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A multilevel analysis of urban neighborhood socioeconomic disadvantage and health in late life

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Abstract

The associations between neighborhood context and various indicators of health are receiving growing empirical attention, but much of this research is regionally circumscribed or assumes similar effects across the life course. This study utilizes a U.S. national sample to investigate the association between urban neighborhood socioeconomic disadvantage and health specifically among older adults. Data are from 3,442 participants aged 70+ in the 1993 Asset and Health Dynamics Among the Oldest Old (AHEAD) Study, and the 1990 U.S. Census. Our approach underscores the importance of multiple dimensions of health (self-reported physician-diagnosed cardiovascular disease [CVD], functional status, and self-rated health) as well as multiple dimensions of neighborhood disadvantage, which are conceptualized as environmental hazards that may lead to a physiologically consequential stress response. We find that individual-level factors attenuate the association between neighborhood disadvantage and both CVD and functional status, but not self-rated health. Net of covariates, high neighborhood socioeconomic disadvantage is significantly associated with reporting poor health. In late life, neighborhood socioeconomic disadvantage is more consequential to subjective appraisals of health than diagnosed CVD or functional limitations.

Keywords

U.S.A.; health status; residence characteristics; socioeconomic factors; multi-level modelling; elderly

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INTRODUCTION

The associations between neighborhood context and various indicators of physical health are receiving growing empirical attention, and multiple studies have shown that poor health is partly a function of macro-level socioeconomic disadvantage (Pickett & Pearl, 2001; Robert & House, 2000; Ross & Mirowsky, 2001). However, much of this research is regionally circumscribed, or assumes similar effects across the life course, even though neighborhoods may be especially consequential for the aged as their exposure to the immediate environment lengthens and their spatial realms diminish with time (Glass & Balfour, 2003). In addition, many studies assume that similar processes operate in all residential areas, even though most neighborhood theories assume an urban setting in describing the impact of concentrated disadvantage (e.g., Raudenbush, 2003; Sampson, 2003). Thus, the generalizability of findings to older adults residing in theoretically relevant urban residential areas is limited.

The connections between various health indicators in late life can be seen as sequential: Individual-level studies have described how chronic disease, for example, has a cascading effect, eventually leading to loss of physical functioning (Hayward, Miles, Crimmins & Yu, 2000). Consistent with previous multidimensional operationalizations of health (Ross & Mirowsky, 2001; Robert, 1998), we conceptualize chronic disease as the initial catalyst for poor health, with daily living activity problems being a direct consequence, and with global health rating representing a subjective endpoint. By examining the associations between neighborhood socioeconomic status (SES) and physical health in a sequential framework, we begin to answer questions about where in this health “hierarchy” the environment may come in to play as an additional risk factor for negative health outcomes among the oldest adults.

For the present study, chronic illness is operationalized as cardiovascular disease (CVD), the leading cause of death among adults (Mokdad, Marks, Stroup & Gerberding, 2000). Previous studies using age-heterogeneous samples find that residents of disadvantaged neighborhoods are at higher risk for CVD than residents of advantaged neighborhoods (Diez Roux, Nieto, Muntaner, Tyroler, Comstock, Shahar et al. 1997; Diez Roux, Merkin, Arnett, Chambless, Massing, Nieto et al., 2001; Sundquist, Winkleby, Ahlen & Johansson, 2004). Hypothesized mechanisms that drive this association include variation in access to healthcare, and variable social norms concerning smoking habits, diet, and physical activity. One study specifically focused on adults aged 65 and older found similar associations (Nordstrom, Diez Roux, Jackson & Gardin, 2004), attributed to differences in cumulative SES-patterned exposures over the life course.

In contrast, there is evidence that difficulties with physical functioning and disability are not directly related to neighborhood SES. Robert (1998) finds no effect of community-level SES on functional limitations after controlling for individual-level and family-level SES. Feldman & Steptoe (2004) report indirect associations between poor physical functioning and low neighborhood SES, via perceived neighborhood strain. Most studies do, however, find that perceiving oneself to be in poor health is significantly associated with residing in a disadvantaged neighborhood (e.g., Cagney, Browning & Wen, 2005; Kawachi, Kennedy & Glass, 1999; Lopez, 2004; Malmstrom, Sundquist & Johansson, 1999; Patel, Eschbach, Rudkin, Peek & Markides, 2003; Robert, 1998; Wen, Browning, & Cagney, 2003; Yen & Kaplan, 1999), citing potential mechanisms similar to those discussed above for CVD. Again, however, little is known about these associations specifically among the oldest adults.

