Am J Community Psychol
DOI 10.1007/s10464-012-9550-6

ORIGINAL PAPER

How Big is My Neighborhood? Individual and Contextual Effects on Perceptions of Neighborhood Scale

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Abstract Neighborhood is a social and geographic concept that plays an increasingly important role in research and practice that address disparities in health and well-being of populations. However, most studies of neighborhoods, as well as community initiatives geared toward neighborhood improvement, make simplifying assumptions about boundaries, often relying on census geography to operationalize the neighborhood units. This study used geographic information system (GIS) tools to gather and analyze neighborhood maps drawn by residents of low-income communities in 10 cities. The median resident map size was approximately 30 percent smaller than the median census tract, but 25 percent of residents viewed their neighborhood as quite small (less than one-fifth of the typical census tract). Multi-level modeling showed significant within context variation in perceived neighborhood scale. Longer term residents with higher education and income and who were more engaged in the neighborhood held more expansive views. But there were also contextual influences with higher density and mixed use areas associated with smaller perceived neighborhoods, and higher collective efficacy associated with larger neighborhood sizes. Artificially imposed neighborhood units may misrepresent resident experience, but GIS tools can be used to craft more authentic neighborhood definitions for research and practice.

Keywords Neighborhood scale · GIS mapping · Community perceptions

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Introduction

Neighborhood is a social and geographic concept that plays an increasingly important role in research and practice that addresses disparities in health and well-being of populations. Research on neighborhood effects is burgeoning and an increasing number of efforts to ameliorate disparities in well-being are focusing on place-based initiatives. However, most studies of neighborhoods, as well as community initiatives geared toward neighborhood improvement, make simplifying assumptions about boundaries, often relying on census geography or political jurisdictions to operationalize the neighborhood units. Conversely, theories about how neighborhoods affect residents' well-being are seldom simple. Among the many pathways of influence, it is often assumed that social and psychological processes within the place are at work or that the impact occurs as residents interact with and make meaning of the surrounding context or environment (Sampson et al. 2002; Shinn and Toohey 2003). To the degree that neighborhood influence is predicated on residents' experience in, exposure to, or perceptions of the place they live, it is important to investigate the scale at which this occurs. If researchers and practitioners craft neighborhood units of a size that differs from residents experiences, this can result in measurement error, misspecification of models and practical problems of looking for results or impact in the wrong places.

This article addresses the question of scale using a unique data set of over 6,000 digitized maps that residents of 10 cities drew of their neighborhoods. The analysis is guided by the following questions: What is the variation among residents with respect to neighborhood scale and how does resident perceived scale compare with commonly used census geography? How do social and economic

Published online: 11 August 2012

characteristics of respondents affect perceived neighborhood size? How do physical and social characteristics of the surrounding context affect residents' perceptions of their neighborhood scale?

Background

The Problem of Neighborhood Definition and Scale

The problem of defining what is a neighborhood and the practical issue of specifying its boundaries for research or practice has received critical attention in recent years (Chaskin 1998; Downey 2006; Galster 2001; Messer 2007; Nicotera 2007). Conceptually, neighborhoods are not merely territory, but "social constructions named and bounded differently by different individuals." (Lee et al. 1994). Individuals have agency with respect to neighborhoods and carve their own activity space which does not map onto externally imposed geographic boundaries (Sherman et al. 2005). Moreover, individuals construct their sense of place and neighborhood fits into their social identity (Stedman 2002). Neighborhood boundaries as experienced are not static but often dynamic and contested, and social interaction shapes the meaning of places for individuals and groups (Gotham 2003). Residents can either embrace surrounding space or disavow parts of it (Gotham and Brumley 2002).

Even when they live in geographic proximity, it cannot be assumed that all residents experience place similarly. In particular, relative position in the social structure, such as that dictated by age, race, class or gender, may affect neighborhood evaluations (Burton et al. 1997; Campbell et al. 2009; Charles 2000; Krysan 2002; Sampson and Raudenbush 2004). Moreover, neighborhoods themselves may differ in the degree to which they are identifiable, such as whether they have naturally occurring boundaries, demarcations or commonly recognized neighborhood names (Taylor 1988).

Measuring Neighborhood Scale

Even though many researchers and practitioners acknowledge the importance of residents' experience of neighborhood, the fact is that the vast majority rely on artificial boundaries, mainly from the Census Bureau. Census tracts are geographic subdivisions of counties, designed for statistical purposes to be of similar population size and demographically and socioeconomically homogeneous. Yet there is little scientific evidence that such units are compatible with the views of residents. At a practical level, an important comparison point is how these units contrast with residents' sense of the geographic scale of neighborhoods and how neighbors' views vary from one another.

