Units of Analysis in Geographic Criminology: Historical Development, Critical Issues and Open Questions

David Weisburd, Gerben Bruinsma and Wim Bernasco

ABSTRACT

Social scientists have had a long and enduring interest in the geography of crime, and the explanation of variation of crime at place. In this introductory chapter we first describe the history of crime and place studies, showing that in the course of two centuries, scholars have increasingly focused their interest on smaller spatial units of analysis. In the 19th century they typically studied large administrative districts such as regions and countries. The Chicago School focused on much smaller urban communities. More recently, interest has moved towards geographic units as small as street blocks or addresses. After this historical account, we address specific questions regarding how the unit of analysis should be chosen for crime and place studies. We address substantive theoretical, statistical and practical problems that are raised in choosing appropriate levels of geography for research and practice. We discuss issues of theory and data and consider the factors that have inhibited the study of units of analysis of crime at place to date, mentioning the specific contributions to the unit of analysis problem that are made by the chapters that follow.

Criminologists have had a long and enduring interest in the idea of place and its role in the production of crime (Weisburd and McEwen 1997). In 1829 Adriano Balbi and Andre-Michel Guerry compared education levels and crime across large French administrative areas ("departments") and discovered not only that crime varied across them, but that places with higher levels of education also had higher levels of property crime (Balbi and Guerry 1829; Kenwitz 1987). This finding though surprising at the time given popular assumptions about the role of poverty in crime, and reflective of a new fascination with the ability of social scientists to bring insights into the nature and causes of social problems, was reinforced in similar studies conducted during the period. For example, the Belgian astronomer and statistician Lambert Adolphe Quetelet (1831/1984) also observed the variability of crime across large administrative areas, noting that some

of the poorest areas of France and the Low Countries had the lowest crime rates (see Beirne 1987). Quetelet concluded that poverty was not in itself the cause of crime, but rather that crime develops when the poor and disadvantaged "are surrounded by subjects of temptation and find themselves irritated by the continual view of luxury and of an inequality of fortune" (1831/1984, p. 38).

The interest of criminologists in geographic criminology did not end with these early contributions to the birth of a "positivist criminology" in Europe. Across the Atlantic Ocean, new and important insights about crime and place were to be brought in the early 20th century by criminologists associated with the University of Chicago (Burgess 1925/1967; Park 1925/1967; Thrasher 1927; Shaw 1929; Shaw and McKay 1942/1969). Led by Robert Park, these scholars looked to characteristics of the urban environment to explain the crime problem in American cities. They found that crime was strongly linked to social disorganization and poverty in urban settings. In turn, just as 19th century studies of crime at place helped to spawn the science of criminology in Europe, study of crime and place in the Chicago School was to encourage the development of a strong empirical science of Criminology in the US.

In recent years, a new generation of interest in crime and place has emerged that is once again at the cutting edge of major theoretical and empirical advances in criminology. In this case, the focus is not on the large administrative areas that were studied by European scholars in the 19th century, or the middle level focus on neighborhoods and communities that sparked many of the important insights of the Chicago School, and that continue to be a important concern of criminologists (e.g. see Reiss and Tonry 1986; Sampson et al. 1997), but rather a new concern with micro units of place such as addresses or street segments, or clusters of these micro units of geography (e.g. see Eck and Weisburd 1995; Taylor 1997; Sherman 1995; Weisburd and Green 1995). Findings that 50% of crime is found at three or four percent of the micro crime places in a city (e.g. Sherman et al., 1989; Weisburd et al., 2004), has generated not only scholarly interest in crime at place but also strong policy and practitioner interest in what has been termed "hot spots of crime" (see Sherman and Weisburd 1995; National Research Council 2004; Weisburd and Braga 2006; Weisburd and Eck 2004).

While study of crime and place has thus had an enduring role in criminology, and has often occupied an important position in advancing theoretical insights, there has to date been little sustained theoretical and methodological interest in understanding and defining the units of analysis that should be used. Criminologists have long been interested in the variability of crime at place, but they have given little thought to the level of geography that should be used in exploring such relationships. What is a place? Should we study place at the micro or macro level? Is the action of crime at the level of regions, communities or micro place hot spots? These questions are critical if we are to develop a systematic understanding of the role of place in crime, and we think it is surprising that to date, scholars have focused little systematic attention upon them.

Importantly, the unit of analysis problem is not unique to study of crime at place. These questions have formed an important focus of study in geography more generally in the context of what has been termed the "modifiable area unit problem" or MAUP (Openshaw 1984). The MAUP is a potential source of error that can affect the outcomes of the analysis of aggregated spatial data. There are numerous ways to aggregate individual point data, and the results of the spatial analysis of aggregated data depend on the particular way by which individual points on the surface of the earth are aggregated into areal units. The MAUP consists of two parts, the problem of *scale* (how large should aggregated units be) and the problem of *aggregation* (how should points be allocated to larger units, i.e. how to aggregate).. The MAUP is a significant problem in studies of crime at places, partly because these studies often depend on aggregated data that are provided by third parties, such as law enforcement agencies or the census administration, and there is often no way to study what the results would look like under alternative aggregations (Ratcliffe and McCullagh 1999).

The unit of analysis problem, in turn, is not restricted to problems of spatial aggregation in crime research. Criminologists over the last few decades have often criticized empirical studies of offenders for failing to recognize and examine critically the nature of the unit of analysis that is examined. The literature on co-offenders, for example, has cautioned criminologists regarding the simplistic assumption that we can explore the causes of individual offending without reference to the fact that crime is often carried out not by single offenders but by offenders working together in smaller groups (Erickson

1971; Erickson and Jenson 1977; Gold 1970; Klein 1969; Reiss 1986; Sarnecki 1986; Shaw and McKay 1931; Warr 1996). Co-offending in turn raises important questions about our examination not only of criminality, but also of the activities of criminal justice, for example of sentencing or processing of offenders (Reiss 1988; Short and Moland 1976; Waring 1998; 2002).

Our goal in this volume is to focus critical attention on units of analysis in what Sherman and colleagues (1989) have called the "criminology of place." We think that the growing interest in crime and place over the last few decades makes it particularly important to shed light on this question. Indeed, we are too far along in the scientific study of crime and place to leave unit of analysis to the serendipitous interest of singular scholars. For crime and place studies to advance significantly over the coming decades, we need to subject not only crime places to empirical inquiry, but also the spatial unit of analysis that we use in studying crime and place.

Our volume raises a series of core questions that we believe are critical to the development of crime and place studies. Would our understanding of crime at place be advanced most significantly if we focused on very small units of geography such as street addresses or street segments, or is the study of crime better served by examining larger aggregates such as administrative areas, census tracts, or communities? Or should we continue to examine differing geographic units depending on the questions we ask? Should the unit of analysis be defined by the nature of the problem that is studied, or the policy questions that are examined? What statistical advances are needed for developing our understanding of units of analysis and especially for differentiating such units?

We begin this introductory chapter with a history of the role of place in criminology. While the chapters that follow focus in on substantive questions related to the unit of analysis problem, we thought it important to begin by placing the criminology of place in context. Importantly, our historical review suggests that in the course of two centuries of study of geographic criminology, scholars have increasingly focused their interest on smaller spatial units of analysis. We then turn to specific questions that are raised regarding how the unit of analysis should be chosen for crime and place studies and the substantive theoretical and practical problems that are raised in choosing appropriate levels of geography for research and practice. The next section of our chapter is

concerned with problems of theory and data and considers the factors that have inhibited study of units of analysis of crime at place to date. In these last two sections we also describe the specific contributions of the chapters that follow, and place them in the context of their contributions to the unit of analysis problem.

Putting Place in Criminological Context

As we have already noted, the story of the development of interest in geographic criminology starts in the early 19th century. Since that period interest has ebbed and flowed, though crime and place has played a part in many of the most important theoretical and practical crime prevention advances over the last two hundred years. Below we trace that history, noting the shifting interests of criminology in different geographic units of analysis and the tendency over time for the action at crime at place to be focused on increasingly smaller units of geography.

The first geographical crime research in France and Belgium: Macro level studies of regions and counties

Geographical criminology begins with the publication of statistics on the French population by the French Home Office in the 1820s. The publication of the *Comptes Générales de l'administration de la justice criminelle en France* inspired many statisticians and other scholars to explore in more detail data on crime. Among the very first was Baron Charles Dupont who spoke for the first time about statistics on morality of people and the nation in a meeting of the *Conservatoire des Arts et Métiers* in November 1826 (Beirne 1993). As a cartographer, he published in 1816 tables on the "distribution of illiterates" across the regions of France. During this meeting he promised to publish a map on crime and criminals soon. However, the Belgian Edouard Ducpétiaux was the first to publish a table with crime and suicide figures of regions in Spain, France, Italy and, England (Ducpétiaux 1827). He observed remarkable differences between regions and countries and concluded that the morality of nations differed (*ibid*, p. 11-12). The Lower Lands (The Netherlands) were especially praised for their low crime rates and for a low number of homeless people (*ibid*, p. 29).

In 1829 the first geographical map of crime was published. Partly based on the *Comptes Générales de l'administration de la justice criminelle en France*, Michel-André Guerry

and the Venetian cartographer Adriano Balbi published on one large sheet, three maps on the distribution of crime in France in the years 1825-1827. It was a novelty in the new field of criminology that they made use of a cartographic method of presenting statistical material. They concluded from their work that 1) in certain regions in France (departments) with higher numbers of personal[1] crimes, there was less property crime; (2) that the area above the line of Orléans and Lyon showed the highest rate of property crimes in France, and (3) in urban areas, especially in the capital of Paris, the highest numbers of property and personal crimes could be observed. Later, when Guerry became head of the Crime Statistics Unit of the France ministry of Justice, he continued his work on mapping crime. In 1833 his influential *Essai sur la statistique morale de la France* was published (Guerry 1833). Inspired by the Reform Movement[2] of the 19th century, Guerry examined whether poverty and density of population might lead to higher crime rates. He observed however an empirical complexity. The rich north *departements* were confronted with higher property crime rates than the poor *departements* in the south of France. He concluded that the level of poverty was not the direct cause of crime. Similarly, his data suggested that population density was not a cause of crime.

