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The geography of crime and crime control

1. Geography of crime

Scientific interest in the geography of crime is not new. The large variation in crime across space and time is one of the oldest puzzles in the social sciences (Glaeser, Sacerdote, & Scheinkman, 1996). In fact, the study of crime started with questions about its geography. Already in the 19th century, Guerry (1833) and Quetelet (1842) published maps of personal and property crime in France, while Mayhew (1862) mapped London's rookeries, a colloquial term used for slum areas. During the first decades of the 20th century, scholars of the Chicago School of Sociology developed an ecological model of urban geography, including the concentric zone model (Park, Burgess, McKenzie, & Wirth, 1925) and an application to juvenile delinquency (Shaw & McKay, 1942), that remained a theoretical and empirical blueprint for many decades. During the 1980s, after a long period of relatively modest progress, the advent of opportunity-based crime theories, the digitalization of law enforcement data and crime records, and the availability of computerized geographic information systems (Chainey & Ratcliffe, 2005; Weisburd & McEwen, 1998) gave a new impetus to the geography of crime. Today, crime is regularly and increasingly covered in research articles appearing in Applied Geography (e.g., Barnum, Caplan, Kennedy, & Piza, 2017; Sadler, Pizarro, Turchan, Gasteyer, & McGarrell, 2017; Summers & Caballero, 2017) and in other geography journals as well. While the possibilities and versatility of geospatial analyses of crime have convincingly been demonstrated to criminologists and geographers alike, recent technological advancements call for a reappraisal of established insights in the role of place in crime. Consider, for example, the prospects offered by the availability of online mapping and navigation applications for the study of crime and place (Vandeviver, 2014). Similarly, the proliferation of smartphones (Hoeben, Bernasco, Weerman, Pauwels, & van Halem, 2014) and the adoption of location-tracking technologies (Versichele, Neutens, Delafontaine, & Van de Weghe, 2012) offer new possibilities to study offenders' and victims' spatial behavior. Many of these developments are addressed in the contributions to this special issue of Applied Geography.

2. Theoretical frameworks

While crime maps are the most visible aspects of the geography of crime, the explanation of spatial patterns and its application in addressing crime problems, require a theoretical framework. Grounded in the ecological approach of the Chicago School, the geography of crime has long been based on social disorganization theory, which links the occurrence of crime to characteristics of residential communities and their residents. Contemporary studies are increasingly based on opportunity-based theories. These theories highlight the spatial dimension of crime and reactions to crime by illustrating the role of the social and physical environment in the commission of crime and the selection of crime targets. In doing so, these theories provide a rationale for the importance of place in our understanding of crime and offer opportunities for the development of place-based crime prevention policies (Eck & Weisburd, 1995). The opportunity theories of crime include the rational choice perspective, the routine activities theory and crime pattern theory. Because elements of each of these theories are present in nearly all research on the geography of crime and crime control, we briefly summarize these theories here.

The rational choice perspective on crime and crime control (Cornish & Clarke, 2008, 1986) focuses on offender decision-making. It argues that offending is purposive behavior through which offenders seek to benefit themselves. In their decision to offend as well as their selection of a crime site, offenders balance the costs and benefits of their choices and select that option through which they expect to achieve the greatest benefit for themselves. As such, this perspective highlights that crime does not occur at indiscriminate locations but that crime site selection is the result of a (semi-)conscious decision-making process. This perspective emphasizes that offenders' spatial decision-making process is informed by a range of attributes of the physical and social environment.

The routine activities theory (Cohen & Felson, 1979) stresses that for a crime to occur a motivated offender and suitable target must converge in space and time in the absence of capable guardians. Targets can be persons or objects. The amount of crime at specific places can fluctuate due to changes in the number of motivated offenders, available targets or capable guardians. Through changes in their spatial behavior, offenders may seek to create suitable opportunities for crime. Routine activities theory thus emphasizes the importance of situational characteristics of places in the commission of crime.

Crime pattern theory (Brantingham & Brantingham, 1984, 2008) combines elements from the rational choice perspective, routine activities theory and environmental psychology, to explain variation in the spatiotemporal distribution of crime. Crime pattern theory states that rational offenders become aware of suitable targets in the absence of capable guardians while performing their daily activities and routines. Offenders may exploit these opportunities immediately or return to exploit them later. Crime, then, is the result of the interactions between motivated offenders and their physical and social environment.

3. Two stylized facts

Parallel with the development of the opportunity theories of crime, police recorded crime data were increasingly digitalized and academics harnessed the growing power and versatility of

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computerized geographic information systems to increase their understanding of the spatial distribution of crime and offenders' spatial behavior (Weisburd, 2004). These developments have facilitated empirical research about a wide variety of topics on the geography of crime. Here, we want to put the spotlight on two major stylized facts that have been corroborated over and again: (1) the strong concentration of crime at micro-places, and (2) distance decay in the journey to crime.

