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GREEN COMMON SPACES AND THE SOCIAL INTEGRATION OF INNER-CITY OLDER ADULTS

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ABSTRACT: For older adults, social integration and the strength of social ties are profoundly important predictors of well-being and longevity. Can the physical environment be designed to promote older adults' social integration with their neighbors? We examined this possibility by testing the relationships between varying amount of exposure to green outdoor common spaces and the strength of ties among neighbors. Results of interviews with 91 older adults (between the ages of 64 and 91 years) from one inner-city neighborhood show that the use of green outdoor common spaces predicted both the strength of neighborhood social ties and sense of community. Although the strength of these relationships were modest, the findings suggest that the characteristics of outdoor common spaces can play a role in the formation and maintenance of social ties among older adult residents of inner-city neighborhoods. The results have implications for designers, managers, and residents of housing developments.

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Social relationships are important to individuals in all cultures and across the entire human life span. Social ties are especially important for elderly people. Elderly individuals with strong social connections have lower levels of mortality (Engedal, 1996; Sabin, 1993; Steinbach, 1992), reduced suicide rates (Durkheim, 1897/1951; Lester & Moksony, 1994), less fear of crime (Eve & Eve, 1984; Lee, 1983), and better physical health (Hughes, 1994; Pilisuk, 1982). In addition, elderly people with stronger social ties have significantly higher levels of psychological well-being (Allard, Allaire, Leclerc, & Langlois, 1995; LaGory & Fitzpatrick, 1992; Mullins & Dougan, 1990; Pellman, 1992; Roberto, 1992). Although social ties in general are critical for older adults, community ties (i.e., shared feelings of belonging, support, and unity within a community) are also important for older adults' well-being.

Neighborhood community ties are important for elderly people in a number of ways. For instance, close attachment to community has been shown to be related to older adults' life satisfaction (Woode, Monano, Cernak, & Irannon, 1979). Community ties are also associated with shared emotional connections with neighbors and better resource exchange among institutionalized elderly individuals (Coppola, Feldheim, Kennaley, & Steinberg, 1990). Another measure of the importance of community ties for the elderly is the cost of losing those ties. Losing community ties can have significant consequences, including social isolation, depression, illness, and early death (Llewellyn, 1981). Older adults who lose their connection to their cultural community often suffer limited integration in their new community and have poor physical health (Hall, 1993). In short, both social and community ties are important to elderly adults' well-being.

Although social and community ties are clearly important for elderly individuals, many elderly people live in settings that restrict the development of social relationships. Many elderly people live in inner-city environments where developing neighborhood social and community ties can be a special challenge. One aspect of the inner-city milieu that is likely to affect elderly

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peoples' social relationships is the physical environment. Physical settings influence older adults' social interaction in part because elderly individuals are more sensitive to environmental variation than younger people (Lawton & Simon, 1968). In fact, environmental characteristics, such as community size, building size, and building height, were better predictors of elderly individuals' social integration than were personal characteristics (Lawton, Nahemow, & Teaff, 1975).

How might the social relations of inner-city elderly individuals be influenced by the physical environment? This article briefly reviews the literature regarding the impact of physical environments on relations among neighbors. We then propose a model to explain these effects and propose a specific feature of the physical environment that might affect social relationships of elderly individuals. Finally, this feature is tested in the context of an inner-city setting—public housing in Chicago.

OLDER ADULTS' SOCIAL AND COMMUNITY TIES IN INNER CITIES

For several reasons, it is especially interesting to investigate the social relations of older adults in the inner city. First, nearly three quarters of older Americans live in metropolitan areas, and almost one third live in densely populated central cities (American Association of Retired Persons, 1994).

Second, due in part to older adults' restricted physical mobility, they are more likely than younger people to remain in their neighborhood. Although most individuals today have social and community ties that extend far from their homes, inner-city elderly individuals often have few resources to develop or maintain social and community ties that are far from their homes. As a consequence of this limited mobility, they often become "block bound" and thus must rely on nearby neighbors and their neighborhood to support their needs (Carp, 1976).

Finally, there is evidence that elderly individuals living in inner cities experience comparatively lower levels of social interaction. For instance, compared to elderly individuals living in suburban areas, elderly people in inner cities are more likely to be socially isolated (Faris & Dunham, 1960). In a recent study, elderly men living in central cities were shown to have narrower social networks and were involved in fewer informal and recreational activities than those living in nonmetropolitan or suburban areas (Reitzes, Mutran, & Pope, 1991). Elderly individuals in large urban communities are also less likely to be involved with friends or to participate in a variety of organized social activities (Lawton et al., 1975). Lower levels of participation in neighborhood social activities in cities might be due to one or a number of environmental features.

THE ENVIRONMENT AND SOCIAL INTEGRATION

A number of environmental features work against the formation of older adults' social and community ties. Noisy, dilapidated, and high-rise environments are associated with social withdrawal and have been shown to discourage elderly people from establishing social relations with their neighbors.

The negative effects of noise on social relations are well established for individuals in various age groups. Young people in noisy environments are less likely to respond to interpersonal social cues (Cohen & Lezak, 1977) or to help others (Mathews & Canon, 1975). Noise affects elderly individuals' ability to build relationships with others. For example, elderly people's ability to hear lessens with age, making it more difficult to carry out conversations in noisy settings. Among older individuals, one consistent reaction to not being able to hear adequately is to withdraw from social settings (Carp, 1976).

