Fear of Walking Outdoors

A Multilevel Ecologic Analysis of Crime and Disorder

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Background: Although a number of studies have tested ecologic models that postulate relationships among social networks, the built environment, and active living, few neighborhood-based studies have considered the role of crime and violence. This study investigates the degree to which individual-level demographic characteristics and neighborhood-level physical and social characteristics are associated with increased fear of crime.

Methods: Data were analyzed in 2007 from a 2005 survey of 901 randomly selected individuals living in 55 neighborhoods in Washington DC. Multilevel ordered logit regression was used to examine associations between individual-level and neighborhood-level characteristics and how often fear of crime prevents a respondent from walking outdoors.

Results: Age and female gender were associated with an increase in fear; the percentage of a resident's life spent in the same neighborhood was associated with a decrease in fear. Results of cross-level interactions showed that at the neighborhood level, women were more fearful than men in neighborhoods without violence, but that the difference in fear between men and women shrinks as neighborhood violence increases. Collective efficacy was found to increase fear among black respondents and had no effect on fear among nonblack respondents.

Conclusions: If the study of neighborhoods and active living is to progress and contribute to both etiologic understanding and policy formation, it is essential that theoretical and empirical models consider the impact of violence and fear on walking. Efforts to increase active living in urban neighborhoods that do not account for the impact of crime and fear may fall short of their intended outcomes.

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Background

In recent years a proliferation of studies has tested ecologic models that postulate relationships among social networks, the built environment, and active living.[1–8] These examinations have included a host of independent variables including indicators of neighborhood social capital and social organization[8,9] and environmental constructs such as land use,[6,10–11] traffic patterns,[6,11] street lighting,[12] and access to recreational settings.[11–14] Several analyses, particularly those focused on the correlates of active living in urban areas, also have incorporated measures of crime and fear of crime.[5–8] These studies, however, have yielded inconsistent results regarding the impact of crime and fear on active living.[15,16] Large-scale reviews of the ecologic literature[15] on active living have suggested that the mixed results related to crime and fear may be due to both the poor operationalization of those measures, including the use of perceived levels of crime in place of actual levels of crime, and the utilization of composite measures that combine safety from crime with indicators of the physical environment or with measures of traffic safety. In addition, most studies incorporating crime or safety have examined the constructs at the census tract or larger level,[5,6,13,17] masking important variation in micro-locations within urban neighborhoods.

The present effort examined the social and physical environmental factors associated with fear of crime and its influence on engaging in physical activity—in this case, walking outdoors. A multilevel social ecology framework was used to assess the contribution of neighborhood-level factors of crime, including the presence of gangs and violent crime, on residents' avoidance of walking in their neighborhoods, while controlling for features of the physical environment, individual-level factors, and neighborhood structural characteristics. Whether neighborhood social capital (i.e., collective efficacy) moderates any association between levels of safety and fear of walking outdoors was also assessed.

An increasing number of studies have shown that collective efficacy—the willingness of residents to inter-

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vene for the good of their neighborhood—is an important variable when assessing crime[18] and health-related outcomes.[19–22] These shared norms at the community level have been hypothesized to hamper criminal behavior (and decrease perceptions of crime) through the circumstance of neighbors looking out for each other when trouble arises and the ability to obtain needed resources. Collective efficacy has been found to reduce obesity and other diseases, and increase overall physical health.[19–22] These studies posited mostly indirect relationships between collective efficacy and health, noting where collective efficacy might operate, for instance, through the social control of negative health behaviors, or through access to services or amenities that promote healthy behaviors. Neighborhoods with high collective efficacy are more likely to take political and informal social action to cultivate a healthy environment. It is reasonable to hypothesize that residents may have less worry about crime, and may be more likely to walk outside, if neighbors are trusted and can be relied on for solidarity and neighborhood action to reduce crime. Research thus far has had limited ability to determine how collective efficacy influences fear while taking into account a variety of objectively measured variables related to crime and gangs as well as features of the built environment.

