

Social Capital and the Built Environment: The Importance of Walkable Neighborhoods

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A growing number of researchers agree that social networks and community involvement have positive health consequences. Persons who are socially engaged with others and actively involved in their communities tend to live longer and be healthier physically and mentally.¹⁻¹²

The more integrated we are with our community, the less likely we are to experience colds, heart attacks, strokes, cancer, depression, and premature death of all sorts. . . . Over the last 20 years more than a dozen large studies . . . have shown that *people who are socially disconnected are between 2 and 5 times more likely to die from all causes, compared with matched individuals who have close ties with family, friends, and the community.*^{13(p326-327)}

Social and community ties are key components of a more encompassing concept, *social capital*. Social capital is defined as the social networks and interactions that inspire trust and reciprocity among citizens.¹³ Individuals with high levels of social capital tend to be involved politically, to volunteer in their communities, and to get together more frequently with friends and neighbors. They are also more likely to trust or to think kindly of others.¹³⁻¹⁵ Social capital has been found to be linked to more than just good health; empirical linkages have been found among social capital, the proper functioning of democracy, the prevention of crime, and enhanced economic development.¹³

An understanding of why some persons and some communities have more social capital than others is important to improving public health. Factors associated with the decline of social capital in recent decades include pressures of time and money on families, long commutes, television usage, and generational change.¹³ Many of these factors appear to be related to suburbanization.^{16,17}

This study examined whether the built environment (i.e., the way we design and build our communities and neighborhoods) affects the degree to which people are involved in

Objectives. I sought to examine whether pedestrian-oriented, mixed-use neighborhoods encourage enhanced levels of social and community engagement (i.e., social capital).

Methods. The study investigated the relationship between neighborhood design and individual levels of social capital. Data were obtained from a household survey that measured the social capital of citizens living in neighborhoods that ranged from traditional, mixed-use, pedestrian-oriented designs to modern, car-dependent suburban subdivisions in Galway, Ireland.

Results. The analyses indicate that persons living in walkable, mixed-use neighborhoods have higher levels of social capital compared with those living in car-oriented suburbs. Respondents living in walkable neighborhoods were more likely to know their neighbors, participate politically, trust others, and be socially engaged.

Conclusions. Walkable, mixed-use neighborhood designs can encourage the development of social capital. (*Am J Public Health*. 2003;93:1546-1551)

their communities and with each other. The fundamental premise is that some neighborhood designs *enable or encourage* social ties or community connections, whereas others do not. Theoretically, the neighborhood designs (or types) most likely to promote social capital are those that are mixed use and pedestrian oriented. Such neighborhoods (usually labeled "traditional" or "complete" neighborhoods) are typically found in older cities and older rural towns.¹⁸ These neighborhoods are walkable, enabling residents to perform daily activities (e.g., grocery shopping, going to the park, taking children to school) without the use of a car. Many of these neighborhoods have places of worship, a local tavern, a coffee shop, or restaurants within walking distance. Complete or traditional neighborhoods encourage walking; pedestrians are not forced to compete with cars along busy highways or to walk across expansive parking lots.

This traditional or complete neighborhood design can be contrasted with its modern suburban counterpart. Today's version of the neighborhood, the suburban subdivision, contains only houses. Daily needs are not met in the neighborhood or even in town; they are instead fulfilled at large megastores in malls or strip malls located along 4-lane connector roads that are typically clogged with traffic. If

residents want to shop, worship, or go to a restaurant, pub, park, or library, they must travel by car. Many contemporary suburban subdivisions do not even have sidewalks: citizens must drive to find a place to exercise or to go for a walk.

