

Assessing Spatial Pattern of Crime in Ciudad Juárez, Chihuahua, Mexico (2009): The Macrolevel, Mesolevel and Microlevel Approaches

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Abstract

The aim of this research is analyze the spatial relationship between aspects of place (socioeconomic, demographic, land use) and the clustering of crime activity in Ciudad Juárez, Chihuahua. The framework proposed in this analysis combines a macrolevel, mesolevel and microlevel approaches at the census block level to identify problem neighborhoods and associated characteristics to determine the relationship between crime incidents and site-specific physical features, socioeconomic, demographic and land use characteristics. The data that were collected by Population and Housing Census (Inegi, 2010) for the socioeconomic variables and the violence and property crimes statistics geocoded by the Municipal Observatory of Security and Citizenship at census tract and block level. The results show the pattern of violent crime at the macrolevel has remained concentrated in low socioeconomic status. Microlevel research emphasizes the analysis of crime at individual locations (hot spots). Findings are expected to enhance crime monitoring and policing capabilities across the urban size spectrum.

Introduction

Most nations are faced with unacceptable levels of delinquency and crime (Ackerman and Murray, 2004). However, an examination of world regions demonstrates the strikingly high level of criminality in Latin American and Caribbean countries (Bourguignon, 1999; 8). The global average homicide rate in 2000 was estimated at 8.8 (per 100,000 population). However, in the world's most dangerous region, the middle- and low-income Americas, the rate was 27.5, three times the world average (Kjaerulf and Barahona, 2010). Males aged 15 to 29 living in the low- and middle-income region of the Americas had a homicide rate of 89.7, twelve times higher than that of young women in that area (Kjaerulf and Barahona, 2010).

Ciudad Juárez is no exception to this pattern. Since the 1990s, it has experienced high levels of gender-based violence. Since 2007, the city has been at the center of a war on drug cartels and labeled Mexico's deadliest city. In 2010, the homicide rate reached 224 per 100,000 residents, the highest rate of homicides around the world. At the same time, the high level of impunity triggered property crimes such as robbery, assault, burglary, etc. However, the police did not have a clear strategy against the criminals. An understanding of the spatial pattern of socioeconomic correlates of violent and property crimes is an important urban public safety policy (Vilalta, 2009).

It is theoretically expected that violent and property crimes are neither uniform nor spatially random (Lum, 2008; Vilalta, 2009b). The social disorganization theory suggests that

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poverty and its associated conditions and processes are the principal correlates of crime and provide the expected spatial pattern of crime. The roots to this theory can be traced to the early ecological studies of Shaw and McKay (1929, 1931, and 1942). This theory has been subjected to empirical testing in many North American and European cities but not in Mexico. In Mexico, few mapping and/or spatial studies on crime activity can be found in Ciudad Juárez (Monárrez and Fuentes, 2004; Cervera, 2010). Some of these studies have focused on drug crimes and their socioeconomic correlates (Vilalta). However, detailed research on the spatial relationship between socioeconomic characteristics and crime incidents (property and violent crimes) has received little or no attention.

The framework proposed in the current analysis combines macrolevel, mesolevel and microlevel approaches at the census block level to identify problem neighborhoods and associated characteristics to determine the relationship between crime incidents and site-specific physical features, socioeconomic, demographic and land use characteristics. In this context, the purpose of this article is to determine the spatial pattern of violent and property crimes and identify the socioeconomic correlates of crime hotspots in Ciudad Juárez, Chihuahua (2009-2010).

Review of Literature

Several theoretical perspectives bear relevance of the contemporary high vacancy rates and their potential impact on community crime rates. The most referenced are modern formulations of social disorganization theory (Haining & Ceccato, 2005; Haining, Ceccato & Kahn, 2007; Sampson, 1993; Weisburd & Mazerolle, 2000) and broken windows theory (Corman & Mocan, 2005; Jang & Johnson, 2001; Silverman & Della-Giustina, 2001; Willson & Kelling, 1987).

The social disorganization theory, developed from the pioneering work of scholars in the Chicago School, has a long history (Shaw and McKay, 1929, 1931 and 1942). "In their work Shaw and McKay fundamentally changed the nature of crime research by focusing on the characteristics of neighborhoods instead of the characteristics of the offenders" (Ackerman & Murray, 2004: 423-424). The authors argued that a general atmosphere of social disorganization is associated with high crime rates. Low socioeconomic status, ethnic heterogeneity, and residential mobility were hypothesized as factors that disrupt community social organization, which in turn accounts for high rates of crime and delinquency.

More recent work using this theory has focused on explaining the mechanism through which certain neighborhood structural characteristics might lead to social disorganization and, therefore, higher levels of property and violent crime (Sampson & Groves, 1989). The structural characteristics of more racial/ethnic heterogeneity, residential instability and economic disadvantage were associated with lower levels of formal and informal social control (Sampson & Groves, 1989). Thus, the cohesion of residents enhances their willingness to confront possible deviants and hence, reduce the level of crime.

The broken windows thesis (Wilson, 1975; Garofalo & Laub, 1978; Wilson & Kelling, 1982) encompasses ideas elaborated more fully within classic and contemporary formulations of social disorganization theory. The basic premise is that visual signs of abandonment in communities such as high vacancy rates, graffiti covered walls, and/or dirty sidewalks can fuel additional incivilities as well as physical and social disorder, which may translate into higher levels of crime. In turn, this may discourage community involvement and provide unregulated private and public spaces in which deviant activities can flourish (Arnio et al., 2012; 1599).

The social disorganization theory emphasizes the potentially destabilizing influence of population turnover and rapid ecological shifts. These processes are posited to increase crime rates by disrupting communication among community residents, impeding their capacity to organize against social problems, and reducing informal social control efforts such as surveillance of public spaces (Shaw & McKay, 2009). Both theories explain criminal spatial variation in responses to environmental conditions (Vilalta, 2010; 264). Some studies have generated considerable supporting evidence on the distribution and spatial dynamics of crime and socioeconomic status, family structure and race. Findings reveal that higher than average rates of crime are disproportionately concentrated in areas with high rates of unemployment and

poverty, large amounts of physical deterioration, and concentrations of minorities and youth (Harries, 1974; Ackerman, 1976; Rengert, 1981; Kohlfeld & Sprague, 1988).