Only a few published studies have reported on the question of neighborhood scale as perceived by residents and findings are difficult to compare due to differences in the methods of quantifying the responses. Several studies have utilized ordinal scales of perceived neighborhood size. A study in Los Angeles asked respondents to choose from the following options to describe their neighborhood: (1) the block or street you live on (35.1 percent), (2) several blocks and streets in each direction (25.0 percent), (3) the area within a 15-min walk from your house (26.8 percent), or (4) an area larger than a 15-min walk from your house (13.1 percent) (Pebley and Sastry 2009). In Seattle, researchers asked open ended questions about neighborhood boundaries and coded the responses into an ordinal scale: (1) own residential unit or lot (0.8 percent), (2) own unit plus 1–5 additional units (4.2 percent), (3) own street block or cul-de-sac (14.3 percent), (4) area no more than one block in each direction (24.6 percent), (5) area larger than one block in each direction within a one-half mile radius (32.0 percent), (6) area greater than one-half mile in radius (18.6 percent). The remainder of respondents (5.4 percent) did not provide boundaries or defined their neighborhoods non-spatially (Guest and Lee 1984). Although these two studies are not directly comparable, after adjusting for non-respondents in Seattle, it appears that approximately 45 percent of Seattle residents describe their neighborhood as a block or less, as compared to 35 percent of Los Angeles residents.

Several other studies of perceived neighborhood scale have used continuous measures, but differences in how the data were gathered make them difficult to compare. A study in South Nashville asked survey respondents how many square blocks were in their neighborhood (Lee and Campbell 1997). This resulted in a continuous variable ranging from one to over 200 square blocks ($M = 14.8$, $SD = 28.6$). Researchers in Green Bay, WI had residents draw their neighborhood boundaries and landmarks on a blank piece of paper and then calculated the area by redrawing these pictures on a city map (Haney and Knowles 1978). The resulting estimates were quite small ranging from a median 0.0306 square miles for inner city residents to median 0.0753 square miles for outer city residents.

A few studies have used geographic information systems (GIS) tools to calculate the areas of resident drawn neighborhood maps. A study in Cleveland reported a mean neighborhood size of 0.32 square miles with a standard deviation of 0.15 (Coulton et al. 2001). That study also identified considerable variation in different parts of the city, ranging from the smallest size being 0.11 square miles ($SD = 0.10$) and the largest being 0.57 square miles ($SD = 0.78$). A comparative study in two different sections of Claremont, California examined perceived neighborhood scale before and after freeway construction. Within the freeway corridor, mean neighborhood size changed from 0.61 to 0.36 square miles after the freeway was built. Outside of the freeway corridor, mean neighborhood size changed from 0.50 to 0.89 square miles during the same 6 year period (Lohmann and McMurran 2009).

Factors Related to Perceived Neighborhood Scale

Some of the studies of neighborhood scale reviewed above also investigated how individual characteristics were related to perceived neighborhood scale. In Los Angeles (Pebley and Sastry 2009), marital status, race/ethnicity, income, employment status, and presence of relatives within one's neighborhood were found not to have a relationship with perceived neighborhood size. However, older adults, those with less than high school education, recent immigrants, and Spanish-speaking respondents perceived smaller neighborhoods, while individuals who were homeowners or had history of neighborhood connections perceived larger neighborhoods. This last result was found earlier in South Nashville (Lee and Campbell 1997).

Multiple studies evaluated the relationship between gender and perceived neighborhood size, with different findings including two that found no significant gender differences (Haney and Knowles 1978; Pebley and Sastry 2009) and one in which women perceived smaller neighborhoods than men (Guest and Lee 1984). The presence of small children in the family also showed inconsistent results, with one study finding the presence of small children to be related to smaller perceived neighborhood size (Guest and Lee 1984), but no relationship between these variables in another study(Pebley and Sastry 2009). Length of residence was found to have no relationship to perceived neighborhood size (Haney and Knowles 1978) or to have a negative relationship (Guest and Lee 1984; Pebley and Sastry 2009).

The effects of contextual characteristics on perceived neighborhood scale were evaluated in a few studies. The census tract was typically used to demarcate the context. No relationship was found between the rate of homeownership or the income composition of a neighborhood and perceived neighborhood size (Lee and Campbell 1997; Pebley and Sastry 2009). Residential stability, population density, vacant housing, and poverty rate were unrelated to perceived neighborhood size, while the size of the census tract was found to have a positive relationship to perceived neighborhood size (Pebley and Sastry 2009). Racial composition of neighborhoods was found to have no relationship to perceived neighborhood scale in South Nashville (Lee and Campbell 1997), but Los Angeles neighborhoods with large percentages of African Americans had residents that perceived smaller neighborhoods compared to residents of other neighborhoods (Pebley and Sastry 2009). Suburban residents perceived larger neighborhoods than did those in inner-city locations of Green Bay, WI (Haney and Knowles 1978).

