The geography of crime and violence surrounding tobacco shops, medical marijuana dispensaries, and off-sale alcohol outlets in a large, urban low-income community of color

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A B S T R A C T

Tobacco shops, medical marijuana dispensaries (MMD), and off-sale alcohol outlets are legal and prevalent in South Los Angeles, California—a high-crime, low-income urban community of color. This research is the first to explore the geographic associations between these three legal drug outlets with surrounding crime and violence in a large low-income urban community of color. First, spatial buffer analyses were performed using point-location and publically accessible January–December 2014 crime data to examine the geography of all felony property and violent crimes occurring within 100, 200, 500, and 1000-foot buffers of these three legal drug outlet types across South Los Angeles. Next, spatial regression analyses explored the geographic associations between density of these outlets and property and violent crimes at the census tract level. Results indicated that mean property and violent crime rates within 100-foot buffers of tobacco shops and alcohol outlets—but not MMDs—substantially exceeded community-wide mean crime rates and rates around grocery/convenience stores (i.e., comparison properties licensed to sell both alcohol and tobacco). Spatial regression analyses confirmed that tobacco shops significantly positively associated with property and violent crimes after controlling for key neighborhood factors (poverty, renters, resident mobility, ethnic/racial heterogeneity). Thus, study findings provide the first empirical evidence that tobacco shops may constitute public health threats that associate with crime and violence in U.S. low-income urban communities of color. Implementing and enforcing control policies that regulate and monitor tobacco shops in these communities may promote community health by improving public safety.

1. Introduction

Crime and violence are pervasive in many low-income urban communities of color (Peterson and Krivo, 2008; Walker et al., 2011), resulting in elevated rates of injury, disability, and death (Kominski et al., 2002; McKenna et al., 2005; Morenoff, 2005; Sampson et al., 2005). In these communities, nuisance properties—i.e., community institutions that exacerbate crime in their immediate locations—are abundant (Ellaway et al., 2010; Lipton and Gruenewald, 2002; Romley et al., 2007), posing significant threats to public health. Examples include motels (LeBeau, 2011; Schmerler, 2005), vacant properties (Kraut, 1999), payday lenders (Kubrin et al., 2011; Wilcox and Eck, 2011), and alcohol outlets (liquor stores, bars) (Campbell et al., 2009; Roncek and Maier, 1991.

In California, alcohol outlets are just one of three legal drug outlets specially designated to sell controlled substances to the public. Tobacco shops and medical marijuana dispensaries (MMD) are also legal, prevalent, and of rising national concern due to the proliferation of dangerous synthetic drugs sold in tobacco shops and acceleration of medical marijuana legalization (Abele, 2004; Boggess et al., 2014; California Police Chief's Association, 2009; Fass et al., 2012). Yet, little is known about these potential nuisance properties' relationships with neighborhood crime in low-income urban communities of color.

1.1. Local ecology of legal drug outlets and crime

Most literature on the nexus of legal drug outlets and crime have examined alcohol outlets, linking alcohol outlet density—denoting

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alcohol availability—with elevated violent crime rates (Costanza et al., 2001; Gorman et al., 2001; Lipton and Gruenewald, 2002; Zhu et al., 2004). Interestingly, off-sale alcohol outlets selling packaged alcohol for off-premises consumption (e.g., liquor stores) display stronger associations with surrounding crime than on-sale outlets selling alcohol for on-premises consumption (e.g., taverns) (Forsyth and Davidson, 2010; Richardson et al., 2015), which have greater on-site social controls (Gruenewald et al., 2006).

Less research has examined the association between MMDs and crime. Prior studies examining marijuana *use* and crime have generated equivocal findings (Arseneault et al., 2000; Green et al., 2010; Moore and Stuart, 2005; Ostrowsky, 2011; Pedersen and Skardhamar, 2010) while geographic information systems (GIS) research studying relationships between marijuana *availability* and crime have failed to link medical marijuana legalization (Morris et al., 2014; Wang and Herrera, 2014) and MMD density with neighborhood property or violent crime (Freisthler et al., 2013, 2016; Kepple and Freisthler, 2014).

Further, the geographic relationship between tobacco shops and crime is unstudied, although research has associated tobacco shop density with smoking (Agaku et al., 2014; Henriksen et al., 2008) and heart disease (Barnes et al., 2016). Tobacco shops are retail outlets that: (1) specialize in paraphernalia for consuming tobacco, marijuana, and smokable herbal mixtures, and (2) sell potent psychoactive substances (e.g., synthetic cannabinoids) that mimic the effects of illegal drugs (Pillay and Kelly, 2010). Due to minimal legislative controls on these psychoactive drugs in tobacco shops, they are more easily obtained than tobacco or alcohol (Spiller et al., 2011), with their legality and attractive pricing encouraging user experimentation (Pillay and Kelly, 2010; Van Hout and Bingham, 2012). Yet, the compounds in many synthetic drugs sold in tobacco shops have been linked to severe side effects including paranoia, psychosis, aggressive/violent behavior, cardiovascular complications, and death (Cary, 2010; Prosser and Nelson, 2012; Rosenbaum et al., 2012; Van Hout and Bingham, 2012).

