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Metropolitan local crime clusters: Structural concentration effects and the systemic model

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ABSTRACT

Purpose: Using community structure and the racial-spatial divide as a framework, this study examines whether geographic sub-regions of violent crime exist in a large metropolitan area, and if the systemic model of crime can predict them. In addition, surrounding social structure measures are included to determine whether they demonstrate the same violent crime links seen in recent work on concentration impacts.
Methods: A LISA analysis is used to identify violent crime clusters for 355 jurisdictions in the Philadelphia (PA)-Camden (NJ) primary metropolitan area over a 9-year period. Multinomial logit hierarchical/mixed effects models are used to predict cluster classification using focal and lagged structural covariates.
Results: Models confirmed links of focal jurisdiction socioeconomic status and residential stability with sub-region classification. Models with spatially lagged predictors show powerful impacts of spatially lagged racial composition.
Conclusions: Findings extend work on racial concentration effects and the basic systemic model to metropolitan sub-regions. Implications for shifting spatial inequalities in metropolitan structure and questions about responsible dynamics merit attention.

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Introduction

Documented spatial variation of crime or delinquency levels across ecological units ranging in size from nations to street corners stretches back many decades, and varies by the size of the unit and outcome in question (Baller, Anselin, Messner, Deane, & Hawkins, 2001; Brantingham, Dyreson, & Brantingham, 1976; Groff, Weisburd, & Yang, 2010; Lawton, Taylor, & Luongo, 2005; McCall & Nieuwbeerta, 2007; Messner & Rosenfeld, 2007; Ratcliffe, Taniguchi, Groff, & Wood, 2011). Given all this work, considerable knowledge has accumulated about the connections between crime or delinquency and features of demographic structure *across* such units (Pratt & Cullen, 2005; Taylor, 2015). But, as Andresen (2011) has pointed out, "investigations into spatial relationships *between* places" are by comparison far more "limited" (p. 394).

The current work investigates such between-place spatial relationships for jurisdictions in the fifth largest primary metropolitan area in the US. Focusing on local violent crime clusters composed of adjoining jurisdictions, it advances earlier spatial work by exploring the reliability of these local cluster classifications over most of a decade. It extends knowledge about demographic structure and the ecology of crime in two ways: by verifying the relevance of focal jurisdiction demographic elements highlighted in the basic systemic model of crime for neighborhoods (Bursik & Grasmick, 1993), and by examining the roles of spatially lagged racial composition and spatially lagged socioeconomic status to violent crime concentrations (Peterson & Krivo, 2010).

The remainder of the introduction is as follows. Select examples highlighting some of the most relevant between-place work on local violent crime clusters are noted, as are examples of spatially lagged demographic concentration effects on violent crime. Reasons to expect sub-regional violent crime patterning, and expectations about the geography of such patterning, are described. The section closes with a brief statement of key questions.

Between-place work on local violent crime: Select examples at different spatial scales

Violent crime rates exhibit local spatial dependency, with the form of that dependency depending on the crime and the ecological unit in question. County level US homicide rates across four different decades generated local clusters of higher than average counties surrounded by other higher than average counties (Baller et al., 2001). But this relationship appeared only in the southern region of the country, suggesting spatial dependency of county homicide rates depended on positioning within South versus non-South regions.

Using jurisdictions within the Philadelphia (PA)-Camden (NJ) primary metropolitan area, Groff, Taylor, Elesh, McGovern, and Johnson

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(2014) examined how land use and street network factors shaped adjacency impacts. Jurisdictions with more permeable boundaries proved more susceptible in some years to increasing violent or property crime if surrounded initially by higher crime locales.

Such a finding aligns with a diffusion model (Messner & Anselin, 2004) for explaining adjacency impacts. This model was supported by Messner and Anselin's (2004) exploratory county-level spatial analyses of homicide rates in the St. Louis metropolitan area at two points in time from the mid-1980s to the mid-1990s. They identified local clusters of counties using LISA statistics (Anselin, 1995) and found both stability over time in the location of some clusters (e.g., a high-surrounded-by-high cluster including St. Louis city in the center of the region) and shifts over time (e.g., some counties in a low-surrounded-by-low local cluster along the northern tier of the metro area shifted to a high-surrounded-by-low local cluster; see their Fig. 7.2). Since their analysis of counties in the St. Louis metro area was explicitly exploratory, they did not test the consistency of local cluster classifications across the two periods, nor did they consider structural covariates of local crime cluster classifications.

