

Neighborhood-Level Cohesion and Disorder: Measurement and Validation in Two Older Adult Urban Populations

Kathleen A. Cagney,¹ Thomas A. Glass,² Kimberly A. Skarupski,^{3,4} Lisa L. Barnes,^{5,6}
Brian S. Schwartz,⁷ and Carlos F. Mendes de Leon^{3,4,8}

¹Department of Health Studies, University of Chicago, Illinois.

²Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland.

³Rush Institute for Healthy Aging, Chicago, Illinois.

⁴Department of Internal Medicine, Rush University Medical Center, Chicago, Illinois.

⁵Rush Alzheimer's Disease Center, Chicago, Illinois.

⁶Department of Neurological Sciences, Rush University Medical Center, Chicago, Illinois.

⁷Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland.

⁸Department of Preventive Medicine, Rush University Medical Center, Chicago, Illinois.

Objectives. Drawing from collective efficacy and social disorganization theories, we developed and validated measures of neighborhood-level social processes.

Methods. Data came from 2 large, population-based cohort studies of urban-dwelling older adults, the Chicago Neighborhood and Disability Study (CNDS, $n = 3,882$) and the Baltimore Memory Study (BMS, $n = 1,140$). Data on neighborhood social processes were collected from residents using a standardized instrument identical in the 2 studies. We used confirmatory factor analysis and descriptive statistics to explore reliability and validity of the neighborhood-level measures.

Results. Confirmatory factor analysis indicated 2 latent factors: *social cohesion and exchange* (i.e., observations of and interactions with neighbors) and *social and physical disorder* (i.e., neighborhood problems and unsafe conditions). Neighborhood-level measures of cohesion and disorder showed moderate to high levels of internal consistency (alphas = .78 and .85 in CNDS and .60 and .88 in BMS). Inter-resident agreements were low (intra-neighborhood correlation coefficients = .08 and .11 in CNDS and .05 and .33 in BMS). Cohesion showed a modest, positive association with a composite measure of neighborhood socioeconomic status (SES). Disorder showed a strong, negative association with neighborhood SES.

Conclusions. Findings provide initial evidence of the reliability and construct validity of these neighborhood-level social process measures.

Key Words: Neighborhood social context—Social capital—Socioeconomic status—Collective efficacy—Social disorganization theory.

COMMUNITY characteristics have been linked to the lives of individual residents in analyses of criminal activity, educational attainment, and health (Brooks-Gunn, Duncan, Klebanov, & Sealander, 1993; Diez-Roux et al., 1997; Morenoff, Sampson, & Raudenbush, 2001). Consequently, researchers from a broad range of disciplines have turned their attention to delineating the structural factors, and associated mechanisms, that connect the larger social environment to the individual. Indeed, research on health has documented neighborhood health associations for outcomes such as functional status, asthma prevalence, physical activity, and mortality (Balfour & Kaplan, 2002; Cagney & Browning, 2004; Ross, 2000; Wen & Christakis, 2005). Although the social and physical environments have been a key concern of public health, contemporary elaborations to existing social theory and methodological advancements have contributed to a resurgence of community-level research (Jencks & Mayer, 1990; Raudenbush & Sampson, 1999; Sampson, Raudenbush, & Earls, 1997).

Structural indicators of community have received the most attention (Diez-Roux et al., 1997; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Krause, 1996; LeClere, Rogers, & Peters, 1997). Levels of poverty, for instance, were found to be associated with cardiovascular disease, infant mortality, and preterm birth (see Pickett & Pearl, 2001, for a review). To some extent, this focus on poverty and associated demographic features has been a result of the limited availability of alternative neighborhood-based measures. Research on neighborhood factors and health has been criticized for being too narrowly focused on structural factors e.g. (poverty), which are relatively easy to obtain through resources such as the census (Kennedy, Kawachi, Glass, & Prothrow-Stith, 1998). A number of authors have urged a shift toward an examination of the social processes and dynamics (e.g., social network interaction and exchange, social cohesion and informal social control, social and physical disorder) that potentially underlie socioeconomic and demographic patterns and may act as the mechanisms

relating structural features to individual-level outcomes (Macintyre, Ellaway, & Cummins, 2002; Mayer & Jencks, 1989; Sampson, 1991).

This more recent shift in research emphases has sought to unpack the influence of socioeconomic disadvantage in what Sampson and colleagues have described as the “process turn” (Sampson, Morenoff, & Gannon-Rowley, 2002). Although theoretical contributions in urban sociology have laid out some promising pathways, the measurement of these social processes is still under development. A number of empirical constructs have been created to capture aspects of neighborhood social processes and to demonstrate their role in individual-level health and well-being (Cohen, Finch, Bower, & Sastry, 2005; Franzini, Caughy, Spears, & Fernandez Esquer, 2005; Kirtland et al., 2003). Findings related to social processes and their effects on health are compelling (Browning & Cagney, 2002; Wen & Christakis, 2005), but fundamental research examining the reliability and validity of such measures is with few exceptions lacking, particularly for older population groups (Raudenbush & Sampson, 1999).

Extant literature indicates that social interaction and social connectedness to neighbors may be important for the health of older adults (Cannuscio, Block, & Kawachi, 2003; Krause, 1993). Moreover, neighborhoods may be even more salient to older persons than to their younger counterparts (Cagney & Wen, 2007; Glass & Balfour, 2003); residential tenure may contribute to feelings of allegiance (Lee, Oropesa, & Kanan, 1994), and factors such as retirement and compromised health may confine both social and service interactions to the immediate environs. Urban social space may pose unique challenges to older adults whose circumstances require that they navigate areas which are physically and socially depleted of resources (Newman, 2003). Older adults, too, may have a particular lens through which they evaluate the context and quality of neighborhood life and may respond to environmental cues in a manner unique to their age and cohort.

We sought to develop and validate new measures of two distinct aspects of neighborhood social processes: social cohesion and exchange, and social and physical disorder. We did so to (a) identify key items that reflect these constructs and assess their reliability, (b) appraise their validity by comparing them with other neighborhood-based assessments (e.g., neighborhood-level socioeconomic status [SES]), (c) examine the extent to which they are robust across two urban locations, and (d) discuss our findings in relationship to other research on the community context of older adults. Our aim was to construct meaningful indexes of social cohesion and exchange and social and physical disorder that can be used in research on neighborhood social processes and the health of older adults. Important to this study, our measures are developed from questions asked solely of older respondents. Most summary measures of neighborhood context are created with responses from individuals across a broad range of ages. We benefit from data

sources specific to older adults; the narrower, and older, age range we draw from allows for insights into perceptions of context that may be shaped by age and cohort. To develop our subscales, we draw from a series of structured questions designed to capture the social and physical aspects of adult lives. By design, the Baltimore Memory Study (BMS) included the original set of questions from the Chicago Neighborhood and Disability Study (CNDS), thereby affording us the rare opportunity to compare community perceptions of two older adult populations in an urban social context.

