Violent Crime in Latin American Cities

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Abstract[*]

In the last two decades, Latin America has been describes as an unsafe and violent region. Nonetheless, such picture is mostly based on homicide rates. Even though homicide is considered the best recorded crime, it does not provide full account of other forms of violent crime. Moreover, a great deal of research on crime throughout the region tends to be descriptive and anecdotal. Misunderstanding the causes of crime and disregarding evidence might induce policy makers to implement ineffective strategies, particularly at the local level. Therefore, based on Social Disorganization Theory, this study explains violent crime across and within selected cities of Latin America.

JEL code: K420
Keywords: crime, crime levels, crime hot spots, crime trends, law enforcement, murder, policing, study of crime

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Prologue

More than in any other region in the world, in Latin America and the Caribbean (LAC), violence and crime affect everyone. Although only 8% of the global population makes up this region, more than 30% of homicides occur there. The homicide rate in LAC is four times higher than the global average. While this is certainly a regional problem, citizens also experience insecurity at the local level, in the neighborhoods and cities of LAC. In 2015, 47 of the 50 cities in the world with the highest murder rates were in LAC. In some cities, however, the rates are relatively low, while others have made significant strides in violence reduction. In other words, insecurity in LAC, aside from being an inherently local phenomenon, is also highly variable.

This variability exists not only among countries and cities, but also within cities. The presence of crime "hotspots" has led to a refocus of crime prevention and control efforts on a local level, while at the same time increasing the need for more and better data. Accordingly, disaggregated and high-quality data have become increasingly important to inform decision-making processes. Crime data must reflect the complex realities of how and where crime takes place within the countries and cities of the region.

This study demonstrates the promise of using localized data about citizen security to understand, with the greatest level of detail, where crime takes place. As a result, it proposes innovative solutions that stem from and respond to local circumstances. The analysis herein demonstrates the uses and great potential of high-quality data, while at the same time illustrating the persistent limitations in counting on systematic data from the administrative records of the police, prosecutors' offices, and other institutions. The main challenge is to reinforce the unquestionable value of the data to those who produce it and work with them to improve it.

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Introduction

For the last two decades, Latin America (LA) has been described as an unsafe and violent region. Evidence from crime records, victimization surveys and health statistics suggests that public fears about safety are well founded, and reveals an increasing occurrence of criminality across sub-regions. Despite this fact, there is a scanty empirical research into the factors that may contribute to it.

Since the 1980s, most studies have used homicide rates as an indicator of the violent crime rise (Bergman & Whitehead, 2009; Bergman, 2010; Morrison, Buvinic, & Shifter, 2005). For instance, the United Nations' Office on Drugs and Crime (UNODC) points out that LA has the highest homicide rate in the world with 23-25 per 100,000 population versus the global average of 6.2. Moreover, "more than one in seven homicide victims globally is a young male between 15 and 29 years of age living in the Americas" (UNODC, 2014, p. 30). This pattern worsens when LA sub-regions are observed. Central America sub-region records the highest homicide rate, while the rest of the sub-regions within the Americas shows significantly lower rates.

Even though homicide is considered the most recorded crime, it does not provide a full account of other forms of violent crime[1]. Furthermore, it must be noted that homicide is highly sensitive to several contexts, for example political violence, civil war, *guerrilla* movements, rural violence, and organized crime. Many of these phenomena have taken place throughout the region and varied over the time. Homicides are more an accurate measure of lethal violence. Thus, arguing an overall increase of crime across the region on the sole basis of homicide rates is flawed (Bergman, 2010; Heinemann & Verner, 2006; Imbush, Misse, & Carrion, 2011).

To examine different types of crime, there are other useful information sources such as crime records[2] and victimization surveys[3]. Unfortunately, both sources face several quality, comparability and availability limitations. This is particularly true when analyzing local contexts; that is the case of cities and metropolitan areas. As a result of the lack of quality data, research and crime prevention policy lag far behind in the region.

Misunderstanding the causes of crime and disregarding evidence might induce policy makers to implement ineffective strategies against crime, as illustrated by the *mano*

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[1] Other forms of violent crime can be domestic violence, youth and gang violence, child abuse, rape, assaults, kidnaps, and robberies. Unfortunately, according to victimization surveys, these crimes are typically unreported.
[2] See for instance United Nations' Surveys on Crime Trends and the Operations for Criminal Justice Systems (UN-CTS).
[3] At a regional scale, three surveys that address some aspects related to victimization are: 1) Latinobarometro; 2) Ecosocial; and 3) Americas Barometer.

dura (Ungar, 2009) and massive incarceration (Dammert & Zúñiga, 2008; Ungar & Magaloni, 2009), increasing public distrust of public safety and democratic institutions (Basombrío & Dammert, 2013; Bateson, 2012; de la Calle & Sánchez-Cuenca, 2014; Whitehead, 2009). Furthermore, ineffective policies enhance vicious outcomes such as security traps, criminal justice system overloads and human right's violations (Bailey, 2014; 2009; Magaloni, 2009; 2007; Martínez, 2013).

Briefly put, Latin America faces a crisis of insecurity in which quality data and evidence-based policy are missing. Starting from that, this report draws three main ideas. First, there is a broad need to generate and systematically collect comparable criminal data at the most detailed level of analysis possible. Second, it is imperative to take a closer look at contexts in sub-national or sub-regional levels. Studying crime in cities, street blocks, and neighborhoods is essential, for the simple reason that each place has its own crime pattern and drivers; that is, every location has policy needs that cannot be addressed with national overall policies. Third, it is also necessary to consider different theoretical perspectives and risk factors when analyzing crime, given that there is neither a unique problem nor a single solution to tackle it. Not recognizing such issues will only lead to a misunderstanding of the crime problem in Latin America, inadequate allocation of resources and ultimately a fail to control and reduce crime.

The general purpose of this document, therefore, is to study violent crime in selected cities of Latin America. It specifically seeks to answer whether signs of social disorganization can account for violent crime. In other words, it assesses whether violent crime is related to the inability of neighborhood inhabitants to control the behavior of others, and the use of the public space.[4] The study is divided in five sections. First, it describes the context, trends and dynamics of violent crime across selected cities of Latin America. The second section discusses several theoretical frameworks that have been used to account for violent crime across the region. In particular, this section will debate the Social Disorganization Theory and its relevance for the Latin American context. The third section contains the methodological and empirical strategy at two levels of analysis— regional and local levels in three case studies. The results and findings are then discussed in the fourth section. The fifth one provides some key policy messages regarding crime prevention policy, institutional strengthening and capacity building.

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[4] The definition of social disorganization comes from Paulsen & Robinson (2009).

1. Violent Crime in Latin America: context, trends and dynamics

1.1. Homicide trends at regional, sub-regional and country levels

In contrast to other world regions, the Americas have traditionally recorded high levels of homicidal violence. Actually, their homicide levels have on average increased over the recent years, even though they showed a decrease in 2013, the first since 2004.

Figure 1.1 Homicide rates by region, 2008-2013

Source: UNODC Homicide Statistics.

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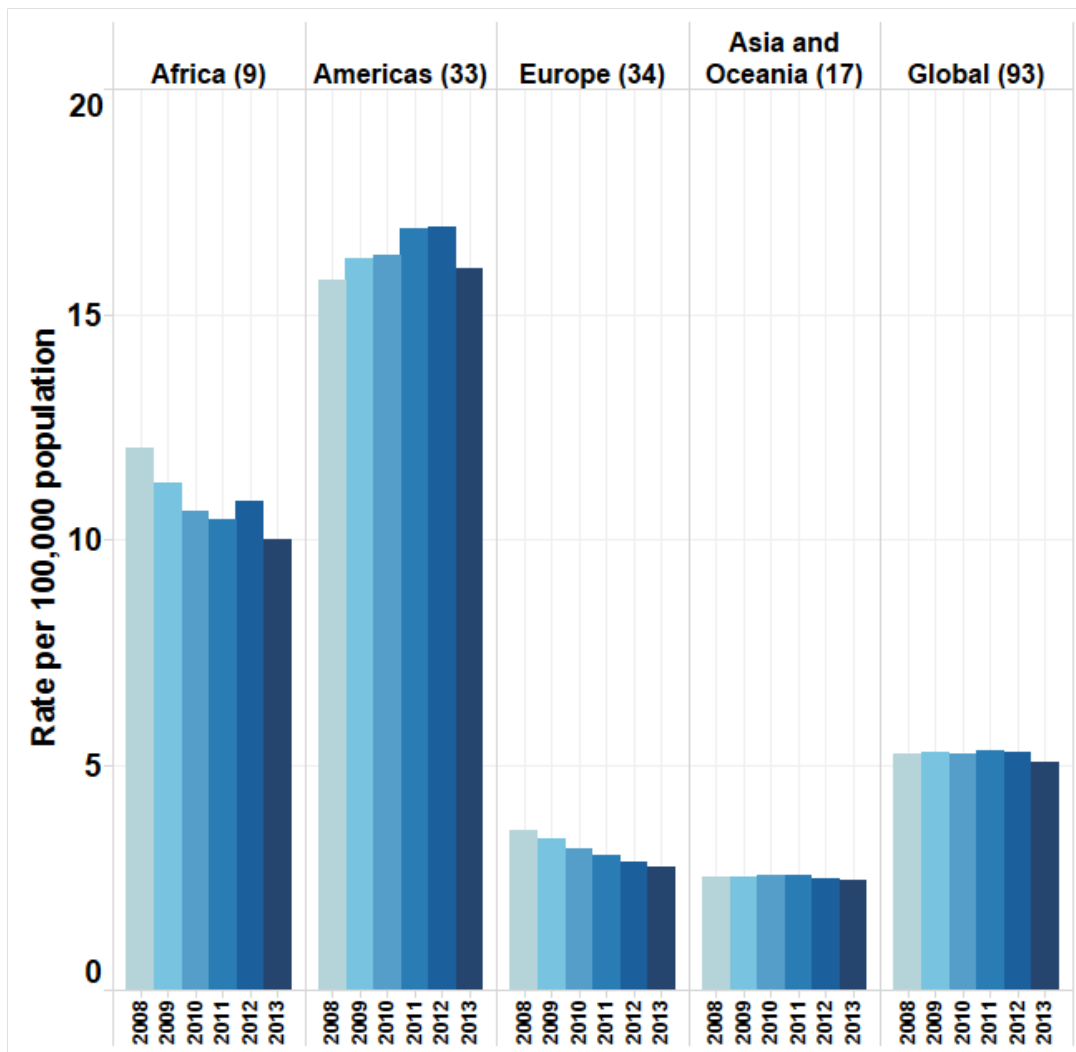
At the sub-regional level, Latin America (LA) has consistently presented higher homicide levels than Northern America. In 2012, with less than 10 percent of the world population, LA registered around one third of the 437,000 reported homicides in the world (UNODC, 2014). Homicide rates in the LA region stand at 23-25 per 100,000 population, nearly four times higher than the global average of just over 6 per 100,000 population. Southern Africa and Central America are the sub-regions with the highest homicide rates worldwide, closely followed by South America, whose rate is around 23 victims per 100,000 population, similar to the rates observed in Middle and Western Africa.

Figure 1.2 Homicide rates by sub-region (2012 or latest year)
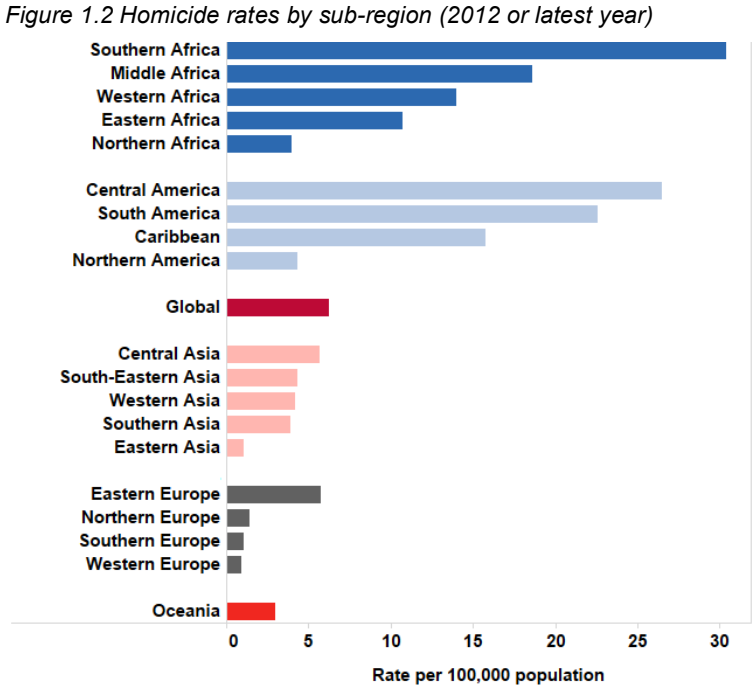
Source: UNODC Homicide Statistics.

Significantly higher homicide rates in LA region are not a new phenomenon. Available data indicate a similar pattern already present in the 1950s (UNODC, 2014). More recently, the increase of the homicide levels in the region was mainly due to the rise in homicide rates in Central America (UNODC, 2014, p. 12).

Figure 1.3 Trends in homicide rates by sub-region of Latin America: 2000-2013
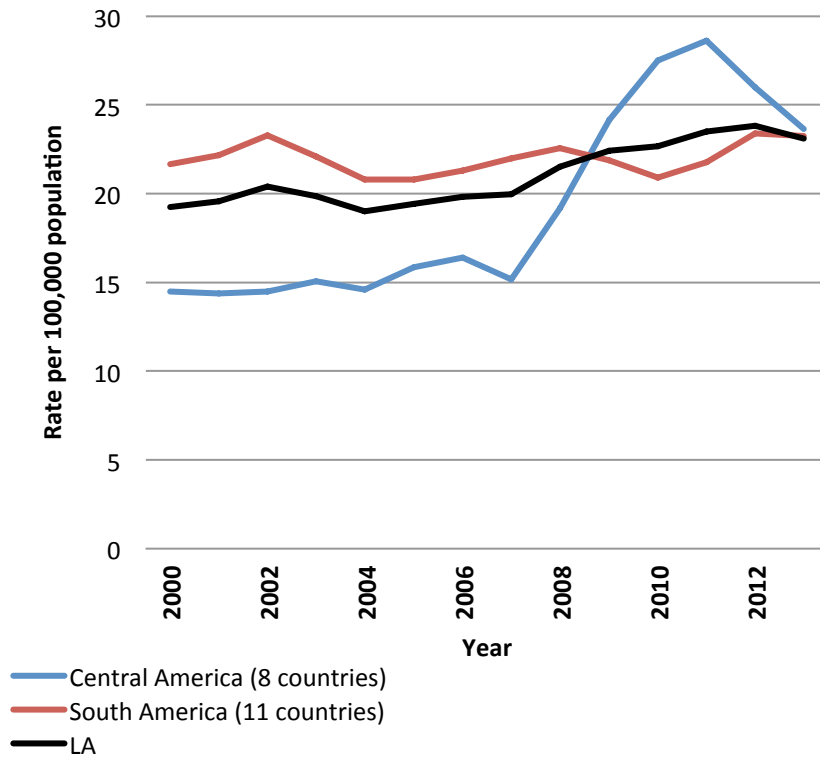
Source: UNODC Homicide Statistics.

Patterns of homicide rates tend to differ according to the income level of each country. From this perspective, there is a link between the level of economic development and citizens' security, thus low-income countries are exposed to higher risk of violent crime. However, when relating homicide rates to income levels of countries, LA shows particular trends as compared to the rest of the world. On average, homicide rates have increased in LA countries with all income levels over the last decade, unlike the rest of the world, where homicides have increased only in countries at the lowest end of the income spectrum. This might give some indication that, whilst economic development is possibly associated with variance in homicide rates in the LA region, additional factors also contribute to this relationship when contrasted to the rest of the world, warranting deeper examination.

Figure 1.4 Average homicide rate by levels of income, Latin America & Caribbean countries, 2003-2013
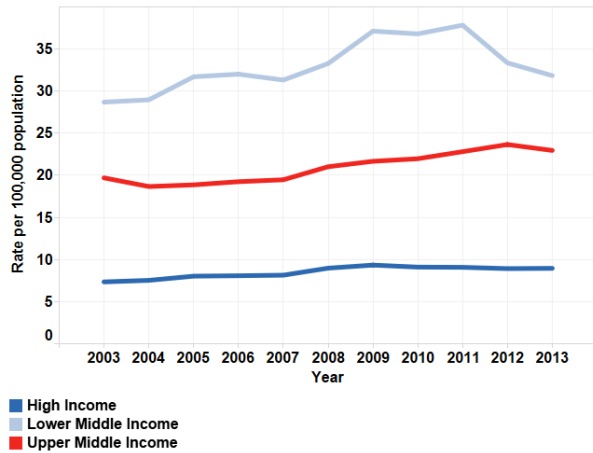
Figure 1.5 Average homicide rate by levels of income of countries, global excluding Latin Amerca & the Caribbean, 2003-2013
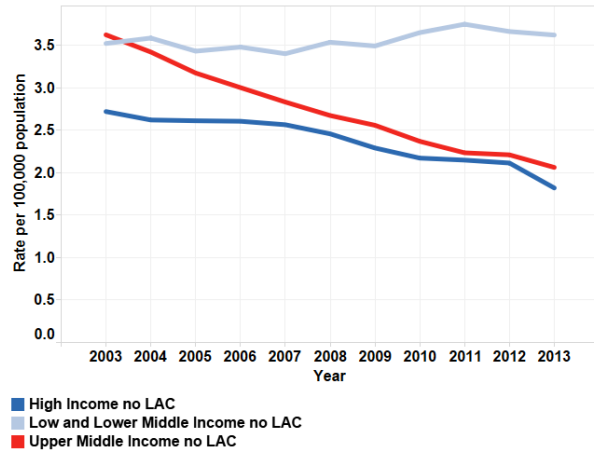
Source: UNODC Homicide Statistics; World Bank list of economies (January 2015).

From 2000 to 2006, homicide rates in Central America remained relatively stable, ranging from 14.38 to 16.41. Nevertheless, during 2007-2011 they showed steep rises, shifting from 15.16 in 2007 to a peak of 28.60 per 100,000 population in 2011. This supposed a dramatic change in the region, since Central America moved from the lowest rates in 2007 to the highest in 2009, staying there so far. The main cause is attributed to drug trafficking, organized crime and gang activities, which mostly affect Mexico, El Salvador, Guatemala and Honduras (UNODC, 2014, p. 33).

Figure 1.6 Trends in homicide rates, Central American selected countries 2000-2013
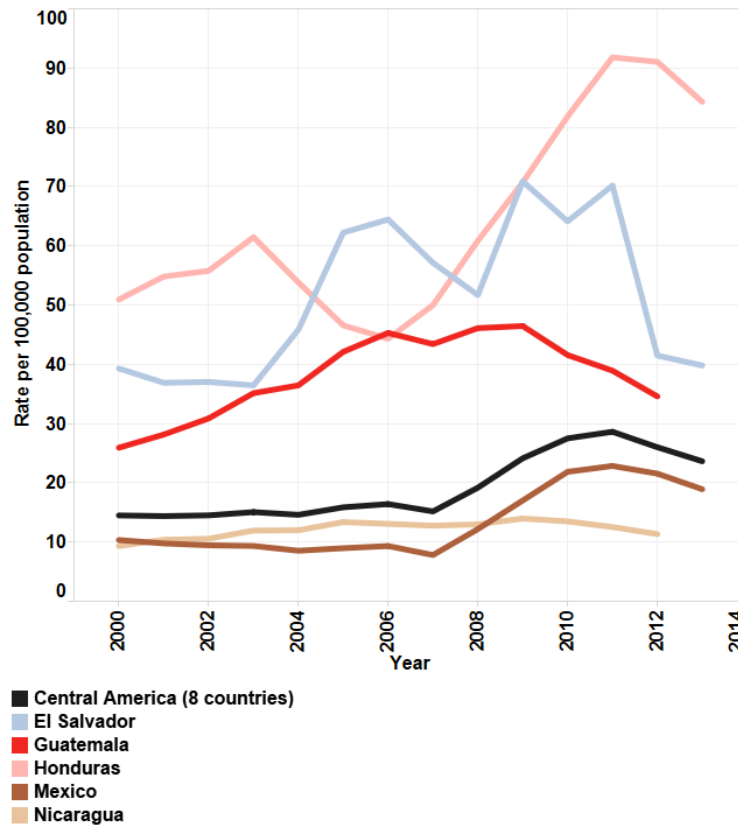
Source: UNODC Homicide Statistics.

South America shows relatively steady levels, with homicide rates ranging from 20 to 23 per 100,000 population between 2000 and 2012. As for country and geographical disparities within sub-regions, it stands out that the northernmost countries such as Colombia and Venezuela tend to have higher homicide rates than the southernmost ones, such as Chile, Peru and Uruguay. Northern countries' rates are closer to those within the Central American sub-region, while southern countries present homicide rates more in line with the global average.

Figure 1.7 Trends in homicide rates, South American selected countries 2000-2013
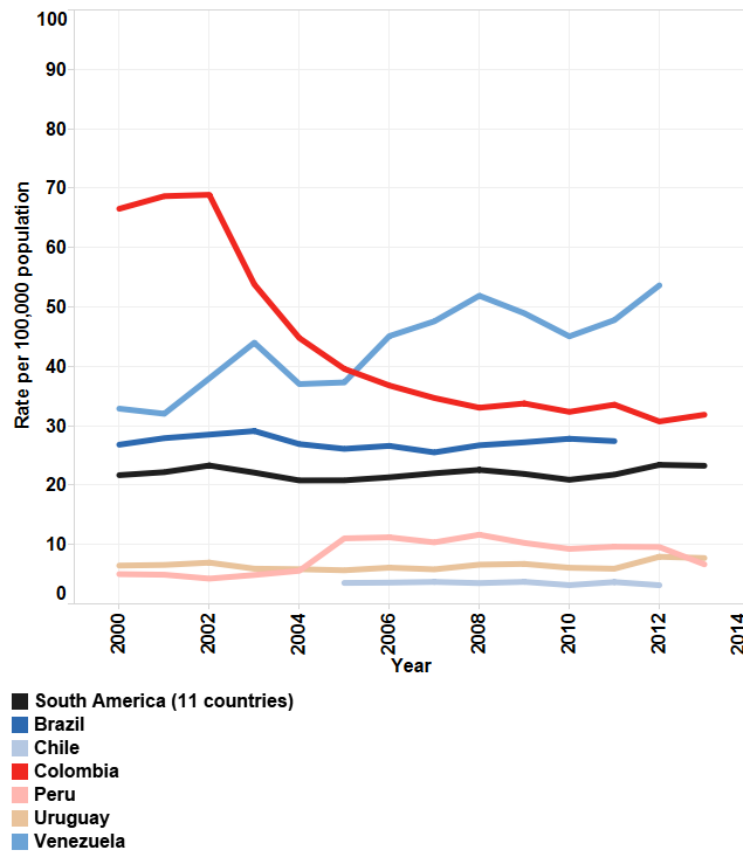
Source: UNODC homicide statistics.

1.2. Homicide and other violent crimes in Latin American countries

Homicide should not be understood as a single representation of a countries' propensity to violence. Instead, it should be examined along with other violent crimes in order to allow a more detailed analysis of violence as a whole. National data indicate that links between homicides and other crimes can vary significantly among countries and over time. Costa Rica and El Salvador trend lines for homicide and other reported crimes behave similarly over time. However, in Colombia, Guatemala, Honduras and Peru divergent patterns are observed in reported theft and homicides. Differences between countries are further illustrated in the case of Mexico, where there was a simultaneous increase in homicide rates and a decrease in assaults, and the opposite case of Colombia, whose assault rates increased whereas homicides decreased. In Brazil, reported theft shows a downward trend in contrast to other recorded crimes.

Figure 1.8 Homicide rates and reported and recorded crime data in Latin America, 2007-2012
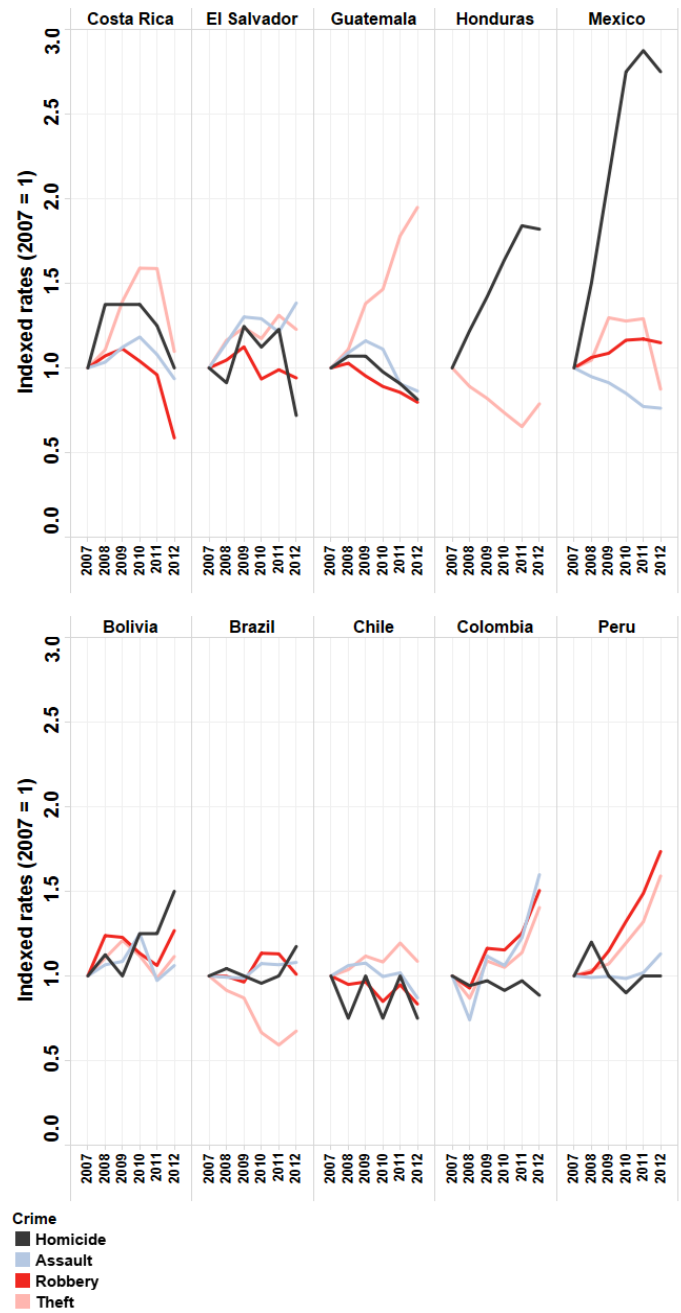
Source: UNODC crime statistics.

1.3. Homicide in Latin American cities: exemplifying the variation

A comparison of selected Latin American cities to the international context underlines the disparity of experiences within the region, as well as the need for data and studies on crime at the local level. Compared with the average global homicide rate of 6.2, city-level rates of LA region reveal a wide variation. Some of them present rates well below it, whilst at the opposite end of the spectrum there are cities with homicide rates 10 to 20 times higher. Available data at the city level are in line with broader patterns at regional level— northern cities of South America tend to have higher homicide rates than those from southern countries. The highest homicide levels among the 41 cities reviewed are found in the Central American sub-region.

As for city-level data, in contrast to national data, not only the variation becomes more evident, but in certain cases national homicide rates can mask important variations at local levels. This is true in Chile, Colombia and Costa Rica, which show a high variability at the city level, but a smoothed national homicide rate. At a national level, El Salvador and Ecuador present a trend similar to the one from their selected cities. Mexico had a decrease in the homicide rate from 2011 to 2013, mirrored by the cities of Tijuana, Torreón, and Aguascalientes, unlike the city of Tapachula, which shows an increasing trend.

Figure 1.9 Homicide rates at the city level (2013 or latest)

Source: CoE using data from selected cities.

Between 2010 and 2011, after a period of increasing levels of violence in LA, the homicide rates of cities within the region have generally lowered as compared to previous years. Although this is perceptible in many cities, it is particularly evident in Antofagasta (Chile) after 2010; Barrancabermeja (Colombia) after 2009; San Marcos, San Salvador and Santa Ana (El Salvador) after 2011; Tijuana and Aguascalientes (Mexico) after 2010, and Santo Domingo (Dominican Republic) after 2009. On the contrary, some cities' homicide rates have increased. Between 2010 and 2013, they almost doubled in the Mexican city of Zapopan (11.6 to 20.2) and tripled in the city of Aguirre (Costa Rica), from 7.6 to 21.7, although dropped to 3.6 in 2014. With some fluctuations, the levels have also been increasing in Iquique (Chile), whose rates doubled during 2010-2011 (2.6 to 4.2) before a drop in 2012 and a new rise to 3.8 in 2013.

