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Neighborhood Socioeconomic Status and Health: A Longitudinal Analysis

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Abstract

Higher income neighborhoods are associated with better health, a relation observed in many cross-sectional studies. However, prior research focused on the prevalence of health conditions, and examining the incidence of new health conditions may provide stronger support for a potential causal role of neighborhoods on health. We used the 2004 and 2014 waves of the Midlife in the United States Study (n = 1726; ages 34–83) to examine health condition incidence as a function of neighborhood income. Among participants who had lived in the same neighborhood across the time period, we hypothesized that higher neighborhood income would be associated with a lower incidence of health conditions ten years later. Health included 18 chronic conditions related to mental (anxiety, depression) and physical (cardiovascular, immune) health. Multinomial logistic regression analyses adjusting for individual income and sociodemographics indicated that the odds of developing two or more new health conditions (no new health conditions as referent), was significantly lower (OR = 0.92, CI: 0.86, 0.99) for every $10,000 increment in neighborhood income. Associations did not vary by age or neighborhood tenure. Results add to a literature documenting that higher neighborhood income is associated with better health.

Keywords

United States; neighborhood income; health conditions; age

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Compliance with Ethical Standards

Conflicts of interest. The authors declare that they have no conflict of interest.

Research Involving Human Participants and/or Animals. The study was completed using ethical guidelines with the approval of each of review boards of the institutions involved. No animals were used in the present research.

Informed Consent. Participants signed informed consent before completing the survey.

Adverse neighborhoods are associated with poor health [see reviews 1–3]. The nature of this relationship for chronic conditions, however, is equivocal. Most investigations are cross-sectional, and findings from longitudinal analyses may be distorted by the presence of acute health conditions. Acute health conditions that improve or disappear completely after a short time, e.g., respiratory infections, may obscure patterns of poorer chronic health in low income neighborhoods. In the present study, we examined the relation between neighborhood income and the development of new chronic health conditions ten years later. We also examined whether this relation varied by age or length of time lived in the neighborhood.

Residents' Characteristics

A challenge when examining relations between neighborhoods and health is that people move in and out of neighborhoods over their life course, so they may be exposed to multiple neighborhoods that differ in socioeconomic status [SES; 4]. For this reason, we restricted the analyses to those who had lived in their neighborhoods for the entire assessment period. Moreover, length of time lived in a neighborhood may interact with neighborhood income for health. For example, chronic exposure to adverse neighborhoods may accumulate over time, resulting in greater health deterioration. Conversely, people may acclimate to their neighborhoods over time which could plausibly buffer the health risks from exposure to low income neighborhoods.

Another challenge is that people do not choose neighborhoods at random. People with low SES, for example, often can only afford to live in low SES neighborhoods. This confounding factor raises the question as to whether health varies not as a function of neighborhood exposure, but rather individual characteristics [1–3]. It is not plausible to adjust for the entire constellation of factors that may result in participants' selection into their respective neighborhoods, but we include individual income, education, health insurance coverage, and other sociodemographic factors in our analyses to adjust for some of these potential individual factors.

Other difficulties in interpreting the relationship between neighborhoods and health include the heterogeneity of health outcomes examined [2, 3] as well as potential effects of the age of the study participants. Although many researchers have examined chronic health conditions in the context of neighborhoods [e.g., cardiovascular conditions;5], some have examined acute conditions such as respiratory infections [e.g.,6, 7]. Both acute and chronic conditions are observed more often in deprived neighborhoods. Short-term conditions such as respiratory infections, however, may obscure the true relation between neighborhoods and chronic health issues in longitudinal studies. A large review [2] described studies that examined multiple health outcomes simultaneously and reported null results, and many of the studies assessed acute health conditions. In the present study, we restrict our analyses to *incidence*, rather than prevalence, of *chronic* health conditions.

In addition, age of the residents may interact with neighborhood income in its relation to health. Older adults typically experience declines in their functional abilities [8, 9] that could make them more vulnerable than younger adults to neighborhood adversity. In the present

analyses we examined whether older adults would be more vulnerable than younger adults to neighborhood adversity.

Neighborhoods and Health: Cross-Sectional and Longitudinal Findings

Three reviews, to our knowledge, describe a large literature attesting to relations between neighborhoods and health [1–3]. The majority of these studies find a small but significant relation between neighborhoods and health after taking into account individual sociodemographics. In one review, results of 86 studies indicated that self-rated health was poorer, and both the rates of cardiovascular health problems and their risk factors as well as overall mortality were higher in more deprived neighborhoods [3].

