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Neighborhood Environment and Health of Injured Urban Black Men.

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Abstract

Introduction: Urban black males are at disproportionately high risk of poor health outcomes, thus we need to measure neighborhood environments appropriately in order to understand aspects of neighborhoods that influence their mental and physical health. We explored associations between physical and mental health of injured, urban black men with objectively measured and perceived neighborhood characteristics.

Methods: In 2017–2018, we analyzed data from 486 black, adult males in Philadelphia admitted to a trauma center with injury between January 2013 and February 2017. Area-level measures of social, economic, and built environments were obtained from multiple sources. At enrollment, participants answered questions about neighborhood environment and self-reported physical and mental health 30 days before injury. We conducted factor analysis to identify neighborhood characteristics, then estimated odds of poor physical or mental health, accounting for spatial correlation of participants.

Results: Poor physical and mental health was reported by 12% and 22% of participants, respectively. In participants' neighborhoods, 29% of adults lived in poverty. Individually, 73% of

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men reported abandoned buildings and 31% reported not feeling safe walking around their neighborhood. Physical health was associated with neighborhood poverty and disconnectedness. Mental health was associated with neighborhood economics and individual perceptions of social disorder and safety. Individual-level factors were not correlated with area-level factors.

Conclusions: We found both area-level and individual-level measures were associated with health, perhaps operating through different mechanisms, but individual experiences may not be easily extrapolated from area-level data. By identifying important components of neighborhood environments, we may better understand how neighborhoods contribute to health in vulnerable populations.

Keywords

neighborhood environment; neighborhood perception; mental health; physical health; black men; injury

Classifications

Blacks; men; mental health; socioeconomic factors; social stress; neighborhood

Introduction

Social and physical environments have a strong influence on health, and exposures and stressors in low-resource neighborhoods are important contributors to health disparities [1–4]. Structural and social neighborhood characteristics have an independent effect on health even after controlling for individual-level exposures [5,6]. These characteristics may directly influence health-related behaviors [7,8], but may also contribute to biological ‘wear and tear’ through a chronic stress response [9]. Structural characteristics, including community-level poverty, income inequality, discrimination, racial segregation, violence, and availability of resources, have potentially unique influences on health, yet also influence each other [10]. Area-level social conditions, including collective efficacy and feelings of safety, also influence health [11,12] and are ‘fundamental causes’ of health inequalities [13,14].

Racial, socioeconomic, and neighborhood disparities in health exist, driven in part by societal forces that have segregated and isolated minority communities [15]. Local socioeconomic conditions have been shown to have a greater impact on mortality in black populations than in white populations, suggesting a synergistic effect of individual and area-level factors on health [16]. Although urban black men have the lowest life expectancy of any group in the US, little research is focused on the health of this population [17,18]. Furthermore, black adults have a lower lifetime prevalence, but a higher risk of persistence, of major depressive disorder and lower likelihood of being diagnosed and receiving treatment than white adults [19]. The neighborhood environment is associated with both psychological distress and utilization of mental health services, exacerbating risks of poor mental health outcomes for residents of high-risk neighborhoods, though the mechanisms for these associations are unclear [20–22].

One of the challenges to understanding neighborhood influences on health is to distinguish the effects of what objectively exists in a neighborhood environment from what people perceive about their environment. Area-level neighborhood features can be measured as objective characteristics that include availability of resources, crime, green spaces, and the quality of sidewalks and playgrounds; these influence health through a variety of mechanisms, including access to healthy food, safe spaces for leisure-time physical activity and active transport to work and school [12]. Area-level social characteristics can be measured via surveys that ascertain subjective perceptions that may be aggregated to estimate the social atmosphere of a neighborhood. Despite each neighborhood having certain common, area-level features, people may experience neighborhoods differently [23], and what people perceive about a neighborhood could have an independent influence on their health [24]. However, few studies have examined both area-level measures and individual-level measures of neighborhood; most explore only a single measure of objective, area-level or perceived, individual-level neighborhood environment [25–31] or are focused on walkability and physical activity [32]. Previously published studies include data from non-US populations [26], low numbers of minority participants [29], or the assumption that objective neighborhood characteristics should be measured in the same way or have the same impact on health across the entire US [31], limiting interpretations of the effects on minority populations living in urban US neighborhoods.