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Figure 1.10 Trends in homicide rates at the city level, selected cities, by countries in Latin America
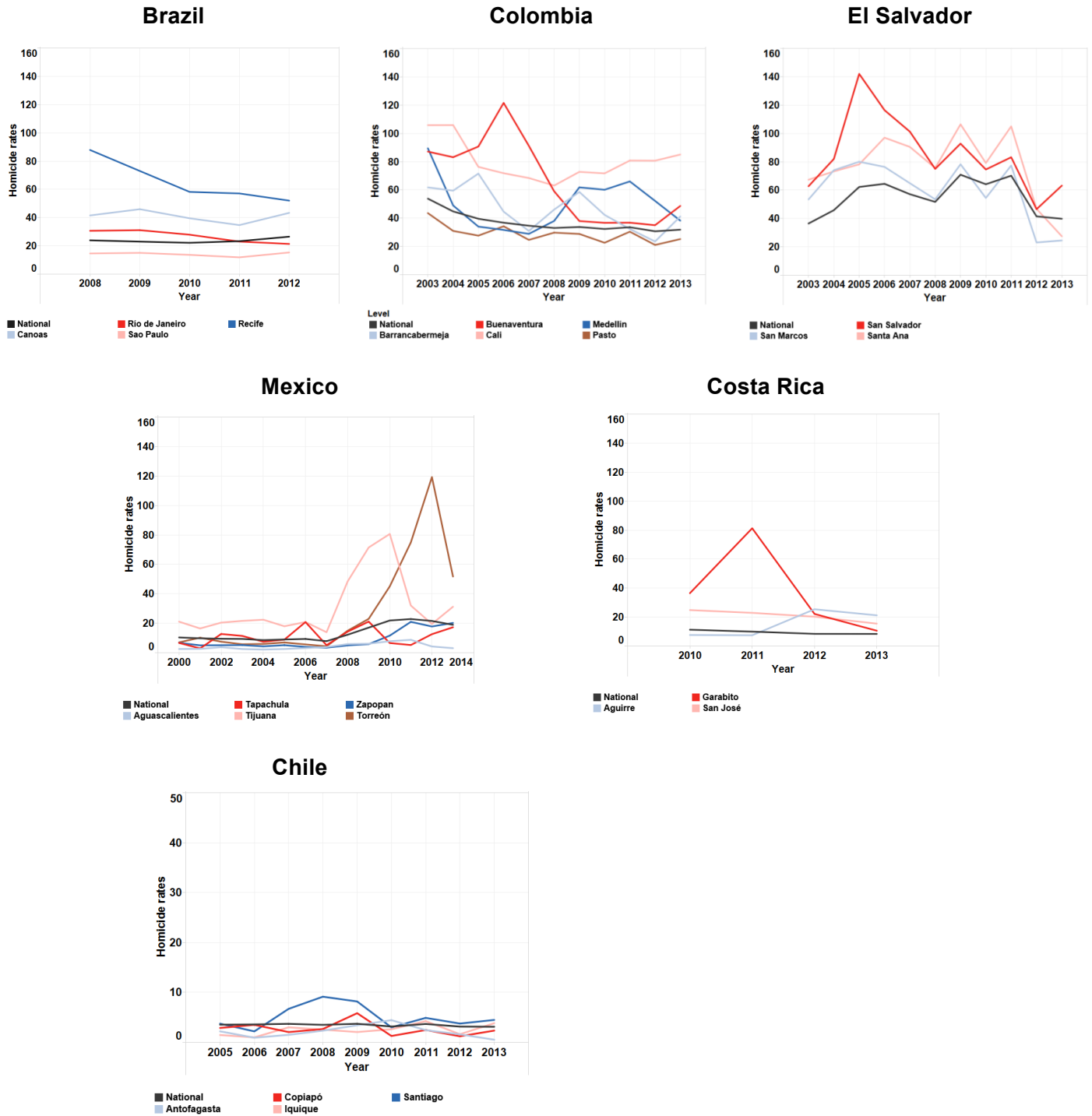
Source: Brazil, Ministério da Saúde; Chile, Ministerio del Interior y Seguridad Pública; Colombia, DIJIN; Costa Rica, OIJ; Ecuador, OMSM – Quito; El Salvador, Policía Nacional Civil; Mexico, INEGI; and, Dominican Republic, ONE.

1.4. Violent crimes in Latin American cities

For a deeper outlook of violence in the region, it is important to examine a range of crimes beyond homicide, such as property crimes and other violent offenses. Several issues, for instance variations in terminology and definitions, difference and gaps in time series, and availability of data, hamper a detailed comparison and analysis of such crimes across Latin American cities. Therefore, this section explores general themes and patterns across time only.[5]

Violent crimes tend to be diverse, most likely as a consequence of the fact that various violent offenses stem from very different drivers. Some violent offenses can occur during the commission of other crimes (such as property crime); some may be related to interpersonal violence, whilst other offenses can be linked to organized crime or gang activity.

In line with this, analysis across Latin American cities points out a diversity of violent crimes, without clear trends among crime types. Homicide as a crime lacks any similarity with other violent crimes and moves across time independently. The same was observed when analysing information on sexual violence and violence against women in the cities for which data were available. No clear trends were observed when reviewing homicide and other violent crimes such as sexual violence and assault. That is the reason why it is necessary to examine each type of crime separately instead of using aggregated crime measures like incidence or prevalence. Each type of crime has its own pattern, seasonality and drivers. Further analysis is required in this regard, yet the lack of detailed data at city level makes it difficult to perform a thorough analysis.

In opposition to this, available data indicate that, within most cities, a majority of property crimes will present trends with similar peaks and troughs over time. This might suggest that several property crimes share common drivers that are distinct from violent crimes. A more detailed look at the characteristics of homicide in Latin American cities is explored in the next section.

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[5] Annexes 1.1 and 1.2 contain detailed description of the crime data used for every city.

Figure 1.11 Selected property crimes and violent crimes, selected cities: Antofagasta (Chile); Pasto (Colombia); Aguirre (Costa Rica); San Salvador (El Salvador); Tijuana (Mexico)

Antofagasta: violent crime

Legend:
— Assault
— Sexual Violence
⋯ Intentional homicide
⋯ Deprivation of liberty and extortion

Pasto: violent crime

Legend:
— Assault
-- Intentional homicide
-- Deprivation of liberty and extortion

Aguirre: property crime

Rate per 100,000 population

Legend:
- Robbery of a car or vehicle
- Robbery from the person
- Theft
- Robbery

Aguirre: violent crime

Rate per 100,000 population

Legend:
- Assault
- Intentional homicide
- Deprivation of liberty and extortion
- Sexual violence

San Salvador: property crime

Rate per 100,000 population

Legend:
- Robbery
- Robbery of a car of vehicle

San Salvador: violent crime

Rate per 100,000 population

Legend:
- Intentional homicide
- Deprivation of liberty and extortion
- Assault
- Sexual violence

Tijuana: property crime

Rate per 100,000 population

Legend:
- Theft of business property
- Burglary of private premises
- Robbery of an establishment
- Robbery
- Robbery of a car or vehicle

Tijuana: violent crime

Rate per 100,000 population

Legend:
- Assault
- Intentional homicide
- Deprivation of liberty and extortion
- Sexual violence

Source: Chile, Ministerio del Interior y Seguridad Pública; Colombia, DIJIN; Costa Rica, OIJ; El Salvador, Policía Nacional Civil; Mexico, INEGI.
Note: Available data for cities in Brazil and Venezuela were not sufficient for trend analysis.

1.5. Characteristics of violent crimes

Contextual factors such as victim characteristics and mechanisms of violence should be examined in order to improve the understanding of how these variables may shape or contribute to the prevalence of violent crimes. Such a deeper understanding can enhance criminal justice prevention policies and responses.

1.5.1. Homicide

Information on homicides across the cities of Latin America for which age- and gender-disaggregated data are available shows that victims of homicide are relatively young and predominantly male. Although the breakdown in age groups varies slightly between El Salvador and the other countries, almost one half (48%) of the victims of homicides where age-disaggregated data are available during 2003-2014 were 15-29 years old (the age group is 18-30 in the case of El Salvador), whereas one third (32%) of the victims belonged to the 30-44 age group (31-40 in the case of El Salvador). A high proportion of the victims of homicide in their late teens and twenties is particularly evident for cities in El Salvador, Ecuador and the Dominican Republic, while in four out of five cities in Mexico the same or a higher proportion of the victims belong to an older age group, that is, thirties and early forties.

Figure 1.12 Percentage distribution of homicide victims by selected age groups, 2003-2014
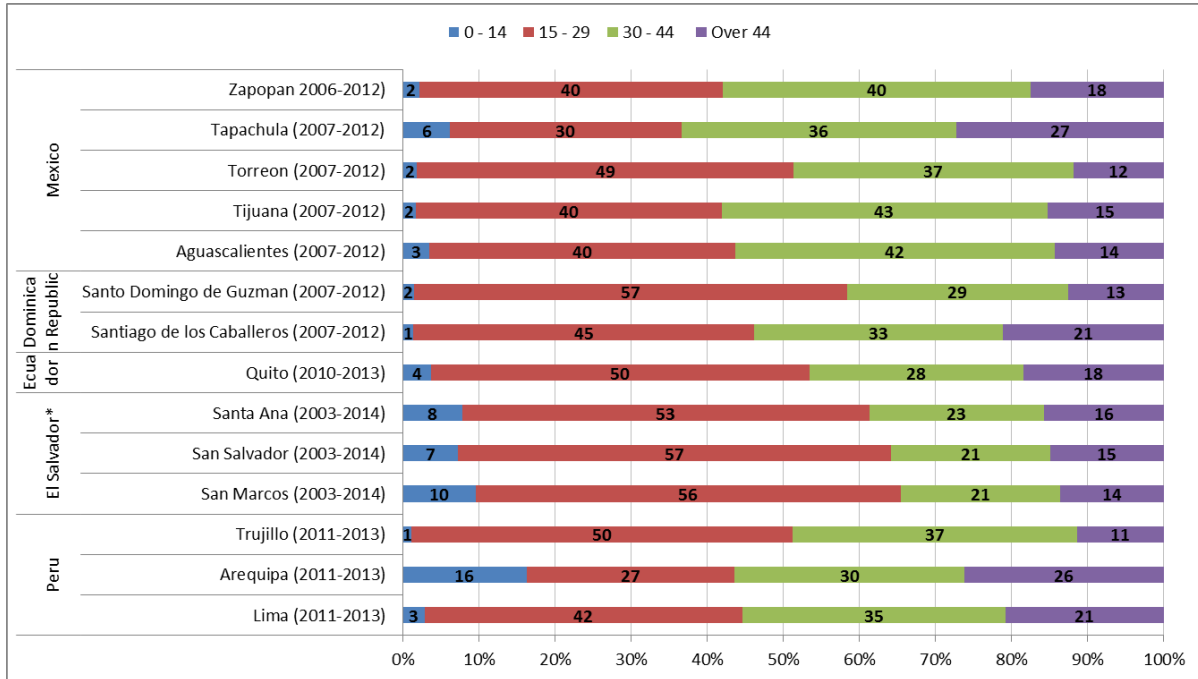
Note: The breakdown in the age groups for cities in El Salvador (0-17, 18-30, 31-40, and 40 and older) is slightly different from the other cities. Data where the age of the victims is known are combined over the years 2003-2014, but not all countries have data for the whole time period. For cities where the gender of the homicide victim is known, the proportion of male victims is very high—at least around three out of four victims are male. In six of the 17 countries, overr 90 percent of the victims were male.

Figure 1.13 Percentage of male victims of homicide, selected cities, 2003-2014
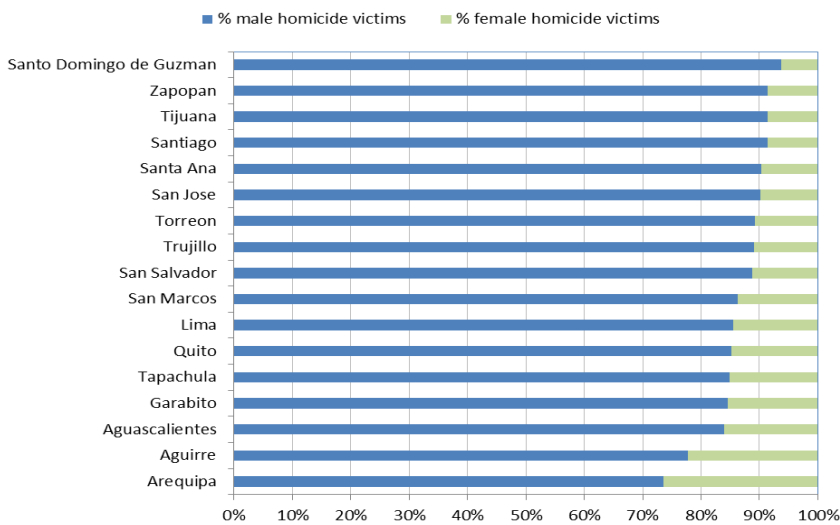
Note: Data where the gender of the victim is known are combined over the years shown in the axis of the chart.

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The vast majority of homicides in the region are related to the use of firearms: two out of three homicides (66%) over the period 2003-2014—where the mechanism was known—were related to firearms.

Figure 1.14 Percentage share of homicides by homicide mechanism, selected cities, 2003-2014
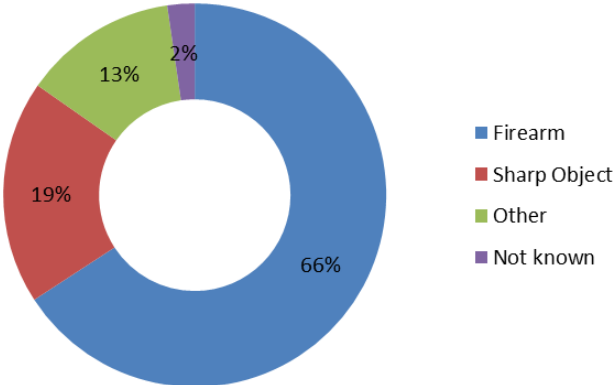
Note: Cities and years are as follows: Aguirre (2010-2014), Garabito (2010-2014), San Jose (2010-2014), Lima (2011-2013), Arequipa (2011-2013), Trujillo (2011-2013), San Marcos (2003-2014), San Salvador (2003-2014), Santa Ana (2003-2014), Quito (2009-2013).

In cities with a relatively high homicide rate, the use of firearms is the most common mechanism. This is clearly the case of San Salvador and Santa Ana, in El Salvador, and San Jose, in Costa Rica, where peaks in the overall homicide rates between 2003 and 2014 for these cities are closely related to changes in the homicide rate due to firearms. Apart from the relation to firearms, a high homicide rate entails as well a high share of young victims (younger than 29, 30 years, respectively). This combination of firearms and larger than average shares of young victims is likely influenced by the organized crime and criminal gangs. However, there are cities in the region that do not follow this general pattern. For example, in Quito (Ecuador), where there is a relatively low homicide rate, homicides with the use of sharp objects is the most common mechanism during the last five years, being the firearm homicide the least. Homicide typologies (UNODC, 2014) indicate that homicides committed with a sharp object are more likely associated with interpersonal, close family/partner conflict as opposed to firearm homicides that are predominantly linked to organized crime.

Figure 1.15 Homicide rates by homicide mechanism, selected cities 2003-2014
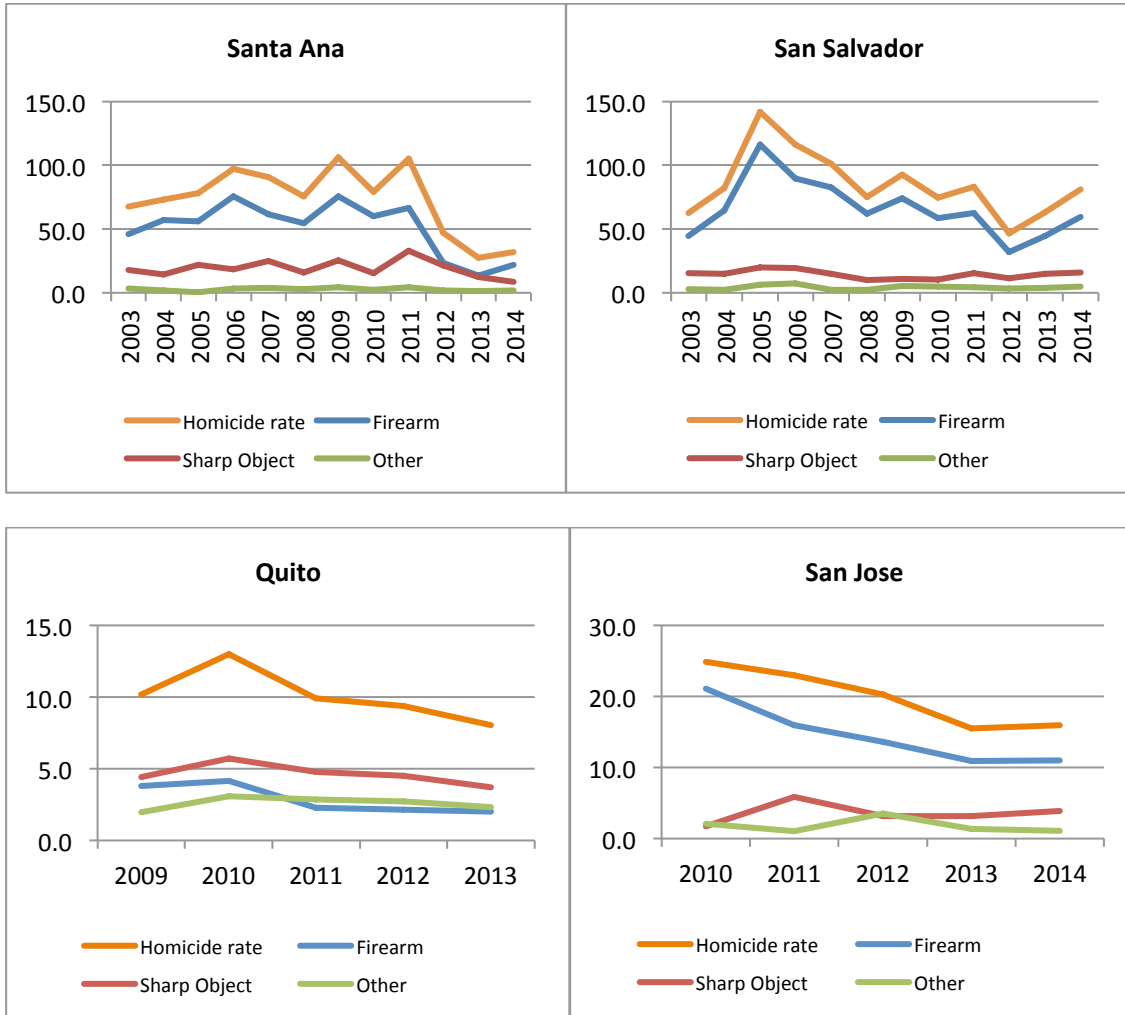
1.5.2. Other violent crimes

While the vast majority of the victims of homicide are male (90 percent of the victims across the cities during 2003-2014 where data are available), for other types of violent crime (threats, extortion, assault and robbery) the proportion of female victims is much higher. In the case of threats, women account for more than half of the victims (53 percent), near one third of the victims of assault or robbery (35 percent and 31%, respectively) and approximately one out of four victims of extortion (26 percent).

Figure 1.16 Gender breakdown of victims of robbery, assault, extortion and threats, 2003-2014
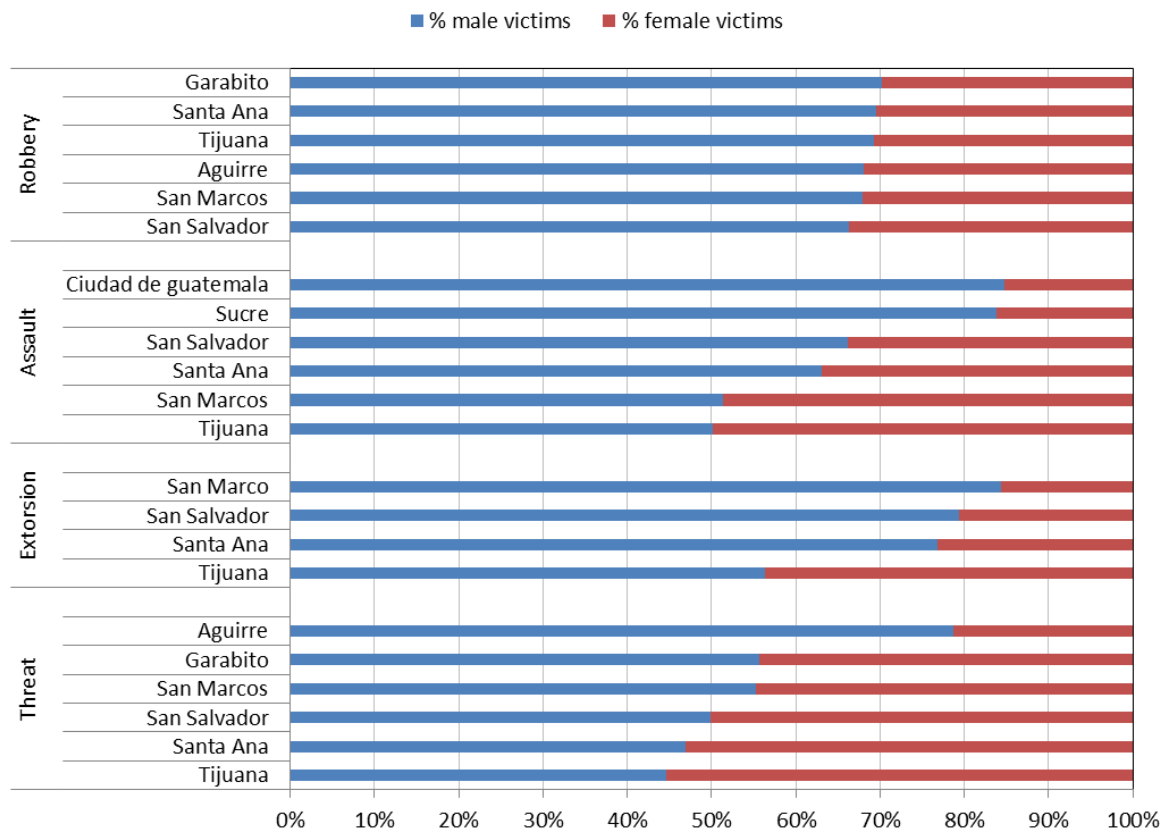
Note: Data where the gender of the victims is known are combined over the years 2003 -2004. Not all cities have data for the whole time period. In a large proportion of the cases the gender of the victim was not reported (robbery, 45%; extortion, 26%; assault, 14% and threats, 10%).

The data presented in this chapter point out a wide variation between crime patterns and trends at a regional and sub-regional levels. Whilst it is important to understand these trends as part of the broader picture and to identify common drivers across crimes, the variation observed between cities suggests a demand for policy responses to be constructed at the local level, starting from the particular needs of the

identified populations. The mapping and deconstruction of crimes should be complemented with an analysis of local contextual variables that might be influencing crime patterns. As such, the following chapters employ the Social Disorganisation Theory to develop a deeper understanding of city-level violent crime and associated drivers in selected Latin American cities.

2. Explaining violent crime in Latin America

2.1. Traditional perspectives

Throughout the past few decades, research attempting to explain the likely causes and drivers of violent crime in Latin America has broadly centered around three perspectives: economic, social/structural, and political. A brief overview of each dimension and their limitations is presented below.[6]

2.1.1. Economic perspective

The economic perspective seeks to explain crime in terms of 'cost/benefit', thus suggesting that criminal behavior is partly driven by a weighting of the benefits of crime versus the likelihood of detection and punishment.

High levels of homicide and robbery crimes are thought to be associated with economic inequality, low enrollment rates, and low levels of schooling. Also, countries with high levels of profit-oriented crimes such as drug production, and its resulting drug possession crime problem, also seem to have higher rates of homicide crimes and robberies, yet the causal link between these types of crimes is not clear. It is important to note that it may be the level of economic inequality/disparity and not the socio-economic status what may explain previous correlations (Fajnzylber, Lederman, & Loayza, 2002; 2000; 1998). Past research has suggested that crime in Latin American cities can be viewed as a consequence of rapid urbanization processes and the inability of governments to satisfy public security demands (Fajnzylber, Lederman, & Loayza, 2002; 2000; 1998;

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[6] For an overall discussion on the studies conducted in Latin America, consult Heinemann & Verner (2006) and Imbusch et al (2011).

Gaviria & Pages, 1999). This argument can be linked to the political perspective mentioned below.

Also, although there is no clear causal link between unemployment and violent crime, Ayers (1998) has suggested that low economic activity is correlated to rises in criminality. In fact, for the case of Mexico, Bergman (2011) has suggested that it is not unemployment itself that is the main cause of delinquency, but rather the quality and type of employment; in this sense, most people who steal do it in order to complement their low income or possibly to satisfy an addiction problem.

2.1.2. The socio-structural perspective

This perspective views fluctuations in crime and violence as a result of changes in societal structures, culture and institutions. Bergman (2009) has argued that rising trends in criminality are a consequence of changing labor market conditions, marginality, and economic crises. They have had profound effects on the state and family structures, causing community breakdown. Subsequently, these processes of change have altered illegal markets and individual preferences, making criminal activity an attractive option for the satisfaction of personal needs (Bergman, 2010). This argument can be linked to economic perspective or cost/benefit approach mentioned above.

Other authors have expanded this argument by making distinguishing between different types of violence (social, domestic and criminal) and their own risk factors.[7] Morrison et al (2005) claim that social violence is associated with income inequality, more access to weapons, post-conflict contexts, and cultural backgrounds shaped by violence and poverty. In turn, family size, low income, household overcrowding, and authoritarian family norms exacerbate domestic violence. Lastly, there is evidence supporting that some individual factors increase criminal or violent behaviors, such as drug abuse, victimization, and neurological dysfunctions. Similarly, Adams (2012) has argued that chronic violence is provoked by multiple and interactive causes, undermining social relations and making communities more vulnerable to violence itself.

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[7] The authors define *risk factors* as circumstances that augment the probability of an individual to develop antisocial or delinquent behaviors (Morrison, Buvinic, & Shifter, 2005, p. 146). For a fuller discussion on risk factors, please refer to Farrington (2007) and Farrington & Welsh (2007).

2.1.3. The political perspective

It is argued that recent democratization and decentralization processes in Latin America have weakened state control, in turn leaving corrupt and inefficient local governments in charge of public safety. However, evidence is mixed in this regard (Bailey, 2009; Bergman, 2010). It is also argued that anti-drug policies and the 'war on drugs' has had unforeseen consequences by fostering the expansion of illegal markets, and competition among drug cartels, ultimately affecting public trust in the police. For example, Keefer et al (2010) have suggested that drug prohibition polices in Latin America have generated economic and social crime drivers by diverting financial resources from social policies to police agencies, judiciary and prison systems, and contributing to economic hardship with no results.

Moreover, it is said that reconfigurations in drug markets caused by leadership removal (known as kingpin strategies) or sudden shifts in political agendas, may contribute to increasing scales of violence (Phillips, 2015) overloading the criminal justice system (Keefer, Loayza, & Soares, 2010; Serrano & Toro, 2005; Williams, 2010).[8]

2.1.4. Limitations of existing research

Independently of the perspective, traditional explanations of crime in Latin America have tended to point towards a common theme that is a weakened state. Whilst institutional weakness is a key factor for explaining the crime problem in Latin America, it is not the only cause; there are other macro and micro factors in play, which are not well understood, neither by researchers nor policy makers (Adams, 2012; Ortega & Sanguinetti, 2014).

Likewise, most research has focused on why some people commit crime and how we can account for individual criminal propensity. Although these micro-level approaches are helpful, they fail to explain why other people in the same circumstance choose not to commit crime. Such approaches focused on the offender, frequently ignore other factors such as "what makes targets suitable for victimization and places suitable to host crimes" (Paulsen & Robinson, 2009, p. 2). In addition, research conducted from inside the region tends to be purely descriptive and lack empirical basis and methodological controls.

Another limitation is that research has focused either at the national or subnational level, ignoring place or local context as a *significative* and revealing unit of analysis.

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[8] For the case of Mexico, see Guerrero (2011); for the Colombian case, Rubio (1998).

Concepts and measures when operationalized at extremely high levels of analysis (e.g. countries) tend to be too imprecise, too abstract, and heterogeneous. Data are aggregated into too broad categories masking significant underlying patterns. For instance, a recent review of 163 empirical studies on crime and violence in Latin America, found that at least 50% of these studies, analyzed crime at very high geographical scales (countries, states, municipalities or other) but only 13% examined crime within cities (Zárate Tenorio, 2015). Moreover, even for studies conducted at the city level, it is noteworthy that most of them focused on victims and offenders, but not on places or structural correlates and causes.

These perspectives have been seen as competing, thus narrowing their analysis to unique and separate causes (i.e. either as a consequence of economic changes *or* due to drug trafficking disputes etc.) and eventually disregarding the interplay between different factors, as if explanations were unidimensional or unidisciplinary. The study of crime and violence requires several perspectives such as traditional criminological theory. This calls for a deeper examination on local conditions.

In order to overcome these limitations, this study was based on Social Disorganization theory (SD) in order to examine structural correlates and the local conditions of crime, at different levels of analysis: at the inter-urban and intra-urban levels of analysis. Research findings in this study can be compared with other findings from other parts of the world, such as North America, Europe, Australia, and Japan.

2.2. Social disorganization theory

Social disorganization theory (SD) was formulated between the 1920's and the 1940's. It was used to explain the geographical pattern of juvenile delinquency in the city of Chicago (Shaw, 1929; Shaw & McKay, 1942). These studies defined social disorganization as the inability of communities to achieve and resolve their common goals. For Shaw & McKay (1942) social disorganization or community incapacities were culturally transmitted, that is, similarly to language, roles and social expectations, antisocial and criminal behaviors are socially learned. Moreover, it was argued that such behaviors persisted over time in places. According to Shaw & McKay, three factors explain social disorganization in cities: Low economic status, racial heterogeneity, and residential instability. Hence, areas within cities with high levels of these factors were more likely to experience social disorganization, which, in turn, explained the spatial clustering of delinquents and crime (Figure 2.1).