Operationalizations of neighborhood socioeconomic disadvantage vary widely across studies. Our approach underscores the importance of multiple dimensions of disadvantage—neighborhood poverty, unemployment, low education, and public assistance needs—which represent forms of “environmental press” (Lawton, 1982). If the “press” of a disadvantaged neighborhood outweighs a person’s own competencies (e.g., health, age, monetary resources) to effectively deal with negative conditions, maladaptive behavior and/or poor health may arise. Favorable outcomes are most likely to occur when personal competencies and environmental press are balanced such that a zone of maximum comfort and performance is achieved. Thus, high or strong press may be harmful or beneficial, depending on its characteristic form and the outcome of interest, and the health connection between the person and their environment is not a simple product of exposure to noxious or beneficial stimuli, but rather a function of person-environment balance.

Environmental press can be equated with “environmental hazard,” which is identified by Catalano & Pickett (2000) as a mechanism by which the specific etiological connection between neighborhood characteristics and health may arise. The assumption is that environmental hazards such as abandoned housing, public deviance, and high crime rates are concomitant to areas characterized by high poverty, high unemployment, low education, and low income, and that exposure to these hazards is threatening and/or stressful. Exposure to or virulence of these hazards varies over space, and coping with adverse circumstances generated by these hazards requires both physical and behavioral adaptation (Catalano & Pickett, 2000), which may be taxing to the individual, leading to poor health. The actual biological mechanism by which poor health may manifest is conceptualised, for example, in terms of allostatic load (McEwen, 1998), which proposes that health outcomes reflect the cumulative impacts of biological dysregulations across multiple biological regulatory systems (e.g., cardiovascular, immune, autonomic), systems that are stress responsive (McEwen & Stellar, 1993). Thus, the threat aroused by environmental hazards leads to a stress response, which is physiologically consequential to the body.

There may also be limited resources available to residents in disadvantaged areas that can assist them to effectively cope with the stress engendered by their environment. For example, such areas are often characterized by a lack of medical screening facilities, health clinics, and health promoting social organizations, which can be considered “acquired resources” that influence the ability to cope with hazards (Catalano & Pickett, 2000). Without such coping resources available to them, residents in disadvantaged neighborhoods may have their health care needs unmet, placing them at elevated risk for untreated chronic conditions. They may also disproportionately turn to unhealthy coping behaviors, such as cigarette smoking, which is associated with exposure to chronic stress (Kassel, Stroud, & Paronis, 2003). Thus, the lack of coping resources in disadvantaged neighborhoods may lead to erosions in the health of its residents.

The purpose of this study is to address gaps in the empirical literature on neighborhood risk factors for poor health in late life by examining a series of health domains (chronic disease [CVD], functional ADL limitations, global health rating) and testing whether and how urban neighborhood socioeconomic disadvantage—which we conceptualize as a form of environmental hazard—affects each domain. Establishing the nature of some basic relationships between the socioeconomic environment and health among the oldest adults is an essential first step in furthering our understanding of how social context may have health consequences for the rapidly aging population. Knowledge about these relationships will also inform the development of theory that specifies the mechanisms by which such associations may arise. Our specific analytic goals are threefold: 1) To determine whether there is significant neighborhood variation in these three hierarchically conceptualized health domains among U.S. urban adults aged 70 years and older; 2) To determine whether

neighborhood variation is explained by sociodemographic and health risk factors at the individual-level; and 3) To examine whether neighborhood-level socioeconomic disadvantage is significantly associated with individual-level health, net of individual-level factors.

METHODS

The Sample

Survey data are from the Study of Assets and Health Dynamics Among the Oldest Old (AHEAD), a U.S. national probability sample in 1993 of noninstitutionalized persons born in 1923 or earlier (i.e. people aged 70 or older) (Soldo, Hurd, Rodgers, & Wallace, 1997). Subjects were selected using a multistage area probability design and a dual-frame sample of Medicare recipients. Within sampled households, one age-eligible individual was sampled; when that person had a spouse, he or she was also included in the sample irrespective of age. The overall response rate of 80 percent yielded an interviewed sample of 8,222 individuals from 6,047 households. For the present analyses, the following were dropped from the sample: 775 age-ineligible spouses to limit the analysis to those aged 70 or older; 791 proxy interviews, which are inappropriate for measuring key variables; and, 532 with missing or invalid data, principally Census tract identifier or cognitive status. To eliminate the household level of clustering, we randomly sampled one person per household, which drops 1,009 persons. The sample is limited to persons living in Census tracts that are at least 75 percent urban because, as noted above, the theories of neighborhood considered here pertain to urban settings; this resulted in a final analytic sample size of 3,442 persons. Weights adjust for variation in probabilities of selection, including the over-sampling of African Americans, Hispanics, and residents of Florida, and the analytic selection of one person per household. Consequently, the analytic sample is nationally representative of noninstitutionalized persons 70 years or older living in urban areas in 1993.

