Published in final edited form as:
J Aging Health. 2010 March ; 22(2): 197–218. doi:10.1177/0898264309355980.

Urban Neighborhood Context and Mortality in Late Life

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Abstract

Objective—To examine the contextual effects of urban neighborhood characteristics on mortality among older adults.

Method—Data are from the Study of Assets and Health Dynamics Among the Oldest Old (AHEAD). Death is assessed between the baseline assessment (1993) and the first follow-up interview (1995). Neighborhood data are from the 1990 Census.

Results—The log odds of dying between the two time points are higher in high proportion Hispanic neighborhoods, net of individual-level sociodemographic variables, but this effect is partly mediated by individual-level health. The log odds of dying are significantly ($p < .05$) lower in affluent neighborhoods, controlling for all individual-level variables and neighborhood proportion Hispanic.

Discussion—There are survival-related benefits of living in an affluent urban neighborhood, which we posit may be manifested through the diffusion of innovations in health care and health-promotion activities.

Keywords

neighborhood; mortality; affluence; AHEAD

A growing body of research indicates that contextual (e.g., neighborhood) characteristics are associated with risk of death among the general population. Among other things, all cause mortality is elevated in areas characterized by low socioeconomic status (SES; e.g., Anderson, Sorlie, Kacklund, Hohnson, & Kaplan, 1997; Bond Huie, Hummer, & Rogers, 2002; Karpati, Bassett, & McCord, 2006; LeClere, Rogers, & Peters, 1997; Lochner, Kawachi, Brennan, & Buka, 2003; van Lenthe et al., 2005; Waitzman & Smith, 1998), high proportion of minorities or residential segregation (Collins & Williams, 1999; LeClere et al., 1997), and urban location (House et al., 2000; Smith, Anderson, Bradham, & Longino, 1995). Yet linkages between neighborhoods and mortality have not widely been examined for older adults in particular, for whom aging-related mobility limitations and heightened health care needs may make the local environment especially consequential. This article examines the contextual effects of several urban neighborhood characteristics on 2-year all-cause mortality in a secondary analysis of data from the Study of Asset and Health Dynamics Among the Oldest Old (AHEAD), a survey of a nationally representative sample of adults aged 70 years and older in 1993, linked with 1990 U.S. Census data.

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Declaration of Conflicting Interests
The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Cagney, Browning, and Wen (2005) provide a useful framework for understanding why neighborhood context may be especially important in late life, with a focus on self-rated health, which is known to be associated significantly with subsequent death (e.g., Idler & Benyamini, 1997). This framework emphasizes collective efficacy theory and the work of Sampson and colleagues (Sampson, Raudenbush, & Earls, 1997; Sampson, Morenoff, & Earls, 1999), which identifies informal social control and social cohesion as mechanisms that link health status to neighborhood structural factors. As highlighted by Cagney and associates (2005), this orientation points to two key attributes of neighborhoods—poverty and residential stability. These investigators also note that affluence may additionally be important in generating a cohesive and trusting environment for older persons who "age in place" because it may influence the provision of health services and neighborhood safety. In addition, it has been contended that the age structure of the neighborhood (e.g., proportion of older residents) may affect health because it is a form of social capital that influences opportunities for social engagement (Cagney, 2006). It stands to reason that similar structural and social neighborhood attributes also would be influential to the likelihood of death among older adults because of inherent linkages between morbidity and mortality.

Other solid theoretical evidence exists for why adults may be increasingly vulnerable to the overall health effects of their neighborhood environment as they age. Glass and Balfour (2003) describe four mechanisms of greater vulnerability: longer duration of exposure; increased biological, psychological, and cognitive vulnerability; changing patterns of spatial use; and reliance on community sources of social integration. Lawton's ecological model of aging (e.g., Lawton, 1982) provides an additional theoretical rationale for expecting that neighborhood context may influence mortality in late life. This framework treats health outcomes as a function of both the person and their environment. Specifically, personal characteristics are considered "competencies" (e.g., monetary resources), whereas environmental characteristics are considered "press" (e.g., poverty), or as having "buoying" effects (e.g., social services, social capital; Glass & Balfour, 2003). Thus, the influence of the local environment on health is hypothesized to have its own effect, independent of a person's own standing in society.