Given some evidence that neighborhood effects on health may be heterogeneous across different individuals via their socioeconomic positions or other characteristics,[20,23,24] this study also modeled two cross-level interaction effects: the interaction between collective efficacy and race, and the interaction between neighborhood violence and gender. Gender is one of the most robust predictors of fear, but few studies have examined the varied contexts of fear with regard to active living.

Methods

Setting and Sample

The setting was a geographically defined area of contiguous parts of the northeast and southeast quadrants of the District of Columbia. A random sample of 25 addresses within each of the 55 included block groups was generated from land-parcel records. Trained interviewers visited each address in fall 2005 to complete a questionnaire with one individual (aged 18 or older) residing there. In-person questionnaires were completed with 618 households. Questionnaires were mailed to residents after four unsuccessful attempts to reach households in person. The questionnaires were completed via mail by 283 households (total N=901; the response rate was 67% after removing and re-sampling vacant houses). The average number of questionnaires completed per block group was 16; the minimum number was 9. The research protocol was approved by the Urban Institute's IRB. Respondents were paid $5.

Dependent Variable

The dependent variable, avoidance of walking outside due to worry about crime (hereafter referred to as fear), was assessed with a single item: "How often does worry about crime prevent you from walking someplace in your neighborhood?" Interviewees were asked to respond on a four-point scale: never, rarely, sometimes, and often. A higher score indicated more fear. The item was developed to explicitly capture a behavior resulting from fear of crime. To ensure a meaningful distinction between scale values, the item was re-coded as a 3-point scale, on which responses of "never" and "rarely" constituted a single response.

Independent Variables

Individual-level characteristics. Individual-level measures included self-reported age (years), gender (male/female), race (black/other), the percentage of lifetime lived in the same neighborhood, and an index of social ties. "Social ties" was measured using three items: number of relatives/in-laws in the neighborhood, number of friends in the neighborhood, and number of friends living outside the neighborhood. The categorical responses were summed and averaged; higher scores indicated greater social ties. In addition to these five individual-level variables, a binary indicator variable was created (thus maximizing power to detect significant effects and avoid a potential source of bias) to account for variation in the response attributable to individuals who were not asked their gender because the question was inadvertently not included on some copies of the survey.[25]

Violence and gangs. Two neighborhood-level variables were included: number of violent crimes and number of gangs per block group. The inclusion of actual levels of violence in studies examining fear has a long history in the sociology literature. The mixed results that have been produced suggest that the finding of no link between crime and fear may be caused by perceptual adaptation processes: Fear levels may be lower than expected in areas characterized by high levels of crime and violence because these hazards become neutral or manageable in that environment.[26] Violent crimes per block group was measured as the total number of homicides, sexual assaults, robberies, and aggravated assaults averaged across 2004 and 2005. These official incident report data were obtained from the Metropolitan Police Department. The count of crimes was used instead of population-based rates because in small-area studies, rates can artificially distort the apparent dangerousness of an area.[27] In a study such as this one examining the correlates of fear, it is reasonable to hypothesize that it is the act of violence itself, and its frequency, that provokes fear, and not the relative risk of violence. Data for the number of gangs per block group were obtained from law enforcement intelligence information collected through meetings and interviews in 2004 and then synthesized. This variable, representing social disorder, directly captures a high fear-provoking element of disorder that has not been adequately tested in extant literature,[28,29] and also avoids the same-sample bias that often has caused problems in analyses of neighborhood effects.

Features of the physical environment. Percentage of greenspace was derived using a GIS that mapped federal and local parkland and calculated the percentage of each block group

Table 1. Summary statistics for individual-level variables

Individual-level variables	μ	SD	Min	Max
Fear of crime	1.54	0.73	1.00	3.00
Age (years)	44.85	14.29	19.00	93.00
Gender (female)	0.59	0.49	0.00	1.00
Black	0.68	0.47	0.00	1.00
Proportion of life in neighborhood	0.22	0.22	0.00	1.00
Social ties (standardized)	0.00	1.00	−2.26	2.53

Max, maximum; Min, minimum.

that consisted of parkland. Percentage of vacant houses was calculated as the sum of the number of parcels that were vacant and abandoned or vacant and not abandoned, divided by the total number of parcels in each block group.