The majority (80%) of these studies were cross-sectional and thus cannot distinguish between prevalence versus incidence rates. Simply assessing health condition prevalence rates in the context of neighborhoods precludes researchers from disentangling the possibility of reverse causation. For example, individuals with declining health may be unable to meet the demands of their job and have to reduce their schedule or choose a less demanding occupation. With a lower income, these individuals may, in turn, be required to move into more modest neighborhoods. Those with poor health, therefore, would select into lower income neighborhoods. To address this concern, we examined the relation between neighborhood income and incidence of *new* chronic health conditions after a ten-year period. Longitudinal studies improve on the cross-sectional design in that multiple assessments of health ideally allow a test of the association between the exposure and outcome after taking into account baseline health status.

Some longitudinal studies have been conducted demonstrating prospective associations between residents' increasingly positive views of the aesthetics and convenience of their neighborhoods and an increase in their neighborhood walking behaviors [10]. Another study found a longitudinal relationship between observer ratings of neighborhood physical deterioration and incidence of lower body functional limitations [11]. Other research has shown that lower neighborhood SES is related to a greater incidence of coronary events [myocardial infarctions; 5, 12] and mortality [all-cause, cardiovascular disease, and cancer; 13, 5, 12] over time. We will build on these findings by examining the longitudinal relationship between neighborhood income and a wider range of chronic health conditions.

The Present Study

The current study examines mental and physical health in the context of neighborhood income using a large sample of United States men and women who ranged in age from 34–83 years at the first time point in our analyses. We build on prior neighborhood examinations in three ways. First, we use a longitudinal data set to investigate the relation between neighborhood income and the incidence of mental and physical health conditions after a ten-year period. Second, we restrict our analyses to individuals who lived in the same neighborhood for at least ten years to minimize biases related to residential mobility. Lastly, we examine whether the individual characteristics of age and neighborhood tenure interact with neighborhood income for long-term health.

Method

Sample and Procedures

Data in the present study came from the Midlife in the United States (MIDUS) study. The purpose of this national telephone and self-administered questionnaire survey was to assess the behavioral, psychological, and social factors explaining differences in physical and mental well-being in midlife and older adulthood. Some participants were drawn from random digit dialing procedures (43.06%). Additional participants were recruited through oversampling in five metropolitan areas (18.92%). Siblings and twins of the main MIDUS participants represent the remainder of the sample (38.03%). MIDUS I took place in 1994 and follow-ups were conducted in 2004 and 2014. Participants in the present study represent those who completed Waves II and III of the MIDUS. Our analytic sample represented those who reported living in their current neighborhoods for at least the last ten years ($N = 1726$). Participants were, on average, 56 years-old ($sd = 10.91$ years) at Wave II, primarily white (93.85%) and comprised of roughly equal numbers of men and women (53.24% female). The study was completed using ethical guidelines with the approval of each of review boards of the institutions involved, and participants signed informed consent before completing the survey.

Measures

Chronic health conditions

In MIDUS II and III, participants reported whether or not (0 = no, 1 = yes) they had experienced any chronic mental or physical health conditions in the past 12 months. Mental health conditions included anxiety or depression, sleep problems, and alcohol-related disorders. The physical health conditions were listed as cardiovascular diseases (e.g., hypertension, stroke, heart problems), infections (HIV), diabetes, cancer, hernias, hay fever, digestive problems (e.g., recurring stomach trouble, constipation all or most of the time), urinary problems, neurological problems, autoimmune disorders (e.g., arthritis, lupus), and problems with the lungs (e.g., emphysema, asthma, bronchitis, other lung problems), bones (e.g., sciatica, arthritis, recurring backache), mouth (e.g., persistent trouble with gums or teeth), thyroid, and gall bladder.

To assess the presence of existing conditions across both waves and the incidence of *new* health conditions at the third wave of data collection, we created a categorical variable which reflected the pattern of prevalence and incidence of the 18 conditions from the first to second wave of data collection. The variable was composed of five categories: those with no health conditions or a decrease in the number of health conditions to 0 from baseline to follow-up (coded 0, 20.31%), those with one chronic condition at both baseline and follow-up (coded 1, 12.67%), those with the same number of two or more chronic conditions at baseline and follow-up (coded 2, 6.37%), those with one incident health condition over the follow-up (coded 3, 31.25%), and those with two or more incident conditions over the follow-up (coded 4, 29.40%).