Given the history of formal and informal processes that have propagated racial segregation of communities, disentangling the effect of the individual experience of race from neighborhood can be problematic, as demonstrated by the stark association that has been found between race and neighborhood disadvantage [31]. Men who have been injured are at particular risk for poor mental and physical health, which can put them at risk for reinjury as well as other long-term health consequences [33,34]. Thus urban black males who were recently injured may be particularly sensitive to their neighborhood environment; focusing on this population may improve our ability to identify aspects of neighborhoods that influence health within urban black males. Focusing on high-risk populations could allow us to gain insight into associations between neighborhood characteristics and health that may be difficult to identify in general population studies that include only a small number of individuals in vulnerable groups.

This analysis focuses on injured black men living in urban neighborhoods in Philadelphia. This city in which 42% of residents are black, is the most impoverished of the ten largest US cities, and life expectancy for black men is below national norms [35–37]. We overcome limitations of previous studies by examining both area-level characteristics and the individual's perception of his neighborhood's poverty, safety, and other characteristics concurrently. The goal of this analysis is to explore the relationship between objective, area-level characteristics and individual-level perceptions of neighborhoods in an urban environment and their associations with physical and mental health.

Methods

Study population

This analysis, conducted in 2017–2018, used data from a study exploring mental health outcomes following injuries in black men living in an urban area. This study included 486 black men age ≥ 18 years living in Philadelphia who were admitted to an urban trauma center with a diagnosis of injury between January 2013 and February 2017. All participants had to speak and understand English and consent to the study, which was approved by the University of Pennsylvania's IRB.

Individual Perceptions of Neighborhood Environment

Participants answered questions of perceived neighborhood environment using an 18-item scale that measures multiple facets of the neighborhood environment at the time of their injury [38]. The scale included questions on neighborhood safety (e.g. "I feel safe when I walk around my neighborhood by myself"), opportunities for physical activity (e.g. "Within walking distance of my house there is a park or playground where I like to walk and enjoy myself"), and poverty (e.g. "In my neighborhood, there are a lot of poor people who don't have enough money for food and basic needs"). Response options were binary (True/False), and questions were coded so that combined higher scores represented perceived riskier neighborhood environments. Individual, geocoded addresses were available for all men in the study. We anticipated that some men in the study would live in the same neighborhood (or census block group); having measures of neighborhood perception from multiple individuals within a block group allowed us to explore variability of perceptions within neighborhoods and better determine whether area-level and individual-level measures of neighborhood environment were correlated.

Area-level Measures of Neighborhood Environment

There is no single, accepted set of variables used to operationalize neighborhood context, so multiple measures of social, economic, and built environments were obtained based on multiple, previously identified factors that were found to be important predictors of health in urban environments [39]. Area-level measures at the census block level were based on geocoded home addresses of participants at the time of injury and were obtained from the 2010 Census, the American Community Survey (ACS 5-year estimates), and other sources listed in Supplemental Table 1 (ST1).

Physical and Mental Health

The primary outcomes were physical and mental health. These two indicators of health were adapted from the 4-item Health-Related Quality of Life scale and were collected by self-report at intake: number of days of poor physical health and number of days of poor mental health in the 30 days before their injury [40,41]. The measures were dichotomized and participants were considered to have poor physical or mental health if they reported 14 or more days [42,43]. Demographic variables including those related to ethnicity, marital status, children, employment, education, housing, and income were collected at study entry along with risk factors related to ability to see a doctor and use of alcohol or drugs.

Statistical analysis

All continuous, area-level variables were transformed to a z-score at the most granular level of detail available. Given the variety of characteristics represented by the available variables, we conducted exploratory factor analysis for both individual-level and area-level variables. Because we anticipated that these indicator variables would be highly correlated with one another, we used factor analysis to identify factors that represented common underlying constructs of neighborhood characteristics using MPlus version 7 [44]. Oblique rotation allowed factors to be correlated. The number of factors was determined based on theoretical distinctions between factors and model fit criteria including chi-square test of model fit and Akaike Information Criteria. A minimum factor loading score of 0.3 was used as a cutoff for potential inclusion in the factor and Cronbach's alpha was used to assess the reliability of the construct. Final sets of variables were determined based on a combination of variable loadings and theoretical consistency. Factor scores for each subject were estimated using the weighted variable loadings for the variables.

