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Neighborhood cohesion, neighborhood disorder, and cardiometabolic risk

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Abstract

Perceptions of neighborhood disorder (trash, vandalism) and cohesion (neighbors trust one another) are related to residents' health. Affective and behavioral factors have been identified, but often in studies using geographically select samples. We use a nationally representative sample (n=9032) of United States older adults from the Health and Retirement Study to examine cardiometabolic risk in relation to perceptions of neighborhood cohesion and disorder. Lower cohesion is significantly related to greater cardiometabolic risk in 2006/2008 and predicts greater risk four years later (2010/2012). The longitudinal relation is partially accounted for by anxiety and physical activity.

Keywords

cardiometabolic risk; neighborhoods; cohesion; disorder; anxiety; physical activity; United States

Social and physical features of neighborhoods are related to residents' health (Diez Roux & Mair, 2010). In general, neighborhoods perceived as having greater social resources, such as those with high levels of social cohesion, are linked to better health (e.g., Bowling, Barber, Morris, & Ebrahim, 2006; Rios, Aiken, & Zautra, 2012; Wen, Cagney, & Christakis, 2005), and those with higher perceived social or physical hazards are related to poorer health (e.g., Bowling et al., 2006; Rios et al., 2012; Wen et al., 2005). Researchers have identified relationships between these neighborhood features and several affective and behavioral factors that may explain links to health (Dulin-Keita et al., 2013; Echeverria et al., 2008; Hill, Ross, Angel, 2005; Latkin & Curry, 2003). These studies provide strong support, yet the data available in prior studies create several challenges in generalization and moving

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toward causal inferences. Several studies relied on data collected in select areas of the United States (U. S.; e.g., Mair, Cutchin, & Peek, 2011). And, although many adverse neighborhood characteristics cluster together, previous examinations of health generally examine one aspect of the neighborhood in isolation. Finally, many researchers are concerned that neighborhood features per se are not the cause of residents' health, but are instead explained by characteristics of the individuals (Pickett & Pearl, 2001).

In the present study, we used data from the Health and Retirement Study (HRS) to address several of these challenges. First, HRS is a nationally representative sample of U. S. adults and their spouses. This representative sample ensured that neighborhood-health relations were not specific to certain neighborhoods, but persisted across neighborhoods in the U. S. Second, in addition to individual-level sociodemographic variables that are commonly adjusted in neighborhoods and health studies (e.g., household income-to-needs, wealth, marital status, race/ethnicity, age, and sex), we further adjusted for levels of neuroticism, as high levels of this personality characteristic may bias estimates relying on self-reports. Finally, we examined a potential interaction between cohesion and disorder and relations to cardiometabolic risk.

Using these data, we addressed three aims. First, we tested the hypotheses that lower levels of perceived neighborhood cohesion and higher levels of perceived neighborhood disorder are associated with greater cardiometabolic risk, both concurrently and four years later. Second, we tested the hypotheses that relations between aspects of the neighborhood and cardiometabolic risk are partially accounted for by individual-level affective (anxiety) and behavioral (physical activity) factors. Third, given that neighborhoods perceived as unsafe are often perceived as less cohesive (Greene, Gilbertson, & Grimsley, 2002), we assessed whether cohesion and disorder are associated synergistically with health.

Neighborhood Cohesion and Health

Neighborhood social cohesion is a group-level resource referring to trust and reciprocity among members of the group (Kawachi, Subramanian, & Kim, 2008). Perceiving more cohesion in one's neighborhood is associated with better self-rated health into older adulthood (Bowling et al., 2006; Bures, 2003; Rios et al., 2012). Other researchers have demonstrated that residents of more cohesive neighborhoods are less likely to have physical health conditions such as hypertension (Mujahid et al., 2008). In addition to these aspects of health, older adults living in neighborhoods with higher levels of social cohesion are at lower risk of mortality (Wen et al., 2005).

Even before the development of chronic health conditions, perceptions of neighborhood cohesion are related to early signs of physiological risk. Aging researchers often use measures of multi-system physiological risk to determine peoples' risk for the development of disease (Sprott, 2010), and have determined that these measures are often more predictive of mortality than chronological age (Levine, 2013). Greater risk captured by such measures may relate to neighborhood environments. Some researchers have found, for example, greater multi-system physiological dysregulation among individuals with worse scores on the Perceived Neighborhood Scale (Mair et al., 2011), which includes sub-scales assessing people's perceptions of social embeddedness and sense of community.