Theoretical Framework

Collective efficacy and social disorganization theories informed the development of our measures (Shaw & McKay, 1969). Collective efficacy theory emphasizes neighborhood social resources in the form of mutual trust and solidarity (*social cohesion*) and expectations for action (*informal social control*) to explain the impact of neighborhood factors on individual-level outcomes (see Sampson et al., 1997, and Raudenbush & Sampson, 1999, for an extended discussion of the collective efficacy framework and its specific operationalization). Collective efficacy, or the ability of the community to come together for the common good, has been shown to affect asthma rates, self-rated health, and adverse birth outcomes (Browning & Cagney, 2002; Cagney & Browning, 2004; Morenoff, 2003). Specific mechanisms through which collective efficacy may contribute to health include the social control of health-related behaviors and conditions and the positive psychosocial processes that generate a protective effect for health (Kawachi & Berkman, 2000). Highlighting the potential to activate social capital in times of need, it reflects the capacity of community members to act on one another's behalf regardless of preexisting network ties.

Collective efficacy is distinguished from social network interaction and exchange in that it assesses norms and expectations for behavior rather than actual ties or direct interaction. However, the theory recognizes that the two are linked; social network interaction contributes to normative orientations. Mechanisms such as social network density have been shown to affect health status on the individual level (Berkman & Glass, 2000; House, Landis, & Umberson, 1988; Mendes de Leon et al., 1999). The richness of networks and the sense of connectedness for the community at large, rather than the individual alone, may also affect health (Kim & Kawachi, 2006). These findings indicate that the normative orientation toward network formation has an effect on health independent of individual-level networks. In general, social process mechanisms have been hypothesized as more proximal to a health event, rather than, say, the economic status or residential stability of the community (albeit these factors may set the stage where networks may either flourish or dissipate).

An additional perspective builds on insights from the criminological literature to examine the effects of social and

physical disorder. Visible signs of community decay and social decline contribute to fear of victimization and social withdrawal (Skogan, 1990). Boarded-up buildings, vacant lots, graffiti, and other physical signs of deterioration combine with indicators of social decline such as gang activity and crime to convey the breakdown of social order and control. In this context, fear of victimization encourages residents to avoid neighborhood life and seals them off from contact with potential neighborhood resources. Krause and colleagues (Krause, 1993; Thompson & Krause, 1998), for instance, found that neighborhood deterioration, as measured by the condition of neighborhood buildings, roads, and the respondent's perceived level of safety from crime in the neighborhood was positively associated with distrust and social isolation and negatively associated with physical health among older adults. Dilapidated conditions also may compromise physical function as older adults attempt to traverse poorly lighted walkways or areas with other physical hazards (Balfour & Kaplan, 2002). The disorder perspective, along with collective efficacy and social network interaction, inform the development of the social cohesion and exchange and physical and social disorder measures, to which we now turn.

METHODS

Studies

The CNDS.—The CNDS was designed to examine the effect of neighborhood factors on disability outcomes in community-dwelling older adults. CNDS is integrated into the Chicago Health and Aging Project (CHAP), which is an ongoing, population-based, longitudinal study of risk factors of Alzheimer's disease and other age-related health conditions (Bienias, Beckett, Bennett, Wilson, & Evans, 2003; Evans et al., 2003). The CHAP study is conducted in a geographically defined community area of three adjacent neighborhoods on the south side of Chicago. This area was selected because it contained a large number of Black and White residents within its boundaries. Participants were selected based on a complete census of the community area to identify all adults who were 65 years or older. All residents who met the age criteria were invited to participate. Of the 7,813 eligible residents, 6,158 (78.8%) agreed. The in-home baseline interview of this cohort began in late 1993 and was completed in 1997. The baseline phase was followed by successive interview cycles at approximately three-year intervals. At the time of the third interview cycle (2000–2002), residents who had turned 65 since the beginning of the study were identified from the census and invited to participate as well.

The 2000–2002 cycle of CHAP in-home interviews forms the baseline for CNDS. As part of CNDS, participants were recontacted by telephone at yearly intervals between the on-

going, three-yearly CHAP in-home interviews to collect additional follow-up data on disability status. Due to the length of the CHAP in-person interviews and to reduce respondent burden, self-report questions on neighborhood conditions were administered in part during the in-person interview and in part during the first yearly telephone follow-up interview. Data for the present analysis come from participants who completed both the in-person interview between 2000 and 2002 and the subsequent phone interview ($N = 4,249$). Of these, 367 no longer lived in the study area and were excluded from this analysis, leaving a total of 3,882 participants (including 2,149 surviving members of the original cohort and 1,733 new participants). Both CHAP and CNDS were approved by the institutional review board of Rush University Medical Center, and all participants (or legal guardians) provided written consent.

The BMS.—The BMS is a multilevel cohort study of risk factors for cognitive decline in Baltimore City residents sampled at random from 65 contiguous urban neighborhoods. Data were collected from 2001 to 2002. The methods are described elsewhere (Schwartz et al., 2004). Dwellings in the study area were linked to telephone numbers, and households with telephones were randomly selected for recruitment. Eligibility was determined on 2,351 subjects (50–70 years old, living at selected households in Baltimore for at least five years), and of these subjects, 60.8% were scheduled for an enrollment visit. Of the 1,430 scheduled for an appointment, 1,140 (79.7%) were enrolled and subsequently tested. Data on individual study participants were collected at the study clinic (in northern Baltimore City) by trained research assistants. A structured interview obtained information on self-report of birth date and age in years, sex, race or ethnicity (using the Census 2000 method [Grieco & Cassidy, 2001]), housing and residential history, and smoking and alcohol history. The BMS was approved by the institutional review board of Johns Hopkins University Bloomberg School of Public Health, and all participants (or legal guardians) provided written consent.

Neighborhood Variables

Individual-level neighborhood perceptions.—Based on previous neighborhood research (Balfour & Kaplan, 2002; Jencks & Mayer, 1990; Sampson et al., 2002), CNDS constructed a series of neighborhood questions that were thought to have specific relevance to older adults. The identical set of questions was then included in BMS. One subset of questions was designed to capture individual residents' own level of integration in the neighborhood, as well as the overall level of social cohesiveness and exchange they perceive to exist in the neighborhood. A second set of questions focused on neighborhood physical and social disorder, particularly the presence of potentially threatening or

intimidating conditions (e.g., presence of strangers) and the state of disrepair or neglect of the built environment (e.g., seeing trash and litter). The questions did not include a guideline about the geographical boundaries of the neighborhood area, which by default was left to the participants' own interpretation. The key measures used in this analysis stem from this common set of questions (Table 1).