Andresen (2011) did address such links in his analysis of 2001 local crime cluster classifications for dissemination areas, somewhat comparable to census block groups in the US, within the city of Vancouver (British Columbia). For violent crime, he observed high-high local clusters "in Vancouver's central business district and Skid Row" where "commercial land use" was extensive while low-low clusters were most likely to be found in the "wealthier western portion of Vancouver" (Andresen, 2011, p. 399). Treating the local crime cluster classification, including being unclassified, as a nominal outcome, he predicted these groupings using demographic structural variables capturing socioeconomic status, residential stability, and racial and ethnic composition.[1] His results have particular importance for the current investigation. First, he found that the demographic links with low-low cluster status vs. unclassified were "generally consistent" with what might be expected given known violent crime demographic ecological correlates (Pratt & Cullen, 2005, p. 400). For example, relative low violence was more likely if unemployment was lower and homeownership was higher (Andresen, 2011, Table 7). Second, results were less likely to match up to known community crime demographic correlates for the high-high clusters, "often … [proving] opposite the expected sign" (Andresen, 2011, p. 400). Third, both the low-surrounded-by-high cluster demographic links, and the high-surrounded-by-low cluster demographic links had "more in common with the high-high local crime cluster results" (Andresen, 2011, p. 400). His findings leave a few concerns unaddressed, however. Confidence in the utility of local crime clusters might be enhanced if cluster classifications proved consistent over time. Further, the failure of Andresen (2011) to observe the expected demographic correlates for high-high violent crime clusters is troubling. Would the expected links surface in a test using a different locale with different sized ecological units? And finally, as Andresen (2011) himself notes, "Why do immediate spatial neighbors impact the nature of local crime areas?" (p. 401). He looks to edge effects for an answer, and earlier results with permeability across metro jurisdictions (Groff et al., 2014) suggest partial applicability of such dynamics. An alternate frame deserving consideration, however, is concentration effects. For economically disadvantaged and/or predominantly non-white jurisdictions, being surrounded by structurally similar jurisdictions can intensify crime-related activities both in surrounding spatial units and in the focal ecological unit.

Concentration effects

The basic idea of concentration effects is that a community structurally susceptible to high violent crime rates is far worse off if surrounded by other communities sharing the same demographic susceptibilities. Such concentration effects come about given the racial-spatial divide and hypersegregation in US communities (Krivo, Peterson, & Kuhl, 2009; Massey & Fischer, 2000), and tightly linked socioeconomic inequalities (Peterson & Krivo, 2010).[2]

Given the racial-spatial divide and linked spatial socioeconomic differentials, it is no surprise that numerous studies find that being surrounded by communities which are structurally disadvantaged links to higher violent crime rates (Mears & Bhati, 2006; Morenoff, Sampson, & Raudenbush, 2001). Perhaps the most comprehensive assessment, conducted by Peterson and Krivo (2010), used almost 9,000 census tracts in more than seven dozen US cities. They found that geographic concentration effects due to spatially lagged racial composition, after controlling for city and focal neighborhood features, rendered black vs. white neighborhood violence differentials non-significant (Peterson & Krivo, 2010, p. 99). Spatially lagged structural disadvantage could not produce the same reduction in black vs. white neighborhood violence differentials. Further, controlling for surrounding violence, neighborhood racial type, and city features, they found surrounding levels of residential instability and racial composition significantly affected violence levels, but surrounding disadvantage levels did not. Peterson and Krivo's (2010) results would seem to question some earlier works finding significant impacts of surrounding levels of disadvantage on violence.

That question can be reframed into a broader query given the focus here on local crime clusters. If concentration effects matter not only for determining the violence level in a focal ecological community but also for determining membership in a violent crime cluster of local communities, models with spatially lagged predictors might outperform models with focal community characteristics in predicting membership type. Further, if models with spatially lagged structural predictors do better, which spatially lagged feature provides the best fitting model? For local violent crime clusters based on positive local spatial autocorrelation, Peterson and Krivo's (2010) research suggests that lagged racial composition and lagged residential stability are both relevant, but lagged SES is not.

Why expect sub-regions of high or low metropolitan violence?

Sub-regions of more or less local violence are expected for many reasons. Centrally located as well as peripherally located urban jurisdictions along with inner-ring suburban sites have experienced significant losses in manufacturing jobs over the past four decades, concomitant with increasingly unequal concentrations of populations of color and of poverty (Adams, Bartelt, Elesh, & Goldstein, 2008). Suburban jurisdictions nearby some of these locales have experienced withdrawal of capital even prior to racial and economic shifts (Smith, Caris, & Wyly, 2001). Other suburban jurisdictions have been or are extremely well off economically (Adams et al., 2008). Road and rail transport systems combined with specific locations of large scale land uses like parks, forests and military bases, and natural barriers like rivers, create differentials in accessibility across jurisdictions (Groff et al., 2014). Finally, as the metropolitan area has grown and evolved, populations and jobs have drifted outward, leaving behind struggling jurisdictions, especially if those places are small and without a diverse job base.

Most broadly, these metropolitan dynamics would suggest centrally located high-high local clusters of violent crime and peripherally located low-low local clusters of violent crime. Messner and Anselin's (2004) county-level examination of homicides in the St. Louis metro area, and the patterning that Andresen (2011) observed in the city of Vancouver itself, along with some theoretical frames (Hawley, 1950) would suggest such a geographic arrangement.

Community structure as an organizing frame

Bursik and Grasmick's (1993) basic systemic model of crime highlights the relevance of three structural precursors of crime- and delinquency-related social and cultural dynamics: community socioeconomic status, residential stability, and racial/ethnic heterogeneity.

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