Theoretically, pedestrian-oriented, mixed-use neighborhoods are expected to enhance social capital because they enable residents to interact. This interaction can be intentional or accidental. Spontaneous "bumping into" neighbors, brief (seemingly trivial) conversations, or just waving hello can help to encourage a sense of trust and a sense of connection between people and the places they live. These casual contacts can occur at neighborhood corner shops, at local parks, or on the sidewalk. To many residents, such contacts breed a sense of familiarity and predictability that most people find comforting. When summed over time, these individual occurrences have been theorized to be of great importance for fostering "a web of public respect and trust, and a resource in time of personal or neighborhood need."^{19(p56)}

In contrast, most contemporary suburban subdivisions do little to enable social interaction. Social interaction is more likely to occur by invitation, not by chance encounter. Life is supposed to take place within the home or in

the backyard.²⁰ In many suburbs, privacy and the automobile are so highly valued that developers do not even bother to lay sidewalks. Corner stores, taverns, coffee shops, and sometimes schools and parks often are not found in the neighborhood, because zoning ordinances have rendered them illegal within residential areas. Most modern, car-dependent suburbs are not places designed to encourage social interaction.

This study examined the relationship between neighborhood design and social capital. The main hypothesis is that pedestrian-oriented, mixed-use neighborhoods are more likely to encourage social capital than are car-dependent, single-use neighborhoods.

METHODS

To examine the relationship between neighborhood design and social capital, a survey was conducted in and around the city of Galway, located in the Republic of Ireland. Galway's population was estimated at 65 457 in April 2001, with an additional 30 000 people living "in the immediate environs."²¹ Galway is the fastest-growing city in Ireland and one of the fastest-growing cities in Europe. It was chosen for this analysis because it has a mix of neighborhood types ranging from the truly mixed-use, pedestrian-oriented variety (built centuries before the automobile) to the contemporary, American-style suburb. Moreover, Galway has no experience with the racism and "white flight" from the city centers that has historically affected American cities and that in many ways continues to distort decisions regarding where to live.

During April and May of 2001, 750 households in Galway and its suburbs were surveyed by mail. The cover letter asked that the survey be completed and returned by 1 adult member (aged 18 years or older) of each selected household. To sample from a variety of neighborhood types, 8 neighborhoods or suburban subdivisions were chosen. In 6 of these neighborhoods (or suburban subdivisions), a survey was delivered to each and every residence. In the other 2, a portion of the subdivision was chosen at random because of the subdivision's size. In this portion or part of the subdivision, all houses received a survey. A total of 279 surveys were re-

turned, for an overall response rate of 37.2%. No follow-up surveys were mailed.

Neighborhood Categories

Galway's neighborhoods were subjectively categorized into 3 ideal types by the researcher before conducting the survey. The neighborhoods selected and surveyed include the following 3 types.

City Center/Near City Center Neighborhoods. The category of "city center/near city center" includes mixed-use, pedestrian-oriented neighborhoods where all daily needs and forms of entertainment are a short walk away. Residents living in these neighborhoods could walk to restaurants, pubs, parks, libraries, department stores, government buildings, post offices, butchers, banks, pharmacies, local schools, theatres, and places of worship without seriously competing with cars.

Older, Mixed-Use Suburbs. Galway has several older suburbs that incorporate some of the more positive aspects of both the traditional city center neighborhood and the quiet suburb. Renmore, for example, has many traditional neighborhood amenities, such as local schools, a few neighborhood corner shops, a centrally located bus line, a church, community center, and playing fields. However, it is much quieter and more predictable than Galway's city center neighborhoods, and the range of places one could access by foot is clearly more limited.

Modern, Automobile-Dependent Suburbs. Galway's recent economic boom has created a demand for new housing that has been met by creating new suburbs. These modern suburbs are car oriented; even local stores have a strip-mall feel about them. With parking lots positioned in front, they seem to suggest that driving is expected. Few places can be accessed by foot, and many of these suburbs do not have sidewalks or parks.

Key Independent Variable: Individual Assessments of Neighborhood Walkability

Categorization of Galway's various neighborhoods ensured that the individuals in the study's sample lived in a range of neighborhood types. In most of the following analysis, however, the assessment of neighborhood "walkability" was made by the respondents,

A lot of people are very dependent on a car these days to get where they want to go. If you or another family member wanted to which of the following could you walk to without too much trouble? *Tick all you could walk to without too much trouble.*

- ☐ 1. A local corner shop/newsagent
- ☐ 2. A church
- ☐ 3. A park (or pitch)
- ☐ 4. A local school
- ☐ 5. A Community Center or Recreation Center
- ☐ 6. A crèche (or child care facility)
- ☐ 7. A Chemist (or pharmacy)
- ☐ 8. A Pub
- ☐ 9. The place that I work
- ☐ 10. None of the above. It is hard to really go anywhere without a car.