The studies by Guerry soon became the subject of a heated debate between proponents and opponents of the Reform Movement, especially in England. A British Member of Parliament defended the work of Guerry, but the industrialist William Greg criticized Guerry's conclusion that education or poverty might not be a cause of crime (Beirne 1993, p. 129-131; Greg 1835). In 1864 Guerry published again a comparison of crime rates between England and France (Guerry 1864). We can hardly imagine today the work he had to carry out collecting and analyzing the data, which included over 226,000 cases of personal crime in the two countries over 25 years and, for France only, over 85,000 suicide records (Friendly 2007). The results of this effort reinforced the findings he had published 30 years before.

His friend Alexandre Parent-Duchâtelet published in 1836 an empirical study containing maps on the distribution of prostitution from 1400 till 1830 in Paris (Parent-Duchâtelet 1837). Because of the official control of brothels by the Paris authorities, systematic data

[1] We would now label them as violent crimes.

[2] In France and England the Reform Movement focused its policy on public health and education for the poor.

were available on prostitutes, especially from the years 1817 to 1827. Even information regarding the '*departements'* they came from were collected. Not surprisingly, the centre of the city had the highest number of prostitutes, especially '*quartier 6*'. He used neighborhoods, as defined by administrative boundaries as units of analyses.

The French scholar Michel-André Guerry is often bracketed together with the Belgium statistician and astronomer Adolphe Quetelet who discovered the normal distribution in statistics with which deviations can be observed and calculated (Landau and Lazarsfeld 1968). In 1828, Quetelet (1831/1984) examined the French *Comptes Générales de l'administration de la justice criminelle en France* in a lecture for the Academy of Science to show how crime rates vary with the seasons of the year. He demonstrated that June had the highest numbers of violent crimes of the year. He also examined crime data in each *arrondissement* and added: "It appeared to me that these numbers were able to give a sufficiently satisfactory idea of the state of knowledge in each department and especially for the inferior classes where most crimes are committed" (ibid: 30). He used provinces and countries as units of analyses. Groningen, South-Brabant, Anvers, Limburg and Drenthe had the highest crime rates of all provinces of the Lower Lands (including Flanders). He discussed these observations as was common in the period, in the context of social factors such as poverty, heterogeneity, composition of the population and attractiveness of cities. He explained the higher rates of property crimes of the richer provinces, as we noted in our introduction, by the unequal distribution of wealth: a great number of people possess nothing compared to the relatively few rich citizens (1984, p. 38).

The French and Belgian scholars were the first who scientifically analyzed crime at place. These scholars focused on the administrative and political borders of their time in their geographical crime analyses. Nations, regions, counties, provinces, departments and *quartiers* were the units of analyses and they were used as a unit for systematic comparisons of crime figures. They were fully dependent on official crime data and other data that the government supplied arranged within these larger geographic units. While the early French and Belgian researchers concerned with crime and place also examined some variability of crime within cities, their overall focus was generally on larger administrative units. Importantly, these early criminologists in their focus on crime rates

and official statistics also helped to encourage the more general development of a positivist empirical criminology (Beirne 1987).

Pioneers in England in the 19th century

France and Belgium were not the only countries where geographical studies on crime were carried out in the 19th century. Members of *the Statistical Society of London* also regularly published on crime topics in their statistical journal. [3] Two articles on crimes were included in the second volume. One was by a prison chaplain who wrote on *Criminal Statistics of Preston* and the other was a short article about the distribution and kinds of robberies in London and Liverpool (mentioned in: Morris 1957, p. 53). In this and later papers of members of the Society, the influence of the work of Guerry can be observed.

In the year 1839, a lecture by William Greg on the spatial distribution of population density, fertility, education and crime in the Netherlands[4] for the *British Association for the Advancement of Science* of August 1835, was published by Ridgway and Sons. He compared the crime figures on property crimes, violent crimes and on serious crimes like rape, murder and manslaughter in the Netherlands with those of England and France. The overall crime figures showed remarkable differences: for the year 1826 the data indicated that the Netherlands had less crime than the other two countries: 1: 28.900 inhabitants, in England 1: 23.400 and in France 1:17.570 (Greg 1839, p. 15). Greg also studied in more detail large areas of the Lower Lands. He counted the most crimes for the province of Overijssel, followed by South-Brabant, Groningen and Drenthe and West-Flanders.[5] The lowest overall crime rates were found in the province of Friesland. For that period the highest position of Overijssel in the crime ranking was striking because this province also showed the highest education level for all of Europe (Greg 1839, p. 24). Serious crime was more likely to be present in the provinces of South-Brabant, Liege, Groningen and East-Flanders.

Rawson R. Rawson, then secretary of the Society, correlated variables such as age and sex with crime, but also presented the number of crimes for the districts of England and Wales (Rawson 1839). He discussed the variability in crime across the districts and

[3] Their Journal was published in 1838 for the first time.
[4] In those days, parts of Belgium and Luxembourg were also included in the Netherlands.
[5] As discussed in the former paragraph Quetelet observed similar findings 25 years later.

concluded that climate and ethnic differences in the population could not be causes of crime. He rejected the conclusions of Guerry on the relationship between education and crime. He assumed that the type of labor could be a cause of crime, and divided regions in England into 1) rural areas with farms; (2) industrial areas; (3) mining areas and (4) big cities. Rawson's research illustrates the critical role that the unit of analysis can play in the development of our understanding of crime at place. He is the first scholar to go beyond the usual administrative and political borders (Morris 1957, p. 55). Based on official data he found that large cities had the highest crime rates and mining areas the lowest.

His successor at the Society, Joseph Fletcher, continued the work of Guerry and Rawson. He studied for many years the relationship between education and crime by producing maps showing the levels of crime and illiteracy of England and Wales (later published in Fletcher 1850). According to Fletcher, there were four causes of the level of 'immorality' of populations: (1) population density; (2) the distribution of property across societies; (3) the number of people earning their own income, and (4) the level of illiteracy of the population.[6] He indicated the level of immorality of the population by the number and nature of crimes committed; the number of marriages with a man younger than 21;[7] the number of illegitimate children and, the number of bank accounts in the population. He argued (1850) that not only were differences between regions important in the explanation of crime rates, but so was the speed with which these regions changed over time economically and demographically. With these ideas Fletcher can be seen as a precursor of the French sociologist Emile Durkheim who introduced the concept of anomie to explain the impact of societal changes on people and society (Durkheim 1893/1964).

John Glyde (1856) was the first to question the validity of the research findings when large areas were chosen as units of analysis in geographic criminology. In his paper *Localities of crime in Suffolk* he showed very clearly that larger units of analysis hide underlying variations in crime. When smaller units than districts or *departements* were taken into account, significant differences in crime rates across smaller areas appeared.

[6] Measured by the number of crosses instead of signatures in the registers of marriage!
[7] This indicator pointed then at forced marriages because of pregnancy.

As Morris (1957, p. 58) notes: “Of the regional studies, a major criticism is that the county was the smallest territorial unit considered, but Glyde, by breaking Suffolk down into its seventeen Poor Law Unions was able to demonstrate that the ‘County Aggregate’ masked considerable differences between the smaller geographical units of which it was composed.” Glyde also observed that middle-sized cities situated along main roads had higher crime rates than the mean of the large area they were part of. Jelinger Symons (1857/2000, p. 281) also examined the relationship between urbanization and crime through ecological analyses of crime in Liverpool, Bristol and Cardiff. In his view it was the speed with which the population increases that explains higher crime figures.

In studies of crime and place in England in the 19th century, the work of Henry Mayhew cannot be neglected. He is well-known in criminology (and cited therefore) for his descriptive studies of the underworld of London in the middle Victorian Age (1851/1950). However, his detailed studies on the distribution of crime in England and London are also a rich source for those studying crime. He was an excellent observer of his time, describing in four voluminous books precisely and in detail the daily life of the Londoners, their habits, their cloths, their quarters and streets in the Victorian era (Mayhew 1865). Mayhew also tried to uncover patterns in the distribution of crime in the city of London combining ethnographic methods as well as statistical data.[8] He interviewed prostitutes, criminals and other citizens about alcoholism, poverty, housing conditions and economic uncertainty. He was the first scholar who focused on small areas like squares, streets and buildings as a unit of analysis in criminological research, predating modern interests in micro crime places (see later) by over a century. Mayhew also used police data of the seven Metropolitan Police Divisions and revealed that two of these divisions produced about 65 percent of all the suspects in London.

After 1870 the interest of French and English academics in geographic and statistical analyses diminished. At the same time, there are important exceptions. In one of them, Cesare Lombroso studied the geographical distribution of homicide, infanticide, parricide and suicide across very large geographic areas in Italy (Lombroso 1878/2006). He explained the different violent crime rates between the north and the south of the country

[8] In a sense Mayhew practiced already the methodology that Robert Park (1925) advocated 70 years later in the 1920s in Chicago.

in reference to the "racial inferiority" of the southern population. The French criminologist Jean-Gabriel Tarde studied the relationship between urbanization and crime from a different perspective than earlier scholars (Tarde 1890/1912, p. 338). By comparing the crime levels of larger areas, he argued that cities were exporting crime to the rural areas. He wrote: "... today we can see crime spreading from the great cities to the country, from the capitals to the provinces, and these capitals and great cities having an irresistible attraction for the outcasts and scoundrels of the country, or the provinces, who hasten to them to become civilized after their own manner, a new kind of ennobling" (Tarde 1890/1912, p. 338).