Factor scores for area-level variables were estimated at the census block group level and assigned to individual subjects based on their home address at the time of injury. The reliability of the latent constructs based on the final set of indicator variables was calculated using Cronbach's Coefficient Alpha for continuous variables and the Kuder-Richardson 20 reliability measure for binary variables. The contribution of area to the variability of the individual-level factor scores was estimated using the intra-class correlation coefficient (ICC).

Associations between individual characteristics and health outcomes were assessed using chi-square tests or Fisher's exact tests when categories had small cell sizes; a t-test was used for the continuous variable of age. We used logistic regression modelling, with individual patients as the unit of analysis, to estimate the odds of poor physical or mental health associated with neighborhood factors and health, using factor scores as measures of neighborhood characteristics. Factor scores were standardized to allow for comparable estimates of association across factors; the correlation between factor scores was also explored. Factor scores were divided into tertiles where there was evidence of a non-linear relationship with mental or physical health. We ran five separate models predicting each health outcome using the following variables: (1) area-level factors, (2) individual-level factors, (3) all area-level and individual-level neighborhood factors together, (4) all neighborhood factors and potential confounders, and (5) the final model. Stepwise regression was used to aid model selection, but final model selection was made based on a thorough review of the variables' estimates of effect and contribution to model fit. All models accounted for correlations of subjects within the same census block group, using census block group as a repeated measure. The discrimination of the models was compared using the area under the receiver operating characteristic (ROC) curve [45]. Statistical analysis other than factor analysis was conducted using SAS® software, Version 9.4.

Results

Study population characteristics

The 486 men in this analysis lived in 116 census tracts (267 census block groups) within the city of Philadelphia (Supplemental Figure 1). Many of the men were clustered in census tracts in west Philadelphia; 73 (63%) of the census tracts had more than 1 participant at study entry. The average age was 36 years; the majority of men did not own their home (81%) and made less than $40,000 per year in income (56%). A little over one-third of the men (37%) reported they could not see a doctor in the past year because of cost and 26% felt that they had used too much alcohol or drugs in the 6 months before their injury (Table 1). Approximately 55% of the men were injured from an intentional act (i.e. violence or intentional injury by another person), but this was not associated with mental or physical health.

Area-level factors

Factor analysis of the area-level variables revealed four latent factors related to neighborhood (1) spending, income, and education; (2) crime and alcohol outlets; (3) deprivation, vacancy and violence; and (4) neighbor disconnectedness (ST2). These factors had moderate to high internal consistency (alphas 0.69 to 0.94). Factor analysis of the individual-level neighborhood perception variables revealed three latent factors related to (1) safety concerns, (2) physical disorder, and (3) social disorder (ST3). The internal consistency of these factors ranged from 0.46 to 0.81 and the factors were highly correlated with each other, with correlations between factors ranging from 0.68 to 0.83. The ICCs suggest that living in the same census tract only explained a small proportion of the variance in the individual-level neighborhood perception (ST3). The individual-level factors had very low correlation with the area-level factors (ST4).

Physical health

Using factor scores to examine associations with physical health, two area-level factors, deprivation, vacancy and violence and neighbor disconnectedness, were associated with physical health (Table 2). There was evidence of a non-linear relationship between these factors and poor physical health. Individual-level factors of neighborhood perception (model 2) were not associated with physical health. In the final model (model 5), living in an area with moderate levels of deprivation, vacancy and violence was associated with an increased odds of poor physical health compared to living in areas with the lowest levels (Odds Ratio (OR)=2.72, 95% Confidence Interval (95% CI): 1.22, 6.09). Moderate levels of neighbor disconnectedness were also associated with increased odds of poor physical health compared to low levels (OR = 2.59, 95% CI: 1.18, 5.65). These associations were observed even after controlling for age, ability to see a doctor, their living situation, and self-perception of alcohol and drug abuse (model 5).

Mental health

The three individual-level factors were each independently associated with a 56–67% increased odds of poor mental health (data not shown), but when all three individual-level

factors were included the associations were attenuated (Table 3, model 2). There was evidence of non-linearity of the effect of perceived social disorder on mental health, with the highest tertile being associated with an increased odds of poor mental health. After controlling for other variables, age, income, and employment status had no effect on the odds of poor mental health. In the final model, neighborhood spending, income and education; individual safety concerns about their neighborhood; and individual perception of neighborhood social disorder were all associated with a moderate (32–70%) increased odds of poor mental health after controlling for ability to see a doctor and self-perception of alcohol and drug abuse (model 5).

