Mapping Children's Neighborhood Perceptions: Implications for Child Indicators

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Abstract A growing literature on small-area effects has linked neighborhood conditions with indicators of child well-being. This paper addresses some of the challenges in identifying and understanding these linkages, with a focus on children's definitions and perceptions of their neighborhood geographies. The study included 60 children aged 7 to 11 and one of their parents in five neighborhoods (census tracts). Neighborhood maps were elicited from both children and parents. Child and parent maps showed only a modest correlation, suggesting that children have their own conceptions of their neighborhoods. Also, home range was not equated with children's definitions of neighborhood boundaries. Accurate and meaningful measures of neighborhood, including child-centered measures, are needed. Child-centered neighborhood indicators are an important complement to the measures that are increasingly available for standard neighborhood units. The neighborhood is a potentially important context for improving child well-being by developing area-based programs to address spatial inequality in child well-being.

Keywords Neighborhood · Children · Indicators · Spatiality · Mapping

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1 Introduction

For more than a century, investigators have been intrigued by the influence of "small areas," including neighborhoods, on human health and development. The neighborhood has been a unit of analysis of interest because it has been thought to affect its residents in a special way, above and beyond the effects arising from characteristics of the individual families who live there. Moreover, the neighborhood has been viewed as an important location for improving child outcomes because there is considerable spatial inequality in child wellbeing, and area-based programs promise to reduce these disparities. However, measuring neighborhood context and status of children at the neighborhood level begs the question as to what is the appropriate and meaningful unit of geography (Coulton and Korbin 2007). The answer to this question is further complicated by the fact that children and adults may experience neighborhoods differently and may, in fact, be influenced by a different geography altogether. Although it is important that child indicators at the neighborhood level be sensitive to the child's point of view (Ben-Arieh 2005), little is currently known about how children experience and define their neighborhoods. This paper will address some of the challenges in linking neighborhood factors to child well-being, with a focus on children's definitions and perceptions of their neighborhood geographies and boundaries.

The growing neighborhood-effects literature has reported links between neighborhood conditions and a wide range of outcomes and indicators of child well-being (Leventhal and Brooks-Gunn 2000, 2003; Roosa et al. 2003), including parenting practices (Furstenberg 1993; Furstenberg et al. 1999; Taylor 2000; Kohen et al. 2008), child maltreatment (Coulton et al. 2007), physical activity and obesity (Nelson et al. 2006), internalizing problems (Xue et al. 2005), smoking (Xue et al. 2007), aggressive/delinquent behaviors (Molnar et al. 2008), school outcomes (McWayne et al. 2007), obstructive sleep apnea (Spilsbury et al. 2006), and asthma (Juhn et al. 2005). However, neighborhood effects are not always demonstrated, particularly after controlling for household- or individual-level factors (e.g., Molnar et al. 2003; Reading et al. 2008). Moreover, when found, neighborhood effects are often small in magnitude, leading to controversy whether neighborhood effects actually exist (see reviews of this topic: Dietz 2002; Sampson et al. 2002; Sellstrom and Bremberg 2006). Instead of signaling a lack of importance for neighborhood contextual factors, the inconsistencies in results of neighborhood-effects research may be due in part to the methodological challenges faced by this research.

Regardless of the population or problem of interest, research on neighborhood influences on children faces several challenges. The first challenge is to define the neighborhood unit of analysis. Although the concept of neighborhood intuitively involves geography or spatiality, precise measurement of this spatial dimension is problematic. One approach has been to utilize administratively-identified areas such as zipcodes, county catchment areas, or U.S. census units (e.g., census tracts, block groups, blocks) as proxies for neighborhoods. This approach has been useful because a wealth of information about such geographic units is readily available from the decennial census or from other political and administrative sources. However, these administratively-defined spaces may not reflect what residents

actually perceive as their neighborhoods and thereby influence findings in ways that are not well understood. While it would be possible to use individually-defined neighborhoods as the unit of analysis, this would reflect individual rather than neighborhood-level constructs. Another method is to utilize a 'common area' approach, in which the geographic space that a predetermined number or proportion of residents identify as being part of the neighborhood is considered as the neighborhood (Coulton et al. 2001).

Neighborhood impact research faces a second challenge in the congruence between proxies such as tracts or block groups and resident-defined areas. In one study (Coulton et al. 2001), census-defined block groups were selected as the unit of analysis instead of census tracts because their smaller size was thought to better approximate the area in which neighborhood interactions would occur. However, neighborhoods as defined by residents averaged four times the size of their block groups of residence. The typical resident-defined neighborhood was approximately the size of a census tract, but included parts of at least two census tracts or at least three block groups. Correct selection of the spatial dimension of neighborhood is important because the strength of associations among study variables can be affected by the size of neighborhood units selected for analysis: if the size or number of geographic units is changed, the relationships among variables measured on the area units may also change. (Coulton et al. 2004; Flowerdew et al. 2008; Heywood et al. 1998). For example, the block, block group, and census tract estimates of a specific study variable (e.g., % families with single parent) may differ widely from each other, producing very different associations between that study variable and an outcome of interest.