Neighborhood ethnic composition also may have a unique effect on mortality in late life because of the permeating life-long effects of institutionalized racism on the one hand and "ethnic enclave" effects on the other. For example, racial segregation clearly has created distinctive ecological environments for African Americans. Although numerically there are more poor non-Hispanic Whites than poor African Americans in the United States, most poor non-Hispanic Whites are residentially located next to nonpoor neighbors, whereas most poor African Americans are concentrated in high-poverty neighborhoods characterized by substandard housing quality, high crime rates, limited access to high-quality medical care, and high mortality rates (Williams & Collins, 2001). Racial segregation also is likely to increase the prevalence of instances of discrimination over the life course, which in turn, is damaging to health, particularly among African Americans (Gee, Ryan, Laflamme, & Holt, 2006). However, there is some evidence that high neighborhood concentrations of African Americans are associated with lower mortality of older African Americans (e.g., Fang, Madhavan, Bosworth, & Alderman, 1998).

Somewhat more ambiguous conditions are thought to permeate predominantly Hispanic neighborhoods, generating an "ethnic enclave" effect or the "Hispanic paradox": health benefits may be derived from high levels of social cohesion, which provide high levels of social support, including patterns of reciprocity and social exchange; and there generally are high rates of labor force participation, intact family structures, and community institutions, particularly among Mexican Americans (Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Markides & Eschbach, 2005; Patel, Eschbach, Rudkin, Peek, & Markides, 2003). In sharp contrast, there appears to be no "barrio" health advantage for Puerto Rican Americans (Lee & Ferraro, 2007). In addition, mortality in largely Hispanic neighborhoods may be misestimated because of the "salmon bias," whereby less healthy Hispanics return to their country of origin to die, subsequently lowering mortality rates for those who continue to reside in the United States, although this pattern may not entirely account for mortality differentials (Abraido-Lanza, Dohrenwend, Ng-Mak, & Turner, 1999). Thus, whereas there appear to be health advantages to residential segregation for some Hispanics, these advantages are not conferred equally across all Hispanic groups, nor can neighborhoods characterized by a high proportion of Hispanic residents ipso facto be considered to be beneficial to mortality.

Overall then, there is conceptual justification to investigate whether neighborhood socioeconomic conditions (including affluence), residential stability, age structure, and ethnic composition of the neighborhood are associated with mortality in late life. However, the few existing studies that have focused specifically on neighborhood context and mortality for this population generally have not found consistent contextual effects, findings that diverge from studies of the general population and that are in contrast to the theoretical expectations described above. For example, Yao and Robert (2008) found that neighborhood socioeconomic disadvantage was not statistically significant in predicting all-cause mortality among adults aged 60 years and above, net of individual-level control variables. Similarly, Waitzman and Smith (1998) found no association between poverty-area residence and all-cause mortality among persons aged 55 through 74 years. Also, Anderson et al. (1997) found no association between median Census tract income and all-cause mortality among persons aged 65 years or greater. As discussed above, mortality risk is conceptualized to be higher in neighborhoods with high concentrations of African Americans, yet Fang et al. (1998) found the opposite to be true of older African Americans and Eschbach et al. (2004) found a protective barrio effect for mortality among Mexican Americans aged 65 years and older.

Given the compelling theoretical evidence that late life mortality may be influenced by neighborhood context, but mixed findings and methodological variations in previous studies of older adults, an additional examination of this topic is warranted that simultaneously examines multiple neighborhood characteristics within one large national sample of older persons. The goals of this analysis are (a) to examine the extent to which all-cause mortality in late life differs, on average, among urban neighborhoods by examining deaths that occurred between the 1993 baseline data collection and the 1995 follow-up survey of the AHEAD sample and (b) to investigate the extent to which mortality differences may be the result of parallel differences in the characteristics of the people who live in these urban neighborhoods. We focus on urban areas because urban structure underlies the theories concerning the impact of neighborhood on health (Raudenbush, 2003; Sampson, 2003) and because the majority of older persons in the United States live in metropolitan areas (Fried & Barron, 2005).

In summary, this national study advances our understanding of theories of neighborhood and late-life mortality because we examine ethnic composition processes that previously only have been examined locally (e.g., Eschbach et al., 2004; Fang et al., 1998) and that may or may not influence vulnerability to mortality. In addition, we examine multiple neighborhood characteristics that are conceptualized as influencing mortality, characteristics that represent both environmental press and buoying processes. Distinguishing neighborhood factors that may influence the risk of death in late life will help to inform "upstream" points for structural interventions that have the potential to extend life and reach large numbers of persons at unnecessary risk for premature death.

Method

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% yielded an interviewed baseline sample of 8,222 individuals from 6,047 households. The following were dropped from the present analysis: 775 age-ineligible spouses; 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 to simplify the analytic model, 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% urban, resulting in a final baseline analytic sample size of 3,442 persons. Weights adjust for variation in probabilities of selection, including the oversampling of African Americans, Hispanics, and residents of Florida, and the analytic selection of one person per household.