Definition of neighborhoods.—Construction of neighborhood-level measures was dependent on the aggregation of individual-level neighborhood data by neighborhood area (see following). Although CNDS was conducted in three defined neighborhood areas on the South Side of Chicago, these areas are relatively large, each encompassing about six to seven census tracts. Given the high density of participants in the study area, we used census block groups ($N = 82$) to define individual neighborhoods in the CNDS data. Although block groups do not necessarily form distinct neighborhoods, there were no other criteria available to specify natural neighborhood boundaries. In addition, census block groups are relatively small geographical areas of about 1,000 residents, which are normally more homogeneous than larger areas such as census tracts or postal ZIP codes (Krieger et al., 2002). According to the 2000 U.S. Census, the average population size per block group was 940 (median = 885).

In the BMS, we used neighborhood boundaries created by the Baltimore City Department of Planning, which are based on community definitions of existing neighborhoods. Thus, these city neighborhoods represent more natural boundaries of neighborhood areas compared with definitions based on census units or ZIP codes. Data on neighborhood characteristics came from the 2000 U.S. Census and the Baltimore City Departments of Planning, Public Works, and Police. BMS included a total of 65 city neighborhoods, which are roughly the size of two census block groups, and

encompassed an average of 2,644 residents (median = 2,080). Participants were linked to their neighborhood of residence by their home address at baseline.

Covariates

Other variables used in the analysis include age (in single years), sex, race (Black or non-Black), duration of neighborhood residence (in CNDS, years of residence in the neighborhood, and in BMS, at current address), individual-level education and income, and neighborhood-level SES. In CNDS, education was measured in years of schooling completed and income as total current income in 10 categories, ranging from lowest, <\$5,000/year, to the highest, >\$75,000/year. BMS included an instrument specifically designed to assess individual and household educational attainment, income, and wealth (Schwartz et al., 2004). In this analysis, we used an index of educational attainment, categorized in nine levels, and total household income. Neighborhood SES was constructed on the basis of four indicators from the 2000 U.S. Census that are available at the block group level, including percent of population on public assistance, percent with a household income less than \$25,000, percent with a bachelor's degree or more, and percent of owner-occupied dwellings valued at greater than \$200,000. These indicators were chosen because they combined information on both the lower (percent public assistance, percent income <\$25,000) and the upper end (percent education greater than bachelor's degree, percent dwellings >\$200,000) of the spectrum of SES, and each represents somewhat different aspects of social position (social service use, education, income, and wealth). In each study, they showed a reasonable degree of variation across the study neighborhoods, and they were at least moderately correlated with one another (range in CNDS: 0.45–0.82; in BMS: 0.36–0.66). The indicators were z scored and then averaged across the four indicators per neighborhood to obtain a measure of neighborhood SES.

Table 1. Survey Items

How often in your neighborhood (often, sometimes, rarely, or never) ...
Do you see neighbors and friends talking outside in the yard or on the street?
Do you see neighbors taking care of each other, such as doing yard work or watching children?
Do you see traffic conditions, such as speeding cars or cars that run stop signs?
Do you see low or inadequate lighting at night?
Do you see neighbors watching out for each other, such as calling if they see a problem?
Do you see people walking around you do not recognize?
Do you see poorly maintained sidewalks or broken curbs?
Do you see vandalism, such as damaging property or graffiti?
Do you see trash and litter?
Do you feel it is unsafe to walk around your neighborhood?
Is there loud noise from neighbors, traffic, or other sources?
How many neighbors ...
Do you know by name?
Do you have a friendly talk with at least once a week?
Could you call on for assistance in doing something around your home or yard or to "borrow a cup of sugar" or some other small favor?

Analysis

The analysis proceeded in three steps. First, we performed a preliminary examination of the response distributions and correlation structure of the 18 neighborhood questions common to both the CNDS and the BMS data sets. This resulted in the exclusion of four items, one (seeing poor public transportation) due to a high number of missing responses (>25%), and three (seeing people making their yards beautiful, seeing neighbors who do not get along, seeing social and civic activities in your neighborhood) due to poor fit in a preliminary factor analysis. The second step involved a two-group confirmatory factor analysis of the remaining 14 items to model the measurement structure of our hypothesized constructs as latent variables, not directly measured by any single indicator. This allowed us to first fit a common measurement model across the two

studies and then to test the measurement invariance of each indicator across both studies. The item responses were assumed to be ordinal-level data with the exception of three items (number of neighbors you know by name, you can call for assistance, you can have a friendly talk with), which were modeled as normally distributed continuous data after log transformation. To accommodate this level of measurement, the confirmatory factor analysis (CFA) was estimated using a mixed matrix of Pearson and polychoric correlations.

The measurement model was fit as a two-group model (representing each study) using the robust weighted least squares estimator with a diagonal weight matrix in M-Plus, version 5 (Muthén & Muthén, 2008). Model fit was tested using conventional methods by requiring a comparative fit index (CFI) and Tucker–Lewis fit index (TFI) of 0.95 or greater and a root mean square error of approximation (RMSEA) of less than 0.05. We began by specifying a base model for the two hypothesized latent factors, neighborhood social cohesion and exchange (six items, henceforth *cohesion*) and neighborhood social and physical disorder (eight items, henceforth *disorder*). Indicators were retained if their lambdas (factor loadings) were significant and theoretically consistent. We sought a solution in which each indicator loaded on only one factor. Guided by our experience examining the model fit iteratively and making adjustments, we relaxed the assumption of no uncorrelated measurement error only when clearly justified. The final measurement model produced the values for the individual-level measures of cohesion and disorder. Neighborhood-level factor scores for cohesion and disorder were then constructed using the results of the measurement model, honoring the ordinal level of measurement of the indicators using M-Plus. The intra-neighborhood correlation coefficient (ICC) was computed to estimate the proportion of variance in the total factor score for each construct between (rather than within) neighborhoods (Raudenbush & Sampson, 1999). A measure of the internal consistency reliability coefficient at the neighborhood level was estimated using procedures described by O’Brien (1990).