Neighborhood-effects research faces a third challenge in deciding which residents' spatial measures of neighborhood are to be used. Ironically, despite the fact that much of the neighborhood-effects research focuses on the development and health of children, relatively little is known about the definition and meanings of neighborhood to children; to date, most work to spatially operationalize the neighborhood has involved adults (Burton and Price-Spratlen 1999; Coulton et al., 2001; Nicotera 2007). The literature on children's perspectives on neighborhoods has focused mainly on neighborhood qualities or characteristics, such as likes and dislikes or dangerous versus safe features of neighborhoods (e.g., Holaday et al. 1997; Morrow 2001; Schiavo 1988; van Andel 1990; van Vliet 1981). A set of related studies has focused on the concept of "home range," or the distance children travel away from home in the course of play and other social activities (Aitken 1994; Matthews 1992; Spilsbury 2005a; Gaster 1995). Several studies on children's views and use of neighborhood have utilized mapping techniques and have acquired rich information about neighborhood characteristics and events but have tended not to report data on the spatial dimensions of the neighborhoods the children identified. There are a few exceptions: Ladd's (1970) study of neighborhood definitions of sixty 12–17 year-old African-American boys in Boston, Massachusetts reported that the boys' neighborhoods ranged in size from 0.008 to 0.75 square miles, with the higher value being unusual (no measure of central tendency or dispersion was provided). Maurer and Baxter's (1972) investigation of the neighborhoods of a sample of 91 African-American, Anglo, and Mexican-American children 7–14 years of age living in Harrisburg (Houston), Texas reported that White children's neighborhoods

(approximately 2 square blocks) were larger than either African-American (.75) or Mexican-American children (1.0). Moreover, neighborhood size increased with child age, from an average of .67 square blocks for elementary-school children to 2.0 square blocks for secondary-school children. The measures' equivalent in square miles is unknown. However, in both of these studies, the relationship between children's spatial dimensions of neighborhood and adult residents' dimensions of neighborhood, including those of the children's parents, are unknown. Burton and Price-Spratlen's (1999) ethnographic study of 185 African-American families living in a northeastern US city compared children's neighborhood boundaries to parents' report of their children's neighborhood boundaries. Study results showed that in over half of the cases, children's reports of their neighborhood boundaries were "vastly different" (p. 85) from children's neighborhood boundaries as defined by their parents.

To the best of our knowledge, no study has directly compared child versus adult (parent) residents' spatial dimensions of neighborhood. To address this gap in the scientific literature, our article presents research results on the spatial dimensions and definitions of neighborhood according to a group of school-aged children compared to those of their parents. As part of a study on children's neighborhood perceptions and help-seeking behavior in five Cleveland, Ohio neighborhoods with different profiles of violence and crime (Spilsbury 2002a, 2005a, 2005b, Spilsbury and Korbin 2004), we asked children to define a neighborhood and to identify their neighborhoods' geographic boundaries. Based on findings in previous studies (Burton and Price-Spratlen 1999; Maurer and Baxter 1972), we hypothesized that: (1) the size of children's neighborhoods would be smaller than that of their parents; and (2) children's neighborhood dimensions would increase with child age. We also hypothesized that: (1) children's neighborhoods would be positively correlated with parents' neighborhoods, as well as with the size of their home ranges; and (2) children's neighborhoods would be greater in size than their home ranges. In addition to testing these specific hypotheses, we conducted exploratory analyses to investigate the nature of the neighborhood space that was shared by children.

2 Method

Details of the study methodology are available in previous publications (Spilsbury 2002a, 2005a). Briefly, the study was conducted with a neighborhood-based sample of 60 children between the ages of 7 and 11 years. One parent of each child also participated. The neighborhoods were recruited from five of twenty randomly selected neighborhoods in Cleveland, Ohio that were already involved in research on the effects of neighborhood conditions on children and families (Korbin and Coulton 1997). In order to meet the original study goals of studying children's helpseeking behavior in neighborhoods with different profiles of violence and crime, selection of the five study neighborhoods was based upon: (a) differences in reported levels of violent crime (homicide, rape, aggravated assault, robbery) and drug arrests (possession, trafficking) in the US census tracts in which the neighborhoods lie; and (b) the first author's previous research experience in these five neighborhoods,

which we expected would facilitate family participation in the study. The five neighborhoods selected for study were predominately European–American. Two neighborhoods (Greenwood and Westown; all neighborhood and street names are pseudonyms) had a yearly average of 9.4 episodes of violent crime/drug arrests per 1,000 residents and were classified as having low violence/crime rates. Three neighborhoods (Blufton, Stockdale, and Mapleville) showed an average yearly rate nearly six times greater, 53.5 episodes per 1,000 residents, and were therefore considered as having elevated violence/crime rates.

2.1 Participant Eligibility Criteria

To be eligible for the study, children had to: (1) be 7–11 years old; (2) reside in the neighborhood for at least 2 months; (3) spend at least 50% of their time at the family home; (4) speak English and have at least one parent or legal guardian who speaks English. The age range of 7–11 years was selected because (a) children's most extensive use of and connection to the neighborhood may occur during middle childhood (Chawla 1992; Marcus 1992); and (b) restrictions on children's ability to circulate in their neighborhoods may be especially salient to children of middle-childhood age because their social networks are typically expanding beyond the immediate family (Belle 1989; Feiring and Lewis 1989). Criteria number 2 and number 3 were established to exclude children whose small amount of time spent in the neighborhood might have unduly limited their familiarity with the neighborhood. Language abilities of the first author precluded participation of non-English speaking children and parents. To increase the number of families participating in the study, only one child in the age range per household participated. If more than one child in the household was in the age range, then the child with the birth date closest to the date of study recruitment was asked to participate.