Implications for Current Study

The preceding studies suggest that there is indeed variation among residents in their perceptions of neighborhood scale, but because of the dissimilarity of the methods that were used to calibrate neighborhood scale, it is difficult to draw any generalizations. Moreover, the findings about the predictors of neighborhood size are contradictory across these studies and this might have to do with the wide variation among the studies in how size was calibrated. The fact that each of the existing studies focused on a different city is another possible explanation for the contradictory findings. The current study attempts to reconcile some of these ambiguities by applying identical methods for measuring residents' perceptions of neighborhood scale in many neighborhoods across 10 different cities.

Additionally, the current study utilizes GIS methods to capture residents' perceived neighborhood size. That GIS tools may be a more reliable approach to calibrating perceived neighborhood scale than the qualitative and ordinal methods used in the majority of previous studies is suggested by the findings from the only two previous studies have used GIS based measures of perceived neighborhood scale (Coulton et al. 2001; Lohmann and McMurran 2009). The differences between the mean map sizes reported in these two studies are consistent with what would be predicted based on previous research showing that city neighborhoods are perceived as smaller than suburban and ex-urban neighborhoods (Haney and Knowles 1978). It appears, therefore, that the GIS methods used in the current study are promising with respect to providing comparable measures of scale that can be used across metropolitan areas and across studies without distortion. It should be noted, though, that cartographic maps do not directly correspond to individuals' mental imagery of a place (Lynch 1960), and individuals differ in their awareness of environments and the ability to represent them spatially (Downs and Stea 1973; Lloyd and Hooper 1991). Nevertheless, we anticipate that the evaluation of individual and contextual correlates of perceived neighborhood scale in this multi-city study will avoid some of uncertainties in the existing literature related to the varying methods of calibrating neighborhood size.

Hypotheses

This article examines whether attributes of the geographic context and individual characteristics are related to the residents' perceptions of neighborhood scale. As this is a multi-level study, there are hypotheses at both the contextual and individual levels. First, it is hypothesized that significant variation in perceived neighborhood size will be found at the contextual level, and that this variation will be at least partially explained by physical and social features of the setting. Second, we also hypothesize that there will be variance among individuals within contexts on perceived neighborhood scale and that this variance will be explained at least in part by their demographic and socioeconomic characteristics and their neighborhood experiences. Given the mixed results in the literature, our hypotheses regarding the effects of these contextual and individual differences are non-directional.

Methods

Data and Sample

The data for this study come from representative samples of households surveyed as part of Annie E. Casey Foundation's Making Connections (MC) program. Making Connections is a place-based initiative that seeks to improve outcomes for disadvantaged children by strengthening their families, improving their neighborhoods, and raising the quality of local services. The Making Connections work takes place in selected target areas of 10 cities (Denver, Des Moines, Hartford, Indianapolis, Louisville, Milwaukee, Oakland, Providence, San Antonio, and Seattle/White Center). The MC target areas were chosen through a deliberative process involving the Foundation and local representatives. Early in the initiative, local MC leaders specified the geographic boundaries of the target areas, taking into account historical, political and organizational factors. These local considerations resulted in MC target areas across the 10 cities that vary in size. Nevertheless, the question of how these places were perceived by residents was pertinent to the community mobilization and social network agenda set in all of the sites.

Data for this analysis come from the first wave (2002–2003) of household surveys conducted in the MC target areas in the 10 cities. The data were collected jointly by the National Opinion Research Center (NORC) at the University of Chicago and the Urban Institute. After obtaining informed consent, interviewers questioned residents in English, Spanish, and additional languages that were prevalent in the particular site. The samples for Making Connections survey were designed to give equal probabilities of selection to all households within each target area. In designing and selecting the samples, NORC used the procedures it developed for list-assisted probability sampling of households using as a basis the United States Postal Service (USPS) master list of delivery addresses (Iannacchione et al. 2003; O'Muircheartaigh et al. 2002). Geocoding software was used to map the addresses and field checks were made to confirm the validity of the lists. The sample design was directed at obtaining a representative sample of households and children in each target area. In households with children, a roster of all children in the household was compiled, and one child was selected at random; this child was designated the focal child. The selected respondent was the adult most knowledgeable about the selected focal child. In households without children, an adult was chosen at random. A total of 7,498 households completed interviews, representing a response rate of 69 percent.