Discussion

This study examined the relationship between area-level characteristics and individual-level neighborhood perceptions in an urban environment and assessed their associations with indicators of physical and mental health. This is the first study exploring multiple objective and subjective area-level and individual-level measures of neighborhood environment on health in a population of recently injured, black men in a geographically-defined urban area. Given the strong associations between race and neighborhood, analyses of representative samples of city residents may be unable to explore the nuance of neighborhood characteristics that influence the health of a high-risk subgroup of the population. Using data from black males living in an urban area, we were able to identify components of neighborhoods of particular importance to this vulnerable population.

Area-level factors

Among the census block groups for participants, we found four area-level factors: spending, income and education; crime and alcohol outlets; deprivation, vacancy and violence; and neighbor disconnectedness. Of these characteristics, both structural (moderate deprivation, vacancy and violence) and social (moderate neighbor disconnectedness) factors were associated with poor physical health. Although this analysis was cross-sectional, the non-linearity of these associations may provide interesting insight into the potential mechanisms that subsequent research should explore. For example, residents in gentrifying neighborhoods may feel more disconnected from their neighbors than residents in neighborhoods with stable populations, even though those more stable neighborhoods may have fewer resources or increased prevalence of other risk factors [46,47]. A recently published report identified Philadelphia as an intensely gentrifying city with high levels of black displacement, suggesting that black residents, or their neighbors, are being displaced in gentrifying neighborhoods [48]. Although most of the participants in our study were not living in neighborhoods identified as gentrifying or previously gentrified, the most recent data available identifies neighborhood gentrification one to 4 years prior to our interviews and was likely undercounted [48,49]. So while we were unable to explore whether the associations observed were driven specifically by participants in gentrifying neighborhoods, gentrification continues to occur in Philadelphia neighborhoods and the impact of gentrification on residents is complex. In this study, while disconnectedness was associated with increased odds of poor health, some of the effects may have been attenuated at higher levels if high disconnectedness was associated with improvement in other areas of

neighborhood quality. Similarly, at the highest levels of deprivation, the lack of access to resources may require people with no personal vehicle to walk further to access public transportation and have the unintended effect of increased physical activity. Although we have considered a variety of neighborhood characteristics, the relationship between neighborhood deprivation, social cohesion and health is complex and warrants further analysis.

The association between area-level spending, income and education and poor mental health may also speak to the complex relationship between changing neighborhoods and the health of minority populations. For minorities in urban environments, the relationship between area-level quality and mental health may be driven by a variety of factors [20]. Again, the effects of gentrification warrant additional research to explore whether an influx of food and transportation resources influence the behaviors of the original population. Conversely, it should be explored whether benefits are outweighed by feelings of loss of neighborhood identity, social cohesion, and financial concerns. In addition, it may take time to realize any benefits from structural changes; we need longitudinal studies to explore the impact of these changes on black populations over time.

Individual-level factors

Analysis of individual-level perceptions of neighborhood environments yielded three factors: safety concerns, physical disorder, and social disorder. These factors were highly correlated each other, though not correlated with area-level factors, suggesting that among people living in the same census tract, there was a great deal of variability of people's perceptions of their neighborhood. Individual experiences may not be easily be extrapolated from area-level measures. At the individual level, having concerns about the safety of their neighborhood and feelings of social disorder were associated with poor mental health.

Our results are somewhat consistent with previous studies exploring area-level and individual-level measures of the environment. The general finding that the neighborhood environment can influence both mental and physical health has been well documented [20,25,26,28–31,50]. Although the small sample size did not allow for subgroup analysis by race, a previous study that considered both individual and area-level measures also found only modest correlations between objective neighborhood socioeconomic status and neighborhood perceptions, supporting our finding that neighborhood experiences may differ substantially within neighborhoods [29]. However, there are also differences between our findings and previous studies. The study by Wen, et al. found that the perceived physical environment was a stronger predictor of self-reported health than perceived social environment [29]. Although Wen, et al. explored self-rated health as a continuous variable and estimates are not directly comparable, our study found that an individual-level perception of social disorder was a stronger predictor of mental health than the individual-level perception of physical disorder. Though these factors were correlated, the differences in the findings between studies may be attributed to differences in study populations, given the inability of Wen, et al., to conduct subgroup analyses [29]. Furthermore, another study found that perceived neighborhood quality was strongly associated with health and mediated the relationship between the objective measures of neighborhood and health [31]. In our