Although these data are not recent, we focus on the baseline assessment to (a) maximize the sample size and statistical power and (b) minimize bias associated with sample attrition at more recent follow-up assessments, thus maintaining the excellent external validity of the sample. We limit follow-up to the 1995 assessment because neighborhoods change over time (e.g., Wheaton & Clarke, 2003), making the 1990 Census tract data (see below) less relevant for our purposes as the duration of follow-up extends over time.

Individual-Level Measures

At the individual level, demographic characteristics known to be associated with morbidity and mortality are controlled. Individual-level health status and health behavior risk factors that may mediate effects of neighborhood context on mortality also are controlled.

Mortality—Death information was obtained from the AHEAD/Health and Retirement Study (HRS) Tracker File, which contains follow-up status data for all participants, including deaths verified through the National Death Index (NDI). The Tracker File is updated regularly making it unlikely that mortality is underestimated to any great extent due to unknown deaths, but this possibility exists. Our dependent variable is scored 1 (*known to have died between the 1993 baseline and 1995 follow-up interview*; n = 302, 8.77%) or 0 (*not known to have died during this time interval*).

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.

Self-rated poor health—Respondents were asked, “Would you say your health is excellent, very good, good, fair, or poor?” with responses ranging from 1 (*excellent*) to 5 (*very poor*).

Cognition—Cognitive function was assessed with a multidimensional 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.

Depressive symptoms—Depressive symptoms were a count of eight items experienced "much of the time in the past week" from the Center for Epidemiologic Studies–Depression Scale (CES-D, α = .78; Radloff, 1977).

Physical functioning—A count of six items comprised the activities of daily living (ADL) measure: bathing, dressing, eating, getting across a room, getting out of bed, and toileting. A count of five items comprised the instrumental activities of daily living (IADL) measure: preparing hot meals, shopping for groceries, making telephone calls, taking medications, and managing money.

Self-reported physician-diagnosed CVD—Respondents were asked about three cardiovascular conditions: (a) whether a doctor ever told them they had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; (b) if a doctor ever told them they had a stroke; and (c) if they have diabetes. Self-reported physician-diagnosed CVD was a count of these three conditions, ranging from 0 to 3. Our operationalization of CVD is consistent with National Cholesterol Education Program guidelines (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001) and parcels out the unique effect of heart disease on mortality because it is the leading cause of death in the United States and combining it with other medical conditions would obfuscate this known relationship.

Other medical conditions—A count of five other medical conditions also was controlled in our analysis: psychiatric problems, cancer, lung disease, arthritis, and high blood pressure.

Health behavior risk factors—The effects of the following two health behavior risk factors for death were included: ever having smoked cigarettes, scored 0 (*no*) or 1 (*yes*); and body mass index (BMI), calculated by dividing self-reported weight (in kilograms) by squared height (in meters).

Neighborhood-Level Variables

Neighborhood-level constructs are operationalized with 1990 U.S. Census tract data (STF3A data), which are linked with geocodes to the individual-level data. Census tracts are particularly suitable representations of neighborhoods in urban areas because of the dense concentration of persons. 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. Six neighborhood-level variables were analyzed because they are theoretically relevant to mortality, as discussed above: (a) a socioeconomic disadvantage principal component (proportion of the following: residents aged 25 or older without a high school degree; households receiving public assistance income; residents living below the poverty level; and residents aged 16 or older who are unemployed), which is consistent with other studies that seek to globally capture the concept of neighborhood SES (e.g., Aneshensel et al., 2007; Beard et al., 2008; Patel et al., 2003; Wight et al., 2008); (b) affluence (proportion of households with incomes of US$50,000 or more); (c) the proportion of residents who are African American; (d) the proportion of residents who are Hispanic; (e) residential stability (the proportion of people aged 5 or older who lived in the same house for the past 5 years); and (f) old age prevalence (the proportion of persons who are above the age of 65 years).

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 Stata statistical software. Multilevel hierarchical logistic regression models for predicting 2-year mortality are estimated with HLM 6.02, using LaPlace iterations. Simulation studies have shown that LaPlace iterations produce a remarkably accurate approximation to maximum likelihood estimates of all parameters (Raudenbush, Bryk, Cheong, & Congdon, 2004), compared to the alternative specification of penalized quasilikelihood (PQL) which has associated bias in the case of nested random effect models with a single random effect per cluster (Breslow & Lin, 1995). The contextual-level variables are grand mean-centered. The gross variance in the log odds of dying between 1993 and 1995 that is associated with neighborhood context is estimated with an unconditional model containing only a random intercept at the neighborhood level. The unadjusted associations between mortality and each of the neighborhood-level variables also are assessed, as is the overall impact on the log odds of dying of all individual-level sociodemographic factors. Subsequently, neighborhood-level variables are added to test for significant ($p \leq .05$) effects, net of individual-level sociodemographic factors, and potential health mediators are examined.

