

Advances in Spatial Criminology: The spatial scale of crime

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Abstract

This essay takes stock of recent advances, as well as enduring and emerging challenges, in the area of spatial criminology. Although the notions of place and space are fundamentally intertwined, *spatial criminology* is distinct in its attempt to measure and theorize explicitly spatial processes and relationships. This essay highlights three key themes. First, the use of increasingly smaller geographic units in recent research creates even greater need to account for spatial behavior of persons when studying the location of crime. Second, although the explosion of spatially precise data in recent years presents exciting possibilities, we argue that theory is falling behind in guiding us in analyzing these new forms of data, and explicitly inductive approaches should be considered to complement existing deductive strategies. Third, an important direction for spatial criminology in the next decade is considering the extent to which micro- and meso-level processes operate invariantly across different macro contexts.

Bio

John R. Hipp is a Professor in the departments of Criminology, Law and Society, and Sociology, at the University of California Irvine. His research interests focus on how neighborhoods change over time, how that change both affects and is affected by neighborhood crime, and the role networks and institutions play in that change. He approaches these questions using quantitative methods as well as social network analysis. He has published substantive work in such journals as *American Sociological Review*, *Criminology*, *Social Forces*, *Social Problems*, *Mobilization*, *City & Community*, *Urban Studies* and *Journal of Urban Affairs*. He has published methodological work in such journals as *Sociological Methodology*, *Psychological Methods*, and *Structural Equation Modeling*.

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Introduction: Defining ‘Spatial Criminology’

This paper takes stock of recent advances, as well as enduring and emerging challenges, in the area of spatial criminology. To begin, we must first delineate what is meant by *spatial criminology*. Much criminological research is rooted in the insight that place matters in some way, whether the goal is to explain differences in phenomena across various geographic units, or to examine the effect of geographic context on individual outcomes. We argue that while place and space are fundamentally intertwined, *spatial criminology* is distinct in its attempt to measure and theorize explicitly spatial processes and relationships. Two examples of recent research should aid in elucidating this distinction.

First, traditional studies which examine the effect of neighborhood structure on community outcomes like collective efficacy would not qualify as spatial criminology according to our definition, though they are rooted in theories and methods focused on place and context. That is, place-based research that measures geographic units (e.g. blocks, tracts, neighborhood clusters, counties, etc) as independent, is fundamentally aspatial and is thus bracketed out of our current focus (although we consider the theoretical relevance of such studies in the conclusion). We instead consider recent work by Browning and colleagues (Browning et al 2017a, Browning et al 2017b, Browning et al 2017c, Browning & Soller 2014) on the relationship between “ecological networks” (or the degree to which routine places patronized by residents overlap) as indicative of spatial criminology as it explicitly considers residents’ use of space in the development of collective efficacy. Second, a similar argument can be made in regards to scale. A typical “neighborhood effects” approach which examines the effect of racial-ethnic heterogeneity on crime at the tract-level without consideration of the underlying spatial process

would not qualify as spatial criminology, despite the neighborhoods focus. However, recent work by Boessen and Hipp (2015) suggests that racial-ethnic heterogeneity (among other constructs) can operate differently (and simultaneously) at different scales (e.g. streetblock, block group, broader spatial areas).

Our interest in this review is not only to assess recent methodological advances, but to take stock of the role of theory in spatial criminological research. We draw upon Logan's (Logan 2012, Logan et al 2010) notion of *spatial thinking*, or "...the consideration of the relative locations of social phenomena, the causes of the locational pattern, and the pattern's consequences." In his review of spatial thinking in the social sciences, he argues that "...the underlying issues are not technical but substantive," a point with which we agree and use to anchor our current discussion (Logan 2012). In drawing upon the notion of *spatial thinking*, we expand it and further distinguish *spatial-contextual thinking*. Spatial-contextual thinking accounts for spatial processes – the movement of individuals, social and physical boundaries, the presence of crime-attracting or crime-reducing facilities and the spatial extent of their influence, the proper scale of a particular phenomenon, and others associated with distance, proximity, exposure and access – while also situating these spatial processes in a place-based social context. Spatial-contextual thinking is also evidenced in studies which examine how characteristics of nested socio-spatial units interact to affect crime.

Given recent advances in the precision of spatial data and methodologies to analyze it, studies in spatial criminology increasingly draw upon multiple theoretical perspectives to address their research questions. Often the data and methods used by researchers in recent years are so novel that theory is at best used in a post-hoc manner to explain findings rather than to generate testable hypotheses. In some ways this indicates a limitation of recent research, but in others it

points to an increasingly inductive approach to understanding spatial findings. In this paper, we discuss key studies of the past decade which mobilize novel data collection and methodologies to theorize spatial processes as they relate to crime. In doing so, we hope to highlight areas in need of scholarly attention, promising modes of inquiry, and future directions in spatial criminological research.

BACKGROUND OF THEORIES

While there have been significant methodological advances in spatial criminology in the past decade, scholars tend to rely on a few traditional criminological theories. In some ways this speaks to the strength of the theories. However, we argue that data availability and methodological progress has outpaced theoretical development in some respects. Many scholars pushing the field forward in these regards often make sense of their results by applying insights from traditional theories in a post-hoc manner, relying on implied, rather than explicitly measured, mechanisms to explain observed effects. This has the effect of an accumulation of empirical findings that could amount to new theoretical insights but are instead interpreted through a more traditional lens. But methodological progress allows for new ways of thinking about and understanding human spatial behavior in an historical moment of changing urban contexts, which may provide an opening for developing new theoretical perspectives.

In this review, we suggest the need for scholars to more explicitly work out the link between theory and measurement in the context of spatial processes. We highlight exemplary studies which have extended theory in interesting and useful ways. Indeed, recent reviews of spatial approaches in criminology have underscored the need for careful spatial thinking and the theorizing of spatial processes to aid and compliment advances in methodology (Tita & Radil 2010a). Here we review the salient theories and the scales at which they are thought to operate

before reviewing key studies which link theory with measurement to understand spatial relationships.