Other studies examine the spatial correlates between crime and proportions of single people, youth males, female-headed families, literacy, vacant properties, social housing, commercial land uses, and access to urban services (Craglia et al., 2005; Sampson & Morenoff, 2004; Savoie, 2008; Schulenberg, Jacob & Carrington, 2007; Tremblay & Ouimet, 2001; Vilalta, 2009). However, most of the studies that tested the spatial correlates between crime and socioeconomic variables were conducted in developed countries. In Mexico, a few mapping and/or spatial studies on crime activity can be found in Mexico City (Vilalta, 2009). A study by Vilalta (2010) tested drug markets and socioeconomic correlates to determine the spatial patterns of arrests for drug possession and identify the socioeconomic correlates of drug hotspots in Mexico City. Cervera (2010) found a high spatial autocorrelation between poverty (measured by socioeconomic indicators) and femicide in Ciudad Juarez. In addition, these hotspots of femicide spatially match city zones with major deficits in infrastructure and urban equipment.

Spatial analysis is a powerful tool for crime research. Currently, the most common techniques are location quotients, point mapping, thematic mapping of administrative units, grid thematic mapping and kernel density maps (Chainey & Ratcliffe, 2005; Savoie, 2008). The availability of detailed socioeconomic and demographic data at neighborhood scales combined with crime rate information and advanced computer technology permit a number of quantitative techniques to be used to assess potential cause and effect relationships. The capabilities of these quantitative methods continue to evolve and allow better evaluation of crime at the microlevel (see Anselin, 1998; Messner et al., 1999; Murray et al., 2001). Specifically, the application of pattern detection and spatial statistical analysis techniques to explore the occurrences of crime are critical in the analysis of criminal activity (Hirschfield et al., 1995; Weisburd & McEwen, 1997). Macrolevel research, e.g., ecological analyses at the census tract level, helps to identify problem neighborhoods. Microlevel research helps to isolate precise trouble spots within neighborhoods and allows better evaluation of crime and specific socioeconomic, demographic, land use and environmental characteristics that may contribute to crime occurrences.

Materials and Methods

Police reports of violent crimes (homicides) and property crimes (robbery and burglary) in 2008 and part of 2009 were analyzed. This study focused on property and violent crime because these two types accounted for 65% of the total crimes³. Data were collected at the police sector level (N=6). Police sectors are distributed along the city in 6 sectors (See map 4). The crime incidents were geocoded, mapped and aggregated to the census-tract level for spatial analysis. Point data representing crime incidents were overlaid on socioeconomic and land use characteristics at the urban level to explore visually (using GIS technologies).

The framework proposed in this analysis combines a macrolevel ecological approach at the census tract level to identify problem neighborhoods and associated characteristics and a mesolevel analysis at the census block level to identify problem neighborhoods at more detail and a microlevel analysis at the address level to determine the spatial relationship between crime incidents and site-specific physical features, social characteristics and land use (Ackerman & Murray, 2004).

At the macrolevel, choropleth mapping of crime incidents by neighborhood is conducted. Factor analysis of census data is employed to identify socioeconomic characteristics of neighborhoods. The independent variables were based on the social disorganization and

³ Lack of reliable data has been perhaps the most important impediment to research on the evolution and nature of crime in developing countries in general and Latin American countries in particular. Official statistics on crime incidence are often incomplete and suffer from serious problems of under-reporting such that the fraction of crimes reported to the police is very small. An option is the use of victimization surveys.

broken windows theories. The socioeconomic variables available were levels of education, housing vacancy rate, social security coverage, housing conditions and female-headed households. Data were collected and analyzed at the census tract level. The violent and property crime data were provided by the Municipal Public Security Secretary and geocoded, mapped and aggregated to the census tract level for spatial analysis by the Municipal Observatory of Security and Citizenship. The socioeconomic data were provided by the Population and Housing Census of 2010 at the census tract level.

At the mesolevel, choropleth mapping of crime data is also employed, but for finer spatial resolution like census blocks and actual incident locations. Factor analysis of block group level census data is employed to explore within neighborhood socioeconomic characteristics and to permit qualitative evaluation of crime and socioeconomic status at a finer scale (Ackerman & Murray, 2004).

Microlevel research emphasizes the analysis of crime at individual locations (hotspots) and attempts to explain the relationship between site-specific physical features, social characteristic and crime (Bennett, 1986; Weisburd et al., 1992). Hotspots can be of varied size and may include high-crime street corners, bars, crack houses, or low-income housing projects (Block & Block, 1995). Factor analysis at this scale also allows for a qualitative evaluation of crime patterns compared to patterns of socioeconomic characteristics. At the microlevel, crime by type may be mapped at the address level and superimposed on choropleth maps of socioeconomic characteristics at the neighborhood level. Fundamentally, a major interest is whether crime hot spots exist. Local spatial statistics, nearest neighbor hierarchical clustering and non-hierarchical cluster are advocated for identifying and assessing potential hotspots in crime analysis (Harries, 1999; Messner et al., 1999; Levine, 2000). Operationally, the delineation of hot spot boundaries is somewhat arbitrary. As Levine (1999) notes, crime density is measured over a continuous area. Therefore, the boundaries that separate hot spots of crime from areas without sufficient activity to merit the label hot spot are perceptual constructs. Moreover, depending on the scale of geographic analysis, a hotspot can mean quite different things (Harries, 1999).

The existence of geographic concentrations of crime and their specific locations suggests a two-way influence between place and criminal activity. Site characteristics can facilitate criminal activity and concentrations of crime have deleterious effects on place. There is considerable evidence supporting the concentration of crime at relatively few places, and these clusters of crime appear to be relatively stable over time (Pierce et al., 1986; Sherman et al., 1989, 1992; Eck, 1995; Spelman & Eck, 1989; Spelman, 1995). The precise identification of concentrations of crime (hotspots) is complex and various conceptualizations suggest different analytical methods that may be useful for evaluation (Goldsmith et al., 2000). The isolation of crime concentrations allows the detailed study of place (socioeconomic demographic, land use, and environmental structures), the possible identification of criminogenic elements, and possible strategies for intervention. There is evidence that strategies that target specific places or areas with heightened control efforts significantly decrease reported crime and calls for service (Kennedy et al., 1997).