Results

Sample Characteristics

As shown in Table 1, the sample is diverse in its sociodemographic characteristics. There are nearly twice as many women as men, as would be expected in an older population. The average age is 7 years greater than the minimum age, but there is substantial variation in this attribute, with a maximum age of above 100 years. Although the sample is predominantly non-Hispanic White, there is substantial representation of African Americans; the proportion of Hispanic is low in part because this is an older sample. The most common marital statuses are married and widowed. Education, income, and wealth are all highly variable. A hypothetical average participant rates their health as “good,” is not cognitively impaired (a score of 0–12 is indicative of impairment; Freund & Szinovacz, 2002), endorses less than two of eight depressive symptoms, reports minimal ADL and IADL assistance needs, reports no CVD risk conditions, reports approximately one of the other comorbid conditions, has smoked cigarettes at some time in his or her life, and is slightly overweight.

Neighborhood Characteristics

As can be seen by the standard deviations in Table 2, the neighborhoods contained within this sample are heterogeneous in their sociodemographic characteristics. The principal component score is difficult to interpret descriptively because it is centered at zero. Consequently, it is more instructive to look at its constituent elements. For each element, the minimum approaches zero (not shown). However, other areas are characterized by concentrated disadvantage, as evidenced by the maximum values: without a high school degree, 86.3%; receiving public assistance, 73.5%; below poverty level, 86.0%; and, unemployment, 48.7%. Affluence is similarly distributed, being absent in some neighborhoods and the defining characteristic in other neighborhoods (maximum = 86.5%).

On average, the tracts have a high density of non-Hispanic Whites, although some tracts are entirely African American, whereas others are entirely Hispanic. The neighborhoods tend to have a high proportion of residentially stable households, although this type of household is uncommon in other neighborhoods (minimum = 11.0%). On average, the proportion of persons 65 years or older is low, but some neighborhoods have a very high density of older persons (maximum = 82.1%).

Socioeconomic disadvantage is most strongly correlated with low affluence, as would be expected, and both measures are moderately correlated with the density of African Americans and Hispanics. Other correlations among neighborhood characteristics are of modest magnitude.

Multilevel Models

The null model indicates that there is significant variation in the log odds of dying between the baseline and follow-up interview across Census tracts ($\tau = .09$; $p < .00$).

Turning to the columns at the far right of Table 2, it can be seen that two of the neighborhood-level characteristics are significantly associated with the log odds of dying when only that characteristic is considered in the multilevel analysis. Specifically, socioeconomic disadvantage is associated with higher log odds of dying whereas affluence is associated with lower log odds of dying. Proportion African American and proportion Hispanic approach statistical significance, but the coefficients for other neighborhood-level characteristics are not statistically different from zero.

Table 3 presents multilevel logistic regression results for the log odds of being deceased at follow-up, controlling for baseline individual-level sociodemographic characteristics. Model 3a is the base model that contains only individual-level sociodemographic variables; other models are elaborations of this base model. As can be seen, baseline characteristics associated with subsequent death are generally consistent with previous research on mortality. Specifically, among older adults, the log odds of dying over the next 2 years are greater for men than women, increase with older initial age, and decrease at higher levels of household wealth and income. Marital status, ethnicity, and years of education do not contribute to subsequent mortality net of other variables in the model.

When these individual-level sociodemographic characteristics are statistically controlled in Model 3a, there remains small but statistically significant between-neighborhood variation in the log odds of dying over the next 2 years.

Ensuing models test whether this variation can be attributed to specific attributes of the neighborhood. Although all of the variables in Table 2 were tested, only those neighborhood-level variables that attain statistical significance ($p \leq 05$) in multivariate analysis are presented in Table 3. The neighborhood-level characteristics that do not meet this criterion are sociodemographic disadvantage (OR = 1.14; CI = 0.98–1.32), proportion African American (OR = 1.55; CI = 0.85–2.81), proportion residentially stable (OR = 1.45, CI = 0.54–3.94), and proportion age 65 and older (OR = 0.35; CI = 0.08–1.34). In contrast, as can be seen in Table 3, the log odds of dying are lower in areas of greater affluence (Model 3b) and higher in areas with a high proportion of Hispanic residents (Model 3c), net of the individual-level sociodemographic characteristics. When neighborhood affluence and proportion Hispanic are included in the model simultaneously (Model 3d), both become marginally nonsignificant ($p < .08$) because the standard errors increase.