The theories put forth in spatial criminological studies can be organized into three principle foci: theories of criminal opportunity which focus on the factors which influence the spatial location and concentration of crime; theories of community social control which focus on how structure comes to shape neighborhood rates of crime through its effect on emergent properties of the community; and theories which seek to explain how characteristics of space and place undergird motivations to commit crime. These three theoretical foci are generally understood to operate at different spatial scales. Opportunity theories tend to be conceptualized and measured at the micro-scale of blocks or street segments. Theories focused on social control are typically situated at a meso-scale of the neighborhood, which is operationalized a number of ways, either as census units or more spatially conscious units (e.g., egohoods). Theories which connect space and place with the motivation to commit crime are generally situated at the meso-level, or more macro units such as cities, depending on the exact research question.

Opportunity Theories: Underlying many opportunity theories are the insights of routine activities theory, which posits that crime requires the combination of three ingredients: 1) motivated offenders, 2) suitable targets, 3) the absence of capable guardians. A significant and persistent challenge for testing the theory is defining exactly who qualifies as an offender, when or who or what constitutes suitable targets and in what scenarios, and who assumes the task of guardianship across contexts. Prior research in the victimization literature detects considerable overlap in offenders and victims (see Jennings et al 2012), and ecological work suggests that in some contexts those traditionally thought of as offenders can take on a guardianship role (Pattillo 1998). Furthermore, the functional form of the equation in which these ingredients lead to crime

incidents is not specified in the theory (Hipp 2016) and is rarely estimated in empirical studies. Nonetheless, the core insight of routine activities that these three ingredients are needed for a crime incident is a useful framework, and informs much spatial criminological thinking.

Crime pattern theory (Brantingham & Brantingham 1984: Chapter 12) is explicitly spatial, as it focuses on where offenders, targets, and guardians move about the landscape. It leans heavily on a psychological perspective, focusing on how offender search patterns are shaped by their awareness space. The theory builds on Kevin Lynch's (Lynch 1960) concepts of paths, edges, and nodes to hypothesize their role in impacting crime (Brantingham & Brantingham 1993). It also incorporates a more macro perspective in conceiving of an urban backcloth that shapes these movement patterns—this backcloth has a geographical component in which physical features impact movement, as well as a sociological component in which the socio-demographic composition of micro- and meso-level areas is presumed to be important. Despite the explicit spatial implications of this theory, it is nonetheless the case that a large body of empirical work has employed the theory to only focus on targets—and therefore does not consider offenders or where they move—whereas another body of literature focuses solely on offenders. Fewer studies have been able to empirically draw together the various strands of this theory for empirical tests.

Another perspective builds on routine activity theory, but leverages the insight that nearly all social behavior is governed by a distance decay function to propose a general theory of spatial crime patterns (Hipp 2016). This approach aims to predict crime patterns based on estimates of where offenders live, and where we might expect offenders and targets to travel. The theory proposes that a distance decay parameter strongly constrains the movement of targets and offenders, such that those movements can be predicted reasonably well. Based on this

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information, a *crime potential* can be estimated at each block at each time period (e.g., 10 minute periods). It is enough that humans behave “as if” the distance decay drives their movement for the theory to generate useful predictions. The strength of the theory is the ability to make general claims about what spatial patterns of crime should occur across different cities.

Theories of Community Social Control: At the meso-level, the dominant theory of neighborhood crime is social disorganization theory (Shaw & McKay 1942). It posits that structural conditions such as concentrated disadvantage, residential instability, and racial/ethnic heterogeneity reduce neighborhood cohesion and the willingness to engage in informal social control behavior to reduce crime (Bursik 1988, Sampson & Groves 1989). In the early empirical tests of the theory, researchers assessed whether these structural characteristics explained the location of offender residences. In more recent decades, the focus has shifted to whether these characteristics explain residents’ ability to engage in informal social control—which in principle can discourage crime incidents from occurring at the point of the incident. With the increasing geographic precision of data, there is a growing need to distinguish between where a crime incident occurs, and where the offender lives, as they will typically not be located in the same geographic units when units become so small.

Other meso- and macro-level research focuses on how forms of racial and economic inequality serve as inducements to criminal offending through perspectives like relative deprivation theory and the racial-spatial divide framework. Relative deprivation theory, rooted in reference group theory (Merton 1968) and strain theory (Agnew 1999), puts forth the argument that perceived inequality can serve as an inducement to criminal behavior. In comparing themselves to a reference group, individuals may feel deprived of an equitable share of resources and may respond with criminal behavior in turn. Property crime may be committed in an attempt

to gain economic resources while violent crime can be seen as retribution. Defining the relevant reference group is a persistent challenge to empirical tests of the theory, and as applied to spatial criminological work, entails a careful consideration of scale at which inequality becomes salient to such perceptions.

The racial-spatial divide framework is borne out of the racial-invariance hypothesis which posits that structural conditions (i.e., disadvantage) predict crime similarly across racial-ethnic groups, and across neighborhoods of varying racial-ethnic compositions (Sampson & Wilson 1995). Racial inequality in social and economic conditions, and unequal access to resources and power, creates a hierarchy among places such that poverty concentrates in non-white (and most severely in black) neighborhoods to a degree that simply does not exist in white neighborhoods. Thus, criminogenic conditions take on a spatial patterning which coheres with patterns of racial segregation, providing inducements to offending and compromising neighborhood informal social control (Peterson & Krivo 2010).

In sum, the theories relevant to a spatial criminological approach provide different justifications for linking space, place, and crime, and are thought to play out on different socio-spatial scales. The focus for some is to predict where crime occurs and concentrates while others are more concerned with the etiology of crime, but all are inherently spatial in drawing out these connections. In the past, theoretical development often occurred prior to empirical testing due to data limitations. For example, while various revisions and extensions of social disorganization theory emerged in the late 20th century, it took time for data collection efforts to allow for the testing and refinement of these propositions. We argue that we are now in the opposite predicament. The increasing availability of point-level crime incident data from police departments allowing for the application of spatial clustering techniques and micro-level

aggregation, as well as other social data on place, has to some degree outpaced theoretical development. Despite the wide variety of social phenomena related to the ecology and spatiality of crime studied by criminologists, we continue to rely on extant theory. In some ways, this reflects the durability of these perspectives over time. However, given that many of these studies are often not able to test the mechanisms implied by such theories but still rely on them to make sense of their findings, it may be time to reflect on some empirical insights from recent work to push theory forward into the 21st century. While this is our general call to researchers, there has been excellent work in the spirit of theory development, in part borne out of new forms of data and analysis which we highlight here.