analyses, the estimates of association between area-level factors and physical health were not substantively changed with the addition of individual-level neighborhood factors to the model, suggesting that the pathway from area-level environment to physical health was independent of individual perceptions. Finally, it should be noted that in our population, self-reported inability to see a doctor because of cost actually was a stronger predictor of both mental and physical health, and any intervention geared toward urban black men should also consider financial barriers to access to appropriate health care as an important component of health.

Limitations

There are some limitations to this analysis. First, although participants were asked about their health in the 30 days before their injury, by design the questions were asked after injury had occurred, and there is a chance that the injury may have influenced the mens' perceptions of both their neighborhood and their prior health status. Additionally, a study limited to analysis of recently injured, urban black men may have limited generalizability to the broader urban population. Although there may be reason to believe the experience of injury makes them feel the effect of their environment more acutely, we do not have reason to believe it changes the direction of the associations between neighborhood environment and health. However, the cross-sectional nature of the analysis and the lack of information about the length of time that men have lived in the neighborhood means that we cannot make any causal assumptions about the associations observed in our analysis. In addition, this secondary data analysis utilized measures of health based on a dichotomized measure of self-reported number of days of poor health, an outcome measure that is not directly comparable with previous, similar studies [29,31]. Finally, neighborhood, as we have defined it for area-level variables in this analysis, may be fundamentally different than a participant's definition of their neighborhood. This disconnect between how individuals define and navigate their neighborhood versus arbitrary administrative boundaries may have contributed to the lack of correlation between measures [51]. This is an inherent struggle in the research of neighborhoods and health, but the results suggest there are relevant insights to be gained even if neighborhoods have multiple boundaries [12].

Conclusion

This analysis of the contribution of area-level characteristics and individual-level perceptions of neighborhood environment to the mental and physical health of recently injured, urban black males is an important step towards understanding factors that contribute to health in this vulnerable population. We find that characteristics and perceptions of neighborhoods are important for health but may operate through different mechanisms. Additional research is needed to explore these mechanisms in this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Descriptive characteristics of study population, Philadelphia, PA, 2013–2017 (N=486).

	Total Study Population	Poor mental health		Poor physical health		Poor mental or physical health	
	N (col %)	*N (col %)*	*p-val*[a]	*N (col %)*	*p-val*[a]	*N (col %)*	*p-val*[a]
Total population	**486 (100)**	**109 (22.4)**		**58 (11.9)**		**139 (28.6)**	
Age (mean (SD))	36.1 (15.2)	34.4 (12.5)	0.12	40.3 (15.1)	**0.02**	35.6(13.2)	0.65
Intentional injury	267 (55.1)	66 (60.6)	0.19	30 (51.7)	0.59	83 (59.7)	0.19
Hispanic *			0.06		0.30		0.81
Yes	21 (4.3)	1 (0.9)		4 (6.9)		5 (3.6)	
No	460 (95.0)	107 (98.2)		54 (93.1)		133 (95.7)	
Declined	3 (0.6)	1 (0.9)		0(0)		2 (0.7)	
Relationship *			0.22		0.66		0.03
Single	295 (60.7)	76 (69.7)		36 (62.1)		98 (70.5)	
Married	71 (14.6)	14 (12.8)		11 (19.0)		19 (13.7)	
Living with partner	91 (18.7)	15 (13.8)		8 (13.8)		17 (12.2)	
Divorced/separated	21 (4.3)	4 (3.7)		3 (5.2)		5 (3.6)	
Widowed	7 (1.4)	0 (0)		0 (0)		0 (0)	
Declined	1 (0.2)	0 (0)		0 (0)		0 (0)	
Children			0.70		0.37		0.46
Yes	327 (67.3)	75 (68.8)		42 (72.4)		97 (69.8)	
No	159 (32.7)	34 (31.2)		16 (27.6)		42 (30.2,	
Rent/own			**0.11**		0.18		**0.01**
Own	92 (18.9)	13 (11.9)		6 (10.3)		15 (10.8)	
Rent	225 (46.3)	55 (50.5)		28 (48.3)		69 (49.6)	
Live with family/friends	169 (34.8)	41 (37.6)		24 (41.4)		55 (39.6)	
Employment status *			**0.07**		0.10		**<0.01**
Full time	158 (32.5)	26 (23.9)		12 (20.7)		34 (24.5)	
Part-time	77 (15.8)	18 (16.5)		6 (10.3)		20 (14.4)	
Student	19 (3.9)	4 (3.7)		2 (3.5)		5 (3.6)	
Retired	29 (6.0)	3 (2.8)		4 (6.9)		4 (2.9)	
Unemployed, looking	151 (31.1)	42 (38.5)		24 (41.4)		53 (38.1)	
Unemployed, not looking	52 (10.7)	16 (14.7)		10 (17.2)		23 (16.6)	
Income *			**0.01**		0.27		**0.02**
<$20K	185 (38.1)	56 (51.4)		29 (50.0)		68 (48.9)	
$20–40 K	89 (18.3)	20 (18.4)		9 (15.5)		23 (16.6)	
$40+	46 (9.5)	7 (6.4)		4 (6.9)		10 (7.2)	
Don’t know/not sure	152 (31.3)	23 (21.1)		14 (9.2)		34 (24.5)	
Declined	14(2.9)	3 (2.8)		2(3.5)		4 (2.9)	
Education			0.99		0.16		0.58
<HS	105 (21.7)	24 (22.2)		18 (31.0)		34 (24.6)	
Completed HS/GED	117 (24.1)	26 (24.1)		11 (19.0)		31 (22.5)	