2.2 Recruitment Procedures

Door-to-door visits to all 1,541 households in the five study neighborhoods were conducted by the first author to determine if the household met the study criteria, and if so, to discuss the study with parents, assess eligibility, and, if the parent(s) and child agreed, to proceed with the study. A total of 125 households met the eligibility criteria, and just over one-third of these households ($n=44$, 35.3%) completed the study. Parents of 79 households (63.3%) refused, and two families dropped out before completion. The proportion of eligible households which declined to participate did not differ by neighborhood level of violence.

Because of the constraints of the recruitment procedure, it was not possible to systematically collect data about the reason for refusal or child demographic characteristics from households declining participation. However, anecdotal reports from some parents of children ineligible to participate and 11 study participants suggested that many parents' suspicion of persons they don't know personally led them to "err on the side of safety" and decline participation rather than expose their children to some type of risk. To increase the number of participants, an additional 16 children, mostly in the elevated-violence/crime neighborhoods, were recruited through flyers, public meetings, and referrals by

previous participants. These 16 participants did not differ demographically from children recruited through the systematic door-to-door visits and were, therefore, incorporated into the sample.

2.3 Informed Consent

Informed consent for parental and child participation was first obtained from parents. After receiving parents' consent, the first author met with their eligible child and described the study. Children were informed in age-appropriate language that (1) they could decline or terminate participation in the study at any time; (2) they could refuse to answer questions; and (3) their responses were confidential. Children were given school supplies to thank them for their time. Parents were given $10 for being interviewed. The study was approved by Case Western Reserve University's Institutional Research Board.

2.4 Procedures to Collect Neighborhood Boundaries and Home Range Data

2.4.1 Neighborhood Boundaries and Home Range According to Children

Information about the neighborhood was collected through two interviews with each child (see Spilsbury 2002a for additional details). The first interview utilized a modified version of Bryant's (1985) 'neighborhood walk' method, in which the child led the first author on a walking tour of the neighborhood and responded to a set of questions designed to generate discussion about the neighborhood's characteristics and child's helpseeking behavior. This method has been shown to be a reliable and engaging way to collect information about neighborhoods from children (Bryant 1985; Wolchik et al. 1989). As part of the discussion, children were asked if they knew what the word "neighborhood" means, and if so, to define it and then describe or show the physical boundaries of the neighborhood over the course of the neighborhood walk. Children were also asked questions to elicit their home range both alone and with a friend: "Where are you allowed to play on your own?" and "How about with a friend?" Similar to the boundaries of the neighborhood, children were able to point out the boundaries of their home range as they led the walk, and many did so. The typical duration of the neighborhood walk was approximately 1.25 h.

During the walk, children wore a small, unobtrusive pack at their waist containing a small tape recorder. The recorder was connected to a small, unobtrusive microphone clipped to the children's shirt or jacket. This arrangement allowed for the neighborhood walk to be recorded without restricting children's movement. All recordings were transcribed and transcriptions verified before analyses.

Approximately 10 days after the neighborhood walk, a second approximately one-hour interview was conducted with each child in order to obtain additional information about children's neighborhood perceptions, their social networks, and their exposure to neighborhood violence. The decision to conduct two interviews with each child (instead of collecting all data during the neighborhood walk) was made to reduce children's fatigue or waning interest in responding to questions. The second interview also provided opportunity to clarify children's neighborhood and

home range boundaries. Fifty-eight of the 60 children participated in this second interview (two children were lost to follow-up).

2.4.2 Neighborhood Boundaries and Children's Home Range According to Parents

Each parent (in one case a grandmother who was the legal guardian) participated in a one-hour interview to collect information about parents' perceptions of neighborhood danger, safety, resources, and parenting practices. To begin the interview, parents were provided with a commercial map of Cleveland and asked to draw the boundaries of what they considered to be their neighborhood. Parents were also asked two questions to elicit information about their children's home range: (1) "Parents all make different decisions about where their children can play. How far from home do you let your children play on their own?"; and (2) "How far from home do you let your children play if they're with a friend?" Interviews were conducted in participants' homes, except for one parent who preferred to be interviewed in a local fast-food restaurant.

Recruiting and interviewing took place in two phases. Phase I was conducted from May 1998 through December 1998, at which point the weather became too cold to conduct the neighborhood walk. Phase II began once the weather warmed, May 1999, and lasted until January 2000.

2.5 Construction of Neighborhood and Home Range Maps

Based upon the information supplied by children and their parents, six maps were created for child-parent pairs: (1) child's neighborhood boundaries; (2) parent's neighborhood boundaries; (3) home range when the child is alone, according to the child; (4) home range when the child is accompanied by a friend, according to the child; (5) child's home range when alone, according to the parent; and (6) child's home range when accompanied by a friend, according to the parent. Maps were created electronically in MapInfo (© 1992, MapInfo Corporation, Troy), a commercially available mapping software package. To create each map, the boundaries of the neighborhood or home range were electronically drawn upon a street map of Cleveland displayed in MapInfo. In ten cases, a complete set of the six maps was not possible because children did not know what the word "neighborhood" meant and/or could not describe its boundaries. Moreover, parents of three children indicated that their children did not have physical home range boundaries. Of note, these three children provided physical range boundaries, and these children's ranges were generally in the upper level (85th percentile) of the home ranges described by the entire sample. In one case, in which a complete set of maps was not collected, an 8 year-old boy was unsure about the boundaries of his home range when he was accompanied by a friend.