3.1. Crime concentration at micro-places

First, crime is not equally nor randomly distributed in space. In fact, crime is strongly concentrated in just a few places of high-crime intensity. In analogy to geology, these high-crime intensity places are called hotspots of crime. For example, in their seminal work Sherman, Gartin, and Buerger (1989) established that just 3.5% of all Minneapolis' addresses produced 50% of all calls for service to the police. Similar results were observed in a variety of cities worldwide (e.g., Andresen & Malleson, 2011; Steenbeek & Weisburd, 2015; Weisburd, Maher, & Sherman, 1992), prompting Weisburd (2015) to formulate a law of crime concentration at places. This law states 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 percentage of crime*" (Weisburd, 2015, p. 133). Scholars also determined that the degree of crime concentration at places is stable over time. Over a 14-year period, Weisburd, Bushway, Lum, and Yang (2004) concluded that half of all crime is concentrated in 4.5% of Seattle street segments. Furthermore, Weisburd et al. (2004) identified a small group of consistently high-crime street segments (see also Andresen, Linning, & Malleson, 2016; Curman, Andresen, & Brantingham, 2015; Wheeler, Worden, & McLean, 2016). The location of crime hotspots, however, may change and existing high-crime intensity places may become cold one year while new places emerge as hot another year (Hodgkinson, Andresen, & Farrell, 2016).

3.2. Distance decay

Second, when tracking offenders' spatial behavior associated with their offending and crime site selection scholars found that offenders typically travel only short distances to offend (Bernasco, 2014; Birks, Townsley, & Stewart, 2012; Rengert, 2004). For example, Wiles and Costello (2000) established that the average travelled distance to a crime site across all crime types for Sheffield offenders was just over 3 km. While some offenders are prepared to travel longer distances to offend (Polisenska, 2008; Van Daele, Vander Beken, & Bruinsma, 2012; Vandeviver, Van Daele, & Vander Beken, 2015), short crime trip distances have repeatedly been observed in a large number of studies for a variety of crimes and have come to be accepted as typical offending behavior (e.g., Barker, 2000; Beauregard, Proulx, & Rossmo, 2005; Capone & Nichols, 1975; Lundrigan & Czarnomski, 2006; Rattner & Portnov, 2007; Smith, Bond, & Townsley, 2009). A closely related observation is that the likelihood of a particular location being selected decreases dramatically as the distance from the offender's home increases (Rengert, Piquero, & Jones, 1999). This is known as the distance-decay effect. It is not unique to offending behavior but governs most human spatial interactions (Taylor, 1983). Distance decay in offenders' spatial behavior has repeatedly been observed in studies focusing on the distance that offenders travel prior to committing their offences, so-called distance-to-crime studies (e.g., Block & Bernasco, 2009; Rengert et al., 1999; Van Koppen & Jansen, 1998; Vandeviver, Van Daele, et al., 2015), as well as crime location choice studies, which explore how offenders select a target and what target characteristics influence offenders' spatial decisions (e.g., Baudains, Braithwaite, & Johnson, 2013; Bernasco & Nieuwbeerta, 2005; Johnson & Summers, 2015; Townsley et al., 2015; Vandeviver, Neutens, Van Daele, Geurts, & Vander Beken, 2015). The presence of distance decay in offenders' spatial interactions has frequently been interpreted as evidence of offender strategies to minimize the costs associated with overcoming distance (Bernasco, 2014; Vandeviver, Van Daele, et al., 2015).

4. Applications to policing

Law enforcement agencies noticed the importance of the spatial dimension of crime as well. In searching for efficient and cost-effective crime control strategies, since the 1980s police forces have embraced the renewed interest in the spatial dimension of crime, and have successfully implemented a series of place-based crime prevention and control initiatives (Weisburd, 2004). This should not come as a surprise. Police and crime prevention resources are scarce and should be used as cost-effectively as possible. Given that the bulk of crime is generated at a handful of small high-crime intensity places, and that place has a higher predictive value for future crime than offender identity (Sherman, 1995, pp. 36–37), it makes sense to prioritize law enforcement deployment to those places that need it the most and where the chances of reducing crime and improving citizens' quality of life are the highest (Braga, Papachristos, & Hureau, 2014). Similarly, police investigations could be more cost-effective and possibly more successful in identifying offenders by adjusting and prioritizing investigative efforts based on offenders' spatial behavior (Rossmo, 2000).

4.1. Hotspots policing

Hotspots policing proved to be one particularly successful and effective place-based crime control strategy (Braga et al., 2014). Hotspots policing is informed by opportunity-based crime theories and based on the observation that crime is highly concentrated in a small number of places. While onsite police tactics may differ, the essence of hotspots policing entails directing patrols to a small number of predefined high-crime areas (Braga et al., 1999; Sherman & Weisburd, 1995). Crime hotspots are identified through mapping crime and analyzing the spatial distribution of offences. The rationale underlying this policing strategy is that by dramatically increasing visible police presence at high-crime locations, offenders will be deterred from committing offences at these locations and the local crime and disorder level will drop. The effectiveness of hotspots policing for reducing crime at such locations has garnered strong empirical support (Braga et al., 2014; Bureau of Justice Assistance, 2013). Hotspots policing has been found to substantially reduce crime at high-crime locations and locations immediately around crime hotspots (Braga et al., 1999; Sherman & Weisburd, 1995) and may also have a benign spillover effect by reducing crime in the larger environment in which such policing strategies are implemented (see Weisburd, Braga, Groff, & Wooditch, 2017), a phenomenon labeled 'diffusion of benefits'.

4.2. Predictive policing

Given the success of hotspots policing, researchers have explored the possibility to predict where and when future high-crime locations are likely to develop and intervene at those locations before they have become proper crime hotspots. This resulted in prospective hotspots policing (Bowers, Johnson, & Pease, 2004) and the development of spatiotemporal crime forecasting models (Johnson, Bowers, Birks, & Pease, 2009; Mohler, Short,