Measures

Self-Reported Physician-Diagnosed CVD—Respondents were asked about three cardiovascular conditions: 1) Whether a doctor ever told them they had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; 2) If a doctor ever told them they had a stroke; and 3) If they have diabetes. Endorsing any of these conditions was scored 1, and otherwise 0. Our operationalization of CVD is consistent with National Cholesterol Education Program guidelines (Expert Panel on Detection, Evaluation, and Treatment of High Blood Pressure in Adults, 2001). It should be emphasized that our measure refers to self-reports of physician diagnosed CVD, as clinical assessments of CVD were not carried out as part of the survey.

Physical Functioning—We assess reported difficulties with both basic activities of daily living (ADL) and instrumental activities of daily living (IADL). Six items comprise the ADL measure: bathing, dressing, eating, getting across a room, getting out of bed, and toileting. Those who received help, had difficulty, or needed special equipment for any of these items received a score of 1, otherwise 0. Five items comprise the IADL measure: preparing hot meals, shopping for groceries, making telephone calls, taking medications, and managing money. Due to the extreme skew at a score of 0, respondents who had difficulty with or were not able to do any of the activities received a score of 1, otherwise they received a score of 0.

Self-Rated Poor Health—Respondents were asked, “Would you say your health is excellent, very good, good, fair, or poor?” A score of 1 represents a response of “fair” or “poor,” with 0 representing all other responses.

Health Risk Factors—For each dependent variable, the effects of the following three risk factors are controlled: 1) ever having smoked cigarettes, scored 0 (no) or 1 (yes); 2) body mass index (BMI), calculated by dividing weight (in kilograms) by squared height (in meters); and 3) self-reported physician-diagnosed high blood pressure, scored 0 (no) or 1 (yes). Due to the subjective nature of self-rated poor health, the effects of two of its known correlates (Han, 2002; Leinonen, Heikkinen, & Jylha, 2001) are additionally controlled: 1) depressive symptoms, a count of eight items experienced “much of the time in the past week” from the Center for Epidemiologic Studies-Depression Scale (CES-D, $\alpha = 0.78$) (Radloff, 1977); and 2) cognitive function, a multidimensional construct using a measure largely adapted from the Telephone Interview for Cognitive Status (TICS) (Brandt, Spencer, & Folstein, 1988), with established reliability and validity (Herzog & Wallace, 1997), and a summed score that ranges from 0 to 35.

Individual-level Sociodemographics—Standard measures included sex, age, marital status, and ethnicity. Educational attainment was assessed as the highest grade of school or year of college completed. Other SES-related measures included household wealth and income, both log transformed.

Neighborhood-level Variable—Neighborhood is operationalized with 1990 U.S. Census tract data, which are linked with geocodes to the individual-level data. The 3,442 participants in our analytic sample reside in 1,217 Census tracts, with the number of participants per tract ranging from 1 to 31 (average 2.8). Socioeconomic disadvantage is operationalized with a principal component comprised of the proportion of: residents aged 25 or older without a high school degrees; households receiving public assistance income; residents living below the poverty level; and residents aged 16 or older who are unemployed.

Data analysis

Normalized grand sample weights are applied so that findings can be generalized to the urban population of U.S. older adults. Descriptive statistics are calculated with the Stata SVY procedure. Hierarchical logistic regression models are estimated with HLM 6.02 (LaPlace iterations). The contextual-level variable is grand mean-centered. The gross variance in each dependent variable that is associated with neighborhood context is first estimated with an unconditional model containing only a random intercept. Second, the overall association between each health outcome and neighborhood-level disadvantage is assessed. Third, the overall impact of individual-level sociodemographic and health risk factors is tested. Fourth, the health effect of neighborhood-level socioeconomic disadvantage, net of individual-level variables, is assessed.