Researchers posit that neighborhood social and physical features may relate to health through behavioral and affective pathways (Diez Roux & Mair, 2010). For example, the level of safety in a neighborhood may determine, in part, how often residents leave their homes to engage in physical activity. Having an active lifestyle is, in turn, related to better health. Moreover, feeling less safe in a neighborhood may increase residents' levels of psychological stress, and chronic stress is generally health-compromising. Although researchers have described these potential pathways linking neighborhood features to health, few studies have empirically tested them. We do not attempt to examine all possible pathways linking neighborhoods to health (i.e., bidirectional relations between behavioral and affective mechanisms) in the present study. Nevertheless, our hypotheses regarding relations between neighborhood social features and health, as well as potential affective and behavioral pathways, were guided by existing models (Diez Roux & Mair, 2010).

Several studies, to our knowledge, examined relations between neighborhood cohesion and both behavioral and affective outcomes. In two studies, researchers identified relationships with an affective factor, showing that low neighborhood cohesion was significantly related to more symptoms of depression (Ahern & Galea, 2011; Echeverria et al., 2008). A behavioral factor was also identified, such that people perceiving lower neighborhood cohesion were less likely to walk for exercise (Echeverria et al., 2008). Others, however, found no evidence of a relation between social cohesion and levels of physical exercise among older adults (Mendes de Leon et al., 2009). In another study, white, but not black, residents of an urban community who perceived more neighborhood cohesion reported lower anxiety, stress, and depression than those perceiving less cohesion (Gary, Stark, and LaVeist, 2007). In the present study, we examined two individual-level factors that may explain links between features of the neighborhood and cardiometabolic health: anxiety and physical activity. The degree to which people observe cohesion or disorder in their neighborhoods may relate to their sense of safety or state of vigilance, which we believe is captured by people's level of anxiety. Moreover, we used a fairly comprehensive measure of physical activity which asked participants about their mild, moderate, and vigorous physical activity.

Neighborhood Disorder and Health

Neighborhood disorder is generally defined as the presence of features such as trash, vacant buildings, and crime (Ross & Mirowsky, 2001). Residents often interpret these examples of disorder as signs of social deterioration, or a lack of social control or respect. Observed and perceived crime, common components of measures of neighborhood disorder, are associated with measures of cumulative physiological risk and self-rated health (Bowling et al., 2006), and mortality among older adults (Wen et al., 2005). Others have observed that perceptions of neighborhood safety, another indicator of neighborhood disorder, are also related to poorer physiological health (Burdette & Hill, 2008; Mujahid et al., 2008; Robinette, Charles, & Gruenewald, 2016) and physical functioning (Clark et al., 2009). Individuals perceiving less safety in their neighborhoods report more physiological arousal (e.g., difficulty breathing; Burdette & Hill, 2008) and exhibit greater objectively assessed physiological dysregulation (Robinette et al., 2016).

Greater perceptions of disorder in the neighborhood are associated with higher levels of fear, which are, in turn, related to poorer physiological risk factors, poorer self-reported health and physical functioning, and the development of more chronic health conditions (Ross & Mirowski, 2001). For example, one study found that the relation between neighborhood safety perceptions and health is partially accounted for by depressive symptoms and levels of anxiety (Hill et al., 2005). Additional research indicates that greater perceptions of neighborhood disorder and related safety concerns are associated with lower levels of physical activity (Dulin-Keita et al., 2013; Mendes de Leon et al., 2009; Meyer, Castro-Schilo, & Aguilar-Gaxiola, 2014).

Challenges in Neighborhoods and Health Research

The aforementioned studies suggest that physical and physiological health are related to perceptions of neighborhood disorder and perceptions of neighborhood cohesion. Furthermore, these relations may be established or maintained via psychological distress and poor health behaviors. Several methodological challenges among neighborhood and health studies, however, limit generalizability and confidence in drawing causal inferences. First, findings are often difficult to generalize, as many studies are conducted with geographically select samples (e.g., Mair et al., 2011). Studies conducted with large national samples still lack generalizability when the participants are not racially or ethnically representative (e.g., Bures, 2003; Robinette et al., 2016). To test our hypotheses, we used data from participants in the HRS who represent the racial and ethnic background of older adults in the U. S.

