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Advances in Spatial Criminology: The Spatial Scale of Crime

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ABSTRACT

This review takes stock of recent advances, as well as enduring and emerging challenges, in the area of spatial criminology. Although the not processes and relationships. This review highlights three key themes. First, the use of increasingly smaller geographic units in recent research of spatially precise data in recent years presents exciting possibilities, we argue that theory is falling behind in guiding us in analyzing these r direction for spatial criminology in the next decade is considering the extent to which micro- and mesolevel processes operate invariantly ac

Keywords

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INTRODUCTION: DEFINING SPATIAL CRIMINOLOGY

This review takes stock of recent advances, as well as enduring and emerging challenges, in the area of spatial criminology. To begin, we must ask whether the goal is to explain differences in phenomena across various geographic units or to examine the effect of geographic context on individual behavior and theorize explicitly spatial processes and relationships.

Our interest in this review is not only to assess recent methodological advances but also to take stock of the role of theory in spatial criminology. “To understand phenomena, the causes of the locational pattern, and the pattern's consequences” (see also **Logan et al. 2010**). In his review of spatial thinking, **Logan (2012, p. 509)** anchor our current discussion. In drawing upon the notion of spatial thinking, we expand it and further distinguish spatial boundaries, the presence of crime-attracting or crime-reducing facilities and the spatial extent of their influence, the proper scale of a particular phenomenon in a place-based social context. Spatial-contextual thinking is also evidenced in studies that examine how characteristics of nested sociospatial processes influence crime. Given recent advances in the precision of spatial data and methodologies to analyze it, studies in spatial criminology increasingly draw upon novel theory that is at best used in a post-hoc manner to explain findings rather than to generate testable hypotheses. In some ways, this indicates a need to review, we discuss key studies of the past decade that mobilize novel data collection and methodologies to theorize spatial processes as they relate to spatial criminological research.

BACKGROUND OF THEORIES

Although there have been significant methodological advances in spatial criminology in the past decade, scholars tend to rely on a few traditional methodological progress have outpaced theoretical development in some respects. Many scholars pushing the field forward with novel methods rather than explicitly measured mechanisms to explain observed effects. This has the effect of an accumulation of empirical findings that could amount to a new way of thinking about and understanding human spatial behavior in a historical moment of changing urban contexts, which may provide an

In this review, we suggest that there is a need for scholars to more explicitly work out the link between theory and measurement in the context. Spatial approaches in criminology have underscored the need for careful spatial thinking and the theorizing of spatial processes to aid and cooperate before reviewing key studies that link theory with measurement to understand spatial relationships.

The theories put forth in spatial criminological studies can be organized into three principal foci: theories of criminal opportunity, which focus on how structure comes to shape neighborhood rates of crime through its effect on emergent properties of the community; and theories that seek to operate at different spatial scales. Opportunity theories tend to be conceptualized and measured at the microscale of blocks or street segments, either as census units or more spatially conscious units (e.g., *egohoods*). Theories that connect space and place with the motivation to

Opportunity Theories

Underlying many opportunity theories are the insights of routine activities theory, which posits that crime requires the combination of three elements: a motivated offender, a suitable target, and a lack of capable guardian. Testing the theory is defining exactly who qualifies as an offender, when or where or what constitutes suitable targets and in what scenarios, and identifying offenders and victims (see **Jennings et al. 2012**), and ecological work suggests that in some contexts those traditionally thought of as offenders and victims is not specified in the theory (**Hipp 2016**) and is rarely estimated in empirical studies. Nonetheless, the core insight of routine activities theory

Crime pattern theory (see chapter 12 in **Brantingham & Brantingham 1984**) is explicitly spatial, as it focuses on where offenders, targets, and guardians move through their awareness space. The theory builds on **Kevin Lynch's (1960)** concepts of paths, edges, and nodes to hypothesize their role in shaping these movement patterns—this backdrop has a geographical component in which physical features impact movement, as well as a social component. An explicit spatial implication of this theory, it is nonetheless the case that a large body of empirical work has employed the theory to only focus on the microscale. 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. Estimates of where offenders live and where we might expect offenders and targets to travel. The theory proposes that a distance decay parameter of this information, a crime potential can be estimated at each block at each time period (e.g., 10-minute periods). It is enough that humans can make general claims about what spatial patterns of crime should occur across different cities.

