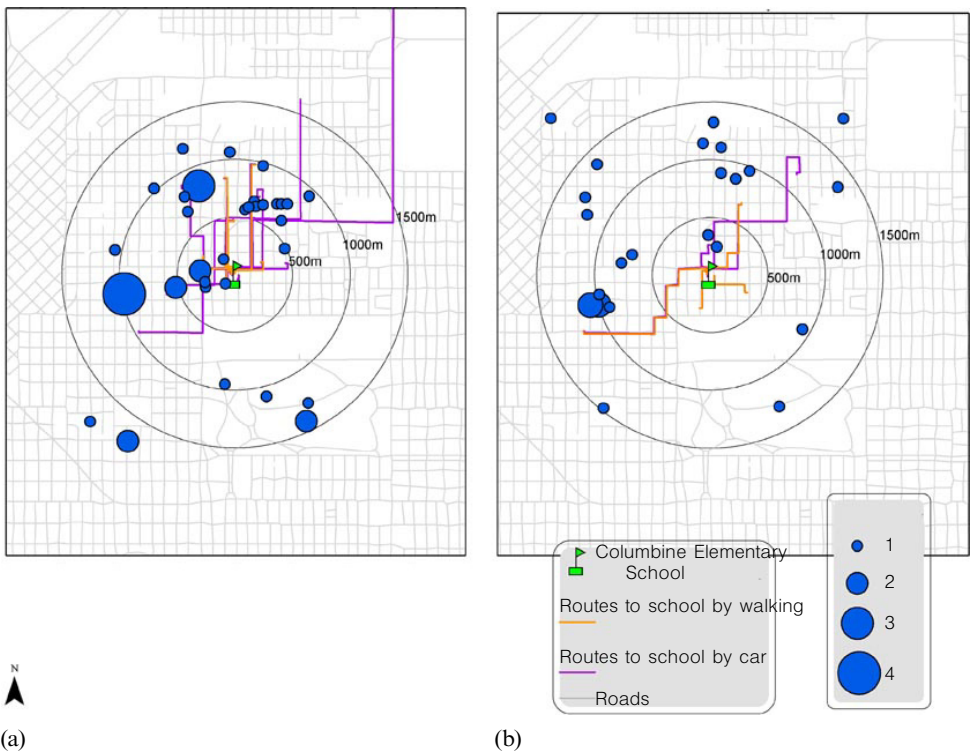


Figure 6. [In color online.] Routes to school, risks, and distance from school by gender for children in the study group: (a) female responses, (b) male responses.

school or daycare. On average, the girls walked 529 m to school, while the boys walked 854 m. The children offered other reasons why they do not ride a bike to school, including such factors as stolen or broken bicycles, weather, and a lack of racks at the school where the bicycles could be locked up.

The importance of parenting norms on children's mobility and active transport in their neighborhood cannot be overestimated (Veitch et al, 2005; Weir et al, 2006). When sharing completed maps of all the bad places the children identified in their community, or group level maps of their routes to school, the children were able to share insights about parental values towards their use of the neighborhood for active transport and physical activity. Two environmental-socialization approaches were identified in our research with the children—*restrictive* and *training*. These approaches were derived from field-note data and represent a dichotomy along a spectrum of parenting norms for the children and the neighborhood environment. These approaches were employed by a wide range of the carers, which consists of parents or guardians and extended family members, such as grandparents, aunts, and older brothers and sisters.

The restrictive approach refers to parenting norms in which children are essentially 'locked up' in their homes to protect them from the environment, primarily driven by fear of kidnapping or other potential hazards. For example, one girl told us that her parents do not let her play anywhere in the neighborhood for fear that her family's undocumented status could be revealed if she accidentally broke something in a public space and police intervention was required, or if simply being seen in such spaces was a basis for police interrogation of her identity. The restrictive models were employed more frequently with the girls than the boys.