2.6 Study Variables

The maps described above were used to generate *Neighborhood and Home Range Parameters* and *Shared Space Proportion*. The parent interview was used to generate the child and family demographic variables of interest.

Neighborhood and Home Range Parameters The MapInfo program was used to calculate area and perimeter for the child and parent mapped shapes.

Shared Space Proportion To develop a measure of shared neighborhood space, we first superimposed each child's neighborhood map onto a map of the census blocks and calculated the number of children who endorsed each census block as being in the neighborhood. Next, we calculated the shared space proportion, which was defined as the percentage of census blocks endorsed by at least two children that were also endorsed by greater than half of child participants. We chose blocks endorsed by at least two children as the denominator for this measure in order to avoid situations where one child with a neighborhood much larger than his/her peers would add an inordinate number of blocks to the denominator and unduly affect the results. The shared space proportion could range from a score of 0 (no block that was endorsed by at least two children as being in the neighborhood was endorsed by 50% or more of the children studied) to 100 (all blocks endorsed by more than one child as being in the neighborhood were also endorsed by at least half of the children). A greater shared space proportion reflected greater amount of geographic space agreed upon by children as being located in the neighborhood.

Child and Family Demographic Information Parents completed a questionnaire that provided information about child age and sex, parent age and sex, family size and structure, length of residence in the current domicile.

2.7 Analysis

Means (SD) and medians (interquartile range) were calculated for neighborhood area and perimeter. Because neighborhood and home range distributions were not normally distributed, we transformed these distributions by taking the natural log of area and perimeter. Pearson correlation coefficients were calculated to determine associations between the logarithmically transformed size of children's and parents' neighborhoods. Paired t-tests were used to test (a) whether children's neighborhoods were significantly greater than those of their parents; and (b) the size of children's neighborhoods compared to their home ranges. Comparisons of parents' versus children's demarcation of children's home range boundaries have been previously reported (Spilsbury 2005a). Quantitative analyses were conducted with SPSS 13.0 (SPSS Inc., Chicago, IL).

To analyze qualitative data pertaining to children's definitions of a neighborhood, two of the study authors reviewed children's responses and developed a mutually agreed classification scheme of six themes or domains. Next, two research assistants not involved in developing the classification scheme coded children's responses according to the scheme. The inter-rater reliability (Cohen's Kappa coefficient) of this coding for each of the six themes was: people, $\kappa=.91$; activity, $\kappa=.70$; physical place, $\kappa=.72$; built aspect, $\kappa=.95$; institute/establishment, $\kappa=.65$; non-built neighborhood aspect, $\kappa=.79$. Discrepancies in coding were resolved by a third researcher prior to the analyses.

3 Results

3.1 The Sample

Sixty children (and a parent of each) participated in the overall investigation. The analytic sample for the study reported here consisted of the 50 child-parent pairs for whom neighborhood boundaries were available. Moreover, in each of the study neighborhoods, analyses of shared space were limited to children who lived in the same block group in order to try to keep residential location as constant as possible for the children collectively. This restriction limited the analysis of shared space to four of the five study neighborhoods: (n=10 children in Westown, n=13 in Greenwood, n=8 in Stockdale, n=5 in Blufton).

Demographic characteristics of the children, parents, and their families are presented in Table 1. Children's median age was 10.0 (Interquartile range, IQR, 8.0–11.0) and parents' median age was 36.5 (IQR=31.0–40.0). Most child

Table 1 Sample characteristics

	N (%) unless otherwise indicated
Characteristic	
Number of children–parent pairs	50
Age	
Children's age in years, median (IQR)	10.0 (8.0–11.0)
Parents' age in years, median (IQR)	36.5 (31.0–40.0)
Gender	
Girls	20 (40.0%)
Boys	30 (60.0%)
Mothers (includes one grandmother with legal custody)	44 (88.0%)
Fathers	6 (12.0%)
Ethnicity	
European–American children	35 (70.0%)
African–American children	5 (10.0%)
Hispanic children	5 (10.0%)
"Mixed" children	5 (10.0%)
European–American parents	39 (78.0%)
African–American parents	5 (10.0%)
Hispanic parents	6 (12.0%)
Household structure	
People in household, median (IQR)	5.0 (4.0–6.0)
Children in household, median (IQR)	3.0 (2.0–4.0)
Families containing parent with married or unmarried partner	40 (80.0%)
Families containing single parent living alone	10 (20.0%)
Family SES	
Median total family income level[a] (IQR)	$20,001–25,000 (<12.501–< 35,001)
Parent employed at least part time	41 (82.0%)
Parent completed high school	34 (68.0%)
Neighborhood residence	
Neighborhood w/ elevated violence	23 (46.0%)
Years residence in house or on street, median (IQR)	5.5 (2.0–12.3)

IQR interquartile range

[a] Parents identified which of a series of income levels included their total annual household income: (1) < $5000; (2) $5001–7500; (3) $7501–10,000; etc

participants (60%) were boys and most parent participants (88%) were mothers. Nearly three-quarters of child participants were European–American. Over three-quarter of families (80%) consisted of a parent living with a spouse or partner. The median number of children residing in the domicile was 3.0 (IQR=2.0–4.0). Median family income level was $20,000–25,000. Most participating parents were employed at least part-time (82.0%) and had completed high school (68.0%). Twenty-three of the child–parent pairs lived in neighborhoods with elevated violence/crime levels. The median length of residence in the current domicile was 5.5 (IQR=2.0–12.3) years.