Second, adverse neighborhood conditions are posited to affect one another (Diez Roux & Mair, 2010). For example, environments where there are few areas for socialization can thwart levels of cohesion. For this reason, we examined whether perceptions of neighborhood cohesion and perceptions of neighborhood disorder interact with one another to predict cardiometabolic risk. Finally, a long history of research attests to the associations between health and individual-level characteristics. Characteristics such as personality and SES, which have arguably received the most attention in the literature, are related to both health (Gruenewald et al., 2012; Lahey, 2009) and neighborhood selection (Jokela et al., 2014; Pickett & Pearl, 2001). For these reasons, we not only adjusted for commonly included sociodemographic characteristics, but also for a psychological characteristic, levels of neuroticism, to reduce the effect of any potential selection biases.

Data and Methods

Participants and Procedures

The Health and Retirement Study (HRS) is a large, nationally representative sample of U. S. men and women aged 50 years and older. The purpose of the survey was to examine the health and retirement status of the growing aging population. All participants completed a core interview (conducted face-to-face at baseline and by telephone during follow-up assessments). Starting in 1992, data have been collected every two years on participants' economic, physical, mental, and cognitive well-being. Response rates for the original HRS sample was high (81.6%), and re-interview response rates have remained high over time, ranging from 85.4–89.4% over the two-year follow-up periods. In 2006, a random half of respondents (selected at the household-level and excluding residents of nursing homes and other institutions) participated in enhanced face-to-face interviews in which they provided blood samples and received a physical exam. At the end of these interviews, participants were left with questionnaires assessing aspects of their psychosocial functioning and perceptions of their neighborhoods. The other half of the HRS respondents completed this same protocol in 2008. Data collected in 2006 and 2008 were combined for a complete sample. The first longitudinal physiological and psychosocial follow-up assessment took place in 2010 (for those who initially completed the interview in 2006) and 2012 (for those who initially completed the interview in 2008). Data in 2010 and 2012 were similarly combined for a complete sample. In the present study, we included data collected in the waves from 2006–2012 to test hypotheses regarding relations between respondents' subjective experience of their residential neighborhoods and their physiological well-being, both concurrently and four years later. All participants signed separate consent forms prior to providing biological samples and all research procedures were approved by the University of Michigan's Institutional Review Board.

Biological samples were collected from 14,576 respondents in the first wave that these data were added to the HRS (2006 for the first random half of HRS respondents, 2008 for the second half). Of the 10,641 participants who completed the enhanced face-to-face interview in 2006 or 2008 and completed a follow-up interview in 2010 or 2012 (3906 did not provide biological samples at the follow-up), 9032 with complete data on our variables were included in our analytic sample. Participants were excluded because they did not answer questions related to their perceptions of neighborhood cohesion ($n = 4$), neighborhood disorder ($n = 8$), or both ($n = 145$). A large group of participants provided biological samples during the enhanced face-to-face interview, but did not return the psychosocial questionnaire which included questions assessing neuroticism, anxiety, and perceptions of neighborhood cohesion and disorder ($n = 747$). An additional 57 participants did not answer questions assessing levels of neuroticism, 105 did not answer questions about anxiety, and 24 did not answer questions about either. Some people ($n = 106$) did not answer questions about their physical activity. An additional 413 participants did not respond to questions about their racial or ethnic background.

To examine potential sociodemographic differences between people in the analytic sample and those who were excluded from the present study, we conducted a series of *t* and chi-square tests. Results of these tests are shown in Table 1. Compared to those who were excluded, members of the analytic sample were wealthier, younger, had higher cardiometabolic risk, had higher perceptions of neighborhood cohesion, had lower perceptions of neighborhood disorder, and had lower levels of neuroticism. Although both the analytic and excluded participants included a greater number of women and non-Hispanic white participants, the proportion of females to males [$X^2 = 38.73$, $p < .0001$] and proportion of non-Hispanic whites to minorities [$X^2 = 849.01$, $p < .0001$] was slightly greater in the analytic sample. The above sociodemographic variables were included as covariates in our statistical models.