The third step in the analysis consisted of testing the correlation of the neighborhood-level measures of cohesion and disorder with a composite measure of neighborhood SES and one measure of neighborhood structural resources (percent vacant dwellings) derived from census data. This was done to examine initial construct validation of the two neighborhood social process measures. We hypothesize that neighborhood SES will be positively correlated with cohesion and negatively correlated with disorder. Informed by the urban social theory discussed earlier, we anticipate that structural characteristics such as neighborhood SES set the stage for certain social process mechanisms to emerge. A rich and extensive literature in urban sociology and related disciplines suggests that neighborhood SES will not be perfectly correlated with these social process

mechanisms but will be associated (e.g., Sampson et al., 2002).

RESULTS

We begin with a description of our data (Table 2). The CNDS ($n = 3,882$) and BMS ($n = 1,140$) samples are relatively similar across demographic category. The CNDS sample is older (by design there are no respondents younger than 65) and primarily African American (72%). The BMS sample is wealthier and, on average, better educated. Neighborhood tenure is longer in the CNDS, compared with BMS. Differences in these sociodemographic variables reflect, at least in part, the differences in age composition between the two studies, and for neighborhood tenure, differences in assessment of residential history.

Analysis of Individual-Level Data

The initial measurement model provided a relatively poor fit to the data (CFI = 0.90, TFI = 0.938, RMSEA = 0.065; $\chi^2/df = 1,262/104$). We allowed several modifications in the measurement model to obtain a significantly improved fit (see Figure 1). We relaxed the restriction of independent error among the three cohesion items (in both studies), and between one cohesion and one disorder item (CHAP study only), which resulted in a significantly improved fit. In addition, “seeing unsafe traffic” had a tendency to load weakly on both latent variables and was removed from the model to retain empirically distinct latent variables. Finally, we relaxed the restriction on invariant threshold values between

Table 2. Descriptive Statistics

	CNDS ($n = 3,882$), %	BMS ($n = 1,140$), %
Age (years)		
49–54	—	31.1
55–64	—	46.6
65–74	55.6	22.0
75–84	35.2	—
85+	09.2	—
Sex		
Female	61.8	65.7
Male	38.2	34.3
Race		
Black	72.2	41.6
Non-Black	27.8	58.4
Education		
<12	30.5	14.5
12	27.9	22.0
>12	41.6	63.5
Income		
<\$15,000	26.9	16.6
\$15,000–30,000	39.7	16.8
>\$30,000	33.4	66.6
Years in neighborhood		
≤15	09.8	45.1
16–30	27.0	37.8
>30	63.2	17.2

Note: CNDS = Chicago Neighborhood and Disability Study; BMS = Baltimore Memory Study.

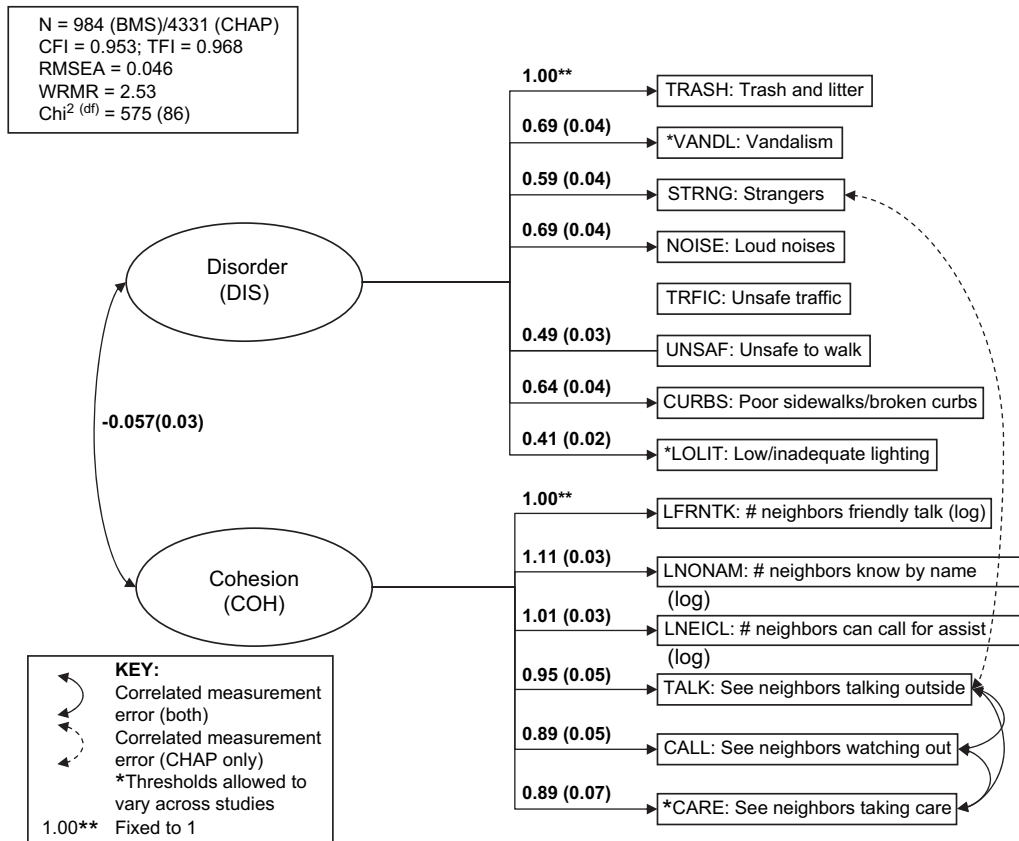


Figure 1. Measurement model of neighborhood cohesion and disorder. WRMR = Weighted Root Mean Square Residual.

the two studies for three items. This allowed us to retain an invariant factor structure between the two studies, at the cost of allowing between-study differences in the hypothesized underlying distribution of true responses to three items. In each case, we hypothesized that the response options might reasonably map to the social reality of these cities in a different way. We argue that it is reasonable to expect such differences in average response to some neighborhood questions between the two studies given they represent two different urban areas. The fit indexes indicate that this final measurement model provided an adequate fit of the data: CFI = 0.953, TFI = 0.968, RSMEA = 0.046, $\chi^2/df = 575/86$.