Measures of Dependent Variables

The dependent variable for this study is perceived neighborhood scale. Neighborhood scale is derived from maps that residents drew of their neighborhoods during the survey interview. The interviewer presented each respondent with a GIS generated map that covered an area somewhat larger than the MC target area. The maps were printed on paper and displayed selected streets and key landmarks. To orient the respondent to the task, the interviewer pointed to the location of the respondent's home and read the following statement:

> "By neighborhood, I mean the area around where you live and around your house. It may include places you shop, religious or public institutions, or a local business district. It is the general area around your house where you might perform routine tasks, such as shopping, going to the park, or visiting with neighbors. Please take a look at this map of the area. Study it for a moment and use this pencil to draw the boundaries of what you consider your neighborhood."

By utilizing this set of instructions, the study could be said to be capturing an essentially behavioral view of neighborhood.

Most respondents ($N = 6{,}224$ or 83 percent) successfully completed the mapping task. The paper maps drawn by respondents were digitized by tracing the boundaries using GIS tools. The digitized maps were saved as shape files and then the census blocks encompassed by the map were identified (Coulton et al. 2011). For each map, we calculated the square miles and the total population residing there according to block level data from the 2000 census.

Measures of Individual and Household Level Independent Variables

Drawing from previous studies, we identified a number of individual and household predictors of the scale of residents' neighborhood maps. *Age* of the respondent was measured in years. *Gender* was a dichotomous measure where 1 = male and 0 = female. *Household with children* is a household including at least one child under 18 years of age. Respondents were asked the highest level of *education* they had completed. Responses were collapsed and coded into two categories where 1 = more than high school education and 0 = high school education or less. *Employed* is a dichotomous measure of the respondents' employment status (1 = employed, 0 = not employed). *Household income* was selected by the respondent from a set of ordinal categories, and then grouped into 0 = less than or equal to $30,000 per year and 1 = income over $30,000 per year. For measures of *race/ethnicity*, all respondents were asked to self-identify their racial or ethnic backgrounds. Respondents were first categorized as Hispanic or non-Hispanic. For non-Hispanics, they were then categorized as: White, African American, Asian/Pacific Islander, or other. We later collapsed Asian and other into a single category because of small group sizes. The race/ethnicity categories were then dummy coded and White was used as the reference group. *Foreign born* indicates that the respondent was born outside the United States. *Home ownership* was coded as 1 if the respondent owned or was in the process of buying the home and 0 otherwise. *Years in the neighborhood* was a continuous measure of length of time the respondent has lived in the community. *Neighborhood participation*, a variable capturing both formal and informal participation, was measured with the following survey question, "Over the past 12 months, have you volunteered or helped out with activities in your community?" *Fear of crime* was measured by a five item scale. Respondents were asked to rate on a seven-point scale (1 = strongly agree and 7 = strongly disagree), the following items: "My neighborhood is a safe place for children," "I feel safe at home at night," "I feel safe being out alone in my neighborhood during the day," "If someone were to stop me at night to ask directions, I would speak with them," and "Most criminal activity going on here is committed by people outside of the neighborhood." The reliability of this scale was calculated to be 0.70.

Measures of Residential Context Independent Variables

Census tracts were chosen as proxies for residential context and to represent physical and social attributes in the geographic area where the residents lived. Census tracts are geographic subdivisions of relatively uniform population size that are provided by the Census Bureau for the production of statistical data and are a convenient unit for data aggregation for this reason. The mean number of survey respondents per census tract was 48, with a range of 1–221. Only 6 of the tracts had fewer than 10 respondent households and we choose to retain all 130 census tracts in the study to enhance statistical power (Snijders and Bosker 1999).

Several measures of the surrounding context were also used as predictors of map scale. These measures include both physical and social characteristics of the area that might potentially affect how residents traverse and engage within the area. *Street connectivity* is a measure of street patterns within each census tract. The measure used within this study is the alpha ratio of street connectivity, which indicates the number of different routes available to travel from one location to another. A higher alpha score indicates higher connectivity. These data were gathered and analyzed based upon 2000 census information and GIS software (Escarce et al. 2011).

The presence of *mixed land use* in the area was derived from interviewer observations. Specifically, the interviewer noted the presence of businesses or institutions (such as hospitals) within one-half block (three hundred feet) of the respondent home. The interviewer also noted the presence of factories or other industrial structures within one-half block of respondent home. These two observations were combined into a dichotomous variable with a positive response to either of these observations indicating mixed land use. The presence of *physical disorder* was also derived from interviewer observations. Interviewers noted the presence of vandalized or abandoned buildings and the presence of trash or litter within one-half block of the respondent home. These two observations were also combined in a dichotomous variable with the presence of vandalism, abandonment, trash, or litter indicating physical disorder. The one-half block radius used in these observations was based on identical items in the National Housing Survey conducted annually by the Department of Housing and Urban Development.