Neighborhood structural characteristics. Three measures of neighborhood structural characteristics, created from census data, are included in analytical models: concentrated disadvantage, residential stability, and racial heterogeneity. Census data for residential block groups were extracted from the 2000 Census of Population and Housing summary tape file 3a[30] and attached to respondent data. Concentrated disadvantage is an index of four census items: (1) households receiving public assistance, (2) population with income below the federal poverty level in 1999, (3) population aged 16 or older in the labor force who are unemployed, and (4) female-headed households with children. These items were converted to their standardized form, added together, and averaged. Residential stability is the sum of z-scores divided by two for responses to two census items: the percentage living in same house since 1995 and the percentage of owner-occupied housing. Racial heterogeneity is calculated using the formula $1-\Sigma p_1{}^2$, where p_1 is the proportion of the total population of the block in a given racial/ethnic group for five groups: white, black, Hispanic, Asian/Pacific Islander, and American Indian. Values can range from 0 (homogenous) to 1 (more heterogeneous).

Collective efficacy. Neighborhood-level collective efficacy is a 10-item construct representing community cohesion and informal social control. Respondents were asked to indicate the extent of their agreement on a 4-point scale ranging from strongly disagree to strongly agree or very likely to very unlikely. The items included: This is a close-knit neighborhood; People around here willing to help neighbors; People don't get along with each other; People do not share same values; People in this neighborhood can be trusted; Likelihood neighbors would do something about kids hanging out; Likelihood neighbors would do something about kids painting graffiti; Likelihood neighbors would scold child showing disrespect; Likelihood neighbors would break up fight in front of house; and Likelihood neighbors would do something if local fire station closed. The 10 items were combined to form a single scale. Internal reliability was high (α=0.84). The measure was the average score for each neighborhood. Aggregate reliability[31] was also high (0.79).

Analysis

Hierarchical linear modeling was employed to examine the influence of both neighborhood-level and individual-level predictors of fear of crime. Models were estimated using Stata's generalized linear latent and mixed models (GLLAMM) procedure.[32] To accommodate a categorical response variable, all models were specified as hierarchical-ordered logit models and were estimated using the ordinal logit link in the GLLAMM procedure. Only fixed effects were examined, as random effects are biased in the presence of a small number of groups and a small number of observations per group (CJM Maas, JJ Hox, unpublished manuscript, 2002).[33] In total, eight separate models were specified. For each model, the dependent variable, fear of crime, was an ordered categorical measure of the degree to which fear of crime prevents an individual from walking outdoors. Beginning with a model containing only Level-I predictors, each of four groups of Level-II predictors was added to the model in sequence, resulting in five basic models. Three additional models that contain interaction terms between key Level-I and Level-II predictors, selected a priori based on their theoretical relevance to the dependent measure, were considered. Because of small within-group sample sizes, results are reported for coefficients significant at the 0.10 level. All analyses were conducted in 2007.

Results

Ninety-eight participants were excluded due to missing data, leaving an analysis sample of 803. Table 1 (individual-level predictors) and Table 2 (neighborhood-level predictors) present summary statistics for all variables used in the analysis. Respondents reported a mean level of fear of crime of 1.54 (SD=0.73) on a 3-point scale, with 483 respondents reporting fear either rarely or never, 209 respondents reporting some fear, and 111 respondents reporting a high level of fear. Respondents were, on average, aged 45 and had spent an average of almost 11 years living in their current residences. Fifty-nine percent of the sample were women, and 68% of the sample was black. The remaining predictors show considerable variability. Social ties, concentrated disadvantage, residential stability, racial heterogeneity, and neighborhood collective efficacy were standardized with μ=0 and SD=1 to increase the interpretability of coefficients.