Figure 2.1 First formulation of Social Disorganization Theory

Observable structural factors

Low Socio-economic Status

Racial heterogeneity

Residential instability

Non-observable process

Social disorganization

Crime
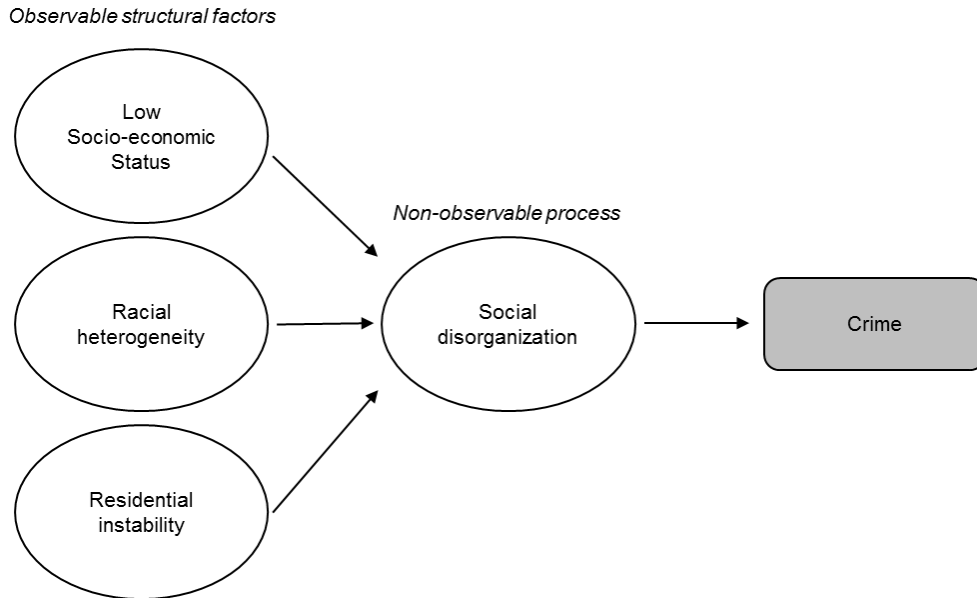
Source: Adapted from Shaw (1929) and Shaw & McKay (1942).

Over time SD has evolved. Sampson and Groves (1989) extended the original SD model by differentiating between endogenous and exogenous sources of social disorganization. They added intervening factors such as local friendship networks, control of street-corners by teenage peer groups, and levels of community participation. Their findings suggested that indeed sparse friendship networks, groups of unsupervised teenagers, and low levels of community involvement, weaken social controls, facilitating the occurrence of crime (Figure 2.2). In other words, spatial variations in crime are attributable to neighborhood's social processes.

Figure 2.1 Second formulation of Social Disorganization Theory

Observable structural factors

Observable Processes / Mediating factors

Low Economic Status

Ethnic heterogeneity

Residential mobility

Family disruption

Urbanization

Social disorganization:

Sparse local friendship networks

Unsupervised teenage peer groups

Low organizational participation

Crime

Indirect visible effects
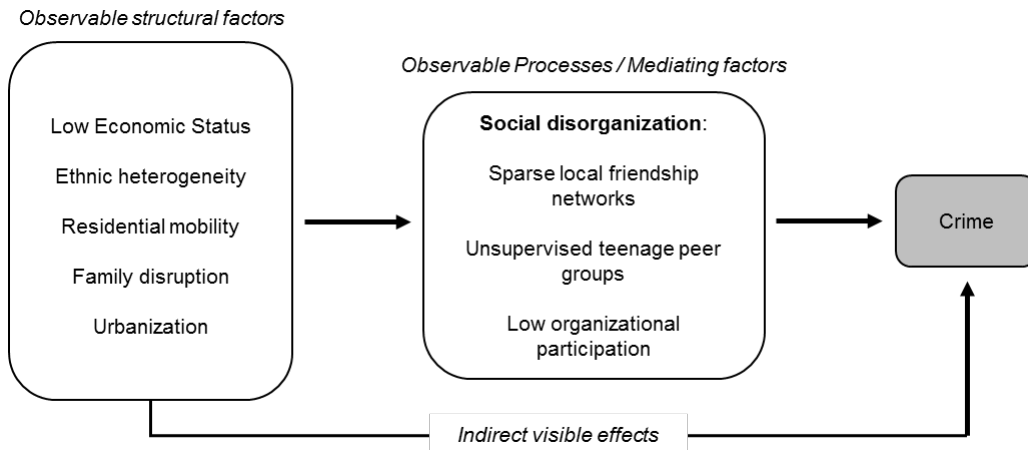
Source: Adapted from Sampson & Groves (1989).

Later on, Sampson et al. (1997) noted that just as individuals have differential capabilities for solving problems, so do neighborhoods. This is why the willingness to intervene in favor of the community and the mutual trust among neighbors create collective efficacy. Collective efficacy helps overturn antisocial behaviors and monitor signs of physical decay in neighborhoods. Drawing on previous research, these authors found that neighborhoods with concentrated disadvantage and family disruption were less capable to develop collective efficacy. Correspondingly, neighborhoods with low levels of collective efficacy suffered from more crime. In sum, social disorganization refers not only to issues of economic deprivation, but also to deficiencies in the way people in communities address their common problems (Figure 2.3).

Figure 2.2 Third formulation of Social Disorganization Theory
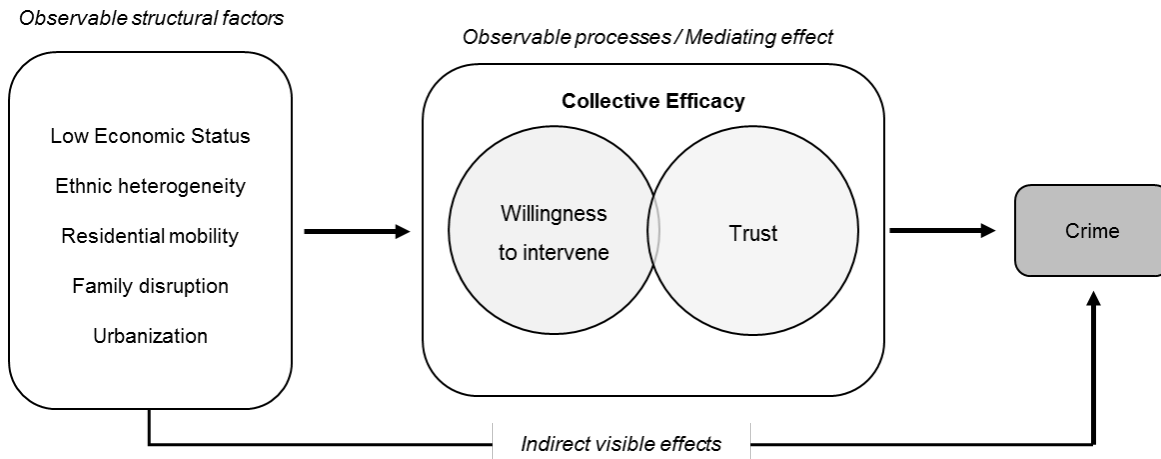
Source: Adapted from Sampson et al. (1997).

More recently, Sampson (2011) has advanced the idea of the ecometric model or neighborhoods effects on crime. Ecometric modeling suggests that individuals should not be studied in isolation (or just as agency) but in combination with structures such as neighborhoods, which are in turn affected and influenced by exogenous macro-level factors such as globalization. This model sees the spatial context in terms of social relationships. This model examines how individuals connect with communities and how these interact in a larger social world to facilitate or impede crime from occurring (Figure 2.4).

Figure 2.3 Sampson's ecometric model or neighborhood effects on crime
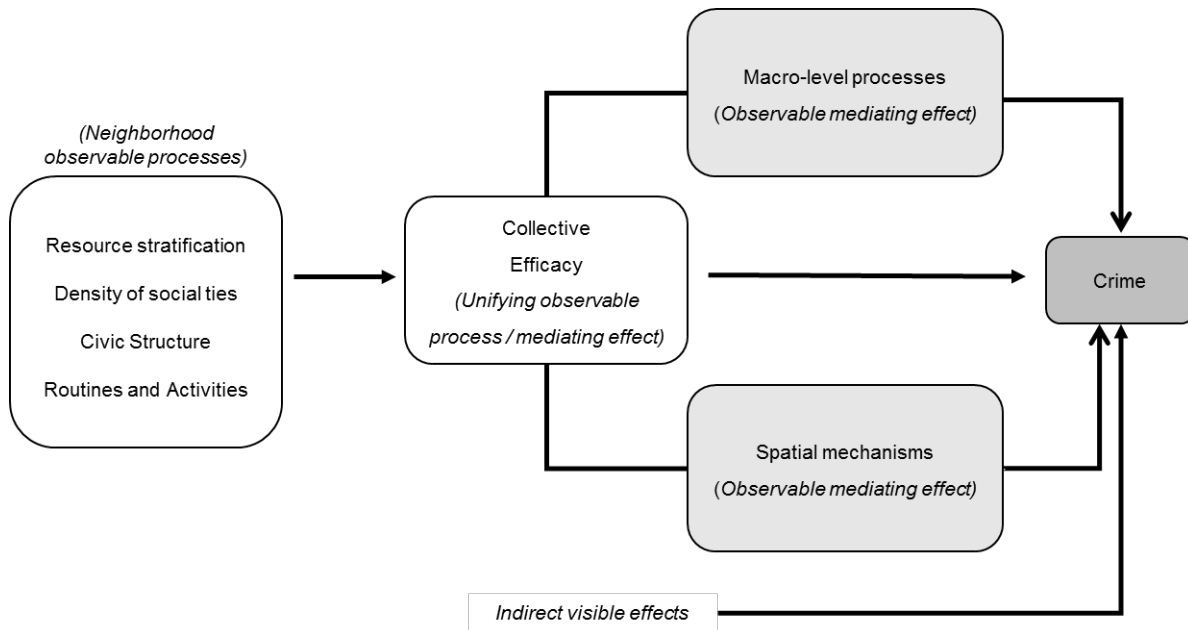
Source: Adapted from Sampson (2011).

Studies from North America and the European Union have used SD for explaining homicide (Martinez, Stowell, & Lee, 2010; Morenoff & Sampson, 1997; Nieuwbeerta, McCall, Elffers, & Witterbrood, 2008), partner violence (Browning, 2002), property crimes (Cancino, Varano, Schafer, & Enriquez, 2007), gang violence (Mares, 2010; Toy, 1992), robbery and assaults (Hipp, Tita, & Greenbaum, 2009; Rollin, 1997), and adolescent delinquency (Kingston, Huizinga, & Elliott, 2009). Additionally, SD has been used to explain the rise of drug markets and drug use (Hayes-Smith & Whaley, 2009; Martínez, Rosenfeld, & Mares, 2008), incarceration rates (Clear, Rose, Waring, & Scully, 2003; Rose & Clear, 1998), bullying (Bradshaw, Sawyer, & O´Brennan, 2009), and crime hotspots (Braga & Clarke, 2014). SD has been even used for examining school and social disorder (Sampson & Raudenbush, 1999; Welsh, Stokes, & Greene, 2000), informal social controls (Warner, 2007), fear of crime (Markowitz, Bellair, Liska, & Liu, 2001), and suicide (Nomiya, Miller, & Hoffmann, 2000).[9]

Despite its broad use, not much research in Latin America has been based on SD. One possible reason is the lack of empirical research and crime data in general. So far, only Vilalta (2013), Vilalta & Muggah (forthcoming) and Reyes et al (2008) have used SD theory to explain criminal violence in Mexico and Puerto Rico, respectively. In the case of

[9] A full description of the listed studies can be found in Annex 1.4.

Ciudad Juarez, Vilalta (2013) found that proclivity of communities to organize for crime prevention was inversely associated with their trust in local police. Also, more schooling, more age, and the perception of more robberies and kidnapping crimes, all enhanced community cooperation. In another case study, Vilalta & Muggah (forthcoming) concluded that crime is highly clustered in the metropolitan region of Mexico City. Several hotspot municipalities account for more than one quarter of all crimes. In this urban area, family disruption as measured by the percentage of female-headed households, was the main predictor of crime. In the case of Puerto Rico, Reyes et al (2008) found that adolescent violence was associated to the presence of adults carrying weapons; further, community organization was hampered by lack of resources and previous negative experiences.

By using SD with other complementary approaches, this study aims to disentangle clear and robust drivers of crime for urban contexts in Latin America. In contrast to previous research conducted in LA, this report tests the theoretical model on two levels: inter-urban and intra-urban for different types of crime, illustrating similarities and differences across cities and within cities.

In addition to SD evolution, some criminologists have promoted the integration of different theoretical perspectives (Maimon & Browning, 2010; Nielsen, Lee, & Martinez, 2005; Rice & Smith, 2002; Smith, Frazee, & Davison, 2000; Weisburd, Groff, & Yang, 2012). While SD emphasizes the structural conditions of neighborhoods, other crime opportunity approaches such as routine activities theory, crime pattern theory, or situational crime prevention, emphasize the study of the characteristics of places that make offenders more likely to succeed (Table 2.1).

Table 2.1 Complementary approaches in the geography of crime

Crime opportunity approaches	Emphasis	Main argument
Situational crime prevention	It emphasizes what physical circumstances of a place facilitate criminal offending	By manipulating the physical environment, it is expected to increase the efforts and risks and reduce the rewards perceived from committing a crime.
Routine activities	It accounts for how offenders choose their victims	For a crime to occur, three elements must converge in space and time: 1) a motivated offender; 2) a suitable target, and 3) lack of guardianship. Moreover, offenders choose their victims depending on their value, their vulnerability, their visibility and access.
Crime pattern	It explains why some locations are more attractive for offending than others.	Crime tends to concentrate in specific places at particular times. Thus, victimization risk is a function of the physical characteristics and social activities related to that area.

Source: Own elaboration based on Clarke (1992), Cohen & Felson (1979), and Brantingham & Brantingham (1993) respectively.

3. Data analysis and interpretation

In order to provide better and more useful findings than those in previous studies based on different perspectives, two types of tests were conducted:

i)   One regional or inter-urban level test of social disorganization theory. This test was based on a sample of cities in the region.

ii)   Three tests of social disorganization theory at the intra-urban level of analysis. These tests were based on three case studies.

The purpose of this research strategy is twofold. On the theoretical side, it aims to test whether SD theory is a useful approach for explaining crime in Latin America cities. On the policy side, it seeks to see if there are divergent patterns across and within cities. One of the key policy contributions of these analyses is to show that national or global solutions do not necessarily work for every location. Tables 3.1 and 3.2 present the variables included in each level of analysis.

        The selection of the cities for analysis responded to data availability criteria. Only cities with crime, demographic and socioeconomic data, disaggregated at the city level,

were included in the study. National Statistical Offices and Criminal Justice institutions proved of utmost importance for completing the database[10]

According to social disorganization, structural variables create local conditions from which processes of socialization take place. Crime is an adaptive behavior or a reaction towards such conditions. Nonetheless, local socialization processes moderate behaviors. For instance, spatial clusters of economic deprivation and family disruption can translate into low levels of collective efficacy. As a result, formal social controls (e.g. police patrols) and informal social controls (e.g. community surveillance) may not be sufficiently strong to overcome antisocial or criminal behaviors.

As shown in Table 3.2, economic deprivation or resource stratification were represented by measures of income inequality (Gini index), unemployment rate, and average schooling years. Density of social ties was represented by the immigration rate, divorced or separated population rates, and female-headed or single-parent household rates. Finally, routines and activities included measures of young people (15-29 years), minors not attending school, and alcohol outlets.

Inclusion of alcohol outlets in the social disorganization model responds to two assumptions. First, previous research has reported a significant association between alcohol selling premises density and crime in areas characterized by high social disorganization levels (Livingston, Chikritzhs, & Room, 2007; Gruenewald, 2008) and young population (Mair, Gruenewald, Ponicki, & Remer, 2013). Second, evidence gathered from two prison populations in Mexico, showed that almost 35% of inmates had consumed some type of psychotropic substance (mainly alcohol) at least six hours before committing a crime (Vilalta & Fondevila, 2013). Along with young population and school absenteeism rates, the presence of alcohol outlets has a conceptual link with other theories on the geography of crime, particularly, crime pattern theory and routine activities theory (Wo, 2014).

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[10] Annex 1.5 contains a full discussion on the limitations and cautions on the data.

Table 3.1 Inter-urban level: Structural variables and neighbourhood processes

Neighborhood processes	Structural variables
Economic deprivation	Gini coefficient
Residential instability	Residents living in other State five year earlier (%)
Family disruption	Female-headed households (%)
Routine activities	Alcohol outlets (count)

Table 3.2 Intra-urban level: Structural variables and neighbourhood processes

Neighborhood processes	Structural variables
Economic deprivation	Marginality and Social development indexes
Economic deprivation	Unemployment (%)
Economic deprivation	Average schooling years
Residential instability	Residents living in other State/Canton/Comuna five years earlier (%)
Family disruption	Divorced or separated (%)
Family disruption	Female-headed households / single-parent households (%)
Routine activities	Population aged 15 to 24/29 (%)
Routine activities	Population aged 6 to 14 who do not attend school (%)
Routine activities	Alcohol outlets (count)

Source: Own elaboration based on available data at city level and social disorganization theory.

3.1. Inter-urban analysis

For the testing of Social Disorganization (SD) theory across cities of Latin America, we used three types of crimes as dependent variables: Acts against property, acts causing harm or intending to cause harm to the person, and homicides. Crime data represent rates per 100,000 inhabitants.[11] We used a sample of LA cities for which crime data was available (n=34).[12] As such, the unit of analysis was the city. SD theory was operationalized using four structural correlates in the theory. Multivariate regression analysis was to test the relationship between these structural correlates and crime. That is,

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[11] These rates were later transformed to Z values for the regression analysis.
[12] Information sources are presented in the Annex 1.3.

SD correlates were regressed on each type of crime, thus having three tests of the theory at the regional level.

3.1.1. Data analysis

As shown in Table 3.3, this sample of cities shows considerable variations in terms of crime. Major differences among LA cities exist in terms of crime activity. Major variations arise for the case of crimes against property, followed by acts causing harm and lastly, homicides. However, these cities still exhibit high levels of homicidal violence overall, with a mean rate of 41.5 homicides per 100 thousand inhabitants. Moreover, variables of social disorganization show a lot of variation as well. These cities are very diverse in terms of immigration percentages and alcohol outlets rates. They are also very different in terms of income inequality (measured by the Gini index). Interestingly, percentages of female-headed households are less variable among cities, yet still representing around a third of all households across the region (Mean = 32.2%).

Table 3.3 Descriptive statistics for crimes and social disorganization correlates in selected cities of LA

Variables	n	Mean	Std. Dev.	Min	Max
Dependent					
Acts against property (rate)	23	1,472.8	1,828.0	6.1	7,980.1
Acts causing harm (rate)	23	533.8	882.6	3.2	3,704.4
Homicide (rate)	34	41.5	40.8	1.3	182.4
Independent					
Gini index	34	0.473	0.091	0.369	0.888
Immigration (%)	34	9.4%	7.7%	1.9%	40.2%
Female-headed households (%)	34	32.2%	5.65	19.0%	42.2%
Alcohol outlets (rate)	34	114.0	199.9	1.0	766.1

*Rates are per 100,000 inhabitants.

Table 3.4 presents the results of the SD test. Social disorganization theory overall provided a good fit to the data. As shown by R2 values ranging between 0.8 and 0.9, the theory strongly predicted crimes against property and acts causing harm to the person. The theory was less strong to predict homicide rates across the sample of cities.[13]

Table 3.4 Ordinary Least-Squares (OLS) regression results for different crime types

	Model 1	Model 2	Model 3
	Acts against property	Acts causing harm	Homicide
Gini index	0.049	-0.074	0.147
	(0.263)	(0.097)	(0.123)
Immigration	0.866***	0.784***	-0.389**
	(0.027)	(0.174)	(0.145)
Female-headed households	0.004	0.148	0.077
	(0.030)	(0.145)	(0.195)
Alcohol outlets	-0.187*	-0.045	0.443
	(0.045)	(0.109)	(0.314)
(Constant)	0.006	-0.008	-0.001
	(0.034)	(0.197)	(0.137)
R^2	*0.909*	*0.809*	*0.402*
F	*512.25****	*11.65****	*3.93***
n	*23*	*23*	*34*

*p<0.10, **p<0.05, ***p<0.001. Clustered by country robust standard errors in parenthesis. All variables transformed to Z-scores.

The scatterplots below show the types of relationships between the SD correlates and each type of crime. These relationships are positive in some cases and negative in others. In the model of acts against property, migration rates (as measured by the percentage of residents living in another state five years earlier) shows a positive independent relationship, meaning that in cities with higher percentages of residential instability, we can find higher rates of reports for these crimes. This correlation is very strong in the sample of cities since it shows that both variables move up or down almost at the same rate.[14] In contrast, alcohol outlets rates shows an inverse relationship with crimes against property, that is, cities with higher rates of alcohol outlets show lower rates of

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[13] Variance inflation factors and tests on the residuals showed no collinearity nor residual distribution problems in the models.
[14] These coefficients show changes in terms of standard deviations. In this case, one standard deviation increase in migration rates is associated with a 0.866 standard deviation increase in the rate of crimes against property.

these type of crimes as a pattern.[15] However, as the scatterplot below shows, these two variables were not strongly correlated. Neither income inequality (Gini Index) nor female-headed households showed to have any relationship with crimes against property after holding all else constant.

Figure 3.1 Scatterplots for the inter-urban regional model
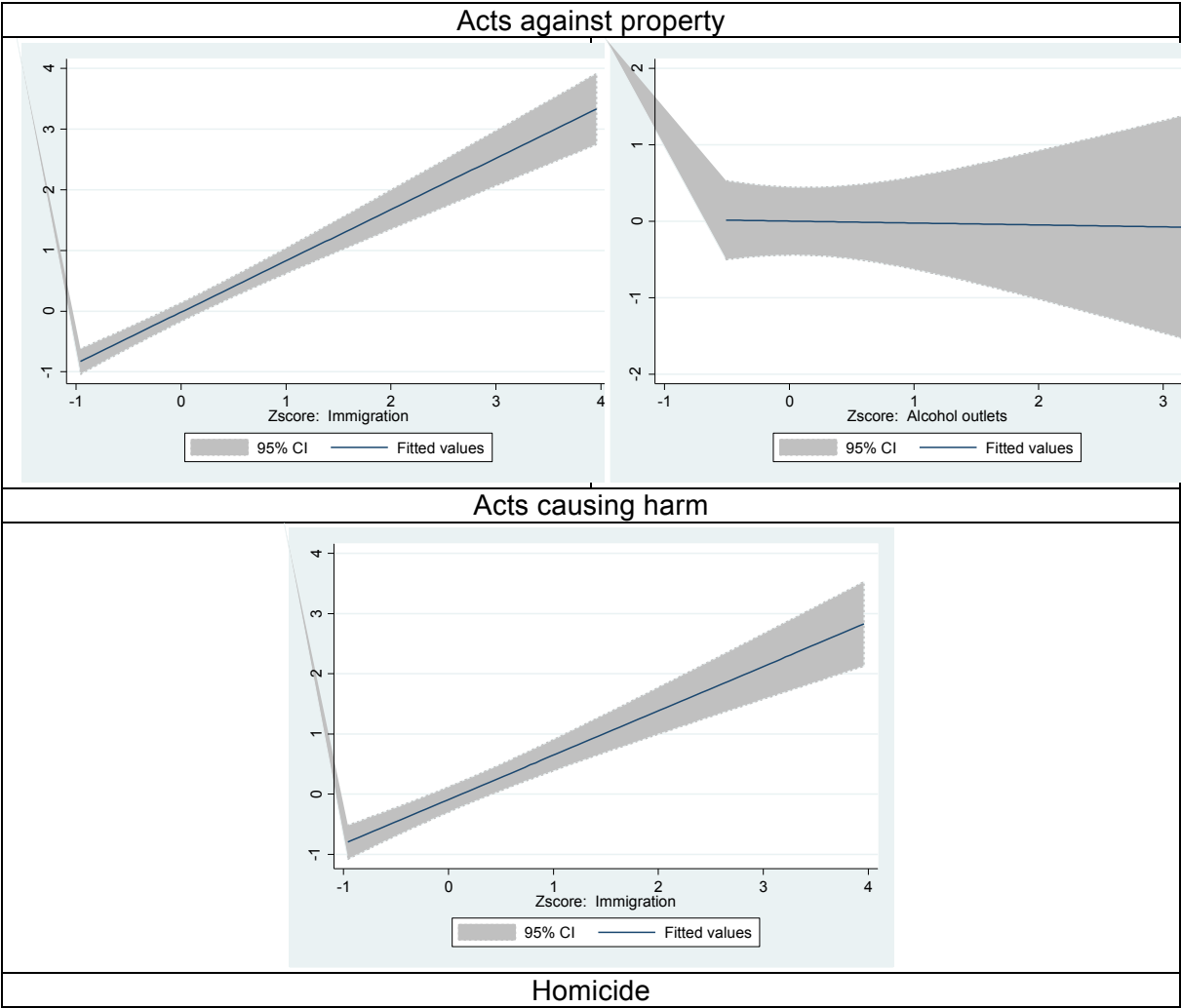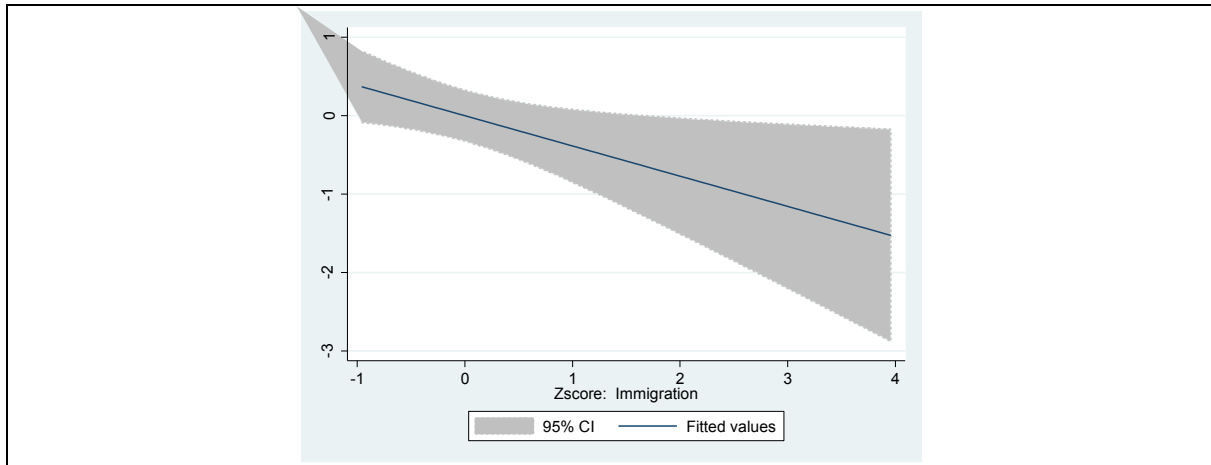
For the case of crimes related to acts causing harm, the migration rates variable also shows to have a strong and positive relationship. Once again, residential instability seems to be a strong structural variable to consider for crime policy. Other structural variables failed to reach conventional statistical significance.

For the case of homicide crimes, migration rates once again shows statistical significance in the social disorganization model, however in an inverse relationship, that is, more migrants, less homicides. In this case, other structural correlates constant, cities in our sample with higher rates of migrants showed lower levels of homicide rates, as if migrant populations served as a protective factor against extreme violence. Of course this is all tentative, however this finding of an inverse relationship between higher levels of residential instability and lower levels of some types of homicide (such as gang homicides) has already been reported – i.e., Mares (2010) and Martínez et al. (2010).

In sum, our inter-urban social disorganization model clearly helps better understand some likely reasons of why some types of crimes are more prevalent in some Latin American cities over others. Even though the theoretical model was operationalized based on a few structural correlates and tested on a reduced sample of cities for which crime data was available, one statistically robust generalization could be deducted. After controlling for other structural characteristics, the residential instability concept, as measured by the percent of recent migrants in the total population, showed a statistical correlation with all crimes. In terms of crimes against property and for acts causing harm, residential instability showed a statistical trend toward more crime in this sample of cities. In terms of homicide, residential instability showed a statistical trend toward less homicide in the same sample. This is a major finding for urban crime policy at the regional level. For policy makers, it suggests there are good reasons to begin discussing the idea of

implementing specific urban programs (e.g. youth programs) directed to recent migrants and their children into these cities. Likewise, in terms of homicidal violence, these data shows that there are good reasons too for regarding migrants as a positive rather than a negative force, which is what some narratives tend to do in terms of promoting a non-factual (i.e. uncertain) discourse against migrant populations. Still, more and better data is necessary for further testing. In this section, we formulated a basic social disorganization model to inform regional crime policy. In the next section, we further test social disorganization theory at the intra-city level, which ultimately brings better understanding and detail for crime policy-makers concerned with evidence-based initiatives.

3.2. Intra-urban analysis

As discussed in chapter one, empirical crime studies based on large-scale geographic units (e.g. states or municipalities) mask important sources of local variation. This issue not only limits our analytical capabilities but also complicates policy discussion. Furthermore, just as victimization tends to be experienced by a small fraction of the total population (Farrell & Pease, 1993; Grove, Farrell, Farrington, & Johnson, 2012), crime and its correlates are typically clustered in small number of neighborhoods within cities (Paulsen & Robinson, 2009; Weisburd, Groff, & Yang, 2012; Weisburd, Telep, & Braga, 2010). Latin American cities are no exception to this spatial empirical regularity (Vilalta and Muggah, 2015). It is necessary to examine why crime mostly occurs in certain areas of cities. For that purpose, this section presents three city case-studies that were examined under the theoretical framework of both social disorganization and crime opportunity theories (see chapter two). The three case studies were the cities of Zapopan in Mexico, San Jose de Costa Rica, and Santiago de Chile.