Neighborhood SES

Median household income at the census tract (CT) level was used as our measure of neighborhood SES, a common operationalization in neighborhoods and health literature [2, 3]. MIDUS II was conducted in 2004, so the 2000 decennial assessment of CT income was the closest match possible to our data set. An incremental neighborhood income variable was created so that model estimates were interpreted as a change in health for every $10,000 increase in neighborhood income.

Neighborhood tenure

In Wave III, participants were asked the number of years they had lived in their current neighborhood, or in their current township if they lived in a rural area.

Covariates

In MIDUS II, participants reported their income from personal wages, pensions, social security, and government assistance. Participants also reported these sources of income for their spouses, and these values were then combined. An incremental family income variable was created to allow for an interpretation of differences based on each $10,000 increments in family income in the analyses. A five-year incremental age variable was created to estimate difference in health conditions based on five-year age differences. Gender was also included as a covariate. Education was assessed by asking participants for the highest grade in school or year of college they completed. We constructed a variable for which 1 = less than high school, 2 = high school graduate or GED, 3 =some college, 4 = completed a 4-year degree, and 5 = completed some graduate school or graduate degree. Respondents were also asked whether they were currently covered by any health insurance. Responses provided were coded 1 = yes and 2 = no.

Statistical Analyses

We first used means and frequency procedures to report descriptive information on our participants. Next, we conducted *t* and *chi-square* tests to assess potential differences between participants who moved and those who maintained stable residences between the baseline and follow-up period to examine any differences between the people used in these analyses and those in the original sample. We then used multinomial logistic regression to test our hypotheses. Our first regression assessed our hypothesis that higher neighborhood income would be associated with fewer existing chronic health conditions and decreased odds of developing new health conditions after a ten-year period adjusting for individual income and education levels, age, gender, and insurance status. Our second model examined whether the length of time participants had been living in their neighborhoods would moderate the relation between neighborhood income and health (Model 2). Lastly, in Model 3 we assessed our hypothesis that older adults would be more vulnerable than younger adults in low income neighborhoods. All analyses were restricted to individuals who had been living in their current neighborhoods for at least ten years, the duration of the assessment period. All analyses were conducted using SAS software, version 9.4 Copyright © 2002–2012 by SAS Institute Inc.

Results

Results of *t* and *chi-square* tests indicated that individuals who maintained stable residences ($n = 1728$) were slightly older than those who moved ($n = 1028$) at some point between the baseline and follow-up periods ($p < .0001$). Women ($p < .001$) and those without health insurance ($p < .001$) were more likely to move than men or those with health insurance. These two groups did not significantly differ in terms of individual income or education levels or neighborhood income.

A description of the participants representing the analytic sample and the frequencies of new chronic health conditions at the follow-up period can be found in Table 1. Both individual family and CT median family income spanned wide ranges. Even after restricting the current sample to those who had been living in their current neighborhoods for at least ten years, there was still a great amount of variability in the number of years participants reported living in their current neighborhoods. Of the 1726 participants in the present study, 680 reported no new health conditions after a ten-year period; 540 participants reported developing one new health condition and 508 people developed two or more new conditions after a ten-year period.

Longitudinal Relation Between Neighborhood SES and Incident Health Conditions

In Model 1 we tested our hypothesis that higher neighborhood income would be associated with fewer existing health conditions and a decreased likelihood of developing new mental and physical health conditions after a ten-year period, adjusting for age, gender, individual income, education and health insurance status. Results indicated that the odds of having two or more chronic health conditions and of developing two or more new health conditions (relative to developing no new health conditions) was lower for every $10,000 increment in neighborhood income. The comparisons of having one existing condition or developing one new health condition relative to having no new health conditions were not significant. Older adults were more likely than younger adults to have one or more existing conditions and to have developed new health conditions over a ten-year period. Women were more likely than men to have one existing health condition and to have developed one or more new health conditions. People with no health insurance (relative to those with some health insurance) were more likely to develop two or more new chronic health conditions (see Table 2).

In Model 2 we examined whether the relation between neighborhood income and health differs as a function of the number of years participants reported living in their current neighborhoods. In Model 3 we tested the hypothesis that low income neighborhoods would be worse for the health of older than younger adults. Neither the time lived in neighborhood × neighborhood income interaction nor the age × neighborhood income interaction was significant.