Theories of Community Social Control

At the mesolevel, the dominant theory of neighborhood crime is social disorganization theory (**Shaw & McKay 1942**). It posits that structural characteristics of neighborhoods, such as residential stability and the willingness to engage in informal social control behavior to reduce crime (**Bursik 1988, Sampson & Groves 1989**). In the early empirical decades, the focus has shifted to whether these characteristics explain residents' ability to engage in informal social control—which in principle 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 neighborhood.

Other meso- and macrolevel research focuses on how forms of racial and economic inequality serve as inducements to criminal offending through group theory (**Merton 1968**) and strain theory (**Agnew 1999**), puts forth the argument that perceived inequality can serve as an inducement to respond with criminal behavior in turn. Property crime may be committed in an attempt to gain economic resources, whereas violent crime is more often a result of 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., disadvantages) (**1995**). Racial inequality in social and economic conditions and unequal access to resources and power create a hierarchy among places such as neighborhoods. Thus, criminogenic conditions take on a spatial patterning that coheres with patterns of racial segregation, providing inducements to

In sum, the theories relevant to a spatial criminological approach provide different justifications for linking space, place, and crime, and are more concerned with the etiology of crime, but all are inherently spatial in drawing out these connections. In the past, theoretical developments in social disorganization theory emerged in the late twentieth century, it took time for data collection efforts to allow for the testing and refinement of the theory from police departments allowing for the application of spatial clustering techniques and microlevel aggregation, as well as other social data to study the spatiality of crime studied by criminologists, we continue to rely on extant theory. In some ways, this reflects the durability of these perspectives. 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 twenty-first century, borne out of new forms of data and analysis that 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 neighborhoods. We explore how actors use space and the implications of population movement for the spatial distribution of crime. They often consider how social and physical environments shape behavior and discuss exemplary studies that 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 increasingly using smaller units of analysis (e.g., neighborhoods, census tracts, block groups, etc.), but in the past decade there has been a renewed interest in raising 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 (e.g., **Hipp et al. 2017, Steenbeek & Weisburd 2016**). The conclusion, sometimes implicit but often explicit, is that this smallest unit is the optimal unit. However, the various geographic units are not necessarily exclusive and proper. The problem with this strategy is that there is a lack of agreement on defining neighborhood boundaries. First, in a neighborhood model, the variance attributed to this mesolevel is crucially dependent on how the mesolevel is defined. Second, detecting variance but lack of a clear model can be a mistake. For example, whereas a bar on a street corner may be associated with more crime on the street, this ignores the endogenous factors of neighborhood associations that mobilize to stop the placement at some locations) as well as city-level policies (e.g., in which city leaders apply zoning regulations). Finally, an exclusive focus on microlevel interactions between microlevel and meso- or macrolevel characteristics may explain variability within micro units. Finally, an exclusive focus on microlevel interactions necessarily misses 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 are present in the same place at the same time, crime is likely to occur. **Hipp (2016)** proposed explicitly accounting for where offenders and targets live, and where they likely travel, when creating predictions for crime. Given that individuals move about space, there is likely not a single proper geographic unit of analysis but rather a need to measure constructs that allow us to more appropriately model when and where crime occurs. However, another question that is less often addressed in existing spatial criminology is how crime location can 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 we assume that the location of crime—that is, they shift where crime occurs—and do not impact the etiology of crime. However, if micro- or mesolevel processes and at least observe a correlational relationship. Rather than mechanically assessing whether certain covariates are associated with the level of crime, we should consider how these processes interact.

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 stationary. For example, there is a large literature discussing offender movement patterns, which consistently finds that they exhibit a strong distance decay. For example, the average distance to robberies is approximately 1.5 miles (**Rossmo 2000**).