Additionally, tobacco shops may associate with neighborhood crime by servicing high-risk clientele; in particular, illegal street, needle-injecting, and poly-drug users—many with criminal histories—attracted to these outlets by the easy accessibility of legal drugs (Ryall and Butler, 2011). Yet, despite their growing presence and possible role as nuisance properties in low-income communities, the relationship between tobacco shops and crime remains unstudied (Clark, 2007; Press, 1980).

1.2. Theoretical frameworks

To understand the potential geographic associations between tobacco shops, MMDs, and alcohol outlets with crime in low-income urban communities of color, this study relies on two complementary ecological theories. Routine activities theory holds that crimes occur around properties that bring three elements together during peoples' routine activities of daily living (e.g., working, socializing): (1) motivated offender, (2) suitable target/victim, and (3) absence of persons to monitor the offender ("handlers"), protect the target/victim ("guardians"), or supervise the location ("managers") (Eck and Weisburd, 1995; Felson, 1995). The convergence in time and place of these three elements thus accounts for crime's increased prevalence around nuisance properties, with effective social controls (handlers, guardians, managers) having the strongest influence on crime (Eck and Weisburd, 1995; Felson, 1995).

Second, social disorganization theory suggests that nuisance properties abound and crime proliferates in low-income urban communities of color due to heightened social disorganization—the inability of a community to realize the common values of its residents and maintain effective social controls to resolve community problems (Bursik, 1988; Kubrin and Weitzer, 2003; Shaw and McKay, 1942). In socially disorganized communities, breakdowns in residents' social ties with each other (i.e., local friendship networks, community meetings) and formal relationships with authorities (Kubrin and Weitzer, 2003; Sampson and

Raudenbush, 2001; Walker, 2009) prevent residents from exerting informal social control over neighborhood crime through street surveillance, supervising misbehaving youth, and reporting misconduct to authorities (Morenoff et al., 2001; Sampson et al., 1997; Sampson et al., 1999).

Three factors have been prominently linked to social disorganization: poverty/social deprivation, resident instability/mobility, and ethnic/racial heterogeneity (Kubrin and Weitzer, 2003; Markowitz et al., 2001; Sampson and Groves, 1989). Poverty/social deprivation promotes crime (Andresen, 2006; Cahill and Mulligan, 2003) by increasing residents' social isolation and enticing criminal behavior from economically disadvantaged residents (Bursik Jr. and Grasmick, 1993; Kubrin and Weitzer, 2003) while resident instability/mobility (i.e., high population turnover) and ethnic/racial heterogeneity hinder residents from maintaining social ties, particularly across ethnic/racial lines; decreasing their likelihood to challenge criminal behavior (Bursik Jr. and Grasmick, 1993; Gruenewald et al., 2006; Kubrin and Weitzer, 2003).

Thus, socially disorganized low-income communities of color are rendered both vulnerable to crime and unable to resist nuisance properties from proliferating in high densities (Peterson et al., 2000; Sampson and Wilson, 1995); signaling a compromised system of social controls to offenders (Gorman et al., 2001). We posit this leads legal drug outlets to become nuisance properties by: (1) undermining informal social control in areas where they are densely located (Kubrin et al., 2011), and (2) creating criminal network breeding grounds around outlets that merge motivated offenders (Asmussen, 2007; Møller, 2008) with cash-rich targets (Kubrin et al., 2011) in the absence of effective social controls (e.g., police, pedestrian traffic) (Costanza et al., 2001; Wilcox and Eck, 2011).

1.3. Study aims

This study had two objectives. First, to examine via GIS buffer analyses the localization of felony property and violent crime around tobacco shops, MMDs, and off-sale alcohol outlets vs. grocery/convenience stores—i.e., comparison retail properties also selling alcohol and tobacco—in South Los Angeles (LA). If crime were found to localize around these legal drug outlets, we used ordinary least squares (OLS) and geographically weighted regression (GWR) to explore these associations while controlling for neighborhood poverty/deprivation, residential instability/mobility, and ethnic/racial heterogeneity.

2. Methods

2.1. Research context

South LA is a large low-income urban community containing LA County's (LAC) highest concentration of: (1) African American residents (28.5%) and second highest concentration of Latina/o residents (67.7%), (2) adults without high school education (38.8%), and (3) residents living in poverty (31.1%), greatly exceeding national poverty rates of 15.9% (U.S. Census Bureau, 2010). In recent Department of Public Health (DPH) data (2013), South LA residents demonstrated LAC's worst population health outcomes, exhibiting elevated rates of adult and childhood obesity, diabetes, HIV/AIDS, and mortality from diabetes, coronary, and cerebrovascular disease. Gang-related crime is pervasive (LAC Police Department, 2011); South LA's homicide rate of 38.8 per 100,000 youth aged 15–34 years nearly quadruples the national homicide rate of 10.6 per 100,000 youth (DPH, 2013).