The training approach refers to an approach in which caregivers deliberately teach children about social and physical hazards in their communities and actively develop strategies to empower them to make informed decisions and to negotiate their environment safely. For example, one boy explained that his mother showed him how to walk home from school by himself, pointing out particular locations to be careful of because of known drug trafficking. Not surprisingly, children with caregivers adopting a restrictive environmental-socialization model had less access to their neighborhood for play, recreation, and active transport, while those with the training approach had more access. Parents, typically, fall somewhere in the middle of both approaches, depending upon the time they have available to be with their children, money, access to resources and trusted adults, knowledge of community opportunities, and other variables that inhibit or enable a carer's ability to socialize children about the environment.

Crime and safety constraints

Parental fear of crime and their perceptions of safety often constrain children's ability to be physically active in their daily routines (Valentine and McKendrick, 1997; Veitch et al, 2005). But what do the children perceive to be unsafe or a risk in their neighborhood, and are there features of the built environment contributing to these risks? Figure 7 illustrates the students' own perceptions of bad places in their neighborhood and compares those perceptions with risks identified in city parcel data. The children's dataset includes the identification of a myriad of perceived risks, including the location of gangs, graffiti, poor lighting, bad people (which includes potential kidnappers, homeless individuals, and drunk people). The parcel data include the location of liquor stores, check cashing facilities, and other 'crime-generating' land uses. The map also shows the area the children identified as their neighborhood.

The majority of the locations identified by both the girls and the boys as bad were streets, perhaps contributing to their lack of use of these spaces for active play.

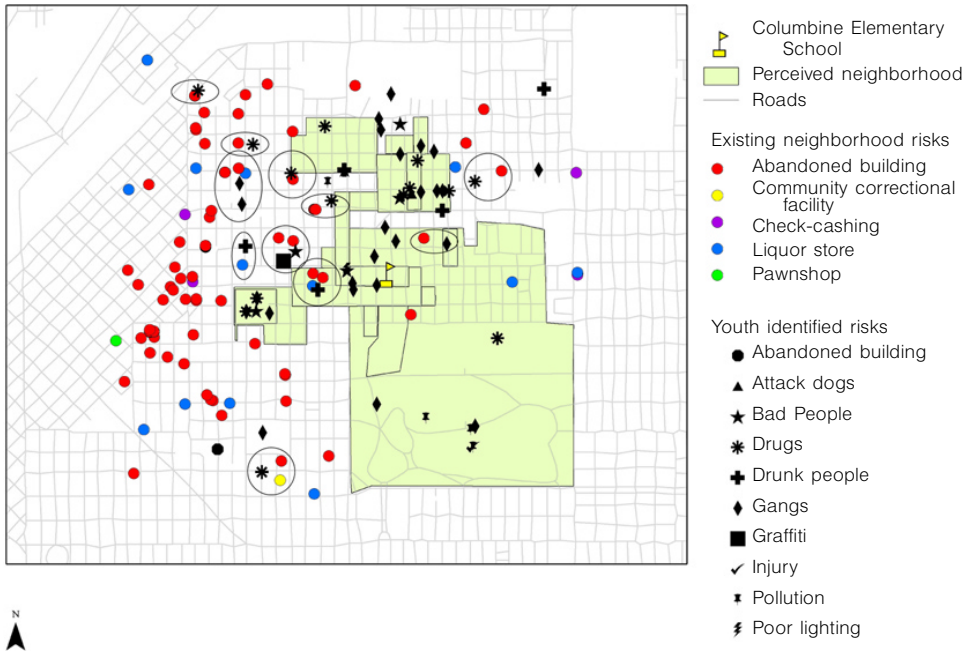


Figure 7. [In color online.] Risks identified by the children in the study group compared with crime-generating land uses.

However, the boys identified a greater number of bad places as school grounds, and alleys. The girls, on the other hand, identified a greater number of bad places as houses and stores. Most of the places identified as ‘bad’ by the students are located within the areas that they consider to be their neighborhood, indicating that children know the risks of the areas they use most and consider to be their territory. In addition, there is a spatial relationship between the perceived (as identified by the children) and observed (parcel data) risks in the community, with an interaction between abandoned buildings, drugs, and gangs, as well as an interaction between liquor stores and drunk people (see circled areas in figure 7). This finding demonstrates that children as young as ten and eleven years of age know the location of, and understand risks in, their neighborhood, and that this knowledge is correlated with features of the built environment. Finally, there are several ‘hot spots’ or concentrations of perceived risks within the neighborhood, which are associated primarily with gang activity.