Table 4 adds individual-level health status to the models presented in Table 3 to ascertain whether neighborhood effects are mediated by differences in health. As can be seen in Model 4a, six of the nine baseline health variables are significantly associated with subsequent mortality in the expected direction, with the exceptions being depressive symptoms, ADL assistance, and IADL assistance, the latter of which is bounded by a confidence interval of 1.00. The log odds of dying are relatively high for persons who at baseline rated their health as poor, evidenced cognitive deficits, reported cardiovascular or other medical conditions, ever smoked, and had a high BMI.

The addition of the health status variables produces some changes in the sociodemographic predictors of mortality. This pattern of sociodemographic and health status associations with mortality is duplicated in multilevel models that contain specific Level-2 characteristics (Models 4b and 4c).

Net of both individual-level sociodemographic characteristics and health status, there remains statistically significant between-neighborhood variation in the log odds of dying. As shown in Model 4b, the log odds of dying are significantly lower in areas of greater affluence even when individual-level health is controlled, meaning that individual-level health status does not mediate its effect on the log odds of death. In contrast, the effect of proportion Hispanic is no longer statistically significant, suggesting that individual-level health status plays a mediating role for this neighborhood characteristic. As shown in Model 4d, the significant effect of neighborhood affluence is maintained when proportion Hispanic simultaneously is controlled.

Discussion

This study adds to the growing body of research on aging that examines the health effects of neighborhood context by using multilevel modeling techniques to study all-cause mortality. Consistent with other studies (e.g., Waitzman & Smith, 1998; Yao & Robert, 2008), we found that the effects of neighborhood-level socioeconomic disadvantage were not significantly associated with late-life mortality once a myriad of individual-level variables were controlled. Our analysis examined a host of other theoretically relevant neighborhood-level characteristics, some of which, however, did demonstrate meaningful associations with mortality.

In particular, the log odds of dying between the two time points are higher in high proportion Hispanic neighborhoods, net of individual-level sociodemographic variables, including individual-level Hispanic ethnicity, contradicting expectations of a possible ethnic enclave mortality benefit or the “Hispanic paradox” (e.g., Abraido-Lanza et al., 1999; Markides & Eschbach, 2005). It appears unlikely that neighborhood proportion Hispanic is a surrogate for neighborhood socioeconomic disadvantage, which did not significantly affect mortality in multivariate models. Ultimately, however, we found that the neighborhood effect of proportion Hispanic is at least partly mediated by individual-level health variables. One possible explanation for the unexpected findings concerning a potential barrio effect is that the neighborhood indicator is a composite of all Hispanic subgroups and does not differentiate between those for whom barrio effects on mortality seem most likely to exist, specifically Mexican Americans, and others for whom this effect is less likely to be evident, such as Puerto Rican Americans. This is a limitation of the Census tract measure used in this study.

In contrast, the log odds of dying are lowest in affluent neighborhoods, controlling for all individual-level variables, including the potential health mediators, and controlling for proportion Hispanic at the neighborhood-level. Thus, it appears to be the presence of economic resources that may be incumbent with neighborhood affluence that matters to the risk of death in late life, rather than the absence of such resources that are associated with neighborhood socioeconomic disadvantage. The socioeconomic disadvantage factor we examined captures the linear effect on mortality of the continuum from poverty to affluence, whereas the affluence variable captures the additional effect of density of high-income earners. That is, the proportion of affluent residents in the neighborhood is a measure of the distinctive contribution of high-income households, with the upper end being unique from the entirety of the spectrum.

Why might this be the case? On a historical scale, it is helpful to bear in mind the broad influence of socioeconomic conditions on mortality at any given time (Preston, 1975). It is possible that the adoption of health innovations is most pervasive among the socioeconomically advantaged, regardless of need, and/or that innovative health resources are disproportionately distributed to those in affluent areas. Hurley, Pham, and Claxton (2005), referring to findings from the Community Tracking Study, concluded that investments in health care are focused on affluent communities and that there is a geographic component to the growing disparities in access to specialty services and pharmaceuticals between poorer and wealthier communities. Thus, from the ecological model of aging perspective, persons living in affluent communities may benefit from the buoying effects of positive environmental press in the form of innovative health care, independent of their own SES, whereas those not living in affluent areas do not garner the same health-related benefits from their local environment that may counterbalance individual-level SES. We contend that the lack of a Hispanic ethnic enclave mortality benefit is consistent with this hypothesis in that high proportion Hispanic neighborhoods, or barrios, are not privy to health care–related buoying effects of their environment because they generally are not targeted for innovative specialty or preventive services.