3.2 Children's Definitions of Neighborhood

As part of the neighborhood walk, the children were asked what the word "neighborhood" meant to them. Most children (50 of 60) could define neighborhood and also identify its location. As seen in Table 2, children noted a range of attributes of neighborhoods that fell into six categories. The children's most frequently offered definition was neighborhood as a physical place ($n=27$), followed by the people that make up a neighborhood ($n=25$). Children also offered the kinds of activities engaged in as a definition of neighborhood ($n=10$). The non-built environment and institutions and establishments located in the neighborhood were mentioned by a small number of children ($n=3$ respectively). Children could offer multiple aspects of neighborhoods to answer this question. Children's answers ranged from the straightforward:

"like, someplace that you live,"

to multi-faceted responses, for example:

"a neighborhood is where people get together to do things or where they go. It's a place where friends come over and visit every day. A place that you go places like to restaurants."

"It's a place where people live. And there's buildings here."

Children's definitions did not show significant differences by gender, age, or neighborhood level of violence.

Table 2 Children's ($n=45$) definitions of neighborhood*

Category	N	%	Definition
Physical place	27	60.0	the place or street or block where you live, grow up; a place close to you
People	25	55.6	Friends, neighbors, people, relationships among people
Built aspects	16	35.6	parks, stores, buildings, houses
Activities	10	22.2	playing, shopping, riding bikes, where you go to do things
Institutions or establishments	3	6.7	school, store, restaurant, library
Non-built aspects	3	6.7	trees, streams, birds

*Because children could give more than one answer, total percentage >100%

3.3 Relationship of Children's Neighborhood Dimensions with Parents' Neighborhood Dimensions and Demographic Characteristics

Children's and parents' neighborhood parameters are presented in Table 3. For children, the median neighborhood area was 0.04 square miles with a median perimeter of 1.27 miles. As hypothesized, paired comparisons showed that children's neighborhood area and perimeter were significantly smaller than their respective parents' neighborhood dimensions (Table 3). The median area of children's neighborhoods was 11% that of their parents, and median perimeter was approximately 44% that of their parents.

As hypothesized, children's and parents' neighborhood dimensions were significantly correlated: for log of neighborhood area, $r=.35$, $p=.01$; for log of neighborhood perimeter, $r=.29$, $p=.04$. Family income level was positively correlated with the log of the area of children's neighborhoods ($r=.34$, $p=.02$) and the log of neighborhood perimeter ($r=.31$, $p=.03$). However, children's neighborhood dimensions did not differ significantly by child age, gender, neighborhood violence rate, or length of residence in the domicile (not shown).

3.4 Relationship of Children's Neighborhood Dimensions with Home Range

As hypothesized, children's neighborhood dimensions were positively correlated with their home ranges both alone and with a friend: for log of neighborhood area and log of home range area when alone, $r=.40$, $p=.004$; for log of neighborhood perimeter and log of perimeter of home range when alone, $r=.35$, $p=.01$; for log of neighborhood area and log of home range area with a friend, $r=.52$, $p<.001$; for log of neighborhood perimeter and log of home range perimeter with a friend, $r=.44$, $p=.001$.

Moreover, and as hypothesized, children's neighborhood dimensions (area and perimeter) were significantly greater than both home range alone and home range with a friend (Table 4).

3.5 Children's and Parents' Shared Neighborhood Space

Table 5 presents the shared space proportions of both children and their parents in the four study neighborhoods. A larger number indicates greater consensus about the

Table 3 Children's and parents' neighborhood dimensions ($n=50$)

	Child	Parent	T	p
Area (sq. miles)				
Median (IQR)	0.04 (0.01–0.10)	0.35 (0.22–0.74)		
Mean (SD)	0.11 (0.16)	0.73 (0.95)		
Log Mean (SD)	−3.14 (1.41)	−1.09 (1.49)	−8.695	<.001
Perimeter (miles)				
Mean (SD)	1.27 (0.70–2.01)	2.85 (2.15–4.07)		
Median (IQR)	1.44 (0.91)	3.53 (2.39)		
Log mean (SD)	0.14 (0.72)	1.04 (0.73)	−7.300	<.001