Measures

Biomarkers—Participants provided blood samples at a baseline period (2006 or 2008) and again four years later. All samples were assayed for several biomarkers including cholesterol, C-reactive protein (CRP), and hemoglobin A1c. Total and high-density lipoprotein cholesterol (HDL) indicated lipid levels. Glycosylated hemoglobin (HbA1c) was a marker of glycemic control (and risk for insulin resistance) over the past two to three months, and CRP indicated general systemic inflammation. Researchers have demonstrated an increased risk of mortality among even the oldest old adults who have elevated levels of cholesterol (Weverling-Rijnsburger, Blauw, Lagaay, Knock, Meinders, & Westendorp, 1998), CRP (Harris, et al., 1999), and A1c (Liu, Yang, Zhu, Tan, Liang, & Li, 2011). More details about these biomarkers are described elsewhere (Crimmins et al., 2008). In addition to the biological samples, respondents participated in a physical exam which included assessments of systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse (HR), and body mass index (BMI). BMI was calculated with the following equation: BMI = ($Weight * 703$) / height^2. These anthropometric indices have each been associated with mortality (Aune et al., 2016; Taylor, Wilt, & Welch, 2011).

Combined with smoking status, these eight biomarkers were used to construct a summary measure of cardiometabolic risk. Scores on similar measures (e.g., Wilson, D'Agostino, Levy, Belanger, Sibershatz, & Kannel, 1998) are related to an increased risk for the development of cardiovascular and related diseases (Wilson & Meigs, 2008). Using published clinical cut-points, each indicator variable was dichotomized into categories representing low (coded 0) and high (coded 1) risk (Centers for Disease Control and Prevention, 2016; Crimmins et al., 2014; National Heart, Lung, and Blood Institute, 2015). For seven of the indicators, higher values indicated greater risk. These cut-points were 240 mg/dL (total cholesterol), 6.5% (HbA1c), 3.0mg/l (CRP), 140 (SBP), 90 (DBP), 90 (HR), and 30 (BMI). The one exception to this was HDL for which higher values are better for one's health, where the high risk (coded 1) group were those below the clinical cut point, 40 mg/dL. Smoking status was assessed with one question asking participants, "Have you ever smoked cigarettes" (0 = no, 1 = yes). The summary cardiometabolic risk variable was calculated by summing the values from the nine dichotomous indicators, with higher values demonstrating greater physiological risk (ranging from 0 indicating no indicators in the category of risk to nine where all indicators were in the category of risk).

Neighborhood cohesion—The 2006/2008 Leave Behind questionnaire contained four items assessing social cohesion in respondents' neighborhoods (Mendes de Leon et al., 2009). Respondents reported the degree to which they agreed with several statements, including "I really feel a part of this area," and "If you were in trouble, there are lots of people in this area who would help you" using a 7-point Likert-type scale. All individual items were reversed coded so that higher average scores represented greater perceived cohesion (Cronbach's $\alpha = 0.84$).

Neighborhood disorder—In the Leave Behind questionnaire, participants answered four questions assessing social and physical disorder in their neighborhoods (Mendes de Leon et al., 2009). Using a 7-point Likert-type scale, participants reported the degree to which they perceived vandalism, trash, and vacant buildings in their neighborhoods as well as the degree to which they believed people would feel safe walking in their neighborhoods alone. Items assessing vandalism, safety, and vacant buildings were reverse-coded and all responses were averaged so that higher scores indicated greater perceived neighborhood disorder (Cronbach's α = 0.74).

Anxiety—Participants answered five questions examining levels of anxiety (Beck et al., 1988; Wetherell, & Arean, 1997). Participants were asked how often in the past week they had experienced any of the following: "I had fear of the worst happening," "I was nervous," "I felt my hands trembling," "I had a fear of dying," and "I felt faint." Responses ranged from 1 = never to 4 = most of the time. Items were averaged, with higher scores indicating higher levels of anxiety (Cronbach's α = 0.80).