Considering Spatial Behavior

In this section we examine the ways in which researchers have considered the spatial nature of crime outside of the traditional confines of neighborhood boundaries. They mobilize the theories discussed above, as well as insights from other fields, to understand ways in which urban actors use space and the implications of population movement for the spatial distribution of crime. They often consider how social and physical conditions constrain or structure individual spatial behavior. Here we highlight the challenges faced in this exciting direction of research, and discuss exemplary studies which constitute promising theoretical developments in the field.

Geographic Precision - Where Crime is Concentrated: The increasing geographic precision of data has had various consequences for the direction of research. One consequence is that studies are, on average, using smaller and smaller geographic units. Cities and counties were a common unit of analysis decades ago, followed by a growth in studies using meso-level units of analysis (i.e. neighborhoods, census tracts, block groups, etc), but in the last decade there

has been an explosion of studies using small units such as blocks or street segments. This ability to use smaller and smaller geographic units has raised the question of the “proper” unit of analysis, and whether some geographic units are more appropriate than others.

This question of the proper geographic unit of analysis has led to a spate of studies assessing the degree of crime concentration at different geographic scales. These studies frequently observe that a higher percentage of the variance occurs in the smallest geographic units (Schnell et al 2016, Steenbeek & Weisburd 2016). The conclusion, sometimes implicit but often explicit, is that this smallest unit is the optimal unit. There are problems with this conclusion. First, using a multilevel model to decompose variance—as these studies typically do—presumes that the various geographic units are exclusive and proper. The problem with this strategy is that there is lack of agreement on defining neighborhoods, with some proposing that they do not even operate as discrete non-overlapping units (Hipp & Boessen 2013). In a multilevel model, the variance attributed to this meso level is crucially dependent on how the meso level is defined. Second, only detecting variance, but lacking the ability to explain it, does not push the scientific process forward. Third, ignoring larger geographic units can pose problems, as cross-level interactions between micro-level and meso or macro-level characteristics may explain variability within micro units. Finally, an exclusive focus on the micro location necessarily ignores where offenders (and even potential targets) live, and given their patterned spatial behavior such an approach will necessarily miss out on how this impacts the location of crime (Hipp 2016).

In light of these issues: is there a single proper unit of analysis (Taylor 2015)? Borrowing from the logic of routine activities theory, if offenders and targets (and even guardians) move about the spatial landscape, arguably any particular unit of analysis will not be

satisfactory. Indeed, Hipp (2016) proposed explicitly accounting for where offenders and targets live, and where they likely travel, when creating predictions for the location of crime. This would imply there is no single proper unit to use.

Given that individuals move about space, there is likely not a single “proper” geographic unit of analysis, but rather a need to measure constructs at different geographic levels (Boessen & Hipp 2015). Measuring concepts of interest at the unit of analysis at which they operate can allow us to more appropriately model when and where crime occurs. However, another question that is less often addressed in existing spatial criminology research is a distinction between whether the processes observed causally affect the amount of crime observed, or whether they simply shift its location. That is, if we are interested in understanding why some larger units (such as cities) have more crime than others, can micro or meso theories help in answering this question? If they do not, this would imply that micro and meso processes simply explain the location of crime—that is, they shift where crime occurs—and do not impact the etiology of crime. However, if micro- or meso-level processes have a causal impact on crime, then there should be a way to aggregate these constructs (in either linear or nonlinear ways) to the larger unit and at least observe a correlational relationship. Rather than mechanically assessing whether certain covariates are associated with the level of crime in a geographic unit, what is needed is a consideration of spatial patterns and how they impact crime. We turn to this question next.

Offender and Target Movement: Spatial criminology is driven by a fundamental observation: offenders, and to some extent targets (depending on the type of crime), are not fixed at one point but instead move about. This insight necessitates accounting for this movement when modeling the location of crime. For example, there is a large literature discussing offender

movement patterns, which consistently finds that they exhibit a strong distance decay effect. That is, offenders are more likely to offend closer to home than further away, but the slope of this decay function is gentle enough that the average distance to robberies is about 1.5 miles (Rossmo 2000).

Arguably the most explicit theoretical grounding in this offender mobility observation is the theoretical work of Wikstrom (2010). In his Situational Action Theory, it is the combination of a potential offender's propensity to commit crime, intersecting with the opportunities contained in the local environment, that brings about crime incidents—a model he refers to as the person and place interaction. Of course, modeling this process requires an enormous amount of data, not only because of the need to follow precisely where potential offenders travel throughout the day (he uses a space-time budget over a very short time period to have respondents recall this information), but because crime incidents are in fact extremely rare events.

There are multiple strategies for thinking about and measuring the movement of both potential offenders and targets. Some strategies leverage data on street networks and insights on offender movement tendencies. Recent studies have built simulation models based on the expected paths of offenders to predict crime locations (Reid et al 2013); others use street networks to measure expected travel flows (Johnson & Bowers 2009); and others find that streets expected to have more traffic—measured with the social network measure of betweenness—experienced higher burglary risk (Davies & Johnson 2014). Other approaches work from the notion of an environmental backcloth put forth by the Brantinghams, measuring the distance to various nodes and paths to assess whether this helps explain the location of crime events (Deryol et al 2016). Yet another approach used data on arrested offenders coupled with survey data on transportation flows, finding that this inflow was associated with both visitor offenders and

visitor targets in crime incidents (Boivin & Felson 2017). Another strategy is to create a typology of the movement patterns that characterize both the offender and the target of a crime, and one study of homicide locations came up with five combinations of victim and offender mobility: internal, predatory, intrusion, offense mobility, and total mobility types (Tita & Griffiths 2005).

Related work premised on opportunity perspectives considers the presence of ambient populations across places and times of day using unique data sources. For example, one study used “crowd-sourced” social media data to measure the population at risk, and then used this information as a denominator when constructing crime hot spots at various time points (Malleon & Andresen 2015). Another study used geo-located Twitter data with the time and location of persons to assess the relationship between the size of the ambient population typically at a location during a specific hour of the day and the amount of crime during that hour (Hipp et al 2017a). However, the ambient population has a complicated relationship with the presence of offenders, targets, and guardians, an issue to which we will return shortly.