The pattern that emerged from the CFA was robust across the two studies and consistent with the two hypothesized constructs of theoretical interest: *social cohesion and exchange* and *social and physical disorder*. Within constructs, we observe a weaker relationship from neighborhood safety (disorder) in the BMS and from neighbors talking outside and taking care of each other (cohesion). The two individual-level measures had a reasonably high level of reliability based on internal consistency; Cronbach's α for the cohesion scale was .71 in CNDS and .76 in BMS. Cronbach's α for the disorder scale was .91 and .74 in CNDS and BMS, respectively. We note that data for the six-item cohesion measure in CNDS were collected during two separate inter-

views (three items at each interview), conducted approximately a year apart. The median time interval between the two interviews was 354 days (interquartile range 348–388). In a separate analysis, we examined whether differences in time interval between the two interviews affected the internal consistency of the cohesion measure. Cronbach's alpha was found to be identical (.71) for participants with a time interval of less than 1 year, and 1 year or more between interviews, suggesting that the duration between interviews did not affect the reliability of the measure.

Analysis of Neighborhood-Level Data

Table 3 shows the characteristics of the CNDS and BMS neighborhoods based on 2000 U.S. Census data. In general, there was a substantial degree of heterogeneity in neighborhood characteristics in terms of their sociodemographic profiles (with the BMS neighborhoods showing lower levels of economic resources). The four census-level sociodemographic indicators (percent on public assistance, percent yearly income less than \$25,000, percent education equal to or greater than a bachelor's degree, and percent of privately owned dwellings with a value of greater than \$200,000) were summarized into an overall neighborhood SES index. The presence of vacant dwellings also varied by site, with

Table 3. Social Characteristics of the CNDS and BMS Neighborhood Areas Based on the 2000 U.S. Census

	CNDS (N = 82 block groups)		BMS (N = 65 neighborhoods)	
	Mean (SD)	IQR	Mean (SD)	IQR
	% Public assistance	5 (5)	0 to 8	6 (6)
% Income ≤ \$25,000	21 (11)	12 to 27	39 (20)	24 to 54
% Education ≥ bachelor's degree	30 (18)	15 to 47	29 (23)	9 to 47
% Dwellings >\$200,000	16 (23)	0 to 22	7 (16)	0 to 3
Neighborhood SES index ^a	0 (0.8)	-0.6 to 0.7	0 (0.8)	-0.7 to 0.4
% Vacant dwellings	4 (9)	0 to 6	14 (10)	7 to 19

Notes: CNDS = Chicago Neighborhood and Disability Study; BMS = Baltimore Memory Study; IQR = interquartile range; SES = socioeconomic status.

^aAverage of z-scored percent public assistance, income ≤ \$25,000, education ≥ bachelor's degree, and dwellings >\$200,000.

the BMS neighborhoods showing a much higher percentage (14%) than the CNDS (4%).

Psychometric information on the neighborhood-level measures is presented in Table 4. The ICCs are low for both variables, indicating a relatively low level of inter-resident agreement on neighborhood conditions. In contrast, neighborhood cohesion and disorder show adequate to high levels of internal consistency, except for the cohesion measure in BMS, which was slightly below standard levels of adequate internal consistency (.60).

To obtain initial information on the construct validity of these neighborhood measures, we evaluated their association with aggregate-level neighborhood SES using SES markers derived from an independent source, the 2000 U.S. Census (as previously discussed). Results in Table 5 indicate that in both studies cohesion shows a positive correlation with neighborhood-level SES, although the size of the correlation was modest, especially in the BMS (.41). As expected, disorder showed a negative correlation with neighborhood SES in both studies, and these correlations tended to be greater in magnitude than those for cohesion. We also evaluated the association of each measure with the percent of vacant dwellings, hypothesizing that the presence of vacant dwellings could both contribute to a disordered community context (e.g., buildings in disrepair) and lower levels of cohesion (e.g., fewer eyes on the street). The percent of vacant dwellings has a modest negative association with cohesion in both CNDS and BMS and a modest but somewhat stronger positive association with disorder (especially in the BMS case, .45).

Table 4. Psychometric Characteristics of Neighborhood-Level Cohesion and Disorder

	CNDS (N = 82 block groups)		BMS (N = 65 neighborhoods)	
	ICC	Reliability Coefficient	ICC	Reliability Coefficient
Cohesion	.08	.78	.05	.60
Disorder	.11	.85	.33	.88

Note: CNDS = Chicago Neighborhood and Disability Study; BMS = Baltimore Memory Study; ICC = intra-neighborhood correlation coefficient.

Table 5. Correlates of Neighborhood-Level Cohesion and Disorder^a

	CNDS (N = 82 block groups)		BMS (N = 65 neighborhoods)	
	Cohesion	Disorder	Cohesion	Disorder
Disorder	-0.52		-0.23	
% Public assistance	-0.39	0.66	-0.18	0.57
% Income ≤ 25,000	-0.55	0.67	-0.30	0.67
% Education ≥ bachelor's degree	0.45	-0.66	0.49	-0.51
% Dwellings >\$200,000	0.35	-0.47	0.27	-0.34
Neighborhood SES Index ^b	0.51	-0.72	0.41	-0.66
Percent vacant dwellings	-0.30	0.32	-0.24	0.45

Notes: CNDS = Chicago Neighborhood and Disability Study; BMS = Baltimore Memory Study; SES = socioeconomic status.

^aCell entries are correlation coefficients (Pearson's r).

^bAverage of z-scored percent public assistance, income ≤ \$25,000, education ≥ bachelor's degree, and dwellings >\$200,000.

Figures 2 and 3 display these associations in graphical form, with fitted smoothed splines to visualize nonlinear patterns in the associations of each variable with SES. The splines suggest that the associations are reasonably linear, except for some attenuation in the relationship between neighborhood SES and disorder at the upper end of SES in CNDS and between neighborhood SES and cohesion at the lower end of SES in BMS. In general, they indicate that cohesion and disorder move in our hypothesized directions with respect to neighborhood SES and therefore provide evidence of construct validity.

DISCUSSION

We examine an array of neighborhood assessments in an attempt to build a set of measures that adequately reflect key aspects of neighborhood social conditions. We do so invoking recent advancements in neighborhood theory, providing guidance in data abstraction to create the domains of social cohesion and exchange and social and physical disorder. We confirm that these two domains are

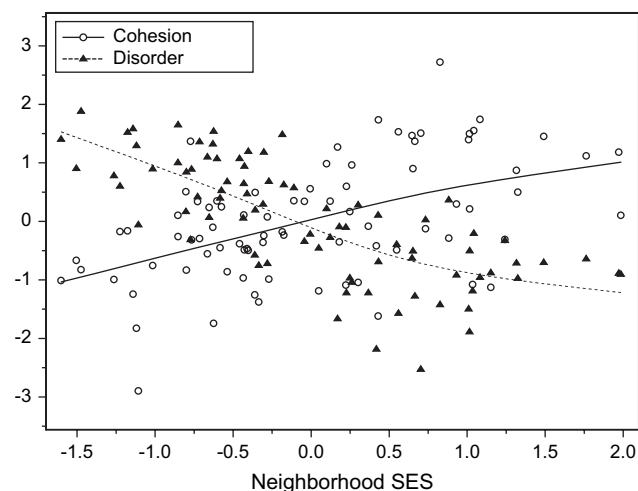


Figure 2. Chicago Neighborhood and Disability Study neighborhood socioeconomic status (SES) and social process measures.