In view of the relatively small average number of individuals per census tract covered by the survey, power calculations were carried out that took into consideration the within-tract correlation in the dependent variable (which reduces the effective sample size by the design effect: $1 + [m - 1] ICC$, where ICC = intra-class correlation [ratio of between-tract variance to the total variance] and m = tract size), and the cross-level correlation between the neighborhood disadvantage index and individual-level variables. The proportion of variance in neighborhood disadvantage explained by individual-level variables is 0.45 (corresponding to a multiple correlation of 0.67). Power in the presence of such a correlation was computed under the conservative assumption that the odds ratio per standard deviation increase in a composite individual-level measure is 2.0 (Tosteson, Buzas, Demidenko, & Karagas, 2003). All power estimates are for 2-sided testing with an alpha of 0.05. For self-reported physician-diagnosed CVD, $ICC = 0.024$, effective sample size = 3,138, and power to detect an odds ratio of 1.2 per standard deviation increase in neighborhood socioeconomic

disadvantage is 93%. For ADL difficulty, ICC = 0.052, effective sample size = 2,877, and power to detect an odds ratio of 1.2 per standard deviation increase in neighborhood socioeconomic disadvantage is 87%. For IADL difficulty, ICC = 0.06, effective sample size = 2,857, and power to detect an odds ratio of 1.2 per standard deviation increase in neighborhood socioeconomic disadvantage is 83%. For self-rated poor health, ICC = 0.085, effective sample size = 2,652, and power to detect an odds ratio of 1.2 per standard deviation increase in neighborhood socioeconomic disadvantage is 86%. Thus, statistical power is adequate (80% or better) to detect moderate sized area-level effects.

RESULTS

Individual-level characteristics of the weighted sample are shown in Table 1. Females outnumber males, the average respondent is in their late 70's, most are non-Hispanic white, nearly half are widowed, average education levels approximate high school graduation, and both income and wealth are variable. Over half report having ever smoked cigarettes, the typical participant is slightly overweight (Gallagher, Heymsfield, Moonseong, Jebb, Murgatroyd, & Sakamoto, 2000), nearly half have high blood pressure, the average participant is not cognitively impaired (a score of 0 – 12 is indicative of impairment, Freund & Szinovacz, 2002), and less than two of eight depressive symptoms are endorsed, on average. A substantial minority of participants report any CVD (29% heart disease, 12% diabetes, 7% stroke, not shown). One-quarter have ADL difficulty, about one in five have IADL difficulty, and nearly a third report poor health. These four dependent variables are significantly correlated with each other (r ranges from 0.15 [ADL vs. CVD] to 0.43 [ADL vs. IADL], not shown).

At the neighborhood-level, there is considerable variation in the Census tract characteristics that make up the socioeconomic disadvantage principal component. For each element, the minimum approaches zero (not shown in Table 1). However, other areas are characterized by concentrated disadvantage, as evidenced by the maximum values: without a high school degrees, 86.3 percent ($Mean = 26.0$); receiving public assistance, 73.5 percent ($Mean = 9.2$); below poverty level, 86.0 percent ($Mean = 14.4$); and, unemployment, 48.7 percent ($Mean = 7.5$).

As shown in Table 2, Model 1 (the null model), there is significant variation in the log odds of self-reported physician-diagnosed CVD across the Census tracts ($\tau = 0.10$; $p = 0.05$). Model 2 shows that there is a nearly significant ($p = 0.06$) positive association between neighborhood-level socioeconomic disadvantage and CVD. For the individual-level (Model 3), being male, African American (in comparison to being non-Hispanic White) reporting a high BMI, and having high blood pressure significantly increase the log odds of CVD. About one-third of the variance in the log odds of CVD across neighborhoods is explained, and the unexplained variation that remains is not statistically significant at the .05 level. Consequently, as shown in Model 4, the log odds of CVD is not significantly associated with living in a disadvantaged neighborhood when the individual-level variables are controlled.

As shown in Table 3, Model 1 indicates that the log odds of ADL difficulty across the Census tracts does vary significantly ($\tau = 0.27$; $p < 0.001$). As shown in Model 2, there is a significant positive association between neighborhood disadvantage and reporting any ADL difficulty, and disadvantage explains a small amount of ADL variation across neighborhoods. The individual-level model (Model 3) shows that ADL difficulty is associated with being female, older, having low education, living in a low wealth/income household, ever having smoked, having a high BMI, and having high blood pressure, explaining about one-third of the variance in the log odds of ADL difficulty across

neighborhoods, compared to the null model. The unexplained variation is not statistically significant ($p = 0.17$). As a result, as Model 4 shows, living in a disadvantaged neighborhood is not associated with ADL difficulty, net of the individual-level covariates.

As with basic ADL difficulty, the null model in Table 4 indicates that the log odds of IADL difficulty across the Census tracts does vary significantly ($\tau = 0.33$; $p < 0.001$). Model 2 shows a significant positive association between IADL difficulty and neighborhood socioeconomic disadvantage, which explains a small amount of the neighborhood variation in IADL difficulty. At the individual-level (Model 3), IADL difficulty is associated with being female, older, married, having low education, living in a low wealth/income household, ever having smoked, and high blood pressure. These individual-level variables explain about 20 percent of the variance in the log odds of IADL difficulty across neighborhoods, and the unexplained variation is non-significant ($p = 0.22$). Thus, as with ADL difficulty, there is no significant variation remaining for neighborhood-level SES to explain, and living in a disadvantaged neighborhood is not associated with IADL difficulty, net of the individual-level variables (Model 4).