Chicago and the dynamics of cities: Neighborhoods and square miles as unit of analyses

After the turn of the century, the locus of geographic research on crime moved to the United States, and especially to the city of Chicago. At the University of Chicago, a group of sociologists[9] took the initiative to undertake new research on urban problems, which centered in part, on crime (Faris 1967; Bulmer 1984; Harvey 1987; Beirne and Messersmidt 1991). They also moved the action of crime and place research from broad comparisons across large geographic areas to more careful comparisons within cities. Interestingly, the Chicago School scholars were either not aware of or ignored till 1933 the work of 19th century crime and place researchers in Europe (Elmer 1933).

American cities grew in the second part of the 19th century and first part of the 20th century faster than ever before in history, with all the social problems associated with such growth. Chicago itself played an important role in the integration of large numbers of Italian, Irish, German, Chinese, Polish, Jewish, and Scandinavian immigrants. The city evolved from a very small settlement in 1840 (with 4,470 inhabitants) to a city with a half-million inhabitants in 1880. Ten years later, the population had increased to one million, and in 1930, to about 3.5 million. Crime was perceived as one of the most important urban problems:

"After World War I (1914-1918), Chicago sociologists turned their ecological attentions to a variety of social problems. Exacerbated by the severe hardships of the Great Depression, Prohibition, and by the well-publicized rise of gangland warfare and

[9] As Burgess and Bogue (1964, p. 1) demonstrated, other disciplines and governmental agencies also studied urban life in Chicago extensively (also see Bulmer 1984; Faris 1967).

union racketeering, crime itself came to be seen as a major social problem in Chicago. Crime, therefore, was one of the chief topics studied by members of the Chicago-School" (Beirne and Messerschmidt 1991, p. 362).

Now a group of American sociologists, among them, Robert Park, William Thomas, Louis Wirth, Ernest Burgess, Clifford Shaw and Henry McKay took a leadership role in the development of the criminology of place, in contrast to the statisticians, criminal lawyers or psychiatrists who dominated criminology more generally in Europe (Vold et al. 2002).

William Thomas contributed to the criminology of place by introducing the important concept of *social disorganization*, referring to "a decrease of the influence of existing social rules of behavior upon individual members of the group" (Thomas 1966, p. 3). The concept naturally focused on neighborhoods or communities. Robert Park (1864-1944), who was recruited by Thomas, was the initiator of urban social research on crime places, shifting the unit of analyses from countries and large areas to cities and their neighborhoods (Park 1925/1967). The city in his opinion was more than "…a congeries of individual men and of social conveniences – streets, buildings, electric lights, tramways, and telephones, etc; something more, also, than a mere constellation of institutions and administrative devices – courts, hospitals, schools, police and, civil functionaries of various sorts. The city is, rather, a state of mind, a body of costumes and traditions, and of the organized attitudes and sentiments that inhere in these costumes and are transmitted with this tradition. The city is not, in other words, merely a physical mechanism and an artificial construction. It is involved in the vital process of the people who compose it; it is a product of nature, and particularly of human nature" (Park 1925/1967, p. 1). Park argued that urban life must be studied in this context in terms of "its physical organization, its occupations, and its culture" a*n*d especially the changes therein (Park, 1925/1967, p. 3). Neighborhoods in his view were the elementary form of cohesion in urban life.

His younger colleague, Ernest Burgess, drawing from an inventory of price changes in housing values in Chicago areas developed a concentric zone model of the distribution of

social problems and crime for cities (especially for Chicago) (Burgess 1925/1967).[10] Burgess suggested that Chicago included five concentric[11] zones, each containing various neighborhoods, four of them situated around 'The Loop' (the business centre of the city): "the typical processes of the expansion of the city can best be illustrated, perhaps, by a series of concentric circles, which may be numbered to designate both the successive zones of urban extension and the types of areas differentiated in the process of expansion" (Burgess 1925/1967, p. 50). Burgess' unit of analyses was a series of neighborhoods within cities that share similar characteristics. He assumed that depending on the distances to the centre and the special features of these zones, the levels of crime would vary.

Clifford Shaw was one of the first Chicago sociologists to carry out extensive empirical research on the geographical distribution of crime on the basis of Burgess' zone model (Shaw 1929). This study can be seen as a landmark in the history of crime and places studies because of its detailed data collection, advanced methods and innovative statistical tools. Based on the concentric zone model of Burgess, he studied the distribution of truancy of young people, juvenile delinquents and adult offenders in Chicago. Assisted by young researchers like Henry McKay, Frederick Zorbaugh and Leonard Cottrell, he took natural areas as units of analyses (Abbott 1997) but in more detail than ever before in these kinds of studies. [12] Shaw introduced new units of analyses. First, he introduced *spot maps* by plotting the home address thousands of offenders on a map of Chicago. Second, he combined the offender address data with census data to created *delinquency rate maps* of square mile areas. And finally, he constructed *radial maps* and *zone maps*, which displayed deliquency rates at regular distances from the city center (Snodgras 1976).

---

[10] The real estate agent had discovered zones in the city of Chicago when he made up an inventory of price changes of houses and real estate. He contacted Burgess regarding his findings, which led to the now famous geographic model of crime and social problems in the urban context..

[11] In reality only half circles because Chicago is situated at the border of Lake Michigan.

[12] It is interesting to note that a similar approach was taken by Cyrill Burt (1883-1971) who studied the location of the home addresses of delinquent boys and girls in the years 1922 and 1923 in London. Following the Chicago School findings, he noted that the highest concentrations in crime were found in three neighborhoods situated closely to the city centre: Holborn, Finsbury, and Shoreditch (Burt 1924/1944). According to Burt, these oldest but not poorest neighborhoods of London were for offenders of strategic importance, because they were situated closely to attractive crime targets in the inner city and - if necessary – they could function as a place to hide from the police.

For further analyses on the distribution of crime across Chicago, Shaw divided the city into 431 census tracts in 1910 and 499 in 1920 (Shaw 1929). Each census tract included convenient age and sex groups of the population. Subsequently, these census tracts were combined into square-mile areas with a minimum population of 500 residents. The technique was to allocate delinquents to their place of residence, and to divide the number of delinquents by the number of boys of juvenile court age, in order to compute rates for small areas. These rates were used by Shaw and his associates to make shaded maps or compute correlations.

In the same year Shaw's research assistant Harvey Zorbaugh published his PhD in which he compared a slum neighborhood (The Lower North Side) with a wealthy area (Gold Coast) in Chicago, both situated in close proximity (Zorbaugh 1929). In this more qualitative study, Zorbaugh presented only a few maps, all of them less detailed in information than Shaw's study. However, his research demonstrated clearly that two areas in close physical proximity did not illustrate that physical and social distances coincide. As Park wrote in his foreword of Zorbaugh's study: "a situation in which people who live side by side are not, and – because of the divergence of their interests and their heritages – cannot, even with the best good will, become neighbors" (1929, p. ix), pointing to the invalid assumption of policy makers (and criminologists) of the time that people living in the same locality shared the same backgrounds and interests. This conclusion is very important for the choice of the unit of analysis in criminological research. This PhD-study made explicit that administrative and political areas and social spaces are not identical. Depending on the size of the area, a variety of social communities with different identities can exist. Importantly, he concluded that the smaller the unit of analysis, the greater the chance of a homogeneous community.

In 1942, Clifford Shaw and Henry McKay published their magnum opus *Juvenile Delinquency and Urban Areas* in which they not only presented their geographical and etiological analyses of crime rates in the city of Chicago, but also those of other cities: Philadelphia, Boston, Cincinnati, Cleveland, and Richmond. In principle they used similar analytic tools as introduced in their study of 1929. Again, they employed spot maps, rate maps, radial maps and zone maps to illustrate concentrations of crime and offenders in the city of Chicago over a long period of time (up to 60 years). In all of the

studied cities, they found similar patterns in the geographical distribution of crime. However, the units of analysis differed a good deal between the various cities. These differences were due to the lack of detailed official crime data in cities other than Chicago. The rapid changes in the city Chicago over a long period of time enabled them also to study the effects of the dynamics of the city on crime and other phenomena. One of their findings was that: "The data on trends also demonstrate with equal sharpness the rapid rise in rates of delinquents in certain areas when a population with a different history and different institutions and values takes over areas in a very short period of time" (Shaw and McKay 1942/1969, p. 382).

The Chicago studies inspired other criminologists to carry out empirical crime and place research in other cities (e.g. see Burgess and Bogue 1964).[13] At the same time, as the decades passed, empirical and methodological critics of the Chicago approach began to emerge (Lander 1954). First, it was argued that Shaw (1929) and Shaw and McKay (1942/1969) could not distinguish between the dwelling place of the offender and the location where he or she committed a crime, neglecting the variability in the mobility of offenders (see also Boggs 1965). Secondly, by relying on official crime figures, their research was seen as biased because offenders of the lower class had (and still have) a greater chance to be processed in the criminal justice system (for instance: Gordon 1967; Chilton 1964; Beirne and Messerschmidt 1991). Thirdly, delinquency rates after 1945 in Chicago did not conform to the distribution patterns of Shaw and McKay's early assumptions (Bursik 1984; 1986). European studies also showed contradicting results. Morris (1957) examined the offender rates of the county of Croydon, but could not confirm the zone model of Burgess. Twenty years later, Morris' findings were replicated in the city of Sheffield (Baldwin and Bottoms 1976). In Europe, the direct and indirect consequences of the operation of housing markets confounded the results of the geographical distribution of crime in American cities.

Another criticism that is key to our concern with units of analysis for crime place studies is that brought by Robinson (1950) who discussed the use of ecological correlations in

[13] Interesting to mention here is the relatively unknown policy report of Edwin Sutherland (1883-1950) on the geographical distribution of juvenile delinquency of the city of Bloomington, Indiana (Sutherland 1937). Inspired by the work of Shaw and McKay and using the zone model of Burgess, he revealed like in Chicago, certain delinquent neighbourhoods with high numbers of adult and juvenile offenders.

geographical studies like that of Shaw and McKay (1942/1969). According to Robinson (1950, p. 351) the object of an ecological correlation is a group of persons, not a person: ".. the individual correlation depends on the internal frequencies of the within-areas individual correlations, while the ecological correlation depends upon the marginal frequencies of the within-areas individual correlations" (Robinson 1950, p. 354). He concluded that ecological correlations cannot validly be used as substitutes for individual correlations. Such an ecological fallacy leads to meaningless conclusions. Looking back, these empirical and methodological critics diminished the attention of criminologists in studies of crime and place for almost twenty years.