Physical activity—Participants answered three questions about their physical activity: "How often do you take part in sports or activities that are vigorous, such as running or jogging, swimming, cycling, aerobics or gym workout, tennis, or digging with a spade or shovel?" "And how often do you take part in sports or activities that are moderately energetic such as, gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises?" "And how often do you take part in sports or activities that are mildly energetic, such as vacuuming, laundry, home repairs?" Responses were 1 = every day, 2 = more than once per week, 3 = once per week, 4 = one to three times per month, or 5 = never. Items were reverse coded so that higher values represented greater engagement in the physical activity, and were weighted so that vigorous activity (scores multiplied by 5) was weighted more heavily than moderate activity (scores multiplied by 3), which was weighted more heavily than light activity (scores multiplied by 1). Similar procedures are used in other measures of physical activity (Gruenewald et al., 2012; Hagstromer, Oja, & Sjostrom, 2006). A final physical activity score was calculated by summing the weighted scores across the three activity levels, with final possible scores ranging from 8–45.

Covariates—Household income was calculated as a sum of income from wages, bonuses, professional trades, and 2nd job or military reserve earnings for both the respondent and his or her spouse combined. Separate income-to-needs variables for 2006 and 2008 were constructed by dividing household income by family size-adjusted poverty thresholds for 2006 and 2008. The value for the final income-to-needs variable was equal to the 2006 constructed value for all participants randomly assigned to 2006 data collection, and to the 2008 value for those randomly assigned to 2008 data collection. We then created a new variable that divided the income-to-needs variable by the year-specific standard deviation so that coefficients could be interpreted as the change in cardiometabolic risk for every one standard-deviation change in income-to-needs. Wealth was calculated by summing across different assets (e.g., real estate, vehicles, businesses, individual retirement accounts, stocks, bonds, savings) less all sources of debt. Wealth was then divided by its standard deviation so that coefficients could be interpreted as the change in cardiometabolic risk for every one standard-deviation change in wealth. Marital status was coded as 0=married and 1 = not married. A detailed description of the wealth, income, and marital status variables and imputation processes is found elsewhere (Bugliari et al., 2016). Age was coded in years. An incremental age variable was created so that coefficients could be interpreted as a change in cardiometabolic risk for every five-year increase in age. To adjust for potential negative response bias, levels of neuroticism were included as a covariate. Neuroticism was assessed by asking participants how well a series of adjectives describes them: worrying, nervous, moody, and calm (Lachman & Weaver, 1997). Responses ranged from 1 = A lot to 4 = Not at all. All items except 'calm' were reverse-coded so that higher averaged scores indicated higher levels of neuroticism (Cronbach's α = 0.72). Gender was also included as a covariate. Race/ethnicity was coded 0 = non-Hispanic White, 1 = non-Hispanic Black, and 2 = Hispanic.

Statistical Analyses

Two sets of analyses were conducted to examine potential direct and indirect effects between the measure of cardiometabolic risk and two neighborhood indicators: perceived neighborhood cohesion, and perceived neighborhood disorder. In our cross-sectional models, we tested our hypotheses that lower neighborhood cohesion and higher neighborhood disorder would be associated with greater cardiometabolic risk using poisson regressions in Stata. All models adjusted for income-to-needs, marital status, wealth, age, gender, race/ethnicity, and levels of neuroticism.

We followed these regression analyses with structural equation models (SEM) to examine potential longitudinal associations and affective and behavioral pathways. In our first SEM model, we tested the hypothesis that individuals perceiving lower cohesion or more disorder in their neighborhoods would have higher levels of anxiety, and higher anxiety would partially explain the links between these neighborhood perceptions and health. Next, we examined a potential behavioral pathway by alternatively including physical activity in the model. In our final model, we examined both potential mediators simultaneously. As a sensitivity analysis, we conducted the above models with a smaller subset of participants (n = 7860) who lived in the same residence at both waves of data collection. Lastly, we examined whether the two neighborhood indicators interacted with one another to create a synergistic influence on cardiometabolic risk. To account for the complex survey design, we applied sample weights provided by the HRS so that findings could be generalized to the older U. S. population. We used the survey (svy) suite of commands in Stata 13.

Results

Weighted characteristics of the participants can be found in Table 2. Participants had, on average, 2 biomarkers with values in the 'risk' category at both the baseline and follow-up assessments. In general, participants perceived their neighborhoods as having fairly low levels of disorder and fairly high levels of cohesion at both waves of data collection. Participants' household wealth and income-to-needs spanned wide ranges. The sample was primarily non-Hispanic white, and included more women than men.