Table 2. Summary statistics for block group–level variables

Block group–level variables	μ	SD	Min	Max
Number of gangs in neighborhood	0.94	1.23	0.00	4.00
Number of violent crimes	20.20	16.60	2.50	70.00
Proportion of the neighborhood that is green/parkland	0.03	0.05	0.00	0.23
Proportion of parcels that are vacant	0.05	0.05	0.00	0.30
Concentrated disadvantage	0.00	1.00	−1.41	3.33
Residential stability	0.00	1.00	−2.35	2.03
Racial heterogeneity	0.00	1.00	−1.28	1.92
Collective efficacy[a]	0.00	1.00	−2.40	2.40

[a]Defined in text.
Max, maximum; Min, minimum.

A null model was specified in order to compute the intraclass correlation coefficient, a measure of the degree of variation in the response observed at the individual versus the neighborhood level. The intraclass correlation indicated that 11% of variation in fear of crime is explained by variation between neighborhoods, with the remaining 89% attributable to variation between individuals. While variability at the neighborhood level may appear low, the magnitude of the intraclass correlation coefficient in studies of individuals within neighborhoods rarely exceeds 0.2.[34] Moreover, a low intraclass correlation coefficient does not preclude the existence of significant neighborhood-level predictors.[35]

Table 3 presents results for five additive models of fear of crime. Results from Model 1 (only Level-I variables) indicate that age, female gender, and black self-reported race were associated with increases in fear of crime; the percentage of a lifetime spent in the same neighborhood was associated with decreases in fear of crime. Black respondents had 71% higher odds of reporting a higher level of fear than nonblack respondents. Women had 52% higher odds of reporting a higher level of fear than men, and each additional year of age is associated with 2% higher odds of moving to the next higher category of the response. When the number of neighborhood gangs and the number of violent crimes were added to the model (Model 2), both variables were associated with increased fear of crime, with each gang present in a neighborhood increasing the odds of reporting an increased level of fear by 29%, and with each violent crime associated with a 2% increase in the odds of reporting a higher level of fear. The explanatory power of race and lifetime in neighborhood is reduced by the inclusion of the neighborhood-level crime variables.

Model 3 added neighborhood physical characteristics to the model. Neither variable—the percentage of greenspace or the percentage of vacant housing—is a significant predictor of fear of crime. Model 4 added three neighborhood-level socioeconomic variables to the model. Only one of these variables, concentrated disadvantage, was significant at conventional levels. However, controlling for neighborhood SES rendered race, gang count, and violent crime insignificant. Finally, Model 5 added collective efficacy to the model. Although collective efficacy was not significant, it dampened the effect of concentrated disadvantage to become only marginally significant, at a less stringent level (p=0.096).

Table 4 presents results for three models containing selected interaction terms. Model 6 added an interaction between race and collective efficacy to Model 5. The coefficient on the interaction term was positive and significant, indicating a disparate relationship between collective efficacy and fear of crime among black versus nonblack respondents—in other words, collective efficacy increased fear among black respondents, but had no effect on nonblack respondents. Results from Model 7, which added an interaction between gender and violent crime to Model 5, indicated that levels of violent crime affect the association between gender and fear: Although female respondents were more fearful of crime overall and were more likely to avoid walking because of fear in low-crime areas, both men and women were fearful in high-crime areas.

Model 8 included both interaction terms in the same model. Among the eight models, Model 8 had the lowest intercept variance component and the lowest value of the Akaike Information Criterion. In Model 8, age and female gender were associated with an increase in fear. At the neighborhood level, the gender effect on fear dissipated in high-violence neighborhoods (as in Model 7), and collective efficacy is associated with higher fear among black respondents but not among nonblack respondents (similar to Model 6). An insignificant intercept variance component indicated that in Model 8, no significant neighborhood-level variation remained unconsidered.

Discussion

This study was designed to expand the nascent body of research developing and testing the cross-disciplinary ecologic conceptual frameworks rooted in the social ecology, criminology, and public health and epidemiology literature. It has taken into particular account the largely overlooked neighborhood-level factors of violence and the presence of gangs and found that levels of violence and the presence of gangs are positively associated with fear/avoidance of walking outside. Although the association between gangs and fear did not remain statistically significant when controlling for neighborhood structural characteristics, the association between levels of violent crime and fear remained in the full model that included the gender-and-violent-crime interaction effect—essentially indicating that violence remains associated with fear in males.