Boundaries: The spatial behavior of individuals is not random, but rather structured by the built environment. Many built features may be important, but the presence of different types of boundaries has attracted attention in recent work. As an example, the presence of a freeway onramp can make a robbery location more attractive due to an easier getaway. Crime pattern theory posits that the boundaries between two areas based on land use characteristics can increase crime opportunities, in part due to the possibility of fewer guardians because of the transitory nature of such locations, but also because such locations might make escape quicker and easier for offenders. Empirical evidence suggests that locations at which land use change occurs have higher levels of crime (Song et al 2015).

An interesting development in this literature is the notion of social boundaries. Recent work by Legewie (2018) used an areal wombling technique to detect boundaries based on sharp changes in racial-ethnic composition, drawing on multiple theories to argue that “...boundaries lack the social control and cohesion of adjacent homogeneous areas; are contested between groups, provoking intergroup conflict; and create opportunities for criminal behavior” (Legewie 2018). The study found that violent crime is higher at these boundaries net of neighborhood characteristics, measures of spatial interdependence, and other physical boundaries. Kim and Hipp (2018) examined the effect of city boundaries, finding that nearness to the city boundary as a distance decay appeared particularly important for motor vehicle theft, consistent with the notion that offenders may target nearby municipalities to reduce (or slow) the possibility of police agencies identifying a string of such thefts as a serial chain (reducing their possibility of apprehension).

Gang boundaries are another important consideration. Taniguchi et al (2011) constructed Thiessen polygons to address the spatial extent of the effect of gang drug dealing sites on crime and apportioned area sociodemographics to the polygons. They found that gang drug dealing sites were associated with higher violent and property crime, particularly when multiple gangs were associated with a corner, net of sociodemographics. Moving beyond routine measures of spatial lag, Tita and Radil (2011) used a survey of police and gang members to uncover rivalries between twenty-nine different gangs. They found that the network connections between the census tracts where these rivalries are embedded were better predictors of the spatial distribution of gang-related violence than more traditional measures of proximity or distance. Another study extended this idea by combining gang boundaries with social network measures to explore the spatial distribution of gang violence (Papachristos et al 2013), finding that adjacency in gang turf

to be a strong predictor of subsequent violence and that spatial and network measures mediate racial effects.

Spatial Behavior and Community: Other work considers how the spatial behavior of neighborhood residents structures their interaction and the development of community characteristics such as cohesion and informal social control. Our own recent work considers residents' use of space in a study of interaction and cohesion – antecedents to neighborhood social organization. We apply the logic of “third places” (Oldenburg 1999) as places conducive to informal interaction and sociality to the neighborhood context, arguing that their presence “provides the socio-spatial opportunity structure for neighborhood interaction and the development of cohesion” as residents come to know one another, at least by sight, through repeated encounters in such places (Williams & Hipp 2019). Concerned with choosing a spatial unit and scale that best captures the ways in which residents use space, we employed half-mile egohoods around the respondents' census block, corresponding to about a 15 minute walk (Duany et al 2010), which better reflects how residents define and use their neighborhoods (Hipp & Boessen 2013) compared to census units. We stratified the analyses by poverty strata, arguing that the amenities of affluent neighborhoods are likely to draw in patrons from around the city, potentially leading to greater anonymity, while third places in poor neighborhoods are more likely to be frequented by local residents. Indeed, we find that third places contribute to cohesion in the poorest neighborhoods, and that this relationship is explained by the effect of third places on neighbor interaction (Williams & Hipp 2019).

In a similar vein, Wickes et al (2018) conceptualize ‘social conduits’ as land uses conducive to interaction, and find their presence in neighborhoods to be associated with social cohesion net of controls. They conceptualized four different types of social conduits – *anchoring*

conduits “support repeated encounters at scheduled points in time” (e.g., schools, childcare centers, churches); *local exposure conduits* support encounters at unscheduled times (e.g., parks, shops, pubs); *scheduled conduits* provide scheduled activities for a wider range of users (e.g., restaurants, cinemas, train stations); and *extra local exposure conduits* support unscheduled encounters among diverse users (e.g., shopping malls). They find that *local exposure conduits* predict neighboring while *anchoring conduits* predict neighboring, social cohesion, trust, and place attachment.

Browning et al (2017c) put forth the notion of econetworks, or the connections between people and their routine activity spaces (Browning & Soller 2014). Drawing on social disorganization theory, activity space perspectives, and the insights of Jacobs (1961), the authors propose that the *extensity* of econetworks (the proportion of other households in the network to which individual households are tied through any location) and econetwork *intensity* (extent to which household dyads are linked through multiple locations) work as determinants of neighborhood social organization. Indeed, they find that neighborhoods with greater econetwork *intensity* show higher levels of intergenerational closure, collective efficacy, and social network interaction and exchange. Greater econetwork *extensity* was associated with higher levels of collective efficacy and intergenerational closure.

In related work, Browning et al (2017a) argue that econetwork intensity, measured with micro-simulations of household travel patterns at the tract level, contribute to greater public familiarity, trust and collective efficacy which should reduce crime. The authors find that greater eco-network intensity is indeed negatively associated with tract-level crime rates, but that a higher prevalence of non-resident visitors in a tract is associated with heightened rates of property crime. Thus, this collection of studies focuses on how the built environment and

residents' use of space is related to interaction and collective efficacy, and in this case, the control of crime. This important development acknowledges that neighborhoods are more than just the aggregate characteristics of residents, but spaces which provide an opportunity structure for interaction with implications for rates of crime.

These findings highlight a tension in the crime and place literature. That is, the relationship between places or “activity nodes,” social organization, and crime appears to be far more nuanced and complex than the notion of “crime attractors, generators and detractors” (Brantingham & Brantingham 1995) generally put forth in crime pattern theory. Places and land uses not only structure the flow of offenders, targets, and guardians, but they are also crucial for social interaction and public familiarity, the building blocks of cohesion and consensus regarding informal social control or guardianship. Places are also imbued with meaning in regards to the function they serve in a community, and are not merely receptacles for more or less criminal opportunity. We argue that the field can move forward by attempting to reconcile both the theory and empirical insights derived from both lines of research, which would not only offer a more comprehensive understanding of the crime and place nexus, but should inform future directions of research. This tension also has implications for the policy insights stemming from spatial criminology. Considering that places can serve a dual function of increasing opportunity for crime, but also opportunity for interaction, researchers must exercise caution in relating their findings to urban planning policy.