Reemerging interest in communities and the emergence of study of micro crime places

In the 1980s, Albert J. Reiss Jr. was to encourage a group of younger criminologists to return to the interests of the Chicago School where he had received his Ph.D. in 1949. Reiss (1986) saw the criminological tradition as including two major theoretical positions, one that focused on individuals and a second that focused on crimes. Communities and crime was a main focus of the latter tradition and he sought to rekindle criminological interest in understanding variability of crime within and across communities. Editing an early volume in the *Crime and Justice* series, Reiss and Michael Tonry sought to bring *Communities and Crime* (1986) to the forefront of criminological interests.

Reiss did not see the new interest as simply mimicking the insights of the Chicago School criminologists. Rather, he sought to raise a new set of questions about crime at place that had been ignored in earlier decades: "Recent work on communities and crime has turned to the observation that Shaw and McKay neglected: not only do communities change their structures over time but so often do their crime rates (Kobrin and Scherman 1981; Bursik and Webb 1982; Bursik in this volume 1986; Scherman and Kobrin in this volume 1986; Skogan in this volume 1986), a recognition that communities as well as individuals have crime careers." (Reiss 1986, p. 19) Many of the contributors to the Reiss and Tonry volume would become leaders of a new generation of criminologists, once again suggesting the important and enduring role of crime and place in advancing the criminological enterprise more generally. Among the contributors were Wes Skogan,

Robert Sampson, Douglas Smith, Robert Bursik, Ralph Taylor, Stephen Gottfredson, and Lawrence Sherman.

This volume and other work developed in this period drew upon the identification of neighborhoods and communities to expand insights about the development of crime (Brantingham and Brantingham 1981/1991; Bursik and Webb 1982; Clarke 1983; Hunter 1988; LeBeau 1987; Rengert 1980, 1981; Roncek and Bell 1981; Sampson 1985; Sampson and Groves 1989). Smith (1987), for example, identified neighborhood variation in the behavior of the police, suggesting the importance of place in understanding not only the etiology of crime, but also the etiology of criminal justice. Skogan brought new insights not only to our understanding of the interaction of community characteristics and policing (Skogan 1987), but also more generally to the developmental processes that led to the emergence of crime and disorder in urban communities (Skogan, 1990). More recently, scholars led by Robert Sampson have used a focus on the community to draw new insights into developmental crime patterns, arguing that social cohesion within communities and shared expectations of community members combine to affect both crime and social disorder (Sampson and Raudenbush 1999; Sampson et al. 1997).

Consistent with Reiss' call for investigation of the criminal careers of communities, Bursik (1987; see also Bursik and Webb 1982) revisited crime in Chicago neighborhoods over time and challenged earlier views of the stability of crime within neighborhoods and communities, arguing that stability in crime patterns was a result of long term stability in the social characteristics of places, and that instability in such patterns would also lead to instability in crime rates. Similarly, Schuerman and Kobrin (1986) identified stability and variability in criminal careers of places, focusing on the residences of juvenile delinquents as had Shaw and McKay (1942). Using the number of residential addresses of officially known delinquents by census tracts in Los Angeles as an indicator of aggregate crime they found three general patterns that led to high crime rates in 1970. The first pattern they termed "emerging", and referred to those clusters that were relatively crime free in 1950 but had moderate to high crime in 1960 and 1970, respectively. The second pattern, "transitional", refers to those clusters that had moderately high crime in 1950, a higher level 1960 and an even higher level in 1970. The

last pattern is referred to as “enduring” and refers to those clusters that had persistently high crime rates at all points in time. The vast majority of census tracts within the clusters were designated as having enduring crime rates over the time span, with fewer census tracts in the transitional and emerging categories.

Interestingly, though the approach of the Chicago School called for the identification of units of geography that would not be drawn from administrative data collection, but from the social units that defined neighborhoods or communities, this new generation of scholars concerned with communities and crime have generally used officially defined units for drawing their data and conclusions. In this case, the US Census definitions, most often census tracts or the smaller census block groups, have become the main source for defining the units of geography that are the focus of research in the US, despite the fact that the goals of the census in creating physically contiguous geographic units are often inconsistent with the goals of community and crime researchers (see Rengert and Lockwood, this volume). Often such studies will simply assume that census units such as census tracts reflect actual community boundaries (Hipp 2007), though some scholars in this area combine census units with the idea of creating boundaries of communities that are more consistent with the theoretical interests of researchers (e.g. see Sampson et al. 1997). Importantly, this new focus on communities and crime often led to study of much smaller geographic units of analysis than had drawn the interests of the early Chicago School scholars.

While a reemergence of interest in communities and crime had been one important source for renewed study of crime and place in recent decades, the 1980s produced a more radical reformulation of the unit of geography that should form the basis of crime place studies, continuing to push the unit of geographic analysis to a more micro level. Traditional criminological interest in place has focused on higher level geographic units such as regions, cities, communities or neighborhoods. One reason for this focus on macro levels of geography is simply that data were often not available at geographic levels lower than the standard administrative or census divisions. But even when data were available, statistical and analytic tools were not readily available for linking crime easily with micro units of geography

Certainly, the difficulty of mapping crimes to specific places and of analyzing geographic data were factors that prevented study of crime at micro units of geography, but another barrier was the lack of consistent theoretical interest in micro places as contrasted with research on individual criminality, or crime across macro geographic units (Weisburd and McEwen 1997; Weisburd et al. 2004). Such theoretical interest was not to emerge until the late 1970s and 1980s, about the time that computerized crime mapping and more sophisticated geographic statistical tools were to emerge (Weisburd and McEwen 1997).

A new group of theorists challenged traditional criminological interests and began to focus more on the "processes operating at the moment of the crime's occurrence" (Birkbeck and LaFree 1993, p. 114). One influential critique that was to have strong influence on the development of interest in micro units of geography was brought by Lawrence Cohen and Marcus Felson (1979). They argued that the emphasis placed on individual motivation in criminological theory failed to recognize the importance of other elements of the crime equation. They argued that crime rates could be affected by changing the nature of targets or of guardianship, irrespective of the nature of criminal motivations. The "routine activities" perspective they presented established the spatial and temporal context of criminal events as an important focus of study.

Canadian criminologists Patricia Brantingham and Paul Brantingham (1993) made the connection between routine activities and place even more directly in their development of "crime pattern theory." Crime pattern theory focuses directly upon places by asking how targets come to the attention of offenders and how that influences the distribution of crime events over time and across places. Like Cohen and Felson, Brantingham and Brantinham see routine human social and economic activities as a critical feature of the crime equation, but in this case the place is made an explicit rather than implicit part of this equation, providing a "backcloth" for human behavior.

Drawing upon similar themes, British scholars led by Ronald Clarke began to explore the theoretical and practical possibilities of "situational crime prevention" in the 1980s (Clarke 1983; 1992; 1995; Cornish and Clarke 1986). Their focus was on criminal contexts and the possibilities for reducing the opportunities for crime in very specific situations. Their approach turned traditional crime prevention theory on its head. At the center of their crime equation was opportunity. And they sought to change opportunity

rather than reform offenders. In situational crime prevention, more often than not, "opportunity makes the thief" (Felson and Clarke 1998). This was in sharp contrast to the traditional view that the thief simply took advantage of a very large number of potential opportunities. Importantly, in a series of case studies situational crime prevention advocates showed that reducing criminal opportunities in very specific contexts can lead to crime reduction and prevention (Clarke 1992; 1995).

One implication of these emerging perspectives is that micro crime places were an important focus of inquiry. Places in this "micro" context are specific locations within the larger social environments of communities and neighborhoods (Eck and Weisburd 1995). They are sometimes defined as buildings or addresses (e.g., see Green (Mazerolle), 1996; Sherman et al. 1989), sometimes as blockfaces, 'hundred blocks', or street segments (e.g. see Taylor 1997; Weisburd et al. 2004), sometimes as clusters of addresses, blockfaces or street segments (e.g., see Block et al. 1995; Sherman and Weisburd 1995; Weisburd and Green 1995). Research in this area began with attempts to identify the relationship between specific aspects of urban design (Jeffery 1971) or urban architecture and crime (Newman 1972) but broadened to take into account a much larger set of characteristics of physical space and criminal opportunity (Brantingham and Brantingham 1991 [1981]; e.g. see Brantingham and Brantingham 1975; Duffala 1976; Hunter 1988; LeBeau 1987; Mayhew et al. 1976; Rengert 1980; Rengert 1981). In 1989, Sherman and colleagues coined the term the "criminology of place," to describe this new approach that drew its theoretical grounding from routine activities and situational crime prevention to emphasize the importance of micro crime places in the etiology of crime.

Recent studies point to the potential theoretical and practical benefits of focusing research on micro crime places. A number of studies, for example, suggest that there is a very significant clustering of crime at places, irrespective of the specific unit of analysis that is defined (Brantingham and Brantingham 1999; Crow and Bull 1975; Pierce et al. 1986; Roncek 2000; Sherman et al. 1989; Weisburd and Green 1994; Weisburd et al. 1992; Weisburd et al. 2004). The extent of the concentration of crime at place is dramatic. In one of the pioneering studies in this area, Sherman et al. (1989) found that only three and a half percent of the addresses in Minneapolis produced 50 percent of all calls to the police. Fifteen years later in a study in Seattle, Washington, Weisburd et al. (2004)

reported that between four and five percent of street segments in the city accounted for 50 percent of crime incidents for each year over 14 years. These studies and others (Brantingham and Brantingham 1984; Clarke 1983; Curtis 1974; Maltzet al. [1990] 2000; Pyle 1976; Rengert 1980; Skogan 1990) have established crime places as an important focus of criminological inquiry. In turn, a number of recent crime prevention programs focused on specific places, often defined as crime "hot spots," have been found to have significant effects on crime and disorder without evidence of spatial displacement of crime to other areas (Braga 2001; Eck and Weisburd 2004; Weisburd et al. 2006).