In urban areas, neighborhoods are typified by high concentrations of the poor, ethnic minorities, and recent immigrants on the one hand, and very wealthy persons on the other, which magnify these health care disparities. For example, the observed lower prevalence of poverty-associated diseases in affluent areas can be attributed in part to higher quality health care in such areas (Preston, 1975). With more preventive and salutary resources available to them, residents in advantaged neighborhoods may have more of their health care needs met, placing them at lower risk for untreated chronic conditions and, ultimately, lower risk of death. Thus, innovation in health care may be quite influential in some urban neighborhoods where the demarcation between affluence and other gradients in residential socioeconomic status provides a fundamental advantage in terms of the morbidity and mortality of its residents.

There are limitations to this research to acknowledge. As discussed in other analyses of the AHEAD data (Herzog & Rodgers, 1999), results may be biased toward a well-functioning population. In addition, selection effects related to unique characteristics of persons who reside in certain Census tracts cannot be ruled out as an alternative explanation for our results. Also, the use of self-reported assessments of health leaves open the possibility for confounding by differences in awareness of specific health conditions. There are limitations associated with the operationalization of neighborhood: Census tracts are official boundaries that create somewhat artificial neighborhoods. However, the use of Census tracts is justified by the availability of official data concerning tracts, data that otherwise are not readily available. An inherent limitation of data from the AHEAD study, which was not designed with multilevel analysis as a scientific objective, is that a substantial proportion of sampled Census tracts contain only one respondent (44%), meaning there is no within-tract variation. However, it has become well established that random intercept multilevel models do not need every cluster (or even a majority of clusters) to have multiple individuals as long as the objective is to examine the effects of measured neighborhood characteristics on individual-level outcomes, and there is enough variability in the neighborhood characteristic of interest across the neighborhoods in the study sample (e.g., Bell, Ferron, & Kromrey, 2008). A limitation is that singleton tracts analytically "borrow strength" from other Census tracts, which potentially introduces room for misestimation of the residual Level-2 (neighborhood) variance. The singleton Census tract issue is primarily consequential to testing cross-level interactions with random slopes (e.g., the mortality effect of being Hispanic and living in a largely Hispanic neighborhood), for which unfortunately we did not have adequate statistical power. We also note that whereas other researchers have found significant mortality-related neighborhood disadvantage effects for cardiovascular deaths in late life (e.g., Diez Roux, Borrell, Haan, Jackson, & Schultz, 2004), the cases of cause-specific mortality were too few to analyze in our study and it is possible that similar effects were undetectable.

Finally, this study was designed to examine neighborhood effects on 2-year all-cause mortality. We had adequate power to detect neighborhood effects over this relatively brief period, thereby avoiding at least some potential sources of Type II error, but it should be noted that for most persons the impact of neighborhood on mortality had been developing over many years prior to the study baseline and was not solely the result of just 2 years of exposure. Extending the study across additional years may have provided additional insight into what other types of neighborhood factors also may be associated with risk of death in late life. However, we chose to keep the current analysis somewhat simple (i.e., multilevel logistic regression instead of multilevel proportional hazards) given that we examined multiple neighborhood characteristics that heretofore only had been examined in separate studies. Despite the smaller number of mortality events using this simpler approach, we did find neighborhood effects and we believe that this study offers a meaningful contribution to the literature on neighborhood context and late-life mortality because it combines important aspects of previous studies to create a concise depiction of competing neighborhood processes. Still, we cannot conclude that these are the only neighborhood effects: Other neighborhood characteristics may affect longer term mortality.

Notwithstanding limitations, our analysis offers unique insight into associations between neighborhood characteristics and all-cause mortality at a single time point in late life and on a national level. Individual-level health and mortality factors have been extensively examined with the AHEAD sample, which is considered a “gold standard” data set for studies of older adults. This analysis is the first to examine how multiple neighborhood characteristics may be associated with mortality among this rich sample of the oldest Americans. Two of our key findings indicate that the negative press of neighborhood socioeconomic disadvantage is attenuated by individual-level sociodemographic characteristics and the negative press of high proportion of Hispanic residents is partly mediated by individual-level health behavior and risk factors. The third key finding is that neighborhood affluence maintains a significant impact on the log odds of dying, net of both individual-level sociodemographic and health factors, a “buoying” effect. We posit that the survival-related benefits of living in an affluent neighborhood may manifest themselves through the diffusion of innovations in health care in these areas, in addition to health-promotion behaviors and resources that are prominent in economically advantaged urban locales.

Acknowledgments

The authors thank Teresa E. Seeman, Dana Miller-Martinez, Joshua Chodosh, and two anonymous reviewers for their helpful suggestions regarding the manuscript for this article.

Funding

The authors received the following financial support for the research and/or authorship of this article: grants from the National Institute on Aging (R01 AG022537, Carol S. Aneshensel, PhD, Principal Investigator; and P30 AG17265, Eileen M. Crimmins, PhD, Principal Investigator).