2.2. Design

Adhering to CBPR principles (Israel et al., 1998), the study concept emerged from over 40 South LA stakeholders recruited by our community partner The Community Coalition for 4 community mapping

sessions—a data-gathering technique that asks participants to record pertinent spatial details on paper maps (Forrester and Cinderby, 2013). Participants were adult and youth residents, public health and park officials, and gang interventionists who helped us identify and chart local nuisance properties preventing residents from accessing local parks.

Participants reported high criminal activity around numerous neighborhood properties but particularly implicated tobacco shops (e.g., "*smoke shops*"), off-sale alcohol outlets (e.g., "*corner stores*," "*liquor stores*"), and MMDs as public nuisances. For example, one gang interventionist stated, "*smoke shops are bad. They're the new liquor stores. That's where the gangs hang out now.*" Driven by similar stakeholder reports, we chose to study the relationships between these three potential nuisance properties and South LA crime to empirically ground the Coalition's grassroots nuisance abatement work (Aboelata, 2004).

2.3. Current study

The study area consisted of the eight contiguous zip codes composing the South LA region: 90001, 90002, 90003, 90011, 90037, 90044, 90047, and 90059. This area contained 30.45 mile^2 and 520,104 residents (Census, 2010). ZIP code descriptive statistics are shown in Table 1. Across the eight ZIP codes, residents' median age ranged from 25.5 to 36.2 years, population density ranged from 10,276 to 24,240 residents per square mile, and median per-capita income ranged from $9505 to $19,552.

2.4. Data

January–December 2014 spatial outlet and crime data for each ZIP code were collected and aggregated in 2015. Spatial outlet data were verified by two research team members to ensure the exposure data accurately measured target outlets.

Point location data for off-sale alcohol outlets were obtained from the California Alcohol Beverage Control Board and two Internet business directories cited in an earlier geospatial study (Hoerster et al., 2009): ReferenceUSA.com and Superpages.com. No Control Board data for tobacco shops or MMDs were available. Therefore, tobacco shop and MMD point location data were obtained from multiple Internet search directories: ReferenceUSA.com, Superpages.com, Google Map Results, Yelp.com, Headshopfinder.com, Findheadshops.com, Headshops.com, Medicalmarijuana.com, Weedmaps.com, and THCfinders.com. Comparison grocery/convenience store addresses were acquired by Internet search, and then phoned to verify they sold *both* alcohol and tobacco. Authors visually confirmed each property's address via Google Maps Street View, then established its active operations from January–December 2014 using: (1) Control Board or Internet search data indicating the property was established before 2014 (e.g., newspaper articles, resident meeting minutes), or (2) pre-2014 property images on

Google Maps Street View (Fig. 1). Unconfirmed properties were excluded from analysis.

January–December 2014 crime data were compiled from LA Police Department (2015) and LAC Sheriff's Department (2015) data, which listed location and code type of crime incidents. Incidents were recoded into felony property and violent crime categories using the Uniform Crime Reporting definitions (FBI, 2004). Property crimes consisted of arson, motor vehicle theft, larceny theft, and burglary. Violent crimes included criminal homicide, aggravated assault, forcible rape, and robbery. For comprehensiveness, we also analyzed total crimes (i.e., all felony *plus* misdemeanor crimes), which we expected to show smaller relationships with our legal drug outlets as total crimes included many non-property and non-violent crimes such as forgeries, identity theft, and sexual felonies/misdemeanors (e.g., failure to register as sexual offender) unlikely to geographically associate with our legal drug outlets.

2.5. Buffer and pairwise analyses

Spatial outlet location and crime data were entered into ArcGIS v.10.3 (ESRI, 2014). Addresses were geocoded to 100%. Spatial buffers were created to determine the mean rates of property, violent, and total crime occurring within 100, 200, 500, and 1000 ft of target properties. To clarify, 100-foot buffers captured all crime occurring within a 100-foot radius of target properties. Then, crime incident counts within 100, 200, and 500-foot buffers of each property were outputted, entered into SPSS v.22 (IBM Corp, 2013), and analyzed via nonparametric Kruskal-Wallis H tests with Bonferroni adjustment to identify significant differences in crime incidence between tobacco shops, MMDs, off-sale alcohol outlets, and grocery/convenience stores. Community-wide scores were not compared as they lacked point locations.

2.6. OLS regression

To further explore spatial associations between legal drug outlet density and crime incidents—using census tracts as the unit of analysis—we constructed three "global" OLS regression models in ArcGIS with: (1) property, violent, and total crime as the three models' dependent variables, and (2) tobacco shop, MMD, and off-sale alcohol outlet density as the main independent variables for all models, with poverty, renters, resident mobility, and ethnic/racial heterogeneity (drawn from U.S. Census, 2014 data) as control variables. Within each census tract, poverty consisted of total number of people below the 2014 federal poverty level; renters referred to total number of renters; mobility referred to total number of people living in the tract < 1 year; ethnic/racial heterogeneity was calculated using: $1 - [p_{African\ American}^2 + p_{Latina/o}^2 + p_{Asian}^2 + p_{Pacific\ Islander}^2 + p_{American\ Indian}^2 + p_{White}^2 + p_{Other}^2]$ where p is the proportion of persons (Warner and Pierce, 1993).