At What Unit of Geography?

Our review suggests not only the enduring importance of research and theorizing about places in criminology, but also the diversity of units of analysis that have informed criminological study over last two centuries. Interest in crime places began for the most part with study of large administrative districts such as regions or even countries, in good part because that is how data were organized and available. In the Chicago School, scholars focused interest on social units that could not simply be defined using administrative units, but their interests still focused primarily on larger geographic units such as neighborhoods or communities. More recent interest in communities and crime has tended to focus on smaller, more specific and targeted definitions of neighborhoods, often analyzing crime at place using data provided by the US census. Over the last two decades, interest in micro crime places has begun to attract significant criminological interest, in this case, bringing scholars to geographic units that operate much below the neighborhood level and sometimes in units as small as addresses or street blocks. While criminologists have had a sustained interest in crime at place, the unit of analysis for study of geographic criminology has received little systematic theoretical or empirical attention. There is consensus about some basic rules of defining spatial units, such as the requirement that boundaries should be well-defined, that units can only have a single boundary and cannot overlap each other, but the choice of spatial units is typically made on the basis of pragmatic arguments. Researchers today generally define the geographic boundaries for their studies based on data that is readily available, much as criminologists

in the 19th century used data drawn from administrative areas defined by government departments. As George Rengert and Brian Lockwood note in this volume:

> "The problem is that most of these boundaries are constructed for administrative purposes rather than for reasons of sound research designs. For example, census boundaries are constructed for administrative purposes of the enumeration of the population, zip code boundaries for postal delivery, police districts for allocation of resources, and political boundaries for purposes of administrative responsibility".

Even when researchers have defined boundaries based on theoretical domains, as did Shaw and McKay (1942/1969) they do not often examine critically the geographic unit of analysis employed.

At what level should we study crime at place? As we have described above there is an important trend over time toward study of crime at place at smaller units of geography. But does that trend reflect a fact about the level of geography that is important to understanding crime, or is it simply a result of the specific data available and theoretical interests of scholars? Of course, we might question why the unit of geography should matter at all. Perhaps the best approach is one that is eclectic in its understanding of crime at place.

While we don't discount the relevance of studying varying geographic units in coming to a more complete understanding of crime at place, it is important to recognize at the outset that studying crime at the "wrong" geographic unit may lead to a very misleading portrait of how place and crime interact. This was pointed out more than half a century ago by Robinson (1950) in his identification of what he termed the "ecological fallacy." In this volume, Liz Groff, David Weisburd and Nancy Morris, suggest that such biases in our understanding of crime may be present even when the units of geography used for study are measured at such levels as census tracts or census block groups. Groff and her colleagues examine street to street variability in juvenile crime patterns across time in the city of Seattle over a 14 year period. While they find that there is greater clustering of street segments with similar patterns or trajectories than would be expected by chance, their analyses show that there is also very strong street to street variability suggesting "independence" of street blocks in terms of crime patterns over time.

Such results imply (as had Glyde's observations more than 150 years earlier; see also Zorbaugh 1929) that examining crime patters at larger geographic levels, even such commonly used "smaller" units such as census tracts or census block groups will mask significant lower order geographic variability. If, for example, a census tract included both increasing and decreasing crime trajectories as identified by Groff et al. the portrait gained when aggregating segments to the census tract would likely lead a researcher to conclude that there is overall a stable trend of crime over time (masking the contrasting trends at the street block level). More generally, when there is a good deal of variability at a very local level of geography (e.g. a street segment or group of street segments), we might in measuring higher order geographic units miss local area effects. This can be referred to as "averaging" and presents today as in earlier decades, an important challenge to crime and place research.

Such averaging can manifest itself in a number of ways that would lead to misleading interpretation of geographic data. A number of very active crime areas within a larger geographic unit might for example give the impression of an overall crime prone area, when in fact most places in the larger geographic unit have low levels of crime. Similarly, when the vast majority of places have very little crime but a few very active places have very high crime counts, there can be a "washing out" of effect. In some sense, a conclusion in such a case that the area overall has little crime is correct. However, such a conclusion would miss the very important fact that some places within the larger unit are "hot spots of crime."

Of course, the ecological fallacy may not only apply to studies which rely on larger geographic units. If the "action of crime" is at higher levels of geography, an approach that focuses only on lower level variability can also be misleading. In this case, we might assume that there are important local effects, when they are simply reflecting higher order influences. Take for example a study that examines street blocks and finds that a relatively small number of street blocks are responsible for a large proportion of crime. It may be that all of those street blocks are in one central area of the city. In this case the focus on micro units of geography might obscure the importance of larger community or neighborhood effects.

Contributors to this volume certainly show that there are local as well as higher order influences on crime at place. We have already noted the findings of Groff, Weisburd and Morris. Oberwittler and Wikström employing a large survey in Peterborough (UK) that was structured to allow comparison of small area with larger area effects, also find strong evidence of the contribution of very local area influences to crime. Their study emphasizes the homogeneity of responses in areas with 300 to 1500 inhabitants as contrasted with units of greater than 5000 inhabitants, and finds that much variability in juvenile delinquency can be attributed to environmental characteristics at the local level. These data once again point to the importance of focusing on smaller more micro units of geography.

Importantly, beginning with a micro level approach also allows the researcher to examine the influences of larger geographic units, while starting at higher levels of geography may preclude examination of local variability. This problem is similar to that presented when choosing levels of measurement. The general admonition is to collect data at the highest level of measurement (interval or ratio scales), since such data can be converted to lower levels of measurement (Weisburd and Britt 2007). At the same time, data collected at lower levels of measurement (e.g. ordinal or nominal scales) cannot simply be disaggregated to higher levels. The same principal applies to geographic information, though the language is reversed. Collecting data at the lowest geographic level, or smallest units of analysis, allows aggregation up to higher levels, but data collection at higher units may not allow conversion to more micro units of analysis. For this reason, Brantingham and Brantingham argue in this volume that crime analysis at places must begin with small spatial units, and build larger units that reflect the reality of crime patterns. Their article presents a statistical methodology for building up from smaller units to levels that fully reflect variability in the data analyzed.

One problem however, as Michael Maltz (this volume) notes is that there just may not be enough data at a very micro level from which to draw inferences (see also in this volume Brantingham et al.; Rengert; and Oberwitter and Wikström). Especially if one is interested in specific types of crime, they may be too rare in any single micro place unit, such as a street segment, to allow the identification of patterns or trends. Importantly, as well, the reality of the study of crime is that we are often dependent on social and

demographic data that are drawn from data sources meant for other purposes. This will often create a dilemma for researchers, who need to do the best they can with the information available. Our point is not that researchers should not use the data at hand, but that they should be critical of the data used and recognize the potential fallacies of interpretation that may lead from the unit of analysis problem. In this context, George Rengert and Brian Lockwood's paper in this volume both identifies the nature of such problems, and presents methods for dealing with averaging and other problems in aggregated geographic data, including the difficult problem of drawing edges or geographic boundaries when such boundaries are difficult to define.

Moving Forward: Problems of Theory and Data

In focusing attention on units of geography for study of crime and place, we think it is important to also consider the factors that have inhibited study of this question to date. Why has the unit of analysis not been a more critical issue in the criminology of place? How can we move beyond prior studies and advance our understanding of how units of analysis influence our portrait of crime and place? Our view is that the "criminology of place" has reached a critical juncture, at which real advancement will require scholars to critically assess the unit of analysis problem. This volume was developed with this goal in mind, and before concluding this introductory chapter, we want to focus on specific barriers to advancement of our identification and understanding of units of analysis in crime and place research.

Perhaps the most important barrier to date develops from the relatively uncritical theoretical approach that crime and place researchers have brought to units of geography. This is in some sense understandable given the fact that most criminological theory has been focused on people and not on places (Brantingham and Brantingham 1990; Eck and Weisburd 2004; Nettler 1978; Sherman 1995; Weisburd 2002). The critical concern for most criminologists over the last half a century has been "why do people commit crime" not "why does crime occur in certain places"? Recent study of crime places suggests that this emphasis has provided a biased portrait of the crime problem, and that the study of crime and place should be central in criminology (see Eck and Weisburd 1995; Weisburd 2002). Lawrence Sherman for example, using data from Minneapolis, Minnesota and

comparing these to the concentration of offending in the Philadelphia Cohort Study (see Wolfgang et al. 1972), notes that future crime is "six times more predictable by the address of the occurrence than by the identity of the offender" (1995, p. 36-37). Sherman asks, “why aren’t we doing more about it? Why aren’t we thinking more about whereduni t, rather than just whodunit?”

While there is growing evidence indicating the importance of crime places in criminology and crime and justice practice, theoretical attention to place and its definition has lagged far behind theoretical advances in study of individuals. But it is important to note that even those theories that have addressed directly the importance of place have failed to provide clear guidance as to the appropriate units of geography for understanding particular theories. For example, as we described earlier, social disorganization theory suggests the importance of macro level area effects, usually identified in such geographic units as neighborhoods or communities. But in defining social disorganization theory, scholars rarely provide specific guidance as to how to define the boundaries of these units of analysis. What is a community or neighborhood? This is still an issue of debate among scholars (Hipp 2007).

Routine activities or crime pattern theory suggests a very different, micro rather than macro level of geography, for crime place studies. But again, we are left with very little guidance as to how to define such "hot spots" or local contexts. Sometimes, places are measured as street segments or block faces, sometimes as addresses and sometimes as small micro clusters of places (such as drug market areas). And this raises another issue, which we noted earlier, which is whether there is a competition between units of analysis or whether the units themselves depend on the nature of the problems studied. There may be no correct unit of geography for criminological study. And in this case we would have to recognize that units of analysis will change from study to study. Another important issue is the extent to which there needs to be integration of the person, context and place levels in theory and in research. Oberwittler and Wikström (in this volume) and Wikström and Butterworth (2006) have begun to explore this question. But our knowledge is still at a very early stage of development.