Discussion

Results from this study add to a growing body of research documenting that higher income neighborhoods are related to better health. People living in higher income neighborhoods were less likely to have – or develop new – mental or physical health conditions ten years

later. These results were observed among a group of participants who had been living in their current neighborhoods for the entire assessment period, minimizing concerns that residential mobility results in multiple neighborhood exposures over time. We observed these results after adjusting for individual income, education, insurance status, and other sociodemographics, which minimizes concerns that our findings reflect the influence of individual SES as opposed to the neighborhood itself. Our findings add support to the notion that neighborhood income is associated with health above individual resources.

Residents' Characteristics

Older adults often experience declines in their physical abilities [9] that may render them less capable of coping with situations of chronic stress. Along this line, we had hypothesized that older adults would be more vulnerable in terms of their health than younger adults in low income neighborhoods. However, this hypothesis was not supported. Our finding that higher income neighborhoods are related to fewer existing chronic health conditions and decreased odds of developing new health conditions was consistent across people who started the study as younger, middle-aged, or older adults. The finding that people in higher income neighborhoods had fewer existing chronic health conditions is consistent with others' research demonstrating the relationship between low neighborhood SES and poor health [1–3]. In addition to confirming prior findings in the literature, results from our study also contribute new information to our understanding of the relationship between neighborhoods and health; people living in lower income neighborhoods developed more *new* chronic health conditions over time. This new finding adds to our confidence that features of the neighborhoods themselves may influence the health of their residents.

Chronic health conditions typically occur in midlife, and results indicate that vulnerability to neighborhood conditions are not reserved only for older adults. Another issue to consider when interpreting these findings, however, is that the oldest participants in our sample may be a relatively healthier, more select sample than the participants in midlife; not all of the midlife participants in the current sample will live into their 70s and 80s, and by definition, the oldest participants in our sample have already reached these ages.

We were also interested in examining whether the number of years participants had lived in their current neighborhood would interact with neighborhood income for their health. Even after restricting our sample to participants who had lived in their current neighborhoods for at least ten years, the entire assessment period, a substantial variability in the number of years participants had been living in their respective neighborhoods allowed us to examine this question. We had expected that greater length of exposure to lower income neighborhoods might enhance the odds of disease development. The results were not significant, however, indicating that in this data set, time lived in one's neighborhood neither strengthened nor attenuated the relation between neighborhood income and health. One explanation for the lack of a moderating effect of length of residential exposure may be that over time residents acclimate to neighborhood conditions and develop strategies to cope with limited resources. For example, prior research has demonstrated that greater feelings of attachment or cohesion with one's neighborhood may help to buffer against the adverse health effects of low neighborhood SES [14]. Unfortunately, we did not have a measure of

neighborhood attachment in the current study to explore this possibility, and thus, this may be an important area for further research.

A strength of the current analyses is that all participants had lived in the same neighborhood during the 10-year study, so residential mobility could not bias results. Nevertheless, we did not examine the possibility that individuals may be exposed to different neighborhoods throughout the day, week, or month. An individual may visit with friends in one neighborhood, work in another neighborhood, and return home to yet another neighborhood. If, for instance, one's friends live in more affluent neighborhoods, it is unclear whether or to what degree the individual will experience health-related benefits as a result of those exposures. Future research may focus on tracking where, and how much time participants spend in various neighborhoods for work and leisure.

Neighborhoods and Health: Cross-Sectional and Longitudinal Findings

Most studies examining health in the context of neighborhoods use cross-sectional designs. Among the few existing longitudinal studies, results are more mixed [2]. One reason for these equivocal findings may be explained by the wide variety of health outcomes assessed, combining acute and chronic conditions. Our statistical models predicted incidence, in addition to prevalence patterns, of a wide range of chronic health conditions. The aim of this strategy was to reduce biases that may occur in one of two scenarios. First, participants might have reported an acute health condition at the baseline period (i.e., a respiratory infection) that may have dissipated at the ten-year follow-up. In addition, some studies have only examined the prevalence rates at the second time point. However, individuals may have the same health conditions at both the baseline and follow-up assessments. Our strategy yielded results indicating that higher neighborhood income is related to both decreased odds of prevalent multi-morbidity, as well as decreased odds of the incidence of *new* chronic mental and physical health conditions over a ten-year period.