	Total Study Population	Poor mental health		Poor physical health		Poor mental or physical health	
	N (col %)	*N (col %)*	*p-val*[a]	*N (col %)*	*p-val*[a]	*N (col %)*	*p-val*[a]
Total population	**486 (100)**	**109 (22.4)**		**58 (11.9)**		**139 (28.6)**	
More than HS	105 (21.7)	24 (22.2)		18 (31.0)		34 (24.6)	
Could not see a doctor b/c of cost			**<0.01**		**<0.01**		**<0.01**
Yes	177 (36.5)	65 (59.6)		37 (63.8)		82 (59.0)	
No	307 (63.3)	44 (40.4)		21 (36.2)		57 (41.0)	
Don’t know/not sure	1 (0.2)	0 (0)		0 (0)		0 (0)	
Used alcohol or other drugs			**<0.01**		0.35		**<0.01**
Yes	378 (77.9)	96 (88.1)		48 (82.8)		120 (86.3)	
No	107 (22.1)	13 (11.9)		10 (17.2)		19 (13.7)	
Felt that you use to much alcohol or drugs			**0.019**		**<0.01**		**<0.01**
Yes	127 (26.2)	38 (34.9)		28 (48.3)		53 (38.1)	
No	358 (73.8)	71 (65.1)		30 (51.7)		86 (61.9)	
Tried to cut down on drinking/drugs			0.36		**0.02**		0.19
Yes	191 (39.4)	47 (43.1)		31 (53.5)		61 (43.9)	
No	294 (60.6)	62 (56.9)		27 (46.6)		78 (56.1)	
Gone to anyone for help because of drinking or drugs			**<0.01**		**<0.0 1**		**<0.01**
Yes	38 (7.9)	15 (13.8)		10 (17.2)		19(13.7)	
No	446 (92.1)	94 (86.2)		48 (82.8)		120 (86.3)	

a. p-val indicates p-value for chi-square test of association between outcome and characteristic.

* Fisher’s exact test used due to small cell sizes

Table 2.

Multivariable models estimating odds of poor physical health.