Collective efficacy was assessed using measures introduced by Sampson, Raudenbush and Earls (Sampson et al. 1997). Respondents were asked to rate on a five point scale (1 = strongly agree and 5 = strongly disagree) a series of ten items. Respondents first evaluated the statement "I live in a close-knit neighborhood," then a series of items about "people in my neighborhood" on the following attributes: "willing to help neighbors," "generally get along with each other," "share the same values," "can be trusted," "would scold a child who was showing disrespect to an adult or acting out of line," "would do something about a child skipping school or hanging out on a street corner," "would do something about a child spray painting graffiti," "would do something about a fight," and "would do something about the closing of a fire station due to budget cuts." These individual responses were summed to provide a score for each respondent and then aggregated for each census tract. Each tract's mean score was used for the analysis. The individual level scale reliability was 0.74 and the aggregate (census tract) level reliability was 0.64.

All other neighborhood level variables were measures of neighborhood economic and physical structure and were taken from the 2000 US Census. *Poverty rate* is the percent of the population in households with income below the federal poverty threshold. *Population density* is calculated as population per square mile. *Vacant housing units* and *multifamily housing units* are the percentage of each found within each census tract.

Statistical Analyses

Our main approach to the analysis was to estimate a two-level hierarchical linear model (HLM) in order to examine both individual differences and contextual effects on perceptions of neighborhood scale (Raudenbush and Bryk 2002). Because the dependent variable was significantly right skewed, we utilized a log transformation. A handful of outliers with maps larger than 16 square miles were top coded for the analysis. The models were estimated in stages following a model building approach (Singer 1998). Step one was to estimate a fully unconditional or null model (i.e. a one-way ANOVA random effects model without any predictors) to determine the components of variance within and between contexts and to determine whether there was significant between-context variance (i.e. intraclass correlation). As there was significant variance at both levels, the next step was to add individual level independent variables to the level one model. Continuous variables were grand mean centered in this step. Third, we estimated a series of models to test whether there was variation in the regression coefficients (i.e. slopes) across contexts. Those individual level variables that had a significant estimated parameter variance were included as random effects, and those without significant variance in the slopes were fixed in all subsequent analysis. The fourth step was to add contextual level independent variables to the level two models. Finally, a slopes as outcomes model was estimated to determine whether there were any significant cross level interaction effects.

Results

Descriptive Results for Neighborhood Scale

The first research question focused on variation in residents' views of neighborhood scale and how they compared with census geography. The size of resident maps, measured in square miles, had a very large range, from 0.000001465 to 25.22, with a mean of 0.90 square miles (SD = 1.68). Given the extreme right skewness of this variable we focus on the median and interquartile range as presented in Fig. 1. It can be seen that the median map size was 0.35 square miles. The map size at the 25th percentile was 0.10 square miles and the 75th percentile map size is 0.98 square miles. For purposes of comparison, we show the median census tract size and the median census block size for the study sample. Since the study took place in city neighborhoods, there is not much variation in block and census tract size. It can be seen that the median census tract size is 0.51 square miles, about five times as large as the 25th percentile, one-third larger than the 50th percentile and half the size of the 75th percentile map. The median census block size is only 0.01 square miles, about one-tenth the size of the 25th percentile map and one-hundredth the size of the 75th percentile map. Translating these descriptive results into blocks, this suggests that the typical (i.e. median) resident map is approximately 30 census blocks.

Multi-level Modeling Results

The descriptive statistics for the independent variables in the models are presented in Table 1. The first section focuses in variables at the individual level. The typical respondent was in her early 40s (M = 42). Approximately half had children in the home under 18. Because the data were collected as part of a community change initiative, the typical respondent is relatively low income, has a high school education or less, has annual household income that is below 30,000 dollars and is classified as Hispanic (of any race) or non-Hispanic black. Approximately one-quarter are foreign born, and approximately 1/3 are homeowners. The average length of residence in the neighborhood was 10 years, approximately more than one quarter were active in neighborhood organizations, and the fear of crime scale was moderately high on average. With respect to contextual level independent variables, the census tracts represented in the study were relatively poor, densely populated, with considerable mixed land use and low-moderate scores on collective efficacy.

The results of the multi-level modeling are presented in Table 2. The fully unconditional or null model (Model 0) revealed significant variance in the residents' map sizes (log) at both the individual and the contextual level. The intraclass correlation coefficient was 0.26 suggesting that 26 percent of the variance in the residents maps sizes was at the contextual level.

