Published in final edited form as:
J Aging Phys Act. 2007 October ; 15(4): 412–424.

Operationalizing Environmental Indicators for Physical Activity in Older Adults

Scott Strath,
Dept. of Human Movement Sciences, University of Wisconsin–Milwaukee, Milwaukee WI 53201-0413

Raymond Isaacs, and
Dept. of Architecture, University of Wisconsin–Milwaukee, Milwaukee WI 53201-0413

Michael J. Greenwald
Dept. of Urban Planning, University of Wisconsin–Milwaukee, Milwaukee WI 53201-0413

Abstract

This qualitative study describes environmental supports and barriers to physical activity in an older adult sample drawn from low- and high-walkable neighborhoods. Thirty-seven individuals age 55 and over were recruited and answered open-ended survey questions, with a subsample invited back to partake in a semistructured interview. Content analysis identified categories and themes linking perceptions of neighborhood-environment characteristics to activity. Emerging categories and themes did not differ across neighborhood walkability, so results are presented for both groups combined. Infrastructure was the most common category identified to encourage activity, specifically, well-maintained sidewalks, bike paths or lanes, and traffic control. Other categories of land use, landscape, and aesthetics were reported. Poorly maintained or missing sidewalks, crosswalks, bike paths or lanes, and traffic safety were categories that discouraged activity. In conclusion, the information obtained is helpful in solidifying which environmental characteristics are important to measure as they relate to activity behavior in an older adult population.

Keywords

exercise; neighborhood design; behavior

Over the last several decades convincing evidence has accumulated documenting the fact that regular physical activity reduces the risk of premature mortality and disability from a variety of conditions including coronary heart disease, diabetes, osteoarthritis, and selected cancers (U.S. Department of Health and Human Services, 1996). Despite the known benefits of regular physical activity, older adults are among the most inactive age group in society (Centers for Disease Control and Prevention, 2004). To promote physical activity in older adults and enable them to realize its associated health benefits, it is important that their immediate surroundings be amenable to encourage such behavior. For instance, is the built, natural, and social environment supportive for older adults to be more physically active? Walking is the most prevalent form of physical activity in older adults (Crespo, Keteyian, Heath, & Sempos, 1996), so environmental characteristics might directly influence walking behavior in this population subgroup.

There has been an emergence of quantitative literature examining the relationships between the built (i.e., presence of sidewalks) and social (i.e., risk of crime) environment and walking behavior in the general adult population (Frank & Engelke, 2001; Humpel, Owen,

& Leslie, 2002; Owen, Leslie, Salmon, & Fotheringham, 2000; Saelens, Sallis, Black, & Chen, 2003; Sallis, Bauman, & Pratt, 1998) and also specific to older adults (Fisher, Michael, & Cleveland, 2004; King et al., 2003; Li, Fisher, Brownson, & Bosworth, 2005; Michael, Beard, Choi, Farquhar, & Carlson, 2006). This literature is beginning to document the importance of destinations within walking distance as a key motivator for walking activity, suggesting that higher densities, greater connectivity, and mixed land use support walking activity (Handy & Clifton, 2001; Saelens et al.). Such documentation has led to new terminology to describe neighborhoods as, for example, high-walkable (high density, high connectivity, mixed land use) and low-walkable (low density, low connectivity, single land use; Saelens et al.).

To date, there have been limited focused qualitative studies examining environmental perceptions of older adults as they relate to physical activity behavior. The available qualitative literature has documented that older adults perceive local services (e.g., convenience stores, the presence of a mall), walking and traffic infrastructure (e.g., traffic volume and speed, the presence of sidewalks), neighborhood aesthetics (e.g., presence of parks and trees), and the availability of public transport to influence physical activity (Aronson & Oman, 2004; Lockett, Willis, & Edwards, 2005; Michael, Green, & Farquhar, 2006). There are currently only limited data on whether these perceptions differ by defined neighborhood walkability characteristics (i.e., low vs. high walkability). Further understanding these perceptions stratified by neighborhood design becomes important to solidify the perceived relationship between the environment and physical activity for this population. Such qualitative analysis allows for a contextual exploration of the complexity and breadth of perception (Denzin & Lincoln, 1994) and represents an important step in developing valid measures to test different a priori hypotheses examining linkages between the neighborhood environment and measured physical activity.

Accordingly, the primary purpose of this qualitative exploratory study was to determine perceptions of environmental supports for and barriers to walking and biking behavior in older adults. A secondary purpose was to evaluate whether perceptions differed by defined neighborhood walkability.