Dilapidated physical environments also discourage older adults' interactions with others. Faris and Dunham (1960) found that social isolation was more common in dilapidated, run-down areas than in well-maintained areas within Cook County, Illinois. Deteriorated living environments were also related to distrust of others; older adults who distrusted others had fewer social interactions than those who were more trusting (Krause, 1993). Although older adults' friendships were most negatively affected by financial strain, the physical deterioration of the neighborhood had a significant negative linear relationship with friendships after controlling for age, sex, and education level (Krause, 1996).

Building height is another physical characteristic that influences older adults' social interaction. After controlling personal and other environmental conditions, elderly people who lived in high-rise public housing buildings were less likely to venture into their neighborhoods than those who lived in low-rise public housing buildings (Lawton et al., 1975). Heller, Byerts, and Drehmer (1984) further investigated older adults' actual social contacts with other individuals. They found that building height was negatively associated with elderly residents' sociability in public housing.

In summary, noisy, dilapidated, and high-rise living conditions discourage older adults' social interaction and are each related to older adults' withdrawal from nearby residents. Sommer (1966) called such settings *sociofugal.* As Sommer suggested, however, other settings can actually encourage older adults to develop social ties with their neighbors. He called these settings *sociopetal.*

Sociopetal settings facilitate social interaction. Indoor and outdoor common spaces are one type of sociopetal setting that has been shown to support social ties among older individuals. Having access to transient public spaces

(e.g., halls and vestibules) was positively correlated with social activities among elderly public housing residents (Heller et al., 1984). Congregated elderly housing residents were more likely to engage in social behaviors than traditional housing residents due to their greater use of public spaces (e.g., central dining rooms, lounge areas) within their facilities (Stephens & Kinney, 1983). Elderly residents of high-rise buildings viewed the common spaces (e.g., lounges, outdoor common spaces) as good places to meet and talk with others (Carstens, 1982). Other outdoor areas (e.g., spaces in front of building, parks, open spaces) were also used by inner-city elderly residents as places to sit and talk with neighbors (Cantor, 1975). In short, common spaces are places in which elderly residents make contacts with their neighbors and possibly develop supportive relationships with them. How is it that common spaces support the development of relationships among neighbors?

Casual social relationships have been shown to develop when there are opportunities for individuals to have informal face-to-face contact (Ebbesen, Kjos, & Konecni, 1976; Festinger, Schachter, & Back, 1950). Neighbors who have frequent face-to-face contact have been shown to form and maintain social ties (Greenbaum, 1982). After neighbors experience repeated day-to-day visual contact, some become acquaintances and engage in social activities. These acquaintanceships sometimes develop into friendships. In this way, by providing neighbors the opportunity to have repeated face-to-face contact with each other, common spaces play an important role in the development of social ties among neighbors.

ARE COMMON SPACES ENOUGH?

The mere presence of common spaces seems not enough to promote social ties. In inner-city settings, outdoor common spaces are too often urban deserts—barren, uninviting, and uncomfortable (Coley, Kuo, & Sullivan, 1997; Kuo, Bacaicoa, & Sullivan, 1998). A line of work conducted in our lab suggests that one of the most important features of outdoor common spaces, a feature that may promote the development of social ties, is the presence of trees and grass (Kuo, Sullivan, Coley, & Brunson, in press). A number of studies lead to this conclusion.

First, the presence of trees and grass is related to residents' preference for outdoor common spaces, and their preference is one important predictor of the use of outdoor common spaces. Recent work has shown that inner-city residents dislike and fear barren, treeless common spaces but that the addition of trees and grass is enough to dramatically change their preferences to those spaces—from spaces they did not prefer and would not use to spaces they prefer and would use (Kuo et al., 1998).

Second, the presence, number, and location of trees strongly predicted the amount of time that inner-city residents actually spent in outdoor common spaces (Coley et al., 1997). The presence of trees in two inner-city neighborhoods consistently predicted greater use of outdoor spaces by youth and adults as well as mixed-aged groups of youth and adults. Moreover, the greater the number of trees found in a space, the greater the number of people who used the space at the same time. The location of trees was also important: The closer trees were to residential buildings, and thus the more accessible they were, the more people spent time outside near them.

Third, there is evidence that common spaces with trees and grass are associated with the amount of social activity that occurs in these spaces. The presence of trees and grass in outdoor common spaces predicted the amount of social activity that occurred within those spaces—more social activities were observed in inner-city common spaces with trees than in equally sized spaces without trees (DePooter, 1997; Taylor, Wiley, Kuo, & Sullivan, 1988).

Fourth, in relation to research on social ties, inner-city residents living near greener courtyard common spaces reported spending more time in their courtyards than did residents with barren courtyards (Kuo et al., in press). The more time residents spent in these courtyards, the better they knew their neighbors, the more they socialized with their neighbors, and the greater their sense of community.

Finally, not only the presence of trees but also caring for trees is related to social ties among neighbors. Inner-city residents who spend time in outdoor common spaces caring for flowers, grass, or trees outside of their home were more likely to have strong social networks with their neighbors (Brunson, Kuo, & Sullivan, 1998).

Is it possible then that the use of nearby green common spaces can foster the growth and development of social and community ties among older adults in the inner city? Although no research has examined the relationship between the use of nearby green common spaces and older adults' social relationships, the trends just described and other research on older adults' reaction to nearby common spaces with trees suggests that such a relationship may exist. Previous work has shown that older adults value nearby nature (Carp, 1986; Talbot & Kaplan, 1991) and that when they have access to nearby natural settings, they report greater residential and life satisfaction (Talbot & Kaplan, 1991).