Model 1 (see Table 2 column 2) added individual level explanatory variables to the model of the log of map size in square miles. The addition of these variables explained 6.4 percent of the between context variability and 4.2 percent of the within context variability. The age of the respondent had a negative effect on perceived neighborhood size ($b = 0.00163$, $p < 0.05$). Respondent age was also evaluated for the presence of a non-linear relationship

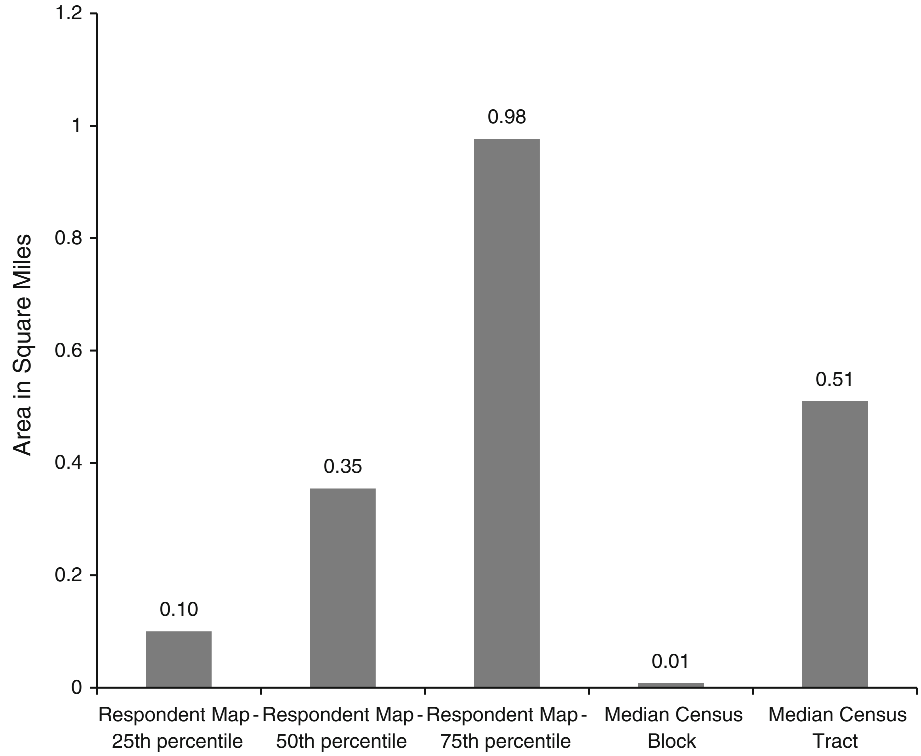

Fig. 1 Comparison of respondent perceived neighborhood size with administrative units

between age and perceived neighborhood size, but the relationship was linear. Families with children viewed their neighborhood as 6 percent larger than those without children ($b = 0.06085, p < 0.01$). Respondents whose education was beyond high school drew maps that were 8 percent larger than those who had a high school diploma or less ($b = 0.08481$, $p < 0.01$). Respondents whose income was greater than $30,000 viewed their neighborhood as 9 percent larger than those who earned $30,000 or less ($b = 0.08953$, $p < 0.01$). Years in the neighborhood had a positive effect on perceived neighborhood size ($b = 0.00416$, $p < 0.01$). Individuals who had history of neighborhood participation also perceived larger neighborhoods than those who did not by approximately 7 percent ($b = 0.07218$, $p < 0.01$). The remaining individual level variables in the model (i.e. gender, employment status, race or ethnicity, nativity, being a home owner and fear of crime) did not have a statistically significant effect on map size.

Model 2 (See Table 2, column 3) added explanatory variables at the contextual level. Relative to the null model, these variables explained 53.6 percent of variance among contexts (i.e. census tracts), and 4.8 percent of variance among individuals. Poverty rate had a positive effect on residents map size ($b = 0.00448$, $p < 0.05$). Population density ($b = 0.00001$, $p < 0.01$), rate of multi-family housing ($b = 0.00390$, $p < 0.01$) and rate of mixed land use ($b = 0.00594$, $p < 0.01$) all had a negative effect on perceived neighborhood size. Respondents who lived in a census tract with a higher mean collective efficacy score drew larger neighborhood maps ($b = 0.34270$, $p < 0.05$) than those who lived in a census tract with a lower mean collective efficacy score.

A final model was tested with slopes as outcomes to determine whether there were any cross level interaction effects between the individual and contextual predictors of resident map size. This model is not shown since none of these were statistically significant. To test the sensitivity of the model to the specification of the dependent variable, we also estimated a model using the log of population size in the residents' maps as the dependent variable rather than the area in square miles. There were no substantive differences between these two models, so this later model is not shown.

Discussion

This study is unique in that it measured residents' views of neighborhood scale across multiple contexts in 10 cities spread across the USA The application of GIS tools to gathering and analyzing resident drawn maps allowed comparable analysis of neighborhood scale across these locales.