Count data of different types of crimes were used as dependent variables. The use of crime rates in statistical analyses with the use of small units of analysis (e.g. census tracts) is problematic due to two methodological reasons. First, there is a denominator problem in small intra-city units. Census tract and neighborhood crime rates calculated based on their resident population are misleading as they disregard key factors such as urban mobility and daily transient populations. These features partially determine the amount of people located at one point at a specific time. In fact, victims and offenders travel across neighborhoods during the day (Brantingham & Brantingham, 1998). Crime rates therefore cannot capture the true extent of the crime problem at the micro-place

level. One problem of course is that daily transient population estimates do not exist in most cases. Another downside has to do with the skewed distribution of crime and estimation problems associated with the use of ordinary least-squares (OLS) regression analysis, especially when populations from which the rates are calculated are small (Osgood, 2000; Tcherni, 2011). This is why count data are normally used in these cases.

In order to strengthen confidence in the results, this section combines traditional statistical techniques with spatial analysis techniques. Zero-inflated Poisson regression models (ZIPR) were used to account for the excess of zero counts in some of the spatial units (e.g. census tracts, districts etc.) within these three cities.[16] In addition, robust standard errors were computed in order to decrease the risk of false positives or false conclusions. Spatial analyses included spatial autocorrelation tests along with Geographically Weighted Poisson Regression (GWPR). Since crime tends to cluster in a few number of neighborhoods, global Moran´s I spatial autocorrelation coefficients were computed to test for the indications of spatial dependence in the datasets. Several local spatial clusters and outliers were detected. Each type of spatial dependency (clusters and outliers) was diagnosed with the use of the Getis Ord Gi score (or local spatial autocorrelation test).[17] In turn, GWPR accounted for spatial heterogeneity, that is, crime not only tends to spatially cluster, but relationships between variables also vary across space. This spatial modelling approach tests statistical relationships in each unit in relation to its neighboring units. GWPR shows how correlated do not always have the same importance in all places, but that there may be geographically varying effects, even divergent, depending on location In other words, GWPR modelling tests if place matters.[18]

3.3. Zapopan (Mexico)

3.3.1. Zapopan: Country and city context

Zapopan is one municipality located in the fourth most populated state of Mexico: Jalisco. It is also part of the second biggest metropolitan area in the country: The Guadalajara Metropolitan Area. According to the National Statistics and Geography Institute (INEGI),

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[16] Due to high number of zeroes (overdispersion in crime data) results from the ZIPR models were compared to equivalent Negative Binomial models (GLBNR). Results were similar in magnitude and did not contradict the sign of the relationships.

[17] To know more on the methodological implications of these tests, please refer to Fornango (2010); Fortin & Dale (2009), and Vilalta (2013).

[18] The statistical packages used for this section were SPSS, Geoda and GWR.

the entire metropolitan area has approximately 4.5 million people. Alone, Zapopan has a total population of almost 1.2 million or 26% of the population living in this area (INEGI, 2010).

Since 2008, Mexico has suffered a sharp crime increase, passing from a homicide rate of 8 in 2007 to 19 in 2013 per hundred thousand inhabitants (INEGI). Furthermore, according to the National Survey on Victimization and Perception of Public Safety (ENVIPE), the rate of victimization among households has ranged between 36% in 2010 to 34% in 2013.[19] Evidently, there are notable regional differences.

Comparatively speaking, Zapopan is one point above the national homicide rate with 20 homicide victims per hundred thousand inhabitants. Nonetheless, back in 2010, Zapopan exhibited a homicide rate of 11 per hundred thousand. Not only homicides have increased. Other crimes show an upward trend as well. For instance, while 28% of the adult population in the country had been a victim of crime in 2014, the crime prevalence rate of the state of Jalisco was 39%.

Recent assessments relate this dramatic shift in violence and crime to conflicts between crime cartels. After the detention of two *Milenio* Cartel leaders and the killing of the former Sinaloa Cartel boss, Ignacio Coronel in July 2010, the dominant drug-cartels split into two opposing factions, leading to one deadly dispute over drug trafficking in Jalisco (Guerrero, 2015; InSight Crime, 2015). Even though other cities in Mexico suffer from more crime, latest trends in Zapopan call for a careful study on its crime patterns and their causes. Hence, the importance of this case study for the analysis of the geographical patterns of robbery, assault and homicide crimes within the city.

The municipal police recorded crime incidents. Such information was available to us through the initiative of *ZapopanLab.*[20]. For this analysis, crime events were spatially joined to its corresponding AGEB (or census tract). In Mexico, INEGI aggregates census data in basic geostatistical areas called AGEB. This is a geographical unit of information conformed by a set of blocks with streets or avenues limits, or any other spatial feature which are easily identifiable for census purposes; land uses are primarily residential, industrial, services or commercial (INEGI). INEGI uses the AGEB as sampling frames in order to conduct censuses and surveys. The Zapopan study area contains 455 AGEB areas.

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[19] Rates are calculated per 100,000 inhabitants. All data come from the National Institute of Statistics and Geography of Mexico (INEGI).
[20] ZapopanLab is a public-private partnership designed for innovating public services and the use of open data within the municipal government.

3.3.2. Descriptive statistics and mapping

As table 3.5 shows, there is high level of spatial variation of crime within Zapopan. While some areas (i.e. AGEB) registered zero robberies assaults and/or homicide crimes in 2010, other areas reported up to 33 crime incidents in total. Compared to other areas of Mexico, Zapopan has lower levels of marginality[21] and higher levels of schooling. Some areas within the city also show high levels of immigration (up to 61.1%) and female-headed households (up to 50.0%).

Table 3.5 Descriptive statistics for crimes and social disorganization correlates in Zapopan (MX), 2010

Variables	Mean	Standard deviation	Min	Max
Dependent				
Robbery (count)	4.4	5.3	0	32
Assault (count)	0.4	1.2	0	21
Homicide (count)	0.2	0.6	0	6
All crimes (count)	5.5	6.1	0	33
Independent				
Population aged 15 to 24 (%)	18.5%	4.6%	0%	41.1%
Marginality index (factor)	2.2	1.4	1	5
Population resident in another state five years earlier (%)	4.0%	5.4%	0%	61.1%
Divorced population (%)	7.5%	3.2%	0%	18.0%
Population aged 6 to 14 not attending school (%)	3.5%	3.4%	0%	20.9%
Unemployed population (%)	3.1%	2.0%	0%	12.6%
Female-headed households (%)	21.6%	8.9%	0%	50.0%
Average schooling (years)	9.8	3.2	0	15
Alcohol outlets (count)	1.2	1.9	0	23

N = 455 AGEB.

The maps below show the spatial patterns of crime. They also show some differences between crimes as if social disorganization significantly differed between areas of the city.

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[21] Measured on a scale from 1 to 5 where 1 means very low marginality and 5 means very high marginality.

Figure 3.2 Robbery count by AGEB in Zapopan (MX), 2010

Robbery count (2010)

- 0 - 2
- 3 - 7
- 8 - 13
- 14 - 22
- 24 - 32
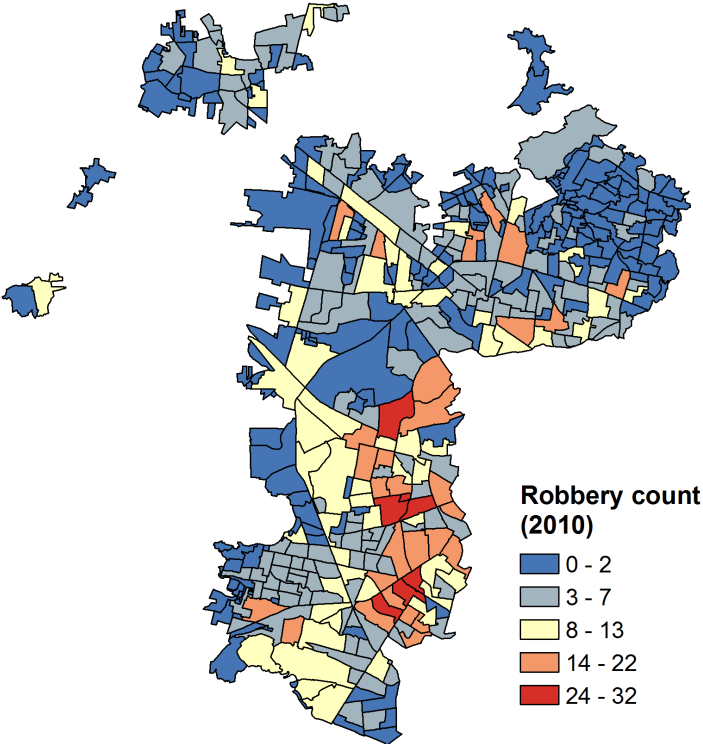
Figure 3.3 Assault count by AGEB in Zapopan (MX), 2010

Assault count (2010)

- 0
- 1
- 2 - 3
- 7
- 21
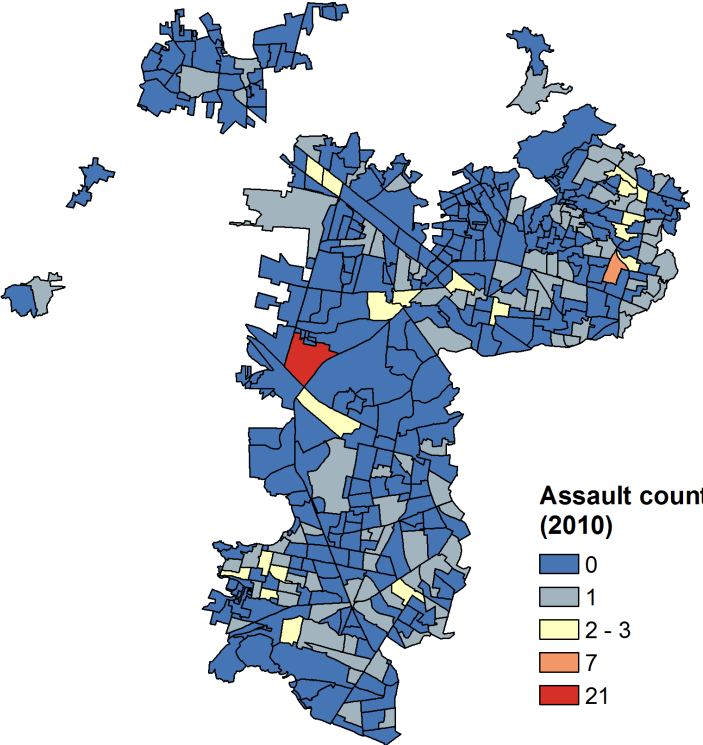
Figure 3.4 Homicide count by AGEB in Zapopan (MX), 2010

Homicide count (2010)
- 0
- 1
- 2
- 3
- 6
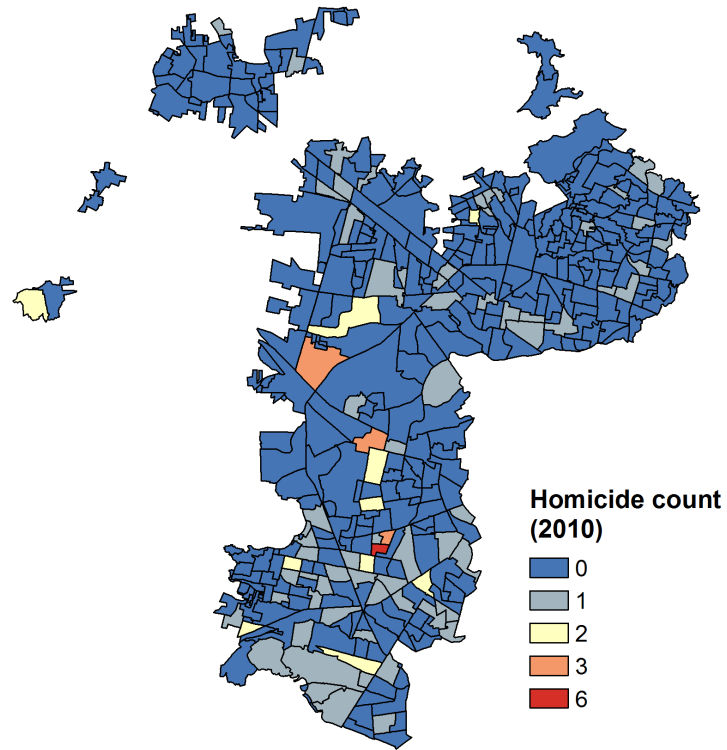
Figure 3.5 Crime count by AGEB in Zapopan (MX), 2010

Crime count (2010)
- 0 - 3
- 4 - 8
- 9 - 14
- 15 - 23
- 24 - 33
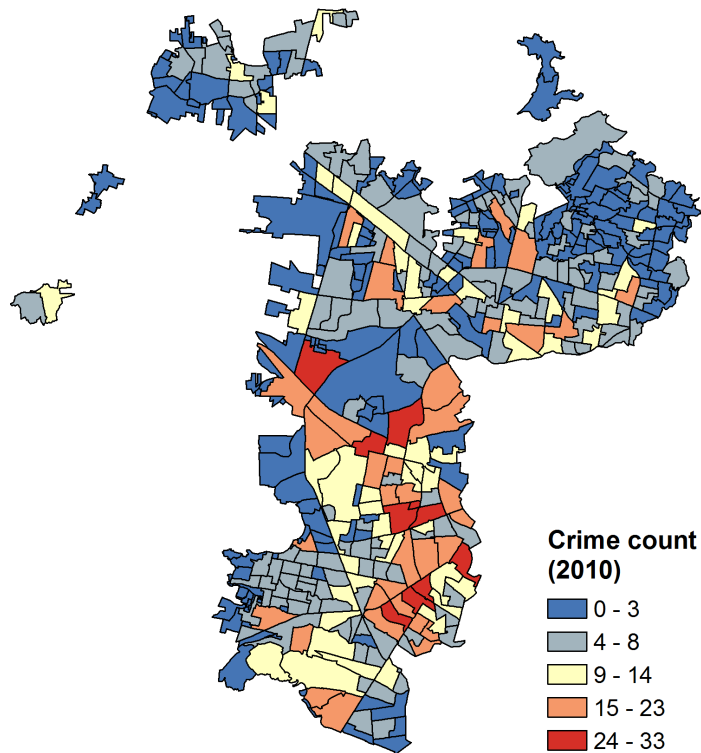
As shown in Table 3.6, almost everything was spatially autocorrelated in 2010. Crime was spatially clustered for Robbery and Homicide crimes and for the total number of crimes. Assaults, on the contrary, seemed to be spatially random. Among structural correlates, average level of schooling shows the highest level of spatial clustering or geography of exclusion, meaning that people with similar education levels lived nearby other people with those education levels. Likewise, marginality was spatially clustered, and the divorced female-headed household populations lived spatially clustered as well. These spatial patterns provide evidence of a geography of resource stratification in Zapopan. Alcohol outlets showed the lowest level of spatial clustering.

Table 3.6 Spatial autocorrelation coefficients for crimes and social disorganization correlates in Zapopan (MX), 2010

Variables	Moran's I Global Spatial Autocorrelation Coefficient
Dependent	
Robbery	0.384***
Assault	0.004
Homicides	0.057*
All crimes	0.334***
Independent	
Population aged 15 to 24 (%)	0.285***
Marginality index (factor)	0.448***
Population resident in another state five years earlier (%)	0.305***
Divorced population (%)	0.495***
Population aged 6 to 14 not attending school (%)	0.392***
Unemployed population (%)	0.202***
Female-headed households (%)	0.449***
Average schooling (years)	0.510***
Alcohol outlets (count)	0.064**

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$. N = 455 AGEB.

The maps below present the geography of hotspots and coldspots for robbery, assault, homicide crimes and for the total count of crimes. In red we see the areas (hotspots) with high counts of crimes, whereas in blue we see the areas (coldspots) with low counts of crimes. Areas in yellow do not show statistically significant spatial patterns; this does not mean that there are no crimes occurring in these areas, but that, in relation to neighboring features, there are no particular spatial trends.[22]

Figure 3.6 Spatial clusters of Robbery by AGEB in Zapopan (MX), 2010

Getis-Ord Gi* score
Robbery (2010)

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

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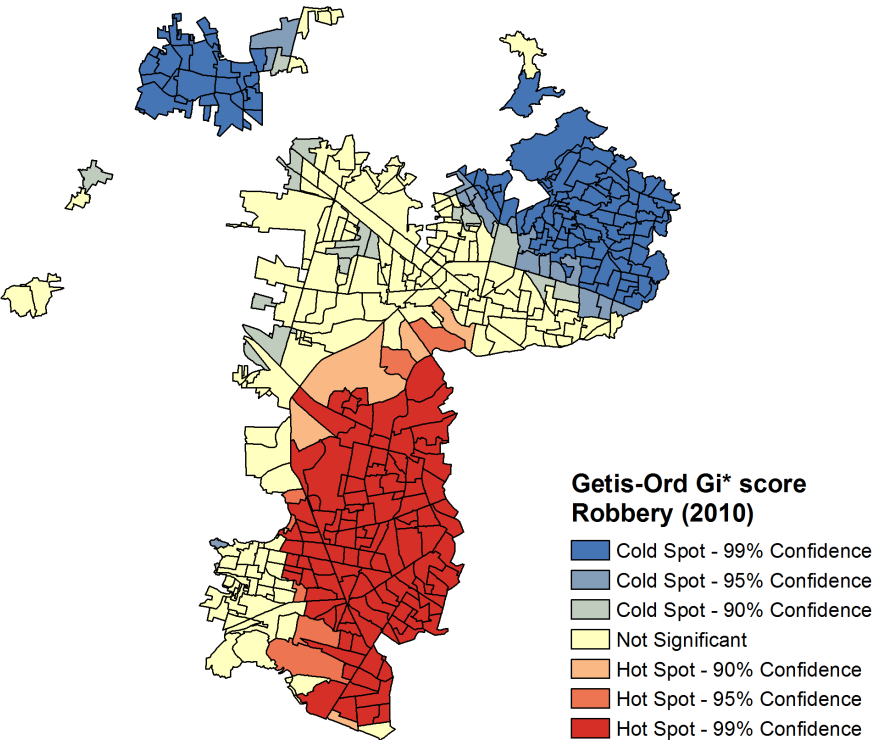
[22] These local effects were calculated using the Getis-Ord Gi* score with an optimizing fixed distance-band for each crime.

Figure 3.7 Spatial clusters of Assault by AGEB in Zapopan (MX), 2010

Getis-Ord Gi* score
Assault (2010)

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence
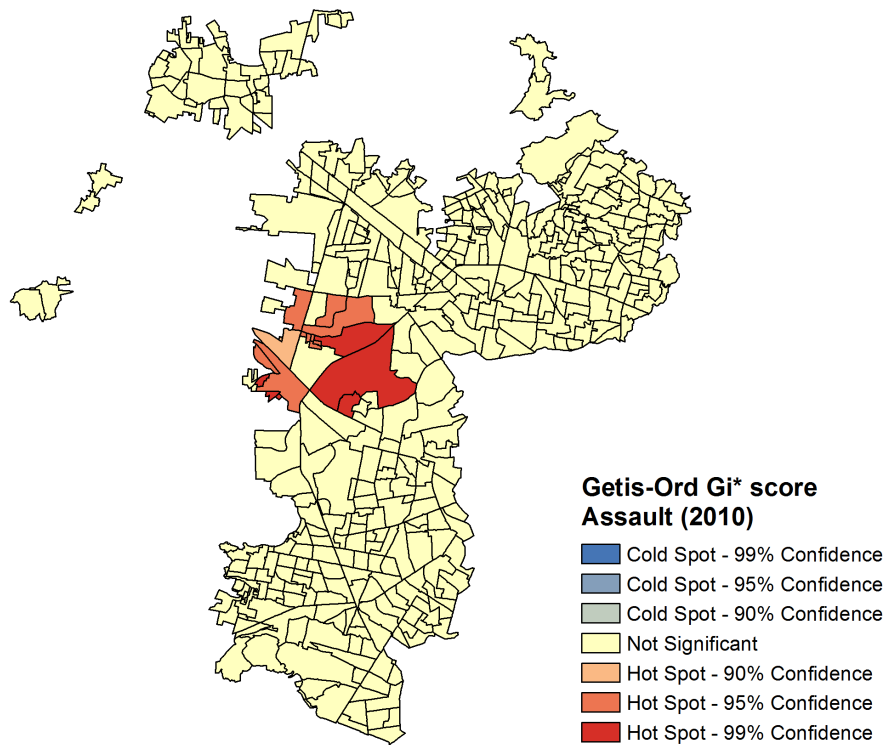
Figure 3.8 Spatial clusters of Homicide by AGEB in Zapopan (MX), 2010

Getis-Ord Gi* score
Homicide (2010)

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence
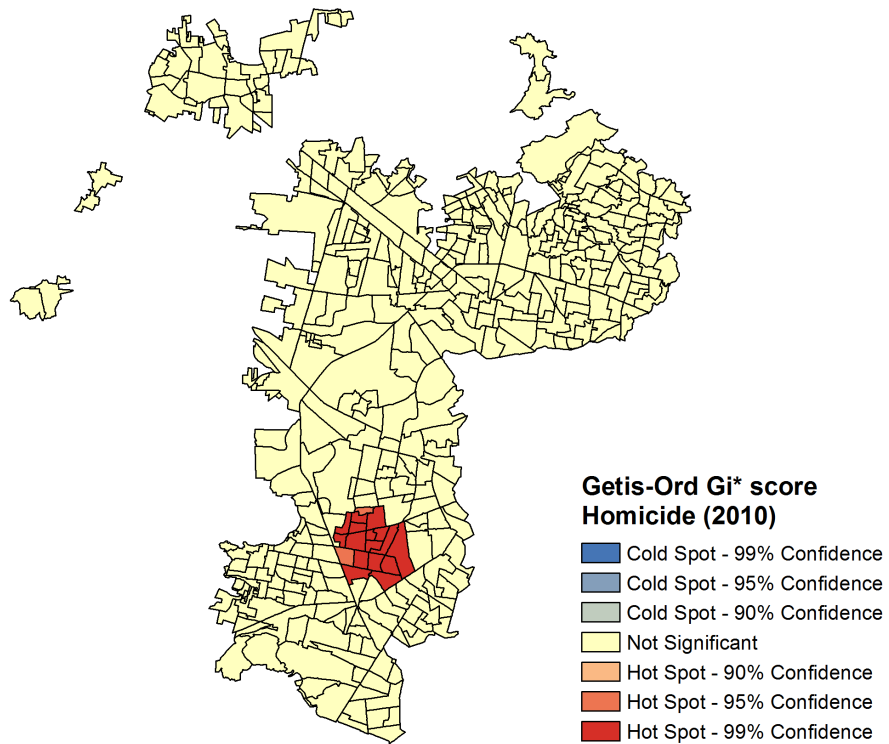
Figure 3.9 Spatial clusters of Crimes by AGEB in Zapopan (MX), 2010

Getis Ord Gi* score
All crimes (2010)

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence
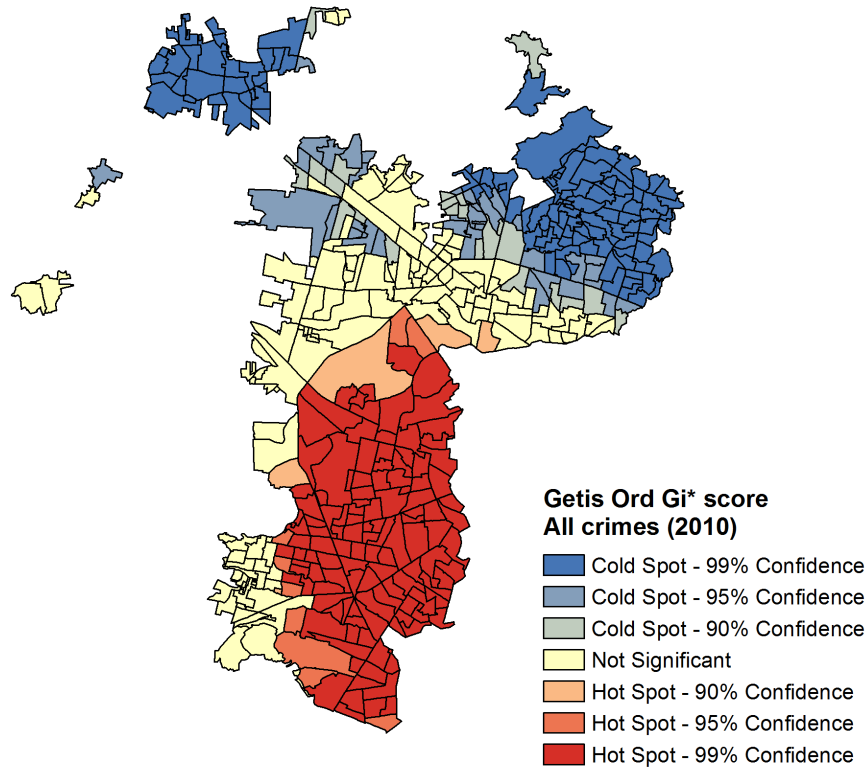
3.3.3. Poisson regression analysis

The regression results estimating the social disorganization model found statistical significance for all crimes. The model for robbery showed three statistically significant correlates. Robberies in 2010 were more frequent in areas characterized by high rates of young people, divorced people, and in areas where schooling was higher as well. Assaults were statistically associated with four social disorganization correlates, namely, young people, marginality, divorced population, and alcohol outlets Homicide crimes were the most difficult to predict, as only two SD correlates reached statistical significance: young people and divorced population. Previous studies in the US have been able to associate homicide crimes (Regoeczi & Jarvis, 2013)[23] and homicides related to domestic violence (Kubrin & Herting, 2003), but in Zapopan it does not seem to have much capacity to predict homicide. However, areas with high numbers of young people have been found to increase the number of homicides in other cities of Latin America (Ceccato, Haining, &

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[23] However, the dependent variable used by these authors was convictions.

Kahn, 2007). Finally, similarly to the case of robbery, the total number of crimes can be predicted by the young people correlate, divorced populations and average schooling. Increases in these variables correspond to increases of crime counts for all crimes.

Table 3.7 Zero-inflated Poisson Regression results for Robbery, Assault, and Homicide in Zapopan (MX), 2010

	Model 1 Robbery	Model 2 Assault	Model 3 Homicide	Model 4 All crimes
Population aged 15 to 24 (%)	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Marginality index (factor)	0.034	0.243**	0.014	0.090
	(0.101)	(0.108)	(0.226)	(0.079)
Population resident in another state five years earlier (%)	0.001	0.016	-0.008	-0.003
	(0.038)	(0.043)	(0.026)	(0.015)
Divorced population (%)	0.123***	0.095*	0.098*	0.115***
	(0.038)	(0.050)	(0.059)	(0.031)
Population aged 6 to 14 not attending school (%)	0.006	-0.011	0.027	0.005
	(0.024)	(0.035)	(0.051)	(0.022)
Unemployed population (%)	-0.017	0.044	-0.029	-0.019
	(0.030)	(0.047)	(0.065)	(0.028)
Female-headed households (%)	-0.015	0.015	0.003	-0.012
	(0.015)	(0.019)	(0.024)	(0.012)
Average schooling (years)	0.236***	-0.041	0.070	0.230***
	(0.070)	(0.065)	(0.071)	(0.036)
Alcohol outlets (count)	0.022	0.042*	0.004	0.025
	(0.021)	(0.023)	(0.064)	(0.016)
(Intercept)	-2.188***	-3.526***	-3.072***	-2.151***
	(0.83.3)	(0.686)	(1.069)	(0.504)
n (nonzero n)	*455 (339)*	*455 (116)*	*455 (81)*	*455 (355)*
AICc	*2389.4*	*598.037*	*531.930*	*2489.170*
Wald Chi-square	*315.38****	*1361.74****	*69.33****	*398.61****

*p < 0.10, **p < 0.05, ***p < 0.01. Robust standard errors in parenthesis.

3.3.4. Geographically Weighted Regression analysis

Geographically Weighted Poisson Regression (GWPR) tests the SD model in every geographical unit, thus providing 455 local intercepts and coefficients in this case. Overall, the GWPR model approach results show a better fit to the Zapopan data as shown by the Akaike criterion statistics.[24] These findings support the use of spatial analysis techniques

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[24] The Akaike criterion (AIC) provides a measure of the balance between simplicity, parsimony and accuracy between different discrete regression models. This criterion helps to choose the best model between a variety

over traditional aspatial techniques for the study of the geography of crime. Table 3.8 shows the averages of the local coefficients of each correlate for every type of crime.

*Table 3.8 Geographically Weighted Poisson regression results for Robbery, Assault, and Homicide in Zapopan (MX), 2010**

	Model 1 Robbery	Model 2 Assault	Model 3 Homicide	Model 4 All crimes
Population aged 15 to 24 (%)	0.025	0.067	0.060	0.025
Marginality index (factor)	-0.052	0.303	-0.099	-0.017
Population resident in another state five years earlier (%)	-0.006	-0.011	-0.012	-0.003
Divorced population (%)	0.065	-0.034	0.055	0.053
Population aged 6 to 14 not attending school (%)	0.040	0.058	0.038	0.043
Unemployed population (%)	0.024	-0.01	-0.023	0.017
Female-headed households (%)	0.018	0.081	0.022	0.023
Average schooling (years)	0.219	-0.053	-0.002	0.171
Alcohol outlets (count)	0.041	0.083	0.006	0.045
(Intercept)	-2.475	-4.520	-3.450	-1.777
Optimum Bandwidth (Neighbors)	*60*	*60*	*166*	*60*
AICc	*1358.293*	*442.663*	*362.267*	*1566.152*

*Average coefficients calculated using Adaptive Gaussian Kernels.