These results are contrary to past sociological studies that have found weak or insignificant relationships between actual levels of crime and fear.[36–38] Consistent with the extant literature, women and older individuals were found much more likely to be fearful and to refrain from walking outside. However, in high-violence neighborhoods, men and women are equally fearful. Aspects of the physical environment (greenspace and vacant houses) were not significantly associated with fear of walking outside. This finding stands in contrast to most studies examining fear.[39] This could be due either to differences across studies in operationalizations of fear of crime or to the physical environment variables, or simply due to differences in neighborhood context (i.e., the geographic area of study).

Table 3. Hierarchical ordinal logistic regression models of fear of walking outside by individual background and neighborhood characteristics

	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
PARAMETER										
Individual-level variables										
Age (years)	1.018**	1.007–1.030	1.019**	1.008–1.030	1.019**	1.008–1.030	1.018**	1.007–1.029	1.018**	1.007–1.030
Female	1.524*	1.085–2.140	1.509*	1.075–2.116	1.504*	1.072–2.110	1.512*	1.078–2.121	1.512*	1.078–2.121
Missing gender	1.578*	1.014–2.457	1.672*	1.082–2.582	1.659*	1.076–2.559	1.612*	1.047–2.482	1.614*	1.048–2.486
Black	1.707**	1.178–2.474	1.371	0.949–1.979	1.346	0.932–1.943	1.186	0.814–1.728	1.177	0.806–1.720
Proportion of life in neighborhood	0.489**	0.231–1.035	0.546	0.259–1.151	0.554	0.258–1.147	0.532	0.254–1.116	0.534	0.255–1.120
Social ties	0.884	0.756–1.032	0.883	0.758–1.030	0.880	0.755–1.026	0.890	0.763–1.039	0.890	0.762–1.039
Crime variables										
Gang count	—	—	1.292**	1.081–1.543	1.253*	1.048–1.498	1.068	0.880–1.297	1.075	0.882–1.311
Violent crime	—	—	1.017**	1.004–1.031	1.015*	1.002–1.029	1.011	0.998–1.024	1.011	0.997–1.024
Physical environment										
% green	—	—	—	—	0.974	0.938–1.013	0.969	0.931–1.009	0.970	0.931–1.010
% vacant	—	—	—	—	1.024	0.979–1.070	0.998	0.954–1.044	0.998	0.954–1.044
Neighborhood structural constraints										
Concentrated disadvantage	—	—	—	—	—	—	1.442*	1.081–1.924	1.382	0.944–2.024
Residential stability	—	—	—	—	—	—	1.008	0.832–1.221	1.009	0.833–1.223
Racial heterogeneity	—	—	—	—	—	—	0.927	0.734–1.173	0.919	0.723–1.169
Social capital										
Collective efficacy	—	—	—	—	—	—	—	—	0.953	0.719–1.263
Intercept variance component	0.397		0.189		0.166		0.108		0.109	
AIC	1444.44		1428.55		1429.70		1426.73		1428.62	
BIC	1481.95		1475.44		1485.96		1497.06		1503.64	

Note: Intercept cut points are excluded from the output.
*$p<0.05$; **$p<0.01$ (two-tailed tests).
AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion.

Table 4. Hierarchical ordinal logistic regression models of fear of walking outside by individual background and neighborhood characteristics