Cross-Sectional Analyses

We tested our cross-sectional hypotheses in Models 1 and 2. Only perceiving higher neighborhood cohesion was significantly related to lower cardiometabolic risk after adjusting for income-to-needs, wealth, marital status, race/ethnicity, age, sex, and levels of neuroticism. Men, those self-reporting non-Hispanic black or Hispanic race/ethnicity, non-married individuals, and those with less wealth were significantly associated with greater cardiometabolic risk. Results of these weighted analyses can be found in Table 3.

Longitudinal Analyses

Main and indirect effects—In a longitudinal model, perceptions of neighborhood disorder did not significantly predict cardiometabolic risk. As such, we only conducted tests of indirect effects in models with perceptions of neighborhood cohesion as the predictor. Consistent with our hypothesis, results of Model 3 indicated that participants perceiving greater cohesion in their neighborhoods had significantly lower cardiometabolic risk four years later after adjusting for income-to-needs, wealth, marital status, race/ethnicity, age, sex, and levels of neuroticism. Men, those self-reporting non-Hispanic black or Hispanic race/ethnicity, and those with less wealth, lower income-to-needs, and younger age, had significantly greater cardiometabolic risk at the four-year follow-up assessment.

Model 4 indicated that anxiety was a significant mediator of the relation between cardiometabolic risk and neighborhood cohesion [indirect: $b = -0.0044$, bootstrapped SE = 0.0020, 95% CI: −0.0083;−0.0006]. Results of Model 5 showed that physical activity was a significant mediator [indirect: $b = -0.0126$, bootstrapped SE = 0.0022, 95% CI: −0.0170;−0.0082]. When anxiety and activity levels were included simultaneously in Model 6, only physical activity significantly mediated the relation between neighborhood cohesion and cardiometabolic risk [indirect: $b = -0.0161$, bootstrapped SE = 0.0028, 95% CI: −0.0217;−0.0106].

Interaction: Synergistic Effects

We hypothesized that perceiving both low cohesion and high disorder in one’s neighborhood would be associated with worse cardiometabolic risk than would be expected among those only reporting the presence of one of these neighborhood features. However, the cohesion × disorder interaction term was not significant, indicating no synergistic relation with cardiometabolic risk.

Discussion

In the present study, we examined whether peoples’ perceptions of cohesion and disorder in their neighborhoods were related with cardiometabolic risk. Consistent with previous investigations (Mair et al., 2011), people perceiving their neighborhoods as having lower levels of cohesion exhibited significantly greater cardiometabolic risk. Moreover, perceiving less neighborhood cohesion predicted significantly greater cardiometabolic risk four years later. Levels of anxiety and physical activity partially accounted for this longitudinal relation. Neighborhood disorder was not significantly associated with cardiometabolic risk. These findings were observed among a representative U. S. sample, even after adjusting for household income-to-needs, wealth, marital status, race/ethnicity, age, gender, and levels of neuroticism.

Tests of Direct Effects

Previous research has demonstrated an association between neighborhood cohesion and single indices of physiological function (e.g., Mujahid et al., 2008). In the present study, we observed a relation between neighborhood cohesion and a measure of physiological functioning representing the cardiovascular and metabolic lipid systems that together comprise a strong risk factor for cardiovascular health. In addition to the more comprehensive assessment of cardiometabolic health, our study included a four-item measure of cohesion asking people about the friendliness, trustworthiness, embeddedness, and helpfulness of others in their neighborhoods. Cardiovascular risk varied as a function of perceived cohesion in the neighborhood even after statistically taking into account many of the selection confounds that sort people into their neighborhoods (e.g., SES and age). These findings further persisted after accounting for levels of neuroticism, a factor that may relate to negative response bias (Lahey, 2009). Taken together, this finding adds to our current understanding of the relations between residents' health and the social features of their neighborhoods.

Higher perceptions of disorder were not significantly associated with greater cardiometabolic risk. It is possible that cohesion is a more enduring social feature of a neighborhood, having more lasting associations with health than disorder, which may fluctuate more over time (our measure of disorder was captured with items such as trash in the streets). Meanwhile, the lack of an association between disorder and health in the present study is inconsistent with some others' findings (Bowling et al., 2006; Rios et al., 2012; Wen et al., 2005). We believe these disparate findings may be explained both by features of the different samples and specific indices used to operationalize neighborhood hazards.