Arguably the most explicit theoretical grounding in this offender mobility observation is the theoretical work of **Wikström et al. (2010)**. In his work, Wikström proposed that crime is contained in the local environment, that brings about crime incidents—a model he refers to as the person and place interaction. Of course, crime is not stationary throughout the day (he uses a space–time budget over a very short time period to have respondents recall this information) but also because offenders and targets move. There are multiple strategies for thinking about and measuring the movement of both potential offenders and targets. Some strategies leverage expected paths of offenders to predict crime locations (**Reid et al. 2013**); others use street networks to measure expected travel flows (**Johnson et al. 2011**), which have been found to experience higher burglary risk (**Davies & Johnson 2014**). Other approaches work from the notion of an environmental backcloth put forth by **Shrader et al. (2011)** to explain the location of crime events (**Deryol et al. 2016**). Yet another approach used data on arrested offenders coupled with survey data on their movement patterns (**Tita & Griffiths 2018**). Another strategy is to create a typology of the movement patterns that characterize both the offender and the target of a crime, and on the basis of this typology, to measure 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 unit-level information as a denominator when constructing crime hot spots at various time points (**Malleon & Andresen 2015**). Another study used geographic information system data to measure a location during a specific hour of the day and the amount of crime during that hour (**Hipp et al. 2018**). However, the ambient population hypothesis suggests that crime is more likely to occur in areas with a high density of potential offenders and targets.

Boundaries

The spatial behavior of individuals is not random but rather structured by the built environment. Many built features may be important, but they make a robbery location more attractive due to an easier getaway. Crime pattern theory posits that the boundaries between two areas based on the nature of such locations, but also because such locations might make escape quicker and easier for offenders. Empirical evidence suggests that an interesting development in this literature is the notion of social boundaries. Recent work by **Legewie (2018)** used an areal wombling technique to show that areas that lack the social control and cohesion of adjacent homogeneous areas; are contested between groups, provoking intergroup conflict; and create unique neighborhood characteristics, measures of spatial interdependence, and other physical boundaries. **Kim & Hipp (2018)** examined the effect of social boundaries on crime, consistent with the notion that offenders may target nearby municipalities to reduce (or slow) the possibility of police agencies identifying a target. Gang boundaries are another important consideration. **Taniguchi et al. (2011)** constructed Thiessen polygons to address the spatial extent of crime sites were associated with higher violent and property crime, particularly when multiple gangs were associated with a corner, net of sociodemographic rivalries among 29 different gangs. They found that the network connections between the census tracts where these rivalries are embedded in a study extended this idea by combining gang boundaries with social network measures to explore the spatial distribution of gang violence (**Park et al. 2018**). These 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 cohesion, i.e., antecedents to neighborhood social organization. We apply the logic of third places (**Oldenburg 1999**, p. 69), as places conducive to structure for neighborhood interaction and the development of cohesion” as residents come to know one another, at least by sight, through which residents use space, we employed half-mile egohoods around the respondents’ census block, corresponding to approximately a 15-mile radius of census units. We stratified the analyses by poverty strata, arguing that the amenities of affluent neighborhoods are likely to draw in patrons from local residents. Indeed, we find that third places contribute to cohesion in the poorest neighborhoods and that this relationship is explained by social capital. In a similar vein, **Wickes et al. (2018)** conceptualize social conduits as land uses conducive to interaction and find their presence in neighborhoods that support repeated encounters at scheduled points in time (e.g., schools, childcare centers, churches); local exposure conduits support encounters at restaurants, cinemas, train stations); and extralocal exposure conduits support unscheduled encounters among diverse users (e.g., shopping centers and place attachment.

Browning et al. (2017c) put forth the notion of econetworks, or the connections between people and their routine activity spaces (**Browning et al. 2017a**). They propose that the extensity of econetworks (the proportion of other households in the network to which individual households are tied through their routine activity spaces) is related to neighborhood social organization. Indeed, they find that neighborhoods with greater econetwork intensity show higher levels of intergenerational social capital, higher levels of collective efficacy and intergenerational closure.

In related work, **Browning et al. (2017a)** argue that econetwork intensity, measured with microsimulations of household travel patterns at the tract level, is related to crime rates. Econetwork intensity is indeed negatively associated with tract-level crime rates but that a higher prevalence of nonresident visitors in a tract is positively associated with crime. The use of space are related to interaction and collective efficacy and, in this case, the control of crime. This important development acknowledges the role of space 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. **Brantingham 1995**) generally put forth in crime pattern theory. Places and land uses not only structure the flow of offenders, targets, and group dynamics but also social control or guardianship. Places are also imbued with meaning in regard to the function they serve in a community and are not merely physical spaces. These empirical insights derived from both lines of research, which would not only offer a more comprehensive understanding of the crime and place literature but also criminology. Considering that places can serve a dual function of increasing opportunity for crime and for interaction, researchers must exercise caution in interpreting the results.