Figure 7 is a powerful contribution to our understanding of the association between perceived and objectivity measured risks found in neighborhoods that are influential to children’s active living and healthy development. Some research suggests that perception of risk may be more influential than observed risk in contributing to physical inactivity (Boehmer et al, 2006; Loukaitou-Sideris, 2007). Figure 8 demonstrates that reported crime also differs from children’s perception of risk, further highlighting the importance of situated knowledge of risk, rather than official documentation and classification of crime. This finding is a reflection of the type of crime reported and tracked by the police (for example, burglary, aggravated assault, and larceny) and how children themselves identify risk (for example, bad people, gangs, and graffiti), which may be more influential in their decision making to walk to, or use, a particular community space.

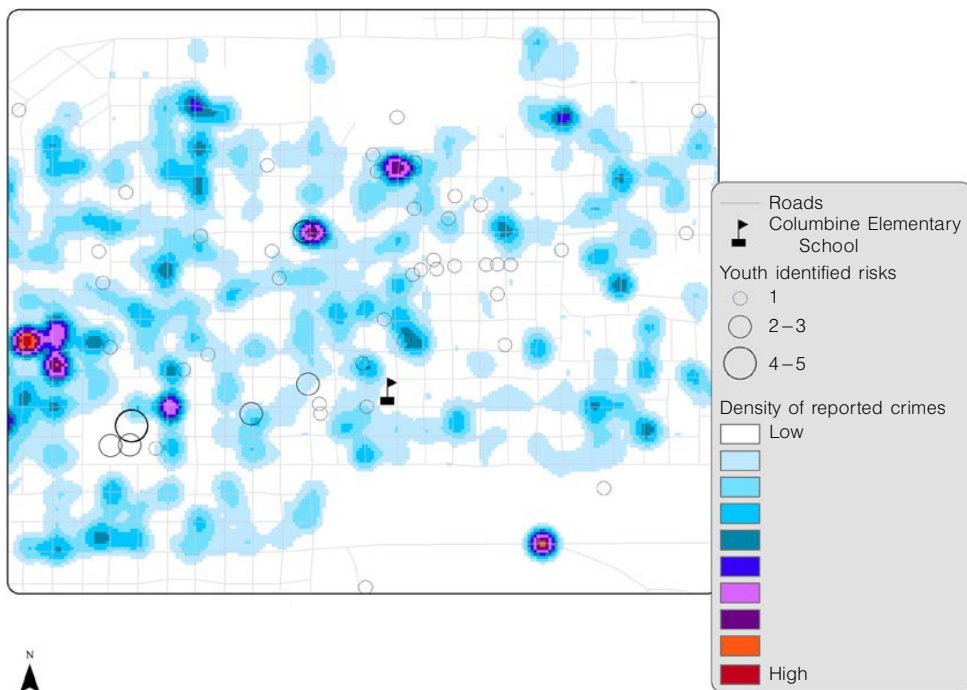


Figure 8. [In color online.] Comparison of reported crime and child identified risks for the study area.

Risk management

How do children negotiate the risks in their neighborhood, and what impact do their risk management strategies have on the potential locations where they can be physically active in everyday life? Figure 9 demonstrates that the spaces the children consider to be their play spaces in the community are often also the spaces they identify as bad places, or places that pose hazards to them. The spatial correlation of good places and play places with bad places tended to occur in public community spaces, such as open fields adjacent to schools, and public parks. One explanation why some spaces in a community are classified as play places or good spaces and also bad places by the children is because they are familiar with these places. Another explanation may be that there is a diurnal nature to the use of these spaces by the various user groups. For example, these spaces look very different in the daytime, after school, and in the evening hours. Children may see gangs in parks after school and then hear from their parents the next day of a shooting that happened there in the evening, but on weekends the space may be relatively tranquil when children and their families visit for a picnic. Such a nuanced portrait of a community space that has the potential to increase physical activity is best understood through participatory and qualitative inquiry.