Methods

This study reports on open-ended surveys and semistructured interviews conducted with 37 individuals over the age of 55 years. Participants were recruited from four neighborhoods through targeted mailings between October 2004 and March 2005. Potential participants were identified through a direct-marketing company (CAS, Omaha, NE), using ZIP code and block group data and appending demographic data. Of the potential participants identified, a random sample was solicited in each neighborhood. This study was approved by the University of Wisconsin–Milwaukee institutional review board, and all individuals provided informed consent before participation.

Neighborhood Characteristics

Participants were randomly drawn from four neighborhoods in southeastern Wisconsin: the Village of Elm Grove (located in Waukesha County), the Village of Mequon (Ozaukee County), the Village of Shorewood, and the City of Milwaukee (Milwaukee County). Neighborhoods within these communities were identified, and data were obtained using 2001 orthophotography from the Southeastern Wisconsin Regional Planning Commission, the U.S. 2000 census block database and shape files, and ArcView 3.2a and ArcMap 9.0/9.1 geographic-information-systems software.

Two distinct neighborhood types were represented, low-walkable and high-walkable. Walkability was defined based on land use, connectivity, and housing-density measures (Saelens et al., 2003). Neighborhood characteristics are described in the Results section.

Low-walkable neighborhoods consisted mostly of single-family detached housing, with combination curvilinear and gridlike street patterns, numerous cul de sacs, longer block lengths, and commercial areas located external to the residential areas. The separation of land uses is consistent with standard post–World War II suburban development practices, as observed by Cervero (1989) and Calthorpe (1993).

In contrast, high-walkable neighborhoods had concentrations of high-density (i.e., more than four units per acre) single- and multiple-family residential structures integrated with nonresidential land uses and a predominantly gridlike street pattern with shorter block lengths, suggestive of greater connectivity. The definition of what constitutes “high density” environments is based on the criteria proposed by Calthorpe (1993) and Duany, Plater-Zyberk, and Speck (2000).

Orthophotographs (aerial photographs whose distortion has been corrected) were used to apply Saelens et al.’s (2003) walkability criteria, identifying regions of interest by street layout and degree of separation of land uses. Once the general communities were identified from the orthophotographs, census block information was overlaid to provide summary characteristics (e.g., housing stock composition and age) of each municipal block (or closest approximation) in the community, allowing us to focus on particular neighborhoods within each community. Finally, we verified the neighborhood classifications with field visits to each area.

Study Design

The 37 randomly recruited individuals stratified by low- (n = 16) and high- (n = 21) walkable neighborhoods answered a general health-history questionnaire to derive sample characteristics (i.e., ethnicity, overall good health, mobility limitations, active or inactive) and afterward answered open-ended survey questions inquiring about environmental supports and barriers to walking or biking activity (see the appendix). Of the original group a random sample of 12 individuals (low walkable n = 6: 3 men, 3 women; high walkable n = 6: 2 men, 4 women) were invited back to participate in the in-depth semistructured interviews to extend and confirm categories and themes identified from group open-ended survey responses. In-depth interview sessions lasted approximately one and a half hours and were led by the same trained moderator. The moderator used the same discussion guide throughout all sessions. Probes were used to further clarify environmental supports and barriers to walking and biking when needed. Physical activity and exercise were defined to participants before they answered any questions. Physical activity refers to any bodily movement that results in a substantial increase in energy expenditure, whereas exercise refers to a structured, repetitive body movement with an aim to maintain or improve cardiorespiratory fitness (Casperson, Powell, & Christenson, 1985). When needed, participants were given a broad definition of neighborhood, which constituted a boundary within a 15-min walk from an individual place of residence.

Data Reduction and Analyses

All open-ended survey responses were computerized and subjected to a content analysis to establish categories and themes spanning identified categories; further textual investigation was employed to quantify the number of occurrences within categories for comparative purposes (Silverman, 1993). The in-depth semistructured-interview sessions built on the open-ended survey questions, probing for further clarification and more in-depth responses,

using the same discussion guide throughout. All in-depth interview sessions were audiotaped and later transcribed verbatim. All transcribed interviews were also subjected to the same content and textual investigation as previously described. Categories, themes, and textual occurrences were first identified by one investigator (R.I.) and then corroborated by another (S.S.). Categories and themes identified were then further corroborated for accuracy by distributing findings to study participants and soliciting verification. Categorical responses were quantified via number of occurrences divided by total responses in a category. This textual investigation was carried out to establish the relative degree to which specific features encourage or discourage activity in a category. Similarly, comparisons across identified categories were made to identify which categories were of most concern to the participants regarding the neighborhood influence on walking and biking behavior. Categories and spanning themes identified were further examined for neighborhood-walkability and gender differences.