FIGURE 1—Survey questions used to create the "neighborhood walkability" measure.

not by the researcher. All survey respondents were asked to rate the degree to which their neighborhoods were pedestrian oriented and mixed use (Figure 1). This question was used to create a variable called "neighborhood walkability," which is an additive index of the 9 places listed in Figure 1. Each respondent was assigned a neighborhood walkability score that could range from 0 (cannot walk to any of the places mentioned) to 9 (can walk to all of them).

Additional independent variables in the multivariate models include controls found to correlate with various aspects of social capital in previous political science and sociological studies.^{13,22–25} These measures included age, whether a respondent has children currently living at home ("child in home"), how much television a respondent watches ("watch TV"), whether and to what degree a respondent attends religious services, how long a respondent has lived in his or her current neighborhood ("years in the neighborhood"), education level, and the degree to which a respondent reports being committed to a political party ("party strength").

Dependent Variables: Measures of Social Capital

The survey conducted for this study measured 4 key aspects of social capital: how well residents knew their neighbors, their political participation, their trust or faith in other people, and their social engagement. These dependent variables were measured as described in the following paragraphs.

The variable "know neighbors" was measured with the following question: "Think about the neighborhood or area in which you live. In general, how well do you feel you know your neighbors? (1) Not at all, (2) Just a little, (3) Moderately well, (4) Extremely well."

Political participation was measured as an additive index. The Political Participation Index assessed whether respondents voted in the last general election, whether they had volunteered to work for a political party in the past 5 years, and whether they had contacted an elected official to express their views in the past 6 months. Each of these activities was scored as either 1 (yes) or 0 (no), and scores were added to create the index. Thus, for each respondent, the variable could range from 0 (no participation) to 3 (yes to all 3 items).

The Trust Index measured whether respondents felt that people could be trusted, whether they thought people were fair, and whether they thought most people try to be helpful. Scores on this index could also range from 0 (a complete absence of trust and faith in others) to 3 (respondent feels that people can be trusted, are fair, and are helpful).

Social participation was measured with 4 questions probing the degree to which respondents reported being engaged socially. The first question asked respondents to report how often they got together with friends: "rarely," "occasionally," or "a great deal." The next 3 questions asked respondents to specify the number of times (in the past 2 weeks) they had gone "out to a pub or restaurant with friends"; the number of times they had invited friends into their home "for company, tea, or a meal"; and the number of times they had gone to a friend's home "for company, tea, or a meal." Summing the responses on all 4 items for each respondent yielded an index score reflecting each respondent's degree of social engagement. The mean Social Index

score was 7.04, and the standard deviation was 5.41.

Data Analysis

All statistical analyses were performed with Stata, version 7 (Stata Corp, College Station, Tex). The first part of the analysis sought to establish whether the "subjective" categorizations of neighborhood types established by the researcher before the surveys were distributed helped to illustrate some of the differences between walkable and more car-oriented neighborhoods. This was accomplished by examining whether the means of the various aspects of social capital differed statistically (using *t* tests) by neighborhood type.

The heart of the analysis used multivariate ordered logit models to examine the effect of the neighborhood walkability measure on the 4 dependent measures of social capital. Ordered logit was used because of the ordinal nature of the dependent variables. Although all of the dependent measures of social capital can be ranked, the distance between categories cannot be assumed to be equal (as in interval data). In the analysis that follows, the neighborhood walkability measure was scored in 2 ways. In the first set of regressions, neighborhood walkability for each respondent was scored from 0 to 9; in the second set, this variable was recoded to assess the odds of respondents' having high levels of social capital if they assessed their neighborhoods to be highly pedestrian oriented and mixed use (high scores of 7, 8, or 9 were coded as 1, whereas lower scores were coded as 0).