CRIME CONCENTRATION AND CONTEXT

The regularity with which crime appears to concentrate in neighborhoods and small geographic units such as street segments gave rise to the notion of a Law of Crime Concentration (Weisburd et al 2012). The provocative claim is that for a defined measure of crime at a specific

microgeographic unit, the concentration of crime will fall within a narrow bandwidth of percentages for a defined cumulative proportion of crime within a particular macro unit (Weisburd 2014). One study compared calls for service for any reasons across eight cities and concluded that such a law appears to exist (Weisburd 2014), and several subsequent studies have looked at a single city or a couple of cities and concluded that they found supportive evidence for this Law (e.g., Andresen et al 2016, Haberman et al 2016).

The potential of a law of crime concentration is quite exciting, given the apparent power of a scientific law. However, if it were to exist, it would pose some interesting theoretical challenges to those adopting an explicitly micro approach to studying the distribution of crime, as it would be quite difficult to construct a micro-level theory that would give rise to a similar concentration of crime across various macro units. Indeed, a macro-level theory may be required to explain such consistent micro concentration levels across macro units (Hipp & Kim 2017: 601-603).

However, the presumption that there is consistent evidence for such a law of crime concentration is in fact questionable. As outlined by Hipp and Kim (2017) there are four primary empirical challenges to measuring this Law. First, it is not clearly specified how much variability we should expect to actually observe: without a precise bandwidth, any observed level of concentration greater than zero might be taken as supportive “evidence”, when in fact the law proposes (albeit not explicitly) some narrower band of values. Second, it is not clear what constitutes a proper macro unit, or the appropriate range of sizes of such units, across which concentration should be measured. It is typically presumed that a city is the proper unit, but given that cities are political units that do not have obvious boundaries that impact social life, it is not clear that cities would be appropriate. Third, there are some statistical challenges when

measuring crime concentration, including the challenge of the proper baseline to compare the concentration against. Although many studies use a uniform distribution as the baseline, arguably a Poisson is a more appropriate baseline distribution (Eck et al 2017). A related problem occurs when there are relatively small numbers of crime events across a city, such that there will be a certain degree of “concentration” for mathematical reasons unrelated to any concentration law (Bernasco & Steenbeek 2016). Naïve approaches that fail to correct for these challenges are, in the extreme, not providing evidence of concentration. A fourth challenge that also has received limited consideration is which temporal assumption is employed when measuring high crime locations (Hipp & Kim 2017). Should such concentration exist over a month, six months, a year, a few years, or many years (Mohler et al 2017)? And should it be consistently concentrated over all these temporal scales?

Beyond these methodological challenges, there is evidence from a study of 42 cities in southern California with at least 40,000 population over the period of 2005-12 that the level of crime concentration across cities for five different Part 1 crimes is not as consistent as one would expect for such a law to operate (Hipp & Kim 2017). This study highlighted that the traditional measure of crime concentration is confounded by the spatial randomness of crimes. In response, it used two measures employing different temporal assumptions: a historically adjusted crime concentration measure, and a temporally adjusted crime concentration measure (which sorted units based on the number of crimes in the *prior* year), which both showed considerable variability across cities. While such empirical evidence is at odds with a Law, it does arguably open an exciting new area of research that attempts to explain *why* levels of crime concentration differ across cities. Explanations for such patterns could be generated by micro-level theories

that generate different concentration patterns, or could be generated by macro-level theories in which a top-down process from the larger unit explains this process.

This raises the general question of how the broader spatial context shapes crime in smaller units nested within it. In the sections to follow, we review studies which have integrated insights from multiple theories to understand how the characteristics of nested spatial units interact to influence crime. We argue that these efforts represent an important emerging focus in the field that can leverage advances in data collection to test the generalizability of extant theories across contexts. Further, such an approach provides the basis for theory development in the spirit of spatial-contextual thinking which not only considers the scale at which certain processes play out, but the potential moderating effects of the broader context.

IMPACT OF NEARBY CONTEXT ON THE MICRO-PLACE

While the advent of point-level data has led to insights regarding spatial crime concentration, and a growing field of micro-level studies, recent work has also considered the broader neighborhood context, beyond noteworthy efforts to apportion and control for broader characteristics at the micro level (e.g. Groff & Lockwood 2014). There are different theoretical justifications for linking characteristics of the micro-place to those at the meso-level, and we highlight studies which take different perspectives on the topic. Jones and Pridemore (2018) propose a multi-level approach which integrates micro-level opportunity perspectives with social disorganization theory. Although the authors do not theorize *why* micro-level characteristics should interact with social disorganization measures at the meso-level explicitly, this work is informative as they find that indicators of opportunity and social disorganization both matter for crime at the segment-level, and that the inclusion of neighborhood measures improved the fit of their models. Other studies have taken a similar approach to studying how the context

surrounding crime attractors/generators conditions their effect on crime (Boessen & Hipp 2018, Contreras 2017, Contreras & Hipp 2019, Kubrin & Hipp 2016, Stucky et al 2012).

Browning and Jackson (2013) draw upon urban ecological theory (Hawley 1950, Jacobs 1961) and make novel use of the PHDCN data to examine how street ecologies (active streets, or “eyes on the street”) have a variable effect on crime depending on the social organizational conditions (anonymity and collective efficacy) of the broader neighborhood ecology. They integrate insights regarding territorial behavior drawing on the early work of Taylor (1988), the work of Cook (1986) on offender decision making, and on social disorganization theory, particularly the notion of collective efficacy (Sampson 2012). They argue that low levels of active streets may increase crime as it increases the pool of potential victims, but at some higher threshold active streets increase the prevalence of potential witnesses, offsetting the attractiveness of available targets, an insight echoed elsewhere in more traditional micro-level work focused on opportunity (Bernasco et al 2017, Felson & Boivin 2015). And indeed this is what the authors find – a criminogenic effect of active street prevalence at low levels and a regulatory effect at higher levels. While collective efficacy did not appear to have an interactive effect with active streets, the authors find that anonymity slightly mitigated the protective effect of active street prevalence on homicide.

