



Short Communication

Neighborhood crime and access to health-enabling resources in Chicago

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ABSTRACT

Neighborhood crime may be an important social determinant of health in many high-poverty, urban communities, yet little is known about its relationship with access to health-enabling resources. We recruited an address-based probability sample of 267 participants (ages ≥ 35 years) on Chicago's South Side between 2012 and 2013. Participants were queried about their perceptions of neighborhood safety and prior experiences of neighborhood crime. Survey data were paired to a comprehensive, directly-observed census of the built environment on the South Side of Chicago. Multivariable logistic regression models were used to examine access to health-enabling resources (potential and realized access) as a function of neighborhood crime (self-reported neighborhood safety and prior experience of theft or property crime), adjusting for sociodemographic characteristics and self-reported health status. Low potential access was defined as a resident having nearest resources > 1 mile from home; poor realized access was defined as bypassing nearby potential resources to use resources > 1 mile from home. Poor neighborhood safety was associated with low potential access to large grocery stores (AOR = 1.73, 95% CI = 1.04, 2.87), pharmacies (AOR = 2.24, 95% CI = 1.33, 3.77), and fitness resources (AOR = 1.93, 95% CI = 1.15, 3.24), but not small grocery stores. Any prior experience of neighborhood crime was associated with higher adjusted odds of bypassing nearby pharmacies (AOR = 3.78, 95% CI = 1.11, 12.87). Neighborhood crime may be associated with important barriers to accessing health-enabling resources in urban communities with high rates of crime.

1. Introduction

Neighborhood crime can confer deleterious health effects that lead to or exacerbate chronic conditions, such as obesity and hypertension (Fish et al., 2010; Tamayo et al., 2016). People living in communities with high levels of crime experience frequent and prolonged activation of stress response pathways (Burdette and Hill, 2008; McEwen, 1998). These pathways are postulated to impact health directly through metabolic and autonomic dysregulation (Burdette and Hill, 2008; McEwen, 1998), or indirectly through adverse health behaviors (e.g., stress eating) (Billimek and Sorkin, 2012; Foster and Giles-Corti, 2008; Russell et al., 2016). However, less is known about the relationship between neighborhood crime and access to health-enabling resources, despite growing consensus in clinical practice that these resources are integral to addressing chronic disease (Coleman et al., 2009; Stelfefon et al., 2013).

Andersen's enduring Behavioral Model defines access in two ways (Andersen, 1995): *potential access* indicates the availability of resources

in a neighborhood, and *realized access* indicates the actual use of those resources (Andersen, 1995). In a recent study, we found that people often bypassed nearby resources for more distant resources, and bypassing was associated with higher BMI; poor safety was identified as an important reason for bypassing (Tung et al., 2016). Zenk and colleagues, in prior qualitative work, also identified crime-related safety as a barrier to accessing healthy and nutritious foods (Zenk et al., 2011). However, few quantitative studies have explicitly examined the relationship between neighborhood crime and access to health-enabling resources, such as grocery stores, pharmacies, and fitness centers. None to our knowledge have used a directly-observed census of the built environment to measure access.

We used cross-sectional data from an address-based probability sample, collected on Chicago's South Side, to examine relationships between neighborhood crime and access to health-enabling resources. Based on previously published work (Tung et al., 2016; Zenk et al., 2011), we hypothesized that neighborhood crime is inversely associated with both potential and realized access to health-enabling

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resources.

2. Methods

2.1. Study design and participants

The South Side Health and Vitality Population Study was conducted in a densely populated, high-poverty region (55% of residents below 200% FPL), with a predominantly non-Hispanic black (77%) and Hispanic/Latino (13%) population (U.S. Census Bureau, 2012). An address-based probability sample of community-dwelling adults, ages ≥ 35 years, was recruited between November 2012 and July 2013. Community and University leaders worked together to decide which populations and age groups should be included in this study, based on community priorities and budgetary constraints. The target population was ultimately selected based on elevated but modifiable risk for chronic disease. Hour-long in-person interviews were conducted in participants' homes. A detailed methodology of this study has been previously described (Tung et al., 2016).