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 microgeographic unit, the concentration of crime will fall within a narrow bandwidth of percentages for a defined cumulative proportion of c 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 such a law appears to exist. 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 be quite difficult to construct a microlevel theory that would give rise to a similar concentration of crime across various macro units. It is, however, the presumption that there is consistent evidence for such a law of crime concentration is in fact questionable. As outlined by **Hipp** should expect to actually observe: without a precise bandwidth, any observed level of concentration greater than zero might be taken as support for a proper macro unit or the appropriate range of sizes of such units, across which concentration should be measured. It is typically presumed that cities would be appropriate. Third, there are some statistical challenges when measuring crime concentration, including the challenge of Poisson is a more appropriate baseline distribution (**Eck et al. 2017**). A related problem occurs when there are relatively small numbers of crime events per law (**Bernasco & Steenbeek 2017**). Naïve approaches that fail to correct for these challenges are, in the extreme, not providing evidence of crime at high-crime locations (**Hipp & Kim 2017**). Should such concentration exist over a month, six months, a year, a few years, or many years (**Mohler**). Beyond these methodological challenges, there is evidence from a study of 42 cities with at least 40,000 people in southern California over the motor vehicle theft, and larceny) is not as consistent as one would expect for such a law to operate (**Hipp & Kim 2017**). This study highlighted employing different temporal assumptions: a historically adjusted crime concentration measure, and a temporally adjusted crime concentration in cities. Although such empirical evidence is at odds with a law, it does arguably open an exciting new area of research that attempts to explain different concentration patterns or could be generated by macrolevel theories in which a top-down process from the larger unit explains this. 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 will explore how these factors influence crime. We argue that these efforts represent an important emerging focus in the field that can leverage advances in data collection and the spirit of spatial-contextual thinking, which considers not only the scale at which certain processes play out but also the potential moderating effects.

IMPACT OF NEARBY CONTEXT ON THE MICROPLACE

Although the advent of point-level data has led to insights regarding spatial crime concentration and a growing field of microlevel studies, researchers have identified characteristics at the microlevel (e.g., **Groff & Lockwood 2014**). There are different theoretical justifications for linking characteristics of the microplace to crime. We propose a multilevel approach that integrates microlevel opportunity perspectives with social disorganization theory. Although the authors' findings are informative, as they find that indicators of opportunity and social disorganization both matter for crime at the segment level and that the immediate surrounding crime attractors/generators conditions their effect on crime (**Boessen & Hipp 2018, Contreras 2017, Contreras & Hipp 2019, Kim & Browning & Jackson (2013)** draw upon urban ecological theory (**Hawley 1950, Jacobs 1961**) and make novel use of the Project on Human Development in Urban Settings' effect on crime depending on the social organizational conditions (anonymity and collective efficacy) of the broader neighborhood ecology. This finding is consistent with decision making, and on social disorganization theory, particularly the notion of collective efficacy (**Sampson 2012**). They argue that low level prevalence of potential witnesses, offsetting the attractiveness of available targets, an insight echoed elsewhere in more traditional microlevel studies of active street prevalence at low levels and a regulatory effect at higher levels. Although collective efficacy did not appear to have an interactive effect, **Boessen & Hipp (2015)** argue that microplace studies risk missing important processes operating at a broader spatial scale. Conversely, measuring a unit of analysis seems unsatisfactory because it is too *large* and because it is too *small*" (**Boessen & Hipp 2015**, p. 400, emphasis in original). Although increased crime at the neighborhood level (block group) and broader spatial area (5 miles surrounding the neighborhood with a distance decay effect on crime, suggesting that within-neighborhood segregation matters for crime, and that the meaning of homogeneity/heterogeneity at the microplace matters from the rest of the city for crime (**Wilson 1987**), this heterogeneity finding suggests the same process could operate within neighborhoods, and between neighborhoods 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 the spatial or distributional phenomenon occurs is important for understanding its effect on crime.