Limitations, Conclusions and Future Directions

Future research needs to replicate these findings with a more comprehensive assessment of neighborhoods. Our measure was operationalized as a single indicator, neighborhood income. Additional aspects of neighborhood SES (e.g., unemployment rates) and neighborhood location (e.g., urban versus rural) that are measured simultaneously with the health outcomes of interest are needed. Furthermore, future studies should include multiple assessments of neighborhood SES to account for potential neighborhood change. Additionally, our findings were based on self-reported diagnosed chronic health status, and additional studies should make use of more objective (e.g., physician-rated) health condition indicators. Finally, replication of these results is needed among more racially, ethnically diverse samples that are more representative of the adult population in the United States. Despite these limitations, our findings add to a growing literature suggesting a possible role of neighborhood SES for residents' health. Our findings indicated that those living in higher income neighborhoods develop fewer health problems than those living in lower income neighborhoods. The examination of the *incidence* of health problems in the context of neighborhoods adds support to a possible causal role between neighborhoods and health.

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Table 1

Description of participants (N = 1741) with wave 3 health condition frequencies

	M (SD)	Range
Baseline Household Income	$76,138.48 ($61,973.82)	$0–300,000
Quartile 1: $0–33,750	435 (25.17%)	
Quartile 2: $33,751–62,250	421 (24.37%)	
Quartile 3: $62,251–100,000	439 (25.40%)	
Quartile 4: $100,001–300,000	433 (25.06%)	
Baseline Age	56.16 (10.91)	34–83
Baseline Education		
Less than high school	72 (4.17%)	
High school or GED	432 (25.00%)	
Some college	476 (27.55%)	
College degree	370 (21.41%)	
Some graduate school or degree	378 (21.88%)	
Sex (% Male)	46.76	
Baseline Insurance (% With)	95.43	
Years Lived in Neighborhood	27.11 (14.24)	10–83
2000 Neighborhood Income	$50,720.23 ($20,974.19)	$10,457–200,001
Quartile 1: $0–35,766	432 (25.00%)	
Quartile 2: $35,767–46,097	432 (25.00%)	
Quartile 3: $46,098–60,652	432 (25.00%)	
Quartile 4: $60,653–200,001	432 (25.00%)	
Baseline Health Conditions		
Cardiovascular Conditions	267 (17.67%)	
Digestive Problems	231 (13.38%)	
Urinary Problems	171 (9.91%)	
Cancer	169 (9.81)	
Anxiety/Depression	161 (9.33%)	
Lung Problems	139 (8.05%)	
Sleep Problems	126 (7.30%)	
Diabetes	123 (7.12%)	
Thyroid Problems	102 (5.90%)	
Mouth Problems	103 (5.96%)	
Hay Fever	97 (5.62%)	
Bone Problems	44 (2.55%)	
Hernia	39 (2.26%)	
Gall Bladder Problems	23 (1.33%)	
Immune Problems	21 (1.22%)	
Alcohol Problems	19 (1.10%)	
Neurological Problems	17 (0.98%)	
AIDS	3 (0.17%)	

Note. For continuous variable, *M* (*sd*) shown; for categorical variables, percentage shown; for chronic health conditions, counts shown.

Table 2

Multinomial Logistic Regressions Predicting Health Conditions (Relative to No Conditions)

	1 Existing Condition	2+ Existing Conditions	1 New Condition	2+ New Conditions
Individual Income	0.98 (CI: 0.95, 1.01)	0.96 (CI: 0.92, 1.01)	0.98 (CI: 0.96, 1.00)	0.99 (CI: 0.96, 1.01)
Age	1.25 (CI: 1.14, 1.36)	1.30 (CI: 1.17, 1.44)	1.24 (CI: 1.16, 1.33)	1.33 (CI: 1.24, 1.43)
Gender (male)	1.59 (CI: 1.12, 2.24)	1.54 (CI: 0.99, 2.39)	1.65 (CI: 1.25, 2.18)	1.70 (CI: 1.28, 2.26)
Education	1.07 (CI: 0.92, 1.26)	1.18 (CI: 0.97, 1.44)	1.03 (CI: 0.91, 1.17)	0.96 (CI: 0.85, 1.10)
Insurance (with)	0.92 (CI: 0.33, 2.54)	2.17 (CI: 0.83, 5.67)	1.22 (CI: 0.58, 2.57)	2.05 (CI: 1.01, 4.17)
Neighborhood Income	1.01 (CI: 0.93, 1.10)	0.87 (CI: 0.77, 0.98)	0.98 (CI: 0.91, 1.05)	0.93 (CI: 0.86, 1.00)

Values represent odds ratios (95% confidence intervals)

Note. Individual income (in $10k increments), age (in 5-year increments), gender, individual education level, and insurance status were covariates. Neighborhood income (in $10k increments) was the primary predictor variable.