This study was approved by the University of Chicago Institutional Review Board.

2.2. Data and measures

Sociodemographic characteristics were measured using items adapted from national surveys, including age, self-identified race and ethnicity, gender, income, and education (Centers for Disease Control and Prevention, 2011–2012a, b; The University of Michigan, 2002). Prior experience of neighborhood crime (“While living in your neighborhood, have you or anyone who lives in your house had anything stolen or damaged inside or outside your home...?”) and self-reported neighborhood safety (“How safe is your neighborhood?”) were measured using items adapted from the Los Angeles Family and Neighborhood Survey (LAFANS) (Pebbley et al., 2010). Neighborhood safety was analyzed as a dichotomous variable because we observed no significant differences using ordered or categorical data.

We selected a subset of resource types identified by the Robert Wood Johnson Foundation (RWJF) Commission to Build a Healthier America as critical building blocks for sustaining health (Mattesich and Rausch, 2013). Although not the full range of resources identified by the RWJF framework, the resources included in this study were chosen for being common, community-based establishments that support the daily activities needed to sustain and enable health, including healthy eating, physical activity, and medication adherence. Access to health-enabling resources was measured in two ways. First, we used data from the 2012 MAPSCorps asset census, a comprehensive, directly-observed census of every open and operating, public-facing business and organization in the region (Lindau et al., 2016) to identify community-based resources near each resident's home. Second, we used survey items to query residents about the community-based resources they most commonly used (Pebbley et al., 2010; Tung et al., 2016). Due to practical constraints on survey length, we included the two most common resource types, specifically, grocers and pharmacies. Participants were asked to give the names and locations of the places they most often frequented to: 1) buy groceries, and 2) fill a prescription or buy other medications.

Height, weight, and blood pressure were measured at the time of interview using a previously described protocol (Smith et al., 2009). Obesity status was defined as BMI ≥ 30 kg/m² (World Health Organization Expert Consultation, 2004); elevated blood pressure was defined as SBP ≥ 140 or DBP ≥ 90 mmHg (Page, 2014).

2.3. Analysis

Descriptive statistics were calculated. Unadjusted and multivariable logistic regression models were used to evaluate relationships between:

1) neighborhood safety (independent variable) and potential access to nearby grocers, pharmacies, and fitness resources and 2) prior experience of neighborhood crime (independent variable) and realized access to nearby grocers or pharmacies. Poor potential access was defined as nearest resources > 1 mile from a resident's home. Poor realized access was defined as bypassing resources within 1 mile to use resources > 1 mile from a resident's home. A fuller description of the methodology has been previously published (Tung et al., 2016). As a secondary analysis, we also explored the relationship between prior experience of neighborhood crime (independent variable) and BMI and BP status, hypothesizing positive associations between neighborhood crime and these biological indicators of stress-related chronic disease.

All regression models adjusted for sociodemographic characteristics. Based on prior studies of the relationship between neighborhood crime and health, the following variables were also considered for inclusion: self-reported health status (Ware et al., 1994), routine physical activity (Chastin et al., 2015), and duration of residence (Park et al., 2008). We included covariates that were significant in bivariate analyses (p -value < 0.1). Final models adjusted for age, gender, education, and self-reported health status. All analyses were performed in 2017 using STATA, v13.1 and ArcGIS, v10.1.

3. Results

Table 1 summarizes sociodemographic characteristics of the sample population. Overall, 431 eligible residents were invited to participate and 267 (62%) completed the survey. The majority of residents were female (63%) and identified as non-Hispanic black (69%; Table 1).

Many participants had at least one small grocer (84%) within 1 mile from home; fewer had at least one large grocer (57%), pharmacy (45%) or fitness resource (57%) within 1 mile. Poor neighborhood safety was associated with low potential access to large grocery stores (AOR = 1.73, 95% CI = 1.04–2.87), pharmacies (AOR = 2.24, 95% CI = 1.33–3.77), and fitness resources (AOR = 1.93, 95% CI = 1.15–3.24), but not small grocery stores (Table 2).