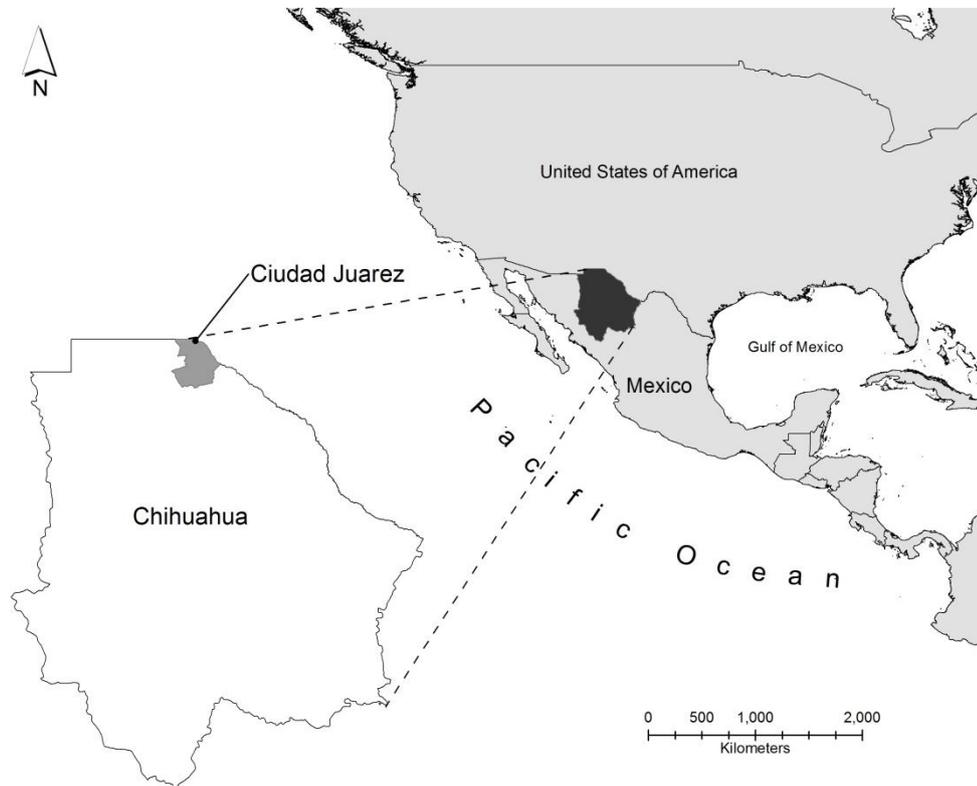
Ciudad Juárez, Chihuahua, Mexico (2009-2010): The Increase of Violent and Property Crime

Ciudad Juárez is the largest city of the northern Mexican state of Chihuahua, with 1,332,131 inhabitants in 2010 (39 percent of the state population) (See Figure 1). The city is also located at the U.S.-Mexico border and is the twin city of El Paso, Texas. The economies of El Paso and Ciudad Juárez have become highly integrated during the last three decades (Fuentes & Peña, 2010; 10). As a result, the city is an export processing zone or *maquiladora*⁴ hub. Since the mid-1960s, the *maquiladora* industry created thousands of employment opportunities, reaching

⁴A *maquiladora* is a labor-intensive assembly operation. In its simplest organizational form, a Mexican *maquiladora* plant imports inputs from a foreign country—typically the United States—processes these inputs and ships them back to the country of origin for finishing and sale.

a peak in the year 2000 with 249,509 positions (Fuentes & Peña, 2010:13). However, after the year 2000, the city suffered substantial job loss in manufacturing (from 2000 to 2003, approximately 83,074 jobs) as a result of the 2001 U.S. economic recession. Furthermore, during the 2007-2009 global economic recession the city lost an additional 34,000 jobs (IMIP, 2010).

Figure 1. Location of Ciudad Juárez, Chihuahua, Mexico.



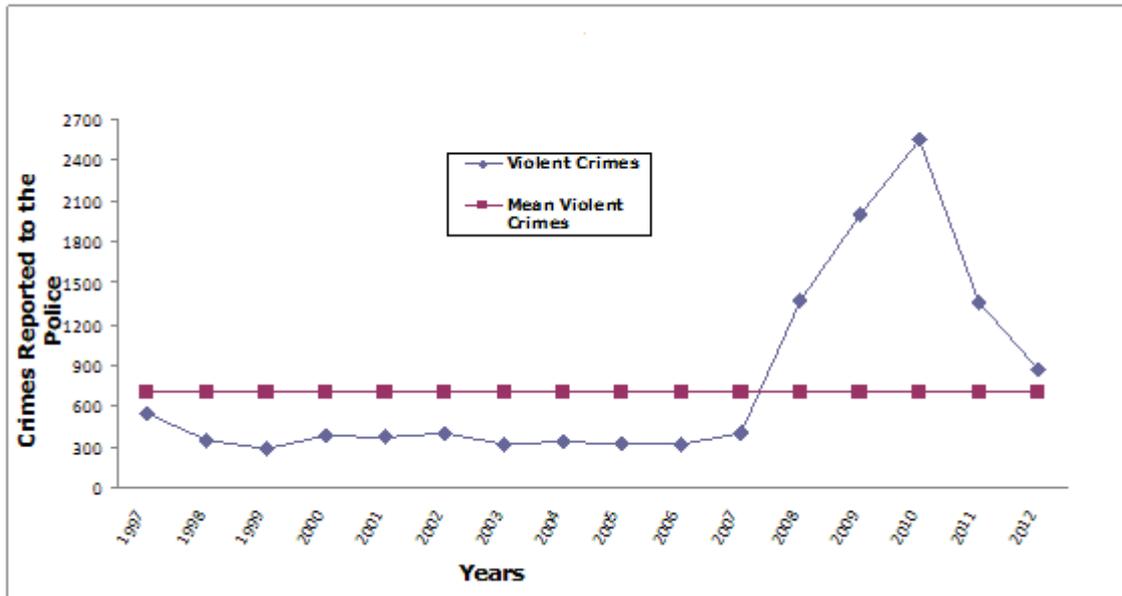
Since the 1990s, the city has experienced high levels of gender-based violence. Between 1993 and 2013, more than 1,440 girls and women were killed (Monárrez & Cervera, 2013). At the same time because 2007, the city has been the center of a war on drug cartels and more than 10,000 men, women and children have died⁵. As a result, levels of poverty, unemployment and crime have increased and became more concentrated in downtown neighborhoods and low-income housing.