RESULTS

Table 1 illustrates some of the differences between more walkable, mixed-use neighborhoods and those that are car dependent. Shown in the table are the means and corresponding *P* values (based on the *t* tests) of measures related to social capital (note that preinvestigative categorizations of neighborhood types are used). All respondents living in mixed-use, pedestrian-oriented neighborhoods (city center/near city center plus older, mixed-use suburbs) were combined and compared with those living in modern suburbs. Interestingly, neighborhood walkability was statistically significant ($P < .0001$), indicating that respondents' self-assessments of their own neighborhoods coincided with the neighborhood categorizations established by the researcher before administration of the survey. Residents living in neighborhoods categorized as walkable by the researcher perceived their neighborhoods as being more walkable.

Table 1 provides examples of how attitudes and behaviors of residents living in pedestrian-oriented, mixed-use neighborhoods (whether located in older suburbs or in town) differ from those of residents living in car-dependent suburbs. Table 1 displays data demonstrating that in complete or traditional neighborhoods, residents walk more (or at least perceive their neighborhoods to be more walkable), feel more connected to (or part of) their community, are more likely to know their neighbors, are more likely to trust or have faith in other people, are more

TABLE 1—Pedestrian-Oriented, Mixed-Use Neighborhoods vs Modern, Automobile-Dependent Suburbs: Galway, Ireland, 2001

	Comparing Means Using <i>t</i> Test		<i>P</i> Value
	Mixed-use, Walkable Neighborhood (<i>n</i> = 163), Mean	Car-Dependent Suburban Neighborhood (<i>n</i> = 109), Mean	
Neighborhood walkability	7.35	4.72	.0001
Feel connected to or part of the community	2.94	2.39	.0001
Know neighbors?	2.67	2.22	.0001
Trust Index	2.32	2.09	.0329
Contacting elected officials	0.32	0.17	.0032
Can walk to work	0.51	0.19	.0001

TABLE 2—Multivariate Ordered Logit Models for Social Capital, by Independent Variable: Galway, Ireland, 2001

Independent Variable	Odds Ratio (95% Confidence Interval)			
	Know Neighbors (n = 256)	Political Participation Index (n = 258)	Trust Index (n = 258)	Social Index (n = 258)
Neighborhood walkability	1.28† (1.14, 1.44)	1.14** (1.02, 1.28)	1.15*** (1.04, 1.28)	1.20† (1.09, 1.32)
Age	1.06† (1.03, 1.08)	1.01 (.99, 1.04)	1.02 (0.99, 1.04)	0.95† (0.93, 0.97)
Child in home	2.80† (1.65, 4.75)	1.51 (0.90, 2.53)	1.17 (0.71, 1.91)	0.33† (0.21, 0.53)
Watch TV	0.085 (0.61, 1.17)	0.89 (0.64, 1.23)	0.87 (0.64, 1.18)	0.78* (0.59, 1.04)
Attend religious services	1.20** (1.01, 1.42)	1.14 (0.95, 1.36)	1.03 (0.88, 1.22)	0.97 (0.83, 1.13)
Years in neighborhood	1.03** (1.00, 1.05)	1.02 (0.99, 1.04)	0.99 (0.97, 1.02)	0.98* (0.96, 1.00)
Education	0.72 (0.45, 1.17)	1.77** (1.10, 2.83)	0.87 (0.54, 1.39)	1.03 (0.68, 1.57)
Party strength	1.16 (0.88, 1.52)	1.98† (1.50, 2.62)	1.04 (0.80, 1.35)	1.22* (0.96, 1.54)
McKelvey and Zavoina R ²	.44	.19	.07	.26

*P = .10; **P = .05; ***P = .01; †P = .001; 2-tailed test.

likely to contact elected officials to express their concerns, and are more likely to walk to work.

Although suggestive, simple mean comparisons do not control for other factors that might also explain why residents in one neighborhood type demonstrate higher levels of social capital. A multivariate model is needed. Table 2 displays the results of the multivariate ordered logit models examining the impact of neighborhood walkability on various aspects of social capital, after control for other independent variables. The results are clear and consistent: the more places respondents report being able to walk to in their neighborhood, the higher their level of social capital. This relation suggests that walkable, mixed-use neighborhoods are better generators of social capital than are modern, car-dependent suburbs.