These averages of local coefficients were transformed to its exponential in order to understand the impact, as measured in same units, of each structural factor on each type of crime.[25] Only statistically significant predictors were transformed. Table 3.9 presents the corresponding impact assessment.

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of models. It is derived from the sum of the likelihood function of the model (times -2 which is a measure of the probability of the model) plus the number of variables and the constant of the model. Among various models, the one with the lowest value of this criterion can be considered the mdeo, with the best fit to the data. The Akaike criterion contains a correction for sample size known as the AICc.

[25] Impact coefficients are calculated by $y = e^b$.

Table 3.9 Average impact on the number of crimes in Zapopan (MX), 2010

	Robbery	Assault	Homicide	All crimes
Population aged 15 to 24 (%)	1.03	1.07	1.06	1.03
Marginality index (factor)	n.s.	1.35	n.s.	n.s.
Population resident in another state five years earlier (%)	n.s.	n.s.	n.s.	n.s.
Divorced population (%)	1.07	0.97	1.06	1.05
Population aged 6 to 14 not attending school (%)	n.s.	n.s.	n.s.	n.s.
Unemployed population (%)	n.s.	n.s.	n.s.	n.s.
Female-headed households (%)	n.s.	n.s.	n.s.	n.s.
Average schooling (years)	1.24	n.s.	n.s.	1.19
Alcohol outlets (count)	n.s.	1.09	n.s.	n.s.

n.s.: non-significant effect

Years of schooling has the strongest impact on the number of robberies and on the total number of crimes. In other words, more robberies and more crimes in total are more likely to happen in areas with higher schooling levels. This might make sense since more property crimes may happen in areas of more economic affluence, that is, more and better targets for crime. In this case, for every (1) annual increase on the average of years of schooling, the number of robberies may increase by 1.24 in average throughout all geographic areas (N = 455) of the city. However, the strongest impact of all is the impact that marginality makes on Assaults. One point increase in marginality levels (which vary between 1 and 5, with 5 being the highest level of marginality), will increase the number of assaults by 1.35. It is evident that areas with higher levels of schooling among its residents are more vulnerable to robbery crimes. Likewise, marginality tends to increase interpersonal violence via assaults.

Another important policy finding is that there are areas within the municipality of Zapopan with significantly poorer initial conditions for conducting crime policy changes there. The mapping of the local t values for the intercepts (initial conditions in the model of social disorganization) reveal the areas where we can expect slower policy results if policy actions are to be implemented based on the social disorganization model. According to the following maps, places or neighborhoods where more time and policy efforts will be needed to reverse or decrease the number of crimes events, are those colored in red. Logic is that areas with higher local intercepts (i.e. closer to zero or near positive) tend to have lower slopes, meaning that crime there is less sensitive to changes in their own social disorganization structure. Fortunately, these areas also have lower levels of crime in

general –many but not all are crime coldspots. The other way around, quicker decreases in the level of crime can be expected in those areas around the center of the municipality mostly (colored in yellow) which correspond to a good number of crime hotspots, as we saw in the previous maps. These results call for crime policies based on social disorganization premises.

Figure 3.10 Local t-values for Robbery in Zapopan (MX), 2010

Robbery intercept
Local t-value
- -8.35 - -6.21
- -6.17 - -4.82
- -4.69 - -3.52
- -3.48 - -2.43
- -2.35 - -1.08
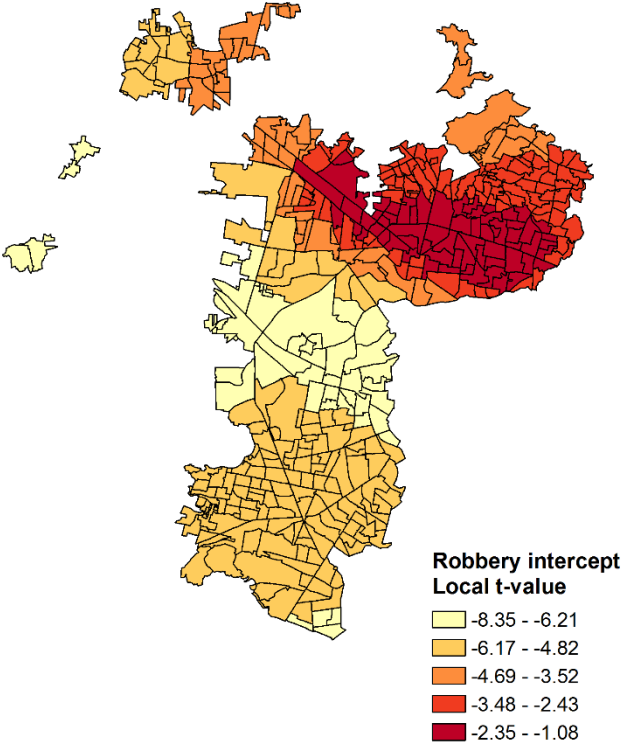
Figure 3.11 Local t-values for Assault in Zapopan (MX), 2010

**Assault intercept
Local t-value**

- -5.48 - -4.10
- -4.02 - -3.09
- -3.05 - -2.26
- -2.24 - -1.70
- -1.70 - -1.27
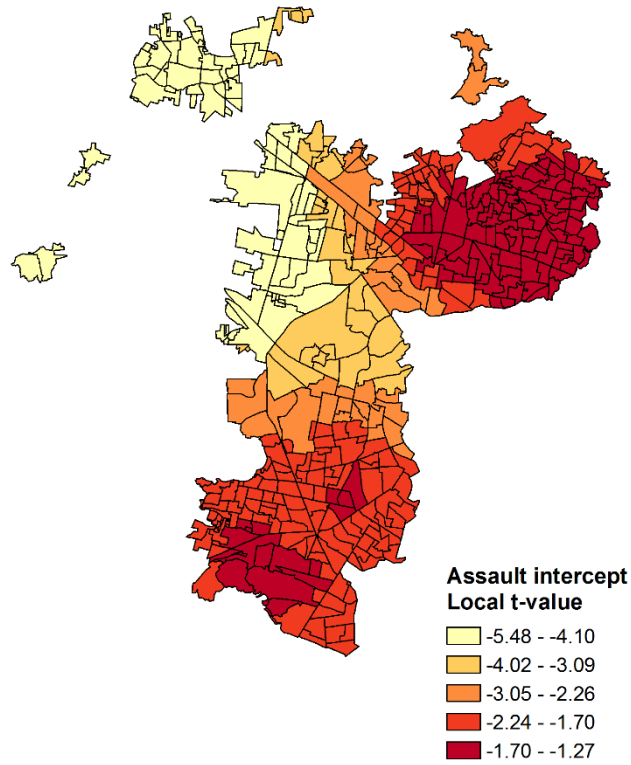
Figure 3.12 Local t-values for Homicide in Zapopan (MX), 2010

**Homicide intercept
Local t-value**

- -3.71 - -3.28
- -3.27 - -2.95
- -2.95 - -2.65
- -2.64 - -2.32
- -2.29 - -1.83
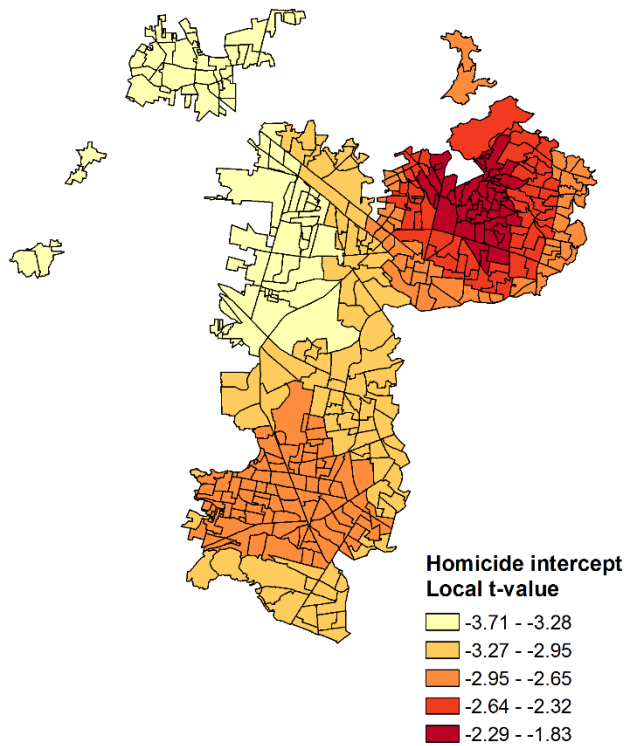
Figure 3.13 Local t-values for All crimes in Zapopan (MX), 2010

**All crimes intercept
Local t-value**
- -7.68 - -5.64
- -5.62 - -4.56
- -4.53 - -3.20
- -3.15 - -1.58
- -1.52 - 0.49
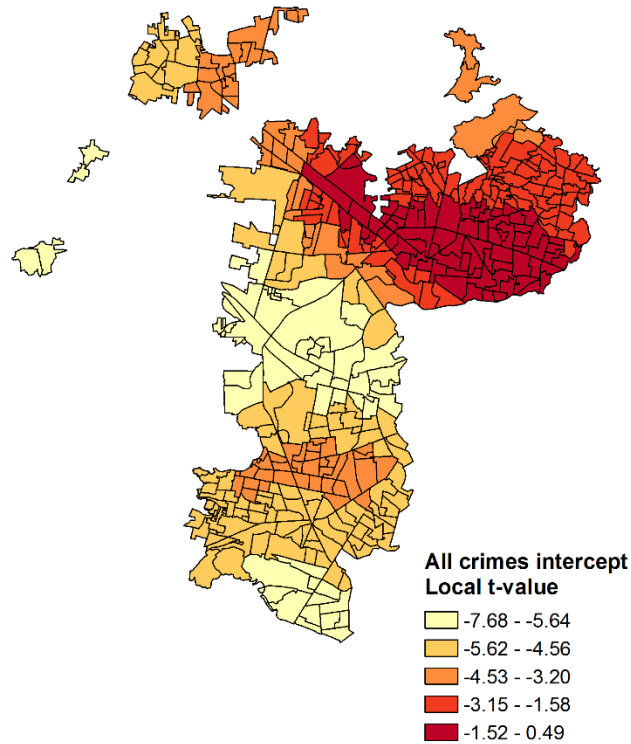
3.4. The Great Metropolitan Area of Costa Rica (GMA)

3.4.1. GMA: Country and city context

The Great Metropolitan Area of Costa Rica (GMA) is located in the Central Region of the country. It is the biggest and most populated area, containing 164 districts and a total population of 2.2 million. According to the National Statistics and Censuses Institute (INEC), GMA involves almost 4% of the national territory and concentrates 53% of the total national population (2011). As such, this area presents the biggest challenges for public policy, particularly for urban development and public safety.

Despite Costa Rica´s lower levels of crime and violence, recent developments point towards a new scenario. First, intentional homicides have been steadily increasing since the 1990s, passing from a rate of 4.8 homicides per 100,000 inhabitants in 1990 to a rate of 8.7 in 2013. Moreover, other crimes have followed the same increasing trend, particularly those against property and other acts leading to harm the person. According to

the national judicial statistics, robbery and theft have been increasing since 1995 and they represent 75% of all reported crimes (INEC & PNUD, 2015).

Costa Rica's household victimization surveys confirm this upward crime trend. The Central Region consistently has the highest household victimization rate in the country—and increasing. Such rates are driven by robbery crimes in public locations: 9.5% versus the national rate of 7.5%.In sum, it is estimated that the Central Region comprises 70.7% of all victimization events captured by the national victimization survey.

In addition, recent accounts on crime and violence have been associated to drug trafficking disputes. Organized crime tends to fight for the control of routes and the territory. In fact, reports by UNODC and the Office of Judicial Investigations, depict Costa Rica as an key country for drug transportation and storage. Data from the Plan and Operations Office (OPO) have established 80 homicides all related to drug trafficking. Furthermore, San Jose de Costa Rica is considered the most important area in the country for the selling of cocaine It must be said that most crimes are committed by local gangs and other delinquent groups (OIJ & UNODC, 2013).

This case study explores the spatial patterns of homicide and robbery crimes occurred during 2011 in the GMA. The crime data source was the Judicial Investigation Authority (OIJ). The GMA is divided into four main regions with 164 geographical units in total called districts. The source of demographic and socioeconomic data was the National Statistics and Censuses Institute of Costa Rica.

3.4.2. Descriptive statistics and mapping

In average, there were 1.4 homicides per district, with a standard deviation of 2.3 in 2011. This is notably lower than in Zapopan. However, GMA districts also varied considerably in terms of homicide counts; while some districts reported zero homicides, others registered up to 15 in the same year (see Table 3.10). On the other hand, many more robberies are reported to the authorities in the GMA than in Zapopan. Likewise, the socioeconomic composition of the GMA population is a bit different. Divorced population and internal migration –as measured by the proportion of the population that lived in another canton (region) in the last five years –are higher in the GMA. But the GMA and Zapopan share about the same proportion of unemployed population (see Table 3.10).[26]

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[26] Nonetheless, these comparisons have their limitations because Zapopan is only part of the whole Metropolitan area of Guadalajara; while GMA comprehends more than one locality.

Table 3.10 Descriptive statistics for crimes and SD correlates in the Great Metropolitan Area (CR), 2011

Variable	Mean	Standard deviation	Min	Max
Dependent				
Homicide (count)	1.4	2.3	0	15
Robbery (count)	57.5	88.7	0	524
Independent				
Male population aged 15 to 29 (%)	13.7%	1.1%	10.4%	16.6%
Residents that lived in another canton in 2006 (%)	11.8%	4.4%	2.7%	27.7%
Divorced or separated population (%)	10.7%	2.5%	5.3%	22.7%
Unemployed population (%)	3.1%	0.9%	0.5%	6.4%
Single-parent households (%)	23.6%	5.4%	12.6%	39.1%
Average schooling (years)	9.4	1.6	6.3	13.7
Social development Index (0 to 100)	72.5	9.5	51.4	100

N = 164 districts.

The maps below show the geography of homicide and robbery counts in the GMA. It can be observed that most crimes occurred in the districts located around the geographic and historical center of the GMA.

Figure 3.14 Homicide count by district in the Great Metropolitan Area (CR), 2011
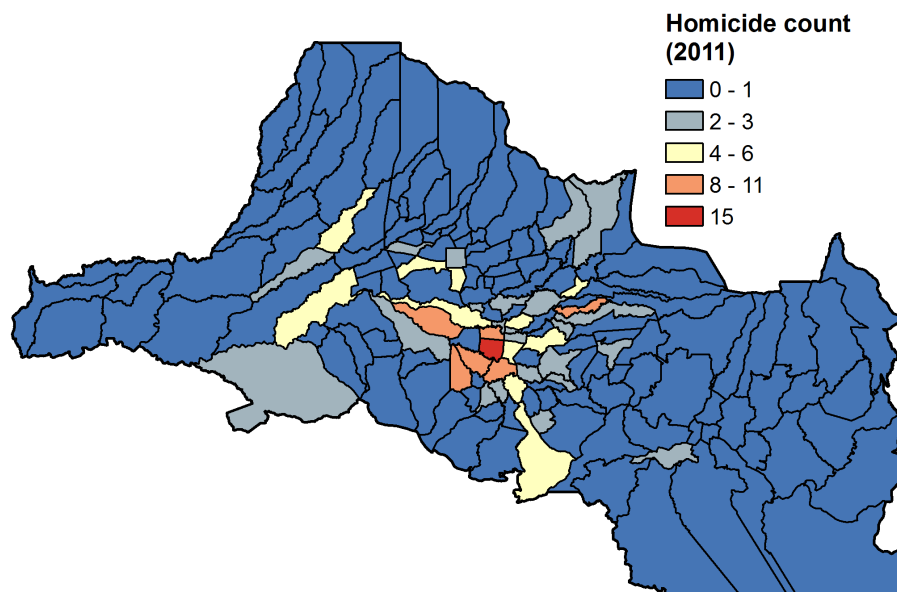
Figure 3.15 Robbery count by district in the Great Metropolitan Area (CR), 2011
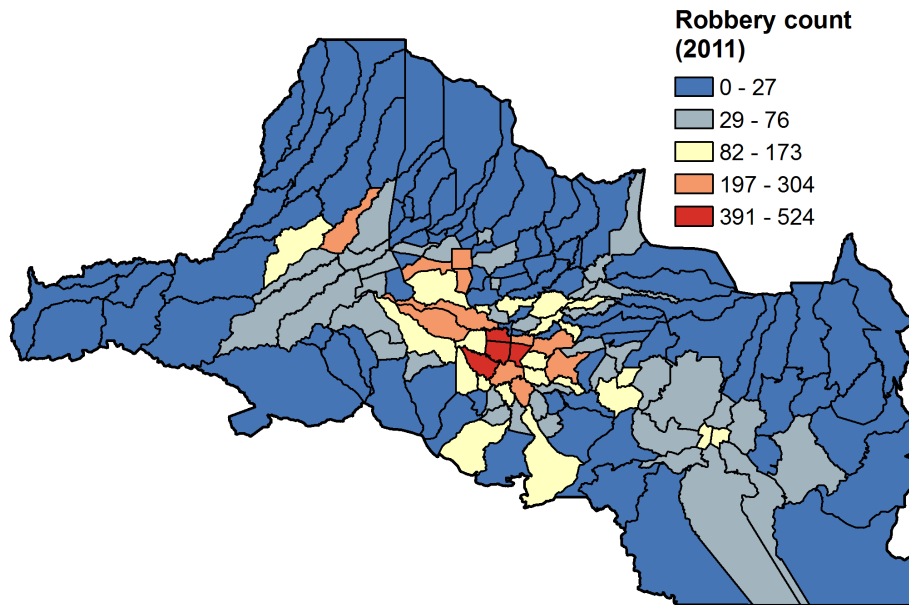
Table 3.11 shows the results of the spatial autocorrelation tests for all variables. Both crime and structural correlates were spatially clustered within the GMA. Single parent households and the divorced or separated population show the highest levels of spatial concentration. Next, the population with similar years of schooling also tends to live in neighboring districts. In terms of crime, both robbery and homicide exhibit strong spatial concentration patterns, particularly robbery crimes. In fact, both crimes tend to cluster in the same districts (see Figures 3.15 and 3.16). Hotspots are almost the same for both crimes.

Table 3.11 Spatial autocorrelation coefficients for crimes and social disorganization correlates in the Great Metropolitan Area (CR), 2011

Variable	Moran's I Global Spatial Autocorrelation Coefficient
Dependent	
Homicide (count)	0.265***
Robbery (count)	0.524***
Independent	
Population aged 15 to 29 (%)	0.149***
Residents that lived in another canton in 2006 (%)	0.463***
Divorced or separated population (%)	0.560***
Unemployed population (%)	0.303***
Single-parent households (%)	0.630***
Average schooling (years)	0.494***
Social development Index (0 to 100)	0.380***

N = 164 districts. *p<0.10, **p<0.05, ***p<0.01.

Figure 3.16 Local clusters of Homicide by district in the Great Metropolitan Area (CR), 2011
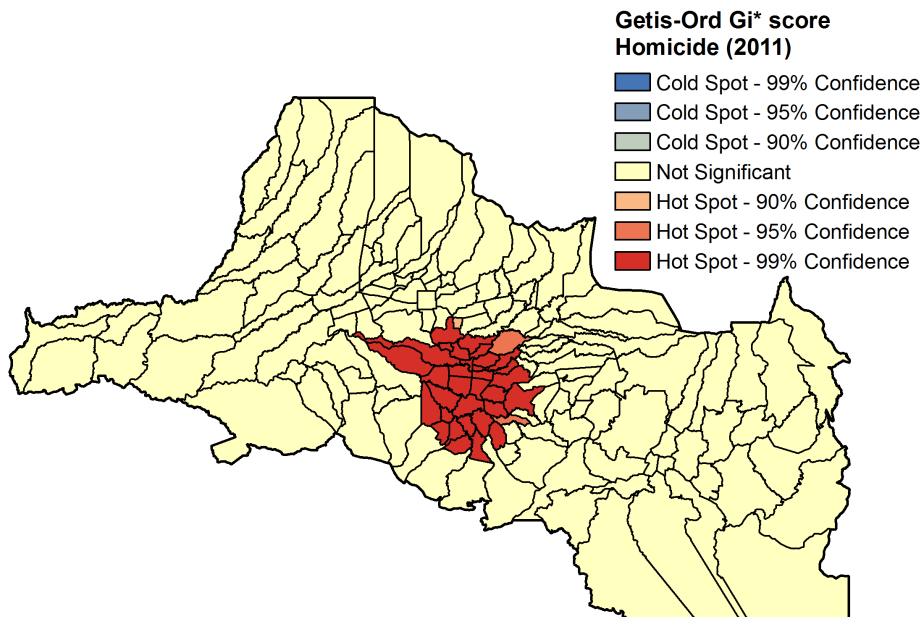
Figure 3.17 Local clusters of Robbery by district in the Great Metropolitan Area (CR), 2011
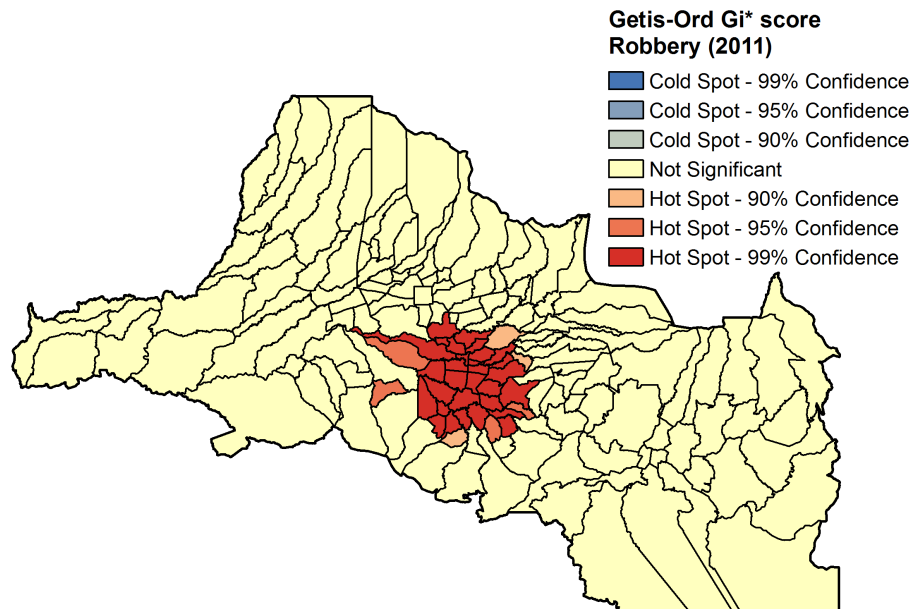
3.4.3. Poisson Regression analysis

The 2011 GMA geography of crime can be modeled using social disorganization correlates (see Table 3.12). Districts with higher levels of unemployment presented significantly higher counts of homicide crimes. On the other hand, districts with higher levels of unemployment, single-parent households, and more schooling presented higher counts of robbery crimes. More schooling is associated with upper incomes, meaning more targets for property crimes. Single parenthood is associated with lower levels of supervision of minors, whereas unemployment is associated with economic hardship.

Table 3.12 Zero-inflated Poisson Regression results for Homicide and Robbery in the Great Metropolitan Area (CR), 2011

	Model 1 Homicide	Model 2 Robbery
Male population aged 15 to 29 (%)	-0.060	0.005
	(0.194)	(0.096)
Residents that lived in another canton in 2006 (%)	0.004	-0.047*
	(0.050)	(0.026)
Divorced or separated population (%)	-0.054	0.016
	(0.179)	(0.082)
Unemployed population (%)	0.560***	0.448***
	(0.206)	(0.113)
Single-parent households (%)	0.116	0.125***
	(0.099)	(0.046)
Average schooling (years)	-0.006	0.323**
	(0.223)	(0.153)
Social development Index (0 to 100)	0.005	-0.028
	(0.026)	(0.019)
(Intercept)	-3.318	-1.475
	(3.733)	(1.992)
n (nonzero n)	164 (89)	164 (4)
AICc	526.96	6620.11
Wald Chi-square	82.6***	271.49

*p<0.10, **p<0.05, ***p<0.01. Robust standard errors in parenthesis.

On the contrary, districts with more recent migrants had lower counts of robbery crimes as a pattern. It seems that migrant populations were a protective factor against violent property crimes. However, it must noted that unemployment was a predictor for both types of crimes. Clearly unemployment it is a crime risk factor in the GMA, even though recorded levels of unemployment is the same as in Zapopan and much lower than the case of Santiago de Chile.

3.4.4. Geographically Weighted Regression analysis

Once again, the GWPR modeling approach offers a better fit for both homicide and robbery data as indicated by the lower Akaike criterion (AICc) values. Table 3.13 below shows local coefficient averages for all districts within the GMA. Some average coefficients vary in sign from those of the previous aspatial model approach. These coefficients result from the average of all local coefficients (N = 164). In other words, this average is the mean geographic effect of all districts in the GMA.

Table 3.13 Geographically Weighted Poisson Regression results for Homicide and Robbery in the Great Metropolitan Area (CR), 2011*

	Model 1 Homicide	Model 2 Robbery
Population aged 15 to 29 (%)	0.008	0.059
Residents that lived in another canton in 2006 (%)	-0.003	-0.062
Divorced or separated population (%)	-0.024	0.042
Unemployed population (%)	0.508	0.398
Single-parent households (%)	0.123	0.110
Average schooling (years)	-0.082	0.318
Social development Index (0 to 100)	-0.002	-0.031
(Constant)	-3.346	-1.534
Optimum Bandwidth (Neighbors)	*56*	*56*
AICc	*289.5*	*5291.3*

*Average coefficients calculated with Adaptive Gaussian Kernels

Local coefficient averages were transformed to incidence rate ratios so that the impact of significant correlates could be better explained. Table 3.14 shows such transformations. Accordingly, the only, yet the strongest risk factor overall, associated with homicide were the local unemployment levels. An increase of one unit in the percent of unemployed population increases the count of homicides by 1.66. This is the strongest effect found in all three intra-urban case studies. For the case of robbery, the strongest risk factor was the unemployed population as well. The geography of crime in this metropolitan area is clearly a geography of unemployment and economic hardship.

Table 3.14 Average impact on the number of Homicide and Robbery in the Great Metropolitan Area (CR), 2011

	Homicide	Robbery
Population aged 15 to 29 (%)	n.s	n.s.
Residents that lived in another canton in 2006 (%)	n.s	0.94
Divorced or separated population (%)	n.s	n.s.
Unemployed population (%)	1.66	1.49
Single-parent households (%)	n.s	1.12
Average schooling (years)	n.s	1.37
Social development Index (0 to 100)	n.s	n.s

n.s.: non-significant

In addition, increases in schooling bring robbery counts up as well. In this case, an increase of 1-year average of schooling increases robbery counts by 1.37. Similarly, one point increase in the percent of single-parent households drives robbery crimes up by 1.12. On the other hand, increases in migrant populations will decrease robbery counts by a 6% (0.94 - 1 = -0.06)

As expected, in GMA there are also districts with poorer initial conditions than others for policy action. According to Figure 3.17 and 3.18, there are places that are, in principle, more prone to homicides and robberies. These places are shown in the map by an intensifying red.

Figure 3.18 Local t-values for Homicide in the Great Metropolitan Area (CR), 2011
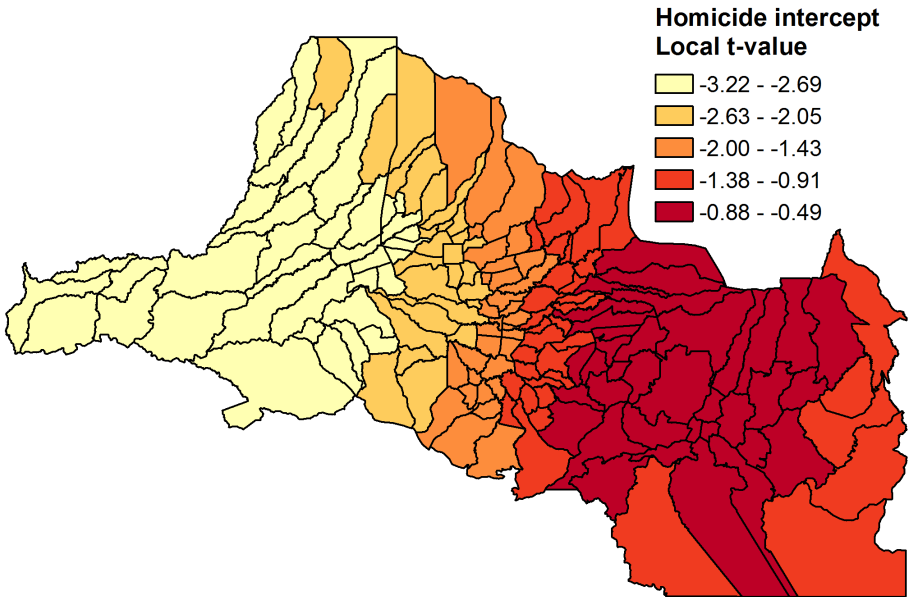
Figure 3.19 Local t-values for Robbery in the Great Metropolitan Area (CR), 2011
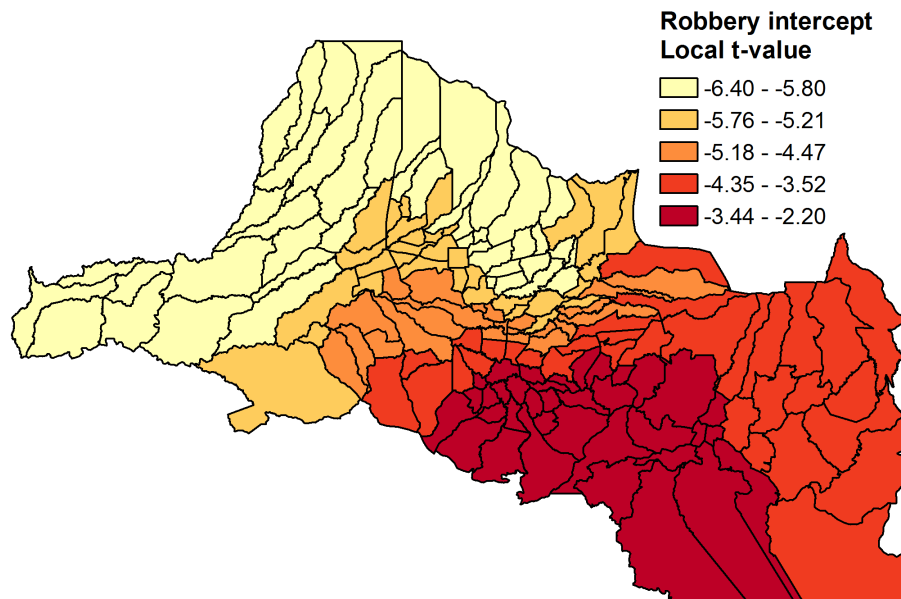
3.5. Santiago de Chile (Chile)

3.5.1. Santiago: Country and city context

Santiago de Chile is the capital city of Chile and it is part of the Metropolitan Region of the country. According to population estimates from the National Statistics Institute of Chile (INE), this region comprises almost 40% of the overall population in the country with 7.3 million inhabitants in 2015. Alone, the province of Santiago has approximately 5.2 million inhabitants, making it the largest human settlement throughout the country.