Results

Stratified across defined neighborhood design, the average age of individuals in the low-walkable neighborhoods was 64.1 ± 4.8 years, and the average age of individuals in the high-walkable neighborhoods was 62.8 ± 5.9 years. Most participants across defined neighborhoods were White and middle class (based on income and education; Krieger, Williams, & Moss, 1997), reported being in good health with no mobility limitations to walking, and reported being active on a weekly basis. Participant characteristics are shown in Table 1.

All participants had lived in their neighborhoods for 12–24 years, originally selecting their neighborhoods for features other than supporting physically active behaviors. Specific neighborhood characteristics stratified by low and high walkability are shown in Table 2.

Using the previously described data-reduction analysis techniques, we organized the responses to the open-ended questions and semistructured-interview questions (see the appendix) into categories and themes representing the physical and social environment. There were six categories identified, which were corroborated by multiple investigators and study participants. All study participants corroborated identified categories and themes. Overall categories identified included infrastructure, land use, landscape, aesthetics, and safety, plus an emergent theme of time. The category of infrastructure included the utilitarian elements of neighborhood environments that facilitate walking and cycling, such as streets, sidewalks, and trails. The category of land use included a variety of nonresidential-use types accessible to walkers or cyclists, such as retail, schools, and libraries. Landscape as a category included parks, water such as lakes and rivers, and areas with trees and other plants. The category of aesthetics included responses directly addressing the aesthetic qualities of the neighborhood, such as “nice houses” and “scenery.” Safety as a category included responses pertaining to safety from crime and harassment. A theme that emerged from content and textual analysis was time, with this theme spanning all identified categories. Time as a theme represented more availability of free time to potentially engage in physically active behaviors and having fewer time constraints and greater flexibility with scheduling. Categories and themes identified did not differ when stratified by defined low- and high-walkable neighborhood characteristics (data not shown), so results are presented for combined neighborhood characteristics. Categories identified did not differ based on gender stratification for infrastructure, land use, landscape, or aesthetics (data not shown) but did differ on safety. The emergent theme of time did not differ based on gender responses.

Categorical Environmental Supports for Physical Activity

Infrastructure—By far the most often mentioned physical features were in the category of infrastructure. Of all responses to the subset of open-ended questions, 54% were in this category. Within the category, the presence and maintenance of sidewalks, the design of streets with an emphasis on traffic control, and adequate and well-maintained bicycle lanes or trails were the most important physical features. This was corroborated from the in-depth semistructured interviews: “[With crosswalks and adequate time] it’s easy to get across the streets.”

A consistent response from survey and interview data in this category was an emphasis on separating and protecting walkers and cyclists from motorized traffic. Separate bike trails were very popular and appreciated for both cycling and walking: “Now we have wonderful biking facilities and path[s]…. I walk with a friend in the morning … it’s a 2-mile stretch.”

Land Use—Despite the emphasis on the category of land use in planning and active-living research, the participants did not mention features of this category as often as expected—only 9% of responses from open-ended surveys. When describing the encouraging features of their own neighborhood and the ideal features for “normal daily travel,” the percentage increased to 13% and 12%, respectively. Of the specific destinations given as important for walking and cycling, 54% of the responses were commercial uses; half of those included retail and one third entertainment such as restaurants. Parks, recreation, and natural areas accounted for 19% of the destinations. Institutions, primarily libraries and churches, accounted for 16%. The interviews placed more emphasis on accessible destinations and collectively highlighted the importance of being able to walk to a nearby convenience:

> This is nice, we can just walk out the door and go three blocks to [the store] and pick up something…. I mean there’s always convenience, restaurants, stores, and places to go … even in the dead of winter you can walk three blocks.

Landscape—Fourteen percent of all responses were in the category of landscape. All were of similar importance. From survey responses regarding normal daily travel, landscape features accounted for 15% of the responses. For pleasure or relaxation, the percentage increased to 27%. The importance of parks and greenways was discussed extensively in the semistructured interviews. Parks were frequently mentioned as destinations and as necessary facilities for recreation and sports, including specialized features such as tennis courts or multipurpose features such as trails, which are used for walking, running, cycling, and skiing. Parks were also important in individuals’ memories and place associations: “The first one I think of is the park. My father would come home … and we would go to the park.”