The quantitative specificity of these results also allows a comparison with other published studies reviewed in the introduction. For example, the Los Angeles study that used an ordinal scale found that approximately 60 percent of respondents viewed their neighborhoods as a couple of

Table 1 Percentages, means, and standard deviations of individual/household and neighborhood predictors

	%/M (SD)
Individual level predictors	
Age in years	42.6 (16.1)
Male gender	34.4
Households with children	49.0
More than high school education	35.6
Employed	51.7
Income greater than $30,000/year	26.5
Race	
Non-Hispanic black	34.8
Hispanic	28.0
Other	12.8
Non-Hispanic white (reference)	24.4
Foreign born	25.2
Homeowner	34.4
Years in neighborhood	10.5 (11.4)
Neighborhood participation	27.9
Fear of crime	4.5 (1.3)
Contextual level predictors	
Poverty rate	33.2
Population density (per square mile)	9,790.0 (7,764.4)
Vacant housing units	9.6
Multifamily housing units	26.8
Street connectivity (alpha)	0.26 (0.07)
Mixed land use	56.5
Physical disorder	52.3
Mean collective efficacy	3.27 (0.21)

blocks in each direction or smaller (Pebley and Sastry 2009). The study in Seattle suggested a somewhat higher proportion reported neighborhoods as a few blocks or less. In this multi-city study, we find far fewer residents that see their neighborhood as so small. Only twenty-five percent of our respondents viewed their neighborhood as smaller than the approximate size of 10 census blocks, arguably similar to the ordinal category "a couple of blocks in each direction". The study evaluating neighborhood size in Green Bay, Wisconsin found perceived neighborhoods much smaller than those found within the current study (Haney and Knowles 1978). However, the fact that respondents in Green Bay drew boundaries and landmarks freehand on a blank paper makes those results rather incomparable to the current study in which respondents drew their neighborhood on GIS maps with pre-printed streets and major landmarks.

Comparing the results of the current study with previously reported neighborhood sizes using a similar GIS method and data collection technique, we find considerable similarity (Coulton et al. 2001; Lohmann and McMurran 2009). In particular, the Cleveland results which were also from central city locations showed quite similar measures of central tendency with respect to perceived neighborhood size. In Claremont, CA, the measures of central tendency are quite close to ours after the freeway was built in the study neighborhood. Taken together, these comparisons suggest that the method used to calibrate perceived neighborhood size matters, and that asking respondents to draw GIS maps will generally result in neighborhoods of larger size than will questions and answers on an ordinal scale or qualitative methods.

Another finding with implications for research and practice is the fact that residents within the same context vary considerably in their perceived neighborhood scale. The unconditional, multi-level model revealed that only 26 percent of the variance in perceived neighborhood scale was between contexts, suggesting considerable individual variation within contexts. The individual level predictors in the multi-level model demonstrate that individuals who have more education and income, who are younger and have lived in the neighborhood longer, and who are more engaged in their communities have more expansive views of the place they think of as their neighborhood. It is somewhat difficult to compare these findings regarding individual level predictors with previous research because only a few individual level predictors (gender, the presence of small children, and length of residence) were evaluated in more than one study prior to this research. The lack of relationship between gender and perceived neighborhood size is consistent with two studies (Haney and Knowles 1978; Pebley and Sastry 2009), while another study found a negative relationship between female gender and perceived neighborhood size (Guest and Lee 1984). The effect of longer residence within a neighborhood has had contradictory findings. The current study found that longer residence is related to a larger perceived neighborhood size, while earlier studies found no relationship (Haney and Knowles 1978), or a negative relationship (Guest and Lee 1984; Pebley and Sastry 2009).

The magnitude of the within context variation, though, should not be interpreted to suggest that contextual factors are not important in neighborhood definitions. In fact, the level two model explained more than half the between context variation in neighborhood size. The physical and built environment, represented by denser population, and more multi-family and vacant housing and mixed land use explained a portion of why neighborhoods were perceived as smaller. There may be more to take in within a smaller space or residents may be less inclusive of certain types of land use. The collective efficacy score for the neighborhood, which is an indicator of the ability of the neighborhood to work together, was associated with more expansive neighborhood definitions, perhaps consistent

Table 2 Multilevel models for resident perceived neighborhood scale (log of map size in square miles)