Overwhelmed by the economic upheaval and resulting social disorganization associated with high rate of unemployment, high levels of impunity and corruption of the police and the judicial system contributed to increase the rates of crime, especially violent crime.

Violent crime began to increase after 1993. There has been an increase in the homicide rate above the national average as a result of the kidnapping, torture, rape and murder of hundreds of women and girls (Monárrez, 2009). However, since 2007, the number of homicides has grown exponentially, reaching a homicide rate of 224 per 100,000 residents in 2010. In this year, the city was considered the most violent city in the world (Figure 2). In 2011, the number of violent crimes began to reduce and in 2012, there were 861 homicides.

⁵The number of homicides includes the period of 2007-2011. In 2006, the Mexican Government launched an offensive against the drug trafficking cartels, and Ciudad Juárez was the epicenter of this war.

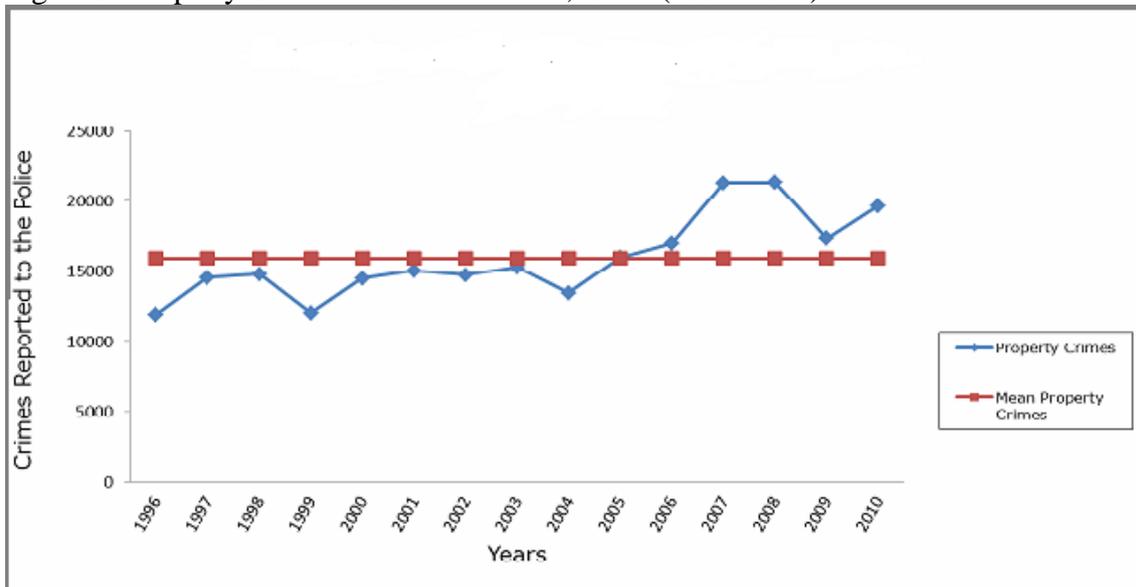
Figure 2. Violent Crimes in Ciudad Juárez, Chih. (1996-2012)



Source: Own elaboration based on data from Chihuahua State Secretary of Public Security (1996-2011).

As a result of the high level of impunity and the diversification of the drug cartels activities, many other property crimes increased such as robbery, burglary, carjacking, and assault, mainly in social housing areas. Property crime began to increase between 2000 and 2003 and by 2005, it increased to a level above the citywide mean for the 2006-2010 period. Following an increase in 2000 to a level below the period mean, property crime has generally increased since 2005 and remained above the city average for 2005-2010 (Figure 3). The above framework proposed for analyzing the spatial pattern of crime in Ciudad Juarez reveals some noteworthy findings.

Figure 3. Property Crimes in Ciudad Juárez, Chih. (1996-2010).



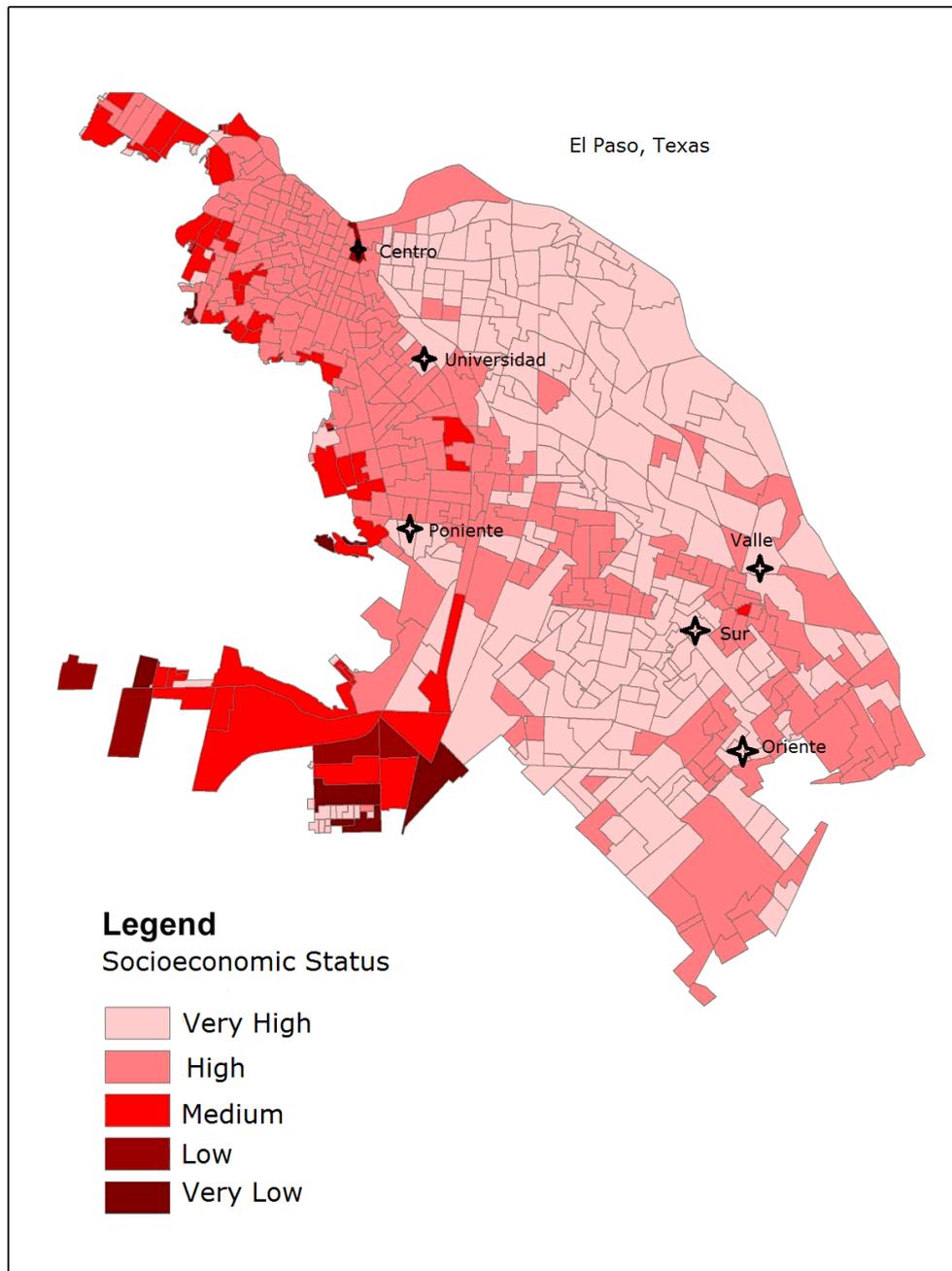
Source: Chihuahua State Secretary of Public Security (1996-2010)