In OLS regression, a single model uniformly summarizes the

Table 1
Descriptive statistics for South Los Angeles study area by ZIP code.

	90001	90002	90003	90011	90037	90044	90047	90059
Total population	57,110	51,223	66,266	103,892	62,276	89,779	48,606	40,952
Total square miles	3.50	3.06	3.55	4.29	2.84	5.17	4.73	3.31
Population density (per square mile)	15,635	16,728	18,660	24,240	21,928	17,365	10,276	12,359
Median age	26.6	25.5	26.3	26.2	29.8	29.8	36.2	25.7
Income (per capita)	$11,409	$10,705	$9963	$9505	$10,957	$12,932	$19,552	$11,308
%								
Female	50.8	51.0	50.7	49.2	49.9	52.0	54.5	52.1
African American	10.0	24.6	25.2	8.4	20.4	38.5	67.5	34.0
Hispanic	89.8	74.2	74.1	90.4	76.8	60.6	31.1	64.5
White, non-Hispanic	0.7	0.8	0.5	0.5	1.8	1.1	1.2	1.0
Below federal poverty level	32.1	34.8	39.2	43.3	40.7	34.4	21.1	36.2

Per capita income data from: www.incomebyzipcode.com/california
Racial demographics data from: 2014 American Community Survey: http://factfinder.census.gov
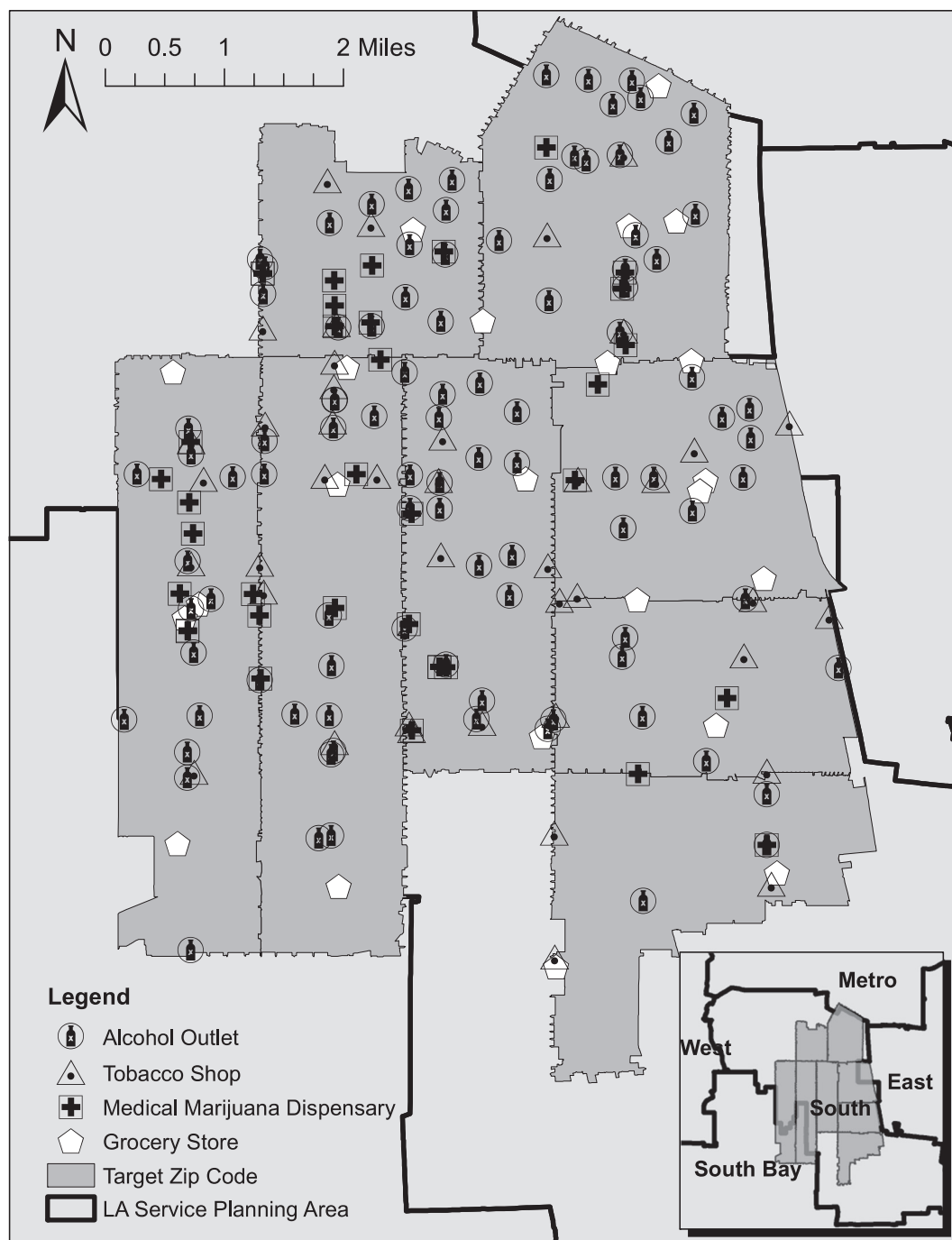
Fig. 1. Locations of study legal drug outlets in South Los Angeles target zip codes.