Another critical problem for criminologists in the study of crime at place is that the data rather than theory have often driven empirical analysis. Our review of the history of

geographic criminology suggests how this problem has been a consistent one beginning with the choice of large administrative areas in early 19th century studies, to examination of much smaller, though still not micro crime place units developed by the US Census Bureau. In this case, geographic criminologists perhaps face a much more difficult problem than criminologists more generally, since most data sets in this area are not created by criminologists but rather drawn from such official agencies as the police or other local government. This means, as both George Rengert and Brian Lockwood. and Michael Maltz note in this volume, that the present data that define the boundaries of units for crime and place studies often have little to do with what is important in the criminology of place.

Clearly, new data bases scaled to the units of geography that fit theories of crime and place will have to be developed if we are to advance our understanding of the criminology of place. Two chapters in this volume illustrate the importance of new data collection for developing such an understanding. The chapter by Oberwittler and Wikström described earlier is based on a major data collection effort that included information on "(i) *the individual* and his and her individual and social characteristics and experiences (data is collected through an interview, interviewer-led questionnaires and psychometric tests); (ii) *the environment* and the characteristics of different small-area environments of Peterborough (data is collected through a community survey); and (iii) *individuals' exposure to different environments* in Peterborough (data is collected using a Space-Time Budget technique)" for a sample of 6600 respondents. Tita and Greenbaum also collect original data in this case on the perceptions and attitudes of gang members to understand the geographic context of gang violence. Their contribution to our volume is particularly important because it emphasizes that specific geographic units may not always be easily defined in trying to understand social phenomena. Indeed, the geographic distribution of gang violence as reflected in their data is conditioned by the "socio-spatial dimensions of the gang rivalry network." While place clearly matters in understanding gang violence, place is only one part of a more complex story. We suspect that such social contexts play an important role as well in many other types of crime.

While original and innovative data collection, such as that represented by these chapters in our volume, must form an important part of crime and place studies, such data

collection is very expensive and we cannot expect for advances in this area to rely solely on costly new data bases given present support for crime research, and social research more generally. Our volume also shows that we can learn much using existing data. Advances in geographic information systems have meant that local governments are now collecting and keeping detailed information on places at lower levels of geography. While they are not doing so to advance criminological inquiry, the data they keep for routine administrative purposes can provide important insights into our understanding of crime and place.

Johnson, Bowers, Birks and Pease draw from official police data on burglaries from Merseyside (UK) over a fourteen month period to assess how well crime locations can be predicted based on prior patterns. Their study reinforces the predictive value of repeat victimization (Anderson et al. 1995; Farrell and Pease 2008; Forrester et al. 1988; Polvi et al. 1990; 1991), but also raises important questions about the level at which police activities should be brought to address burglary problems. Johan van Wilsem also uses crime data collected by the police, but supplements such data with social information collected by the Center for Research and Statistics of the Rotterdam municipality to examine the factors that influence the commission of violent crime. Van Wilsem finds that street level characteristics and routine activities are important to understanding the geographic concentration of crime reinforcing recent interest in micro place units of analysis. Finally, Smith, Bond and Townsley use official data to draw new insights about the geographic distances that typify offender journeys to crime. One very important insight from this work is that there are a considerable minority of offenders in their sample that travel relatively long distances, contradicting research that emphasizes the relatively short journeys to crime of offenders (e.g. see Rossmo 2000; Rengert et al. 1999; Rhodes and Conly 1981; Paulsen and Robinson 2004; Chainey and Ratcliffe 2005). This finding emphasizes that units of analysis for geographic criminology may at times be shifting because of the social context of offender behavior, reminding us of the observations of Tita and Greenbaum described earlier. The unit of analysis for geographic crime studies cannot be divorced from the social contexts of crimes and criminals.

A final critical issue to be mentioned concerns the statistical issues raised by spatial data in general, and by small spatial units of analysis in particular. It is well recognized that in most spatial crime research, the spatial units of analysis are not independent observations. In fact, many substantive questions precisely pertain to how adjacent spatial units interact. For example, we are interested in whether crime prevention activity in one place displaces crime to nearby places (Weisburd et al. 2006). The interdependence between spatial units of analysis requires statistical techniques and models that are geared to spatial structures (Anselin et al. 2000), and many of them are utilized in the other chapters in this volume.

The trend towards increasingly smaller units of analysis that has been documented here, not only implies that we need to consider more closely the interactions between adjacent and nearby units, it also gives rise to additional statistical challenges. For example, the distributions of dependent variables will typically be skewed (e.g., a large percentage of the units experience no crime at all), which poses additional (non-linearity) requirements to the statistical models employed. In addition, some spatial relations are also hierarchical, for example all street segments within a police beat or other administrative boundary are subject to the same policies and procedures, irrespective of their spatial arrangement viz-aviz each other. In those cases the statistical models used need to account for hierachical and spatial structure simultanuously (e.g. Morenoff et al. 2001).

Conclusions

Our intention in this book is to bring attention to the problem of units of analysis in geographic criminology. We recognize at the outset that no single volume can explore the myriad of issues that are important in this area, but we try to cover a broad spectrum of critical questions and concerns in the chapters that follow. Our book is divided into two main sections, reflecting the broad themes that we have raised in this introductory chapter. The first section deals directly with the substantive question of the unit of analysis that should be the focus of criminologists, and suggests a number of methodological approaches to identifying units appropriate for analysis and investigation. The second part of the book focuses on case studies of crime at place, illustrating how we

can advance our understanding of units of analysis for geographic criminology through specific empirical studies.

In this introductory chapter we have focused on the history of crime and place studies, and the specific challenges that geographic crime researchers face in advancing this promising area of criminological inquiry. We hope that this exploratory effort in identifying the problem of units of analysis in crime and place studies will spur interest in advancing geographic criminology and strengthening its influence in criminology more generally. While by necessity our book takes a broad approach to the problem of units of analysis, we think that the contributions share a common theme in that they make explicit the importance of clearly defining and specifying geographic units of analysis. This is a theoretical problem, as well as a practical question of data and methods. It is time to “put crime in its place.”

References

Abbott, A. (1997). Of time and space: The contemporary relevance of the Chicago school. *Social Forces*, 75(4),1149-1182.

Anderson, D., Chenery, S., & Pease, K. (1995). *Biting back: Tackling repeat burglary and car crime*. Crime Detection and Prevention Series Paper 58. London: Home Office.

Anselin, L., Cohen, J., Cook, D., Gorr, W. & Tita, G. (2000). Spatial analyses of crime. In: Duffee, D. (Ed.), *Criminal Justice 2000: Volume 4. Measurement and Analysis of Crime and Justice* (pp. 213–262). Washington, DC: National Institute of Justice.

Balbi, A., & Guerry, A-M. (1829). Statistique comparée de l'état de l'instruction et du nombre des crimes dans les divers arrondissements des Académies et des Cours Royales de France. Paris.

Baldwin, J., & Bottoms, A. E. (1976). *The urban criminal*. London: Tavistock.

Beirne, P. (1987). Adolphe Quetelet and the origins of positivist criminology. *American Journal of Sociology*, 92(5), 1140-1169.

Beirne, P. (1993). *Inventing criminology. Essays on the rise of 'homo criminalis.'* New York: State University of New York Press.

Beirne, P., & Messersmidt, J. (1991). *Criminology*. San Diego: Harcourt Brace Jovanovich.

Birkbeck, C., LaFree, G. (1993). The situational analysis of crime and deviance. *Annual Review of Sociology*, 19, 113-137.

Block, C., Dabdoub, M., & Fregly, S. (Eds.) (1995). *Crime analysis through computer mapping.* Washington, DC: Police Executive Research Forum.

Boggs, S. L. (1965). Urban crime patterns. *American Sociological Review*, 30(6), 899-908.

Braga, A. A. (2001). The effects of hot spots policing on crime. *The Annals of the American Academy of Political and Social Science*, 578, 104-115.

Brantingham, P. L., Brantingham, P. J. (1975). Residential burglary and urban form. *Urban Studies*, 12**,** 104-125.

Brantingham, P. J., & Brantingham, P. L. (1984). *Patterns in crime.* New York Macmillan.

Brantingham, P. J., Brantingham, P. L. (1990). Situational crime prevention in practice. *Canadian Journal of Criminology*, 32(1), 17-40.

Brantingham, P. J., & Brantingham, P. L. (1991). The dimensions of crime. In P. J. Brantingham & P. L. Brantingham (Eds.), *Environmental criminology* (pp. 7-26). Beverly Hills, CA: Sage. (Original work published 1981).

Brantingham, P. L., & Brantingham, P. J. (1993). Environment, routine, and situation: Toward a pattern theory of crime. In R. V. Clarke and M. Felson (Eds.), *Routine Activity and Rational Choice.* Advances in Criminological Theory, Vol. 5. New Brunswick, NJ: Transaction.

Brantingham, P. L., Brantingham, P. J. (1999). Theoretical model of crime hot spot generation. *Studies on Crime and Crime Prevention*, 8, 7-26.

Bulmer, M. (1984). *The Chicago School of sociology. Institutionalization, diversity, and the rise of sociological research*, Chicago & London: The University of Chicago Press.

Burgess, E.W. (1967). The growth of the city. An introduction to a research project. In R. E. Park & E. W. Burgess (Eds.), *The city: Suggestions for the investigation of human behaviour in the urban environment*. Chicago: The University of Chicago Press. (Original work published 1925).

Burgess, E. W., & Bogue, D. J. (1964). Research in urban society: A long view. In E. W. Burgess & D. J. Bogue (Eds.), *Contributions to urban sociology* (pp. 1-14). Chicago & London: The University of Chicago Press.