The odds ratios (ORs) reported in Table 2 were generated with ordered logit regression. It is important to note that neighborhood walkability scores ranged from 0 to 9 and that the odds ratios must be interpreted with this in mind. A 1-unit increase in neighborhood walkability score is linked with an increase of 1.28 (95% confidence level [CI] = 1.14, 1.44) in the odds that a resident knows his or her neighbors. Therefore, the more walkable a neighborhood (and the more places that can be walked to), the more likely a resident is to know his or her neighbors.

The neighborhood walkability measure was also statistically significant in the equations examining political participation and trust. The higher the neighborhood walkability rating assigned by respondents, the more likely they were to participate politically (OR = 1.14; 95% CI = 1.02, 1.28) and to have trust or faith in others (OR = 1.15; 95% CI = 1.04, 1.28).

The fourth measure of social capital was the Social Index, reflecting the degree to which a respondent reports being socially engaged. The model demonstrated that the more places respondents reported being able to walk to in their neighborhood, the more likely they were to be engaged with others socially (OR = 1.20; 95% CI = 1.09, 1.32). Interestingly, the model also indicated that respondents become less social as they

grow older (OR = 0.95; 95% CI = 0.93, 0.97), that people with children living in the home are less social (OR = 0.33; 95% CI = 0.21, 0.53), and that watching TV limits one's social activities (OR = 0.78; 95% CI = 0.59, 1.04).

The neighborhood walkability measure had a statistically significant effect on all of the measures of social capital. No other predictor was consistently significant. Moreover, neighborhood walkability consistently held its own in comparison with the other predictors, often playing a more powerful role. Stata reports a standardized odds ratio (not shown here) based on standard deviational changes in the independent variable.²⁶ Neighborhood walkability was the most important predictor of the Trust Index, the second most important predictor for the Know Neighbors variable and the Social Index, and a close third for the Political Participation Index.

Table 3 explores the effects had by the most walkable (and most mixed-use) neighborhoods on social capital. Respondents who reported their neighborhoods as being highly walkable and mixed use (7, 8, or 9 on the original neighborhood walkability measure) were compared with those who rank their neighborhoods as less pedestrian oriented and less mixed use, after control for other factors. The results indicated that residents living in high-walkability neighborhoods (many in this category reported walking to work) were likely to score higher on all measures of social capital. The odds ratios ranged from 1.80 to 1.95, and all were statistically significant in the predicted direction.

TABLE 3—Multivariate Ordered Logit Models of Social Capital: Highly Walkable, Mixed-use Designs vs All Others: Galway, Ireland, 2001

	Odds Ratio (95% Confidence Interval)			
	Know Neighbors	Political Participation Index	Trust Index	Social Index
High level of neighborhood walkability or mixed-use design	1.88** (1.14, 3.11)	1.83* (1.10, 3.05)	1.79* (1.10, 2.92)	1.95** (1.25, 3.05)

Note. A high level of neighborhood walkability or mixed-use design was scored 1 if a respondent reported a 7, 8, or 9 on the neighborhood walkability measure and scored 0 otherwise. All other independent control variables were included in the analysis, as in Table 2.

*P = .05; **P = .01; 2-tailed test.

DISCUSSION

This study suggests that the way we design and build our communities and neighborhoods affects social capital and thus physical and mental health. The results indicate that residents living in walkable, mixed-use neighborhoods are more likely to know their neighbors, to participate politically, to trust others, and to be involved socially.

Unfortunately, America's built environment has been moving in a direction that is likely to have a negative effect on social capital. Over the last several decades, buying a home in a neighborhood that resembles the traditional, mixed-use, pedestrian-oriented model has become increasingly difficult. In fact, many Americans have no choice but to live in a modern, car-dependent suburb, because not enough viable, affordable traditional neighborhoods exist; their options are biased toward car-dependent suburban subdivisions, because such environments are what most developers build.²⁷

The trend toward building car-dependent subdivisions is not just the fault of the developers. That American communities have become increasingly car oriented and less walkable is also the result of municipal zoning codes and other public policy changes that clearly promote transport by private vehicle, deemphasize public transport, and discourage (or even outlaw) the building of mixed-use, pedestrian-oriented neighborhoods.^{18,28} Changing this trend will require political will and a shift in land-use and transportation priorities and policies.^{29,30} Public consciousness must also change. Government policy has helped to change the public's view of smoking and of race and gender discrimination; it could help change our concept of the built environment by discouraging sprawl and encouraging the creation of new pedestrian-oriented towns and neighborhoods. Changes in government policy and tax law might also encourage the revitalization of existing traditional neighborhoods.