Despite being in the world's most violent region, Chile has comparatively lower homicide rates, with only 3.1 homicides per 100,000 inhabitants, which is way below the region´s average. Even more, Chile is the only Latin American country whose homicide rate has never been above 5 per 100,000 inhabitants. This makes this country comparable to other European countries. Moreover, the prevalence of homicides committed with firearms is also lower, with 27% of all homicides (UNODC, 2014).

Nonetheless, national authorities recognize high levels of property crimes and fear of crime or insecurity. They also point out an increasing trend in crimes related to drugs, incivilities and sexual abuse (Ministerio del Interior y Seguridad Pública, 2014, p. 19). For example, according to the Citizen Security Survey (ENUSC), insecurity against crime is considered the third most important problem in the nation. Furthermore, ENUSC estimated

that practically 4 out every 10 people in Chile live in fear of becoming a victim of crime. Similarly, 80% of the surveyed population thinks that crime has increased in comparison to the previous year. Notably, fear of crime differs from actual crime prevalence estimates (INE, 2014), that is, there is more fear of crime than crime.

While in 2013 the national crime prevalence was 24.8% for all urban households, for the Metropolitan Region it was 28.3%. Both national and regional victimization rates have undergone through a downfall of 42% and 34% respectively since 2003. Whilst low household victimization rates, individual victimization tells a different story. For example, at the national level, 39.5% of the surveyed population declared to have been a victim of robbery; this figure was 33.4% for the Metropolitan Region. In general, household and personal victimization rates are higher at the national level than for the Metropolitan Region. In contrast to the last two case studies, 40% of all victimized households in Chile reported a crime; this represents a comparatively lower dark figure (INE, 2014). In sum, Chile and its Metropolitan Region have low rates of crimes against persons but high rates of crimes against property. Most property crimes refer to thefts and attempted robberies on the streets and residential premises. Despite violent crimes are relatively lower than property crimes, governmental and civil society organizations remark persistent patterns among these crimes (Fundación Paz Ciudadana, 2015, p. 12; Ministerio del Interior y Seguridad Pública, 2014, p. 12). Thus, it is worth studying whether social disorganization indicators can account for such patterns.

This case study examines the spatial patterns of robberies, assaults and homicides occurred in 2012 in urban districts of Santiago de Chile under the light of social disorganization theory. Districts are a subdivision of Comunas, which are the closest level of government to the people in Chile. Districts are also utilized for census purposes and they are divided into three different types: urban, rural or mixed. The study includes the 316 urban districts that conform the entire city of Santiago de Chile. The Ministry of Interior and Public Safety provided the crime data per crime type. The local Police or "Carabineros" systematically records this information. Sociodemographic data is from the 2012 Population Census, which was carried out by INE.[27]

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[27] Due to technical adjustments, the 2012 Population Census cannot be considered as official statistical information.

3.5.2. Descriptive statistics and mapping

In terms of crime incidence and sociodemographic composition, Santiago de Chile is somewhat different to the previous case studies of Zapopan (MX) and the GMA in Costa Rica (CR). For example, the counts of reported robberies and assaults in Santiago are notably higher than those observed in Zapopan. While in Zapopan the average of reported robberies for the AGEBS is 4 per AGEB, in Santiago the mean for Districts is 286, that is, 71 times higher, in comparable geographic units. This difference may be due to the very level of crime underreporting in Mexico (i.e. 92% at the national level). On the contrary, homicide counts are not that different from the previous cities.

With regard to the demographic and socioeconomic composition, Santiago is also somewhat different from previous case studies. For instance, there are much higher levels of immigration and recorded unemployment. Likewise, there are higher proportions of female-headed households and teenagers not attending school, although these differences are not that acute.

Table 3.15 Descriptive statistics for crimes and social disorganization correlates in Santiago (Chile), 2012

	Mean	Standard deviation	Min	Max
Dependent variables				
Robbery (count)	286	223	9	1,659
Assault (count)	7	7	0	81
Homicide (count)	0.2	0.4	0	2
All crimes (count)	293	224	9	1,674
Independent variables				
Male population aged 15 to 29 (%)	12.6%	2.3%	6.8%	41.8%
Population resident in another Canton in 2007 (%)	16.5%	10.4%	4.4%	70.3%
Divorced population (%)	8.9%	1.8%	4.4%	13.3%
Population aged 6 to 14 not attending school (%)[a]	7.8%	12.2%	0.1%	89.3%
Unemployed population (%)	7.1%	2.0%	1.8%	16.5%
Female-headed households (%)	29.1%	4.3%	8.0%	43.3%
Population with some college education (%)	20.3%	17.8%	1.3%	71.8%

Number of districts: 316
a. For this variable there are 4 missing values thus the n = 312

The maps below show the geography of the four types of crimes under study. Maps show that each type of crime possesses its own spatial pattern, which is a feature that was not present in the cases of the GMA and Zapopan. In those cases, there were some spatial matches between different types of crimes.

Figure 3.20 Robbery count by district in Santiago (Chile), 2012
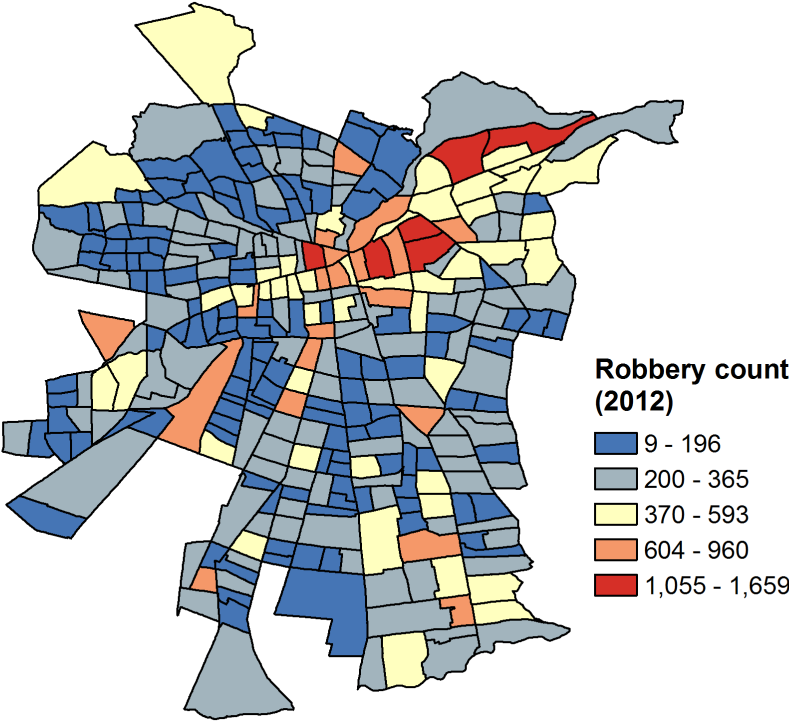
Figure 3.21 Assault count by district in Santiago (Chile), 2012

Assault count
(2012)

- 0 - 4
- 5 - 10
- 11 - 17
- 19 - 29
- 81
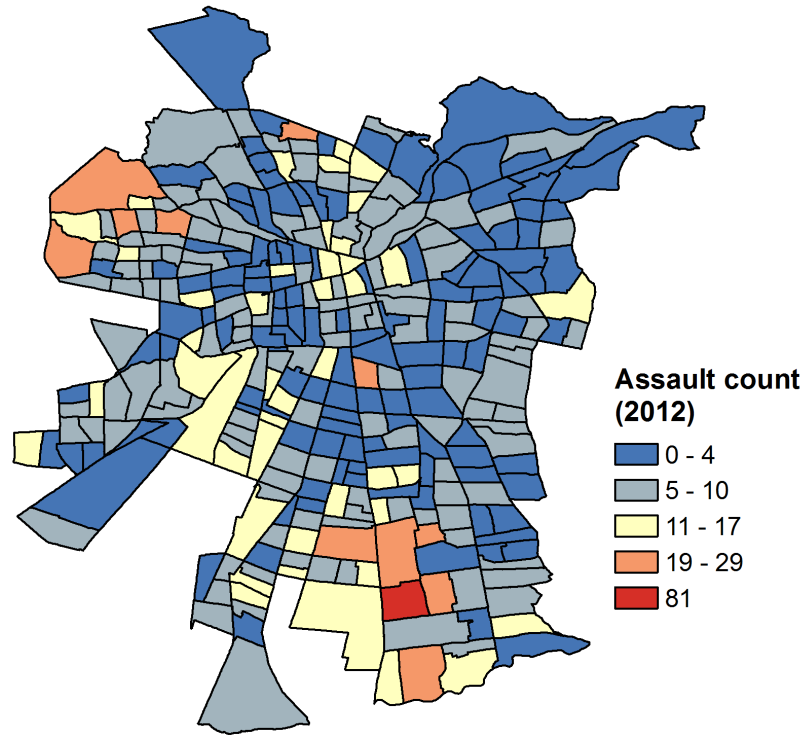
Figure 3.22 Homicide count by district in Santiago (Chile), 2012

Homicides count
(2012)

- 0
- 1
- 2
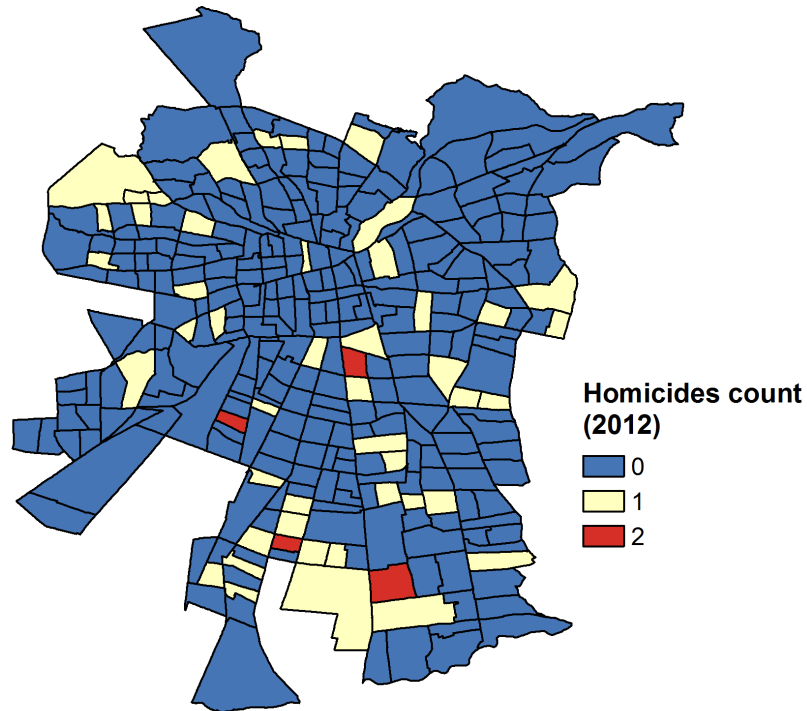
Figure 3.23 Crime count by district in Santiago (Chile), 2012

All crimes count (2012)
- 9 - 204
- 207 - 372
- 387 - 601
- 617 - 962
- 1,059 - 1,674
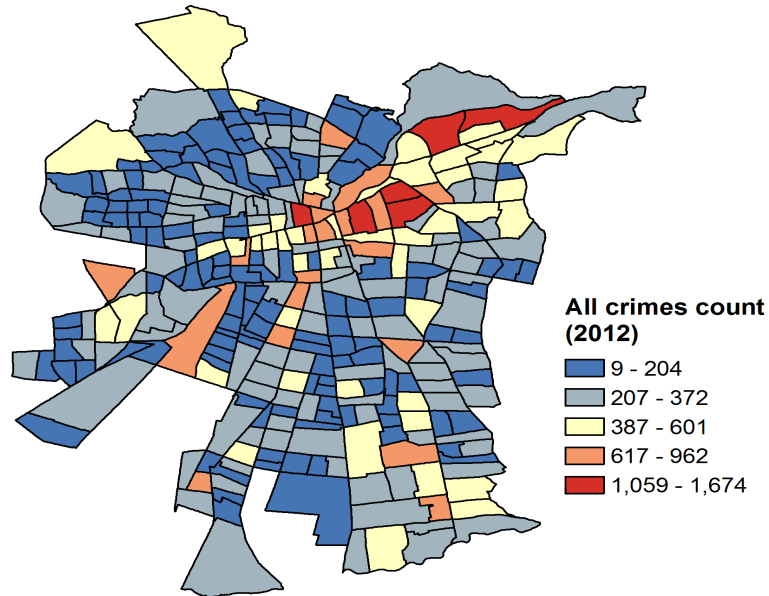
Setting aside previous differences, crime counts and social disorganization structural correlates exhibit significant spatial clustering. Among crimes, robbery was the most spatially clustered crime in 2012, followed by the sum of all crimes, assaults and homicides in that order. Amid structural correlates, it was the population with some college education the one with the highest level of spatial clustering meaning that this population tended to live very close to each other.

Table 3.16 Spatial autocorrelation coefficients for crimes and social disorganization correlates in Santiago (CL), 2012

	Moran's I Spatial autocorrelation coefficient
Robbery	0.381***
Assault	0.197***
Homicide	0.073**
All crimes	0.375***
Male population aged 15 to 29 (%)	0.233***
Population resident in another Canton in 2007 (%)	0.592***
Divorced population (%)	0.497***
Population aged 6 to 14 not attending school (%)[a]	0.101***
Unemployed population (%)	0.534***
Female-headed households (%)	0.511***
Population with some college education (%)	0.812***

Number of districts: 316, *p < 0.10, **p < 0.05, ***p < 0.001
a. For this variable there are 4 missing values thus the n = 312

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The maps below show the hotspots and coldspots of crime. They suggest that each type of crime seems to have its own high-risk and low-risk areas. There is a spatial match of hotspots in the north side of Santiago between robberies and the total number of crimes, as many crimes are robberies in fact. However, both assaults and homicide hotspots were located in the south side of the city, sharing a few districts. What all this means is that the probabilities of crime victimization significantly varies across the city districts and by type of crime.

Figure 3.24 Local clusters of Robbery by district in Santiago (Chile), 2012
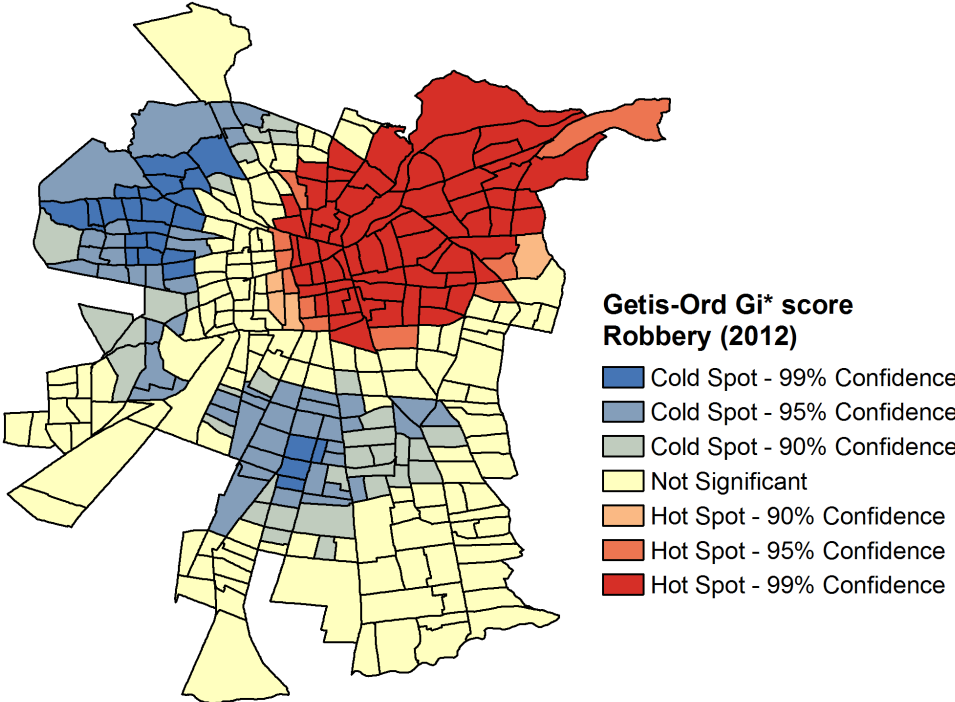
Figure 3.25 Local clusters of Assault by district in Santiago (Chile), 2012
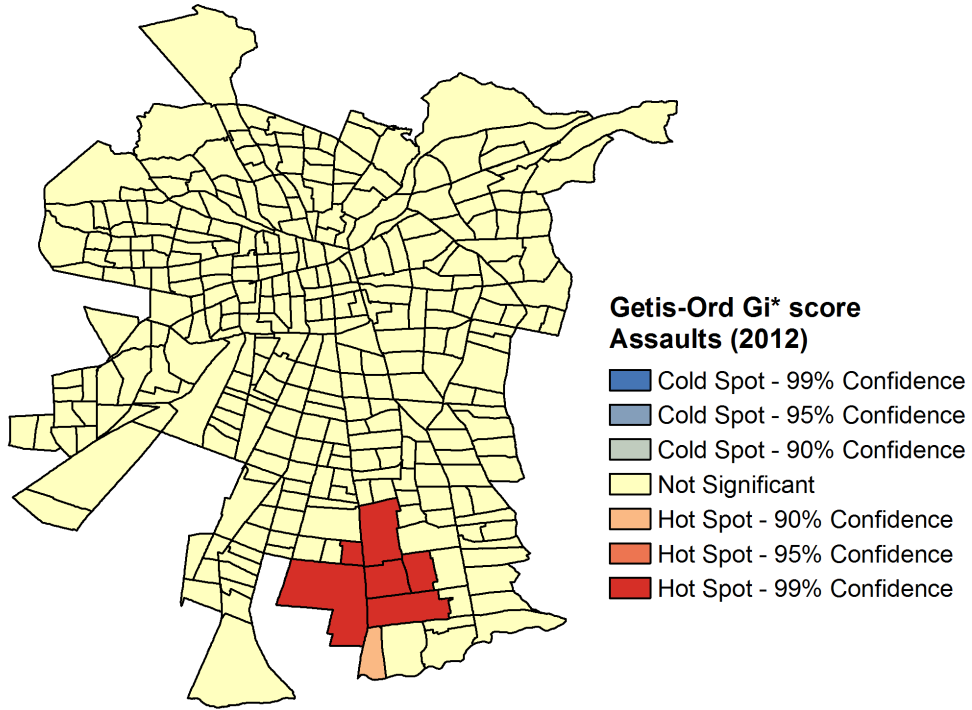
Figure 3.26 Local clusters of Homicide by district in Santiago (Chile), 2012
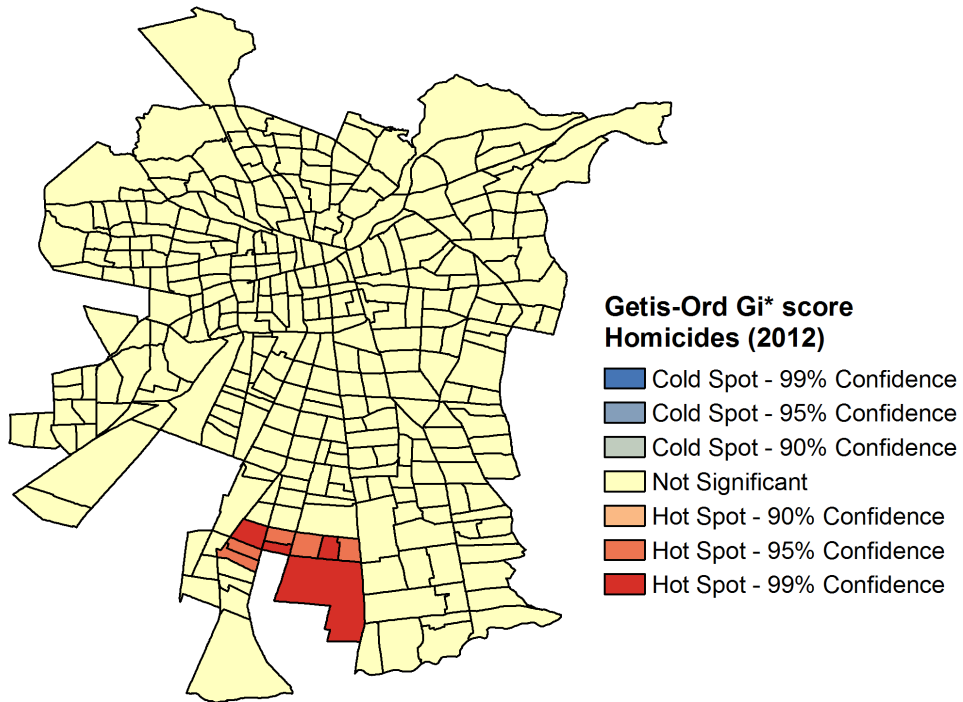
Figure 3.27 Local clusters of All crimes by district in Santiago (Chile), 2012

Getis-Ord Gi* score
All Crimes (2012)
- ■ Cold Spot - 99% Confidence
- ■ Cold Spot - 95% Confidence
- ■ Cold Spot - 90% Confidence
- ■ Not Significant
- ■ Hot Spot - 90% Confidence
- ■ Hot Spot - 95% Confidence
- ■ Hot Spot - 99% Confidence
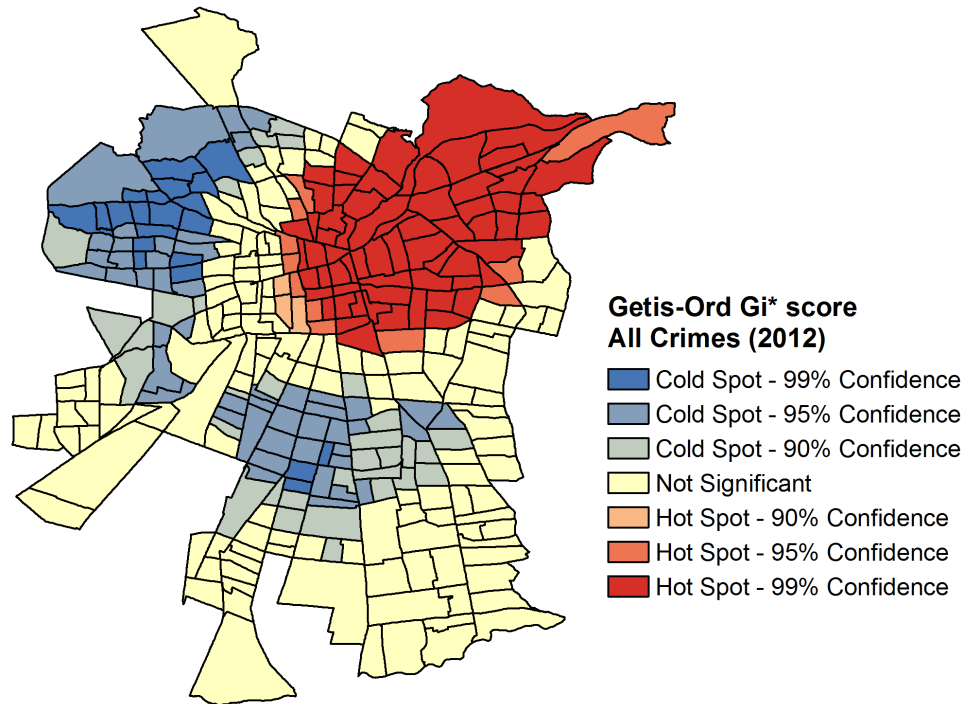
3.5.3. Poisson Regression analysis

Similarly to previous cities, social disorganization correlates fit the data well, particularly for the case of assault crimes (see Table 3.17). The SD model for homicide crimes, as in the previous cases, did not seem to have the same predictive capacity.

Among the findings, some are counterintuitive. First, there is the finding of a negative association between young male populations and assaults. This finding is contrary to the one in Zapopan and to what is theoretically expected. Holding other structural variables constant, districts in Santiago with higher proportions of young male populations recorded significantly lower counts of assaults. The young male population correlate was statistically significant only in the case of assault crimes.[28] Likewise, higher proportions of divorced populations led to lower counts in most crimes in Santiago (except robbery), but to higher counts in all crimes in Zapopan (with no exception). Yet one coincidence among all cities is that areas with higher levels of schooling tended to suffer from more crimes, particularly robbery. Santiago was no exception to this.

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[28]In fact, there is a positive bivariate correlation between assault crimes and young male populations, so this finding might be the product of a mediation effect of another correlate present in the model.

Table 3.17 Zero-inflated Poisson Regression results for Robbery, Assault, and Homicide in Santiago (Chile), 2012

	Model 1 Robbery	Model 2 Assault	Model 3 Homicide	Model 4 All crimes
Male population aged 15 to 29 (%)	-0.023	-0.066**	-0.118	-0.024
	(0.025)	(0.029)	(0.109)	(0.024)
Population resident in another Canton in 2007 (%)	0.010	0.005	-0.032	0.009
	(0.007)	(0.010)	(0.030)	(0.006)
Divorced population (%)	-0.048	-0.209***	-0.268**	-0.053*
	(0.029)	(0.046)	(0.109)	(0.029)
Population aged 6 to 14 not attending school (%)	0.007***	0.005**	-0.012	0.007***
	(0.002)	(0.002)	(0.010)	(0.002)
Unemployed population (%)	-0.053	0.061	0.189	-0.048
	(0.034)	(0.039)	(0.146)	(0.033)
Female-headed households (%)	0.012	0.065***	0.064	0.013
	(0.012)	(0.019)	(0.039)	(0.011)
Population with some college education (%)	0.013***	-0.012**	-0.003	0.012***
	(0.003)	(0.005)	(0.020)	(0.003)
(Intercept)	5.808***	2.349***	-0.591	5.838***
	(0.427)	(0.541)	(1.859)	(0.420)
*n (nonzero n)**	312 (312)	312 (294)	312 (50)	312 (312)
AICc	27,340.399	2,127.845	297.607	27,451.493
Wald Chi-square	176.02***	59.23***	17.72**	169.03***

*$p < 0.10$, **$p < 0.005$, ***$p < 0.01$. Robust standard errors in parenthesis
a. There are 4 missing values in one variable thus the n = 312

3.5.4. Geographically Weighted Poisson Regression analysis

As in previous cases, GWR allows to obtain the average impact of each correlative in crime as a function of distance between spatial units (districts). One assumption of GWR modelling is that relationships between variables are spatially variable (spatial heterogeneity) meaning that policy effects cannot be the same in all places. Table 3.18 presents the results for the GWPR in Santiago de Chile. As the AICc statistics shows, this modelling approach provides a better for the data.

Table 3.18 Geographically Weighted Poisson Regression results for Robbery, Assault, and Homicide in Santiago (Chile), 2012

	Model 1 Robbery	Model 2 Assault	Model 3 Homicide	Model 4 All crimes
Male population aged 15 to 29 (%)	-0.017	-0.054	-0.145	-0.019
Population resident in another Canton in 2007 (%)	0.006	-0.004	-0.029	0.006
Divorced population (%)	-0.050	-0.220	-0.253	-0.055
Population aged 6 to 14 not attending school (%)	-0.008	0.006	-0.007	0.008
Unemployed population (%)	-0.073	0.054	-0.212	-0.068
Female-headed households (%)	0.008	0.063	0.047	0.009
Population with some college education (%)	0.015	-0.007	0.003	0.015
(Intercept)	5.996	2.408	-0.300	6.023
Optimum Bandwidth (Neighbors)	*56*	*56*	*178*	*56*
AICc	*25,401.125*	*955.085*	*197.620*	*23,234.786*

*Average coefficients calculated using Adaptive Gaussian Kernels.

To better understand the impact of each social disorganization correlate on crime, Table 3.19 shows the incidence rate ratios. These were calculated based on the GWR mean estimates. For instance, a one percent increase in the proportion of divorced population may decrease robbery crimes by 0.80 (or 20%), of homicides by 0.78, and all crimes by 0.95. These effects can be considered somewhat strong. It seems that areas with divorced populations in Santiago serve as a protective factors against these crimes (but not for robbery). Likewise, an increase of one percent in the proportion of female-headed households may increase robbery crimes by 1.06 (o 6% increase in the number of counts).