Because of the ephemeral characteristic of risk, children still use community spaces in their local environment for physical activity, despite safety concerns that they or their caregivers may have about the neighborhood. In part this is because children develop strategies to negotiate bad places in their community and learn how to ‘read’ the environment for potentially hazardous events (Cahill, 2000; Wridt, 2004b). These risk-management strategies include traveling with a friend, sibling, or adult, carrying a cell phone to call someone in the event of an emergency, knowing the location of community resources (such as churches) where children can go to get help, and

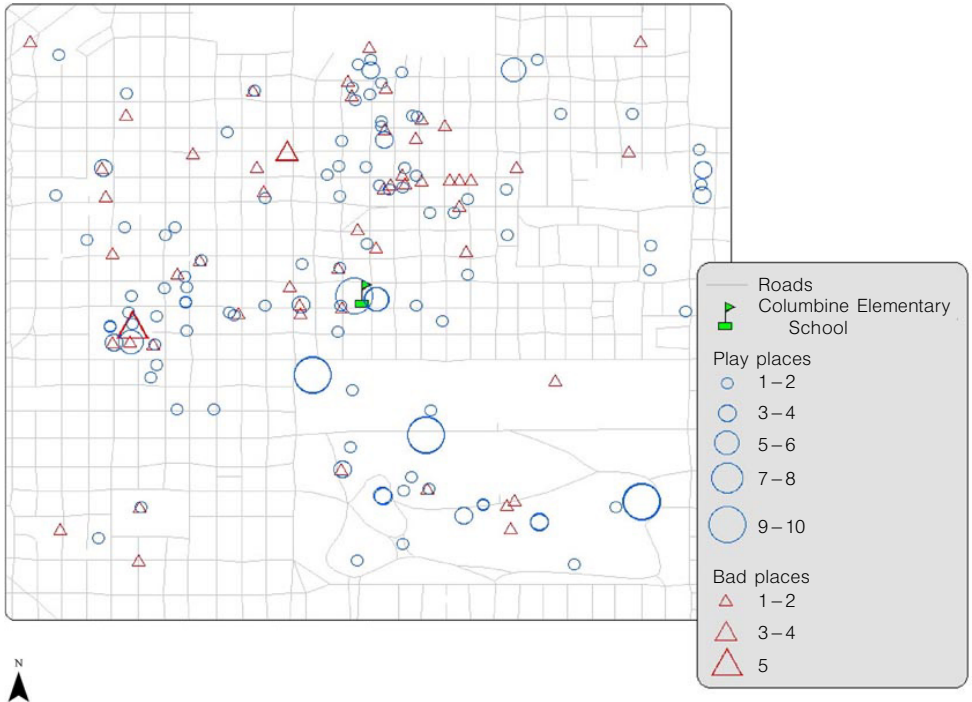


Figure 9. [In color online.] Comparison of play places and bad places identified by the children in the study group.

walking with a dog. Such strategies tend to be employed by children whose caregivers adopt a ‘training’ environmental-socialization model, whereas those employing the ‘restrictive’ model practice avoidance. These risk-management strategies are a key component for designing physical-activity interventions in poor urban communities, but are often overlooked by health professionals because studies, typically, do not ask children how they negotiate hazards. Such strategies demonstrate the ability of children to understand the complexity of risk and to construct with their parents methods to negotiate hazards so they can still use community resources that are important to them in their daily lives.

Child-friendly community planning

The process of engaging children in community and neighborhood planning is not a new concept, but it is relatively nascent to the field of active living. Many researchers and public officials in urban areas around the world have attempted to understand how cities affect human development and how children’s participation can facilitate the design of communities that address their needs, desires, and access to the city (Chawla, 2002; Driskell, 2002). Findings from this research suggest a number of interrelated variables are influential in how children negotiate their local environment for physical activity, including the ability of children to walk to destinations in their neighborhood, their access to healthy foods, their access and use of public spaces for play, the perceived safety to use such spaces for active living, and parenting approaches to environmental socialization.