We argue that linking microlevel characteristics and processes with the broader neighborhood ecology represents an important advancement not wholly a function of contextual inducements to offending. Rather, these three pillars of spatial criminological theory coalesce to produce which aspects of opportunity, control, or criminal inducements play out shapes their relationship to crime. Pursuing this research focus has t

NEIGHBORHOODS AND THE BROADER SPATIAL CONTEXT

Neighborhoods are not islands unto themselves (**Mears & Bhati 2006**), as studies that measure only internal dynamics have sometimes imagined. Neighborhoods have permeable borders, and both social and institutional ties extend beyond their boundaries, which is particularly true for implications for how we think about the spatiality of inequality and segregation, captured in the recent neighborhood-network approach (**Br** the diffusion of violence, due in part to retaliatory homicides and gang activity (**Cohen & Tita 1999, Morenoff et al. 2001, Sampson & Moren** and the distribution of resources (**Bursik & Grasmick 1993, Logan & Molotch 1987, Sampson 2012**), which has implications for the control c 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 internal and nearby changes in sociodemographics influence neighborhood informal social control. **Hipp & Kubrin (2017)** draw on social dis inequality within a neighborhood and throughout a 2.5-mile radius around it shapes changes in crime over a ten-year period. They argue tha homogeneity in census-delineated units. Within the focal neighborhood, inequality is indicative of heterogeneity in residents' economic stan ties that extend outside the immediate neighborhood, with implications for securing the resources needed to address crime problems. Awar increased opportunity for crime because of proximity to more wealthy residents, may result in higher crime. They find that increasing inequa 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 jurisdiction jurisdictions or low-violence jurisdictions, or in a mixed-violence cluster. Using data on the 355 jurisdictions situated within the Philadelphia- then predict cluster classification based on insights from the two theories. They find that measures of socioeconomic status and stability wer the insight that proximity to the privileges afforded to white communities is associated with the resources to keep violence low, the authors f and lower chances of being in a high- or mixed-violence subregion. Taken together, this work suggests that broader spatial processes are dist 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 microprocesses operate similarly across city contexts, and y past, it was difficult enough to collect spatially precise data for a single city, and therefore studies have often been limited to a single city. Ind whatever processes are observed will generalize to other city contexts, although the uncertainty of generalizability has become a routine pas empirical literature on social disorganization suggests that results differ across contexts (**Groff & Lockwood 2014, McNulty 2001, Morenoff & mesolevel patterns across studies in different contexts is typically quite difficult given varying methodological decisions across studies and b To date, no studies of microlevel processes across a large number of cities exist. Given the limited number of cities with microlevel crime data: varied along micro- and macroenvironment population (**Hipp et al. 2017**). Defining microenvironment population as the population density study assessed robbery rates in the blocks of four cities: (a) San Francisco (high in micro- and macroenvironment population); (b) Honolulu (l Sacramento (low in micro- and macroenvironment population). The study found that the size of the population up to 2.5 miles away impacte crime literature about the distance offenders tend to travel and also provide suggestive evidence that offenders may travel longer distances i between cities differing in microenvironment population compared to those differing based on macroenvironment population, which may p 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 criminol designed to intervene at the street-block level, would be more successful (**Taylor 2015**), we argue that interventions that do not address bro: situational characteristics conducive to crime exist in varying configurations in neighborhoods as a social fact attributable to broader pattern

Second, the accumulation of single-city studies can lead to mixed results. Although mixed results can be attributed to a number of decision points, these could have different social meanings and consequences for crime depending on the broader context in which it occurs. Considering these theories of place focus on global methods, which show the average effect across units, a problem underscored by recent work focused on the macrolevel contingencies that 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 mesolevel processes differ across cities, arguably the most important contribution to this literature (Krivov 2010). In one study using 36 large cities from the NNCS, they found that not only does the neighborhood level of disadvantage matter, although restricting their sample to only very large cities with populations greater than 300,000 may have constrained macrolevel variability, 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 NNCS crime data with city-level measures of black political opportunities and mobilization. The researchers found that this positive relationship varies across city-level measures. In another study, this same team found that the negative relationship between immigration and crime at the neighborhood level is weaker in cities with higher levels of immigration. A strength of comparing neighborhoods across many city contexts is the ability to empirically compare theories. A study using the NNCS assessed differing predictions that social disorganization, opportunity, and relative deprivation theories make about crime when taking into account that as the area increased violent crime, consistent with social disorganization theory. However, the fact that property crime was higher in neighborhoods with higher levels of segregation is better explained by relative deprivation theory. Given the spatial uncertainty in which relative deprivation might operate (Hipp 2007, Hipp & Baumer et al. (2012) used data from 5,517 tracts nested within 50 large US cities to examine whether city characteristics moderate the relationship between a unique city across regions of the country, using different spatial units, with differing measures of foreclosure and different modes of analysis, i.e., those with less new construction, an aging housing stock, high rates of pre-existing vacancies, and high unemployment and socioeconomic 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 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 varies across spatial scales. The study noted that theoretical expectations differ depending on the spatial scale. At the neighborhood level, social disorganization theory predicts that inequality allows for the convergence of crime. Also at the neighborhood level, routine activities theory and general strain theory posit that inequality allows for the convergence of crime. City-level racial heterogeneity and inequality may also interrupt political cooperation in addressing problems, resulting in higher overall levels of crime. Furthermore, greater economic segregation resulted in more crime in cities with greater overall inequality.