Table 4 Children's neighborhood and home range dimensions

	Neighborhood (n=50)	Range "Alone" (n=50)	Range "With a Friend" (n=49)	Neighborhood–home range "alone" comparison		Neighborhood–home range "with a friend" comparison	
				t	p	T	p
Area (sq. miles)							
Median (IQR)	0.04 (0.01–0.10)	0.004 (.001–.019)	0.01 (0.002–0.042)				
Mean (SD)	0.11 (0.16)	0.05 (0.12)	0.06 (0.13)				
Log mean (SD)	−3.14 (1.41)	−5.34 (2.21)	−4.45 (2.19)	7.437	< .0005	4.757	<.0005
Perimeter (miles)							
Median (IQR)	1.27 (0.70–2.01)	0.36 (0.14–0.87)	0.81 (0.22–1.43)				
Mean (SD)	1.44 (0.91)	0.68 (0.84)	1.0 (0.98)				
Log mean (SD)	0.14 (0.72)	−1.22 (1.53)	−.66 (1.52)	6.696	<.0005	4.060	<.0005

physical space considered part of the neighborhood. The proportions among both children and parents ranged widely across neighborhoods, from .10 (one-tenth of blocks shared by at least two individuals was shared by over half of individuals) to nearly .87 among the parents living in the Greenwood and Blufton neighborhoods, respectively. Generally, parents had a larger shared space proportion than their children, but this was not always the case: in Greenwood, the shared space proportion of children was three times that of their parents. The small number of study neighborhoods (n=4) precluded statistical analyses comparing children's versus parents' shared space proportions. Children's and parents' shared neighborhood spaces for each study neighborhood are described in greater detail below.

3.5.1 Blufton

The Blufton neighborhood (Fig. 1a) consists of a mix of residential and commercial areas that is criss-crossed by major city streets in both north–south (Apple St.,

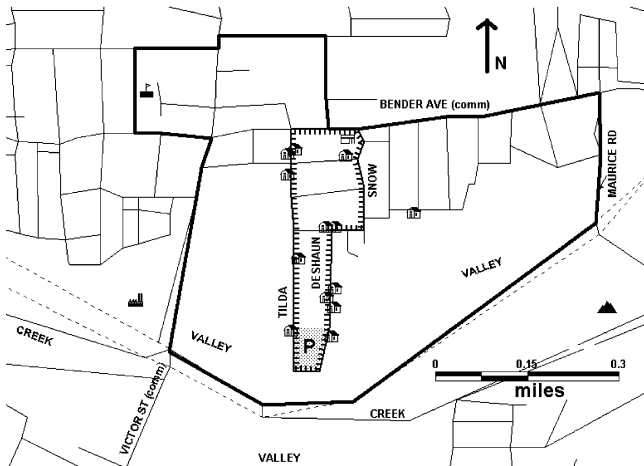**Table 5** Neighborhood shared-space proportions

Neighborhood	Shared space proportion*	
	Children	Parents
Blufton	.64	.87
Stockdale	.11	.66
Greenwood	.36	.10
Westown	.14	.27

*Equals the number of blocks shared by at least two children (or parents) that are shared by over half the children (parents) in the neighborhood

a
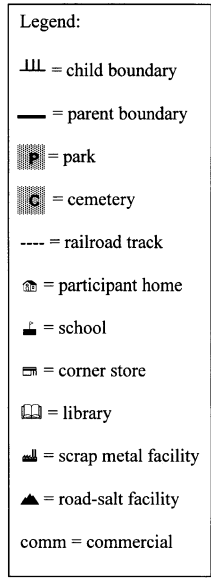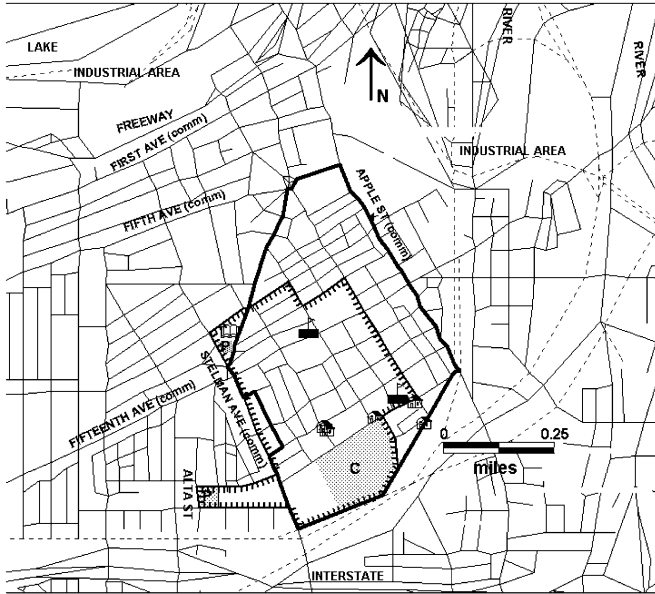
b

Fig. 1 Children's and parents' shared neighborhood spaces for Blufton (**a**) and Greenwood (**b**)

Stelman Ave) and east–west (First Ave, Fifth Ave, Fifteenth Ave) directions, as well as an east–west interstate highway. To the north, residential and commercial areas terminate at a freeway. On the other side of the freeway, the land, largely industrial, gradually drops to a large lake and is occupied by industries. To the east, a major north–south route lined with commercial enterprises lies (Apple St.), and beyond this route the land descends to a river valley lined with industries. The land to the west and south is mostly residential, with major streets forming the official boundaries

with other city neighborhoods. Active railroad tracks running east–west cut through the center of the neighborhood and a parallel set of tracks run in the northern part of the neighborhood. The Blufton neighborhood as defined by municipal authorities has a total of 306 blocks.