Some previous investigations of health in the context of neighborhood disorder have used fairly racially/ethnically homogeneous samples of adults (e.g. Bowling, et al., 2006). Both the level of neighborhood disorder and residents' interpretation of signs of disorder may vary across racial and ethnic groups which may be better represented in the present sample. After taking racial/ethnic background into account, the relation between neighborhood disorder and health was not significant, a phenomenon observed by others (Mendes de Leon et al., 2009). Furthermore, other researchers have defined neighborhood hazards with questions asking participants about fights, violence, gang activity, and assaults (e.g., Wen et al., 2005). These items may elicit stronger affective and physiological responses from residents than perceiving trash and vandalism, as was measured in the present study.

Tests of Indirect Effects

Several researchers have argued for the inclusion of affective states to elucidate pathways from neighborhood features to residents' health (Daniel, Moore, & Kestens, 2008). We predicted that one way by which neighborhood environments relate to the health of their inhabitants is through people's thoughts and behaviors. In the present study, levels of anxiety partially accounted for the relation between cardiometabolic risk and neighborhood cohesion. This finding indicated that experiences of trembling hands, feeling faint or nervous, general fearfulness, or fearing death are more common among individuals living in neighborhoods perceived as having low levels of cohesion, and that these experiences are, in turn, associated with greater cardiometabolic risk.

We also predicted that the degree to which people feel safe in - or connected to - their neighborhoods are related to people's levels of physical activity. We found that physical activity accounted for part of the relation between cardiometabolic risk and neighborhood cohesion. Levels of physical activity accounted for a greater proportion of the relation between health and neighborhood cohesion than anxiety and was more strongly associated with cardiometabolic risk. In summary, people living in neighborhoods characterized as less cohesive engage in thoughts and behaviors that are related to greater physiological wear and tear.

Interaction: Synergistic Effects

Others have observed that adverse neighborhood features tend to cluster together, with neighborhoods low in safety also having low levels of cohesion, for example (Greene et al., 2002). We examined the possibility that the presence of more than one hazardous neighborhood feature would be worse for residents' health than in isolation. However, we did not find support for this hypothesis. Despite our relatively comprehensive assessments of cohesion and disorder, it is possible that variability within a wider range of neighborhood characteristics, including features such as the availability of greenspace or objective crime rates, would enable a stronger test of potential interactive effects.

Limitations and Future Directions

In the present study, our measures of anxiety and physical activity were assessed at the same time as our measure of neighborhood cohesion. The HRS did not begin collecting biological samples from participants until 2006, and the first longitudinal follow-up of these data was not completed until 2012. Therefore, we were restricted to simultaneous assessments of mediating factors and neighborhood indicators. Future research should make use of additional waves of data collection so that mediation models contain neighborhood indicators that precede the potential mediators, and consider using more comprehensive scales of anxiety.

Our results replicate and extend those of others who have used relatively abbreviated scales assessing physiological well-being, as well as those who have used more select samples of adults. However, contrary to our hypotheses, we did not observe a significant interaction between the two aspects of the neighborhood environment. In the present study, perceptions of neighborhood disorder were not significantly related to cardiometabolic risk. Future tests of these questions should use a wider range of neighborhood characteristics that may relate more directly to measures of physical health. Additionally, 1172 participants moved to new residences between waves. We were unable to determine from, and to where, they moved. Future research should track where people live and use objective assessments of those neighborhoods.

Despite these limitations, we observed that neighborhood cohesion related to cardiometabolic health even in a relatively short follow-up period (4 years), and this finding persisted among a smaller set of participants who did not move between waves. These findings indicate that neighborhood cohesion has lasting relations to cardiometabolic risk factors associated with the development of disease. Efforts to build levels of trust and reciprocity among members of the same neighborhood may reduce levels of anxiety and increase residents' willingness to engage in physical activity. These affective and behavioral processes may therefore slow the process of biological aging and help communities to prevent or delay the development of chronic disease. These efforts may be achieved through such interventions as the transmission of resources to neighborhoods characterized as having low social cohesion, such as the development of green space for children to play and people of all ages to exercise and socialize. These findings underscore the importance of building neighborhood social resources as a means of enhancing community well-being that will ultimately have lasting effects for its residents.