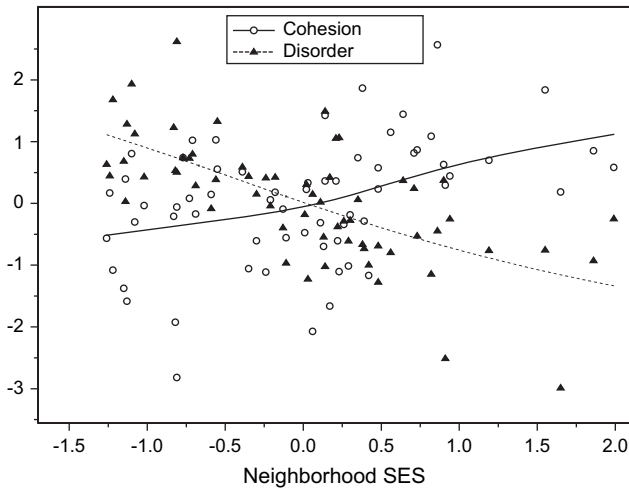


Figure 3. Baltimore Memory Study neighborhood socioeconomic status (SES) and social process measures.

present in our data. Further, we demonstrate that these indexes are reliable. We then go on to provide initial evidence of their construct validity, examining their relationship to a composite index of neighborhood-level SES.

The focus of our neighborhood measures was to assess aspects of the social context that may have relevance to the health and well-being of older adult populations. Using the framework of collective efficacy and social disorganization theories (Sampson et al., 1997; Shaw and McKay, 1969), we were especially interested in capturing the social processes and dynamics that may contribute to the differential distribution of these outcomes across social-structural strata. These strata, which are typically defined by poverty or other characteristics of socioeconomic disadvantage, are often derived from administrative databases such as that of the U.S. Census. Other sources of information on neighborhood conditions include real estate data and, in rare circumstances, systematic social observations of public spaces (Sampson & Raudenbush, 1999). Any of these sources, however, has limited capability in assessing community social processes of neighborhood areas. We therefore relied on self-reported assessments of neighborhood quality, interactions, and attitudes and aggregated these self-reports to characterize neighborhood social processes. We contend that perceptions of neighborhood quality are a critical determinant of residents' motivation to engage in neighborhood-based activities such as exercise.

Evidence of the reliability and validity of such neighborhood-based measures in an older adult population is lacking. Most measures have been developed across a wide population range, and many focus on dimensions most relevant for families with young children (Earls & Buka, 1997). We identify the community characteristics most likely to shape the experience of older adults, establish that these characteristics reflect larger social dimensions, and demonstrate that these dimensions are reliable and valid across two distinct urban contexts. We chose a broad array of indicators and in doing

so aimed to capture the impact from a full range of socioeconomic advantage and disadvantage. Our measures are consistent in two different urban centers in the United States.

In both studies, we find that resident assessments can provide reliable and valid measures of neighborhood social context. The reliability of the two measures was reasonably high, except for cohesion in the BMS. It is of note, however, that the average number of residents per neighborhood area was smaller in the BMS ($M = 17$), compared with CNDS ($M = 41$), which may have contributed to the difference in reliability coefficients (Raudenbush & Sampson, 1999). The low degree of inter-resident agreement on neighborhood conditions indicates a relative lack of homogeneity in neighborhood perceptions among residents of individual neighborhood areas. Low ICCs are not uncommon in measures of social context (Raudenbush & Sampson, 1999). In the case of the CNDS, this may be due to the fact that neighborhoods were defined on the basis of administrative boundaries; they may not correspond to residents' perceptions of neighborhood areas. Also, CNDS neighborhoods were all located within the same geographically defined area. This may produce patterns of spatial correlation in neighborhood conditions which may have attenuated between-neighborhood heterogeneity, resulting in lower ICCs. Low levels of inter-resident agreement may be most indicative of perceptions that, in fact, differ. This does not mean that the measures are of poor quality but rather that there is substantial variation in the way older adults view their social and physical environment. This result may provide additional evidence that cohorts become more heterogeneous with age, as some life course theorists suggest (Dannefer, 2003). This variation is interesting in its own right and warrants further investigation.

Initial validation suggests that our two measures were meaningfully associated with a neighborhood-level measure of SES. As hypothesized, cohesion tended to be higher in neighborhoods composed of residents with, on average, higher levels of SES, whereas the opposite pattern was found for disorder. Consistent with previous neighborhood research (Ross & Mirowsky, 2001; Sampson et al., 2002), these associations were larger in magnitude for disorder than cohesion, suggesting that neighborhood cohesion may be less dependent on compositional SES than disorder. In other words, living in low-SES neighborhoods may not preclude the development of patterns of social cohesion, exchange, and trust among residents, or, perhaps equally as likely, living in high-SES neighborhoods does not guarantee high levels of social cohesion and exchange. This is illustrated in our figures that show considerable variation in cohesion at both ends of the spectrum of neighborhood SES. Relationships between neighborhood SES and disorder, in contrast, were considerably greater in magnitude, suggesting that signs of disorder are for the most part derivative of the lack of structural resources within a community (Sampson & Raudenbush, 2004; Wen, Hawkey, & Cacioppo, 2006). We anticipated that the percent of vacant dwellings would be negatively associated with cohesion and positively associated with disorder

based on the notion that they would signal a lack of monitoring or ability to galvanize and would likely be in a disintegrated state. Modest associations in the expected directions provide additional evidence of construct validity.