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Table 1

Individual-Level Characteristics (Unweighted) of Sample of U.S. Urban Adults Aged 70+ in 1993

	% or *M*	***SD***
Individual-level sociodemographic variables		
Gender		
Female	63.97	
Male	36.03	
Age (years)	77.20	5.71
Ethnicity		
Non-Hispanic White	75.25	
African American	17.14	
Hispanic	6.30	
Other	1.31	
Marital status		
Married	39.16	
Widowed	48.78	
Separated/divorced	7.67	
Never married	4.39	
Education (years)	11.15	3.61
Income (thousand US$)	25.57	63.50
Wealth (thousand US$)	169.64	392.19
Individual-level health variables		
Poor health rating (1–5)	2.96	1.16
Cognition (1–35)	19.54	5.83
Depressive symptoms (0–8)	1.70	2.03
ADL assistance (0–6)	0.54	1.13
IADL assistance (0–5)	0.35	0.79
Cardiovascular risk conditions (0–3)	0.39	0.49
Other medical conditions (0–5)	1.08	0.92
Ever smoked cigarettes (/never)	0.55	
Body mass index	25.59	4.53

Note: N = 3,442.

Table 2

Correlations of Census-Tract Variables and Simple Multilevel Logistic Regressions of Mortality

	Correlation[a]							
Tract-level variables	**I**	**II**	**III**	**IV**	**V**	**VI**	**OR[b]**	**95% CI**
I. Socioeconomic disadvantage[c]	1.000						1.19	1.08–1.31
II. Affluent[d]	−0.749****	1.000					0.24	0.11–0.53
III. African American[d]	0.577****	−0.346****	1.000				1.39	1.00–1.94
IV. Hispanic[d]	0.377****	−0.222****	−0.138****	1.000			1.78	0.99–3.21
V. Residentially stable[d]	0.018	0.145****	0.177****	−0.084***	1.000		1.15	0.43–3.06
VI. Aged 65 and older[d]	−0.054*	−0.126****	−0.127****	−0.173****	0.187****	1.000	0.37	0.10–1.39
M	−0.014	0.251	0.195	0.119	0.534	0.143		
SD	1.053	0.172	0.311	0.209	0.134	0.086		
Range	−2.61—5.38	0.0–0.86	0.0–1.00	0.0–1.00	0.11–0.82	0.01–0.82		

Note: Mortality was regressed separately on each Level 2 variable; no individual-level characteristics were controlled.

[a] N_j = 1,217 tracts.

[b] N_j = 1,217 tracts; N_i = 3,442 individuals.

[c] Factor score.

[d] Proportion.

* $p < .1$.

** $p < .05$.

*** $p < .01$.

**** $p < .001$.

Table 3

Multilevel Logistic Regressions of Mortality Among U.S. Urban Adults Aged 70+ in 1993

	Model 3a	Model 3b	Model 3c	Model 3d
Independent variables	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Individual-level sociodemographic variables				
Female (/male)	0.53 (0.39–0.71)	0.53 (0.40–0.71)	0.52 (0.39–0.70)	0.53 (0.39–0.71)
Age (years)	1.08 (1.06–1.10)	1.08 (1.06–1.10)	1.08 (1.06–1.10)	1.08 (1.06–1.10)
Widowed[a]	1.07 (0.77–1.49)	1.07 (0.77–1.49)	1.07 (0.77–1.49)	1.07 (0.78–1.49)
Separated or divorced[a]	0.91 (0.56–1.50)	0.89 (0.54–1.46)	0.92 (0.56–1.50)	0.90 (0.55–1.47)
Never married[a]	1.15 (0.64–2.09)	1.13 (0.63–2.04)	1.13 (0.62–2.04)	1.11 (0.62–2.00)
African American[b]	0.94 (0.68–1.29)	0.86 (0.62–1.19)	0.95 (0.69–1.31)	0.88 (0.64–1.22)
Hispanic[b]	0.96 (0.57–1.63)	0.90 (0.53–1.53)	0.60 (0.30–1.20)	0.59 (0.30–1.19)
Other ethnicity[b]	0.60 (0.17–2.13)	0.60 (0.17–2.12)	0.56 (0.16–1.98)	0.57 (0.16–2.00)
Years of education	1.01 (0.97–1.05)	1.02 (0.98–1.06)	1.02 (0.98–1.06)	1.02 (0.98–1.06)
Household wealth (log)	0.67 (0.51–0.87)	0.71 (0.54–0.93)	0.67 (0.52–0.88)	0.71 (0.54–0.93)
Household income (log)	0.84 (0.73–0.97)	0.84 (0.73–0.97)	0.84 (0.73–0.97)	0.84 (0.73–0.97)
Census tract-level variables				
Affluence[c]		0.38 (0.15–0.96)		0.42 (0.17–1.07)
Hispanic[c]			2.30 (1.02–5.17)	2.08 (0.92–4.70)
Intercept variance component				
Between-group (τ)	.0037 ($p \le .01$)	.0031 ($p \le .02$)	.0032 ($p \le .04$)	.0030 ($p \le .06$)

[a]Reference group = married.