"global" relationships between variables throughout an area. But when variable relationships throughout an area are not uniform and instead exhibit spatial dependence—i.e., values at one location depend on values at neighboring locations (Anselin, 2003)—"global" OLS models cannot explain these clusters of correlated values. Of our three OLS models, only the violent crime model displayed spatial dependence via Moran's Index.

2.7. GWR regression

To account for this spatial dependence, "local" geographically weighted regression (GWR) analyzed separate "local" violent crime regression models for each census tract (Fotheringham et al., 1998).

This "local" GWR analysis allowed us to explore regional variations (spatial non-stationarity) (Brunsdon et al., 1996) in any violent crime-outlet relationships that emerged as significant in the "global" OLS model.

3. Results

3.1. Outlet locations & surrounding crime incidents within buffers

Crime incidence was exceedingly high between January–December 2014 with approximately 15,000 property crimes, 14,000 violent crimes, and 37,500 total crimes reported in the study area. Table 2 presents mean property, violent, and total crime rates occurring within

Table 2

Number of 2015 property violent, and total crimes within 100, 200, 500, and 1000 ft buffers around tobacco, off-sale alcohol, medical marijuana, and grocery/convenience retail businesses across all target South Los Angeles ZIP codes.

	Community-wide	Tobacco shops (N = 41)	Off-sale alcohol outlets (N = 99)	Marijuana dispensaries (N = 38)	Grocery/convenience stores[*] (N = 23)
Property crimes (N = 15,817)					
100 ft	0.59	**2.20**	**1.91**	2.08	0.22
200 ft	2.34	6.34	6.32	5.03	3.17
500 ft	14.64	21.51	22.90	20.05	29.35
1000 ft	58.54	69.34	45.49	62.669	85.87
Violent crimes (N = 14,004)					
100 ft	0.52	**2.51**	**2.33**	1.58	0.09
200 ft	2.07	6.78	7.92	5.32	2.39
500 ft	12.96	23.80	23.42	20.68	22.39
1000 ft	51.83	64.51	64.14	60.11	64.00
Total crimes (N = 37,575)					
100 ft	1.39	6.93	5.84	4.00	0.39
200 ft	5.56	**17.29**	**19.40**	11.61	6.74
500 ft	34.76	56.29	41.03	47.42	64.13
1000 ft	139.06	166.90	163.37	146.05	188.04

Bold-faced: Nuisance property mean score is significantly different from mean score of <u>grocery/convenience stores</u> at $p < 0.05$.

[*] Grocery/convenience stores refer to retail businesses (non-liquor, marijuana, tobacco shops) that are licensed in the target zip codes to sell both liquor and tobacco to the public.

Table 3

Ordinary least squares regression results of associations between 2015 property, violent, and total crimes with South Los Angeles tobacco, off-sale alcohol, and medical marijuana outlets at the census tract level.

	Property crimes	Violent crimes	Total crimes
R^2	0.40	0.43	0.44
Adjusted R^2	0.39	0.39	0.40
AIC	1219.53	1214.05	1402.36

	Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	t value
Intercept	− 0.14	19.19	− 0.01	− 29.85	14.51	− 2.06*	− 14.96	42.21	− 0.35
Tobacco shops	16.53	7.00	2.36**	15.07	6.90	2.18*	40.37	15.40	2.62**
Off-sale alcohol outlets	5.18	4.45	1.16	3.82	4.16	0.92	8.70	9.79	0.89
Marijuana dispensaries	20.77	6.45	3.22**	12.92	7.14	1.81	20.90	14.19	1.47
Renters	0.03	0.01	3.14**	0.02	0.01	2.18*	0.09	0.02	4.01*
Poverty	− 0.02	0.01	− 1.44	− 0.01	0.02	− 0.15	− 0.06	0.03	− 2.15*
Resident mobility	0.04	0.02	1.72	0.05	0.02	1.99*	0.12	0.05	2.57*
Racial heterogeneity	127.37	32.96	3.86**	160.48	27.24	5.89**	314.01	72.50	4.33**

* $p < 0.05$.

** $p < 0.01$.

100, 200, 500, and 1000-foot buffers of all target properties and community-wide.

Buffer analyses revealed higher mean rates of property, violent, and total crime occurring within 100 and 200 ft of tobacco shops, MMDs, and off-sale alcohol outlets versus: (1) grocery/convenience stores, and (2) community-wide rates. Conversely, at 500 ft, grocery/convenience stores displayed equivalent mean property, violent, and total crime rates vs. tobacco shops, MMDs, and off-sale alcohol outlets, suggesting grocery/convenience stores were located in similarly high crime areas as our legal drug outlets.