Boessen and Hipp (2015) argue that micro-place studies risk missing important processes operating at a broader spatial scale. Conversely, meso-scale studies assume, either in theory or in practice, that crime is evenly distributed within neighborhoods, suggesting that “...’neighborhood’ as a unit of analysis seems unsatisfactory because it is too *large* and because it is too *small*” (Boessen & Hipp 2015). They argue that scale is particularly important for distributional measures such as racial-ethnic heterogeneity, finding that heterogeneity increased

crime at the neighborhood-level (block group) and broader spatial area (5 miles surrounding the neighborhood with a distance decay), but decreased crime at the block level. Further, homogenous blocks within highly heterogeneous block groups have the most crime, suggesting that within-neighborhood segregation matters for crime, and that the *meaning* of homogeneity/heterogeneity at the micro-level is best understood in relation to heterogeneity in the surrounding neighborhood. While past work has stressed the role of isolation from the rest of the city for crime (Wilson 1987), this suggests the same process could operate within neighborhoods, as a homogenous block within a heterogeneous neighborhood implies greater social distance, and thus fewer social ties, between that block and the rest of the neighborhood, which has been found to be consequential for crime at other spatial scales (Bellair 1997). These results indicate that different processes can have a simultaneous influence on crime at different spatial scales, and that the context in which a particular spatial or distributional phenomenon occurs is important for understanding its effect on crime.

We argue that linking micro-level characteristics and processes with the broader neighborhood ecology represents an important advancement in spatial criminology. It is our view that crime in place is not wholly a function of opportunity, not wholly a function of social controls, and not wholly a function of contextual inducements to offending. Rather, these three pillars of spatial criminological theory coalesce to produce places and neighborhoods with differential levels of crime, suggesting the need to understand how they interact. Importantly, the context in which aspects of opportunity, control, or criminal inducements play out shapes their relationship to crime. Pursuing this research focus has the potential to provide avenues for new theoretical development and explain variability across macro contexts such as cities.

NEIGHBORHOODS AND THE BROADER SPATIAL CONTEXT

Neighborhoods are not islands unto themselves (Mears & Bhati 2006), as studies which measure only internal dynamics have sometimes imagined them, and there are various reasons to suspect that the surrounding context is consequential for a neighborhood's level of crime.

Neighborhoods have permeable borders and both social and institutional ties extend beyond their boundaries, which is particularly true for arbitrary census units (Hipp & Boessen 2013, Sampson & Morenoff 2004). Relatedly, individual mobility has implications for how we think about the spatiality of inequality and segregation, captured in the recent 'neighborhood network' approach (Browning et al 2017b, Graif et al 2017, Papachristos & Bastomski 2018, Sampson 2018, Wang et al 2018). Early spatial studies focused on the diffusion of violence, due in part to retaliatory homicides and gang activity (Cohen & Tita 1999, Morenoff et al 2001, Sampson & Morenoff 2004, Tita & Radil 2010b). Further, neighborhoods are linked together and to the broader urban ecology in relation to the city polity and the distribution of resources (Bursik & Grasmick 1993, Logan & Molotch 1987, Sampson 2012), which has implications for the control of crime. Thus, within the realm of what would qualify as spatial-contextual thinking, there have been varying approaches to, and theoretical frameworks by which to interpret, the connection between space and context.

Past work finds that structural conditions in the surrounding context can exert influence on crime rates in focal neighborhoods, independent of the effect of internal neighborhood dynamics, and recent work continues to explore this topic. Wickes and Hipp (2018) find that both internal and nearby changes in sociodemographics influence neighborhood informal social control. Hipp and Kubrin (2017) draw on social disorganization theory, routine activities and crime pattern theory, and relative deprivation theory to understand how changing economic inequality within a neighborhood and throughout a 2.5 mile radius around it shape changes in

crime over a ten year period. They argue that past studies of inequality and crime situated at the neighborhood level tend to find null or weak relationships given the relative homogeneity in census-delineated units. Within the focal neighborhood, inequality is indicative of heterogeneity in residents' economic standing and can impede interaction and the development of informal social control. At the broader spatial scale, inequality may reduce social ties which extend outside the immediate neighborhood, with implications for securing the resources needed to address crime problems. Awareness of inequality at the broader scale may engender feelings of injustice, serving as a source of motivation to offend, and coupled with the increased opportunity for crime due to proximity to more wealthy residents, may result in higher crime. They find that increasing inequality in the broader area is associated with greater increases in crime in the focal neighborhood, especially among neighborhoods experiencing increasing average household income and increasing inequality (Hipp & Kubrin 2017).

Johnson et al (2015) take a creative approach to this issue at a larger spatial scale, focusing on how structural characteristics of jurisdictions associated with the systemic model and the racial-spatial divide framework explain a jurisdiction's position within a cluster of high violence jurisdictions, low-violence jurisdictions, or in a mixed-violence cluster. Using data on the 355 jurisdictions situated within the Philadelphia-Camden metro area, the authors conduct a LISA analysis to identify where violent crime clusters and then predict cluster classification based on insights from the two theories. They find that measures of SES and stability were related to lower chances of being in a higher violence region, and that internal racial composition did not have an effect. However, reflecting the insight that proximity to the privileges afforded to white communities is associated with the resources to keep violence low, the authors find that being surrounded by more predominantly white jurisdictions is associated with higher chances of

being in low violence sub-region, and lower chances of being in a high- or mixed-violence sub-region. Taken together, this work suggests that broader spatial processes are distinct from those of internal neighborhood processes, and that theory should grapple with how identical measures can take on different social meanings and have different impacts on crime and its spatial distribution depending on the context surrounding neighborhoods.

THE CITY CONTEXT

One implication of a law of crime concentration is a need to understand whether micro processes operate similarly across city contexts, and yet a major limitation of spatial criminology research is the lack of evidence regarding this point. In part, this is a data limitation issue – in the past it has been difficult enough to collect spatially precise data for a single city, and therefore studies have often been limited to a single city. Indeed, the Chicago School made the single city of Chicago its laboratory. As a consequence, scholars have been left with the assumption that whatever processes are observed will generalize to other city contexts, though the uncertainty of generalizability has become a routine passage in the “limitations” section of papers, without further insight. Even given its predominance as a theory of communities and crime, the empirical literature on social disorganization suggests that results differ across contexts (Groff & Lockwood 2014, McNulty 2001, Morenoff et al 2001, Rountree & Warner 1999, Sampson & Raudenbush 1999, Wilcox et al 2004). However, assessing the consistency of micro- or meso-level patterns across studies in different contexts is typically quite difficult given varying methodological decisions across studies, and because studies typically have a unique empirical focus.