Our study is not without limitations. First, the age ranges for the BMS (49–74 years) and CNDS (65 and older) differ. The BMS sample may include a substantial number of respondents who are still actively engaged in the work force and for whom neighborhood experiences may be distinct. The lower reliability coefficient for cohesion in the BMS case may in some part be attributable to this variation in age. Second, we compare only two urban locations. Although the performance of our measures across these two contexts is reassuring, data on other urban contexts would be useful to examine. Third, our neighborhood classifications vary. The Baltimore data cover a much wider range of neighborhoods, whereas the Chicago data are confined to a smaller region of the city. Apart from size, the construction of neighborhood boundaries differs; CNDS is drawn from administrative boundaries, whereas the BMS used a historical classification of neighborhood areas. A critical issue in neighborhood-based research is the definition of “neighborhood.” Because much of the data used to characterize communities is census based, the construction of neighborhood boundaries is at least partially dependent on these administrative units. We acknowledge that theory should direct the appropriate level of neighborhood aggregation. Different constructs may have different influences on the outcome of interest; for example, block group measures may predict functional status, whereas tract-level measures may predict depression (Cagney & Wen, 2007). Attention to these differences may be particularly relevant for the myriad and diverse conditions that develop at later stages of the life course. Fourth, the role of adjacent communities is not examined. That is, our investigation is not a spatially derived process (i.e., we ignore spatial correlations); such an approach would be an important extension (Chaix, Merlo, Subramanian, Lynch, & Chauvin, 2005). Fifth, neighborhoods change. We do not investigate change over time in this analysis but encourage research that incorporates longitudinal analyses of neighborhood context. Finally, the design of both the BMS and the CNDS means that we cannot generalize our findings beyond those at older ages.

Our analyses indicate that survey-based measures provide one avenue for understanding the environment in which older adults live. We were able, with a relatively parsimonious set of measures, to capture two distinct aspects of neighborhood social context. These two concepts—social cohesion and exchange and social and physical disorder—have been critical to the understanding of urban life for decades (Shaw & McKay, 1969). We illustrate that such concepts (a) can be effectively assessed in an older adult population and (b) are critical indicators of the quality of life of urban elderly. Context shapes opportunities for older adults to exercise (Ross, 2000), forge and maintain social connections (Krause, 1993), and more generally enhance

physical and emotional well-being. Measures such as these may capture certain aspects of social contextual processes that affect these outcomes in older populations and inform community-level strategies and policies aimed at preventing decline in health and promoting overall quality of life.

FUNDING

This research was supported by grants from the National Institutes of Health: National Institute on Aging (AG11101 and AG19604) and the National Institute of Environmental Health Sciences (ES10902).

ACKNOWLEDGMENTS

We thank the editor and three anonymous reviewers for their feedback and constructive commentary. We are grateful to Flavio LaMorticella and Jennifer Tarpey for coordination of the study, and Nicole Kim and Todd Beck for their assistance in statistical programming. We also benefited from the comments of Christopher R. Browning, who reviewed an earlier version of the manuscript. K.A.C., T.A.G., and C.F.M. de L. planned the study, conducted the data analysis, and wrote the paper. K.A.S., L.L.B., and B.S.S. provided comments during the revision process.

CORRESPONDENCE

Address correspondence to Kathleen A. Cagney, PhD, Department of Health Studies, The University of Chicago, 5841 South Maryland Avenue, MC 2007, Chicago, IL 60637. E-mail: k-cagney@uchicago.edu

REFERENCES

- Balfour, J. L., & Kaplan, G. A. (2002). Neighborhood environment and loss of physical function in older adults: Evidence from the Alameda County Study. *American Journal of Epidemiology*, *155*, 507–515.
- Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. In L. F. Berkman & I. Kawachi (Eds.), *Social epidemiology* (pp. 137–173). Oxford, England: Oxford University Press.
- Bienias, J. L., Beckett, L. A., Bennett, D. A., Wilson, R. S., & Evans, D. A. (2003). Design of the Chicago Health and Aging Project (CHAP). *Journal of Alzheimer's Disease*, *5*, 349–355.
- Brooks-Gunn, J., Duncan, G. J., Klebanov, P. K., & Sealander, N. (1993). Do neighborhoods influence child and adolescent development? *American Journal of Sociology*, *99*, 353–395.
- Browning, C. R., & Cagney, K. A. (2002). Neighborhood structural disadvantage, collective efficacy, and self-rated physical health in an urban setting. *Journal of Health and Social Behavior*, *43*, 383–399.
- Cagney, K. A., & Browning, C. R. (2004). Exploring neighborhood-level variation in asthma and other respiratory diseases: The contribution of neighborhood social context. *Journal of General Internal Medicine*, *19*, 229–236.
- Cagney, K. A., & Wen, M. (2007). Social capital and aging-related outcomes. In I. Kawachi, S. V. Subramanian, & D. Kim (Eds.), *Social capital and health* (pp. 239–258). New York: Springer.
- Cannuscio, C., Block, J., & Kawachi, I. (2003). Social capital and successful aging: The role of senior housing. *Annals of Internal Medicine*, *139*, 395–399.
- Chaix, B., Merlo, J., Subramanian, S. V., Lynch, J., & Chauvin, P. (2005). Comparison of a spatial perspective with the multilevel analytical approach in neighborhood studies: The case of mental and behavioral disorders due to psychoactive substance use in Malmö, Sweden, 2001. *American Journal of Epidemiology*, *162*, 171–182.
- Cohen, D. A., Finch, B. K., Bower, A., & Sastry, N. (2005). Collective efficacy and obesity: The potential influence of social factors on health. *Social Science and Medicine*, *62*, 769–778.
- Dannefer, D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. *Journals of Gerontology: Social Sciences*, *58*, S327–S337.
- Diez-Roux, A. V., Nieto, F. J., Muntaner, C., Tyroler, H. A., Comstock, G. W., Shahar, E., Cooper, L. S., Watson, R. L., & Szklo, M. (1997).