Model 1 in Table 5 establishes that there is significant variation in the log odds of reporting poor health across the Census tracts ($\tau = 0.41$; $p < .001$). As shown in Model 2, living in a disadvantaged neighborhood significantly increases the log odds of reporting poor health, and explains a large amount (34%) of neighborhood variation. Model 3 indicates that being married (in comparison to being widowed or separated or divorced), having low education, reporting low household wealth, ever having smoked, having high blood pressure, reporting numerous depressive symptoms, and having low cognition scores increase the odds of reporting poor health. These individual-level variables account for over half of the random neighborhood variation in poor health, but the unexplained variation remains statistically significant. Model 4 reintroduces Level-2 socioeconomic disadvantage to the individual-level model. As shown, living in a disadvantaged area significantly increases the log odds of reporting poor health, net of the individual-level covariates.

DISCUSSION

Our results indicate that there is significant neighborhood variation in self-reported physician-diagnosed CVD, ADL difficulty, IADL difficulty, and self-rated poor health among older persons living in U.S. urban areas. There are also overall associations between these health outcomes and neighborhood socioeconomic disadvantage. However, the variation in CVD, ADL difficulty, and IADL difficulty, and the associations with neighborhood-level disadvantage, are explained by individual-level sociodemographic and health risk factors. In contrast, the significant neighborhood variation in self-rated poor health remains, net of individual-level covariates, and high neighborhood socioeconomic disadvantage increases the odds of reporting poor health. Each standard deviation increase in the neighborhood socioeconomic disadvantage index was associated with a 12% relative increase in the odds of reporting poor/fair health (95% CI: 01% to 26%). This translates to a 5% increase in the proportion of residents with poor/fair self reported health. Thus, increments in urban neighborhood disadvantage appear to be quite consequential to subjective appraisals of health in late life.

The lack of neighborhood findings for CVD is inconsistent with previous work (Diez Roux et al., 1997; Diez Roux et al., 2001; Nordstrom et al., 2004; Sundquist et al., 2004). Although the CVD effect of neighborhood socioeconomic disadvantage nearly attains statistical significance, it appears that for the oldest adults, urban neighborhood context is less consequential to CVD than individual-level factors. Other studies, for the most part, utilized clinical data to operationalize CVD, whereas in our operationalization, participants

were asked to report if a doctor had told them about the presence of CVD, meaning that they were aware of the disease and under a doctor's care. People living in disadvantaged areas may be especially unlikely to be aware of underlying CVD compared to residents of other areas, hence yielding a relatively low rate of reported "doctor-diagnosed" CVD and thus attenuating the observed association with neighborhood disadvantage. The age range of participants may also account for the lack of consistency between our findings and findings from other studies (ours is the only study we could identify specifically assessing persons aged 70 years and older). By older ages, the increase in CVD associated with underlying aging processes may over-ride the contribution of social context by increasing CVD even in neighborhoods with relatively little socioeconomic disadvantage.

The lack of a neighborhood SES effect for ADL or IADL difficulty among these oldest adults is consistent with previous studies of age heterogeneous samples (e.g., Robert, 1998; Feldman & Steptoe, 2004), but is particularly notable since functional limitations are much more common among the aged than earlier in the life course. Our results indicate that there is an overall association between neighborhood disadvantage and functional difficulty, but that age, sex, individual-level SES, and health risk characteristics are more consequential to having difficulty with either type of daily living activity than neighborhood economic characteristics. Thus, these factors attenuate any significant variation across neighborhoods in the odds of having functional difficulty, suggesting that the lack of findings in previous studies is not due to limited power to detect daily living assistance requirements.

Our findings for self-rated health are consistent with previous research conducted with age-heterogeneous samples, in that living in a low SES neighborhood increases the odds of reporting poor health. Unlike most previous studies, however, we additionally assess the impact of emotional and cognitive health at the individual-level, and find that the relationship between neighborhood SES and self-rated health is maintained even once these other risk factors are taken into account. This finding is important because the subjective nature of this self-appraisal lends itself to being influenced by current emotional and cognitive states. We conducted additional analyses to test whether depressive symptoms and cognition mediate the association between neighborhood disadvantage and self-rated poor health, and found that the coefficient for neighborhood disadvantage was similar in models that contained these two variables, compared to models that did not contain them. Thus, the effect of neighborhood disadvantage on self-rated poor health is not solely due to these other factors, and depressive symptoms and cognitive status do not account for the observed associations.