Results

Macrolevel analysis

Substantial prior research suggests that higher than average incidents of crime concentrate in areas with high rates of unemployment, poverty, physical deterioration, and youth (Cervera, 2010). In Ciudad Juárez, many of the socioeconomic variables that correlate highly with crime are also highly intercorrelated. Due to intercorrelation in the data, principal axis factor analysis with varimax rotation is employed as a macrolevel approach to identify underlying constructs (Ackerman, 2004). The use of principal components of factor analysis at the census tract level allowed the identification of low socioeconomic vs. high socioeconomic status neighborhoods (Figure 4). Those characterized as low status combined above average levels of poverty, unemployment, lack of access to health services, and low education (Fuentes et al., 2012). This previous study also discovered a significant statistical relationship between areas with the most violent crime and those with the most property crime.

Figure 4 Socioeconomic status with COP Stations in Ciudad Juárez, Chih.(2010).



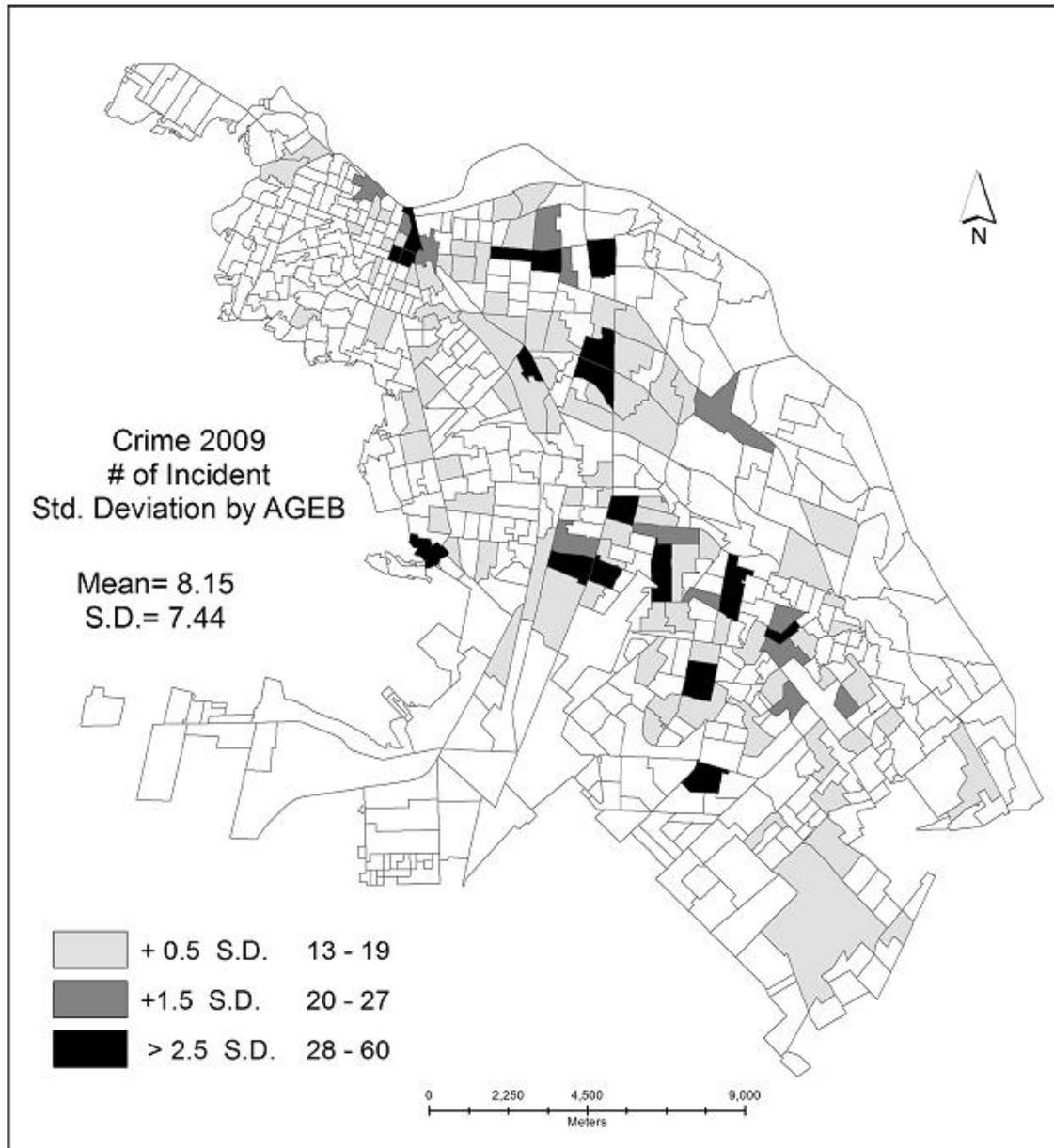
Source: Own elaboration based on Population and Housing Census (Inegi, 2010).

Violent crime: macrolevel

The goal is to generate and evaluate patterns at a finer scale that permit a clearer understanding of the location of crime and associated socioeconomic, demographic, land use and environmental characteristics of high-crime areas. The above framework proposed for analyzing the spatial pattern of crime in Ciudad Juárez, reveals some noteworthy findings.