What remains to be seen, however, is whether the use of green outdoor common spaces is related to social and community ties among older adults. To examine this possibility, we conducted structured interviews with older adults living in one Chicago public housing development. One purpose of this study was to explore the relationship between older adults' exposure to

nearby green common spaces and their level of social integration and attachment to local community. Another goal was to explore the mechanism by which spending time in green common spaces might be related to older adults' local sense of community. This article explores the possibility that older adults' exposure to green common spaces is related to an increased sense of local community because of enhanced levels of social integration.

METHOD

This research was part of a larger study looking at the effects of natural environments on older adults' well-being in domains such as their physical health, social relationships, activity involvement, and psychological functioning.

SITE AND DESIGN

This study was conducted in Chicago's Robert Taylor Homes, an age-integrated public housing development composed of 3 of the top 10 poorest neighborhoods in the country (Ihejirika, 1995). Robert Taylor Homes provides several methodological advantages for examining the relationship between exposure to varying degrees of nearby nature and older adults' social relationships with their neighbors.

The first advantage is that Robert Taylor Homes consists of 28, architecturally identical, 16-story buildings (Miller, 1992). Typically, 3 buildings are grouped together to create a U-shaped courtyard; this pattern is repeated throughout most of the development. The common spaces immediately outside of the buildings are not identical—some include trees and grass, whereas others consist only of concrete or asphalt paving.

> Although Robert Taylor Homes was originally built in the 1960's with green common spaces around each building, over time, the majority of the green spaces have been paved in an effort to keep dust down and maintenance costs low; this paving has killed many of the original trees, leaving some buildings with completely barren common spaces and others with pockets of green. (Kuo et al., in press)

Thus, whereas the architecture of the 28 buildings is identical, the amount of trees and grass in the common spaces varies (see Figure 1).

The second advantage is that residents of Robert Taylor Homes share many social characteristics: 99.7% are African American, only 3.5% are

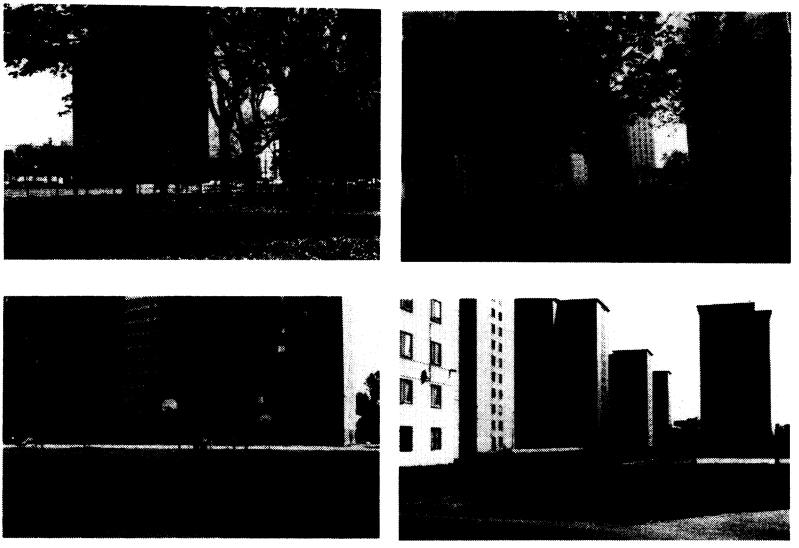

Figure 1: Two High-Nature Buildings (top 2) and Two Low-Nature Buildings (bottom 2) From Chicago's Robert Taylor Homes

officially employed, and their major sources of income are from government income assistance programs (AFDC and SSI) (Chicago Housing Authority, 1995). Thus, the demographic characteristics of the residents are nearly identical.

The final advantage is that residents are assigned to apartments at Robert Taylor Homes in a way that results in de facto random assignment. Currently, potential residents have three options when shown apartments. If they reject the first apartment they are shown, they can wait until another apartment becomes available, see that apartment, and decide if the second apartment is acceptable. If they reject the second apartment, the same procedure is followed a third time. If they reject all three choices, their names are placed at the bottom of a waiting list and they must wait 1 to 2 years before their names rise to the top and they are given another opportunity to choose an apartment. However, at the time that most elderly people sought housing at Robert Taylor Homes (on average 16.6 years earlier), they had only one chance to accept or reject an apartment they had been shown. If they rejected the apartment, their name went to the bottom of the waiting list. The effect of this process was to put tremendous pressure on potential residents to accept the first apartment that became available.

Thus, a number of factors—architecturally identical buildings; consistency in race, income, and education; and de facto random assignment of individuals to the nature conditions—contribute to the methodological strength of this study.

Eleven buildings were selected for this study: 5 buildings had outdoor common spaces with several trees and some grass, and 6 buildings had outdoor common spaces that contained few or no trees and very little grass.

PARTICIPANTS

Although the exact number of people who actually live at Robert Taylor Homes is unknown, the total population of official residents is more than 12,000. About 60% of the total population (7,300) are children. About 300 older adults (2.3% of the total population) officially live at Robert Taylor Homes (Chicago Housing Authority, 1995). No records are available indicating the age distribution of residents among the various buildings. Given the de facto random assignment of individuals to apartments, however, we assume the age composition of residents in buildings is evenly distributed. The participants in this study consisted of 91 individuals, including 11 male and 80 female African Americans, who were at least 64 years old and were distributed by building as shown in Table 1. The proportion of male and female participants interviewed is similar to the ratio between male and female elderly residents at Robert Taylor Homes: 78% of elderly residents are female, whereas 22% of elderly residents are male. The average age of participants was 68.7 years and ranged from 64 to 91 years old. The majority (58%) were widowed, 9% were married, 22% were divorced, and 11% had never married. Forty-seven individuals lived in apartment buildings with more nearby trees and grass, and 44 individuals lived in buildings with less nearby trees and grass. Only 3 elderly individuals refused to participate in this study; thus, the response rate was 97%.