Table 3.19 Average impact on the number of Robberies, Assaults and Homicides in Santiago (Chile), 2012*

	Robbery	Assaults	Homicides	All crimes
Male population aged 15 to 29 (%)	n.s.	0.95	n.s.	n.s.
Population resident in another Canton in 2007 (%)	n.s.	n.s.	n.s.	n.s.
Divorced population (%)	n.s.	0.80	0.78	0.95
Population aged 6 to 14 not attending school (%)	0.99	1.01	n.s.	1.01
Unemployed population (%)	n.s.	n.s.	n.s.	n.s.
Female-headed households (%)	n.s.	1.06	n.s.	n.s.
Population with some college education (%)	1.02	0.99	n.s.	1.02

n.s.: non-significant effect

However, these are mean geographical effects. Effects will vary among districts. In other words, each social disorganization correlate impacts differently according to location. That is, there are places (districts) within Santiago where changes in these structural conditions will exhibit stronger or lesser effects. To see this geographical variance, figures 3.27 to 3.30 show the likely impact of changes in social disorganization levels for each type of crime at the baseline level or initial conditions for change.

Figure 3.28 Local t-values for Robbery in Santiago (CL), 2012

**Robbery intercept
Local t-value**

- 88.6 - 98.5
- 98.7 - 106.7
- 106.9 - 115.5
- 115.8 - 124.7
- 124.9 - 136.5
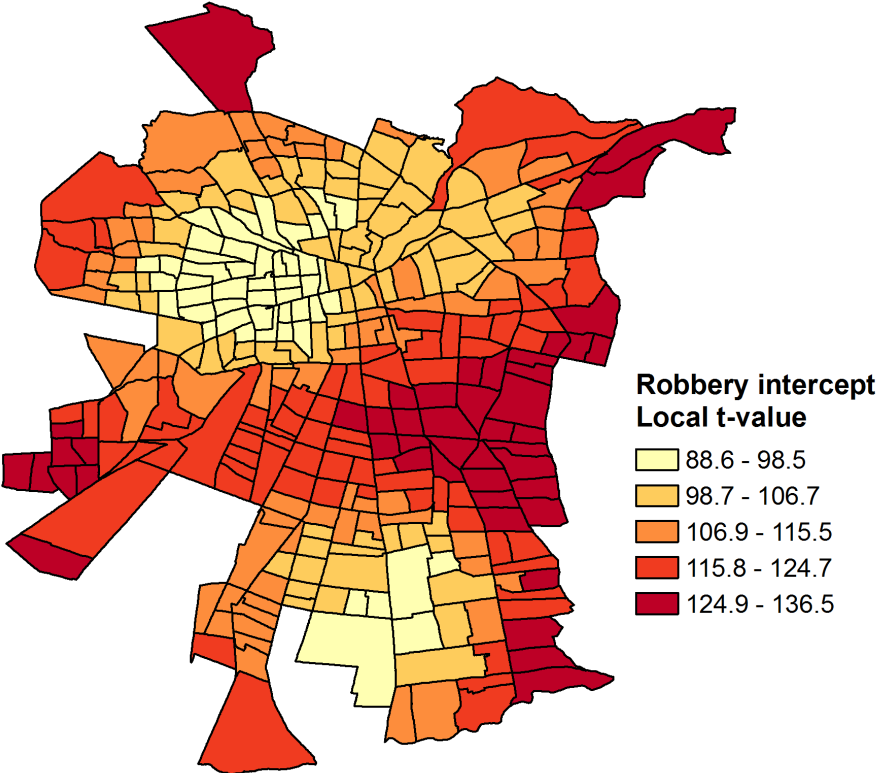
Figure 3.29 Local t-values for Assault in Santiago (CL), 2012

**Assaults intercept
Local t-value**

- 6.9 - 7.9
- 7.9 - 8.7
- 8.8 - 9.7
- 9.9 - 11.1
- 11.2 - 13.1
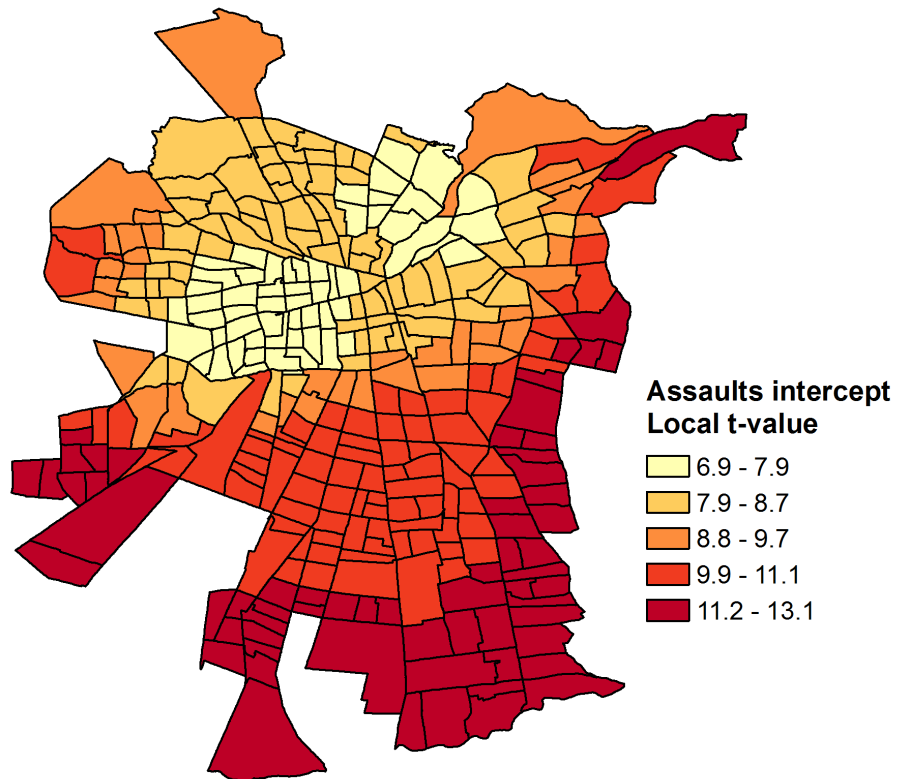
Figure 3.30 Local t-values for Homicide in Santiago (CL), 2012

**Homicides intercept
Local t-value**

- 1.95 - 2.00
- 2.00 - 2.05
- 2.05 - 2.12
- 2.12 - 2.19
- 2.19 - 2.24
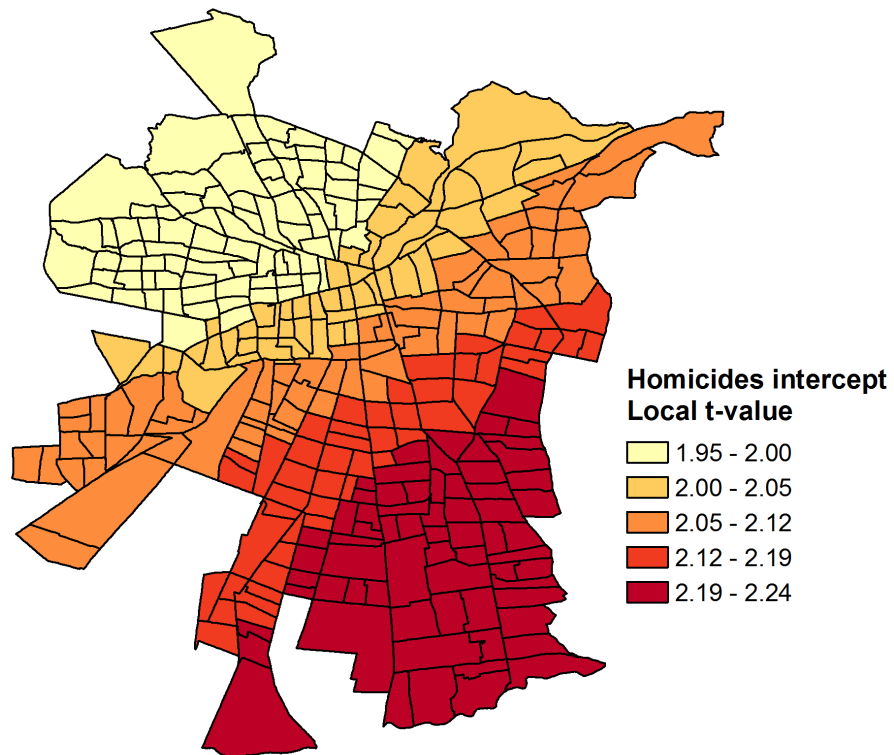
Figure 3.31 Local t-values for All crimes in Santiago (CL), 2012

All Crimes intercept Local t-value
- 90.5 - 100.9
- 101.3 - 109.1
- 109.4 - 117.8
- 118.4 - 127.5
- 127.6 - 139.5
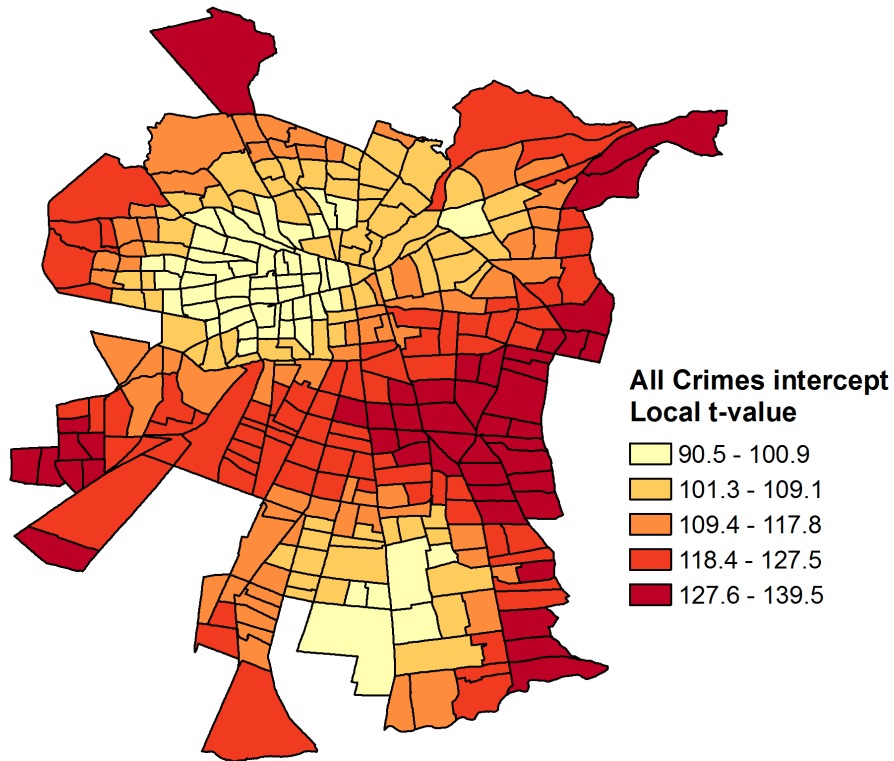
4. Discussion

4.1. Summary of findings

This study started with an overview of the context and trends in crime in Latin America as a whole. This overview focused on homicide and other violent crimes. The main conclusion is not that homicidal violence is already high in the region, but that it has increased in the recent years. This regional trend is contrary to the progress happening in other parts of the world where in fact homicidal violence is decreasing and expected to decrease even further. Likewise, another key conclusion is the urgent need that the region has in terms of more quantity and quality data in the area of crime and justice. There are not only important gaps in databases in general, but a severe scarcity of the most basic geographically aggregated and times series indicators necessary for policy evaluation and evidence-based policy. For this reason, the next section presents a reduced number of

case studies that demonstrate the utility of developing regional comparative data systems and systems of indicators of crime for different levels of analysis.

As such, based on environmental criminology premises, the study then empirically tested whether local conditions determined by social disorganization theory premises can predict spatial patterns of crime at two different levels of urban analysis. First at the inter-urban level, using a sample of selected cities in Latin America for which crime and socioeconomic data were available. Second, at the intra-urban level, in a set of three cities --Zapopan (MX), the Great Metropolitan Area of Costa Rica or GMA, and Santiago de Chile (Chile). At inter-urban level, three types of crimes were examined: Crimes against property, assaults and homicides. At the intra-urban level, the geography of robbery, assault, homicide, and the total number of crimes were studied.[29]

As expected, analytical strategy and statistical techniques were different in each level of analysis. A traditional OLS regression approach was utilized for the inter-urban level analysis, from now on regional analysis. The purpose here was to detect which social disorganization correlates were statistically associated to crime in this sample of cities. Later on, a traditional Poisson regression approach and a geographically weighted regression approach were utilized at the intra-urban level.[30] In addition, spatial statistics were utilized to detect crime hotspot and coldspot locations.

Social disorganization theory proved to be very successful and provided a powerful tool for crime analysis and policy decision. The analytical strategy proved successful too as it permitted the identification of a good number of local structural conditions conducive to crime. From a total of 90 multivariate correlation tests, 32 were found statistically significant (35.6%). In all tests, everything constant, at least one social disorganization correlate would be able to predict local levels of crime. In other cities, up to 4 out of 7 correlates would be able to predict crime, meaning that overall social disorganization theory would be able to predict crime better in some cities than others. Local context then seems to matter. But the type of crime seems to matter too. The least predictable crime of all was homicide. The more predictable was assault, followed by robbery.

As expected, social disorganization theory provided better explanatory power at the intra-urban level of analysis. This was expected because social disorganization theory was originally formulated to explain crime variations within cities (Ceccato, Haining, & Kahn, 2007; Kingston, Huizinga, & Elliott, 2009; Sampson, Morenoff, & Gannon-Rowley, 2002;

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[29] The case of GMA (CR) only includes homicide and robbery.
[30] Due to high presence of zeros and overdispersion in the dependent variables, Zero-inflated Poisson regressions were utilized and also validated using an alternative negative binomial model.

Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997; Shaw & McKay, 1942). Nonetheless, social disorganization has started to be tested in rural areas as well. These new tests have pointed towards the need to make adjustments to the theory and to test it using non-official information (Kaylen & Pridemore, 2012; 2011; Osgood & Chambers, 2000). Table 4.1 below shows a summary of the findings in this study.

Table 4.1 Summary of findings

	All cities			Zapopan, Mexico				GMA, Costa Rica		Santiago de Chile, Chile			
	Against property	Assault	Hom.	Robb.	Assault	Hom.	All crimes	Robb.	Hom.	Robb	Assault	Hom.	All crimes
Gini index	n.s.	n.s.	n.s.										
Internal migration	(+)	(+)	(-)	n.s.	n.s.	n.s.	n.s.	(-)	n.s.	n.s.	n.s.	n.s.	n.s.
Female HH	n.s.	n.s.	n.s.							n.s.	(+)	n.s.	n.s.
Alcohol outlets	(-)	n.s.	n.s.	n.s.	(+)	n.s.	n.s.						
Population 15-24				(+)	(+)	(+)	(+)						
Marginality				n.s.	(+)	n.s.	n.s.						
Divorced population				(+)	(+)	(+)	(+)			n.s.	(-)	(-)	(-)
School absenteeism				n.s.	n.s.	n.s.	n.s.			(+)	(+)	n.s.	(+)
Unemploy-ment				n.s.	n.s.	n.s.	n.s.	(+)	(+)	n.s.	n.s.	n.s.	n.s.
Female-headed households				n.s.	n.s.	n.s.	n.s.						
Average schooling				(+)	n.s.	n.s.	(+)	(+)	n.s.				
Male pop. 15-29								n.s.	n.s.				
Male pop. 15-24										n.s.	(-)	n.s.	n.s.
Divorced or separated								n.s.	n.s.				
Single parent HH								(+)	n.s.				
Social development index								n.s.	n.s.				
Pop. some college education										(+)	(-)	n.s.	(+)
Structural correlates	*2*	*1*	*1*	*3*	*4*	*2*	*3*	*4*	*1*	*2*	*5*	*1*	*3*

*Robb: Robbery. Hom: Homicide.
n.s.: not significant

These findings lead to a number of elements and pieces of evidence for discussion. Taken as a whole, there are at indications of four main structural conditions that seem to be driving crime in these cities. One is economic deprivation. Findings support the social disorganization argument that communities with lower economic resources will find it more difficult to control their surroundings and counter-balance crime and other antisocial behaviors. Unemployment and socioeconomic marginality drive crime up, but not everywhere and not for all crimes. Likewise, more crime can be expected in areas of cities where residents have more schooling, but again, not for all types of crimes. We were expecting this results as higher education levels may function as a crime generator, meaning that offenders know where potentially richer victims reside (Brantingham & Brantingham, 1993). But one lesson is that the "crime problem" is not just one type of problem, but many different, and its solutions vary between and within cities.

The second main structural condition or factor driving crime is residential instability. The variable internal migration seems to be of fundamental importance. This was the only SD factor tested both at the inter-urban and at the intra-urban level of analysis, as well as in all case studies. It is of fundamental importance because its effect was conditional on place and the type of crime. At the inter-urban level, internal migration was a risk factor for crimes against property and assaults, but a protective factor for homicide. On the contrary, the GMA of Costa Rica, it also served as a protective factor against robbery crimes, and made no difference with regards to homicide. Finally, in Zapopan and Santiago, internal migration made no difference either. Other studies have found similar effects. For instance, Martinez et al (2008) found that higher migration levels can have unexpected positive effects like fostering economic development and building new community dynamics. This clearly evidences that residential instability has local effects, it requires more attention in crime policy, though no universal generalizations can be derived for the region´s cities.

The third main structural condition driving crime is a composite of family disruption, school absenteeism, and the age structure of the population. Areas with more single parents suffered from more robberies in the GMA of Costa Rica, and areas with more female-headed households had more assaults in Santiago. However these conditions made no difference anywhere else. Similarly, areas with more minors not attending school drove most types of crimes in Santiago, with the expection of homicide, but it made no effect in Zapopan apparently. Finally, with regards to the age structure, the presence of

more young people seemed to increase all types of crimes in Zapopan.[31] This city evidently has the need to implement youth programs against crime. Parental supervision, school attendance and family cohesion, all in connection to the age structure, can play a role in controlling crime and violence across neighborhoods.

Finally, alcohol consumption is another factor related to crime. It was particularly important in Zapopan: More assaults happened in areas of the city where more alcohol outlets could be located. Again, this finding is not universal, however previous studies at the individual level have been able to find a correlation between alcohol use and crime behavior. As an example, Vilalta and Fondevila (2013) found that 35% of prison inmates in the Mexico City metropolitan area consumed alcohol before committing a crime. On the other side, more alcohol outlets might increase the presence of place managers and guardianship, deterring the risk of criminal victimization (Eck & Weisburd, 1995). In this sense, alcohol outlets provide evidence of contextual effects as well.

4.2. Strengths and limitations of the study

Compared to previous studies of urban violence in Latin America, this study has two strengths. One is that the findings show substantial progress over previous studies that are mere general descriptions of past events. We have provided new data and theory-based tests that point towards probable causes of crime and public policy solutions. Another is that the empirical evidence provided here supports the argument that Latin American cities are not a homogeneous bloc of crime problems and challenges. The reality of our cities is far from that. We have shown that crime levels and correlates vary significantly between cities and areas within cities. As such, crime policy solutions must address these variations.

One important limitation refers to data homogeneity and open data. Overall, most censuses in the region share the same characteristics and definitions, but some other indicators are not available. While we were able to use proxy variables to estimate the effects of structural conditions, we lacked social process variables. This limited our capacity to see causal mechanisms. Similarly, in terms of open data, countries do produce statistical information on crime, but most is based on administrative records and it is not publicly available to the public. Ideally we would have used estimates of crime victimization

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[31] More young males corresponded with less assaults in Santiago, although this finding was the effect of a meditation in the model, in other words, it may be a superfluous finding.

incidence and prevalence at the inter-urban and intra-urban levels of analysis. The same thing happened with crime and socioeconomic spatial data. We could not include more case studies since we lacked cartographic data.

5. Key policy messages

Social disorganization is not a micro-theory or a theory about individual criminal behavior. It is a theory that explains how local structural conditions can affect community processes, especially collective efficacy and social cohesion. In addition, crime is viewed as a multidimensional phenomenon that involves the interaction of various factors in different ways in different places. Local context matters importantly for the structuring of place-aggregated behaviors such as violence and crime. Neighborhoods or groups of neighborhoods constitute local contexts because in them residents affect each other in different ways from one place to another. The basic premise is that attitudes and behaviors towards crime and violence vary from one place to another since these attitudes and behaviors are a function of the local social networks or social environment. We have provided evidence of these local variations in crime and structural correlates.

In this sense, the usefulness of social disorganization for crime policy is warranted as long as good crime data and empirical evidence of relationships between variables is available at the neighborhood level or some other small-scale unit of information. This study has put forward the idea that the most meaningful unit of analysis for crime policy is the neighborhood. This study has used either cities or census tracts either as units of analysis or as units of information. A city is indeed a unit of analysis, but a census tract is not a unit of analysis but a unit of statistical information. There is no sense of place or neighborhood in a census tract, but there is a sense of place in a city and in a neighborhood (Vilalta, 2013). In spite of that, results have pointed towards the utility of census tracts or other small-scale units of information for crime analysis. Given the findings and limitations of this study, several policy recommendations are presented below.

For **producers of crime statistics**, it is of utmost importance to improve the availability and quality of data throughout the region. For that purpose, the following points need to be addressed:

- **Develop data systems with a focus on crime policy issues**

  In order to generate useful data, standardized crime statistics are needed. For this, criminal justice institutions require common goals and mechanisms. Police, prosecutors, justice and prison authorities should join efforts to produce crime statistics under a common framework. To this end, statistical classifications on crime can help to ensure comparability across crime types, institutions and administrative units. Moreover, the inclusion of national statistical offices is advisable in order to provide technical expertise and methodological soundness and quality.

- **Foster additional sources on crime**

  While administrative records provide valuable information on the phenomena of crime, they are subject to institutional trust, transparency and governmental capacities. Thus, additional sources, such as local victimization surveys are needed to complement administrative data. Surveys can provide basic measures of incidence and prevalence of crime and other data on victims, offenders, and on the characteristics of the criminal event. Finally, georeferenced data is necessary in order to identify the range of spatial patterns and trends in every city.

- **Further develop international databanks on crime and criminal justice**

  Making crime statistics available to several audiences enhances the level of public discussion. Open data systems promote discussion, academic research, and evidence-based policy. It also elevates our understanding of the crime problem by facilitating new insights and boosting our knowledge of patterns and trends from different places with other types of dynamics.

For policy-makers, practitioners, and researchers, as main **consumers of crime statistics**, it is necessary that they advance capacity building and evidence-based discussions. Higher standards in crime analysis are needed and can be propelled by several different mechanisms. In detail:

- **Promote capacity building**

  In order to design and implement effective crime prevention policies, policy-makers and criminal justice institutions must strengthen their analytical capacities. It is necessary to promote the use of data for policy purposes and to build crime data and analysis units.

- **Move from general descriptive accounts to in-depth analyses**

  So far, most studies and reports on crime in Latin America describe trends and patterns. They provide a broad context of the crime problem but are insufficient for contributing to the design and implementation of evidence-based policies. National governments, think tanks, universities and international organizations should encourage in-depth analyses about the causes and consequences of crime.

- **Use maps and investigate deeper into the neighborhood as a powerful unit of analysis**

  This study proves that crime needs to be studied at different levels of analysis. In this sense, it is important to remark two main lessons:

    o Crime exhibits different spatial patterns in different places (i.e. - homicide hotspots and coldspots may be different from assault or robbery). In other words, there is a geography of crime risk.

    o Also, each type of crime has its own structural correlates or risk factors, which happen to covary with place or case study.

- **Local context matters**

  Crime patterns and policy solutions are function of the local context. National crime policy programs face the risk of disregarding local conditions and promoting similar yet ineffective solutions for all crimes in all places. This is a mistake. Crime control and prevention policies need to be based on sound local data, informed by local judgment, and implemented with the support of communities and local experts.

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Annexes

1.1 Database on crime (1/2)

City	Country	Homicides				Acts against property				Acts causing harm or intending to cause harm to the person			
		Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source	Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source	Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source
La Paz	Bolivia	5.75	5.75	5.63	UNODC	1010.26	1010.26	918	Alcaldía de La Paz				
Antofagasta	Chile	2.14	2.19	4.43	Ministerio del Interior	1560.97	1703.41	2362.2731	Ministerio del Interior	1377.83	1529.31	1620.4778	Ministerio del Interior
Copiapó	Chile	2.68	2.46	1.26	Ministerio del Interior	1688.42	1745.26	1745.2642	Ministerio del Interior	1581.24	1611.98	1730.1155	Ministerio del Interior
Iquique	Chile	2.48	2.53	2.61	Ministerio del Interior	2101.81	2160.37	2610.1116	Ministerio del Interior	1531.41	1477.84	1747.8985	Ministerio del Interior
Santiago	Chile	5.11	4.48	2.99	Ministerio del Interior	8206.18	8464.19	7980.0769	Ministerio del Interior	3312.92	3613.48	3704.4382	Ministerio del Interior
Barrancabermeja	Colombia	44.81	43.45	42.30	DIJIN	1456.78	1556.41	1400.5368	DIJIN	10.83	7.41	16.188159	DIJIN
Buenaventura	Colombia	63.32	53.84	36.68	DIJIN	475.64	450.36	447.84557	DIJIN	7.13	6.66	5.2395726	DIJIN
Cali	Colombia	77.41	74.52	71.68	DIJIN	1993.33	2337.36	2368.4432	DIJIN	4.29	4.32	3.2076427	DIJIN
Medellín	Colombia	47.58	43.60	60.09	DIJIN	1240.93	1308.23	623.37578	DIJIN	6.65	5.28	6.8713885	DIJIN
Pasto	Colombia	27.39	28.22	22.59	DIJIN	1775.78	1655.17	764.13752	DIJIN	8.99	8.81	5.5865108	DIJIN
Aguirre	Costa Rica	15.09	13.78	7.64	OIJ	2490.86	2571.87	2158.7464	OIJ	240.91	223.85	324.76716	OIJ
Garabito	Costa Rica	33.13	22.17	36.47	OIJ	3943.87	3970.05	4637.4344	OIJ	581.92	626.85	759.73695	OIJ
San José	Costa Rica	22.22	22.91	24.83	OIJ	2294.05	2227.58	2227.585	OIJ	259.18	252.10	231.75989	OIJ
Quito	Ecuador	10.26	10.05	12.95	OMSC								
San Marcos	El Salvador	57.26	59.65	54.44	Policía Nacional Civil	124.30	127.85	133.77883	Policía Nacional Civil	235.57	242.59	283.11334	Policía Nacional Civil
San Salvador	El Salvador	85.02	81.40	74.53	Policía Nacional Civil	423.86	397.36	400.02404	Policía Nacional Civil	366.11	393.06	384.2056	Policía Nacional Civil
Santa Ana	El Salvador	73.20	76.87	79.10	Policía Nacional Civil	180.15	166.90	179.49635	Policía Nacional Civil	235.77	228.84	265.44163	Policía Nacional Civil
Quetzaltenango	Guatemala	21.77	21.77	23.57	Secretaría Técnica del Consejo Nacional de Seguridad								
Ciudad de Guatemala	Guatemala	103.85	112.02	126.80	Secretaría Técnica del Consejo Nacional de Seguridad	447.68	447.68	488.55017	Secretaría Técnica del Consejo Nacional de Seguridad	205.43	201.40	243.4853	Secretaría Técnica del Consejo Nacional de Seguridad
San Pedro Sula	Honduras	163.18	163.18	182.43	SEPOL	54.21	54.21	71.053996	SEPOL	32.14	32.14	35.91598	SEPOL
Tegucigalpa	Honduras	77.81	77.81	78.01	SEPOL	46.29	46.29	54.208262	SEPOL	24.62	24.62	25.368806	SEPOL
Juticalpa	Honduras	73.27	73.27	97.89	SEPOL	8.96	8.96	6.1183327	SEPOL	40.88	40.88	59.653744	SEPOL

1.2 Database on crime (2/2)

City	Country	Homicides				Acts against property				Acts causing harm or intending to cause harm to the person			
		Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source	Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source	Average 2000-2014 (or available years)	Median 2000-2014 (or available years)	Rate (2010 or latest available year)	Source
Aguascalientes	México	4.18	3.42	7.78	INEGI								
Tijuana	México	31.26	21.32	80.59	INEGI	1629.41	1664.35	1693.6134	Secretaría de Seguridad Pública	333.02	335.49	334.23458	Secretaría de Seguridad Pública
Torreón	México	27.27	8.82	45.03	INEGI								
Zapopan	México	8.56	5.13	11.58	INEGI	371.19	426.04	474.20877	Gobierno Municipal de Zapopan	72.89	78.32	124.1401	Gobierno Municipal de Zapopan
Tapachula	México	10.90	10.12	6.55	INEGI	319.23	362.44	129.81704	Procuraduría General de Justicia del Estado de Chiapas	237.81	195.61	184.11551	Procuraduría General de Justicia del Estado de Chiapas
Managua	Nicaragua	19.94	18.77	23.76	UNODC								
Arequipa	Perú	6.34	6.37	6.37	INEI								
Lima	Perú	5.57	5.64	5.36	INEI								
Trujillo	Perú	17.74	17.78	17.78	INEI								
Santiago de los Caballeros	República Dominicana	22.95	24.04	25.32	ONE								
Santo Domingo	República Dominicana	31.78	31.94	41.35	ONE								
Sucre	Venezuela	81.08	81.14	90.62	Alcaldía de Sucre					143.97	153.10	181.24828	Alcaldía de Sucre