	Model 0 unconditional	Model 1 level 1 predictors		Model 2 level 1 and 2 predictors	
		Coefficient	95 % confidence interval	Coefficient	95 % confidence interval
Random effects					
Intercept (between-tract variability)	0.15400**	0.14420**		0.07141**	
Residual (within-tract variability)	0.43510**	0.41680**		0.41430**	
Intraclass correlation	0.26142				
Variance explained (relative to model 0)					
Between-tract variability	0	6.4 %		53.6 %	
Within-tract variability	0	4.2 %		4.8 %	
Fixed effects					
Individual characteristics (Level 1)					
Age		−0.00163*	[−0.00319, −0.00006]	−0.00172*	[−0.00327, −0.00016]
Gender male		0.01409	[−0.02869, 0.05686]	0.01568	[−0.02696, 0.05831]
Household w/children		0.06085**	[0.01514, 0.10660]	0.05296*	[0.00726, 0.09865]
Education					
More than high school		0.08481**	[0.04087, 0.12870]	0.08532**	[0.04153, 0.12910]
Employed		0.01435	[−0.02806, 0.05677]	0.01344	[−0.02882, 0.05569]
Income					
Income greater than 30 K		0.08953**	[0.03851, 0.14060]	0.09061**	[0.03975, 0.14150]
Race					
Non-Hispanic black		0.02995	[−0.03235, 0.09226]	0.02906	[−0.03391, 0.09204]
Hispanics		0.04033	[−0.02904, 0.10970]	0.02956	[−0.03990, 0.09902]
Non-Hispanic other		0.00557	[−0.07330, 0.08444]	−0.00196	[−0.08064, 0.07671]
Non-Hispanic white (reference)		0.00000		0.00000	
Foreign born		−0.03198	[−0.09123, 0.02728]	−0.01590	[−0.07504, 0.04325]
Homeowner		−0.02789	[−0.07760, 0.02183]	−0.04490	[−0.09474, 0.00495]
Years in neighborhood		0.00416**	[0.00209, 0.00623]	0.00408**	[0.00201, 0.00614]
Neighborhood participation		0.07218**	[0.02962, 0.11470]	0.07404**	[0.03163, 0.11650]
Fear of crime		0.00449	[−0.01084, 0.01923]	0.00235	[−0.01266, 0.01736]
Neighborhood characteristics (*level* 2)					
Poverty rate				0.00448*	[0.00020, 0.00876]
Population density (per square mi)				−0.00001**	[−0.00002, −0.00001]
% Vacant housing unit				−0.00933	[−0.01975, 0.00108]
% Multifamily housing unit				−0.00390**	[−0.00634, −0.00147]
Street connectivity (alpha)				0.24760	[−0.59830, 1.09340]
% Mixed land use				−0.00594**	[−0.00867, −0.00321]
% Physical disorder				0.00066	[−0.00241, 0.00372]
Mean collective efficacy score				0.34270*	[0.07141, 0.61400]
Goodness-of-fit					
−2 Log Likelihood	12,816.0	9,338.5		9,229.9	
Akaike's information criterion (AIC)	12,822.0	9,372.5		9,279.9	

* $p < 0.05$, ** $p < 0.01$, N = 6,224

with the idea that larger scale is associated with successful collective action. Surprisingly, after controlling for these factors, poverty rate had a positive effect on perceived neighborhood scale when it is generally believed that poverty reduces neighborhood connections and engagement, but it should be remembered that the areas represented in this study were all quite poor. The restriction of range on this variable may have led to results that are not generalizable and suggests that further research with economically diverse places is needed before drawing conclusions about the relationship between the context of poverty and perceived neighborhood scale. The other study that examined some equivalent contextual factors found no significant relationship between population density, poverty rate, or rate of vacant housing and perceived neighborhood size (Pebley and Sastry 2009).

This study has several limitations that should be noted. First, the focus was on low income urban communities, so the results will not necessarily apply to other types of places. Nevertheless, it would also be a mistake to assume poor neighborhoods are unique or more problematic than more affluent areas with respect to neighborhood identity and boundaries. Second, the mapping task itself is a source of some limitations. The instructions given to the residents imposed a behavioral definition of neighborhood, but it is possible that some residents would have been more comfortable with a cognitive or emotional definition. Moreover, there may have been individual variation in the ability to translate their perceptions of the neighborhood context into cartography. Third, the census tract was used to represent the surrounding context in the multi-level models. Data availability dictated this choice, but tracts cannot be assumed to accurately capture the relevant context in all instances. Finally, several of the measures, such as land use and physical disorder, were based on interviewer observations. With only one observer, it was not possible to establish inter rater reliability.

A main motivation for this study was the concern that a large amount of research and community practice tends rely on artificial definitions of neighborhood boundaries. Beyond revealing that a one-size-fits-all definition is likely to be a misspecification, this study suggests that collections of blocks may be better approximations for neighborhoods as experienced by residents than the commonly used census tract definitions. Historically, the reliance on census tracts has been due to the availability of data aggregated to this level, but GIS tools now allow point level data to be aggregated to more refined geographies for both research and action. Moreover, armed with resident drawn maps, it is possible to create unique neighborhood context measures for each individual or for various sub-groups of residents who live in proximity and have a common neighborhood view. Neighborhood definitions that take resident perceptions of boundaries and scale into account should provide more solid underpinnings than artificial units for both research and practice in the quest to understand and reduce place-based disparities in well-being.

Acknowledgments This research was supported by a grant from the Annie E. Casey Foundation.

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