3.2. Nonparametric comparisons of average crime incidents around outlet locations

Kruskal-Wallis H tests were significant for: property crime at 200 ft [$\chi^2(3, N = 201) = 10.57, p < 0.05$]; violent crime at 100 ft [$\chi^2(3, N = 201) = 11.48, p < 0.01$] and 200 ft [$\chi^2(3, N = 201) = 23.43, p < 0.001$]; and total crime at 100 ft [$\chi^2(3, N = 201) = 12.39, p < 0.01$], 200 ft [$\chi^2(3, N = 201) = 23.27, p < 0.001$] and 500 ft [$\chi^2(3, N = 201) = 15.94, p < 0.001$].

Bonferroni comparisons (Table 1) indicated that at 100 ft, tobacco shops and off-sale alcohol outlets—but not MMDs—experienced significantly higher property and violent crime rates than grocery/convenience stores ($p < 0.05$). These preliminary findings of increased crime around tobacco shops and off-sale alcohol outlets justified running OLS regressions to examine whether outlet density significantly associated with increased crime.

3.3. Global spatial dependence between crime incidents and outlet types

Table 3 displays OLS regression property, violent, and total crime model results: tobacco shops, MMDs, and off-sale alcohol outlets were the main predictors; poverty, renters, resident mobility, and ethnic/racial heterogeneity were control variables. Model diagnostics revealed no multicollinearity in any models (all Variance Inflation Factors < 4.75) and only the violent crime model demonstrated spatial autocollinearity.

The property crime model accounted for 39% of the total variance in area property crime, with tobacco shops, MMDs, and renters and ethnic/racial heterogeneity significantly positively associating with
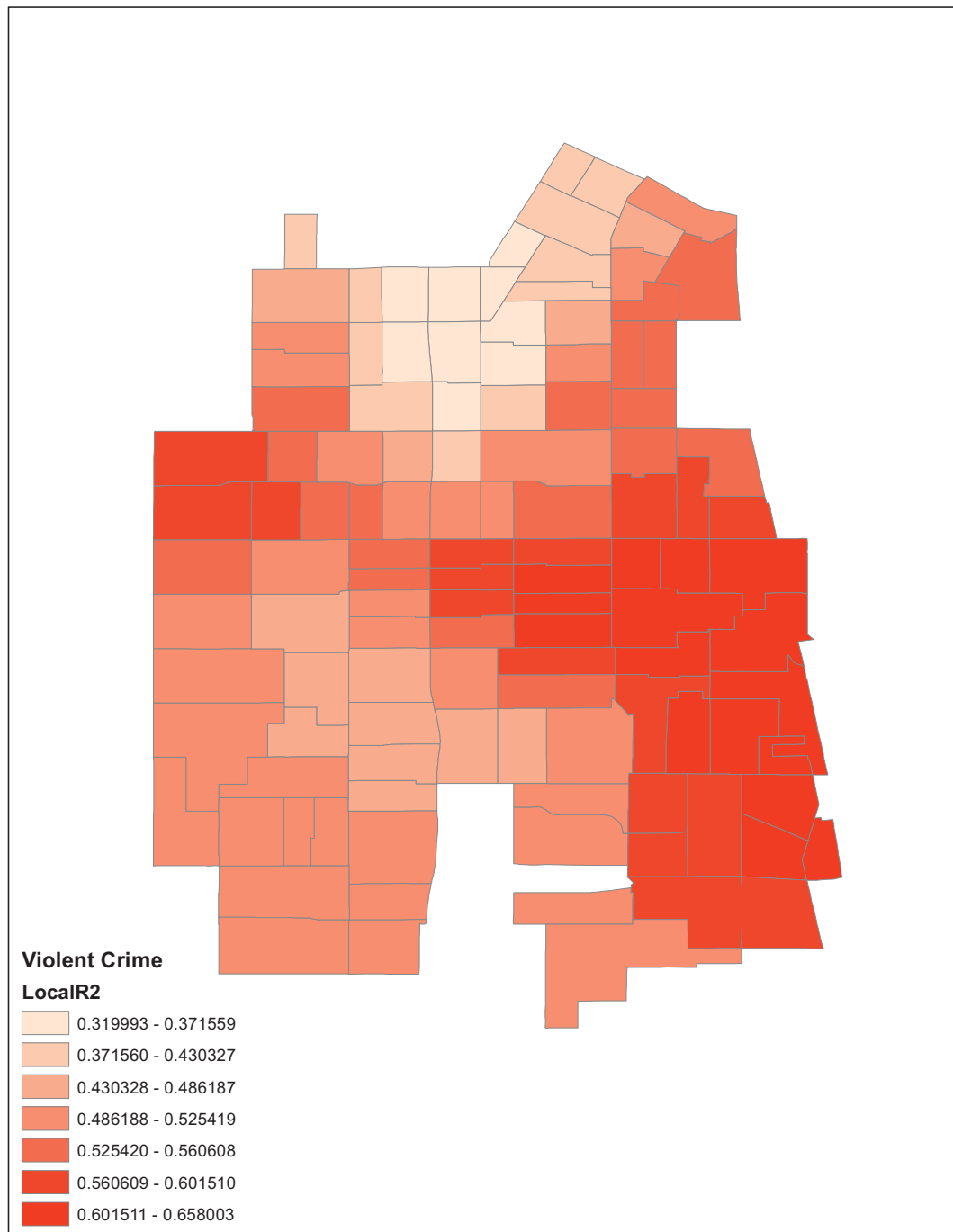
Fig. 2. Geographically weighted regression violent crime model "local" R^2 values by census tracts in South Los Angeles.