The children of Blufton had the largest shared space of the four study neighborhoods: 56 of the 94 blocks endorsed by at least one child were endorsed by at least two of the five children living in the Blufton block group. Thirty-six of these 56 blocks were endorsed by at least three of the children, resulting in a shared space proportion of .64. In other words, over 60% of the blocks endorsed by at least two of the children were endorsed by half or more of the children. Common areas included two municipal parks (one with a pool and skateboarding facility; the other with playground equipment), two public schools, a private school, public library, and a cemetery, which the children reported using as a playground.

Similar to the children, the parents of Blufton also had the greatest shared space proportion of any parents in the study neighborhoods: .87. In other words, 87% of the 84 blocks that were shared by at least two parents were shared by three or more parents. A total of 123 blocks were endorsed by at least one parent. To the north and east, the parents' shared space extended beyond that of their children to two major thoroughfares, Apple St. and Fifth Ave. To the south, both parents' and children's shared space terminated with the cemetery. Parents and children's shared space shared several sections of a major street, Stelman Ave. Of note, unlike the other study neighborhoods, portions of the children's shared space extended beyond that of their parents to include a public pool and adjacent park to the west (Alta St.), and, in the northwest, a small triangle of space that included the public library and small municipal park.

3.5.2 Greenwood

The greater Greenwood neighborhood consists of a mix of residential and commercial areas (Fig. 1b). Two major streets, the north–south oriented Victor St. and east–west oriented Bender Ave, cross within the neighborhood. The two streets are major commuter arteries and are lined with commercial enterprises: e.g., stores, gas stations, fast-food restaurants. Beyond the southern and eastern edges of the neighborhood, the land abruptly drops about 90 feet to a narrow valley below approximately .20 miles in width at its narrowest point. A small creek, active railroad tracks, scrap metal facility, and road-salt storage facility lie in the valley. Continuing southward, the land rises again to another study neighborhood. Greenwood has 126 blocks according to official boundaries.

In Greenwood, 14 of the 16 blocks endorsed by at least one child were endorsed by at least two children. Of these 14 blocks, 5 were endorsed by over half of the children ($n > 6$), resulting in a shared space proportion of .36. To the north, the children's shared space ends at Bender Ave and includes a corner store at the corner of Snow St. that was specifically mentioned by five of the children as a place to go for pop and other snacks. To the east and west, the boundaries of the shared space consist of two residential streets (Tilda and DeShaun) that terminate to the south at a playground and park. The land bordered by the two streets and park juts out like a finger over the valley below. Eleven of the thirteen children lived on the perimeter of

the shared space. The southernmost shared block, which contains the playground and park, was endorsed by all 13 children as being located in the neighborhood.

The shared space proportion for parents was .10 (21 of the 208 blocks endorsed by at least two parents were endorsed by over half of the parents) and was the smallest for parents of all four study neighborhoods. The parents' shared space extended beyond that of their children, and its boundaries included both major throughfares (Victor St. and Bender Ave). To the east, the shared space terminated at Maurice Rd., the last street overlooking the valley below, but parents' shared space descended down the hillside into the valley to the south and southwest. To the northwest, the parents' shared space included the local public school, which was attended by all the study children in this neighborhood.

3.5.3 Stockdale

The Stockdale neighborhood studied here is a mostly residential area with a small number of businesses (e.g., several restaurants, corner stores), many of which are located on a single street called Eagle (Fig. 2a). To the north, east, and south, the land slopes downwards to a large river valley, where several industries are located. The area to the west is a mix of residential and commercial space. The center of the neighborhood contains a large park and pool. Two main north–south thoroughfares (Vesta St., Gold St.) traverse the neighborhood, as well as two elevated interstates. One of the interstates roughly borders the neighborhood to the south. Stockdale has a total of 225 blocks.

Nine of the 11 blocks identified by at least one child were also endorsed by at least two children. Only one of the nine blocks was endorsed by at least half ($n>4$) of the children as being in the neighborhood, resulting in a shared space proportion of .11 (1/9). Of note, this one block, endorsed by six of the eight children, contained the local public elementary school and its adjacent playground. Although only one of the children's homes was located on the perimeter of the shared space, all the children attended this school and seven identified it as an important neighborhood feature.

Stockdale parents' shared space proportion was .66. The parents' shared space was larger than that of their children, extending in the north, east, and south to the streets bordering the industrial areas. Parents' shared space included the local library branch and, to the west, the large park and pool and terminated at the thoroughfares.

3.5.4 Westown

The Westown neighborhood is largely residential, crisscrossed by major streets (Gulf, Hilo, Silver, and Union) lined with numerous small businesses (stores, restaurants) and which handle a large amount of commuter traffic (Fig. 2b). A private hospital, local library, and two private elementary schools are located along Hilo. To the immediate south of the area where the children resided lies a large cemetery. A public high school abuts this cemetery. Westown contains 326 blocks.

Seventy-four blocks were endorsed by at least one child, and 43 of them were endorsed by at least two children as being in the neighborhood. Of these blocks, six were endorsed by over half of the children ($n>5$), resulting in a shared space

Fig. 2 Children's and parents' shared neighborhood spaces for Stockdale (a) and Westown (b)

proportion of .14. Unlike the other study neighborhoods, the blocks endorsed by over half of the children were not contiguous and were not characterized by any specific detectable feature. A private elementary school is located on one of these blocks, although none of the children reported attending it. The large cemetery served as the southern border for the children's shared space. Hilo St., a major thoroughfare, served as the eastern border.