There are 480 census blocks in the city of Juárez, and 157 blocks had a number of violent crimes in 2009 that was more than one-half of a standard deviation above the mean (three incidents or more). These 157 blocks (33% of the city total) account for 79.3% of the violent crime in the city (See Figure 5).

Figure 5. Number of Crimes (Homicides, Robbery, Assault) by Census Tracts in Ciudad Juárez, Chih (2009).



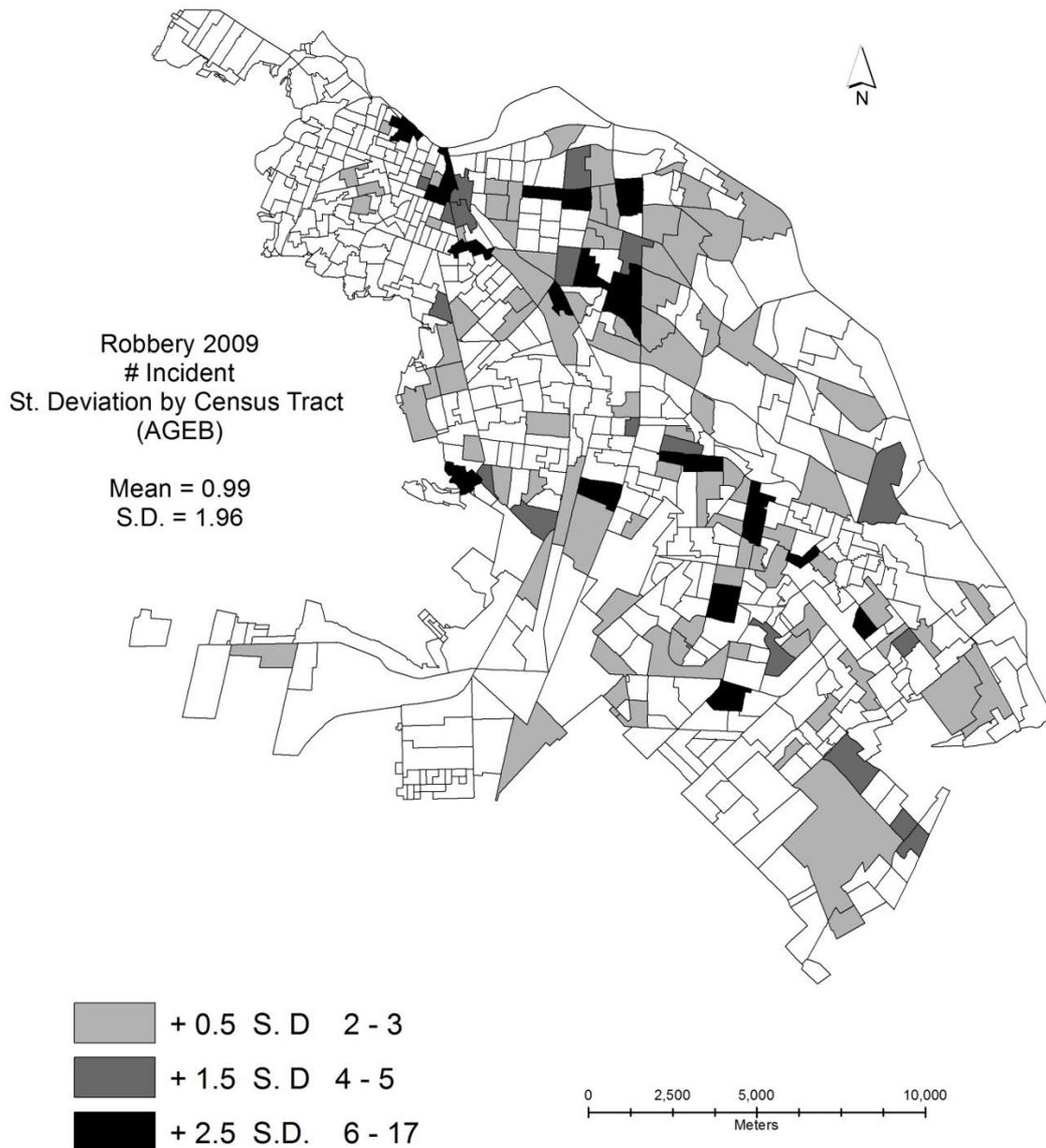
Source: Own elaboration based on Municipal Observatory of Security and Citizenship (2009).

It is noteworthy that only 33 blocks experience five or more violent crimes (plus 1 or more standard deviations above the mean), but account for 32% of the violent crime in Ciudad Juárez, The blocks exhibiting the highest numbers of violent crime are concentrated in Avenida Juarez in the historical downtown, in areas with significant low-income housing projects in the southeast and squatter settlements in the northwest.

Property crime: macrolevel

In 2009, 31 blocks experienced numbers of property crimes that ranked them equal to or greater than one-half of a standard deviation above the mean (seven incidents or more). These 31 blocks, comprising 6.7% of the city total, accounted for 50% of the property crime in Juárez. Fourteen blocks experienced numbers of property crimes that placed them equal to or greater than two standard deviations above the mean (seven incidents or more). These blocks (4.1%) are home to 27% of the property crime in Juárez. More than two-thirds of these blocks (046-9, 077-4, 082-5) are located in the Central Business District (CBD) and in a nearly circular pattern around the CBD in tracts contiguous to the city downtown. Significant outliers include one block on the west side in tract 130 and two blocks in the north end (See Figure 6).

Figure 6. Number of robbery crimes in Ciudad Juárez, Chih., by Census Tracts (2009).



Source: Own elaboration based on Municipal Observatory of Security and Citizenship (2009).

At the city tract level, the east–west pattern of property crime apparent at the census tract level is replaced by a more circular pattern focused on the CBD and contiguous areas. Most importantly, the block-level analysis demonstrates that crime is concentrated in a few census tracts in the city of Ciudad Juárez and further concentrated within a few blocks in those tracts. However, the block-level analysis uncovers additional information about the spatial distribution of crime in Ciudad Juárez. At the north end of the city (tract 122), two blocks experience the highest rates of violent and property crime in the city. These specific blocks are the location of three large low-income housing developments. Previous research has also reported a relationship between high crime rates and public housing projects, especially violent crime rates (Fagan & Davis, 2000; McNulty & Holloway, 2000).