Parks were also socially significant for neighborhood identity and as gathering places. Organized activity in parks was seen as a way of including more individuals in both social and physical activity: “[The park organization] was born in the 1990s … so I’m over there every day…. It might be weeding, it might be nature walks, it might be for concerts in the summer, so there’s a purpose to go over there.”

Aesthetics—Only 5% of the total survey responses fell within the category of aesthetics. In-depth-interview responses centered on aspects that made walking and cycling more pleasant: “I like to see living things…. Tree[s] make you feel better … it just makes walk[ing] more pleasant.”

Social Environment—The broader role of the social environment in physical settings was addressed. Almost 62% of the participants from open-ended survey responses agreed that they would be more physically active if other physically active individuals were present.

Among the reasons given were a more positive social environment, a stronger sense of security, and that "[seeing others has a] psychological effect of encouraging others to do more."

Categorical Environmental Barriers for Physical Activity

Infrastructure—When a question pertained to the negative, such as features in their own neighborhood that discouraged walking or cycling or features in a less that ideal neighborhood, the percentage of survey responses to infrastructure increased to 73% and 67%, respectively. Survey and interview responses indicated that missing or poorly maintained infrastructure features are considered the strongest deterrent to walking and cycling. Participants discussed the negative impacts of traffic and the lack of well-maintained sidewalks: "[I'm] very nervous walking on the side of the road…. [The traffic] goes so fast … we have so much more traffic than we did 50 years ago." "[On poorly maintained sidewalks], you gotta be conscious of the fact that you might be tripping if you're not careful."

The lack of sidewalks was a consistent physical feature that emerged from the interviews as a barrier or discouraging factor to walking: "No sidewalks, you have to go in the street. It's not safe … so why would I want to walk?" Throughout there was also a focus on the need for more crosswalks: "I'd like to see more crosswalks; it would make it easier to get about safely. We're all taxpayers; we help[ed] pay for the road."

Land Use—Interview participants reinforced the view that a lack of convenient destinations is a deterrent to walking and cycling for utilitarian purposes: "In the location I was in where I grew up, I could walk to school, I could walk to church, I could walk to the library. I could walk everywhere, [now] you have to get in your car to go anywhere." "Probably the biggest barrier is a lack of purpose, to do something, [if things aren't close] you won't walk to them."

Safety (From Crime and Harassment)—Safety represented 7% of the total responses and increased to 9% when the participants were asked about discouraging or less than ideal features. Of the responses noted, only 12% were from men, with 88% stemming from women. Although perceived personal security was an issue reported more frequently by women, it was less important than expected. This might be because of the neighborhoods and participants included in the study. Safety was not a category that consistently emerged from the interview process, again likely a function of the neighborhood and sample.

Emergent Theme

Time was a theme that emerged from the survey and interview data, and it spanned all identified categories. This theme likely emerged largely because of the age of the participants, nearing retirement and beyond, in that they had more free time available to partake in physically active behavior. The average time for willingness to walk to a destination was 33.6 min, with most responses falling between 20 and 45 min. The average estimate for cycling was similar to that for walking, 33.4 min, with a similar range of responses. In the interviews participants explained that after retirement, time is less of a barrier; they have more time and more flexibility to do what they like to do: "Now I have enough time, so I can get on my bike and go to the library, and bike to church, or bike wherever I want to." Even if they have the time, however, if barriers are present the older adults are less likely to engage in an activity: "[Even with time] the absence of sidewalks, high traffic … I won't walk, why would I?"

Discussion

Our overall results suggest that older adults believe that neighborhood environment features can either support or act as a barrier to walking and biking activity. The use of both open-ended surveys and semistructured in-depth interviews revealed key supports and barriers to walking and biking for an older adult population. Key supports included the need for well-maintained, hazard-free sidewalks with crosswalks that were sufficiently separated from motorized traffic. Accessible destinations along with sidewalks were reemerging categories throughout. Although it was not as frequently mentioned, many older adults in this sample also spoke of the serene aspects of pleasant aesthetics' increasing the likelihood of their engaging in walking or biking activity. Another finding from this qualitative study was that categories and themes identified did not differ based on defined low- and high-walkable neighborhood characteristics. This would suggest that irrespective of the neighborhood in which one resides, environment neighborhood features identified as either encouraging or discouraging to walking and biking activity do not change.