- Neighborhood environments and coronary heart disease: A multi-level analysis. *American Journal of Epidemiology*, 146, 48–63.
- Earls, F., & Buka, S. L. (1997). *Project on human development in Chicago neighborhoods: Technical report*. Rockville, MD: National Institute of Justice.
- Evans, D. A., Bennett, D. A., Wilson, R. S., Bienias, J. L., Morris, M. C., Scherr, P. A., Hebert, L. E., Aggarwal, N., Beckett, L. A., Jøgelkor, R. et al. (2003). Incidence of Alzheimer disease in a biracial urban community: Relation to apolipoprotein E allele status. *Archives of Neurology*, 60, 185–189.
- Franzini, L., Caughy, M., Spears, W., & Fernandez Esquer, M. E. (2005). Neighborhood economic conditions, social processes, and self-rated health in low-income neighborhoods in Texas: A multilevel latent variables model. *Social Science and Medicine*, 61, 1135–1150.
- Glass, T. A., & Balfour, J. L. (2003). Neighborhoods, aging and functional limitations. In I. Kawachi & L. F. Berkman (Eds.), *Neighborhoods and Health* New York: Oxford University Press.
- Grieco, E. M., & Cassidy, R. C. (2001). *Overview of race and Hispanic origin*. U.S. Department of Commerce, Economics and Statistics Administration. U.S. Census Bureau, Washington, DC.
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241, 540–545.
- Jencks, C., & Mayer, S. E. (1990). The social consequences of growing up in a poor neighborhood. In J. Laurence, E. Lynn, & M. G. H. McGeary (Eds.), *Inner-city poverty in the United States* (pp. 111–186). Washington, DC: National Academy Press.
- Kawachi, I., & Berkman, L. F. (2000). Social cohesion, social capital, and health. In L. F. Berkman & I. Kawachi (Eds.), *Social epidemiology*. Oxford, England: Oxford University Press.
- Kawachi, I., Kennedy, B. P., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality, and mortality. *American Journal of Public Health*, 87, 1491–1498.
- Kennedy, B. P., Kawachi, I., Glass, R., & Prothrow-Stith, D. (1998). Income distribution, socioeconomic status, and self-rated health in the United States: Multilevel analysis [see comments]. *British Medical Journal*, 317, 917–921.
- Kim, D., & Kawachi, I. (2006). A multilevel analysis of key forms of community- and individual-level social capital as predictors of self-rated health in the United States. *Journal of Urban Health*, 83, 813–826.
- Kirtland, K. A., Porter, D. E., Addy, C. L., Neet, M. J., Williams, J. E., Sharpe, P. A., Neff, L. J., Kimsey, C. D., Jr., & Ainsworth, B. E. (2003). Environmental measures of physical activity supports: Perception versus reality. *American Journal of Preventive Medicine*, 24, 323–331.
- Krause, N. (1993). Neighborhood deterioration and social isolation in later life. *International Journal of Aging and Human Development*, 36, 9–38.
- Krause, N. (1996). Neighborhood deterioration and self-rated health in later life. *Psychology and Aging*, 11, 342–352.
- Krieger, N., Chen, J. T., Waterman, P. D., Soobader, M. J., Subramanian, S. V., & Carson, R. (2002). Geocoding and monitoring of US socioeconomic inequalities in mortality and cancer incidence: Does the choice of area-based measure and geographic level matter? The Public Health Disparities Geocoding Project. *American Journal of Epidemiology*, 156, 471–482.
- LeClere, F., Rogers, R. G., & Peters, K. D. (1997). Ethnicity and mortality in the United States: Individual and community correlates. *Social Forces*, 76, 169–198.
- Lee, B. A., Oropesa, R. S., & Kanan, J. W. (1994). Neighborhood context and residential mobility. *Demography*, 31, 249–270.
- Macintyre, S., Ellaway, A., & Cummins, S. (2002). Place effects on health: How can we conceptualise, operationalise and measure them? *Social Science and Medicine*, 55, 125–139.
- Mayer, S. E., & Jencks, C. (1989). Growing up in poor neighborhoods: How much does it matter? *Science*, 243, 1441–1445.
- Mendes de Leon, C. F., Glass, T. A., Beckett, L. A., Seeman, T. E., Evans, D. A., & Berkman, L. F. (1999). Social networks and disability transitions across eight intervals of yearly data in the New Haven EPESE. *Journals of Gerontology: Social Sciences*, 54, S162–S172.
- Morenoff, J. D. (2003). Neighborhood mechanisms and the spatial dynamics of birth weight. *American Journal of Sociology*, 108, 976–1017.
- Morenoff, J. D., Sampson, R. J., & Raudenbush, S. W. (2001). Neighborhood inequality, collective efficacy, and the spatial dynamics of urban violence. *Criminology*, 39, 517–560.
- Muthén, L. K., & Muthén, B. O. (2008). *Mplus user's guide* (5th ed.). Los Angeles: Authors.
- Newman, K. (2003). *A different shade of gray: Mid-life and beyond in the inner city*. New York: New Press.
- O'Brien, R. M. (1990). Estimating the reliability of aggregate-level variables based on individual-level characteristics. *Sociological Methods and Research*, 18, 473–504.
- Pickett, K. E., & Pearl, M. (2001). Multi-level analyses of neighborhood socioeconomic context and health outcomes: A critical review. *Journal of Epidemiology and Community Health*, 55, 111–122.
- Raudenbush, S. W., & Sampson, R. J. (1999). Ecometrics: Toward a science of assessing ecological settings, with application to the systematic social observations of neighborhoods. *Sociological Methodology*, 29, 1–41.
- Ross, C. E. (2000). Walking, exercising, and smoking: Does neighborhood matter? *Social Science and Medicine*, 51, 265–274.
- Ross, C. E., & Mirowsky, J. (2001). Neighborhood disadvantage, disorder, and health. *Journal of Health and Social Behavior*, 42, 258–276.
- Sampson, R. J. (1991). Linking the micro- and macrolevel dimensions of community social organization. *Social Forces*, 70, 43–64.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. G. (2002). Assessing “neighborhood effects”: Social processes and new directions in research. *Annual Review of Sociology*, 28, 443–478.
- Sampson, R. J., & Raudenbush, S. W. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology*, 105, 603–651.
- Sampson, R. J., & Raudenbush, S. W. (2004). Seeing disorder: Neighborhood stigma and the social construction of “broken windows.” *Social Psychology Quarterly*, 67, 319–342.
- Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, 227, 918–923.
- Schwartz, B. S., Glass, T. A., Bolla, K. I., Stewart, W. F., Glass, G., Rasmussen, M., Bressler, J., Shi, W., & Bandeen-Roche, K. (2004). Disparities in cognitive functioning by race/ethnicity in the Baltimore Memory Study. *Environmental Health Perspectives*, 112, 314–320.
- Shaw, C. R., & McKay, H. D. (1969). *Juvenile delinquency and urban areas: A study of rates of delinquents in relation to differential characteristics of local communities in American cities*. Chicago: University of Chicago Press.
- Skogan, W. G. (1990). *Disorder and decline: Crime and the spiral of decay in American neighborhoods*. Berkeley: University of California Press.
- Thompson, E. E., & Krause, N. (1998). Living alone and neighborhood characteristics as predictors of social support in late life. *Journals of Gerontology: Social Sciences*, 53, S354–S364.
- Wen, M., & Christakis, N. A. (2005). Neighborhood effects on posthospitalization mortality: A population-based cohort study of the elderly in Chicago. *Health Services Research*, 40, 1108–1127.
- Wen, M., Hawkey, L. C., & Cacioppo, J. T. (2006). Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: An analysis of older adults in Cook County, Illinois. *Social Science and Medicine*, 63, 2575–2590.

Received September 3, 2008

Accepted December 2, 2008

Decision Editor: Kenneth F. Ferraro, PhD