[b]Reference group = non-Hispanic White.

[c]Proportion.

Table 4

Multilevel Logistic Regressions of Mortality Among U.S. Urban Adults Aged 70+ in 1993

	Model 4a	Model 4b	Model 4c	Model 4d
Independent variables	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Individual-level sociodemographic variables				
Female (/male)	0.60 (0.43–0.82)	0.60 (0.43–0.83)	0.59 (0.43–0.81)	0.58 (0.43–0.80)
Age (years)	1.06 (1.04–1.09)	1.06 (1.04–1.09)	1.06 (1.04–1.09)	1.06 (1.04–1.09)
Widowed[a]	1.11 (0.79–1.57)	1.12 (0.79–1.58)	1.11 (0.79–1.57)	1.13 (0.80–1.59)
Separated or divorced[a]	0.94 (0.56–1.60)	0.92 (0.54–1.55)	0.95 (0.56–1.62)	0.93 (0.55–1.58)
Never married[a]	1.20 (0.65–2.21)	1.19 (0.64–2.18)	1.18 (0.64–2.18)	1.18 (0.64–2.18)
African American[b]	0.88 (0.62–1.26)	0.81 (0.57–1.15)	0.90 (0.64–1.28)	0.82 (0.57–1.17)
Hispanic[b]	0.89 (0.62–1.26)	0.84 (0.49–1.45)	0.58 (0.27–1.23)	0.56 (0.27–1.17)
Other ethnicity[b]	0.60 (0.16–2.27)	0.60 (0.16–2.24)	0.58 (0.15–2.20)	0.57 (0.15–2.14)
Years of education	1.06 (1.01–1.11)	1.07 (1.02–1.11)	1.06 (1.01–1.11)	1.06 (1.02–1.12)
Household wealth (log)	0.81 (0.62–1.07)	0.87 (0.66–1.16)	0.82 (0.62–1.08)	0.88 (0.66–1.17)
Household income (log)	0.88 (0.76–1.03)	0.89 (0.77–1.03)	0.88 (0.76–1.03)	0.89 (0.77–1.03)
Individual-level health variables				
Poor health rating (1–5)	1.25 (1.10–1.43)	1.25 (1.10–1.42)	1.25 (1.10–1.42)	1.26 (1.11–1.43)
Cognition (1–35)	0.96 (0.94–0.99)	0.96 (0.94–0.90)	0.96 (0.94–0.99)	0.97 (0.94–0.99)
Depressive symptoms (0–8)	1.04 (0.97–1.11)	1.04 (0.98–1.11)	1.04 (0.97–1.11)	1.04 (0.98–1.11)
ADL assistance (0–6)	1.08 (0.95–1.23)	1.08 (0.95–1.23)	1.07 (0.95–1.22)	1.09 (0.96–1.24)
IADL assistance (0–5)	1.17 (0.99–1.38)	1.18 (1.00–1.39)	1.18 (1.00–1.40)	1.20 (1.02–1.42)
Cardiovascular risk conditions (0–3)	1.34 (1.12–1.60)	1.34 (1.13–1.61)	1.34 (1.13–1.61)	1.27 (0.96–1.69)
Other medical conditions (0–5)	1.28 (1.10–1.49)	1.28 (1.10–1.49)	1.29 (1.11–1.50)	1.28 (1.11–1.47)
Ever smoked cigarettes (/no)	1.76 (1.30–2.40)	1.76 (1.30–2.39)	1.78 (1.31–2.40)	1.78 (1.32–2.41)
Body mass index	0.95 (0.93–0.98)	0.95 (0.93–0.98)	0.95 (0.93–0.98)	0.95 (0.92–0.98)
Census tract-level variables				
Affluence[c]		0.34 (0.13–0.88)		0.37 (0.14–0.97)
Hispanic[c]			2.19 (0.90–5.36)	1.92 (0.80–4.64)
Intercept variance component				
Between-group (τ)	.0035 ($p \le .02$)	.0030 ($p \le .03$)	.0033 ($p \le .02$)	.0030 ($p \le .03$)

[a]Reference group = married.

[b]Reference group = non-Hispanic white.

[c]Proportion.