Among residents who had resources within 1 mile from home, many bypassed grocers (50%) and pharmacies (58%) to use resources farther away; very few used any fitness resources (11%). A prior experience of theft or property crime was associated with higher adjusted odds of bypassing nearby pharmacies (AOR = 3.78, 95% CI = 1.11–12.87; Table 2); an association with bypassing grocery stores (AOR = 1.14, 95% CI = 0.67–1.96) was not significant in final adjusted models (Table 2).

A prior experience of theft or property crime was also associated with 74% higher adjusted odds of obesity (95% CI = 1.02–2.95) and 50% higher adjusted odds of hypertension (95% CI = 0.86–2.60); however, hypertension analyses were not significant in final adjusted models.

4. Discussion

In this high-poverty, urban community with a predominantly racial and ethnic minority population, we found a consistent relationship between neighborhood crime and poor access to health-enabling resources. People reporting poor neighborhood safety were less likely to have large grocers, pharmacies, and fitness resources within 1 mile from home. Even among those who did have resources within 1 mile from home, a prior experience of neighborhood crime was associated with bypassing pharmacies.

These findings provide evidence to suggest that neighborhood crime may impede access to health-enabling resources in two important ways. First, neighborhood crime may reduce the total number of available resources (i.e., potential access), perhaps because health-enabling businesses avoid locating to high-crime neighborhoods. Second, neighborhood crime may impede utilization of available resources (i.e., realized access). In previous qualitative work, an older woman reported

Table 1
Participant characteristics: South Side Health and Vitality Studies Population Health Study, Chicago, IL, 2012–2013^a.

N = 267	n	%
Demographic characteristics		
Age (years)		
35–50	95	35.6
51–70	136	50.9
71+	36	13.5
Gender		
Female	168	62.9
Male	99	37.1
Race and ethnicity		
Black non-Hispanic	182	68.9
Hispanic	51	19.3
White non-Hispanic or other	31	11.7
Education		
Less than secondary school	71	26.6
Secondary school graduation or GED	84	31.5
Some post-secondary school	57	21.4
Post-secondary school degree	55	20.6
Income (annual household)		
< \$25,000	109	44.5
\$25,000–49,000	78	31.8
\$50,000–99,000	44	18.0
\$100,000+	14	5.7
Health status (self-reported)		
Poor	12	4.5
Fair	74	27.8
Good	111	41.7
Very good	49	18.4
Excellent	20	7.5
Chronic disease status		
Body mass index ^b (kg/m ²)		
Normal (BMI < 25)	45	17.7
Overweight (BMI 25–29.9)	70	27.5
Obese (BMI ≥ 30)	140	54.9
Elevated blood pressure ^c (mm Hg)		
Normal or controlled (SBP < 140 and DBP < 90)	127	51.0
Stage I (SBP 140–159 or DBP 90–99)	70	28.1
Stage II (SBP ≥ 160 or DBP ≥ 100)	52	20.9

^a Compared to U.S. Census data from the American Community Survey (2012), for each of the 7 census tracts included in our study, our sample had slightly more middle-aged females (+12% ages 51–70 years, +11% female). All other characteristics were similar (< 10% difference) to census data.

^b Based on the World Health Organization BMI classification.

^c Based on the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7).

bypassing a nearby grocery store due to loitering gang members—her safety concern presented a physical barrier to accessing fresh produce (Tung et al., 2016). This prior work also identified a relationship between bypassing and higher BMI (Tung et al., 2016). Our new quantitative findings build on this prior work to support evidence of a potential pathway between crime, accessing resources and health.

Notably, we found that experiences of neighborhood crime were consistently associated with poor access to pharmacies. In addition to having fewer pharmacies, participants were also more likely to bypass nearby pharmacies if they had been a victim of theft or property crime. No quantitative studies to our knowledge have specifically identified exposure to crime as a risk factor for bypassing nearby pharmacies. Importantly, a previous study from our group identified bypassing as a risk factor for medication underuse (Qato et al., 2017), thus corroborating concerns that neighborhood crime may pose a barrier to medication adherence in vulnerable populations (Billimek and Sorkin, 2012). Taken together, we speculate that health prevention efforts, which have heavily emphasized the quantity of resources in a given community, will also need to address the social barriers that impede access to and utilization of resources that support and sustain a healthy life.