Of course, before we get to that point, we need to know more about how the built environment affects health and social capital. This study has several limitations. To what degree can the results of this study, which was based on a fairly small Irish city, be generalized? Se-

lection bias also may have affected the results. Social people might be more likely to choose walkable neighborhoods, rather than walkable neighborhoods' encouraging sociability. The models presented in Tables 2 and 3 attempted to statistically control for this possibility by including measures of age and years in the neighborhood. However, the selection bias needs to be untangled; a much larger longitudinal study would be required to do so. In addition, much more must be learned about which architectural aspects of the built environment most affect health and social capital. This study used a measure that allowed respondents to rate the walkability of their own neighborhoods; more information is needed regarding how measures such as block size, density, street widths, and traffic speed affect the perceived walkability of a neighborhood^{18–20} and social capital.

Finally, more data must be gathered regarding how the built environment affects health in general.³¹ To what extent is our car-dependent, "drive-through" suburban culture discouraging physical activity,^{32–34} thus encouraging obesity^{35–39} and other associated health problems?^{38,39} How does sprawl affect health over the life span? According to the Centers for Disease Control and Prevention, today's built environment is affecting how children travel to school. Instead of walking or biking to school, most children are now driven by bus or private vehicle; the main deterrents to walking or biking are long distances (55%) and traffic danger (40%).^{40,41} One must wonder whether the short-sighted planning decisions that lead to so many young people being driven rather than walking will have long-term health consequences. How are the elderly affected? Does car-dependent sprawl contribute to the sort of social isolation that negatively affects the health of seniors? The consequences of not walking and of not interacting with others may have consequences far more negative, for persons of all ages, than we ever imagined. ■

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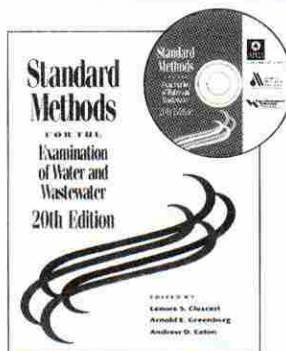
Human Participant Protection

The protocol for this study was approved by the institutional review board of West Virginia University's Eberly College of Arts & Sciences.

References

1. Kaplan GA. Social contacts and ischaemic heart disease. *Ann Clin Res.* 1988;20:131–136.
2. House JS, Landis KR, Umberson D. Social relationships and health. *Science.* 1988;241:540–545.
3. Berkman LF. The role of social relations in health promotion. *Psychosomatic Med.* 1995;57:245–254.
4. Berkman LF, Syme SL. Social networks, host resistance and mortality: a nine year follow-up of Alameda County residents. *Am J Epidemiol.* 1979;109:186–204.
5. House JS, Robbins C, Metzner HL. The association of social relationships and activities with mortality: prospective evidence from the Tecumseh Community Health Study. *Am J Epidemiol.* 1982;116:123–140.
6. Seeman TE, Kaplan GA, Knudsen L, Cohen R, Guralnik J. Social networks ties and mortality among the elderly in the Alameda County Study. *Am J Epidemiol.* 1987;126:714–723.
7. Kawachi I, Kennedy BP, Glass R. Social capital and self-rated health: a contextual analysis. *Am J Public Health.* 1999;89:1187–1193.
8. Kawachi I. Social capital and community effects on population and individual health. *Ann N Y Acad Sci.* 1999;896:120–130.
9. Yen IH, Kaplan GA. Neighborhood social environment and risk of death: multilevel evidence from the Alameda County Study. *Am J Epidemiol.* 1999;149:898–907.
10. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. *Soc Sci Med.* 2000;51:843–857.
11. Kawachi I, Berkman LF. Social ties and mental health. *J Urban Health.* 2001;78:458–67.
12. Brummett BH, Barefoot JC, Siegler IC, et al. Characteristics of socially isolated patients with coronary artery disease who are at elevated risk for mortality. *Psychosom Med.* 2001;63:267–272.
13. Putnam RD. *Bowling Alone: The Collapse and Revival of American Community.* New York, NY: Simon & Schuster; 2000.