Urban neighborhood socioeconomic disadvantage, which we hypothesized was associated with health threats due to environmental hazards, therefore appear most strongly related to older persons' perceptions of their health status. It is well-established that perceived health is strongly related to actual health (e.g., Wilson & Kaplan, 1995), and we do not suggest that associations between neighborhood disadvantage and other operationalizations of health are non-existent. Rather, perceived health represents the subjective appraisal of *multiple dimensions* of one's own physical health—most of which were not assessed in this study and some of which may not be diagnosable in medical terms (Wen et al., 2003). The ability to detect a neighborhood disadvantage effect on perceived health therefore is enhanced because it is a more global measure of well being than any single disease indicator. The comprehensive nature of self-rated health may be especially relevant among the oldest adults, who must deal with numerous symptoms and ailments associated with normal aging.

Our findings for self-rated poor health support a *structural model*, which posits that attributes of the environment influence similarly all persons within that environment. In analytic terminology, this approach posits main effects of neighborhood characteristics on

individual outcomes, consistent with an orientation that Jencks and Mayer (1990) refer to as the "disadvantages of disadvantaged neighbors." In a further set of analyses (detailed results not reported here), we investigated evidence for an *ecological model*, which is concerned with the junction of person and environment, as embodied in the phrases "person-environment fit" and "relative deprivation." Specifically, we utilized a series of cross-level interactions to examine whether the effect of neighborhood socioeconomic disadvantage on self-rated poor health was contingent upon the individual's own educational attainment, household income, or household wealth. These tests were not statistically significant, and our findings do not support the presence of a systematic SES-related process that renders some older persons (e.g., those with low education or little wealth) especially vulnerable to neighborhood socioeconomic disadvantage, at least with regard to their self-rated health. However, caution should be used in interpreting these particular findings as our ability to detect such systematic processes may have been diminished by a lack of statistical power for cross-level interaction analyses.

There are limitations to this research to acknowledge. First, as discussed in other analyses of the AHEAD data (Herzog & Rodgers, 1999), results are somewhat biased towards a well-functioning population by the unavoidable exclusion of institutionalized persons, proxy-assisted interviews, and persons missing a large portion of cognitive data. Second, selection effects (endogeneity) related to unique characteristics of persons who reside in certain residential areas may have affected the findings, and social selection remains an alternative explanation for our results. Third, the study is cross-sectional and thus causal pathways cannot be definitively determined. Fourth, the use of self-reported assessments of physical health in the AHEAD survey leaves open the possibility for confounding by differences in awareness of specific health conditions such as CVD. Fifth, for theoretical reasons, we have limited our analysis to persons living within urban areas, so that our results do not generalize to those living within rural areas. Finally, whereas there was adequate power to detect meaningful neighborhood-level effects, it always remains possible that existing effects were undetected. However, if there is an undetected neighborhood disadvantage effect on CVD, ADL difficulty, or IADL difficulty, we are 95% confident that the adjusted odds ratio in each case is no bigger than 1.14 for CVD odds, 1.08 for ADL difficulty odds, and 1.11 for IADL difficulty odds.

In summary, we have found that in late life, high neighborhood socioeconomic disadvantage in the urban setting is associated with poor global health rating—conceptualized here as a subjective endpoint that arises out of chronic disease and functional limitations—but not with the actual presence of reported "doctor-diagnosed" CVD or functional difficulty. Given that subjective health ratings are highly predictive of mortality (Idler & Benyamini, 1997), this finding also suggests that urban neighborhoods may indeed have important effects on overall health, even if they do not appear to affect specific illness processes (such as CVD) that may arise earlier in the health "hierarchy" and serve as the catalysts for a more global poor health rating. Future studies should investigate other factors (e.g., racial composition, income inequality, crime rates) that may account for the unexplained neighborhood variation in self-rated health among older adults. Future research also should address the mechanisms that connect the individual and neighborhood levels, that is, the means through which deleterious neighborhood effects are transmitted to individuals, for example, neighborhood disadvantage undermining self-efficacy that then curtails health-enhancing behavior. These mechanisms are crucial to the design of community-based interventions because these processes are more amenable to change than entrenched structural properties of neighborhoods (e.g., concentrated poverty). Although this study does not investigate these mechanisms, our findings clearly provide evidence that social context is associated with health independent of individual-level health risk factors, challenging a purely

individualistic approach to health, and pointing to the importance of health promotion and disease prevention at the community level.