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Research Highlights

- Perceptions of neighborhood cohesion relate to multisystem biological risk
- Exposure to low neighborhood cohesion has long-lasting (4-year) relations to health
- Anxiety and physical activity partially account for neighborhood links to health

Table 1

Comparison of analytic sample and excluded participants

	Analytic *M* (SE)	Excluded *M* (SE)	*t*
Cardiometabolic Risk	1.84 (1.39)	1.80 (1.50)	−2.47**
Disorder	2.45 (1.34)	2.69 (1.47)	8.05***
Cohesion	5.54 (1.34)	5.32 (1.51)	−6.86***
Wealth	$563,659 ($1,422,379)	$431,435 ($1,236,130)	−6.65***
Income-to-Needs	5.07 (4.84)	4.35 (3.56)	−1.71
Age	67.57 (9.97)	70.20 (12.43)	14.48***
Neuroticism	2.04 (0.61)	2.11 (0.66)	5.27***

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2

Weighted sample characteristics

	Baseline *M* (SE)	Follow-up *M* (SE)
Cardiometabolic Risk	2.22 (0.02)	2.11 (0.02)
No Biomarkers at Risk, %	9.72	10.94
One Biomarker at Risk, %	24.64	25.31
Two Biomarkers at Risk, %	26.37	26.99
Three or More Biomarkers at Risk, %	39.27	36.76
Neighborhood Disorder	2.34 (0.02)	2.39 (0.02)
Neighborhood Cohesion	5.58 (0.02)	5.57 (0.02)
Household Income-to-Needs	5.58 (0.14)	
Wealth	$590,098 ($15,930)	
Age, years	64.82 (0.12)	
Neuroticism	2.04 (0.01)	
Gender, % male	45.85%	
Marital Status		
Married	66.52%	
Non-Married	33.48%	
Race/Ethnicity		
Non-Hispanic White	91.72%	
Minorities	8.28%	
Anxiety	1.51 (0.01)	
Physical Activity	24.63 (0.13)	

Table 3

Cross-sectional and longitudinal models of neighborhood perceptions predicting cardiometabolic risk (estimates [SE])

	Cross-sectional Regressions		Longitudinal Structural Equations			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	0.89 (0.08)	1.03 (0.08)	1.13 (0.09)	2.80 (0.19)	3.44 (0.20)	3.39 (0.20)
Income-to-Needs	−0.02 (0.02)	−0.02 (0.02)	−0.08*** (0.02)	−0.08*** (0.03)	−0.08*** (0.02)	−0.08*** (0.02)
Wealth	−0.08*** (0.02)	−0.08*** (0.02)	−0.05** (0.02)	−0.09*** (0.02)	−0.07*** (0.02)	−0.07** (0.02)
Marital Status	0.08*** (0.02)	0.07*** (0.02)	0.04 (0.02)	0.09* (0.04)	0.08 (0.04)	0.08 (0.04)
Age (5-year)	−0.01 (0.00)	−0.01 (0.00)	−0.02*** (0.00)	−0.03*** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)
Gender[a]	−0.14*** (0.02)	0.14*** (0.02)	−0.13*** (0.02)	−0.27*** (0.04)	−0.31*** (0.04)	−0.31*** (0.04)
Neuroticism	0.02 (0.01)	0.02 (0.01)	0.01 (0.02)	−0.01 (0.04)	0.01 (0.03)	−0.03 (0.04)
Non-Hispanic Black[b]	0.18*** (0.03)	0.18*** (0.03)	0.24*** (0.03)	0.58*** (0.07)	0.55*** (0.07)	0.54*** (0.07)
Hispanic[b]	0.10** (0.04)	0.10** (0.04)	0.09** (0.04)	0.21** (0.09)	0.20** (0.09)	0.19* (0.09)
Anxiety				0.10** (0.04)		0.07 (0.04)
Physical Activity					−0.02*** (0.00)	−0.02*** (0.00)
Disorder	0.01 (0.01)					
Cohesion		−0.02*** (0.01)	−0.02** (0.01)	−0.04** (0.02)	−0.03* (0.02)	−0.03 (0.02)
N	13,441	13,441	13,441	13,441	13,441	13,441

[a] Compared to males;

[b] Compared to non-Hispanic White;

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$;

Note. Of the 9032 participants in the analytic sample, 7860 remained in the same residence between waves (1172 moved). Findings persisted when analyses were run on a subset of the sample representing those who stayed in the same residence between waves.