These studies suggest potential benefits of considering the macrocontext, and with increasing data availability, it will be possible to assess the extent to which, however, as we believe macrolevel theorizing is not adequately developed to address these questions. Furthermore, it raises the question of whether their boundaries have meaning for the spatial behavior of residents (Hipp & Kim 2017). Recent work found that city and metropolitan area boundaries have changed over decades, suggesting that theories must also take seriously macrohistorical changes (Hipp & Kane 2017). Although the goal of most theories is to identify a general relationship, both for the strength of the theory and the efficacy of policy recommendations. However, we warn against approaches that ignore higher-order variability in some construct produces a significant interaction with a meso- or microlevel construct needs to be folded into the theory.

CONCLUSION: MOVING FORWARD

We have emphasized the need for scholars to explicitly consider spatial behavior when considering the location of crime. This is particularly important 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 a city naturally brings about a certain degree of spatial autocorrelation, and treating this in a theoretically explicit manner (rather than as a nuisance variable) is important. The shift to examining spatial behavior raises the question of how we should assess evidence from the large body of micro- and mesostudies that are the focus of this review, such studies are still theoretically informative. For example, neighborhood studies of collective efficacy and crime may be committing the ecological fallacy. However, if collective efficacy truly operates at a smaller scale, measuring it as such would simply detect a

theoretical insights. Of greater concern is the extent to which prior studies, by failing to consider spatial mobility, have provided empirical results. Many of these prior results would be overturned, or simply refined, by adopting an explicitly spatial perspective.

Another point we have highlighted is that although the explosion of spatially precise data in recent years presents exciting possibilities, our theoretical frameworks that have guided criminology for many decades, there may be other processes generated by other theoretical frameworks but rather use the growing amount of data to generate inductive results that may provide insights for novel theories. As a related point, although typically there is little explicit theorizing about which measures of the context might be important for moderating these relationships, how theoretical opportunity, social control, and contextual inducements to offend interact to produce places and neighborhoods with differential levels of crime is important to actually measure the mechanisms implied by these theoretical connections. The need to measure mechanisms highlights that researchers must undertake the arduous task of surveying residents within neighborhoods (however defined) to provide insights on how some of these processes operate. Although we lacked the space to discuss the consequences of increasingly available longitudinal data, we argue that we need to consider what is possible in sectional studies, but in an arguably better way, although there may be difficulty in publishing longitudinal work if results are similar to what is known from evidence of causality (if any) and typically do not model possible endogeneity between the covariates of interest and crime. Although longitudinal studies are important, researchers must also consider the effect of urban and neighborhood change on crime rates and spatial patterns. **Kirk & Laub (2010)** argue that the 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 of crime change over some period. Thus, it is important that researchers think carefully about the temporal scale of the substantive process of interest. For example, the temporal scale at which it operates) depending on the temporal scale examined. To offer just one example, foreclosures may have an immediate effect on neighborhood crime rates. Researchers must 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- and macrotheories are in relatively short supply. In part, this call may indicate a need for theoretically linking micro- and macroprocesses: micro-theorizing the proper macro unit—although studies have frequently used the city as the macro unit, the fact that cities are often embedded in an exciting field that has experienced enormous empirical progress in recent years given the explosion of data availability, but we also believe that

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