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TABLE 1Characteristics of sample of U.S. urban adults aged 70+ in 1993, $n = 3,442$

	% or Mean	SD
<i>Individual-Level Variables</i>		
Gender		
Female	62.25	
Male	37.75	
Age (years)	77.15	5.69
Ethnicity		
Non-Hispanic White	84.39	
African American	10.16	
Hispanic	4.18	
Other	1.27	
Marital status		
Married	41.66	
Widowed	47.25	
Separated/Divorced	6.59	
Never married	4.50	
Education (years)	11.54	3.42
Income (\$)	28,036.47	71,407.49
Wealth (\$)	189,654.90	423,764.83
<i>Health Risk Variables</i>		
Ever smoked/ No	55.03	
Body mass index	25.44	4.45
High blood pressure/ No	45.57	
Cognition (1 – 35)	20.12	5.60
Depressive symptoms (0 – 8)	1.63	1.98
<i>Dependent Variables</i>		
Cardio-vascular disease/ No	39.44	
Poor health/ No	30.17	
Any ADL difficulties/ No	25.77	
Any IADL difficulties /No	20.88	
<i>Census Tract-Level Variable</i>		
Socioeconomic disadvantage (Principal component)	–0.01	1.05

Note: Individual-level data are weighted. ADL = activities of daily living; IADL = instrumental activities of daily living.

TABLE 2

Multilevel logistic regressions of any self-reported physician-diagnosed cardiovascular disease among U.S. urban adults aged 70+ in 1993

<i>Independent Variables</i>	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
<i>Individual-Level Variables</i>				
Female (/male)			0.79 (0.67, 0.95)	0.80 (0.67, 0.95)
Age			1.01 (0.99, 1.02)	1.01 (0.99, 1.02)
Widowed ^a			0.91 (0.77, 1.09)	0.91 (0.77, 1.09)
Separated or divorced ^a			0.97 (0.72, 1.30)	0.96 (0.72, 1.30)
Never married ^a			0.71 (0.49, 1.03)	0.70 (0.48, 1.02)
African American ^b			0.81 (0.66, 1.00)	0.78 (0.62, 0.98)
Hispanic ^b			0.75 (0.55, 1.02)	0.72 (0.52, 1.01)
Other ethnicity ^b			0.73 (0.38, 1.40)	0.72 (0.37, 1.38)
Years of education			0.98 (0.96, 1.01)	0.98 (0.96, 1.01)
Household wealth (log)			0.88 (0.77, 1.01)	0.89 (0.78, 1.03)
Household income (log)			0.96 (0.86, 1.07)	0.96 (0.87, 1.07)
Ever smoked (/no)			1.12 (0.96, 1.31)	1.12 (0.96, 1.31)
Body mass index			1.01 (1.00, 1.03)	1.01 (1.00, 1.03)
High blood pressure			1.91 (1.67, 2.20)	1.91 (1.66, 2.20)
<i>Census Tract-Level Variable</i>				
Socioeconomic disadvantage		1.07 (1.00, 1.14)		1.04 (0.95, 1.14)
<i>Intercept Variance Component</i>				
Between-group (τ)	0.10 ($p = 0.05$)	0.09 ($p = 0.06$)	0.07 ($p = 0.09$)	0.07 ($p = 0.09$)

^aReference group = Married

^bReference group = Non-Hispanic white

TABLE 3

Multilevel logistic regressions of any activities of daily living difficulties among U.S. urban adults aged 70+ in 1993

<i>Independent Variables</i>	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
<i>Individual-Level Variables</i>				
Female (/male)			1.41 (1.14, 1.75)	1.41 (1.14, 1.75)
Age			1.12 (1.10, 1.14)	1.12 (1.10, 1.14)
Widowed ^a			0.91 (0.74, 1.13)	0.91 (0.74, 1.13)
Separated or divorced ^a			0.89 (0.62, 1.27)	0.89 (0.62, 1.27)
Never married ^a			0.86 (0.55, 1.33)	0.86 (0.55, 1.33)
African American ^b			1.03 (0.81, 1.30)	1.05 (0.81, 1.37)
Hispanic ^b			1.03 (0.71, 1.48)	1.05 (0.71, 1.54)
Other ethnicity ^b			0.79 (0.43, 1.44)	0.80 (0.44, 1.46)
Years of education			0.97 (0.95, 1.00)	0.97 (0.95, 1.00)
Household wealth (log)			0.67 (0.57, 0.81)	0.67 (0.56, 0.81)
Household income (log)			0.86 (0.77, 0.96)	0.85 (0.76, 0.96)
Ever smoked (/no)			1.41 (1.18, 1.69))	1.41 (1.18, 1.69)
Body mass index			1.07 (1.05, 1.09)	1.07 (1.05, 1.09)
High Blood Pressure			1.50 (1.25, 1.79)	1.50 (1.25, 1.79)
<i>Census Tract-Level Variable</i>				
Socioeconomic disadvantage		1.25 (1.17, 1.35)		0.98 (0.89, 1.08)
<i>Intercept Variance Component</i>				
Between-group (τ)	0.27 ($p < 0.001$)	0.22 ($p = 0.003$)	0.17 ($p = 0.17$)	0.17 ($p = 0.16$)