property crime at the census tract level ($p < 0.01$). The total crime model accounted for 40% of total variance in area total crimes, with tobacco shops and poverty, renters, resident mobility, and ethnic/racial heterogeneity significantly positively associating with total crime at the census tract level ($p < 0.05$). For the violent crime model, tobacco shops and renters, resident mobility, and ethnic/racial heterogeneity significantly positively associated with violent crimes at the census tract level ($p < 0.01$) but this model's residuals were spatially autocorrelated (Moran's Index = 0.16, $Z = 2.48$, $p < 0.05$). This necessitated GWR analysis to explore the regional variation (non-stationarity) of the significant tobacco shop-violent crime relationship in the OLS model while correcting for autocorrelation.

3.4. Local spatial dependence between violent crime incidents and tobacco shops

ArcGIS estimates of the violent crime GWR model produced an optimal adaptive bandwidth of 67 neighbors, an R^2 of 0.71, and adjusted R^2 of 0.58; substantially exceeding the OLS model's adjusted R^2 of 0.40. The GWR model generated a smaller *AICc* value of 1199.70 vs. the OLS model's *AICc* value of 1214.05; a "serious" *AICc* model difference (Fotheringham et al., 1998). Thus, by accounting for regional variation, the "local" GWR model had superior explanatory power over the "global" OLS model.

Fig. 2 displays the local R^2 values of the GWR violent crime model for each census tract. As all local R^2 values were positive (from 0.32 to 0.66), the GWR model positively predicted violent crime in all tracts.
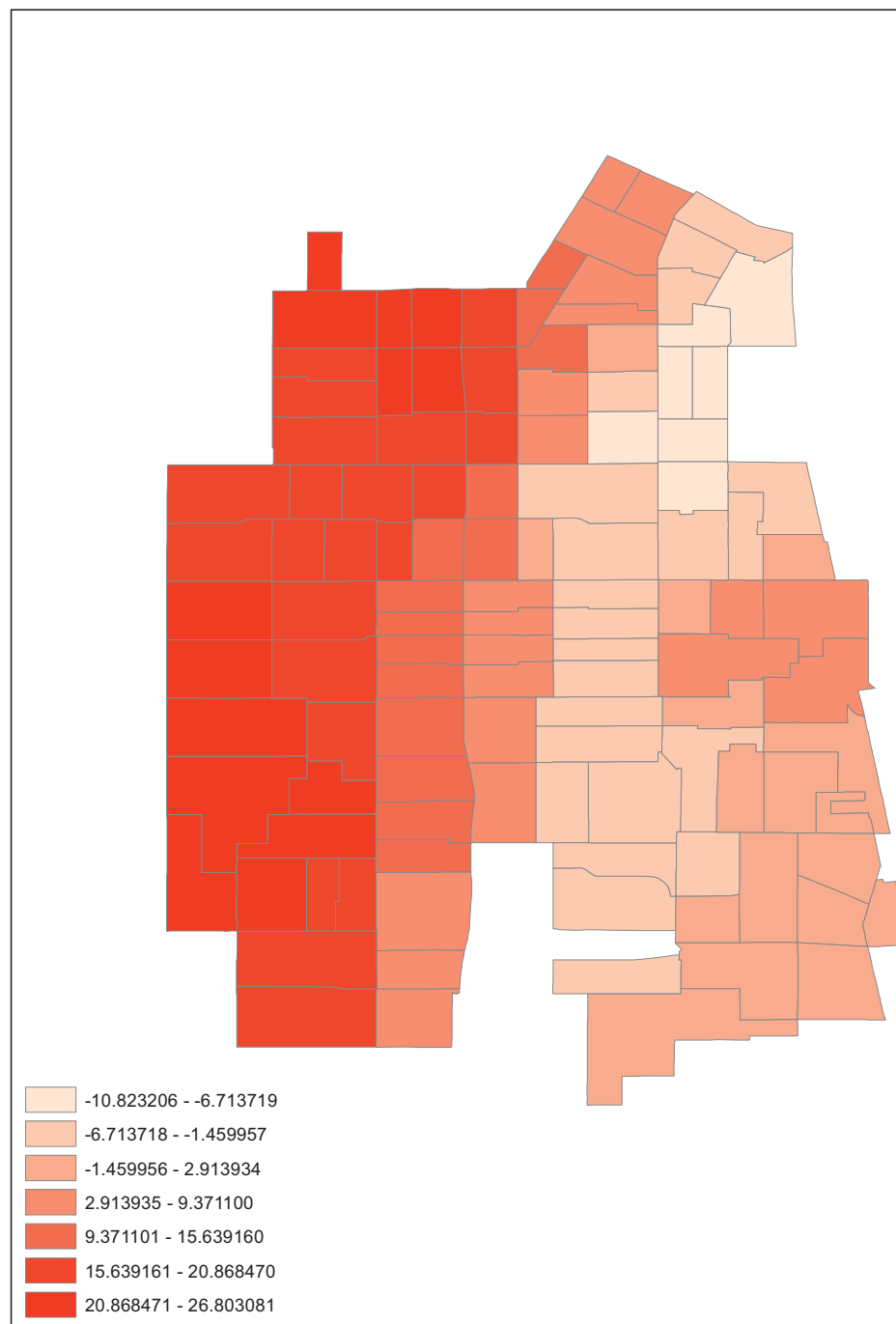
Fig. 3. Geographically weighted regression coefficients indicating associations between tobacco shops and violent crime incidents by census tracts in South Los Angeles.