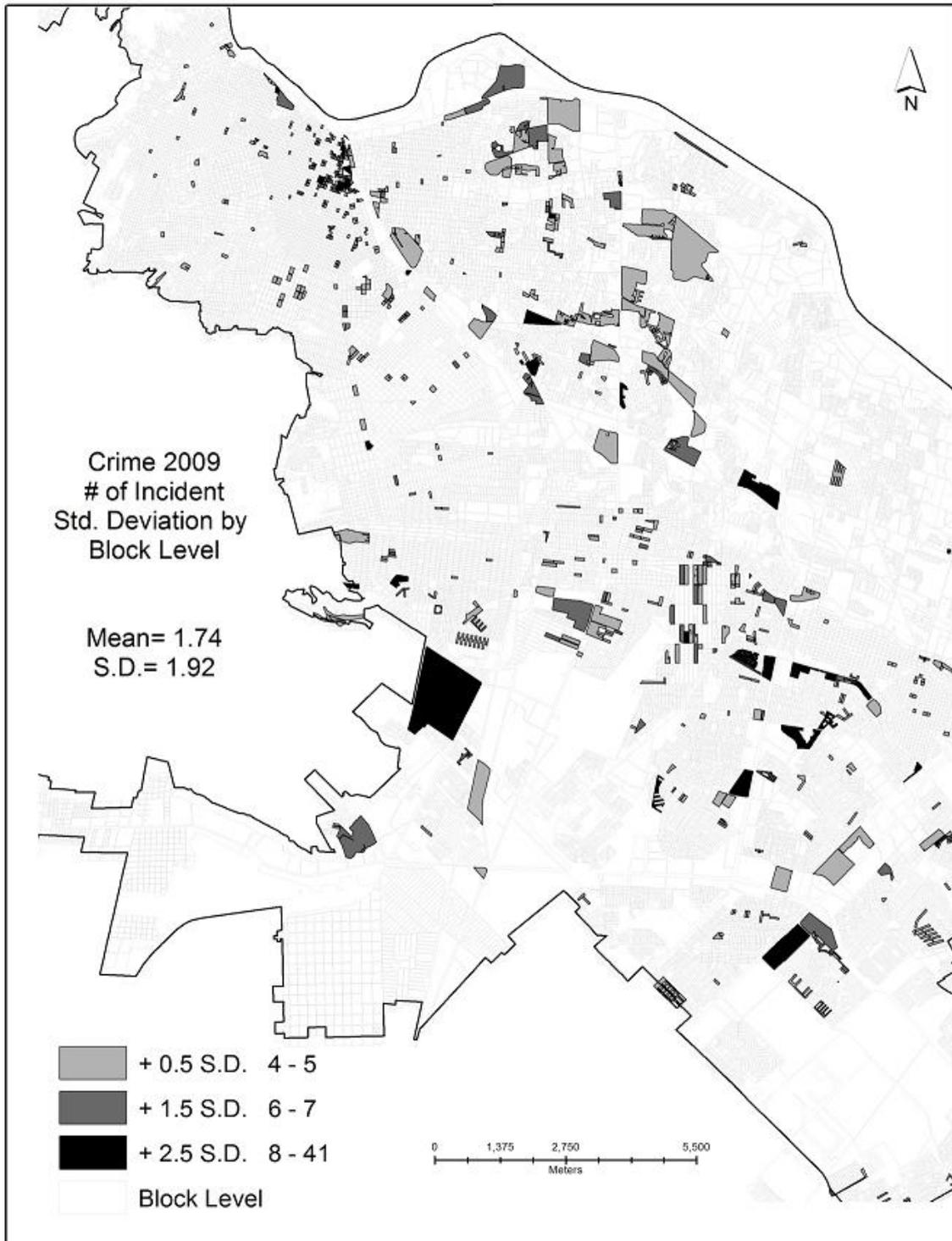
To assess socioeconomic variation at a smaller scale and to compare these patterns to crime, a factor analysis using 2010 Population and Housing Census data at the block group level was carried out. The analysis of socioeconomic data at the block group level generates three factors. These two rotated factors explain 70% of the variance in the data. Factor one combines measures of low educational attainment, low quality of housing materials, and unemployment. This factor is identified as a measure of human capital deficiency and economic marginalization. Factor two combines measures of poorly educated youth and female-headed households. Factor two is a measure of youth and weak family structure. Factor three measures high vacancy rates. This factor is a measure of economic crisis.

Factor one demonstrates a pattern of low socioeconomic status similar to that at the census tract level. The CBD and the immediately contiguous block groups are most notable. Factor two also demonstrates the previously described north–south axis but with obvious exceptions. For instance, the CBD is not characterized by youth and female-headed households. In addition, the pattern of low status is elongated to the northwest and extends farther to the southwest. The expected relationship between low socioeconomic status and high crime is apparent.

Ciudad Juárez crime: mesolevel analysis

The persistent pattern of crime in Ciudad Juárez at the census tract level clearly identifies problem neighborhoods and suggests the need for a mesolevel approach to further isolate trouble spots within these neighborhoods. The goal is to generate and evaluate patterns at a finer scale that permits a clearer understanding of the location of crime and associated socioeconomic, demographic, land use and environmental characteristics of high-crime areas. There are 650 census blocks in the city, and 101 blocks had a number of violent crimes in 2009 that was more than one-half of a standard deviation above the mean (three incidents or more). These 101 blocks (15.5% of the city total) account for 61.4% of the violent crime in the city. It is noteworthy that only 45 blocks experience five or more violent crimes (plus 2 or more standard deviations above the mean) but account for 40% of the violent crime in Ciudad Juárez. The blocks exhibiting the highest numbers of violent crime are concentrated in the area south of downtown and in areas with significant low-income housing projects in the north end. The spatial extent of the north end concentration is misleading due to the inordinately large block size in that area resulting from large areas of undeveloped land. In 2009, 115 blocks (17.7% of the city total) experienced rates of violent crime that placed them equal to or greater than one-half of a standard deviation above the mean (three incidents or more). These 115 blocks accounted for 65% of the violent crime in CJ. Thirty-two blocks (4.9%) were two or more standard deviations above the mean (six incidents or greater) and accounted for 31.2% of the violent crime (See Figure 7).

Figure 7. Violent Crime Rate by Census Block in Ciudad Juárez, Chih (2009).