To date, no studies of micro-level processes across a large number of cities exist. Given the limited number of cities with micro-level crime data, one strategy is to strategically select a

small number of cities for comparison purposes. As one example, a study selected four cities that varied along micro- and macro-environment population (Hipp et al 2017b). Defining micro-environment population as the population density in the local meso-level, and macro-environment population as the population within a larger predefined area size (e.g., within 20 miles), the study assessed robbery rates in the blocks of four cities: 1) San Francisco (high in micro- and macro-environment population); 2) Honolulu (high in micro- but low in macro-environment population); 3) Los Angeles (low in micro- but high in macro-environment population); 4) Sacramento (low in micro- and macro-environment population). The study found that the size of the population up to 2.5 miles away impacted robbery rates, especially in the two cities with less dense micro-environment population. Such results are consistent with the journey to crime literature about the distance offenders tend to travel, and also provide suggestive evidence that offenders may travel longer distances in lower density environments (Hipp et al 2017b: 16). They also found evidence that coefficient estimates differ somewhat more between cities differing in micro-environment population compared to those differing based on macro-environment population, which may provide a clue to where future research may wish to explore macro-level variability for understanding the generalizability of micro-level processes.

There are other reasons to consider the city context as it interacts with micro- or meso-units. The first relates to the ability of spatial criminology to put forth meaningful policy recommendations. While some argue that a “small wins” approach (Weick 1984), where programs are designed to intervene at the street block level, would be more successful (Taylor 2015), we argue that interventions that do not address broader social conditions are likely to be stymied by persistent disadvantage. An alternative approach is to recognize that structural and

situational characteristics conducive to crime exist in varying configurations in neighborhoods as a social fact attributable to broader patterns of stratification, but that the effect of these configurations on crime might be moderated by city-level policy.

Second, the accumulation of single-city studies can lead to mixed results. While mixed results can be attributed to a number of decision points researchers face when crafting an analysis, it could also be due to unmeasured contextual factors. That is, the same phenomenon could have different social meanings and consequences for crime depending on the broader context in which it occurs. Considering these city-level contextual effects should also allow for more concise theory building. Much of the empirical work based on traditional criminological theories of place focus on “global” methods which show the average effect across units, a problem underscored by recent work focused on the spatial heterogeneity of macro-level processes (Cahill & Mulligan 2007, Graif & Sampson 2009, Light & Harris 2012). Thus, considering the macro-level contingencies which shape the relationship between some lower-order spatial process and crime is a desirable line of theory development.

When it comes to the question of whether meso-level processes differ across cities, arguably the most important contribution to this literature comes from Peterson and Krivo’s National Neighborhood Crime Study (NNCS) data collection effort of over 90 large cities (Peterson & Krivo 2010). In one study using 36 large cities from the NNCS they found that not only does the neighborhood level of disadvantage matter, but spatial adjacency to heavily white areas resulted in lower crime rates (Peterson & Krivo 2009). They did not find differences across cities, although restricting their sample to only very large cities with greater than 300,000 population may have constrained macro-level variability. A second study by Krivo et al (2009) used the NNCS to explore the extent to which city-wide segregation moderated meso-level

relationships, finding that higher levels of segregation were positively associated with violent crime rates in white and various types of nonwhite neighborhoods.

Another study using the NNCS asked whether the relationship between the percent black in a neighborhood and violence differs based on the political macro context (Velez et al 2015). The study built on theories from the social movement and racial politics literatures and combined NNCS crime data with city-level measures of black political opportunities and mobilization. The researchers found that this positive relationship between percent black and crime in neighborhoods can be attenuated in cities with favorable political contexts for blacks based on their measures. In another study, this same team found that the negative relationship between immigration and crime at the neighborhood level is enhanced in cities characterized by immigrant political opportunities (Lyons et al 2013).

A strength of comparing neighborhoods across many city contexts is the ability to empirically compare theories. A study using the NNCS assessed the consequences of disadvantage measured at various scales for neighborhood level crime (Chamberlain & Hipp 2015), exploring the differing predictions that social disorganization, opportunity and relative deprivation theories make about crime when taking into account the broader areas in which neighborhoods are embedded. The study found that disadvantage both in the focal neighborhood and surrounding area increased violent crime, consistent with social disorganization theory. However, the fact that property crime was higher in neighborhoods in which there was greater difference in levels of disadvantage between a neighborhood and the surrounding area (as well as the city) was better explained by relative deprivation theory. Given the spatial uncertainty in which relative deprivation might operate (Hipp 2007, Hipp & Kubrin 2017) these results highlight the importance of gathering data across a larger number of macro units.

Baumer et al (2012) used data from 5,517 tracts nested within 50 large U.S. cities to examine whether city characteristics moderate the relationship between neighborhood foreclosures and robbery and burglary. They note that prior studies of foreclosure and crime each focused on its own unique city across regions of the country, using different spatial units, with differing measures of foreclosure and different modes of analysis, producing mixed results. They found that the effect of neighborhood foreclosures on crime may be more pronounced in “vulnerable” cities –those with less new construction, an aging housing stock, high rates of pre-existing vacancies, high unemployment and socioeconomic disadvantage as these things signal that high-foreclosure neighborhoods might be less apt to obtain external resources (various mitigation programs, vacant home upkeep) when situated in a broader political context characterized by strained resources.

Another study takes a different approach, exploring whether the spatial distribution of racial groups and inequality in neighborhoods within cities impact the level of crime at the city-level (Hipp 2011). Using a sample of 352 cities from 1970 to 2000 in metropolitan areas that experienced a large growth in population after World War II, the study hypothesized that the effect of racial/ethnic or economic segregation on crime will be stronger in cities in which these concepts are more salient (because of greater levels of heterogeneity or inequality in the city itself). The study noted that theoretical expectations differ depending on the spatial scale. At the neighborhood-level, social disorganization theory implies that racial heterogeneity or inequality reduces social interaction and potential informal social control, resulting in heightened levels of crime. Also at the neighborhood level, routine activities theory and general strain theory posit that inequality allows for the convergence of motivated offenders (the poor) and suitable targets (the wealthy) in space, and creates a sense of injustice among the disadvantaged which may lead

to violence. City-level racial heterogeneity and inequality may also interrupt political cooperation in addressing problems, resulting in more crime overall. The results indeed indicate that higher levels of segregation in cities with high levels of racial/ethnic heterogeneity resulted in higher overall levels of crime. And the same pattern was found in which greater economic segregation resulted in more crime in cities with greater overall inequality. In other words, it is the amount of variation in racial heterogeneity or inequality *across* neighborhoods that explains city levels of crime.