	Model*				
	(1)	(2)	(3)	(4)	(5)
Predictor	***Area-level neighborhood predictors***	***Individual-level neighborhood predictors***	***All neighborhood variables***	***All neighborhoo variables + confounders***	***Final model: selected neighborhood variables + confounders***
Age (1-year increase)				**1.03 (1.00–1.05**	**1.02 (1.00–1.04)**
Unable to see a doctor because of cost				**3.16 (1.71–5.85)**	**3.36 (1.84–6.13)**
Living situation (vs. renting)					
Live with family				1.64 (0.85–3.16)	1.47 (0.78–2.78)
Own home				0.48 (0.18–1.31)	0.44 (0.16–1.20)
Felt they used too much alcohol/ drugs				**2.52 (1.32–4.79)**	**2.48 (1.35–4.54)**
Area-level spending, income, education	0.93 (0.68–1.27)		0.95 (0.69–1.31)	0.94 (0.62–1.42)	
Area-level crime	1.08 (0.86–1.37)		1.08 (0.84–1.38)	1.07 (0.78–1.48)	
Area-level deprivation (ref = low)					
High deprivation	1.80 (0.82–3.94)		1.83 (0.82–4.06)	1.84 (0.70–4.88)	1.93 (0.86–4.31)
Medium deprivation	**2.38 (1.06–5.36)**		**2.38 (1.03–5.48)**	**2.72 (1.12–6.62)**	**2.72 (1.22–6.09)**
Area-level disconnectedness (ref = low)					
High disconnectedness	2.04 (0.95–4.36)		2.26 (1.01–5.04)	2.15 (0.90–5.13)	1.84 (0.81–4.19)
Medium disconnectedness	**2.72 (1.28–5.75)**		**2.84 (1.30–6.19)**	**2.86 (1.25–6.54)**	**2.59 (1.18–5.65)**
Feeling unsafe in neighborhood		0.95 (0.57–1.59)	1.02 (0.62–1.67)	1.06 (0.62–1.82)	
Perceived neighborhood physical disorder		1.32 (0.76–2.30)	1.16 (0.67–2.01)	0.89 (0.49–1.58)	
Perceived neighborhood social disorder (high vs med/low)		1.03 (0.51–2.08)	1.08 (0.54–2.12)	1.26 (0.60–2.64)	
Area under ROC	*0.663*	*0.566*	*0.673*	*0.768*	*0.769*

*In each column, estimates of association are presented for all variables included in that version of the model.

Bold estimates demonstrate statistical significance at $p<0.05$.

Table 3.

Multivariable models estimating odds of poor mental health.

	Model*				
	(1)	(2)	(3)	(4)	(5)
Predictor	***Area-level neighborhood predictors***	***Individual-level neighborhood predictors***	***All neighborhood variables***	***All neighborhood variables + confounders***	***Final model: selected neighborhood variables + confounders***
Unable to see a doctor because of cost				**3.06 (1.92–4.88)**	**3.11 (1.97–4.93)**
Felt they used too much alcohol/drugs				1.56 (0.94–2.59)	1.57 (0.95–2.59)
Area-level spending, income, education	1.23 (0.99–1.54)		**1.31 (1.03–1.66)**	**1.34 (1.02–1.75)**	**1.32 (1.05–1.65)**
Area-level crime	1.09 (0.87–1.36)		1.02 (0.80–1.30)	1.03 (0.80–1.34)	
Area-level deprivation (ref = low)					
High deprivation	1.20 (0.69–2.11)		1.10 (0.62–1.97)	1.03 (0.53–2.03)	
Medium deprivation	1.04 (0.60–1.81)		0.93 (0.52–1.66)	0.97 (0.52–1.82)	
Area-level disconnectedness (ref = low)					
High disconnectedness	0.92 (0.56–1.51)		0.94 (0.55–1.59)	0.91 (0.50–1.66)	
Medium disconnectedness	1.17 (0.72–1.93)		1.15 (0.67–1.96)	1.04 (0.59–1.84)	
Feeling unsafe in neighborhood		1.25 (0.85–1.81)	1.25 (0.86–1.83)	1.28 (0.85–1.94)	**1.36 (1.04–1.79)**
Perceived neighborhood physical disorder		1.23 (0.82–1.87)	1.28 (0.85–1.94)	1.09 (0.70–1.71)	
Perceived neighborhood social disorder (high vs med/low)		1.48 (0.86–2.54)	1.46 (0.83–2.57)	1.62 (0.91–2.86)	**1.70 (1.00–2.90)**
Area under ROC	*0.554*	*0.654*	*0.671*	*0.729*	*0.728*

*In each column, estimates of association are presented for all variables included in that version of the model.

Bold estimates demonstrate statistical significance at $p<0.05$.