Overall results support prior qualitative research findings. For instance, Lockett et al. (2005), using a photo-prompt approach in a sample of 22 seniors (mean age >70 years), found environmental barriers to walking to include categories of traffic hazards and fall hazards. The category of traffic hazards pertained to busy intersections, insufficient time to cross streets on designated crosswalks, and speeding traffic. Fall hazards largely pertained to sidewalks' intensifying fall risk by being uneven and poorly maintained. Participants in the current study identified barriers to walking that included the lack of well-maintained sidewalks, with difficulty to traverse uneven sidewalks seen as increasing the risk of falling or stumbling. This, along with facilitating a safe distance from fast-flowing traffic, appeared particularly pertinent as a barrier to walking in the current sample. This facet might be more important depending on an individual's age and also physical ability. Environmental obstacles including uneven sidewalks can be particularly problematic for some older adults with physical disabilities. Further work qualifying neighborhood environment supports and barriers to walkability by functional ability would be particularly informative.

The environmental barriers to walking identified here have also been reported by others (Michael, Green, & Farquhar, 2006). Michael, Green, and Farquhar used focus groups to reveal key themes illustrating how neighborhood design influences active aging in a sample of 60 older adults (mean age 69 years, range 56–84). Key categories emerged from their study representing both barriers and supports and included amenities and services to which one could walk, pedestrian and traffic infrastructure, neighborhood attractiveness, and adequate public transportation. Such findings largely coincide with the current study's results, although in the current study, a dominant category of public transportation did not emerge.

In addition to physical neighborhood environment features discussed, limited social factors also materialized from survey and interview responses from the current study. Safety from crime and harassment was a minor aspect that surfaced, and it was mostly reported by women. Other qualitative studies in older adults have not consistently reported on categories of social relevance, especially as they pertain to crime (Aronson & Oman, 2004; Lockett et al., 2005; Michael, Green, & Farquhar, 2006). Interpretation of such data is limited to those of a higher socioeconomic status. Although this category was not dominant throughout the current findings, and appears limited to crime only, it warrants further consideration because it is likely to depend on specific neighborhood and socioeconomic status and might be gender specific.

An interesting theme of time materialized and spanned identified categories in the current study. Older adults, particularly retirees, alluded to the notion of having more time to engage in pleasurable or purposeful activities such as walking to get to and from places. Irrespective of time, if physical barriers were present, participants noted that they were less likely to engage in active behaviors. Further investigation into the theme of time would be informative as it relates to environmental influences on walking and biking activity. For instance, with time available individuals might be more prone to select a scenic route to a destination, therefore choosing a route based on both time and aesthetics.

Although valuable information was obtained by seeking perceived neighborhood environment supports and barriers to walking and biking activity specific to an older adult population using qualitative methods, this study is subject to limitations that warrant comment. Results obtained are confined to the characteristics of this relatively small sample of predominantly White, middle-class older adults. As such, generalizability is limited. Data collected were also confined to one season, so whether barriers or supports to walking and cycling activity have a seasonal effect could not be determined. Data collected were also limited to a nonrural sample, further limiting generalizations.

In summary, qualitative studies contribute to our understanding of factors influencing walking and biking behavior, and the current study extends the literature on neighborhood environment supports and barriers to such activities specific to an older adult population. Understanding the role that perceived neighborhood context plays in active aging through older adults' eyes has important inferences for developing quantitative assessment tools and hypotheses relating objectively determined environmental characteristics to measured physical activity levels. Overall, categories identified conform to previous literature, corroborating selected infrastructure, land-use, landscape, and aesthetic characteristics' being related to active living. Our findings suggest that older adults believe that their physical and social surroundings influence physical activity irrespective of whether they reside in a low- or high-walkable neighborhood.

Acknowledgments

This work was supported by a grant from the Robert Wood Johnson Foundation Active Living Research program, as well as a Career Development Award from the National Institute on Aging (K01AG025962). The authors would like to thank Nora E. Miller, Janet E. Laatsch, Andre Harwell, and Nicholas Davis for data-collection assistance.

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Appendix: Open-Ended Survey Questions and In-Depth Semistructured Interview Guide

Open-Ended Survey Questions

1. Which destinations would you walk or cycle to if they were available in your neighborhood?
2. How many minutes are you willing to walk or cycle to one of these destinations?