Burgess, E. W., & Bogue, D. J. (1964). The delinquency research of Clifford R. Shaw and Henry D. McKay and associates. In E. W. Burgess & D. J. Bogue (Eds.), *Contributions to urban sociology* (pp. 591-615). Chicago & London: The University of Chicago Press.

Bursik, R. J. Jr. (1984). Urban dynamics and ecological studies of delinquency, *Social Forces*, 63, 393-413.

Bursik, R. J. Jr. (1986). Ecological stability and the dynamics of delinquency. In A. J. Reiss, Jr. & M. Tonry (Eds.), *Communities and Crime. Crime and Justice: A Review of Research, Vol. 8* (pp. 35-66). Chicago: The University of Chicago Press.

Bursik, R. J. Jr., Webb, J. (1982). Community change and patterns of delinquency. *American Journal of Sociology*, 88(1), 24-42.

Burt, C. (1944). *The young delinquent*. London: University of London Press. (Original work published 1924).

Chainey, S., & Ratcliffe, J. (2005). *GIS and crime mapping*. Hoboken, NJ: John Wiley.

Chilton, R .J. (1964). Continuity in delinquency area research: a comparison of studies for Baltimore, Detroit, and Indianapolis. *American Sociological Review*, 29, 71-83.

Chilton, R. J., Dussich, J. P. (1974). Methodological issues in delinquency research: Some alternative analysis of geographical distributed data. *Social Forces*, 53(1), 73-82.

Clarke, R. V. (1983). Situational crime prevention: Its theoretical basis and practical scope. In M. Tonry & N. Morris (Eds.), *Crime and Justice: An Annual Review of Research, Vol. 14*. Chicago: The University of Chicago Press.

Clarke, R. V. (1992). *Situational crime prevention: Successful case studies.* Albany, NY: Harrow and Heston.

Clarke, R. V. (1995). Situational crime prevention. In M. Tonry & D. Farrington (Eds.), *Building a Safer Society: Strategic Approaches to Crime Prevention. Crime and Justice: A Review of Research, Vol. 19* (pp. 91-150). Chicago: The University of Chicago Press.

Cohen, L. E., Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, 44(4), 588-605.

Cornish, D., & Clarke, R. V. (Eds.). (1986). *The reasoning criminal: Rational choice perspectives on offending*. New York: Springer-Verlag.

Crow, W., & Bull, J. (1975). Robbery deterrence: An applied behavioral science demonstration -- Final report. La Jolla, CA: Western Behavioral Science Institute.

Curtis, L. A. (1974). *Criminal violence: National patterns and behavior.* Lexington MA: Lexington Books.

Ducpétiaux, E. (1827). *De la Justice de prévoyance, et particulièrement de l'influence de la misère et de l'aisance, de l'ignorance et de l'instruction sur le nombre des crimes*. Bruxelles: J. J. de Cautaerts.

Duffala, D. C. (1976). Convenience stores, armed robbery, and physical environmental features. *American Behavioral Scientist*, 20**,** 227-246.

Durkheim, E. (1964). *The division of labour in society*. New York: Free Press. (Original work published 1894).

Eck, J. E., & Weisburd, D. (1995). Crime places in crime theory. In J. E. Eck & D. Weisburd (Eds.), *Crime and place* (pp. 1-33). Monsey, NY: Willow Tree Press.

Eck, J. E., Weisburd, D. (2004). What can the police do to reduce crime, disorder, and fear? *The Annals of the American Academy of Political and Social Science*, 593, 42-65.

Elmer, M. C. (1933). Century-old ecological studies in France. *American Journal of Sociology*, 39(1), 63-70.

Erickson, M. L. (1971). The group context of delinquent behavior. *Social Problems*, 19(1), 114-129.

Erickson, M. L., Jensen, G. F. (1977). Delinquency is still group behavior! Toward revitalizing the group premise in the sociology of deviance. *The Journal of Criminal Law and Criminology*, 68(2), 262-273.

Faris, R. E. L. (1967). *Chicago sociology 1920-1932*, San Francisco: Chandler.

Felson, M., & Clarke, R. V. (1998). *Opportunity makes the thief: Practical theory for crime prevention*. Police Research Series Paper 98. London: Policing and Reducing Crime Unit; Research, Development and Statistics Directorate.

Fletcher, J. (1850). *Summary of the moral statistics of England and Wales*, London: Private distribution of the author.

Forrester, D., Chatterston, M., & Pease, K. (1988). *The Kirkholt burglary reduction project, Rochdale*. London: Home Office Crime Prevention Unit.

Friendly, M. (2007). A.-M. Guerry's Moral Statistics of France: Challenges for Multivariable Spatial Analysis. *Statistical Science*, 22, 368-399.

Glyde, J. (1856). Localities of crime in Suffolk, *Journal of Statistical Society of London*, 19, 102-106.

Gold, M. (1970). *Delinquent behavior in an American city*. Belmont, CA: Brooks/Cole.

Gordon, R. A. (1967). Issues in the ecological study of delinquency, *American Sociological Review*, 32, 927-944.

Green (Mazerolle), L. (1996). *Policing places with drug problems.* Thousand Oaks, CA: Sage.

Greg, W. R (1835). *Social statistics of the Netherlands*. London: Ridgway, Harrison and Crosfield.

Guerry, A-M. (1832). La Statistique comparée de l'état de l'instruction et du nombre des crimes, *Revue Encyclopédique*, 55, 414-424.

Guerry, A-M. (1833). *Essai sur la statistique morale de la France*. Paris: Crochard.

Guerry, A-M. (1864). *Statistique morale de l'Angleterre compare avec la Statistique Morale de la France*. Paris: Bailliére.

Harvey, L. (1987). *Myths of the Chicago School of sociology*, Hong Kong: Avebury.

Hipp, J. R. (2007). Block, tract, and level of aggregation: Neighborhood structure and crime and disorder as a case in point. *American Sociological Review,* 72, 659-680.

Hunter, R. D. (1988). *Environmental characteristics of convenience store robberies in the state of Florida*. Paper presented at the meeting of the American Society of Criminology, Chicago.

Jeffery, C. R. (1971). *Crime prevention through environmental design.* Beverly Hills, CA: Sage.

Kenwitz, J.W. (1987). *Cartography in France: 1660-1848.* Chicago: The University of Chicago Press.

Klein, M. (1969). On the group context of delinquency. *Sociology and Social Research*, 54, 63-71.

Kobrin, S., & Schuerman, L. A. (1981). *Ecological processes in the creation of delinquency areas: An update*. Paper presented at the meeting of the American Sociological Association, Toronto, Canada.

Landau, D., Lazarsfeld, P. F. (1968). Quetelet, Adolphe. *International Encyclopedia of the Social Sciences*, 13, 247-257.

Lander, B. (1954). *Towards an understanding of juvenile delinquency*. New York: Columbia University Press.

LeBeau, J. L. (1987). The methods and measures of centrography and the spatial dynamics of rape. *Journal of Quantitative Criminology,* 3, 125-141.

Lombroso, C. (2006). *Criminal* man (translated and with a new introduction by M. Gibson & N. Han Rafter), Durham, NC: Duke University Press. (Original work published 1878).

Maltz, M. D., Gordon, A. C., & Friedman, W. (2000). *Mapping crime in its community setting: Event geography analysis.* Originally published New York: Springer-Verlag. Internet edition available at http://www.utc.edu/depts/lib/forr. (Original work published 1990).

Mayhew, H. (1950). *London's underworld. Being selections from 'Those that will not work', the 4th vol. of 'London labour and the London poor'* (edited by P. Quennell), London: Spring Books. (Original work published 1851 & 1862).

Mayhew, H. (1865). *London labour and the London poor. Volume 4: Those that will not work*, London: Charles Griffin.

Mayhew, P., Clarke, R. V., Sturman, A., & Hough, M. (1976). *Crime as opportunity*. Home Office Research Study, Vol. 34. London: Home Office, H.M. Stationary Office.

Morenoff, J., Sampson, R.J. and Raudenbush, S.W. (2001). Neighborhood Inequality, Collective Efficacy and the Spatial Dynamics of Homicide. *Criminology,* 39, 517-560.

Morris, T. (1957). *The criminal area. A study in social ecology*, London, Routledge & Kegan Paul.

National Research Council. (2004). *Fairness and effectiveness in policing: The evidence.* Committee to Review Research on Police Policy and Practices. W. Skogan and K. Frydl (Eds.). Committee on Law and Justice, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Nettler, G. (1978). *Explaining crime.* Montreal: McGraw-Hill.

Newman, O. (1972). *Defensible space: Crime prevention through environmental design.* New York: Macmillan.

Openshaw, S. (1984). *The Modifiable Areal Unit Problem.* Norwich: Geo Books.

Parent-Duchatelet, A. J. B. (1837). *Prostitution dans la ville de Paris*. Paris.

Park, R. E. (1967). The city: Suggestions for the investigation of human behaviour in the urban environment. In R. E. Park & E. W. Burgess (Eds.), *The city: Suggestions for*

the investigation of human behaviour in the urban environment (pp. 1-46). Chicago: The University of Chicago Press. (Original work published 1925)

Paulsen, D. J., & Robinson, M. B. (2004). *Spatial aspects of crime: Theory and practice.* Boston, MA: Pearson.

Philips, P. D. (1972). A prologue to the geography of crime. *Proceedings of the Association of American Geographers*, 4, 86-91.

Pierce, G., Spaar, S., & Briggs, L. R. (1986). *The character of police work: Strategic and tactical implications.* Boston, MA: Center for Applied Social Research, Northeastern University.

Polvi, N., Looman, T., Humphries, C., Pease, K. (1990). Repeat break and enter victimisation: Time course and crime prevention opportunity. *Journal of Police Science and Administration.*

Polvi, N., Looman, T., Humphries, C., Pease, K (1991). The time course of repeat burglary victimization. *British Journal of Criminology*, 31(4), 411-414.