There are several limitations to this study. This is a cross-sectional

analysis, limiting causal inference. The survey queried participants about prior experiences of theft or property crime, but did not include other types of crime (e.g., homicide). However, theft or property crime may be the more relevant exposure type when analyzing resources (e.g., pharmacies) where products are directly purchased, if residents are primarily concerned about personal theft. We were underpowered to examine realized access to fitness resources due to low utilization (11%). Additionally, we did not limit respondents to reporting use of large grocers only, potentially biasing our food access result toward the null.

Limitations are balanced by several important strengths. First, we recruited a probability sample, representative of the entire Chicago South Side population. Second, many prior studies have used secondary or proprietary databases of the built environment. Ours used a directly-observed census (Lindau et al., 2016) which has been found to have significantly higher sensitivity for resources in high-poverty settings (Makelarski et al., 2013). Finally, our study examines a high-poverty, urban region quite similar to other urban metropolitan areas with high levels of concentrated poverty and residential segregation by race.

5. Conclusion

Neighborhood crime may be associated with barriers to accessing health-enabling resources in urban communities with high rates of crime. Strategies to mobilize community resources in healthcare settings should address the impact of safety on both potential and realized access among vulnerable populations.

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Conflict of interest disclosure

Dr. Lindau directed a Center for Medicare and Medicaid Innovation Health Care Innovation Award (1C1CMS330997-03) called CommunityRx. This award required development of a sustainable business model to support the model test after award funding ended. To this end, Dr. Lindau is founder and co-owner of NowPow, LLC and President of MAPSCorps, 501c3. Neither entity is supported through CMS funding. Neither the University of Chicago nor the University of Chicago Medicine is endorsing or promoting any NowPow or MAPSCorps Entity or its business, products, or services. The remaining authors declare that they have no conflicts of interest.

Author contributions

Respective author contributions are as follows. Study concept and design: E.L.T. and M.E.P. Acquisition of data: M.E.P., S.T.L. Analysis and interpretation of data: All authors. Drafting of the manuscript: All authors. Critical revision of the manuscript for important intellectual

Table 2
Neighborhood crime and access to health-enabling resources.

Self-reported neighborhood safety	Low Potential Access to Resources (dn > 1 mile) ^a n = 265							
	Large grocery stores		Small grocery stores		Pharmacies		Gyms or fitness centers	
	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)
Fairly or completely safe	50.7	Ref	16.7	Ref	47.3	Ref	37.3	Ref
Somewhat or very dangerous	63.8	1.73 (1.04–2.87)	16.4	0.92 (0.47–1.81)	66.4	2.24 (1.33–3.77)	50.9	1.93 (1.15–3.24)

Prior experience of neighborhood crime	Bypassing resources (du ≥ 1 mile) ^b				Chronic disease status			
	Grocery stores n = 241		Pharmacies n = 72		Body mass index (BMI) ≥ 30 kg/m ² n = 254		Blood pressure (BP) ≥ 140/90 mm Hg n = 248	
	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)	%	AOR ^c (95% CI)
No prior theft or property crime	47.7	Ref	34.4	Ref	46.9	Ref	41.4	Ref
Prior theft or property crime	52.6	1.14 (0.67–1.96)	54.8	3.78 (1.11–12.87)	61.3	1.74 (1.02–2.95)	55.1	1.50 (0.86–2.60)

Note: Boldface indicates statistical significance (p < 0.05).

^a Low potential access was defined as the nearest resource (d_n) > 1 mile from each participant's residential address.

^b Bypassing (poor realized access) was defined as the utilized resource (d_u) > 1 mile from each participant's residential address when nearer resources (≤ 1 mile) were available.

^c Adjusted for age, gender, education, and self-reported health status.

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