^aReference group = Married

^bReference group = Non-Hispanic white

TABLE 4

Multilevel logistic regressions of any instrumental activities of daily living difficulties among U.S. urban adults aged 70+ in 1993

<i>Independent Variables</i>	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
<i>Individual-Level Variables</i>				
Female (/male)			1.68 (1.33, 2.13)	1.68 (1.33, 2.13)
Age			1.10 (1.09, 1.12)	1.10 (1.08, 1.12)
Widowed ^a			0.54 (0.42, 0.69)	0.54 (0.42, 0.69)
Separated or divorced ^a			0.40 (0.27, 0.61)	0.40 (0.27, 0.61)
Never married ^a			0.49 (0.30, 0.81)	0.49 (0.30, 0.81)
African American ^b			0.85 (0.66, 1.12)	0.86 (0.65, 1.16)
Hispanic ^b			1.22 (0.84, 1.76)	1.23 (0.83, 1.83)
Other ethnicity ^b			0.76 (0.38, 1.55)	0.77 (0.38, 1.57)
Years of education			0.89 (0.87, 0.92)	0.89 (0.87, 0.92)
Household wealth (log)			0.74 (0.62, 0.88)	0.74 (0.62, 0.88)
Household income (log)			0.89 (0.79, 1.00)	0.89 (0.78, 1.00)
Ever smoked (/no)			1.28 (1.04, 1.56)	1.27 (1.04, 1.56)
Body mass index			1.01 (0.99, 1.03)	1.01 (0.99, 1.03)
High blood pressure			1.40 (1.16, 1.69)	1.40 (1.16, 1.69)
<i>Census Tract-Level Variable</i>				
Socioeconomic disadvantage		1.26 (1.16, 1.37)		0.99 (0.88, 1.11)
<i>Intercept Variance Component</i>				
Between-group (τ)	0.33 ($p = 0.001$)	0.27 ($p = 0.008$)	0.26 ($p = 0.22$)	0.26 ($p = 0.21$)

^aReference group = Married

^bReference group = Non-Hispanic white

TABLE 5

Multilevel logistic regressions of self-rated poor health among U.S. urban adults aged 70+ in 1993

	Model 1	Model 2	Model 3	Model 4
<i>Independent Variables</i>	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<i>Individual-Level Variables</i>				
Female (/male)			1.02 (0.84, 1.25)	1.03 (0.84, 1.25)
Age			1.00 (0.98, 1.01)	1.00 (0.98, 1.01)
Widowed ^a			0.75 (0.61, 0.93)	0.75 (0.61, 0.93)
Separated or divorced ^a			0.60 (0.42, 0.86)	0.60 (0.42, 0.85)
Never married ^a			0.66 (0.42, 1.05)	0.66 (0.42, 1.04)
African American ^b			1.26 (0.99, 1.60)	1.10 (0.84, 1.45)
Hispanic ^b			1.13 (0.77, 1.66)	1.00 (0.67, 1.49)
Other ethnicity ^b			1.58 (0.82, 3.01)	1.48 (0.77, 2.83)
Years of education			0.96 (0.93, 0.99)	0.96 (0.93, 0.99)
Household wealth (log)			0.58 (0.49, 0.70)	0.60 (0.50, 0.72)
Household income (log)			0.92 (0.82, 1.02)	0.93 (0.83, 1.03)
Ever smoked (/no)			1.26 (1.05, 1.51)	1.26 (1.05, 1.51)
Body mass index			1.01 (0.99, 1.03)	1.01 (0.99, 1.03)
High blood pressure			1.53 (1.29, 1.81)	1.53 (1.29, 1.81)
Depressive symptoms (1–8)			1.43 (1.38, 1.50)	1.43 (1.38, 1.50)
Cognition (1–35)			0.98 (0.96, 1.00)	0.98 (0.96, 1.00)
<i>Census Tract-Level Variable</i>				
Socioeconomic disadvantage		1.52 (1.41, 1.63)		1.12 (1.01, 1.26)
<i>Intercept Variance Component</i>				
Between-group (τ)	0.41 ($p < 0.001$)	0.27 ($p = 0.004$)	0.19 ($p = .009$)	0.19 ($p = 0.01$)

^aReference group = Married^bReference group = Non-Hispanic white