Pyle, G. F. (1976). Spatial and temporal aspects of crime in Cleveland, Ohio. *American Behavioral Scientist,* 20**,** 175-198.

Quetelet, A. (1847). Statistique morale de l'influence du libre arbitre de l'homme sur les faits sociaux, et particulièrement sur le nombre des mariages, *Bulletin de la Commission Centrale de Statistique*, III: 135-155.

Quetelet, A. (1984). *Research on the propensity for crime at different ages, translated and with an introduction by S.F. Sylvester*, Cincinnati: Anderson Publishing. (Original work published 1831).

Ratcliffe, J. H., McCullagh, M. J. (1999) Hotbeds of crime and the search for spatial accuracy. *Geographical Systems*, 1, 385-398.

Rawson, R.W. (1839). An inquiry into the statistics of crime in England and Wales, *Journal of the Statistical Society of London*, 2, 316-344.

Reiss, A. J., Jr. & Tonry, M. (1986). Preface. In A. J. Reiss Jr. & M. Tonry (Eds.), *Communities and Crime. Crime and Justice: A Review of Research, Vol. 8* (pp. vii-viii). Chicago: The University of Chicago Press.

Reiss, A. J., Jr. (1986). Why are communities important in understanding crime?, In M. Tonry and N. Morris (Eds.), *Communities and crime. Crime and Justice: A Review of Research, Vol. 8* (pp. 1-33). Chicago: The University of Chicago Press.

Reiss, A. J., Jr. (1988). Co-offending and criminal careers. In A. J. Reiss Jr., & M. Tonry (Eds.), *Communities and crime. Crime and Justice: A Review of Research, Vol. 10* (pp. 117-170). Chicago: The University of Chicago Press.

Rengert, G. F. (1980). Spatial aspects of criminal behavior. In D. E. Georges-Abeyie & K. D. Harries (Eds.), *Crime: A spatial perspective* (pp. 47-57). New York: Columbia University Press.

Rengert, G. F. (1981). Burglary in Philadelphia: A critique of an opportunity structure model. In P. Brantingham & P. Brantingham (Eds.), *Environmental Criminology* (pp. 189-201). Prospect Heights, IL: Waveland Press.

Rengert, G. F., Piquero, A.R., Jones, P. R. (1999). Distance decay reexamined. *Criminology,* 37(2), 427-446.

Rhodes, W. M., & Conly, C. (1981). Crime and mobility: An empirical study. In P. J. Brantingham & P. L. Brantingham (Eds.), *Environmental criminology*. Beverly Hills, CA: Sage.

Robinson, W. S. (1950). Ecological correlations and the behavior of individuals, *American Sociological Review,* 15, 351-357.

Roncek, D. W. (2000). Schools and crime. In V.Goldsmith, P. G. McGuire, J. H. Mollenkopf, & T. A. Ross (Eds.), *Analyzing crime patterns: Frontiers of practice* (pp. 153-165). Thousand Oaks, CA: Sage.

Roncek, D. W., R. Bell. (1981). Bars, blocks, and crimes. *Journal of Environmental Systems,* 11(1), 35-47.

Rossmo, D. K. (2000). *Geographic profiling*. New York: CRC Press.

Sampson, R. J. (1985). Neighborhoods and crime: The structural determinants of personal victimization. *Journal of Research in Crime and Delinquency,* 22, 7-40.

Sampson, R. J., Groves, W. B. (1989). Community structure and crime: Testing social disorganization theory. *American Journal of Sociology,* 94(4), 774-802.

Sampson, R. J., Raudenbush, S. W. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology,* 105(3), 603-651.

Sampson, R. J., Raudenbush, S. W., Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science,* 277(5328), 918-924.

Sarnecki, J. (1986). *Delinquent networks*. Stockholm: National Council for Crime Prevention.

Scherman, L., & Kobrin, S. (1986). Community careers in crime. In A. J. Reiss Jr., & M. Tonry (Eds.), *Communities and Crime. Crime and Justice: A Review of Research, Vol. 8* (pp. 67-100). Chicago: The University of Chicago Press.

Shaw, C. R. (with F. M. Zorbaugh, H. D. McKay & L. Cotrell) (1929). *Delinquent areas. A study of the geographical distribution of school truants, juvenile delinquents, and adult offenders in Chicago*. Chicago & London: The University of Chicago Press.

Shaw, C. R., & McKay, H. D. (1931). *Social factors in juvenile delinquency*. Report on the Causes of Crime, National Commission of Law Enforcement and Observance, vol. 2. Washington, DC: Government Printing Office.

Shaw, C. R., & McKay, H. D. (1969). *Juvenile delinquency and urban areas. A study of rates of delinquency in relation to differential characteristics of local communities in American cities*, Chicago & London: The University of Chicago Press (Rev. ed.). (Original work published 1942).

Sherman, L. W. (1995). Hot spots of crime and criminal careers of places. In J. E. Eck & D. Weisburd (Eds.), *Crime and Place*. Monsey, NY: Willow Tree Press.

Sherman, L. W., Weisburd, D. (1995). General deterrent effects of police patrol in crime `hot spots': A randomized, controlled trial. *Justice Quarterly,* 12(4), 625-648.

Sherman, L. W., Gartin, P., & Buerger, M. E. (1989). Hot spots of predatory crime: Routine activities and the criminology of place. *Criminology,* 27(1):27-55.

Short, J. F. Jr., & Moland, J. Jr. (1976). Politics and youth gangs: A follow-up study. *The Sociological Quarterly,* 17, 162-179.

Skogan, W. (1986). Fear of crime and neighbourhood change. In A. J. Reiss Jr., & M. Tonry (Eds.), *Communities and Crime. Crime and Justice: A Review of Research, Vol. 8* (pp. 203-229). Chicago: The University of Chicago Press.

Skogan, W. (1990). *Disorder and decline: Crime and the spiral of decay in American cities.* New York: Free Press.

Snodgrass, J. (1976). Clifford R. Shaw and Henry D. McKay : Chicago criminologists. *British Journal of Criminology* 16, 1-19.

Symons, J. (2000). On crime and density of population. In D. M. Horton (Ed.), *Pioneering perspectives in criminology. The literature of 19th century criminological positivism* (pp. 279-285). Incline Village, NV: Copperhouse. (Orginal work published 1857).

Tarde, J-G. (1912). *Penal philosophy (*translated by R. Howell*)*, Boston: Little, Brown and Company. (Original work published 1890)

Taylor, R. B. (1997). Social order and disorder of street blocks and neighborhoods: Ecology, microecology, and the systemic model of social disorganization. *Journal of Research in Crime and Delinquency,* 34, 113-155.

Thomas, W. I. (1966). *On social organization and social personality. Selected papers.* M. Janovitz (Ed.), Chicago and London: The University of Chicago Press.

Thrasher, F.M. (1927). *The gang: A study of 1,313 gangs in Chicago.* Chicago, IL: Phoenix Books. (Abridged ed. 1963).

Vold, G. B., Bernard, T. J., & Snipes, J. B. (2002). *Theoretical criminology*. 5th ed. New York: Oxford University Press.

Waring, E. J. (1998). Incorporating co-offending in sentencing models: An analysis of fines imposed on antitrust offenders. *Journal of Quantitative Criminology,* 14(3), 283-305.

Waring, E.J. (2002). Co-ofending as a network form of social organization. *Advances in Criminological Theory* 10, 31-48.

Warr, M. (1996). Organization and instigation in delinquent groups *Criminology*, 34(1), 11-37.

Weisburd, D.. (2002). From Criminals to Criminal Contexts: Reorienting Criminal Justice Research and Policy. *Advances in Criminological Theory,* 10, 197-216.

Weisburd, D. (2005). Hot spots policing experiments and criminal justice research: lessons from the field. *The Annals of the American Academy of Political and Social Science* 599, 220-245.

Weisburd, D. (2008). Place-based policing. *Ideas in American Polcing*. The Police Foundation: Washington DC.

Weisburd, D., & Green, L. (1994). Defining the drug market: The case of the Jersey City DMA system. In D. L. MacKenzie & C. D. Uchida (Eds.), *Drugs and crime: Evaluating public policy initiatives*. Newbury Park, CA: Sage.

Weisburd, D., Green, L. (1995). Policing drug hot spots: The Jersey City DMA experiment. *Justice Quarterly*, 12(4), 711-735.

Weisburd, D., & McEwen, T. (1997). Introduction: Crime mapping and crime prevention. In D. Weisburd & T. McEwen (Eds.), *Crime mapping and crime prevention* (pp. 1-23). Monsey, NY: Criminal Justice Press,

Weisburd, D. & Britt, C. (2007). *Statistics in criminal justice*. (3rd ed.) New York: Springer.

Weisburd, D., Maher, L. & Sherman, L. (1992). Contrasting crime general and crime specific theory: The case of hot spots of crime. In F. Adler & W.S. Laufer (Eds.), *Advances in criminological theory,* Vol. 4 (pp. 45-70). New Brunswick, NJ: Transaction.

Weisburd, D., Bushway, S., Lum, C., Yang, S-M. (2004). Trajectories of crime at places: A longitudinal study of street segments in the city of Seattle. *Criminology,* 42(2), 283-321.

Weisburd, D., Wyckoff, L. A., Ready, J., Eck, J. E., Hinkle, J. C., Gajewski, F. (2006). Does crime just move around the corner? A controlled study of spatial displacement and diffusion of crime control benefits. *Criminology,* 44(3), 549-592.

Wikström, P-O. & D.A. Butterworth (2006). *Adolescent crime. Individual differences and lifestyles*. Devon: Willan.

Wolfgang, M. E., Figlio, R., & Sellin, T. (1972). *Delinquency in a birth cohort*. Chicago: The University of Chicago Press.

Zorbaugh, H. W. (1929). *The gold coast and the slum. A sociological study of Chicago's near north side*. Chicago: The University of Chicago Press.