PROCEDURE

Data were collected through structured interviews that lasted 60 to 90 minutes. To increase ecological validity, we employed five female Robert Taylor Homes residents to conduct the interviews. Each interviewer completed 50 hours of detailed training and supervised interview practice. To control for visual and physical access to outdoor common spaces, interviewers only recruited older adults who lived on Floors 2 through 5 of the selected

TABLE 1
Greenness, Number of Participants, Participant's Age, and Length of Residence for Each of the 11 Buildings Sampled at Robert Taylor Homes

Building	*Mean Greenness*	*Number of Participants*	*Mean Age*	*Mean Length of Residence in Years*
1	3.56	10	66.3	13.1
2	3.13	9	73.4	18.1
3	3.11	9	67.6	22.9
4	2.88	9	67.6	17.6
5	2.88	7	67.9	11.3
6	1.75	5	69.8	17.0
7	1.63	12	67.1	15.9
8	1.63	7	69.3	13.9
9	1.00	7	69.6	22.6
10	1.00	6	67.0	15.2
11	.75	10	71.3	14.9

buildings. Because the first-floor apartments had been converted into offices and administrative spaces, no interviews were conducted on the first floor. Interviewers were instructed not to interview individuals with whom they were familiar.

Apartments with elderly people were first identified with the help of the Chicago Housing Authority, and participants were recruited individually by the interviewers. Participation in the interviews was voluntary, and participants were compensated $10 for their time and effort. Before the interviews, participants were told that they could decline to answer any question and could stop the interview to take a break or to end the interview at any time. Large-print response cards were used in conducting the interviews because it is often easier for older adults to answer multiple choice questions if the choices are visible on a response card (Lawton, 1982). The interviews took place in the participants' apartments during the late Spring and early Summer, 1996.

MEASURES

The measures employed in this study include exposure to nature in nearby outdoor common spaces, social integration, and sense of local community. Additional supplementary measures—physical health and fear of crime—were also used.

Exposure to Green Common Spaces

Exposure to green common spaces measures how much contact that older adults have with trees and other vegetation in the outdoor common spaces just outside of their apartment buildings. Exposure to green common spaces is composed of a measure of greenness of outdoor common spaces multiplied by time spent in outdoor common spaces by participants.

The greenness of outdoor common spaces is a measure of the amount of trees and grass in the outdoor common spaces just outside of each apartment building (see Table 1). Greenness was measured by taking 16 photographs of each building from specific vantage points (see Figure 2) and having each building's set of photographs compared and rated by 22 researchers. The researchers rated the greenness around each building using a 5-point scale (where 0 = *not at all* and 4 = *very much*). The greenness of outdoor common spaces, then, is the mean of 22 ratings and has an internal consistency of .97.

Time spent in outdoor common space just outside of each participants' apartment was measured by asking "How much time do you spend outdoors in the area just outside the apartment?" Participants responded by using a 5-point response scale (where 0 = *not at all* and 4 = *very much*).

Social Integration

Social integration measured social ties with neighbors and friends in participants' buildings and at Robert Taylor Homes in general. The social integration measure includes 15 items with a 5-point response scale (where 0 = *not at all* and 4 = *very much*).

Varimax rotation factor analysis of the 15 items generated two factors. The first factor, Neighborly Activities, consists of 9 items and has an internal consistency of .89; examples include "How often have you looked in on them (your neighbors) to see how they are doing?" and "How often have you looked after their apartment when they were away?" The proportion of variance accounted for by this factor is 41%. The second factor, Friends and Neighbors, consists of 5 items and has an internal consistency of .72; examples include "How well do you know the people next door to you?" and "Are most of the residents here strangers to you?" The proportion of variance accounted for by this factor is 11%.

This measure of social integration has been used in the same setting (Robert Taylor Homes) to examine social ties among younger residents (Kuo et al., in press). The measure was extensively pretested with residents of Robert Taylor Homes to ensure that residents' understanding of the measure

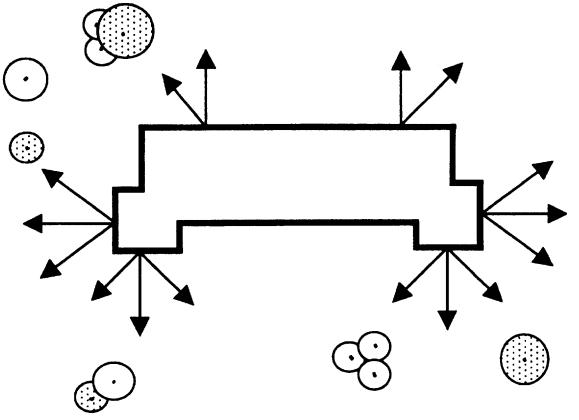

Figure 2: 16 Photographs Taken From Specific Vantage Points

was consistent with the measure's intended purpose. The measure was found to have clear face validity in our debriefing of the pretest participants.

Sense of Local Community

Sense of local community was measured by the following three items: (a) "Is there a feeling of unity and togetherness among residents in this building?" (b) "In Robert Taylor Homes, is there a strong feeling of belonging?" and (c) "Are people here concerned with helping and supporting one another?" Participants used a 5-point response scale (where 0 = *not at all* and 4 = *very much*) to report their feelings of unity, feelings of belonging, and level of support within their neighborhoods. The internal consistency of the three items is .76. This measure has also been used in the same setting (Kuo et al., in press).