Overall, while the tobacco shop-violent crime relationship was "globally" significant in the OLS model, it exhibited regional variation as "local" GWR regression coefficients fluctuated from negative to positive (− 10.82 to 26.80) across census tracts (Fig. 3). Thirty-four of the 116 study area census tracts (29.31%) had negative associations between tobacco shop density and violent crime, indicating tobacco shops may have associated with decreased violent crime in these tracts. In contrast, 70.69% of census tracts had positive associations, indicating that for most of South LA, more tobacco shops may have associated with increased violent crime.

4. Discussion

Study findings revealed that tobacco shops and off-sale alcohol

outlets—but not MMDs—are proximal to heavy felony property and violent crime activity within South LA. GIS regression results further indicated that after accounting for core neighborhood indicators of social disorganization that could additionally influence crime's geography in South LA's census tracts—i.e., poverty, renters, resident mobility, and ethnic/racial heterogeneity—tobacco shops positively associated with neighborhood property, violent, and total crimes in the census tracts; validating residents' perceptions that tobacco shops are linked with neighborhood crime. Thus, our data suggest tobacco shops may constitute nuisance properties associated with dangerous neighborhood conditions for crime and violence in South LA, and perhaps similar low-income urban communities of color.

In contrast, while MMDs associated with increased property crimes at the census tract level, they were not linked to surrounding violent

crime, aligning with emerging reports indicating limited MMD associations with nearby crime (Chang and Jacobson, 2017; Freisthler et al., 2016). Several MMD-related factors may suppress their associations with violent crime in South LA: (1) presence of visible property safeguards (e.g., security cameras), which may lower dispensary-related violence (Freisthler et al., 2016), (2) visual anonymity of many MMDs to passers-by including potential offenders, and (3) MMDs' tendency to close or relocate quickly—e.g., by June 2015, few MMDs operated at their 2014 locations.

As expected, grocery/convenience stores encountered significantly less crime within 100 and 200 ft than tobacco shops and off-sale alcohol outlets despite also: (1) selling alcohol and tobacco, and (2) being situated in high crime areas (based on high surrounding crime rates at 500 and 1000 ft). Drawing from surveillance scans we subsequently conducted revealing that all but one grocery/convenience store—vs. no legal drug outlets—possessed well-lit parking lots ranging between 100 and 300 ft in size, we surmised parking lots deterred crime by containing highly visible social controls including "guardians" (e.g., other customers) and "managers" (e.g., clerks, security guards) (Freisthler et al., 2016; Wilcox and Eck, 2011). Consequently, for commercial properties selling legal drug products within high-crime environments, their physical characteristics (e.g., presence of "guardians," active security measures) may strongly influence surrounding crime (Costanza et al., 2001; Wilcox and Eck, 2011). Additional studies may wish to explore which social and physical controls (e.g., security guards, parking lots, street lights, cameras) most limit crime around these high-risk commercial properties, as implementing these control features may prevent these properties from becoming public nuisances.

Limitations included cross-sectional analyses restricting causal inferences and an inability to evaluate the effects of synthetic drug availability on crime around tobacco shops; an important research area given tobacco shops' evidenced association with neighborhood crime. Also, significance levels for tobacco shop-violent crime GWR coefficients were not provided as the significant positive association between tobacco shops and violent crime reported in the "global" OLS model obviated the need to draw further statistical inferences from GWR data, which were intended for visually mapping the "local" spatial distribution of variable relationships (Anselin, 2005; Brunsdon et al., 1996; Siordia et al., 2012).

5. Conclusion

Current results are the first to empirically implicate tobacco shops as likely nuisance properties that associate with crime and violence within a large low-income urban community of color. Accordingly, residents, researchers, and policy makers may potentially improve public health in these vulnerable communities by reducing tobacco shop density using federally-recommended evidence-based strategies (Jernigan et al., 2013; Task Force on Community Preventive Services, 2009) such as public advocacy for zoning and nuisance abatement policies and enforcement (Bobo et al., 2010), and community-guided, problem-oriented policing of these potential public nuisances (Weisburd et al., 2010).

Acknowledgements

Conflict of interest statement

The authors have no conflicts of interest to declare.

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