While these variables have been identified by researchers as important considerations to promote an active lifestyle among children in poor urban communities, the process of engaging children in community mapping in relation to neighborhood

physical activity has yielded a number of findings previously unknown to active-living researchers. In particular, a spatial analysis of children's own perceptions, use, and knowledge of the neighborhood as it relates to the built and social environment has unveiled the complexity and nuances of how to create place-specific and culturally sensitive planning, design, and health interventions to promote physical activity in neighborhood settings. Developing maps that can be interpreted, analyzed, and read by children—and thereby give children a voice about what is going on in their communities—but which also resonate with planners and public officials who make decisions on capital investments and programmatic needs in communities is fundamental to the process of creating child-friendly neighborhoods. In conclusion, I will reflect on some of the outcomes of engaging children in the mapping of their community to bring about an improvement in their healthy development and to suggest areas for potential action on the basis of the children's use and knowledge of their neighborhood.

On the basis of this research with the children, there are a number of planning, design, and health interventions that should be considered when residents work with city officials. In terms of opportunities for active play, this research suggests a number of policy-based interventions may be appropriate. The lack of use of several neighborhood parks and recreation centers in the study area should be examined in greater detail to determine if additional programming or design elements are needed to attract children and their families or if there are financial or cultural issues associated with access. The lack of recreation centers near the children's homes may be contributing to their preference to play on the indoor playground at McDonald's. Joint-use agreements between the local golf course and the school could be explored to encourage the creation of organized sport programs and greater opportunities for physical activity after school. Sidewalk width and connectivity to family-oriented spaces in the neighborhood should be improved so families can walk together to play destinations.

Access to healthy food is a major problem in the study area. The concentration of fast-food restaurants, corner stores, and gas stations in the community is likely to be a contributory factor to unhealthy eating habits. Parents and children, typically, shop at Wal-Mart or grocery stores that are less expensive and located outside their neighborhood, which requires that they travel by automobile or bus, but often they rely upon corner stores for everyday needs. Given the abundance of abandoned buildings in the neighborhood, there is an opportunity to encourage the renovation of such spaces into commercial and retail outlets that could offer a greater range of healthy-food options, promote economic development, and provide jobs for local residents. The city could also discourage new fast-food restaurants from locating in the area through zoning ordinances.

Opportunities for active transport and recreation in everyday community spaces are influenced by parental fears for children's safety. Results indicate that many of the children's perceived risks align spatially with objectively measured risk factors found in the built environment, demonstrating that children's local knowledge should be valued and solicited in community-level health and design interventions to promote physical activity. The risk-management strategies employed by the children and their families warrant further investigation. Those parents adopting a training model of environmental socialization could be enlisted to create culturally sensitive educational programming with the goal of developing strategies that give children greater access to their community. Special consideration should be given to children of undocumented families, who may have the least access to their local environment through fear of deportation.

Alfonzo (2005) suggests there is a hierarchy of needs in a community that must be considered when thinking through variables that promote physical activity, arguing that factors such as accessibility and safety are fundamental basic needs for physical activity to occur. Only after these factors have been met will 'higher order' factors, such as the greening of the built environment, become important in promoting physical activity. Given the historic neglect of private investors, neoliberal economic policies, racial segregation, and environmental pollution in many poor urban communities in the United States, such basic needs must be addressed for physical activity to be a viable option in children's everyday lives (Day, 2006).

I have demonstrated the power of a qualitative GIS approach to community mapping with children to promote their healthy development and child-friendly neighborhood planning. While the results of this study are not generalizable to other study populations and locations, the *process* developed in this research is, and it can be implemented with teenagers, adults, or the elderly on a range of themes important to community development and active living. More importantly, the process demonstrates to residents that their knowledge about the neighborhood is valuable to planners and researchers and produces dialogue that enables residents to see commonalities in their lived experiences, where differences of perception lie, and how to move forward with locally specific interventions. Replicating the methodology employed in this research with children and families living in disadvantaged communities offers the potential to produce interventions to promote physical activity that are grounded in the everyday lives of neighborhood residents.

Acknowledgements. This research was supported by a grant from the Robert Wood Johnson Foundation Active Living Research program. The author thanks all the students, parents, school teachers, neighborhood residents, and city officials involved in this study. Thanks also to the supportive research assistance from Uddhab Bandary, Lois Brink, Debbie Flanders, Anobha Gurung, Laura Pazik, Illene Pevec, Deb Thomas, Jennifer Trumble, Brittany Zwickl, and Willem van Vliet.

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