Supplementary Measures

Physical health. Physical health was measured by asking "How would you rate your overall health at the present time?" Participants responded by using a 5-point scale (where 1 = *very poor* and 5 = *excellent*).

Fear of crime. Fear of crime is "a negative emotional reaction to crime or symbols associated with crime" (Ferraro & LaGrange, 1987, p. 72). The fear of crime measure is assessed by 14 items with a 5-point response scale (where 0 = *not at all afraid* and 4 = *very much afraid*). Examples include "How afraid are you of having someone break into the home while you are home?" "How afraid are you when you are at home during the day?" and "How afraid are you of being threatened with a knife, club, or gun?" The fear of crime score is the mean of the 14 items. The internal consistency of the 14 items is .92.

LEVEL OF ANALYSIS

A number of possible levels of analysis might be used to investigate the relationship between exposure to green common spaces, social integration, and sense of local community at Robert Taylor Homes. Analyses might examine these relationships at the building level, the individual level, or a combination of the two.

It is possible that the social integration of residents living in the same building is related; thus, modeling relationships at the building level in which individuals are nested within buildings would be appropriate.[1] To assess whether we should model building-level effects, we calculated building-level reliabilities using the procedure described by O'Brien (1990) for calculating reliability estimation of aggregate-level variables. The results, shown in Table 2, indicate that the building-level reliabilities are unacceptably low; they ranged from .08 to .35 for Neighborly Activities, Friends and Neighbors, and sense of local community and indicate that there was virtually no agreement among residents within a building for these measures of social integration. The individual level reliabilities for these same variables, on the other hand, were quite acceptable; they ranged from .72 to .89.

The unacceptably low building-level reliabilities may stem from the small number of individuals interviewed in each building (mean of 8.3 individuals per building). To effectively model building-level effects, Richards (1990) recommended interviewing a minimum of 20 to 25 individuals. Our data collection fell far short of that standard, and this may account for low building-level reliabilities.

There is a second difficulty associated with modeling relationships at the building level. We did not collect data from enough buildings to have sufficient power to detect building-level differences. Richards (1990) recommended collecting data from 84 settings to detect an ecological correlation of .30 for an alpha of .05 and a power level equal to .80. Given that there were only 28 buildings at Robert Taylor Homes, this kind of data collection was not possible.

TABLE 2
Individual- and Building-Level Reliabilities for Three Dependent Variables

	Individual-Level Reliability	*Building-Level Reliability*
Neighborly activities	.89	.35
Friends and neighbors	.72	.10
Sense of local community	.76	.08

In a final attempt to examine possible building-level differences with individuals nested within buildings, we conducted a series of one-way ANOVAs. Were there significant differences on levels of social integration between buildings? We found no significant differences among the 11 buildings for levels of Neighborly Activities ($F(10, 80) = 1.53$, $p = .14$), contacts with Friends and Neighbors ($F(10, 80) = 1.05$, $p = .41$), and sense of local community ($F(10, 80) = 1.08$, $p = .39$).

In sum, the combination of too few people interviewed per building, low building-level reliabilities, the small number of buildings sampled, and the lack of detectable differences on levels of social integration between buildings leads us to model the relationship between exposure to green common spaces, social integration, and sense of local community at the individual level.

RESULTS AND DISCUSSION

OLDER ADULTS' SOCIAL RELATIONSHIPS AT ROBERT TAYLOR HOMES

Although elderly people in Robert Taylor Homes are profoundly poor, and often physically frail, they were relatively well-adjusted socially and had positive social connections with their neighbors. Using a 5-point response scale (where 0 = *not at all* and 4 = *very much*), elderly individuals at Robert Taylor Homes indicated that they were well adjusted ($M = 2.8$). They reported acknowledging people that they encountered in the hallway ($M = 2.3$) and expressed some excitement and interest about life at Robert Taylor Homes ($M = 2.1$). In addition, the actual number of neighbors they knew well enough to visit with was 3.5. In case of emergencies, they could rely on approximately three neighbors.

The analyses that follow examine two questions: (a) Are there systematic relationships between older adults' exposure to green common spaces, their

levels of social integration, and their sense of local community? and (b) If there is a relationship between exposure to green common spaces and sense of local community, does anything mediate this relationship?

EXPOSURE TO GREEN COMMON SPACES AND SOCIAL RELATIONSHIPS

The first set of analyses tests the hypothesis that exposure to green common spaces is related to older adults' Neighborly Activities and their contact with Friends and Neighbors. As the first column in Table 3 shows, exposure to green common spaces is significantly correlated with Neighborly Activities and Friends and Neighbors. The total amount of variance explained by exposure to green common spaces is 6% for Neighborly Activities and 7% for Friends and Neighbors. Compared to individuals who have very little contact with green outdoor spaces, older adults who have greater exposure to such spaces experience greater involvement in neighborly activities; that is, on the whole, they more frequently talk with their neighbors—either in person or on the telephone—and loan them things more often. In general, these individuals also report stronger social relationships with friends and neighbors; they tend to be more familiar with residents in their building and indicate that they know the people next door to them very well in general.

In Table 3, one can see that exposure to green common spaces is also significantly related to older adults' sense of local community. The total amount of variation in sense of local community that is explained by exposure to green common spaces is 5%. Older adults who have more exposure to green common spaces share a stronger sense of local community than those with less exposure to green common spaces; on the whole, they report a stronger sense of unity among residents, experience a stronger sense of belonging to the neighborhood, and feel that neighbors are more supportive of one another than individuals who have less exposure to green common spaces.