These studies suggest potential benefits of considering the macro context, and with increasing data availability, it will be possible to assess the consistency of micro- and meso-level processes across cities, and how they interact with city characteristics. This does present a challenge, however, as we believe macro-level theorizing is not adequately developed to address these questions. Further, it raises the question of the proper macro unit. Cities are typically used, but they are political units often embedded in larger metropolitan areas, and it is not clear that their boundaries have meaning for the spatial behavior of residents (Hipp & Kim 2017: 597). Recent work found that city *and* metropolitan conditions impacted changes in city crime between 1970 and 2010, and that the coefficients for some measures were not consistent over these decades, suggesting that theories must also take seriously macro historical changes (Hipp & Kane 2017). Although the goal of most theories is to understand a global relationship, it is important to understand and theoretically integrate the macro-level conditions which shape the general relationship, for both the strength of the theory and for the efficacy of policy recommendations. However, we warn against approaches that propose mechanical interactions between higher- and lower-order socio-spatial units without theorizing *why* the two should interact. That higher-order variability in some construct produces a significant interaction with a

meso- or micro-level construct needs to be folded into explicit theorizing to tell us something substantive and interpretable about the conditions that produce crime.

MOVING FORWARD: CONCLUSION

We have emphasized the need for scholars to explicitly consider spatial behavior when considering the location of crime. This is particularly necessary as scholars use smaller and smaller units: whereas the home residence was appropriate for measuring the composition of people when relatively large units such as cities were used, this is no longer reasonable for very small units. It is well known that persons travel about the environment through their routine activities, and this needs to be accounted for in our theories and empirical models. This movement naturally brings about a certain degree of spatial autocorrelation, and treating this in a theoretically explicit manner (rather than as an nuisance) is necessary (Tita & Radil 2010a).

The shift to examining spatial behavior raises the question of how we should assess evidence from the large body of micro- and meso-studies which do not qualify as spatial criminology, that is, those that conceive of and measure geographic units as independent. While excluded from the focus of this review, such studies are still theoretically informative. For example, neighborhood studies of collective efficacy and crime may not be capturing the proper scale at which collective efficacy operates, and to the extent that the unit is too large, such studies are at risk of committing the ecological fallacy. However, if collective efficacy truly operates at a smaller scale, measuring it as such would simply detect a stronger relationship, implying better measurement, but this would simply reinforce our theoretical understanding rather than providing new theoretical insights. Of greater concern is the extent to which prior studies, by failing to consider spatial mobility, have provided empirical results that are overturned by studies that more appropriately account for spatial processes. Nonetheless, it is an

empirical question as to how many of these prior results would be overturned, or simply refined, by adopting an explicitly spatial perspective.

A related point we have highlighted is that although the explosion of spatially precise data in recent years presents exciting possibilities, our sense is that theory is falling behind in guiding us in analyzing these new forms of data. Although we do not advocate abandoning existing theoretical frameworks that have guided criminology for many decades, there may be other processes generated by other theoretical frameworks not being considered. One possible direction would be for researchers to not remain tied to an explicit deductive empirical approach, but rather use the growing amount of data to generate inductive results that may provide insights for novel theories. As a related point, whereas some scholars in recent years have proposed linking opportunity theories at the micro level with moderating constructs at the meso-level, typically there is little explicit theorizing about which measures of the context might be important for moderating these relationships, how they might operate, or even the expected direction of such effects. In our view an explicitly spatial-contextual perspective considering how opportunity, social control, and contextual inducements to offend interact to produce places and neighborhoods with differential levels of crime would be best suited to providing such theoretical guidance. As more and more researchers take up this call, it will become increasingly important to actually measure the mechanisms implied by these theoretical connections.

While we lacked the space to discuss the consequences of increasingly available longitudinal data, we argue that we need to consider what exactly is gained in longitudinal approaches. One important advantage is the ability to ask the same research questions posed in cross-sectional studies, but in an arguably “better” way, though there may be difficulty in publishing longitudinal work if results are similar to “what we already know” from cross-

sectional work. An obvious problem with cross-sectional approaches is that they provide only very weak evidence of causality (if any), and typically do not model possible endogeneity between the covariates of interest and crime. While longitudinal data can account for endogeneity, typical approaches focus on the relatively short term, such as a few years.

Researchers must also consider the effect of urban and neighborhood change on crime rates and spatial patterns. Kirk and Laub (2010) argued that most studies do not treat neighborhoods as dynamic, failing to account for processes of growth, change and decline as both causes and consequences of crime. In many ways, this is still the state of affairs. One problem presented by the question of change is that our theories do not specifically address change. Regardless of its form, change can have a destabilizing effect in a community which may increase crime over some period. Thus, it is important that researchers think carefully about the temporal scale of the substantive process of interest. For example, the effect of a certain type of change on crime might differ (either in that it increases or decreases crime, or through the mechanism by which it operates) depending on the temporal scale examined. To offer just one example – foreclosures may have an immediate effect on neighborhood crime by altering opportunity. They may also have an effect over many years by initiating a process of decline. Future work should carefully consider the interplay between spatial processes and temporal scaling.

Finally, we believe that an important direction for spatial criminology in the next decade is considering the extent to which micro- and meso-level processes do or do not operate invariantly across different macro contexts. We have highlighted that we believe the existing macro theories are in relatively short supply. In part, this call may indicate a need for theoretically linking micro and macro processes: micro and macro theories have typically

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developed independently from one another. Nonetheless, we have noted that this will also require theorizing the proper macro unit—although studies have frequently used the city as the macro unit, the fact that cities are often embedded within larger metropolitan areas might indicate that they are not necessarily the proper macro unit. We conclude that spatial criminology is an exciting field that has experienced enormous empirical progress in recent years given the explosion of data availability, but we also believe that there is room for tremendous theoretical advancement over the next decade as well.

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