Source: Own elaboration based on Municipal Observatory of Security and Citizenship (2009).

Ciudad Juárez crime: microlevel analysis

The identification and analysis of geographic concentrations of crime for increasingly smaller areas make an important contribution to improving the efficiency and effectiveness of law enforcement. The ability to accurately delineate areas of concentrated criminal activity enhances the opportunity to more carefully evaluate why crime is occurring in those specific places. If one can explain the pattern, one can more accurately predict outcomes and perhaps intervene with solutions. Thus, maps that spatially identify hotspots should influence decision making and the geographic focus of police activities and social service anti-crime initiatives (Goldsmith et al., 2000). The ability to accurately isolate concentrations of criminal activity allows police departments to marshal their forces in a manner that obtains maximum results from minimum expenditures.

Data for violent crime and property crime at the address level from 2009 were obtained from the Chihuahua State Public Security. These incidents are plotted on maps of socioeconomic status of Juárez census tracts generated from a factor analysis of 2010 census tract data. From this analysis, one factor explains 70% of the variance in the data. This factor combines measures of poverty, high vacancy rates, unemployment, low educational attainment, and female-headed households. This factor is indicative of economic marginalization, human capital deficiency and weak family structure. These tracts are generally aligned along a north-south axis and include the CBD and seven contiguous tracts to the south, east, and west of the CBD. There is a high degree of spatial correlation between tracts with low socioeconomic development and those with elevated violent crime.

An important question is raised by these incident distributions. Are there clusters? Is there a discernable pattern? It seems apparent from studying these figures that spatial pattern assessment techniques are necessary to evaluate these crime incident data. In the current paper, a number of spatial analysis techniques were employed. These fall under the general heading of exploratory analysis of point incidents. The basic approaches include quadrat analysis, kernel density, nearest neighbor, cluster analysis (hierarchical and non-hierarchical), and standard deviation ellipses (Chainey & Ratcliffe, 2005; Savoie, 2008), as noted previously.

Here, we focus on the results depicted in Figure 7, the kernel density of violent crimes. The indicated hotspots are consistent with those found using many of the other techniques. The resulting microlevel kernel density pattern of violent crime (Figure 8) clearly mirrors the macrolevel census tract pattern (Figure 4) and the mesolevel block analysis for the area south of the CBD (Figure 6). The center of the microlevel cluster more clearly pinpoints the highest level of violent crime in Ciudad Juárez and provides a clearer spatial definition of the landscape of violence that is centered south of the CBD and extends in a semi-circular pattern to the southeast.

Figure 8. Kernel density of crime in Ciudad Juárez, Chih. (2009).



Source: Own elaboration based on Municipal Observatory of Security and Citizenship (2009).

The downtown is a part of Ciudad Juárez that is characterized by older and run-down housing where prostitution, bar fights and drug turf struggles are a continuous problem. This part of Ciudad Juárez clearly needs additional policing and community resources. However, the kernel density technique failed to identify the high level of violent crime in the north end that was apparent at the mesoscale analysis of city blocks and appears to be associated with high-density low-income housing. This may be because only two blocks are involved in the north end surrounded by low crime areas, whereas in the south CBD area, numerous blocks experience high crime in close proximity.

Discussion

In the current paper, a number of spatial analysis techniques were employed to accurately delineate areas of concentrated criminal activity. To understand the spatial distribution of crime in Ciudad Juárez, the combination of techniques discussed in the current framework (employing macro, meso and microscale analyses) provides the best overall results. The results are

consistent with the social disorganization and broken window theorists. Higher proportions of vacant housing units in low income developments and higher proportions of female-headed households were found in property and violent crimes hotspots. Naturally, for the case of Ciudad Juárez (as in many other cities) socioeconomic composition variables are associated with neighborhood age structure. Violent crimes hotspots are concentrated around downtown and property crimes are concentrated in some social housing developments in the southwest of the city. This permits policy makers and police departments to develop strategies and to marshal their forces in way that should provide maximum results with minimum expenditures. Our results suggest that in Ciudad Juárez community policing should be re-established in carefully selected areas, large-scale low-income housing projects should be discouraged and replaced in future planning with smaller more widely scattered projects. The long-term solution to the crime problem must emphasize the reduction of poverty and the reversal of the trend toward the concentration of poverty.

Conclusion

Although crime is increasingly a problem in many Latin American cities, the study of crime in these cities continues to be an underdeveloped area of research. In cities with a serious crime problem, regardless of population size, police departments, city officials and policy makers all recognize the importance of a better understanding of the dynamics of crime. In this paper, we study violent and property crime at the macrolevel, microlevel and mesolevel of analysis. We identify problem neighborhoods, problem areas within identified neighborhoods, and hot spots within those problem areas. We evaluate the relationship between aspects of place (socioeconomic, demographic, land use and environmental structures) and the clustering of crime. Ciudad Juárez, Chihuahua, was used to illustrate this analytical and theoretical framework.

The results also show that since 2009, the pattern of violent crime at the macrolevel has remained remarkably consistent in Ciudad Juárez, concentrated in low socioeconomic status census tracts situated on a north–south axis centered on Main Street in and south of the CBD. The mesolevel analysis demonstrates that violent and property crime concentrates in a few blocks within the high-crime tracts. Additionally, the mesoscale analysis identifies two high-crime blocks in CJ north end not delineated at the macroscale. These two blocks are home to three large low-income housing projects. The microlevel kernel density pattern of violent crime adds additional spatial information that is useful in the explanation of crime location and developing strategies to reduce criminal activity. The center of the hot spot identified by the kernel smoothing technique is located in one census tract and covers approximately 10 city blocks. This encompasses an area of the city that is characterized by low socioeconomic status, a high concentration of old, run-down buildings, largely minority businesses and high vacancy rates.

The analytical approach developed here accurately delineates areas of concentrated criminal activity and permits policy makers and police departments to develop strategies to marshal their forces in a manner that should provide maximum results with minimum expenditures. The results suggest that in Juárez, community policing should be re-established in carefully selected areas, large-scale low-income housing projects should be discouraged and replaced in future planning with smaller more widely scattered projects, and careful consideration should be given to the renewal of liquor licenses for bars that consistently generate problems. The police, however, in spite of their knowledge and capabilities, can only attack the symptoms of a larger problem. The long-term solution to the crime problem must emphasize the reduction of poverty and the reversal of the trend toward the concentration of minorities and poverty.

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