It is interesting to note that, in this study, exposure to green common spaces is not significantly related to older adults' self-reported physical health or fear of crime (see Table 3). In other studies, researchers found that self-reported health (Gilker, 1992), recovery from surgery (Cimprich, 1993; Ulrich, 1984), and the number of visits to doctors (Moore, 1981) were positively correlated with contact with nature. Both positive (Nasar & Fisher, 1992; Schroeder & Anderson, 1984) and negative (Kuo et al., 1998) correlations between fear of crime and amount of nature in outdoor common spaces were also found in other studies. Although it makes intuitive sense that physical health and fear of crime may have some association with older adults'

TABLE 3
Intercorrelations Among Major Variables

Variable	*1*	*2*	*3*	*4*
Exposure to green common spaces				
Neighborly activities	.26*			
r^2	(.07)			
Friends and neighbors	.25*	.54***		
r^2	(.06)	(.29)		
Sense of local community	.23*	.60***	.59***	
r^2	(.05)	(.36)	(.35)	
Physical health	.03	−.09	.00	.08
Fear of crime	.05	.22*	−.07	.05
r^2		(.05)		

*$p < .05$. ***$p < .0001$.

exposure to green common spaces, we found no such relationship in this study. One reason may have to do with the amount of nature found at Robert Taylor Homes. Even the greenest outdoor common spaces at Robert Taylor Homes might contain less nature than is required to affect physical health or fear of crime. Another reason for this lack of association may be the age of the individuals in this study. Elderly persons' health and fear might differ from the participants in previous studies (i.e., college students, young to middle-age hospital patients, prisoners, and adult public housing residents).

HOW SHOULD THESE FINDINGS BE UNDERSTOOD?

The first set of results shows that exposure to green common spaces is systematically associated with higher levels of social integration and a greater sense of local community. Two interpretations of these results are worth considering. Because these are correlational data, it is possible that we have conceptualized backward the relationship between exposure to green common spaces and social integration. That is, one possible interpretation is that higher levels of social integration lead to greater exposure to green common spaces. Perhaps individuals who have many friends experience greater exposure to green common spaces because they are drawn in to such spaces to have conversations with their friends. Although our data cannot conclusively determine the direction of this relationship, we can examine this possibility by looking more closely at two key pieces of evidence that bear directly on the relationship between exposure to green common spaces and social integration.

Our measure of exposure to green common spaces is a scale that consists of two measures: time spent in common spaces just outside of each participant's apartment building and the greenness of these spaces. Is it possible that social integration leads to more time spent in common spaces just outside of one's apartment building? Yes, this does seems possible. Because of the lack of indoor meeting places, socially integrated older residents who seek places to meet their friends may choose to meet in the outdoor spaces just outside of their apartments. Is it also possible that social integration leads to greener common spaces? At Robert Taylor Homes, the answer is no. Residents of Robert Taylor Homes have very little control over the greenness of their outdoor common spaces. Residents are not permitted, let alone encouraged, to plant trees or to maintain the grass in outdoor common spaces. Grounds maintenance and all planting are controlled by the Chicago Housing Authority. Thus, it is unlikely that socially active older adults worked together to improve outdoor common spaces by planting trees and grass in these spaces. That is, at Robert Taylor Homes, social integration does not lead to greener outdoor common spaces.

Another bit of evidence casts doubt on the interpretation that greater social integration leads to greater exposure to green common spaces. This evidence comes from the interaction between greenness of outdoor common spaces and time spent in outdoor common spaces for each of the social integration measures. In an ordinary least squares (OLS) multiple regression, greenness of common spaces, time spent in common spaces, and the interaction of the two independent variables are used to predict levels of Neighborly Activities and contact with Friends and Neighbors (see Table 4). In predicting Neighborly Activities, 12% of the variation is explained by the two independent variables and the interaction between the two independent variables ($R^2 = .12$, $p = .01$). The main effects of greenness of outdoor common spaces and time spent in the common spaces by themselves are not significant. The interaction effect for the two independent variables, however, is marginally significant ($\beta = .14$, $p = .09$) in predicting Neighborly Activities. In predicting Friends and Neighbors, 12% of the variation is also explained by the two independent variables and the interaction between the two independent variables ($R^2 = .12$, $p = .01$). Although the greenness of outdoor common spaces is a significant predictor of the Friends and Neighbors factor, the main effect of time spent in the common spaces is not significant. The interaction effect for the two independent variables is significant ($\beta = .16$, $p = .04$) in predicting Friends and Neighbors.

These interactions indicate that when time spent in common spaces is held constant, the change in older adults' social integration is greater when they spend that time in common spaces with more trees and grass than in common

TABLE 4
Interaction Effects of Time Spent in Outdoor Common Spaces and the Greenness of Outdoor Common Spaces Predicting Older Adults' Neighborly Activities and Their Contact With Friends and Neighbors

	Neighborly Activities β	*Friends and Neighbors* β
Time spent	*ns*	*ns*
Greenness	*ns*	−.31 ($p = .05$)
Time Spent × Greenness	.14 ($p = .09$)	.15 ($p = .04$)
Model R^2	.12 ($p = .01$)	.12 ($p = .01$)

spaces with less trees and grass. In other words, the effect of time spent in outdoor common spaces on social integration is stronger when there are more trees and grass in outdoor common spaces than when there are fewer trees and less grass. Thus, the first interpretation, that social integration leads to greater exposure to green common spaces, falls short.