	Model 6		Model 7		Model 8	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
PARAMETER						
Individual-level variables						
Age	1.019**	1.008–1.030	1.020**	1.009–1.031	1.020**	1.009–1.031
Female	1.520*	1.084–2.130	2.509**	1.486–4.236	2.056**	1.484–4.229
Missing gender	1.626*	1.027–2.438	1.787*	1.145–2.788	1.748*	1.120–2.726
Black	1.139	0.782–1.659	1.185	0.810–1.732	1.146	0.786–1.671
Proportion of life in neighborhood	0.539	0.257–1.129	0.511	0.243–1.076	0.516	0.246–1.086
Social ties	0.890	0.763–1.039	0.886	0.759–1.034	0.887	0.759–1.035
Crime variables						
Gang count	1.080	0.889–1.311	1.074	0.880–1.310	1.078	0.888–1.309
Violent crime	1.009	0.996–1.023	1.023**	1.006–1.039	1.021*	1.005–1.038
Physical environment						
% green	0.973	0.935–1.013	0.969	0.931–1.009	0.973	1.070–1.012
% vacant	1.000	0.956–1.045	0.997	0.953–1.043	0.998	0.955–1.043
Neighborhood structural constraints						
Concentrated disadvantage	1.330	0.912–1.940	1.390	0.948–2.036	1.340	0.918–1.954
Residential stability	0.961	0.792–1.167	1.008	0.832–1.221	0.961	0.791–1.166
Racial heterogeneity	0.886	0.697–1.125	0.930	0.730–1.184	0.897	0.706–1.141
Social capital						
Collective efficacy	0.747	0.515–1.082	0.944	0.712–1.251	0.743	0.512–1.077
Interaction terms						
Black × collective efficacy	1.451**	1.002–2.103	—	—	1.441[a]	0.998–2.089
Female × violent crime	—	—	0.977**	0.960–0.995	0.978*	0.960–0.995
Intercept variance component	0.092		0.109		0.092	
AIC	1426.76		1424.30		1422.60	
BIC	1506.32		1504.00		1506.99	

Note: Intercept cut points are excluded from the output.
[a]$p<0.10$.
*$p<0.05$; **$p<0.01$ (two-tailed tests).

Collective efficacy was found to increase fear among black respondents but it had no significant effect on fear among nonblack respondents. It is possible to imagine that very high levels of crime are fear-producing even when neighborhoods are very cohesive and work together to fight disorder and crime, and that, for blacks, collective efficacy taps dimensions of neighborhood communication that could result in the increased exchange of information about incidents of neighborhood violence, thus resulting in fear. For instance, some criminologists, attempting to explain the slippage between crime and fear, have suggested that certain types of local social ties can amplify or spread the impact of a criminal event and thereby increase fear levels.[38,40]

A number of limitations should be mentioned. First, as stated earlier, the dependent variable, avoidance of walking outside because of fear, was developed by the authors for this study, and has not been validated through use in other studies examining fear or physical activity. However, given the measure's strong correlation with gender and age, as well as with levels of violence, construct validity appears high. But it should be noted that the use of a new measure of fear in this study renders it difficult to compare to the findings of other studies related to fear of crime or victimization. In addition, the dependent variable was measured through self-report; objective measures of walking or the intention to walk were not included, nor was information provided either to differentiate between nonwalkers (those who cannot walk or would not walk regardless of the crime environment) and those who must walk for transport, or to understand the difference in their possible responses. Second, a measure of personal victimization in the past—found in some studies to be related to fear—was not available and, therefore, not used as an individual-level control. Third, because these data are cross-sectional, causal relationships could not be established. And finally, generalizability may be limited, as the study site consisted of only one urban area.

Even with these limitations, given the dearth of health-focused ecologic research at the neighborhood level that incorporates objective measures of crime and disorder, the study succeeds in expanding the theoretical and empirical bases from which policy decisions can be made. The findings suggest that policymakers and implementers of public safety programs must be sensitive to local contexts. For instance, in some neighborhoods comprehensive programming should be de-

veloped both to reduce the incidence of criminal events and to increase comfort levels to the extent that residents are not fearful to walk even within crime-prone neighborhoods.

The findings also imply that architectural and design-based strategies, as well as improved recreational amenities targeted to increase walking as part of active living, may do no good in urban neighborhoods characterized by the presence of gangs and high levels of violence unless the strategies themselves are designed to reduce crime. Policymakers and community practitioners seeking to increase active living or prevent sedentary behavior should find natural allies in those looking to prevent violence. Furthermore, replication of these findings in future studies will provide additional evidence that violence should be treated as a public health problem.

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