The shared space proportion of Westown parents was .27. Parents' shared space extended beyond that of their children and was largely defined by major

thoroughfares: Gulf to the north, Hilo and Union to the east, and Silver to the west. Parents' shared space thus contained all the businesses on these streets, as well as the local library, the schools, and private hospital.

4 Discussion

This is the first study to our knowledge to systematically compare quantitative aspects of children's versus parents' neighborhood boundaries. Our main study hypothesis—that children's and parents' neighborhood dimensions would be correlated—was confirmed. However, the relatively modest size of the observed correlation suggests that children are not simply adopting their parents' views but are instead developing their own concept of the neighborhood.

Intuitively, it seems reasonable to think that a child's neighborhood dimensions are in some way related to that child's home range. And once again, per our hypothesis, they were related. However, the study results also showed that a child's neighborhood isn't merely where that child is allowed (or not allowed) to go. To a clear majority of children, the neighborhood was something bigger. This has important implications in neighborhood research involving children—one cannot equate home range with neighborhood boundaries.

Although all of the children's neighborhoods overlapped, the amount of shared space differed greatly across the four study neighborhoods. This suggests that the process of defining a neighborhood may depend on a constellation of factors; the degree to which every neighborhood is unique may mean that a unique combination of factors gives rise to a neighborhood's spatial boundaries. That said, particular resources' locations may be important in shaping neighborhood boundaries: in three of the four neighborhoods studied here, at least one specific resource (e.g., school, park, library) was located in the shared space. In the specific case of Stockdale, the only shared space was the block on which the elementary school is located, the school that all children attended and that most of the children identified as an important neighborhood feature.

From a methodological standpoint, residents' "shared" or "common" space has been used by investigators in the attempt to identify neighborhoods that more accurately reflect residents' construction of neighborhood than census tracts, zipcodes, and other administrative or census-defined areas. Our study results suggest that investigators need to be circumspect in deciding what a neighborhood is and how it will be defined: in this study, the shared space of parents and children was not equivalent. From a research perspective, investigators going out to collect data on the neighborhood may first need to decide whose neighborhood needs to be measured and why. The parent–child differences observed in our study suggest that in order to capture neighborhood qualities in neighborhood-effects research, care must be taken to identify discrepancies between neighborhoods as defined by children versus parents, and such discrepancies should be included in any analyses of neighborhood effects.

Study results also have implications for programs designed to improve neighborhoods for children and families. First, we cannot assume that locations to be targeted for "neighborhood improvement" are perceived equally by all

residents, even on the basic level of whether that location is considered part of the neighborhood. One suggestion is that efforts to improve the perceptions of a neighborhood might be most effectively perceived by residents collectively as "neighborhood improvement" if they occur in "shared space." If neighborhood improvement is to be visible, we need to know where residents will see it. The idea of shared space may well provide a clue to a potentially good area. For example, if officials wanted to implement neighborhood improvement activities to improve children's perceptions of the Stockdale neighborhood, then such efforts might be most effective (visible) in the shared geographic space containing the school, the space that all children considered part of the neighborhood. However, it is possible that less visible neighborhood improvements would also make a difference in child and adult perceptions of neighborhood. Future studies should query both parents and children as to the types and locations of neighborhood improvements or changes that they might see as positive, or also negative. We would not necessarily expect children and their parents to agree. For example, areas that might to the outside or adult eye appear inconsequential might be highly valued by children (Spilsbury 2002b).

Finally, with respect to child indicators, this study supports the contention that there are potential differences between adult and child perspectives. The development of neighborhood indicators for children has heretofore relied on neighborhood units defined by administrative agencies rather than by children themselves. Although standard units are a necessary and practical tool, the interpretation of neighborhood indicators for children should be tempered by the recognition that what is important to children may not fall within these defined boundaries. The mapping methods illustrated in this paper can be a useful tool for developing child indicators that capture the neighborhood context that is directly relevant to the children. Such child-centered neighborhood indicators are an important complement to the measures that are increasingly available for standard neighborhood units.

Study limitations should be noted. First, the sample size in terms of both neighborhoods and children was small, so study results may not generalize to the larger population of children in the study neighborhood or to other neighborhoods. Generalizability to larger populations and geographic areas remains a matter for future research. Second, the data were cross sectional in nature. Thus, the consistency and reliability of children's neighborhood boundaries are unknown. Third, although the study was able to successfully collect data about the spatial boundaries of children's neighborhoods, the study did not address in any way how children learn or decide what a neighborhood is, including its spatial dimensions.

In light of these limitations, our study results point to additional research needs. Future research should be conducted with larger samples of children, including children of different ethnicities. Data from such research might more adequately elucidate perceptions of neighborhood that more accurately reflect the larger population of children. Moreover, longitudinal research would permit investigators to gauge how children's perceptions of neighborhood change over time. Finally, future research should directly assess how and why children come to draw the neighborhood boundaries the way they do. Such information would

add to our theoretical understanding of how larger aggregates of the environment come to be defined.

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