14. Coleman JS. *Foundations of Social Theory*. Cambridge, Mass: Harvard University Press; 1990.
15. Fukuyama F. *Trust: Social Virtues and the Creation of Prosperity*. New York, NY: Free Press; 1995.
16. Oliver JE. *Democracy in Suburbia*. Princeton, NJ: Princeton University Press; 2001.
17. Freeman L. The effects of sprawl on neighborhood social ties: an explanatory analysis. *J Am Plann Assoc*. 2001;67:69-77.
18. Duany A, Plater-Zyberk E, Speck J. *Suburban Nation: The Rise of Sprawl and the Decline of the American Dream*. New York, NY: North Point Press; 2000.
19. Jacobs J. *The Death and Life of Great American Cities*. New York, NY: Random House; 1961.
20. Lofland LH. *The Public Realm: Exploring the City's Quintessential Social Territory*. Hawthorne, NY: Aldine De Gruyter; 1998.
21. Galway City Council Web site. Available at: <http://www.galwaycity.ie>. Accessed August 2002.
22. Kasarda JD, Janowitz M. Community attachment in mass society. *Am Sociol Rev*. 1974;39:328-339.
23. Rosenstone SJ, Hansen JM. *Mobilization, Participation, and Democracy in America*. New York, NY: Macmillan Publishing Co; 1993.
24. Sampson RJ. Local friendship ties and community attachment in mass society: a multilevel systemic model. *Am Sociol Rev*. 1988;53:766-779.
25. Verba S, Scholzman KL, Brady HE. *Voice and Equality: Civic Voluntarism in American Politics*. Cambridge, Mass: Harvard University Press; 1995.
26. Long JS, Freese J. *Regression Models for Categorical Dependent Variables Using STATA*. College Station, Tex: Stata Press; 2001.
27. The Urban Land Institute Web site. Available at: <http://www.uli.org>. Accessed April 2003.
28. Calthorpe P, Fulton W. *The Regional City*. Washington, DC: Island Press; 2001.
29. Newman P, Kenworthy J. *Sustainability and Cities*. Washington, DC: Island Press; 1999.
30. Cervero R. *The Transit Metropolis*. Washington, DC: Island Press; 1998.
31. Frumkin H. Urban sprawl and public health. *Public Health Rep*. 2002;117(3):201-217.
32. Mokdad AH, Bowman BA, Ford ES, et al. The continuing epidemics of obesity and diabetes in the United States. *JAMA*. 2001;286:1195-1200.
33. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults. *JAMA*. 2002;288:1723-1727.
34. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA*. 2002;288:1728-1732.
35. Manson JE, Greenland P, LaCroix AZ, et al. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *N Engl J Med*. 2002;347:716-725.
36. Lee IM, Rexrode KM, Cook NR, Manson JE, Buring JE. Physical activity and coronary heart disease in women: is "no gain, no pain" passe? *JAMA*. 2001;285:1447-1454.
37. Paillard T, Lafont C, Costes-Salon MC, Dupui P, Riviere D, Vellas B. Cholesterol reduction and increased cardiovascular fitness following a 12 weeks brisk walking. *J Nutr Health Aging*. 2002;6(2):138-140.
38. Feskanich D, Willett W, Colditz G. Walking and leisure-time activity and risk of hip fracture in postmenopausal women. *JAMA*. 2002;288:2300-2306.
39. Kraus WE, Houmard JA, Duscha BD, et al. Effects of the amount and intensity of exercise on plasma lipoproteins. *N Engl J Med*. 2002;347:1483-1492.
40. Centers for Disease Control and Prevention. Barriers to children walking and biking to school—United States, 1999. *JAMA*. 2002;288:1343-1344.
41. US Dept of Transportation. Available at: <http://www.nhtsa.dot.gov/people/injury/pedbimot/ped/saferoutes.html/toc.html>. Accessed April 2003.



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