A second interpretation of the relationship between exposure to green common spaces and social integration is that by spending more time in greener outdoor common spaces, older adults actually get to know their neighbors better. That is, spending time in nearby common spaces with trees and grass fosters older adults' informal face-to-face contacts with their neighbors and in doing so supports the development of meaningful relationships among acquaintances and neighbors. This interpretation is similar to the results in three recent studies. In the first study, African American female heads of households who lived adjacent to common spaces with trees and grass reported more frequent use of common spaces and greater neighborhood social ties than those who lived adjacent to common spaces without trees and grass (Kuo et al., in press). In the second study, more social play interaction among African American children occurred in high vegetation common spaces than in low vegetation common spaces in Ida B. Wells, a low-rise Chicago public housing development (Taylor et al., 1988). In the third study, more adults engaged in social activities in spaces with trees than in equal-sized spaces without trees (DePooter, 1997). Given the results of the current study and the similarity of these findings to results from studies on young adults and children, we argue that exposure to green common spaces influences older adults' social involvement with their neighbors. Furthermore, we suggest that even though the strength of the relationship was modest, exposure to green common spaces helps to build social relationships with friends and neighbors and increases sense of local community for older adults in the inner city.

HOW DOES THE USE OF GREEN COMMON SPACES RELATE TO SENSE OF LOCAL COMMUNITY?

The second set of analyses investigates the relationship between exposure to green common spaces and older adults' sense of local community. We hypothesize that this relationship is mediated by higher levels of social integration. That is, we suspect that greater exposure to green common spaces is related to sense of local community through increased levels of Neighborly Activities and Friends and Neighbors. Mediation effects were tested using OLS regression analyses in the method prescribed by Baron and Kenny (1986). To show mediation effects, the independent variable (exposure to green common spaces) must be a significant predictor of possible mediators (Neighborly Activities and Friends and Neighbors) and the dependent variable (sense of local community). As we saw in Table 3, this first step has been satisfied; older adults' exposure to green common spaces is significantly related to Neighborly Activities, Friends and Neighbors, and older adults' sense of local community.

The next step in the mediation test is to conduct a multiple regression using both the independent variable and the potential mediating variables to predict the dependent variable. In this particular case, for successful mediation to occur, the potential mediators (Neighborly Activities and Friends and Neighbors) must significantly predict the dependent variable while the effects of exposure to green common spaces are reduced to an insignificant level. In accordance, we ran two multiple regressions, the first using exposure to green common spaces and Neighborly Activities to predict sense of local community and the second using exposure to green common spaces and Friends and Neighbors to predict sense of local community. In both cases, as can be seen in Table 5, the possible mediators (Neighborly Activities and Friends and Neighbors) significantly predict sense of local community, whereas the effects of exposure to green common spaces are reduced to an insignificant level.[2] Thus, Neighborly Activities and Friends and Neighbors mediate the relationship between exposure to green common spaces and older adults' sense of local community.

These results indicate that older adults who had greater exposure to green common spaces were more socially integrated (i.e., they did more neighborly activities and had better relationships with friends and neighbors), which in turn was positively related to a stronger sense of local community. In other words, greater exposure to green common spaces is related to an increased sense of local community among older adults through neighborhood social integration.

TABLE 5
OLS Regression Mediation Models Testing Exposure to Green Common Spaces, Neighborly Activities, Friends and Neighbors, and Sense of Local Community

	Sense of Local Community β	*Model* R^2
Exposure to green common spaces	.06 (p =.03)	.05
Exposure to green common spaces Neighborly activities	.02 (p =.36) .51 (p < .0001)	.36
Exposure to green common spaces Friends and neighbors	.03 (p = .43 .58 (p < .0001)	.35

NOTE: OLS = ordinary least squares.

GENERALIZABILITY AND DIRECTIONS FOR FUTURE RESEARCH

In this study of older adults in an age-integrated setting, we found that spending time in green outdoor common spaces was systematically related to stronger social integration and a stronger sense of local community. The effects of outdoor common spaces on older adults' social integration might differ from that experienced by individuals living in age-segregated settings. Many elderly people live in settings that are planned specifically for retired individuals (e.g., senior housing, nursing homes, and retirement communities). Individuals living in age-segregated settings may have more opportunities to develop social relationships than individuals living in age-integrated settings. In fact, two studies have shown that elderly individuals living in age-segregated housing do have stronger social ties with neighbors than individuals living in age-integrated housing (Hochschild, 1973; Rosow, 1967). Given that the research reported here was conducted in an age-integrated setting, future research might examine the effects of the physical environment on elderly individuals' social relationships in age-segregated settings.

The role of outdoor common spaces might also differ in places where there are other kinds of meeting spaces. Robert Taylor Homes does not have indoor meeting spaces available for casual, unplanned socializing. It is possible that interior lounges, dining rooms, or other indoor common meeting spaces would positively influence older adults' social relationships (Heller et al., 1984; Stephens & Kinney, 1983). However, it is still possible that outdoor common spaces play an important role, regardless of the existence of other kinds of meeting spaces. It would be worthwhile to examine if the existence

of additional meeting places influences the relationship between use of green outdoor common spaces and the social integration of older adults.

We found that exposure to green common spaces is related to elderly African American urban public housing residents' social integration and attachment to their local community. It is possible, however, that these same relationships may not exist for individuals in different social class environments. For example, most middle-class individuals live in well-maintained and relatively green environments. Increasing the number of trees in outdoor spaces might not have the same consequences for middle-class older adults who are already surrounded by trees, shrubs, grass, and flowers. Future research might investigate if social class mediates the relationship between exposure to green common spaces and older adults' social relationships.