1.3 List of crimes included by category and city

Ciudad	País	Acts against property												Acts causing harm to the person		
		Hurto	Hurto a la persona	Hurto de bienes en tránsito	Hurto de establecimientos	Otros hurtos	Robo	Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos	Robo de bienes públicos	Otros robos	Amenazas	Lesiones	Otros actos contra la persona
Río de Janeiro	Brasil		Hurto a la persona	Hurto de bienes en tránsito	Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas		
Sao Paulo	Brasil			Hurto de bienes en tránsito	Hurto de establecimientos	Otros hurtos			Robo de vehículos o autopartes				Otros robos			
Antofagasta	Chile							Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Copiapó	Chile							Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Iquique	Chile							Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Santiago	Chile							Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Barrancabermeja	Colombia	Hurto	Hurto a la persona		Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes							Otros actos contra la persona
Buenaventura	Colombia	Hurto	Hurto a la persona		Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes							Otros actos contra la persona
Cali	Colombia	Hurto	Hurto a la persona		Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes							Otros actos contra la persona
Medellín	Colombia	Hurto	Hurto a la persona		Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes							Otros actos contra la persona
Pasto	Colombia	Hurto	Hurto a la persona		Hurto de establecimientos			Robo en casa habitación	Robo de vehículos o autopartes							Otros actos contra la persona
Aguirre	Costa Rica	Hurto					Robo		Robo de vehículos o autopartes	Robo a la persona				Amenazas	Lesiones	Otros actos contra la persona
Garabito	Costa Rica	Hurto					Robo		Robo de vehículos o autopartes	Robo a la persona				Amenazas	Lesiones	Otros actos contra la persona
San José	Costa Rica	Hurto					Robo		Robo de vehículos o autopartes	Robo a la persona					Lesiones	Otros actos contra la persona
Quito	Ecuador															
San Marcos	El Salvador						Robo		Robo de vehículos o autopartes					Amenazas	Lesiones	Otros actos contra la persona
San Salvador	El Salvador						Robo		Robo de vehículos o autopartes					Amenazas	Lesiones	Otros actos contra la persona
Santa Ana	El Salvador						Robo		Robo de vehículos o autopartes					Amenazas	Lesiones	Otros actos contra la persona
Quetzaltenango	Guatemala															
Ciudad de Guatemala	Guatemala		Hurto a la persona					Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos				Lesiones	
Villa Nueva	Guatemala		Hurto a la persona					Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos					
San Pedro Sula	Honduras			Hurto de bienes en tránsito				Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos				Lesiones	Otros actos contra la persona
Tegucigalpa	Honduras			Hurto de bienes en tránsito				Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Juticalpa	Honduras		Hurto a la persona	Hurto de bienes en tránsito				Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos				Lesiones	Otros actos contra la persona
Tijuana	México				Hurto de establecimientos		Robo	Robo en casa habitación	Robo de vehículos o autopartes		Robo en establecimientos			Amenazas	Lesiones	Otros actos contra la persona
Zapopan	México			Hurto de bienes en tránsito				Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos	Robo de bienes públicos		Amenazas	Lesiones	Otros actos contra la persona
Tapachula	México					Otros hurtos		Robo en casa habitación	Robo de vehículos o autopartes	Robo a la persona	Robo en establecimientos		Otros robos	Amenazas	Lesiones	Otros actos contra la persona
Sucre	Venezuela														Lesiones	

1.4 List of studies on social disorganization theory

Type of crime or disorder	Author & Year	Area & unit of analysis	Findings
Homicide	Martinez et al. (2010)	United States Neighborhoods (N=297)	Due to its revitalization process, more immigration translates into fewer overall homicides. Nonetheless, effects vary according to race.
Homicide	Nieuwbeerta et al. (2008)	Netherlands Neighborhoods (N=3,979)	Neighborhood social cohesion and socioeconomic disadvantage increase homicide risks; no effects were found for indicators on confidence in the police.
Homicide	Sampson et al. (1997)	United States Neighborhoods (N=343)	Effects of concentrated disadvantage and residential instability are mediated by collective efficacy levels. Higher levels of collective efficacy are associated with lower levels of violence.
Homicide	Vilalta & Muggah (2013)	Mexico District (N=735)	Homicides are highly clustered in specific districts of Ciudad Juarez. Districts with higher rates of immigration, vacant housing and dwellings with no access to water were associated with higher homicide rates. Counterintuitively, districts with higher education levels presented higher homicide rates as well.
Partner violence	Browning (2002)	United States Neighborhoods (N=343)	Measures of neighborhood cohesion and informal social control are negatively related to intimate homicide rates and nonlethal violence. Likewise, higher levels of collective efficacy increase the likelihood that women will disclose intimate partner violence situations.
Youth violence	Reyes et al. (2008)	Puerto Rico Individual (N=691)	Adolescent's perceptions on social disorder within the neighborhood were associated with higher rates of violent behavior. Social disorder fosters defensive responses towards fear of violence.
Auto theft and residential /vehicular burglary	Cancino et al. (2007)	United States Census block groups (N=1,016)	Interactions between alcohol outlets density and concentrated disadvantage were strongly associated with property and violent crime. In contrast, interactions between measures of generosity and concentrated disadvantage were inversely related to those crimes.
Theft and vandalism	Estrada & Nilsson (2008)	Sweden Neighborhoods (N=3,391)	Living in rented dwellings and in poorly resource neighborhoods increase risks for vandalism. Neither evidence was found for vehicle-related property crimes nor for the effects of density of social ties or social cohesion.
Gang violence	Mares (2010)	United States Census tracts (N=800)	In contrast to other homicide-motives, more instability levels were associated with lower rates of gang homicides. Consistently, economic disadvantage and heterogeneity levels were strongly related to all homicide motives.
Robbery and assaults	Hipp et al. (2009)	United States Census tracts (N=149)	Transition from African-American to Latino neighborhoods leads to higher levels of intergroup and intragroup violence. Likewise, greater inequality levels leads to more violence by the most disadvantaged group.
Youth delinquency	Kingston et al. (2009)	United States Neighborhoods (N=48)	Economically depressed neighborhoods vary in terms of their social processes. Poverty is the strongest predictor for variations in perceived effectiveness of social institutions and perceptions of limited opportunities for the future. Such high-risk neighborhoods present higher rates of problematic behaviors.
Youth delinquency	Weijters et al. (2009)	Netherlands Multilevel	City level characteristics are more important for accounting youth delinquency than neighborhood's

		(n_city = 11; n_neighborhood = 200)	context. Single-parent families is the strongest predictor; no evidence was found for measures of ethnic heterogeneity.
Drug use	Hayes-Smith & Bridges (2009)	United States School district (N=202)	Adolescent methamphetamine use is a function of low economic status, residential instability, predominantly white people and community type factors.
Drug market activity	Martínez et al. (2008)	United States Census tracts (N=72)	Besides social disorganization indicators, drug activity has a strong and independent effect in aggravated assaults and robbery. Moreover, drug activity clusters in neighborhoods characterized by low immigration rates, racial diversity and more linguistic homogeneity.
Incarceration	Clear et al. (2003)	United States Neighborhood (N=80)	Seen as a form of coerced mobility, incarceration releases one year affect a community's crime rate the following year. Incarceration at high rates disrupts family, economic and political networks.
Bullying	Bradshaw et al. (2009)	United States Schools (N=95)	Indicators of school disorder – student-teacher ratio, student poverty, mobility and suspension rates- were strongly associated with bullying involvement and revengeful attitudes.
School disorder	Welsh et al. (2000)	United States Schools (N=43)	Communities surrounding schools have stronger effects than communities where students belong to. Levels of school disorder were mediated by student attendance and turnover. Community poverty and school size exerted relevant indirect effects. No effects were found for community crime rates on school disorder.
Public disorder	Sampson & Raudenbush (1999)	United States Neighborhoods (N=196)	Controlling for neighborhood structural factors, cohesion and shared social expectations explained lowers levels of crime and disorder. The association between signs of physical disorder and crime is spurious.
Public disorder	Markowitz et al. (2001)	United Kingdom Neighborhoods (N=151)	Levels of social disorganization increase disorder. Cohesion mediates the effects of structural factors on disorder. Signs of disorder increase fear, decreasing social involvement, collective efficacy, and foster more crime. Thus, disorder and cohesion affect each other reciprocally.
Social control	Warner (2007)	United States Neighborhoods (N=66)	Stronger social ties increase the probability of directly intervening in the community, but not for calling the authorities. Trust in the police is not a predictor for intervening in one way or another.
Suicide	Nomiya et al. (2000)	Japan Counties (N=47)	Social network disruption caused by rural depletion is the strongest predictor for suicide rates. Migration and poverty factors showed inversed relations to suicide. No evidence was found for residential instability and population density levels.
Community organization	Vilalta (2013)	Mexico Individual (N=65,208)	Higher perceptions of frequent kidnapping, theft crimes and more schooling years increased the probability of organizing for crime prevention purposes. Mistrust in the local police and perceptions on drug use around the neighborhood showed inverse relation to community organization. Inconclusive evidence was found for employment status.

1.5 About the data

In general, due to data availability or data quality, empirical studies lack comparability and face several methodological challenges. Data is necessary for diagnosing, understanding and targeting the phenomenon of crime and violence. Data collection at the global and national level can contribute to understanding certain types of crimes and violence –*inter alia*, money laundering, trafficking in persons and illicit drug trafficking-, however these data may have limitations when characterizing other types of crimes such as homicides, robberies and assaults that take place at smaller geographic scales. It is important to analyze local patterns of crime and violence when designing public policies for crime prevention as having data at the local level may facilitate identifying factors that influence certain crimes.

Data for analyzing crime at the local level draw two broad lessons. The first lesson is that there are differences among small geographic units –municipalities, neighborhoods, blocks or street segments. Crime is not equally distributed among geographic units, on the contrary, crime tends to occur in places with specific characteristics at specific times, which implies a significant association between crime and place. The second lesson is that every crime has its own drivers and spatial distribution, this means that underlying factors leading to commit a crime can be very different from one area to another. Therefore, strengthening data collection on crime at the local level should be a core activity for local governments, as these "are in the best position to understand their own needs and strengths, as well as citizens' concerns" (UNODC, 2010: 21). Considering that strategies, tactics and operations must be adapted to each local context, these two lessons have major implications for policy making in regards to addressing crime and violence. Hence, empirical evidence at the local level is urgently needed for designing effective policies for preventing and reducing crime.

Generally speaking, there are two main sources when it comes to crime data: crime administrative records from the criminal justice system (police, prosecutors, courts and prisons) and victimization surveys. Administrative records mostly come from reported crimes. They generally contain information about the type of crime, location, time, modus operandi and general details of the victim. Nonetheless, such records tend to be highly unreliable; this is due to four main reasons. First, not all crimes are reported to the

authorities.[32] Second, most of the time, data collection is not a priority for many institutions; hence problems of data imputation, processing and quality. Third, due to its political salience, there tends to be an unwillingness to collect data on crime. Fourth, due to registering processes and compatibility among legal definitions, cross-national and even cross-local comparisons prove difficult.[33]

On the other hand, victimization surveys can provide information on the proportion of households, individuals, businesses, women, children and other populations that have been victims of at least one crime during a specific time frame. This type of surveys can be helpful to estimate the overall crime rate, the dark figure, trust in criminal justice authorities, fear of crime and crime experience.[34] However, such estimates are only available at aggregated scales, –i.e. national, regional, state or provincial levels. Costs, privacy rights and statistical accuracy make almost impossible to achieve representativeness for smaller geographical units such as blocks, neighborhoods, small villages or towns.

Thus, in spite of the drawbacks resulting from the number of unreported and unrecorded crime incidents, *vis-a-vis* victimization surveys, administrative records on crime contain a key component required for analyzing crime patterns at local levels: spatial information at smaller geographical areas. Consequently, the quality of the analysis will much depend on the quality of the geographical detail. All in all, this geographic feature places administrative records as the main source for the analysis of crime for guiding local-based approaches.

This report aims to study crime in Latin American cities and advocates on the importance of *local-based* perspectives to prevent crime and violence. When initially defining which data was required for analyzing crime at the city level, three main questions were addressed:

- Which data is needed for meeting the purpose of the study?
- Which cities should be included?
- Which institutions produce this data?

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[32] Unreported crime is also known as "dark figure". The reasons for unreported crime range from: a) lack of trust in the police; b) believing that the crime was unimportant; or c) thinking that reporting crimes to the authorities is not worth it.

[33] For that matter, UNODC, UNECE and the Center of Excellence in Statistical Information on Government, Crime, Victimization and Justice (CoE) have worked in an International Crime Classification Framework for Statistical Purposes (ICCF). To read more on the development of the ICCF, please consult UNSD/UNODC (2013), CoE (2012), and UNODC/UNECE (2012) reports.

[34] To know more about victimization surveys, please consult UNODC/UNECE's Manual on Victimization Surveys (2010).

Overall, two broad groups of data were needed to analyze violent crime at the city level: crime data and demographic and/or socioeconomic data.

Crime data

Police institutions were the main source used for getting crime data according to the following categories:

- **Type of crimes:** Intentional homicide, robbery, vehicle theft, burglary, theft from premises, theft from persons, assaults and injuries, sexual violence, threats, domestic violence, extortion, kidnapping, drug-related offenses and possession or use of weapons.
- **Features of crimes:** temporal reference (year, month, day and time), geographic location (state/department, city/town, commune, district, quadrant, ideally block or geographic coordinates), use of weapons and type of weapon (firearm, bladed weapons, etc.), and offenses related to organized crime or gangs.
- **Characteristics of the offender/accused person:** age, sex, socioeconomic status, relationship to the victim.
- **Characteristics of the victim:** age, gender, socioeconomic status, relationship to the offender/accused person.

An important fact to highlight during the data collection phase is the institutional arrangements and its data access policies. Most of the cities show institutional weaknesses in terms of statistical capabilities in general and became even worse when referring to crime and justice data at the local level. Crime data is not seen as part of a larger statistics system that could be linked to other relevant statistical sets such as social, demographic and/or economic statistics and in consequence, crime data is unarticulated from public making. An additional downside to crime statistics is that most of the criminal justice institutions adopt restrictive policies for data access, which impede an effective diagnosis and analysis of crime.

The results of crime data collection were as follows:

- Homicide was the most reported crime at the local level -41 cities-, followed by acts against property (robbery, vehicle theft, burglary, theft from premises, theft from persons) along with acts causing or intending to cause harm to the person (assaults and injuries) -23 cities- and acts of sexual nature -16 cities-.

- Unfortunately, only a handful of cities reported information to identify crimes associated to other types of violence such as domestic and gender-based. This limited the possibility of analyzing other violent crimes.

- Three major sources of crime data were identified: police, prosecutors and public health institutions (vital records statistics).

- Regarding homicides, 7 out of 10 cities reported data from police records, 2 out of 10 cities from the health system and the rest of cities reported information from the prosecution statistics.

- 80% of data on acts against property and acts causing or intending to cause harm to the person were from police and around 20% from prosecution offices.

- In the case of homicide data, almost 50% of the cities disaggregated data by sex and age of the victim, by type of weapon and motive. Additionally, about 40% of cities disaggregated data by age and gender of the offender.

- On the whole, other than homicide, data collected on crimes did not contain information to describe or characterize the victim, the criminal incident and/or the offender.

- Generally speaking, crime data at the city level does not provide metadata describing variables, definitions, categories, etc.

- Only 5 cities provided microdata (i.e., data for every crime incident)

- Cities were asked to provide crime data from 2000 to 2014, in the case of homicide data, they only reported information for 7.5 years, on average. Only 29 cities reported information for 5 or more years; and 13 cities for 10 or more years.

- 6 cities reported information on homicide covering 1 or 2 years.

- At the end of the data collection process, only 18 cities reported homicide data for 2014.

- Of the 41 cities with crime data, only 5 had information by areas within the city. Of these 5 cities, 4 cities had geographic data by coordinates. However, of these, only 3 had crime and socio-demographic data for the same geographical space.

- In conclusion, the inclusion or exclusion of types of crimes and cities was determined by data availability and compatibility.

It is important to remark that police data do not provide a full picture of crime and violence since these records depend on the willingness of people to report crime to the justice system. It is also important to bear in mind that great caution has to be advised

when making direct comparisons between geographic units since there may exist significant differences for data recording and imputation processes. For instance, crime data collection and coverage is generally not uniform among cities or other administrative units, i.e., not all reported crimes are recorded by police since institutions may have discretion when dealing with certain types of crimes. In consequence, a rise in crime rates do not necessarily reflect an increase in the actual crime level, this might be a result of an increase in the number of reported or recorded crimes.

Demographic and socioeconomic data

Finding demographic and socioeconomic data at the city level was one of the biggest challenges for this research. However it is important to remark that only official data was considered for this report, thus national statistical offices were the main source for this type of data. The results of demographic/socioeconomic data collection were as follows:

- Only 34 cities (out of 41) had demographic/socioeconomic data at the local level.
- Censuses, both on population and economic, were the main source for the demographic/socioeconomic data. Gini coefficient came from official income surveys;
- 38 cities had information on Gini coefficient, percentage of residents living in other city five years earlier and rate of female-headed households;
- Alcohol outlets by city was the variable less frequently found, only 34 cities reported it;
- Due to privacy rights, not all the demographic/socioeconomic data can be georeferenced by coordinates but the alcohol outlets. Unfortunately, only 13 cities from 4 different countries had information on the location of these type of establishments within the city. Unfortunately, only 6 cities from 2 different countries had digital cartography.

In summary:

- It was possible to collect data on crime -at least one type of crime, homicide- for 41 cities from 15 different countries;
- Out of 41 cities with crime data, only 34 had demographic/socioeconomic data related to other structural variables;
- Out of 34 cities, it was possible to collect accurate crime and demographic/socioeconomic data with geographical information on neighborhoods, blocks or segments of streets for only 3 metropolitan areas.

1.6 Database on structural variables of the model (1/2)

City	Country	Structural variables							
		Income Gini coefficient (2010 or latest available year)		Percentage of residents living in other State five year earlier (2010 or latest		Rate of female-headed households (2010 or latest available year)		Alcohol outlets (2010 or latest available year)	
		Value	Source	Value	Source	Value	Source	Value	Source
La Paz	Bolivia	0.392	Alcaldía de La Paz	6.12%	INE	19.00%	Alcaldía de La Paz	52.02	Alcaldía de La Paz
Antofagasta	Chile	0.376	ONU Hábitat	16.45%	INE	32.24%	Ministerio de Desarrollo Social	36.24	INE
Copiapó	Chile	0.412	ONU Hábitat	15.04%	INE	29.80%	Ministerio de Desarrollo Social	32.61	INE
Iquique	Chile	0.423	ONU Hábitat	18.70%	INE	33.75%	Ministerio de Desarrollo Social	66.73	INE
Santiago	Chile	0.558	ONU Hábitat	40.22%	INE	40.56%	Ministerio de Desarrollo Social	393.64	INE
Barrancabermeja	Colombia	0.410	Programa Dinámicas Territoriales Rurales	8.30%	DANE	30.84%	DANE	113.18	DANE
Buenaventura	Colombia	0.430	Programa Dinámicas Territoriales Rurales	4.60%	DANE	37.97%	DANE	12.03	DANE
Cali	Colombia	0.390	Programa Dinámicas Territoriales Rurales	5.70%	DANE	33.61%	DANE	22.02	DANE
Medellín	Colombia	0.538	DANE	7.50%	DANE	37.09%	DANE	60.54	DANE
Pasto	Colombia	0.523	DANE	5.30%	DANE	31.24%	DANE	54.97	DANE
Aguirre	Costa Rica	0.480	Carmona, Ramos & Sánchez (2006)	13.72%	INEC	24.60%	INEC	41.33	INEC
Garabito	Costa Rica	0.475	Carmona, Ramos & Sánchez (2006)	21.42%	INEC	27.54%	INEC	20.22	INEC
San José	Costa Rica	0.497	ONU Hábitat	12.11%	INEC	39.64%	INEC	19.83	INEC
Quito	Ecuador	0.507	ONU Hábitat	8.39%	INEC	28.11%	INEC	13.49	INEC
San Marcos	El Salvador	0.410	Programa Dinámicas Territoriales Rurales	4.25%	DIGESTYC	34.19%	DIGESTYC	14.24	DIGESTYC
San Salvador	El Salvador	0.409	ONU Hábitat	2.53%	DIGESTYC	37.17%	DIGESTYC	98.39	DIGESTYC
Santa Ana	El Salvador	0.480	Programa Dinámicas Territoriales Rurales	1.85%	DIGESTYC	34.63%	DIGESTYC	40.34	DIGESTYC
Quetzaltenango	Guatemala	0.420	Instituto de Agricultura, Recursos Naturales y Ambiente	6.79%	INE	32.31%	INE	66.52	INE
Ciudad de Guatemala	Guatemala	0.514	ONU Hábitat	4.01%	INE	35.85%	INE	83.67	INE
San Pedro Sula	Honduras	0.477	ONU Hábitat	9.46%	INE	27.58%	INE	766.11	INE
Tegucigalpa	Honduras	0.510	ONU Hábitat	5.51%	INE	30.64%	INE	534.80	INE
Juticalpa	Honduras	0.497	Robles, M. (2003)	5.35%	INE	27.30%	INE	477.31	INE

1.7 Database on structural variables of the model (2/2)

City	Country	Structural variables							
		Income Gini coefficient (2010 or latest available year)		Percentage of residents living in other State five year earlier (2010 or latest		Rate of female-headed households (2010 or latest available year)		Alcohol outlets (2010 or latest available year)	
		Value	Source	Value	Source	Value	Source	Value	Source
Aguascalientes	México	0.437	CONEVAL	4.57%	INEGI	24.03%	INEGI	27.48	INEGI
Tijuana	México	0.438	CONEVAL	6.09%	INEGI	26.56%	INEGI	16.41	INEGI
Torreón	México	0.452	CONEVAL	3.58%	INEGI	24.91%	INEGI	25.33	INEGI
Zapopan	México	0.465	CONEVAL	3.55%	INEGI	25.09%	INEGI	11.18	INEGI
Tapachula	México	0.496	CONEVAL	2.13%	INEGI	29.31%	INEGI	53.99	INEGI
Managua	Nicaragua	0.513	ONU Hábitat	2.35%	INIDE	40.44%	INIDE	696.43	INIDE
Arequipa	Perú	0.369	ONU Hábitat	19.47%	INEI	32.95%	INEI	0.97	INEI
Lima	Perú	0.401	ONU Hábitat	18.70%	INEI	30.42%	INEI	7.14	INEI
Trujillo	Perú	0.382	ONU Hábitat	15.26%	INEI	31.95%	INEI	5.83	INEI
Santiago de los Caballeros	República Dominicana	0.550	ONU Hábitat	8.56%	ONE	38.69%	ONE	1.43	ONE
Santo Domingo	República Dominicana	0.579	ONU Hábitat	8.31%	ONE	41.73%	ONE	1.55	ONE
Sucre	Venezuela	0.888	Agostini & Pérez (2013)	3.56%	INE	42.16%	INE	9.57	Alcaldía de Sucre

1.8 List of empirical studies on crime in Latin America at the city level

Type of crime or disorder	Author & Year	Area & unit of analysis	Findings
Assault & Robbery	Duque et al. (2003)	Colombia City and individual	Age adjusted past year prevalence of witnesses, victims, and perpetrators of physical aggression was 61%, 27%, and 27%, respectively, while lifetime prevalence of witnesses, victims, and perpetrators of assault with a weapon in this population reached 70%, 55%, and 5.8%. Between 11% and 67% of the victims consulted a health service and less than 32% reported the incident to an authority. Those involved in most types of physical violence tended to be young, male, from lower middle social classes, with some degree of secondary education, and single or divorced
Assault & Robbery	Birkbeck (1991)	Venezuela City and individual	Coercive crimes are less situationally clustered than noncoercive crimes and that instrumental crimes are more situationally clustered than character crimes (Situation = the perceptive field of the individual at a given point in time; who is there, what is going on, and where it is taking place)
Burglary & theft	Faria et al. (2013)	Brazil Neighborhood	Higher overall crime rates in the Plano Piloto are related to the concentration of commercial activities, vertical housing, lower density and greater population size, while lower burglary rates reflect the predominance of vertical housing
Homicide	Bergman (2011)	Argentina City	Descriptive data shows the existence of a moderate increase in criminality over the last 15 years combined with a steep rise in violent and property crime during a two-year span in the mid-1990s
Homicide	Ceccato (2005)	Brazil City	Central and peripheral deprived areas show the highest number of killings over the year. Moreover, homicides take place when most people have time off: particularly during vacations (hot months of the year), evenings and weekends. Overall, the results show that temporal variables are far more powerful for explaining levels of homicide than weather covariates for the Brazilian case.
Homicide	Ceccato et al. (2007)	Brazil Districts	Variation in homicide rates is explained by poverty, situational conditions determined by differences in land use, and processes that indicate links with the geography of drug markets and the availability of firearms
Homicide	Falbo et al. (2001)	Brazil Individual	History of personal police records, use of illicit drugs, tap water at home, and maternal age at birth over 26 years were identified as risk factors. While higher education, religious practice, and presence of the father in the household were protective factors.
Homicide	Cerda (2012)	Colombia Neighborhood	The decline in the homicide rate was 66% greater in intervention neighborhoods than in control neighborhoods (rate ratio ¼ 0.33, 95% confidence interval: 0.18, 0.61), and resident reports of violence decreased 75% more in intervention neighborhoods (odds ratio ¼ 0.25, 95% confidence interval 0.11, 0.67). These results show that interventions in neighborhood physical infrastructure can reduce violence.
Homicide	Patino et al. (2014)	Colombia Neighborhood	The percentage of impervious surfaces other than clay roofs, the fraction of clay roofs to impervious surfaces,

			two structure descriptors related to the homogeneity of the urban layout, and the uniformity texture descriptor were all statistically significant. Areas with higher homicide rates tended to have higher local variation and less general homogeneity; that is, the urban layouts were more crowded and cluttered, with small dwellings with different roofing materials located in close proximity to one another, and these regions often lacked other homogeneous surfaces such as open green spaces, wide roads, or large facilities. These results seem to be in agreement with the broken windows theory and CPTED in the sense that more heterogeneous and disordered urban layouts are associated with higher homicide rates.
Homicide & Vehicle theft	Figuereido (2014)	Brazil Neighborhood	For homicides, only income has a significant coefficient. However, the explained variance is 12.36 percent. Income, degraded urban environment, and organizational participation all have significant effects on vehicle crimes. In this case, the variable with the highest impact on crime is degraded urban environment, and its effect is negative. For mugging, only local friendship network was not significant. For the rest of the crimes all variables were significant.
Youth violence	Costa (2014)	Brazil Metropolitan area	Having close relatives incarcerated increases the adolescents' probability of fighting with a classmate by 2.69 p. p. and the probability of misbehaving in class by 4.8 p. p. This result is in line with social learning theories of crime, and it complements recent empirical evidence about the influence of peers on adolescent's time allocation and engagement in delinquent activities
Property crime	Bourguignon (2003)	Colombia City	That part of the population which most matters for time t fluctuations in the crime rate thus are those individuals whose welfare lies below 80 percent of the mean of the whole population. It is the proportion of those people in the population, their mean relative income and the average density of the distribution in that relative income range that better explains time variations in the crime rate within cities. On average over all observations, approximately 60 percent of the population is in that relative income range
Robbery	Paes-Machado & Levenstein (2004)	Brazil City	The approaches used by the police during the raids constitute a disturbance for the users, either in the form of loss of time, caused by having to get off the bus or by the disrespect shown for their rights as citizens. Likewise, police action, by direct confrontation and physical elimination of the offenders, has increased the fear and risk of fatalities inside vehicles
Robbery	Villarreal & Silva (2006)	Brazil City	Lower-income neighborhoods, including irregular settlements known as favelas, have higher levels of social cohesion. Contrary to the results of research in U.S. urban areas, we find that greater cohesion among neighborhood residents is not significantly associated with lower levels of crime, and is in fact associated with a higher perceived risk of victimization. By contrast, neighborhood social and physical disorder increases violent victimization, but does not affect residents' perceived risk of being victimized. The effect of social cohesion on risk perception is explained by the greater spread of information regarding crimes occurring in more cohesive neighborhoods where residents interact more frequently with each other
Violent &	Duque et al.	Colombia	Multivariate analyses of the data show that a family

aggressive behavior	(2003)	Individual	history of crime, physical aggression among family members, lack of clarity of parental norms, beliefs justifying the use of violence, and alcohol consumption are the main correlates of verbal and physical aggression independent of age, gender and social class
Theft	Vilalta (2010)	Mexico Metropolitan Area	Two independent and positive correlations of distance to crime: the monetary gain of the crime and if the prison inmates' intimate partner was also in jail.
Victimization	Cuesta & Alda (2012)	Colombia Individual	Using GMM estimates, this study finds evidence of a relationship between interpersonal trust and victimization, statistically significant and negative in sign
Violent & aggressive behavior	Duque et al. (2011)	Colombia Individual	Men reported the highest prevalence of being victims, perpetrators and witnesses in all forms of violence, except for robbery and sexual violence. The number of victims per perpetrator was positively correlated with the severity of the type of violence. The highest victimization proportions over the previous twelve months occurred among minors. Perpetrators are typically young unmarried males from lower socio-economic strata.
Violence exposure	Hansen-Nord et al. (2014)	Honduras City	Results support previous evidence from Guatemala showing that cognitive and structural social capital were inversely related to risk of violence: people with high cognitive social capital had a lower risk of violence (OR 0.46 CI 95: 0.28–0.76) compared to people with low cognitive social capital, whereas people with high structural social capital had a higher risk of violence (OR 1.68 CI 95: 1.04–2.71) compared to people with low structural social capital.