3. Do you think that your neighborhood is a good neighborhood for walking and/or cycling? Please list all encouraging or discouraging features.
4. In an ideal neighborhood environment for walking and cycling, which physical features support or encourage walking and/or cycling as part of normal daily travel? Please be specific when listing features.
5. In an ideal neighborhood environment for walking and cycling, which physical features would encourage you to walk and/or cycle for pleasure and relaxation? Please be specific when listing features.
6. In a less than ideal neighborhood environment for walking and cycling, which physical features discourage walking and/or cycling as part of normal daily travel? Please be specific when listing features.
7. Would the presence of other individuals engaged in physical activity in your neighborhood encourage you to be more physically active or less than if no other individuals were present? Please explain your answer.
8. How would you change your own neighborhood to make it a better place for walking and cycling?

In-Depth Semistructured Interview Guide

1. a. What do the words *physical activity* mean to you?

1. b. What does the word *exercise* mean to you?

2. a. What do the words *physical environment* mean to you?

2. b. What do the words *social environment* mean to you?

3. a. How long have you lived in your neighborhood?

3. b. Why did you choose to live in your neighborhood?

4. a. In which other neighborhoods have you lived?

4. b. How long did you live in each of those neighborhoods?

5. a. Did you walk or cycle in any of those neighborhoods in which you lived, for transport or for recreation?

5. b. Comparing all of the neighborhoods in which you have lived, which ones do you think were the best for walking and cycling?

5. c. Which physical features do you think encouraged or supported walking and cycling the most?

5. d. Which physical features do you think discouraged you, or acted as a barrier, for walking and cycling the most?

6. a. Did you exercise other than walking or cycling in any of the neighborhoods in which you lived?

6. b. Comparing all of the neighborhoods in which you have lived, which ones do you think were best for exercising?

6. c. Which physical features encouraged or supported exercising the most?

6. d. Which physical features do you think discouraged you from, or acted as a barrier to, exercising the most? Other than walking or cycling.

7. Is there anything else you would like to add regarding the relationship between physical activity and neighborhood environment?

Table 1

Participant Characteristics

	High-Walkable Neighborhoods				Low-Walkable Neighborhoods			
	A (*n* = 9)		B (*n*= 11)		C (*n*= 9)		D (*n* = 8)	
Characteristic	**Men (*n* = 4)**	**Women (*n* = 5)**	**Men (*n* = 4)**	**Women (*n* = 7)**	**Men (*n* = 4)**	**Women (*n* = 5)**	**Men (*n* = 4)**	**Women (*n* = 4)**
Age (years)	63.4	62.8	61.1	64.4	64.9	65.3	62.1	64.5
Income range ($k)	40–45	40–45	35–40	40–45	45–50	35–40	40–45	40–45
Completed college/university	75%	80%	50%	71%	100%	20%	75%	75%
Physically active	75%	80%	100%	100%	100%	80%	75%	100%
In good health	75%	60%	100%	100%	75%	80%	100%	50%

J Aging Phys Act. Author manuscript; available in PMC 2010 April 26.

Table 2

Neighborhood Characteristics

	High-Walkable		Low-Walkable	
	Urban Form			
Street pattern	Merging grids	Grid	Curvilinear	Irregular/mixed
Pedestrian infrastructure	Sidewalks with buffers	Sidewalks with buffers	No sidewalks	No sidewalks
Average block size	4.45 acres	5.24 acres	15.09 acres	23.09 acres
	Housing Density			
Total area (acres, measured at census block level)	106.9	104.9	513.1	623.6
Total housing units in local study area (measured at census block level)	1,547	1,233	511	421
Net housing density (units/acre)	14.47	11.74	0.99	0.67
	Land Use			
Commercial centers	Integrated node[a]	Integrated linear[b]	External[c]	External[c]
Time to commercial centers[d]	<5 min	<5 min	>15 min	>15 min

[a] *Integrated* refers to the combination of residential high density (i.e., 4 units/acre or higher) and compatible nonresidential land uses in close proximity; see Calthorpe (1993); Duany, Plater-Zyberk, and Speck (2000); and Cervero (1989).

[b] *Node/linear* refers to whether or not the area in question serves as a final activity destination (node) or as a travel conduit that is intended only for temporary occupation (linear). The designations are consistent with the spatial taxonomies proposed by Lynch (1960).

[c] *External* refers to the strict separation of incompatible land uses. Commercial centers in external environments are strictly separated from residential land uses, often with large buffers in between.

[d] Estimated as an approximate time based on walking at 3 mph from various locations in each neighborhood.