In this study, we found that simply spending time in green common spaces was systematically related to older adults' social integration and sense of community. Is it possible that these relationships would be even stronger if older adults were actively involved in creating greener outdoor spaces? A recent study of younger adults has shown that actively caring for trees, shrubs, and flowers was associated with positive community dynamics and stronger territorial functioning (Brunson et al., 1998). Active participation in planting and maintaining outdoor common spaces immediately outside of residents' apartments may provide an opportunity not only to meet neighbors but also to develop stronger attachment to the community. Future research might explore how participation in greening activities, such as the development and maintenance of community gardens, benefits older adults' social integration and their sense of community.

IMPLICATIONS

The findings from this study suggest that exposure to trees in the common spaces near elderly individuals' homes may be a relatively inexpensive way to improve their social integration. When choosing a place to live, elderly individuals would do well to choose housing locations that include green outdoor common spaces. In addition, elderly individuals may benefit from actively creating or caring for green neighborhood common spaces. Participation in gardening and other green care activities provides practical benefits, such as fresh vegetables, flowers, and fruit, and physical benefits, such as exercise. Caring for gardens or green spaces also offers opportunities for elderly people to maintain an active life (Powell, Felce, Jenkins, & Lunt, 1979) and to interact with and serve others (Burgess, 1990). Doing so is likely to have important consequences for older adults because social integration is

strongly related to older adults' well-being. In summarizing the state of the literature regarding older individuals and social integration, Berardo (1985) states that there is "strong evidence that social relations and networks are life-enhancing and contribute to longevity" (p. 37). Because spending time in nearby outdoor common spaces with trees and grass is modestly, but systematically, related to higher levels of elderly residents' social integration, the findings here suggest that making common spaces greener may improve not only social integration but also, indirectly, may have a positive impact on a host of other important factors related to older adults' well-being.

In this study, regular contact with nearby green outdoor spaces was systematically related to older adults' sense of local community. To the extent that strong sense of community facilitates stronger neighborhoods (McMillan & Chavis, 1986), these findings have implications for building stronger communities. Strong community plays an important role in inner-city neighborhoods. On one hand, the decline of community in inner-city neighborhoods is linked to increased sales of illegal drugs (Johnson, Williams, Sanabria, & Dei, 1989), an increase in abandoned houses, an increase in families without homes (Ropers, 1988), and a higher crime rate (Power, 1989). On the other hand, individuals with strong community relations have been shown to actively participate in neighborhood problem solving, which is related to the development of a neighborhood drug program (Lurigio & Davis, 1992) and a proposed hazardous waste facility (Bachrach & Zautra, 1985). To the extent that green outdoor common spaces are linked to older adults' sense of local community, elderly people who have greater contact with such spaces might be more capable of and willing to participate in activities that support and benefit their neighbors. By providing green outdoor common spaces, communities may more effectively tap into the enthusiasm, skill, experience, and wisdom of older adults.

There are also implications for architects, landscape architects, developers, and other professionals who design housing for the elderly. Designers should make it a priority to include usable outdoor common spaces with trees, grass, and other amenities in their designs, such as seating, lighting, and structures that control exposure to sun, shade, and wind. Although creating such places will surely cost more in the short term than not providing trees, grass, and places to sit, the benefits resulting from such designs will certainly outweigh the costs.

Finally, these results have implications for managers of public housing developments. Public housing is intended to provide safe, affordable, quality housing to low-income families. Housing officials are interested in providing an environment in which residents function effectively (Cisneros, 1997).

Supportive interaction among neighbors seems to reduce the burden on public social agencies because older adults have a clear order of preference for getting support: family, friends, and neighbors are sought out first as means of support, followed by formal social agencies (Cantor, 1979). If green outdoor common spaces facilitate supportive relationships among neighbors in a community, then perhaps public housing managers should provide more green common spaces or turn vacant lots into livable public spaces. Doing so could help improve older inner-city residents' social support and reduce the burden on public social service agencies.

CONCLUSION

This study is the first endeavor to establish systematic links between exposure to green common spaces and older adults' social integration in their neighborhoods. The results showed that the strengths of these relationships were modest, but relevant nonetheless. Older adults are the most rapidly growing portion of the U.S. population, and their well-being is a particularly important social challenge. In this study, we found that exposure to green common spaces was associated with a key component of well-being (i.e., social integration). Perhaps then, modest improvements in well-being may be achieved through creating neighborhood settings that support the formation of social and community ties. Given the array of factors affecting older adults' quality of life, and the difficulty of changing the vast majority of these factors, the relationships described here are noteworthy in that modest gains may be attained through greening efforts that are inexpensive and relatively easy to accomplish. For elderly individuals who live in poverty, inadequate housing, and barren inner-city neighborhoods, planting trees and grass in neighborhood outdoor common spaces appears to be one way to create more vital, socially supportive places to live.

NOTES

1. Hierarchical Linear Modeling (HLM) is an analytic tool that is capable of modeling the relationship between individuals, the settings they live in (or work in, or study in) and some outcome. HLM separates Level 1 (between-subjects) and Level 2 (environment) while taking advantage of the power afforded in the two sources of variability. HLM requires a larger sample size (for both individuals and environments) than was possible in this study. For more details about the HLM technique, see Bryk and Raudenbusch (1992).

2. We found that no multicollinearity exists between exposure to green common spaces and Neighborly Activities (tolerance = .93, Variance Inflation Factor [VIF] = 1.07) and exposure to green common spaces and Friends and Neighbors (tolerance = .94, VIF = 1.07).

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